**U.S. Environmental Protection Agency (EPA) Board of Scientific Counselors (BOSC)**

**Sustainable and Healthy Communities (SHC) Subcommittee**

**Face-to-Face Meeting Minutes**

**September 24–25, 2015**

**FINAL**

**Date and Time:** September 24, 2015, 8:00 a.m. to 5:00 p.m.; September 25, 2015, 8:30 a.m. to 4:00 p.m.

**Location:** EPA Campus – C111-C, 109 T.W. Alexander Drive, Research Triangle Park, 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, participants are listed in Appendix B, and SHC materials provided to the SHC subcommittee members are enumerated in Appendix C.


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## Thursday, September 24, 2015

The meeting generally followed the issues and timing as presented in the agenda provided in Appendix A to this meeting-minutes document.

### Welcome, Introduction, and Opening Remarks

*Dr. Robert Richardson, Chair*

Dr. Richardson welcomed members and guests to the first meeting of the Sustainable and Healthy Communities subcommittee by saying it was a pleasure to see everyone and that he was looking forward to getting to know each other and beginning a long-term engagement. He began by having each member introduce themselves and the watershed they live in. Dr. Richardson acknowledged other individuals in the room, including SHC research program project leads and Environmental Protection Agency (EPA) employees. Dr. Richardson gave a special thanks to the Designated Federal Officer (DFO), Jace Cujé, as well as Dr. Michael Slimak and Dr. Andrew Geller for preparation of the meeting. He explained there have been many calls to discuss the program and prepare for the meeting, and that their efforts were extremely helpful.

Dr. Richardson discussed the plan for the two days of the public meeting. He stated the subcommittee members should have looked over the agenda already, but he wanted to familiarize them with the objectives. He said that that on Day 1, they would hear a lot from EPA and the day would be devoted mostly to learning more about the SHC program and tools, and the subcommittee members would have the opportunity to ask the presenters questions. There would be time set aside to discuss the six charge questions assigned to the subcommittee. Dr. Richardson acknowledged the relative newness of the program and answering the charge questions that have been assigned may be difficult to answer, given the subcommittee has had very limited contact before the meeting. He assured the subcommittee that their depth of knowledge will grow. Dr. Richardson stated that engagement in the discussion was important and much appreciated. He thanked the subcommittee for taking the time out of their busy schedules to engage with this subcommittee as they provide assessment comments to EPA.

### Designated Federal Officer (DFO) Welcome

*Mr. Jace Cujé, Designated Federal Officer*

Mr. Cujé thanked Dr. Richardson for his kind words and introductory remarks and also welcomed members of the subcommittee. He explained they began the process in April, and he appreciated everyone's patience as the meeting was organized such that almost everyone could attend. Mr. Cujé told the subcommittee Dr. Earthea Nance would be unable to join due to prior commitments, and that Dr. Leslie Rubin was en route and would arrive soon. He noted the package of materials provided included an agenda, a matrix that cross-walks the materials given out against the charge questions, context for each of the charge questions, a description of the poster session, and brief biographies of the program and regional office partners that would speak that afternoon, noting that the matrix and the context will be points of discussions a little later.

Mr. Cujé told the members that BOSC was re-chartered in 2014 to provide advice, information, and recommendations to EPA's Office of Research and Development (ORD) on all aspects, technical and management, of its research programs. In July 2014, the BOSC Executive Committee met with the Science Advisory Board (SAB) and evaluated ORD's Strategic Research Action Plans (StRAPs) culminating in a set of recommendations provided in January

2015 that focused on the emerging direction of the national research programs. ORD provided responses, which were emailed to the subcommittee members, to each of the BOSC recommendations. Subcommittees are moving beyond these initial recommendations to provide more in-depth expertise and targeted advice on each of the individual research programs. The first of five BOSC subcommittees [Air, Climate and Energy Subcommittee] met in June. He mentioned that all of the more program specific recommendations would be rolled up and provided in a final report from the BOSC Executive Committee noting that subcommittees themselves are not chartered under FACA. Nevertheless, EPA is committed to ensuring openness so we are moving forward with transparency and posts the materials online so they are available to public participants. Mr. Cujé explained that his biggest role as DFO is to serve as the liaison between the subcommittee members and the Agency and intends of maintaining the requisite level of transparency and openness. The meeting is open to the public, and, upon certification by the Chair, the minutes will be posted on the EPA website for the public to access.

Mr. Cujé stated an electronic public docket was established for the meeting and presented in the September 3, 2015, *Federal Register*. He mentioned that he has not been contacted by any members of the public thus, there are no public comments anticipated. Mr. Cujé told the members there was an Adobe Connect link, which was chosen to avoid distractions and help maintain the subcommittee's focus. "Ground rules" included the Chairs running the meeting and posing specific questions. He encouraged the EPA to be responsive if there are specific questions posed. He also noted that there will be poster sessions, which often involve one-on-one discussions. For FACA purposes, Mr. Cujé explained it would be important for the subcommittee members to capture these conversations and key recommendations during subsequent subcommittee discussions such that they can be included in the minutes.

In closing, Mr. Cujé explained that any requests for new materials should be submitted through him to the Agency. He reminded attendees that BOSC members are Special Government Employees, meaning they must not have any conflicts of interest and must have completed an annual ethics report and training requirements. Mr. Cujé said that if anything of concern came to light during the meeting, to alert him and they would figure out how to proceed together. He reiterated that while there were some requests for information from the public, no member of the public had requested time to present oral comments.

Dr. Richardson urged participants not to hesitate to ask what an acronym means.

**SHC Welcome and Discussion of Materials Provided**

*Dr. Michael Slimak*

Dr. Slimak wished the subcommittee a good morning, welcomed them to North Carolina, thanked the panel, and assured the subcommittee that the service it provides is extremely important as the SHC research program moves forward. After working with BOSC subcommittees, SAB, NAS, and all panels are important to ORD and EPA to reach out to design the Agency's national research programs. Because of the close relationship throughout the history of EPA, they see significant environmental improvements as a result. Dr. Slimak mentioned their service is very important to them and he hopes to keep the panel together over the next four years and stated he appreciates the chair and co-chair and the investment they have made.

Dr. Slimak clarified they have provided a lot of material because it was hard to decide what material would benefit the subcommittee—sometimes he refers to as evidence that the research program is well defined and moving in the right direction. ORD provided a notebook with posters, project charters, abstracts from specific journal articles, and other materials, all of which is electronically posted with a bibliography of publications. He commented that if there was something a member needed and they didn't see, to let them know and it would be provided to them.

Operating a traditional government matrix is new to ORD (started only a few years ago), and Dr. Slimak mentioned they are still learning. ORD contains a small staff and most of the work is done in laboratories and the scientists within them. He commented the easiest way to understand the matrix is that national program directors determine the "what" and the laboratories determine the "how" and they work very closely together to determine the what and the how. ORD is still learning how to operate the matrix, but has made a lot of progress.

Dr. Slimak introduced Dr. Andrew Geller, the Deputy Program Director. He noted they serve together, and he appreciates his leadership in the program, as well as the leadership of all of his staff. Each of ORD's six national programs have NPDs and Deputy Program Directors that work together and share progress of the program.

He again thanked the subcommittee and noted when they interact with staff and view posters, they will come to realize this program reflects a big change in the environmental science movement in EPA, especially in ORD, as we transition into an era where we need to understand individual behavior, how social determinants impact health and well-being, and how communities are an important unit to understand and implement environmental protection. Dr. Slimak mentioned this is a shift from ecotoxicology and human health toxicology to a different paradigm with concepts of sustainability at its heart. ORD made this transition under our previous Assistant Administrator, Paul Anastas, and this is still being maintained by our new Assistant Administrator appointee, not yet been confirmed, Tom Burke. So this is the path that ORD is on, as well as the rest of the Agency, which is embracing the concept of sustainability.

Dr. Slimak revealed that admittedly, they need to understand what sustainability means for some programs for after all, EPA is a regulatory agency. Most of the improvements are a result of taking regulatory steps, and those steps are still important to the Agency along with our enforcement arm, noting Volkswagen as the most recent example requiring enforcement. SHC represents a change in the way ORD is looking at the environment in communities, understanding their decisions, and providing tools to help with those decisions. In a nutshell, that's what SHCRP is all about.

Dr. Geller introduced himself and said he is fortunate to work with Dr. Slimak. He reiterated Dr. Slimak's comments by saying their program is about sustainability and communities. Dr. Geller provided additional appreciation for Mr. Cujé and the Office of Science Policy who pulled this BOSC subcommittee together since this review committee is unique in EPA and ORD history. He mentioned that the orientation towards sustainability is a new mission for the Agency and drawing together a committee that has specialists in planning, community activities, economics and information technology provides them with an incredible opportunity for ORD to learn from the subcommittee members who have a variety of specialties, and they are thankful to have their advice on building the program. He concluded by saying he is looking forward to the meeting discussions and the coming years.

**Review of Charge Questions**

*Mr. Robert Richardson, Chair*

Dr. Richardson thanked Dr. Slimak, Dr. Geller, and Mr. Cujé. He acknowledged the uniqueness of the group and admitted he enjoyed the interdisciplinary discussions and that he always learns a lot. Dr. Richardson proceeded to discuss two of the five documents that were given to the subcommittee members that morning. The first document was called "Charge Questions for BOSC Review of SHC" which includes the charge questions and their context. He noted the subcommittee has received an immense amount of material, but this document would be important to look over in preparation for the breakout groups on Day 2. The second document was the matrix, which was a one-page table presenting the six charge questions along the top row and which SHC material(s) supported those charge questions. Dr. Richardson mentioned those would become helpful in the poster sessions to see the extent to which those poster sessions inform the charge question the members' breakout session will review, which particular tools that will be discussed, and how those align with the charge questions. That said, Dr. Richardson reminded the subcommittee that each member was responsible for providing feedback to ORD for all six charge questions. While each member is assigned to one breakout group where they would be discussing one or two charge questions more deeply, he urged all members be responsible for input on all charge questions. Everyone would be included in the charge question discussions on Day 2, using detailed breakout groups.

Dr. Richardson then continued by reviewing the charge questions, assuring Dr. Flint and himself would review the charge questions with an eye toward needing to flesh anything out or addressing any charge questions that need additional discussion. Mr. Richardson and Dr. Flint introduced the charge questions according to breakout groups to which they are assigned. Dr. Richardson mentioned Breakout Group A will be responsible for questions 1 and 5. He began by restating:

***Charge Question 1****: Given the research objectives articulated in the Strategic Research Action Plan (StRAP), are the topics and project areas planned and organized appropriately to make good progress on these objectives in the 2016-2019 time frame?*

Dr. Richardson highlighted a couple points—are they being planned and organized appropriately. He noted that the context provided with the charge questions gives some additional insight on how projects are planned and organized instructing the group to reflect on whether or not they are appropriate to make good progress. He emphasized that the provided context described how problems are formulated in the Agency and how this essentially comes from the Agency's own stated priorities. The context gives information on how those priorities were set. They are partly due to the EPA's strategic plan, senior staff from states and regions articulating problems that they face and then senior managers at EPA discuss the problems in order to identify Agency priorities. Dr. Richardson noted that after Day 1, the subcommittee would learn much more about how priorities are set.

Dr. Richardson explained that Breakout Group A will spend some time research question 5 thus, this group has two questions on which to reflect, restating Charge Question 5:

***Charge Question 5****: SHC's portfolio includes both hypothesis-driven research and the development of decision-support tools to aid Agency, state, and community stakeholders. Is the balance of research and tool development appropriate for this program?*

Dr. Richardson explained that the Chairs felt this was closely related to the content of question 1 and asked that Group A tackle those two questions together, reflecting on the design of the program and the balance between research and tool development. No questions were raised on Charge Questions 1 and 5 thus, Dr. Richardson turned it over to Dr. Flint to highlight what Groups B and C will do for Charge Questions 2, 3 and 4.

Dr. Flint began by noting Charge Questions 2 and 3 are asking them to think about the relationship that the SHC program has with partners, which include a broad cast of characters from within other EPA programs, the policy arms, the laboratories, the centers, the regions across the country, states, and communities, with which EPA is engaged.

She restated ***Charge Question 2****: How effective are the approaches for involving the EPA partners (program offices and regions) in the problem formulation stage of research planning?*

In that particular planning stage, how effective has the program been in involving that wide array of partners?

Moving on, she then restated ***Charge Question 3****: How well does the program respond to and anticipate the needs of EPA partners (program office and regional).*

She stated that this, again, includes partners within the program office as well as in the regions and in communities that are being served. She mentioned this incorporates both established priorities and needs as well as unanticipated needs, crisis or issues that might come up. Dr. Flint closed by stating that Charge Questions 2 and 3 and Breakout Group B would really think about the relationship with partners at the different phases of this full endeavor, reiterating that all of the different research program subcommittees will be tackling the issue of partner relationships.

Specific to her Breakout Group C, Dr. Flint stated that this question requires the members to really examine the essential charge of the program and its thinking about sustainability restating ***Charge Question 4****: SHC has committed to integrating ecological and human health to better address issues of human and community well-being. Does the research program contain the elements necessary to integrate these two critical elements of EPA's mission?*

The subcommittee members would be looking across all materials and the exposures of the programs to help evaluate how well the ecological and human health are being integrated towards the endeavor of moving toward sustainability. Breakout Group C would tackle this question—Charge Question 4.

Dr. Richardson resumed leading this session, explaining that Breakout Group D will tackle the last charge question—

***Charge Question 6:*** *SHC has a mission to address the short-term needs of EPA's Office of Solid Waste and Emergency Response (OSWER) for research on contaminated sites, oil and fuel spills, and sustainable materials management. How can SHC best leverage these short-term research goals with longer term community sustainability and environmental justice goals?*

Finishing the six charge questions and four breakout groups, Dr. Richardson then asked for questions before moving to the next section.

Dr. Irwin asked if there was a list of breakout groups printed for reference. Dr. Richardson explained they were sent as an email attachment, and they could be put on the screen to remind everyone. Each group should have three to four people. It was mentioned that Dr. Nance would

be in Breakout Group D, but because of her absence, they invited her to provide comments, which would be received sometime within the course of the workshop. He urged members to reflect that evening on which charge questions they were assigned and the context statements provided for them noting that they will reconvene as full group tomorrow morning.

Dr. Cervero asked if there would be a designated chair of each of the breakout groups or if there was any other organization of the breakout groups that the members needed to know. Dr. Richardson stated that each group should have a spokesperson to report back at the end of Day 2. Dr. Flint continued by saying that because everyone is responsible for providing feedback on all charge questions, the subcommittee will start [tomorrow morning] together as a group and everyone will have an opportunity to raise key issues on charge questions to which they are **not** assigned so the Chairs can gather consensus issues. They will then separate into breakout groups to begin writing. Dr. Flint said that she and Dr. Richardson will be facilitators for their groups on Day 2, but they need to determine who will facilitate notes for the other two groups. The members would come back at the end of Day 2 to share and establish a process of pulling together notes to meet the deadline of November 17th. Some logistics would unfold depending on how far they got addressing those questions. Dr. Richardson commented that during lunch on Day 2, he and Dr. Flint would spend some time with the other two groups to check in on their progress and see if additional resources are needed and how can they position them to ensure they can make the greatest progress over the afternoon. At the end of Day 2, they would explain how they envision interacting as a group moving forward. He mentioned they have suggestions about the report due to ORD in the months coming, but would like to hear from the subcommittee members about the process they would like to engage with going forward after the meeting. Noting the subcommittee is ahead of schedule, Dr. Richardson inquired as to whether there are other items that need to be discussed before moving on.

Dr. Martin wanted to clarify Charge Questions 2 and 3 regarding partnerships. The charge questions explicitly use the word “partner,” but in some of the materials, definitions explain that ORD only uses “partner” to only include EPA program and regional offices, excluding stakeholders. He asked if the charge was only to look at only official partners or to include the broader scope. Dr. Slimak answered by explaining “partner” is a broad term for ORD. It includes non-EPA organizations, which can refer to communities, their leaders, those involved in managing them, and NGO organizations involved at the community scale.

Regarding the use of the word “community,” Dr. Meyer stated that this word could refer to individual neighborhoods or municipalities. The materials given to the members reference communities as mostly municipal rather than sub-municipal, specifically with regard to questions involving data, and certainly relevant to Charge Question 6, in terms of serving individual neighborhoods with contaminated land, for example, and environmental justice issues associated. He asked how the word “community” is being used in all of the materials the members have received. Dr. Richardson suggested that the subcommittee think of it in terms of the multiple scales in which they interact, inviting EPA to respond. Dr. Slimak noted that was a great question. He mentioned they have discussed this at length and as a team within EPA and that question came up the first time that we presented this program to the SAB. They believe a community is itself a researchable unit. Research may be conducted at a community scale. It can

be vertical communities (skyscrapers); so, New York City (NYC) is a community – a big one. The subunits within NYC (the boroughs) would also be considered a community. He noted the scale question always pervades the thinking we do at the community level. There are also very small, horizontal communities that are spread out with a large landscape footprint. Dr. Slimak said there are also communities that the Agency emphasizes—those with a legacy of a history of contamination, e.g., Superfund sites or hazardous waste sites. They work specifically with the Office of Solid Waste and Emergency Response (OSWER) to clean up those communities. Their view is that they cannot move towards the goal of sustainability with contamination still in that community. The Agency works with underserved communities (those that don't have access to the goods and services that other communities do). EPA sometimes calls those environmental justice communities. Dr. Slimak continued by saying the research and tools they are developing should be useful at whatever scale is being discussed. They have stayed away from defining a community because it is up to the community who has decisions to make and that reach out for assistance from us …that is considered the community.

Dr. Tomlinson followed up on the previous questions about communities by stating both chairs have mainly discussed geographically cited communities. He asked if they are mostly physical communities that have a location, because community has a very different meaning for him. He questioned EPA if they consider non-physical/geographical locations as well. Dr. Slimak answered that he had not thought about that, but believes it involves mostly physical communities because they rely on the existence of ecosystem goods and services, so there is certainly a landscape need. He said it is a physical community, but guessed it could involve a virtual community or an internet community, but that has not been considered much. Dr. Richardson noted that to the extent that those communities interact with the environment in some way, place-based communities seem to be the most relevant. We can think about communities in the broadest sense in relation to our charge questions. Dr. Geller commented that most of what they are thinking about are place-based communities, particularly when orienting our science and our tools in the decisions that are going to affect place-based communities. Their challenge is in working with communities to make a tool, perhaps through a case study, and then applying that tool to similar communities. That said, Dr. Geller said they do have the broader definition of communities, for example, most of their work on children's environmental health and work that is related to other vulnerable populations. Because the program is so broad, they are providing some of the fundamental science that will ultimately feed into their decision support and other tools. The main focus is on place-based communities.

Dr. BenDor referenced the extensive electronic and software tools being developed. With regards to online communities and support mechanisms for those and sustaining those communities, he asked if that would be included in thinking about how to create that ecosystem so that these tools are actually used by a wide variety of stakeholders. Dr. Slimak assured any guidance the subcommittee could give them in that respect would be helpful. He noted that they haven't been thinking along those lines in the program, but with the digital world expanding as quickly as it is, it is something that they should seriously consider. Dr. Flint noted this topic is where they can bring the subcommittee expertise to bear as they go through their charge questions when addressing how communities intersect and how they might be able to provide some

recommendations for SHC with regard to thinking about communities. Dr. Geller mentioned there was an opportunity to learn more about ORD and EPA structure. In their community, they have the Office of Science Information Management, and they have discussions about software lifecycles and some of the work the subcommittee will see is on interoperability. They are difficult issues and he commented that any insight is welcome.

Dr. Richardson asked if the subcommittee had any more questions. When there were none, Dr. Flint added that on Day 2, before they get into addressing charge questions, there is time set aside to pose any clarifying questions to Dr. Slimak. As questions came about in Day 1, she asked the subcommittee members to track them because they will have time to organize and clarify them on Day 2. She asked that a running tab of clarifying questions be kept so if they were not addressed on Day 1, they could be answered at the beginning of Day 2.

Dr. Richardson reminded the subcommittee that as they go into their next section, the poster session will occur after Dr. Slimak's discussion of program planning, organization, and research. He urged members to remember the gist of their small-group or one-on-one discussions or take some notes of what emerged as part of those discussions so they can be brought up, recorded in the minutes, and shared as part of the webinar in order to meet FACA requirements. Bring the essence of those conversations back into this room such that they can be shared during the last thirty minutes when come back together and synthesis the small-group discussions.

**Program Planning, Organization, and Research I: SHC StRAP Overview**

*Dr. Michael Slimak*

Dr. Slimak said he would discuss logistics of the meeting at the end of his slides. He mentioned there was an art to crafting charge questions, and admitted that he himself—experienced with charge questions—still had difficulties. He said charge questions are meant to be guidance questions so no one should feel constrained; their primary purpose was to guide the subcommittee toward giving feedback to direct EPA. The goal of the program is to better integrate ecological and ecosystem services with human health—a task that EPA has not been doing in the past, but one they want to do now. Dr. Slimak requested feedback from the audience on whether integration being developed/done in these plans.

Dr. Slimak began his brief overview based on the SHC 101 course—a two-hour course given in July—noting the slides are in the notebooks. He opened his presentation with the three cross-agencies strategic priorities of EPA—to make a visible difference in community, which certainly is relevant to SHCRP, clean up and advance sustainable development, and work towards a sustainable future. Dr. Slimak noted that all three of these cross-agencies goals are consistent with research planning in his program. He reminded the group that SHC stands for sustainable and healthy communities.

Dr. Slimak said EPA was not a fundamental research agency, but an applied research agency that works with its program offices and its ten regional offices. This characteristic distinguishes EPA from other research programs in the federal government—especially the National Science Foundation (NSF).

National decisions and regulations are developed through the program offices—Office of Water (OW), Office of Air (OA), Office of Chemical Safety and Pollution Prevention (OSCPP), and OSWER. These offices set the national agenda for regulations that are implemented throughout

the ten regional offices. EPA has evolved to include action at the regional level, and since then regional involvement has been critical to implementing EPA's agenda. Many state departments of environmental protection or natural resources were stood up as a result of grants from EPA in the early 1980s. Subsequently, there is more work at state and regional level than national level which is evidence of the natural evolution of environmental protection in this country.

ORD is the science arm of the EPA—it supports the program offices, regions, and EPA's –-missions. ORD does not own science. There are scientists, engineers, and other individuals are scattered across the Agency and throughout the regions. They all work very close together and have a very collaborative relationship.

Dr. Slimak shared SHC's "slogan"—research to integrate nature's benefits and communities. He stated the slogan was not final, but he wanted to bring attention to the three components of sustainability represented by the figure on the right, where the larger oval is environmental integrity, which SHC believes is the ultimate driver in terms of sustainability. The goal was for environmental integrity to benefit health and well-being and provide a robust and healthy economy. Dr. Slimak suggested that the three components of sustainability are not mutually exclusive and there is need to be work to understand how these three components, formerly pillars, work together. The SHC program is attempting to establish casual relationships between human health and ecosystem services in order to provide tools for communities to become self-sufficient and solve local issues.

Dr. Slimak fully reviewed the StRAP, which is written in four-year cycles, for the fiscal years 2016 to 2019. He noted that the current version, which reflects changes and inputs in response to SAB/BOSC recommendations received last year, was set to be released on October 1. He recounted that one of the revisions requested was to consider challenges of community-based decision making, which would be a tough sell in terms of sustainability. Dr. Slimak stated that environmental health was the ultimate driver in terms of well-being and sustainability. A whole part of the program is dedicated to the development of decision-making tools and the science behind the tools. He noted SHC definitely wants to address both ecological and human health as an integrated system although historically, they have been considered separately. SHC wants to focus on well-being and what it means (e.g., access to green space not absence of disease). Additionally, to better understand the whole field of sustainability—a rapidly moving field—the committee should look outside of the agency for ideas. Most important is the recognition is that SHC is moving into the field of social science and individual behavior.

Dr. Slimak revealed that EPA historically dealt with corporate behavior in terms of regulations and enforcing corporations to comply with regulations; however, to really achieve sustainability, the focus should switch to individual behavior. He recognized the program's movement into the field of social sciences and individual behavior since individuals make decisions (e.g., to recycle, how they travel, the vehicles they buy), so understanding the motivation and the drivers behind those individual decisions is where SHC is going. He noted that individuals live in communities, how individual decisions aggregate up to community scale and influence the decisions a community makes as whole. Dr. Slimak sought advice from the group on how to understand this relationship, which is new to the overall program. He declared there was no longer a three-legged stool, but nested ovals of sustainability where environmental integrity was the most important oval. SHC responses to the SAB/BOSC review of the StRAP were sent August 4$^{th}$ and each of you should have them.

Dr. Slimak mentioned within the program there are four topics and 11 projects in total: three projects on decision support and innovation, four projects on community well-being, three projects on sustainable approaches for contaminated sites and materials management, and one project on integrated solutions for sustainable communities, which is where SHC tries to bring it all together. Outside of the topics, ORD has four cross-cutting research roadmaps that include children's environmental health, nitrogen and co-pollutants, climate change, and environmental justice, which do not quite rise to the need for StRAPs.

Dr. Slimak detailed the matrix nomenclature behind the StRAP:

- Each of the six national research programs has a StRAP that outlines four years of planned research.
- The NPD plans the "what" which is described in the StRAP.
- Labs and centers determine the "how"—implementation of the research; labs and centers are the heart of ORD and where the bulk of the workforce exists.
- Matrix Interface (MI) scientists serve as the pivot point by working on planning and implementation and reporting to laboratory directors and NPDs.
- Topics cover broad research programs within a national program—there are four within SHC.
- Projects are key operational units in a national program and are important in terms of allocating resources and implementing the research (11 in SHC).
- Focus areas are subordinate units within a project.
- Project charters are a short description of the project including project formulation, EPA context, and description of focus areas.
- Project plans implement the research for laboratory directors and include minute details such as QA/QC and resource allocation. Dr. Slimak mentioned that for this program in particular, the plans are still in development—currently over 600 pages long. The plans are very detailed for lab and task implementation for the program and for the program director to manage implementation of programs.
- Project leads are the key leadership positions in the labs and centers who prepare project plans—a number of which are present at the meeting today.
- Tasks are a unit of research within a project—average of five tasks per SHC project.
- Task Leaders (TLs) are under the direction of the Project Leader (PL).
- A product is a tangible item generated by the research (report, model, tool, database, website, journal article, etc.).
- The output is a synthesis of a representative body of work.
- The outcome is the good that comes from the research.

Dr. Slimak detailed the relationship between tasks, products, outputs, and outcomes through an analogy of sailing a boat. The outcome is sailing a boat from one part of a lake to another. This cannot be accomplished without the boat—the output. The individual products that go into that boat are the hull, the mast, etc. In order to build the hull, there are set of tasks.

Dr. Slimak mentioned all of the materials for the subcommittee meeting were provided in their binders—including the bibliography of research and abstracts—and that if more was needed then members should request materials. He reiterated the agenda, described the RTP complex, including the location of poster sessions, and emphasized that he wanted the subcommittee to have as much interaction with program leaders, labs, etc. as possible. For that reason, the agenda

included multiple poster sessions (one in the morning and one in the afternoon), a tools café (demonstration of four specific tools), and an afternoon discussion to hear from program offices and regional offices. He thanked everyone for their participation. Dr. Richardson ended the session by reminding everyone of their breakout group assignments:

- Group A: Feiock, Richardson and Tomlinson;
- Group B: Martin, Naud and Steinhoff;
- Group C: BenDor, Dannenberg, Flint and Rubin; and
- Group D: Cervero**,** Irwin**,** Meyer and Tharakan

He reiterated that they each member is responsible for providing feedback on all of the charge questions in addition to serving on their breakout groups, which will look at individual charge questions in more detail.

**Program Planning, Organization, and Research I: Topic 2 Posters**

1. *Project 1.62 - EnviroAtlas: A Geospatial Analysis Tool*
2. *Project 2.61 - Community-Based Ecosystem Goods and Services*
3. *Final Ecosystems Goods and Services Classification System (FEGS-CS) and NESCS*
4. *Ecosystem Services Model Library*
5. *Project 2.62 - Community Public Health and Well-being*
6. *Community -Focused Exposure and Risk Support Tool (C –FERST) and Tribal-Focused Environmental Risk Support Tool (T-FERST)*
7. *CCAT - Community Cumulative Assessment Tool*
8. *Solution-Oriented Community-based Cumulative Risk Assessment in EPA Regions*
9. *EQI and HWBI - Environmental Quality Index & Human Well-being Index*
10. *Project 2.64 - Indicators, Indices and Report on the Environment*
11. *Report on the Environment*
12. *Project 2.63 - Assessing Environmental Health Disparities and Vulnerable Populations*
13. *Understanding social determinants of environmental health: complementary animal and population based approaches*
14. *Tribal Science*
15. *Centers of Excellence on Environmental Health Disparities*
16. *Children's Centers (STAR)*
17. *Health Impact Assessment (HIA) -- Proctor Creek*
18. *Air pollutant concentrations due to roadway vehicle emissions*

**Program Planning, Organization, and Research I: Subcommittee Discussion**

Dr. Richardson hoped everyone had interesting discussions and conversations about the posters. He laid out that the session would primarily be used to draw out any major themes or highlights that emerged during their discussions on posters or for members to make comments on topics and themes they noticed were not represented. He recognized there was clearly not sufficient time to get into the finer details of particular posters due to time constraints, but hoped everyone noticed the posters were organized around projects, themes, and topics. Dr. Richardson invited the group for comments, questions or feedback related to the poster session, as well as overall impressions.

Dr. Martin noticed that from the amount of information he was able to get from a few posters, there was a level of data given in the binders that did not necessarily reflect the robustness and richness of some of the other conversations he had through the posters. Additionally, he heard of other projects and project collaborations, which he could not find listed in the given materials. Dr. Martin suggested the subcommittee should think more about the presentation of material in order to give useful feedback and accurately assess the program, and that there should not be any holes in data. Dr. Richardson concurred with Dr. Martin's observation.

Dr. Cervero thought he retained more information from posters and one-on-one conversations than the lecture series even though he only viewed three or four posters. He mentioned through the plethora of discussions, he began to sort through landscape of EPA and what it does (e.g. healthy communities and healthy living). Traditionally, he thought of EPA in terms of natural resources and breathable air and drinkable water, but he began to see other connections, including those between EPA and other agencies such as the Occupational Safety and Health Administration (OSHA's) connection to worker health. He also cited another example in urban planning with regards to greening places, and that it is not just about water pollution and heat island effect, but also about healthy eating, nutrition, and food security. Dr. Cervero noted that this raised boundary questions of what EPA is and is not engaged in and inquired to what degree anyone could illuminate on the questions of boundaries and interconnectivity. Dr. Richardson concurred that Dr. Cervero raised a useful observation. He said that with programs that emphasize sustainability and health from a systems perspective, boundary questions were logical and natural, and that they'll probably come up in ongoing discussions. Dr. Slimak agreed that the boundary question was quite legitimate, and admitted that they struggled with this issue. They are pushing boundaries because some say they don't have the regulatory authority to deal with the food issue, and yet, it could be argued that they do through the pesticides program, in terms of contamination of foods. However, some believe and have challenged the Agency pushing boundaries with the argument that it is going beyond its mission. Dr. Slimak disagreed with this sentiment, and noted that many of his colleagues do as well. He looked to the audience, as an outside body, for input or guidance on this challenge.

Dr. Gellar recalled Dr. Cervero's question in the previous week's research planning discussions. He rhetorically inquired how often does the program deal with issues such as food security? and Is it EPA's mission to map out where sources of healthy food are? Dr. Gellar suggested that if it is important for the EPA to understand the interaction between chemical and non-chemical stressors and if it is going into their models for vulnerability and cumulative impact and risk then yes, it falls under EPA's mission. Dr. Gellar acknowledged that thinking within boundaries is complicated, but pooling data across all resources of federal government and other resources to build models is something on which they are working.

Dr. Cervero continued trying to better understand the federal landscape as it relates to food security. He mentioned a group within the Department of Housing and Urban Development (HUD) that argues if one creates urban agriculture and healthy nutrition it can help regenerate inner-city areas and contributes to brownfields redevelopment and more affordable housing. Similarly, the U.S. Department of Transportation (DOT) when thinking about food access—particularly in low-income neighborhoods—illustrating the overlaps with other federal agencies.

He inquired to what degree, as part of the STRAP, are there interconnections among these federal funders of different research projects, recognizing that it's an inherently complex topic.

Dr. Flint noticed while moving from the text on the page to the interactive discussions at the posters, it became apparent that whole was greater than the sum of its parts. She built on a previous idea that was raised on the problem of ecosystem services that are difficult to measure, such as cultural dimensions, and the human well-being measures and all the intangibles that are being measured and incorporated. She began seeing the connections between the posters, where the whole is about the fact that they are all within topic 2 (vs. only 2.64, etc.). She noted it was helpful to see that references to one another were within a topic and agreed they were not always referenced in collaboration. Dr. Richardson thought Dr. Flint's point was excellent, and recognized the challenge of engaging with many interesting posters in a limited amount of time.

Dr. Tomlinson was excited by the projects he interacted with, and he thanked everyone for their ongoing work. He paralleled the challenge of integrating projects with that of integrating many different aspects of life in terms of pursuing something sustainably. He asked if the broader goal of sustainability was to figure out how to map that within EPA's work, could that provide insightful lessons on how to do that in civilization more broadly.

Dr. Irwin echoed that the projects and posters she encountered were great, and offered congratulations to all presenters. Within the ones she interacted with, she saw great research on environmental impacts and systems, processes, ecosystem processes, and production. Dr. Irwin heard Dr. Slimak say in his overview comments that the EPA was moving into the social sciences and understanding how individual behavior and how it aggregates into community-level decisions. She saw the need for this integration since in many of the posters there seemed to be many opportunities for taking this next step to more rigorously understand how people make decisions into modeling scenario. Additionally, a need existed to better understand how policy will impact ecosystems services directly and indirectly through human behavior responses. She requested Dr. Slimak to say a few words on the subject and how, looking forward, he hopes to integrate this research to what has already been seen at the meeting.

Dr. Slimak concurred that Dr. Irwin was correct—social sciences is the direction they wanted to move. For a number of years, the program has been investing in ecosystems work, and initially more from a theoretical understanding of those services and how to measure and account for them, but not thinking a lot about how those services factor into human well-being. Yet, now there is interest in factoring in those services and how they play out in human well-being and the impact it has from sociological perspectives. He mentioned that the social science expertise was not that deep in ORD. Dr. Slimak noted that even designing experiments from sociological perspective was different for the program because it was typically approached from a natural and physical sciences perspective. He requested any advice the committee could give in that respect.

Dr. Richardson was impressed with the level of integration on posters and the depth of community engagement in the projects; however, he noted he did not see a lot of economics. He mentioned that there was good work presented on the flows of ecosystem services, but not much on the values of them and how they might be used in making tradeoffs in policy decisions. Dr. Slimak responded that one of the tasks was working to value ecosystem services but there was no

poster presentation for this task today noting that there are more economists than social scientists within EPA. As a regulatory agency, EPA has to complete regulatory impact analyses for all major rulemakings thus, economists are working side by side with ecosystem scientists to put values on services. Dr. Slimak believes that EPA undervalues ecosystem services, nature's benefits and services, and therefore not effectively considering all values of services in rulemakings. To assist with these efforts, EPA has begun working with the Council for Environmental Quality to provide guidance to Federal agencies. He acknowledged there was a ways to go, but that they were moving in that direction.

Dr. Gellar recalled the poster on how the final ecosystem goods and services handshake with the national ecosystem services classification system (NESCS) was designed to be both that economic handshake as well as the beginning of really applying ecosystem goods and services to policy analysis. That is, how does a proposed policy propagate through and can SHC use the classification system be used to do that—something the subcommittee should think about. Dr. Gellar referenced Dr. Brian Dyson's future demonstration of his tool that uses a hot-off-the-fieldwork an example of decision science and engagement. He encouraged the subcommittee to think about how they currently are applying decision science and working to enhance that.

Dr. Martin noted that, when reading the Charters, he wondered where are the economics? Thus, his first comment that he believed the current data was not fully representative of the data that should be under analysis. He also commented on the opportunity of useful redundancy between federal research agendas. For example, Homeland Security deals with national flood insurance protection valuation issues, which requires evaluation of physical and natural community infrastructure. He thought those were other opportunities that suggests SHC needs to be a little more aggressive and empire building around with the program's charge since the EPA is one of the few agencies with robust research infrastructure. With regards to social and behavioral sciences, he inquired if there was any guidance or follow up following the White House announcement on additional resources with regards to social and behavioral science resources given across all federal agencies research agendas. Dr. Slimak was aware of the White House's initiative and the guidance going out to agencies, since he represents EPA on the intergovernmental Committee on Environment, Natural Resources, and Sustainability. The Federal Government is distributing guidance and figuring out what it means for each Federal agency; however, it's too early yet to say where EPA is going in response to the guidance. Dr. Gellar alluded that his role of Deputy NPD was required to sit on ORD's Management Council. With the council he discussed strategic workforce planning of all six national research programs' and partnerships' with lab and centers broad commitment to reducing the gap of social scientists in the program's workforce by prioritizing hiring social scientists.

Dr. Rubin thought it was a lovely event and likened walking through the posters to being a kid in a candy store. He was impressed by the shift from linear thinking of cause and effect in a direct line to understanding the complexities and intricacies associated with an integrated model of health. He referenced the question about economics, and asked if anybody looked at cost-benefit analysis. Dr. Rubin wondered if this analysis was invested in this situation today, what benefit could be expected in 10, 20, and 30 years down the road, or if something had been done in the past that could be looked forward to today.

Dr. Slimak noted that some of the work in decision support—including cost-benefit—can be seen during the Tools Café. With this tool, communities can ask a question and the model will output the costs and benefits of any given decision. He mentioned the program moving in that direction, but could not put his finger on a single project directly responsive to the cost-benefit issue that underlies a lot of this work. In regards to linear *vs.* holistic thinking, for a research organization steeped in reductionism, most of colleagues—even the ORD workforce as good as it is—come in with training in reductionism, taking complex issues, studying them in small parts, and adding them up. Dr. Slimak mentioned there was a movement towards a more holistic, systems approach in human health, but acknowledged there was still a ways to go.

Dr. Gellar noted that a project in Tampa Bay was developed using development strategies and their potential impact on ecosystem services, such as the cost and benefit of nitrogen flows. This case study is worth expanding on in terms of how long term these strategies are. Dr. Gellar worked with colleagues in the Office of Air and Radiation (OAR) on a tool called BenMAP that calculates the cost of illness and cost of illness avoided. This tool has widely been used as a regulatory tool. As SHC interfaces with them, they bring in ecosystem service benefits to look broadly at the base of evaluation for them to do their own benefits analysis.

Dr. Dannenberg looked at some of the indices, such as human well-being and some others, and noted they looked transparent and well done. However, he wanted to know how to get a specific community's input on which factors are more important knowing that will vary depending on location. Dr. Dannenberg knew there was work needed on the national level, but was more interested in the usefulness for communities, specifically the options for communities that value certain components differently, was there a way to influence those factors.

Dr. Martin noted that several documents detail that aside from the research projects tasks made through the roadmaps, there are many "ad hoc" requests. He questioned approximately how much time and resources, on average, each year go to ad hoc requests versus other tasks. Dr. Slimak referred to the term "ad hoc"—considered to be unplanned assignments—as "over the transom." He acknowledged these are some component of SHCRP's work and estimated that these assignments take probably less than 15% of the program's time; however, ORD needs to provide technical support in groundwater, Superfund, and other hazardous waste sites. For these tasks, there is a strong need to be incredibly responsive. He cited other time-sensitive examples such as the gold mine tragedy in Colorado and the oil spill in the Gulf of Mexico. ORD tries to be as responsive to the needs of its regions and programs as possible. For that reason, Dr. Slimak mentioned the creation of five technical support centers within this program that regional and program staff can call for quick assistance—one of which exclusively deals with ground water. They factor technical support into the SHC research program; he estimated that on a year-to-year basis technical support makes up approximately 25-30% of time and effort.

Dr. Richardson concluded the discussion since no one else had any questions. He noted that the lunch break was one hour, and the meeting would reconvene at 12:30.

**Demonstration of SHC Tools**

Dr. Richardson reconvened the subcommittee for the afternoon session, noting the packed calendar. He explained that demonstrations of SHC tools would follow the Agenda. Accordingly, the following tools were demonstrated for the BOSC SHC Subcommittee:

1. Decision Analysis for Sustainable Environment, Economy, and Society (DASEES)
2. EnviroAtlas
3. Report on the Environment (ROE)
4. PVI screen

*DASEES*

*Dr. Brian Dyson*

Dr. Dyson introduced himself as the Project Lead for SHC 1.61 and would be sharing one of its tools. DASEES' focus is helping communities make a decision analysis using the ideas of structured decision making and values-focused thinking. Decision analysis is multifaceted, rigorous analytical approach, and more or less an academic discipline. Decisions are based on values instead of alternatives (i.e., things we want to do to achieve our values). We then can identify and prioritize values and clearly elucidate them using objectives and measures. This can link into data information, modeling, scientific analyses, and to evaluate alternatives. The idea of the tool is to structure all the pieces and information—values, measures, data, and analytical approach—to merge values with the analytical output because informing values of analytical output is what decision makers need.

Dr. Dyson did not show all pieces of the tool, but instead focused primarily on a case study of the Dania Beach just below Ft. Lauderdale, Florida. The first phase of the project was to obtain preferences, objectives, and values of the community. The Dania Beach is a proud community that is not very developed, that wanted to maintain its small-town feel. The beach is currently not developed, and with one key objective being the community wanted it to keep it that way, providing an alternative to Ft. Lauderdale and Hollywood. This first phase is done through a workshop based on the Socratic Method. Community members were asked what was important and structured their thoughts. The facilitators used more approachable words (e.g., ensure, preserve, maintain) to see what was really important to the community and why. At the end of the day, the facilitators and community members were able to structure a hierarchy of values important to them. At the top of the list included maintaining a distinct small-town feel, flooding, salt-water intrusion, property values and sea-level rise. The area itself is one long development with expected population increases and sea level rises, which are both elucidated in their objectives. After identifying values, they started linking preferences and created a list of objectives—which were later prioritized and narrowed down to the top six.

The DASEES tool then uses the objectives and priorities laid out by the community using a preference weighting tool to measure them relative to each other in a straight-forward manner. The value function of the tool weights the analysis output, then you convert it to a normalized score and preference weighting is added to reflect community priorities and score the various alternatives. This is a way to merge values and science and identify what's important to the community of the people and what the facts are—what people need to make effective decisions.

Dr. Dyson showed how after identifying objectives and you start coming up with some management options—the yellow boxes represent management options, which the community at Dania Beach had already identified—they wanted to know which one to use…cost effectiveness? The community was told to identify values, objectives, and criteria, then they can start creating suites of actions and link them in with decision methodology to determine the best course of action. Once measures and objectives—green boxes—were identified, they were connected to management options, which broke down into three small models eventually serving as flow charts. They need money—probably be broken into a conceptual plan for few small groups, talking to certain people, but not a lot of technical analysis.

Once the user has completed the initial setup, they need to start building a model. This begins with a proposed action and ends with measure and needs a plausible mechanism to get there by also incorporating any uncertainty using distributions. Two key issues for the community were saltwater intrusion and effect on property values. These issues caused tension between Dania Beach and the Broward County because the county was concerned with flooding, whereas Dania Beach was concerned with property values. The important thing here is all of that stuff that is important to the government can be factored into the socioeconomic analysis, process modeling, sea level rise, etc., but the output from the models needs to be converted to a measure that is meaningful and informative to the community to help figure out where to go to make decisions. The third model is more ecosystem management concern, and Dr. Dyson believes at some point the community will realize that they are connected to the other models. For example, if the community wants mangroves or dunes protected, they will realize that the social, economic, and environmental values are all connected. He and his team walked away with Broward County being aware of community values, and generated scientific output the community needed and presented it in a format that was useful for them to make decisions.

*EnviroAtlas*

*Dr. Anne Neale*

Dr. Neale, the current project lead for EnviroAtlas, showed the audience the landing page for EnviroAtlas—what someone sees when they visit their website—which has a lot of background information. There is also a section on data development and another for ecosystem services. All data and background information contained within EnviroAtlas are based around seven benefit categories, which are seen repeatedly in the tool. Overall, there's a lot of background information and tools and data that are downloadable in navigation panel. Dr. Neale did not cover those aspects of the tool, and primarily focused on interactive map and Eco-health browser.

The Eco-health Relationship Browser is a fun to use tool with a sophisticated interactive front end to access an extensive literature review looking at the links between ecosystems, ecosystem services, and human outcomes. The potential user can start with either ecosystems, ecosystem services, or health outcomes, and can walk through a series of relationships in order to eventually be directed to existing literature that supports those relationships. Dr. Neale was excited about groups using data in EnviroAtlas (EA) to conduct studies based human health data and will eventually write articles that would increase the science literature base. The interactive map contains data organized into the three tabs across the top of the webpage. The data summarizes,

to some spatial unit, indicators of benefits from nature, the drivers of change, or the beneficiaries are listed. The background information coming from census data and other data sources on people and built spaces includes some additionally indicators that are currently being developed. Supplemental maps are used because they contain various information such as land cover, stream and waterbody locations, wetland locations, and land protection status. Users have the ability to zoom in and out and turn on and off layer data. Data are also organized at the national and community component levels. National components include 160 layers that span the lower 48 states—need to expand to Alaska and Hawaii—and the community component is higher resolution data for 50 select communities by the end of 2019 (14 published in EnviroAtlas so far, many more on development server).

An example of the 160 data layers is the condition stream buffers … water body buffers across United States. Stream buffers are related to water quality and flood control, aesthetic benefits, habitat, and aquatic life benefits. The cost of water treatment can go up if riparian buffers are heavily disturbed. This map's data is summarized by a twelve-digit hydrogeologic unit code (HUC); there are about 90,000 mid-sized drainage across the lower 48 states. Each of these layers represent the amount of water body buffer that the land cover is naturally vegetated with wetlands or forests. Yellow represents a low amount of natural land cover within water body buffer and blue represents a higher amount. The short map descriptions are available in the "information" ("i") icons for users. Information fact sheets are available on every single data layer on how to use the tool and what it is. There are also "geeky," technical metadata details that are put into fact sheets in more user-friendly terms. In the case presented, the fact sheet answers the following questions: what is the background, what the user looking at, why it is important, how the user could use this information, what are the limitations, and how each data layer is generated. Dr. Neale pointed out every data layer is published as a web service; therefore, the user can use Bing Map, Google Earth, GIS on desktop to assess the layers by clicking on "access web services," copying the URL, and adding that data layer into the user's own system. This new technology takes SHC miles towards the concept of interoperability. Metadata is available to view or can be downloaded for use. Available datasets have been downloaded over 30,000 times, and Dr. Neale hoped that number will go up in the future. The user can also change the transparency to view underlying layers/maps; the basemap to look at high resolution aerial imagery; symbology; and the colors or formatting to make it more useable to a wider audience. This tool was developed using Flex API and was converted to JavaScript this year in order to improve usability and make it available as a mobile application. The data layer matrix allows users to view all the available layers and allows them to sort or search for specific layers.

Community-level data currently contains 14 communities. For every community contained within EnviroAtlas, data layers are consistent across communities so they can be used in a lot of different research projects. Using Pittsburgh as an example, near-road environments analysis identifies busy roads, completes a buffer analysis (26 meters within roadway), and analyzes land cover type—red areas have very low tree cover along the roadway and green has high. If a community where to engage in tree planting, then there would be a data layer to use for analysis. Additionally, if the users know where the busy roadways are and what the buffer is, but care about how that effects people, they can zoom in and see how many people are living within

300 meters of busy roadway. If the users click on any unit, they can see the actual value (e.g., 944 residents) for any given roadway. To look more at demographic information, the user can start layering geospatial layers to see how parameters interact with one another.

Dr. Neale mentioned that the users can utilize the building analysis tools into EA by importing their own shape file or web service into the map. The raindrop tool traces pathways to the closest body of water across the United States and illustrates where water will flow through landscape to body of water. If the user is interested in intervention or restoration the tool could help find locations to implement BMPs. The public-facing server tool is in production and available to the public. The development server is where many things are in developed including data layers and provides a list of functionalities that are coming soon and their current status. Users can opt to join the email signup which gives updates. The analyze ecosystem services tool is still under development, but allows users to select any 12-digit HUC in the national and runs index values and weight metrics going into index values through a base weighting scheme. The tool takes many indicators and combines them into index values for each of the categories, which will later be distilled down to more finely resolved components to allow users to combine different metrics into single index in a graphic application.

*Report on the Environment (ROE)*

*Dr. Seema Shappelle*

Dr. Shappelle presented slides on what the website is and what it is not. EPA's ROE is the Agency's comprehensive source of scientific indicators that describe the national, and in some cases, regional statuses and trends on the nation's environment and human health. ROE indicators help answer questions of critical importance to EPA's mission of protection human health and environment. These indicators were developed on a national level to answer policy-relevant questions fairly early on and to provide depth and trends. This tool is a part of SHC research program, project 2.64 – collection of indicator work and development of indices, showcasing a lot more synergy among efforts.

ROE was developed with the intent of reporting trends for the Agency on environment and human health at national and—in some cases—regional scales. These trends and indicators are useful to inform the Agency in priority areas and improve their ability to communicate with the public in a clear manner through an easy to use tool. ROE does not analyze or diagnose the reasons for and relationships between trends in stressors and environmental and health outcomes.

ROE was re-launched in July 2015 with a new home page. Dr. Shappelle noted there were many features available from the landing page to look at such as the user's guide and glossary. The top multi-colored bar showcases the five thematic areas—all ROEs are oriented under these areas or across a few. ROE now provides information in a fully online format. Previous ROE iterations released hardcopy reports that essentially mirrored website information. The exclusively online format is much more engaging with its interactive graphics that typically doesn't translate well into hard copy. There are currently 85 indicators and varied regional information including data, graphics, and resources. The tool contains a site-specific search function. Another major change to the online platform is the inclusion of a discussion on sustainability. The tool takes a systems-based approach on how introducing sustainability and indicators can be integrated and further

developed to support sustainability based environmental protection. Additionally, four new indicators were added to illuminate issues around sustainability—energy use, freshwater withdrawals, municipal solid waste, and Resource Conservation and Recovery Act (RCRA) hazardous waste.

Each topical area (theme)—air, water, land, human health, and ecological condition consists of agency questions that the tool is attempting to answer through the 85 indicators. Dr. Shappelle focused on the water thematic area, which had seven questions to answer. Looking at the questions, there are visible gaps, but she believed it was a good start. Indicators are noted below each question, some of which are bolded, which means they rely on EPA data sets as opposed to other federal or other organization data. Many indicators have pulled from data outside the EPA. Continuing with the water example, two indicators highlighted in green included nitrogen and phosphorus and drinking water indicators. The nitrogen and phosphorous indicator shows the percent of stream miles and the concentration of phosphorous in them. The interactivity of the indicator allows actually data points to pop up, and the buttons on the right allow users to look at specific regions. Furthermore, there's a fairly robust discussion on the introduction of the issue, a summary of data, and discussion of limitations and data sources, provided for each of the indicators. The drinking water indicator shows the percent of the U.S. population served by community water systems with no reported violations against health-based standards from the early nineties to 2013. Similarly to the nitrogen and phosphorus indicator, hovering over the bar shows actual data points. Four gray and blue boxes/icons on the right of the graph allow users to look at the PDF and excel spreadsheet versions of indicators and download data points in an excel format to integrate into other work.

Moving forward, Dr. Shappelle noted that ROE met with SAB a year before its release to receive recommendations and comments to incorporate into the tool fairly quickly or in out years. Many recommendations include the need for ROE to better integrate sustainability concepts. ROE provides a nice platform for cross-programmatic Agency discussions. The SAB suggested to expand sustainability indicators relevant to EPA's mission. They also recommended to better define target audiences through user feedback and focus groups, and consider expanding their scope—a potentially useful, but challenging area to address. ROE is considering all of the recommendations and trying to figure out what they would look like. The tool also wants to look at certain policy initiatives and try to decipher some trends that have come out of that. Previous hard copy reports had an executive summary, which is an element they want to bring back into the online version. Dr. Shappelle and her team wanted to get feedback through ongoing communication.

*Assessing Variability in Petroleum Vapor Intrusion with PVI Screen*

*Dr. Jim Weaver*

Dr. Weaver presented a newly developed PVI screen based on the EPA issued vapor intrusion guide. Vapor intrusion refers to subsurface contaminants (volatile contaminants) coming into residence and commercial buildings. He began by explaining that chlorinated solvents do not degrade under aerobic conditions. Anytime there is a dissolved plume from a chlorinated solvent release, there's a likely potential for vapor intrusion. With regards to the petroleum situation,

underground storage tanks released gasoline or diesel fuel forming a lens on the water table, which leads to dissolved contamination and vapors. The main difference between the two situations is the vast capability of aerobic degradation of the petroleum due to the high amounts of oxygen available from the atmosphere. Field data show that in the majority of cases, prevalence of oxygen and biodegradation reduces contaminated vapors so they do not make it into the building. If the source is located close to the bottom of the foundation or the building is located above the gasoline zone, there is more potential than shown in the figure.

Dr. Weaver referenced the two EPA guides—the 2002 draft which originally excluded petroleum because the biodegradation situation was being dealt with scientifically and the 2015 as the final guides for petroleum vapor intrusion and chlorinated solvents. The guides put the use of models in context to demonstrate sufficient oxygen for degradation, plausible vapor concentration distributions, and reasonableness of biodegradation. They can be used to improve site-specific monitoring strategies, test conceptual site models, and assess impacts on future buildings such as brownfield developments. To keep this in context, the use of a model is only one line of evidence for degradation or impacts to indoor air quality within a whole, comprehensive site assessment strategy—laid out on EPA PVI guide.

Models play a strong role in vapor intrusion due to technical and social limits on indoor air sampling. For example, if there's gasoline in a garage for a lawnmower, there's a likelihood of petroleum contamination in the air in the home. Socially, homeowners refuse indoor air sampling because of a variety of reasons including lowering property values, concern about lawsuits, etc. Models also have limitations, an idea that was presented in a series of articles in the *Denver Post* in 2000 where a vapor intrusion model for chlorinated solvents (Johnson-Ettinger) sometimes over-predicted and sometimes under-predicted indoor air concentrations. Dr. Weaver did not find this to be surprising because it was a simple model with default values, very few site-specific values, and no indoor air confirmation of predictions. His model addressed problem of simulating petroleum intrusion to include biodegradation and to address uncertainties. The tool is a part of SHC's Environmental Releases of Oils and Fuels Project (3.62) in collaboration with EPA's Office of Underground Storage Tanks (OUST), sub-office of OSWER.

PVI Screen can include a source of a petroleum hydrocarbon lens, soil gas, or a groundwater source. The model was based on an approach that was conducted in 2007 by DeVaull which looked at oxygen flux into the subsurface, partitioned out all degraded hydrocarbons into soil gas, and reduced the equations to Johnson-Ettinger model if no biodegradation occurred. The main contribution added by the new PVI Screen automated Monte Carlo uncertainty analysis and increased user facilitation through flexible unit choices, user interface, and an automated report. The model has been shown to reproduce the BioVapor results (of which the model was based on), characteristics of compiled field cases, and observations from individual cases.

Within the model itself, some parameters that are well known and treated as constant, others are within an order of magnitude between minimum and maximum, and others are based on empirical frequency distributions. Users can use can combination of parameter types as inputs, resulting in multiple model runs that show the indoor air concentration frequency distributions that were simulated. Dr. Weaver showcased an example problem based on reformulated gasoline

for benzene (carcinogen), toluene, ethylbenzene, xylenes, and total petroleum hydrocarbon by groups. He used some variable parameters as inputs that were not expected to be known—air exchange rate, moisture content under building, etc. and arcane things such as soil gas flow rate. He showed the model interface, which was designed to be simple and straightforward. The green buttons indicate available features. He demonstrated entering inputs such as dimensions of the building and foundation depth below grade, etc. as constants, foundation thickness and crack width vary and other parameters that each have input screens. The model allows the user to specify the number of depth relationships with the building, contamination source, and location of water table and so the model draws a schematic from input data.

After the model is run, a frequency distribution curve is shown, which graphs frequency with respect to the indoor air quality concentration—log scaled because concentrations varied by orders of magnitude. Red part of the curve means exceed concentrations while the green means not likely according to model and its inputs. Each curve is marked with C—cancer risk, H—non-cancer health risk, and M—model threshold. Each chemical results in a different frequency distribution curves. This feature illustrates that when trying to condense all given parameters, something is likely to be exceeded somehow. The model automatically creates a report including background, results and inputs so regulators can evaluate what has been done.

Dr. Weaver provided context by stating expectations that the model will help with backlog of 72,000 leaking underground storage tank sites that have yet to be closed or remediated. The model can be used to aid decisions to close sites based on potential for vapor intrusion. Due to the nature of biodegradation, this could lead to closing sites because evidence shows that biodegradation is widespread and prevents impact. The model does not bias this result and is anticipated to be used by states, state organizations, and consultants. Dr. Weaver and his team have done a lot of outreach to get across the idea of using uncertainty analysis, how that frames the question of setting up the model, and how to interpret results. The model is in final stages of peer review, and will available to public in early 2016. Ended his presentation by showing the plots of chemical results using the actual model interface and an example of an automated report.

**Program Planning, Organization, and Research II: Brief Introduction**

*Dr. Michael Slimak*

Dr. Slimak thanked the Tools Café presenters. He noted the breadth of the tools and the subcommittee's commitment to building tools for EPA's regional offices, communities, individuals, and services; he continued by summarizing the purpose of each tool. The first tool, DASEES, used structured decision analysis to help communities make decisions. The second tool, EnviroAtlas, was an atlas tool of ecosystem goods and services and a mapping tool that allowed communities to look at services within their communities both at the national and community scales. The third tool, ROE, portrayed 85 indicators of status and current trends of the nation's environment. The fourth tool—a very sophisticated tool that looks at vapor intrusion—was predominately used by program office personnel and state employees that are dealing with leaking underground storage tanks.

Dr. Slimak emphasized that the subcommittee is committed to the underlying research to understand causal relationships, build tools, and make those tools available to program partners,

including those on a state and community level. He understood that since certain communities cannot handle those models there needed to be a way to make those tools available to communities. The purpose of the Tools Café was to give a breadth of tools. He also mentioned there was an entire spreadsheet list of developed tools in the program. Dr. Slimak mentioned the first poster session was based on projects and topics in Topic 2 (community well-being) whereas the next poster session was going to be based on Topics 1, 3, and 4. Dr. Richardson thanked the audience and adjourned the meeting to the atrium for the next poster session.

**Program Planning, Organization, and Research II: Topics 1, 3, and 4 Posters**

19. *Project 1.61 - Decision Science and Support Tools*
20. *Decision Analysis for a Sustainable Environment, Economy, and Society (DASEES )*
21. *Structured Decision Making (Guanica Bay featured as an example)*
22. *RESES - Regional Sustainable Environmental Science Grants*
23. *Durham Light Rail Project*
24. *Project 3.61 - Contaminated Sites*
25. *Superfund Tech Support Centers*
26. *Assessment of Permeable Reactive membrane Barriers . . .*
27. *Project 3.62 - Environmental Releases of Oil and Fuels*
28. *Biodegradation of Dispersed Crude Oils*
29. *Project 3.63 - Sustainable Materials Management*
30. *State of the practice on bioreactor landfills*
31. *Project 4.61 - Integrated Solutions for Sustainable Communities*
32. *Cost of Reactive Nitrogen*
33. *Project 1.63 - Environmental Workforce and Innovation*

**Program Planning, Organization, and Research II: Subcommittee Discussion**

Dr. Flint facilitated the session and asked the audience to provide any compelling thoughts or to share a meaningful conversation that happened at posters that may have provoked a thought and gone beyond textual reading that was done.

Dr. Tomlinson inquired as to why there was not more integration across projects. Dr. Richardson further questioned Dr. Tomlinson as to whether he was thinking of integration across four research topics or projects. Dr. Tomlinson specified he was thinking of integration primarily within the specific task, but across the projects; specifically, between posters was the functional unit he was considering. Dr. Martin had a mental dilemma in figuring out how much was documented and how much was a discrepancy between collaboration and partner engagement. After digging more deeply, in some cases they found a level of engagement that was not documented while, in other cases, documentation wasn't necessarily consistent or partnership arrangements weren't formally documented—some of which are informal partnership arrangements. Dr. Martin was challenged by the time constraints, which only allowed him two or three posters conversations and caused him to miss more information and was unable to investigate to a deeper level.

Dr. Flint revealed this topic was the essence of the conversation she had with Dr. Gellar the prior week, and that it was a challenge and frustration that other subcommittees have felt. She acknowledged that this was the subcommittee's first exposure beyond the text and that it was very recent and part of a longer term multi-year engagement that was being initiated. The goal is to move along and get a deeper understanding of these topics, projects, and outputs.

Dr. Richardson offered a helpful conversation about how a specific project or task might help link between science and technical support provided to communities to solve problems. Learning about the process was informative to him, but he did not know how typical it was of other tasks.

Mr. Naud knew there was a lot of highly relevant ongoing science that would be useful to the subcommittee such as his work on brownfields, specifically vapor barrier information. He has seen many good partnerships with cities, but wondered, especially with SHC, since the group is unique due to its extensive, interesting work going on in cities, whether working with states was on the way. He counseled members to look for opportunities to work more directly with cities. He saw a lot of work being done on cities and a network of sustainability directors, SHC now needs to get it in the pipeline to rally busy people.

Dr. Flint thought the same thing to a certain extent—but did not want to jump all the way up to states—but also thought about consortia and relationships among communities as opposed to thinking within communities or cities. She was struck by Topic 4 which had amazing examples of real cities and communities engaging with interactive tools, nevertheless wondered about how opportunistic the sites were versus careful, typological efforts to select communities across different settings, issues, and capacities to use tools. Dr. Flint did not want to negate the wonderful things that seemed to be going on with this integrated solutions, but some people might have issues and can't even collectively raise their hands.

Dr. Martin echoed Dr. Flint's comments with the issue of selection bias of actual partnerships, and wondered if Dr. Slimak or Dr. Gellar wanted to comment on whether the issue of selection bias has come up politically within EPA. Dr. Slimak noted that SHC worked with communities without a sample scheme—selecting these communities in any sort of representative way. He did not say this as a criticism, but just to shed light on the way the research program reaches out to communities. He acknowledged there were issues in the process to contend with such as following contract guidelines that require competition. The EPA Administrator has a focus on reaching out to underserved environmental justice type communities—specifically identifying 50 of these communities. There are great efforts in development to reach out to these communities and to make a difference within them. The selection process is at a regional level where regions select these communities and nominate them and ultimately the Administrator's office selects the final 50 communities. Communities as a group range from small to large, but certainly are not representative from a statistical standpoint—a fact that is learned from working in those communities. Dr. Slimak said this was an issue in the program from the very first time he met with the SAB. SHC wanted to work at the community level, but couldn't go to every community and therefore needed a scheme to extrapolate all communities. This goal still remains for this program to work at community scale and to learn from the communities in which work

has been completed. Dr. Slimak said the SHC program is looking for a way to extrapolate to communities that the program can't work in.

Dr. Gellar noticed much of what is looked at in the review is at the strategic level, where implementation is done through the labs. The poster that was most likely referred to was on the RESES program, where communities are identified by regional partners and where they want to do projects with SHC become the focal areas. Dr. Gellar said Dr. Neale could provide more detail for the EnviroAtlas program. In general, she mentioned 50 communities within the tool that were chosen based on criteria that that team developed. An example would be contaminated sediments as an area of concern for geographic regions around the Great Lakes where some areas are largely waterfront. The goal is to look for different kinds of communities with different problems, so EnviroAtlas can generalize—which is a large issue across communities. Developed tools like the community typology allow communities to sort between tools and sciences that may be applicable to them and for SHC to have some level of classification like decision technology. Dr. Gellar realized this is a tough problem and it is being approached at multiple levels.

Dr. Cervero continued the discussion on underserved communities. He thought the research program seemed data intensive and hypothesis driven. He believed the developed tools were great and provide robust applications in terms of impact, but at the risk of being controversial, his own sense is that a lot of underserved communities are interested in answering questions. These questions may include: how much, why, what are the limitations, what are the underlying resources. He was certain that qualitative case-base inquiries would give useful insight, but was unsure of the current data driven research process. He inquired if that was part of the picture here or if there was any room for more case-driven research.

Dr. Gellar agreed that when he and Dr. Slimak as well as the rest of SHC team charged the labs to go forth and implement research, some of the designed criteria were essentially to conduct actionable research on problems formulated at the stakeholder level, and where possible, through participative and collaborative case studies to build stakeholder expertise and focus on the end user. This effort is already being seen through Dr. Dyson's DASEES tool, which has pushed forward development of decision science in a case-base study in Dania Beach. Similarly, the Gulf of Mexico area has research on ecosystem goods and services in a large sample of communities. Dr. Gellar observed that SHC has some place-based work, and at its best, the subcommittee is doing this in real-world examples. Some of the Health Impact Assessment (HIA) work includes other examples.

Dr. Cervero had no doubt that there was case-focused research, but wondered if there was room for ethnographic research or other types of qualitative assessments. He did not say that was the only pool because he understood the need of science to comprehend chemical processes. If the subcommittee is trying to reach underserved communities, a lot of them think of cases. There's much work showing cases *vs.* variables and covariables and covariation among them can be effective in showing differences of communicating fundamental structures. Dr. Cervero asked if those perspectives have a place in the StRAP.

Dr. Gellar replied SHC's focus is on quantitative kind of work. Dr. Tim Barzyk was one person in the group that does research on over-burdened communities and environmental justice—where some of initial work is to present qualitative differences. A community can be defined as over-burned, environmental justice, or at-risk due to many different factors such as proximity or density, proximity of facility, or density of facilities. Some of qualitative work going on each of these tools is to communicate the utility of the tools. Dr. Gellar referenced EnviroAtlas which uses cases; for example, a layer could be urban canopy and where it is distributed or missing. Other communities are using those case studies as examples motivate themselves into planning urban forestry. Dr. Gellar hoped to pull best practices forward from case studies, particularly in HIA and location based work.

Dr. Flint said this was great conversation that could be taken further. The narrative and rich experience of living in the absence of sustainability, the process of trying to achieve it, and lessons learned can be captured by systematic social research methods and meta-analysis. To capture experience in the room and by those people out delivering decision tools, that can be systematically done within and across cases to record experience. Dr. Gellar was talking about almost ethnographic anthropological work as an input. Dr. Slimak mentioned this was an area that historically was not taken fully advantage of. Looking at narratives from individuals or communities is a social science perspective into which SHC is just now moving. Dr. Slimak said any guidance on this would be extremely helpful. Dr. Gellar noted work on tribal sustainability is actually moving into that area. Specifically, incorporating traditional ecological knowledge into the process and working with the tribes to create their own assessment properties for assessing that knowledge.

Dr. Martin was concerned that the group was using the phrases case and case study too loosely. He did not believe this would be something that all methodologists would agree on. One phrase refers to the communication of the story about how a research project got implemented or used by a group—which could by definition be used as a case study from a methodological standpoint. However, it also sounds like the discussion also refers to the phrases as a story or communication piece that EPA's press office would put out, and these are two very separate things. Dr. Martin wanted to share his conversation with Dr. Slimak where he asked him earlier about outcome evaluations of the individual and portfolio research projects, for which Dr. Slimak responded there hadn't been any. Dr. Martin realized a need to think not only through charge questions, but also they were framing this in a portfolio assessment of the program.

Dr. Meyer mentioned that communities and cases were on a slightly different level. Within SHC, a lot of data is being generated and analyzed as well as the creation of decision-support tool. Dr. Meyer referenced one big question SHC will face is making these tools available to and useable by communities of interest—environmental justice communities and small municipalities. On that note, ORD products might have to be reformulated in terms of presentation. ORD cannot count on program offices to take the next step of implementation and use. He cited that even with regard to applicants for grants, states are desperately trying to educate environmental justice communities on how to apply for grants through workshops. Dr. Meyer believed states were educating communities about a process that they were ill equipped to engage in. He referred to the lack of tools to act on their own behalf with regard to a triple bottom line.

Dr. Rubin touched on the environmental justice story as well by stating if a community that's actively vibrant and wants to make a difference, they'll be motivated to appeal and go through the process to get changes made. Yet, if the environmental justice community is unlikely itself to come forward like that—the political capital for them isn't there. His question was how to go into those communities, and how to get what the people really want and need. Dr. Rubin hoped to have a conversation with Dr. Barzyk on this subject.

Dr. Barzyk held that environmental justice communities have the passion, motivation, and community pride to make things happen, and what they need was something to mobilize them to pursue their goals. Additionally, they need the structure to do that. SHC is attempting to develop ways to understand the nuances and complexities of working with communities such as inviting them to the table as equals, and understanding that they have as much to say about what's going on in their communities as scientists and policy makers. Dr. Barzyk believed that communities may see that engagement, and they draw from resources provided, but it is difficult to know where to start. He noted that it doesn't take that much to get environmental justice communities upset, but perhaps a point person (or regions) could come in and work at the ground level to get them started. There's a need for a structure that policymakers can relate to and a process that community members understand and work through. SHC's goal is not just creating information and tools but also procedures for getting people started and organized, increasing transparency, establishing equality at the table, and working towards sustainable solutions together.

Dr. Rubin realized everyone was vulnerable to environmental factors, but environmental justice communities suffered the most health impacts and economic fallout as well. He asked what thoughts the subcommittee had for taking what Dr. Barzyk said and applying it to an operational level.

Dr. Gellar mentioned ORD will soon share with the SAB and BOSC its latest draft of an environmental justice research roadmap designed to capture research across ORD which addresses environmental justice concerns. Within the program, members will be able to see a large portfolio of research, a large amount of which resides in SHC program and includes decision-support science designed to develop processes and charges to bring science to the table along with values of community. For example, health impact assessment brings values and economic and social conditions of community together. Policy results and science ultimately influence decisions for the health of the community and operationalize the science of interest. SHC needs to understand how cumulative risk, social determinants of health, and the chemical environment are used in risk assessment. Dr. Gellar recalled that Science to Achieve Results (STAR) grants have requirements for community engagement and identify social determinants. The STAR grant program has funded five minority and health disparity centers and across programs in air, climate, and energy and have included a requirement community engagement to look at exposures and community varied, modifiable factors. Additionally, there is a need to understand the intersectionality of tribal science and climate vulnerability for communities most vulnerable to climate stressors such as heat stress, drought, and extreme weather. Dr. Gellar realized the work on community vulnerability and resilience indices cuts across all national research programs, SHC, Department of Defense, etc. Dr. Flint adjourned the discussion session.

**Program and Regional Office Perspectives: Panel Discussion**

Dr. Richardson began the final session of the day by stating there would be six presentations from representatives from program and regional offices. He asked each panelist to limit their discussion to 10 minutes in duration, so there would be a half hour remaining for discussion following these presentations.

The SHC panelists that would be speaking were asked the following questions:

- How do you and your organization interact with SHC?
- Please provide examples of where SHC research tools, reports, data, or technical support has assisted your program.
- What can SHC do to be more responsive to your organization's needs?
- To what extent do you count on SHC research to meet your needs?

*Kathleen Raffaele, OSWER*

Dr. Kathleen Raffaele is the senior scientist advisor in OSWER. Before she addressed the questions they were asked to answer, she wanted to give a brief background on OSWER as an organization because they are not limited to Superfund. There are six program offices within OSWER, with multimedia responsibilities in air, water, and land. OSWER's programs have overlapping and separate responsibilities including cleanup of contaminated sites. Some of those sites include federal facilities, which are very large sites with unique issues (e.g., explosives). They handle emergency response including oil spills, chemical spills, and disaster response. OSWER has the Brownfields program that works closely with communities to clean up brownfields and they have a grant program dedicated to that. She stated they have the OUST, conduct prevention and regulation work, and hazardous waste management (which includes both cleanup, prevention, and national regulations related to the management and handling of hazardous wastes). They also, within that same program, oversee sustainable materials management, which includes beneficial use of industrial materials and making sure components of those that may be hazardous are not dangerous to the environment. Dr. Raffaele noted they have a broad mandate as a program and work closely in many areas with communities and regions to get that work done. Within OSWER, they have many research coordination efforts, and because the research is so important to their program, they have a research coordination team that generates research priorities for each of their separate offices. Those research priorities are reviewed by their Office Director as well as their Assistant Administrator so they create a list of research priorities that come from all programs. They use those priorities to work with ORD and make sure the research being done addresses their highest-priority needs. Their priorities have been communicated as a list to ORD, and while some do not correspond to this program, many do because a lot of them are specific to the SHC program.

When referring to interactions with SHC, Dr. Raffaele mentioned SHC has initiated monthly interactions with meetings, webinars given by the researchers to explain the research projects, yearly meetings at the Assistant-Administrator level where they discuss their accomplishments of the year and receive feedback from both program and regional offices, and OSWER participates heavily in review of the StRAPs and charters. She expressed they were interested in working more closely at the detailed level and she is hopeful that would come in the future. The SHC organization has been helpful in making sure the StRAPs and charters cover the research they need. She also noted SHC initiates interactions such as quarterly meetings at the Administrator level where important and ongoing issues are discussed. Those were useful to their

program because of the engagement at high levels of the Agency so they can work out any issues related to priorities. They have formed topic specific teams where OSWER scientists work with scientists from ORD in areas where they believe need closer collaboration (e.g., vapor intrusion, development of community tools, methods development). Dr. Raffaele stated she strives to have weekly conversations with Dr. Geller about the SHC research. For the OUST, a quarterly teleconference is held directly between their scientists and ORD researchers to collaborate closely on research being conducted. This format had proved to be very helpful.

To address the second question, Dr. Raffaele commented it was partly related to Charge Question 6 and she reinforced that they have more than just short-term needs; they have ongoing research needs. Although some may be short term, she wanted to make SHC is aware they would continue over the long term. Her organization did not want SHC to think their research needs would end at any point. She said that many of the research support authors, especially related to contaminated sites, were contained within her program. They believe their research is necessary to support the program, including trust funds related to research supporting Superfund, etc. Research is critical to support their mission.

Dr. Raffaele discussed a few examples, one from each program. For the OUST (Office of Underground Storage Tanks) program, there was a tool developed in collaboration with OUST that was related to petroleum vapor intrusion. Some additional work had been done related to tank corrosion (e.g., biofuels). When gas stations began using biofuels, there were tank-corrosion issues related to the ethanol content that weren't immediately obvious. ORD has worked closely with their organization to locate the sources of those problems and help develop methods to prevent those problems in the future. For the Office of Emergency Management (OEM), there was a poster pertaining to oil spills. They were currently developing regulations related to better management of dispersants and the work done on toxicity testing of those dispersants. This was crucial to regulatory efforts. In the Office of Resource Conservation and Recovery (ORCR), which is the office that manages the hazardous waste program, there had been a coal ash rule related to safe ways to dispose of coal ash. ORD research was crucial in that to develop methods of measure leaching if you use coal ash in concrete, for example. Coal ash contains a lot of heavy metals and those metals were leaching into the environment. ORD is developing methods for measuring that. She noted a multimedia model was also mentioned in the poster to help their waste management office in their national rule development and the sustainable materials on lifecycles. For their federal facilities office, Dr. Scozzafava from the Superfund office would be discussing that, but she did want to mention two things related to the bioavailability and exposure research. Bioavailability of metals, for example, is a big issue. If the metals found in their sites were not available biologically, they didn't need to worry about them as much. She stated they need methods to measure the bioavailability of those metals at the site so they can know how much they need to spend and what they need to do in remediating those sites. Dr. Raffaele mentioned children's exposure was also a big issue, especially soil and dust ingestion. The data supporting their work in evaluating soil and dust ingestion was poor at that point. She noted they do the best they can with what they have, but they have a crucial need for better data regarding soil and dust ingestion. That is a major risk driver at many of their sites. The Office of Brownfields had some of these same issues, including bioavailability, climate change adaption work, and technical support.

Regarding what SHC can do to be more responsive to their organization's needs, they realize ORD has limited resources. Dr. Raffaele mentioned one of the issues was working closely with

them to prioritize the work so OSWER obtains the research they need to support their needs. They can also optimize that task so they get the focus they need. Communication and collaboration varies among the different programs. She noted OUST has been very good at working closely together, for example. Some other areas have been problematic, such as the sustainable materials management work. SHC has been made aware of that and they have been trying to help OSWER improve in that area. For the tools, they want to ensure tools are useful for their intended purpose (e.g., by who is asking for the tools and if they are performing as they were designed to perform). They were also concerned about minimizing the chances of misuse and misunderstanding in respect with how the outputs of the tools align with what EPA and programs are actually able to do. Clear messaging with the tools should be examined.

The next issue Dr. Raffaele described was that research programs develop many tools on their own and OSWER wants to make sure the tools are not providing information that contradicts itself and that may confuse communities when they try to use them. Their organization wanted to make sure the tools are able to be used by their intended audiences. Again, consulting with them early and often would be helpful. In closing, Dr. Raffaele commented that SHC was the only program that performs much of the work they need for their sites. It's important to them to keep that work going. OSWER is very supportive of the SHC program and wants to continue working with them.

*Bruce Duncan, Region 10*

Dr. Duncan stated he was representing Region 10 as a Regional Science Liaison, which he described as playing in the ORD "candy store" and performing "e-harmony science matching" between regional staff science needs and the research underway. He works closely with the SHC program because his region is the lead region for the RCRA program. This meant they have a Lead Region Coordinator who is responsible for coordinating across all regions with respect to RCRA issues and the national RCRA program. As Dr. Raffaele mentioned, there are strong ties between Superfund and RCRA and SHC research. That is why there would be a RCRA bend in answering the questions asked.

Regarding interacting with SHC, Dr. Duncan explained that they have a bimonthly call with SHC leadership and program office representatives, Lead Region Science Liaisons, regional Superfund and Technology Liaisons (STLs), and Lead Region Coordinators. This was a good way to become informed with what was happening within regions in respect to SHC. There is also an annual face-to-face partnership meeting with SHC, showcasing ongoing and completed work. Two years prior to this meeting, they had several members of Region 10 attend one of these meetings and they liked the Tools Café held there so much that they held another one, mostly supported by SHC, in Region 10. Mr. Naud mentioned earlier tools that communities do not know about. Dr. Duncan noted that regional staff do not even know about these tools. One big hurdle to get over within the following year would be educating regional staff in the ORD tools. It might seem simple, but the spreadsheet of SHC tools shown was large and it is often confusing to choose among them—which ones would be of most benefit? How well do they work? How much do they cost? He mentioned they are moving nicely down that road of working between regions, and SHC in particular, and overcoming that educational hurdle. He highlighted interactions that work well next. One was the Technical Support Centers. These are extremely important to regions. The Technical Support Centers give regions a place to go to get a response within 6 months, a white paper from ORD within a year or a year and a half, and they can get a draft report, which is often enough for them to move ahead with decisions in a region. He noted

it may take longer to get final reports and publications. Dr. Duncan wanted to mention the OUST program and he explained the quarterly calls, held since 2003, including headquarters, regions, and states with ORD representatives from four key programs. These include the folks at the table, talking real-time about issues as they come up and the solutions. Good reports would be seen from the OUST program on the value of ORD and the publications and reports they have produced. That is something to notice.

To get into examples of technical support data and assistance to their regional program, again, the Technical Support Centers have been great. That is tracked by the STLs. SHC provides tools they can use. Dr. Duncan highlighted the one they are working on, the C-FERST tool (community-focused exposure and risk screening tool). Tribal-FERST (T-FERST) is a tool they are working closely on as well, especially in Region 10, because they have around 250 tribes. T-FERST is a tool to help the tribes and region, and Dr. Duncan mentioned his appreciation of the collaboration to work with SHC on that and to get tools in the community in a very sustainable way. The C-FERST program is one where they think they have found a good way to work with local community colleges where they can incorporate that into their environmental curriculum. That means that the tool would be released into the communities that are using it and away from ORD thinking they can reach out to every community and provide training. They were very excited about that. He mentioned a webinar the following Wednesday where they would be hearing from the communities where that had been done with the C-FERST tool and how they were starting to use it in their communities to help with their issues. Regions do not have the capacity to reach out to every community. There is research they would be able to use directly in a couple of years on the RARE and RESES program, which would be discussed by Dr. Marie O'Shea. They have regional events that SHC helps with (e.g., Tools Café in Region 10) and he believed they would begin to see more of that. There are many beneficial users of the tools that are very interested in becoming aware of them and how they might use them.

Dr. Duncan approached his next question from the RCRA side of things. As far as what SHC could do to be more responsive, as Dr. Raffaele covered, there are a list of regional needs and issues on improving beneficial use of materials (e.g., tire crumbs, coal combustion residuals). They are also interested in help with inadvertently produced polychlorinated biphenyls (PCBs).

Dr. Duncan provided suggestions for SHC beginning with their need to emulate areas of success in coordination (e.g., OUST program). The next suggestion he mentioned was to strengthen ties with NIEHS and its Superfund Research Program. He described this as a natural place to look for leveraging given the Superfund/RCRA issue. His next suggestion was to help with the dialogue of clarifying a lifestyle approach to tools as they are developed. What is the intent? How long would EPA support these? Do they want them to go out into the communities? Who is going to do the curations? Dr. Duncan expressed the importance of those tough dialogue questions being built into the process and not every tool must "survive and reproduce." His next suggestion included changing the ORD culture and helping to endorse it from the top down. When looking at the support of when ORD scientists support regional programs and needs, to have that recognized as a value component in their promotion packages would be an improvement. At that moment, the promotional packages were heavily weighted towards publications. This was one area he believed could be opened up slightly. He then described the idea of helping them match their regional issues and science needs with what ORD had done in the past, was doing then, and would do in the future. He suggested getting that matching out of the way so they could focus on key issues that come up (e.g., emerging needs for the regions such as spills, lawsuits, etc.). They

would also like to know more about ORD's long range view to emerging issues and what they were seeing coming down the road. Even if their staff couldn't use it then, they would need to get back to the national program to get buy-in that the new research could be used in the regional programs. There is a progression along that timeline of 5 years. Knowing how ORD is looking to the new tools and cutting-edge things and being aware of that and how we get that mainstream would be helpful. He thanked the subcommittee for the opportunity to speak.

*Michael Scozzafava, OSWER*

Dr. Michael Scozzafava from OSWER began his presentation following Dr. Duncan. He apologized for not being present in person. As Dr. Raffaele mentioned, he stated he worked under OSWER but mostly in the Superfund remedial program. He mentioned they handle the long-term cleanup of contaminated sites, which was different than emergency response actions. He is the chief of the Science Policy Branch and they provide science policy and technical support among all aspects of the Superfund program, from preliminary investigations to the review of remedies that are in place for the five-year review process. He noted they also perform a lot of the science support for other contaminant site programs, including RCRA and Brownfields in the federal facilities. Dr. Scozzafava commented they like to say every Superfund site is a snowflake and can present its own unique challenges when it comes to science and engineering. Those challenges at complex sediment sites, for example, including large rivers and harbors, were the driver behind billion-dollar remedy decisions. More importantly to the SHC theme—do decisions at Superfund sites directly impact communities? One in five Americans live within three miles of a Superfund site. He explained about 17.5% of all children less than the age of five live within three miles of a Superfund site. Superfund is a communities program and large percentages of the population live near to Superfund sites, so the SHC research is important to their program. In addition, their needs vary and are unpredictable. They rely on ORD's long-term research and technical support to help address their challenges.

Dr. Scozzafava applauded Dr. Raffaele for her presentation. He noted she did a good job of talking about ways in which they interact with SHC on regular basis. He has been in the Superfund office for over two years, and he had been impressed with the amount of outreach SHC does to try and engage with his program's staff and technical issues in their research needs. His experience with interactions has been most productive when technical staff in his program were interacting directly with principal investigators in ORD early and often from the conceptualization to the implementation of a project. This was working well in some areas (e.g., contaminated sediment and technical support), but it was not as common in other areas. SHC is making an effort to improve this but there is still work to be done.

Dr. Scozzafava wanted to spend most of his time going through specific examples of where they've used SHC research. The National Exposure Research Laboratory (NERL) program had been instrumental in development of passive sampling to monitor hydrophobic organics at Superfund sediment sites. That technology greatly reduced detection limits, increased methods precision and improved their understanding on bioavailability, which is very important at their Superfund sites. There was a specific researcher (Dr. Rob Burgess) who developed methods for passive sampling in sediment and surface water. He piloted that technology at a Superfund site, trained Superfund staff on its use, and was currently developing an interagency user's manual for passive sampling, working alongside the Corps of Engineers. He was also the author on an Office of Superfund Remediation and Technology Innovation (OSRTI) guidance to remedial project managers on using passive sampling. That was a good example of where they were

working really well together on something very important to Superfund sites because contaminated sediment sites are among the most complex and expensive.

In addition, vapor intrusion is a major part of Dr. Scozzafava's program. They had recently published a vapor intrusion guidance earlier that year. It had taken about 14 years. Research conducted by ORD staff is important in explaining that vapor intrusion can be complex. That may sound simple, but it had influenced the recommendations they put in the new guidance document he had mentioned previously, particularly some research done at the "test house" where it was experiencing vapor intrusion. Based on that research that showed vapor intrusion was complex, they now recommend a more sophisticated scientific approach for assessing vapor intrusion on a site- or building-specific basis. They also recognize that implementation of remedies depended on a broader array of site- or building-specific factors. SHC research was the reason they were able to better understand the vapor intrusion process and put out major recommendations in the previous year.

Groundwater was another major area. Between 2007 and 2010, ORD developed three documents that laid out technical basis and approach for assessing the applicability of monitored natural attenuation in groundwater for radionuclides and inorganic contaminants. That suite of documents complimented a 1999 OSWER guidance document. They had recently developed a summary technical document on those three documents, which ORD completed to provide layman guidance to those Superfund reasons. Dr. Duncan had touched on Technical Support Centers previously, and Dr. Scozzafava reiterated how important they are to his program. One example he thought up that arose in the last year was an indoor air issue where there was a spring of contaminated groundwater near some residential properties. What was happening was trichlorobenzene (TCB) in the contaminated groundwater was coming from that spring, and as a result, TCB vapors were building up in the residences, and the outdoor air was more contaminated than the indoor air. That, for example, was a problem of how the homes' indoor air could be mitigated. Fresh air could not be brought into the homes. They had to temporarily relocate the residents. They worked with the Technical Support Centers to come up with a technology to mitigate the vapors at that spring source.

Regarding how SHC could be more responsive to Dr. Scozzafava's organization, he recommended more frequent interactions with principal investigators and technical staff. It would show them that projects do not veer off in directions that are not helpful. He mentioned they see the value of decision tools like C-FERST and DASEES to some programs, but as Dr. Raffaele alluded to, Superfund already had a decision framework provided. While those tools are helpful to communities, it is important to set expectations when all of their goals could be realized through a Superfund cleanup. To the extent that they can communicate how those tools are used would be beneficial. However, after talking to his staff, given their ongoing science needs, they preferred SHC focus in the contaminated sites program in the science and engineering challenges they need to clean up sites. One gap they have is not having the function or capability to ground truth vendors and developers of technologies for site characterization and cleanup. He noted it would be great to work with ORD through SHC to give their site managers a resource to screen the viability of new technologies and provide an access point to vendors with technologies. That was something he believed they could work with SHC on in the coming months.

*Marie O'Shea, Region 2*

Dr. Richardson moved to Dr. Marie O'Shea from Region 2 to begin her presentation. She regretted not being able to attend in person, but thanked BOSC and ORD for the opportunity to provide her input. For the charge question regarding interactions, Dr. O'Shea acknowledged Dr. Duncan, Dr. Scozzafava, and Dr. Raffaele for providing examples for communication on a regular basis, so she wanted to provide examples of opportunities for collaboration.

Dr. O'Shea mentioned the most viable opportunity for collaboration has been through the Regional Applied Research Effort (RARE) program. ORD sets aside 2.6 million dollars annually for RARE funding, $260,000 for each region. RARE proposals are developed by regional staff in collaboration with ORD scientists and funding selections are made within each regional office. In her region, she mentioned RARE proposals are sought that address their regional science needs and the RARE projects have been valued by ORD scientists since the participation in those projects are favored in ORD's promotional review process. Another opportunity for collaboration is by SHC's RESES program. This program is similar to RARE in that their proposals are developed collaboratively by regional and ORD staff. Dr. O'Shea noted both RARE and RESES are the best existing opportunities for the regions to have their near and immediate needs addressed by ORD and that SHC should be commended for making funding available through the RESES program to increase those opportunities for collaboration. At this time, SHC was the only program in ORD's portfolio presently reserving a portion of its funding for those collaborative projects. Another source of funding used to support near-term high priority regional Superfund science needs were the funds made available by ORD's Superfund and Technology Liaison program. As with RARE and RESES, those proposals were solicited from regional staff and competitively awarded. Projects are typically just one year in duration and they receive modest funds, typically around $15,000-25,000 in funding. Since 2008, over 30 of those projects were funded in the regions at total nearly $700,000.

ORD's regional research partnership program was another opportunity Dr. O'Shea acknowledged for regional scientists to collaborate with their ORD counterparts. Under this program, regional scientists have had the chance to train alongside ORD scientists and engineers at one of ORD's labs or centers, or they may have had the opportunity to train in the field. Another opportunity for collaboration is through regional involvement on ORD initiated projects. In contrast to the RARE and RESES programs that are initiated by regions, those are initiated by ORD. They often involve the piloting of a SHC tool in the specific region. Regional staff are involved in this process. A more recent opportunity for collaboration involved administrators making a visible difference effort. To support those activities, ORD had committed to providing staff, mainly from the SHC research program, to work alongside regional teams to address community priorities. Finally, as Dr. Scozzafava and Dr. Duncan had stressed, regional scientists also work closely with their SHC counterparts as part of the technical support ORD provides to regional Superfund programs. Cleanups at Superfund are complex processes. She stressed they often require expertise unavailable within the regions. ORD provides technical support to OSWER and the regions through five technical support centers Dr. Duncan mentioned previously. Those provide a valuable link between ORD's research and contaminated site problems. They recently conducted inventory of technical support to regional Superfund sites. In the first three quarters of the fiscal year, ORD provided support for over 160 Superfund sites. That concluded her list of collaborative opportunities.

Moving forward to address the section on where SHC tools have assisted their region, outside of the Superfund program, for which they are the lead region, there were three multicomponent examples where Region 2 had parted with SHC to advance the sustainability in their communities. The first example was the application of structured decision-support tools to incorporate stakeholder involvement in watershed management and land use planning in Puerto Rico, where she mentioned a poster describing the Daisy's tool. The second example was the development and piloting of tools for improving and furthering Region 2's science program and mentioned Dr. Barzyk was a partner on that project. Her final example was the development of approaches aimed at advancing sustainability and incorporating ecosystem services in a health impact assessment to Region 2 superstorm Sandy recovery and redevelopment decision making.

As the lead region for Superfund, Dr. O'Shea wanted to discuss examples where SHC research had advanced the Superfund research program and informed OSWER guidance. Those examples were already reports on the national attenuation of inorganics and radionuclides in ground water that led to updated guidance from OSWER the previous August. They issued a paper on sediment and vapor intrusion as Dr. Scozzafava had mentioned. She noted innovative research on the state of hexavalent chromium in sedimentary rock, which would help regions evaluate remediation approaches at other hexavalent chromium sites. That research project was a RARE project initiated by Region 2. Finally, Dr. O'Shea explained, under SHC's contaminated sites project, the task devoted to the technical support centers. They are critical to regional offices and noted she mentioned over 160 examples of site assistance just in the first three quarters of the fiscal year. There were numerous examples of support she wanted to describe, but the few she had been asked to discuss were the soil amendment work that would result in a process of evaluating beneficial reuse of organics and other materials, technical support at several Region 10 mining sites, an evaluation of the influence of reservoir water level fluctuations on sediment methylmercury concentration downstream of the historical Black Butte mercury mine, and support on the contaminated groundwater sites emerging in situ oxidation technology that had limited documentation.

Dr. O'Shea recommended SHC establish a systematic way to involve knowledgeable regional and program staff early in the project planning so that regional science needs are included in SHC research plans, and proposed tools can be evaluated, prior to funding, to determine if they will be useful to the mission of the regional program. By way of example, in addition to being the lead region for EPA's Superfund program, Region 2 was also the lead region for EPA's Homeland Security, so they also work closely with ORD's Homeland Security Research Program (HSRP). As they assist HSPR in obtaining input from the other regional offices, they are impressed by HSRP's partner process, which is their name for the transparent mechanism they have designed to conceive and develop scientific products that address the needs of their customers. Included in the partner process, Dr. O'Shea mentioned steps related to needs identification and prioritization. They feel ORD's other research programs, including SHC, would similarly benefit by bringing knowledgeable regional and program office staff into the needs identification and prioritization phase of the planning process, and she urged ORD to consider HSRP's research program as a model, and goal, for the successful involvement of its customers in the research planning process.

Dr. O'Shea applauded SHC for annually setting aside some of its funding to permit collaboration under its RESES program. She encouraged SHC to continue to serve as an example, and they hope also an advocate, for this type of research program-specific collaborative funding.

Similarly, she commended SHC for bringing its tools out to the states and regions, for example, through SHC's recent Tools Café in Region 10. The ACE program has taken a similar approach, by bringing community groups interested in Citizen Science to its Research Triangle Park lab to receive training on air sensors. While those and all ORD efforts to connect users with ORD tools should be applauded, she encouraged SHC to also consider increasing the use of their tools at Superfund sites to extend their outreach to regional program managers and the Superfund program's community engagement staff. The application of SHC tools to Superfund redevelopment efforts was another potential use of SHC tools that they encouraged SHC to explore.

In the area of support for SHC's contaminated sites technical support and research, Dr. O'Shea noted the regions look to ORD to provide technical assistance on complex sites and conduct new research that will provide solutions to increase the Agency's ability to restore contaminated sites and clean up communities in faster and more efficient ways. For that reason, the regions felt that SHC's contaminated sites research was not receiving sufficient funding relative to other projects in SHC's research portfolio. While they understand that funding for SHC's contaminated sites research was tied to the Agency's annual Superfund appropriation, they hoped SHC was open to augmenting those funds to provide a better balance between contaminated site technical support and research and SHC's other project areas (such as the development of GIS-based decision-support tools).

Finally, for SHC, as well as other ORD research programs, Dr. O'Shea and her organization hope that ORD will endeavor to replace experienced research scientists who have retired, or train junior scientists to continue their important research.

*Mary Reiley, OW*

Ms. Reiley is affiliated with OW as their Senior Research Coordinator. She mentioned it was interesting because the community program was a principal partner in research coordination of the Superfund program. OW has an interest in all of the research programs ORD has instituted. To provide a background on how they interact with the research programs ORD has, she noted in 2007, OW organized, along with the regional office, to make sure they were in position to inform corporately to ORD what OW needed in a way of research in order to support its programmatic objectives. They published in 2009, for the first time, a national water program research strategy to grasp all the various offices and regions and to align them on the same page as what was important to them so they could speak to ORD with one voice. Ms. Reiley acknowledged that had worked well. When they had their thoughts on something, they would share with ORD and get comments back from the NPDs and their staff on whether or not there were aspects on what was missing that they hadn't looked far enough into the future at because of the type of regulatory and court order deadlines they had that kept them locked in the present. They would take ORD thoughts and bring those into the research plans. They use those discussions with ORD and other potential collaborators to make sure the type of work they need and the type of work others were doing were aligned.

One thing they have used to help collaboration between the two is OW has an objective community for research, which is staffed by their Deputy Assistant Administrator, Dr. Mike Shapiro. Ms. Reiley explained it was made up of all four office directors and the lead region for water. The purpose was to make sure that, as they put together their research needs, they have an objective committee that looked at those holistically and would be able to speak back with that

one voice at the beginning of each fiscal year. They had most recently been engaged with the regions in the development of the StRAP (participating in discussions of StRAP development and attending workshops) so they would have a good understanding of the water issues that were important to them in the community's arena. She mentioned they had a lot of interest in economics work in the communities program in areas that push them to think about how they work with municipalities. She described next the nutrient work, while working very closely with the Corvallis lab, as they put together the agency nutrient and co-pollutant research roadmap, which had been helpful in assisting them to integrate science, multidisciplinary, and cross statute needs in order to address nutrients, which was not a single media problem; it is an air, water, and land problem. If one doesn't think about it that way, they end up moving the problem around instead of solving it.

Ms. Reiley addressed levels of collaboration and things that were going on that were helpful to the research community and programmatic implementation. The most helpful collaboration opportunities had been community willingness to listen to what water's issues had been, even though they are not their primary customer. She recognized OW does tend to push their way in the door, but they opened it for them. The level of organization they have put together to make sure their internal priorities were aligned was impressive, so when they come to us with what they want to know about, they have enough to consume the entire ORD budget by themselves. SHC has continued to bring excellent expertise to their needs. OW looked at themselves as a secondary partner. She believed so far, SHC has done well and has improved over the 15 to 20 years she had led research coordination. She commented she had seen more collaboration and integration across the programs.

*Erika Sasser, Office of Air Quality Planning and Standards (OAQPS)*

The next panelist introduced herself as Dr. Erika Sasser and she is the Director of the Health and Environmental Impacts Division in OAQPS, which is one of the main regulatory offices within OAR. Her division is responsible for the review of the National Ambient Air Quality Standards (NAAQS) for health and welfare, economic and cost-benefit analyses for major air regulations, and risk analyses in support of air toxics regulations. They also support international policy initiatives. She spoke on behalf of OAR, which also included their Transportation, Climate, and Indoor Air programs.

Dr. Sasser acknowledged the appreciation of the efforts SHC had demonstrated to reach out to program offices through regularly scheduled meetings and the opportunities that have been provided to comment on the StRAP and charters. She noted there was a lot of important work going on in SHC, including several SHC project areas that have been especially useful to OAR. She focused on work in two main areas: ecosystems and communities.

With regard to ecosystems, Dr. Sasser mentioned they support the entire effort to better understand the roles that ecosystems play in community well-being through provision of ecosystem services. They strongly support the NESCS (pronounced "nexus") effort to standardize the process for translating ecosystem functions into ecosystem services. That was very important for their ability to tell the "story" of why specific ecological impacts matter from a policy perspective. Of particular interest to OAR is ORD's work related to the nitrogen roadmap, especially regarding ecosystem services affected by nitrogen. Those efforts are critical to their reviews of secondary standards to protect public welfare. They are especially relevant

now as they were beginning their review of the secondary standards for oxides of nitrogen and sulfur.

With regard to communities, Dr. Sasser first applauded the overall ORD effort to address public health and environmental challenges through engagement with communities. That engagement was important for prioritizing risks and research dollars. In OAR, they have a lot of experience working with states and local communities, and they are aware that there are many challenges associated with that work. She noted how difficult that would be with finding out and delivering what a community wants. That included making sure they understand the questions and concerns the communities have as well as defining the process by which they can participate together in finding solutions. She noted a real opportunity for wasted resources and effort if they fail to understand the environmental problems communities are concerned about, or fail to engage with them in meaningful and appropriate ways. They also urged SHC to consider that in moving forward in this work, it is essential for them to maintain a balance with core research to support EPA programmatic needs. They believed that ORD should gradually explore and expands its efforts towards more direct interaction with communities, while maintaining critical research needed to support program needs such as the reviews of the National Ambient Air Quality Standards. Recently, SHC had been focusing on producing a large number of tools for community use. While those tools can potentially be valuable to communities, they could also cause confusion if they were not placed in the context of other EPA sponsored tools. She encouraged SHC to evaluate how their proposed tools complement or contrast with OAR and other EPA tools. For example, they had been working with SHC to compare C-FERST to the agency's EJSCREEN tool, and were having ongoing discussions on how SHC might incorporate OAR's National-scale Air Toxics Assessments (NATA) modeling in their tools. Dr. Sasser also emphasized the need for SHC to be in close coordination with related activities in the Air Climate and Energy research program, Human Health Risk Assessment research program, and other program offices.

In general, Dr. Sasser said work remained to ensure coordination across ORD programs. There are some cross-cutting "roadmaps" (e.g., Nitrogen) but those did not clearly shape research agendas within specific ORD programs. In addition, there are a number of important cross-cutting areas (e.g., Cumulative Risk) that may not have roadmaps but would benefit from creation of better linkages across programs. They also recognize the growing interest in citizen science, including the use of air quality sensors. She commented there was a lot to be excited about with regard to sensors and the use of citizen science, but it was important to move forward deliberately to ensure that we can actually make use of the data that is being collected. EPA understands the importance of the sensor issue and how quickly it is moving. The community interest in this is rapidly out moving EPA's ability to stay on top of the issue. She wanted to make sure they would be able to answer those questions being asked by the communities. She noted they were working closely with states (and ECOS) to develop a plan to promote the development and use of new technologies.

Dr. Sasser thanked the subcommittee for inviting her to represent OAR at their meeting. She looked forward to the many exciting projects and products that they anticipate to come from the SHC program.

**Program and Regional Office Perspectives: Subcommittee Discussion**

Dr. Richardson thanked the panelists for their useful, helpful feedback providing input and review for the program. The next fifteen minutes were used to discuss any comments on high level salient points that emerged or anything that was not included. Panelists had the opportunity to answer questions as well. Dr. Richardson noted that due to limited time, the comments should focus on programs and regional activity.

Mr. Naud noted that the session on Citizen Science and Sensors was interesting with respect to within and across cities.

Dr. Martin said that there was push back on the panelists request for the responsiveness from SHC. He inquired to what trade-offs were being made within SHC to be responsive. Additionally, if the panelists thought SHC was referring a specific process or a different mission orientation that prevented the responsiveness the panelists would want. Dr. Raffaele responded that the push back is uneven. With regards to partner programs, OSWER and her work closely with the research program on homeland security where they've had a positive experience through a process in which homeland security engaged programs in meetings early on to identify priorities. Within SHC, Dr. Raffaele noted that certain processes seem to be working smoothly and collaboration worked well. Yet, she recalled finding about projects later on that she did not know about but which her team could have assisted. In some cases, tool development projects have been going fairly far along before engagement; so, maybe the type of project is not the issue but that they don't feel uncomfortable. Dr. Raffaele wanted to work on this issue by engaging projects early on in conversation so there not be a disconnect in information on the tool (i.e., what it is, what it does).

Dr. Duncan answered that collaboration was a push back and that they were working on that. Additionally, he recognized that the over-the-transom approach was not satisfying to anyone because it didn't allow delivery to ORD in a timely. He has seen changes in collaboration—regions taking shared responsibility in collaboration and finding ways of creating ongoing prioritized needs that are kept up for anyone to look at. He continued by saying that the prioritization of needs should be done at a high enough level so they're useful as priorities and granular enough so they could provide input in dialogue with scientists—he's begun to see that happen. Dr. Duncan mentioned that more collaboration at the right levels could develop a continual process so there would be more focus on other things. Thus far, Dr. Duncan noticed that SHC does not look responsive at things happening in an office above them but was not sure as to why that was the case.

Dr. Rubin replied that cumulative risk raises a new issue. He recalled Dr. Gellar's comments on the environmental justice issue as well as the social determinants of health—there were lots of issues that addressed these two subjects. He reminded the audience members that Dr. Sasser mentioned the development of a systematic approach to engaging communities that could serve as a valuable guide given that the program deals with so many different communities.

Dr. Cervero queried the panel about how cross-sectoral initiative connections happen in reference to what Dr. Raffaele spoke about solid waste and how many people think of bio-waste as a negative externality instead of a positive externality when converted to biofuels. He questioned how those connections happen. He also cited that some examples of green urbanism and sustainable urbanism in many cities of Europe were very proactively taking bio-waste to

convert to biofuel through co-generation which is a very efficient waste reduction and recycling initiative, but essentially tied to energy initiatives.

Dr. Irwin appreciated the comment from Dr. Sasser about core scientific work—they should trade off work on biological and ecological science parts of a program. However, at the same time, she realized SHC is interested in moving fully and wholly into a sustainability science arena with a core mission including social science. She questioned the panel if they were scared or excited about this change, if they saw a reason for moving in that direction, and if they had any concerns.

Ms. Reiley responded that social science issues were becoming more important to her program as it matured. OW benefited from command and control approaches, but now plans to look at more voluntary programs now that problems in water are more subtle since they are not the type of thing that can be seen visually. She said that OW is trying to help the public make the connection between water quality and all of social components that go into their health (fishing, recreation, property values, etc.). She continued that anything that goes into adopting strategy that improves water quality is becoming more and more important as they finish reaping benefits of existing command and control approaches. She was excited about putting more resources into social science discussions and how to bring that science into implementation of projects. Dr. Sasser agreed with Ms. Reiley and asked if ORD and SHC moved in the social science direction it would be important to recognize that an investment in new disciplinary areas requires staff, money, and adjustment of existing disciplines. This transition should not be done just ad hoc—but through a strategic, concerted approach.

Dr. Raffaele noted that their resources were shrinking, not expanding. This has become an issue because OSWER relies heavily on ORD and needs research to continue to continually work with community sites and respond to spills—which requires science. Dr. Raffaele doesn't think that ORD shouldn't do that work but doesn't want existing work that supports OSWER to get lost. OSWER has a lot of experience working with communities including social scientists that do risk benefit analysis in these areas. Since they have existing experience in social sciences, she wanted to emphasize the importance of collaboration with ORD if they move in that direction. She didn't want communities seeing conflicting responses from different portions of EPA/federal agencies.

Dr. Meyer followed up on the last line of conversation, saying that it seemed to him that it argued for preservation of resources for pure scientific research at the level of ORD. If that was the case, ORD needs to make sure that endeavor begins with regions and program offices. They are the ones with social science experience. The regional and program offices are engaged in the social science necessary to translate scientific research where resource constraints argue in favor higher level of coordination among other things in the great design of the research projects. Dr. Meyer noted that constraining ORD's path down that tangent might be critically important not particularly valuable to program offices.

Dr. Martin wondered if it would be possible if panelists could send in their recommendations as to not belittle methodological points. Dr. Richardson responded to Dr. Martin that they may have to rely on higher level notes, but will confirm later. He closed the session by thanking panelists, the subcommittee, and all participants for investing their time.

### Wrap-up and Adjourn Day 1

Dr. Richardson noted that the schedule for Friday allocated one hour for Dr. Slimak to answer questions before breakout sessions. He recommended to the subcommittee members that they spend time in the evening brainstorming any remaining questions. Dr. Richardson suggested questions be categorized based on subject matter such as the StRAP, projects, tools, programs and regions, and any clarifications on charge questions. He said that following the one hour question session, there would be public comments and then a two hour and fifteen minute breakout session prior to lunch. Dr. Richardson mentioned that he and Dr. Flint would touch base with each spokesperson of the two breakout groups that they were not a part of during the working lunch.

With regards to answering charge questions, Dr. Flint suggested maintaining structure to tackle each charge question by providing recommendations and context with respect to SHC to be as helpful as possible. Dr. Richardson said that the hour at the end of each day may be highly insufficient to address all six charge questions. Dr. Flint advised that consensus recommendations and comments be under discussion. Dr. Richardson further instructed that where the subcommittee did not reach consensus, they should give rationale instead.

Dr. Irwin inquired to how far the committee would get the next day. Dr. Richardson noted he would want to get as far as possible. He proposed that if at lunch time the next day, three groups were far into organization recommendations, then the subcommittee could provide suggestions to help them make progress. Dr. Richardson also acknowledged the challenge of group writing, but suggested to organize recommendations around bullet points in an outline form so context could be added at a later time while writing the report. Mr. Cujé mentioned that the general idea is for the report to be 10 to 15 pages in length.

Dr. Slimak thanked Dr. Flint and Dr. Richardson for a very well run subcommittee meeting as well as the audience's general attentiveness. He suggested members to think about how they want SHC meetings to be ran in the future and how to approach reviewing the program, and opened the floor for discussion.

## Friday, September 25, 2015

### Subcommittee Discussion and EPA Response to Subcommittee Questions

*Subcommittee and Dr. Mike Slimak*

Dr. Richardson began the subcommittee discussion by mentioning that the first hour of the morning was scheduled to discuss a few clarifying questions to help in interpreting the task and understanding the charge questions, and opened the floor to discussion of these questions. Dr. Flint said they would categorize the questions and comments as they received them, for response from EPA representatives.

Mr. Naud asked if SHC had a model of partnering with other funders with similar interests in urban sustainability, where one partner could develop the tool and the other can develop the training, or if this would be new territory.

Dr. Martin asked if they had focused on understanding history of partner engagement, as he did not understand how the last StRAP was informed by partners, or how this draft would. Dr. Richardson asked the subcommittee if they wanted some clarification about how projects are conceived, or at what stage partners are engaged. The subcommittee agreed that they would like

some more clarifications. Dr. Martin expressed that most of his questions during the poster session were focused on that.

Dr. Rubin shared his experience with EJ communities identifying the problem, raising the issue and mobilizing EPA, ATSDR and therefore, the pediatric environmental health specialist community, which he represents. The question is how are adverse environmental factors identified within communities that need remediation or intervention to look at creating healthy communities that can then be sustained. Dr. Richardson asked what they should do when that adverse effect relates to research–does it spark not only a remediation treatment, but also a research project? Dr. Rubin responded the answer was yes at two different levels. One, what kind of health effect is it causing, and two, how is it causing that health effect—direct or indirect. He said that they went into the study to address PCB toxicity, but then realized that it was only the tip of the iceberg, as the real issues were political and economic, noting his experience in Anniston, AL and the different sides of the railroad tracks, literally, and the need to identify common interests—kids. Dr. Richardson suggested soliciting clarification in terms of how such events can lead to action and ultimately SHC research.

Dr. Irwin asked two questions. First, is there a strategy for ramping up in terms of expertise to do more broadly sustainability science, which would include investments in new disciplines such as social sciences, noting that she considers economics to be a social science. Second, she asked how decisions are made about investments in data collection to test causal relationships versus investments in tools development. She suggested that you need empirical evidence before you can build a tool. Tools are making assumptions about causal relationships, and while scientists cannot have evidence of all causal relationships, they should have evidence of all critical ones. Dr. Flint asked for consideration of EPA's treatment of causal relationships as framing everything. Dr. Irwin asked in reply if the interest is primarily in environmental and economic factors that impact human well-being. Furthermore, she asked if it is necessary to understand other mechanisms that influence human well-being, especially in a social or economic manner. Dr. Richardson agreed, noting might be able to use feedback loops in terms of human actions.

Dr. Dannenberg stated that he was intrigued by the strategic priority of working to make a visible difference in the community, as certain projects cannot be addressed with Superfund money. He gave the example that at a Seattle Superfund site, explaining that they're spending enormous amounts of money for the clean-up of the Duwamish River, but not addressing the other problems occurring in the Native Americans and other vulnerable populations along the edge of the river. When they're done they still won't be able to use the river to swim and fish. Moreover, having a cleaner river doesn't take care of any of the other problems. With all the money being spent, is there a way to make a visible difference by cleaning up the river, when the community would suggest cleanup our neighborhood, give us education, parks, etc. and yet the Superfund money can't be used for that.

Dr. BenDor stated that the poster session presented a range of tools and how they were used and created, but he was confused about the methods for identifying and creating these tools. He said there seems to be two models: either have idea, create hammer, and then go find the nails, or have capacity, go find tool that is needed and then create the tool. He suggested that both are being used, but said he is not clear where the tools are coming from, why they are in the form they are, and for whom they are made. Furthermore, he noted almost seems like a client and consultant relationship, which seems to be so in certain toxicology work, which is very specific uses for very specific stakeholders, versus something like EnviroAtlas, which is raw and open to

the general public. Dr. BenDor mentioned that he is unclear if there are formal tool development strategies and would like to know the kind of engagement that goes on to create these tools and how SHC is searching for the people to use these tools. Furthermore, he asked if there were long-term plans for software maintenance of these tools, strategy for how they're disseminated, etc., giving the example of SWMM (Storm Water Management Model) taking on a life of its own outside of the EPA and wondering if there's a vision for other tools.

Dr. Tomlinson stated that when the primary outputs of an organization are text and data, having a coherent style is very easily. However, when building software tools, having a coherent look and feel and software interaction style is a much bigger deal. He asked if there are any plans for creating a unified feel for these tools, and if not, then why not, and if so, then what are they. Dr. Cervero added that regarding data, it depends what SHC is trying to create, whether it be comparative analyses or outcome metrics, etc. and what it really says about the community well-being and health, especially in regards to primary and second order impacts. In regards to Superfund and site remediation, a primary order impact would be improving water quality, but a second order benefit would be structural adjustments to cities. There might be increased industries, more people walking, less automobile use, etc. Dr. Cervero asked how you would bound and measure those outcomes. Could you only look at first-order effects, or is there also a way to examine and measure these second-order effects?

Dr. Richardson asked Dr. Slimak and Dr. Gellar if they would like to respond to these questions, or have all the questions asked and respond to them after. Dr. Flint stated that SHC might suggest that some of the questions should be taken into their deliberations and response charge question discussion, while others might have easier answers that can be more immediately answered. For an example of an easier question, she asked what is a crosswalk? Dr. Slimak said he would answer the questions brought forward before they started a second wave of questions.

Dr. Slimak stated that, in regards to how communities were engaged and the level of community engagement across the Agency, the Agency is highly engaged in community-based work. The Agency has been moving in that direction, so there is a lot of activity occurring at the community scale. This work is managed predominately at the regional offices, who know the regional health and contamination issues. At the national level, OSWER has an entire group called the community engagement team that actively works with the communities that have the contamination issues. Also at the national level, there is an Office of Sustainable Communities located in EPA's Office of Policy. The program is predominately grant-based, as it issues grants to achieve community sustainability. Those are two national programs at a community scale. Certain departments also work directly with communities, such as the pesticides and the air offices, so there is a lot of community-based work. The EPA Administrator recently called on the Agency to make visible difference in communities by identifying 50 communities that are overburdened due to contamination, EJ issues or lack of financial resources to achieve environmental protection, as well as that are representative of each region. This research program specifically is designed to support the Agency in assisting these communities. This varies from understanding what the contamination issue is in the community, by taking and processing environmental samples, to working in a lab to understand causal relationships between chemical contamination and outcome, or to helping to clean up at remediation sites, Superfunds, and brownfields. SHC was created to respond to anything at the community scale. Dr. Slimak stated that they did not have a scheme of identifying communities, and that they did not draw a random sample of communities or subcategorize the sample, but that they did pick

seven communities for listening sessions with community leaders. In these sessions they asked them what their issues were and what decisions are they facing when trying to achieve sustainability. These sessions influenced SHC's first StRAP and moved the research program towards the development of simplified tools that are easy to use by communities, as all too often EPA tools are extremely complex and require large datasets. Communities said that they could not handle the tools, as they do not have the staff and technical knowledge or capability, which is a problem. This was a very important question across SHC, ORD, and the entire agency: what is the strategy for engaging communities?

Dr. Raffaele was asked by Dr. Slimak if she could add to this topic. Dr. Raffaele stated that OSWER has a big program with respect to community engagement, as they have lots of staff involved in it and an annual conference about it. The Office of Brownfields works closely with communities, working with grantees to award and facilitate grants. OSWER also has been working with NIEHS Superfund Research Program's Community Engagement Core as part of each grant NIEHS issues, and can be used to track grant-related research. Regions works directly with communities that have contaminated sites, and sometimes HQ gets involved. The other program offices work with communities, especially at plants where they are doing residual risk assessments.

Dr. Duncan [Region 10 Regional Science Liaison] was next asked to contribute to the subject, and was asked to answer Dr. Dannenberg's question involving native tribes. Dr. Duncan said he is glad tribes were mentioned, as there are 250 in his region, the Northwest EPA region. They have coverage for all of these tribes, who each have a tribal coordinator. Grant programs require tribes to work with EPA Region 10 to help develop the ETEPs—EPA Tribal Environmental Plans—new requirement on a five-year renewable cycle where they hear from all the tribes and their issues. This provides complete coverage of the federally recognized tribes in that area, which would not include Duwamish Tribe in Seattle. The tribes lay out their issues, such as their fears of dioxin contamination of their food supply. Dr. Duncan added that in regards to the systematic way of identifying communities, things such as the environmental justice screen tool and the well-being index can help with the planning and identification of communities in need.

Dr. Slimak said that in regards to the Agency having a prioritized list of communities, he does not think that they do, noting that the subject is a bit controversial (e.g., Community concerned as to "Why am/aren't I on the list?" which could require enforcement action or entail receiving grant). Anytime an agency like EPA publishes a list of anything, it is controversial. There may be a prioritized list within each of the regions, or within each of the national programs, but he is not aware of a list at the national agency level. Dr. Flint asked if they had criteria for what makes a difference visible. Dr. Slimak responded that the Agency has built a whole work group that focuses on metrics and that works to show that a visible difference was made. He said that he does not know where they are with that. Furthermore, in terms of measuring outcomes, they have a group devoted to figuring out what metric would work to evaluate the differences in those 50 communities. Dr. Tharakan asked if there is a mechanism that communities could use to identify themselves to EPA and come to them with their problems. Dr. Slimak responded that the Office of Sustainable Communities reaches out to communities and they respond back. They have a grant program in conjunction with HUD and DOT and have an annual call for ideas that's sent out broadly to communities, but other than that, each program/Region probably has their own mechanism for reaching out to communities and getting input. Dr. Meyer mentioned that with the outreach process, one issue is that the communities with the biggest problems are also those

in the most disarray and they cannot figure out how to get help. He asked to what extent does EPA utilize its partners, like national associations of local governments, townships and cities, (function of SHC?) that can provide organizational feedback about the utility of some tools.

Related to outcome issue, Dr. Martin asked what does the EPA reports in the annual GPRA report. Dr. Slimak responded that ORD reports the number of products they said they were going to produce, and the percentage of those that were actually produced. Dr. Martin asked what they reported for the last reporting cycle, and was given the response that EPA was about 85% in ORD. Dr. Slimak asked Ms. McCullough, who was involved in listening sessions held during early design of SHC, for further comment.

Ms. McCullough, SHC Senior Sustainability Advisor, stated that when developing the program, they had seven communities in five regions for cross-community discussions. They also had a key leaders meeting where they had groups like ICLEI (International Council for Local Environmental Initiatives), the Urban Sustainability Directors' Network, ULI (Urban Land Institute), the National League of Cities, APA (American Planning Association), and data that came out of ICMA (International City/County Management Association) cross-community evaluations, as well as held a series of webinars and invited mainly urban sustainability planners such as APA to discuss the issues. They did not ask these key leaders what kind of research they needed, but instead asked what kind of information would you want or would you be able to use to decide on the actions to take to reach sustainability goals and what could they do to make a compelling case for the actions they would like to take. SHC combined these findings with information from huge partner meetings they held at the beginning, took the combined information and boiled it down to what people needed. There were three main questions discovered: How do we understand the decision process and the psychology behind the decisions?; How do we use metrics and measures to set and track goals?; and How do we evaluate the holistic implications of our decisions? These major factors, which were heard from the major stakeholders and partners, developed the foundation of the program. The EnviroAtlas had already been started, but evolved to address these expressed needs. She continued by explaining that aggregate membership organizations like ICLEI and others were incredibly valuable. Congress has tied EPA's hands for certain actions, such as the national Federal Advisory Committee Act (FACA) and the national Paperwork Reduction Act place restrictions on SHC outreach. SHC has regular calls with a lot of these partnerships as legal and effective mechanism for outreach.

Dr. Richardson asked to move on to answer the questions about either partner engagement or the development of tools, in the interest of time. Dr. Gellar started the conversation about how these tools are created, in response to Dr. BenDor's earlier question. The EnviroAtlas and C-FERST started before SHC was invented. On one side of these endeavors there are enterprising scientists and engineers involved in a technology push (cool idea and want to push it out), while on other side is the demand pull by the community and users of the technology. As the program evolves, SHC is really trying to move towards the demand pull side—it's much easier to give people a tool they are asking for instead of invent something and tell partners they should use it. C-FERST was put together in direct response to the Agency's Community Action for a Renewed Environment (CARE) program. The program is jointly run through region and program offices to engage communities to first diagnose and consider their issues, and then to address them. C-FERST was initially developed as an electronic version of the CARE roadmap. Through that process, SHC learned that communities are awfully good at identifying their own issues.

However, in many cases, the communities do not have the resources, technical information, or expertise necessary to go deeper into these issues. SHC hopes that further tool creation by the EPA would enhance these communities' ability to gain access to critical information. In cases like Dr. Weaver's presentation on the Petroleum Vapor Intrusion Screening Tool, they have whole sets of tools that address direct needs of the Agency. Historically, there are places where the SHC can do better, as they had some great ideas but the tool was probably started to be developed in the labs before communities and partners in the Agency were engaged. SHC is doing much better, noting the life cycle analysis tools working towards sustainable materials management program as an example of where SHC is working more closely with the RCRA office in OSWER so SHC vision matches their vision. Dr. BenDor then mentioned, in regards to tools, that he was curious about the extent to which working with a community to understand the demand of the tool is like working with a building contractor versus like working with Steve Jobs. In other words, is the community given exactly what they asked for, or are they given what the researchers think they actually need. Dr. BenDor's question, more specifically, was to what extent is the research arm actually contributing to tool development. Dr. Gellar responded to this question, and answered that it is a mix and there are a full range of tools. There are some tools, like EnviroAtlas, which are general use tools and, like a Swiss army knife, have many functions and are widely used by a variable audience. Then there are tools like T-FERST, in which SHC went to the national tribal science council and asked if they would be interested in this tool and engaged them during its development. The ultimate goal of this tool was that the tribes would eventually take over ownership and be in charge in the facilitating and updating of the tool. The tools need to be shaped by stakeholders' and users' needs. SHC's and EPA's goal should be to move towards the latter empowerment model, because ultimately it will have challenges sustaining all of these tools in the long run.

Dr. Cervero mentioned that it is important to discuss ownership and he redefined this ownership as empowerment, which is the term used in many fields when communities and individuals are engaged and brought into the loop. A self-ownership mindset is essential to truly receive engagement at the community level. He asked how tools could be packaged so that users and audiences can perform self-help responses. Dr. Gellar responded that there is community-owned-and-managed research is a step beyond community participatory research. It is key for tools to have the capacity for locals to upload their own data that do not get pulled into a federal database, and instead ownership stays in the hands of the communities. SHC tools give a community without GIS expertise or resources a platform and allows them to enter their own data and map it. Dr. Gellar stated that he liked Dr. Rubin's earlier point about how, where his group's initial goal was addressing PCBs, but then realized other political and economic factors are important. Sustainability is not a technology push that is magically going to solve everything, but a political and community decision assisted by SHC technology. He closed by clarifying that SHC scientists are not currently properly equipped to deal with all the issues, particularly with the shortage of social scientists, to participate at the community level. SHC needs to work with regional offices and partners that do have that experience with those communities such that it can gain entry into those communities.

Dr. Richardson brought up that they had limited time left in the discussion and should focus on answering the most critical questions in order to proceed. Dr. Slimak mentioned that there was an important postscript about the tools that he felt obliged to discuss. In EPA's 45-year history of developing predictive tools, they first developed exposure tools, and then linked them to effects and toxicology tools. EPA is where the action is for these tools, and these tools are grounded in

science. The early years, EPA had a training program with a lab in Athens, Georgia, that brought the appropriate people in and spent a week teaching them how to use and run these scientific tools. Now, all EPA models are required to be open-source code so the user can modify them, which was not the case historically. SHC is aware of the need for these tools to be interoperable and will host a big workshop in October to deal with interoperability across the Agency, since any model or tool has to go through extensive review process within the Agency, including its Office of Information Management. One important development in the early 1990s, while the government was dealing with budget issues, the Office of Management and Budget (OMB) said that EPA can have money to develop tools, but maintenance of tools was a private sector issue and that the ORD could not sustain a clearinghouse of tools. For example, SWMM was picked up and used by consultants.

Dr. BenDor commented on the topic, stating that one of EPA's major goals is enforcement. He said that all tools can be geared towards community engagement and decision making, but asked to what extent are the tools created and used for enforcement. He stated that EPA creating tools used by themselves to enforce regulations seems like a ripe area to explore. Dr. Slimak replied that the national enforcement center in Colorado asked for applications for cell phones that their enforcement teams can use in the field, instead of taking a sample, putting it on ice, shipping it and waiting for months for the results to be processed. In regards to this, the question is if there are some sort of quick techniques that an enforcement individual can use in the field to identify, for example, heavy metals coming from a gold mine. The examples, even just for this one topic, are endless.

Dr. Richardson stated the charge question was more encompassing then just addressing tools and that they may want to move on address other questions. He turned the conversation to partner engagement.

Dr. Slimak stated that, as discussed earlier, they reached out to communities to learn what their needs are. SHC's engagement in terms of partners is at the national program level. These partners are very involved and help SHC plan research programs. They also work closely with regions, but reaching out directly to communities can be problematic. SHC relies predominantly on national program and regional offices for engagement with the public. Dr. Martin asked how the partners that presented yesterday engaged in development of the last draft StRAP versus the current one. Dr. Duncan replied that, back in the old days, regional partners were asked to listen in as the ORD heard about each research project and then provide comments. The regions usually never heard back, because the planning cycle meant a change would occur a year later, actual research two years after that, and products three years later. The regions were struggling to get real feedback to their input. Dr. Duncan confirmed that the current process has changed and is now qualitatively and quantitatively better. Dr. Meyer clarified that there were partnerships on many levels—ORD, within EPA with other federal agencies--and asked if they should recommend partners that are not currently engaged with SHC. Dr. Slimak answered that yes, they would be interested in those recommendations, noting that SHC has recently started reaching out to ECOS (Environmental Council of the States) and its research arm, ERIS, as well as a lot of professional societies, which it had not done previously. Additionally, more and more staff have started attending annual meetings dealing directly with states and communities. Thus, we're seeing a shift within the research community and across the entire Agency, which is beginning to engage with new people. For example, ORD is very much engaged with the

Rockefeller 100 Resilient Cities program and heavily share a select number of SHC tools with them so they can engage in those Rockefeller cities.

Dr. Richardson then asked the SHC panel to answer questions related to funding and how investments are made. He clarified the question to focus on the balance of investment in data collection versus the investment in the development of tools. Dr. Slimak responded that the best example was the presentation the day before with the vapor intrusion model. The project spent about 5-6 years understanding the physics and chemistry of vapor movement through subsurface systems, which was about six years of data collection and understanding. Once the researchers began to see and understand the relationships, they began to model those relationships and spent the last two years developing the PVI tool. This process is typical of the tools developed: start with an issue or problem, data collection, begin to understand the science behind the issue/problem, and then try to develop predictive tools users can use to help them understand the phenomenon. Historically, they have taken a reductionist approach to produce the model, which is then used to create the tool, write a user's manual and do what they can to keep updated. SHC has a spreadsheet of the tools just they themselves have developed and it is pages long. Some of these tools would figuratively fall to the bottom of the tool box because they are tiny little tools, and other bigger and more complex tools would stay at the top of the toolbox.

Dr. Richardson rephrased the question about the balance of investment between data research and tool development, and framed his question by inquiring if Congress allocated any money towards ORD, to where would it go—data collection or tool development or even split? Dr. Slimak responded that the previous year saw a budget increase, as SHC asked for additional funding to make the ROE more interpretive. These funds went partly to data collection and partly towards learning how to make the ROE interpretive. That is, what do the status and trends in these 85 indicators mean in terms of what the Agency has done? Even that interpretation is still data collection. A better balance example is that while ORD focus on better understanding the social determinants of well-being, and better understanding of the causal relationships of well-being (i.e., data collection), while on the back end develop a tool like the well-being index. Thus, the front end is data collection and the back end is tool development.

Dr. Flint brought up the causality issue, which is the bridge between the research and the tools. Research establishes the relationship between x and y, and then the tools put in all the x's and get association to y. She asked the question whether or not they are taking the notion of causality and this quest for causal relationships potentially too far. Some tools are about a suite of indicators that researchers may actually be a long way from understanding the real causal effect. Researchers can get at relationships and influence, but in terms of separating out variables whether something is related to something else, sometimes it is a chicken and egg situation. She asked about discussing the pervasive use of the word "causal" and if the usage is intentional or if it is coming from an earlier generation where it was about exposure and response. Dr. Slimak responded that, historically, ORD has been a causal relationship research program. They are steeped in designing experiments that establish causal relationships and understand causal mechanisms. Establishing causal effect from a holistic approach is much more complicated. SHC is currently moving much more toward eco-epidemiology, in which the researchers try to explain what they see and then work backwards to determine what is causing what is seen. As the Agency moves towards a more holistic approach, they are not sure they can continue to establish this causality, but they can hopefully still establish the relationships. An example is that people seem to do well when they live near green spaces, but the causality of this is unknown, and

perhaps it does not need to be known. Research shows there's a positive relationship, and that is as far as research needs to go.

Dr. Martin asked if, from the start of SHC to the present, Dr. Slimak could describe Congressional allocations and staffing level as well as the general rate of decline or increase. Dr. Slimak responded that they are both declining. The budget is declining. The year before there was $151 million given to SHC with ORD given about half a billion dollars, and SHC is the largest ORD program. The FY15 operating plan is $151 million, which mostly covers employee salary. SHC is more than 500 employees in FY15. The President asked for $138 million in FY16. FY12 was the first year for SHC appropriations and it was roughly about the same, in the neighborhood of $140-150 million. Dr. BenDor asked for clarification if one-year budget cuts meant staffing or research cuts. Dr. Slimak responded that it depends on guidance received from the appropriators, noting that funding the STAR and Greater Research Opportunities (GRO) fellowship programs, which is the single, largest component of SHC and they're extramural grant programs. There have been 1,789 STAR and GRO fellows since its inception in 1985, and the last three years EPA has not been appropriated the money to cover the STAR and GRO programs so he has taken money from the base (Labs/Centers) program. The Executive Office decided to consolidate all government fellowship programs through a science, technology, engineering, and mathematics (STEM) initiative so that they all would be administered through NSF (National Science Foundation). Congress did not accept this request, and instead said that EPA had to fund the fellowships, but that they were not going to be given more money to do so. Money had to be taken from laboratories. The impacts of budget cuts depend on the appropriators' guidance. An appropriations bill is a law, and must be followed explicitly. SHC receives funding from four different appropriations: Science and Technology, Superfund, oil and spill, and leaking underground storage tanks. Four separate appropriations and each has specific guidance attached that have to be followed.

Dr. Richardson, Dr. Flint and the subcommittee discussed the logistics for splitting into groups for breakout group discussion. Noting that responding to all of the charge questions is a collective task, he suggested the room quickly discuss all of the charge questions and decide what matters should be kept in mind before they split into groups. Dr. Richardson asked what the subcommittee as a whole would like Group A to keep in mind as they look at Charge Question 1, in terms of issues, recommendations, etc. as they deliberate their responses to this question.

Dr. Meyer stated that it is critical whether or not the topics and project areas are paying attention to what the outcomes are, not just the outputs. Dr. BenDor said that it seems like there has not been apparent questions or responses about background material, so that many of the goals are being met, but are not being discussed or advertised. He asked if the charge question being asked is about actually answering whether or not the goals are being satisfied by the program, or whether or not the committee is effectively answering whether or not they have been satisfied.

Dr. Cervero stated that there was a lot of information for the charge questions, but that it would be useful to have bullet listing on the question of community health and outcomes, in order to figure out the knowledge gaps between what is known on the question and what is not known.

Dr. Flint commented that, in regards to Charge Question 1 and the phrase "organized to meet research program objectives listed in the StRAP," there is a need for more of a meta-analytical framework and emphasis on program evaluation. There is so much going on directly addressing

objectives 1, 2, and 3, but a more systematic way to track that and analyze across all of the tools, partners, and efforts is necessary in order to determine if findings about decision tools, their uses and how they are being received are lining up, are we seeing establishment of casual relationships and if there are similar patterns of utility. She asked what they would need to do in order to be able to effectively evaluate in 2019 whether or not these objectives have been met.

Dr. Martin recommended being cautious about our mental-scope creep regarding what SHC is capable of, as a research organization within ORD that handles other research domains, all of the program offices that also are charged with community engagement, as well as relative to other federal agencies that are dealing with issues of economic develop, housing, etc. in comparison to the objectives listed in the StRAP that were created by SHC. Dr. Irwin responded that some of the objectives are worded incredibly broadly and display a research agenda of 10 or more years. She urged the subcommittee think about adding more clarity to the objectives, such as laying out sub-points that could distinguish between shorter- and longer-term objectives, which may help answer the question of how well planned/organized are the objectives and project areas.

Dr. BenDor mentioned that in the planning processes they should have actions and objectives that are completely measurable, prioritized, structured, and that describe the goal in a broken down checklist form so that the next StRAP can examine if they effectively met all those goals.

Dr. Richardson then asked the subcommittee their opinions on Charge Question 2. Dr. Flint suggested further, more clearly articulating the different types of partners and the roles they play with problem formulation and response. She wanted more clarity on the mode of partner interaction, as it may look different depending on the nature of the partner. Dr. Dannenberg wanted the partners to be asked if they felt their ability to have input is effective from their point of view. Dr. Rubin asked about problem formulation and who is involved. Dr. Richardson noted this is in the context and commented that it is probably appropriate for some partners and not appropriate for others to be involved in problem formulation.

Dr. Meyer first brought up Charge Question 3 in association with Question 2 by asking how well the program serves the needs of the non-EPA partners or the needs of the communities that need more data analysis. He said that it comes back to outcomes, and that the language concerning him was that community health and well-being seemed not to have fully encompassed social/psychological well-being and socioeconomic status, and those are the needs that are getting an inadequate voice. Dr. Martin asked if SHC can engage stakeholders outside of the formal offices and regional partners, and replied to his own question that he thought they could, and that his breakout group would review stakeholders separate from partners.

Dr. Richardson brought up Group C and Charge Question 4. Dr. Dannenberg asked what it would look like if ecological and human health were truly integrated in analyses. Dr. Richardson responded that it seemed that the framework had tried to integrate through the lens of ecosystem services and human well-being. Dr. Irwin commented that t economic and social aspects need to be considered when asking about how comprehensive the research is in those sectors, as it is highly relevant. Dr. Tharakan spoke to coming up with ways of identifying community well-being more effectively. Dr. Richardson replied that the concept of well-being can be quite broad, but that the subcommittee has to think of it in terms of contribution to ecological health and community well-being. Dr. Rubin stated that resilient economy is a vibrant term and the issue that is faced on a regular basis is that the economies of these vulnerable communities are far from resilient. This poses a big challenge because the nested diagram explaining the relationships

between environmental integrity, health and well-being, and inside that economy should maybe be reversed—economy, health and well-being and environmental integrity. Dr. Richardson responded by asking, in regards to the nested diagram, where are these vulnerable communities that are not economically resilient and what are the ecological factors contributing to that. For example, are they coastal communities concerned about sea-level rise, are they drought prone regions, etc, that makes the regional economy vulnerable rather than the environment making the area vulnerable.

Dr. Meyer said that another way of looking at the relationship between ecological and human health is that ecological health influences human health, but the process of that influence is filtered by the socioeconomic forces/conditions. These factors are modifying processes that greatly impact the interaction between ecological and human health. Dr. Rubin added in that there is not a direct A to B cause and effect relationship in this area. There is A, then there are a lot of complex factors, and then there is B. The real question becomes what factor within the system can be influenced and how are to set the priorities in order to get good public health, a sustainable environment, and a resilient economy. Dr. Tharakan stated that in terms of the scope of feedback the SHC wants from the committee, the nested diagram is one way of conceptualizing relationships, but there could be a converse way that should be investigated. He asked if the groups should give responses with converse ways things can be investigated. This is given a nod of approval by Dr. Slimak. Dr. Tharakan mentioned that the previous BOSC meeting was framed on how the six StRAPs and questions were configured in relationship to each other. The committee had commented that these were not six independent research areas, and that SHC was an overarching umbrella to which these other areas provided input and needed to be informed by SHC's priorities. He maintained that, in terms of the configuration of almost independent research plans, integration and priority that SHC should be given, even in terms of funding, as well as the appropriate conceptual and philosophic attention.

Returning to Group A and Charge Question 5, Dr. Flint stated that she did not see the two—hypothesis-driven research and development of decision-support tools—as separate; maybe it's in the crosswalk. There's hypothesis-driven research and the development of tools, but for her they are intrinsically linked. Tools should be the manifestation of the understanding of these relationships among indicators. For her, the real question was about the relationship between the understanding and development of tools, so the charge question is oddly worded. Dr. Cervero agreed that they are obviously codependent and intrinsically connected. In certain ways, hypothesis-driven research clarifies the science and means that tools allow one to begin identifying interventions and policy responses, in order to do "what-if" analyses. If hypothesis-driven research was robust enough not only to tell direct and interactive effects, in the case of air quality, that emissions could be regulated, it would not tell the effect of some other regulations coupled with that. There is a need to take the science and place it on this tool-based platform, which could help these groups. Dr. Richardson stated that he liked Dr. BenDor's earlier remarks about this matter with his analogy about a person with a hammer looking for nails, or a community with nails looking for a hammer, and that there is an important use for both. Dr. Irwin said that, when looking at posters the day before, some tools were good at "what if" scenarios, which is good for determining low-hanging fruit, but that this method is far from being able to implement a policy scenario like implementing a tax and influence public behavior. These tools need to be made more useful for policy scenarios, which would be the next step in their evolution. Dr. Martin asked if the charge question was code for SHC researcher-driven research versus a program-specific request. Dr. Slimak shook his head indicating no in response

to this question. Dr. Rubin stated that different tools are for different purposes, and that question 5 is talking about these different tools. He suggested having different categories, and having a menu of tools that can be set up in order to make them more readily accessible.

The subcommittee discussed Charge Question 6, to be undertaken by Group D. Dr. Martin asked why OSWER was individually called out, and why air, water, and chemicals were not. Dr. Richardson responded that it was OSWER focused as it was drawing upon SHC Topic 3. Dr. Martin replied that he thought it might be that OSWER's program work is most related to SHC. Dr. Slimak noted that he mentioned yesterday about Technical Support Centers, where technical support can be provided because of the investments in long-term research programs to understand groundwater and sediment contamination. There is tension between how much can be devoted to short-term needs versus longer program needs, which could be 5-7 years in development. He advised the members not to be hung up by the exact language of the questions, but to look at the essence of the charge question more than the specifics if possible. There has always been an issue within ORD—the tension between short-term needs and long-term needs. Short term in ORD is 1–2 years, while long term is 5–7 years. In a program office, short term is three months, and long term is a year. This tension has been a criticism of ORD for taking a long time to do anything. He asked for specific feedback or guidance on the relationship between short-term and long-term needs. Dr. Cervero stated that the short versus long term discussion is critically important, because with rebound effects, urban planning is a field in that short term is the context that politicians relate to, and long term is someone else's term of office. There is no incentive to invest in longer-term goals. Dr. Richardson added that the focus of the question seems to be on communities, and so an example of a short-term goal is to clean up a spill, while a longer-term goal is to achieve community sustainability and environmental justice.

Dr. Tomlinson asked the SHC panel if there are any other comments on any other charge questions they would like to add. Dr. Slimak responded that the charge questions are for guidance and straying from the charge questions would be welcomed. SHC is not looking for a right answer, but provided guidance questions to help the subcommittee in their deliberations. He asked, now that the committee has a sense of the SHC program, based on what they have heard, whatever guidance they can give SHC on the direction the program is going and how the program is laid out would be helpful. Dr. Richardson reminded the subcommittee that the first three charge questions are for all five subcommittees since they are ORD wide. Dr. Flint questioned whether it would be helpful and worth highlighting positive feedback and the things that are working, which they did for last year's efforts and charge questions. Dr. Slimak responded that they should absolutely do that, as he used the input from this group and SAB to justify budget requests to OMB and the appropriators, as the BOSC members carry more weight than he does in these matters. The BOSC needs to consider both the positives and the negatives. Dr. Rubin brought up the point that the definition of short-term and long-term effects is variant in medicine as it depends on the illness or situation. Short versus long term becomes critically dependent on the nature of the particular crisis. Dr. Flint recommended that by lunch, at the very least, get all of the issues on the table.

**Public Comments**

Dr. Richardson noted there were no public comments received at that time and dismissed the subcommittee to their breakout groups.

**Subcommittee Breakout Groups**

The subcommittee divided into Breakout Groups A-D to discuss the assigned charge questions before reconvening to report out in the afternoon.

**Subcommittee Discussion**

*Subcommittee*

Dr. Richardson began the afternoon subcommittee discussion session by thanking the participants for their engagement in the breakout sessions and for adapting their schedules to come back together earlier. He explained that they will go in order of groups, not questions, and introduced Group A, who tackled Charge Questions 1 and 5.

*Group A - Charge Questions 1 and 5*

Dr. Tomlinson started the conversation on Charge Question 1 by stating that their group had structured their responses as a set of bullet points with context and then recommendations. Group A unanimously applauded the sustainability focus. The fact that EPA is working on sustainability is great. They are the right organization to be doing it. The EPA has an interoperability workshop that is supportive of the call for integration. The group acknowledged the following challenges: breadth of sustainability, limitations of budget, and other agencies' scope and how to handle the inevitable boundaries.

Dr. Tomlinson then presented the recommendations given by the group. They encouraged integration across different projects and different scales. They advocated for the development of a meta-analytic framework that would serve as a systematic process for the selection of communities, projects, etc. They recommended focusing on outcomes rather than outputs as well as documenting knowledge gaps. They asked for the development of projects under Topic 4, integrated solutions that are more closely related to the topic area, as well as the development of shared appointments across topics in order to achieve integrative and holistic goals. Lastly, the group called for the development of a sustainability and healthy community's conceptualization that defines terms a little more strongly. Dr. Tomlinson paused for full-subcommittee input.

Dr. Martin suggested that there are two pieces of this question: (1) content areas within the StRAP—whether they are organized properly and whether they are the right ones, and (2) what is their potential for implementation. Regarding the second question, in SHC's partner conversations, it was unclear what the StRAP becomes when it is done, as it is a long-term planning document that is unclear from a partner perspective and whether it simply goes on the shelf or whether it evolves as projects evolve. He asked if Dr. Tomlinson and his group talked about the implementation side of this, aside from the content areas. Dr. Tomlinson responded that they did not, but that it does not mean that they should not have. Dr. Martin replied with another question, asking, that if it is a planning document that has goals, would there be a schedule, timeline, or point of contacts. Dr. Flint mentioned that the StRAP documents the plan and can stand alone, but an adaptive implementation component is necessary. The StRAP should have benchmarks and second-order objectives delineated on a timeline, but it could well be a living document or a process by which it is reflected and adapted while it is carried out. What may happen within ORD is that they will have this StRAP, but then they will very quickly start work on the next StRAP, which may be that they have already started to change the plan, adjust timelines. Dr. Martin noted that came up in their partner conversations. Dr. Tomlinson remarked that it all comes back to systematic process and what the StRAP is attached to. Ms. McCullough

reminded the group of the matrix, and that the StRAP is developed by the NPDs and describes the "what" and the "when"—the project plans that come after described the "how." Dr. Martin then commented that the "what" part of the plan can change substantively over three years and asked how that can be known and documented. Dr. Richardson remarked that it is hard to know what "good progress" is, but in general, the group believed that SHC was organized in a way to make good progress, but this is a nuanced reaction. Dr. Flint stated that she wanted a more systematic way for them to document their progress, discussing the projects, the how, the what, and the plan.

Dr. Rubin asked what kind of projects they thought should be created under Topic 4. Dr. Richardson responded that Topic 4 is titled "integrated solutions for sustainable communities," but if you look at the projects and abstracts for the topic, they are not integrated solutions, but seem more like basic science. The other projects seem more directly related to the topic area, but not for Topic 4. Dr. BenDor said that the reason for having an implementation idea or plan is to give yourselves guidance, so that they can inform the next StRAP, and that by virtue of having those way points they are giving their future self-guidance. Dr. Flint mentioned that Topic 4 felt like it should be integrating and putting pieces together, and that a meta-approach within Topic 4 would help figure out what would realistically happen. Dr. Rubin asked what they meant by shared appointments across topics. He also suggested they are anything but integrated. Dr. Tomlinson responded that there was one member who had joint appointment between Topics 4 and 2, as it seemed like a good way to connect those topics and get those two integrated. As integration has loomed over the entire SHC conversation, one possible way to facilitate integration would be to have people whose appointments stretch across topics. Dr. Rubin responded that yes, he could see that this could be a major missing piece, and that there is nothing much on integrative solutions, which is ironic, because that is almost what the whole subcommittee meeting is about, and it is sort of absent. Dr. Tomlinson confirmed that Dr. Rubin wanted to add other ways to support integration (beyond shared appointments) to the list of bullet-point suggestions, to which Dr. Rubin agreed. Dr. Richardson gave some clarification, in that the critique about integrated solutions is related to Topic 4, but Dr. Tomlinson's shared-appointments point applies generally across all topic areas. Dr. Rubin further clarified that it also responds to integrated solutions.

Dr. Tomlinson and the subcommittee then moved on to discussing Charge Question 5, questioning whether there is a proper balance between research and tools. The context of the question is that research and tools should not necessarily be seen as separate Dr. Irwin agreed, but asked what is meant by "research"? Dr. Tomlinson clarified that "research" was seen as data collection and making the casual linkages between things whereas, tools are the set of systems by which they are brought to bear on particular problems. Dr. Richardson clarified that this charge question is talking about the balance between hypothesis-driven research and development of tools, which they felt are inextricably linked. Dr. Tomlinson resumed with the second piece by acknowledging that, in spite of the controversial nature of tools that rank communities and make many other assessments, it may be necessary to do so for prioritization of the efforts. The group applauded the Human Well-being Index and the Decision Analysis for a Sustainable Environment, Economy, and Society (DASEES) tool. The group also gave a list of recommendations for Charge Question 5. They recommended the development of a menu of tools, as well as the development of a logic model to link objectives and articulate the linkages between environment and human well-being issues. The group advised that SHC raise the profile

of research in the StRAP objectives list, clarify the scales at which community is defined, and make products accessible at the appropriate scales.

Dr. Dannenberg commented that he could offer two specific Centers for Disease Control (CDC) examples where they collected information on ranking systems had value to the lower-ranked areas or communities by helping them get something that raised them in the rankings. Dr. Flint suggested when thinking about rankings, ratings, and lists, as long as they are articulated based on clearly defined and bounded based on these indicators, these questions, this issues, then this is a tentative list as to what this combination tells us. This list can then be used as a point of entry into further inquiry, as conversation points with communities. The difficulties surface when this is "the" list of everything that matters for all communities in the country, and how well they are doing … end of discussion. The list and tools should be used to produce assessments that serve as an entry point to further dialogue.

Dr. Irwin asked, when referring to the statement about raising profile research, if they meant data collection and testing of causal hypotheses or if they meant something else. Dr. Richardson clarified that this charge question is talking about the balance between research and tools, all four objectives in the StRAP talk about tools, but the word "research" is mentioned in number three. They suggested that maybe hypothesis-driven research needs a greater profile, and maybe a greater emphasis in the objectives, such as a research question. Dr. Irwin completely agreed with that and then asked if that would imply data collection. Dr. Richardson replied that it could, depending on the situation. Dr. Irwin stated that it seemed like it should be phrased as data collection and tools in response to research questions. Dr. Tomlinson said that he sensed from the discussion that it was not that research was missing from the work itself, but from the objective list. He then asked the group if they thought it was missing from the projects as well. Dr. Richardson said that he felt it was missing from the objectives, but since they could not change those, maybe it does not warrant discussion. However, as a stated list of objectives in the StRAP, research is not given much attention. Dr. Irwin commented that it felt like in the description of projects, there were more descriptions of tools than data collection. She stated that Dr. Slimak's response to that was typically there are years of data collection and then a tool is developed. She said she did not know where they were with that process, and maybe now they were just in "tool-building mode," but that she did not want them to lose sight of the importance of data collection, research, and hypothesis testing in that process. Dr. Rubin stated that he agreed that the question had little discussion of research and focused on tools, and required more elaboration on this point. He asked Dr. Slimak to discuss this point if possible, and Dr. Slimak responded by inquiring if Dr. Rubin believed that the tools were essentially the product of the research. Dr. Rubin said that he just wanted the topic area clarified and the relationship between research and tools as seen by the subcommittee. Dr. Slimak replied that "research" is a word used in the StRAP and in ORD very broadly, and that includes tools. A tool cannot be developed without underlying research to develop that tool. Dr. Slimak stated, that to him, a tool is what results from research. More and more these days, SHC is building tools. In the early days they were writing journal articles, but they now build tools more than they ever have in the past. These tools are really what-if type setups, or decision-support tools, because a program or regional office has to make a decision. These tools are a product of research. Dr. Rubin summarized that the positive note there was that the research is done to create something useful,

not just for the sake of the research, it really is both the "R" and "D" in the acronym ORD. Dr. Slimak agreed and said that it really is about the "D," which some people tend to forget about.

Dr. Cervero commented that looking at the decision-support tools discussed in the poster session the day before, it seemed like many inputs were based on defaults and narrow studies or assumptions. Defaults are very debatable, but the real challenge on the research and data side is to understand the relationships, under different socioeconomic conditions or settings. The need for better research under various contexts and different conditions would help minimize defaults that sway the results, and can begin to do the "what-if" scenarios more accurately. Ultimately, tools are important, but more information is needed to help set the correct default parameters to better use the tools. Mr. Steinhoff stated that in order to find balance, as a tool producer himself, he is constantly looking at outputs of research as something to put into the tools. Research outputs are also products and can also be communicated to different stakeholders or user groups so that the tools are ultimately less "black box-like." Those research products can be put out in some way that other people can make useful, which might be a good way to elevate the research side of it.

Dr. Richardson said he would like to be more direct in his earlier critique and that the question is asking if there is an appropriate balance between hypothesis-driven research and the use of tools. To this question, he said that it appeared that the balance, including journal articles, is heavily tilted towards tools and he wanted to know if others concur with this thought. Dr. Tomlinson asked for clarification of the charge question and if they wanted to know if the balance should be equal or appropriate. The response was "appropriate," and he commented that not being exactly balanced could be fine if that is deemed what was appropriate. Dr. Richardson asked the room for some feedback on this point. Dr. Irwin said that her impression is to agree with Dr. Richardson that things are weighted more towards tools, but that it could just be a reflection of the stage of where the research is. She also added that an emphasis on data collection and hypothesis testing will be important for answering any of the broader questions they had been discussing. Dr. Feiock stated that one of things that they had observed in the process before tools, is that for the PVI tool, there was a six-year process of researching the question and understanding the chemistry before the tool was developed. For tools where users are in the communities and not EPA, it does not seem to be the same basic research going in first to identify the assumptions of the tools, and maybe what the group is asking for more of. Dr. Flint said that she liked what Dr. Feoick just said. It is good to use hypothesis-driven research to drive tools, and that there is a role for data collection, but they should also use tools and available data to answer hypothesis-driven research questions. Tools are currently being developed and are going out to answer community-based research questions and needs for them. It is not that they are not being used to answer questions, but they could be turned around and used to work on hypothesis-related research questions. This got back to point that they are not separate. Dr. BenDor commented that a point that he belabored in his group was the idea that if SHC was in the business of creating tools, one of the research programs might be "how do you better create tools," instead of "how do you create better tools." That would require self-reflective meta-research. It requires performing research on how the tool-building business and process of research and development is actually going. It is a much longer term planning process than a four-year StRAP, but might unhinge some of the discussions that they have been having. Charge Question 5 and Group A was brought to a close.

*Group B - Charge Questions 2 and 3*

Group B took over discussion and talked about Charge Questions 2 and 3. Dr. Martin said that his group grappled with the normative and objectives aspects of these questions, for each of which they provided qualitative answers, context and findings. They are interrelated so they separated the questions by chronology of engagement. The second question was about research planning and the third one was about research implementation, use, and utility. For Charge Question 2, the group mainly focused on the StRAP as being the primary research planning vehicle. SHC appeared to be moderately effective for both questions in terms of engagement, noting that there was a wide range of partnership engagements that were not documented. Group B believed that SHC could develop a process to provide more transparent and clear evidence of partner priorities to support partner engagement in problem formulation. There is limited evidence for conclusive findings so finding is SHC needs to document its engagement. That said, based on discussions with EPA program offices and regions and comparing the current StRAP engagement process with past SHC involvement, they noted positive improvements. Dr. Martin asked the group if anyone felt otherwise to their conclusion that the program moderately responds to the needs of the EPA regional program.

Dr. Flint remarked that, based on the evidence that the subcommittee has, the findings may be accurate, although they have other evidence suggesting that there's a lot that they do not know. She thought they needed to qualify the conclusion, suggesting it appears to be a lot more materials than they can get their heads around in two days. The recommendation, then, is that documenting this would elucidate what appears to be a fairly elaborate network of partner relationships. She stated she was very optimistic about the partner relationships. Partners is a very mixed group and has to be disaggregated in a way that we are having difficulty doing.

Dr. Cervero echoed that, remarking that he was still unclear as to who the partners are, other than a broad understanding of federal agencies, private sector, regulatory agencies, and non-governmental organizations (NGOs), and would like more information on the subject. Dr. Martin responded that they chose to expand the definition upon the definition of "partners" and distinguished between the formal EPA partners and other research stakeholders, but included both groups in their comments. Partners can and have included many constituencies and stakeholders for SHC. Formally, this included EPA formal partners (regional and program offices), all of which have some level of official involvement in the StRAP and other planning processes. The involvement of other EPA offices is either unclear given the evidence presented or not documented, such as the Office of Sustainable Communities. Other stakeholders are engaged in planning as mediated through the regional offices. These may include: state/local/tribal authorities, citizenry and neighborhood-level stakeholders, other federal research offices, including EPA's National Center for Environmental Economics (NCEE), logical networks/knowledge, advocacy research organizations, the scholarly community, and other funders (philanthropy). They tried to identify as many as possible, but their recommendations were not only to be conscious of these groups but also to engage in these and be explicit about what the engagement strategy should be.

Dr. Irwin commented that she wanted to challenge the moderately effective statement. She heard specific examples of highly effective engagement, but perhaps there was an unevenness in how effective the engagement process was, and that she wanted a more nuance in how the response is articulated. Dr. Martin responded that to really make a decision, they would have to decide effectiveness compared to what other standards, such as other ORD offices and federal agencies.

The group did not have that metric, so they looked at past SHC and talked to the partners that said the engagements have gotten better. Dr. Irwin also commented that SHC is the only ORD research program that contributes to the RARE and RESES programs. The group offered several recommendations, which focused on documentation requests and being explicit in terms of the protocol of engagement. SHC needed to explicitly define partners and their appropriate roles in research planning. It was appropriate to note that certain stakeholders should or should not have a role in research planning, but that should be a conscious and documented decision. The Agency should define measures for criteria for the effectiveness of stakeholder involvement. This question would be easier to answer if EPA defined the process for involving EPA partners and measures of its effectiveness. In the future, the BOSC SHC subcommittee would like to review a defined process and documentation of the actual engagement in the preceding year. Dr. Martin stated they solicited program regional offices, and when they dug more deeply, it was not clear what the protocols were with actual documentation of engagement activities. They did not hear about the number of phone calls, in-person meeting, or any of the engagement that happened. There should be actual documentation also at the project, task, and planning phases. Dr. Flint added that there is something here more than just documenting. She was not sure if that information was always known, and it might require an assessment across the different types of partners to evaluate the effectiveness of partner engagement. She suggested more qualitative assessment, looking at more than just quantitative measures, and using survey-based methods to assess the experiences, lessons learned, and needs. This was about data collection and research pertaining to what the group was learning, and was more than just documentation. Dr. Martin responded that his group agreed, and that they look into program evaluation and made some recommendations. They suggested that they expand upon Government Performance and Results Act (GPRA) reports on outputs, such as tool usage and customer satisfaction ratings, in regards to measuring outputs. In regards to the issue of informal versus formal partners, there are a lot of other partners that ORD is working with, but that are not documented and SHC is not getting the credit because ORD is not the lead agency on that project. Those need to be encouraged and included in engagement. The informal partnerships should not be discounted.

Dr. Martin continued by noting while each project and individual tasks may have different involvement requirements, there should be a conscious state of criteria. The group must insure that there are staff motivators for partner engagement (e.g., performance reviews), and that there are more opportunities to fix engagement or solicitation of feedback from external partners beyond the initial problem formulation. SHC resources should be allotted to “landscaping” efforts (including potential philanthropic funders and co-funders of SHC projects) and informal engagement with all stakeholder types. In particular, other federal researchers could be productive and easily justifiable partners. SHC and ORD should coordinate with EPA’s program evaluation office to conduct a study of SHC’s partner engagement approach, and output or outcomes evaluations of partner engagement (in addition to other outputs and outcomes as noted by other working groups). ORD should develop a partner usage/utility measure for its outputs as part of its GPRA reporting requirements. Note, again, that partners include members of the scholarly community as much as EPA program and regional offices. So, metrics could include, for example, bibliometrics for the former and peer review/satisfaction for the latter.

*Group C - Charge Question 4*

Breakout Group C looked at Charge Question 4. Dr. Flint led Breakout Group C, and expressed that the group went round and round, and that their recommendations capture where they were at

that point. The group discussed the need to look at multidirectional relationships amongst the ecological conditions, human health, and human and community well-being, rather than as uni-directional relationships. They see a lot of uni-directional framing of these issues, but so much of their conversation came back to complex relationships and their multidirectional nature amongst the elements. They needed to explicitly include social and economic conditions in the conceptualization as well. Another recommendation was that SHC needs to step back from always focusing on causal thinking to a more systems approach to understand complex relationships, noting causality may be very key in some places, but impossible in others Or that a sequence of thinking about relationships will help arrive at understanding of casual relationships, but we need to understand relationships before getting into causality; the weighting among variables is key. An example is allowing EcoHealth Browser to guide testing of relationships found in the literature using indicators in tools such as EnviroAtlas getting the tools and the questions to speak to each other. SHC needs to work to elaborate the role of social and economic determinants. The Agency should continue to refine the definition of well-being and to wrestle with data availability (mating units and levels of analysis for research questions), while watching out for ecological fallacies of making conclusions about individual or state-community units based on aggregate data. The issue here pertains to scaling. SHC had acknowledged that the Human Well-being Index is at a county scale and that community indicators would be better, as researchers should not want to use county or aggregate data to describe smaller-scale phenomena. ORD needs to tap into existing expertise outside of EPA, instead of staffing up, as many people are working on what it is and how it is measured. Dr. Flint stated that one question was how much work goes into data collection versus analyzing existing data and whether additional data collection might be needed in some target areas to flesh out these relationships. Another was what are the EPA tools and resources for measuring and representing the ecological health piece and ecosystem goods and services, noting exceptional work such as Environmental Quality Index, EnviroAtlas, ROE and the Ecoservice models library... there was a lot to document of good progress on that piece.

Then the group asked if there are EPA tools solely examining human health, and drew a slight blank. They began discussing tools available beyond EPA such as tools from CDC, data layers from the CDC, the American Academy of Pediatrics, NIH, etc. What are the tools and resources for measuring and representing the human and community well-being? Dr. Flint noted SHC has the Human Well-being Index, the T-FERST/C-FERST present opportunities, to examine the variety of tools, and assess the components of the tools as well as their aggregation noting they need to work on interoperability and connections among tools.

EPA needs to clearly define well-being. At some stage, EPA will need to state its definition and metrics. Dr. Flint went over the variety of tools and the capabilities SHC and EPA offers, and where better data layers can be found.

Furthermore, there is an issue of working towards guidelines for community engagement and the selection of cases. SHC must better develop their integration and communication techniques if they want to be more systematic about communities and documenting attributes, instead of being ad hoc about the application of tools in communities. Having guidelines for how to do that would be helpful.

SHC needs to focus on evaluating tools on ecological, health, and well-being factors, and provide feedback into tool development and refinement. There needs to be evaluation performed to document the lessons learned, including what is working and what is not. They need to look at

a carefully selected cross-section of communities and catalogue their attributes in order to assess if the arsenal of tools is appropriate and where they can tap into the community typology.

EPA needs to establish longer-range focus on emerging challenges, as there is a laundry list of drivers in those relationships such as climate change, immigration, shrinking cities, economic changes, geopolitics, changing demographics, and increasing inequality and poverty. SHC needs to examine drivers at both global and national scales. Scenario building efforts could be helpful, specifically on impacts of well-being. That could help shape workforce development. Perhaps a task force on the issues to get out beyond the immediate and be anticipatory on the longer range and bigger issues down the pipeline.

Dr. Irwin commented that these are really complex systems and questions, so in that context, simply understanding relationships is the first step. She asked if the next step should be trying to understand the causality, even if it is impossible in some cases, or if there are some cases where it should not be a goal. Dr. Flint replied that they should not try to force it where it is not possible. Dr. Irwin responded that is seems like it should always be a goal and asked if that was achievable. Dr. Flint replied that in the way Dr. Irwin just articulated the problem, is the way it should be. However, if the goal is always causal relationships, it should still report all the relationships. Dr. Irwin totally agreed on that point. Dr. Dannenberg brought up the precautionary principle and stated that they should use the best available evidence to make decisions and not wait for direct (absolute) proof. Dr. Richardson applauded the group for spending time thinking about multidirectional relationships, which was the idea of the group as a logic model. The unidirectional relationships, like developing causal loop feedback, are a way to conceptualize these relationships as a system dynamics model.

Dr. Rubin commented that the group analysis captured a lot of their thoughts. One idea that emerged was that they should perhaps take the tools being developed and begin to apply them in the real world. There were 50 communities currently under study and assistance, and Dr. Rubin advocated for them to choose some and look at them critically along every aspect of the cause-effect continuum with other complicating factors. He stated that if they could begin to apply the tools and look at them and look at what works and doesn't work, and what's a benefit or not, then they could learn a lot. He ended by remarking that he did not know to what extent that work has been done or systematically documented at each level.

Dr. BenDor asked does the SHCRP contain the elements to integrate ecological and human health. He stated that it seemed that there are 16 communities where the tools are being applied, but that they did not actually know anything about those communities. He commented that he would like to see it flipped. If the frame is 16 case studies, and they are using tools to address well-being in those communities, then knowing a lot about those communities, looking in rather than out, would be helpful in framing whether these have been successful. Dr. Flint stated that they have discussed a lot about the value of future interaction, and that if they could really find out where these tools are out and about, and who have looked at the well-being components, then that is where they can really see it in action. Dr. Martin wanted to make sure that the discussion the day before about the importance of economic finances at the household level was being incorporated into the definition of well-being and into the analysis. Dr. Flint asked Dr. Richardson to take note of talking about the individual on up and noted how they converge, and

to include it at many stages as an integrative component. Dr. Martin added looking at how people's poverty rates affect their health status.

*Group D - Charge Question 6*

Breakout Group D examined Charge Question 6, with the discussion led by Dr. Irwin. After restating the charge question, Dr. Irwin explained her group took the word leverage as being very meaningful. She began by sharing the context of this question was that a lot of excellent products and tools have been made available from the SHC for risk determination and remediation, and heard from the panel discussion that the responsiveness to regional needs for technical assistance provided by SHC had been great. Also a lot of evidence that ORD learning from technical assistance to inform tool development had been effective and worked well. This group also talked about how many of these tools are very site-specific, but that OSWER's thinking has evolved over time and has been increasingly focused on areas around contaminated sites from remediation to reuse, for example, reuse of a Brownfields site. This led to the group thinking about this question of scales where you have the site where the environmental damage has occurred, you have the area around that and the effectiveness of cleanup and even the type of response that you might have and in terms of how you manage the environmental damage may be determined in part by what's happening in the surrounding areas. Thinking then more broadly about the longer-term research goals that have been articulated at the community level, she recognized that sustainability and environmental justice outcomes cannot be evaluated in a site-specific context.

Dr. Irwin showed a diagram that summarizes leverage and how SHC can leverage the short-term needs for longer-term research goals. They thought about this at different scales—site scale, area (initially "neighborhood") scale—area around the site—and the community scale. They concluded that this is working very well and that SHC engagement has been highly effective. That is, given that the environmental damage has occurred, the question is what should the management response be? SHC has been highly effective in doing the necessary research and developing the correct technical solutions in terms of answering specific questions and commented that the arrows in the diagram are essentially researchable areas/research topics. Then you can think about what type of management response should it be? This question is informed by how the land and materials should be reused as part of the cleanup and containment effort. This was expressed in terms of productive use—productive use of the land and productive use of the materials—and need to consider the area context and the spatial arrangement of the other land uses around this site and mix of economic activities that are taking place, which is necessary to examine because there are many things that can influence that decision.

The researcher needs to think about nearby polluting industries or poor air quality that could trump the benefits from cleaning up the site. It is important to think about human capital, skills, services, etc. in terms of productive use and the kind of land, economy, and human aspects of it. If those questions are taken into account, then they are studying much more complex sets of relationships, as each arrow on the diagram, is researchable and each influenced by various institutions. Ultimately, the question of community well-being, sustainability and environmental justice arise, which are the outcome measures that SHC has an interest in measuring so

understanding how productive use is impacting these outcome variables and then feeding back into these variables is important.

The diagram started out simple and became more complicated. The group recognized there was a time dimension to that as well. Response is operating on a short term, immediate-need basis, but then there are more long term research questions with longer term well-being outcomes as the goal. They presented a schematic answer to how ORD can leverage this need to justify or bring in some of those longer term research questions and felt it was already articulated in the StRAP.

Breakout Group D provided a few recommendations on Charge Question 6 for ORD. ORD needs to expand its focus from site-specific mitigation outputs (e.g., technologies, tools) to area outcomes. There is need for data collection and research on local area redevelopment contexts. Longitudinal panels of local economic development efforts on contaminated sites are needed to better inform decisions on immediate response and longer term management of those sites. The analytical frames that ORD uses in research and tool development needs to include people-focused as well as place-focused orientations. This group recommended a holistic approach to research on productive use of land and materials that can be translated into community well-being outcomes. Outcomes need to include measures of economic prosperity, environmental justice and special equity addition to ecosystem services.

Dr. Rubin stated that the diagram was worth a thousand words and that the recommendations mirrored what they were talking about as well; taking the tools out into the community and seeing how they work might be one of the strongest recommendations. This would allow ORD to see how they work, how well, and if they need modification.

**Wrap-up and Adjourn**

Dr. Richardson began adjournment of the meeting. He stated that they needed to create a report by November 17. He said that the can appreciate the challenge of 15 people editing one document at the same time. He offered another approach, in which he and Dr. Flint collaborate to draft a document and the other members react to it. The subcommittee agreed to this approach. Dr. Richardson stated that they would still need a systematic way to gather input that avoids 15 emails with tracked changes, and invited ideas for better ways. Dr. Richardson also mentioned scheduling a teleconference.

Dr. Tomlinson proposed sharing a Google document to make changes. He asked if that would violate FACA. Mr. Cujé replied that they could work on it collectively, though that gets tricky in terms of FACA. He also mentioned breakout groups could continue to modify their language and forward them to Dr. Richardson. Dr. Richardson said it was a good option, but again, they want the collective to take responsibility for charge questions.

Dr. BenDor asked if a Google document that people are editing counts as a meeting. Mr. Cujé responded that he was not sure, would need to look into it, and could find out by the next Monday. Dr. Richardson commented that they are conferring as a small group on that Monday in order to finalize the process.

Dr. Rubin stated they should do a combination of the suggestions so far, and suggested that the two lead chairs develop and put all the material in the structure, and then give it back to the small groups to work on content, and then it should be brought back to the big group. Dr. Richardson liked that approach, and stated they would still need to synthesize all the information anyways.

Dr. Tharakan asked if the breakout groups reconvene and have a separate meeting before November 17, if that would violate FACA. Mr. Cujé said that it would not and that it would be a good approach. Dr. Tharakan suggested a two-stage process where the breakout groups convene first, have a general template provided by the leads, and then they meet again as a whole group. Dr. Richardson and most of the subcommittee agreed. The small group would develop a template, synthesize what they have been given, give it back to all the small groups, and they can convene however they like and submit comments back to the main small group. Dr. Richardson asked, at that stage, if would they prefer a teleconference or to continue electronically. Dr. Tharakan asked if an endorsement of the final report is required by all the members. Dr. Richardson stated that in theory they are meant to reach consensus. Where they do not meet consensus, they must document the rationales.

Dr. Rubin commented they should work backwards from the deadline, and asked when they would want the completed document, input from the larger group, etc. The final document should be sent to everyone and a conference call would be ideal. Dr. Flint said they would put the timeline together on their Monday call and get it back to them by the next week. Dr. Richardson asked if the working groups would be able to respond to it within 10 days. There was varied discussion. Dr. Richardson stated that it would mean around October 12, 2015, which would give them roughly a month to turn that into a document. Not hearing objections, Dr. Richardson replied that they would send an email midweek the following week with the template and proposed timeline. Dr. Richardson asked if they should use reply all in e-mails. Mr. Cujé responded that, no, they should not reply to all the members. Dr. Richardson asked the facilitators of the groups to gather input and reply to him and Dr. Flint, and to CC Mr. Cujé. Mr. Cujé replied that it would be an ideal plan and that he would try and set up a doodle pool for a day to meet in late October.

Dr. Rubin suggested that when they create the final structure, they might just want to send each section to each of the four leaders, and then they can work with the other groups. Dr. Richardson remarked this was a good point.

Dr. Slimak thanked everyone for all of their help and stated that they would start implementing some of the suggestions and ideas they have already heard. He commented on how the whole FACA concept is based on the Administrative Procedures Act, which states that everyone is allowed to observe the government's business, so everything must to be open to the public. Dr. Richardson added his thanks to everyone for their hard work and thanked individuals, the staff, and EPA's contractor, ICF.

The meeting was adjourned at 4:00 p.m., Eastern.

Respectfully Submitted:

**/Signed/**

Mr. Jace S. Cujé

BOSC SHC Subcommittee DFO

Certified as Accurate:

**/Signed/**

Dr. Robert Richardson

BOSC SHC Subcommittee Chair

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

## Appendix A: Agenda

# United States Environmental Protection Agency
# Board of Scientific Counselors (BOSC)
# Sustainable and Healthy Communities (SHC) Subcommittee

Meeting Agenda – September 24-25, 2015

EPA Campus – Room C111-C

109 T.W. Alexander Drive, Research Triangle Park, NC 27709

Remote participation will be available on Sept 24th via: https://epa.connectsolutions.com/shcteam

| TIME | TOPIC | PRESENTER |
|---|---|---|
| **Thursday, September 24, 2015** | | |
| 8:00 - 8:30 | Registration | |
| 8:30 - 8:45 | Welcome, Introduction, and Opening Remarks | Robert Richardson, Chair |
| 8:45 - 9:00 | DFO Welcome | Jace Cuje |
| 9:00 - 9:15 | SHC Welcome and Discussion of Materials Provided | Mike Slimak |
| 9:15 - 9:45 | Review of Charge Questions | Robert Richardson, Chair |
| 9:45 – 11:30 | Program Planning, Organization, and Research I<br>• SHC StRAP Overview (15 minutes)<br>• Attend Topic 2 & EnviroAtlas Posters (1 hour)<br>• SC Discussion (30 Minutes) | Mike Slimak<br>ORD Scientists<br>Subcommittee |
| 11:30-12:30 | Lunch | |
| 12:30-1:30 | Demonstration of SHC Tools | Brian Dyson<br>Anne Neale<br>Seema Schappelle<br>Jim Weaver |
| 1:30-3:00 | Program Planning, Organization, and Research II<br>• Brief introduction<br>• Attend Topic 1, 3 and 4 Posters (1 hour)<br>• SC Discussion (30 min) | Mike Slimak<br>ORD Scientists<br>Subcommittee |
| 3:00-3:15 | Break | |

| | | |
|---|---|---|
| 3:15 – 4:45 | Program and Regional Office Perspectives<br>• Panel Discussion (1 hour)<br>• SC Discussion (30 minutes) | Kathleen Raffaele (Office of Solid Waste and Emergency Response)<br>Bruce Duncan (Region 10)<br>Mary Reiley (Office of Water)<br>Michael Scozzafava (Office of Solid Waste and Emergency Responses)<br>Marie O'Shea (Region 2)<br>Erika Sasser (Office of Air & Radiation |
| 4:45 – 5:00 | • Wrap-up and Adjourn | |

| TIME | TOPIC | PRESENTER |
|---|---|---|
| **Friday, September 25, 2015** | | |
| 8:30-9:30 | Subcommittee discussion<br>EPA response to Subcommittee questions | Subcommittee<br>Mike Slimak |
| 9:30 - 9:45 | Public comments (if any) | |
| 9:45 - 12:00 | Subcommittee discussion and writing | Subcommittee |
| 12:00 – 1:00 | Working Lunch | |
| 1:00 – 3:00 | Subcommittee discussion and writing | Subcommittee |
| 3:00 – 4:00 | Wrap-up and Adjourn | Robert Richardson, Chair |
| | | |

Breaks at the discretion of the Chair.

## Appendix B: Participants

**BOSC SHC Subcommittee Members:**

Robert B. Richardson, *Chair*
Courtney G. Flint, *Vice Chair*
Todd BenDor
Robert Cervero
Andrew Dannenberg
Richard Feiock
Elena G. Irwin
Carlos Martin
Peter B. Meyer
Earthea Nance*
Matthew Naud
I. Leslie Rubin
Mike Steinhoff
John Tharakan
Bill Tomlinson

* Not in attendance

**EPA Designated Federal Officer (DFO):** Jace Cujé, *Office of Science Policy, ORD*

**EPA Presenters:**

Mike Slimak, *Office of Research and Development, National Program Director for the SHC Research Program*
Brian Dyson, *Office of Research and Development*
Anne Neale, *Office of Research and Development*
Seema Schappelle, *Office of Research and Development*
Jim Weaver (remote), *Office of Research and Development*
Kathleen Raffaele, *Office of Solid Waste and Emergency Response*
Bruce Duncan, *Office of Research and Development, Region 10*
Mary Reiley (remote), *Office of Water*
Michael Scozzafava (remote), *Office of Solid Waste and Emergency Response*
Marie O'Shea (remote), *Office of Research and Development, Region 2*
Erika Sasser (remote), *Office of Air & Radiation*

**Other EPA Attendees:**

Rochele Araujo
Tim Barzyk
Ben Berolzheimer
Robyn Conmy
Peter Egeghy
Emily Eisenhauer
Gary Foley
Florence Fulk
Andrew Geller
Tim Gleason
Greg Grissom
Intaek Hahn
Fred Hauchman
Beth Hassett-Sipple
Vlad Isakov
Lek Kadeli
Abdel Kadry
Robert Kavlock
Gregory Lank
Sylvana Li
Danelle Lobdell
Nica Louie
Sarah Mazur
Melissa McCullough
Cynthia McOliver
Bridget O'Brien
Jim Quackenboss
John Rogers
Marc Russell
Kathryn Saterson
Mya Sjogren
Lisa Smith
Kevin Summers
Kathy Sykes
Nicolle Tulve
Barb Walton
Rick Wilkin

**Other Participants:**

Six additional participants joined by webinar, but did not identify themselves.

**Contractor Support:**

Courtney Skuce, ICF International
Nicole Vetter, ICF International
Canden Byrd, ICF International

## Appendix C: List of SHC Materials Provided (posted at http://www2.epa.gov/bosc/sustainable-and-healthy-communities-subcommittee-meeting-documents)

### SHC Subcommittee Meeting Overview

- SHC 101 Presentation (59 pp.)
- Sustainable and Healthy Communities Strategic Research Action Plan Fiscal Years 2016 - 2019 (44 pp.)
- Recent Accomplishments in Sustainable and Healthy Communities Research (12 pp.)

### SHC Subcommittee Meeting - Topic 1: Decision Support and Innovation

#### Charters

- Nov 17 Revised SHC Project Charter 1.61 for Partners (9 pp.)
- Nov 17 Revised SHC Project Charter 1.62 for Partners (13 pp.)
- Nov 17 Revised SHC Project Charter 1.63 for Partners (6 pp.)

#### Posters and Abstracts

- Poster: Decision Science and Support Tools - SHC 1.61 (1 pg.)
- Poster: EnviroAtlas - SHC 1.62 (1 pg.)
- Poster: Innovation and Sustainable Education - SHC 1.63 (1 pg.)
- Poster: Actionable Science for Communities (DASEES) - SHC 1.61 (1 pg.)
- Poster: Structured Decision Making - SHC 1.61 (1 pg.)
- Abstract: Digital repository of associations between environmental variables: A new resource to facilitate knowledge synthesis (1 pg.)
- Abstract: A national approach for mapping and quantifying habitat-based biodiversity metrics across multiple spatial scales (1 pg.)
- Abstract: Linking ecosystem services and human health: the Eco-Health Relationship Browser (1 pg.)
- Abstract: Integrated environmental modeling: A vision and roadmap for the future (1 pg.)
- Abstract: EnviroAtlas: A new geospatial tool to foster ecosystem services science and resource management (1 pg.)
- Abstract: Design of a component-based integrated environmental modeling framework (1 pg.)

### SHC Subcommittee Meeting - Topic 2: Community Well-being: Public Health and Ecosystem Goods and Services

#### Charters

- Nov 17 Revised SHC Project Charter 2.61 for Partners (1 pg.)
- Nov 17 Revised SHC Project Charter 2.62 for Partners (11 pp.)
- Nov 17 Revised SHC Project Charter 2.63 for Partners (8 pp.)
- Nov 17 Revised SHC Project Charter 2.64 for Partners (13 pp.)

**Posters and Abstracts**

- Poster: EPA-NIMHD Centers of Excellence on Environment and Health Disparities - SHC 2.63 (1 pg.)
- Poster: Community-Based Final Ecosystem Goods and Services - SHC 2.61 (1 pg.)
- Poster: Community Public Health and Well-being - SHC 2.62 (1 pg.)
- Poster: Assessing Environmental Health Disparities in Vulnerable Groups - SHC 2.63 (1 pg.)
- Poster: Indicators, Indices and the Report on the Environment - SHC 2.64 (1 pg.)
- Poster: Solution-Oriented CBCRA in EPA Regions - SHC 2.61 (1 pg.)
- Poster: Community Cumulative Assessment Tool (CCAT) - SHC 2.62 (1 pg.)
- Poster: C-FERST and Tribal-FERST Poster - SHC 2.62 (1 pg.)
- Poster: Linking FEGS-CS (Final Ecosystems Goods and Services Classification System) and NESCS - SHC 2.61 (1 pg.)
- Poster: Region 4 Health Impact Assessment (HIA) on the Use of Green Infrastructure in Proctor Creek - Task #2.2.1.6 (1 pg.)
- Poster: EPA's Report on the Environment (ROE) - SHC Task 2.64.3 (1 pg.)
- Poster: Understanding Social Determinants of Environmental Health: Complementary Animal and Population-Based Approaches in Projects 2.62 and 2.63 (1 pg.)
- Poster: The EPA/NIEHS Children's Environmental Health and Disease Prevention Research Centers –SHC 2.63 (1 pg.)
- Poster: Research to Understand Ecological and Human Health for Tribal Sustainability and Well-Being (1 pg.)
- Abstract: Elevated Blood Pressure in Offspring of Rats Exposed to Diverse Chemicals During Pregnancy (1 pg.)
- Abstract: Mapping vulnerability to climate change-related hazards: children at risk in a US–Mexico border metropolis (1 pg.)
- Abstract: Exploring effects of climate change on Northern Plains American Indian health (1 pg.)
- Abstract: Managing for resilience: early detection of regime shifts in complex systems (1 pg.)
- Abstract: Hispanic heterogeneity and environmental injustice: intra-ethnic patterns of exposure to cancer risks from traffic-related air pollution in Miami (1 pg.)
- Abstract: Detection and source tracking of Escherichia coli, harboring intimin and Shiga toxin genes, isolated from the Little Bighorn River, Montana (1 pg.)
- Abstract: Alaskan Wild Berry Resources and Human Health under the Cloud of Climate Change (1 pg.)
- Abstract: Construction of an environmental quality index for public health research (1 pg.)
- Abstract: Detection of Pathogenic and Non-pathogenic Bacteria in Drinking Water and Associated Biofilms on the Crow Reservation, Montana, USA (1 pg.)

- Abstract: What data should we collect? A framework for identifying indicators of ecosystem contributions to human well-being (1 pg.)
- Abstract: Estimating Benefits in a Recovering Estuary: Tampa Bay, Florida (1 pg.)
- Abstract: Social stressors and air pollution across New York City communities: a spatial approach for assessing correlations among multiple exposures (1 pg.)
- Abstract: Relating ecosystem services to domains of human well-being: Foundation for a U.S. index (1 pg.)
- Abstract: An Index of Human Well-Being for the U.S.: A TRIO Approach (1 pg.)
- Abstract: An ecological function and services approach to total maximum daily load (TMDL) prioritization (1 pg.)
- Abstract: The effects of perfluorinated chemicals on adipocyte differentiation in vitro (1 pg.)
- Abstract: Developing scientific information to support decisions for sustainable coral reef ecosystem services (1 pg.)
- Abstract: Integrating Human Health and Environmental Health into the DPSIR Framework: A Tool to Identify Research Opportunities for Sustainable and Healthy Communities (1 pg.)
- Abstract: Developing scientific information to support decisions for sustainable coral reef ecosystem services (1 pg.)
- Abstract: Comparison of methods for quantifying reef ecosystem services: A case study mapping services for St. Croix, USVI (1 pg.)

**SHC Subcommittee Meeting - Topic 3: Sustainable Approaches for Contaminated Sites and Materials Management**

**Charters**

- Nov 17 Revised SHC Project Charter 3.61 for Partners (6 pp.)
- Nov 17 Revised SHC Project Charter 3.62 for Partners (7 pp.)
- Nov 17 Revised SHC Project Charter 3.63 for Partners (12 pp.)

**Posters and Abstracts**

- Poster: Contaminated Sites - SHC 3.61 (1 pg.)
- Poster: Environmental Releases of Oils and Fuels - SHC 3.62 (1 pg.)
- Poster: Sustainable Materials Management - SHC 3.63 (1 pg.)
- Poster: Biodegradation of Dispersed Oil - SHC 3.62 (1 pg.)
- Poster: PERFORMANCE ASSESSMENT OF A PERMEABLE REACTIVE BARRIER (PRB) - SHC 3.61 (1 pg.)
- Posters: State of the Practice on Bioreactor Landfills - SHC 3.63 (1 pg.)
- Poster: US EPA ORD Technical Support Centers in Safe and Healthy Communities (1 pg.)
- Abstract: High-resolution magnetic susceptibility measurements for investigating magnetic mineral formation during microbial mediated iron reduction (2 pp.)

- Abstract: Submersible Optical Sensors Exposed to Chemically Dispersed Crude Oil: Wave Tank Simulations for Improved Oil Spill Monitoring (1 pg.)
- Abstract: Influence of reservoir water level fluctuations on sediment methylmercury concentrations downstream of the historical Black Butte mercury mine, OR (1 pg.)
- Abstract: Comparative Laboratory-Scale Testing of Dispersant Effectiveness of 23 Crude Oils Using Four Different Testing Protocols (1 pg.)
- Abstract: Life-Cycle Inventory and Impact Evaluation of Mining Municipal Solid Waste Landfills (1 pg.)
- Abstract: Monitoring exposure of brown bullheads and benthic macroinvertebrates to sediment contaminants in the Ashtabula River before, during, and after remediation (1 pg.)
- Abstract: The New Bedford Harbor Superfund site long-term monitoring program (1993–2009) (1 pg.)
- Abstract: Identifying/Quantifying Environmental Trade-offs Inherent in GHG Reduction Strategies for Coal-Fired Power (1 pg.)
- Abstract: Travel distance and transformation of injected emulsified zerovalent iron nanoparticles in the subsurface during two and half years (1 pg.)
- Abstract: Fifteen-year assessment of a permeable reactive barrier for treatment of chromate and trichloroethylene in groundwater (1 pg.)

**SHC Subcommittee Meeting - Topic 4: Integrated Solutions for Sustainable Communities**

**Charters**

- Nov 17 Revised SHC Project Charter 4.61 for Partners (14 pp.)

**Posters and Abstracts**

- Poster: Integrated Solutions for Sustainable Communities - SHC 4.61 (1 pg.)
- Poster: PROGRAMC-LINE & C-PORT models –Air pollutant concentrations due to roadway vehicle emissions (1 pg.)
- Poster: Durham Light Rail Model –A Transit-Centered, Multi Sector, Systems Approach for Sustainability - SHC 4.61 (1 pg.)
- Poster: Regional Sustainability and Environmental Research Program (RESES) - SHC 4.6 (1 pg.)
- Abstract: A near-road modeling system for community-scale assessments of traffic-related air pollution in the United States (1 pg.)
- Abstract: Carbon stable isotopes as indicators of coastal eutrophication (1 pg.)
- Abstract: Field assessment of the effects of roadside vegetation on near-road black carbon and particulate matter (1 pg.)
- Abstract: Nutrient enrichment and precipitation changes do not enhance resiliency of salt marshes to sea level rise in the Northeastern U.S. (1 pg.)
- Abstract: Below the disappearing marshes of an urban estuary: historic nitrogen trends and soil structure (1 pg.)

- Abstract: Estimated losses of plant biodiversity in the United States from historical N deposition (1985–2010) (1 pg.)
- Abstract: Cost of reactive nitrogen release from human activities to the environment in the United States (1 pg.)

**SHC Subcommittee Meeting -- Supplemental Materials**

- ORD SHC Charge Questions (1 pg.)
- SHC Usable Tool List (XLSX)
- ORD Research Definitions (1 pg.)

**EPA Response to SAB/BOSC Recommendations in Strategic Research Planning for 2016-2019 (74 pp.)**