PARTNERS IN ENVIRONMENTAL TECHNOLOGY

SUMMER 2002
NUMBER 13

SERDP
Strategic Environmental Research and Development Program

ESTCP

INFORMATION BULLETIN

INSIDE THIS ISSUE

2 Success Stories

6 Program Development Update

6 Kudos

7 Program Notes

8 Calendar of Events

SERDP Workshop Lays Foundation for Range Sustainability R&D Agenda

Range sustainability, or the ability for the Department of Defense (DoD) to operate the ranges that are essential for realistic military training and testing for the foreseeable future in a manner that protects human health and the environment, has received notable attention in recent years. Multiple hearings in both the Senate and House over the last two years have addressed the current challenges plaguing DoD ranges such as encroachment, environmental regulations, and requirements of new weapon systems for more acreage for training and testing. Although SERDP has invested in research and development to address sustainable range issues since its inception, it has not managed these efforts through an overarching range sustainability framework. The need for a framework motivated SERDP to facilitate a workshop to gather information from range operators, trainers, testers, and planners and develop a strategic framework for future SERDP range sustainability research and development efforts. Held June 4-5, 2002, the Workshop resulted in two critical products: 1) a preliminary framework (i.e., goals, objectives, and strategies) and 2) a list of user needs associated with pertinent sustainable range issues. These products will serve to guide subsequent workshops conducted in specific topic areas that surfaced to refine a research and development plan and specific Statements of Need that will be used for future SERDP solicitations associated with range sustainability.

The building of the preliminary sustainable range strategic framework was based on a group analysis of perceived strengths and weaknesses internal to the DoD as well as an analysis of perceived opportunities and threats external to

See RANGE SUSTAINABILITY WORKSHOP, page 5

THE PARTNERS IN ENVIRONMENTAL TECHNOLOGY TECHNICAL SYMPOSIUM & WORKSHOP

"Meeting DoD's Environmental Challenges"

December 3-5, 2002
Marriott Wardman Park Hotel ■ Washington, D.C.

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....

- **Treatment of Range Contaminants**
- **Military Operations and Marine Mammals**
- **Greening the Industrial Complex**
- **Sustainable Ranges: Characterization, Fate & Transport, and Effects**
- **Sustainable Ranges: Air Quality & Noise Issues**
- **Greening the Force: Weapons Platforms**
- **Greening the Force: Weapons**
- **Reducing the Cost of Long-Term Remedial Actions**
- **UXO: Technologies & Data Processing**
- **UXO: Demonstration/Deployment**
- **Perchlorate Treatment and Toxicity**
- **Ecosystem Management for Threatened and Endangered Species**

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

FISH BONES USED TO REMEDIATE LEAD-CONTAMINATED SOIL

The old expression "one person's trash is another person's treasure" has been illustrated recently through a successful ESTCP-funded demonstration effort utilizing fish bones. While fish bones are garbage for most, innovative researchers examined their potential use as a cost-effective method for treating lead-contaminated soils. Known as Phosphate Induced Metal Stabilization or PIMS, this groundbreaking remediation technology is primarily composed of Apatite II or bones of fish. Apatite II is a natural component found in fish bones that chemically binds metals to stable and insoluble minerals.

The PIMS technology is applicable to numerous Department of Defense sites because of the large quantity of lead-contaminated soils on military ranges across the United States. Historically, the most common method for lead-contaminated soil clean up has been costly and has involved removal and disposal in a landfill. More recently, the PIMS technology has been investigated as a low cost alternative to landfill disposal.

The PIMS technology transitioned to field demonstration as part of the ESTCP project *PIMS — Remediation of Soil and Groundwater Contaminated with Metals* (CU-0020). The technology was demonstrated at Camp Stanley Storage Activity (CSSA) in Boerne, Texas. The site was formerly an open burn and open detonation area with soil lead contamination concentrations of 3,000 mg/kg and above. A soil mixing treatment was selected to remediate 500 cubic yards of soil. Following removal of the contaminated soil, a two-inch layer of Apatite II was used to line the treatment area. Contaminated soils then were mixed with 35 tons of Apatite II and spread with a backhoe. Subsequently, the treated area then was covered by clean soil and rocks followed by irrigation. System leachate was monitored, and concentrations of dissolved lead measured below the maximum contaminant levels (MCL) of 0.015 mg/L. As a result of the successful application of PIMS to this initial test area, an additional 2,500 cubic yards of CSSA soils were remediated using a similar process. Soil was mixed with 5 percent Apatite II by weight and covered with clean soil without the need of the two-inch Apatite II liner layer. Shallow monitoring wells were placed in the treated area, and the soil was seeded with indigenous wildflowers and grasses. Initial leachate monitoring results indicate concentrations well below the MCL for lead. Additional monitoring is currently under way.

A bag of Apatite II is applied to the treatment area at Camp Stanley Storage Activity by a backhoe.

The project team led by Dr. Judith Wright of UFA Ventures and Dr. James Conca of Los Alamos National Laboratory has developed other uses for Apatite II as well. It has been determined that permeable reactive barriers (PRB) consisting of Apatite II can be emplaced in an excavated trench that intersects groundwater flow to treat lead, uranium, zinc, and cadmium. In another application, a home gardener commercial product is advertised to keep heavy metals out of vegetables and is being test marketed in Washington State.

For further information about this technology, please contact Dr. Judith Wright, UFA Ventures, Inc., Richland, WA, at (509) 528-1444 or via e-mail at judith@ufaventures.com. ◆

SERDP
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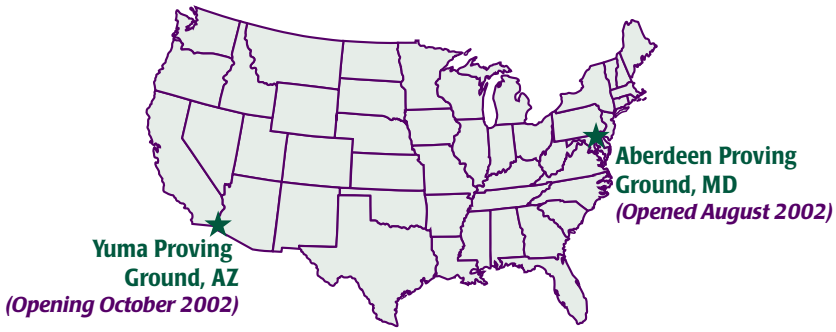
NEW CAPABILITY

SERDP FUNDS UXO STANDARDIZED TEST SITES

To support the transfer and restoration of contaminated Department of Defense (DoD) land, advancements are necessary in technology that can detect unexploded ordnance (UXO) and discriminate it from harmless ordnance fragments and other nonordnance items. Technologies under development for the detection and discrimination of UXO require testing so that their performance can be characterized. To that end, standardized test sites currently are being developed under SERDP project *UX-1300: Standardized UXO Technology Demonstration Sites* to provide a diversity of geology, climate, terrain, and weather, as well as diversity in ordnance and clutter. Testing at these sites will support characterization technologies, track performance with system development, compare performance of different systems, and compare performance in different environments, all on consistently constructed sites with common protocols.

This project, spearheaded by the U.S. Army Environmental Center, will provide a screening matrix of system performance, a series of standardized site protocols, a standardized target repository, and a variety of technology transfer materials. The sites at Aberdeen Proving Ground (APG), MD, and Yuma Proving Ground (YPG), AZ, are currently under construction. The APG site opened in August 2002 and the YPG site is scheduled to open in October 2002.



Standardized sites currently are under construction at locations with varying environmental conditions for comparison of systems used for detection and discrimination of UXO.

Each site will include a calibration grid, a blind grid, and an open-field scenario. The calibration grid will allow demonstrators to test their systems with complete access to truth data on a variety of ordnance targets and clutter objects. In the blind grid, the demonstrators will be provided the location of each opportunity, but the contents, either ordnance, clutter, or nothing, will be unknown. The blind grid will allow for sensor characterization in the absence of uncertainties due to navigation and site coverage. The open-field scenarios will test the performance of the technologies in multiple acre sites with ordnance and clutter emplaced at unknown locations, simultaneously stressing sensors, platforms, navigation systems, and processing. The open fields also will present special challenges including wooded areas, mogul/crater areas, adjacent power lines, steep terrain, and desert extremes.

Performance information gathered on various UXO detection and discrimination technologies via the standardized test sites will aid local project managers in determining appropriate systems for specific applications. Standardized procedures and methodologies developed as part of this project will help to ensure that performance metrics such as system efficiency, detection capability, discrimination capability, and false alarm rates are accurate and comparable. Data gathered in the process of characterizing and testing sensors and systems will support future research and development efforts and will hasten the development of more efficient remediation operations.

For more information about this project, please contact Mr. George Robitaille, U.S. Army Environmental Center, Aberdeen Proving Ground, at (410) 436-6865 or via e-mail at george.robitaille@aec.apgea.army.mil. ◆

For more information about this new capability you may also visit http://aec.army.mil/usaec/technology/uxo03.html. Also, be sure to stop by the poster presentation highlighting this project at the upcoming *Partners in Environmental Technology Technical Symposium & Workshop* in December.

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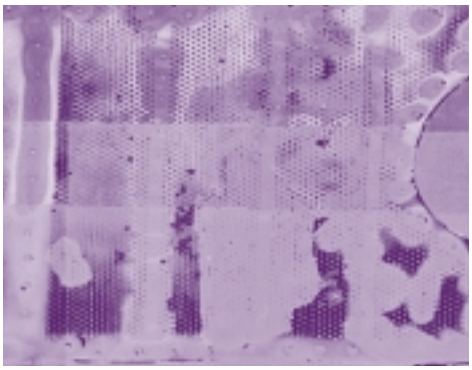
SUCCESS STORY

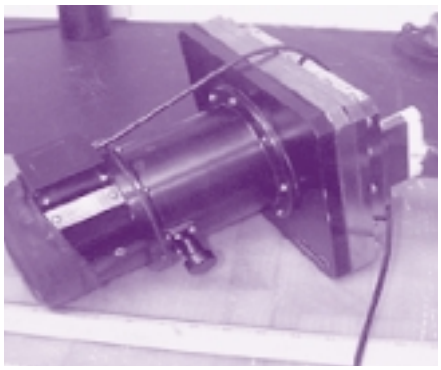
SERDP PROJECT DEVELOPS INNOVATIVE NONDESTRUCTIVE EVALUATION TECHNOLOGIES

The Department of Defense (DoD) has numerous high performance weapon platforms that require stringent monitoring of structural integrity given the low tolerance of these structures for corrosion and/or cracks. Inspection of these substrates for corrosion, fatigue cracking, and other operationally induced damage is very time consuming and costly, often necessitating the removal and subsequent replacement of the coating system, not to mention the handling of the hazardous wastes associated with these materials and processes. The paint, stripping, and repainting process generates significant and costly pollutant streams containing toxic solids, volatile organic compounds (VOC), and hazardous air pollutants (HAP). Today's more stringent environmental regulations are limiting emissions of the VOCs and HAPs, and DoD efforts to attain compliance have identified removal and reapplication of coatings as major contributors to the emissions problems at DoD facilities. Developing realistic and practical nondestructive inspection technologies for "inspection-through-paint" is considered to be one means by which the DoD can extend the service life of coatings systems, extend the life of aging weapons systems, meet the increasingly stringent environmental requirements, and increase operational capability with limited assets.

To address this need for nondestructive detection of cracks and corrosion under coatings, SERDP sponsored a multi-year research effort aimed at developing and evaluating three different innovative nondestructive evaluation technologies for the detection of fatigue cracks and corrosion hidden under paint. The project, *Development of Innovative Nondestructive Evaluation Technologies for the Inspection of Cracking and Corrosion Under Coatings (PP-1134)*, was led by a scientific team from the Naval Surface Warfare Center Carderock Division (NSWCCD) and the Naval Air Warfare Center Aircraft Division (NAWCAD) with participation from scientists within private industry and academia (Imperium, Inc., Wayne State University, Thermal Wave Imaging, Inc., Texas Research Institute/Austin, and Colorado State University). The three technologies investigated included **real-time ultrasound imaging, thermal imaging,** and **near-field microwave imaging.** These technologies were selected and developed for their potential to inspect areas rather than points (translating into efficient inspection scan rates), portability to the job site, overall projected economy to implement, and relative technology maturity. Highlights of the research are summarized below.



Large composite thermographic image of F-18 intake panel created from eight smaller individual images.



The benefit of the ultrasound Acoustocam reflection imaging camera is its ability to provide real-time data.

Three different configurations of camera [through transmission, reflection (pulse-echo), and oblique angle beam] were developed by Imperium, Inc., for the **ultrasound imaging** technique in order to acquire an image of a sample in real-time. All of the camera systems were designed to be portable and demonstrated the ability to detect light corrosion and fatigue cracks under paint. The **thermal imaging** techniques pursued by Thermal Wave Imaging and Wayne State University were fairly successful in their ability to detect light corrosion and fatigue cracks under paint. Thermal Wave Imaging evaluated the use of inductive heating, laser diode heating, and pulse heating (flash lamps) as means to produce the heat gradients necessary to obtain thermographic images of test samples. The pulse heating technique was found to be very useful for the detection of hidden corrosion and showed the most promise for transitioning into the field given its portability. The main shortcoming of the pulse thermography system was the inability of the system to locate fatigue cracks consistently because of the low thermal contrast between the base metal and the crack. In contrast, the sonic thermography system developed by Wayne State University was very effective in locating fatigue cracks in samples. Studies still need to be performed to determine the capabilities of sonic thermography

See EVALUATION TECHNOLOGIES, page 5

EVALUATION TECHNOLOGIES, from page 4

for the detection of hidden corrosion. The **near-field microwave imaging** investigation conducted by Colorado State University and Texas Research Institute showed a high potential for detecting corrosion in aluminum under a layer of paint and primer using open-ended rectangular waveguide probes. Researchers at Colorado State University also demonstrated successfully the use of these probes and coaxial probes for locating cracks under coatings. Coaxial probes were found to be less susceptible to edge effect issues than the open-ended rectangular waveguide probes. While near-field microwave imaging techniques have demonstrated proof-of-principle concepts, further work is necessary before these techniques would be viable for field use.

This project's research has led to the advancement of nondestructive evaluation technologies for the inspection of fatigue cracks and corrosion hidden under coatings. An application has been made by Imperium, Inc., and the Naval Air Warfare Center Aircraft Division (NAWC-AD) for the issuance of a patent based on the oblique angle beam real-time ultrasound imaging system. As a direct consequence of this work, Imperium also is fabricating the first through transmission real-time ultrasound imaging system for Boeing/Vertol in Philadelphia. Finally, Thermal Wave Imaging, Inc., developed and demonstrated a field portable pulse thermography unit for the inspection of corrosion hidden under paint.

For further information about this project, please contact Dr. Kirsten Lipetzky, Naval Surface Warfare Center Carderock Division, Welding and NDE Branch, West Bethesda, MD at (301) 227-5074 or via e-mail at lipetzkykg@nswccd.navy.mil. ◆

RANGE SUSTAINABILITY WORKSHOP, from page 1

the DoD. The geographical distribution of ranges and the diversity of range environments are examples of strengths that were identified, whereas the limited size and shape of ranges were considered weaknesses since the physical dimensions of ranges are no longer meeting mission needs. Examples of external opportunities and threats included increased public interest in collaboration with DoD and increased pressure from environmental regulators, respectively. This set of lists was used to generate ideas on how to capitalize on strengths and opportunities and how to address weaknesses and threats.

Using these strengths, weaknesses, opportunities, and threats, the Workshop participants helped to develop a set of objectives and strategies. This led to a discussion and the formulation of specific user needs to be considered under a research and development plan. Examples of user needs included: 1) Detection/spotting of training munitions (specific to residues and fires/hot spots), 2) Noise propagation models that are accessible and user friendly to the range community, and 3) Characterization of the energetic residues on the ranges and their fate and transport in the soil and water.

Throughout the two and one-half day intensive Workshop, participants noted the valuable exchange between the disciplines, perspectives, and services represented. This forum enabled the development of the preliminary strategic framework and list of user needs. These two products now will serve as the building blocks for SERDP to construct a research and development agenda that is coordinated with other DoD efforts and germane to the needs of range operators. SERDP Staff already are planning future opportunities to expand on this framework through additional workshops as well as at the upcoming annual *Partners in Environmental Technology Technical Symposium & Workshop*, December 3-5, 2002, at the Marriott Wardman Park Hotel, Washington, D.C. Four of the twelve technical sessions scheduled for the Symposium directly address environmental issues related to sustainable range management.

For further information about the Sustainable Range Workshop, please contact Ms. Eileen Regan, SERDP Support Office, at (540) 869-0477 or via e-mail at eregan@hgl.com. For additional information about the upcoming Symposium & Workshop sponsored by SERDP and ESTCP, please visit our web site at http://www.serdp.org/symposiums/2002/announcement.pdf or call the Symposium Contact Line at (703) 736-4548. ◆

Program Development Update

Both SERDP and ESTCP FY 2003 proposals are entering the final review stage. An announcement of selection/award should be made by October 1.

SERDP

SERDP received 136 full proposals in response to the FY 2003 Call for Proposals. All were reviewed by a set of independent peer review panels by early May. Based on the peer review recommendations, 66 were sent on to the multi-agency Technology Thrust Area Working Groups (TTAWG). In late June and early July, these TTAWGs deliberated for one to two days in order to pare down these very competitive proposals. While incorporating the peer review comments on the key metrics of technical merit and personnel, the TTAWGs also included transition potential, cooperative development, and cost into their deliberations to develop a priority listing of proposals that could best meet the requirements as stated in each of the 17 Statement of Needs. Once the TTAWGs submitted their recommendations for funding to the Program Office, the SERDP Technical Director and Staff selected the top proposal(s) to be briefed to the SERDP Scientific Advisory Board (SAB) which is scheduled to review these proposals through September. (Note: SEED proposals are not reviewed by the SAB). Using the recommendations of the SAB, the Executive Director will formulate a draft FY03 Program Plan and submit it to the Executive Working Group in mid September and then, to the SERDP Council for final approval in late September. Approved projects will receive their funding in FY03. Unsuccessful bidders have been notified.

ESTCP

After completing their Phase I review of 87 DoD proposals, the ESTCP Review Committees selected 27 of these proposals to return for full briefing to the Committees at their Phase II reviews. Concurrently, 83 preproposals were submitted by either industry, academia, or non-DoD Federal organizations. ESTCP has asked 19 of these proposers to submit full proposals and brief them at the Phase II reviews in August. DoD points-of-contacts have been selected who will assist the project leads to focus the proposal on real DoD issues at DoD locations. The ESTCP Review Committees have been charged with creating a prioritized list of projects for the ESTCP Director's consideration in developing a draft FY03 Program Plan. This Plan will be submitted, after Congress has appropriated funding, to the Deputy Under Secretary of Defense for Installations and Environment for final approval. All bidders will receive notification of review results. ◆

Congratulations to . . .

SERDP Scientific Advisory Board (SAB) member **Dr. Lily Y. Young** who has been named laureate of the 2002 Proctor & Gamble Award in Applied & Environmental Microbiology. Dr. Young, Professor of Environmental Sciences at the Biotechnology Center for Agriculture and Environment at Rutgers University, was honored for sustained accomplishment in environmental microbiology and bioremediation and for innovation that has bridged gaps in the creation of an interdisciplinary science that combines microbiology, environmental engineering, and chemistry. With a large body of work dating back to the 1970s, Dr. Young is a world leader in both the characterization of anaerobic microbes and their applications for the cleanup of contaminated environments. In May, Dr. Young delivered the General Meeting Procter & Gamble Award Lecture *"Anaerobic Processes in the Environment and the Biodegradation of Hydrocarbons and Related Compounds"* in Salt Lake City, Utah.

SERDP Principal Investigator **Dr. Virginia H. Dale** who has been named corporate fellow by University of Tennessee-Battelle (UT-Battelle), Oak Ridge National Laboratory (ORNL) managing contractor. Earlier this summer, ORNL Director and UT-Battelle Chief Executive Officer Bill Madia announced the appointment, which is made on a limited basis to recognize "exceptionally gifted individuals throughout the organization for their outstanding technical achievements in science or engineering." The appointment of Dr. Dale brings the number of active corporate fellows to 27.

Dr. Dale was honored for pioneering the development and application of ecological models for understanding disturbance and its effect on ecosystems and applications for decision-making. Her citation reads, in part, "She has shaped the field of applied ecology. Her work has influenced the land management of some of the largest land holders in the world. She has helped formulate the U.S. Environmental Protection Agency's research program on landscape ecology." She also has worked with SERDP to develop ecological models and ecosystem indicators to assist in resource management.

SERDP Principal Investigator **Mr. Alan Fletcher** of the Air Force Research Laboratory's Materials &

See CONGRATULATIONS, page 7

PROGRAM NOTES

- **MARK YOUR CALENDARS FOR SERDP AND ESTCP'S ANNUAL PARTNERS IN ENVIRONMENTAL TECHNOLOGY TECHNICAL SYMPOSIUM & WORKSHOP SCHEDULED TO BE HELD DECEMBER 3-5, 2002,** at the Marriott Wardman Park Hotel, Washington, D.C. For more information about this event, visit either web site (www.serdp.org or www.estcp.org), call our contact line at (703) 736-4548, or send an e-mail to partners@hgl.com.
- **THE FINAL REPORT FROM THE EXPERT PANEL WORKSHOP SPONSORED BY SERDP AND ESTCP ON RESEARCH AND DEVELOPMENT NEEDS FOR CLEANUP OF CHLORINATED SOLVENT SITES HAS BEEN PUBLISHED.** The Final Report outlining science and technology focus areas for the clean up of chlorinated solvents and SERDP and ESTCP's potential approach to address DoD sites contaminated with chlorinated solvents can be viewed at www.estcp.org/documents/techdocs/chlorsolvcleanup.pdf or www.serdp.org/news/other_events/2001/chlorsolv/ChlorSolvCleanup.pdf.

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- **QUARTERLY PROGRESS REPORTS** (i.e., the quarter's technical accomplishments, updated completion dates for milestones, and any concerns regarding technical/financial progress using SPIRS) for the fourth quarter of Government FY 2002 are due by October 15, 2002. For assistance, contact your Program Manager Assistant.
- **THE SERDP SCIENTIFIC ADVISORY BOARD (SAB)** is

S◆E◆R◆D◆P *(Continued)*

scheduled to meet in Falmouth, Massachusetts, September 17-18 and in Arlington, VA, October 15 to review primarily FY 2003 New Start projects.

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- **QUARTERLY REPORTS** for the fourth quarter of Government FY 2002 are due October 15, 2002. For assistance, please contact your Program Manager.

CONGRATULATIONS, from page 6

Manufacturing Laboratory who in April was selected not only as the Air Force's recipient of the 2001 Defense Standardization Program Achievement Award but who also was selected to receive the top prize for outstanding achievement across all of the Department of Defense (DoD). Mr. Fletcher led a DoD-wide effort to convert from military specifications and Qualified Products Lists (QPL) to non-Government standards (NGS) in the areas of aerospace sealants and aerospace elastomeric seals. As a result of his efforts, consensus industry standards have been developed to replace military specifications, and an industry QPL program has been established. This has had a great effect on Air Force and Navy Programs such as the F-22, where NGSs and PRI QPLs are used instead of each company producing its own unique specifications and associated QPLs. In conjunction with these efforts, Mr. Fletcher played an important role in the development of the National Defense Contractor Accreditation Program (NADCAP) that has been used in sealer and elastomer specification to evaluate the quality systems for suppliers and distributors. As a result of this program, the number of product returns has decreased by 90 percent as shown by GSA and vendor data. ◆

PARTNERS IN ENVIRONMENTAL TECHNOLOGY

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

INFORMATION BULLETIN

SUMMER 2002 NUMBER 13

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C◆A◆L◆E◆N◆D◆A◆R

FOR SERDP AND ESTCP

SEPTEMBER 2002

September 12
SERDP Executive Working Group (EWG) Meeting

September 17-18
SERDP Scientific Advisory Board (SAB) Meeting

September 26
SERDP Council Meeting

OCTOBER 2002

October 7-11(tentative)
SERDP In-Progress Review (IPR) Meeting

October 15
SERDP Quarterly Progress Reports Due for the Fourth Quarter of Government FY 2002

October 15
ESTCP Quarterly Reports Due for the Fourth Quarter of Government FY 2002

October 15
SERDP Scientific Advisory Board (SAB) Meeting

NOVEMBER-DECEMBER 2002

November 7
The FY 2004 Core Solicitation for SERDP as well as the Solicitation for the SERDP Exploratory Development (SEED) Program To Be Released on or about This Date

December 3-5
SERDP and ESTCP Partners in Environmental Technology Technical Symposium & Workshop

RELATED CONFERENCES & EVENTS

October 21-24
The Annual International Conference on Contaminated Soils, Sediments, and Water
University of Massachusetts at Amherst
Amherst, MA

For information, visit http://www.umasssoils.com.

INFORMATION
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