DoD EPA DOE SERDP

ANNUAL REPORT TO CONGRESS— FISCAL YEAR 1996

A REPORT BY THE SCIENTIFIC ADVISORY BOARD OF THE STRATEGIC ENVIRONMENTAL RESEARCH AND DEVELOPMENT PROGRAM

March 1997

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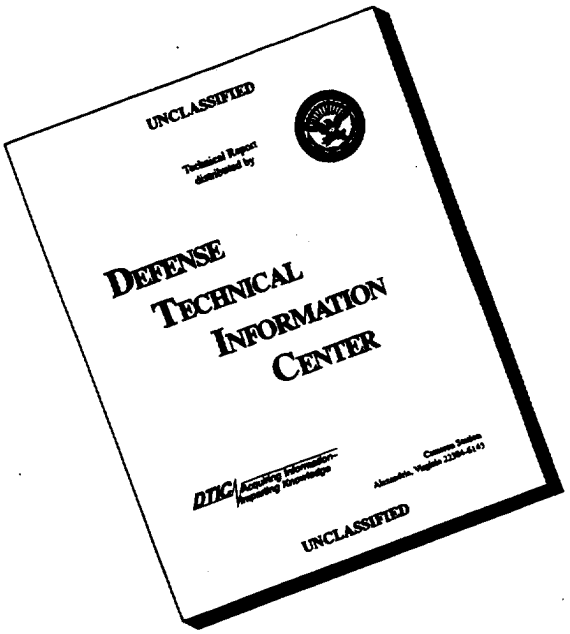

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February 25, 1997

Dr. Anita K. Jones
Director, Defense Research and Engineering
3030 Defense Pentagon
Washington, DC 20301-3030

Dear Dr. Jones:

On behalf of the Strategic Environmental Research and Development Program (SERDP) Scientific Advisory Board (SAB), I am forwarding the FY 1996 SAB Annual Report to you for submission to Congress.

During FY96, the SAB continued and expanded its activities and involvement with SERDP. The Board reviewed 16 continuing projects, valued at $29.6 million, and 22 FY96 and FY97 new start proposals, valued at $14.0 million. Board members continued their participation in the annual SERDP In-Progress Reviews that were initiated in FY94. In addition, the SAB participated in a complete review of SERDP's National Environmental Technology Test Sites (NETTS) program.

In the past year, the Board has devoted significant attention to formulating the SAB's collective view on SERDP's scientific opportunities and priorities and how best to utilize the expertise and experience of the SAB in making recommendations to the Council. The results of these deliberations are incorporated as an Executive Statement at the beginning of this Annual Report. I urge you, in reviewing the report, to note this section in particular and to share the SAB's thoughts with others.

Following direction from the SERDP Council, SERDP is now entirely focused on defense mission-related environmental requirements. The SAB fully supports this refocusing of SERDP. At the same time, the Board encourages SERDP to continue to be a forward-looking program and to avoid the tendency toward low-risk, incremental approaches for solving today's problems. Because of its unique, multi-agency nature, SERDP can capitalize on the expertise of other agencies and institutions and serve as a catalyzer inside and outside of government to promote long-term, strategic solutions to important environmental problems.

An example of SERDP's strategic focus relates to the SAB's attention to adaptive ecosystem management. This concept is increasingly adopted by policy makers and land managers. Yet, much of the fundamental ecological knowledge needed to address applied ecosystem management problems comprehensively at management scales of space and time is lacking. The SAB has recommended that SERDP identify areas of scientific deficiencies and corresponding research opportunities focused on the applied problems of defense installations. As a result of this SAB initiative, the SERDP Program Office has started the planning process for a workshop on Management Scale Ecological Research scheduled to be held in the Spring of 1997.

The SAB is pleased with the increased scientific quality of the proposals presented to the Board for review during FY96. Technical quality of the Program is fundamental to ensure that the Department of Defense reaps the most benefit from its investment. The Board strongly encourages and applauds the initiatives to embrace the widest possible competition through direct participation of non-Federal organizations and the increased use of outside peer review for the technical evaluation of proposals.

Finally, I want to thank you for your support of SERDP.

Sincerely,

Walter J. Weber, Jr.
Chair
SERDP Scientific Advisory Board

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This document was prepared for the Executive Director, Strategic Environmental Research and Development Program (SERDP), on behalf of the SERDP Scientific Advisory Board (SAB) by

HydroGeoLogic, Inc.

under Contract Number DACA39-95-D-0023. Questions regarding SERDP should be directed to the SERDP Program Office located at 901 North Stuart Street, Suite 303, Arlington, VA, 22203.

FOREWORD

Section 2904(h) of title 10, United States Code, requires that an annual report of the Strategic Environmental Research and Development Program (SERDP) Scientific Advisory Board (SAB) be submitted to Congress no later than March 15 of each year. The Annual Report is required to describe the actions of the SAB during the preceding year and to provide any recommendations, including recommendations related to projects, programs, information exchange, and additional legislation within the scope of SERDP. This is the fifth Annual Report of the SERDP SAB and includes SAB activities and Program recommendations during FY96.

SAB EXECUTIVE STATEMENT

The Strategic Environmental Research and Development Program (SERDP)

As evident in both its title and its legislative history, Congress clearly intended a strategic focus for this environmental research and development program. "Strategic" is defined in Webster's Dictionary as meaning "of great importance within an integrated whole or to a planned effect." SERDP is, in fact, an R&D program of great importance within the broad Department of Defense (DoD) context; one that contributes significantly to the successful resolution of defense-related and national security environmental concerns; past, present, and future.

SERDP was established by Congress in Public Law 101-510 (Title 10, U.S.C., §§2901-2904) as a Department of Defense (DoD) program planned and executed in partnership with the Department of Energy (DOE) and the Environmental Protection Agency (EPA) to:

1. Address environmental matters of concern to the DoD and DOE through support for environmental basic and applied research and development of technologies.
2. Identify research, technologies, and other information developed by the DoD and DOE for national defense purposes that would be useful to governmental and private organizations, and share such information with governmental and private organizations.
3. Furnish other governmental and private organizations with data, enhanced data collection capabilities, and enhanced analytical capabilities for use by such organizations in the conduct of environmental research.
4. Identify technologies developed by the private sector that are useful for Department of Defense and Department of Energy defense activities concerning environmental restoration, hazardous and solid waste minimization and prevention, and hazardous material substitution.

SERDP is the Department of Defense's "corporate" environmental quality R&D program encompassing cleanup, compliance, conservation, and pollution prevention. It is fully integrated with and complementary to the individual Services' Environmental Quality programs, which by nature are more tactical in focus and purpose. As such, SERDP addresses high priority, mission relevant requirements focusing on needs that are common across two or more Services. As a "corporate" R&D program, SERDP should be proactive and visionary as opposed to reactive and, as such, should focus on undertaking high-risk, potentially high-payoff research and development projects. Such projects are commonly long term in nature and, in all cases, projects that are best carried out by partnerships among the Services, other participating Federal agencies, academia, and the private sector.

SERDP must address not only defense industrial complex and DoD force readiness-related environmental concerns and issues, but also strategic environmental issues of concern to long-range national security policy formulation, decision making, and management. Environmental degradation directly impacts both human and ecological health and well-being, as well as indigenous natural resources and economic viability. Environmental integrity is thus recognized clearly as key to the economic and social welfare of nations.

Associated characteristics consistent with a "strategic" defense R&D program:

- essential for the solution of major defense mission-readiness related problems;
- scientifically plausible;
- focused on areas where progress under other program sponsorship in DoD and/or other agencies is not sufficient or satisfactory;
- catalytic in nature to initiate, organize, and accelerate essential research in partnership with the Federal and private sector; and
- provides sufficient proof of principle demonstrations to attract follow-on Research Development Test & Engineering (RDT&E) support.

The Role of the SERDP Scientific Advisory Board

The function of the Scientific Advisory Board (SAB) is to enhance Program quality. This function is addressed both by rigorous reviews of the scientific and technical quality and relevance of proposed and on-going projects and by providing the SERDP Council with guidance on new areas of scientific opportunity relevant to the Program. Consistent with this mission, the SAB may annually provide consensus input to the SERDP Executive Director on strategic research needs.

Title 10 U.S.C.S. 2904 establishes the Scientific Advisory Board (SAB) and directs the Board to:

- review all projects valued in excess of one million dollars for technical quality and appropriateness for SERDP funding;
- make recommendations to the SERDP Council regarding technologies, research, projects, programs, activities, and, if appropriate, funding within the scope of the SERDP;
- submit to the Congress an annual report setting forth its actions during the year preceding the year in which the report is submitted and any recommendations, including recommendations on projects, programs, and information exchange and recommendations for legislation, that the Advisory Board considers appropriate regarding the Strategic Environmental Research and Development Program.

The collective knowledge and experience of the SAB have been effectively utilized for the past four years on critical review of proposed projects. More recently, the SAB has thoroughly reviewed the progress made throughout SERDP to identify technology "gaps." For the future, our function shall expand to define science and engineering opportunities for the Program and contribute to the annual process of developing the Statements of Need that define future efforts.

SAB Views on SERDP Program Development

To build upon SERDP successes and enhance Program quality, the SAB supports a proposal solicitation/evaluation process that:

- embraces the widest competition possible through the introduction of direct participation of non-Federal research capabilities;
- increases the use of outside peer review for the technical evaluation of proposals and the conduct of projects; and
- emphasizes the leveraging of Federal participant and private partner capabilities.

The SAB considers technology transfer of paramount importance. As one of the basic keys to SERDP's success, continued emphasis on the transfer of technology among the DoD, DOE, EPA, other Federal organizations, and the private sector is essential to a successful and robust R&D program. The Board endorses and encourages the four avenues of technology transfer currently emphasized by the Executive Director, i.e., publication in the open literature, transition to further development, implementation by operational programs, and commercialization. These avenues ensure that the benefits of SERDP projects, be they basic research or prototype demonstration, are fully and effectively realized and employed.

SAB Views on SERDP Program Future

SERDP has transferred significant advances in environmental technology to the Departments of Defense and Energy, industry, and academia for the good of our nation. The SAB clearly recognizes:

- the value of SERDP to our nation;
- that project results are enhancing military readiness and operational effectiveness;
- that defense unique capabilities can and do have a direct impact on our ability to understand and deal with complex environmental conditions on a global, regional, and ecosystems scale; and
- that SERDP's multi-agency management approach provides value-added above the Services' Environmental Quality technology programs.

Further, the SAB views with concern the continual erosion of fiscal support to the SERDP. Accordingly, the SAB wholeheartedly endorses SERDP and recommends full and continued backing by the Department of Defense.

ORGANIZATION AND PROCESS

The SERDP Management Structure

The organization chart in Figure 1 illustrates the functional management structure of SERDP. General oversight of SERDP and policy guidance is provided by the SERDP Council which has representatives from each of the three major participants (DoD, DOE, and EPA). An Executive Working Group (EWG) that is representative of the Council formulates recommendations on policy and program content, and an Executive Director coordinates the efforts of all program participants. The Technology Thrust Area Working Groups (TTAWGs) were established by the EWG to facilitate technical reviews of SERDP research proposals and to assist the Executive Director in the program development process. The SAB is responsible for providing advice and recommendations to the SERDP Council on those programs reviewed.

FY96 SAB Membership and Meetings

Section 2904(a-c) of title 10 U.S.C. requires the joint appointment of members of the Scientific Advisory Board by the Secretary of Defense and the Secretary of Energy, in consultation with the Administrator of the EPA. Membership on the SAB is consistent with legislative requirements. Dr. Walter J. Weber, Jr., and Mr. Amos S. Eno served as the SAB Chair and Vice-Chair, respectively, during FY96 and were nominated and elected for another term in their current positions. During this fiscal year, Dr. Rosina M. Bierbaum (current SAB member) and Dr. Robert Watson served as the designee for the Assistant to the President for Science and Technology. Mr. Robert S. Winokur (current SAB member), Dr. Kathryn D. Sullivan, and Dr. Ned A. Ostenso also served as statutory members representing the Administrator of the National Oceanic and Atmospheric Administration. In addition, during FY96, Mr. Richard A. Carpenter, Dr. Raymond C. Loehr, and Dr. Lydia W. Thomas were appointed to the SAB. The following SAB members continued their terms during FY96: Mr. Richard A. Conway, Dr. Marvin K. Moss, Dr. Frank L. Parker, and Dr. Michael J. Ryan. Dr. Rita R. Colwell and Ms. Mary A. Gade completed their terms in FY96. Appendix A contains a short biographical summary of each SAB member during FY96.

During FY96, Dr. John Harrison continued his term as the Executive Director of SERDP. He was the designated employee of the Federal government for attending the SERDP SAB meetings in accordance with the requirements of Subsection 10(e) and (f) of the Federal Advisory Committee Act. During FY96, Dr. Harrison called each of the meetings, approved the agendas, and attended all of the four scheduled meetings of the SERDP SAB. A list of the SAB meetings held during FY96 is provided in Table 1.

As requested by the Executive Director, during FY96 the Scientific Advisory Board reviewed all proposed new research projects as well as continuing projects with a funding request approaching or in excess of $900 thousand, made recommendations to the SERDP Council through the Executive Director regarding the programs reviewed, and assisted and advised the Council in

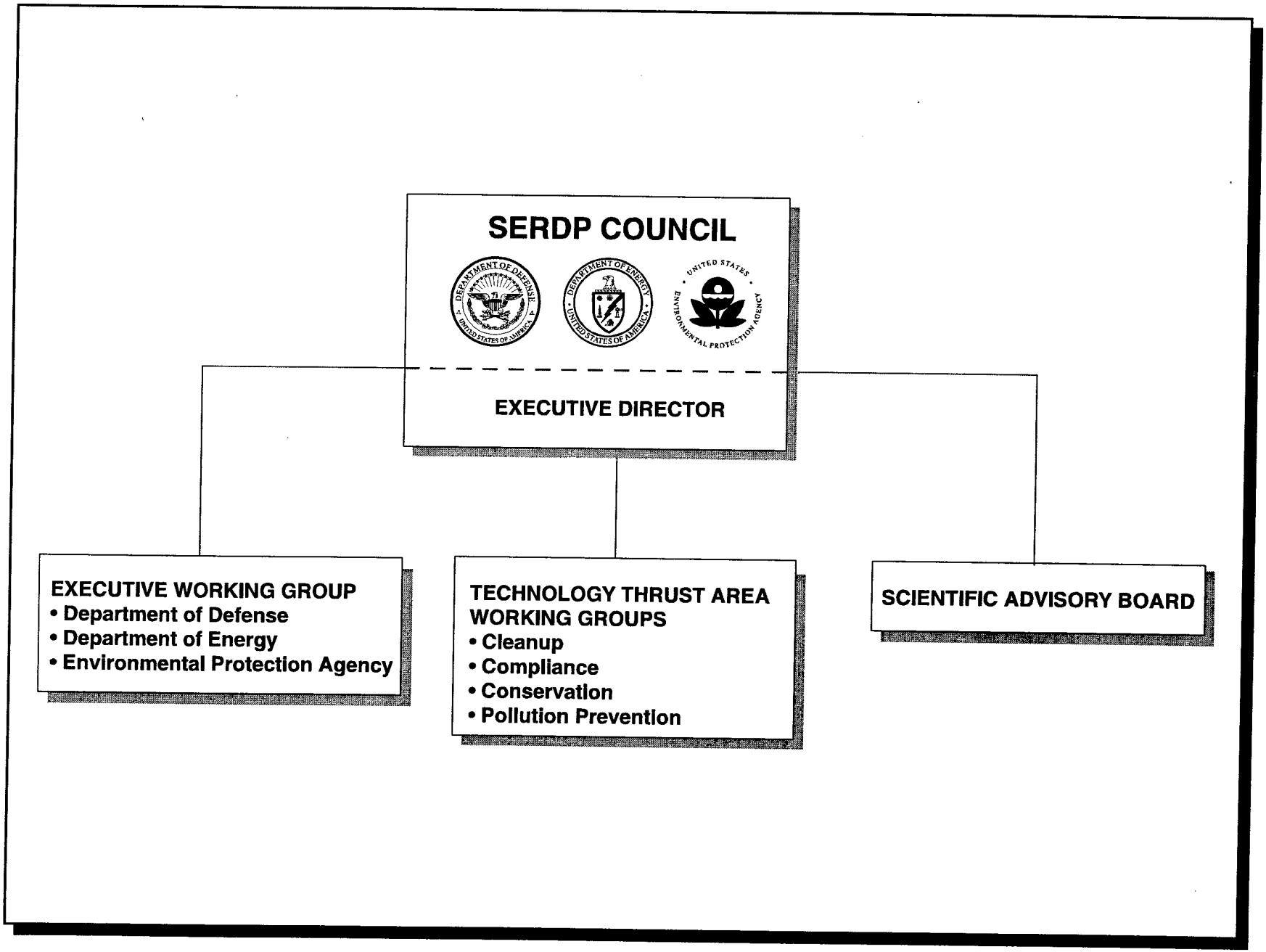

Figure 1 SERDP Organization

SAB Meeting No.	Dates	Location	Total No. of Projects Briefed
1	October 24-25, 1995	Federal Highway Administration Conference Room Arlington, VA	8
2	February 6-7, 1996	Radisson Plaza Hotel at Mark Center Alexandria, VA	9
3	July 9-11, 1996	Federal Highway Administration Conference Room Arlington, VA	14
4	August 13-15, 1996	Federal Highway Administration Conference Room Arlington, VA	14

Table 1 - Summary of FY96 SAB Meetings

identifying environmental data within the scope of SERDP. Additional responsibilities of the SAB included providing advice and recommendations on other environmental issues within the scope of SERDP.

During its first meeting of FY96, the Scientific Advisory Board reviewed four new start and four ongoing projects (including four return briefings to address SAB requests for additional information); one new start and eight ongoing projects during the second meeting (including one return briefing); seven new start and seven ongoing projects during the third meeting (including two return briefings); and 12 new start and two ongoing projects during the fourth meeting. Taking into account re-briefs on several proposals, the SAB reviewed 38 different proposals.

In accordance with the Federal Advisory Committee Act, announcements of all meetings were published in the Federal Register; the meetings were open to the public; detailed minutes were taken; and all records, reports, minutes, working papers, and agendas were made available for public inspection.

ACTIVITIES AND EVENTS

In addition to its essential role of providing scientific review and technical and funding recommendations regarding projects funded, or considered for funding by SERDP, the SAB in FY96 devoted significant attention to discussing the scientific direction of, and opportunities for, the SERDP Program and ways to enable the SAB to function more effectively. At each of its four meetings, the Board set aside time for strategy sessions.

The Board discussed criteria by which to evaluate projects, including scientific quality of the research, especially with regard to innovation, responding to multi-service requirements, and qualifications of the Principal Investigators (PIs).

During the strategy sessions, the Board members also discussed the most effective way to respond to the SAB's charge as prescribed in 10 U.S.C. 2904 with regard to both the procedures to review individual projects and provide funding recommendations, as well as to provide recommendations regarding strategic technology and research areas.

Section 2904 of title 10 authorizes the SERDP SAB to develop procedures for carrying out its responsibilities. Consistent with this authority, the SAB in FY96 adopted modified bylaws (Appendix C) which clarified the procedures for notification of SAB meetings and the procedures for ratification of SAB actions taken in the absence of a quorum.

In order to improve the effectiveness of the SAB project review process, the Board assigned sub-committees to better handle more detailed information on specific projects and to provide follow-on review of issues and questions raised during the project review process. The sub-committee assignments were made, during the August meeting, on the basis of preference and expertise, as follows.

Cleanup:	Mr. Conway, Dr. Loehr, Dr. Parker, Dr. Ryan, Dr. Thomas, and Dr. Weber.
Compliance:	Dr. Bierbaum, Mr. Conway, Mr. Eno, Dr. Loehr, and Dr. Moss.
Conservation:	Dr. Bierbaum, Mr. Carpenter, Mr. Eno, and Mr. Winokur.
Pollution Prevention:	Mr. Carpenter, Dr. Moss, Dr. Parker, Dr. Ryan, Dr. Thomas, and Dr. Weber.

During FY96, the SAB initiated a discussion on the topic of adaptive ecosystem management. The concept of ecosystem management is now being adopted as a policy and land management tool. Many SERDP-supported projects in the Conservation Thrust Area address aspects of ecosystem management. The SAB was concerned that the current state of the underlying science is not adequate for the task of ecosystem management. Natural ecosystems are extremely complex and

non-linear, and there is no good scientific basis for making effective policy. Ecology is the underlying science of ecosystem management. The vast majority, over 90%, of ecological research is done on areas of not more than several square meters, rather than at scales that are relevant for land managers and policy makers.

The SAB identified a potential catalytic role for SERDP in initiating and/or executing ecological research at the management scale. The SAB recommended that SERDP organize a workshop to define critical deficiencies of fundamental ecological science while simultaneously identifying and focusing on research opportunities that address the applied problems of defense installations. As a result of this SAB initiative, the SERDP Program Office has started the planning process for a workshop on Management Scale Ecological Research, scheduled to be held in the Spring of 1997.

During FY96, the SAB continued its active involvement in the SERDP Program. SAB members participated in the SERDP In-Progress Reviews during the month of May. Board members also participated in the Integrated Biotreatment Consortium workshop held in May and served on the comprehensive review panel for the SERDP National Environmental Technology Test Sites (NETTS) program. A comprehensive review and a needs and cost analysis of the NETTS program was conducted in FY95 and was presented to the SAB during the February meeting where the SAB concluded that the NETTS program provided extensive qualitative and quantitative benefits to the DoD and other participants. At the request of the SAB, a follow-up review was conducted in FY96 to evaluate planned demonstrations in the queue and the validity of assumptions made in the needs and cost analysis. The results of the second comprehensive review were presented to the full SAB during the August meeting. The SAB adopted most of the Comprehensive Review Panel's recommendations regarding future funding levels and priorities for NETTS sites. The SAB also endorsed the Review Panel's recommendation to update the prior cost/benefit analysis with actual technology demonstration data from the test locations using updated metrics and assumptions.

Integration of projects with similar objectives continued to be an important consideration during the SAB's review of projects. On several occasions, the Board requested clarification on the coordination among, and integration of, SERDP projects. During the October meeting, the SAB was briefed on the results of the non-stakeholder peer review of three SERDP projects in the metals cleaning and processing area. The Board had requested this review in FY95 to provide recommendations on the technical and scientific merits of the three projects involved, to explore the interrelationships and the down-selection process between the various technologies, and to resolve any apparent duplication. The peer review clarified the down-select procedure incorporated into the individual projects, with a final down selection to be made during FY96, and provided a number of recommendations to help focus the efforts being conducted. Following this briefing, the SAB recommended that the projects be approved for FY96 funding and that the recommendations of the peer review panel be followed and implemented.

During FY96, the SAB requested that SERDP develop an overview of the Conservation Thrust Area to clarify how the SERDP projects complement each other and collectively address DoD conservation requirements.

Within the Pollution Prevention Thrust Area, the Board requested that SERDP develop, with assistance of the DoD user community, a complete perspective of DoD energetic materials research projects, encompassing SERDP and non-SERDP projects, and demonstrate how they are integrated and relate with each other. These reviews are in process and will be presented to the SAB in FY97.

Ms. Sherri Goodman, Deputy Undersecretary of Defense (Environmental Security), visited the SAB during the July meeting. Ms. Goodman made brief comments to the Board. She noted that the SERDP investment continues to be very valuable but needs to remain focused on military requirements. She mentioned several specific areas of interest, including the environmental aspects of weapons systems' life cycle costs, integrated pest management, unexploded ordnance (UXO) detection, and the interrelationship of SERDP and the Environmental Security Technology Certification Program (ESTCP).

Dr. Walter Weber, Chair of the SAB, addressed the SERDP Council during the annual Council meeting on September 19, 1996. Dr. Weber commented on the SAB's increased activity and involvement with SERDP and the increased scientific quality of the program he has observed during his tenure on the SAB. Dr. Weber endorsed the appropriate focus of SERDP on the highest priority DoD requirements, but he also stressed the need to be forward looking and to avoid the tendency to emphasize low-risk, incremental approaches for solving today's problems. He encouraged SERDP to continue and to strengthen its role as a catalyzer inside and outside of government by capitalizing on the expertise of other agencies and institutions. Dr. Weber encouraged the Council to support additional funding opportunities and identified a number of underfunded requirements in each Thrust Area. He encouraged a gradual, well-thought out plan to expand into new areas of scientific importance. In concluding his remarks, Dr. Weber referred to Dr. John Harrison's departure as SERDP Executive Director at the end of November 1996. Dr. Weber thanked Dr. Harrison for his support of the SAB and his efforts to promote an active and integrated role of the SAB in the Program. Dr. Weber expressed his looking forward to working with Mr. Bradley Smith, the new Executive Director.

SERDP THRUST AREAS

SERDP research efforts in FY96 were based on the four existing pillars within the Services' Environmental Quality technology program. Research in these Thrust Areas focused on the development of cleanup technologies for existing hazardous wastes and the development of approaches to minimize, treat, and dispose of hazardous waste, in order to meet current and future compliance requirements. SERDP also developed technologies to improve the understanding of the impacts of the Department's operations on our natural and cultural resources and to minimize or eliminate unacceptable impacts as well as developed methods to prevent pollution at its source in order to eliminate future problems. [SERDP completed research in one additional area of interest -- Global Environmental Change -- to assess the state of the global atmospheric and ocean environments.]

Cleanup

Research in this Thrust Area focused on conducting research and development to achieve more efficient, effective environmental cleanup of soil, sediment, groundwater, surface water, and structures already contaminated by past practices with hazardous materials (including unexploded ordnance) and toxic substances. The principal focus of this area is more cost effective: cleanup/ remediation techniques and technologies, monitoring and characterization methods and technologies, and assessment methods.

Compliance

Compliance research and development included technologies to support environmental monitoring, waste treatment and disposal, and environmental management not directly related to site restoration, but related to meeting current and future environmental compliance requirements. It also included end-of-pipe recycling, i.e., waste that is recycled for other than its original purpose. Further, it addressed understanding the fate and transport of defense-related air and waste water discharges.

Conservation

There is a growing need to effectively use and maintain training and testing facilities to support environmental and operational requirements. Management of natural resources is an important consideration in maintaining the use of these facilities to provide the realistic training environment in which to exercise and test the capabilities of the military forces. Therefore, efforts in this Thrust Area focused on research to understand, protect, and maintain natural resources in order to ensure (1) compliance with environmental laws [such as the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), and the National Historic Preservation Act (NHPA)]; (2) sustainable use of land and coastal resources; and (3) support for the stewardship of those resources on relevant Federal lands. Research efforts were intended to (1) predict effectively the presence, quantity, and quality of natural and cultural resources; (2) improve the knowledge of

the basic processes of these resources as they relate to, and are impacted by, use of lands; and (3) advance the technology to mitigate, rehabilitate, and maintain these resources.

Pollution Prevention

The focus of this Thrust Area was to conduct research and development to reduce or eliminate pollutants prior to treatment and disposal and to reduce the cost of compliance with environmental regulations. This is achieved through source reduction and other practices primarily involving material substitution or process change. Improved technology is the catalyst for better pollution prevention. As a result, the Thrust Area focused on the need to identify alternatives for or minimize the use of hazardous and toxic chemicals/materials, identify alternative processes or technologies that result in less pollutants, improve the efficiencies of mechanical and chemical systems, and assess the life-cycle effect of materials and systems. The application of pollution prevention will positively influence the other SERDP Thrust Areas by encouraging the use of innovative, pollution reducing technologies and practices.

PROPOSALS REVIEWED AND RECOMMENDATIONS

All projects briefed to the SAB during FY96 and the recommendations for each are presented in Appendix B. In summary, the SAB reviewed 38 proposals for 22 new projects and 16 ongoing projects, totaling $10.84 million in FY96 funding requests and $32.81 million for FY97. The Board recommended against funding 2 projects requesting a total of $0.99 million for FY96 and 1 project requesting $0.3 million for FY97. Upon being briefed, at the October meeting, on the results of a non-stakeholder review of three projects relating to the cleaning and surface preparation of metal surfaces (projects PP-116, PP-130, and PP-139), the Board recommended releasing FY96 funding, a total of $1.234 million to these projects. During their review of FY97 projects, the SAB declined to make a funding recommendation, either positive or negative, for one proposed FY97 new start project, advising the PI instead to consider substantially revising the proposal before bringing it back for review.

SUMMARY AND OUTLOOK

The SERDP Scientific Advisory Board represents a diverse membership from the scientific community whose professional backgrounds and areas of recognized expertise provide a balanced, unbiased, and forward-looking perspective in all phases of their work (Appendix A). The SAB encourages coordinated efforts by the Department of Defense, the Department of Energy, and the Environmental Protection Agency in successfully meeting their environmental challenges and obligations. It is intended by the Executive Director that the SAB be fully integrated within the SERDP management structure and, therefore, be instrumental in establishing and executing an appropriately focused R&D program. The SAB's activities include, but are not limited to, the following:

- providing recommendations in the project selection process;
- identifying areas ripe for technology development;
- fostering technology transfer between the private sector and governmental agencies;
- determining feasibility and applicability of using Federal data resources for environmental purposes; and
- participating in overall strategy formulation and program management issues.

This group of high-level, dedicated, environmental professionals, acting in an advisory capacity, helps ensure that duplication of effort is minimized between participatory agencies and that the SERDP Council is investing scarce resources wisely.

During FY96, the SAB reviewed and provided funding recommendations for 38 projects with a total value of $43.7 million. The Board endorsed direct participation of non-Federal research organizations and using outside peer review of all proposals submitted to SERDP. The Board continued to emphasize the participation of multiple Federal and private partners, including users, in the execution of projects. This leverages SERDP's own resources and promotes successful technology transition. The Board views these factors as essential to a strong and successful program.

The Scientific Advisory Board has been, and will continue to be, an active and concerned partner in the effort to enhance the agencies' and Services' capabilities to meet their environmental commitments, to encourage technology transfer and collaborative efforts, and to focus on methods to meet the environmental challenges of the future.

During FY97, the SERDP Scientific Advisory Board will continue to assist the SERDP Council in addressing effectively environmental matters of concern to the Department of Defense and the Department of Energy. It is anticipated that the Board will play an even more proactive role in

Program review and development. Nominations for appointees will be solicited as required by the SERDP statute.

APPENDIX A

FY96 SAB MEMBERSHIP

Weber, Walter J., Jr., SAB Chair

Current Position: The Gordon M. Fair and Earnest Boyce Distinguished University Professor; Director, the Great Lakes and Mid-Atlantic Center for Hazardous Substance Research; Executive Director, the National Center for Integrated Bioremediation Research and Development, University of Michigan.

Degree(s): Ph.D., Environmental and Water Resources Engineering, Harvard University, 1962; A.M., Environmental Chemistry, Harvard University, 1961; M.S.E., Environmental Engineering, Rutgers University, 1959; Sc.B., Chemical Engineering, Brown University, 1956.

Previous Positions: Chairman, University Program in Water Resources, University of Michigan, 1968-1992; Visiting Professor, University of California at Berkeley and University of Melbourne, Australia, 1971.

Professional Activities: Member, National Academy of Engineering; Diplomate, American Academy of Environmental Engineers; Member of several National Research Council committees and boards and a number of academic, government, and industrial advisory committees; Member and active participant in the American Chemical Society, American Institute of Chemical Engineers, Association of Environmental Engineering Professors, American Society of Civil Engineers (Fellow), American Water Works Association (Fellow), International Association for Water Quality, and the Water Environment Federation.

Awards: Athalie Richardson Irvine Clarke Prize for Outstanding Achievement in Water Science and Technology, National Water Research Institute, 1996; Dist. University Professor, University of Michigan, since 1994; The Gordon Maskew Fair Award, American Academy of Environmental Engineers, 1995; Dist. College Professor, University of Michigan, 1987-1994; Dist. Scientist Award, U.S. EPA, 1991; Dist. Faculty Award, State of Michigan, 1989; Stephen S. Atwood Award for Engineering Excellence, University of Michigan, 1987.

Publications: Three books and approximately 300 peer-reviewed technical publications.

Eno, Amos S., SAB Vice-Chair

Current Position: Executive Director, National Fish and Wildlife Foundation, Washington, DC.

Degree(s): M.A., Cornell University, 1977; B.A., Princeton University, 1972.

Previous Positions: Director, Conservation Programs, National Fish and Wildlife Foundation; Director, Wildlife Programs, National Audubon Society; Special Assistant to the Chief, Office of Endangered Species, U.S. Fish and Wildlife Service; Special Assistant to Assistant Secretary of the Interior for Fish, Wildlife, and Parks.

Professional Activities: Consultant/Production Assistant to National Audubon Society's TV specials and to WTBS for wildlife films; Consultant to President's Commission for Americans Outdoors; North American Wetlands Council; Director, North Atlantic Salmon Fund; Advisor WNET New York, "Nature's Trail."

Awards: Frederick Douglas Prize, Princeton University, 1972; Chevron Conservation Award, 1992.

Publications: FY89-96 (annual) Federal Agency Needs Assessments, four Audubon Wildlife Reports, and Crossroads: Environmental Priorities for the Future; Co-Author, Wolf Recovery in the Northern Rocky Mountains.

Bierbaum, Rosina M., Represents Assistant to the President for Science and Technology

Current Position: Acting Associate Director of Environment, Executive Office of the President, Office of Science and Technology Policy.

Degree(s): Ph.D.,Ecology & Evolutionary Biology, State University of New York (SUNY) at Stony Brook.

Previous Positions: Senior Analyst, Office of Science & Technology Policy (OSTP); Senior Associate, Office of Technology Assessment (OTA); Project Director for Climate Change, OTA; Assistant Project Director for Acid Rain, OTA; Congressional Fellow, OTA; Editorial Fellow, *The Quarterly Review of Biology*; Research Assistant, SUNY, Stony Brook.

Professional Activities: American Association for the Advancement of Science, Ecological Society of America, Sigma Xi; Editorial Board Consequences; National Science & Technology Council (NSTC) liaison to U.S. Global Change Research Program; Acting Chair, Committee on Environment & Natural Resources, NSTC; Acting Chair, Environmental Monitoring Initiative Committee on Environmental & Natural Resources (CENR); Member, White House Ecosystem Management Implementation Task Force.

Awards: Received OSTP Merit Awards 1995, 1994; awarded OTA's highest honor--Senior Associate, 1991; elected member Sigma Xi, 1985; Congressional Fellowship, 1980.

Publications: Primary Author of *Changing by Degree: Steps to Reduce Greenhouse Gases*, 1991; *Preparing for an Uncertain Climate*, 1993; Contributor to nine assessments on environmental issues published by OTA; co-authored and published numerous articles in technical and popular journals; testified before both House and Senate on environmental issues.

Carpenter, Richard A.

Current Position: Environmental Consultant, Charlottesville, Virginia.

Degree(s): M.S., Organic Chemistry, University of Missouri, 1949.

Previous Positions: Senior Fellow, East-West Center, Honolulu, Hawaii; Executive Director, Commission on Natural Resources, U.S. National Research Council; Founder and Chief, Environmental Policy Division, Congressional Research Service, Library of Congress; Consultant to United Nations, World Bank, Asian Development Bank; Research for Shell Oil Co., Midwest Research Institute, and Callery Chemical Co.

Professional Activities: Co-Founder and Chairman of the Board (1991), Pacific Basin Consortium for Hazardous Waste Research; currently Regional Editor for the Americas, *Land Degradation and Rehabilitation*; Study Director, Hawaiian Environmental Risk Ranking project (1991-1992).

Awards: The Private Conservation Award, Virginia Chapter of The Nature Conservancy for Ecological Risk Assessment of Clinch Valley Bioreserve, 1996; elected full member of Sigma Xi, the Scientific Research Society, University of Missouri, 1949.

Publications: Several books, many professional papers, and patentee.

Colwell, Rita R.

Current Position: President, University of Maryland Biotechnology Institute and Professor of Microbiology, University of Maryland.

Degree(s): Ph.D., Marine Microbiology, University of Washington, 1961; M.S., Genetics, Purdue University, 1958; B.S., Bacteriology, Purdue University, 1956.

Previous Positions: Vice President for Academic Affairs, University of Maryland; Director, Sea Grant College, University of Maryland; Associate Professor of Biology, Georgetown University.

Professional Activities: Chairman, Board of Governors, American Academy of Microbiology; Science Board, Food and Drug Adminstration; Past-President, American Society for Microbiology; Presidential Appointee to the National Science Board of the United States; Past-President of the International Union of Microbiological Societies; Past President, Sigma Xi, National Science Honorary Society; Fellow and President of the American Association for the Advancement Science (AAAS).

Awards: Tenth Annual Sea Grant Lecturer and Research Award, MIT, 1982; Fisher Award, American Society for Microbiology, 1985; Gold Medal Award, International Institute of Biotechnology, 1990; Honorary Degrees awarded from Heriott-Watt University, 1987; Purdue University, 1993; Hood College, 1993; Notre Dame College, 1994; University of Surrey, 1995; Andrew White Medal from Loyola College, 1994; Honorary Professor, University of Queensland, 1988 and University Catolica de Valparaiso, Chile, 1976; Barnard College, Columbia University Medal of Distinction, 1996.

Publications: Sixteen books and 450 scientific publications.

Conway, Richard A.

Current Position: Senior Corporate Fellow, Union Carbide Corporation.

Degree(s): M.S., Environmental Engineering, MIT, 1957; B.S., Public Health, University of Massachusetts - Amherst, 1953.

Previous Positions: Corporate Fellow, Development Associate, Group Leader, and Development Engineer, Union Carbide Corporation.

Professional Activities: Member, National Academy of Engineering; Consultant and former Chair of Environmental Engineering Committee, Science Advisory Board, Environmental Protection Agency; Member, Commission on Engineering and Technical Systems and several study committees, National Research Council; Diplomate, American Academy of Environmental Engineers; Fellow, American Society of Civil Engineers; Member, Advisory Committees to several university research centers; Registered Professional Engineer.

Awards: Award for Personal Achievement in Chemical Engineering, 1986; Dudley Medal, ASTM, 1984; Rudolfs Award, Water Environment Federation, 1974 & 1983; State-of-the-Art Civil Engineering Award, American Society of Civil Engineers, 1975; Hering Award, American Society of Civil Engineers, 1974; Gascoigne Award, Water Environment Federation, 1967.

Publications: One book, Editor/Co-Editor of 8 books, 21 refereed publications (numerous others), and three U.S. patents.

Gade, Mary A.

Current Position: Director, Illinois Environmental Protection Agency.

Degree(s): J.D., Washington University School of Law, 1977; B.A., University of Wisconsin, 1974.

Previous Positions: Deputy Assistant Administrator of U.S. EPA Office of Solid Waste and Emergency Response; U.S. EPA Associate Division Director for Superfund, Waste Management Division; U.S. EPA Deputy Director, Waste Management Division; U.S. EPA Associate Regional Counsel, Office of Regional Counsel; U.S. EPA Assistant Regional Counsel, Office of Regional Counsel; Instructor, Roosevelt University's Geography Department.

Professional Activities: Current affiliations include Officer, Environmental Council of States; Member, National Clean Air Act Advisory Committee; Officer, Foundation E.A.R.T.H., Board of Advisors, National Environmental Policy Institute; Chair, Women Executives in State Government; Chair, National Ozone Transport Assessment Group.

Awards: Phi Beta Kappa; U.S. Environmental Protection Agency Bronze Medal for Achievement.

Publications: More than 10 articles from 1987 to 1994.

Loehr, Raymond C.

Current Position: Hussein M. Alharthy Centennial Chair and Professor of Civil Engineering, The University of Texas at Austin.

Degree(s): Ph.D., Sanitary Engineering, University of Wisconsin, 1961; M.S., Civil Engineering, Case Institute of Technology, 1956; B.S., Civil Engineering, Case Institute of Technology, 1953.

Previous Positions: Liberty Hyde Bailey Professor of Engineering, Cornell University; Professor, Cornell University -- joint appointment, Department of Agricultural Engineering and Department of Environmental Engineering; Senior Program Manager, Hazardous Wastes, Environmental Research and Technology, Inc.; Director, Environmental Studies Program, College of Agriculture and Life Sciences, Cornell University; Program Advisor, Effluent Guidelines Division, U.S. Environmental Protection Agency, Washington, DC; Associate Professor and Professor, University of Kansas; Instructor and Assistant Professor, Case Institute of Technology.

Professional Activities: National Academy of Sciences, National Academy of Engineering, National Research Council Committees; Environmental Protection Agency, Chair Executive Committee, Science Advisory Board; International Joint Commission, Science Advisory Board Committee, Phosphorous Management Strategies Task Force.

Awards: Member, National Academy of Engineering, 1983 to present; Gordon M. Fair Award, American Academy of Environmental Engineering, 1996; Rachel Carson Award, Society of Environmental Toxicology and Chemistry, 1995; T.H. Feng Distinguished Lecturer in Environmental Engineering, University of Massachusetts, Amherst, Mass., 1994; Thomas R. Camp Lecture Award, Boston Society of Civil Engineers, American Society of Civil Engineers, 1992; Joe J. King Professional Achievement Award, The University of Texas at Austin, 1992; Billy and Claude Hocott Distinguished Centennial Engineering Research Award, The University of Texas, 1991; G. Brooks Earnest Lecture Award, Cleveland Section, American Society of Civil Engineers, 1991; Engineering Foundation Faculty Excellence Award, The University of Texas at Austin, 1987; Senior Fulbright-Hays Scholar, New Zealand, 1979; Rudolph Hering Medal, American Society of Civil Engineers, 1969; Water Conservationist of the Year, Kansas Wildlife Federation, 1967.

Publications: More than 160 technical publications since 1974.

Moss, Marvin K.

Current Position: Provost, Vice Chancellor for Academic Affairs, and Professor of Physics, The University of North Carolina at Wilmington, 1992-present.

Degree(s): Ph.D., Physics, North Carolina State University, 1961; M.S., Nuclear Engineering, North Carolina State University, 1957; B.S., Math and Physics, Elon College, 1955.

Previous Positions: Associate Vice-Chancellor for Marine Sciences, University of California, San Diego, and Deputy Director, Scripps Institution of Oceanography (1987-1992); Director and Technical Director, Office of Naval Research (1982-1987); Director, Office of Energy Research, U.S. Department of Energy (1979-1982); Director, Nuclear Division, U.S. Arms Control and Disarmament Agency (1976-1978); Professor of Physics, North Carolina State University (1961-1977).

Professional Activities: National Research Council, Marine Board Committee Assessment of Benefit of U.S. Army Corps of Engineers Civil Works R&D Program (1996-1997); National Resource Council, Marine Board Committee on Coastal Engineering Research and Education (1997); Member, Board of Governors, Consortium for Oceanographic Research and Education (CORE); Member, University of North Carolina Marine Sciences Advisor Board; Past Member, Executive Committee, International Ocean Drilling Program; American Association for the Advancement of Science; American Geophysical Union.

Awards: Atomic Energy Commission Fellow during graduate study; NSF Post-Doctoral Fellow, Tait Institute of Mathematical Physics, University of Edinburgh, and Imperial College, University of London; Distinguished Alumni, Elon College, 1979; Presidential Rank Government Executive, 1985; U.S. Navy Distinguished Civilian Service Award, 1987.

Publications: Author of numerous research papers, reports, and successful grants.

Ostenso, Ned A., Represented Administrator, NOAA

Current Position: Assistant Administrator for Oceanic and Atmospheric Research, National Oceanic and Atmospheric Administration (NOAA), Department of Commerce.

Degree(s): Ph.D., University of Wisconsin, 1962.

Previous Positions: Acting Chief Scientist, NOAA; Acting Assistant Administrator for Research and Development, Deputy Assistant Administrator for Research and Development and Director of the National Sea Grant College Program, NOAA; Deputy Director and Senior Oceanographer of the Ocean Science and Technology Division, Office of Naval Research; Assistant Presidential Science Advisor in the Office of Science and Technology of the Executive Office; Faculty, University of Wisconsin, Department of Geology and Geophysics.

Professional Activities: Member of numerous scientific professional associations and advisory committees; Johns Hopkins School for Advanced International Studies; American Political Science Association Fellow in the U.S. Senate and U.S. House of Representatives, where he developed the National Earthquake Hazard Reduction and National Climate Program Acts; Woods Hole Oceanographic Institution; the Lamont-Doherty Geological Observatory of Columbia University; the Arctic Institute of North America.

Awards: Meritorious Service Awards from the Department of Defense, the Navy Department, and the National Academy of Sciences; a mountain in Antarctica and a seamount in the Arctic Ocean named after him.

Publications: More than 50 published scientific research papers.

Parker, Frank L.

Current Position: Distinguished Professor of Environmental and Water Resources Engineering, Vanderbilt University.

Degree(s): Ph.D., Harvard University, 1955.

Previous Positions: International Atomic Energy Agency, Head, Radioactive Waste Disposal Research, Oak Ridge National Laboratory; Professor of Management of Technology, Vanderbilt University; Senior Research Associate, Vanderbilt Institute of Public Policy Studies.

Professional Activities: Member, National Academy of Engineering; Advisory Committees: Pennsylvania Power and Light Company, Oak Ridge National Laboratory, Bechtel Hanford, National Institute for Environmental Renewal, Medical University of South Carolina, Sandia National Laboratory Environmental Protection Agency; Chair, International Atomic Energy Agency's (IAEA) Seminar on International Cooperation on Nuclear Waste Management in the Russian Federation; Plenary Speaker IAEA seminar on Safe Waste Disposal and NATO Seminar on Risk Management Strategies applied to Environmental Cleanup in Central and Eastern Europe.

Awards: Senior Research Fellow, International Institute Applied Systems Analysis; Harvie Branscomb Distinguished Professor 1994-1995; Alexander Heard Distinguished Service Professor, 1988-1989; Senior Research Fellow, The Beijer Institute, The Royal Swedish Academy of Sciences, 1984-1987.

Publications: Three books, Co-Editor of two books, Author or Co-Author of 25 book chapters and 40 journal articles.

Ryan, Michael J.

Current Position: Manager of Technology, Bechtel Environmental, Inc.

Degree(s): Ph.D., Environmental Engineering, University of North Carolina, 1975.

Previous Positions: Senior Vice President, Metcalf & Eddy Inc.; Executive Vice-President, ICF Technology Inc.; Chief of Environmental Policy, U.S. Air Force (USAF) (Pentagon); Director of Environmental Engineering and Industrial Hygiene, HQ Strategic Air Command; Director, Environics R&D Program, AFESC.

Professional Activities: Consultant to the USAF Surgeon General; Member, USAF Engineering and Services "Future Vision" Panel; Professional Engineer (Texas); Board Certified Industrial Hygienist; Diplomate to American Academy of Environmental Engineers.

Awards: U.S. Patent on filtration.

Publications: Twelve articles or other publications since 1985.

Sullivan, Kathryn D., Represented Administrator, NOAA

Current Position: Chief Scientist, National Oceanic and Atmospheric Administration, Department of Commerce; Commander, Naval Reserve.

Degree(s): Ph.D., Geology, Dalhousie University, 1978; B.S., Earth Sciences, University of California at Santa Cruz, 1973.

Previous Positions: Mission Specialist Astronaut, NASA's Space Shuttle Program (flights on Challenger, Discovery, and Atlantis); variety of oceanographic research under auspices of U.S.G.S., Woods Hole Oceanographic Institution, Canada's Bedford Institute; NOAA's National Undersea Research Program.

Professional Activities: National Commission on Space; Challenger Center for Space Science Education; numerous oceanographic, geological, and aerospace associations.

Awards: NASA's Medal for Outstanding Leadership, Exceptional Service Medal (twice), and Space Flight Medal (three times); National Air and Space Trophy; American Astronautical Society's Vic Prather EVA Award; AIAA Haley Award; Navy Commendation Medal.

Thomas, Lydia W.

Current Position: President and Chief Executive Officer, Mitretek Systems.

Degree(s): Ph.D., Cytology, Howard University, 1973; M.S., Microbiology, American University, 1971; B.S., Zoology, Howard University, 1965.

Previous Positions: Senior Vice President and General Manager, Center for Environment, Resource and Space, Mitretek Systems.

Professional Activities: American Association for the Advancement of Science; American Society of Toxicology; American Defense Preparedness Association; American Institute of Aeronautics and Astronautics/ Public Policy; American Management Association; The Conference Board; National Energy Resources Organization; Teratology Society; Superintendent's Business/Industry Advisory Council for Fairfax County Public Schools; United States Energy Association. Serves on the Board of Directors of Cabot Corporation and Advisory Boards of INFORM and George Washington University's Virginia Campus and is a Corporate Member of the Charles Stark Draper Laboratory, Inc.

Awards: Received the 1991 Dean's Award at the 1991 Black Engineer of the Year Conference; the 1990 "Ebony" Image Award presented by The Coalition of 100 Black Women, Northern Virginia Chapter, for outstanding achievement in the public service; the 1986 TWIN Award (Tribute to Women in International Industry) presented by the Young Women's Christian Association, National Board.

Publications: Co-Authored one book and has written many technical reports -- the most recent printed in the 1993 Science and International Security Anthology, titled "Dismantlement and Destruction of U.S. Chemical Weapons," published by the American Association for the Advancement of Science.

Watson, Robert, Represented Assistant to the President for Science Technology

Current Position: Associate Director for Environment, Office of Science and Technology Policy, The White House.

Degree(s): Ph.D., Queen Mary College, London University, 1973.

Previous Positions: Director, Science Division, and Chief Scientist (Acting), Office of Mission to Planet Earth National Aeronautics and Space Administration. Director, Process Studies Program Office, Earth Sciences and Applications Division; Branch Chief for Upper Atmospheric Research and Tropospheric Chemistry Programs; Acting Program Scientist (NASA). Research Scientist, Jet Propulsion Laboratory; Postdoctoral Research Scientist at University of Maryland and the University of California.

Awards: Climate Institute Scientific Achievement Award for Coordinating International Scientific Assessments, 1993; American Association for the Advancement of Science Award for Scientific Freedom and Responsibility, 1993; American Meteorological Society Special Award, 1993; National Academy of Sciences Award for Scientific Reviewing, 1992; American Geophysical Union's Edward A. Flinn Award, 1991; Designated member of UNEP's: "The Global 500: The Roll of Honour for Environmental Achievement," 1989; NASA Group Achievement Award (EOS), 1993; NASA Cooperative External Achievement Award (High Speed Research Program), 1992; NASA Distinguished Service Medal, 1989; NASA Public Service Group Achievement Award (Antarctic Aircraft Ozone Expedition), 1989; NASA Group Achievement Award (International Ozone Trends Panel), 1989; NASA OSSA, Edelson Award, 1987; NASA Public Service Group Achievement Award (International Ozone Assessment), 1986; NASA Exceptional Service Medal, 1983.

Winokur, Robert S., Represents Administrator, NOAA

Current Position: Assistant Administrator, National Environmental Satellite, Data and Information Service, National Oceanic and Atmospheric Administration, Department of Commerce.

Degree(s): M.S., American University; B.S., Rensselaer Polytechnic Institute.

Previous Positions: Technical Director, Office of the Oceanographer of the Navy; Senior Civilian Technical Manager, Navy Operational Oceanography Program; Associate Technical Director, Ocean Science and International Programs, Office of Naval Research; Director, Planning and Assessment, Office of Naval Research; Deputy and Special Advisor, Office of the Deputy Assistant Secretary of the Navy for Antisubmarine Warfare; Special Assistant for Acoustics to the Director, Antisubmarine Warfare and Surveillance Programs, Office of the Chief of Naval Operations; Branch Head and Division Director, Naval Oceanographic Office.

Professional Activities: Fellow, Acoustical Society of America; Former Vice President Technical Affairs, Marine Technology Society.

Awards: Presidential Distinguished Executive and Meritorious Rank Awards for Senior Executives.

Publications: Numerous papers and reports on underwater acoustics and Naval oceanography.

APPENDIX B

SAB PROJECT ACTIONS DURING FY96

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
	CLEANUP	
CU-052: Mobile Underwater Debris Survey System (Navy) $1,120K (FY97)	The goal of the MUDSS project is to demonstrate the technologies necessary for underwater surveys of shallow water inland and coastal sites littered with ordnance. A successful demonstration will prove the concept of a trailerable, low-maintenance, catamaran-based system capable of finding and mapping the locations of ordnance ranging from small shells to large bombs in water depths of from four to forty feet. MUDSS will supply the object detection and classification technology necessary for the environmental cleanup of ordnance at scores of underwater ordnance litter sites. The effort includes multi-sensor detection, discrimination and location, real-time mapping, and 3-D visualization. The capability was successfully demonstrated in tests at St. Andrews Bay, Panama City, FL, during August 1995.	**(February)** Originally funded by SERDP in FY94, this project requested $1,120K to continue development of technologies for efficient surveying of underwater sites littered with ordnance and explosive wastes (OEW). The effort seeks to develop a capability to detect/identify OEW targets, to discriminate against clutter, and to map the OEW locations for remediation. SERDP provided the impetus to start the effort and continues to provide for selection/testing of sensors. Other potential dual-use benefits for this technology include: removing obstructions in navigable waters, locating discarded buoy batteries, and underwater archeology applications. In the absence of a quorum, the Board voted 6-0 to recommend funding at the requested level. This vote was later ratified 8-0 in the presence of a quorum.
CU-107: In-Situ Remediation of Chlorinated Solvents (USAF) $990K (FY97)	This project is focused on in-situ remediation of groundwater using funnel-and-gate technology. The funnel-and-gate consists of low hydraulic conductivity cutoff walls (the funnel), which modify flow patterns so that groundwater flows primarily through high conductivity gaps (the gates). The gaps contain in-situ reactors (such as reactive porous media), which remove contaminants by abiotic or biological processes. Remediated groundwater exits the down gradient side of the reactor. This research will develop the design principles necessary for the effective installation of funnel-and-gates and also develop technology to treat in-situ the aqueous plume emanating from a contaminant source. The primary target contaminant is trichloroethylene. The project integrates laboratory scale investigations, hydraulic modeling, and field demonstration. The field demonstration will attempt a field scale mass balance to demonstrate the efficacy of funnel-and-gate treatment technology. It will also provide data to support development of design protocols.	**(February)** The project requested $990K in FY97 to continue the research. The Board had several concerns about this project, including a sense that the concept was well beyond the proof-of-principle stage and uncertainty regarding the relationship of this project with related efforts of the Remediation Technology Development Forum (RTDF, an organization of government and industry representatives in cleanup technologies). This research, as proposed, looks at site-specific factors for modeling purposes but does not seem to bring the technology the needed next step. The funnel and gate aspects of the system will vary widely from site to site, and it is unreasonable to expect the proposed work to generalize these aspects in a generic hydraulic model. With proof-of-principle already demonstrated, the technology needs field-scale demonstrations at a variety of sites. The SAB noted that the proposed resources appeared inadequate for this next demonstration step. The project should be re-briefed at a later SAB meeting if, and when, sufficient resources are identified to take the technology the next appropriate step in development. Accordingly, in the absence of a quorum, the SAB voted 3-2 to recommend against FY97 funding, but the Board urged that a revised proposal be presented that addresses how this project will leverage, and be integrated with, other related efforts (e.g., RTDF, ESTCP, other programs) to eventually take this technology to full scale. Further, the new proposal should fully describe any proposed role of H2O2 and the project's application to DNAPL. Finally, the revised proposal should represent an appropriately funded, research-oriented demonstration and/or laboratory/pilot studies to support other field demonstrations. Some SAB members felt that the funnel and gate engineering aspects needed to be de-coupled and urged the PI to focus on the gate component. This vote was ratified 8-0 in the presence of a quorum later in the meeting.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CU-107: In-Situ Remediation of Chlorinated Solvents (USAF) $990K (FY97) (continued)		**(July)** In a re-brief to the Board, this project requested $990K in FY97 to continue efforts to develop the funnel and gate technology. Specifically, the current objectives are to: (1) investigate reactive media alternatives; (2) integrate tools in a design protocol for funnel and gate systems; (3) establish a mass balance approach for proof-of-principle field demonstration; and (4) develop and verify the performance monitoring protocol. The Board raised numerous concerns and issues with this project, including the issue of emplacement techniques for reactive walls and funnel walls and the risk of leaking walls which would severely inhibit an accurate mass balance approach. The Board was assured that emplacement verification was a planned component of the overall effort through the Remediation Technology Demonstration Forum (RTDF), and the planned approach included Lagrangian sampling techniques combined with dye tracers which should detect any leakage and account for it in the mass balance analyses. The Board sought assurances that the performers would interact with the Moffett Field demonstration and others to demonstrate protocol testing at other sites. Further, the Board advised the performers to coordinate with the DOE's "Plume Management Group." One SAB member opined that proof-of-principle with this technology has already been demonstrated, but the specific design details are critical, and these will be different for each site and particular set of site conditions. Dr. Weber noted that in his opinion it is beyond the responsibility of SERDP to fund a full-scale demonstration like this, and it may be time for industry to embrace this technology. Others pointed out that the project was planned to provide significant generic information. The Board voted 6-1 to recommend approval as presented.
CU-368: Aquifer Restoration by Enhanced Source Removal (EPA) $1,100K (FY96) $1,300K (FY97)	The goal of this project is to provide field demonstrations of innovative processes to remediate aquifers contaminated by non-aqueous phase liquids (NAPLs) including fuels, solvents, and other organic contaminants in a timely and cost-effective manner. Low-solubility organics, such as chlorinated solvents, were used and released to the environment in massive quantities during the 1950's, 60's and 70's. These contaminants have migrated through the subsurface and have entered ground water at over 2000 DoD sites. The objective of this research is to demonstrate processes for enhancing contaminant removal (enhanced pump-and-treat technologies) in a variety of geologic settings (including Hill AFB in Utah) and to produce engineering design guidance documents for applying these processes to remediate contaminated ground water.	**(October)** This project requested $1,100K in FY96 funding. The Board had raised a number of questions regarding the effectiveness and potential risks of the proposed technology at the last project review held during the January 1995 SAB meeting. Dr. Enfield addressed these questions to the complete satisfaction of the Board. The Board characterized the project as quality research and a focused technical effort. The project shows appropriate technical milestones and is planning to take full advantage of the Dover D/NETDP test site. In the absence of a quorum, the Board voted 6-0 to recommend approval of the requested FY96 funding. The vote was ratified by a quorum via a teleconference call on October 25. Dr. Parker commented via telephone that Dr. Enfield should acknowledge the limitations and capabilities of pump-and-treat aquifer remediation; and he recommended that Dr. Enfield be sent a copy of the National Academy of

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CU-368: Aquifer Restoration by Enhanced Source Removal (EPA) $1,100K (FY96) $1,300K (FY97) (continued)		Science (NAS) report on "Alternatives for Groundwater Cleanup," along with a memo documenting Dr. Parker's comments. **(July)** This project, initially funded by SERDP in FY93, requested $1,300K in FY97 to continue efforts to demonstrate (in the field) the effectiveness of emerging source removal technologies using side by side comparisons in controlled experiments and to compare the performance of each to "pump and treat" technology. The Board inquired about the planned design manual and asked if it would be an integrated report and coordinated with others. In order to provide a complete answer, Dr. Enfield was asked to provide a letter describing the design guidance manuals -- including title, publication schedule, coordination with other researchers and organizations, and what each one covers -- to be produced by this project. Board members also asked how the proponents planned to clean up the individual cells after each experiment. The technologies used should clean up the cells fairly completely, although not quite 100%. Other Board members asked about the contingency plan in case of a leak. Since it appeared that the only real contingency plan was to dig up the contaminated soil very quickly, the Board therefore added that efforts should be made to ensure that the monitoring plan is sufficient to detect leaks in the cells. It is very important that dense non aqueous phase liquid (DNAPL) not leak because the consequences are so severe. The Board asked that a comprehensive monitoring program become part of the project plan, if it is not already included. With this caveat, the Board voted 7-0 to recommend approval of the project as presented.
CU-514: The Engineering Design of In-Situ Bioremediation (DOE) $350K (FY96-New Start)	In situ bioremediation (ISB) has been used successfully for two decades for the restoration of soils and groundwater contaminated with hydrocarbons. ISB is more environmentally sensitive and less expensive than more invasive alternatives. In addition, it acts as a useful complement to other in situ technologies such as air stripping, hydraulic containment and pump and treat. The ISB designer actually has two tools available; the mathematical model and experiments. The objective of this project is to show that best results are obtained only if these tools are properly integrated. The obvious, but often overlooked, requirement that no parameter be allowed into a model unless experimental procedure exists to measure its value, automatically limits the complexity of the model. This project involves three tasks: a) developing design models with appropriate levels of complexity, b) designing treatability experiments so that they provide data in a useful form, and c) transferring these procedures to the ISB industry.	**(October)** This project was presented to the Board as a proposed new start with an FY96 funding request of $350K. The project was brought up for reconsideration. At the original briefing at the June 1995 meeting, the SAB had expressed numerous concerns about this proposed effort. Following this re-briefing, the Board still had considerable reservations about the project. The proposed modeling work was believed to be several years behind the current state-of-the-art; the differential reactor technique was not new; the proposed use of dimensional analyses for scaling up a "retardation factor" was not consistent with the Reynolds' dynamic similitude as claimed; and the problem of heterogeneity in scaling up to the field was not sufficiently addressed. Dr. Conway commented that the proposed Differential Soil Bioreactor might have uses in other SERDP projects. The Board voted 4-1 with 1 abstention to recommend against funding this project. This decision was ratified via the October 25 teleconference call with quorum present.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CU-115: Toxicology and Human Health Risks (USAF) $900K (FY97)	Chemical contamination of groundwater and soil is a national problem which consumes extensive technological and financial resources. Cleanup levels are determined on the basis of risk calculations, usually requiring extrapolation from laboratory animal studies. Determining acceptable levels for humans from animal studies is a conservative, policy-driven process that involves extrapolation and interpretation of scientific findings. Scientific uncertainties in this process are often compensated for by conservative assumptions that result in lower cleanup levels with inherent increased costs. Current costs to clean up to the low ppb range in water and soil are in the hundreds of millions of dollars. TCE, tetrachloroethylene, and other volatile organics are priority groundwater contaminants for DoD and the US EPA. These chemicals often greatly exceed current risk-based cleanup levels at Superfund landfill sites. It has been estimated that for 125 Air Force sites with TCE contamination, raising the drinking water standard from 5 to 50 ppb would save $620 million. This project is designed to further the development of newer risk assessment methodologies for developing reasonable health protective criteria for important groundwater contaminants for use in establishing cleanup requirements.	**(February)** Originally funded by SERDP in FY93, the project requested $900K to complete crucial research which will create a robust foundation for scientifically-based trichloroethylene risk assessment. The project has attracted substantial EPA support. EPA has put TCE risk assessment on the "fast track," an accelerated review procedure within EPA relating to cleanup standard setting (or re-evaluating existing standards) based on health risks. TCE is the only new chemical of the small number of chemicals on this "fast track," primarily as a result of the SERDP research findings. The Board expressed concern with the expectation that the project will result in an increase in the TCE maximum allowable limit. This language may bias the research and could possibly result in negative public perception; however, the expectation seems to be scientifically justified. The Board urged that this new scientific approach minimize subjectivity and uncertainties to the extent possible. The Board was supportive of this project and voted, in the absence of a quorum, 5-0 to recommend the FY97 funding request. This vote was ratified 8-0 in the presence of a quorum later in the meeting.
CU-720: Integrated Biotreatment Research Program (Army) $1,962K (FY96) $2,150K (FY97)	This project represents a collective research initiative by several key governmental and academic organizations with a long history of developing treatment technologies. The ultimate goal of this program is to perform research efforts that will result in the fielding of several biotreatment processes for remediation of predominant DoD contaminants. The proposed experimental approach will be to first investigate a variety of promising biotreatment techniques at the bench scale. During performance of bench activities, engineers with design and implementation experience will assess the overall implementation potential and projected costs associated with these techniques. Upon completion of the bench efforts, several small scale pilot studies will be performed using those techniques considered most promising. After performance of the intermediate scale studies, at least four of the most economically and technically sound processes will be evaluated on the field pilot scale at actual DoD sites.	**(October)** The Board reviewed the status of the project and the proposed FY96 and beyond activities. While supporting the project, the SAB offered a number of comments. The Consortium was encouraged to emphasize the transition of projects to the field and/or industry. The project should emphasize down-selecting candidate technologies, especially beyond FY96. The SAB asked about the communication between the Consortium and other researchers in this field; the Consortium was encouraged to open itself up to outside users. Dr. Ryan and Mr. Conway encouraged other SAB members to attend the Consortium's Spring 1996 meeting and asked Dr. Zappi to work with SERDP to facilitate this by providing the SAB members with the meeting agenda and list of attendees. The SAB recommended that the date for the meeting not be later than April 1996. The Board voted 6-0 with 2 abstentions to recommend approval of the FY96 funding request of $1,962K with the Board's comments added as recommendations. The vote was ratified via conference call on October 25. **(July)** This project, initially funded by SERDP in FY94, requested $2,150K in FY97 to continue its efforts to: (1) develop field implementable, cost-effective bioremediation technologies; (2) produce at least one field ready biotreatment technology for each contaminant group; (3) develop treatment systems that are better oriented toward contaminated soil, sediment, and groundwater treatment; and (4) increase understanding of process mechanisms and limitations. The SERDP Counsel recommended that the performers involve Mr. Bill Lovelady, the U.S. Army Waterways Experiment Station Counsel, in this project to ensure that peer review membership and actions do not conflict with the Federal Advisory Committee Act. The Board recommended that a link with the DOE's EM-

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CU-720: Integrated Biotreatment Research Program (Army) $1,962K (FY96) $2,150K (FY97) (continued)		50 "Plume Management Group" be incorporated into the program. The Board asked for a description of the transition criteria for each phase of this effort; what are the metrics used, and what are the screening (gate) criteria. The Board members agreed that for the SAB briefing in FY98, these screening criteria needed to be fully developed and in place, and they requested a full description at that time. The Board noted that this project should probably interact with another program called "Environmentally Acceptable End Points." The Board voted 6-0 with 1 abstention to recommend approval of this project as presented.
CU-729: Accelerated Tri-Services SCAPS Sensor Development (Army) $1,689K (FY96) $2,050K (FY97)	Currently, site characterization represents a significant portion of remediation efforts, accounting for approximately one-third of the total costs. Environmental site characterization has been traditionally based on drilling, sampling, and laboratory analysis. This traditional approach to site characterization hampers remediation efforts because of its uncertainty, time requirements, and cost. The Site Characterization and Analysis Penetrometer System (SCAPS) was developed to address many of these deficiencies. SCAPS combines traditional cone penetrometer technology with contaminant and geophysical sensors to rapidly provide a profile of contaminants and geophysical properties in a cost effective manner. In order to maximize their payoff in future remediation efforts, it is critical that environmental sensors be developed to characterize sites containing metals, POLs, solvents, explosives, and radioactive contaminants. This project addresses the need to accelerate the research, development, and demonstration of sensor, sampling, and associated data processing technologies for SCAPS.	**(October)** At the January 1995 review, the $1,689K in requested FY96 funding had been approved by the Board contingent upon satisfactory progress. Upon being briefed on the project's progress, the Board was impressed with the reported progress on research, development, and implementation of novel SCAPS sensors. The efforts of this umbrella project have also been scrutinized by a multi-agency peer review panel. The SAB voted unanimously to recommend approval of the requested FY96 funding; the Board's decision was ratified 7-0 with 1 abstention via teleconference call on October 25. **(July)** This project, initially funded by SERDP in FY94, requested $2,050K in FY97 to continue efforts to accelerate the development of SCAPS technologies (i.e., Laser Induced Breakdown Spectroscopy - LIBS, Laser Induced Fluorescence - LIF, Fiber Optic Raman Spectroscopy - FORS, electrochemical sensors, X-Ray fluorescence - XRF, and sampling capabilities) and to accelerate field demonstration testing and transitioning of the SCAPS technologies. While it was noted that EPA was not contributing any funding, EPA was well integrated into this effort and had several representatives on internal project advisory groups. The project's goal is to meet the EPA action levels for detection. In many cases these sensor technologies can do better, depending on the background matrix. Accordingly, the Board voted 7-0 to recommend approval of the project as presented.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CU-723: National Environmental Sites Program (Army/Navy/Air Force/EPA) $3,040K (FY97)	The current process for gaining acceptance of cost effective innovative technologies for the cleanup of federal installations is laborious and costly. The problem stems from several causes, including the lack of formally established technology demonstration programs ensuring protocols and quality assurance/quality control procedures sufficient to meet requirements of regulators and users and information dissemination in formats suitable for all interested parties. These causes can be addressed by a comprehensive technology demonstration/evaluation/transfer program. This project provides such a comprehensive technology demonstration/evaluation transfer program. The goal is to provide locations for comparative demonstration and evaluation of cost effective and innovative technologies to enable transfers from research to full-scale use. The Test Sites Program provides five different demonstration locations in a wide variety of geologic and contaminant settings, all fully characterized. These sites include a fuel hydrocarbon site located at Port Hueneme, California, an organic contaminants site, located at the former Wurtsmith AFB in Michigan, an energetics test site, located at Volunteer Army Ammunition Plant (AAP) in Tennessee, a solvents test site located at McClellan AFB in California, and a controlled release site at Dover AFB in Delaware.	**(August)** The NETTS mission is to provide accessible, well supported field locations for proof-of-principle, applied research and comparative demonstrations and to facilitate transfer of innovative environmental technologies from research to full scale use. This briefing presented the results of the 1996 Comprehensive Review Panel meetings, which were established to evaluate performance and to recommend FY97 funding levels to the five test locations. The Board moved to approve the Comprehensive Review Panel report with the following modifications: (1) the McClellan Test Site is recommended to receive $130K in FY97-99 (the out-years are subject to further review) and the cost/performance database be funded at $50K annually but moved to an appropriate location; and (2) the Wurtsmith facility receive $800K (versus $500K) in FY97 as a first step in transition to a lower out-year funding line. This motion was seconded and approved by a vote of 5-0 with 1 abstention.
CU-1043: Natural Attenuation of Explosives Contaminants (Army) $800K (FY96-New Start) $850K (FY97)	The goal of this project is to demonstrate tools for monitoring natural attenuation of explosives through both immobilization processes and microbial degradation processes. The project will develop the following four areas: microbial monitoring tools, stable isotope technology, site geological characterization, and modeling. Effective monitoring tools will be integrated into guidance for selection and implementation of natural attenuation as a remedial alternative. The payoff of this work is an estimated cleanup cost of $30 per ton as compared to $300 per ton using traditional "pump and treat" technologies. Results of this project will be integrated into and contribute significantly to an ESTCP funded field effort for demonstrating natural attenuation of explosives.	**(August)** This is a proposed FY96 new start seeking $800K in FY96 funding and $850K in FY97 funding. The SERDP Executive Director had authorized release of FY96 funds for this project in order to jump start the effort, but it was appearing before the Board to obtain approval for both FY96 and FY97. The Board recommended that Dr. Pennington contact Dr. William Suk at the National Institutes of Health who conducts significant work on biomarkers. The Board was generally supportive of this research and this project as presented and recommended approval of the FY96 and FY97 funding by a vote of 7-0.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CU-1049: Application of Neural Network Model Coupled with Genetic Algorithms to Optimize Soil Cleanup of Subsurface Contamination (Army) $196K (FY96-New Start) $250K (FY97)	This project plans to use Neural Network modeling for (i) site characterization, and (ii) remedial optimization in cold regions. The first objective is the automatic decomposition of Ground Penetrating Radar (GPR) signals into stratigraphic layers using Neural Networks. GPR can probe the subsurface non-invasively at high resolutions. However, methods for quantitative interpretation of these data are sparse. The project plans to use Neural Networks, which are ideally suited for pattern recognition, to recognize quantitative layer configuration, such as top-of-permafrost, bottom-of-permafrost, watertable and top-of-bedrock. Neural Network modeling will be used in combination with numerical formulations of the propagation of GPR signals derived from the traditional governing equations for electromagnetic wave propagation. The proposed effort is an extension of a successful application of these techniques for non-destructive acoustic-wave analysis of composite materials. If successful, this modeling strategy can be extended for non-invasive evaluation of the subsurface in general.The second objective is to use a Neural Network system coupled with a genetic optimization algorithm for decision analysis of various remedial strategies and of various configurations within a remediation treatment. A key benefit of the genetic optimization system is that it avoids the pitfalls of gradient-based optimization algorithms. These latter strategies are plagued with local minima search terminations. The genetic algorithm incorporates a mutation function that allows the system to examine alternate settings and not be bounded by local minima. These algorithms will be applied to both remediation strategies for in-situ treatment and to deployment of monitoring stations at remedial sites.	**(July)** This is a proposed new start for FY96 requesting $250K. The Executive Director had authorized release of FY96 funds for this project in order to jump start the effort, hence it appeared before the Board to obtain approval for both FY96 and FY97. The project's objectives are: (1) to develop a strategy for automatic decomposition of ground penetrating radar (GPR) signals into stratigraphic layers; and (2) to develop/implement a rapid optimization strategy capable of analyzing selective remediation alternatives. The Board advised that since none of the performers are remediation experts, input and advice from representatives of the cleanup community should be included in the project now, not just at the end of the project. The Board voted 7-0 to recommend approval of technical objective #1 but asked the SERDP Executive Director and Dr. Sullivan to jointly clarify the language of technical objective #2. Specifically, objective #2 should be modified to indicate that no new models are being developed and to note that these optimization techniques are only as good as the initial models used. In effect, this task accelerates the computational aspects of the initial model. The Board withheld approval of technical objective #2 until they were able to review the revised language.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CU-1052: Multi-Sensor Data Fusion for Detection of Unexploded Ordnance (Army) $300K (FY96-New Start) $300K (FY97)	A recent demonstration of current technologies for the detection of unexploded ordnance (UXO) at the Jefferson Proving Ground (JPG) in Indiana showed that some sensing approaches were partially successful, others completely failed, and that the best opportunity for success will have to be a multi-sensor platform, or multiple sensors from different platforms whose data can be processed in a complementary manner. While the JPG UXO Technology Demonstration provided an unbiased ranking of current technology performance in the field, it did not provide a mechanism for a scientific evaluation of why particular systems did or did not perform well. The first element of this project will be to support such an evaluation. This will be accomplished by forming a technical review committee to evaluate the technical performance of various systems and to prepare a report that will address many of the phenomenological issues that affect sensor performance and provide general guidance for system improvements that would feed the effort to develop a multisensor detection platform. The second element of this project will focus on the combination of data from several sensors to optimize detection system performance. This effort will begin by examining more closely any attempts at data fusion performed by JPG demonstration participants who utilize multisensors. A prototype data fusion algorithm will then be developed and tested on JPG data taken from both multiple sensor platforms and from multiple sensors used by different participants that could be spatially coregistered. The final product of this effort will be a model that could easily be adapted to the fusion of data from the array of sensors that would serve as the prototype UXO detection system. This effort will allow the USACE to assemble a prototype multisensor UXO detection platform along with the software necessary to accomplish fusion of the enormous amount of data such a platform will create.	**(July)** This project was a proposed new start for FY96 as a result of the research gap identified in the SERDP-funded FY95 UXO detection feasibility study. The Executive Director authorized release of FY96 funds for this project in order to jump start the effort, hence it appeared before the Board to obtain approval for both FY96 and FY97. The project requested $300K in FY96 and $300K in FY97 to understand better the environmental factors and phenomenologies that dictate success/failure in subsurface anomaly detection. Rather than perform any platform development, several members of the Board noted that this project should include (in its final report) recommendations to SERDP regarding sensor effectiveness in this environment and include a conceptualization of the optimal sensor platform to be developed, along with sensitivity analyses. Other Board members pointed out that significant technical risks are inherent in this project. It has been assumed that the Jefferson Proving Ground data sets collected are of sufficient quality and accuracy. Further, all of the technical risks listed in the presentation relate to sensor effectiveness issues and their limitations which are not the focus of this project and are beyond the control of the Principal Investigator (PI). However, the project will provide data weighing which will help normalize the sensor effectiveness issues. In order to fully understand the types of recommendations this project will provide to SERDP, the Board requested that Dr. Cespedes fully characterize in writing the information that will be contained in the project's final report, i.e. what recommendations for multiple sensor applications will be included, what types of analyses, and what level of detail will the platform conceptualization entail. Accordingly, the Board voted 7-0 to recommend approval of this project as presented with the caveat that the Executive Director collect the requested information, evaluate it, and distribute it to the Board.
CU-1062: Development of Simulators for In-Situ Remediation Evaluation, Design, and Operation (Army) $550K (FY97-New Start)	The primary technical objectives of this investigation are to 1) Develop and enhance remediation simulators that employ the state-of-the-art algorithms for the following technologies: in-situ bioremediation including, surfactant-enhanced bioremediation, electrokinetic-enhanced bioremediation, electrokinetic-enhanced mobilization of metals, natural attenuation of hydrocarbons and explosives, in-situ chemical treatment, surfactant/cosolvent/polymer flushing to recover nonaqueous phase liquids, soil vapor extraction, bioventing, and air sparging; 2) Incorporate these simulators in a comprehensive user environment that provides for their productive use in conjunction with conceptualization, parameterization, visualization, and animation capabilities. DoD Groundwater Modeling System (GMS) will serve as the common computational environment for all of these simulators; and, 3) Through leveraging of AEC-sponsored activities and collaboration on other research areas, verify simulator and provide DoD and DOE with the computational ability to assess the tradeoff between environmental risk (cleanup level) and cost-effectiveness for a variety of cleanup technologies prior to their implementation.	**(August)** This was a proposed FY97 new start seeking $550K. The Board voiced concern that simulators might become too complex for our level of data and understanding. The Board encouraged the PI to take advantage of the data developed by SERDP projects that were related to proposed simulator research areas. Members of the Board raised a variety of other issues with this project, including: the fact that there may be too many simulators being developed under this one project; the fact that McClellan AFB might have a great deal of applicable data in the Soil Vapor Extraction (SVE) and bioventing area; concern that the best available science may not be incorporated into the models; questions about whether an organization within the Services would carry this research forward beyond this proposed SERDP effort; that the project seemed too ambitious; and an overall concern that the site specific information regarding on-going or completed SERDP projects should have been expressed more clearly through the TTAWG discussions. There was also a difference of opinion with regard to the approach taken to develop simulators. Notwithstanding these concerns, the Board moved to recommend approval of the project for FY97 funding and

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CU-1062: Development of Simulators for In-Situ Remediation Evaluation, Design, and Operation (Army) $550K (FY97-New Start) (continued)	Remediation simulator development will proceed along three paths 1) utilize existing, proven remediation simulators where available and consistent with project goals, 2) modify promising groundwater codes to simulate additional technologies as appropriate, or 3) develop new codes as required for efficient simulation of innovative technologies. All simulator codes will be in the public domain. Thus far, the major thrust in remediation simulation within the GMS has been toward adapting or enhancing existing codes for remediation purposes. A plan for GMS integration of additional simulators has been developed that places priority on certain simulators based on remediation technology maturity, user demand for a given remedial technology, and the degree to which the additional simulator would complement existing GMS capabilities.	asked that it return to re-brief on a regular basis -- regardless of the annual funding requests -- in order to bring the Board members into the planning process. The Board also recommended that the newly-formed SAB Cleanup sub-committee review the project very carefully and interact with the corresponding TTAWG sub-committee as needed to ensure that the project was headed in the correct scientific path. The Board voted 5-2 to recommend approval of the FY97 increment of this project.
CU-1063: In-Situ Reactor Method for Remediation of Contaminated Sediments (Navy) $450K (FY97-New Start)	The project objective is to evaluate the in-situ reactor method for the remediation of contaminated sediments. The system adapts and integrates recent technological developments in the offshore oil and environmental industries for use in remediating contaminated marine sediments. This novel method uses a reusable semi-batch reactor devise, based on offshore suction pile technology, coupled to a portable remediation treatment unit. If proven, this method would eliminate the associated costs for removal, disposal, and containment of contaminated dredged materials at "hot spot" areas with minimal risk to the environment. An engineering simulation model approach will be used in conjunction with a contaminated sediment characterization survey and an ongoing expert panel review of the reactor design and prospective remediation processes. Candidate remediation process streams will be evaluated and refined by bench laboratory treatment tests simulating in-situ conditions. The bench-scale viability of the "best" in-situ reactor remediation process streams will be determined. Concurrently, a test reactor will be developed for evaluation in harbor sediments at the CBC Port Hueneme National Test Site. This reactor model will be used for "proof of concept" evaluation and generate the design parameters for a prospective follow-on pilot prototype. Evaluation criteria include: cost-to-benefit ratios related to reactor size and handling elements, expected reactor and remediation process performance and reliability, and environmental safety. The expected outcome of this project is the development and evaluation of a new tool that will provide a needed option for the cleanup of contaminated sediment "hot spot" sites.	**(August)** This project was briefed as an FY97 new start proposal seeking $450K. The Board pointed out a potential problem in the scientific formulation of the project -- specifically that the biochemical oxygen demand (BOD) may be too high within the reactor vessel to allow this approach to succeed. In dealing with sediments heavily laden with organic material and detritus, the demand for oxygen might be so high as not to be satisfied, no matter how much O2 is pumped into the reactor vessel. Thus, aerobic treatment of contaminants could not occur because the oxygen would be removed from the system to satisfy the high BOD as quickly as it is pumped into the vessel. Dr. Weber advised that the PIs contact one or more of the following experts to obtain advice on the treatment side of their proposed effort: Dr. Jones-Meehan of the NSWC-Carderock, Dr. Joe Hughes, Dr. Robert Engler, or Dr. Bill Blase. The SAB deferred to vote on approval for funding this project. The Board and the SERDP Executive Director agreed that the PIs should focus on the treatment issue and see if a plausible approach can be developed.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CU-1064: Bioenhanced In-Well Vapor Stripping to Treat TCE (USAF) $280K (FY97-New Start)	The objective of this project is to demonstrate that a combination of two in-situ treatment technologies, in-well vapor stripping and in-situ bioremediation, can be used to reduce and contain the high levels of chlorinated solvent (TCE) contamination found in the proximity of a non-aqueous phase liquid contaminated zone. The aim is to approach or obtain compliance with the exceedingly low regulatory standards established under the Safe Water Drinking Act. For this project, an in-well vapor stripper will be installed next to a TCE-contaminated "hot spot," and up gradient from a downflow biotreatment well. In operation, the in-well vapor stripper will use air-lift pumping to pump contaminated water from the lower portion of the aquifer to a screened interval above and below the water table to create a circulation zone within the aquifer. 90-99% of the VOCs will be stripped from the water to the gaseous phase and treated via G.A.C. The treated water leaving the upper screen of the in-well vapor stripper will flow to the upper screen of the biotreatment well. This water will be pumped down through the well, where a primary substrate such as toluene will be added. Oxygen may also be added in the biotreatment well to support the aerobic bioremediation process. After the addition of the primary substrate, the water reenters the aquifer through the lower screen interval where indigenous microorganisms can aerobically metabolize the primary substrate and simultaneously cometabolize the residual chlorinated solvent.	**(August)** This was a proposed FY97 new start seeking $280K. The Board noted that, in adapting this approach to remediate DNAPLs, there may be an issue of scale that would not necessarily exist with an aqueous source. Board members also pointed out that control of the hydraulics is fairly important to the project, especially as it relates to a confined area, such as in a test cell at the Dover NETTS site. The Board noted that the first year of this effort should concentrate on the planning and design of the system. When sufficient progress has been made on the design, they asked that the project return to re-brief the Board. The Board then moved to approve the FY97 funding request. This motion was seconded and approved by a vote of 6-0.
CU-1065: Surfactant/ Emulsifier Enhanced Biodegradation In-Situ and Excavation-based Treatment Systems (Army) $300K (FY97-New Start)	This project is a follow up research effort to the previous SERDP funded study **CU-731**. Studies with three commercially available nonionic synthetic biodegradable surfactants showed that surfactants could significantly reduce biotreatment costs, but their efficacy varies with the surfactant and contaminated soil studied. More and more synthetic surfactants are being marketed for the purpose of enhancing bioremediation, but at present, there is no way to judge which synthetic surfactants are effective. We will evaluate the ability of 20 biodegradable synthetic surfactants (10 ionic and 10 nonionic) to enhance the rates of degradation of contaminants in slurries of 20 different soils (5 explosive-contaminated soils, 5 PAH-contaminated soils, 5 PCB-contaminated soils, and 5 chlorinated solvent-contaminated soils). The partitioning of contaminants into the aqueous phase of the slurries will be determined in sterile controls. Degradation rates of the contaminants will be determined by using conventional analytical methods. The results obtained will be used to evaluate the performance of the surfactants on four commonly encountered groups of contaminants using a range of different soil types. Results of this study will be immediately published and used in biotreatment studies funded by the users.	**(August)** This was a proposed FY97 new start seeking $300K. The Board raised numerous concerns about this new start proposal, primarily that they could not understand the relationship between this project and the larger project, **CU-720: Integrated Biotreatment Research Program: From Flask To Field**, which briefed at the last meeting. The Board suggested that any new research might focus on mobile contaminant problems, and they recommended against funding this proposal as presented, by a vote of 7-0.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
	COMPLIANCE	
CP-1038: Development of Non-Thermal Plasma-Reactor Technology for Control of Atmospheric Emissions (DOE) $500K (FY96-New Start)	The objective of this project is to evaluate and develop NTP reactor technology for DoD air emissions control applications. A key goal is to provide a basis for selecting an optimum NTP technology for DoD applications by evaluating the performance of prototype and pilot-scale NTP reactors for NO_x and HAP abatement and VOC control and to assist in the commercialization of the technology. Methods used to achieve this objective include: conducting a rigorous technology comparison (e.g., discharges and electron beams), formulating engineering scaling criteria and algorithms, demonstration of the operational effectiveness, and developing a basis for selecting the most appropriate NTP technology for DoD applications.	**(October)** This project was presented as a proposed new start with a FY96 funding request of $500K. The effort is focused on NOx abatement; the work is based on the premise that many DoD facilities, especially jet engine test facilities, are out of compliance with regard to Nox emissions. Overall, the Board commented that this was an outstanding presentation and applauded the quality of the proposed research team. The Board inquired about the extent of Nox non-compliance at DoD facilities, as well as the relative importance of Nox/Sox emissions versus VOCs. The Board also asked about the risk of producing undesirable by-products when the non-thermal plasma technology is applied to real-world waste streams. In the absence of a quorum, the Board voted 6-0 to recommend approval of the project funding conditional upon: (1) revision of the execution plan to incorporate a comparison with conventional Nox removal technologies, and (2) confirmation, by SERDP, of DoD non-compliance with regard to Nox emissions. The Board ratified this decision, with one abstention, in a quorum via a teleconference call on October 25.
CP-034/887: Compact Closed-Loop Waste Incinerator (Navy) $1,500K (FY97)	A new generation of incinerators based on recently developed active ramjet-combustion control is required for ship-board waste disposal to enable Navy ship access to ports and bodies of water around the world without operational constraints from environmental laws and regulations. Thermal destruction is considered the ultimate solution beyond year 2000 for all types of waste, including trash, garbage, plastics, medical and hazardous wastes. Present commercial incinerators are typically unsuitable for Navy shipboard installation and operation because they are oversized and often do not meet incineration standards, particularly at off-design operation. For ship-board use, compact (small size) incinerators with assured (pollution-free) waste destruction during design and off-design operation are essential. The overall goal of this project is the demonstration of a compact prototype incinerator with closed-loop active combustion control.	**(February)** In FY96, the project was split into 2 components, a research effort (CP-034) and a demonstration effort (CP-887). The FY97 funding request is $900K (CP-034) + $600K (CP-887) for a total of $1,500K. The overall effort seeks to develop compact waste incinerator technology (CP-034), to optimize system size and throughput, to demonstrate active combustion control technology with real-time monitoring for application to Navy systems (CP-887), and to apply this capability to combined waste streams, such as black/gray water and oily waste water. The current focus is on the vortex sludge incinerator and the plasma arc pyrolysis afterburner. The SAB was generally supportive of this project but had several questions relating to the incineration effectiveness/dioxin production when applied to chorine-containing compounds (chlorinated solvents), and the need for a real-time monitoring capability and whether such a system was essential for incineration systems. Notwithstanding these issues, the Board voted 4-0 with 1 abstention (Mr. Conway) to recommend the FY97 funding request as proposed. This vote was ratified 7-0 with 1 abstention (Mr. Conway) in the presence of a quorum later in the meeting.
CP-247: Characterization of Open Burning/Open Detonation Emissions (Army) $2,095K (FY97)	The substantial amounts of energetic materials (propellants, explosives, and pyrotechnics (PEP)) accruing within the Department of Defense (DoD) have become an increasing burden on the military logistics systems and have become the subject of growing public concern. Despite the critical need to reduce the demilitarization inventory, use of the only available process -- OB/OD -- has been sharply curtailed. Environmental regulators are demanding item-specific empirical data before granting OB/OD permits under subpart X of the Resource Conservation and Recovery Act (RCRA). These data are not available, and the system for obtaining them has not been fully	**(February)** Originally funded by SERDP in FY93, the project requests $2,095K in FY97 to continue: (1) to provide scientifically sound understanding of the processes that occur when munitions and PEP materials are destroyed by OB and OD; and (2) to modernize OB/OD technologies to maximize the conversion of munitions and PEP materials into harmless products while reducing the noise, shrapnel, and blast wave released by OB/OD activities. The second objective needs to be explicitly included and addressed in the milestones of the project. The SERDP Executive Director requested that Mr. Wilcox revise his project milestones to include efforts on

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CP-247: Characterization of Open Burning/Open Detonation Emissions (Army) $2,095K (FY97) (continued)	developed. Limited small-scale testing indicates that OB/OD-generated emissions of interest are so minute that they pose no hazard to health or the environment. The goal of this project is to technologically expand testing facilities, instruments, and procedures so that they can be applied to current and projected disposal permitting data needs. This includes designing new and larger BangBox testing chambers, characterizing emissions of complete munitions, and grouping munitions into emissions families so that future testing requirements can be abbreviated.	process optimization, specifically configuring charges/optimizing arrangement of the charges to reduce emissions. With a quorum present, the Board voted 7-0 to approve the funding request as proposed.
CP-1060: Laser-Based Spectrometers for Measurement and Monitoring of Toxic Metals and Organic Emissions (DOE) $600K (FY 97-New Start)	The objective of this project is to: (1) assess the feasibility of sharing three common system elements (the laser, the sample interaction region, and the operating software), (2) develop a configuration for a common IR/LIBS sensor, and (3) develop an integrated system for field-testing to demonstrate simultaneous detection of metals, VOCs, and NOx. The advantages of developing a common instrument include: the use of a laser-based instrument capable of real-time in situ sampling, minimizing complicated and costly laboratory analysis and inaccuracies introduced by grab sampling, and the cost savings resulting from monitoring a large number of sites with an integrated instrument.	**(August)** This was a proposed FY97 new start seeking $600K. Some of the Board members questioned the need for laser-based technologies given the apparent adequacy of conventional monitoring techniques for most requirements. Other members underlined the importance and need for continuous field monitoring and expressed support for the project. The Board cautioned the PIs not to spend too much time on the task of integrating the two systems; maintaining quality should be the first priority. Accordingly, the Board moved to recommend approval of the project at the requested funding level for FY97. Mr. Conway amended the motion to request that a user representative be added to the existing project performers team. Dr. Weber also amended the motion and requested that the project be briefed to the Board for approval in FY98, regardless of the requested funding level. This motion, as amended by Mr. Conway and Dr. Weber, was approved 8-0.
CP-1061: Detection and Identification of Multiple Hazardous Air Pollutants (HAPs) at Extended Distances $245K (FY97-New Start)	The objective of this project is to develop a UB radiation source for active remote sensing of HAPs. Ultra broadband radiation will allow the identification of multiple HAPs at extended distances of up to 3 km. Specific goals include the development and characterization of detectors, preliminary experiments on chemical identification, planning and performing a proof-of-concept experiment. The results of this project will lead to the development of monitoring sensors capable of continuous, real-time identification of HAPs at extended distances.	**(August)** This was a proposed FY97 new start seeking $245K. The Board questioned the consistency and accuracy of the monitoring when performed over long distances and through the ambient air. Dr. Sprangle explained that the proposed technology would be temporally coherent throughout the distance. The Board commented that the project appeared to have DoD-wide applications and was backed by sound scientific research. The Board voted 7-0 to approve the project.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CONSERVATION		
CS-048: Whale Monitoring/Fishing Enforcement (Navy) **$2,400K (FY96)** **$2,140K (FY97)**	The goal of this effort is to continue to apply capabilities of the U.S. Navy Integrated Undersea Surveillance System (IUSS) to support the High Seas Driftnet Fisheries Act (PL102-582) and other national treaty and maritime law enforcement requirements and to monitor various species of marine mammals to contribute toward conservation and regulations compliance. This work explicitly supports the SERDP Goal to "help solve significant...environmental problems through the application of (DoD's) technical capabilities..." The IUSS provides a unique resource to monitor the population and movements of several endangered marine mammals -- specifically, the great whales. In no other way can these movements be monitored over the scale of an ocean basin. Exploitation of this resource is vital in complying with the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), and the Marine Mammals Protection Act (MMPA).	**(October)** This project has requested $1,900K in FY96 funding. The Board strongly supported this project as one providing direct benefits to the Navy with regard to compliance with marine endangered species issues. The project is also a good example of transfer of DoD technology. Dr. Ryan noted that the transition plan should show how the project will be transitioned to Navy, NOAA, or other agencies at its completion. Given the benefits of this work to the Navy, he recommended that next year the project should be reviewed with the expectation of support by the Navy. Following introduction of an amendment by Dr. Ostenso (for Mr. Eno) to increase FY96 funding by $500K for a) Bermuda Array reactivation, and b) fishing enforcement application, and at the suggestion of the Executive Director, the Board requested the Executive Director to explore how an additional $500K of funding can be leveraged. The Board voted unanimously (8-0) via teleconference call on October 25 to recommend approval of the existing funding request of $1,900K and to allow the Executive Director to develop a $500K project enhancement, to be presented to the SAB at their next meeting. **(February)** This project already briefed the Board at the last SAB meeting. The Board had asked that Dr. Conlon return to brief the potential for re-opening the Bermuda SOSUS array. The Bermuda facility was closed in November of 1994, taking away a vital component of the IUSS for doing work in the western North Atlantic. With other funding from the private sector (largely Loral Inc.), a re-opening of the Bermuda facility would process data that would be made available for a range of dual-use purposes, especially whale research and monitoring in the western North Atlantic. Dr. Conlon outlined 3 alternatives for reactivating the array. The SAB members raised several issues, including the costs associated with each reactivation option, the security issues to be resolved, details of the partnership arrangement, and the anticipated availability of resulting data and information. Without recommending which approach to take, the SAB voted to approve the additional $500K request with certain stipulations: (1) that the security issues be resolved to the satisfaction of the USN before March 15, 1996; (2) that partnership funding be assured before March 15, 1996, with some assurance of the duration of operational funding commitments; (3) that the SAB be provided with a clear definition of expected data availability and assurance that the data produced from the Bermuda facility will be available equally to the scientific community at large, at least as long as SERDP funds this effort; and (4) that assurances be provided that data from the Bermuda facility will become available by 31 December 1996. The Board voted 7-0 with 1 abstention (Mr. Eno) to approve the additional funding request of $500K.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
CS-048: Whale Monitoring/Fishing Enforcement (Navy) $2,400K (FY96) $2,140K (FY97) (continued)		**(July)** This project, initially funded by SERDP in FY93, requested $2,140 in FY97 funds to continue efforts to determine how Navy undersea surveillance systems can be used to detect, classify, and track marine mammals, and more generally to measure the impact of Navy operations on living marine resources, particularly marine mammals. The Board questioned whether this project would be completed as scheduled in FY98. The Executive Director provided assurances of this and indicated that any new related efforts would be submitted as separate proposals. The Board commended Dr. Conlon for his management of this project over the years and voted 5-0 to recommend approval of FY97 funding as proposed. The vote was later ratified by a quorum via fax.
CS-1054: Development and Demonstration of a Risk Assessment Framework on Military Training and Testing Lands (DOE) $330K (FY97-New Start)	The goal of this project is to develop a consistent, defensible, and easily implemented framework for assessing risks to natural and cultural resources from military testing and training missions, thus maintaining required levels of readiness. This framework would incorporate physical, chemical, and biological stressors, including noise, and their direct and indirect effects, short and long term, on natural and cultural resources.	**(August)** This was a proposed FY97 new start seeking $330K. Several members of the Board were unclear about the scientific approach and the anticipated science inputs to the overall framework. Many of the Board members noted the importance of this research but could not see how the end product could be achieved. Nonetheless, the Board moved to recommend funding the FY97 increment but requested that Dr. Suter return to re-brief them when he completes the draft conceptual framework and again prior to release of FY98 funding. This motion was approved by a vote of 6-2.
CS-1055: Analysis and Assessment of Military and Non-Military Impacts on Biodiversity: A Framework for Environmental Management on DoD Lands Using the Mojave Desert as a Regional Case Study (EPA) $250K (FY97-New Start)	The goal of this project is to provide the DoD with the capability (including techniques, tools, and training) to most effectively carry out its military mission in the context of regional management of biodiversity and related environmental considerations and to consider them not only within the boundaries of the installation but also in the context of the surrounding stakeholders and the cultural and ecological resources they manage. This new start would build upon prior Biodivesity Research Consortium (BRC) work at Marine Corps Base Camp Pendleton and would apply those strategies to the regional scale of the Western Mojave Desert of California.	**(August)** This was an FY97 proposed new start seeking $250K. The Board asked how this project relates to CS-1054, a Risk Assessment Framework project. This effort is focused on a specific problem, i.e. biodiversity conservation in the context of regional land management schemes. The knowledge gained by this effort and its predecessor at Camp Pendleton should feed into the risk assessment framework as it relates to the risks of military training and testing on biodiversity management, but the two efforts can be executed in parallel. Furthermore, the risk assessment framework will serve as a means to deal with broad uncertainty while this project will directly address the uncertainty associated with regional biodiversity management on military facilities and those lands surrounding them. Accordingly, the Board moved to recommend funding this project as presented by a vote of 7-0 with 1 abstention. The Board emphasized that the generic learning gained by the Pendleton effort and this project need to be well publicized; it should not be viewed as a site-specific effort, but rather as a strategic research project.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
POLLUTION PREVENTION		
PP-081: Aircraft Depainting Technology (Navy) $930K (FY97)	The objective of this project is to develop a non-hazardous replacement for chemical paint stripping for use on DoD aircraft (A/C), Weapon Systems (WS), and Ground Support Equipment (GSE). The most promising existing and developmental methods for paint removal such as PMB, Flashlamp, UV, dry ice stripping, water jet stripping etc., have been compared with regard to efficiency, effects on substrate surfaces, hazardous waste generation and applicability to DoD aircraft. The method which provides the greatest reduction in hazardous waste, applicable to fighter and cargo size aircraft is the Flashjet Process, consisting of a xenon arc flash lamp used simultaneously with dry ice and an effluent capture system. The flash lamp/dry ice prototype was successfully demonstrated on a Navy F/A-18 Radome at McDonnell Douglas Aerospace in St. Louis. Other parts successfully depainted included: C-17 wing slats, F-15 Radome, and AV-8B horizontal stabilizers. Flashlamp/dry ice testing for material compatibility on monolithic composite specimens was completed and data will be available soon. The practical application of the Flashjet process will require the use of robotics assisted manipulation. Two manipulators are under investigation. The first is a mobile (vehicle integrated) semi-robotics system for depainting large aircraft. The second is a fixed gantry robotics system ideal for small aircraft and off-aircraft parts.	**(February)** The project requested $930K in FY97 to continue the effort and to demonstrate a prototype system for the first time at full scale. The SAB raised several concerns, including: (1) the high cost ($2,500/ton) of current hazardous waste disposal; (2) the apparent lack of contributing Air Force funding; (3) the apparent use of SERDP funding to demonstrate a commercial Flashjet(tm) system; and (4) the high proportion ($750K out of $930K) of FY97 funding devoted to hardware/equipment. The SAB also requested a more detailed cost-benefit analysis. Accordingly, the Board requested the following additional information before rendering a decision on this project: (1) clarification of the actual breakout of hardware vs. engineering costs for FY97; (2) a more thorough explanation of the $2500/ton cost for disposing of current wastes from depainting operations; and (3) further information on the cost/benefit analysis presented, i.e. what are the assumptions (e.g., number of aircraft serviced, etc.), and what are the annual maintenance costs, plus cost figures for a five-year period? The Board also requested information concerning the Air Force's interest in this technology and how this system could be used on tanks and other military vehicles that require painting and depainting. **(July)** In a re-brief to the Board, the PI addressed issues raised by the SAB during the February 1996 meeting. The total funding required in FY97 to complete the project is $1.4M, out of which the SERDP contribution is $930K with the additional $400K expected from the Navy. The project is closely coordinating efforts with **PP-139: Laser Cleaning and Coatings Removal**, as well as with **PP-134: Large Aircraft Robotics Paint Stripping (LARPS)**. Members of the Board noted that while this project in FY97 leans towards 6.4, it has progressed to the point where sufficient demonstration is necessary. Accordingly, the Board voted 5-0 to recommend supporting the project with the contingency that the Navy provide the additional $400K and that the project be completed in FY97. The vote was later ratified by a quorum via fax.
PP-139: Laser Cleaning and Coatings Removal (AF) $950K (FY97)	This project is a field demonstration of a prototype, laser-based facility, for environmentally acceptable, affordable and controllable component cleaning and coating removal. Laser cleaning and coating removal will be demonstrated on components ranging from turbine engine blades to landing gear and radomes. System operations will be fully robotized and computer controlled with on-line instrumentation for component positioning and measuring and controlling laser inputs to the part surfaces.	**(August)** This is a continuing project seeking $950K in FY97. The SAB questioned the return on investment for this project. Mr. Waddell explained that the DoD might need approximately 5 operational units and acknowledged that the cost of this technology at present is high; however, he is also working to bring the cost down by using off-the-shelf components rather than developing them individually. The Board generally supported the development of this technology and commented that if the proposed technology is successfully and cost-effectively developed and demonstrated, many intermediate level maintenance depots would adopt this technology. The Board moved to recommend approval of FY97 funding for this project by a vote of 8-0.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
PP-158: Advanced Streaming Agent (AF) $950K (FY97)	The objective of this effort is to develop a "drop-in" clean, environmentally safe streaming fire suppressant to replace Halon 1211 used in flightline and aircraft portable fire extinguishers. Although extensive research has been conducted by both industry and the Department of Defense (DoD), a suitable replacement for Halon 1211 used in flightline and aircraft portable fire extinguishers has not been found/developed. Prior efforts to find a replacement concentrated on currently in-production chemicals and were directed at finding a chemical that had a low to zero ozone depletion potential (ODP), was non-corrosive, left little to no residue, had low toxicity, and had a fire suppressant effectiveness close to that of Halon 1211. Perfluorohexane (C_6F_{14}) was recommended as the candidate replacement agent for the DoD and the EPA tentatively approved it for military fire fighting use only. Although Perfluorohexane meets all performance requirements, the Air Force recommended not to field this chemical due to the chemical's long atmospheric lifetime.	**(February)** The project requested $950K in FY97 funds to continue the effort. The SAB asked that the PI revise the project title to better reflect the contents/significance of the effort and to better reflect the focus of the research from the perspective of someone who is not intimately familiar with the topic. The Board also asked that the PI remove the word "charged" in "neutral-charged metal ion complex." Additionally, one Board member requested follow-up information on the potential use of a supercritical fluid delivery system for fire suppressants. The Board member explained that he hoped Dr. Kibert might be able to report on a supercritical fluid delivery system by way of a future presentation, unless the idea proves to be a total failure. The SAB voted 6-0 to recommend approval of FY97 funding request as proposed. This vote was ratified 10-0, with 2 abstentions (Dr. Moss and Dr. Parker), by a quorum via telefax.
PP-331: Integrated Expert Solvent Substitution Database (EPA) $1,000K (FY96) $1,000K (FY97)	The objective of this project is to facilitate the transfer of information to, and from, industry and government and to eliminate potentially redundant activities. Additionally, this project will provide an important technology transfer function for Federal agencies, states, and small and medium industries to reduce hazardous waste releases/emissions and meet the requirements of Executive Order 12856 which requires a 50 percent reduction of toxics by 1999, and compliance with the Clean Air Act/SNAP hammer deadlines. It will also assist in redevelopment of many Mil Spec Standards under Executive Order 12856, and will assist participating agencies and the U.S. in meeting its ozone depletion reduction and toxic use reduction goals. The project is building the Enviroene environmental information transfer network using the Internet and World-Wide Web to link multiple databases and networks into an integrated distributed management framework (WWW Home page is: **http://es.inel.gov**).	**(February)** The FY97 funding request was $1,000K, which would complete the project. The SAB expressed concern over the apparent lack of direct involvement by solvent manufacturers and suppliers, but the PI agreed to adjust the project to address this concern. Accordingly, the SAB voted 5-0 to recommend approval of FY97 funding request as proposed. This vote was ratified 10-1, with 1 abstention (Dr. Moss), by a quorum via telefax.
PP-873/PP-867: Solventless Manufacture of Artillery Propellant Using Thermoplastic Elastomer (TPE) Binder (Navy) $250K (FY96-New Start) $300K (FY97)	The objective of this project is to demonstrate the feasibility of reducing or eliminating the emission of volatile organic compounds (VOCs) associated with the production of multibase gun propellants by using thermoplastic elastomer (TPE) propellants. Artillery propellant production currently creates up to 2.5 tons/day of VOC emissions, based on an annual production rate of 5.5 million lb/day of triple-base propellants. New propellant formulations which reduce or eliminate the use of solvents will be developed and evaluated for replacement of current propellants that require solvents to manufacture. After down-selecting to one or two formulations, manufacturability, safety, sensitivity, and performance characteristics will be evaluated in "proof of principle" tests.	**(October)** This project was a proposed new start with a $250K FY96 funding request. The project had originally been briefed to the SAB during the June 1995 meeting and was brought back for reconsideration. SAB questions at the original presentation concerned the environmental pay-off and the appearance that benefits of the proposed work would be limited to the Radford Army Ammunition plant and would not be readily transferable. Dr. Carpenter commented on the good quality of the presentation but questioned where in the 6.1-6.3 spectrum this project would fall. The Board expressed a concern that product improvement, rather than environmental concerns, were driving this work. They also questioned the overlap between this project and PP-063 (Clean-Agile Manufacturing of Energetic Materials). Notwithstanding these concerns, the Board voted to recommend approval of funding for the project, with the recommendation that the project be presented next year at the same time as PP-063, at either project's next

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
PP-873/PP-867: Solventless Manufacture of Artillery Propellant Using Thermoplastic Elastomer (TPE) Binder (Navy) **$250K (FY96-New Start)** **$300K (FY97)** (continued)		review. The vote was ratified 5-2 with 1 abstention via teleconference call on October 25. **(August)** The Board had requested that this project be re-briefed at this meeting to clarify its relationship to the CRUSADER weapon system. The Board expressed continuing concern regarding the relationship of this project with **PP-063: Clean, Agile Manufacturing of Energetics** and requested that these two projects (PP-063, and PP-867) be presented for review at the same time during the next year. The Board then recommended approval (8-0) of FY97 funding with this contingency.
PP-872:Minimization of Uranium Alloy Waste by Electron Beam Melting (Army) **$640 K (FY96-New Start)**	The goal of this project is to develop technology that will permit recycle of demilitarized penetrators, machining chips, grindings, and other sources of bulk uranium back into the processing stream for the manufacture of kinetic energy penetrators. This effort will focus on developing the electron beam, cold hearth vacuum furnace technology to convert Depleted Uranium waste to billets for production uses. This project will also develop a recycle approach associated with the life cycle of Kinetic energy penetrator munitions. Chemical reprocessing recovery investigations being conducted within the Department of Energy (DOE) complex will also be considered for applicability to Department of Defense (DoD) needs.	**(October)** This was a proposed new start with a $640K FY96 funding request. The project had been briefed to the Board in June 1995 and was brought back for reconsideration. The original briefing had resulted in questions from the Board concerning the relationship of the proposed work to alternative technologies, and the total amount of waste that would be eliminated by this proposed technology. Following this re-briefing, the Board expressed concern about the perceived lack of science in the proposed work, the relevance to the DoD (versus the DOE) weapons program, the lack of leveraged funding from other interested parties, and the lack of a clear description of the extent to which this project would impact the overall amount of uranium handled by DOE and DoD. The SAB questioned the role of this project in SERDP. The project did not appear to represent an investment in the future. While it may address a high priority need, it seemed to be a low risk application of existing technology. Accordingly, the Board voted 6-1 with 1 abstention to recommend against funding this project.
PP-1042: Trapped Vortex Combuster for Gas Turbine Engines (AF) **$500K (FY96-New Start)** **$500K (FY97)**	The goal of this project is to develop a pilot-scale trapped vortex (TV) combuster that will 1) reduce aircraft pollutant emissions (NOx, VOCs, CO, and PM-10) by 60 percent, bringing them significantly below the proposed 1996 EPA regulations, and 2) reduce the NOx emissions from land and marine based gas turbine engines burning distillate fuels by 60 percent, bringing them below the 1995 EPA regulation. Additionally, the trapped vortex design could result in a three percent decrease in fuel consumption.	**(July)** This proposed new start for FY96 requested $500K and is a follow-on project to a completed 6.1 effort originally funded by SERDP in FY93. The Executive Director had authorized release of FY96 funds for this project in order to jump start the effort, but it was appearing before the Board to obtain approval for both FY96 and FY97. The Board explained that their primary interest was in the environmental benefits of the new technology; these environmental aspects could potentially become less important if the EPA continues to exempt military aircraft from stringent emissions standards. One Board member commented that aircraft and other turbine engines are the largest growing NOx source; a successful effort will result in lower NOx emissions with no fuel penalty that has local, global, and stratospheric impacts. Accordingly, the Board voted 5-0 (subject to ratification by a quorum) to recommend approval of FY96 and FY97 funding as proposed and requested that the project be re-briefed next year to evaluate progress, integration, and proposed plans at that time. The vote was later ratified by a quorum via fax.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
PP-1053: Pesticide Reduction through Precision Targeting (Navy) $150K (FY96-New Start) $380K (FY97)	The technical objective of this project is to research and develop a comprehensive, novel, documentable risk reduction/pollution prevention system to address DoD's high priority disease vector and pest management requirements using sophisticated surveillance of disease vectors and pests combined with a novel process of pesticides "precision targeting." Precision targeting is a functional strategy allowing incorporation of independent Integrated Pest Management tools. Precision targeting technology will be developed using geostatistics to generate documentation contour maps. They will be incorporated into a comparative risk reduction/assessment model which will spatially display pests and risks. The need for intervention will be assessed by the model and the least toxic intervention will be selected. The system will then document the location and efficacy of interventions. The project will be initiated at Naval Air Station, Jacksonville, FL because of its wet warm climate producing a broad variety of pest and environmental management problems and knowledgeable on-site coordinators.	**(July)** This proposed new start for FY96 requested $150K in FY96 funds and $380K in FY97 funds. The Executive Director had authorized release of FY96 funds for this project in order to jump start the effort, but it was appearing before the Board to obtain approval for both FY96 and FY97. The Board recommended that efforts be made throughout the project to ensure that the tools produced would not become too complex or difficult for the users. Several Board members advised that the investigators should strive to become proactive in the application of this tool and recommended that the proponents should not be too modest in their approach and goals in addressing this important issue. If the project can be broadened with additional funding, the investigators should formally propose to do so. Accordingly, the Board voted 5-0 (subject to ratification by a quorum) to recommend approval of the project as proposed for both FY96 and FY97. The vote was later ratified by a quorum via fax.
PP-063: DoD/DOE Program for Clean Agile Manufacturing of Propellants, Explosives, and Pyrotechnics (Navy) $900K (FY97)	The objective of this program is to develop and demonstrate energetics materials, processing technologies, tools, and concepts for re-configuring existing PEP life-cycle facilities into clean, agile operations that will function economically with total life-cycle wastes reduced by 90 percent from a 1994 baseline. For this project, life-cycle facilities are defined to be the set of existing, geographically separate, PEP facilities that design, develop, or produce PEP products, recycle the production by-products into usable products, or recycle PEP parts returned as excess from the ordnance inventory. This project also addresses the requirements to develop new chemicals and processes to prevent pollution and simultaneously increase energy and lower production costs, as identified in the Defense Safety Board Task Force on Environmental Security report dated April 22, 1995 (Page 28, 35).	**(July)** This FY97 continuing project requested $900K. The project will continue to develop a new material, tri-nitroazetidine (TNAZ), with reduced environmental impacts to replace TNT and will develop new thermo plastic elastomer (TPE) based binders which can be recovered, reused, or reprocessed. The Board expressed concern regarding the high ($2 million) expenditure on life-cycle assessment (LCA) and inquired as to whether a milestone exists to document a generic LCA process. Dr. Short (a Co-Principal Investigator) described the history of the project's LCA task and indicated that upon completion of PP-063, the proponents expect to transition the LCA tools to a commercial software house for implementation. The SAB recommended that SERDP take appropriate credit for this transfer. The SAB members commended the Principal Investigator of this project, Dr. Miller, for the world-class research performed as part of this project and voted 6-0 (subject to ratification by a quorum) to recommend approval of FY97 funding. The vote was later ratified by a quorum via fax.
PP-1057: Toxic Elimination from Small Caliber Ammunition (Army) $500K (FY97-New Start)	The objective of this project is to eliminate the major toxic materials from small caliber ammunition (5.56mm, 7.62mm, 9mm, and 0.5mm) which meets US and NATO performance standards. It will develop composite materials to replace lead-antimony in projectile cores and will investigate metastable interstitial composites (MIC) as alternatives to lead-styphnate in cartridge primer compositions. A MIC material is an engineered energetic material consisting of two or more chemical species that are exothermically reactive with each other. A typical MIC composition consists of a metal and a metal-oxide oxidizer, both of which are ultra-fine grain form. The MIC composition proposed for use in ammunition primers is a stoichiometric mixture of aluminum and molybdenum. The reactants of this reaction are non-toxic and environmentally benign.	**(July)** This proposed FY97 new start requested $500K. A successful effort will lead to the reopening of hundreds of indoor ranges and result in significantly increased personnel readiness. The Board complimented the Principal Investigator, Mr. Bunting, for providing an excellent presentation and voted 5-0 (subject to ratification by a quorum) to recommend approval of FY97 funding with the contingency that the project actively solicit user resources in the outyears and be included in the integrated picture of related energetics efforts at the project's next briefing for FY98 funds. The Board also suggested that Mr. Bunting retitle his project to better reflect its environmental benefits. The vote was later ratified by a quorum via fax.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
PP-1058: Elimination of Toxic Materials and Solvents from Solid Propellant Components (Army) $500K (FY97-New Start)	The objective of this project is to eliminate major sources of toxic/hazardous materials used in missile systems. This will be accomplished by implementing pollution prevention research in two areas: 1) Green Energetics: a) eliminate lead as a ballistic catalyst in minimum signature propellants and b) eliminate HCl as a combustion product of tactical and strategic booster propellants. 2) Clean Energetic Processing: Develop energetic oxidizer processing methods which do not require VOCs and toxic materials.	**(July)** This proposed FY97 new start requested $500K. The SAB members made a number of comments relating to: the magnitude of the environmental problems addressed; the relative TTAWG priority of this project; resource support from the user community; and regulatory benefits. The Board requested a membership list of the management team (and their areas of expertise; environmental expertise should be identified) that will oversee the progress of the project to ensure that environmental considerations are adequately addressed. The Board voted 4-1 (subject to ratification by a quorum) to recommend approval of the project for FY97 funding, with the contingency that the project actively solicit the user community for contributing resources and that the presenter include an integrated picture of related energetics efforts at the project's next briefing for FY98 funds. The vote was later ratified by a quorum via fax.
PP-1059: Next Generation Fire Suppression Technology Program (NGFSTP) (DDR&E/NIST) $1,300K (FY97-New Start)	The goal of this program is to develop and demonstrate, by 2004, environmentally friendly and user safe processes, techniques, and fluids that meet the operational requirements satisfied by halon 1301 systems in aircraft, ships, land combat vehicles, and critical mission support facilities. The results will be specifically applicable to fielded weapon systems, and will provide dual-use fire suppression technologies for preserving both life and operational assets. The program is divided into the following six fully integrated technical thrusts each with sequential and synergistic research elements: 1) Risk Assessment and Selection Methodology 2) Fire Suppression Principles 3) Technology Testing Methodologies 4) New Suppression Concepts 5) Emerging Technology Advancement and 6) Suppression Optimization. In all, the NGFSTP framework consists of thirty two research elements. The research activities within the 32 elements will begin identifying and developing fire suppression technologies within the first year, and additional knowledge will be added continuously throughout the program.	**(July)** This proposed FY97 new start requested $1,300K. DoD has unique requirements with respect to weight and volume restrictions in various missions and applications, and thus must develop an alternative to Halon 1301. DoD has spent approximately $70 Million in evaluating near term solutions for Halon 1301 replacement, but it appears that there is no "silver bullet" replacement for Halon 1301 use in DoD. A combination of application-specific fire suppressants will most likely serve the purpose. This project consists of six technical thrust areas, each with sequential and synergistic research elements. Nine individual sub-projects were selected and recommended by the Technical Coordinating Committee (TCC) of this project for SERDP funding starting in FY97. The Board members expressed concerns regarding the project's environmental versus operational aspects. The Technology Thrust Area Working Group (TTAWG) has and will continue to take steps to identify appropriate tasks and projects for SERDP that clearly demonstrate an environmental nexus. For each Next Generation Fire Suppression sub-project recommended in the future, the TTAWG will provide an indication or ranking of the sub-projects' environmental relevance. The Board requested that, in the future, the projects within the NGFSTP be briefed at the same level of detail that is expected of other SERDP projects. The Board voted 6-0 (subject to ratification by a quorum) to recommend approval of FY97 funding contingent upon receiving, reviewing, and accepting complete technical and accounting details for all nine sub-thrust projects in a format that is consistent with SERDP requirements. The vote was later ratified by a quorum via fax.

TITLE/AGENCY/ REQUESTED FUNDING	SUMMARY	RECOMMENDATION
PP-1056: Low VOC Chemical Agent Resistant Coatings (CARC) (Army) $500K (FY97-New Start)	The technical objective of this project is to develop a low VOC chemical agent resistant coating (CARC) suitable for use on military equipment by all services, in which the materials and processes for the reformulation/application, stripping and disposal are optimized and in compliance with current and anticipated regulatory requirements. The research will be performed primarily in two focus areas: 1) Reformulation/Application, and 2) Stripping and Disposal. The primary deficiency in the current CARC is the excessive VOC level of the polyurethane topcoat. At current production levels, 10.4 million #/year of VOCs are emitted to the atmosphere from CARC painting operations. The existing CARC topcoat has a VOC content of 3.5 #/gal, while the local regulations are 2.8 #/gal in the San Diego Air Quality Management District. Moreover, some installations must limit VOC contents to 1.8 #/gal in order to meet total VOC emission limits imposed by regulatory agencies. At the current annual usage nationwide, estimated to be 3.0 million gallons per year, a CARC with a VOC content of 1.8 #/gal would reduce VOC emissions during the applications by at least 5 million pounds proportionately reducing photochemical smog, and avert Notices of Violations (NOVs) at various DoD facilities.	**(August)** This was a proposed FY97 new start requesting $500K. The Board questioned the value of the SERDP investment in light of the high amount of leveraged funds for this project. Mr. Katz responded that while the original intent was to complete the project using Service funds, he anticipated that constraints on these funds would increase the duration of the project by at least two or three times and would result in three different uncoordinated projects instead of one integrated project as envisioned in this program. Accordingly, the Board recommended to approve the project by an 8-0 vote with the contingency that it be presented to the Board for review in each of its planned four years, regardless of the requested SERDP funding level.
PP-1068: Overview of the FY96 Congressional Earmark - Life-Cycle Costing/Energetics Production - Texas Regional Institute for Environmental Studies (TRIES) Project (Navy) $2,270K (FY96)	The project has three technical objectives: 1) Develop an image assessment software that houses select algorithms for natural resource assessment and provides user-friendly, accurate, and statistically defensible image analysis; 2) Reduce the waste and increase the chemical synthesis yield of "fourth generation" energetic materials such as TNAZ, CL-20, and difluoroamino compounds; and, 3) Develop accounting methodology for life cycle direct environmental costs of a weapon system and demonstrate use of the methodology using specific case studies related to actual weapon systems.	**(August)** This is an FY96 SERDP earmark project being presented before the SERDP Scientific Advisory Board. Dr. Michael Warnock from the Texas Regional Institute for Environmental Studies (TRIES) explained that this project is comprised of three components: remote sensing; environmental life-cycle cost analysis; and energetics production. Dr. Patrick Van Fleet from TRIES summarized the proposed work under the remote sensing component. The Board members provided the name of the MEDEA project technical coordinator as a point of contact and potential source of information, so that the proposed project can benefit from earlier, related work. The Board strongly encouraged Dr. Van Fleet to enhance his efforts with outside remote sensing experts. Following Dr. Van Fleet's presentation, Dr. James Short briefed the Board on the other two components of this project, i.e., energetics production and life-cycle cost analysis. The Board was generally satisfied with the technical approach of these two project components.

APPENDIX C

SAB BYLAWS

SERDP SCIENTIFIC ADVISORY BOARD BYLAWS

10 U.S.C. §2904(d) provides that, "the Advisory Board shall prescribe procedures for carrying out its responsibilities. Such procedures shall define a quorum as a majority of the members, provide for annual election of the Chairman by the members of the Advisory Board, and require at least four meetings of the Advisory Board each year."

Consistent with this statutory authority, the SERDP Scientific Advisory Board (SAB), by a vote of the majority of the members, a quorum being present, adopts the following Bylaws to be effective immediately and to remain in effect unless and until amended.

1. Meetings of the SAB - The SAB shall meet not less than four times per year. (Required by statute) Written notice of SAB meetings shall be provided to members at least 15 days prior to each meeting.

2. Election of Chairman - There shall be an annual election of a Chairman and Vice Chairman of the Advisory Board before the beginning of each fiscal year. (Annual election of Chairman required by statute)

3. Quorum - A quorum for meetings of the Scientific Advisory Board (SAB) is a majority of the members of the SAB. (Required by statute)

4. Proxy voting - Proxy voting at meetings of the SAB shall be permitted only in accordance with the following:

a. A quorum is present. Proxies shall not be used to create a quorum.

b. Proxy votes may be cast by any other member present on behalf of any absent member, pursuant to instructions by such absent member, on SAB recommendations to the Council that the SAB considers appropriate regarding any proposed research project referred to the SAB or any other recommendation.

5. Emergency Actions - Notwithstanding the requirements for a quorum set forth in paragraph 4., above, the Chair may permit actions to be taken by the SAB in the absence of a quorum if he or she determines that not to proceed in the absence of a quorum might deprive the Council of the timely views of the members of the SAB present, provided at least four members are present. Any such actions by the SAB in the absence of a quorum are null and void unless they are ratified by the SAB (a) at a later time in the same meeting, a quorum being present, (b) after discussion at the next meeting of the SAB, a quorum being present, or (c), via a majority vote of all the members of the SAB via FAX, all members of the SAB having received written notice of the issue at hand. Any member of the SAB may request a teleconference to discuss and vote upon such ratifications in lieu of a vote via FAX. If so requested, any such discussion and voting shall be via teleconference and a quorum shall be present.

Notwithstanding the preceding, if recommendations are made by the SAB when a quorum is not present and such recommendations could not be subsequently ratified in accordance with the above procedures because of the continuing unavailability of a quorum, the Chairman may inform the Council of such recommendations and the fact that a quorum was unavoidably not available.

APPROVED BY A MAJORITY VOTE OF THE SAB, A QUORUM BEING PRESENT, AUGUST 13, 1996

Dr. Walter Weber, Chairman