

**U.S. Environmental Protection Agency (EPA) Board of Scientific Counselors (BOSC)**  
**Homeland Security Subcommittee**  
**Face-to-Face Meeting Minutes**  
**February 14–16, 2017**

**Dates and Times:** February 14, 2017, 8:00 a.m. to 6:00 p.m.; February 15, 2017, 8:00 a.m. to 5:30 p.m.; February 16, 2017, 8:00 a.m. to 1:00 p.m. Eastern Time

**Location:** EPA Research Triangle Park Research Facility, 109 TW Alexander Drive, Durham, North Carolina

**Meeting Minutes**

Provided below is a list of the presentations and discussions that took place during the meeting with hyperlinked page numbers. The minutes follow. The agenda is provided in Appendix A, the participants are listed in Appendix B, and the charge questions are provided in Appendix C.

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**Tuesday, February 14, 2017**

The meeting generally followed the issues and timing as presented in the agenda provided in Appendix A of this meeting summary.

**Introductions**

*Thomas Tracy, Designated Federal Officer (DFO)*

Mr. Tom Tracy, the DFO for the Homeland Security (HS) BOSC subcommittee formally opened the meeting and welcomed the HS members. The BOSC subcommittee and attendees in the room introduced themselves.

Dr. Paula Olsiewski, Chair of the HS subcommittee, said she is a Program Director at the Alfred P. Sloan Foundation where she directs the Foundation's programs in Microbiology of the Built Environment and Synthetic Biology. Dr. Tammy Taylor, Vice Chair of the subcommittee, is the Chief Operating Officer of the National Security Directorate at the Pacific Northwest National Laboratory. Mr. Edwin (Ed) Roehl is the Chief Technical Officer for Advanced Data Mining International with expertise including data mining and water assessment. Mr. Edward (Ed) Hackney is the Director of Engineering Systems at SUEZ North America, a company formerly known as United Water. His focus involves supervisory control and data acquisition cybersecurity. Mr. Lance Brooks works for the Defense Threat Reduction Agency running corporate and biological engagement programs. His expertise includes homeland security science and technology, response, and restoration. Dr. Debra (Debbie) Reinhart is the Associate Vice President for Research and Scholarship with the University of Central Florida. Dr. Michael Wichman is the Director with the U.S. Food and Drug Administration's Office of Regulatory Affairs and is affiliated with the Arkansas Regional Laboratory. His expertise involves analytical chemistry and sampling and analysis. Mr. Andrew DeGraca is with the San Francisco Public Utilities as the Water Quality Division Director. He is a licensed chemical engineer with extensive knowledge of water quality and treatment. Ms. Melanie (Patricia) Lamb is the Critical Infrastructure Protection Program Manager for the District of Columbia Water and Sewer Authority. Dr. Monica Schoch-Spana is a Senior Associate at the Johns Hopkins University Center for Health Security. Her background is in cultural anthropology as well as disaster response and recovery from the perspective of citizens and the society at whole.

Dr. Gregory (Greg) Sayles, Director of the Homeland Security Research Program (HSRP), and Dr. Emily Snyder, Deputy Director of the HSRP, introduced themselves and welcomed the subcommittee members.

**Welcome**

*Paula Olsiewski, Chair*

*Tammy Taylor, Vice Chair*

Dr. Olsiewski explained that the HS subcommittee's charge is to oversee, review, and develop recommendations for the HSRP to improve their research. She expressed excitement about the learning about EPA's efforts anthrax cleanup work. Dr. Taylor welcomed the newest members.

## Overview Presentation

*Gregory Sayles, National Program Director*

*Emily Snyder, Acting Deputy National Program Director*

Dr. Sayles explained HSRP's mission, EPA's HS responsibilities, specific area of the program being reviewed by the BOSC, wide-area biological incident scenarios and challenges encountered during those events, and the complexity and scope of the program's response. He noted the subcommittee would be presented with HSRP's current research portfolio for a wide-area biological event and an overview of the research conducted by scientists working in the National Homeland Security Research Center (NHSRC).

The HSRP mission is focused on assisting EPA with their HS responsibilities by conducting the right research and constructing the desirable products. The program has three main responsibilities. First, HSRP supports water systems in their preparation and recovery from attacks and other disasters. Second, HSRP is responsible for the cleanup of buildings and outdoor areas. Finally, the program is accountable for developing a nationwide laboratory network. The HSRP is designed to fill science gaps.

Dr. Sayles emphasized that HSRP's responsibility is not to carry out HS responsibilities. This is the responsibility of other program offices. Within the realm of research and development, the program seeks to fill the most critical science gaps across all areas. HSRP works closely with each program office to identify key priorities.

During the previous HS subcommittee meeting, the HSRP asked the BOSC for feedback on the entire program. This year, Dr. Sayles explained that HSRP wants to focus on research on wide-area remediation due to the Agency's high priority on wide-area biological incident response.

The component of the HSRP focused on biological agents is organized into five science questions: fate and transport, characterizing contamination and assessing exposure, decontamination, waste management, and decision support.

Dr. Sayles presented an example from the Department of Homeland Security's (DHS) Wide Area Recovery and Resilience Program. The example described a hypothetical incident in which a truck releases spores on a highway in Denver, Colorado. An important research question is to consider the breadth of the impact.

Dr. Sayles presented a subway release scenario example. If a biological agent were released in a subway station in New York and subway tunnels might distribute the release of the agent, the Agency would expect most of lower Manhattan to be affected. This would result in an area shut down and impacts to human health. He presented a diagram showing transportation system shut downs, highlighting the potential impacts to public health and the economy. He emphasized the scale, complexity, and capabilities needed for remediation.

Dr. Sayles asked the subcommittee to imagine a similar release in downtown Washington DC. After such an event, EPA would be tasked with restoring and reopening the area. The Agency would first characterize the extent of the contamination (e.g., capacity needed, complexity, subway stations, detailed infrastructure, waste generated, carpets in buildings). EPA strives to identify and fill the science gaps so that the Agency can perform this duty well in the future.

Dr. Sayles explained how HSRP decided to prioritize decision making. At the national scale, HSRP uses the White House Office of Science and Technology Policy to address research gaps associated with each scenario. DHS risk assessments and other sectors focus on water priorities. To identify the highest priorities, HSRP engages the response part of the Agency and specifically responders, guidance/policy, and water utilities. The program then inserts that into a “reality lens.” The program identifies the available facilities and budgets of these resources. Dr. Sayles explained that HSRP form collaborations with additional agencies.

Dr. Sayles described the basis of the national priorities as well as EPA’s responsibility to address these national priorities. HSRP works with Agency program and regional offices to create its research portfolio. Dr. Sayles emphasized that the subcommittee should address the actual body of work HSRP is conducting to address the needs of the five science questions.

HSRP’s research is focused on *Bacillus anthracis* (anthrax) and a limited amount of research is also conducted on other priority biological agents. Because anthrax decontamination is so difficult, HSRP is focused on developing an optimal decontamination method. *B. anthracis* is a persistent spore that often does not go away on its own and must be cleaned up. It is heat resistant, chemical resistant, and aerosolizable.

The subcommittee was tasked with addressing the following questions:

1. Are we doing the right research? Taking resource limitations into consideration, should the HSRP increase or decrease the emphasis of certain areas of research?

Dr. Sayles asked the subcommittee to determine if HSRP was using the right body of work. He stressed the subcommittee should not focus on the needs driving the work but on the actual program, if HSRP is on track to address those needs, and if emphasis has been placed in the appropriate areas.

2. Assess the current approaches that the HSRP uses to transition research to end-users. How might these approaches be improved?

Dr. Sayles emphasized the importance of getting the work into the desirable end-user’s hands and asked the subcommittee to address how effective HSRP is at that transition.

3. To what extent will the program’s work provide multiple benefits to our nation by addressing critical needs beyond those directly related to terrorist attacks?

HSRP is focused on the use of biological agents by terrorists. Dr. Sayles stated they want to have multiple uses for their work (e.g., applicable to other kinds of environmental challenges). As the subcommittee views the portfolio, Dr. Sayles asked them to brainstorm other areas where this research could be applied more broadly.

Dr. Olsiewski asked the amount of the current HSRP research budget. Dr. Sayles replied that the budget changed every year. The current budget is approximately \$20 million, which includes funds for research, salaries, and benefits.

Dr. Sayles introduced Dr. Bruce Rodan, the Acting Deputy Administrator of Research and Development, who is acting as the Science Advisor to the Acting Administrator of Science, Dr. Robert Kavlock. Dr. Rodan emphasized the importance of the BOSC’s role to the Office of

Research and Development (ORD) by providing expert advice to improve their research focus and work. He thanked the subcommittee for their thoughts and opinions.

**Presentation of the Fate and Transport Mechanisms for Biological Agents in the Urban Environment to Inform Mitigation and Cleanup Decisions**

*Paul Lemieux, NHSRC*

Dr. Paul Lemieux explained that this project focused on fate and transport mechanisms for biological agents in the urban environment. Specifically, the project examines where the agents move after their release and the duration of their persistence in the environment.

There are many potential transport mechanisms, but HSRP typically focuses on the outdoor area including buildings, tunnels, subways, and environmental media (e.g., air, land, and water). During a biological incident, there is a latency period between the release of an agent and the realization that a release has occurred. If information is not properly disseminated, knowledge of the release may not occur until victims begin visiting hospitals. Many of the fate and transport activities include developing mitigation and response approaches.

Outdoor remediation challenges include reaerosolization, infiltration into buildings, the impact of precipitation events, possible presence of naturally occurring organisms, and selecting appropriate staging areas for response personnel and waste management.

Partners want to understand the fate and transport of spores in wide areas to inform sampling, analysis, and remediation. Another important component is understanding the fate and transport of spores through a wastewater treatment (WWT) system, their impacts on plant operations (including impacts of wash-down additives on the fate and transport in WWT), and the impact of spores on sludge. It is also important to understand how the Agency can use the available information to alter tools to predict the impact of fate and transport in the environment (including water and wastewater).

Dr. Lemieux explained HSRP is examining several aspects of these problems. First, the program strives to study the transport of particulate-based contaminants (e.g., spores) from realistic-scale physical models. It can be difficult to study small particles in a large area because of scaling issues. HSRP seeks to look at mannequin studies in a large aerosol test facility (i.e., wind tunnel) to examine tracking and the influence of human activity in a building on spore movement. They also want to determine persistence of priority biological agents under a range of weather conditions and on different surfaces. Lastly, the program strives to study the transport of spores and vehicle contamination due to response vehicle traffic.

Dr. Lemieux explained HSRP is evaluating the issues of naturally occurring target organisms. For instance, if there is a wide-area incident involving anthrax, the program wants to find the location of the spores and explain if the location could serve as a natural reservoir for the organisms.

The program wants to create interactive maps of naturally occurring target organisms based on soil characteristics and environmental conditions. To create such maps, an appropriate surrogate must be used during a large-scale field testing scenario. Currently, HSRP is developing a report on the transport of *B. anthracis* surrogate spores in the environment as well as the persistence of

vegetative bacteria in the environment. They are also conducting experimental and modeling studies of the fate and transport of *B. anthracis* spores or surrogates due to precipitation and flooding events. HSRP wants to develop strategies to divert precipitation and address whether a rain event can dislodge the spores, and if so, where the spores travel.

Planned outputs include interactive maps, developed using geographic information system (GIS) approaches, of naturally-occurring microorganisms of interest as a function of environmental conditions and soil composition. Dr. Lemieux stated EPA partners have requested exposure studies in a field environment. One goal is to conduct a field study with the partners to examine an outdoor remediation. Project goals also include evaluating how spores are transported in a subway environment and how this transport might impact the cleanup approach.

Dr. Lemieux stated that during the demonstration portion of the meeting the subcommittee would observe experimental studies assessing fate and transport of *B. anthracis* spores or surrogates due to precipitation and flooding events. He stated that a reactor chamber is used to simulate different types of rainfall to fall on small pieces of test material (coupons) with a uniform concentration of spores. This work helps guide remediation, identify overland flow, and examine linear velocities of water that may be simulated from roads.

Other work is focused on identifying the appropriate surrogate to use for outdoor studies. The experiment, which involves two small wind tunnels, must be conducted with both *B. anthracis* and a surrogate to determine if the surrogate is appropriate. Because EPA cannot conduct this experiment using the actual *B. anthracis* strain in its laboratory, the experiment will be conducted with *B. anthracis* at an Army laboratory.

Results would be used primarily by HSRP's partners such as EPA's Office of Land and Emergency Management (OLEM), who provide technical support directly to the EPA regional offices. Results are used to inform mitigation decisions and are incorporated into decision support tools. HSRP wants to develop mapping products for direct use by partners and provide technical support for deliberate contamination incidents, accidental biological releases, or naturally occurring contamination.

Dr. Olsiewski asked what conditions are required for the spores to germinate. Dr. Sarah Taft explained several variables are needed to create the right environment, including temperature and humidity. Dr. Olsiewski noted that once a spore loses some of its properties, it may be easier to kill.

Dr. Reinhart stated that chemicals can be characterized based on their properties. She asked if there was an analogous characterization for biological agents. Dr. Lemieux explained the program strives to identify and capture these properties, but there are challenges.

Dr. Reinhart asked if information on surface adhesion could be extended to other agents. Dr. Lemieux stated that it was just applicable to spores because other agents are not aerosolized or persistent in the environment.

Dr. Wichman asked if there were studies on particle size distribution. Dr. Lemieux suggested talking to Dr. Russell Wiener during the first demonstration portion of the meeting.

Mr. Roehl asked what had been learned from past anthrax releases. Dr. Lemieux noted that some of this information is classified and that most of the current information is primarily based on work conducted by HSRP. Dr. Lemieux explained that the military work, which primarily focuses on how troops are impacted and how to minimize threats to those troops, had a different goal and did not obtain the data the program would need. Because the civilian application has different questions to address, Dr. Shawn Ryan stated the military data and results were not as helpful.

Dr. Lemieux mentioned that much of the work done on assessing indoor decontamination is in direct response to the gaps identified in the 2001 incidents.

Mr. Brooks asked if the demonstrations would discuss the validation of models. Dr. Lemieux responded that validation would be discussed. Mr. Brooks explained that intentional releases would likely aim for a greater adverse impact and would not correlate with natural releases data. Dr. Snyder responded that Dr. Taft would discuss this issue within the context of exposure. She added that strain specificity is also an important consideration because not all strains are equivalent.

Mr. Roehl asked how the program would characterize the current state of the knowledge. Dr. Lemieux responded that EPA has a long history of studying certain particles in the atmosphere, but their knowledge of spores is lacking. Dr. Lemieux explained that HSRP research is adding to the information base on adhesive properties, where tracking human beings might lead to increased exposure, and dispersion of spores in an urban environment using models.

Ms. Lamb asked if EPA was collaborating with any international organizations. Dr. Worth Calfee stated they try to coordinate, if possible, and align the research programs so they do not duplicate efforts. Dr. Ryan explained that similar work is being conducted in Turkey.

Mr. Roehl asked for details on the current state of in-place water treatment facilities to deal with wastewater streams produced during a cleanup effort. Dr. Hiba Ernst explained there were no federal rules or regulations associated with accepting wastewater. The Agency coordinates efforts with the National Science Foundation to examine the guidelines and means to treat the water. Dr. Ernst stated onsite treatment increases the disposal capability. Mr. Roehl asked why they would not utilize a municipal WWT facility. Dr. Ernst answered that these facilities do not want to accept the wastewater.

## **Demonstrations of Specific Research Efforts and Product Development**

### ***Aerosol Test Facility***

*Russell Wiener and John Archer, NHSRC*

Dr. Wiener provided a description of the facility and introduction of the general program. He explained that reaerosolization is of particular concern after a wide-area biological agent release. To address this concern, HSRP has conducted research using a small wind tunnel to examine particle reaerosolization from common outdoor urban surfaces. Dr. Wiener stated that previous studies have shown that *Bacillus thuringiensis*, a commonly used biological pesticide, was a viable *B. anthracis* surrogate.

Dr. Wiener discussed two research efforts—the Brooklyn Traffic Real-time Ambient Pollutant Penetration and Environmental Dispersion (B-TRAPPED) study and the Scientific Program on Reaerosolization and Exposure (SPORE) study.

Mr. Roehl inquired about the adherence properties of the biological contaminant used in the research experiments. Dr. Wiener explained that numerous variables being tested including the type of deposition, test surfaces, effect of surface roughness, wind velocity and amount of resuspension. Dr. Wichman asked about the effects of varying particle size. Dr. Wiener discussed the distribution of particles and single particle deposition versus multi-layer deposition. He also mentioned the effect of precipitation effect of surface.

Dr. Laurie Brixley, research scientist with Jacobs Technology, discussed other research experiments including reaerosolization studies using the wind tunnel. She discussed the preliminary findings using wind-induced reaerosolization in both outdoor and indoor environments. Dr. Brixley presented findings on the resuspension of particles by a walking simulator and demonstrated a foot to carpet apparatus and the effects into the breathing zone.

Mr. Brooks asked for details regarding the use of wet versus dry deposition and the incidence of anthrax reaerosolized directly into the environment. Dr. Wiener responded that the purpose of the HSRP projects is to identify parameters that are most important for the removal of *B. anthracis* and determine how much energy it takes to remove the contaminant.

After the demonstration site presentation, the BOSC HS subcommittee visited the wind tunnel, scientific posters, and a mock-up of nine surface areas. Mr. DeGraca asked for details on the percentage of contamination that is resuspended or stuck to other materials. Dr. Wiener stated that parameters, such as particle type, particle concentration, and relative humidity, could cause a constant release for days. He explained that HSRP is conducting grass and sod studies in the wind tunnel to examine effects of exposure in an outdoor environment.

Dr. Olsiewski asked if research is being conducted using aged and soiled materials, as well as materials such as paint and wood, to reflect a real-world scenario. Dr. Wiener explained that age and erosion of materials is being examined.

### ***Water Wash-Off Experiment***

*Anne Mikelonis and Worth Calfee, NHSRC*

Dr. Anne Mikelonis demonstrated the experimental apparatus designed to investigate the impact of precipitation events on the movement of spores in an urban area. She explained the purpose of the experiment is to study the outdoor transport due to water and air to assess the complex system-of-systems involved in a wide-area contamination incident. Dr. Mikelonis showed the example of results and methods used to inoculate the coupons.

Dr. Reinhart inquired about the experiment methodology with the overland flow. Dr. Mikelonis explained the experiments are run in triplicate because overland flow is difficult to replicate. Dr. Mikelonis described the multiple benefits of the research, including the information is provided to collaborate with storm water utilities and sediment transport and erosion modeling.

Mr. Roehl inquired about the use of pressure washers by homeowners. Dr. Mikelonis explained they are also conducting experiments to examine the power washing and various self-help mitigation measures. Dr. Olsiewski asked for details regarding the amount of removal from rain versus other methods. Dr. Ryan responded that some the rain application experiments have resulted with no spore count removal. Dr. Mikelonis stated that once the contaminant enters the soil and a precipitation event occurs, the issue of contamination occurs again.

Mr. Roehl asked for details on the modeling methods. Dr. Mikelonis discussed the assessment of various models and explained that about 60 types of surface water models exist. She explained the challenges of replicating hydrologic conditions and the validation of these models involves the use of historical pictures. Dr. Sang Don Lee added that HSRP has also gathered models from their customers and local governments.

Following the demonstrations, Dr. Sayles asked if the subcommittee had any questions. Mr. Roehl asked if they were going to cover model development during the meeting. Dr. Lemieux explained there was a session on decision support tools. Dr. Mikelonis stated they had ongoing projects assessing various models. As part of that work, approximately 60 different models have been used and their capabilities have been identified. For flood modeling, the validation involved historical pictures and outflow data. She explained that modeling contaminants that cannot be released to the environment presents different challenges. The program has also explored how to print a three-dimensional model with the capability to test the wash off.

Mr. Roehl asked if the subcommittee would see how these models would work during a real event. Dr. Taft explained that Dr. Janet Burke would demonstrate the Stochastic Human Exposure and Dose Simulation (SHEDS) model.

Dr. Lee reiterated that the work to identify the capabilities of the 60 models, mentioned by Dr. Mikelonis, is a project aimed to select models that provide the most benefit and streamline model usage across EPA's customer base. Currently, a wide variety of models exist because each local government uses a different model.

**Presentation of Effective and Efficient Tools, Strategies and Methods to Characterize and Assess Exposure Following a Biological Contamination Incident in the Wide-Area Environment**

*Sarah Taft, NHSRC*

Dr. Taft explained HSRP's sampling and exposure research with an emphasis on biological agents. Following a wide area release of a biological contaminant, HSRP has the role of characterization and remediation. The program examines tools, strategies, and models to support the three general steps of characterization. First, concentrations of the agent in various environmental media (e.g., water, air, surfaces, soil) are evaluated through sampling. Most research is focused under this step. After obtaining the data and interpreting the results, the potential exposure pathways (e.g., showering, walking, driving) are identified. Lastly, if these pathways are associated with potential exposure, exposure concentrations are identified. The need for cleanup, remediation, and potential water treatment is also assessed.

Dr. Taft described an incident timeline and highlighted how sampling and analysis occurs throughout the entire process. She explained how the sampling methods will differ based on the scenario.

Dr. Taft explained that EPA's partners have identified specific needs. These needs include how best to conduct and utilize results from air sampling; how to optimize deployment of composite-based sampling (e.g., street sweepers); how to identify best practices for determining biological agent data quality objectives, data interpretation, and data utilization/extrapolation of field-collected samples; and how to apply appropriate sample methods and interpret results for exposure assessment.

Dr. Taft addressed the current state-of-the-science for sample collection. The Centers for Disease Control and Prevention (CDC) National Institute for Occupational Safety and Health (NIOSH) recommended three techniques: (1) sponge and gauze wipes, (2) swabs, and (3) 37 millimeter cassettes for vacuums. Because they are time-consuming and labor intensive and require a large number of samples due to their small and discrete sample areas, these small sampling methods would not work for wide-area sampling or sampling multiple buildings. Dr. Taft described the composite sampling technique. She explained that composite sampling can be used to save time and resources. Emerging composite sampling includes robotic floor cleaners, floor shampooers/vacuums, activity-based air samplers, and native air samples (e.g., heating, ventilation, air conditioning filters).

Dr. Taft discussed the development of the MicroSAP tool as a standardized approach to develop biological sampling and analysis plans (SAPs) while incorporating required data quality objectives. She stated the tool uses exposure assessment approaches to address the potential exposure pathways, determine what people could be exposed to, and understand what the sampling results mean.

Dr. Taft explained that there are significant challenges because no standard protocols or methodologies exist for the use of microbial exposure assessment to inform response decisions during a wide-area biological incident. She highlighted that substantial research is needed to understand how data collected in the field can be used to estimate exposure following a release and can be utilized for remediation decisions (e.g., prioritization of areas for cleanup, informing cleanup goals).

Dr. Taft explained HSRP is trying to use exposure to inform sampling. To do this, the program coordinates with on-scene coordinators and response teams to test the research products. In addition, HSRP works with these field responders to develop outputs for incidents, sample collection protocols, sample strategy guidance, best practice summaries, and sample collection information documents.

Dr. Reinhart asked if the program's research becomes an element of the training for first responders. Mr. Francisco Cruz, biologist with the Office of Emergency Management's (OEM) Chemical, Biological, Radiological, and Nuclear Consequence Management Advisory Division (CBRN CMAD), explained that many of the sampling techniques were adopted and utilized by the on-scene coordinators. He stated that the research products are incorporated into training at the county level hazardous materials teams and do transfer to the local responder level.

Mr. Brooks asked how they select the sampling methods. Dr. Lee responded that the subcommittee would have the opportunity to see that first hand during the systems analysis demonstration. Dr. Lee explained that a sampling plan must consider criteria such as personnel, widely available technology, as well as overall resources. Additionally, the role of the researchers includes identifying the technologies and working with responders to gather input on procedural safety and the reality of the application.

Dr. Sayles emphasized that each project strives for increased collaboration by incorporating both a researcher and an operational person.

## **Demonstrations of Specific Research Efforts and Product Development**

### ***Composite Sampling***

*Sang Don Lee, Timothy Boe, and Worth Calfee, NHSRC*

The subcommittee observed demonstrations and technical videos of various biological sampling techniques used in the laboratory and field-scale evaluations. Using methods recently developed by HSRP, the subcommittee was given the opportunity to perform hands-on trials of surface sampling methods. Dr. Lee stated that sampling is a critical tool that needs to be representative and repeatable. He further described the need for a SAP to provide information for the type, quantity and location of sampling.

Dr. Calfee described the 2001 anthrax incident which led to an increase in sampling methods research. He stated that the sampling methods recommended by the CDC NIOSH (i.e., microfoam swab, wipe methods for porous and nonporous surface, 37 millimeter cassette) are the best methods for repeatable results and acceptance by the Environmental Response Laboratory Network.

Dr. Calfee and Dr. Lemieux discussed the economic issue of waste management and waste sampling to evaluate the level of decontamination. Dr. Calfee explained that there are no criteria for acceptance of the waste. EPA is working to determine the level of sampling needed on waste items (i.e., personal protective equipment) prior to disposal.

Mr. Roehl asked for details regarding the recovery rate and level of removal is needed level for cleanups. Dr. Lee explained that HSRP is characterizing the current sampling methods based on the proven efficacy under various conditions so that on-site responders can make decisions on cleanup strategy.

Mr. Timothy Boe presented the application of biological agent sampling methods to a wide-area incident concentrating on sample collection methods using the swab, sponge, and the vacuum. He demonstrated HSRP's use of a visual sampling plan (VSP) to define a sampling area in a larger sampling environment. He explained the purpose of this research was to identify and recommend the gaps using these sampling methods in a hypothetical wide-area scenario. He discussed tools, such as EPA's Waste Elimination Tool (WEST) and Incident Waste Assessment and Tonnage Estimator (IWASTE), to help estimate the environmental impacts of disposal decisions.

Dr. Reinhart inquired how the decision is made to begin sampling. Dr. Snyder explained that the dispersion modeling provides information helpful to identify a hot zone and develop a sampling plan. Dr. Reinhart asked what level of concentration is acceptable for model input. Dr. Calfee explained the model was only looking for a presence or absence (i.e., positive or negative) of the contaminant.

Dr. Lee explained that composite sampling in a large area incident reduces the number of samples. He demonstrated other viable sampling options using commercially available products such as the robotic floor cleaner and wet vacuum cleaner. Dr. Reinhart asked about the availability of the products and the waste generated by these products. Mr. Roehl inquired whether the robotic floor cleaner and the wet vacuum were intended for a one-time use sampling method. Dr. Calfee said these products are used once and properly disposed. He added that despite the one time use of the product, it is a still more economically viable option considering the man hours and waste (sampling and analytical) of other methods.

Dr. Olsiewski pointed out that the sampling methods are cleaning products, and asked if the products are also cleaning while sampling. Dr. Lee stated they are, but not to an acceptable level.

### ***MicroSAP Tool***

*Erin Silvestri, NHSRC*

Ms. Erin Silvestri discussed the utility of the MicroSAP tool which provides environmental samplers with a user friendly way to develop a SAP while improving data quality objectives. She provided a walk-through of the steps to develop a sampling plan, as well as examples of tool features and user-friendly work flow options to collect and compare data.

Ms. Silvestri stated that the MicroSAP tool helps document the sampling design, but does not tell the responder when or where to take the samples. She explained how the tool tracks and documents the changes made to the SAP. She added that EPA is performing quality assurance in conjunction with other agencies.

Dr. Olsiewski asked whether the intent of the tool is for use by on-site responders prior to doing their sampling and data collection. Ms. Silvestri stated that goal of the tool is to assist first responders by documenting the on-the-ground sampling plan. The tool also has the ability to upload site maps and look up reference material. Mr. Francisco Cruz explained that the MicroSAP tool helps responders apply a logical process to determine where to take the samples. He also mentioned that the MicroSAP tool creates uniformity among state and local agencies by documenting processes to improve future responses.

Mr. Hackney asked what architecture the MicroSAP tool is built on. Ms. Silvestri stated it will be housed on the EPA server but did not know whether it is built on Java. Mr. Hackney asked if the tool is intended as part of a large field mobile work management system and whether it will be used digitally with an iPad system. Mr. Cruz stated that the digital capability depends on the on-site coordinator. Dr. Tonya Nichols added that the MicroSAP tool can assist in the planning for laboratory response since the responders can determine the number of samples and notify the laboratories.

Mr. Roehl asked whether the tool should have intelligence built in to actually recommend a plan, like a tax preparation tool, rather than just be a passive tool. Ms. Silvestri explained that the tool does filter out non-relevant aspects, but recognized that suggestion would be a great goal. Ms. Lamb asked if the tool has the capability to add or edit sections that are prepopulated. Ms. Silvestri explained that all the information can be edited. Mr. Cruz added that the tool also allows the responder to access sampling plans that have already been created by other responders.

### ***SHEDS Modeling for Biologicals***

*Janet Burke, NHSRC*

Dr. Burke discussed the SHEDS model which is currently being assessed for application to biological agents, such as *B. anthracis* following an outdoor release within an urban area. The SHEDS model estimates population distributions of exposure and dose by using the U.S. Census demographic data to estimate the population to be simulated and human activity pattern to account for how people interact with their environment.

Mr. Roehl and Mr. Hackney asked for details on the amount of time required to utilize the database (i.e., from input the information to delivery of an output). Dr. Burke explained that the output is based on the concentration data. She estimated 30 minutes for the tool to be useable, but it varies based on the input and the number of census tracts.

Mr. Brooks suggested that the tool could also be applicable as an exposure model tool. He inquired whether EPA is collaborating with CDC and other federal partners to use this data and provide prophylaxis/treatment and consequence management strategies. Dr. Snyder mentioned that the Quick Urban and Industrial Complex (QUIC) model is another tool to support emergency response. Dr. Taft explained that the tool is currently being modified for biological data, but there is discussion to determine other uses.

### **Subcommittee Work Time**

Dr. Olsiewski explained the subcommittee's charge to address three charge questions across five science questions, as highlighted in the table on pages 6 and 7 of the booklet.

Mr. Roehl questioned the priority of research regarding the issue of wastewater. Mr. Hackney agreed and requested focused discussion on wastewater. Dr. Wichman stated that public health risk should establish the priorities.

Based on Dr. Lemieux's presentation, the subcommittee agreed that HSRP is doing outstanding research on the fate and transport of spores. The subcommittee discussed the use composite sampling and readily available sampling items is a move in the right direction. Mr. Brooks and Dr. Taylor stated that they would like to see more research to address the wastewater issue.

The subcommittee questioned HSRP's focus of spores, rather than other types of contaminants. Mr. Brooks asked whether other types of deposition or clumping scenarios play a role. Mr. DeGraca suggested the inclusion of painted wood as a test coupon. Based on the members' suggestions, Dr. Taylor recommended the need for matrix of experimental conditions.

The subcommittee discussed the exposure scenario via a mail attack. Dr. Reinhart commented that there is no safe exposure level. Dr. Olsiewski confirmed learning from past events informs

future approaches. Mr. Brooks and Mr. Roehl stated that the SHEDS model provides characterization data and parameters to deal with a public health emergency. Mr. Brooks added that a chronic exposure model could overestimate the exposure scenario.

Dr. Reinhart expressed concern that basing cleanup approaches on easy to find items could be limiting. Dr. Olsiewski suggested that adopting a practical solutions approach is useful for the homeowner.

The subcommittee discussed culture method versus the quick results using polymerase chain reaction (PCR) approaches. Mr. DeGraca questioned whether the PCR method caused overestimation.

Mr. Hackney explained that the structure of the MicroSAP tool should be similar to a work management system. He also stated that all tools should be digital and not use multiple platforms. Mr. Hackney liked the use of modifying an existing product, rather than starting from scratch. Mr. Roehl expressed concern over the weakness of plume modeling and suggested continued performance of sensitivity analysis. Lastly, Mr. Brooks stated that QUIC provided plume modeling but for a different purpose.

Dr. Olsiewski stated the need for HSRP collaboration with federal state and local agencies. The subcommittee acknowledged inclusion of OEM's CMAD in research and decision making. Mr. Brooks stated that some regions work with other stakeholders more so than other regions. Dr. Reinhart asked if training exists for emergency responders to share tools. Dr. Wichman replied that most states take part in command exercises.

### **Wednesday, February 15, 2017**

#### **Day 1 Follow-up Comments**

Mr. Hackney explained that during the wash-down process, spores disappear down the drain and enter the wastewater collection system. He asked for details on EPA's progress with research on the wastewater collection plant. Dr. Ernst responded that HSRP has conducted pilot scale research to examine the fate of spores through a treatment at a wastewater plant. Data shows that spores are present in the sludge and during other steps of the treatment process. Next, the program plans to apply spore-containing sludge to soil to determine how spores travel through this soil. They are also collaborating with Dr. Calfee to develop a workshop focused on gathering knowledge on anthrax and other organisms of potential concern to the Agency to develop common guidelines for use by water resource recovery facilities.

From the exposure side, Dr. Taft explained that HSRP is conducting a project examining exposure pathways for Ebola and anthrax.

Dr. Wichman asked if aerosols have been studied in the WWT plan. Dr. Ernst replied that the better sampling approaches are being considered. Although drinking water sampling might be in place, these guidelines do not apply to wastewater.

Mr. Brooks raised the use of PCR sampling and analysis. PCR captures deoxyribonucleic acid (DNA), which could be ubiquitous in the environment. The organism's viability could be overestimated if only DNA is considered. Dr. Taft stated that CDC recommends culture as the

standard for bioavailability, which is part of their clearance phase approach. HSRP uses rapid viability PCR as part of sampling in the characterization phase. Mr. Brooks inquired if rapid viability PCR would be applied for all samples if a PCR sample tests positive for *B. anthracis*. Dr. Taft replied that it was situational. Dr. Calfee explained that the suite of analytical methods is dependent on the SAP. PCR is specific for targeted sequences. Viability is needed post-decontamination. Mr. Brooks noted that because they are mapping naturally occurring anthrax, characterization should occur. Dr. Taft stressed that DHS has guidance for first responders in preparation for an anthrax attack, so EPA would use that guidance.

Dr. Lee explained that the program is conducting a project to assess municipal equipment for assessing biological and radiological agents in wide-area incidents. An expert workshop for state and local responders will be held in Chicago in March 2017. If the Agency recommends the use of particular equipment, responders need to inform EPA of any safety considerations (i.e., will equipment be beneficial or harmful to the public). Mr. DeGraca asked if HSRP worked with country representatives. Dr. Lee replied that coordination occurs at all levels of response.

Mr. Brooks appreciated the SHEDS presentation. He inquired if the tool had been shared with other federal partners and emphasized the importance of early discussion. Dr. Burke stated SHEDS work has been conducted by other federal partners, but resource issues exist.

Dr. Reinhart asked what happens to spores that are carried into the soil and groundwater and whether this represents a potential exposure pathway. Dr. Taft replied that this might be a potential exposure pathway but there are challenges with understanding this exposure. The program has conducted studies assessing ingestion associated with shower exposure, but it is not easily fit into scenarios. Dr. Ryan noted that one challenge associated with wide-area incidents is that when a biological agent is released, it may or may not be located in the soil and that timeframe is difficult to estimate.

### **Presentation of Effective Methods for Decontamination After a Wide-Area Biological Contamination Incident for Indoor and Outdoor area**

*Shawn Ryan, NHSRC*

Dr. Ryan addressed HSRP's research of effective methods for decontamination after a wide-area biological contamination incident for indoor and outdoor areas. He explained that this work began with a single building in 2001, when many facilities were contaminated with anthrax. Because it was unprecedented to sterilize the facility to kill the spores, all methods and guidelines were developed onsite. This process spanned from months to years. HSRP developed improvements based on lessons learned.

HSRP ultimately seeks to understand the factors that impact the efficacy of these decontamination methods (e.g., lower temperature, lower humidity) so they conducted an interagency effort to test laboratory methods at a full-scale facility. HSRP released spores and examined the efficacy of decontamination methods with respect to cost, time, and waste management. The program gained understanding of the capabilities of a single building. Sampling, decontamination, waste management, and post-decontamination sampling timelines drastically improved.

Next, the program then investigated how to salvage sensitive equipment within the facilities. Dr. Ryan stated the decontamination methods were often harsh and the program sought to identify friendlier methods. HSRP partnered with DHS to locate the impact on materials and sensitive equipment and to identify ways to tweak their decontamination processes. Although a perfect solution was not found, some alternatives were identified.

There are challenges associated with treating critical infrastructure facilities (e.g., too much to remove), large urban areas (e.g., multiple buildings), and outdoor areas (e.g., the need to understand where things should be moved). There are also significant challenges with sampling, fate and transport, and waste management. There is correlation among these issues. For example, good decontamination methods reduce the post-decontamination sampling burden and a robust understanding of the fate and transport of an organism isolates sampling and decontamination.

Dr. Ryan explained that HSRP works with partners to understand the capability goal and what should be accomplished. From there, they assess what would result in the largest impact. He described the current list of partner needs: effectiveness of wash-down (e.g., how will rain impact the situation), efficacy of the common cleaning equipment and potential impacts of use, research to support the development of self-help decontamination guides, new decontamination procedures for all vehicle types, and methodologies for decontamination of critical infrastructure.

To address the partner needs, HSRP breaks their program into three basic areas: (1) decontamination efficacy; (2) material compatibility and the impact of effective methods on sensitive materials; and (3) decontamination engineering, seeking to bring effective laboratory methods into the field.

For decontamination efficacy, the program focuses on *B. anthracis* spores because they are difficult to kill. Dr. Ryan noted that if the program obtains beneficial research to address *B. anthracis* on complex surfaces, they would have a good understanding of what would work for other biological agents that are more easily eliminated. If HSRP is able to use cheaper and quicker methods to kill a biological agent, they will. Store-bought disinfectants will inactivate many biological agents. HSRP research focuses on the impact of materials on decontamination efficacy. Because ideal disinfectant application conditions are not always present, testing begins in the lab. HSRP can work with their partners to conduct field testing, if necessary.

Dr. Ryan explained the challenges of bio-decontaminating expensive equipment (e.g., a magnetic resonance imaging [MRI] machine). Initial testing started with personal computers. The program developed a protocol to expose the computers to decontamination conditions, monitor the impact over time, examine what parts were being impacted, and modify the conditions to alleviate those impacts. Ultimately, HSRP hopes to improve field application. For example, instead of spraying a room, it may be more favorable to release the liquid as a fog. The use of home humidifiers might also be appropriate.

The program's current planned outputs align with their partners' needs. First, HSRP hopes to assess self-help decontamination methods and their potential uses and precautions for wide-area anthrax contamination incidents. Second, they want to develop low-tech, readily available bio-decontamination methods suitable for large indoor areas. Next, HSRP seeks to determine the impact of decontamination methods on sensitive equipment, materials, and high value or historic

items. Lastly, they hope to determine the effectiveness of decontamination options for critical infrastructure and outdoor environments contaminated with biological agents.

Dr. Ryan explained the subcommittee would have the opportunity to witness the application of decontaminants, watch a video on the use of existing equipment for outdoor decontamination, and observe decontamination methods for critical infrastructure.

Dr. Ryan highlighted that the program's work is planned in collaboration with partners, who provide guidance. HSRP wants to ensure their work is on target to meet the current needs of their partners and increase research and response collaboration. The program hopes to develop training modules and guidance documents to assist with the growing need for technical support requests.

Mr. Brooks pointed out that most wide-area scenarios do not include federal facilities, but privately owned buildings instead. He inquired who was responsible for cleanup in those situations. Dr. Ryan explained that every incident has local responders, but EPA could be contacted for assistance. He stated that state and local governments have the authority to decide EPA's involvement.

Dr. Ryan described the process for two incidents, in Connecticut and New Hampshire, involving drum-making anthrax incidents. Local governments contact the state government, who then contacts EPA for assistance, if necessary. In these examples, the Agency provided technical support instead of site support.

Mr. Brooks inquired if EPA's research focus included guidelines for contractors responding at the state and local level. Dr. Ryan responded that HSRP hopes to expand the cleanup workforce by developing capabilities that do not require specialized equipment and expertise and making cleanup criteria publically available.

Dr. Reinhart asked how a computer test resulted in a "failure" during the sensitive equipment testing. Dr. Ryan explained that the program PC Doctor was performed on a monthly basis. While running tests, the software detects certain "failures" (e.g., a laser didn't fire when prompted, the drive did not open). The software detects the number of failures per month. Additional tests were performed on the computers with the most failures to determine why the occurrence rate was high.

Mr. Brooks noted the differences of decontamination compared to mitigating health effects. He asked what the drivers were when examining decontamination methods. Dr. Ryan stated that any pesticide applied should be registered under the Federal Insecticide, Fungicide, and Rodenticide Act, and there are three products registered for *B. anthracis*. He explained that HSRP wants to obtain a 6 log reduction of *B. anthracis* under the appropriate conditions.

Mr. Brooks reiterated that one of the goals investigated sample reduction time. Dr. Ryan noted that if the process parameters can be measured and understood, then sampling could be limited and targeted. He explained that HSRP is testing whether the amount of sampling required to demonstrate that decontamination was effective.

Dr. Olsiewski asked what resulted from the homes decontaminated in Connecticut and New Hampshire. Dr. Ryan answered that both homes returned to normal.

Dr. Schoch-Spana inquired whether the public was assured by responders that they were safe from cutaneous and inhalation anthrax. She also asked how HSRP communicates cleanup success to the residents. Dr. Ryan responded that the guidance relies on the results of surface sampling. The message communicated to the public is dependent on the confidence in the sampling results. Dr. Schoch-Spana suggested that a range of public perception exists on different infections. HSRP anticipates that as physical science improves, so will communication.

Dr. Schoch-Spana asked if residents would be vaccinated for anthrax during an incident. Dr. Taft responded that local governments are responsible for communicating with their communities and would make the decision on whether to vaccinate the community. Local governments will look to CDC for guidance and involve EPA, if necessary.

Dr. Reinhart requested more discussion on clearance sampling. Dr. Taft explained that characterization sampling identifies where the contamination is, how bad it is, and what is needed for remediation. Clearance sampling involves working with decontamination experts to determine the success of the cleanup and if any spores remain. Dr. Ryan added that the two sampling types have different purposes. Dr. Lemieux pointed out challenges with funding clearance sampling. Because EPA cannot force private sectors to allow EPA to conduct cleanup, Dr. Ryan emphasized the importance of providing guidance to those conducting the cleanup.

### **Demonstrations of Specific Research Efforts and Product Development**

#### ***Street sweepers, COMMANDER projects, Biolab and Material Capability***

*Joseph Wood, Worth Calfee, and Sang Don Lee, NHSRC*

Dr. Joseph Wood discussed decontamination efficacy of low concentration hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) for bio-remediation. He demonstrated the application method of backpack sprayers and street sweepers for decontamination of urban surfaces. He discussed how this research effort demonstrates how deploying decontaminants that might be applicable to urban surfaces and reduce the amount of runoff.

Mr. Brooks inquired about the selection of coupon materials. Dr. Wood explained that HSRP uses the same materials (e.g., wood, concrete, asphalt) for research consistency. Mr. Roehl asked about the process of spore preparation. Dr. Calfee explained that spores are prepared using liquid deposition and mixed with ethanol. After deposition, the sampling materials are cultured for spore growth.

Dr. Wood also discussed the use and effectiveness of fogging with sporicidal contaminants, e.g., H<sub>2</sub>O<sub>2</sub>, bleach, and dichlor (an easily obtained pool treatment chemical). This effort utilizes a room size decontamination chamber, COMMANDER, to assess the effectiveness of delivering sporicidal decontaminant in the form of fog, offering benefits over spraying. Dr. Reinhart inquired how humidity plays a role. Dr. Wood stated that multiple environmental factors (i.e., time, relative humidity, temperature) effect the overall decontamination efficacy. Mr. Roehl wondered if the low-tech low cost methods were more effective than expensive treatment

options. Dr. Wood expressed that HSRP is testing all type of methods and there are positive results from the off the shelf methods.

Mr. Leroy Mickelson, OEM's CBNRN CMAD, discussed the large-scale experiment using humidifiers with H<sub>2</sub>O<sub>2</sub> to decontaminate a home of surrogate *B. anthracis* spores. He also described the use of commercially-available equipment, such as orchard sprayers, for a subway decontamination exercise. He stated that the operational technology demonstration (OTD) proved this technique, using bleach and H<sub>2</sub>O<sub>2</sub>, was effective for removing spores.

Dr. Taylor inquired about the communication of the decontamination process and resulting effectiveness to homeowners Dr. Schoch-Spana suggested the need for a focus group to address the communication challenges dealing with homeowners. Dr. Snyder added that ORD has created an effort to address social science topics within each research program.

Mr. Brooks suggested that associations, such as real estate associations, should be consulted to help determine some guidelines for decontamination cleanup. He explained that if the property cannot be cleaned up within a certain timeframe, the homeowner might abandon the property, thereby creating a larger problem for the city.

Mr. DeGraca acknowledged the ingenuity of the home treatment work. Dr. Olsiewski agreed and congratulated the program on their research efforts.

Dr. Lemieux and Dr. Ryan discussed the effort to assess the impact of effective decontamination methods on sensitive equipment and difficult to replace materials. The subcommittee observed posters showing research on the impact of fumigation using methyl bromide on electronic equipment. Dr. Lemieux explained that HSRP is examining the off-gassing of the fumigants and corresponding need for personal protective equipment (PPE) of the responders. He stated methyl bromide is used as a fumigant for termites.

The subcommittee observed the testing of the fumigated computers. Dr. Ryan explained that PC Doctor is the industry standard to test the mechanical aspects of the computers.

### **Presentation of What Science is Needed to Inform Waste Management Decisions Following a Wide-Area Biological Contamination Incident**

*Shawn Ryan, NHSRC*

Dr. Ryan addressed what science is needed to inform waste management decisions during a wide-area biological contamination incident. He discussed the correlation between sampling and waste. Decontamination options generate waste, and the resulting waste must be disposed. Approaches are needed to address how the program can inform sampling and decontamination to reduce waste generated, as well as generate waste to improve disposition.

He discussed the factors that influence waste management decisions including the extent of the incident, types of materials contaminated, contaminant properties (i.e., persistence), site decontamination decisions, availability of waste management options, and waste sampling or analytical requirements. Waste handling involves determining areas and methods for temporary storage and staging, treatment methods for waste volume reduction, availability of disposal

options, and transportation/packaging and subsequent treatment. The packaging of waste to be transported offsite is also an important consideration.

Dr. Ryan explained that research needs range from developing different ways to handle waste onsite, ways to sample waste, methods for convincing WWT plants to accept wastewater, and approaches for sampling/analytical activities related to waste. To inform decision makers, HSRP assesses the effectiveness of treatment methods and the relationship between decontamination methods and waste generation. He explained that the development of waste disposal options is important, whether it involves permanency in landfills or WWT plant acceptance.

Dr. Ryan discussed the Bio-Response Operational Testing and Evaluation (BOTE) project and the treatment of materials in place using fumigation. The team questioned removing the mattresses to decrease aeration time. From the BOTE project, Dr. Ryan described waste volume generated during a full scale evaluation of three different decontamination methods. The amended bleach was the cheapest to apply (e.g., time, labor, spraying), but generated the most waste.

The program plans to develop effective onsite treatment methods for materials removed prior to decontamination and products of decontamination (e.g., wastewater). A recently developed method is waste dunking. HSRP is also examining options to investigate the collection and treatment of wash water decontamination runoff from PPE and site decontamination.

Dr. Ryan elaborated on the current planned outputs including (1) persistence of biological agents in landfill leachate and development of *in situ* methods for *B. anthracis* remediation in a landfill; (2) a summary of integrated waste management approaches, including onsite waste treatment and staging; (3) methods for containment and treatment of bio-contaminated wash down water; and (4) development of an all-hazards tool for estimating the resource demand associated with transporting large volumes of waste.

At the demonstrations, Dr. Ryan explained the subcommittee would witness the development of onsite waste treatment methods and watch the Underground Transport Restoration (UTR) video. He noted the work is used to inform guidance development and response to partner inquiries.

Dr. Olsiewski asked how quickly HSRP could respond to incidents after inquiries and what they could complete quickly in an emergency. Dr. Ryan noted that one of the benefits of HSRP's partner relationships is that they are confident who to call in an emergency. Examples of incidents include those involving ricin and *Burkholderia*. Dr. Ryan explained that HSRP usually does not respond to large emergencies. Dr. Snyder noted they constantly receive inquiries to provide technical support during small emergencies. Dr. Sayles added that the expertise of ORD is available to anyone within hours. Dr. Rodan noted OEM, National Oceanic and Atmospheric Association, and the United States Coast Guard have strong relationships with HSRP.

Dr. Lemieux explained that the challenge with waste management is the lack of a federal regulatory framework by which biologically contaminated waste is regulated. Landfills have to be willing to accept the waste and most facilities are not willing. To smooth the process, Dr. Lemieux stressed the importance of negotiating with the landfill companies. Many of the decision support tools focus on providing information to enable state and local governments to

plan for these situations. HSRP has tested autoclaves to examine their ability to process porous materials. All hospitals have now removed their onsite incinerators and autoclaves. The Department of Transportation (DOT) has also developed packaging rules.

Dr. Reinhart asked if onsite incineration was recommended. Dr. Lemieux responded it is can be completed in a few locations, but only a few autoclaves are large enough and waste staging areas is critical.

Dr. Schoch-Spana asked if EPA coordinated with the U.S. Department of Agriculture (USDA) for animal waste management. Dr. Lemieux stated USDA is the lead investigator and EPA is the supporting agency.

Dr. Reinhart inquired if size reduction or compaction before packaging was an option. Dr. Lemieux explained the challenges with this approach include release (e.g., a mattress can be removed, but chopping it would release spores) and weight (i.e., humans are lifting the packages inside the building). Dr. Ryan noted field tests help determine effective methods.

## **Demonstrations of Specific Research Efforts and Product Development**

### ***Waste Dunking***

*Paul Lemieux, NHSRC*

Dr. Lemieux demonstrated the waste dunking method, a type of on-site waste treatment by dunking waste into bleach solutions. This method is being investigated to determine the types of materials that can be treated and the contact time needed for effective inactivation of the contaminant. He explained that this research effort was operationally investigated during the UTR operation technology demonstration.

Dr. Lemieux discussed the testing of various bleach combinations and the use of pH-adjusted bleach using chlorine dioxide, vinegar, and water. He noted the challenges of this approach including buoyancy of materials which prevents them from effectively being submerged, weight of saturated item during removal, and large-scale operational issues.

Dr. Reinhart inquired about the use of autoclave treatment. Dr. Lemieux explained that the saturation of the materials extended the amount of treatment time because it took longer to reach the required temperature.

Mr. Roehl inquired if waste dunking was a viable option. Dr. Lemieux stated that data are still being collected from composite samples to determine efficacy of spore removal. Dr. Reinhart asked if municipal landfills would accept waste if packaged and sealed in accordance with DOT regulations. Dr. Lemieux stressed the need for on-site treatment to reduce the landfill disposal.

Dr. Rodan asked for details about what happens to the items after removal from the bleach solution. Dr. Lemieux described how the items are allowed to drip dry and then placed into clear plastic bags, which are tagged and tracked using a radio-frequency identification chip. He explained this adds an incremental cost to the operation.

## **Presentation of How Decision Support Tools Can be Best Designed to Support a Systems Approach to Environmental Response Decision Making Following a Wide-Area Biological Contamination Incident**

*Hiba Ernst, NHSRC*

Dr. Ernst discussed how decision makers must evaluate options to make decisions. She provided a diagram of the process of making a balanced decision includes hazard mitigation, waste management, exposure assessment, sampling strategies, and hazard characterization.

She addressed the decision support tools are important because they input site- and incident-specific information to inform decisions, use scientific data (e.g., decontamination efficacy) provided in tools, model “what-if” scenarios, facilitate discussions in complex environments, and help decision makers make rapid response and remediation decisions.

Dr. Ernst highlighted HSRP’s key efforts. They include BOTE; Bio-Response Guide, an EPA-led collaboration between EPA and New York City’s Department of Health and Human Hygiene to provide guidance for what to do if an incident occurs; UTR project led by DHS; and building on existing tools and databases (e.g., the Decontamination Selection Tool [DeconST] and the Incident Waste Assessment & Tonnage Estimator [I-WASTE]).

She described the variety of HSRP developed tools. HSRP is modifying WEST, originally developed to respond to a radiological incident, to assess biological scenarios. WEST is a GIS-based tool that assists in planning/preparedness activities at multiple levels of government. It provides an aerial view. The spreadsheet portion identifies sensitivity analysis, liquid and solid waste estimations, and associated costs.

The Wide Area Decontamination Estimator (WADE) assists EPA responders in the development of an independent government cost estimate for deployment of EPA resources. The tool helps determine what should be deployed and how as well as the cost of the deployment. Lastly, the program uses commercial off-the-shelf technology to develop a proof-of-concept all-hazards virtual reality (VR) tool to create scenarios and full-scale exercises to assess the feasibility of the technology compared to traditional training and exercise. Additional tools in development include the Carcass Disposal Tool and the Decontamination Database, which is responsible for storing and distributing data for use in all-hazards response and recovery research, operations, and tools.

Dr. Ernst explained that HSRP hopes to modify their successful radiological tools and apply them to more complex biological incidents. She noted the program seeks to work with partners to solicit feedback throughout the process in order to obtain innovative methods to reduce development and maintenance costs. Primary partners, which include OLEM and EPA regional offices, could operate the tools themselves or work with HSRP to run the tools.

Dr. Reinhart asked if the Agency provides resources to locate access to disinfectants such as bleach or H<sub>2</sub>O<sub>2</sub>. Dr. Lemieux explained that HSRP tries to incorporate tools in the mapping process. The program would not generate the data, but they could insert data into the map to locate the closest landfill or retail store to purchase disinfectants.

Mr. Hackney asked for details on the integration of tools. Dr. Ernst stated integration depended on the tool. Mr. Boe stated he will discuss the integration and transparency of tools on Day 3 of the meeting.

Mr. Roehl asked for details on the users of the tools and if there were different classes of users. Dr. Ernst explained that the tools are not open-source, so while tools are in the development phase, HSRP receives technical support inquiries, performs calculations and analysis, and sends results. Dr. Lemieux noted that while the program strives to reach a broad range of users with their tools, most are niched.

Dr. Olsiewski inquired whether first responders will accept options from a tool to make decisions. Dr. Lemieux explained that end-users ask why certain options are preferable over others and the source of calculations. Feedback from end-users revealed that they prefer to make their own decisions. Mr. Roehl suggested the tools should be easy to use because casual users would struggle obtaining a quick answer. Dr. Lemieux stated the program is working with OLEM to create a program to assist state and local governments in developing their waste management planning documents.

Mr. Roehl suggested that resources should focus on tools with the largest number of users. Dr. Ernst clarified EPANET has a large user base, due to the fact that it is commercialized, but noted that it requires technical support, which is not provided by HSRP. Dr. Lemieux explained that I-WASTE has approximately 500 state and local users and does not strive to attract thousands of users. The number of end-users is estimated before tool development begins. Dr. Reinhart asked for clarification on the difference between WEST and I-WASTE. Dr. Lemieux explained that the I-WASTE database supports planning.

Dr. Reinhart asked if HSRP considered annual cost fluctuations. Mr. Hackney expressed concern about the operational and maintenance costs for tools. Dr. Snyder responded that both topics are addressed during the annual budget planning process. Mr. Hackney suggested the program should consider a mobility strategy (e.g., Windows versus Mac) and limiting technology platforms.

Dr. Schoch-Spana suggested that social science capabilities be applied to the decision support tools. Dr. Sayles agreed.

Mr. Brooks asked if the tools included parameters for radiological contamination. Dr. Lemieux explained WEST was originally developed for radiological incidents. However, because the program has not solidified outdoor decontamination, it has not been used.

Mr. Brooks asked if OLEM could operate and maintain WEST. Dr. Lemieux explained their resources are more limited than HSRP's, and other groups do not want to pay for the maintenance of the tool.

### **Public Comments**

Mr. Tracy asked for public comments, and there were none.

### **Subcommittee Work Time**

Mr. Tracy explained that the BOSC Executive Committee has created a focused effort to address social science and program metrics and evaluation. He requested input on specific program evaluation metrics that would be helpful to the subcommittee.

The subcommittee discussed the decision support tools and integration of software. The subcommittee voiced HSRP's need for basic research and applied science, as well as the development and operability of user-based tools and models for their user base (i.e., emergency responders/managers and OLEM). Mr. Hackney wondered if budget spending was increased due to the development and building of these tools. Mr. Brooks recommended that HRSP partner with EPA's Office of Water and OLEM.

Mr. Hackney requested the need for more information on the management of the technology tools requested clarification on customer base for the tool package. Mr. Roehl wondered if the issue of tool management was pervasive within ORD. Mr. Tracy provided details on the Agency's implementation of information technology (IT) and the development of the tools (i.e., language, script, contractor access, resources).

Dr. Wichman noted how resource intensive it is to develop and maintain tools. Mr. Brooks and Ms. Lamb questioned how EPA's tools are disseminated to the cleanup contractors, onsite coordinators, and local municipalities. The subcommittee discussed whether the BOSC Executive Committee should also address the topic of tool management.

The subcommittee reflected on the current role of HSRP and the function of the future HSRP. Mr. DeGraca suggested that EPA should focus on all major cities. Ms. Lamb highlighted EPA's need to foster adoption of the I-WASTE tool due to the beneficial use in multi-hazard scenarios. She suggested there is critical need for this tool and text should be incorporated into Charge Question 3.

The subcommittee identified the need for more information on product availability and tool dissemination. Ms. Lamb mentioned local authorities' rely on the assistance of next-level of emergency managers, rather than EPA directly. Mr. Brooks questioned how local communities acquire the information that EPA is producing and suggested EPA disseminate products into the local emergency responder community.

Dr. Schoch-Spana recommended the incorporation of social science and social justice into the current projects. She discussed the need to address social justice regarding individuals performing cleanup tasks. She also mentioned the use of focus groups to address the groups' perceptions and concerns (i.e., subway passengers, subway drivers, maintenance workers).

Mr. DeGraca added the need to address the public perception of cleanup standards and acceptance of waste. Ms. Lamb shared her experience regarding the public's lack of trust during cleanups. After reviewing the information on EPA's website, Dr. Olsiewski discussed the lack of the attention on the public's focus on biological attacks.

Dr. Taylor suggested revisiting the FY16 HS Annual Report to identify how previous recommendations were addressed. Dr. Olsiewski added the subcommittee will review HSRP's responses to the summary report for HS in the EC report.

The subcommittee acknowledged the positive work within the HSRP program. Mr. Brooks and Dr. Taylor supported HSRP's focus on practical, easy to attain solutions in the field and applied realm. He commented on the ability of the program to move from operational test beds to large scale operations. Dr. Reinhart appreciated HSRP's systems approach.

The subcommittee discussed Charge Question 1, "Are they doing the science right?" Dr. Wichman voiced his concern regarding the impacts varying of concentration. Dr. Brooks mentioned the use of a matrix approach to address varying concentrations. The subcommittee also discussed the need for better coordination of test coupons to ensure consistency between laboratories. Mr. DeGraca expressed concern about the ability for municipalities to reject waste/wastewater.

The subcommittee discussed the use of economic drivers to practically look at decontamination procedures. Mr. Roehl mentioned the use of asphalt, the most difficult to clean substrate, to evaluate the cost decontamination materials. This could cause a gross overestimation of cleanup costs. Dr. Reinhart added her concern for addressing other contaminants, rather than focus solely on spores.

#### **Thursday, February 16, 2017**

##### **Day 2 Follow-up Comments**

Mr. DeGraca asked if there is sufficient guidance within the five science questions aimed at partner-stated needs because most of the program's discussion surrounds spores. Dr. Ryan clarified that work with biological agents did not, and could not, occur onsite at EPA. Dr. Ryan explained that approximately 80 percent of the program's focus is devoted to spores, which contributes to knowledge of other biological agents. The Ebola outbreak refocused the Agency's priority to other viruses.

Dr. Lemieux noted USDA's emphasis on viral agents with animal disease. EPA's collaboration with USDA involves non-spore forming biological agents. Dr. Ryan noted that viruses are easier to inactivate than spores, but inactivation is similar when viruses are applied to complex materials. Dr. Taft added that biological agents that are harder to kill are more persistent and, therefore, easier to sample.

Dr. Olsiewski asked how each HSRP team gained awareness of surrounding work and acted in synergy to provide a holistic response to an attack. Dr. Sayles highlighted that the five science questions were identified exclusively for the BOSC subcommittee, and HSRP does not necessarily plan their program around the specific questions. HSRP ensures integration by engaging staff on multiple teams.

Dr. Olsiewski acknowledged the benefit of holding the BOTE exercise indoors and inquired how HSRP would complete a similar exercise outdoors. Dr. Snyder noted that the program continues to use interagency partners, but these collaborations can become costly.

## **Presentation on the Integration of Tools**

*Timothy Boe, NHSRC*

Mr. Boe, a geographer and computer developer, discussed the integration of tools used in the field for communication to the end-users. He described how HSRP develops short-term solutions, often including a prototype resulting in gaps that require additional resources. The initial program tool provides scripts and spreadsheets.

Mr. Boe discussed how HSRP strives to provide a systems approach with its tools in order to balance response, recovery, and investigation. The program begins by conducting laboratory experiments to develop response solutions. These activities feed into approaches used during recovery. HSRP advances long-term solutions to provide immediate help to field personnel.

In an effort to reduce costs, HSRP evaluated the tool individually. As part of this process, it was noted that each tool pulled data from separate databases. Costs could be reduced by building one central database that all tools access. The database would also service end-users by functioning as a searchable tool for on-scene coordinators and emergency responders.

Mr. Boe described the Agency's participation and valuable input at the Northern Light Nuclear Power Plant accident exercise. During the exercise, Mr. Boe stated that on-scene coordinators and emergency responders were unable to easily access contamination maps. He explained how HSRP provided a solution involving EPA's GeoPlatform where users upload their data to the program and stakeholders can immediately access maps of contamination and critical infrastructure. As stakeholders receive more detailed contamination maps, EPA uploads the data to GeoPlatform. Dr. Lemieux pointed out the challenges that using GeoPlatform presented to non-EPA users. Mr. Hackney recommended the use of another platform, Esri. Mr. Boe added that HSRP is collaborating with IT to streamline the process.

Mr. Boe shared the gaming industry's interest in the VR tool. The tool is used for developing situational awareness, techniques, and muscle memory. Dr. Reinhart asked if HSRP contracted development of the tool out to the gaming industry. Mr. Boe responded that there are approximately 20 gaming developers in the Raleigh-Durham area. These developers help by using EPA's remote sensing tools and applications to build maps. Many high-risk facilities have already been mapped three-dimensionally.

Mr. Boe discussed the need to emphasize critical infrastructure in the database so it would be available to stakeholders. He explained that VSP makes problem solving easier.

Mr. Boe discussed the integrations of tool during the HSRP's field exercise. He described how responders, entering and exiting the hot zone, were tracked using Quick Response (QR) codes located on their PPE. The codes are built on the Python platform making them easily distributable. Additionally, Google developed an indoor navigation technology, Tango, which inserts data directly into the VR tool.

Mr. Boe discussed tools applied to decontamination. He provided the example of a facility, in EPA Region 5, contaminated with cobalt 60. Region 5 used a gamma ray imager to examine cobalt 60 activity on the wall and floor of the facility in real time. Region 5 characterized the contamination and reached out to HSRP for assistance. HSRP's short-term solution relied on the

use of a spreadsheet to quantify the hot spot surface area and impending decontamination costs. By using a holistic approach (i.e., consideration of cost, decontamination, fate and transport, removal depth), the program created a site-specific decontamination plan. On-scene coordinators decided which technology to use.

Mr. Boe acknowledged that HSRP obtains a lot of data during the response, characterization, and recovery processes. The program is modeling social response by building a data simulator that allows on-scene coordinators and emergency responders to access the virtual scenario, make decisions, and witness the impact of these decisions on their community.

Dr. Reinhart asked about the use of VR tools to train the on-scene coordinators. Dr. Snyder clarified the role of the Agency is to serve as subject matter experts and provide training tools and support to on-scene coordinators, who would then train additional staff during the annual training program at the On-Scene Coordinator Academy. He explained how VR tools provide an augmented virtual environment to practice sampling and collection techniques in a simulated environment and validate the research during training.

Mr. Hackney inquired if there were declared technology standards. Mr. Boe replied that HSRP is part of EPA's developer guild and is working to develop standards. Currently, they use Esri.

Mr. Brooks noted the use of additional assistance in wide-area scenarios. He asked if HSRP relies on on-scene coordinators and emergency responders for training others involved in response during wide-area scenarios. Mr. Boe stated that as regions are exposed to HSRP's work, they receive more calls for assistance. He emphasized the importance of developing technology to assist those training in the field.

Mr. Brooks asked if the on-scene coordinators had a training transition plan to distribute training to the community. Dr. Lemieux responded that there is an interagency agreement to develop an outreach program to non-EPA stakeholders where on-scene coordinators are the primary instructors. Dr. Sayles added that HSRP would provide technical support for this effort.

Mr. Brooks asked if the program is helping on-scene coordinators develop training curriculum now that HSRP's focus is applied research. EPA will not train the community, but will provide training to those who train members of the community. Dr. Lee mentioned his role as a primary investigator in Japan's Fukushima cleanup, noting that more than 30,000 personnel assisted with the clean-up effort daily. The program's outreach program is intended to provide sufficient information to train their customers and their communities.

### **Presentation on Transitioning Research**

*Emily Snyder, Deputy National Program Director, HSRP*

Dr. Snyder discussed the program's aim to transition research. She noted that HSRP has many end-users, including program offices, regions, water utilities, and federal, state, and local agencies.

Dr. Snyder stated that EPA's Facebook and Twitter accounts provide a platform to disseminate short synopses of their research in a controlled manner and reach new end-users. In addition,

EPA generates reports and peer-reviewed journal articles to increase the general body of knowledge. Most outcomes are published in reports.

Dr. Snyder described the annual International Decontamination Research Conference, which is held so those conducting homeland security research in the United States and internationally can connect and exchange ideas. She also commented that many of EPA's federal partners access the program's research using the website.

Dr. Snyder described HSRP's semi-annual stakeholder newsletter which has more than 1,500 subscribers and stakeholder notifications redirect users to HSRP's website. She discussed the use of technical briefs which serve as a useful communication tool within the Agency and the Office of Management and Budget.

Dr. Snyder highlighted webinars focused on a recently completed body of work. These webinars were requested by end-users and facilitate relationships between end-users and researchers as well as provide a forum for questions.

Dr. Snyder noted that partner training includes training on-scene coordinators at the annual On-Scene Coordinators Academy and assisting the OEM in constructing training for the regions (e.g., responding to Ebola and ricin incidents). Dr. Snyder mentioned that HSRP involves end-users in product development. HSRP informs end-users to ensure developed tools are meeting their needs.

To support the development of guidance, HSRP works with their end-users to ensure the latest research is incorporated. Notably, HSRP researchers bring forward research that advises response. Biological-focused examples included the Department of Defense's (DoD) anthrax incident and the Ebola outbreak. When questions arise, HSRP works with OEM and CDC to address them.

Lastly, Dr. Snyder discussed HSRP's participation in operational demonstrations and exercises to collaborate with interagency partners and end-users to jointly demonstrate and evaluate cleanup methods at a full scale. These activities provide hands on experience with research and identification of logistical challenges with tested approaches.

### **Discussion of the Operational Technology Demonstration (OTD)**

*Lukas Oudejans, NHSRC*

Dr. Lukas Oudejans discussed HSRP's role in the UTR Project. He explained that conducting a large scale, realistic training exercise of this magnitude enables HSRP to improve its capability for a transit system to rapidly recover from a biological event, evaluate existing sampling methods, and develop guidance and decision frameworks.

Dr. Oudejans stated that as part of the OTD, HSRP demonstrated selected technologies such as fogging using sporicidal liquids (e.g., peracetic acid, bleach, dichlor), fumigation of railcar interior using methyl bromide, and fumigation under subway environmental conditions using chlorine dioxide.

By transitioning from laboratory research to a subway OTD, HSRP is able to identify capability gaps. Examples of these gaps include the efficacy of a fumigant application in a porous and dirty

environment and complexities of sampling and decontaminating an intricate infrastructure. Dr. Oudejans explained that HSRP recently performed laboratory studies to fill these gaps related to underground remediation. These studies addressed the application of fogging sporicidal liquids for decontamination of subway materials and the efficacy of low temperature fumigation using different fumigants. He presented other examples, including the evaluation of commercially available equipment for decontamination of *B. anthracis* spores in a subway environment, the waste dunking method, and the use of the QR coding approach for tracking personnel activities.

Dr. Oudejans described the OTD as a collaborative effort involving more than 175 personnel from federal, state and local agencies. He calculated more than 10,000 hours were spent on the planning and execution of the OTD. Collaborators included EPA, DHS, national laboratories, and DoD.

To provide a realistic scenario, sampling and decontamination teams consisted of researchers, actual responders and remediation contractors. HSRP conducted pre- and post-decontamination sampling to determine the background *Bacillus atrophaeous* concentration. Dr. Oudejans stated the objective of the study was to test and evaluate the efficacy, time and personnel required, cost of each application, and waste disposal requirements.

Dr. Oudejans explained that barriers were built to keep *B. atrophaeous* spores from dispersing outside of the training zone. Two rounds of decontamination were performed by fogging and spraying surfaces with low-pressure sprayers.

A video of the OTD was played for the subcommittee. Dr. Sayles explained that videos of the exercise are an important educational tool. Dr. Oudejans described the actions of the emergency responders performing fogging, pressure washing, and sampling methods.

Mr. Roehl asked for details on the decontamination efficacy on substances applied to the gravel and the dirt. Dr. Oudejans responded that the spores remained on the surface level and that preliminary results indicate that both methods were effective. Laboratory tests are on-going to determine if the methods are equally effective.

Mr. Roehl asked for more information about fumigant residues. Dr. Oudejans replied that the pH-amended bleach did not leave any residuals. Dr. Reinhart inquired if air movement contributed to this observation. Dr. Oudejans said that air movement was not a factor, but that it could impact the results in an above-ground scenario.

### **Wrap-Up**

Dr. Sayles thanked the NHSRC staff for planning and preparing for the BOSC HS subcommittee meeting. He thanked Mr. Tracy, Dr. Olsiewski, and Dr. Taylor for their leadership and the new BOSC members for their enthusiasm and engagement during the meeting. He looked forward to the subcommittee's final report.

### **Subcommittee Work Time**

The subcommittee praised the effort of the program members and the quality of the presentations. The BOSC members noted the integration of the recommendations from the FY16 Annual Report and highlighted the synergy among aspects of the program.

Ms. Lamb commented on the integration of HSRP personnel into multiple aspects of the center's research laboratories. She noted that, although this integration is essential and beneficial, it is also detrimental because if HSRP loses these personnel the program as a whole could be affected.

Dr. Wichman pointed out the need to expand research of compounds, specifically with respect to varying concentrations and particle size. Mr. DeGraca noted the use of practical tools and solutions. He stated that gaps remain in areas such as the testing of various paint samples as a material. He suggested the development of white paper summaries for HSRP's partners and the community. These white papers will allow HSRP to reach end-users and promote their research.

Mr. Brooks observed a dependence on funding from outside agencies to conduct large-scale exercises. He noted that embedding end-user personnel into the program is of critical importance for applied science. He agreed with Mr. DeGraca that HSRP might not be taking full advantage of professional associations and outside agencies (e.g., Real Estate Roundtable).

Ms. Lamb stated that every state's emergency management group would be interested in EPA's tools.

Dr. Reinhart noted the practicality of easy to find materials but cautioned against overlooking newer or innovative materials. Mr. Roehl discussed the CANARY software incident and his background before joining the subcommittee. He expressed confidence in the work being done by HSRP.

Mr. Hackney expressed enthusiasm about HSRP's involvement with the user community and the application of VR and augmented reality. Recognizing the benefit of Mr. Boe's involvement in the EPA developer guild, he suggested a BOSC recommendation focused on EPA developer guild tool approval.

Mr. Roehl and Mr. Hackney discussed the platform for the MicroSAP tool. They agreed that Esri and Microsoft work together as a cohesive structure and will provide that as a BOSC recommendation.

The subcommittee discussed the crosswalk of science questions (on pages 6–7 of the booklet) and assigned each individual a specific topic to address. Suggestions for BOSC recommendations included the integration of tools; fate and transport; research gaps; incorporating social sciences; transition methods to partners; positive accomplishments; and the systems approach and opportunities for improvement.

Dr. Olsiewski and Mr. Tracy adjourned the meeting.

**Appendix A: Agenda**

**United States Environmental Protection Agency  
Board of Scientific Counselors (BOSC)  
Homeland Security (HS) Subcommittee  
Meeting Agenda – February 14–16, 2017  
Research Triangle Park, North Carolina**

Breaks at the discretion of the chair.

**Day One – February 14**

|               |  |   |
|---------------|--|---|
| 8:00 – 8:15   | Introductions and FACA guidelines  | Tom Tracy                                     |
| 8:15 – 8:25   | Welcome  | Paula Olsiewski<br>Tammy Taylor               |
| 8:25 – 9:15   | Overview Presentation  | Gregory Sayles<br>Emily Snyder                |
| 9:15 – 9:45   | Presentation: What are the fate of and transport mechanisms for biological agents in the urban <i>environment</i> to inform mitigation and cleanup decisions?      | Paul Lemieux                                  |
| 9:45 – 10:00  | Break and walk to demo site  |   |
| 10:00 – 12:00 | Demos: Small Wind Tunnel<br>Water Wash-off   | Russell Wiener<br>Anne Mikelonis              |
| 12:00 – 1:00  | Lunch  |   |
| 1:00 – 1:30   | Presentation: What are effective and efficient tools, strategies and methods to characterize and assess exposure from biological contamination in the environment? | Sarah Taft                                    |
| 1:30 – 1:45   | Walk to demo site  |   |
| 1:45 – 4:30   | Demos: Composite Sampling<br>MicroSAP<br>SHEDs Exposure Modeling   | Sang Don Lee<br>Erin Silvestri<br>Janet Burke |
| 4:30 – 6:00   | Subcommittee work time   |   |

**Day Two – February 15**

|              |  |              |
|--------------|--|--------------|
| 8:00 – 8:30  | Presentation: What are effective methods for decontamination after a wide area biological contamination incident for indoor and outdoor areas?   | Shawn Ryan   |
| 8:30 – 8:45  | Break and walk to demo site  |              |
| 8:45 – 12:00 | Demos: Street Sweepers   | Joseph Wood  |
|              | COMMANDER Projects   | Joseph Wood  |
|              | Biolab   | Worth Calfee |
|              | Material Compatibility   | Sang Don Lee |
| 12:00 – 1:00 | Lunch  |              |
| 1:00 – 1:30  | Presentation: What science is needed to inform waste management decisions during a wide area biocontamination incident?  | Shawn Ryan   |
| 1:30 – 1:45  | Walk to demo site  |              |
| 1:45 – 2:15  | Demo: Waste Dunking  | Paul Lemieux |
| 2:15 – 2:30  | Return to classroom  |              |
| 2:30 – 3:00  | Presentation: How can decision support tools be best designed to support a systems approach to environmental response decision making after a wide area biological contamination incident? | Hiba Ernst   |
| 3:00 – 3:15  | Public Comment   |              |
| 3:15 – 5:30  | Subcommittee work time   |              |

**Day Three – February 16**

|              |   |                |
|--------------|---|----------------|
| 8:00 – 8:30  | Presentation: Integration of Tools      | Timothy Boe    |
| 8:30 – 9:00  | Presentation: Transitioning Research    | Gregory Sayles |
| 9:00 – 9:30  | Underground Transport Restoration Video | Lukas Oudejans |
| 9:30 – 10:00 | Wrap-up                                 |                |
| 10:00 – 1:00 | Subcommittee work time                  |                |

**Appendix B: Participants**

**BOSC Homeland Security Subcommittee Members:**

Paula Olsiewski, Chair  
Tammy Taylor, Vice Chair  
Lance Brooks  
Andrew DeGraca  
Edward Hackney  
Melanie (Patricia) Lamb  
Debra R. Reinhart  
Edwin A. Roehl, Jr.  
Monica L. Schoch-Spana  
Michael Wichman

**EPA Designated Federal Officer (DFO):** Thomas Tracy, *Office of Research and Development (ORD)*

**EPA Presenters:**

Gregory Sayles, *ORD, National Program Director, Homeland Security Research Program (HSRP)*  
Emily Snyder, *ORD, Acting Deputy National Program Director, HSRP*  
Paul Lemieux, *ORD, National Homeland Security Research Center (NHSRC)*  
Russell Wiener, *ORD, NHSRC*  
Anne Mikelonis, *ORD, NHSRC*  
Sarah Taft, *ORD, NHSRC*  
Sang Don Lee, *ORD, NHSRC*  
Erin Silvestri, *ORD, NHSRC*  
Janet Burke, *ORD, NHSRC*  
Shawn Ryan, *ORD, NHSRC*  
Joseph Wood, *ORD, NHSRC*  
Worth Calfee, *ORD, NHSRC*  
Hiba Ernst, *ORD, NHSRC*  
Timothy Boe, *ORD, NHSRC*  
Lukas Oudejans, *ORD, NHSRC*

**Other EPA Attendees:**

|                |                  |                      |
|----------------|------------------|----------------------|
| Judy Ancharski | Tonya Nichols    | Mya Sjogren          |
| Romy Campisano | Kathy Nickel     | Kelly Smith          |
| Francisco Cruz | Michael Pirhalla | Kelly van Bronkhorst |
| Brian Kleinman | Bruce Rodan      |                      |
| David Kryak    | Ramona Sherman   |                      |

EPA BOSC Homeland Security Subcommittee Committee February 14-16 Meeting Minutes

**Other Participants:**

Pamela Bailey

Mike Soraghan

Dahman Touati

**Contractor Support:**

Canden Byrd, ICF

Catherine Smith, ICF

### **Appendix C: Charge Questions**

**Charge Question 1: Are we doing the right research? In other words, how well does the HSRP's current research portfolio address high-priority Agency needs in this area? Taking resource limitations into consideration, should the HSRP increase or decrease the emphasis of certain areas of research?**

Context: Given limited resources and the urgency of its mission, HSRP must conduct a research portfolio that is closely aligned with the high-priority needs of the Agency. The EPA end-users of the program's research work closely with the program to delineate these needs, help define the science questions that must be addressed, advise on the research as it is conducted, help design and deliver effective products. These high-priority needs are cross-walked with the science questions that are designed to address the needs. The research aimed at addressing these science questions is outlined in the science questions narratives. We seek advice from the Subcommittee on the resultant, current portfolio.

**Charge Question 2: Assess the current approaches that the HSRP uses to transition research to end-users. How might these approaches be improved?**

Context: The HSRP is not fully successful unless its scientific products are transitioned effectively to the partners who will use them. However, this transition is an important challenge because it requires that products are formulated and delivered so that they meet end-users' needs and so the users can understand the utility and limitations of the products and are comfortable with and confident in using them. HSRP will present the current practices it uses for research transition and seeks the Subcommittee's assessment of these practices and advice on how to advance its transition capabilities.

**Charge Question 3: To what extent will the program's work provide multiple benefits to our nation by addressing critical needs beyond those directly related to terrorist attacks? In other words, will the research, while designed primarily to improve our partners' capabilities to respond to acts of terrorism, result in science that is useful in addressing other environmental problems?**

Context: HSRP develops data and tools to help EPA address acts of terrorism while attempting to build in relevancy to multiple hazards. HSRP seeks the subcommittee's assessment of the program's progress in this effort and advice on opportunities for how the program's work can be used for various purposes.