PARTNERS IN ENVIRONMENTAL TECHNOLOGY

SERDP Strategic Environmental Research and Development Program

ESTCP

INFORMATION B•U•L•L•E•T•I•N

SPRING 2003
NUMBER 16

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Christine Todd Whitman Receives Briefing from SERDP Researcher at EPA's Research Triangle Park

In late May, outgoing U.S. Environmental Protection Agency (EPA) Administrator Christine Todd Whitman received a briefing and tour of research being conducted at EPA in Research Triangle Park (RTP). The purpose of the visit was to review the research conducted for the Safe Buildings Program, managed and coordinated at RTP. The safe buildings research is being conducted for EPA's National Homeland Security Research Center, established in 2002 and headquartered in Cincinnati, Ohio. The EPA campus in RTP is the center of EPA's national air research program where research is conducted to improve the understanding of exposure and health effects of air pollutants and how to prevent or control air pollutants.

Scientists and engineers in RTP, including SERDP Researcher Dr. Brian Gullett, are working to develop new methods for detecting hazardous air pollutants (HAP). Through his

SERDP Researcher Dr. Brian Gullett demonstrates the REMPI/LIBS real-time air monitor to outgoing EPA Administrator Christine Todd Whitman.

SERDP-funded effort, *Temporal and Modal Characterization of DoD Source Air Toxic Emission Factors (CP-1247)*, Dr. Gullett is developing advanced instrumentation for real-time analysis of trace organic and metallic air toxics from Department of Defense (DoD) sources. The instruments include Jet

See WHITMAN, page 6

PARTNERS IN ENVIRONMENTAL TECHNOLOGY

SERDP ESTCP

TECHNICAL SYMPOSIUM & WORKSHOP

CALL FOR POSTER ABSTRACTS

Both federal and non-federal submitters will be considered.

There is a limited number of spaces available to display poster presentations that are relevant to one of the SERDP and ESTCP focus areas (Cleanup, Compliance, Conservation, Pollution Prevention, and UXO). If you are interested in being considered for poster space, please refer to the abstract guidelines that are posted at www.serdp.org or www.estcp.org.

Abstracts are due August 22, 2003.

There is no additional charge for poster space.

THE PARTNERS IN ENVIRONMENTAL TECHNOLOGY TECHNICAL SYMPOSIUM & WORKSHOP

"Meeting DoD's Environmental Challenges: Sustaining Our Ranges; Reducing Environmental Liabilities"

December 2-4, 2003
Marriott Wardman Park Hotel ✦ Washington, D.C.
Sponsored by SERDP and ESTCP

This year's technical program will feature comprehensive sessions that will illustrate how SERDP and ESTCP research & development and demonstration & validation efforts are assisting the Department of Defense to address increasingly complex environmental challenges. Take a look at the preliminary list of technical sessions...

- **Challenges of Dense Non-Aqueous Phase Liquid (DNAPL) Source Zone Remediation**
- **Monitored Natural Attenuation of Chlorinated Solvents**
- **Perchlorate Monitoring and Treatment**
- **Advanced Electromagnetic Induction (EMI) for Unexploded Ordnance (UXO) Detection and Discrimination**
- **Wide Area Unexploded Ordnance (UXO) Detection**
- **Range Impacts Inside and Outside the Fence**
- **Indicators of Range Carrying Capacity**
- **Heavy Metal-Free Corrosion Protection**
- **Environmentally Benign Alternatives to Heavy Metals Plating**
- **Environmental Impacts of Munitions on Ranges**
- **Bioavailability of Contaminants in Sediments**
- **Environmentally Safe Fire Suppression Systems**

For updated Symposium information, visit one of our web sites www.serdp.org or www.estcp.org or call (703) 736-4548 for assistance.

S•U•C•C•E•S•S STORIES

SERDP-funded research and development efforts and ESTCP-funded demonstration and validation activities continue to provide a rapidly increasing number of outstanding technical and environmental advances. These developments are highly important and relevant to the Department of Defense (DoD), Department of Energy (DOE), Environmental Protection Agency (EPA), and many other user communities.

SUCCESS STORY

Non-ODC Oxygen Line Cleaning System (OLCS) Developed for Use On Aircraft

In the mid 1990s, Air Force oxygen systems engineers at Tinker Air Force Base began exploring the potential for new technologies that would enhance the methods for cleaning oxygen systems on aircraft. Traditional maintenance techniques, in use since the post World War II era, are dated. The chemicals used to clean oxygen system lines and components have been deemed environmental hazards and are strictly regulated or their production has ceased. Engineers were certain that a better method could be devised to clean oxygen systems and components, as well as validate the cleanliness of the components once cleaned. This was a new concept given that no existing cleaning methods validated the degree of cleanliness. Existing methods were merely best practices for the industry using a known solvent, primarily CFC 113 (Freon).

In early 1999, ESTCP began sponsoring a multi-year project, *On-Board Oxygen Line Cleaning System (OLCS) for Use with DoD Weapons Systems (PP-9910)*, with Air Force engineers from Wright-Patterson Air Force Base (WPAFB), Tinker Air Force Base Air Logistics Center (OC-ALC), and Versar Inc., to develop a prototype system that could clean aircraft oxygen lines onboard the aircraft. Essentially, such a system would clean the entire plumbing system without requiring removal of oxygen lines or components while also eliminating or reducing the ozone depleting chemicals (ODC) currently used in the cleaning process. Historically, contaminated oxygen systems require complete dismantling of the system lines and components followed by a manual cleaning of each piece by open spraying of CFC 113. This procedure takes 1-3 months to accomplish on a B-1B aircraft, requires an extensive number of man hours to complete, and then necessitates comprehensive systems checks as a result of nearly every functional system on the aircraft having been disturbed during the cleaning process.

The portable Oxygen Line Cleaning System (OLCS) pictured above cleans aircraft oxygen lines onboard without the need for removal.

Researchers working on the project partnered with NASA and the Navy to develop a Joint Test Protocol to ensure that all critical test criteria were identified and that the new system would meet or exceed the requirements of current Military Specifications, Technical Orders, and American Society for Testing and Materials. Extensive testing was conducted over the course of the project, and demonstration/validation procedures were tested on the B-1B, F-15, F-16, and C-130 weapon systems. Results demonstrate that the OLCS works better than anticipated. As a side benefit, this system also measured on-aircraft contamination levels for the first time.

The results of the OLCS testing revealed a number of benefits that can be achieved through implementation of the system. The initial benefit is the reduction or elimination of hazardous solvents used in cleaning of oxygen systems. The OLCS cleans with an environmentally-friendly solvent and captures, distills, and recycles it for future cleanings. Second, the OLCS can reduce Operations & Maintenance costs for weapons systems. A conservative estimate by the oxygen system engineers is that the Air Force could potentially realize more than $1M savings annually in the oxygen regulator overhaul necessitated by particulate contamination in oxygen systems. Further savings could be realized by decreasing the failure rates of other oxygen system components. A third and substantial benefit is that the OLCS can save the Air Force at least $1M per occurrence each time a contaminated aircraft is cleaned. This figure is based on experience with B-1B and T-6 aircraft.

See OLCS, page 4

SERDP
Strategic Environmental Research and Development Program

SUCCESS STORY

Eavesdropping on Endangered Species

Department of Defense (DoD) military installations are required to inventory and monitor threatened and endangered species (TES) on their lands to manage the impacts of base operations and to support species recovery. However, large areas on many installations are inaccessible or hazardous, with unexploded ordnance (UXO) presenting a special hazard that restricts or precludes access by the inventorying groups.

To address this problem, researchers working on the SERDP-funded project *Acoustic Monitoring of Threatened and Endangered Species in Inaccessible Areas (CS-1185)* have successfully implemented new acoustical systems and software to monitor two breeding songbird species over large areas of Fort Hood, Texas, including the live-fire and artillery impact areas. Fort Hood hosts the largest breeding populations of Golden-Cheeked Warblers and Black-Capped Vireos under a single management authority. Both species are federally listed as endangered.

Dr. Kurt Fristrup and his team of researchers from Cornell University have developed autonomous digital recording systems, drifting balloon platforms for aerial acoustic surveys, and signal processing programs that localize and classify bird songs. The autonomous recording units (ARU) can be deployed for weeks or months at a time to monitor sites such as live-fire training areas that are accessible only rarely to biologists on the ground. Each unit can be programmed to record sounds to an internal hard disk on any desired schedule. After an ARU is retrieved, the audio recordings can be scanned by signal processing software to identify sounds of the species of interest.

To survey areas that are completely inaccessible, such as artillery impact areas where ground access is prohibited by UXO hazards, the Cornell researchers have developed an airborne balloon platform for recording animal sounds. The balloon system maintains a set altitude (typically between 100 and 400 m) by venting helium or dropping ballast and drifts passively with the wind. An onboard Global Positioning System (GPS) module logs the balloon's track. When the GPS system detects that the balloon has left the designated survey area, the command processor initiates a descent to the ground for recovery. Throughout the balloon's flight, a digital storage module records signals from a microphone mounted in a trumpet-like horn. The horn amplifies sounds in the frequency band of interest. The balloon itself is approximately 1.3 m in diameter, and the instrument package weighs less than 1.2 kg. The complete system is small enough to be exempt from mandatory Federal Aviation Administration regulation (CFR 101.1) and easy enough to launch and recover that a small fleet of balloons could be launched in a single morning. On a typical drift at Fort Hood, approximately 1 percent of the base area is surveyed by one balloon. After a balloon system is retrieved, the acoustic data can be scanned by software to identify sounds from the target species, or it can be reviewed by human experts to produce a more complete survey of all animal sounds present. Interactive data visualization software developed at Cornell aids human review of the audio recordings.

To date, prototype software and software packages have been developed that automatically detect songs of Black-Capped Vireos and Golden-Cheeked Warblers and interactively review their results in both Java and Matlab. In addition, statistical models have been produced that relate balloon drift rates to the probability of a bird singing while the balloon is in range.

The Black-Capped Vireo (*Vireo atricapillus*) is one of two endangered songbird species being studied at Fort Hood, Texas, with new acoustic monitoring methods.

When this three-year project concludes in early 2004, more than 10,000 hours of ground-based recordings of Black-Capped Vireos and Golden-Cheeked Warblers will have been collected from 50 sites at Fort Hood. These recordings provide training and test data for the development of automatic song detection algorithms. These ground-based recordings also quantify diurnal and seasonal variation in temporal singing patterns and may show that the breeding status of each male can be inferred from its singing patterns.

Balloon surveys using this SERDP-developed technology can be applicable immediately to many sites as an expert listener can detect and identify the animal sounds from a number of these brief recordings in a short period of time. Ground-based or aerial acoustic listening systems similar to those developed for this work also can be used to track other acoustically active animals where accessibility or length of surveys is an issue. Development of a means for more rapid identification and separation of the various animal and background sounds is the next step in this type of research.

For more information about this project, please contact Dr. Kurt Fristrup, Cornell University, Laboratory of Ornithology, Ithaca, NY, at (607) 254-2438 or via e-mail at kmf6@cornell.edu. ◆

F ◆ A ◆ Q s

from SERDP and ESTCP Principal Investigators

SUBJECT: NEW SERDP AND ESTCP PROJECT REPORTING SYSTEM

Q: *Have my reporting responsibilities changed with the implementation of the new reporting system for SERDP and ESTCP Principal Investigators?*

A: No, your reporting responsibilities have remained virtually unchanged in the new SERDP and ESTCP Management System (SEMS). However, you should find that reporting is easier because of the enhancements to the design of the system. One of the new features of SEMS is a sidebar on the left side of the screen that greatly improves navigation. During the various reporting periods, you will be able to input, review, and edit your data more quickly.

Users who require access to the reporting system for both SERDP and ESTCP (or have multiple projects in either) now need only one User ID and Password to input and access all of their projects' data. Similarly, other users who historically have needed access to multiple SERDP or ESTCP web applications, such as peer reviewers of research proposals, will find the same simplified access and navigation enhancements plus access via one login.

Should you need additional information or require assistance with SEMS, please contact the SEMS Database Administrator, Jen Rusk (jrusk@hgl.com), or the SEMS Project Manager, Jack Mulrooney (jmulrooney@hgl.com).

SUBJECT: ESTCP PHASE II PROPOSALS

Q: *I've heard there have been changes in the ESTCP proposal process. Is this accurate, and if so, what exactly do the changes involve?*

A: Yes. The DoD proposal submittal process for ESTCP has been changed and key dates have been modified to 1) accommodate expanded technical proposal requirements for DoD proposals that are selected to go forward to Phase II and 2) make the non-DoD proposal process more closely parallel the DoD proposal process. The new requirements reflect the need to provide the review committees with sufficient technical information about technologies proposed for demonstration. The main changes can be summarized as follows:

FOR DOD ESTCP PROPOSALS:

- A requirement to submit a proposal with an expanded technical section.
- A shift in the Phase II review meeting dates from mid-late August to early-mid September.

FOR NON-DOD PROPOSALS

- A delay in the due date for full proposals from late July to early August.
- A shift in the meeting dates for full proposals from mid-late August to early-mid September.

For exact dates and specific proposal instructions, please refer to the Funding Opportunities section of the ESTCP web site (http://www.estcp.org/opportunities).

SUBJECT: SERDP ANNUAL REPORTS

Q: *When are SERDP Annual Reports due to the Program Office?*

A: Every SERDP Principal Investigator is required to submit an Annual Report summarizing a project's technical progress each year for which funding is provided. (The exception is during the last year of funding when the PI is responsible for preparing a Final Report upon the project's completion.) The Annual Report is due to the Program Office by December 1 of each year. Following receipt of the Annual Report, the Program Office Staff reviews the information and utilizes appropriate material to complete SERDP's Congressional reporting requirements.

For specifics about preparing an Annual Report, please contact your Program Manager Assistant.

SUBJECT: TECHNOLOGY TRANSFER

Q: *How do I go about informing my associates regarding new technologies developed by SERDP and ESTCP that can help address current and upcoming environmental needs of my military organization?*

A: First, information about all SERDP and ESTCP projects is available on the web sites (www.serdp.org and www.estcp.org), including fact sheets that summarize each funded project as well as information about upcoming events and links to other relevant web sites.

Second, a number of informational materials are available both on the web sites and in hard copy from the SERDP and ESTCP Program Office by request. These materials include information about the proposal selection and funding process as well as fact sheets that summarize each program, the focus of research thrust areas, and individual project efforts.

Finally, members of the SERDP and ESTCP staff, including the Executive Director and Director/Technical Director, travel to military organizations, as schedules permit, to provide briefings in person to appropriate members of the military user community.

For additional information about potential site visits, please contact the Program Office at Execdir@serdp.org or Techdir@serdp.org. ◆

OLCS, from page 2

The demonstration and validation program has proven to be very successful in achieving its intended goals, including the development of a fully functional prototype OLCS. The next steps, as outlined by ESTCP, are to transition and implement the new technology fully into aircraft production and overhaul facilities.

For additional information about this project, please contact the Air Force Program Manager Mr. Jerry Gore, Tinker Air Force Base, OK, at (405) 739-0062 or via e-mail at jerry.gore@tinker.af.mil, or you may contact Mr. John Herrington, Versar Inc., Wright-Patterson Air Force Base, OH, at (937) 864-7812 or via e-mail at John.Herrington@wpafb.af.mil. ◆

SERDP
Strategic Environmental Research and Development Program

SUCCESS STORY

RESEARCHERS DEVELOP ENVIRONMENTALLY-FRIENDLY ALTERNATIVE FOR CHROMATED AIRCRAFT SEALANTS

Aircraft systems require numerous sealants to prevent moisture entry, to provide corrosion protection and electrical insulation, and to seal fuel tanks. Chromium, a hazardous material targeted for removal to comply with Occupational Safety and Health Administration regulations, is currently the primary corrosion-inhibiting component used in sealants. Most of these sealants also contain relatively high levels of volatile organic compounds (VOC), such as toluene and methyl ethyl ketone (MEK), which are necessary for proper processing and curing. Each year, aircraft maintenance activities generate approximately one million pounds of waste sealant, with a total disposal cost of $1.5 million. In addition, depaint/deseal activities in major depot reclamation facilities cost millions of dollars to construct and operate.

The sealants industry has been researching and developing new chrome replacement products for several years. One potential chromate-free, corrosion-inhibiting sealant has been developed, tested, and transitioned to the field. But, this new sealant replaces only one class of material. There are many more types and classes of materials still to be addressed. A newly-developed polymer, polythioether, possesses properties that make it suitable for use in corrosion-inhibiting sealants. These include rapid cure times, low temperature curing, excellent rheological properties, and high solvent resistance. SERDP funded the research project *Replacement of Non-Toxic Sealants for Standard Chromated Sealants* (PP-1075) to use this polymer as the basis to formulate chrome-free, corrosion-inhibiting sealants for all of the remaining types and classes of sealants.

The objective of this project was to develop non-chromated sealants that meet the requirements of Military Specification "Performance Specification Sealing and Coating Compound, Corrosion Inhibitive" (MIL-PRF-81733C) to prevent moisture entry, seal fuel tanks and other containers and/or pressurized areas, provide corrosion protection, and, if necessary, provide electrical insulation. Researchers at the Air Force Research Laboratory at Wright-Patterson Air Force Base (AFRL) met this goal by formulating and qualifying non-chromated sealants with properties that are equivalent or superior to the properties of existing chromated sealants. They also reduced the VOC content of the replacement sealants.

Following the completion of the project's seven technical tasks, a non-chromated, VOC-free fuel tank sealant system based on the polythioether polymer was qualified. A blend of three non-chromated, corrosion-inhibitor/curing agent formulations also has been selected and has been evaluated against military specification requirements. In addition to the application and performance properties, the corrosion protection capabilities were determined to be superior as compared to the control sealant, PS870, a chromate-containing corrosion-inhibiting sealant.

Based on the results of this evaluation, the new sealant formulation was qualified, and it will be ready for market in the fall of 2003. Other classes of low- or zero-VOC fuel tank sealants based on this formulation also are being developed. In addition, other types of sealants such as cabin, windshield, environmental, and aerofairing sealants will be developed by building on this non-chromated polymer-based sealant formulation.

These non-chromated, low-VOC sealants will significantly reduce material disposal costs for aircraft maintenance, eliminate 75 percent of the source waste streams that contain hazardous materials, reduce VOC emissions by 65 percent, and increase safety for personnel involved in the application and removal of these materials. A survey conducted prior to this project predicts the DoD will save $700,000 in hazardous waste handling costs each year, the manufacturer will save $250,000 annually in hazardous waste elimination, and, as a result of a longer shelf life, the DoD also will save $110,000 in material, based on the reduced need to dispose of expired sealants.

Alternative non-chromated sealants will generate environmental cost savings in applications on aircraft such as the F-22.

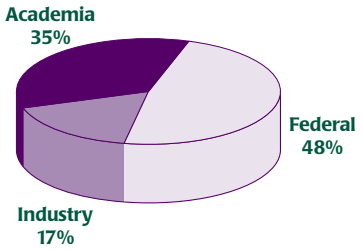
For additional information about this project, please contact Mr. Alan Fletcher, Wright-Patterson Air Force Base, OH, at (937) 255-7481 or via e-mail at alan.fletcher@wpafb.af.mil. ◆

Program Development Update

SERDP

The 2004 program is in the second phase of technical evaluation. Of the 206 full proposals that were submitted for independent technical peer review, 104 proposals were sent to the multi-agency technology thrust area working groups (TTAWG). The TTAWGs evaluate proposals for elements of cost, transition potential, and cooperative development and also consider the technical and personnel evaluation of the peer reviewers. Proposals were ranked in order of priority and provided to the Executive Director for incorporation into the draft 2004 Program. In the fall of 2003, these proposals will undergo their final technical review by the SERDP Scientific Advisory Board (SAB). The SAB was established by Congress to ensure that the SERDP Council was advised on technical quality of projects, appropriateness of programs, and adequacy of allocated resources. The results of this process from prior years may be found in the Annual SERDP Report to Congress that is available on the SERDP web site by selecting Publications & Products under the General Information button.

Of note, the breakdown of proposals reviewed by the TTAWGs is shown below.



ESTCP

More than 100 preproposals were submitted to the ESTCP Program Office from the private sector, academia, and federal organizations other than DoD in response to a solicitation for ideas concerning Unexploded Ordnance (UXO) Detection, Discrimination, and Remediation; In Situ Remediation of Contaminated Sediments; Characterization and Treatment of Range Contamination; and In Situ Remediation of Groundwater. These preproposals have been reviewed by a DoD review committee to ascertain each proposal's relevancy and utility for resolving these DoD environmental problems. Those with potential merit were asked to submit a full proposal and prepare a briefing to articulate the technical approach and environmental benefit to the Department.

Simultaneously, DoD proposers submitted more than 85 preproposals to ESTCP on a variety of issues in Cleanup, Compliance, Pollution Prevention, and UXO. These proposals have undergone a similar review by ESTCP review committees, with promising ideas being asked to submit a full technical proposal that will be reviewed in the July/August timeframe. At this Phase II review, all proposers, from DoD as well as private, academia, and other federal partners, will present their ideas to these multi-agency technical committees for downselection and recommendation to the Director of ESTCP for incorporation into the draft 2004 ESTCP Program. ◆

WHITMAN, from page 1

Resonance Enhanced Multiphoton Ionization (Jet-REMPI) and Laser Induced Breakdown Spectroscopy (LIBS). These instruments have applicability to hazardous air pollutants as well as chemical and biological agents and toxic industrial chemicals (CBTIC).

During the meeting with Administrator Whitman, Dr. Gullett demonstrated operation of the REMPI/LIBS system, highlighting a real-time, 15 parts per trillion capability for dibenzodioxin. A video presentation of the DoD/SERDP project highlighted the 3-D spectra (time, concentration, mass) of a DoD mobile generator start-up emissions, and a poster explained the applications to CBTICs. After instruction, Administrator Whitman ran a real-time LIBS analysis, discerning an anthrax surrogate (bacillus globigii) from common household powders.

The technology demonstrated to Administrator Whitman is the result of a collaborative effort between Dr. Gullett's EPA laboratory and the Army Research Laboratory, SRI International, and ARCADIS Geraghty & Miller. The SERDP and Homeland Security projects are supported by cooperative development from the U.S. Army Program Manager for Elimination of Chemical Weapons, Environmental and Monitoring Office.

For additional information about this research, please contact Dr. Brian Gullett, U.S. EPA Office of Research and Development, National Risk Management Research Laboratory, Research Triangle Park, NC, at (919) 541-1534 or via e-mail at gullett.brian@epamail.epa.gov. ◆

PROGRAM NOTES

- **MARK YOUR CALENDAR FOR SERDP AND ESTCP'S ANNUAL PARTNERS IN ENVIRONMENTAL TECHNOLOGY TECHNICAL SYMPOSIUM & WORKSHOP SCHEDULED TO BE HELD DECEMBER 2-4, 2003,** at the Marriott Wardman Park Hotel, Washington, DC. The Call for Poster Abstracts will close on August 22, 2003. If you are not yet in our mailing database, be sure to subscribe via one of our web sites so that you will receive the Registration & Program brochure that will be released late this summer.

S◆E◆R◆D◆P

- **THE FY 2002 ANNUAL REPORT TO CONGRESS** has been published and submitted. This Program Annual Report provides a summary of SERDP's activities and most significant accomplishments during FY 2002, its plans for FY 2003, and new initiatives to be undertaken during the year. The Annual Report is available on the SERDP web site by selecting Publications & Products under the General Information link.
- **QUARTERLY PROGRESS REPORTS** (i.e., the quarter's technical accomplishments, updated completion dates for milestones, and any concerns regarding technical/financial progress) for the third quarter of Government FY 2003 were due July 15, 2003. For assistance, contact your Program Manager Assistant.
- **THE SERDP SCIENTIFIC ADVISORY BOARD (SAB)** is scheduled to meet in Arlington, Virginia, in September and October to review primarily New Start projects.

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- **QUARTERLY REPORTS** for the third quarter of Government FY 2003 were due July 15, 2003. For assistance, please contact your Program Manager.
- **REQUESTED FULL PROPOSALS IN RESPONSE TO THE DOD CALL FOR PROPOSALS ARE DUE** to the ESTCP Program Office by 4:00 p.m. EST on August 7, 2003. (Note: This is a new requirement. See the FAQ on p. 4 for more information.)

E◆S◆T◆C◆P *(Continued)*

- **REQUESTED FULL PROPOSALS IN RESPONSE TO THE BROAD AGENCY ANNOUNCEMENT (BAA) ARE DUE** to the ESTCP Program Office by 4:00 p.m. EST on August 7, 2003.
- **NEW PUBLICATIONS NOW AVAILABLE ON THE ESTCP HOME PAGE** (www.estcp.org)

Cost and Performance Reports:

Cleanup

- Reductive Anaerobic Biological In Situ Treatment Technology (RABITT) Treatability Testing

Compliance

- Plasma Arc Destruction of DoD Hazardous Waste
- Reduction of Diesel Engine Particulate Emissions Using a Self-Regenerating Soot Filter

Pollution Prevention

- Alternatives to Solvent-Based Ink and Paint Stenciling for Identification Markings
- Closed Loop Energetics with VOC Emission Reduction (CLEVER)
- Powder Coating for Small-Arms Bullet Tip Identification

PARTNERS IN ENVIRONMENTAL TECHNOLOGY

STRATEGIC ENVIRONMENTAL RESEARCH AND DEVELOPMENT PROGRAM (SERDP)
&
ENVIRONMENTAL SECURITY TECHNOLOGY CERTIFICATION PROGRAM (ESTCP)

INFORMATION BULLETIN

SPRING 2003 NUMBER 16

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The Partners in Environmental Technology Information Bulletin is written and published quarterly by HydroGeoLogic, Inc., under contract DACA39-99-C-0002. All written information contained in the Information Bulletin is public and not copyrighted.

Information and ideas for future articles are always welcome. Address comments and suggestions to

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C◆A◆L◆E◆N◆D◆A◆R

FOR SERDP AND ESTCP

AUGUST 2003

August 7
ESTCP-requested full proposals due in response to the DoD Call for Proposals

ESTCP-requested full proposals due in response to the Broad Agency Announcement

August 22
Call for Poster Abstracts closes for SERDP and ESTCP's Partners in Environmental Technology Technical Symposium & Workshop

SEPTEMBER 2003

September 3-4
ESTCP Compliance Phase II Review Committee Meeting

September 4-5
ESTCP Pollution Prevention Phase II Review Committee Meeting

September 25
SERDP Executive Working Group (EWG) Meeting

September 10-12
SERDP Scientific Advisory Board (SAB) Meeting

September 15-17
ESTCP Cleanup Phase II Review Committee Meeting

September 18-19
ESTCP UXO Phase II Review Committee Meeting

RELATED CONFERENCES & EVENTS

August 3-8, 2003
The Ecological Society of America
88th Annual Meeting
Savannah, Georgia

For more information, visit http://www.esa.org/savannah/.

August 11-14, 2003
8th Annual Joint Services Pollution Prevention Conference & Exhibition
San Antonio, Texas

For more information, visit http://www.p2-hwmconference.com/index.cfm.

August 21-22, 2003
Marine Environmental Engineering Technology Symposium (MEETS)
Arlington, VA

For more information, visit http://www.navalengineers.org/Committees/CEE/CEE.html#TechSymp.

December 2-4, 2003
2003 Partners In Environmental Technology Technical Symposium & Workshop
Washington, DC
Sponsored by SERDP and ESTCP.

For more information, visit www.serdp.org or www.estcp.org or call the Symposium Contact Line at (703) 736-4548.

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