UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C. 20460

May 1, 1992

OFFICE OF
THE ADMINISTRATOR
SCIENCE ADVISORY BOARD

EPA-SAB-EPEC-LTR-92-008

Honorable William Reilly
Administrator
U.S. Environmental Protection Agency
401 M St., S.W.
Washington, D.C. 20460

RE: SAB Review of the EMAP Program Plan and Concepts for Integration and Assessment

Dear Mr. Reilly:

The Environmental Monitoring Subcommittee of the Ecological Processes and Effects Committee of the Science Advisory Board conducted a review on December 4-5, 1991 of the Environmental Monitoring and Assessment Program's (EMAP) Program Plan. A consultation was also held at this meeting on the EMAP plans and concepts for assessment of monitoring data and integration of the ecosystem components. In the charge for this meeting, the SAB was asked to:

a. Review the revised Program Plan (November, 1991) to assure that the plan is technically accurate and adequately explains the purpose,, objectives, organization, capabilities, and limitations of EMAP to an informed Public.

b. Discuss EMAP's concepts and approaches for integration and assessment and the framework for reporting information.

The purpose of this letter is to advise you of the significant recommendations of the Subcommittee for further improvements to the Program Plan. Overall, the Subcommittee believes that the revised Program Plan is very useful and addresses many of the comments of the earlier SAB review (Evaluation of the EMAP Program Plan EPA-SAB-EPEC-91-011, July, 1991) However, there are still several areas which need refinements to make the Program Plan (which has been renamed the "Program Document") more effective in explaining EMAP. We identified the following topics for further development in the revised Program Document:

Continuum Concept

The Draft Assessment Program would benefit from the inclusion of a diagram of the type on page 8 of the briefing material. This diagram would assist the reader in knowing what is included in EMAP and what is excluded. The relationship of EMAP to other ecological programs within the Agency should be included in this and other diagrams (See relationship to ecorisk).

The figure developed to explain the continuum ranging from data collection through various forms of assessment should show EMAP's position on that continuum and should be included in the Program Document, along with sufficient discussion to make clear the objectives and limitations of each level. The position of other ecological risk assessment programs in the Agency should also be described.

Conceptual Ecorisk Framework

A relatively high degree of consensus is currently evolving concerning the conceptual framework for ecological risk assessment (Risk Assessment Forum, Agency Workshops, NAS/NRC Committee on Risk Assessment Methods). Figure 1 of the Program Document should incorporate this contemporary thinking and clearly show how EMAP program elements will affect an ecological risk assessment. A full explanation of how EMAP outputs will contribute to the accepted steps of hazard identification, exposure assessment, stress-response and risk characterization will clarify what EMAP is intending to deliver.

Potential Contributions to Ecorisk and Beyond

The program document needs to clarify the relationships between EMAP and other ecological programs within EPA. We recommend that a figure be developed showing the relationship of EMAP to the Ecorisk Research Program, the Ecological Risk Assessment Guidelines and habitat assessment programs of the Agency. The contributions (both real and potential) that EMAP can make to these programs and the coordination between the programs should be explained.

A long-term program such as EMAP is much more valuable and viable of it has clear near-term fallouts (e.g., operating principles, theories or procedures used by EMAP) which may benefit or contribute to other areas of knowledge and research. These fallouts should be sought, identified, and publicized by EMAP, and applied within EPA and elsewhere. The National Aeronautic and Space Agency has been expert in identifying many technological fallouts from its long-term space program. These contributions convinced the public and Congress to continue its investment in the effort so that long range goals could be achieved.

Criteria for selecting indicators

The Document emphasizes the importance of EMAP to the Agency's efforts to ecological risk assessment. The results of EMAP's monitoring should be valuable inputs to assess environmental hazards and stresses and provide information on stress/effects relationships. Therefore, it is essential that individuals with expertise in ecological risk assessment be involved in the selection of indicators and the sampling design (e.g., temporal and spatial characteristics, and the required accuracy and precision). Furthermore, the document should clearly provide for this interaction on a continuing basis as the selection of indicators and sampling design continues to evolve.

Provide Examples, Definitions, and References

The EMAP Program Document could be improved by including an example of an EMAP project, a brief glossary, and a list of supporting documents. The current version of the Program Document outlines approaches and generally describes products and product applications. A brief description of a project, such as the forest study, would illustrate how a project is implemented, an outline of the technologies involved, and explain how it can contribute to ecological risk assessment. A key list of supporting documents should be available to the public and provide more details on the approaches, methods, and specific projects of EMAP.

Tiers 3 and 4

The purpose and application of EMAP's Tiers 3 and 4 sampling protocols are inadequately explained. The Program Document should discuss what these tiers entail, where they fit along the continuum of data collection and assessment, how they relate to pilot and local-regional studies (e g., South Florida initiative), and how these studies would expand and build upon the base level of EMAP characterization activities.

Data of Known Confidence

The Program Document lists the basic EMAP objective in terms of characterization of the environment with known confidence, yet the Program Document fails to discuss what that means, how that would be demonstrated, and what issues are critical to quantify uncertainties. For example, while the data generated within the internal parameters of the statistical sampling scheme for a demonstration project were of a known confidence (i.e., lot), the confidence limits in terms of background variability (i.e., signal vs. noise) were unknown.

Sensitivity Analysis

The EMAP report should include a discussion of sensitivity analysis, i.e., what questions will EMAP data answer? The use of sensitivity analyses, simulations using hypothetical and actual data, and power analyses should be discussed in broad, concise terms in the general

Program Document and in specific details in the companion Program "technical document". EMAP should structure its sampling programs to include assessments of the natural temporal and spatial variability of the ecosystem so it can distinguish signals from noise.

Use State-of-the-Art Methods

The Document states little or nothing about the importance of appropriate biological and chemical analytical methodologies to be employed in the monitoring program and their precision and specificity. While this may be implicit in the document, it should be explicitly stated. We recommend that the Program Document give an example of how such methods are selected and how the quality and compatibility of the data are assured within and between the resource groups.

Information Management

It is absolutely essential that the system and associated software be fully configured early in the EMAP program. This will ensure that subsequent data generation and submittals to the EMAP data base are fully quality-assured and of a form that can be readily incorporated into the system. We recommend that EMAP consider the use of a relational data base and pilot options which may be appropriate. The Program Document should describe EMAP's approach for accessing and handling data from disparate sources to produce the useful data bases, statistical summaries, and assessments.

Clients for EMAP

There is a fundamental tension for EMAP between the need to provide useful information to some EPA program office clients and the need to do broad, generic long-term monitoring that may be able to detect regional changes and trends in ecological resources over time for the Administrator's needs. EMAP is designed to gather information for the second need, however, the Program Document implies that EMAP can meet more specific client needs that can be addressed more efficiently by a focused monitoring effort. The principal client for EMAP is the Administrator and meeting his needs should be the primary objective. EMAP serves a vital census that EPA clients, such as the regulatory offices, may not yet recognize as being important. The Program Document should emphasize the benefits of such information.

User/Client Data Access

The document should contain a description of just how a user or client of the EMAP system will be able to access data. If the system is to be maximally useful to researchers, industry and the regulatory community, early definition of the data types and forms available to the potential user community is essential. The Document should also provide some tentative or vague schedule for when data may be accessible.

The Sequencing Problem in EMAP Management

Many of the components of EMAP depend on one another in ways that make the sequence of their development extremely important. Some activities cannot be pursued until the results of other activities are in hand (e.g., preliminary selection of indicators precedes demonstration projects). Furthermore, there are some activities whose outcomes cannot at present be predicted, but which will critically affect subsequent strategy and planning decisions. The Subcommittee recognizes that EMAP design did not evolve following a strict sequence of activities, and that as experience is gained with demonstration projects and with testing indicators, the fundamental EMAP sampling strategy and design may require modification. The Program Document should discuss this problem and reassessment tasks should be included in the Implementation Plan.

Concepts for Integration and Assessment

The Subcommittee recommended earlier that EMAP prepare a pilot assessment for SAB review. At the December 4-5 meeting, EPA presented the concepts and prototypes materials on integration and assessment for discussion with the Subcommittee. The Subcommittee recommends that EMAP use the oral comments to prepare specific documents illustrating EMAP approaches for data assessment and integration (including both a regional ecosystem and single resource examples) for SAB review.

Final Thoughts

In summary, we are pleased that the revised EMAP Program Plan has responded to the Subcommittee's previous recommendations (July, 1991) concerning preparation of an overview document. We have suggested some refinements and improvements which we hope the Agency will incorporate into the final Program Plan. A number of fundamental questions about the program still remain to be clarified. We expect that these will be addressed in the Technical Program Document and Implementation Plan that are now under development. We look forward to the opportunity to review the Technical Program Document, the Implementation Plan, and the approaches for data assessment in detail.

Sincerely yours,

Raymond C. Loehr

Raymond C. Loehr, Chair
Science Advisory Board

Kenneth L. Dickson

Kenneth L. Dickson, Chair
Ecological Processes and
Effects Committee

U.S. ENVIRONMENTAL PROTECTION AGENCY

NOTICE

This report has been written as a part of the activities of the Science Advisory Board, a public advisory group providing extramural scientific information and advice to the Administrator and other officials of the Environmental Protection Agency. The Board is structured to provide a balanced expert assessment of scientific matters related to problems facing the Agency. This report has not been reviewed for approval by the Agency; and hence, the contents of this report do not necessarily represent the views and policies of the Environmental Protection Agency or other agencies in Federal government. Mention of trade names or commercial products does not constitute a recommendation for use.

US ENVIRONMENTAL PROTECTION AGENCY
SCIENCE ADVISORY BOARD
ECOLOGICAL MONITORING SUBCOMMITTEE

ROSTER

CHAIR

*Dr. Kenneth L. Dickson, Director, University of North Texas, Denton, Texas

VICE CHAIR

*Dr. Stanley I. Auerbach, Oak Ridge National Laboratory, Oak Ridge, Tennessee

MEMBERS

Dr. Donald F. Boesch, University of Maryland, Cambridge, Maryland

Dr. Mark A. Harwell, University of Miami, Miami, Florida

*Dr. Robert J. Huggett, College of William and Mary, Gloucester Point, Virginia

Dr. Richard Kimerle, Monsanto Corporation, St. Louis, Missouri

Dr. Betty H. Olson, University of California, Irvine, California

Dr. Paul Risser, University of New Mexico, Albuquerque, New Mexico

CONSULTANTS

Dr. Daniel Goodman, Montana State University, Bozeman, Montana

Dr. Allan Hirsch, Midwest Research Institute, Falls Church, Virginia

Dr. Alan W. Maki, Exxon Company, USA, Houston, Texas

Dr. John Neuhold, Utah State University, Logan, Utah 84322

Dr. Dean B. Premo, White Water Associates, Inc., Amasa, Michigan

Dr. William H. Smith, Yale University, New Haven, Connecticut

SCIENCE ADVISORY BOARD STAFF

Dr. Edward S. Bender, Designated Federal Official, US EPA, Science Advisory Board, 401 M Street, S.W., Washington, D.C. 20460

Mrs. Marcia K. Jolly (Marcy), Secretary to th Designated Federal Official

*Members of the Executive Committee

Distribution List

Administrator
Deputy Administrator
Assistant Administrators
EPA Regional Administrators
EPA Laboratory Directors
Director, Environmental Monitoring and Assessment Program
Director, Risk Assessment Forum
EPA Headquarters Library
EPA Regional Libraries
EPA Laboratory Libraries
National Research Council