**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**WASHINGTON, D.C. 20460**

May 15, 2001

**OFFICE OF THE ADMINISTRATOR**
**SCIENCE ADVISORY BOARD**

EPA-SAB-RSAC-01-005

Honorable Christine Todd Whitman
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Subject: Review of the FY2002 Presidential Science and Technology Budget Request for the Environmental Protection Agency

Dear Governor Whitman:

On May 1 and 2, 2001 the Research Strategies Advisory Committee (RSAC) of the US EPA Science Advisory Board (SAB) met to review the Science and Technology component of the FY2002 Presidential Budget Request for the US Environmental Protection Agency (EPA). As in past years, this report was developed by the entire RSAC in a rapid response fashion so the report would be available for the House Science Committee's Congressional hearing on EPA's Science and Technology budget. RSAC's report was approved by SAB's Executive Committee during a public meeting on May 15, 2001.

As part of the review process, the RSAC responded to six charge questions:

a) Can the objectives of the research and development program in the Office of Research and Development (ORD) and the broader science and technology programs in EPA be achieved at the resource levels requested?

b) Does the budget request reflect priorities identified in the EPA and ORD-Strategic Plans?

c) Does the budget request reflect coordination between ORD and the Program Offices?

d) Does the budget request support a reasonable balance in terms of attention to core research on multimedia capabilities and issues and to media-specific, problem-driven topics?

e) Does the budget request balance attention to near-term and to long-term research and science and technology issues?

f) How can EPA use or improve upon the Government Performance and Results Act (GPRA) structure to communicate research plans, priorities, research requirements, and planned outcomes?

Detailed answers to these questions are found in the body of the report. The major findings and recommendations are:

a) In terms of financial resources, the S&T component of the total Agency budget request is approximately 9%. This percentage has remained the same for more than a decade. RSAC notes that the current and future environmental and health problems have become increasingly complex and multi-media. RSAC recommends that the Agency and Congress consider increasing the S&T share of the total Agency budget by a modest but important additional 1% per year for the next three years from its current level of 9% of the total Agency budget to 12% of the Agency's budget in FY '04

b) The Presidential Science and Technology (S&T) budget request is similar to the level requested in the last three years, and it is $39 million less than last year's enacted budget due to the EPA policy of not requesting Congressionally directed add-ons. RSAC strongly recommends that if Congress adds specific projects or programs for EPA, Congress also appropriate the funds needed for the successful completion of the projects or programs it adds on to the S&T program budget as was done in the current fiscal year appropriations

c) RSAC commends ORD on the development and implementation of its planning structure for research. The use of National Program Directors to serve as a focus for developing strategies to address major issues has been very effective and RSAC endorses continuation of this approach

d) RSAC strongly recommends that the Agency be vigilant in defining and maintaining core research needed to achieve a balanced S&T research program

e) RSAC recommends that the criteria used for the classification of research activities as "core" or "problem-driven" should be further clarified and applied consistently

f) RSAC notes that nearly 50% of the ORD workforce is over the age of 50, and to remain vital, the Agency must assemble the next generation of Agency scientists and engineers. An important approach is the post-doctoral program, but it appears that this approach may be limited by the FTE ceiling imposed on ORD RSAC recommends that EPA explore possibilities to have the ORD FTE limits not apply to the number of post-doctoral fellows who can be hired under this program

g) RSAC recommends that EPA continue with its Science Inventory efforts which catalogue science projects and products, so as to capture and identify the extent of science being done at EPA and expand the planning process to include development of an overall science planning process for the Agency that uses the Science Inventory as a reference.

In addition, we wish to inform you that RSAC is beginning a process of evaluating, on an ongoing basis, the total S&T budget and funding needs in the context of its evaluation of the Agency's multiyear plans and science inventory. We are also considering the science available in the larger scientific community outside of EPA, and how the Agency identifies, accesses and uses this information. We will keep you informed of our efforts, and expect to provide our first report to you on this subject in late 2001.

We appreciate the opportunity to review and provide advice on the Science and Technology component of the FY2002 Presidential Budget for EPA. The Research Strategies Advisory Committee would be pleased to expand on any of the findings described in our report, and we look forward to your response.

Sincerely,

***/ S /***
Dr. William H. Glaze, Chair
EPA Science Advisory Board

***/ S /***
Dr. Raymond C. Loehr, Chair
Research Strategies Advisory Committee
EPA Science Advisory Board

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copies and further information are available from the SAB Staff [US EPA Science Advisory Board (1400A), 1200 Pennsylvania Avenue, NW, Washington, DC 20460-0001; 202-564-4546].

## ABSTRACT

The Research Strategies Advisory Committee (RSAC) of the Science Advisory Board (SAB) met May 1 and 2, 2001 to review the Science and Technology portion of the FY 2002 Presidential Budget Request for the U.S. Environmental Protection Agency (EPA). The S&T component of the total Agency budget has remained approximately 9% for more than a decade. RSAC notes that the current and future environmental and health problems have become increasingly complex and multi-media. RSAC recommends, therefore, that the Agency and Congress consider increasing the S&T share of the total Agency budget by a modest but important additional 1% per year for the next three years from its current level of 9% of the total Agency budget to 12% of the Agency's budget in FY '04. The Presidential Science and Technology (S&T) budget request is similar to the level requested in the last three years, and it is $39 million less than last year's enacted budget due to the EPA policy of not requesting Congressional add-ons (earmarks). RSAC strongly recommends that if Congress adds specific projects and programs for EPA, Congress also appropriate the funds needed for the successful completion of those projects and programs as was done in the current fiscal year appropriations. RSAC commends ORD on the development and implementation of its planning structure for research. The use of National Program Directors to serve as a focus for coordination and developing strategy for addressing major issues has been very effective and RSAC endorses continuation of this approach. RSAC recommends that the criteria used for the classification of research activities as "core" or "problem-driven" should be clearly stated and applied consistently. RSAC strongly recommends that the Agency be vigilant in defining and maintaining core research needed to achieve a balanced S&T research program. RSAC notes that nearly 50% of the ORD workforce is over the age of 50, and to remain vital, the Agency must assemble the next generation of its scientists and engineers. An important approach to accomplishing this is the post-doctoral program, but it appears that this approach may be limited by the FTE ceiling imposed on ORD. RSAC recommends that EPA explore possibilities to have the ORD FTE limits not apply to the number of post-doctoral fellows who can be hired under this program. RSAC recognizes that there is more science being conducted at EPA than is identified in the S&T budget. RSAC recommends that EPA continue with its Science Inventory efforts which catalogue science projects and products, so as to capture and identify the extent of science being done at EPA and expand the planning process to include development of an overall science planning process for the Agency that uses the Science Inventory as a reference. This inventory that should be updated at least annually, with appropriate adjustments to multiyear plans, would make the Agency's direction in its research program much more understandable.

**Keywords**: GPRA, budget, research, strategic planning

**US ENVIRONMENTAL PROTECTION AGENCY**
**SCIENCE ADVISORY BOARD**
**RESEARCH STRATEGIES ADVISORY COMMITTEE**
**MAY 1-2, 2001**
**1200 PENNSYLVANIA AVENUE, NW**
**ARIEL RIOS BUILDING NORTH ROOM 6013**
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# 1. INTRODUCTION

## 1.1 Background and Schedule

RSAC is composed of senior members of the SAB, including past chairs, and it includes members from most of the other standing committees of the Board. The Committee has reviewed the Office of Research and Development's (ORD) budget request annually for more than a decade. This is the third year that all of the Science and Technology components in Agency Program Offices were reviewed, and it is the third year that a GPRA goal-based budget was presented. The purpose of this review is to provide the Agency and Congress with advice and insight on the adequacy of the FY 2002 President's budget request to implement a science program of high quality that is responsive to the Agency's needs. The Committee was provided with background documents supplied by the Agency, supplemented by briefings from Agency senior managers and a presentation from staff of the American Association for the Advancement of Science during the meeting.

The Science Advisory Board (SAB) review of the proposed Science and Technology budget for the Environmental Protection Agency is an annual event. The timing associated with the public availability of the budget materials often makes scheduling of a formal review difficult. Reviews completed by RSAC also require formal public review and approval of the SAB's Executive Committee. This year, the budget materials were released in early April, with various review materials made available to the Committee between April 9 and April 19. The Committee met on May 1 and 2, 2001, with formal review and approval of its report by the Executive Committee on May 15, 2001.

Generally, the Chair or another Member of the RSAC provides expert testimony to the House Committee on Science during its annual budget hearings, which are normally scheduled shortly after the release of the proposed budget. This year's budget hearing will be held on May 17, 2001, with Dr. Wm. Randall Seeker, RSAC Past-Chair, testifying on behalf of the committee and the Board.

RSAC reviewed the S&T and the ORD Fiscal Year 2002 budget categories. EPA's Science and Technology Program is designed to produce the scientific knowledge and tools necessary to support decisions on preventing, regulating, and abating environmental pollution and to advance the base of understanding on environmental sciences. The Agency's science and technology efforts are conducted through contracts, grants, and cooperative agreements with universities, industries, other private commercial firms, nonprofit organizations, State and local government, and Federal agencies, as well as through work performed at EPA's 12 laboratories and various field stations and field offices. The S&T account funds activities such as developing and improving sampling and analytical methods and instruments for measuring pollutants; determining the effects of pollutants on many animals, plants, materials, and the general environment; researching the processes that relate to pollution; evaluating technologies for preventing and controlling pollution; and developing guidelines and research tools to improve risk assessments. This account also provides S&T operating expenses such as personnel salary and benefits, laboratory supplies and materials, operation and maintenance of lab facilities,

equipment, ADP support, human resource development, and printing. Beginning in FY 1996, this account also funds Hazardous Substance research formerly appropriated in the Superfund account.

RSAC recognizes that there is more science being conducted at EPA than is identified in the S&T and the ORD budgets. Therefore, RSAC recommends that EPA continue with its Science Inventory efforts which catalogue science projects and products, so as to capture and identify the extent of science being done at EPA. RSAC recommends that this process be expanded to include development of an overall science planning process for the Agency that uses the Science Inventory as reference.

In the past five years, ORD in coordination with Program Offices and regional offices, has made considerable progress in its planning process, in its focus on strategies and goals, in the development of multi-year planning, in the use of National Program Directors, and in transitioning some portions of the R&D program to the states (e.g., Coastal Monitoring Program). RSAC strongly recommends that ORD "stay the course" and continue these efforts.

### 1.2 Charge to the Committee

a) Can the objectives of the research and development program in ORD and the broader science and technology programs in EPA be achieved at the resource levels requested?

b) Does the budget request reflect priorities identified in the EPA and ORD Strategic Plans?

c) Does the budget request reflect coordination between ORD and the Program Offices?

d) Does the budget request support a reasonable balance in terms of attention to core research on multimedia capabilities and issues and to media-specific problem-driven topics?

e) Does the budget request balance attention to near-term and to long-term research and science and technology issues?

f) How can EPA use or improve upon the Government Performance and Results Act (GPRA) structure to communicate research plans, priorities, research requirements, and planned outcomes?

Responses to these questions, and to other issues the Committee wishes to address, are provided to both the Agency and the Congress.

### 1.3 Format of this Report

Following this Introduction, the report provides specific responses to the questions in the Charge to the Committee (Chapter 2).

# 2. RESPONSE TO THE CHARGE

## 2.1 Objectives Versus Resource Levels Requested

*Charge Question: Can the objectives of the research and development program in ORD and the broader science and technology programs in EPA be achieved at the resource levels requested?*

The Presidential Science and Technology (S&T) budget request was similar to the levels requested in the last three years. The S&T budget request decreased by $54 million from last year's enacted budget due to the EPA policy of not requesting Congressionally directed add-ons (known as earmarks). The 2002 S&T budget request was $5.2 million less than the 2001 enacted S&T budget when Congressional add-ons and Superfund transfers are taken out. The ORD activities in the request were selected using a priority-setting process that identifies the highest environmental risks within each environmental goal established in the EPA Strategic Plan, and using the sound scientific principles established in the risk assessment/risk management framework. The process is similar to that used in the last past few years. The RSAC found the funding request priorities to be consistent with the environmental goals established in the Agency Strategic Plan. However, RSAC is concerned about ORD's ability to fully meet these environmental goals in future years within the limitations of a level budget that may force the Agency to not be able to fund projects and programs that are critically needed to meet GPRA goals and strategic objectives. In the following comments, we make specific observations and recommendations about the budget with respect to human and general financial resource issues.

In terms of financial resources, the S&T component of the total Agency budget is approximately 9%. This percentage has remained the same for more than a decade. RSAC notes that the current and future environmental and health problems have become increasingly complex. For instance, many of the pressing environmental problems are not separate air or water media-specific problems, rather they are integrated multi-media problems. As another example, the environmental problems facing humans and ecosystems are not chemical-specific. Rather they are system issues related to low environmental concentrations of mixtures of contaminants and other stressors. Research addressing these problems is much more complex and the Agency is currently forced to resort to the precautionary principle (or simplistic application of uncertainty factors) for the lack of appropriate data or validated principles upon which to act. RSAC recommends, therefore, that the Agency and Congress consider increasing the S&T share of the total Agency budget by a modest but important additional 1% per year for the next three years from its current level of 9% of the total Agency budget to 12% of the total budget in FY '04.

The ORD budget request for FY 2002 has decreased by $39 million from the FY 2001enacted budget. This decrease is the result of this Administration not requesting funds for Congressionally directed add-on (so-called earmarked) projects. RSAC strongly recommends that if Congress adds

specific projects or programs for EPA, Congress also appropriate the funds needed for the successful completion of the projects or programs it adds on to the S&T program budget as was done in the current fiscal year appropriations. This Congressional action will minimize impacts on the already scarce S&T budget for EPA .

To identify its core and problem-driven research priorities and projects, ORD has undertaken a careful research planning process in coordination with the Agency's Program Offices. RSAC believes that both the S&T budget, including the ORD budget, is the result of a sound and appropriate prioritization of Agency needs and distribution of resource levels at the allocated resource levels. If additional programs or projects are added to ORD by Congress without the appropriate additional funds, it is not likely that ORD will be able to accomplish its identified goals and objectives.

RSAC notes in particular, that in terms of personnel resources, nearly 50% of the ORD workforce is over the age of 50. To have a continuing strong research and development program at ORD, it is imperative that there be an influx of younger competent researchers. These individuals need to have the scientific skills that will allow them to address complex current and future environmental issues.

To remain vital, the Agency must assemble the next generation of Agency scientists and engineers. As one approach, in 1999, ORD began a multi-year effort to enhance the EPA workforce through its post-doctoral program. This program:

a) brings fresh perspective and new skills to the EPA research program

b) enables EPA to improve workforce diversity

c) assists with succession planning

d) contributes new ideas and concepts to important areas such as particulate matter research, ecological risk assessment and human exposure modeling

The ORD post-doctoral program has been very successful. However, it appears that the post-doctoral program recruitment is limited by the FTE ceiling imposed on ORD. RSAC recommends that EPA explore the possibility of having the ORD FTE limits not apply to the number of post-doctoral fellows who can be hired under this program.

To have some controls on this program, RSAC does recommend that:

a) other than the postdoctoral program, all other components of ORD be consistent with Agency FTE limits deemed appropriate

b) individuals in the ORD post-doctoral program be limited to a three year term in the program

**2.2 Budget and Priorities in Strategic Plans**

*Charge question: Does the budget request reflect priorities identified in the EPA and ORD Strategic Plans?*

The Science and Technology budget is consistent with the priorities set by the criteria for risk-based decision making in the Agency. In general, the information provided relates reasonably well to the goals and objectives for research in the EPA and ORD strategic plans. Priorities and budget allocations for research flowed from a defined process that included inputs from Programs Offices to fulfill legislative and regulatory mandates, inputs from Agency staff on opportunities for reducing uncertainties, and ascertaining the scientific feasibility of the research to be conducted. However, RSAC notes that the budgeting priority-setting process is not sufficiently transparent to allow understanding of the basis for final budget allocations. The choices are increasingly constrained by the budget ceilings and resource limitations. In order to facilitate its evaluation of the sufficiency of the funds and their proper allocation, RSAC recommends the Agency provide to RSAC estimates of the total costs of undertaking the multi-year research programs that will be necessary to accomplish all of the major strategic goals, and not just the fiscally constrained final budget allocation.

RSAC did not always understand how the level of a particular budget request was derived to reflect the priorities set through the strategic planning process. RSAC further noted that when a legislative mandate is absent, "orphan" risks (even when known) remain unattended in the budgeting process. Because environmental concerns are more complex, and need more scientific insights, it is necessary that the Agency emphasize and conduct anticipatory research and place high priority to the topic of new and emerging risks in the budget allocation process.

For example, endocrine disruptor research addresses issues related to the registration of pesticides and TSCA handling of high volume chemicals. However, the EPA program does not appear to address broader problems associated with the appearance of estrogenic chemicals from birth control pills, and natural estrogens in municipal waste water, as well as in effluents from intensive agricultural practices. In fact, the FY 2002 budget request for endocrine disruptors research appears to have been reduced in EPA Goals 3, 4 and 8 despite the fact that RSAC recommended increases in this area in last year's report.

Similarly as we have noted in the past, the estimated health risks from hazardous constituents in indoor air are widely judged by scientists working in this arena to be greater than those posed by emissions from point, area, and mobile sources. Yet research to reduce residual uncertainties and risks from indoor air, or to devise intervention strategies in this area, is not well funded in comparison to the more traditional regulated sources of airborne hazards. While EPA has no statutory authority to regulate indoor air quality, research in this area is necessary to achieve the ultimate goal of reducing exposures and health risks resulting from exposure to airborne contaminants.

The Agency does have authority, however, to regulate Non-Aqueous Phase Liquids (NAPLs) that occur in subsurface soils from leaking storage tanks, spills, and improper disposal of wastes.

NAPLs are generally thought to pose significant risks and to require considerable resources for remediation with currently available technologies. However, development of cost-effective methods to characterize and clean up these contaminants has not received a corresponding level of attention at EPA or elsewhere. It is not clear from the materials presented to the RSAC why higher priority has not been given to NAPL characterization and remediation technologies. EPA leadership and federal funding would help address this need. Exploitation of opportunities to leverage EPA funds through partnerships with the owners of contaminated sites, and other responsible parties, could also be effective.

In September 2000, the Agency published its strategic plan which charts the course which it plans to follow in the coming years. The Office of Research and Development followed suit by issuing its revised Strategic Plan in January 2001. Both of these Strategic Plans are clear and set several strategic directions for pursuing and achieving the Agency's goals. RSAC compliments the Agency and the ORD for these plans and endorses their use for conducting Science and Technology programs. However, research strategies that attempt to address the multi-pollutant and multiple pathway complexities of many current and emerging environmental problems still need to be more vigorously pursued.

### 2.3 Coordination between ORD and the Program Offices

*Charge question: Does the budget request reflect coordination between ORD and the Program Offices?*

The Committee was impressed with the continued progress made by EPA to heighten the level of interaction between ORD and Program Offices.

Goal 1 of the ORD strategic plan is to support the Agency's mission. Implicitly, this requires that ORD must work with Program Offices to plan its research agenda. This mechanism should position the Agency to meet its near and far term objectives of protecting human health and safeguarding the environment.

ORD has chosen to organize interactions with Program Offices (and interests outside of the Agency) in several tiers. Large interdisciplinary, and even interagency, programs are organized under National Program Directors. This has led to a much more structured and actively managed research programs in some areas such as:

a) Particulate matter

b) Drinking water

c) Global change

d) Endocrine disrupting chemicals

e) Environmental monitoring and assessment

While the National Program Directors do not have line or budget authority, each works with the support of Laboratory or Center Directors. This ensures that these programs garner proper attention at the highest management level of ORD. The National Program Directors seek appropriate input from Program Offices in the development of the research plans in each area, as well as coordinate EPA's efforts with other stakeholders within and outside of government agencies. The planning within these strategic programs is used to set the direction for both intramural and extramural research. The extramural outlet for ORD funds is largely through the STAR program.

A sizable portion of ORD's research falls outside the direction of the National Program Directors. They are programs with less sweeping horizons and somewhat smaller budgets. The larger of these are being integrated with the needs of the Program Offices into the development of multi-year research plans. Areas integrated in these efforts include:

a) Clean water

b) Ecosystem assessment and restoration

c) Human health risk assessment

d) Pollution prevention and new technologies

These areas are all clearly important for both the long- and short-term regulatory agenda of several Program Offices.

Finally there are other areas of importance to ORD, but where other parts of the Agency may have lead responsibilities or are just being introduced into ORD's research portfolio. These include:

a) Safe food (led out of the Office of Prevention, Pesticides and Toxic Substances)

b) RCRA waste management

c) Mercury

d) Socioeconomic research

Again, it is apparent that ORD has structured its more limited research in these areas with consideration of the needs of the Program Offices within EPA. RSAC commends ORD for taking on the difficult task of organizing their planning process to allow for more efficient coordination of their

research program with the priorities of the Program Offices within EPA and throughout the federal government.

Program staff interviewed by the committee supported RSAC's perception that there have been tremendous strides in communication between ORD and Program Offices. The level of interaction has been most successful where ORD has established National Program Directors. It is also emerging in those areas where multi-year plans are to be developed. In some cases, the direction of these programs may actually reside within Program Offices with substantial interests in a particular topic. For example, meetings have been conducted with the goal of establishing an Agency-wide effort on a sediments research plan that is, at least for now, being led out of the Office of Solid Waste and Emergency Response.

Problems associated with the indoor environment might also be profitably addressed in this way as there are Program Office interests across the Agency, but there are no clear legislative mandates for regulation in this area. Despite the lack of legislative mandates, information on the indoor environment is a critical need in developing regulations by many Program Offices (e.g. relative source contributions to total exposure). Shortcomings in this area have been a major difficulty in the Agency's development of key regulations (e.g. radon in drinking water).

The Program Offices noted that planning the multimedia research activities included in Goal 8 is very difficult. The committee notes that difficulties in this area are to be expected, because multimedia planning requires the Program Offices to look further into the future and, perhaps, even beyond their current legislative mandate to see and recognize the importance of this research. RSAC recognizes that there is a considerable amount of experience that comes out of the regulatory programs that may not be obvious to some researchers. Conversely, it is obvious that many Program Offices may lack individuals with the scientific insight to determine what might be accomplished with research tools that are available today as opposed to conditions that existed only 3-5 years ago. Consequently, RSAC encourages both ORD and the Program Offices to continue this dialogue, because it will benefit the Agency mission in major ways in the future.

The Mid Atlantic Initiative provides an example of how core research can eventually translate into the applied realm. This program was started as a project within EPA's Environmental Monitoring and Assessment Program, but now has commitments from States and interested Tribes to continue the activities into the future. This is freeing Agency resources to focus on designing and developing monitoring strategies for the differing environmental conditions that exist in Western states.

RSAC finds that ORD's adoption of the National Academy of Sciences (NAS) recommendation that a portion of ORD's resources be reserved for core research is beginning to play an important role in the Agency's thinking about research planning. It now appears that most Program Offices recognize the need for ORD to build and maintain itself as a competent research organization.

This is important, because, as is indicated elsewhere in this document, ORD must make strategic decisions about the direction and emphasis of its research portfolio. RSAC continues to have concerns that much of ORD's talents and knowledge in certain areas may be dissipated by retirements, and that the ability of ORD to build new scientific capabilities may be hampered by FTE ceilings.

It remains difficult to obtain a clear view of how ORD's research plan is implemented within the laboratories. To a large extent, what is visible in ORD's plans is the process by which research is planned, but the detailed multi-year plans are not yet available that would allow evaluation of how the direction of specific plans shift in response to results from research or in response to shifting priorities of the Agency. Tracking of such information would allow for better internal and external review of how efficient ORD is in updating its strategies with time. It is hoped that the Agency will follow through on developing multi-year plans that can provide a better basis for evaluating the research planning process.

Two years ago, an EPA wide science inventory was created. The committee found that the inventory to be extraordinarily helpful in its evaluation of the Agency's research planning and coordination activities. The committee was informed that the first edition of this effort had not been stored in an electronic form. This has delayed updates, but RSAC was assured that the inventory, and the multi-year plans, would become available in the fall of 2001. As was recommended by RSAC, there are plans to combine the new science inventory with the database on products requiring peer review. This inventory, that should be updated at least annually with appropriate adjustments to multiyear plans, would make the Agency's direction in its research program much more understandable. RSAC recommends that EPA continue with its Science Inventory efforts which catalogue science projects and products, so as to capture and identify the extent of science being done at EPA and expand the planning process to include development of an overall science planning process for the Agency that uses the Science Inventory as a reference.

In summary, RSAC commends ORD on the development and implementation of its planning structure for research. The use of National Program Directors to serve as a focus for developing strategy for addressing major issues has been very effective and RSAC endorses continuation of this approach. Planning in other areas also appears to be working effectively. We encourage further cooperation of between Program Offices and ORD in developing longer-term research strategies of the Agency. It is essential that ORD continues to take a leadership role in these issues, but to capture both the attention and expertise that reside in Program Offices.

### 2.4 Balance Core and Problem-Driven Research

*Charge Question: Does the budget request support a reasonable balance in terms of attention to core research on multimedia capabilities and issues and to media-specific, problem-driven topics?*

ORD uses the definition of core and problem-driven research that was identified in the NRC "Building a Foundation for Sound Environmental Decisions" report to categorize its projects and activities. Those definitions are as follows:

a) Core research - Core research aims to provide broader, more generic information that will help improve understanding of many problems now and in the future. The NRC definition of core research includes three components:

i) Acquisition of a more systematic understanding of the physical, chemical, biological, geological, social and economic processes that underlie environmental systems and the biochemical and physiological processes in humans affected by environmental agents

ii) Development of broadly applicable research tools, more accurate models of complex systems and new methods for analyzing, displaying and using environmental information

iii) Design, implementation and maintenance of appropriate environmental monitoring programs essential for understanding the status of, and the changes to, environmental resources

b) Problem-driven research – Problem-driven research refers to investigations that attempt to understand and solve an identified problem. Frequently these efforts are motivated by current or foreseen regulatory action. This includes:

i) investigations that seek to elucidate key physical, chemical, biological, geological, sociological and economic processes that underlie environmental systems

ii) development of tools and collection of data required to detect and assess environmental threats, prevent or mitigate environmental harm, and determine whether environmental policies are effective

Using these definitions, ORD feels that the research efforts identified as associated with Goal 8 of the Agency's Strategic Plan are mostly the core research projects. ORD also feels that its efforts associated with Goals 1-7 of the Agency Strategic Plan are more appropriately categorized as problem-driven research. With these definitions, the FY2002 ORD request allocates approximately 46% and 54% of the budget, respectively, to core (Goal 8) and problem-driven research areas (Goals 1 through 7). As in past years, this allocation is consistent with the balance recommended by the National Academy of Sciences (NAS) and with ORD's strategic plan.

However, in spite of recent discussions with ORD on this issue, the decision process and criteria that lead to a project being classified as "core" or "problem-driven" research is still not transparent, so the RSAC cannot fully evaluate this charge question. The committee recognizes that the resource allocations to the two areas of research may vary from year to year as budgetary constraints and Agency needs change. RSAC emphasizes the importance of maintaining core research capabilities as the problems confronting the Agency are increasingly multimedia rather than single-media issues. RSAC recommends that the criteria used for the classification of research activities as "core" or "problem-driven" should be further clarified and applied consistently.

RSAC is concerned about the ORD's ability to maintain a balanced core and problem- driven S&T program because of the increasing pressures from Program Offices for more attention to problem-driven research. Therefore, RSAC strongly recommends that the Agency be vigilant in defining and maintaining core research needed to achieve a balanced S&T research program.

In addition, RSAC recommends that ORD provide examples that can better identify the interaction and performance of core and problem-driven research. Such examples could include illustrations of:

a) the extent that core research efforts provided results that then caused an effort to enhance or move to a problem-driven category

b) how information or knowledge from problem-driven research or monitoring efforts resulted in subsequent core research efforts to reduce key uncertainties.

**2.5 Balance Near-term and Long-term**

*Charge Question: Does the budget request balance attention to near-term and to long-term research and science and technology issues?*

Long-term research projects are at special risk, because they can be terminated or truncated due to cost-cutting imposed by the need to respond to high-priority, short-term objectives within a fiscally-constrained budget. Long-term research requires multi-year planning and evaluation. ORD reports that they have been actively developing multiyear plans for major research programs. However, at this time, they have not shared these plans outside the Agency; thus, RSAC is unable to adequately judge EPA's ability to integrate long-term program planning into the annual budget planning process.

RSAC perceives that many important environmental issues rest at the interface between the authorizing legislation for various EPA programs. We believe the Agency's research program would benefit by the careful examination of research efforts across these multi-year plans. Below, we provide

some examples of interactions among the research programs that should be explored in developing ORD's long-term, multi-year research plans.

As indicated earlier in the report, the solutions to future problems must consider systems rather than individual components. For instance, it should be recognized that there is a connection between the National Pollution Discharge Elimination System (NPDES) and drinking water programs. For example, the provision of high quality drinking water depends upon the character of the source water, the type of treatment that is instituted, and interactions between the source water and the treatment and distribution system. The NPDES program recognizes and limits the introduction of recognized toxic chemicals into source waters, but does not address more diffuse inputs that will interact with drinking water treatment processes to produce toxic by-products. These precursors are as likely to arise from non-point sources as from point sources, and drinking water quality may benefit significantly from efforts to protect water resources.

It is also clear that the Office of Water should have an interest in the Endocrine Disruption Research Program. There are an increasing number of small and large water systems in the United States need to seriously consider various forms of potable reuse of wastewater for drinking water purposes. Municipal waste water is one well-documented source of such contaminants, yet there appear to be no efforts to address these issues under the drinking water research program. These problems are distinct from those identified under the Food Quality Protection Act. In no case have we seen these types of environmental interactions to be factored into research approaches to problems under the Safe Drinking Water Act or under the Clean Water Act.

Thus, there are important interactions between the Drinking Water research program and the research programs for Clean Water, Environmental Monitoring Assessment Program (EMAP) and Endocrine Disruptors. We suspect that additional connections between ecosystem research programs (EMAP and Endocrine Disruptors) and the Clean Air research program can be identified, since atmospheric deposition can represent a major non-point source of some contaminants into ecosystems.

In addition, each program area identified above has overlapping concerns about factors that determine the susceptibility of human subgroups to environmental stressors. Thus, ecosystem protection research needs to be connected to the Clean Air and Clean Water research programs. Our overview of the ORD's research planning process suggests that major unmet environmental research needs could lie at these interfaces.

Better leveraging of resources may be realized by aligning the multi-year plans and looking for points of interaction. Examples of leveraging could result in synergies in the research efforts, as well as the pooling of resources, to provide a more comprehensive program than any single program alone could provide. Alignment of plans would likely help to eliminate duplication of efforts and maximize the impact of research results across the Agency both in ORD and the Program Offices. This process could be facilitated by a variety of mechanisms, including targeted workshops to bring together both

researchers and managers to review what each group is doing and to encourage thinking outside the individual plan "boxes." Research activities identified as having a high probability of making significant impact on human health or the environment should be identified in the budget process. Therefore, RSAC recommends that the ORD use the multi-year plans to find ways to leverage resources and to broaden the benefit and impact of research across programs and offices.

In addition, we urge the Agency to improve its ability to identify and pursue emerging issues. Although emerging issues are identified as Goal 5 in the ORD Strategic Plan, there is no clearly identified budgetary support for research to identify and explore emerging issues.

In this year's budget request, there are directed Request for Applications (RFAs) in the STAR program focused on nanotechnologies, natural science and socio-economic issues. These RFAs are what remain of the Exploratory Research Program. However, this approach appears to be too restrictive because of the limited scope of EPA's RFAs. It would be useful for the ORD to support the full range of scientific and engineering issues faced by EPA in an exploratory research program. Thus, RSAC recommends the reinstatement of an exploratory research program similar to that which used to be part of the EPA grants program where there are no *a priori* constraints on the subject matter. Such a fully open solicitation is necessary even for a mission-oriented agency, such as EPA, to stimulate and take advantage of the full creativity of the scientific community in identifying areas that may become critical in the future. Such future environmental concerns are difficult to anticipate and, as such, cannot be the subject of RFAs that are restricted in their focus.

The Committee believes that emerging issues need to have ongoing stable funding and consistent research solicitations from EPA, because EPA is the key agency that can aggressively watch for critical new threats to human and ecological health. In addition to an adequate funding level, RSAC recommends that selections for Exploratory Grant proposals be based on the extent to which they identify novel and important themes that are relevant to EPA's responsibilities.

### 2.6 Improvements to GPRA Structure

*Charge: How can EPA use or improve upon the Government Performance and Results Act (GPRA) structure to communicate research plans, priorities, research requirements, and planned outcomes?*

The EPA has again used its GPRA goals structure to organize and present the FY 2002 Budget Summary (EPA-205-5-01-001). The RSAC is pleased with this strategy as it clearly correlates budget allocations with Agency goals and objectives. Consistency of goals over time allows annual tracking of program funding. The consistency of the charge questions posed to RSAC invites an assessment of previous RSAC requests/recommendations and Agency responses to them.

Research Plans – Research planning and implementation at EPA involves both core research and; problem-driven research. The latter is law-, program-, or project-specific while the former is

more general and involves multiple programs, projects, or media. In addition, the Agency conducts in-house research and also supports external grant and contract research. While the RSAC does not argue for specific allocations to these various efforts, it does recognize the merit of core and problem-driven and internal and external research efforts.

ORD's has developed a list of FY 2002 Annual Performance Goals, Objectives, Subobjectives and deliverables. The budget allocation is organized around specific work products and deliverables to be produced consistent with EPA's GPRA goals and objectives. RSAC recognizes the large effort and organization necessary to produce these products. It remains important, however, to seek identification and development of metrics to assess the "usefulness" of these deliverables to ORD customers.

Research priorities -- The statement of research priorities in the 2002 budget document is clear. In addition, RSAC agrees with ORD's use of the following primary criteria for prioritizing research:

a) contributes to achievement of Agency GPRA goal(s)

b) consistent with ORD Strategic Plan criteria

i) human and ecological health criteria

ii) methods/models criteria

iii) risk management criteria

c) responsive to input from external scientific community

A fourth stated criterion is that "ORD can make a difference". The ORD strategic plan indicates that this criterion is the ability to make a contribution relative to other research institutions who may be doing work in this area, and it is within ORD's capability and expertise to do the research. RSAC recognizes the utility of not duplicating ongoing research activities. However, RSAC is concerned that this criterion may exclude critical research that no one else is doing. When this is the case, the Agency needs to build the needed capabilities internally or find ways to obtain the necessary science from other sources.

Research Requirements -- RSAC looks forward to seeing the multi-year plans under development by the Agency and identified at the RSAC March 2001 briefing. Such plans will enable RSAC to assess the compatibility of the research programs with the GPRA goals.

Planned outcomes -- The ORD Annual Performance Goals and Associated Key Annual Performance Measures constitute a useful tool for the evaluation of outputs resulting from research activities, and EPA should be commended for moving in this direction. However, this evaluation process is incomplete. There is a need to evaluate the outcomes of research program activities, particularly addressing the question of how ORD programs specifically contribute to the knowledge base that provides the sound science required to successfully accomplish EPA's mission. It is recommended that the Agency develop criteria and measures for evaluating the outcomes of its research programs and the linkage to specific GPRA goals.

# APPENDIX A - ACRONYMS

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| EMAP | Environmental Monitoring and Assessment Program |
| EPA | US Environmental Protection Agency |
| FY | Fiscal Year |
| GPRA | Government Performance and Results Act |
| NAPL | Non-Aqueous Phase Liquids |
| NAS | National Academy of Sciences |
| NPDES | National Pollution Discharge Elimination System |
| OPPTS | Office of Pollution Prevention, Pesticides and Toxic Substances |
| ORD | Office of Research and Development |
| RFAs | Request for Applications |
| RSAC | Research Strategies Advisory Committee |
| SAB | Science Advisory Board |
| S&T | Science and Technology |

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# FY 2002 PRESIDENTIAL SCIENCE AND TECHNOLOGY BUDGET REQUEST FOR THE ENVIRONMENTAL PROTECTION AGENCY; AN SAB REVIEW

## A REVIEW BY THE RESEARCH STRATEGIES ADVISORY COMMITTEE (RSAC) OF THE US EPA SCIENCE ADVISORY BOARD (SAB)