

**Summary Minutes of the US Environmental Protection Agency
Science Advisory Board Meeting
Sheraton Four Points Hotel, 1201 K St., NW
Washington, DC 20005
December 12, 13, 14, 2006**

Purpose of the Meeting: The Meeting was held to learn about the disaster and emergency response planning and experience of a broad group of non-EPA organizations largely in the private sector. The meeting agenda is in Attachment A. The Board Roster is in Attachment B. The *Federal Register* announcement for the meeting is in Attachment C.

Members Participating in the Meeting:

Dr. M. Granger Morgan, Chair	Dr. James Bus
Dr. Virginia Dale	Dr. Gregory Biddinger
Dr. Baruch Fischhoff	Dr. James Johnson
Dr. Deborah Cory-Slechta	Dr. James Galloway
Dr. Rogene Henderson	Dr. Heeringa
Dr. George Lambert	Dr. Jill Lipoti
Dr. Michael McFarland	Dr. Jana Milford
Dr. Rebecca Parkin	Dr. Deborah Swackhamer
Dr. Joan Rose	Dr. Steve Roberts
Dr. Thomas L. Theis	Dr. Kathleen Segerson
Dr. Robert Twiss	Dr. Judy Meyer
Dr. Valerie Thomas	

MEETING SUMMARY

Tuesday, December 12, 2006

Mr. Thomas Miller, SAB Designated Federal Officer, convened the meeting noting that it was an official meeting of the Chartered US EPA Science Advisory Board and that the meeting would be conducted in compliance with requirements of the FACA and EPA policies for expert advisory committees. Mr. Miller introduced the SAB Staff Director, Dr. Vanessa Vu who welcomed members, agency officials and the public to the meeting. Attachment D contains the sign-in sheets for those persons who registered their presence.

EMERGENCY & DISASTER RESPONSE INFORMATION SESSIONS

1. Chair's Introduction to the Topic

Dr. Morgan welcomed members, expert presenters, EPA representatives and the public. He attributed the Board's interest in planning and response to emergencies and disasters as an outgrowth of: i) the Board's visits to several Regional Offices where science needs were discussed; ii) the Board's reviews of various Regional monitoring

plans during the response to hurricane Katrina; and iii) knowledge of news that was both congratulatory on, and critical of, EPA's response to several events.

Dr. Morgan acknowledged that EPA is working to adapt and enhance its response plans and tools, and that EPA is in a difficult position because of public expectations in response issues seems to be that an agency with "Environment" in its name must have broad authorities for response and recovery actions. However, EPA's response mission is narrower than its name implies. Dr. Morgan anticipates the Board's advice will also be more focused and include a number of things that EPA might do to enhance its readiness.

Dr. Morgan stated that the objective of the meeting was to explore preparedness and response activities by learning of the experiences of organizations that are outside government. This is critical information as the SAB decides on what advice it might provide to EPA in support of Agency enhancements to its readiness program. Dr. Morgan emphasized that the Board would not be the place to, nor does it intend to, develop a plan for those enhancements.

Attachment E contains the pre-meeting and post-meeting materials and handouts giving background on this topic and presentations by the experts who participated in the meeting with the SAB.

Dr. Morgan introduced Ms. Dana Tulis, Deputy Director, EPA Office of Emergency Management who gave an overview of EPA's roles and responsibilities in emergency response.

2. EPA's Roles and Responsibilities in Emergencies

a) Dana Tulis, Deputy Director, EPA OSWER Office of Emergency Management. EPA's emergency response operations are mandated by several statutes (e.g., CERCLA, Clean Water Act/Oil Pollution Act, Stafford Disaster Relief/Emergency Assistance Act), the National Response Plan, and several Homeland Security Presidential Directives.

EPA's Emergency Response Program: EPA has over 30 years experience in emergency response. The system is intended as a "safety net" to back up state and local entities when requested; however, nationally mandated agency responses can also be conducted (events of national significance). EPA receives some 30,000 release notifications per year (20,000 hazardous materials releases and 10,000 involve oil spills) under this program and conducts 300 responses per year. In addition, EPA assists in about 500 responses under CERCLA or the CWA. EPA can conduct clean up operations and often deals with the public. High profile responses have included: i) the World Trade Center attack of 9/11/2001, ii) the anthrax attacks, iii) the Columbia shuttle Accidents, and iv) Hurricanes Katrina and Rita.

More specifically, EPA responds to: i) environmental emergencies, ii) acutely hazardous sites/inland oil spills, iii) nationally-declared disasters, iv) terrorist incidents, and v) major national security events. Response activities include: i) sampling and

monitoring, ii) site screening, iii) decontamination, iv) disposal, v) dust mitigation, and vi) data management.

The National Approach to Response: EPA's national response approach is intended to improve its capability to respond to nationally significant incidents. Response operations are decentralized and based in the 10 Regional Offices. EPA has some 250 On-Scene Coordinators with experience and delegated authority to manage incidents. Support infrastructure for OSC's includes intra-agency, interagency, and contract assets. EPA uses an extensive working and planning relationships with local, state, and federal responders to provide scientific and engineering expertise that has access to state-of-the-art technology.

EPA's response system was established in a policy document issued by the EPA Administrator (Whitman; June 27, 2003) that created the foundation for a system that can leverage across agency resources in a response. There are clearly defined roles and responsibilities for Headquarters and Regional Offices, an Incident Command/Unified Command structure, and a structured approach for full utilization of Agency resources, including a volunteer Response Support Corps drawn from across EPA. EPA's National Incident Coordination Team meets periodically to consider how to improve preparations for responses and response actions. Regional Incident Coordination Teams are also in place. Coordination teams meet as frequently as necessary during events and continue meetings with a focus on preparation at other times.

Areas of special attention within the overall EPA national approach structure include: i) Health and Safety, ii) National Incident Management System implementation, iii) human capital strategy, iv) Incident and data management-IT strategy, v) Response Support Corps, vi) training and exercises, vii) Decontamination Strategy and Decontamination Portfolio, viii) equipment, ix) Field Communications, x) Radiation response coordination, x) Environmental Lab Capacity, xi) Contracts, xii) Administrative Support and Finance, and xiii) Public Communications and Outreach.

The National Response Plan (NRP): The "National Response Plan," mandated by Homeland Security Presidential Directive (HSPD)-5, has an all-hazards focus and sets up how the Federal government responds to "Incidents of National Significance." EPA is the Coordinator and Primary Agency (along with the US Coast Guard) for Emergency Support Function (ESF) #10, Oil and Hazardous Materials. EPA is a Support Agency for numerous other ESFs. EPA works with all appropriate agencies and departments to be prepared for major incidents.

For ESF #10 (Oil and Hazardous Materials) EPA detects, contains and cleans up oil or hazardous material events. Actions can include removal of drums, barrels or containers and household hazardous waste collection. EPA also permits and monitors debris disposal, has responsibilities for water quality monitoring/protection, air quality sampling and monitoring, and protection of natural resources.

EPA Support Functions to other Agencies under the NRP may include:

<u>ESF</u>	<u>Title</u>	<u>Functions</u>
#3	Public Works and Engineering	Drinking water/waste water facility infrastructure protection; assist in determining suitability of drinking water source; locate disposal sites for debris; assessments; technical assistance and monitoring for debris management
#4	Firefighting	Technical assistance for fires involving hazardous materials and assistance in identifying uncontaminated water sources for firefighting.
#5	Emergency management	Support to the Joint Field Office and provision of staff liaisons and technical experts.
#8	Public Health and Medical	Technical assistance and environmental information for health/medical aspects of hazardous materials situations; technical assistance for drinking water supplies; assistance identifying water supplies for critical care facilities.
#11	Agriculture and Natural Resources	Technical assistance for biological and chemical agents regarding environmental monitoring, contaminated crops/animals, and food/product decontamination.
#12	Energy	Response to State/local requests for fuel waivers to address fuel shortages.
#13	Public Safety and Security	Assistance through specialized evidence response teams who can work in a contaminated environment; investigation of criminal violations of environmental statutes; forensic analysis of industrial chemicals.
#14	Long-term Community Recovery	Technical assistance for planning for contaminated debris management and environmental remediation.
#15	External Affairs	Appropriate support as required.

EPA's Role in 2005 Hurricanes: Ms. Tulis commented on EPA's response activities after Hurricanes Katrina and Rita. She underscored the revealed need for adaptability on-site, noting that EPA was able to also rescue over 800 evacuees from flooded sites. EPA worked on sites of varying size (e.g., a large site was the Murphy Oil Spill). EPA participated with FEMA, state, and local authorities in assessing the needs for permanent restoration of drinking and waste water facilities; employed ASPECT (Airborne Spectral Imagery of Environmental Contaminants) to screen for potential releases; used the mobile TAGA (bus based Trace Atmospheric Gas Analyzer) to conduct real time monitoring; conducted real time air monitoring at debris burning sites; and assisted with establishment of long term air monitoring sites.

EPA conducted sampling, analysis, validation, interpretation, and communication of over 10,000 samples from floodwater, sediments, air, and water (over 450,000 total analyses were completed). EPA collaborated with the CDC (ATSDR – Agency for Toxic substances and Disease Registry) on interpreting and communicating the data results. Other activities included hazardous waste removal (over 4 million containers of household hazardous waste were collected; over 660,000 electronic goods were collected and recycled; over 380,000 large appliances were properly handled and recycled). EPA

also monitored debris removal activities, coordinated with USACE on debris management activities, handled fuel waivers, conducted surface water sampling, conducted community outreach, and developed guidance materials.

Another highlight of EPA's Katrina/Rita response was to learn (based on their contacts with RMP, FRP, and EPCRA industrial facilities in the affected areas) that there were no major releases of hazardous chemicals to the environment and for the most part, industry took care of minor releases. Ms. Tulis attributed this to generally well designed facilities and safe shutdown procedures. [NOTE: See additional comments on this aspect in the summaries of discussions below by Mr. Timothy Scott and Mr. Tim Overton, Dow Chemical Co on their preparedness and response activities.]

SAB Comments

Members complimented Ms. Tulis' presentation and asked follow-up questions on several issues. Issues of interest to SAB Members included the following:

- i) EPA's use of generic sampling plans as the basis for plans that were tailored for use at a specific site.
- ii) Transition of Agency focus on acute hazards during and soon after releases to chronic exposures that might be associated with longer time frames needed to complete a large response action.
- iii) The definition of Incidents of National Significance.
- iv) The handling of spatial uncertainties in sampling plans.
- v) The reasons for 6-day turn around required for release of monitoring data to the public.
- vi) Plans for providing interpretive information to supplement the extensive data on analytical results that EPA now places on its website during a major emergency.
- vii) Activities to improve communications and to validate messages that would be typical of those released during an emergency (e.g., are messages understood by decision makers and the public, can their instructions be followed?).
- viii) The utility of EPA's exploration of "message mapping" (Dr. Covello is doing this work for EPA) to EPA's risk communications planning.
- ix) EPA development of nano-sensors for use in monitoring networks.
- x) EPA and/or CDC activities to develop surveillance programs for those exposed to toxic agents during disasters.
- xi) Risk communications lead during disasters.
- xii) The possible use of less stringent DQOs early on in a response and DQOs with increased stringency later in a response.
- xiii) Funding for the analytical work that EPA does on scene.
- xiv) The extent of EPA's consideration of predictable events and developing strategies for responses (e.g., earthquakes will happen, don't know when but they will certainly occur).
- xv) The extent of EPA work on emergency permitting approaches for future events.

- xvi) Responsibility for Indoor Air Quality issues during events.
- xvii) Difficulties in finding informational websites during an emergency.
- xviii) The use of models during events.
- xix) The use of ORD scientists on scene for support.

3. Petrochemical Industry Preparedness and Response

a) **Mr. Timothy Scott** is CSO and Global Director, Emergency Services and Security for the Dow Chemical Company. Mr. Scott gave an overview of Dow's approach to preparedness and response activities. Mr. Scott noted that 60 percent of Dow's manufacturing is located along the Gulf Coast and that facilities are distributed on both sides of the Katrina storm track. Dow's approach integrates several component functions into an overarching chemical security concept, including: i) site/facility/process safety and security; ii) emergency preparedness and response; iii) personnel security; and iv) information security.

Mr. Scott attributed industry success in minimizing releases and responding to the small releases that did occur with Hurricane Katrina (as noted by Ms. Tulis earlier) to be the result of: a) a sound response structure, b) expert response people in place, and c) effective communications approaches. He complimented EPA for outstanding work during the Katrina Response and noted that EPA was good to work with throughout the process.

Key activities in the Dow preparedness and response program include Preplanning, Training, Response, and Feedback of lessons learned to future response planning. Mr. Scott highlighted several key considerations in each of these areas.

- i) Planning Structure: An important aspect is Dow's response structure that incorporates tiered Corporate Crisis Management Teams and eight response centers that prepare for and respond to emergencies. Depending on the scope of an event, "Team" involvement escalates from a site-specific level to higher levels as needed. Dow's development of plans with a "Community-Wide" focus are important to their effective preparation for events. These plans consider issues beyond just the immediate Dow facility. The plans are flexible enough to be rapidly adaptable to reflect the characteristics of actual events that are encountered on the ground. The governing philosophy for all involved is to ensure that their response actions do not make a situation worse.
- ii) Training: Another key to success is frequent "drilling" in the use of response plans so all are familiar with what to do and so that all can learn from such exercises. It is also important to modify existing plans and approaches to address difficulties observed during drills. This training and exercise involves not just Dow personnel, but others in communities where Dow has a presence.
- iii) Response: Dow uses integrated teams that have access to all Dow

technical capability (physical, biological, communications, etc.) and Dow is able to rapidly mobilize this expertise. Mr. Scott stated that a key difference between industry and government in this regard is the ability of industry to move quickly in response situations because of the short approval process associated with obtaining needed assets versus a longer process in government.

- iv) Feedback: Another key to improving preparedness is to conduct “post event critiques” that allow learning from drills and actual responses. The escalating Crisis Management Team structure also allows Dow to put together a big-picture view of the event while conducting their post-event critique of responses. An important lesson from the post-Katrina critique was the need to consider and plan for worst-case scenarios and to plan for and practice responses to such events. Mr. Scott noted that planning prior to Katrina tended to pay little attention to events that were considered not likely to happen.

b) Mr. Tim Overton is the Director of Dow’s Process Safety Technology Center. Mr. Overton noted that the best way to conduct an emergency response is to avoid incidents that lead to the need to respond. In that regard, Dow’s process/facility safety/security programs are an important part of their overall chemical security approach. Mr. Overton used a “Bow-Tie Diagram” to illustrate the way in which an effective process safety management program addresses hazards by incorporating independent “Layers of Protection” (e.g., process, operations, and maintenance along with elimination and mitigation/emergency preparedness measures) to minimize the number of events and the consequences of events should they occur.

In the above approach, Dow uses Topic-specific “Loss Prevention Principles” (e.g., plant layout, fire protection, buildings, venting systems, piping, storage, etc.) that cover many best practices, recommendations, and mandatory requirements for their facilities that are focused on how to design safer facilities. Also, Dow incorporates its Reactive Chemical review process to the mandated Process Hazard Analysis that is required to evaluate facilities on a 3 to 5 year cycle. Dow uses a Process Risk Management Program to determine the level of analysis needed for each facility. This process goes from doing required Process Hazard Analyses in Level 1 to Risk Reviews via Layers of Protection Analyses (LOPA) in level 2, to Enhanced Risk Reviews in Level 3, and finally to Quantitative Risk Analyses in level 4. Specific triggers are used to determine the level of analysis to be conducted.

Mr. Overton discussed how Dow uses “Inherently Safer Technologies (IST) as part of its overall risk management and process safety program. IST’s include techniques such as, using smaller quantities of hazardous substances (intensification), replacing a material with a less hazardous substance (substitution), using less hazardous conditions or less hazardous forms of materials (attenuation), designing to minimize impacts of release of materials or energy (limitation of effects), and designing to eliminate operating errors (simplification and error tolerance). He gave examples of each category of IST action.

Key learnings from IST implementation include: i) IST is best implemented early in a project as a chemical process is first designed; ii) ISTs can be misapplied and result in higher risk if the “big picture” is not properly considered; iii) making chemical plants safer through application of IST is an evolutionary process; and iv) it would be unwise to attempt to regulate the use of IST.

SAB Comments:

Members commented on several aspects of Mr. Scott’s and Mr. Overton’s remarks and asked follow-up questions on several issues. Issues of interest to SAB Members follow.

- i) Members were interested in the extent of reciprocal agreements with other firms that would allow them to work together on responses and response planning. {Mr. Scott stated that such agreements are in place. Emergency events are viewed as “industry” events, not just “firm-specific events.” There is also a Chemical Sector Council associated with Homeland Security that helps to provide industry-wide, and nation wide attention to planning and response. In addition, the American Chemistry Council’s “CARE” program (Responsible Care^R Security Code) provides a code that requires member companies to conduct periodic comprehensive security vulnerability assessments of facilities, IT systems, and transportation, and to remediate vulnerabilities that are shown. }
- ii) Members noted that the scope of consideration in planning, response, and feedback can be narrowed to just a facility. This narrowing can limit effectiveness of responses. Is this a problem encountered by Dow? {Mr. Scott stated that this issue was also raised by its own Independent Advisory Panel on Chemical Security. Dow’s consideration in planning involves all those who are a part of its business cycle. Dow assists these organizations in their preparedness. Mr. Scott noted that Dow can not restart its facility if its supply chain does not function. }
- iii) Members were interested in how Dow prepares to communicate with communities during emergencies. {Mr. Scott again noted the CARE program’s two sided focus. One involves proactive interaction with first responders on emergency response actions. The other is community awareness which involves working with organizations in communities before an event occurs regarding possible situations that could be experienced. A variety of techniques are used, such as, informational signs in shopping malls, quarterly meetings with communities, and sending written information home from school (this has proven to be effective because people tend to read what comes home in this way). Another important factor is knowing what message you need to get out and designing simple ways of doing that. Some of these messages have a “siren-like” function that directs people to additional sources of more detailed information. Once alerted in this manner, communications can

shift to a longer term focus. Dow does have pre-tested messages that are available for use in various situations. Dow also has the ability to call all houses within a 10 mile radius of a facility to alert people to situations and they have “dark” websites that can be brought on line quickly to provide additional information. }

- iv) Members also learned that Dow’s communications is not just directed to those outside the facility but it also includes their workers and targets small, hard to anticipate issues that could be encountered within an office.
- v) How does public health fold into response planning (i.e., coordination with public health departments or regulators)? {Mr. Scott noted that at the local level, County Health Departments look at Dow’s plans via Local emergency Planning Committees-LEPCs. There is an attempt to integrate each organizations’ plans together. A stronger link is now growing with states in this regard, especially in conducting drills and obtaining feedback. }
- vi) The challenges in response are great, what has industry learned from its experience? {Mr. Scott noted that industry probably benefits much from its freedom to act quickly – industry uses teamwork to integrate its assets and efforts and thus can have quick responses. Further, industry knows its plans well and can implement them. Their own Incident Command System helps to get all the players aligned. It appears that government may be hampered in responding in a rapid system-wide way by its decision making process leading to action}.
- vii) Rail transportation seems to present a situation in which you lose some layers of protection. Has Dow been able to move into transportation issues in that regard? {Mr. Scott noted that Dow considers security, safety, preparedness and response throughout its supply chain. The ACC TransCare program (developed by Union Pacific) helps in this. Dow communicates with communities where its product transits so they understand the threat that might exist. Dow is working to further bring the communities around its supply chain into the response preparedness process. Dow is also working on improvements to transit components (e.g., rail cars).
- viii) Is the Dow approach used across the chemical industry? {Mr. Scott noted that across industry we might not be where they would want to be. However, some 90% of production occurs with the major firms who are in good shape in this regard. The remaining 10% of production is spread across as many as 15 thousand companies who are in different states of preparedness. }
- ix) Are the Dow Loss Prevention Principles applied only in the US? {Mr.

Overton stated for Dow they are applied globally.}

c) **Mr. William Wark**, Board Member, United States Chemical Safety and Hazard Investigation Board (CSB), discussed the role of the CSB and several examples of their investigations. The CSB is an independent U.S. agency that investigates accidents in chemical plants, oil refineries, and facilities using chemicals (e.g., toxic gas releases, explosions, fatalities). It was authorized by the 1990 Amendments to the Clean Air Act and follows the model of the National Transportation Safety Board. Members of the CSB are appointed by the President of the United States. The CSB investigates accidents in the chemical industry to determine root causes and makes recommendations that are intended to prevent similar accidents in the future. The CSB's work is open and is communicated through press statements and interviews, press conferences, public meetings, investigation reports/digests, safety bulletins, videos and through the CSB website (www.csb.gov). Typically, the CSB evaluates about 650 incidents each year and investigates some 8 to 12 of these.

Mr. Wark discussed several examples of past CSB investigations. He noted that in some cases seemingly small initiating events can become large events. Mr. Wark cited several areas where improvements could pay significant benefits, including: i) community emergency notification and response, ii) emergency responder training and preparedness, iii) emergency response coordination with on and offsite response organizations, and iv) joint planning in accordance with the requirements of EPCRA.

SAB Comments

Members commented on several aspects of Mr. Wark's remarks and asked follow-up questions on several issues. Issues of interest to SAB Members included the following:

- i) To what extent is the CSB able to separate its analytic work from litigation and advocacy issues? {Mr. Wark indicated that the CSB strives to stay on the analytic side so that its safety mission is not compromised. He believes that the CSB is successful at doing this }.
- ii) Mr. Wark was asked to discuss CSB communications activities that are used to get information out to industry and the public. {Mr. Wark stated that the communications portfolio contains videos, a website, safety bulletins, written recommendations to OSHA and EPA when appropriate, in addition to those items mentioned in his earlier remarks. Mr. Overton, Dow Chemical Co., stated that the CSB does an exceptional communications job and sends out weekly emails, publicizing information at meetings, and often provides videos with excellent information that is useful in training programs. Mr. Scott, Dow Chemical Company, noted that in addition to CSB's formal processes, they have a good working relationship with industry. Also the CARE program discussed earlier is intended to get with the communities and to talk about response plans and

to conduct drills, etc. The whole point of that is to maintain communications and the response network. This is also integrated with Local Emergency Planning Committees.}

- iii) Does the CSB include staff social scientists who can evaluate their risk communications efforts? {Dr. Manuel Gomez-CSB Staff member stated that this was not yet a part of the staff expertise, but they are looking at bringing in expertise from these disciplines to help with communications.}
- iv) How does CSB screen the large number of reported incidents (about 650) and get to some 12 investigations per year? {Mr. Wark noted that the CSB has a protocol that they apply. Incidents scoring below a certain value are not subjected to intense field investigation.}
- v) What is the timing associated with the CSB getting on site? {Mr. Wark noted that the CSB responds within 24 hours and begins by conducting interviews on site.}
- vi) Does CSB look across incidents to see what commonalities might exist? {Mr. Wark noted that so far they have not done this but with sufficient resources it could be done.}
- vii) Has there been a systematic evaluation of the science needs that might be useful in evaluating incidents? {Mr. Overton stated that building relationships with academic institutions might be useful in this regard.}

4. Nuclear Materials

a) **Mr. Alan Nelson**, Nuclear Energy Institute, discussed nuclear power industry emergency preparedness. Mr. Nelson identified the incident at Three Mile Island in 1979 as the initiating event for modern emergency preparedness and he believes that the nuclear industry's system is a model for others.

The industry's Emergency Preparedness (EP) is a part of the Nuclear Regulatory Commission's "Defense-in-Depth" safety philosophy. Emergency Planning Zones are established for each plant at 10 miles (EPZ for plume exposure pathway) and 50 miles (EPZ for ingestion pathways). Facilities are required to have on-and off-site emergency plans that provide reasonable assurance that public health and safety can be protected. Under a Presidential Directive (1979) FEMA has responsibility for offsite radiological emergency preparedness and they interact with NRC to determine whether state and local emergency plans are adequate and provide a reasonable assurance that they can be implemented. Regulatory requirements are contained in the Code of Federal Regulations at 10 CFR 50, Appendix E. There are Standards in 16 specific topics ranging from Assignment of Responsibilities, to Public Information, and Responsibility for Planning Efforts.

Under the EP regulations, Nuclear power plant operators/licensees must: i) develop and implement onsite radiological emergency plans; ii) train onsite emergency responders and conduct periodic exercises; iii) assist state/local agencies in developing offsite emergency plans and training offsite responders; and iv) declare emergencies, notify offsite response agencies, and recommend protective action.

State and Local Governments are responsible for: i) developing and implementing offsite radiological emergency plans; ii) maintaining facilities, equipment and personnel to respond to radiological emergencies; iii) participating in biennial exercises for each licensed power reactor; iv) making protective action decisions and v) notifying the public.

The Federal Government must: i) develop requirements and guidance for emergency preparedness (NRC and FEMA); ii) regulate nuclear power plant licensees (it has no direct authority over states); iii) evaluate and participate in exercises; and iv) respond to emergencies in support of State and local governments in accordance with the Federal Radiological Emergency Response Plan.

Decision Making Processes are shared across Federal, state, local and facility levels. **Nuclear Power Plant Operators:** i) classify emergencies (based on emergency Action Levels); declare an emergency and implement onsite emergency plans; iii) notify offsite authorities (within 15 minutes and NRC within one hour); and iv) develop Protective Action Recommendations. **State and local governments:** i) activate offsite emergency response organizations; ii) review and evaluate information from the licensee; iii) develop Protective Action Decisions based on plant information and weather/travel conditions; iv) alert and notify the public (within 15 minutes); and v) implement preplanned response procedures.

Mr. Nelson discussed a number of lessons that have been learned from exercising emergency preparedness plans. These include the importance of: i) testing all aspects of your plan; ii) insuring that emergency equipment is ready; iii) effective drilling (you perform in the way that you drill); iv) maintaining control over emergency response networks; v) validating procedures; vi) assessing emergency response organizations; and vii) aggressively addressing corrective actions.

b) Dr. Gayle Sugiyama is the Program Leader for Lawrence Livermore National Laboratory's National Atmospheric Release Advisory Center (NARAC)/Interagency Modeling and Atmospheric Assessment Center (IMAAC). Dr. Sugiyama discussed dispersion modeling in support of response activities. This modeling can be used for nuclear power plant and weapons accidents, toxic chemical releases, fires, and biological agents. The LLNL modeling system includes many models that were developed by various agencies to predict plume movement of a variety of released pollutants through the air. Airborne modeling is necessary to determining exposure potentials for released agents.

The first use of NARAC's capabilities was at Three Mile Island in support of the DOE. NARAC mapped dose plots from release of noble gases. IMAAC was created to serve as the single point for coordinating Federal dispersion modeling (April 2004) and disseminating Federal dispersion modeling and hazard prediction products. These products help to determine the Federal position on plume dispersion during actual or potential incidents requiring Federal coordination. IMAAC experts at LLNL provide timely and accurate multi-hazard atmospheric release assessments throughout an event. This includes **Event Information** (weather data, nuclear-radiological-chemical-biological source information, terrain, land use, population databases, measurement data and observations); **Operational Services and Expertise** (suite of stand-alone to advanced WMD modeling tools, 24/7/365 expert scientific staff, detailed analysis, expert interpretation, quality assurance, training); and **Actionable Information** (hazard areas, health effects and exposed populations/facilities, casualty, fatality, and damage estimates, and protective action recommendations and response strategies).

Event-specific information can be provided to show wind observations, forecast data, wind fields, field measurement data, deposition plots, time series or plume animation, plume hazard areas, affected population counts, health effects, protective action guidance, geographical information, and full consequence reports. IMAAC provides Internet- and Web-based software tools to give easy access to information and distribution of predictions to local/state emergency operations centers and local/regional/state responders, as well as to city, county, state and federal agencies.

Modeling is a key resource for preparedness and response activities. For example preparedness modeling has been used in planning, training, and national exercises. It has also been used in expert analysis of risk and threat assessments. Examples of response use of modeling include expert reach-back analyses, national security at special events, major real-world incidents, coordination with multiple agencies, and support of state and local responders and decision-makers.

Decision-makers can use model predictions to inform their emergency response decisions. In this regard, modeling can be used to: i) identify safe approach routes, ii) locate incident command posts, iii) inform decisions on use of personal protective equipment, iv) determine where to deploy field monitoring teams, v) support evacuation/shelter-in-place/relocation decisions, vi) predict impacts to and contamination of emergency response and health services facilities, vii) predict potential numbers of casualties, and viii) identify areas where crops may be contaminated.

Dr. Sugiyama noted that effective modeling support requires close collaboration with other agencies during early, intermediate, and late response phases. Modeling and Monitoring are coupled in a cyclical process to provide the best situational analysis. For example, plume model predictions guide measurement surveys and measurements refine model predictions which continue the cycle to refine monitoring, etc.

Dr. Sugiyama discussed an example of IMAAC support in an actual toxic industrial chemical release in Cincinnati, OH during 2005.

SAB Comments

Members commented on several aspects of Mr. Nelson's and Dr. Sugiyama's remarks and asked follow-up questions on several issues. Issues of interest to SAB Members included the following:

- i) There seem to be few opportunities to learn from real-world events in the nuclear energy industry. How can you be sure your procedures will work in real world events? {Mr. Nelson stated that there are no recent evacuations to learn from in the United States. However, the procedures that have been developed reflect careful study of emergency events with technology and natural disasters – over 50 such events were looked at by the NRC – and the lessons learned from these have been the model for our emergency preparedness procedures. }
- ii) Who is in charge in a response? Does response control present the industry with difficulties? {Mr. Nelson stated that this can be difficult but conducting periodic drills helps to clarify who has control in specific situations. Control comes in tiers which move from the local, to the state level, to the federal level and our plans help in passing control through the tiers as needed. }
- iii) With events like the World Trade Center, or hurricanes, it is simple to define a significant event. What constitutes a significant event in the nuclear power energy sector for an emergency? {Mr. Nelson stated that in one recent year there were 17 unusual events (fires, high winds, power loss, etc.) declared. A 10 minute leak would be a significant event. These situations present realistic situations for testing our preparedness and the lessons learned from them are important. }
- iv) How many events can your center support simultaneously? {Dr. Sugiyama stated that, at a minimum, they can do two major Events of National Significance simultaneously for about two weeks. }
- v) How do you couple health and exposure data to predict risk? {Dr. Sugiyama stated that they use values that have been agreed on by a variety of organizations (e.g., TAGs, AEGLs, PEELs). }
- vi) What type of risk communications is used to help citizens understand implications of being in the track of a predicted plume of contamination? {Dr. Sugiyama stated that people are given information on what they might notice if they are within the exposure plume, e.g., they might be told that they could detect an odor. }

- vii) Do health assessments focus on most susceptible populations? (Dr. Sugiyama thought they probably do not focus on the most susceptible.)
- viii) Focus on pollutants with chronic effects (e.g., benzene) is surprising. It might be better to focus on things that are more noticeable (e.g., the extreme irritation from aldehydes).
- ix) The one-hour time steps in exposure predictions may not be as useful to decision-makers because it may mask actual exposure levels. {Dr. Sugiyama stated that they can get to lower intervals and noted EPA wanted one-hour averages}.
- x) What capability do you have at the building level in urban modeling? {Dr. Sugiyama noted that data to drive building footprint modeling is not as mature as others and that running the models may take hours. Indoor flows are also very complex and with similar looking buildings one can have very different indoor flow of air from the outside.}
- xi) How would EPA bring you in for a nuclear event? {Mr. Nelson noted that in an actual release, the industry can begin actual monitoring before LLNL or EPA get to the scene. At Three Mile Island, the industry did extensive sampling to see if there was any contamination. In case of an actual release, the industry will quarantine a site in the short term and then transition into a recovery phase for the long term. Dr. Sugiyama noted that LLNL can then do actual monitoring on site.}
- xii) Do you use RadNet information routinely? {Dr. Sugiyama said that they are looking into using such information. LLNL can also help in determinations of where to locate monitors that will be brought in.}
- xiii) How are models improved and validated? {Dr. Sugiyama noted four levels of effort; one at a systems level, and several at the model level including basic verification in use of algorithms, field tracer studies, and real world event feedback.}
- xiv) How is model uncertainty conveyed for an event? {Dr. Sugiyama noted that various source term uncertainties are addressed. This is a research need.}

5. Office and Commercial Structures-Protecting Responders

a) **Dr. Henry Willis**, The Rand Corporation. [NOTE: Some of the notes below are taken directly from the actual report volumes provided by Dr. Willis and not necessarily from his summary presentation.] Dr. Willis gave an overview and discussed major messages of each of the four volumes listed below in this series of studies on “*Protecting Emergency Responders*.” The effort was supported by, and conducted in

collaboration with the National Institute for Occupational Safety and Health. The four volumes include:

- i) *Protecting Emergency Responders; Lessons Learned from Terrorist Attacks*, (Jackson, Peterson, Bartis, LaTourrette, Brahmakulam, Houser and Sollinger; 2002; RAND; California, Virginia, and Pennsylvania).
- ii) *Protecting Emergency Responders; Community Views of Safety and Health Risks and Personal Protection Needs*,(Vol. 2) (LaTourrette, Peterson, Bartis, Jackson, and Houser; 2003; RAND; California, Virginia, and Pennsylvania).
- iii) *Protecting Emergency Responders; Safety Management in Disaster and Terrorism Response* (Vol. 3) (Jackson, Baker, Ridgely, Bartis and Linn; 2004; RAND; California, Virginia, and Pennsylvania).
- iv) *Protecting Emergency Responders; Personal Protective Equipment Guidelines for Structural Collapse Events* (Vol. 4) (Willis, Castle, Sloss, and Bartis; RAND; 2006; California, Virginia, and Pennsylvania).

Volume 1, “Lessons Learned”, is a synthesis of the discussions at a conference held from December 9-11, 2001 that was used to gather firsthand experiences from emergency responders. The focus was on “...the performance, availability, and appropriateness of their personal protective equipment...” during their response to terrorist incidents at the World Trade Center (2001), the A. P. Murrah Federal Building in Oklahoma City, OK (1995), and several responses to anthrax contamination during the Fall of 2001. These events were unique and differed from responses to natural disasters in several ways: i) they were large in scale, ii) had long durations, and iii) presented a complex range of hazards (multi—threat environment).

Generally, **personal protective equipment** (PPE) was reported to have shortcomings. PPE often worked as designed, but the design was not adequate for the multi-threat environment presented. Head protection and high-visibility vests worked well, but protective clothing was problematic (insufficient protection from biologicals, heat from fires and not light and flexible enough to work in the demanding physical environment, uncomfortable) as were respirators (fogging of view plates, obstructed views, limited time until tank refill was needed, cartridge to faceplate incompatibility, on-site maintenance). In addition to increased threats associated with the equipment there was the feeling that some equipment also interfered with responders’ ability to accomplish their mission. Training in PPE use was also an issue for ensuring that all those who might respond have adequate PPE knowledge. There is an important need for consistent, timely, and reliable health information relative to threats. **Site Management** issues relevant to PPE use included inconsistent information on risks and appropriate PPE responses, as well as communications of risk, lack of a coherent command authority, lack of perimeter/scene control, and lack of PPE enforcement.

Volume 2, “Community Views,” is intended to help decision-makers i) “understand the evolving work and safety environment surrounding emergency situations” ii) “develop a comprehensive personal protective technology research agenda” and iii) “improve federal education, training, and other programs directed at the health and safety of emergency responders.” The report provides information gathered from interviews with those in the emergency response community; e.g., firefighters, police, emergency medical service responders, researchers, etc. It addresses tasks undertaken, situations where risk is greatest, and current/emerging technologies for protecting responders. It also considers drivers of, impediments to, and gaps in technologies being developed.

Firefighters are generally pleased with their ensemble’s flame retardance and thermal protection. However, they see some component incompatibilities that can lead to exposure, have concerns with the weight and body heat trapping characteristics of their gear, have communications and fire-ground accountability issues, and would like some improvements to their respiratory protection. Emergency Medical Service Responders are concerned with the lack of Personal Protection Technologies (PPT) designed for their varied situations, exposure to infectious diseases and chemical agents – especially in the context of terrorism, physical assault, and the lack of hazard assessment training. Law Enforcement Officers’ concerns include a lack of advance information on hazards on site when they arrive (often they are first), mobility requirements for patrol officers that limit the gear that can be carried, appearance requirements that also limit gear availability, limited training opportunities, and the lack of PPT designed specifically for their tasks. In terms of threats their concerns focus on ballistic protection, automobile accidents, and pathogens/chemical agents.

Across all categories of those interviewed, concern was registered for vulnerability of non-specialist first responders to terrorist incidents due to inadequate protection technologies. Human factors are involved as are logistics issues (e.g., PPT availability, knowledge of risks and appropriate technologies for specific risks; lack of storage and carrying capacity for needed PPT; and equipment maintenance/reliability requirements, expertise, and resources). Equally important to responders was the impact of PPT deficiencies on their ability to carry out their response missions. The report identified relatively straightforward PPT priority issues whose solution would improve PPT, its availability, and its use. Other complex policy issues were also identified for solution if PPT problems are to be solved.

Volume 3, “Effective Management,” “...addresses the protection of emergency responders against injury, illness, and death on ... such rare occasions, when emergencies become disasters.” Its focus is “...on preparedness (especially planning and training) and management as means of controlling and reducing the hazards emergency responders face” and it recognizes that responder safety involves more than just protective equipment. Volume 3 also involves “...preparing thoroughly before an event and managing effectively afterwards.” Safety Management for responders on site requires one to: i) gather information, ii) analyze options and make decisions, as well as to iii) take action. This process occurs in a cyclic fashion throughout a response. In major

disasters that involve a multiplicity of on-scene agencies, there is a need for integrated, incident-wide approaches to safety. Improving this Safety Management Cycle will require i) improvements in gathering information on potential and actual hazards, the responder workforce on-site, and the status of responder injury and health status; ii) assessing hazards, understanding PPT options available and their impact on risks; and iii) taking action by having effective mechanisms to implement safety decisions, to meet medical needs of responders, to have the means to track their status, and to have management systems and procedures in place to control the flow of responders, resources, and safety equipment to an incident. In addition to these issues, there is a need to implement integrated, incident-wide safety management approaches across disparate organizations that will become involved in responses.

Volume 4, “PPE Guidelines for Structural Collapse Events,” characterizes activities and hazards, and develops guidelines for Personal Protective Equipment (PPE) during the first days of a response to large structural collapses (a time when activity is most intense, information most limited, and challenges are often the greatest). It is intended to serve as a technical reference for organizations that manage responses to these events so that they can develop guidelines for use of PPE by emergency responders. Responses to attacks with weapons of mass destruction were not within the scope of the report.

The **most salient health risks** among the possible biological and chemical hazards associated with these events depend on the cause and magnitude of the collapse, “...the building materials and contents, the use and on-site storage of chemicals, the presence and duration of fires, and weather conditions during and immediately following the collapse.” These combine to give a multi-hazard environment that presents multiple possible exposures for responders and others. Biological hazards, which are generally easy to identify and treat, can be from blood borne pathogens encountered while in contact with victims; molds in the air; and various waterborne pathogens. Chemical hazards arise from gases, dust/particulate matter, metals, and various organic and aromatic compounds.

Meeting **biological and chemical protection needs** requires exposure monitoring so that PPE decisions can be made to provide adequate protection. Often adequate information will not be immediately available and PPE decisions will be made on the basis of prudence. For blood-borne pathogens, NFPA approved PPE are generally adequate for most responders, except that those treating victims and those who handle debris will need eye and face protection as well as gloves that are impenetrable to viruses. Waterborne pathogens require water-resistant clothing/boots and prompt washing of contaminated body areas, as well as replacement of PPE when exposed. Protection from pathogens in dust requires use of skin barriers to minimize contact and protect from cuts. Respiratory protection is required if there is an oxygen-deficient environment (SCBA required), smoke from fires, irritant dusts, and/or chemical hazards (air purifying respirators). Incident Commanders will operate with less than full information and with limited PPE availability. Thus, their decisions on respiratory PPE needs must be balanced with the mission goals and practical limitations on use of some PPEs (e.g., dust can

obscure face plates).

Because of the long response duration, multi-hazard environment, and the size of the event, standard **PPE** ensembles may not be appropriate for large building collapse responses and they may require some **modification**. An Urban Search and Rescue (USAR) ensemble is the most appropriate but it should be supplemented with the structural firefighting ensemble if fires or high temperatures are present. Additional modifications to the USAR in large collapses include increased biological protection (latex or nitrile gloves, face shield) and additional respiratory protection (full-facepiece APRs, PAPRs, or SCBAs depending on the situation). For Firefighters working around active fires the full NFPA 1971 structural firefighting ensemble is required. When excessive heat from fires is not present the modified Urban Search and Rescue ensemble discussed above is appropriate. Emergency Medical Services personnel ensembles are not adequate for building collapse and they should use the modified Search and Rescue ensemble (see above). Law Enforcement personnel will usually be involved in perimeter control away from the immediate site but if they enter the site or are to handle victims of the collapse they will need the modified USAR ensemble as well as viral penetration protection and respiratory protection as discussed above. Other Workers (e.g., construction, utility, volunteers) involved with work in and around the response effort must wear the modified USAR ensemble in addition to any specialized PPE required for their trade (e.g., welders would need eye protection). These persons will not likely have access to or training on PPE and this must be provided.

Other Challenges at sites include issues with supply and logistics associated with PPE, integration and compatibility between PPE components from different responder organizations, on-site training for those not familiar with PPE, and decontamination of responders before they leave the site.

SAB Comments

Members commented on several aspects of Dr. Willis's remarks and questioned him on several issues. Issues of interest to SAB Members included the following:

- i) Have studies been conducted on respiratory disease in responders? {Dr. Willis noted that a Mt. Sinai study is showing signs of respiratory disease in first responders at the WTC.}
- ii) Has any post-event analysis been done of spent respirator filters from the WTC? {Dr. Willis did not know of any such studies.}
- iii) Someone should explore whether the buying power of DOD could be used to leverage the market to provide better PPE and at better prices.
- iv) What is the shelf life of respirator cartridges and is this limiting? {Dr. Willis stated that this was not a constraint for some types of canisters but for vapor cartridges it could be. Stocking up on equipment prior to events is usually not good outside major cities.}
- v) How can the guidelines (Volume 4) become assimilated into the system? {Dr. Willis stated that further demonstration of their connections to safety

- management is part of how this can be accomplished. They could be made a part of standard operating procedures, and we can work with Incident Commanders to ensure they incorporate them into their actions. }
- vi) How can on site personnel keep politics from coming into site decisions and send wrong messages (no respirator) or interfere with activities? {There does not appear to be a good solution because they will show up. However, the National Response Plan establishes a hierarchy of officials and their responsibilities that can help to minimize real problems that could arise. }
 - vii) How difficult is communications when wearing respirators? {This is a noted as a problem in the report. }

Wednesday, December 13, 2006

6. Drinking Water Facilities

a) **Dr. L.D. McMullen** is the Chief Executive Officer of the Des Moines, IA Water Works. He is also a member of the SAB Homeland Security Advisory Committee. Dr. McMullen discussed his utility's experiences and lessons learned in responding to a major flood at the Des Moines Water Works (DMWW) during 1993. DMWW pumps an average of 49 million gallons per day with peak pumpage of about 92 MGD. DMWW serves some 400,000 people. The flood resulted from an extreme rain event in the upper Raccoon River watershed on July 8 and flooding overtopped the DMWW 25 foot high levee around 1:00 a.m. on July 11 resulting in plant shutdown about 3:00 a.m. that day.

Among the many problems encountered were flooded and silt/oil/grease contaminated facilities, lack of electricity, destroyed pumps and other equipment, flooded access roads, lack of replacement equipment nearby, the need to obtain replacement equipment rapidly.

The Management Team set a goal to begin pumping again in 7 days. This goal was met and customers were able to use the water for sanitary purposes by day 12 and there was water safe to drink on day 19. Dr. McMullen attributed DMWW's success in this rapid return to service to leadership, teamwork, and effective communications with the public. Leadership was established at the local level because of DMWW's intimate knowledge of the facility and familiarity with all aspects of issues that were important to recovery (i.e., DMWW leaders designed the plant and were the most able to determine how to most efficiently and effectively get it back on line). Leaders developed teams for specific focal areas and each team member had specific responsibilities assigned. Leaders maintained continuous communications with all others at the state and national level who had some responsibilities during the recovery phase.

Teamwork, especially the people who made up the teams, was key to successful recovery at DMWW. Each team was given timelines for accomplishing specific tasks (e.g., setting up a temporary office, restoration of voltage and pumping capability, chemical feeds, dewatering, refilling the distribution system). Teams and management

met often to provide updates on progress, with meetings becoming less frequent as the recovery effort progressed.

Communications with the public was critical throughout the recover phase. This let people know the status of recovery efforts, when water would be available and how it could be used, as well as to gain their help in certain tasks (e.g., when the system was refilled). One person acted as the spokesperson -- twice-daily news conferences were held and periodic tours for the media were conducted at the plant itself. News conferences were announced so all knew when they would occur and they were used to brief all on what had just been accomplished and what would be done next.

Lessons learned during the event and subsequent recovery included: i) communications with the media, the public, and DMWW employees was extremely important; ii) working cooperatively with others (state, city, county, customers) was necessary to success; iii) water supplies are critical and need to be protected; iv) there should be redundancy in the system so all treated water does not come from just one site; and v) use multiple sources of information on threats, such as the extent of flooding to expect.

SAB Comments

Members commented on several aspects of Dr. McMullen's remarks and asked follow-up questions on several issues. Issues of interest to SAB Members included the following:

- i) What types of changes have been made since the flood? {Dr. McMullen stated that they had contingency plans prior to the event and followed it somewhat for the 1993 flood. DMWW now has diversified and there are 3 treatment plants in separate locations. The original plant is now elevated by 6 additional feet, and additional storage capacity has been provided for in case a similar situation should arise. }
- ii) What extra protection was necessary for those working on recovery? {Those working inside the plant were given inoculations, there was sufficient water to have workers shower periodically, and clothing was not laundered on site and not taken home. }
- iii) Did *Cryptosporidium* present any special problems? {*Crypto* and *Giardia* are always something we monitor for and the use of lime softening does a very good job of getting particulates from the system. Also for this event we added 2.5 mg/kg free chlorine to the water to disinfect the system and to discourage people from drinking the water initially. }
- iv) Did your pre-planning work? {DMWW had already planned to use Teams in any needed recovery efforts in prior planning and we knew who would be on each team. The live media events evolved from our prior planning for press conferences. Our earlier ideas on how we would get new parts/equipment did not work as planned, but we did have excellent support from Emory Freight who worked with DMWW on this event and

- our suppliers stayed open on weekends to get us needed supplies. }
- v) Are there arrangements for DMWW to share response resources with nearby systems? {Not for the plant itself, because of the equipment differences, but yes for distribution system issues. }
 - vi) Was the County Health Department on the Communications Team? {They were more active early on but as the event went forward they deferred to the Natural Resources agency who worked with us throughout. }
 - vii) Did you have laboratory capacity problems for monitoring during the event? {DMWW lost its on-site lab to the flood, but the state hygiene laboratory in Des Moines allocated space to us and worked with us on our testing needs. We did not focus on monitoring flood water so much as looking at what was in the drinking water itself. With the high initial free chlorine levels, we did not have any positive tests for coliforms. }
 - viii) Were there problems in coordinating with other levels of officials? {Initially there was a possibility that the State would step in and lead the effort, but DMWW had their confidence and they let us go ahead. The Governor did make the National Guard available to support us in specific ways. The Mayor never indicated a need to step in and take over the lead. }

b) Dr. Baruch Fischhoff is the Chair of the SAB Homeland Security Advisory Committee and a Member of the Science Advisory Board. Dr. Fischhoff discussed the activities of the HSAC that are related to the emergency response issue. HSAC has consulted with EPA on two programs, Water Sentinel and Standard Analytical Methods. The consultation is noted in a letter to the Administrator dated March 20, 2006 (<http://www.epa.gov/sab/pdf/sab-con-06-005.pdf>). The HSAC believed that both programs were responsive on technological issues of water management. However, communications components did not seem to be as well off and they are in need of research to support effective communications during events. Skilled and effective communications are vital in situations where available information on risk is most limited.

For effective communications about available information there is a need for four skills: i) understanding the science being modeled from available information; ii) risk and decision analysis; iii) behavioral science to help in knowing what people do and don't understand relative to messages used to give guidance; and iv) traditional media communications expertise to help in getting the message out (developing the technical message is the province of the first two skills). Dr. McMullen's success story shows how this can be done well if one has the core knowledge and skills noted here (i.e., that message success is built upon a core understanding of the system, the risk, and people's needs and behavior when the known systems experience emergencies, and how to get the word to the people). It could be the case that even with the large expenditures being made on national level emergency response programs, the pieces might not come together effectively without a better understanding of the core issues noted above.

SAB Comments

Members commented on several aspects of Dr. Fischhoff's remarks and asked follow-up questions on several issues. Issues of interest to SAB Members included the following:

- i) The needs to have effective communications at some "random location" will be more complicated to prepare for and to accomplish than in the DMWW example because of the variety of sites and situations that have to be considered, and in essence mastered, prior to an occurrence. Communications is a two way process and the research that is now missing is different than developing tactics to present just one message. There is a need to pre-test anticipated communications approaches and to develop message approaches that can be understood and acted upon. This research would put EPA in a better position to communicate effectively when actual events with specific characteristics do occur.
- ii) It is likely that in the drinking water area the top 100 utilities will be well prepared for emergency situations; however, smaller systems do not have the same training and capabilities as the largest systems.
- iii) Dr. Fischhoff clarified that social science needs for effectively communicating with decision makers and the public is not just in understanding individual behavior. It also extends to organizational behavior, economics, and more. The need for improved knowledge in this area is emphasized in the HSAC consultation report's reference to General Welch's (Chair of the Department of Homeland Security Advisory Committee on Homeland Security) statement that "We give a very high importance to preparedness, realistic expectations and public understanding that lead to confidence...the public needs to know in an emergency that there's one communication channel that they can use to get the information and help they require. It needs to be a consistent source; it needs to be trustworthy." At EPA, current research on the human-information interface seems to be at the bottom of the chain of perceived needs. Thus, the current state of communications knowledge will not help to provide the needed public confidence and it will be attended with great political risk.

7. Transportation

a) **Mr. Patrick Brady**, Assistant Director of Hazardous Materials, BNSF Railway, discussed the BNSF railway safety and response system. As a common carrier, BNSF must handle large amounts of hazardous materials (Hazmat) (and at a competitive rate, i.e., railways can't price the commodity out of its business portfolio to avoid emergency situations). The good news is that accident rates have declined about 90% since 1980 and fatalities in railway incidents since 1989 are roughly equivalent to the

annual fatality rate in trucking. Hazmat accounts for about 5% of total freight rail carloads and about 70% of that amount moves in tank cars. Rail transportation faces significant challenges in preparedness and response, including: the large number of different materials and hazards that could be presented; diverse locations where events could occur from rural to city and arid to wet; the 24/7/365 (hours per day, days per week and year) nature of rail transportation; difficulties and pressures associated with community evacuations; and interruption of third party business as well as rail business (railway down time is valued at \$1 million per hour). There are large logistical issues associated with responses in the diverse response environment associated with railways.

BNSF has a series of response plans in place to deal with events. These include a System Emergency Response Plan for mainline incidents, Local Preparedness Plans for Terminal and Yard facilities, and Local Reaction Plans for non-rail hazards or sensitive environmental receptors. These are in paper form and are being transitioned to Web based “smart” programs to provide countermeasures for specific incidents. Mr. Brady discussed the Incident Notification tree that is used to pass the word on events.

The BNSF “Formula of a Successful Response” involves community responders, BNSF responders and other employees, BNSF’s pre-approved contractors, state responders, and Federal responders. Training is important to ensuring that those involved are successful. Intensive internal training of employees is focused on promoting employee responsibility and providing resources necessary for effective responses. Responders take 80 hours of hazmat training initially and annual refresher training of 32-40 hours on focused topics. BNSF also provides a variety of information and support to local communities (e.g., hazmat flow information, information on shipments via shipping papers and placards, equipment, incident assessments, and field training). Chemical air dispersion modeling is also available for use in incidents. Mr. Brady discussed several rail emergency responses (St. Paul, MN; Scottsbluff, NE).

Lessons learned and issues that confound human and environmental measurement of released chemicals were discussed. Among the lessons learned are things as diverse as i) helping people to understand that detecting chemicals by odor is often well below levels that can cause health effects; ii) being aware of the time component of health criteria applied to a site; iii) evacuating only areas that are necessary; iv) collecting sufficient data; v) the importance of responding to people when they need help, vi) monitoring as needed and demonstrating to people that you are knowledgeable of what they might be exposed to, vii) letting people know that you care; viii) having positive interactions with health departments; and ix) considering dividing samples into sub-sets so that multiple laboratories can do analyses. In addition it is important to maintain positive relations with the media and know what messages are necessary regarding potential contamination concerns for food, clothing, pets, odors, and homes.

b) Mr. Mike Lunsford, Director, Hazardous Material Systems, CSX Transportation, discussed the CSX approach to emergency management. He noted that along with Mr. Brady, two of the six units involved with U.S. railroad hazardous material response are in the room and that this small community talks to each other and share

information frequently. CSX Transportation is the largest railway east of the Mississippi having 21,000 route miles of track. It handles 1,200 trains per day and has 4,000 locomotives and 80,000 freight cars. CSX serves 45 auto distribution centers, 165 bulk intermodal and truck transfer terminals, 125 coal mines, and 105 coal-fired power plants.

The keys to successful crisis management involve:

- i) having incident-adaptable plans – you can't plan for every possible scenario so you need a core plan that is flexible;
- ii) having trained and experienced personnel – people who have “seen this before” can implement a general plan and make it responsive to specific situations;
- iii) being familiar with support resources – new personnel are not as familiar and usually increase costs of actions;
- iv) having courageous leadership – who can make the right decisions and stand by them;
- v) having a bias for action – rapid action without hanging on formalities that impede action; and
- vi) having a common desire to do what is right.

The CSX approach to Disaster Preparedness and Response includes Emergency Responses to events and also to the consequences of events (Consequence Management). CSX has a dynamic process in which information from conduct of exercises, planning, and actual responses, is evaluated retrospectively and used to inform their planning and management of the consequences of future events. The effectiveness of response activities requires up front work with governments and communities prior to an emergency.

CSX uses several guides and programs to plan, exercise and evaluate responses, including, e.g., Transportation Emergency Response Plans for terminals and line-of-road; Community Awareness Emergency Planning Guides; Emergency Response to Railroad Incidents Self-study Program for Responders; internal and external crisis management exercises; response contractor evaluation programs; and annual planning/training meetings with all support groups. Advanced response programs include TestNet Air Monitoring for public and employee safety and Rail Accident Technical Support (RATS) teams.

Mr. Lunsford discussed the CSX response to Katrina in New Orleans. Lessons learned from their activities include:

- i) develop mutual-trust relationships with support entities before you need them;
- ii) share information early with interested parties;
- iii) use common sense logistics planning and response;
- iv) drive decision making to the lowest responsible levels;
- v) response agility ensures getting ahead of most other organizations; and
- vi) implement plans consistently across organizations for mutual benefit.

Mr. Lunsford left a copy of the *CSX Emergency Response to Railroad Incidents – Course Manual* as an example of just one guide provided to their emergency responders to give them information on railway transportation emergency responses.

SAB Comments

Members commented on several aspects of Mr. Brady's and Mr. Lunsford's remarks and asked follow-up questions on several issues. Issues of interest to SAB Members included the following:

- i) Chlorine tank cars are controversial in some urban areas. Does CSX face this issue? {Mr. Lunsford stated that chlorine transportation was a difficult issue and that they try to get shipments off railroad property and into more secure user-property as soon as possible. In rail transit, large yards in urban areas are the norm and we have threat and risk based security plans; physical controls; and trained people that work with TSA personnel to ensure security. Railways also have their own internal security-police forces.}
- ii) How do you handle risk communications, comparisons? {Mr. Brady stated that there are many in the public who are not prepared to believe anything you say and so we communicate as best we can, but only 80% of the people hear and maybe only 10% understand. Mr. Lunsford stated that usually railway companies are not considered as the "trusted organization" in these cases and we often defer to public safety agencies to interpret and communicate based on data we provide. With evacuations, the call is theirs. Mr. Brady referred to Peter Sandman's conception of risk as a function of hazard, exposure and outrage and he noted the difficulty in overcoming outrage.}
- iii) Were the EPA response personnel of help to you in Katrina? {Mr. Lunsford stated that EPA's field personnel are very good and are dedicated. They are stretched too thin, thus we work with them by letting them know of our plans for responses. Mr. Brady noted that EPA representatives usually arrive on scene about the time as the railway contractors arrive.}
- iv) Do railway companies interact much with those who do responses in the trucking industry? {Mr. Brady stated that his contractors usually work with these people. Mr. Lunsford noted that CSX is inter-modal and that they interact with the trucking representatives on an ongoing basis – CSX recently had a regional multi-modal conference to talk of these issues.

8. Non-Governmental Organizations

a) **Ms. Suzanne Mattei**, New York City Executive, The Sierra Club, provided her reflections on communications issues associated with the World Trade Center collapse of September 11, 2001. She started by recommending that EPA involve the SAB when there is an emergency so that it can get another view of how to adjust to information that becomes available during the event. She reinforced her feeling that with the WTC common sense dictated that there would be problems with pollutants by just observing the dust/smoke cloud that was associated with the WTC collapse – there was little need for monitoring to confirm that hydrocarbons and mercury, among other things, would be released.

She noted that the official reaction to the event suggested a focus on getting “back to work” as soon as possible (and apparently with incomplete exposure information being developed and inadequate clean up having been accomplished). Ms. Mattei listed a number of shortcomings that her analysis of EPA’s actions during the event, suggested to her, including: i) not alerting the public to hazards from polycyclic aromatic hydrocarbons (PAHs); ii) not following its own rules for using more modern asbestos testing equipment on site; iii) not testing for the smallest hazardous airborne particles; iv) not conducting indoor air sampling; v) not alerting the public that released dusts were highly caustic; vi) not issuing special warnings to prevent exposure to children and people with compromised health; vii) waiting for too long to begin cleanup and using inadequate procedures when it did so; and viii) not ensuring the safety of indoor spaces. She believes that the new National Response Plan seems to codify as policy some of the behaviors that were unsuccessful in this event.

Ms. Mattei stated that the result of EPA’s performance led to an erosion of the Agency’s credibility with the public. She made several recommendations for the future that would restore trust in the Agency and would mitigate the consequences of its past Ground Zero communications. She suggested that EPA:

- i) “Take action now to prevent more harm from the lack of proper cleanup. A new cleanup must cover both residential and non-residential buildings, including firehouses.”
- ii) “Work with Ground Zero-affected communities, labor unions and environmental health advocacy groups to develop effective national policies and practices that promote truthfulness in the communication of health hazards and effective response actions.”
- iii) “Urge the Department of Homeland Security to revise its National Response Plan to provide strong policies to prevent issuance of false assurances of safety, including establishing a ‘better safe than sorry’ approach to health warnings and eliminating the heavily politicized screening of scientific information on pollution and risks.”
- iv) “Urge the Department of Homeland Security to revoke its radiological cleanup guideline and defer to the Environmental Protection Agency. Why should the contamination caused by terrorists be treated more leniently

than contamination caused by negligence or an accident? Environmental standards should be set by EPA, with proper peer review.

SAB Comments

Members commented on several aspects of Ms. Mattei's remarks and asked follow-up questions on several issues. Issues of interest to SAB Members included the following:

- i) What would need to be in place today for EPA to make a different impression of its performance? {Ms. Mattei stated that the agency should have science advisory oversight from the beginning; it should adopt a "better safe than sorry" precautionary approach to its advice and actions; do better site characterization; conduct better cleanups; and address indoor as well as outdoor spaces.}
- ii) Did the New York City universities prove to be a helpful resource in the response? {Ms. Mattei believes they were not much involved and that mostly they came in after the event with grant proposals to study the event.}

b) Mr. Joe Becker, Senior Vice President of Preparedness and Response, The American Red Cross (ARC). The ARC is chartered by congress to provide disaster relief in the United States. The Red Cross focus is on providing relief to those affected by disasters and to responders. The ARC has some 800 Chapters in the U.S. and each Chapter has a Disaster Team of volunteers that respond to emergencies ranging in size from house fires to large events (e.g., hurricanes, etc.). The response structure is the same for events from small to large, the difference is in the scale of the response itself. The ARC has decentralized decision making to its 8 regions across the nation. A key in the ARC ability to respond successfully is the knowledge that Chapters have of their specific communities and their ability to respond 24 hours a day.

The Red Cross plans locally and each Chapter has a Disaster Plan that is unique to the circumstances/threats in their area. ARC planning focuses on worst case scenarios likely based on the threats and the uniqueness of an area. ARC builds capacity that is flexible enough to respond to any disaster. The plan is used frequently in small responses and when a large event occurs the ARC adds people to the response effort. The downside is that the people added may not have specific expertise based on the local area because they often come from outside Chapters. The Red Cross often partners with the Salvation Army, Catholic Charities, and others from the faith community and elsewhere. It also plans with County, State, local and Federal government organizations. Issues that the Red Cross considers in its drills include what to do when evacuees have no place to return to and the need for shelter for many weeks.

An important factor in ARC relief efforts is maintenance of situational awareness (knowledge of events on the ground). ARC normally keys efforts to the County Emergency Managers. It is important to know about specific characteristics at a site

when deciding where to place people to do their jobs. In Katrina ARC relied to a great extent on best judgments of the situation. The Red Cross also has teams from Harvard and from Johns Hopkins that can work with them on site to help determine health status of persons who come to them for assistance. Also, the US Postal Service is a good source of site information because they go out one day after an event to see who is able to receive mail service. The Walmart Operations Center also has a large amount of valuable information about local sites. The Red Cross also has mobile satellite communications and internet service for deployment. This has been upgraded since Katrina showed a larger need. There ARC made some use of Ham Radio operators to help with communications post-Katrina.

The Red Cross has approximately one million volunteers available. Sixty thousand are disaster trained and available for 3-week deployments to sites. Spontaneous volunteers help also. An issue that can face ARC is that with so many people all may not have exactly the same information on new procedures. However, all personnel know the core policies and procedures that are non-negotiable in an event and we trust them to abide by these rules. However, the “sin” in the relief situation is in not acting. Being wrong in other than “cardinal” practices is not a “sin.” Also, we react quickly so waiting for monitoring results for 6 days is not an option for us to have as a condition for getting people on site.

An important practice for the Red Cross is their Post Event Evaluations to learn of things such as, customer satisfaction, worker satisfaction, and how well they, and their partners, worked on the event. A major lesson from Katrina was that events can become much larger than expected. This revealed a need for mechanisms to move larger amounts of money to a site to fund the needs that were presented.

SAB Comments:

- i) Have you explored use of IPODs on site for reference materials? {Mr. Becker stated that the nurses on site in shelters have PDAs and they have local resource information on them.}
- ii) Do you get information from EPA? {Mr. Becker noted that such information would be coming to the Red Cross indirectly via their contact with County or State Emergency Directors.}
- iii) Who did Red Cross get advice from on protective gear for the World Trade Center? {Mr. Becker stated that their policy is to not put volunteers into harms way. Thus there was not a need for protective gear. However, as ARC considers possible pan-flu situations, identifying “safe” areas will not be as easily determined and we may need to rethink the policy. It is also the case that some volunteers self-deploy to areas and thereby can get into exposure situations and, as happened in Katrina, become victims themselves.}

- iv) How do you get equipment to sites? {Mr. Becker stated that the Red Cross has warehouses located around the U.S. that provide equipment and supplies as an event goes forward. Local Chapters have resources on hand for the first 72 hours. Since Katrina, ARC has added 22 pre-positioned equipment warehouses to the 15 that existed prior to that event. The Red Cross is upgrading its “supply chain” software to help with logistics.}
- v) Have universities been solicited for on-scene risk advice? {Mr. Becker stated that this has not been done in the past because their focus within the overall public health system has been in First Aid. For the future, the risk information needs might require enhancement in this area.}
- vi) Is the Red Cross noticing a drop in the number of volunteers available? {Mr. Becker noted that there has not been a drop in numbers; however, there seems to be a change in how people want to volunteer. They are now less likely to want to volunteer for one day per week. Rather, they seem to want to volunteer to work on specific projects or events and then drop back out of the system.}

NEXT STEPS - EMERGENCY & DISASTER RESPONSE

Members on reflecting at the end of day one of the meeting noted a number of messages that they had gained from hearing the presentations to that point. Members noted:

- i) EPA’s briefing did not clearly recognize that needs differ in the longer term than in the first hours or days following an emergency event.
- ii) EPA does not seem to have moved closer to an understanding that flood water exposure determination through use of *E. coli* testing is not useful. EPA needs to invest in the science to understand the biological side of sewage releases.
- iii) Adaptive management is used often in the eco-risk management area. Does such an approach make sense in the response arena?
- iv) There seems to be no clear information on a Communications Plan encompassing the time from the first few minutes to months later. There is massive data collection necessary. How is that data digested and given meaning to those outside EPA in the impacted area and other areas? Specific information audiences have different needs for the information and all need clear messages tailored to their needs not a one-size fits all message.
- v) It might be useful to contrast the Dow approach to frequent exercising with difficult scenarios with EPA’s sparse practice scenarios.
- vi) It is important to remember that even when EPA has enhanced its practice the agency is but one of many actors in a response and other organizations must upgrade their practices as well. The public expects all agencies to work together and to get it right.

- vii) We have gotten only a quick view of the presenter's approaches so far, but ultimately we might be able to develop a list of resources that we learn of for EPA's consideration.
- viii) The Board needs to think of the key areas it wishes to continue to address based on what we have learned today.
- ix) EPA needs to talk with the public about what its expectations are in cleaning up after an event. There needs to be a strategy that discusses priorities for how one would address specific types of pollutants.
- x) Much of this work is short term and response people may not be linked into ORD to conduct research over the long term. Our advice might be couched within the context of sustainability of actual systems that are impacted.
- xi) EPA seems to be focused on the "message mapping" context of communications. No one expert approach will likely be sufficient for the variety of messages that are necessary. Ultimately messages that are developed need to have a sound behavioral and social sciences underpinning.

Action Items:

- i) Members should provide their input via email to Tom Miller on what you have taken away from the presentations over the last two days. This should include suggestions of what the SAB should do next (i.e., what we might focus on for a follow on activity from this meeting). Suggestions should have a science focus. We are not yet looking for advice to the agency because that would be the intended outcome of what we do next. Dr. Morgan will use this to draft some synthesis of comments and suggested future activities for the Board members' consideration and comment. **{Due Date: January 12, 2006}**
- ii) Ideas for future work were identified:
 - a. Consider competency requirements for enhanced responses.
 - b. Comment on current EPA activities.
 - c. It would be helpful if EPA obtained comments on its performance from its partners and the public.
 - d. Conduct discussions of how the SAB might advise during future emergency situations.
 - e. The SAB might invite additional outside groups to tell their stories as well (County Emergency Managers, e.g.).
 - f. Additional discussions with EPA seem necessary. Advice will be useful only if they are mindful of it. We might ask EPA to think about what it might like to have the SAB focus on as it goes further. Also, the SAB should learn more about the linkages within EPA and among EPA and other Federal agencies, states, locals, etc. in terms of preparedness and response.
 - g. Further discussions on communications seems to be an obvious area

for further focus as does the idea of pushing on site decision making to the lowest possible level (what new institutional arrangements would be needed for this?).

- h. Identification of impediments to getting on site and getting information out to the public seems important.
- i. The differential data quality needs for activities during early phases vs. later phases of responses might be worth further discussions. EPA seems to have an inbuilt bias for high quality data which impedes getting information out in real time (notwithstanding the stated rapidity associated with a 6-day turnaround time). There may be a need to consider the regulatory changes needed to allow more rapid responses.
- j. A discussion of competing objectives of getting back to normal vs. evaluations to ensure no long term health problems from returning too soon seems important.
- k. The needs associated with short term responses are different from long term ones (e.g., recovery) which usually follow a more in-depth evaluative path (e.g., Superfund ROD process) that is more focused on chronic exposures leading to long term health effects.
- l. There is a critical need for information during an event and the quality needs that are associated with data generation. Consideration needs to be given to data interpretation and packaging for communicating on risk and response actions. Lists of un-interpreted data on the Internet do not seem to be very useful to the public or for technical people in other disciplines. Better communications is necessary for the public to understand what is important.
- m. EPA can learn much from the types of private sector discussions we have heard at this meeting.
- n. The scale of events associated with Katrina presented a problem to the whole Federal government. Knowing more about how some organizations scale up to large events more readily than seemed to happen with the government might be valuable to consider (e.g., Red Cross example). EPA's range of possible events, the number of unique places where events could occur, and EPA's uncertain role in specific events might present a more difficult universe of potential response scenarios for which EPA must be prepared to handle. How can EPA learn from the practices developed for the more narrowly described response universe that is faced by specific industries in well-known locations; or for specific organizations as the Red Cross with a more narrow set of on site responsibilities help EPA move forward?
- o. The capacity of EPA to respond will be important to consider (see Fischhoff's 4 key expertise areas). It is not clear how much capacity EPA should build and what capacity should be left for others to build. EPA's authority and responsibility on paper vs. reality on scene is important – what does the public expect of EPA should be an important part of EPA planning for responses. This is all part of the

systems focus that is needed.

- p. There is also the need to consider tradeoffs of the EPA response mission with other EPA mission areas – especially in a constrained resource environment. Can EPA actually do all things and if so, how can they do so?
- q. EPA’s performance in Katrina was good. Their role may be characterized as an “Honest Broker” among other government levels and other actors. EPA could be perceived as a trusted 3rd set of eyes in response situations. This seems an appropriate role.

Thursday, December 14, 2006

Dr. James Johnson served as Acting Chair for the meeting on December 14.

QUALITY REVIEWS

1. Quality Review of the Draft Report on ‘Estimation Programs Interface Suite (EpiSuite)’

Dr. McFarland introduced the Panel’s effort on EpiSuite and its draft report. Notable Panel comments focused on the need: i) to incorporate large amounts of data from the literature and new algorithms into EpiSuite; ii) for more transparency on how data is brought into the system; iii) to expand the functionality available; iv) to update the antiquated feel of the system; and v) because of its use internationally, to make EpiSuite available in other languages. Attachment F provides the written comments on the draft report that were received from SAB members prior to the meeting. Other comments were made during the meeting.

Dr. Swackhamer complimented the draft report as one of the most well-done she has reviewed for the SAB. She noted that EpiSuite is used quite a bit in the academic community. As is often the case, she noted that the full text of the report does not completely track with the Executive Summary or the Letter to the Administrator. For air and water coefficients, there is a need to clarify dimension vs. dimensionless aspects in the draft.

Dr. Theis also complimented the panel on a job well-done. Most of his comments are for clarifications. Line 34 of the letter has no documentation cited for the statement about EpiSuite’s likely role in setting European Union chemical policy (repeated on page 24). Regarding module validation (p. 20, line 35+) needs to have added the need to include this in the Models Knowledge Base. On page 5 line 52 you might not need to use the word “Lavoisier.” The fact that the tool has widespread use suggests the need for a statement calling for more investment in its further development.

Dr. Parkin referred to her written comments (Attachment F) and asked about the seeming inconsistencies among the body, executive summary, and letter. Dr. McFarland stated that each section was focused on distinct audiences. For example, the letter is for

the Administrator, the Executive Summary for science managers, and the body of the report is for those directly involved with developing and maintaining EpiSuite. This is consistent with past Board discussions and guidance on how to focus each section to make them most relevant to audiences expected to read from the report. However, he will ensure that they are consistent.

Dr. Johnson asked if the report was actually one reflecting full consensus of participants. Dr. McFarland noted that the use of “the Panel,” “unanimous opinion,” etc., in the report reflects a breadth of panelist views on specific topics. In essence, it is an agreement to disagree on some aspects; however, the text of the draft in front of the Board was reviewed by the full Panel and approved. Dr. Theis noted that this reflected a continuing need with the SAB for a “writers guide” to give guidance on how to handle things such as this. Dr. Vu noted that general guidance can be given, but it is good for each report to define panel-specific terms. The DFO was given an action item to survey other advisory committees to see if they have issued guidance to their members on this issue. We should take this up in a future meeting.

Dr. Meyer noted that the first overarching conclusion looked like a call for clarification of what to do when a function is not in EpiSuite but it stopped short of explicitly doing so in the letter (page 2 paragraph 1). Dr. Johnson also asked for more information on the “uncertainty” statement in that paragraph. Dr. McFarland noted the Panel’s recognition that EpiSuite does not apply to all chemicals in all possible situations. Some on the Panel wanted to extend the approach to tell EPA to provide guidance for what to do in such cases. In the end the Panel decided that was beyond its charge. As for the uncertainty issue there, the Panel discussed the possibility of asking for quantification of uncertainty within the model. Some thought this would be too confusing to users. In the end there was no consensus for a specific recommendation. We will clarify the paragraph.

Action: A motion was made and seconded to accept the report contingent upon edits being made consistent with the discussion and written comments. The three lead reviewers will review the final edits for conformance to the Board’s approval guidance (Drs. Dickson, Swackhamer, and Theis) and once they agree with the Panel Chair on the edits the report can be sent forward to the Administrator. The Board voted on the motion and it was approved unanimously.

2. Discussion of the Letter to the Administrator on Regional Screening Tools

Dr. Theis provided background information on the draft letter noting that it grew from Members’ insights during the review of several screening tools that had been developed by or for Regional Offices. Some common concerns had been raised during these reviews and the Board decided to write a separate letter to the Administrator and the Assistant Administrator for Research and Development to highlight the concerns.

Members agreed to combine the first and second paragraphs and to add a new introductory sentence to note that the letter applied to such tools in general and not only

to GISST.

In paragraph 3, Members agreed to clarify that some modern tools do not have the deficiencies the letter points to and that some further editing could make the statements better, e.g., “Single vulnerability or improperly derived impact scores...” instead of the existing language. There is a need to soften the statement in the sentence beginning at the bottom of page one -- “It appears that developers of these GIS based tools ignore or are unaware of the large literature on multi-attribute decision making”—and to reflect the need for other statistical tools as well. For example, it could say, “Developers of these GIS-based tools should include the large literature on multi-attribute decision making and other statistical tools.”

Members agreed that paragraph 4 seemed to call for a specific approach to be used and noted that other approaches were available as well. Members decided to delete the paragraph.

Members agreed to note in paragraph 5 that “many models” not just “models which are in development” and add “by EPA Regions” do not rely on..... The SAB has not reviewed all models rather they have recently reviewed REM, ReVA, GISST, and CrEAM.

Members agreed that for paragraph 6 they would revise the language to:

- 1) Add in the first sentence between “EPA decision making,” and “the SAB strongly encourages” the following: “and the ongoing development of statistically based tools by the overall research community,”.
- 2) In the last sentence of the draft change “systems on regression” to systems or regression”
- 3) Add after the last sentence, “The Board urges further development and use of these important tools.”

The letter is to be redrafted and sent to the Board for review.

3. Discussion of the Letter to the Administrator on Risk Assessment

Dr. Parkin summarized the background information on the draft letter to the Administrator on ways to advance human health risk assessment (see Attachment H). The letter grew from a consultation with EPA Office of Research and Development representatives and the combined SAB EHC and IHEC committees. The deliberations during that consultation focused on: 1) addressing aggregate exposure and cumulative risk assessment, 2) addressing populations, groups, or life stages of potential concern, 3) evaluating uncertainty and variability, including probabilistic analyses, 4) involving communities and communicating results, and 5) use of data versus defaults. The letter contains recommendations on 11 issues.

The Board Members agreed that certain edits would be needed in the letter. These include:

- 1) Clarifying that the letter focuses on human health and not ecosystem risk assessment in paragraph 1, and to make this paragraph less clumsy;
- 2) Clarifying the relationship of the 5 topics in paragraph 2 to the charge questions during the IHEC/EHC meeting with EPA;
- 3) Clarify the makeup of the group doing consultations (supplemented with several Board members);
- 4) Throughout the letter ensure that recommendations/conclusions are expressed as those of the Committees and not generally as the SAB;
- 5) In the third paragraph, the fourth sentence “Although this framework identified...” The language created an expectation that there would be a recommendation to prioritize the needs. Add a sentence suggesting that EPA prioritize the needs;
- 6) In the first bullet clarify what is meant by “most relevant data”;
- 7) In the third bullet under paragraph 3, add at the beginning “Continue to” develop greater...” to reflect that EPA has done substantial work already;
- 8) In the fourth bullet “Clarify the underlying assumptions....” might be changed to suggest EPA be “more systematic” in this;
- 9) Possibly add in one of the recommendations a suggestion to evaluate whether risk assessment predictions match the reality; and
- 10) In Attachment 1 to the letter; in bullet 1, define RfD.

A motion was made and seconded to approve the letter contingent upon the edits being accomplished. Drs. Meyer, Dale, Johnson, and Segerson will review the edited letter for conformance with the Board’s approval guidance. The Motion was passed unanimously.

ADVISORY COMMITTEE LIAISON AND STAFF OFFICE UPDATES

a) Dr. Vanessa Vu, SAB Office Director: Dr. Vu updated the Board Members on the FY 2007 Operating Plan and summarized a number of the specific upcoming projects. Dr. Vu noted that the SAB budget for 2007 is flat this year. The resource available will allow us to do about 30 projects.

b) FIFRA Scientific Advisory Panel (SAP) Dr. Steve Heeringa, Chair FIFRA SAP: Dr. Heeringa noted that Dr. Daniel Schlenk has been appointed to the FIFRA SAP beginning in January 2007. He replaces Dr. Christopher Frey whose term has ended (see Attachment I in the physical file). Dr. Heeringa noted that the recent SAP meetings and upcoming meetings are on his handout.

c) Board of Scientific Counselors (BOSC) Updates: Dr. James Johnson noted that his tenure as BOSC Chair is over and that Dr. Swackhamer, of the SAB, is now joining the BOSC. BOSC has completed a number of reports this year, including reports on Water Quality, and STAR. BOSC is ready to start another round of ORD Laboratory

reviews. They are also looking at ORD research at the Program Project Level of activity.

PLANNING FOR STRATEGIC RESEARCH & BUDGET EVALUATION

Dr. Morgan led discussions about plans for the “budget review” on days one and two of this meeting. On day three, Dr. Johnson served as Acting SAB Chair and led an additional discussion with the SAB and Dr. Teichman of EPA.

Dr. Morgan noted on day one that the SAB evaluation of EPA’s research budget is an important task. It allows the SAB to comment to the Congress when asked, it provides additional information to the SAB on EPA’s research programs, and it also helps EPA itself to learn more about its own programs. In past years the SAB reviewed the total EPA ORD research budget (and on occasion some elements of the science programs of some EPA Program Offices). This was all completed in an environment of compressed time frames and without full information on ORD, EPA, and other Federal environmental research efforts. This format allowed the SAB to deliver advice on specific issues that it identified in budget proposals and to support its testimony to the Congress during the appropriations process.

Several years ago, the SAB elevated its review of the research budget from a Subcommittee level to the Chartered SAB itself. The Board also began to shift its focus from a detailed review of smaller research program components (e.g., “small” projects) to a more strategic review of larger programs (i.e., contents, trends, and budgets of Program Projects). Notwithstanding this shift in emphasis for the SAB, the Congress has still requested the Board’s testimony on what could be considered to be small program components.

Dr. Morgan noted that after the last several years of reviewing the EPA research budgets, it was not clear if EPA made use of the advice offered by the SAB. He suggested that on a couple of occasions (most notably, the STAR Fellowship program) the Agency, or the Congress, has taken the Board’s advice and addressed issues raised in the SAB review. However, additional examples are not easily identified. In contrast, on several occasions the SAB has made strong recommendations against cutting the ecological research program, and the Agency has taken the opposite route and made large decreases in the program. This raises the question of whether an activity that takes so much of the SAB’s time and effort each year makes effective use of SAB resources if the advice is not taken.

Members discussed how they might have a more productive interaction on EPA’s research directions. Because EPA seems to need more strategic advice than project specific advice, the Board might try an approach that looks strategically at the total research program and budget and also at some specific cross-cutting program themes. This would allow consideration of strategic research directions across the research program (the big picture trends and focus), and to identify the targets of budget deltas to enable comments to be made on specific issues. Consideration of several key cross-cutting thematic areas of importance in the coming years would also allow the SAB to

learn how issues of emerging importance are being invested in, to identify what more might be done beyond current plans, to identify what core competencies might be needed to do this, and to learn how this might fit within activities in the relevant program offices, i.e., their strategic goals and objectives in such areas (both regulatory analysis and their own “research”). This in-depth look would limit the number of programs that would need to be looked at in this manner and still allow the SAB to explore how well EPA was doing in planning for such important issues.

Possible key themes for SAB focus were identified -- a) Human and ecological consequences of Climate change (impacts, adaptation, and abatement); b) Sprawl (also brings in ecological research in the sense of hybrid ecosystems); and c) Sensitive and susceptible human populations and ecosystem components.

Various factors need to be kept in mind for this activity. One, it seems very likely that the EPA research budget will continue to shrink in the next few years before the picture stabilizes or improves. Another is that some might believe that the SAB should advise EPA on which programs should be cut. The SAB is reluctant to do this.

The Board should not lose sight of how programs are still described by EPA and others in terms of Program Projects, Multi-year Plans, Long-term and Annual Performance Goals and Measures, etc. These are the focus of how EPA, OMB and the Congress consider ORD’s research activities, outcomes, and success. Because of this the Board might need to keep its focus on programs in a way that is compatible with the way in which others consider them. Notwithstanding this need, there is no desire on the part of the Board for long presentations on long lists of specific projects. The Board would like to receive background information early so it can be reviewed prior to the meeting and the meeting can then be used for discussions of research with EPA representatives.

1. Kevin Teichman, Acting Deputy Assistant Administrator for Science, US EPA Office of Research and Development- Strategic Directions for EPA’s Office of Research and Development

Dr. Teichman discussed ORD’s needs for SAB advice on its research directions. He acknowledged the frustration felt by the SAB at the perception that EPA has taken little of its advice on specific budget issues. He believes that the reality is not a rejection of the SAB’s advice rather it reflects the pragmatism associated with a need to set priorities across government for funds that are made available. No agency or department gets all that it asks for; therefore, difficult decisions are necessary.

Dr. Teichman stated that the Agency’s primary need in the research budgeting issue is for SAB advice on the long term directions of the research program, i.e., where the research program should be in 2012. For this focus, advice would be solicited on areas in need of increased emphasis and areas where emphasis can be decreased. In the way of background information, Dr. Teichman offered to have each of the ORD National Program Directors (NPDs) discuss each of their Program Projects. Considerations of how the Agency research program gets to its new emphasis for 2012 will involve

strategic workforce planning (i.e., how to change the workforce to obtain new expertise in emerging science areas while maintaining a diverse multi-disciplinary expertise base) and looking for opportunities to increase the efficiency of programs (e.g., trimming overhead, use of CRADAs under the Federal Technology Transfer Act, and by entering into partnerships with other research entities within and outside of the government).

Dr. Teichman listed several important considerations for getting to a changed program configuration by 2012. These include:

- a) The FY 2008 budget request will be the basis for guidance out to 2012 (i.e., assume that there will be a flat budget over that interval);
- b) Fixed costs will continue to increase at their historic rates;
- c) ORD will maintain high-quality support for its scientists;
- d) ORD is committed to maintaining the STAR program at least at its current level; and
- e) The above implies a more-focused program by 2012 (i.e., there will be some programs that fall out of the ORD portfolio).

An important part of ORD's program will be to continue supporting Regional Office needs. In this ORD will actively seek to link science to outcomes, that is, they will identify examples of how ORD's science has influenced Regional activities and resulted in positive environmental outcomes (i.e., how research has changed the environment).

Dr. Teichman noted that ORD will hold discussions of strategic research program directions during December 2006 and January 2007. The discussions, as well as advice from the SAB, EPA client offices, and others will lead to strategic guidance for the period 2008-2012. This guidance will begin to be implemented immediately thereafter and it will be incorporated into ORD's FY 2009 planning discussions.

2. Questions and Comments of the Board

- i) Dr. James Johnson, Acting Chair, US EPA Science Advisory Board, thanked Dr. Teichman for his presentation. He acknowledged the SAB's frustrations as characterized in Dr. Teichman's presentation and suggested that even with ORD's desire to refocus their research programs, that the full budget is not flexible because of specific programs that must be continued (e.g., NAAQS criteria documents, Candidate Chemical List research, etc.). Dr. Teichman agreed that this was the case and that ORD's system of long term plans for specific Program Projects, is designed to fit into various EPA operating programs. That said, program offices also conduct science activities with resources budgeted under the Environmental Program Management (EPM) account, as well as with some 20% of funds that come from the Science and Technology (S&T) account which is also the source of most of the funding ORD uses for its research program. In addition, homeland security efforts are also S&T focused. Dr. Teichman is committed to providing information on the ORD portion of the research/science programs; but the program office sponsored

science has not been successfully brought to the SAB during the several past years when we tried to do so and thus it will not likely be on the table for discussion this year. ORD tries to mesh their research with program needs, but ORD has no ability to control their science. Thus the premise is correct – not all science is on the table nor is it all subject to quick and unilateral change.

- ii) How is Homeland Security planned? There seems to be no NPD. Dr. Teichman noted that there are ORD leads for planning these activities and that ORD will bring in representatives to discuss the Homeland Security Research Center. This is also the case with Nanotech and GEOSS.
- iii) Is inflation built into your budget projections? If not then you actually have a decreased resource. Dr. Teichman noted that inflation is not built into the budget.
- iv) The SAB will need to obtain written information from ORD to support its evaluation prior to the meeting because we wish to use the available meeting time to discuss the programs with ORD prior to reaching our conclusions. What information will be provided? Dr. Teichman said that ORD will provide some feedback from the ORD Senior Management discussions in December and January. These discussions will determine the 5 year strategic directions for each of the program. It is not certain that the information will be available up front or at the meeting itself.
- v) Are laboratory closures on the table for your planning efforts? Does that influence your workforce planning? We have not had a discussion of lab closures. Attrition via retirement will change the overall structure of the expertise available at different places. We are now supporting some retraining via specific person's Individual Development Plans that are a part of each year's performance evaluation process.
- vi) The SAB can envision giving advice on areas for increased emphasis, not sure about decreases, but how could we contribute to efficiency issues? {It is possible that you will be able to identify opportunities for EPA to leverage with other organizations that you know of. The actual efficiency issues are most directly addressed by the Board of Scientific Counselors (BOSC) who looks at our lab management issues, among other things.}
- vii) During this meeting the SAB discussed how it might conduct this advisory activity (budget or other focus). The Board identified a hybrid model in which it could look at EPA ORD's overall strategic directions and then see how its program tracks with several cross cutting themes that have been identified (climate change, sprawl, sensitive and susceptible subpopulations of human and ecosystem components). The ORD needs from the SAB seem to dovetail with this and the Board will continue to discuss and refine its approach to meet ORD's needs prior to the February 22-23, 2007 SAB meeting.
- viii) When would EPA want the SAB's advice on this topic? Dr. Teichman stated that the President's Budget decisions are at a stage where advice in February 2007 will not

be able to influence the budget for FY 2008. It is possible that such timing can influence the Appropriations activity of the Congress. Having advice in February will mesh with the timing of ORD's planning activities for 2009 forward, some of which will be a part of the FY 2009 budget process and proposal. }

- ix) The SAB will need to be clear about its notion of asking EPA to focus on several key cross-cutting issues in detail so that it will be clear that they are important examples of emerging need but they are not the only areas that the research program should focus upon. All Program Projects will be considered at some level. One of the motivations for the SAB's suggesting several cross-cutting themes comes from the Board's frustration at the perceived Agency indifference to its advice. Also, it comes from the tendency to dwell on details of small research project areas without thinking of them in a larger aggregate like Program Projects, and because of the tendency of the Agency presentations on each of its research programs to be too long and to erode the SAB's time for discussing the programs with EPA.
- x) It might be good to identify areas where the advice of the SAB has resulted in change. For instance, at least two MYPs did not exist prior to our discussions. We might need to identify SAB advisory themes from recent reports and testimony and to see what success stories exist for our advice being taken by EPA, or by the Congress during the appropriations process.
- xi) One of the SAB's roles in doing this review each year is to serve as an advocate for science knowledge in EPA's mission achievement. For this, it is important that the SAB be able to articulate a clear argument about why existing budget support for many programs is inadequate to achieve the support needed for EPA program operations. The approach that asks for relating details of science programs to various thematic mission areas can help us to get to level of detail we need to construct those arguments.

Action:

- i) Further Planning for February: The SAB will continue to discuss its plans within its leadership and then get back with Dr. Teichman to agree on a final approach.
- ii) Background Information: ORD should provide background information based on NPD Key Recommendations from the ORD Dec-Jan strategic discussions on program change 2008-2012. Intent is to focus meeting on discussion and deliberation -- not long dog and pony presentations on specific programs.
- iii) The SAB will explore possible connections with some BOSC members for this task.
- iv) For now, it seems the SAB will:
 - Evaluate the written program information to be provided by ORD;
 - Look for outliers in 2008 budget;

- Determine how the ORD information from NPDs on future trends tracks with several major themes (to which we might add Homeland Security);
- Determine if there is an adequate track from 2008 budgeted items, and plans from ORD to the future (2012) and if there seem to be resources sufficient to support the desired trend.
- Link research activities with EPA's operational programs and desired "business" successes to help the SAB to develop its arguments for why the research program is necessary to successful achievement of EPA's business (mission).

The Meeting was adjourned by the Designated Federal Officer.

Respectfully submitted:

/ Signed /

Thomas O. Miller
Designated Federal Officer
EPA Science Advisory Board

Certified as True:

/ Signed /

Dr. M. Granger Morgan
Chair
EPA Science Advisory Board

Attachments:

- A Meeting Agenda
- B SAB Roster
- C Federal Register Notice
- D Sign-in Sheets
- E Meeting Background Information
- F Draft Epi-Suite Report
- G Draft Regional Screening Tools Letter
- H Draft Risk Assessment Letter
- I FIFRA SAP update

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ATTACHMENT A

http://www.epa.gov/sab/07agendas/sab_12_12-14_2006_agenda.pdf

ATTACHMENT B

Roster

**U.S. Environmental Protection Agency
Science Advisory Board
December 12-14, 2006 Meeting**

CHAIR

Dr. M. Granger Morgan, Professor and Head, Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA,

SAB MEMBERS

Dr. Greg Biddinger, Environmental Programs Coordinator, ExxonMobil Biomedical sciences, Inc., Houston, TX

Dr. James Bus, Director of External Technology, Toxicology and Environmental Research and Consulting, The Dow Chemical Company, Midland, MI

Dr. Deborah Cory-Slechta, Director, Environmental and Occupational Health Sciences Institute, Robert Wood Johnson Medical School, University of Medicine and Dentistry of New Jersey and Rutgers State University, Piscataway, NJ,

Dr. Virginia Dale, Corporate Fellow, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN

Dr. Kenneth Dickson, Professor, Institute of Applied Sciences, University of North Texas, PO Denton, TX

Dr. Baruch Fischhoff, Howard Heinz University Professor, Department of Social and Decision Sciences, Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA

Dr. James Galloway, Professor, Department of environmental Sciences, University of Virginia, Charlottesville, VA.

Dr. Rogene Henderson, Scientist Emeritus, Lovelace Respiratory Research Institute, Albuquerque, NM. Aso Chair: CASAC

Dr. James H. Johnson, Dean, College of Engineering, Architecture & Computer Sciences, Howard University, Washington, DC. Also Chair: Board of Scientific Counselors

Dr. George Lambert, Associate Professor and Director, Center for Child and Reproductive Environmental Health and Pediatric Clinical Research, Department of Pediatrics, UMDNJ-Robert Wood Johnson Medical School/University of Medicine and Dentistry of New Jersey, New Brunswick, NJ

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

of Environmental Protection, Trenton, NJ

Dr. Michael McFarland, Associate Professor, Department of Civil and Environmental Engineering, Utah State University, Logan, UT.

Dr. Jana Milford, Associate Professor, Department of Mechanical Engineering, University of Colorado, Boulder, CO

Dr. Joan B. Rose, Professor and Homer Nowlin Chair for Water Research, Department of Fisheries and Wildlife, Michigan State University, E. Lansing, MI

Dr. Steve Roberts, Professor and Director, Department of Physiological Sciences, University of Florida, Gainesville, FL.

Dr. Kathleen Segerson, Professor, Department of Economics, University of Connecticut, Storrs, CT.

Dr. Deborah Swackhamer, Professor, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Minneapolis, MN

Dr. Thomas L. Theis, Professor, Director, Institute for Environmental Science and Policy, University of Illinois at Chicago, Chicago, IL

Dr. Valerie Thomas, Anderson Interface Associate Professor of Natural Systems, School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, GA

Dr. Robert Twiss, Professor, University of California-Berkeley, Ross, CA

LIAISONS TO THE SAB

a) **FIFRA Scientific Advisory Panel (FIFRA SAP)**

Dr. Steven Heeringa, Research Scientist and Director, Statistical Design Group, Institute for Social Research (ISR), University of Michigan, Ann Arbor, MI,

SCIENCE ADVISORY BOARD STAFF

Mr. Thomas Miller, Designated Federal Officer, Washington, DC

ATTACHMENT C

Federal Register Announcement for the Meeting

ATTACHMENT D

Sign-in Sheets (in physical file only)

ATTACHMENT E

Pre-meeting Information and Copies of PowerPoint Presentations of experts who discussed emergency response approaches with the SAB on December 12-13, 2006

(See in physical file)

ATTACHMENT F

Compilation of SAB Member Comments on Draft EPI Suite Review Report

A. Lead Reviewers

1) **Dr. Kenneth Dickson:**

Tom, I have read the EPI Suite™ Review Panel's draft report and have the following comments regarding the cover letter to the administrator, adequacy of the draft report to address the charge question, the clarity and logic of the report, and whether or not conclusions and recommendations are supported by information in the body of the draft report.

First let me say how impressed I am by the amount and depth of work done by the Review Panel in performing their review of the EPI Suite. The EPI Suite incorporates many facets of chemical risk assessment and the charge questions required the reviewers to not only be knowledgeable about the scientific supporting the current version of the EPI Suite but to be knowledgeable about emerging chemicals and modeling approaches. I think they admirably met the challenge.

I found the letter to the administrator to be refreshing, brief, focused, and appropriate. My only suggestion is that a sentence be added on page 2 line 15 to the effect that ---The Review Panel has made recommendations on possible new chemical categories and associated chemical properties for the Agency to consider when revising the EPI Suite

In regards to the adequacy of the Review Panel to address the charge questions, I think the panel effectively addressed the charge questions and provided thoughtful constructive recommendations. The inclusion of a short overview of the EPI Suite for the reader of the report (pages 4 and 5) prior to direct responses to the charge questions was a thoughtful and effective addition and helps the reader by providing a context.

I think the organization of the Draft Report is good. The Executive Summary expands the important recommendation beyond the overarching issues presented in the Letter to the Administrator. The short overview of EPI Suite is an effective transition into the blow-by-blow response to the charge questions. I liked the bulleted and "Advantage and Disadvantage" organizational approach used in the response to the charge questions.

There are a number of appendices in the Draft Report providing additional information on various responses to charge questions. Upon examination I found that there is a sprinkling of recommendations from the Review Panel in the Appendices. It seems that recommendations are embedded in many different contexts in the report. Some appear as bullets, some as sentences in paragraphs, and some as phrases in boxes in tables in the appendices. Since they take so many different forms and locations in the Draft Report, it might be helpful to present all recommendations in a different font or to bold them to make them more readily apparent. .

I think adequate information is provided in the body of the Draft Report to support the conclusions and recommendations provided by the Review Panel.

2) Dr. Deborah Swackhamer

Pending

3) Dr. Thomas Theis

Pending

B. Other Member Comments

1) Rebecca Parkin

Answers to the three standard questions:

- a) Yes, most of the charge questions were adequately addressed. This reviewer found the responses to 3 A) i and ii the least clear, and validity not directly addressed in 2 G) ii.
- b) Yes, the report is both clear and logical
- c) Yes, the statements are supported effectively.

Other comments:

Overall, the Panel has completed a very sound report, with many technical recommendations for EPA to consider. It is clear that the Panel conducted their work thoroughly and thoughtfully, considering many options and technical issues in response to the Charge. The Panel is to be commended for their excellent report.

However, there are some inconsistencies between the Letter, Executive Summary (ES), and report, which may be worth considering for strengthening the Panel's final products.

The Letter notes three areas of recommendations (scope, accuracy, and ease of operations), but the two overarching findings noted later in the same paragraph omit ease. The report includes many excellent suggestions for improving the ease of operations, so it is unclear to this reviewer why that area would not have been noted with 1-2 sentences in the Letter, as was done for the other two areas.

When crossing the text of the ES and the Letter, the headings used in the former follow the organization of the Charge; these are not the same as the three areas noted in the Letter. The ES covers all three areas noted in the Letter, and also says the least about ease.

The ES and report use the same three major categories (Science, functionality, and uses), but the emphasis placed on some points in the ES does not reflect the sense of priority given to some points in the text. The following are examples of what stood out for this reviewer.

- "Strongly recommends" is often used in the report but is curiously used only once in the ES – for a recommendation which does NOT have "strongly" attached to it in the report (see line 40 on p. 3 and lines 16-22 on p. 36). Some of the strong recommendations in the report are: criteria to identify and prioritize the most important physical-chemical properties, definition of the BIOWIN

module, and use of peer-reviewed literature to determine external evaluation of modules.

- A data quality oversight program is strongly recommended in the report (p. 17), but not noted in the ES. This recommendation appeared to have at least equal weight to this reviewer as did the scientific forum, which was noted in the ES.
- The “opportunities for functional improvement” (p. 2, lines 10-11) are described as “significant” and “substantial” (pp. 26 and 30) in the report, but are not emphasized similarly in the ES. Given the extent of recommendations made in the report, this reviewer believes these opportunities should receive the same emphasis in the ES as in the report.
- Further under “functionality,” this reviewer was surprised that the many recommendations for greater flexibility were not stated. Recommendations about this issue were found in the report on pp. 21, 25-28, and 30.
- Under this section as well, important issues, including one labeled a “major shortcoming,” were not noted (pp. 34-35).
- Issues related to defaults are mentioned many times in the report (e.g., pp. 5, 11, 15, 18, 21, and 27-28), but are not included in the ES.
- Transparency is named in the Letter and addressed many times in the report (e.g., pp. 6, 7, 16, 19, 21, 29, 32-34), but receives little attention in the ES. As a key issue for the Agency, this reviewer would prefer to see more discussion about transparency in the ES.

Are the “technical transfer symposia” on page 7 of the report in addition to the scientific forum recommendation made in the ES?

Less importantly, the ES points under “Science” do not flow in the order presented in the report. Also, this reviewer expected to see the same language in the Executive Summary as in the report, but found little repetition in the ES. Perhaps a clearer linkage and flow of the points in the ES and report would aid the reader.

Nonetheless, this reviewer found the report comprehensive, well-supported, and easy to follow.

2) Dr. Jana Milford

I've completed my review of the EPI Suite report and think the review panel did an excellent job. The review was very clear and did an excellent job of responding to the charge.

There were a couple of places in the report where I wished for clarification. The first is on p. 16, lines 28 - 44. In these two paragraphs, it was unclear whether the panel thought EPI Suite should or should not be "conservative" if it is to be used for screening. It was also not clear to me what the panel meant with the suggestion that "greater transparency in describing the process by which decision errors are considered ... would more effectively communicate environmental assessment decisions." Was this meant as a recommendation for descriptive information to be provided with EPI Suite, or a broader recommendation for the Agency?

The second place where I wished for more information/clarification is on p. 20, lines 8 - 17. Throughout the report, the panel talks about the need to

consider whether the chemical being evaluated is within the "domain" of the training set. I think I understand what they mean by this, but I also think it could be explained better (perhaps by providing an example or two). On p. 20, the panel points to the work by Nikolova-Jeliazkova et al. as a novel approach for describing the domain of a training set. I wish the report could say a little more about how this approach works.

3) Dr. Valerie Thomas

The SAB Panel's review of EPI Suite addresses the charge questions, is clear and logical, and the conclusions are well supported. I concur with the report.

4) Dr. Jill Lipoti

I have no comments on the draft.

ATTACHMENT G
Draft Letter on Regional Screening Tools

_____, 2006

The Honorable Stephen L. Johnson
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington D.C. 20406

The Honorable George Gray
Assistant Administrator ORD
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington D.C. 20406

In 2006 the Science Advisory Board reviewed the EPA Region 6 Compliance Assurance and Enforcement Division's Geographic Information System Screening Tool (GISST). GISST is a tool developed by Region 6 for rapid preliminary environmental assessment and reconnaissance in support of environmental impact statement evaluations. The SAB report on that review was forwarded to you on September 28, 2006 (*SAB Review of the EPA Region 6 Geographic Information System Screening Tool*; EPA-SAB-06-011).

The SAB has also received briefings on Region 6 and Region 4 activities in response to hurricane Katrina including application of GIS tools to target sampling efforts and assist in clean-up operations. The SAB has also reviewed or been briefed on a number of other GIS based tools developed by other EPA regions, laboratories and headquarter's offices. Examples are the Region 4 Southeastern Ecological Framework, the Region 5 Critical Ecosystem Assessment Model, the Office of Water's Index of Watershed Indicators, and the ORD Regional Vulnerability Assessment Methods.

Discussions among SAB members during its review of the draft SAB Report on the Region 6 GIS based screening tool (GISST) catalyzed a broader discussion of a systemic problem that the SAB has observed with other EPA developed GIS based decision support tools. That is, a number these tools do not adequately utilize modern decision analytic techniques in their development of numerical scoring. Single vulnerability or impact scores if improperly derived can mask important differences in individual data layers critical to the evaluation of environmental impacts. It appears that developers of these GIS based tools ignore or are unaware of the large literature on multi-attribute decision making.

It is too expensive to send a team of experts to assess every plot of land for which a change in land-use might be considered. Thus, models which utilize broadly available remote-sensing data, and perhaps other comprehensive and spatially specific information, are desired in an attempt to reproduce the types of ratings that might be assigned to particular plots of land by experts if they had the opportunity to study the plot in person. From a statistical perspective, the way to construct such a model is to select a sufficiently large random sample of plots of land and to actually send teams of experts to each plot to make a quantitative evaluation (probably along a number of several distinct dimensions). These judgments can then be treated as dependent variables in statistical models that seek to explain systematic variation in these actual (and preferred) on-the-ground expert judgments as a function of whatever information can be

assembled from remote-sensing or analogous data. Once the model has been statistically calibrated--and if it can be shown to reliably explain a substantial amount of the observed variation in expert judgment across different types of plots--then there is some basis for arguing that one can rely upon models and remotely sensed data to replace the on-site judgment of a team of experts.

Currently, the models which are in development do not rely on representative samples and statistical inference. There is no opportunity to allow the data to dictate the most appropriate functional forms for these models (i.e. the formulas which should be used to combine the remotely sensed data to produce an indicator of the status of a given plot of land). Instead, these formulas typically involve arbitrary weights on different types of remotely sensed data, based upon intuition, and in some cases, spurious normalizations—a strategy that could be described as “guessing at regression coefficients in the absence of a dependent variable.” The weights being used can be described, at best, as testable hypotheses about the relationships between remotely sensed data and the status of any particular plot of land. But these hypotheses are merely that. They have been neither confirmed nor refuted with real data, although they could be.

Considering the growing use of GIS based assessment tools in EPA, the diffuse origins of such tools within EPA and their potential value to assist EPA decision making, the SAB strongly encourages the Agency to utilize the guidance of its Council on Regulatory Environmental Modeling (CREM).. It is very apparent that technical assistance needs to be provided to developers of GIS based decision support systems on regression modeling and other analytic techniques.

Sincerely

Dr. M. Granger Morgan, Chair
EPA Science Advisory Board

ATTACHMENT H

Risk Assessment Enhancement Draft Letter

DRAFT December 6, 2006

Honorable Stephen L. Johnson
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Dear Administrator Johnson:

The Office of Science Advisor and the Risk Assessment Forum requested that the Science Advisory Board (SAB) conduct a consultation to provide input on ways to advance the Agency's human health risk assessment practices and to update the 1992 Exposure Guidelines, respectively. On September 6 and 7, 2006, representatives of the Office of Research and Development (ORD) and several other EPA offices provided informative presentations to the Environmental Health (EHC) and Integrated Human Exposure (IHEC) Committees of the SAB. The focus of the presentations by EPA representatives for this consultation was on advancements made in risk assessment and exposure assessment. On behalf of the committee members, we would like to express our sincerest gratitude to the presenters for their expertise, perspectives and insights. Their contributions greatly increased our understanding of the Agency's current policies, methods, practices and future directions.

Committee members focused on five major topics throughout both consultations; 1) Addressing Aggregate Exposure and Cumulative Risk Assessment, 2) Addressing Populations, Groups, or Life Stages of Potential Concern, 3) Evaluating Uncertainty and Variability, Including Probabilistic Analyses, 4) Involving Communities and Communicating Results, and 5) Use of Data (Mechanistic, Models, Genomics, CompTox, etc.) versus defaults. Feedback on the charge questions was provided by committee members and summarized according to each of the five topics. A compilation of these comments are appended to the minutes for this meeting. Highlighted in this letter are several key messages that emerged among the Committee members as a result of the Agency presentations and discussions.

The SAB agreed that the Agency has obviously put great effort into advancing risk assessment practices in many areas. The Agency has utilized sound principles and science, external peer review, and is developing guidelines that should result in more transparent assessments. The Agency presented a comprehensive conceptual framework for risk assessment. Although this framework identified many scientific and practical needs, it did not provide an assessment of priorities or a plan for meeting those needs. The SAB is providing a number of overarching recommendations to address both advancing risk assessment and updating the exposure guidelines because the Agency has focused on many of the same concerns with regard to both efforts. The SAB recommends that the Agency:

- Use the most relevant data, ensuring that data derived from humans remains a priority.
- Characterize variability and uncertainty more fully, including extending where scientifically feasible related quantitative analyses to the dose response and hazard identification parts

of the Agency's cancer and noncancer risk assessments, and thereby identify ways to minimize uncertainty.

- Develop greater understanding of modes and mechanisms of action, including mechanisms of genotoxicity, to improve understanding of the relevance of data from animal models to humans.
- Clarify the underlying assumptions used to build probabilistic distributions for the processes and the observations on those processes.
- Incrementally replace the current system of single-point uncertainty factors with a set of uncertainty and variability distributions, using probabilistic methods. (Some of the potential benefits of probabilistic analyses are included in Attachment 1.)
- Advance cumulative risk assessment methodologies, in order to reflect real-world human exposure that includes multiple stressors.
- Consistently address early life susceptibility in assessments, using weightings for children, prenatal exposure, and lifetime to pregnancy (body burden) exposure.
- Include the elderly subpopulation and existing health, medication, and nutrition status when conducting risk assessments.
- Develop mechanisms to evaluate both exposure and human health predictions of current and new risk assessment models.
- Integrate work completed to better characterize cumulative exposure and risk across age groups, and among children and the elderly.
- Determine the status of populations in terms of background exposures and disease factors.

Finally, the SAB recognizes that the design and implementation of new methods will require specialized expertise and sustained support. We urge the Agency to provide the necessary resources and support to ensure that continued improvements are made. We look forward to working with the Agency to further both risk assessment and exposure assessment approaches.

Sincerely,

Rebecca T. Parkin, PhD, MPH
Chair, Integrated Human Exposure
Assessment Committee and
Environmental Health Committee

Granger Morgan, PhD
Chair of the Science Advisory Board

Att. (1)

3 DRAFT December 6, 2006

ATTACHMENT 1

Examples of Potential Benefits of Probabilistic Analyses

- In contrast to the current definition of the RfD, RfDs designed to meet a probabilistic goal would allow the technical vs. policy considerations to be made explicit in quantitative terms—making clear how much confidence the analysts should be able to achieve that risks are below some specified incidence.

- Assessment of uncertainties quantitatively could facilitate “value of information” type analyses to help set research priorities toward the largest and most easily reducible sources of uncertainty.
- A probabilistic RfD system could help reduce the potentially inaccurate implication of zero risk below the RfD. The likelihood of finite risks for some noncancer effects at low doses is highlighted by the recent example of apparently substantial mortality to vulnerable portions of the population from ambient levels of small airborne particles.
- A probabilistic RfD system would provide a capability to quantify risk below or above the RfD. This would allow EPA to quantify benefits of exposure control measures for OMB-mandated juxtapositions of economic and health consequences of different policy options. Without this capability, reductions in air toxics and non-cancer effects from other exposures are effectively not counted in analyses of benefits in regulatory impact analyses. This may lead to underweighting of efforts to abate such effects in the policy formulation process.
- A probabilistic RfD would remove the apparent contrast in the best current assessments that are highly sophisticated probabilistic exposure assessments joined to simple-appearing single-point representations of information from the field of toxicology.
- A probabilistic RfD system would encourage the generation of better information because it would create a clear regulatory market for such a system. As pointed out in our discussions, this would improve on the World Health Organization International Programme on Chemical Safety’s (WHO IPCS) data derived uncertainty factor procedures, that are not rigorously founded in terms of allocation of variances between pharmacokinetic and pharmacodynamic components, or over-constrained by the requirement that default kinetic and dynamic components must multiply to the traditional factor of 10.
- An innovative probabilistic system is more likely to attract the efforts of innovative researchers interested in producing improved technical information and seeing policy responses to that information. Currently researchers in this area have a difficult struggle to achieve acceptance in place of the heritage of prior “case law” choices made from the 1954 Lehman and Fitzhugh “100 fold safety factor” paper to the present.