SCAPA Meeting Highlights
May 5, 2005

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EXECUTIVE SUMMARY

The Department of Energy (DOE) Subcommittee on Consequence Assessment and Protective Actions (SCAPA) convened its annual meeting at the Marriott Renaissance Arts Hotel in New Orleans, LA, on Thursday, May 5, 2005, in conjunction with the Emergency Management Issues Special Interest Group (EMI SIG0 meeting. Forty-six (46) individuals from the public and private sectors participated in this year's SCAPA meeting.

The primary purpose of the annual SCAPA meeting was to continue to provide a forum for SCAPA members and its associates to review its accomplishments, products, and projects since the last SCAPA meeting on May 6, 2004 in Washington, DC, and to also discuss its present and future mission and its implementation. Several technical presentations of interest to the membership, including those from the now four active SCAPA Working Groups, were delivered.

Dr. Al Feldt, NA-41 SCAPA Federal Official, welcomed everyone. Tom Rotella, spoke briefly for Jim Fairobent indicating that SCAPA was a very viable part of NA-41 and will continue to be funded.

Carl Mazzola reviewed the important points that were discussed and decisions that were made during the 2004 SCAPA Meeting and briefly discussed the report on the Washington, DC SCAPA meeting. Carl reviewed the status of the open action items and their proposed disposition.

Since the last SCAPA Meeting, all of us have lost a good friend in Doan Hansen, who passed away on March 12, 2005. Rocky Petrocchi presented a brief memoriam about the life and accomplishments of Doan Hansen. His passing leaves a void in the SCAPA program and in the lives of the many people who knew him.

Cliff Glantz introduced several DOE/NNSA Biosafety Officers (BSOs) and reported on their meeting. Three of the BSOs engaged in a panel discussion of how they support the consequence assessment and protective actions functions of their respective Emergency Operations Centers (EOCs). Bettina Stopford and Reed Hodgin made presentations related to Biosafety topics. Bettina's addressed the limitation of biological detection devices the difficulties in integrated biological components into an emergency management regime. Reed discussed the biosafety consequence assessment system he is developing for BNL. This is the first SCAPA Meeting that has had a biosafety component and the five presentations jump started the establishment of this SCAPA program element.

Cliff Glantz moved on to the efforts of the Consequence Assessment Modeling (CAM) Working Group (WG) and the issues that the group was addressing. The primary concern of the CAM WG is to develop the appropriate NA-41 response to upcoming DOE O 414.1C and its companion guide, G 414.1-4, which will soon be finalized. These guides are requiring some level of Software Quality Assurance (SQA) of codes associated with consequence assessment and Emergency Preparedness Hazard Assessments (EPHAs). The CAM WG is also addressing other matters associated with the transport and dispersion modeling of uranium hexafluoride and the appropriateness of different International Council on Radiation Protection (ICRP) dose conversion factors to radiological consequence assessment. Carl Mazzola presented an update on the new SQA requirements for Chip Lagdon, who is responsible for the DOE/EH Central Toolbox Registry. SQA requirements are graded into Levels A, B, and C, depending on the safety significance of the code. Larry Campbell discussed why Fluor-Daniel, the Hanford M & O Contractor, believes that certain emergency preparedness codes are Level B per the classification in the upcoming DOE order.

Michael Dillon presented an update to the National Atmospheric Release Advisory Capability (NARAC) system and its products to the DOE/NNSA community, and both he and Chuck Hunter presented separate responses that NARAC and Savannah River Site (SRS) took to assist in the consequence assessment of the January 6, 2005 rail accident and chlorine release at Graniteville , SC.

Reed Hodgin presented decision-based consequence assessment tools that he had developed for the Sandia National Laboratory (SNL)/New Mexico (NM), while Carl Mazzola provided an annual update of the activities of the DOE Meteorological Coordinating Council (DMCC). These seven presentations completed the consequence assessment portion of the meeting.

Doug Craig, Rocky Petrocchi, Po-Yung Lu, and Richard Thomas each presented various talks on the toxic end point Protective Action Criteria (PAC) and reviewed the activities of the Chemical Exposure Working Group (CEWG) and the Chemical Mixture Working Group (CMWG). This segment of the meeting concluded with a fifth presentation by Tony Pierpoint on the automated Temporary Emergency Exposure Level (TEEL) data base.

Carl Mazzola recapped the meeting, reviewed the action items, and indicated when the next SCAPA meeting will be conducted. There were no new action items identified during the meeting. All existing action items will be periodically reviewed by NA-41 through future conference calls. Each WG will report on its activities at the next SCAPA meeting which is scheduled on May 4, 2006 in conjunction with the next EMI SIG meeting. This meeting will be held in the Dallas , TX , San Antonio TX , or Las Vegas , NV areas.

OVERVIEW AND WELCOME FROM NA-41

A meeting of the SCAPA convened in New Orleans, LA, at 8:30 a.m. on Thursday, May 5, 2005 . The reasons for holding this meeting were to present and discuss new DOE Office of Emergency Management (OEM) (i.e., NA-41) and SCAPA initiatives with its membership and its associates, and to share the progress and results of recent SCAPA work products and accomplishments. More than 20 technical presentations of interest were made to SCAPA members and its associates. The agenda of this meeting and the meeting logistics is contained in Appendix A of this report.

Dr. Al Feldt , NA-41, welcomed all of the attendees, and briefly described the NA-41 mission and objectives, and where the SCAPA program was focused on to meet these objectives.

Tom Rotella, NA-41, discussed the SCAPA Program background and its present priorities, and indicated that SCAPA is a mature program that supports the entire DOE emergency management community in consequence assessment and protective actions for emergencies involving radiological, chemical and biological hazards. He indicated that SCAPA was a very important program and will be funded accordingly.

The following identifies the forty-six (46) individuals that attended the meeting and their respective company affiliations. Each individual was given a brief opportunity to discuss their background, and relate what role they played in the SCAPA program.

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REPORTS ON SCAPA PROGRAM INITIATIVES AND OTHER MATTERS OF INTEREST

Washington, DC Meeting Report and Review of Action Items

Carl Mazzola reviewed the important points that were discussed and the decisions that were made during the May 2004 SCAPA Meeting in Washington, DC. This meeting was another very successful and productive meeting, and was attended by thirty seven (37) professionals. The Washington , DC SCAPA Meeting Report and the power point presentations have been posted on the SCAPA web page.

At the May 2004 Washington , DC meeting, as well as from the previous meetings in San Francisco, CA (May 2000), Las Vegas, NV (October 2000), Augusta, GA (April 2001), Richland, WA (November 2001), Charleston, SC (May 2002), and Las Vegas, NV (May 2003), several action items (AIs) have been opened. Over the past two years, due to new efficiencies in the SCAPA program, many of these action items have been completed and brought to closure.

Carl Mazzola briefly reported on the status of the open action items and had copies of these action items available. The 15 open action items at the time of this meeting are presented in Appendix B to this report. Due to the invocation of monthly conference calls and the addition of new SCAPA members, the SCAPA program continuity has been enhanced and many of the action items have been worked off and subsequently closed.

During this meeting, no new action items were opened.

Memoriam to Doan Hansen

Rocky Petrocchi presented a moving memoriam created by Cliff Glantz to the late Doan Hansen, focusing on Doan's education and numerous accomplishments in his brief 52-year life. Doan contributed greatly to SCAPA for more than a decade and also made significant accomplishments to the public and private sector occupational, toxicology and emergency management communities.

Doan Hansen's memoriam can be located in Appendix C of this report.

Report on Biosafety Officers (BSOs) Meeting

Cliff Glantz provided a summary of the BSO meeting that took place in the afternoon of May 4, 2005. The BSOs discussed the new Emergency Management Guide (EMG) for biosafety facilities. One area of strong disagreement was the designation of what constituted an operational emergency. The BSOs did not feel that a release of a biotoxin in some cases was serious enough to warrant the classification of an operational emergency. This is one area that needs to be worked out in the near-term, before the EMG is issued.

Cliff's summary report can be located in Appendix D of this report.

Rads, Rems, Bugs and Drugs

Bettina Stopford made a presentation on planning for Weapons of Mass Destruction (WMD) events and the comparison between planning for biological events versus planning for chemical and radiological events. Bettina quickly noted that most of these plans are classified as conceptual operational (i.e., conops) and therefore they are not easy to implement.

Bettina emphasized that biological hazards can occur in two distinct scenarios which require very different preparedness and response capabilities. However, ultimately, it is an effective, practiced, and fully integrated plan that will lead to the most effective emergency response. For chemical and radiological emergencies, since the release is immediately known, all planning and response can be patterned after traditional chemical or radiological release mitigation and response plans, with a manageable number of variables to consider. Another key issue to consider is that the important variables that determine the outcome of the biological event are very hard to measure and the effects of a biological weapon are usually delayed, requiring long-term field monitoring for ultimate verification of the severity of event. In fact, detection of the biological event will likely occur through syndromic surveillance in the community. To make matters even worse, public health organizations may have only minimal response capabilities.

Bettina stated that today's biological detection technologies are severely limited in scope and application. In addition, there are sensitivity and expense issues, and these instruments are not as robust as the more conventional chemical and radiological detection devices. In fact, biological hazard detection may likely be through observing medical signs and symptoms that may be delayed for several days that may be quietly occurring, without the general community being aware of what is actually going on.

Bettina discussed some of the issues and limitations associated with biological detection and treatment. Initially, there is limited or classified research on exposure criteria, and that different populations react in an unlike manner to the same exposure (i.e., lack of repeatability). Secondly, the positive identification of the biological agent is accomplished through a laboratory culture which takes time to establish. An effective emergency response does not have the luxury of that much time. Lastly, pharmaceuticals and treatment, including vaccination and post-exposure chemoprophylaxis is a variable.

Bettina next discussed some of the planning elements for biological emergencies, which include the following considerations:

- Occupational health issues are prevalent with the release of a biological agent since its effects on the population are delayed;
- Due to the delayed detection, the response to a biological incident requires an active surveillance program;
- A biological release is easily spread to neighboring communities which requires ongoing links to public health, medical and emergency management agencies;
- Planning should definitely include agent-specific chemoprophylaxis;
- There should be a program of ongoing environmental sampling;
- There should be a robust biosafety program with regular reviews and systems testing;

- Due to the nature of the agent and the way it affects a population, particulate dispersion modeling may give little rapid data that would effect emergency response post-release actions, as many biological agents may not be very airborne; and,
- Linkages should be fostered with emergency managers embedded within community response planning [e.g., Local Emergency Planning Committee (LEPC)], coupled with public health and medical community

Bettina then related various types of detection equipment for chemical Weapons of Mass Destruction (WMDs) and discussed the merits and demerits of each. Relative to on-scene control considerations, hot-, warm-, and cold-zone characteristics were discussed and methodologies for defining them were provided. Bettina's talk concluded with some advice on how emergency response to biological incidents can be improved.

Biosafety Consequence Assessment Modeling at BNL

Reed Hodgin discussed an approach to biological consequence assessment modeling that is presently being implemented at the Brookhaven National Laboratory (BNL). Reed indicated that there are really two different problems that need to be addressed. The first problem is related to biotoxins, while the second problem is associated with infectious agents. Biotoxin emergency response and infectious agent emergency response are distinctly different from one another. Moreover, the vectors and pathways that are common to chemical and radiological consequence assessment are very different for either biological consequence assessment approach.

Reed emphasized that in order to effectively design a Biosafety Consequence Assessment system at BNL, specific information needs to be known about the biological hazards at BNL and accordingly, a biologically-based EPHA needs to be conducted. BNL has limited biological hazards at a small number of locations with a few biotoxins and no infectious agents. These consist of a small fragments of organisms used for research in essentially particulate form. BNL has two facilities rated as Biosafety Level (BSL)-2 and 1 facility rated as Biosafety Level-3 (BSL-3).

Reed described the biological emergency management program at BNL, which has both laboratory- and building-level emergency plans and a hazard survey. However, the program has not yet looked into establishing a DOE O 151.B program, as it is essentially exists as a contamination control response program. BNL plans to include biological agents in its future EPHAs.

With respect to the biological consequence assessment methodology at BNL, Reed indicated that the approach and methods are presently under development and the final program is dependent on how the final DOE order and guidance develops.

Reed stressed that the hazard-driver for consequence assessment is much lower than for chemical and radioactive materials, as the biotoxins and infectious agents act much like chemical toxins (e.g., exposure occurs and the consequence develops in the receptor, effects are not passed on to other receptors). BNL is looking to develop equivalents of Protective Action Criteria (PAC) and TEL. This is very difficult since each of the biological hazards act very differently from one another. For example, the consequence to the receptor may actually grow over time (i.e., infection), the consequence may be transmitted to other receptors (i.e., index patient effect), and secondary consequence delivery may be very complex (i.e., multiple vectors and pathways). Therefore, the traditional approach to consequence assessment for chemical and radiological hazards is not very applicable.

As previously mentioned, the biological vectors are distinctly different, and these vectors may include human-to-human contact and transmission by insect, animal, water, food, indoor air and outdoor air. While outdoor air transmission (i.e., transport and dispersion) is essential for chemical and radiological releases, biological vectors are different since outdoor air is usually the least important exposure producing vector. However, biological warfare agents (e.g., anthrax) can be specifically engineered to overcome problems with the atmospheric vector through weaponization technologies. Similarly, although inhalation is a significant vector for chemical and radiological releases, biological pathways are far more complex and multiple pathways (e.g., ingestion, skin absorption, inhalation) may often exist.

Reed then presented a decision-based approach to atmospheric modeling of biological agents even though the atmosphere might not be the most important vector. The approach involves finding index cases, quarantining the area to control the spread by secondary vectors and identifying critical receptors. Reed stated that modeling outdoor airborne pathway infectious agents involves identification of colony-forming units, using the standard breathing rate, subsequently estimating concentration of the bioagent in the carrier substance, estimation of the release to the atmosphere, transport and dispersion by the atmosphere and other importance effects such as settling and deposition, and the calculation of inhalation exposure at each receptor. Decision-support products are then generated for use by the emergency management organization.

Reed closed his talk by discussing some overarching issues associated with biological consequence assessment modeling. These include toxins versus infectious agents, identifying all important vectors, accounting for multiple pathways, and bio-specific transport considerations, such as the viability of the bioagent in the atmosphere.

Reed's presentation can be located in Appendix F of this report.

Biosafety Panel Discussion (Dina Sassone,Gail Van Gorp,Roger Mitchell)

A panel consisting of Dina Sassone (LANL), Gail Van Gorp (ANL) and Roger Mitchell (PNL) convened and presented various viewpoints on biosafety integration into the various DOE/NNSA emergency response programs.

Roger Mitchell

Roger Mitchell briefed the SCAPA attendees on his perception of the role of the BSO at PNNL. The BSO role is a multi-disciplinary one, involving support to numerous line organizations. The duties of the PNL BSO include:

- Being a member of the Institutional Biosafety Committee (IBC);
- Working as the Laboratory Assistant Research Officer (ARO);

- Providing consulting services to organizations such as the Institutional Review Board (IRB), Institutional Animal Care and Use Committee (IACUC), and the Municipal Transportation Agency (MTA);
- Being a reviewer of rDNA protocols, BWP protocols, Blood Borne Pathogens (BBPs), Exposure Control Plans (ECPs) and Transportation Plans;
- Acting as a Laboratory Inspector and an Accident Investigator;
- Performing as a Program Manager and Regulatory Reviewer;
- Playing the role of an Occupational Medicine Contact; and,
- Maintaining expertise as a Subject Matter Expert (SME) by keeping current on technical methods and events.

Roger indicated that the daily contacts by a BSO involve exchanges of information with managers, researchers, safety and health representatives, trainers, occupational physicians, the Centers for Disease Control (CDC); the United States Department of Agriculture (USDA); the DOE, security, and Emergency Preparedness & Response (EP &R).

The technical challenge can be summarized in the following phrase: “Biology is Messy.” Roger discussed a recent event of exploding toads in Germany which suggested a biologically-based issue, but turned out to be something far different.

Roger turned his discussion to how a BSO defines biosafety risk. The regulations and guidance is manifold and includes select agent regulations from the CDC, the USDA, the Occupational Safety and Health Administration (OSHA) BBP enabling regulations, chemical hygiene regulations, Department of Transportation (DOT) regulations, National Institute of Health (NIH) rDNA guidelines (e.g., IBC structure), DOE Order 450.7, BMBL (e.g., CDC Biological Safety Guidelines for the Laboratory; and, World Health Organization (WHO) Biological Safety Guidelines (BSGs).

Biosafety risks can also be categorized by select agent bacteria into four Biosafety Levels (BSLs) in increasing levels of severity (i.e., BSL-1, BSL-2, BSL-3, BSL-4). The following microorganisms are of concern:

- Bacillus anthracis
- Brucella abortus
- Brucella melitensis
- Brucella suis
- Burkholderia mallei (formerly Pseudomonas mallei)
- Burkholderia pseudomallei (formerly Pseudomonas pseudomallei)
- Clostridium Botulinum (and botulinum nerurotoxin producing species of Clostriduim
- Cowdria Ruminantium (Heartwater)
- Coxiella burnetii
- Francisella tularensis
- Liberobacter africanus
- Liberobacter asiaticus
- Mycoplasma capricolum
- Mycoplasma mycoides (contagious bovine pleuropneumonia agent)
- Ralstonia solanacearum, race 3, biovar 2
- Rickettsia prowazekii
- Rickettsia rickettsii
- Xanthomonas oryzae pv. Oryzicola
- Xylella fastidiosa (citrus variegated chlorosis strain)
- Yersinia pestis

Biosafety risks can also be categorized by select agent toxins, such as:

- 100 mg of Abrin
- 0.5 mg of Botulinum neurotoxins
- 100 mg of Clostridium perfringens epsilon toxin
- 100 mg of Conotoxins
- 1,000 mg of Diacetoxyscirpenol
- 100 mg of Ricin
- 100 mg of Saxitoxin
- 100 mg of Shigatoxin
- 100 mg of Shiga-like ribosome inactivating proteins
- 5 mg of Staphylococcal enterotoxins
- 100 mg of Tetrodotoxin
- 1,000 mg of T-2 toxin

Roger then moved on to describe his view of the BSO role in emergency response. He indicated that the BSO develops emergency response procedures which are embedded in laboratory manuals and are discussed in training. The BSO is also involved in the local emergency notification process and participates in drills associated with select agent regulations. Within the EOC, the BSO advises on emergency response challenges associated with bioagents, provides coordination with health experts (e.g., medical service providers, public, facilities), communicates health risk to emergency management, and determines the adequacy of consequence assessment models associated with the transport and dispersion of bioagents.

Roger concluded his talk by addressing the rhetorical question, “Do we need a DOE Biosafety WG to help resolve problems across the complex?”, and answered it firmly in the affirmative.

Roger’s presentation can be located in Appendix G of this report.

Gail Van Gorp

Gail Van Gorp discussed her responsibilities as a BSO at Argonne National Laboratory (ANL). In her capacity as BSO, Gail serves as a consequence assessment officer that interfaces with the Industrial Hygiene (IH) group. She has a place on the Emergency Response Organization (ERO), which is four teams deep on a 2-week on-call basis; one team which is a consequence assessment team. Gail also participates on an Environmental Safety and Health Quality Assurance (ESHQA) oversight group.

Gail shared that she is looking forward to receiving NARAC training in the fall, and likes the DOE requirement on addressing limited biosafety inventory.

Gail mentioned that ANL has one BSL-2 facility that needs additional work on detection capability. The facility studies biocrystalline structures from the University of Chicago . Her work also includes developing clean room protocols and requirements, which is input into design basis documents for new facilities and prepares associated environmental assessments. Gail is presently supporting a BSL-2/BSL-3 design effort for a new regional biocenter laboratory building, planned for 2006. Once this building is operational, the ANL ERO will provide emergency response support.

Gail indicated that she is presently wrestling with medical surveillance questions of employees who are at risk from infectious diseases, in her support to the onsite medical department.

Gail closed her discussion with her opinion of consequence assessment. She believes that modeling is appropriate for certain bioagents, but should not be overprescribed.

Dina Sassone

Dina Sassone, BSO for LANL for the past six years, mentioned that the SCAPA Biosafety Working Group was very timely and much needed. Dina is a Certified Biosafety Professional (CBP) and sits on the LANL Biosafety Committee. She also is part the ERO.

LANL has several BSL-1 and BSL-2 facilities and an empty BSL-3 facility. A new BSL-2 facility with High Efficiency Particulate Air (HEPA) filters is in the design stage and will incorporate several new nanotechnology features. The BSL-3 facility is designed with primary confinement Structures Systems and Components (SSCs).

Dina indicated that there are five major technological challenges that she is facing:

- LANL has inappropriate consequence assessment models for application to biological monitoring. The existing Meteorological Information Data and Acquisition System (MIDAS) code does not provide the information that is needed for decisions;
- There are limitations and challenges to providing a valid field test for biological materials;
- It is difficult to make judgment calls using very little technical data;
- Onsite response needs better clarification; and,
- Interfaces with offsite agencies need better definition.

Dina emphasized that in her opinion, biotoxins is not a biosafety issue, but a chemical issue, unless the materials are weaponized for easy dispersal and maximization of infection.

Dina briefly described her role as BSO. Her responsibilities involve acting as the biological SME for the emergency preparedness organization, acting as the coordinator of the emergency support center which includes meteorologists, and participating in drills and exercises; in particular with the final select agent rule.

Consequence Assessment Modeling Working Group and SCAPA Website

Cliff Glantz, SCAPA Coordinator and Chairman of the Working Group (WG), presented the activities of the Consequence Assessment Modeling (CAM) WG since the last SCAPA Meeting. The CAM WG is pursuing several areas of interest, which include:

- SQA activities
- NARAC-DOE Users Advisory Group

- UF_6 modeling and protective actions definition
- ICRP-30 versus ICRP 68/72 versus ICRP-90 determination
- Multi-container release effects on downwind concentrations and protective actions

With respect to SQA, DOE O 414.1C and DOE G 414.1-4, which address this topic in great detail, will be published in the next few weeks. Cliff indicated that Carl Mazzola will soon be talking about the substance of the SQA order and the guidance documents, while Larry Campbell will be discussing Hanford 's initial response to the new SQA directives.

Cliff mentioned that the NARAC-DOE Users Advisory Group met on Monday, May 2, 2005, with approximately 15 NARAC users and other interested parties present. The CAM WG received an update from Brenda Pobanz on NARAC activities; which will be summarized during Michael Dillon's NARAC talk this afternoon. Cliff mentioned that t he user's group indicated their interest in receiving more news from NARAC via periodic newsletters, to see more NARAC documentation, to test the new iClient 2.0, and to have a meeting of all of the user groups. Cliff extended an invitation to all in attendance that have interest in NARAC products or consequence assessment matters to join the User Group.

With respect to the UF 6 issue, Cliff reported that only a handful of DOE/NNSA sites (i.e., Y-12, Portsmouth, Paducah) have this chemical, and questions still persist on how to appropriately model the impact of a UF 6 release that hydrolizes into uranyl fluoride and hydrofluoric acid upon release to the atmosphere; reacting with atmospheric water vapor according the following chemical equation:

$$UF_6 + 2H_2O \longrightarrow UO_2F_2 + 4HF$$

Typically as with relatively unique problems, different organizations are adopting different approaches toward its solution, with the SCAPA CAM WG attempting to provide a technically defensible guidance on what is a multi-disciplinary problem. There are three transport and dispersion models that address the hydrolysis reaction (i.e., TRIAD, HGSYSTEM-UF6, RASCAL), and different Protective Action Criteria (PAC) for UF 6, UO 2F 2, and HF; as well as different target organs that are affected by the two chemicals produced in the hydrolysis reaction. Wayne Davis is coordinating this issue, with Jim Jamison and Po-Yung Lu playing prominent roles. A SCAPA Position Paper is being drafted and will become the final product.

Cliff elaborated on the ICRP-30, ICRP-68/72, or ICRP-90 issue that the CAM WG is also presently addressing. ICRP 30 has long been used for dose conversion factors in the calculation of Total Effective Dose Equivalent (TEDE). However, t he newer ICRP-68/72 is less conservative and is being used by some organizations for safety analysis and authorization basis applications. ICRP-30 is still commonly used for emergency response applications, including NARAC coding, and it is used in codes of the Federal Radiological Monitoring and Assessment Center (FRMAC). To further complicate matters, a new ICRP-90 may hit the streets before the end of the decade. The CAM WG will be evaluating the merits of using each of these dose conversion factor options and seek to enable a consistent approach throughout DOE/NNSA.

Cliff then addressed the Multi-container problem. The DOT Emergency Response Guidebook (ERG) provides default protective distances for large spills that are greater than 200 liters, stating that if more than one large container is involved (i.e., rail car), protective distances may need to be increased. In general, this qualifier makes perfect sense since the releases and subsequent downwind impacts would increase if more rail cars are involved. Chuck Hunter, SRNL is looking at how to address this.

Cliff then discussed some of the recent modifications to the SCAPA Website. These included:

- Improved navigation features;
- Revised news pages;
- Revised TEEL values pages;
- A downloadable Chemical Mixture Methodology (CMM) EXCEL workbook; and,
- Posting of a contact list.

Cliff's presentation can be located in Appendix H of this report.

DNFSB Recommendation 2002-1 and Improving Accident Analysis Software Applications

Cliff Glantz gave a progress report on addressing the requirements of the Defense Nuclear Facility Safety Board (DNFSB) Recommendation 2002-1 which is driving the revision of the SQA order and guide. Cliff provided some background on DNFSB Recommendation 2002-1 which has its roots in DNFSB Technical Report-25, published in January 2000. This technical report indicated that virtually all atmospheric transport and dispersion codes used for DOE safety applications and authorization bases did not have a sufficient level of SQA.

In response to DNFSB Recommendation 2002-1, DOE issued "Quality Assurance for Safety-Related Software" in September 2002 after there was little progress and results in addressing SQA deficiencies identified in DNFSB Technical Report-25, "Quality Assurance for Safety Related Software at Department of Energy Defense Nuclear Facility". It was clear that prompt actions were needed in defining SQA responsibility and authority, in recommending computer codes for safety analysis and design, in changing the DOE Directive system, and in conducting research and development.

This led to the development of a DOE safety analysis Implementation Plan (IP) and to various commitments to close the SQA gap. One of the commitments was to create a DOE Central Registry for Toolbox codes. Cliff mentioned that Carl Mazzola will be discussing this in more detail when he presents Chip Lagdon's talk. Chip is in charge of the DOE Central Registry for Toolbox codes.

Cliff also discussed the other commitments that were made by DOE to satisfy the DNFSB recommendation. These included gap analysis reports for toolbox software, code guidance reports, improved communication links between the software developers and the software users, and the publication of a safety software guide (i.e., DOE G 414.1-4). The DNFSB recommendation on computer codes required DOE to identify software that would be recommended for use in performing design and analyses of SSCs important to safety, and for analysis of expected consequences of potential accidents, and an o rganization responsible for management of each of these software tools, including SQA, technical support, configuration management, training, notification to users of problems and fixes, and other official stewardship functions.

Cliff went on to discussing the DNFSB Recommendation 2002-1 IP. DOE accepted the recommendation in November 2002 and i ssued the IP in March 2003 with 26 commitments, with work starting in June 2003. DOE/EH was given the responsibility for meeting 17 of the commitments and completing the IP, while NNSA and DOE line organizations were responsible for the other nine commitments; as well as performance and oversight of SQA activities at their sites. Presently, these commitments are nearly met with the impending publication of the SQA Order and safety software guide.

Cliff continued the discussion on the products resulting from meeting the IP commitments on safety analysis codes and toolbox. These included:

- An SQA Knowledge Portal and Central Registry (http://www.eh.doe.gov/sqa/) that was launched in June 2004;
- Promotion of continuous improvement and knowledge sharing of safety SQA and related information;
- Consolidation of information and contains links to SMEs, procedures, training material, program descriptions, good practices, lessons learned and Central Registry toolbox codes;
- Site Assessments and Criteria and Review Approach Documents (CRADs);
- Discussion forum and list server;
- Training;
- SQA Directives;
- Sharing information and lessons learned;
- SQA Library; and,
- SQA links and newsletter.

The SQA Central Registry (http://www.eh.doe.gov/sqa/central_registry.htm) includes six designated codes recognized for the DOE "Toolbox", as safe harbor codes. These are, ALOHA, CFAST, EPICODE, GENII, MACCS2, and MELCOR which address source term, facility leak path, and radiological and chemical dispersion and consequence analyses. The registry web page also includes guidance reports, gap analyses, and a design code survey and recommendations for the toolbox.

Cliff spent some time on briefing everyone on the DOE Central Registry which was formed in 2001 and used the process and products from the previous Accident Phenomenology and Consequence (APAC) Evaluation Program for code identification. Cliff discussed the other process improvements in the IP which included gap analyses for DOE Toolbox software by evaluating toolbox codes against SQA standards, guidance on use of DOE toolbox software, web-based sharing of SQA information; and the safety software guide; the latter scheduled for a May 2005 release.

Cliff closed his discussion by identifying the DOE/EH Contacts and Resources. These include:

- Chip Lagdon, Acting, Chief of Nuclear Safety (301-903-4218, chip.lagdon@eh.doe.gov); and,
- Bob Loesch, Acting Director, EH Office of Quality Assurance Programs (301-903-4443, robert.loesch@eh.doe.gov)

Cliff's presentation can be located in Appendix I of this report.

Update on New SQA Requirements

Chip Lagdon was presenting a paper on the same topic at the Energy Facility Contractors Group (EFCOG) meeting in Santa Fe , NM and could not be available to support the SCAPA meeting. Carl Mazzola presented his talk on the new SQA requirements that will be affecting virtually all organizations within NNSA and DOE.

Carl stated that safety software requirements are in DOE O 414.1C and DOE G 414.1-4. The purpose of these requirements is to improve DOE and contractor safety software and meet the Secretarial Commitment to DNFSB Recommendation 2002-1. These requirements are focused on nuclear facility safety, are compatible with national standards and current program requirements, and do not supersede externally regulated software.

Carl elaborated on the requirements that within the DOE Order and Guide are the following three important definitions:

- **Safety System Software** - Software for a nuclear facility that performs a safety function as part of a SSC and is cited in either: (a) a DOE-approved documented safety analysis or, (b) an approved hazard analysis per DOE P 450.4, Safety Management System Policy, dated 10-15-96, and the DEAR clause.
- **Safety and Hazard Analysis Software and Design Software** - Software that is used to classify, design, or analyze nuclear facilities. This software is not part of a SSC but helps to ensure the proper accident or hazards analysis of nuclear facilities or an SSC that performs a safety function.
- **Safety Management and Administrative Controls Software** - Software that performs a hazard control function in support of nuclear facility or radiological safety management programs or technical safety requirements or other software that performs a control function necessary to provide adequate protection from nuclear facility or radiological hazards. This software supports eliminating, limiting, or mitigating nuclear hazards to workers, the public, or the environment as addressed in 10 CFR 830, 10 CFR 835, and the DEAR Integrated Safety Management System (ISMS) clause.

Carl mentioned that DOE O 414.1C also defines the basic safety software requirements. These require facility design authority involvement in identifying software for its entire life-cycle (i.e., specification, acquisition, design, development, verification and validation [including inspection and test], configuration management, maintenance, and retirement), and to i dentify, document, and maintain safety software inventory. Furthermore, DOE O 414.1C establishes ASME NQA-1-2000, or other national or international consensus standards that provide an equivalent level of quality assurance requirements as NQA-1-2000, as the standard that must be used. It also establishes grading levels for safety software, which need to be documented in a Quality Assurance Program (QAP).

The order and guide also provide guidance in selecting and implementing applicable SQA work activities using the grading levels. Ten SQA work activities are required which include:

- Software project management;
- Software risk management;
- Software configuration management;
- Procurement and vendor management;
- Software requirements identification and management;
- Software design and implementation;
- Software safety design;
- Verification and validation;
- Problem reporting and corrective action; and,
- Training of personnel in the design, development, use and evaluation of safety software.

Federal responsibilities are also defined in DOE O 414.C. These include:

- Technical competency for oversight;
- Formal qualifications for SQA points of contact;
- Line assessment of contractors to approved QAP and safety software processes;
- EH issues requirements and guidance; and,
- EH manages DOE SQA Program, inclusive of the central registry, monitoring implementation, training, notifications, and the SME Panel.

Carl discussed the guidance in DOE G 414.1-4, on how to implement the ten SQA work activities and related sub-activities. The Guide also identifies grading based upon software source types and level of impact (i.e., Level A, B or C), and describes these grading levels.

- **Level A:** Includes safety software applications that meet one or more of the following criteria: (1) Software failure that could compromise a limiting condition for operation; (2) Software failure that could cause a reduction in the safety margin for a safety SSC that is cited in DOE approved documented safety analysis; (3) Software failure that could cause a reduction in the safety margin for other systems such as toxic or chemical protection systems that are cited in either: a) DOE approved documented safety analysis or, b) an approved hazard analysis per DOE P 450.1 Safety Management System Policy and the DEAR ISMS clause; and, (4) Software failure that could result in non-conservative safety analysis, design or misclassification of facilities or SSCs;
- **Level B:** Includes safety software applications that do not meet Level A criteria but meet one or more of the following criteria: (1) Safety management databases used to aid in decision making whose failure could impact safety SSC operation; (2) Software failure that could result in incorrect analysis, design, monitoring, alarming, or recording of hazardous exposures to workers or the public; and, (3) Software failure that could comprise the defense in depth capability for the nuclear facility;
- **Level C:** Includes software applications that do not meet Level B criteria but meet one or more of the following criteria: (1) Software failure that could cause a potential violation of regulatory permitting requirements; (2) Software failure that could affect environment, safety, health monitoring or alarming systems; and, (3) Software failure that could affect the safe operation of an SSC.

DOE G 414.1-4 also describes the software source types, which include software that is custom developed, configurable, and acquired, as well as utility calculations, and commercial design and analysis.

Carl discussed the DOE Central Registry management process which has criteria for adding, modifying, or removing codes, and criteria for evaluation based upon ten work activities. This process contains detailed procedures and evaluation input forms, available to all DOE/NNSA sites.

The remainder of the discussion turned to the safety software assessment tools which are based on the ten SQA work activities and sub-activities using the grading system from DOE G 414.1-4. These tools provide basic guidance on performing an assessment.

At the present time, all issues have been resolved, and Program Secretarial Office (PSO) concurrence and DNFSB agreement is expected in early May, and the issuance of the order and guide are expected in early June, to be followed by a kickoff general information meeting in mid-late June.

Chip's presentation can be located in Appendix J of this report.

Hanford Emergency Preparedness Response to New SQA Directives

Larry Campbell presented an analysis performed by his group on the applicability of SQA to emergency response software.

Larry indicated that at Hanford, the emergency preparedness group occasionally has difficulty in getting the attention of management to discuss emerging issues. Usually the flow down process gets the most attention. For this case, the DNFSB identifies a problem which flows down to a DOE Corrective Action Plan (CAP) which flows down to site assessments which flows down to a Contractor CAP.

During 2004, Hanford performed DOE SQA reviews on 50 safety software applications, which included o ne emergency response code. The review identified 35 findings and 25 observations. However, the i mpact of this review on the Hanford emergency preparedness organization is still uncertain. Requirements are in the process of revision and are still changing. One initiative that is in place is to r etire and eliminate programs to reduce workload and to develop better documentation for all codes.

When asking the question, “Does the software determine or implement emergency actions?” The conclusion was that it did and was then classified as Level B.

Larry mentioned that a further evaluation needs to be made on the following Hanford Emergency Planning/Response Codes:

- EPICODE;
- APGEMS;
- HOTSPOT;
- METVIEW; and,

- iClient.

Other legacy and Commercial Off The Shelf (COTS) software will also be evaluated.

Larry's presentation can be located in Appendix K of this report.

NARAC Update

Michael Dillon presented an update on the activities of the NARAC and how this program is serving its DOE and NNSA clients.

Michael gave an overview of NARAC, indicating that the code can now provide predictions for assessing a wide range of atmospheric hazards , including explosive dispersal of radiological materials, nuclear explosions, toxic industrial chemical spills, fires, biological agents, chemical agents, and nuclear power plant accidents.

Michael showed an example of the NARAC 3-dimensional model simulation overlaid on a photograph of a tire dump fire in Tracy , CA on August 7, 1998. The NARAC modeling results tracked the photograph of the fire very closely inclusive of a directional change with height. Michael mentioned that NARAC has been used to provide consequence assessments for other real-time incidents including the Three Mile Island Unit I nuclear accident in March 1979, Chinese nuclear weapons tests, the Chernobyl nuclear accident in April 1986, the Richmond, CA chemical cloud, Desert Storm Kuwait oil fires, the volcanic eruption of Mount Pinatubo, and other significant accidental release or natural phenomena events.

Michael next described the various NARAC products , which include the development of plume hazard areas, affected population counts, integrated health effects, protective action guidelines, and other graphical map features.

Michael described the NARAC Web, which is a web-based information distribution for Internet, dial-up, satellite or wireless communication . It provides access to a dvanced modeling tools and scientific support and analyses to local and State EOCs, and local, regional, and State emergency responders. It is a fast-running local model.

Michael then discussed the recent NARAC modeling reach-back support which has become available throughout the response and recovery phases . The i nitial response involves limited information on source characteristics, and initial rapid dispersion prediction using simple models and/or a generic source term. Initial simulations are based on limited information obtained from direct observations and local weather data. The r efined response from 30 minutes to 24 hours after the event provides simulations that are used as guidance for deployed field and aerial monitoring teams. This feature provides more detailed simulations and event characterization analyses that utilize specific information about airborne release that are obtained from on-scene observations and measurements. Lastly, for the e xtended response and recovery phase which is 24 hours and beyond the event, NARAC can incorporate on-scene measurements for the event and source term reconstruction provide a revision of the estimates of population exposure, and estimated food contamination.

Michael identified the various NARAC sponsors that include:

- DOE NA-40 Emergency Operations: Atmospheric Release Advisory Capability (ARAC) Program;
- DHS Science & Technology (S & T) EP&R Portfolio: Interagency Modeling and Atmospheric Analysis Center (IMAAC) ;
- DOD/DOE naval reactor sites emergency response ;
- DHS S & T Biological-Chemical Countermeasures Portfolio: Urban and ChemBio (CB) plume modeling research and development, and the Local Integration of NARAC with Cities (LINC) demonstration project ;
- DOE NA-23 Office of International Emergency Management and Cooperation: International nuclear emergency response ; and,
- LLNL Nonproliferation, Arms Control, and International Security (NAI) /Homeland Security Office (HSO) projects which support DHS, DOE, and DOD.

In addition, NARAC supports the following organizations:

- DOE/HQ Operations Center (OC);
- DOE nuclear incident response teams including the Radiological Assistance Program (RAP), Nuclear Emergency Search team (NEST), Nuclear Radiological Advisory Team (NRAT), Joint Technical Operations Team (JTOT), and the Office of Transportation Safety (OTS);
- FRMAC;
- DHS/HQ Homeland Security Operations Center (HSOC);
- Federal Emergency Management Agency (FEMA) National Response Coordinating Center (NRCC);
- 40 DOE, naval reactor and DOD sites;
- 5 DHS LINC Demonstration Cities (i.e., New York, NY, Seattle, WA, Fort Worth, TX, Cincinnati, OH, and Albuquerque, NM); and,
- More that 100 collaborating local, State, and Federal agencies.

Michael then discussed the future directions that the NARAC program will be pursuing. New research and development will create advanced tools for detection, characterization, and emergency response actions . NARAC is developing tools to address c omplex urban environments, indoor exposures and indoor-outdoor coupling, urban tool development and integration into operations. In addition, NARAC will be addressing d ata-driven simulation for incident characterization, and event reconstruction.

Other new research and development areas include real-time data assimilation for high-density meteorology and remote sensing data, u ncertainty–probabilistic risk assessment algorithms, end-to-end uncertainty estimation features, and interpretational products.

Michael mentioned that customer products will also be improved including e nhanced Geographical Information System (GIS) capabilities, improved health effects prediction by age group, shelter type, and population movement, advanced nuclear explosion modeling, agricultural applications, waterborne transport modeling, fire and smoke emission modeling, and decision support systems.

Michael then focused on the ongoing development of NARAC which includes building-scale flow and dispersion models , a fast-running empirical Urban Dispersion Model (UDM) urban model, and a high-resolution building-scale Computational Fluid Dynamics (CFD) model (i.e., FEM). Michael mentioned that LLNL is collaborating with multiple agencies on urban experiments to test and develop urban flow and dispersion models. NARAC and SNL/NM are integrating source term, modeling, and effects prediction tools from SNL/NM standardized model products and standardized methods for calculating dose, number of injuries and fatalities using population databases, and prompt effects (e.g., blast, thermal, radiation) from nuclear and conventional explosions .

Michael closed his talk by mentioning that NARAC is also integrating Lawrence Berkeley National Laboratory (LBNL) research on outdoor-indoor infiltration models, while LLNL is developing data-driven modeling tools for event reconstruction using Bayesian inference, stochastic sampling, and optimization methods.

Michael's presentation can be located in Appendix L of this report.

NARAC Support to January 2005 Graniteville , SC Rail Accident and Chlorine Release

Michael Dillon also presented the NARAC response to the January 6, 2005 train wreck and subsequent chlorine release at Graniteville , SC where nine people lost their lives. Michael began his presentation by introducing the attendees to the IMAAC, and identified Bruce Davis, DHS Science & Technology Directorate EP & R Portfolio, as the Interim IMAAC Director, and Gayle Sugiyama as the IMAAC and NARAC homeland security program leader at LLNL.

The IMAAC mission is to provide answers to four key questions when a hazardous airborne release occurs:

- What was released?;
- Where is it going?;
- Who is at risk?; and,
- How do we respond?

Accordingly, the mission of IMAAC is to provide a single source of federal hazards predictions during the response and recovery phases of Incidents of National Significance (INSs), which are defined in the National Response Plan (NRP). Michael went into the protocols associated with a d eclaration of an INS. This can be declared when a Federal department or agency requests assistance of the Secretary of Homeland Security, when State and local authorities are overwhelmed and request Federal assistance, when more than one Federal department or agency becomes involved in responding to an incident, and when the President of the United States (POTUS) directs the Secretary of Homeland Security to assume responsibility for managing a domestic incident.

Michael indicated that the IMAAC program follows four main principles, which are:

- To integrate the best and brightest scientific capability with the vast emergency response capacity of the federal government ;
- To distribute atmospheric hazard predictions to Federal, state, and local response agencies to assure a common operating picture;
- To provide expert interpretation of results to Federal, state, and local government; and,
- To eliminate confusing and conflicting hazard predictions.

On April 15, 2004, when the Homeland Security Council (HSC) indicated that DHS will establish the IMAAC, and designated NARAC as the primary provider of IMAAC products. During the following month, a DHS-led interagency working group with representatives of seven federal agencies began developing a Memorandum of Understanding (MOU) and Standard Operating Procedures (SOPs).

Michael then provided a sample of important events that have been supported by IMAAC. These included:

- February 18-25, 2004: United Defense 04 exercise;
- May 25-26, 2004: Conyers , GA chemical fire at a chlorine processing plant;
- May 27-30, 2004: National World War II memorial Ddedication;
- June 8-11, 2004: G8 Summit and Ronald Reagan funeral;
- July 26-30, 2004: Democratic National Convention (DNC);
- August 1-5, 2004: New York City and Washington DC alerts;
- August 5-10, 2004: Determined Promise 04 exercise;
- August 13-29, 2004: Summer Olympics in Athens , Greece ;
- August 19, 2004: Cincinnati, OH Queen City Barrel Company building fire;
- August 30- September 3, 2004: Republican National Convention (RNC);
- **January 7, 2005: Graniteville, SC chlorine rail car accident;**
- January 20, 2005: Presidential Inauguration; and,
- April 4-7, 2005: Top Officials (TOPOFF3) national exercise.

The balance of Michael's discussion then turned to the IMAAC support for the January 6, 2005 chlorine spill in Graniteville, SC, and the post-accident analysis. Michael reviewed the IMAAC response timeline, which started approximately 7:55 a.m.; approximately 5 and 1/4 hours after the accident event. By 8:15 a.m., a worst case run was posted to the NARAC Web, and by 8:41 a.m. another run was posted to the NARAC Web and shared with HSOC, Science & Technology (S & T), Transportation Security Operations Center (TSOC), SRS, and DOE/HQ users.

At 9:10 a.m. IMAAC called the DOE SRS EOC to discuss weather and source location and to share NARAC Web plots with SRS, while at 9:29 a.m., a fourth run was posted to the NARAC Web and shared with HSOC, S & T, TSOC, SRS and DOE/HQ users. Michael showed several IMAAC products that were used to assist the emergency responders.

Michael summarized his discussion indicating that IMAAC is a federal center for coordinating dispersion modeling for atmospheric hazards, and that the roles are codified in the NRP and the National Exercise Program (NEP). IMAAC is the single source of federal dispersion products for "INSs", and that NARAC has been designated the primary initial provider of IMAAC capabilities.

Michael's presentation can be located in Appendix M of this report.

SRS Support to January 2005 Graniteville, SC Rail Accident and Chlorine Release

Chuck Hunter presented the SRS response to the January 6, 2005 train wreck and subsequent chlorine release at Graniteville, SC.

Chuck summarized the impacts to the community from the train wreck and subsequent release of deadly chlorine gas. The SRS Fire Department provided assistance in the form of 16 on-duty HazMat specialists, and approximately 30 volunteer members from SRS participated in the response. The Westinghouse Savannah River Company (WSRC) emergency management organization provided 7 critical incident stress counselors.

The Savannah River Site Operations Center (SRSOC) was activated with six personnel to handle logistics requests and to provide briefings to DOE/HQ and DHS. Wackenhut Services Incorporated (WSI), the SRS Security Contractor, provided seven personnel, while the Savannah River National Laboratory (SRNL) Atmospheric Technologies Group (ATG) provided six personnel contributing consequence assessment modeling, real-time meteorological data, weather forecasting, and consulting services.

Chuck discussed the SRNL ATG involvement in mutual aid agreements with local governments inclusive of the 1996 mutual aid agreements with local county Emergency Management Agency (EMA) offices. This agreement provided the framework for the meteorological assistance that was provided during and after the Graniteville, SC train wreck and chlorine release. The participants in this mutual aid agreement include the counties of Aiken, Barnwell, Allendale, Richmond, and Columbia. These agreements identified three primary areas of collaboration:

- Meteorological monitoring in critical hazard zones;
- Custom hazard consequence assessment software; and,
- Consultation and support.

Chuck identified the SRNL ATG resources that were provided to assist in the emergency response of the Graniteville, SC train wreck and chlorine release. These included real-time weather observations data and r egional US observations. In addition, the suite of various SRNL consequence assessment models (e.g., Area evacuation, puff/plume/2DPUF, LPDM, and Stream II) were also made available, as well as capabilities in regional and local forecast modeling. Stream II is an aquatic dispersion model. SRNL ATG also contributed other codes that were developed outside of SRS (i.e., NARAC, CAMEO, ALOHA, HOTSPOT, VSMOKE, HPAC, and HYSPLIT).

Chuck provided a synopsis of the early support that SRNL delivered. Assistance was requested shortly after 7:00 a.m. and meteorological data was provided to the emergency responders. The first model result was web-posted for external access by 8:00 a.m. , and updated model were results posted throughout the day on a 2- to 3-hour basis. SRNL ATG conducted ongoing discussions with both the Aiken County EOC and South Carolina Department of Health and Environmental Control (SCDHEC), providing briefings on current and forecasted weather and model results. A very important support element was the provision of weather support for the SRS on-scene responder teams.

Chuck then moved on to the ongoing SRNL Response, which was provided the next day. SRNL ATG developed and provided updated model results which were posted throughout the day (i.e., every 2-3 hours), and participated in ongoing discussions with the Aiken County EOC; providing briefings on the current and forecasted weather conditions and on the results of the consequence assessment modeling.

Lastly, Chuck discussed the support that was provided to support recovery actions. SRNL ATG modeled scenarios of a spill of 40% inventory and a spill of 100% inventory. Chuck showed the output of the LPDM model (i.e., a concentration loop with time). Post-accident analyses included surveys of the area and mapping of vegetation damage to infer the extent of the chlorine plume, detailed simulations of local winds using the RAMS model, and atmospheric transport and dispersion modeling using the LPDM and HPAC codes.

Chuck's presentation can be located in Appendix N of this report.

Sandia National Laboratory Consequence Assessment Program

Reed Hodgin provided an insight into his new decision-based consequence assessment program and system that was recently developed for SNL-Albuquerque.

Reed elaborated on the concept of consequence-based decision-making. The consequence-based decisions are:

- Event categorization/classification;
- Onsite protective actions;
- Offsite protective action recommendations;
- Response planning and operations;
- Event termination;
- Re-entry planning and operations;
- Recovery planning and operations;
- Long-term protective actions and cleanup; and,
- Root-cause analysis.

Reed spoke on the new consequence-based decision structure at SNL/NM and the consequence-based decision flow, which flows sequentially from the early phase of an emergency to post-emergency. With respect to initial decisions [e.g., Emergency Action Levels (EALs) and Protective Action Plans (PAPs)], the IC answers a short set of key EAL questions based on the initial event information and rapid pre-developed work aids. These answers lead to a rapid selection of an EAL from an EAL set, since the EAL is directly related to the analyzed event from the EPHA. The EAL then identifies the best choice of a PAP and event classification for event. With this information, the IC (Incident Commander) incorporates the EAL recommendations in decisions and subsequently implements actions. Reed then described the EAL Process, which is based on five straight-forward steps, and emphasized that the entire process from gathering information to communicating decisions has been designed for completion within about 10 minutes after the event.

Next, Reed mentioned the follow-on consequence-based decisions that are made after the initial EAL-based decisions. These decisions are based on the projection of consequences for specific event and atmospheric conditions. They are progressively more realistic as information and analytical resources improve. These consequence projections are performed by the Consequence Assessment Team (CAT).

Reed showed an example of the consequence-based decision structure at SNL/NM, using the IC as the “client. The IC requires the following information:

- Initial and ongoing event-specific meteorological conditions;
- Event-specific weather forecast;
- Rapid confirmation of initial event classification and protective actions;
- Rapid initial and then ongoing consequence assessment with consequence-based event classification and protective action recommendations; and,
- Notification of event-impacting atmospheric and weather conditions.
- The Emergency Director (ED) needs a completely different set of information which includes:
- Ongoing event-specific meteorological conditions;
- Event-specific weather forecasts;
- Confirmation of initial event classification and protective actions;
- Rapid initial and then ongoing characterization of sources and events from a consequence assessment perspective; and,
- Rapid initial and then ongoing consequence assessments with consequence-based event classification and protective action recommendations,

The Primary EOC Team needs another completely different set of information which includes:

- Notification of event-impacting atmospheric and weather conditions;
- Atmospheric and ground deposition support for field monitoring planning and management;
- Reconciliation of field monitoring and modeling results; and
- Consequence-based support for recovery planning and management.

Reed then reviewed the mission of the CAT, which is to provide timely, useful information to the IC and the Primary EOC Team for making informed decisions about o nsite protective actions, offsite protective action recommendations, and event classification associated with a hazardous materials (i.e., radioactive, chemical, biological or explosive) emergency at or impacting SNL/NM.

The next areas that Reed explored were the phases of a consequence assessment response, where the CA Checklist acts as a guide:

- **Timely Initial Assessment (TIA)** : Its objectives are to get your arms around the event, to support and confirm initial decisions, and to provide event-specific decision advice. Its characteristics are that little information is available, there is little time for analysis, while a high degree of decision pressure from the various customers. Its framework is to provide initial decision support products within 18 minutes after the CAT is declared operational. It is a highly-focused operation with effective tools.
- **Ongoing Assessments** : Its objectives are to provide a fully event-specific assessment using a refined analysis which projects into the future. This assessment evaluates contingencies, and reacts to changing situations. Its characteristics are progressively better information is available, there is more time for analysis, and decision pressure is variable but often less than the TIA. Its framework is to provide ongoing, progressive decision support products within about 10-15 minutes of a situation change and request while developing information from the event scene and other resources.

Reed’s presentation can be located in Appendix O of this report.

DMCC Program Update

Darryl Randerson, Chairman of the DOE Meteorological Coordinating Council (DMCC), was unable to attend the meeting. Carl Mazzola presented the activities of the DMCC program since the last SCAPA meeting.

Carl reviewed the DMCC mission and objectives. The mission is to coordinate meteorological support and atmospheric research to meet DOE objectives. The objectives are to:

- Promote cost-effective support for all DOE facilities:
- Facilitate the use of common methods, standards and procedures;
- Plan for future needs, requirements, and missions; and,
- Advocate awareness of atmospheric science applications and benefits to DOE.

DMCC participants include the following DOE/NNSA organizations:

- DOE/HQ (NA, EH, OS, OA);
- Nevada Test Site (NTS);
- Oak Ridge Operations Office (OROO) (Y-12/ETTP);
- Richland Operations Office (ROO) (Hanford);
- Savannah River Operations Office (SROO) (SRS);
- Carlsbad Area Office (CAO) (WIPP);
- Pantex Area Office (PAO);
- Ohio Area Office (OAO) (Fernald, Mound);
- Yucca Mountain Project Office (YMPO);
- Rocky Flats Environmental Technology Site (RFETS); and,
- Eight DOE/NNSA national laboratories.

Carl mentioned that DMCC conducted 12 meetings since its inception in 1994, and provided the dates and locations of the meetings. Recent DMCC meeting reports are posted on the SCAPA web page.

Carl reviewed the activities of the DMCC in 2004. These included:

- Conduct of an annual meeting and the development of the 2004 DMCC Meeting Report (posted on SCAPA Web Page);
- Performance of a meteorological data assist visit at Y-12 (5/04);
- Performance of a meteorological data and CA assist visit at INL (9/04);
- Development of the DOE meteorological program report for the annual Office of the Federal Coordinator for Meteorology (OFCM) Federal Plan;
- Development of a scoping document for the revision of Atmospheric Sciences and Power Protection (ASP&P) -1984;
- Assistance in the population of the DMCC segment of the SCAPA web page;
- Completion of the revision to Chapter 4 and the summary of DOE/EH-0173T;
- Assistance in the development of ANSI/ANS-3.11 and ANSI/ANS-2.15 Working Groups;
- Reviewed the ASTM Sonic Acoustic Detection and Ranging (SODAR) standard;
- Reviewed the National Environmental Standards for Hazardous Air Pollution (NESHAP) particulate report;
- Supported the October 2003 Nuclear Utility Meteorological data User Group (NUMUG) Meeting; and,
- Support of several OFCM Joint Action Groups (JAGs).

Carl closed his talk with a discussion of the activities DMCC is undertaking in 2005. These include:

- Prepare for and convene the November 2005 DMCC Meeting in Washington, DC;
- Continue the assist visit program. Assist visits are scheduled for Pantex and the Waste Isolation Pilot Plant (WIPP) in the late-summer 2005;
- Continue developing the annual DOE meteorological program report for OFCM Federal Plan;
- Develop various annual meeting and special technical reports;
- Facilitate the National Oceanic and Atmospheric Administration (NOAA) Meteorological Acquisition and Data Ingestion System (MADIS) ingestion of Quality Assured (QA) DOE/NNSA mesonet data;
- Provide technical assistance and oversight on the revision to the ASP&P;
- Support ANSI/ANS meteorological standards WGs (e.g., ANSI/ANS-3.11/-2.15);
- Support future revisions to DOE/EH-0173T Chapter 4;
- Establish a meteorological data-Environmental Monitoring Program (EMP) link;
- Support technical sessions in the 9th Topical Meeting on EP & R: Salt Lake City, UT in February 2006; and,
- Provide meteorological support to NA, EH and OS sponsors, as requested.

Darryl's presentation can be located in Appendix P of this report.

TEEL Advisory Group

Tom Tuccinardi presented the work of the TEEL Advisory Group (TAG) and the important decisions that it had made during the last year as an oversight group to the CEWG and CMWG. These decisions will be part of the upcoming presentations.

The present TAG members are Richard Thomas, Rocky Petrocchi, Po Yung Lu, Cliff Glantz and Doug Craig. The TAG will continue to met and advise NA-41 on CEWG and CMWG matters; especially with respect to the upcoming SQA of the software that develops the TEELs and the CMM.

Update on Emergency Response Planning Guide (ERPG) Developments

Richard Thomas, the Chairman of the Emergency Response Planning (ERP) Committee, American Industrial Hygienists Association (AIHA), presented the status of the work by the AIHA in its development of ERPG values. Richard began his discussion with an update on the recent work of the ERP Committee, indicating that the committee has approximately 15 full members from government, industry, academia and foreign organizations. The ERP Committee is responsible for the maintenance of the 115 existing ERPG values and the production of ERPG values for new chemicals. The ERP Committee holds four meetings per year, and these meetings are open meetings as all individuals are invited to attend.

Richard mentioned that ERPGs are presently being used in the U.S. , Europe and Asia as toxic endpoints for emergency preparedness and response planning for accidental chemical releases, or for chemical releases as the result of malevolent acts.

Richard shifted his discussion to the ERPG value development and maintenance. There are currently 115 chemicals that have ERPG values, and approximately 10 new chemicals have ERPG values developed through a comprehensive consensus process each year. Each year, the updated ERPG values are posted on the AIHA website www.aiha.org/Committees/documents/erpglevels.pdf). In addition, to the website postings, AIHA also publishes a yearly handbook and documentation for each of the chemicals with ERPG values. Both the ERPG handbook, and the technical support documents that are associated with each ERPG, can be obtained from AIHA.

New chemical candidates for ERPG values are selected based on their potential for release and significant community exposure. Right now, approximately 250 chemicals are currently under consideration for developing new ERPG values. Richard noted that any organization may nominate chemicals to the ERP Committee for future consideration.

Richard stated that the ERPG values are developed using chemical, physical and toxicological properties, and that safety factors and extrapolations may also be used to develop these values. In the process of ERPG value development, all available human and animal toxicological data are examined with a particular emphasis on acute toxicity effects. In addition, both published and propriety data are considered as well as other exposure guidelines that may be available. After the draft ERPG values are developed, they and their rationales are published on the AIHA website for 60 days to obtain public and stakeholder comments. After these public and stakeholder comments are appropriately addressed, the final ERPG values are developed which represent consensus numbers. Richard indicated that ERPG values have automatic sunsets and are updated based on new information approximately every seven years.

Richard's presentation can be located in Appendix Q of this report.

Update on Acute Exposure Guideline Limits (AEGL) Developments

Po-Yung Lu discussed the work of the Environmental Protection Agency (EPA) in its development of Acute Exposure Guideline Levels (AEGLs) and presented a table that defined the human health effects for AEGL-1, AEGL-2 and AEGL-3. Po-Yung indicated that these AEGLs can be applied to Hazard Assessments (HAs). They describe the risk to humans resulting from once-in-a lifetime, or rare exposure to airborne chemicals.

AEGLs cover three specific severity levels:

- Non-disabling;
- Disabling; and,
- Lethal.

Unlike ERPG values and TEEL values, which are for one-hour exposure periods, AEGLs are developed for five specific exposure periods of 10-minutes, 30-minutes, one-hour, 4-hours and 8-hours. As of April 2005, there are 24 chemicals that have final AEGLs, 60 chemicals with interim AEGLs, 51 chemicals with proposed AEGLs, and 15 chemicals with AEGL development work on hold for various reasons, for a total of 150 chemicals. The most recent AEGL values are posted on the internet at www.epa.gov/oppt/aegl/.

Po-Yung discussed the AEGL development process inclusive of the public peer review meetings initially conducted by EPA through the National Advisory Committee (NAC), and presently by the NAS Committee of Toxicology-AEGL Subcommittee. The next three NAC meetings are:

- June 13-15, 2005, Washington, DC.;
- September 28-30, 2005; and,
- December, TBD.

Po-Yung continued his presentation indicating that AEGL values are acute, single exposure limits for the general population, including susceptible individuals, for application to chemical EP & R, and prevention. The AEGL process is international, involving countries from many nations. It is a consistent developmental process within the context of a stringent peer- review process with meetings to ensure science-based values are produced.

Po-Yung closed his presentation mentioning that based on the recommendation of the TEELs Advisory Group (TAG), DOE OEM has adopted the 1-hour AEGL values for Protective Action Criterion (PAC) determinations. AEGLs, when complete, will replace both the TEEL values and ERPG values as the PAC of choice for DOE/NNSA sites.

Po-Yung's presentation can be located in Appendix R to this report.

Chemical Exposures Working Group

Doug Craig presented an overview of the work of the CEWG since the last SCAPA Meeting, with specific emphasis on the development of Revision 21 TEELs.

Doug indicated that in the past year, AEGL values have been incorporated into the hierarchy, as one-hour final and interim AEGL values are now the primary PAC criterion and ERPG values have been relegated to second choice for PACs. This has resulted in a significant revision to the TEEL-derivation methodology, which will be applied to the Revision 21 TEEL package.

In addition to the hierarchy change established by the inclusion of the interim and final AEGL values, Lower Explosive Levels (LELs) have been entered on the input data worksheet and TEEL values on "Rec TEELs" output is flagged if greater than certain percentages of LEL. A third revision to the methodology involves the addition of a " Source of TEELs" column. Lastly, TEEL values for simple asphyxiants have been revised.

Doug reviewed the work undertaken by the CEWG since the last SCAPA meeting. He indicated that TEELs Revision 20 was published on SCAPA web page in April, 2004. Soon after that, the TAG was established and first met at the 2004 EMI SIG meeting, with Tom Tuccinardi, former Federal Official for the SCAPA program, serving as chairman.

Over the past year, the TEEL-derivation methodology revisions that were approved by TAG include:

- AEGL value incorporation into the PACs;
- Treatment of TEELs with LEL values;
- Revision of the simple asphyxiant TEELs; and,
- Revised TEEL table designation.

Doug reported on the work associated with TEELs Revision 21. Due to major changes in the macros to accommodate TEEL hierarchy and output changes, the TEELs Revision 21 has not yet been published. Doug elaborated on the use of the interim and final AEGLs. TAG selected the one-hour AEGLs as the primary PAC (i.e., PAC-1 = AEGL-1; PAC-2 = AEGL-2; PAC-3 = AEGL-3). To effectuate this change, it required inclusion of additional columns in the TEEL input worksheet, and the macro was revised with an option to select the AEGL exposure time value. The AEGL values are used “as is”, with no rounding, and all published AEGL values are entered on worksheet. These AEGL values are bolded, are shown in larger font, in the “Rec TEEL” and “Rec mTEEL” output worksheets.

Doug then provided a summary of the AIHA ERPG values. The 2004 ERPG Handbook presents values for 109 chemicals, while the 2005 ERPG list includes values for 4 new chemicals. ERPG values for 5 chemicals were reviewed and four were unchanged. The ERPG-2 and ERPG-3 values decreased for the fifth chemical, methyl isocyanate.

With respect to the LELs, Doug conceded that the LEL was not originally considered in TEEL derivation, since the LEL focus was viewed as a safety and not as a health concern. This issue was also debated by TAG and a decision was made to adopt the AEGL approach. Thus, TEEL values on “Rec TEELs” output will be flagged in the following manner:

- 10% LEL $\leq$ TEEL $<$ 50% LEL - italicized pink;
- 50% $\leq$ TEEL $<$ LEL - italicized, underlined, red; and,
- TEEL $\geq$ LEL - italicized, double underlined, dark red

Doug also discussed the new approach adopted for all gases that are simple asphyxiants:

- **TEEL-0:** 60,000 ppmV [O_2 concentration = 19.5%, OSHA lower limit for confined space entry (CSE)];
- **TEEL-1** : 145,000 ppmV (O_2 concentration = 18%, decreased ability to work strenuously);
- **TEEL-2** : 280,000 ppmV (O_2 concentration = 15%, impaired coordination, perception, judgment); and,
- **TEEL-3** : 500,000 ppmV (O_2 concentration = 10%, unconsciousness and death).

Doug returned to his discussion of the TEELs and provided some housekeeping changes that will be included in the Revision 21 package. To avoid confusion, the TEEL tables will have a new heading, “AEGLs, ERPGs, and TEELs for Chemicals of Concern”. Table 1 includes some physicochemical data, Table 2 gives values in “original” units, inclusive of a “Comments” column, Table 3 orders chemicals by the Chemical Abstract System Registry Number (CASRN), while Table 4 gives values in mg/m^3 inclusive of a column giving source of values.

Doug closed his presentation by giving a summary of his progress report. TEELs have been derived and published for 2,519 chemicals (i.e., TEELs Revision 20) and are posted at http://tis-hq.eh.doe.gov/web/chem_safety/. The introduction supplements published TEEL-derivation methodology. TEELs Revision 21 will include chemicals with 60-minute final and interim AEGLs and output values formatted as an alert for LEL values for about fifty new chemicals. A one-page TEEL-value review request form will be posted on the SCAPA web site.

Doug's presentation can be located in Appendix S to this report.

Chemical Mixtures Working Group

Rocky Petrocchi reported on the work of the CMWG since the last SCAPA Meeting.

Rocky provided a progress to date on the Health Code Numbers (HCNs), which have been developed for all chemicals through TEELs Revision 19. This includes o ver 2,200 chemicals. HCN development for TEELs Revision 20 is about 10% complete, with about 30 of 300 chemicals ready for peer review. The reason why progress has not been more significant is due in part to a funding review hold since mid-February 2005, and the HCN development will be resumed when funding is re-established.

Rocky presented a "things to remember" primer on the HCNs, including a reminder that HCNs are default health effects codes (e.g., if effect seen in toxicological databases an HCN is assigned and no further evaluation of toxicological data is performed). As an example, Rocky discussed the primary versus secondary organ effect. He indicated that if the secondary organ effect is insignificant, it can be ignored. Rocky emphasized that a toxicologist should make this determination.

Rocky turned his discussion to the CMM Excel Workbook, which was revised and extensively tested in October 2004. The changes, completely automates the CMM, where only user mixture input including chemical names, CASRNs, plus the concentration of each chemical at the receptor point of interest and choice of PAC level are required. Also in October 2004, the CMM Workbook and User Guide were posted on http://www.orau.gov/emi/scapa/healthcodenumbers.htm. The Excel Workbook and User Guide are also downloadable.

Rocky also stated that in addition, there is a lookup table for all PACs (e.g., ERPG values, TEELs) in TEELs Revision 20 and HCNs for all chemicals in TEELs Revision 19. Another feature that is provided to the user is that the user can add its own chemicals, PACs, HCNs, and also change or delete HCNs. Rocky stressed that password protection is in place to maintain software integrity for SQA purposes.

Rocky concluded his discussion with a review of the PAC and CMM Workshop which was presented at the 2005 EMI SIG meeting on May 2, 2005. The workshop addressed major CMM concepts. It showed that the CMM is a better method for mixture analysis, as c urrent methods are non-conservative or over-conservative. Rocky invited feedback on the workshop. If the feedback is positive, there may be a longer hands-on version of workshop developed.

Rocky's presentation can be located in Appendix T of this report.

TEEL Documentation and Database Development

Tony Pierpoint discussed the new TEELs searchable data base and other TEEL-related products that have been developed by ATL International over the past year.

Tony reported on the TEEL documentation activities and database development. Over the past year, an activity tracking system has been added, return buttons have been added, and some screens have been modified. In addition, the CMM can now address up to 10 HCNs. Updates have been performed for source data and the DOT 2004 ERG project has been completed. The CAMEO data project is in progress, while the NIOSH Pocket Guide is waiting for release.

Tony presented a recently compiled activity report for the first four months of 2005. The total volume was 1,564. However, this represented d ecreasing activity from 773 in January to only 98 in April. Activity by chemical specie showed chlorine with the most hits, followed by benzene, hydrogen fluoride and hydrazine hydrate (aqueous solutions).

Tony gave a status report on present update projects:

- DOT ERG 2004 Version is complete;
- CAMEO is in progress and currently data is being extracted; and,
- NIOSH Pocket Guide will be released in approximately a month.

Tony indicated that documentation projects involve the publication of the TEEL methodology, and an SQA review of TEEL and CMM applications. The SQA review will be based on the DOE O 414.1C, Quality Assurance and Safety Software Guide.

Tony stated that a determination of whether this software is Level A or Level B needs to be made. Within the SQA process, a Verification & Validation (V & V) will be conducted, and a manual calculation versus an automated calculation will be performed.

Tony closed his talk discussing system security and virus corruption countermeasures that were being taken.

Tony's presentation can be located in Appendix U of this report.

WRAP UP AND REVIEW OF ACTION ITEMS/NEXT SCAPA MEETING

Carl Mazzola thanked everyone for their attendance and all of the input they provided and indicated that the next SCAPA meeting will be conducted in conjunction with the next TRADE EMI SIG meeting, since SCAPA is now a subcommittee of THE EMI SIG. The meeting will be located either in San Antonio, TX; Dallas, TX; or Las Vegas, NV.

ACRONYMS

Acronym	Definition
2DPUF	An atmospheric transport and dispersion model
A	
AEGL	Acute Exposure Guideline Level
AI	Action Item
AIHA	American Industrial Hygienists Association
ALOHA	Areal Locations of Hazardous Atmospheres, an atmospheric transport and dispersion model
ANL	Argonne National Laboratory
ANS	American Nuclear Society
ANSI	American National Standards Institute
APAC	Accident Phenomenology and Consequence
APGEMS	An atmospheric transport and dispersion model
ARAC	Atmospheric Release Advisory Capability
ARO	Assistant Research Officer
ASME	American Society for Mechanical Engineers
ASP&P	Atmospheric Sciences & Power Protection
ASTM	American Standards for Testing and Materials
ATL	Advanced Technology Laboratory
B	
BBP	Blood Borne Pathogens
BMBL	Biosafety in Microbiological and Biomedical Laboratories
BNL	Brookhaven National Laboratory
BSL	Biosafety Level
BSO	Biosafety Officer
BSG	Biological Safety Guideline
BWP	Biosafety Work Program
C	
CA	California
CAM	Consequence Assessment Modeling
CAMEO	A map overlay system to ALOHA, an atmospheric transport and dispersion model
CAO	Carlsbad Area Office
CAP	Corrective Action Plan
CASRN	Chemical Abstract System Registry Number
CAT	Consequence Assessment Team
CB	Chem Bio
CBP	Certified Biosafety Professional
CDC	Centers for Disease Control
CEWG	Chemical Exposure Working Group
CFAST	A fire propogation model
CFD	Computational Fluid Dynamics

CFR	Code of Federal Regulations
CMM	Chemical Mixture Methodology
CMWG	Chemical Mixture Working Group
COTS	Commercial Off The Shelf
CRAD	Criteria and Review Approach Document
CSE	Confined Space Entry
D	
DC	District of Columbia
DEAR	Department of Energy Acquisition Regulations
DHS	Department of Homeland Security
DMCC	DOE Meteorological Coordinating Council
DNC	Democratic National Convention
DNFSB	Defense Nuclear Facility Safety Board
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
E	
EAL	Emergency Action Level
ECP	Exposure Control Pan
ED	Emergency Director
EFCOG	Energy Facility Contractors Group
EH	Environmental and Health
EMA	Emergency Management Agency
EMG	Emergency Management Guide
EMI	Emergency Management Issues
EMP	Environmental Monitoring Program
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
EPHA	Emergency Preparedness Hazard Assessment
EP & R	Emergency Preparedness and Response
EPICODE	An atmospheric transport and dispersion model
ERG	Emergency Response Guidebook
ERO	Emergency Response Organization
ERP	Emergency Response Planning
ESHQA	Environmental Safety and Health Quality Assurance
ETTP	East Tennessee Technology Park
F	
FEM	A computation fluid dynamics model
FEMA	Federal Emergency Management Agency
FRMAC	Federal Radiological Monitoring and Assessment Center
G	
G	Guide
GA	Georgia
GENII	An atmospheric transport and dispersion model
GIS	Geographical Information System
H	
HA	Hazard Assessment
HazMat	Hazardous Materials
HEPA	High Efficiency Particulate Air

HCN	Health Code Number
HGSYSTEM-UF6	An atmospheric transport and dispersion model
HOTSPOT	An atmospheric transport and dispersion model
HPAC	An atmospheric transport and dispersion model
HQ	Headquarters
HSC	Homeland Security Council
HSO	Homeland Security Operations
HSOC	Homeland Security Operations Center
HYSPLIT	An atmospheric transport and dispersion model
I	
IACUC	Institutional Animal Care and Use Committee
IBC	Institutional Biosafety Committee
IC	Incident Commander
iClient	A NARAC system
ICRP	International Council for Radiation Protection
IH	Industrial Hygiene
IMAAC	Inter-agency Modeling and Atmospheric Analysis Center
INL	Idaho National Laboratory
INS	Incident of National Significance
IP	Implementation Plan
IRB	Institutional Review Board
ISMS	Integrated Safety Management System
J	
JAG	Joint Action Group
JTOT	Joint Technical Operations Team
K	
L	
LA	Louisiana
LANL	Los Alamos National Laboratory
LBNL	Lawrence Berkeley National Laboratory
LEL	Lower Exposure Level
LEPC	Local Emergency Planning Committee
LINC	Local Integration of NARAC with Cities
LLNL	Lawrence Livermore National Laboratory
LPDM	An atmospheric transport and dispersion model
M	
M & O	Management & Operating
MACCS2	An atmospheric transport and dispersion model
MADIS	Meteorological Acquisition and Data Ingestion System
MELCOR	An in-facility transport model
METVIEW	A meteorological data view companion to an atmospheric transport and dispersion model
mg	milligram
MIDAS	Meteorological Information Data and Acquisiion System, a transport and dispersion code
MOU	Memorandum of Understanding
MTA	Municipal Transportation Agency
N	

NA-41	DOE Office of Emergency Management
NAC	National Advisory Committee
NAI	Nonproliferation, Arms Control, and International Security
NARAC	National Atmospheric Release Advisory Capability
NEP	National Exercise Program
NESHAP	National Environmental Standards for Hazardous Air Pollution
NEST	Nuclear Emergency Search Team
NIH	National Institute of Health
NIOSH	National Institute for Occupational Health and Safety
NM	New Mexico
NNSA	National Nuclear Security Administration
NOAA	National Oceanic and Atmospheric Administration
NQA-1	Quality Assurance for Nuclear Facilities
NRAT	Nuclear Radiological Advisory Team
NRCC	National Response Coordinating Center
NRP	National Response Plan
NTS	Nevada Test Site
NUMUG	Nuclear Utility Meteorological data User Group
NV	Nevada
O	
O	Order
OA	Office of Oversight and Assessment
OAO	Ohio Area Office
OC	Operations Center
OEM	Office of Emergency Management
OFCM	Office of the Federal Coordinator for Meteorology
OH	Ohio
OR	Oak Ridge
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
OROO	Oak Ridge Operations Office
OSHA	Occupational Safety and Health Administration
OTS	Office of Transportation Safety
P	
P	Policy
PAC	Protective Action Criteria
PAO	Pantex Area Office
PAP	Protective Action Plan
PNNL	Pacific National Northwest Laboratory
POTUS	President of the United States
ppmV	parts per million Volume
PSO	Program Secretarial Office
Q	
QA	Quality Assurance
QAP	Quality Assurance Program
R	
RAMS	An atmospheric transport and dispersion model
RAP	Radiological Assistance Program
rDNA	Recombitant Deoxyribose Nucleic Acid
RFETS	Rocky Flats Environmental Technology Site

RNC	Republication National Convention
ROO	Richland Operations Office
S	
S & T	Science & Technology
SAIC	Sicence Applications Incorporated International
SC	South Carolina
SCAPA	Subcommittee on Consequence Assessment and Protective Actions
SCDHEC	South Carolina Department of Health and Environmental Control
SIG	Special Interest Group
SME	Subject Matter Expert
SNL/CA	Sandia National Laboratory/California
SNL/NM	Sandia National Laboratory/New Mexico
SODAR	Sonic Acousitc Detection and Ranging
SOP	Standard Operating Procedure
SQA	Software Quality Assurance
SRNL	Savannah River National Laboratory
SROO	Savannah River Operations Office
SRS	Savannah River Site
SRSOC	Savannah River Site Operations Center
SSC	Structures Systems and Component
T	
TAG	TEEL Advisory Group
TBD	To be determined
TEDE	Total Effective Dose Equivalent
TEEL	Temporary Emergency Exposure Level
TIA	Timely Initial Assessment
TOPOFF	Top Officials
TRAC	Terrain Response Atmospheric Code
TRIAD	A transport and dispersion code
TSOC	Transportation Security Operations Center
TWA	Time Weighted Average
TX	Texas
U	
UDM	Urban Dispersion Model
US	United States
USDA	United States Department of Agriculture
UT	Utah
V	
V & V	Verification & Validation
VSMOKE	A smoke propagation model
W	
WA	Washington
WG	Working Group
WGI	Washington Group International
WHO	World Health Organization
WIPP	Waste Isolation Power Plant
WMD	Weapons of Mass Destruction
WSMS	Washington Safety Management Solutions
WSI	Wackenhut Services Incorporated

WSRC	Westinghouse Savannah River Company
X	
Y	
YMPO	Yucca Mountain Project Office
Z	