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EPA

AN SAB REPORT: REVIEW OF MITRE CORP. DRAFT REPORT ON THE EPA LABORATORY STUDY

PREPARED BY THE RESEARCH STRATEGIES ADVISORY COMMITTEE

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

May 31, 1994

OFFICE OF THE ADMINISTRATOR
SCIENCE ADVISORY BOARD

EPA-SAB-RSAC-94-015
Honorable Carol M. Browner
Administrator
U.S. Environmental Protection Agency
401 M Street, SW
Washington, D.C. 20460

Subject: Review of Mitre's Draft Report on the EPA Laboratory Study

Dear Ms. Browner,

The Research Strategies Advisory Committee (RSAC) of the Science Advisory Board (SAB) met in Washington, D.C. on May 12-13, 1994 to review the Draft Laboratory Study Report prepared by Mitre Corp. for EPA. This review was conducted at the request of the Deputy Administrator in order to provide input to the Lab Study Steering Committee when it meets in early June to develop final recommendations for improving the service of the EPA laboratories to the needs of the Agency.

The attached report presents our findings and recommendations, together with additional commentary about our view of the management and organization of science at EPA. We were struck by the fundamental importance that these issues play in determining the success--or failure--of the Agency to carry out its mandate to protect human health and the environment. If the Agency cannot or does not address these issues that have bedeviled the Agency directly and indirectly for years, the ultimate success of the entire Agency will be in doubt. Given the central role that the Office of Research and Development (ORD) plays in science at EPA, this report highlights the conditions in the ORD laboratories, although the principles are applicable to the regional and program laboratories as well. There are a number of points that we would like to emphasize.

First, we agree with your oft-stated premise that good environmental protection must be founded on a solid scientific base. That solid base consists of a continuum of scientific activity ranging from long-term fundamental (strategic) research to shorter-term applied investigations, integrated across the spectrum to address current, emerging, and future environmental problems. Understandably, the Agency program

and regional offices more often focus on today's problems and how today's science might be brought to bear to address these problems. They are the primary customer for applied and problem-oriented research. Consequently, there are few institutional champions who have the perspective to argue for the resources needed to build the fundamental knowledge base that will provide the information both to deal with today's difficulties, tomorrow's conundrums, and the future's problems. As a result, there has been a steady long-term erosion of the Agency's research capabilities (in terms of both FTEs and dollars) over the past fifteen years which has only begun to turn around this year. The Committee believes that a centralized R&D operation promotes strategic focus, as well as overall efficiency and quality of research efforts. We are concerned that recent decisions in the Agency could open the door for Program Offices to set up their own research and development programs with extramural funds, a practice which would likely undermine any focus on strategic research which is vital to advance the course of environmental protection. We conclude and urge that the Administrator of EPA be recognized as the principal customer and spokesperson for the basic research component of the scientific and engineering activity at the Agency. You have demonstrated an awareness of this role. The Committee urges that you pursue it with force and vigor, using the reaction to the EPA Laboratory Study as a vehicle to make needed changes in research management, human resources, and budget.

Second, the rich collection of data in the Mitre report has confirmed earlier SAB findings of a state of research management dysfunction within the Agency that is approaching a crisis level. The management dysfunction has been exacerbated, rather than improved, by what were no doubt well-intentioned management actions to remedy past problems. For example, less that 50% of the average ORD research scientist's time is spent at the bench; Agency-imposed, self-hobbling management constraints limit creativity and intellectual yield; the focus appears to be on "bean-counting administration," rather than "mission-achieving management"; vertical management tracking of projects and human and financial resources is nearly impossible; and data are collected and presented in ever-changing ways so as to defy rational analysis over time. The Committee urges that immediate corrective action be taken to create a more effective, efficient, and mission-oriented research management system, minimizing the barriers to achieving its scientific and engineering goals. The present band-aid approach of conducting a plethora of management studies/initiatives without correcting the fundamental underlying management problems is unlikely to be successful.

Third, the Committee strongly recommends that actions to correct these basic management problems precede any considerations to realign the laboratories. We believe that sound management can lead to improved research efficiency and effectiveness; however organizational structure is only one component of the more comprehensive approach needed to address the Agency's problem. This concern about premature restructuring is particularly important since a new AA/ORD is in the process of being confirmed. It would be unwise and unfair to make significant structural changes without his studied input. Also, our Committee was seriously remiss in not pointing out earlier the necessity of including a critical assessment of the Headquarters ORD component in any study of the EPA laboratories. In fact, Headquarters and the laboratories should form an integrated "research team," devising and conducting a research program to provide the necessary quality scientific basis required for quality management decisions. Therefore, any study that excludes >15% of the Federal FTEs and nearly 25% of the team's budget is incomplete on its face. Regarding the regional and program laboratories, we recognize the unique relationships with and the valuable contributions to their parent organizations. At the same time, we urge the Agency to explore some sort of "dotted line" liaison relationship between the program/regional labs and ORD Headquarters as a means of promoting efficiency and common approaches on generic scientific issues. We believe that such an arrangement is far preferable to any option that would gather these disparate labs into a single, separate, and competing scientific organization within the Agency. In short, without an integrated, comprehensive mission/management plan that includes Headquarters, any structural change in the laboratories could work at cross purposes to the ultimate good and effectiveness of science at EPA.

Fourth, while the Mitre report captures invaluable cross-sectional information about the EPA laboratories, it lacks many insights into the human factors that the Committee believes are vital to the success of any organization. Specific suggestions along these lines are included in our report.

Finally, it was in the light of the above that the Committee reviewed the options generated in the Mitre report. Again, assuming that the primary management problems are initially and successfully addressed, the Committee believes that some variant of the Carnegie Commission report recommendation holds the greatest promise for an EPA Laboratory structure that would meet the needs of the Agency. Organizational, if not physical, consolidation provides strategic focus for the efforts of the research activities, shifts headquarters FTEs to the laboratories, and reduces the number of managers under direct control of the AA/ORD. Potential benefits include greater empowerment at lower levels in the organization, as well as a greater number

of scientists in the laboratories and increased scientist time at the bench. In addition to the megalabs envisioned by the Carnegie Commission, we recommend inclusion of an integrating unit focusing on risk assessment. Such a unit would force the Agency into inter-laboratory, multidisciplinary collaboration that would both provide more relevant research products for the Agency and tend to prevent the megalabs from becoming discipline-oriented fiefdoms.

We appreciate the opportunity to provide advice on this matter of critical importance to the Agency and the future of environmental protection. The Agency staff and the Mitre workers were of substantial assistance in providing the materials for this review. We look forward to receiving your reaction to our recommendations.

Sincerely,

Genevieve M. Matanoski

Dr. Genevieve Matanoski,
Chair, Science Advisory Board

Roger O. McClellan

Dr. Roger O. McClellan
Chair, Research Strategies
Advisory Committee

U.S. Environmental Protection Agency

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ABSTRACT

The Research Strategies Advisory Committee of the Science Advisory Board reviewed the Mitre Corporation report on the "EPA Laboratory Study", a compilation of data and analysis. This report was prepared for senior EPA managers and evaluated the facilities, equipment, and staffing of three types of laboratories (ORD, program office, and regional). The SAB was asked to review the report and offer its recommendations for laboratory realignment and management.

The Committee found that the research management was dysfunctional, research funding and capacity had declined significantly over the past 15 years, and that long-term strategic research lacked a customer/advocate. The Committee recommended the Agency correct its management problems before it begin any reorganization of the laboratories. They recommended that ORD headquarters resources also be considered as part of a comprehensive reorganization of the laboratories within ORD. They recommended that the Administrator become the advocate and primary client for centralized, long-term strategic research. The management plan should also include a consideration of the human resources and activities to develop and maintain the pool of scientific talent; options for coordinated budgets and evaluations with the client program office; a commitment to increase extramural research; and plans to convert contractor laboratory research personnel to federal employees. The Agency was advised by the Committee to resist pressure to make decisions on laboratory realignment in the near term.

KEY WORDS: Laboratory organization, research management, strategic research.

Research Strategies Advisory Committee
EPA Laboratory Study
Roster

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DESIGNATED FEDERAL OFFICER

Dr. Edward S. Bender, Environmental Protection Agency, Science Advisory Board (1400F), 401 M Street, S.W., Washington, DC 20460

STAFF SECRETARY

Mrs. Dorothy Clark, Environmental Protection Agency, Science Advisory Board, 401 M Street, S.W., Washington, DC 20460

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1.0 EXECUTIVE SUMMARY

The Research Strategies Advisory Committee (RSAC) of the Science Advisory Board (SAB) was asked by the Deputy Administrator of EPA and the Acting Assistant Administrator of the Office Research and Development to review the scope of the study and final draft of the EPA Laboratory Study prepared by Mitre Corp. for EPA senior management. The Laboratory Study was intended to collect data on the functions, facilities, staffing, and resources of almost 40 laboratory facilities which support program offices, regional environmental services, and the Office of Research and Development. The National Academy of Public Administration also convened panels in science and management to review the Mitre draft report and offer recommendations to EPA senior management on the organization, structure, and management of the laboratories to support science.

RSAC provided comments on the scope of the Mitre study through a brief conference call on January 19, 1994. The Mitre report (April 18 and updated May 3) was review by RSAC May 12-13, 1994. Mitre's work, conducted over a very short time frame, collected extensive data on the labs, their work force, facilities, and the customers which each laboratory served. Program office laboratories and environmental service division laboratories were focused on the near-term applications of science, particularly those associated with monitoring, methods development, inspections, and enforcement of particular media statutes and regulations. There is direct and frequent interaction between the labs and their customers and a general understanding of the mission they support. The ORD laboratories tend to focus on problem oriented research and long-term research which is more strategic in that it often leads to new insights about mechanisms or interrelationships. Many of the interactions with clients and program offices are controlled or coordinated by headquarters staff. RSAC recommends that the Administrator of EPA be recognized as the principal client and spokes person for basic research within the Agency.

The Committee states that good regulatory decisions must be based on good science which is relevant and of high quality. Based on this review, its recent evaluation of ORD's FY 1995 Presidential Budget Request to congress, and its experience with scientific research in EPA, the SAB concludes that research management is in a dysfunctional state. This dysfunctional state threatens research productivity and undermines the reputation and creative potential for the Agency to provide national environmental leadership. The Committee notes that the current dysfunctional state was preceded by a fifteen year period in which the Agency's budget (less grants) and FTEs nearly doubled while ORD declined slightly. The Agency attempted to compensate for the lack of FTEs by hiring contract researchers, but the collaboration of researchers and contractor management are irreconcilably incompatible. This is perhaps a major reason it has been often stated that ORD

laboratory scientists spend less than half of their time engaged in research--shackled by administrative requirements and contractor oversight procedures. The Committee also found that the management information system was incapable of tracking the costs of projects. The Committee urges that immediate corrective action be taken to create a more effective, efficient, and mission-oriented research management system, minimizing the barriers to achieving its scientific and engineering goals.

The Committee recommends that actions to correct the basic research management problems, considering both the laboratories and ORD headquarters, before any initiative is taken to realign the labs. Such action should include the new AA for ORD. They also opposed a proposal by the NAPA panel to consolidate the Environmental Services Division and program office labs under a new AAship.

The Committee recommended that the Agency expand its analysis of the human resource needs of its work force and the impacts of the reorganization and realignment on human resources. The Committee offered several criteria which Mitre Corp. may apply to each option. Additional advice is provided in an Appendix.

The Committee did not wish to endorse a particular option, because several tasks should precede that step. As noted earlier, changes in management are essential precursors to improvement. Indeed, the Committee notes that further realignment or physical consolidation may be unnecessary if the problems of management dysfunction are resolved. Given those reservations, it appears that the most appropriate option for configuring the ORD laboratories would be some variation of the Carnegie Commission recommendation for Mega-Laboratories representing particular themes related to EPA's mission. The Committee envisions an option which would favor strategic planning, reduce the number of coordination points, and provide greater responsibility and accountability to lower levels in the organization. The Committee recommends that Risk Assessment be included as a separate thematic laboratory. The Committee also recommended that EPA expand its extramural research program.

The Committee also provided guidance and suggestions for making management changes, setting priorities, and conversion of contractor employees. Additional comments on the recommendations were appended.

2.0 INTRODUCTION

The Research Strategies Advisory Committee (RSAC) of the Science Advisory Board (SAB) met in Washington, D.C. on May 12-13, 1994 to review the Draft Laboratory Study Report prepared by Mitre Corp. for EPA. This review was conducted at the request of the Deputy Administrator in order to provide input to the Laboratory Study Steering Committee which plans to meet in early June to develop final recommendations for improving the service of the EPA laboratories to the needs of the Agency.

The original charge to the Committee was to review recommendations that the Laboratory Steering Committee was preparing for the Administrator regarding whether and how the laboratory structure of the Agency could be altered to improve the overall quality, quantity, and timeliness of scientific data for decision makers at EPA. These recommendations were to have been generated, in part, from a review of the Mitre EPA Laboratory Study that would have been reviewed by the National Academy of Public Administration (NAPA). Given the constraints of time, imposed by a need to provide a report to Congress, the Steering Committee subsequently asked for SAB input in a time and form similar to that of the NAPA panel. This change of sequence was not accompanied by a change in the charge; therefore, the Committee generally interpreted its charge as providing advice to the Steering Committee regarding the recommendations that they were going to give to the Administrator.

The Committee review included the following:

a. Review of the April 18th draft of the Mitre "EPA Laboratory Study" report and a May 12th addendum
b. A briefing by Mitre personnel on the results of the Study
c. A briefing by two members of the National Academy of Public Administration (NAPA) panels involved in their own review of the Lab Study
d. A progress report on the NAPA's Congressionally mandated study of "EPA's Extramural/Intramural Resource Use"

e. An ORD February 7, 1994 report, entitled "Redesigning Research at EPA: Proposed Changes to Mission, Organization, and Streamlining in the Office of Research and Development",

f. A February, 1979, prepared by the SAB, entitled "Report of the Health Effects Research Review Group."

The Committee notes that the Mitre Corporation, assisted by the staff and laboratory personnel of the Agency have compiled valuable data and information to assist both the laboratory study and other important analyses which the Agency should perform in the future. At the time of our meeting, limited analysis was available because data were still being verified and reconciled with other sources.

This report summarizes the results of fact-finding meetings with the Agency and the 1/2 day public meeting in May, which included a helpful briefing by two members of the NAPA panels (Dr. David Chiu and Dr. Charles Bingmam) on the preliminary thoughts of the management and scientific groups. Section 2.0 contains the RSAC's major Findings and Recommendations. Section 3.0 presents additional significant points. The Appendix contains further discussion of these and other issues that should be of help to the Agency.

Our goal throughout has been to provide advice to the Administrator that will lead to an improved management framework and laboratory structure that can generate the kind of technical information that Agency managers need to make the kind of difficult environmental protection decisions needed to protect public health and the environment today...and in the future.

3.0 FINDINGS AND RECOMMENDATIONS

3.1 Need for a primary customer/advocate for long-term strategic research

3.1.1 FINDING 1: There is no easily identified spokesperson for centralized, strategic, long-term research and its importance to the Agency

The Committee's work involved reviewing the Mitre report and discussing science with Agency personnel in the Office of Research and Development (ORD), the program offices, and the regional offices. Each of these encounters confirmed the presence of a dynamic tension between the need for a solid base of scientific knowledge to address tomorrow's problems and the need for technical assistance to address today's problems. This tension has existed since the beginning of the Agency more than 20 years ago and still exists today.

In the competition for time, attention, and resources, the need to expand the base of fundamental strategic research in the complex world of environmental science is often sacrificed to address near-term needs. Given the mission orientation of regional and program offices, it is altogether understandable how these offices would eschew longer-term research into new fundamental principles in favor of shorter-term technical applications of existing principles.

However, as the Administrator has often stated, the long-term credibility and effectiveness of the Agency tomorrow is tied directly to the generation of new, basic knowledge today. It is by expanding that knowledge base and "looking over the horizon"; e.g., the ongoing SAB Environmental Futures Project, that the most cost-effective environmental protection will emerge.

In fact, the research mission of the EPA extends along a continuum from highly applied research dealing with analytical or monitoring methodology to fundamental strategic research attempting to anticipate future environmental issues. All types of research along this continuum are important, and all have customers. For example, the program and regional offices need the technical data

supplied by targeted monitoring studies. However, basic science--whose goal is the discovery of new knowledge upon which technical applications and sound regulatory programs are built--is often without a champion when resources are distributed. This has been reflected in a generally downward trend in the Agency's research capabilities, relative to other Agency programs, over the past fifteen years.

The Committee was also concerned by a Feb., 1994, memo from the Office of the General Counsel to ORD that appeared to open the door for Program Offices to establish their own research and development programs with extramural funds, either their own or funds that would ordinarily support the ORD activity. We believe that such a practice would likely undermine any focus on strategic research which is vital to advance the course of environmental protection.

3.1.2 RECOMMENDATION 1: The Administrator must be the primary customer/advocate for centralized strategic research at EPA.

The EPA Administrator has a unique perspective from which to survey the scientific needs of the Agency. The Administrator should be recognized as the principal customer and spokesperson for the basic research component of the scientific and engineering component at the Agency. The Administrator should also be the guardian to ensure that a vital, centralized strategic research program is maintained, even in the face of competing needs from program and regional offices. No program or regional office leader can be expected to fulfill such a role. It is unreasonable to expect that the Assistant Administrator for the Office of Research and Development can successfully exercise this leadership from a position that is only collateral with colleagues heading other AAships and Regions. Without aggressive leadership by the Administrator, we can anticipate a continuation of the shrinking of ORD that has gone on uninterrupted for the past 15 years.

The current Administrator demonstrates an awareness of the role as envisioned by this Committee. The Committee urges her to pursue that vision

with force and vigor, using the vehicle of the EPA Laboratory Study as a means to restate and act upon the need for an expanding base of scientific knowledge.

Without a suitable customer/advocate, no organizational or structural change can resolve the tension between competing needs for short- versus long-term and centralized versus dispersed research.

3.2 Need for fundamental change in the management of science at EPA

3.2.1 FINDING 2: A state of research management dysfunction exists at EPA

The Mitre EPA Lab Study Report is a rich, unique collection of raw and semi-analyzed data, assembled with substantial assistance by the Agency. It provides valuable input for further management analysis, review, and ultimate action. [See Appendix Section A-3 for limitations of the study.]

In many respects the data in the EPA Lab Study confirm the findings of the SAB (EPA-SAB-RSAC-ETR-94-008) that there is a general management dysfunction with regard to the research operations of the Agency. For example, the data present a picture of a well-educated cadre of scientists and engineers spending less than 50% of their time on the research work that is the intellectual capital the Agency is amassing for the future. Instead, the record of the past 15 years starkly reveals a steady long-term erosion of the base of scientific and engineering researchers and research dollars (Figures 1 and 2). For example, while the FTEs in the Agency have increased by 50% during that time, the number of FTEs in ORD have actually declined. This creates the untenable situation of many more laboratory customers being supported by even fewer research suppliers; a condition that only exacerbates the tension along the entire length of the research continuum referred to above.

FIFTEEN YEARS OF EROSION (RELATIVE TO THE AGENCY AT LARGE)

Figure 1. Budget Trends ($B)

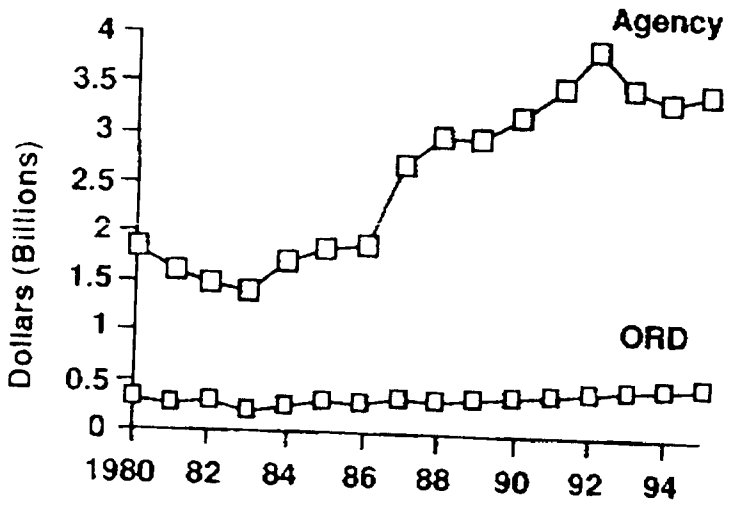
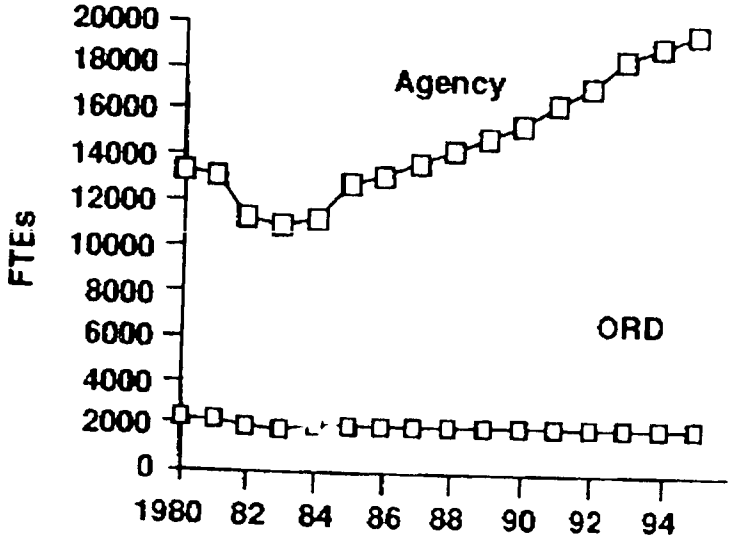


Figure 2. FTE Trends



Further, existing management systems actually work against the Agency's ability to rationally develop research strategies, implement them, and gauge their effectiveness. In some cases, self-inflicted constraints, imposed to guard against conceivable, but arguably not likely, eventualities have hamstrung certain operations, a practice that would not be tolerated in the private sector. The cost of these constraints can be measured in terms of reduced responsiveness to customers, lost creativity, and diminished intellectual yield. A picture emerges of an organization more devoted to bean-counting administration than to mission-oriented management.

Even the existing administration structures cannot provide the kind of information needed for rational research management. For example, it is nearly impossible to track the research program from issue identification to research plan to implementation plan to resource allocation to product delivery to program evaluation. The data are collected and presented in ever-changing ways so as to defy constructive analysis over time.

There are a number of studies underway that impact on the way that research is managed--or should be managed--at the Agency. These include the following:

a. The Mitre EPA Laboratory Study
b. The NAPA review of the Mitre EPA Laboratory Study
c. The Congressionally mandated study by NAPA, "EPA's Extramural/Intramural Resources Use"
d. The ORD streamlining report, "Redesigning Research at EPA: Proposed Changes to Mission, Organization, and Streamlining in the Office of Research and Development"
e. The research issue based planning activity initiated with ORD leadership in the past two years
f. The "Setting National Goals for Environmental Protection Activity" project
g. Your strategic plan for achieving the environmental goals over the next five years.

It is unclear how these efforts relate to one another. Indeed, based on the Associate Comptroller's remarks at the May 12 meeting of this Committee, the conclusions of the NAPA panel on "EPA's Extramural/Intramural Resource Use" is likely to increase management constraints and contract management responsibilities, further reducing the time researchers will spend at the bench. We were alarmed to learn from a senior manager from the Office of the Comptroller that the goal is to have management equal to mission. Such a statement fails to recognize that management is not an end in itself; it only exists to achieve the mission. It is most critical that recommendations from such narrowly focused studies be considered in the context of ORD's mission, its goals, and your vision for science within the Agency.

3.2.2 RECOMMENDATION 2: The Agency should take immediate action to create a more effective and efficient research management system, including an information system.

The Agency must design and put in place a research management system that integrates scientific activity from the problem development stage to publication of peer reviewed results. A key component will be a research information system that can easily respond to the need of different audiences; e.g., Congress, top Agency management, intermediate Agency management, program/regional offices, ORD, the laboratories, and the public. Therefore, the system should be capable of presenting and reconciling budgetary, appropriation, and expenditure data over time in terms of environmental media, specific intra- or cross-media issues, individual laboratories, separate projects, and so forth. The system should be informed by the collective impact of the efforts described at the end of 3.2.1.

The management system should have some easily measurable attributes; e.g., increased time that researchers spend on research rather than contract management. It should increase the efficiency of providing support to the researchers, increase the effectiveness of communication within the organization, and increase responsibility and accountability of those in the lower hierarchical

levels of the Agency. Management must shift from a focus on quantities and widgets to managing for quality results to achieve the mission.

3.3 Need for proper sequencing of research management reform and scientific laboratory realignment

3.3.1 FINDING 3: Events are being driven by considerations other than "good science"

The urgency given to the EPA Lab Study is obviously related to Congressional initiatives, which may stem from the best of intentions, admixed with impatience, frustration, and perhaps some regional interest. The underlying motive, consistent with your goals, is to improve the science at EPA, but a rush to action could inadvertently have just the opposite effect.

Research requires teamwork between researchers, management, and technical services. The efficiency and effectiveness of the research can be facilitated by sound management practices. Management must define a clear mission, goals, and objectives, wherever possible, it should delegate authority and responsibility to working units to achieve the mission, and provide support for administrative needs of the researchers. Structural change is only one aspect management may consider to improve research productivity.

3.3.2 RECOMMENDATION 3: Correction of research management problems should precede any realignment of the labs

As noted above, the research management dysfunction is at the core of many of the science problems--laboratory and otherwise--at the Agency. Therefore, these problems need to be addressed before any initiative is taken to realign the labs.

The appointment of a new Assistant Administrator for the Office of Research and Development, when it takes place, should advance the process of

fashioning organizational or structural changes. The new AA, charged with this mission, should have latitude to act from a "hands-on" position.

When this Committee reviewed the Mitre study plan for the EPA Lab Study, we were remiss in not commenting that the study should include a critical examination of the Headquarters operations that support and direct the EPA laboratories. In fact, Headquarters and the laboratories form a "research team" that must be considered as a whole. Within ORD alone, the HQ operations involve more than 300 of the roughly 1800 FTEs in the total ORD organization and $125.6M out of the total of $518M. Figure 3, depicting the ORD structure for both headquarters and laboratory operations, and Figure 4, showing the Headquarters/ORD Laboratory work force and budget, illustrate the issue. To exclude an analysis of the structure and function of the HQ operation is quite possibly to exclude an area in which pivotal management/direction changes should and could be made.

Regarding the regional and program laboratories, we recognize the unique relationships with and the valuable contributions to their parent organizations. At the same time, we urge the Agency to explore some sort of "dotted line" liaison relationship between the program/regional labs and ORD Headquarters as a means of promoting efficiency and common approaches on generic scientific issues. We believe that such an arrangement is far preferable to any option that would gather these disparate labs into a single, separate, and competing scientific organization within the Agency.

Figure 3 Organizational Chart for ORD HQ and Field Components

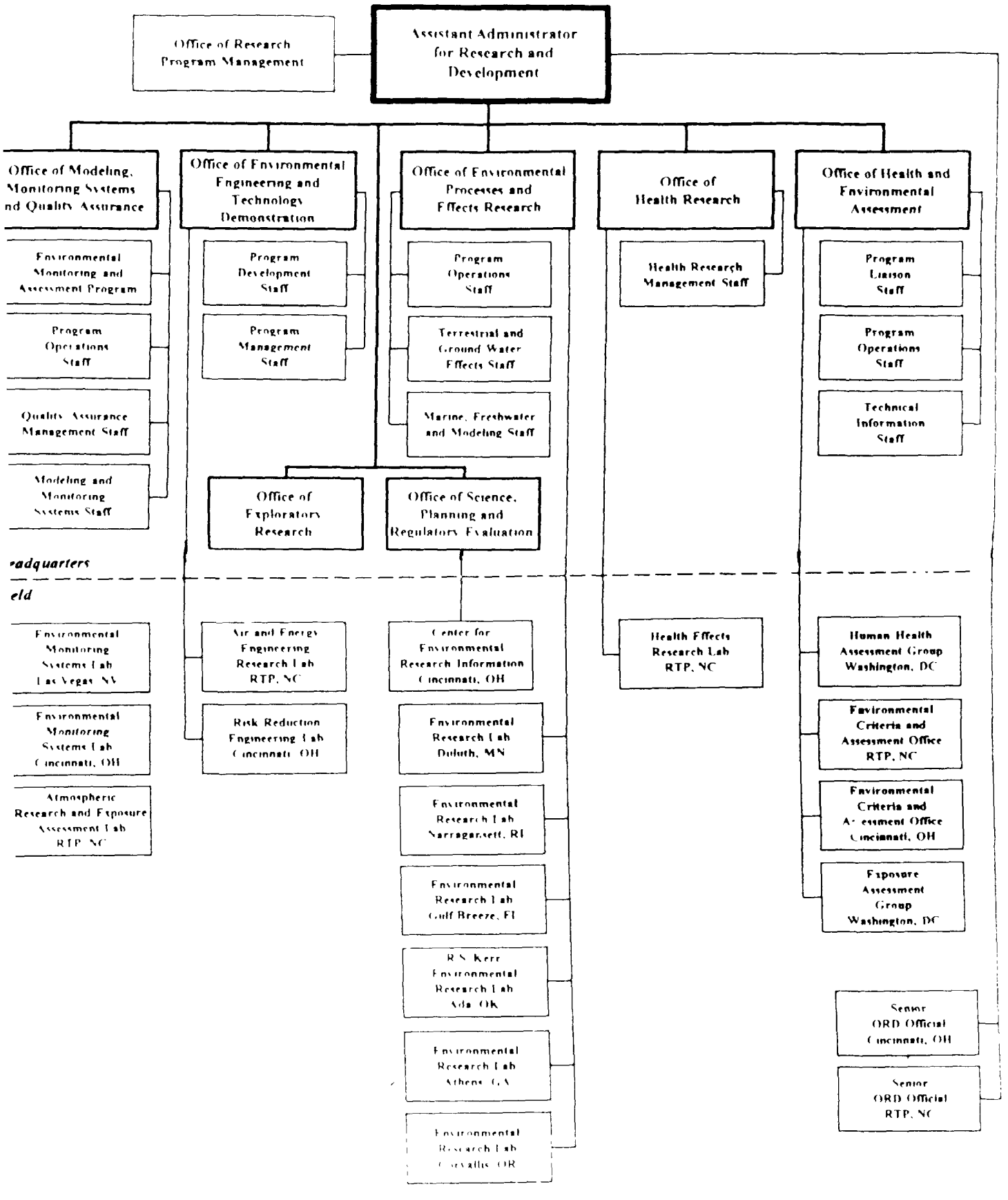
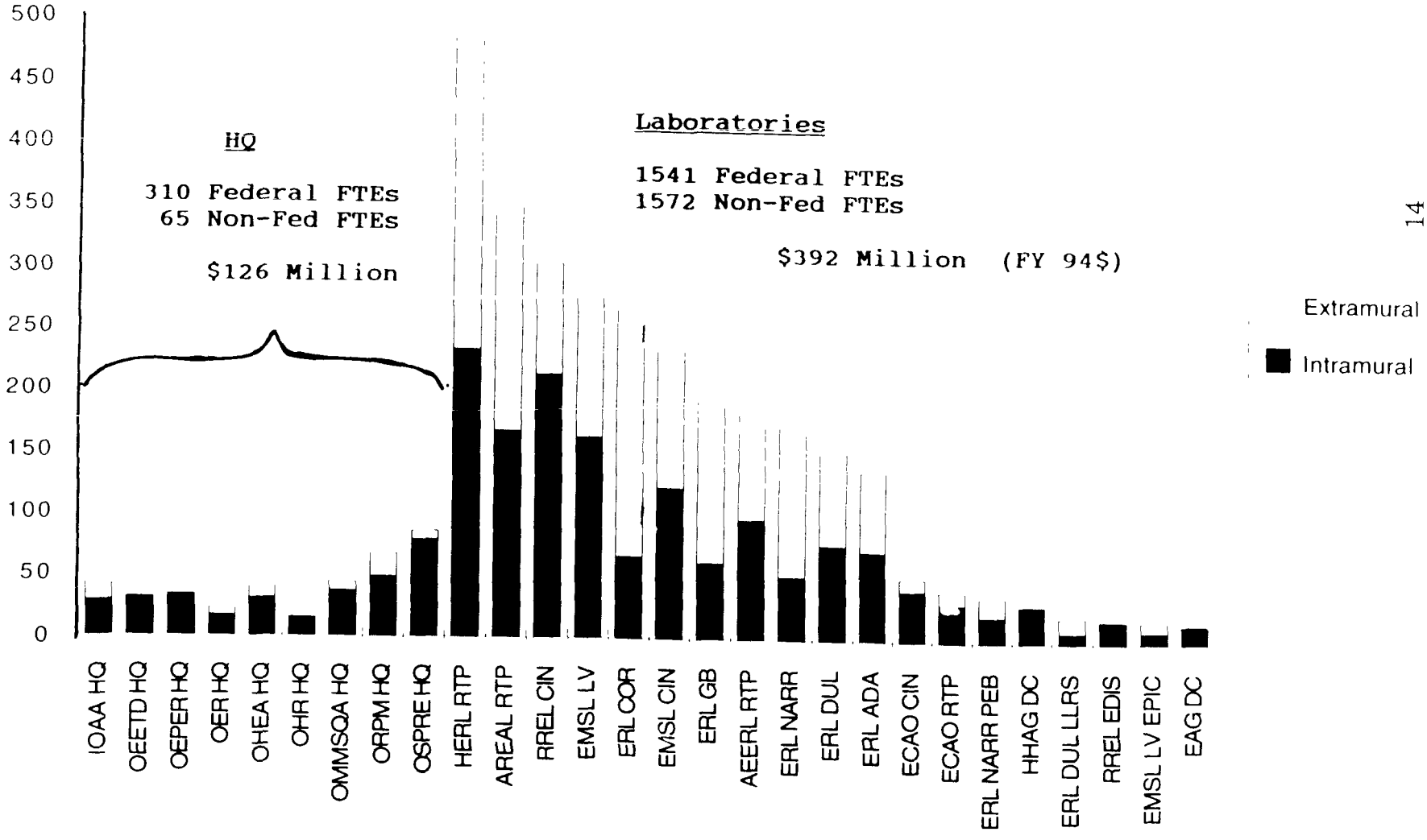


Figure 4 ORD HQ/LAB WORKFORCE AND BUDGET



3.4 Need for consideration of human factors involved in EPA laboratories

3.4.1 FINDING 4: The Mitre report is short in considering human resources issues.

As noted above, the Mitre report contains a plethora of data that will provide additional valuable insights when they are analyzed in the future. However, the "human face" of EPA science does not come through in these data. How do the scientists and engineers working within the laboratory feel about their condition? What do they project as their future? As they age, are they recommending a career at EPA to their younger colleagues? What is the long-term outlook for the contractor conversion process? In an era when most of the complex scientific problems faced by the Agency must be tackled by multi-disciplinary teams, is it feasible to create effective teams using a mix of federal employees and "contract employees" and also abide by the rules? We doubt it. Figure 3 illustrates the magnitude of the problem.

3.4.2 RECOMMENDATION 4: The Agency should pay close attention to the human resources impact of any changes. These changes should include continued efforts to convert contractor positions to Agency employee positions and promote professional development of its research staff.

A key concern of the Committee is that whatever option is adopted for the laboratories is that it should meet certain criteria that advance the state of science and technology at the Agency and EPA should examine the impact of the option on individual scientists. Examples of criteria that should be considered in the evaluation of the options in the Mitre report include the following:

a. Maximize the time of laboratory personnel spend on scientific endeavors.
b. Allow for easy recognition of needs for both additional and <u>new</u> kinds of scientific talent and provide for renewal of this scientific competency.

c. Allow for the addition of senior scientists.

d. Provide dual development career tracks for scientific contributors and management contributors.

e. Support the nurturing, development, and re-creating of the agency scientists and engineers, including individual career development planning.

f. Allow for cooperative and coordinated environmental research and development with other agencies, universities and industry in which EPA scientists can work in off-site laboratories of other institutions. However, Cooperative Agreements should not be used as an alternate source of human resources but used only in those instances where a "true cooperative" program is being carried out with another institution. (Appendix A-2).

g. Develop a continual planning process that provides long-term stability to the enterprise, while maintaining the flexibility of reacting to significant changes in the environmental science and/or problems.

h. Improve the mechanism by which timely and effective technical assistance can be given to the program and regional offices and monitor the results and feedback.

i. In short, address scientific career development "as if scientific achievement really mattered."

A principal human resources action that the SAB has long advocated is the conversion of positions currently occupied by contractor employees to positions to be occupied by full-time government employees. The Agency has been able to make a remarkably fine start on this effort in the FY95 budget. However, even with this influx of new FTEs, less than half of the potential contractor positions on-site at EPA labs[1] will be converted by the end of FY95. By demonstrating imagination, creativity, and good stewardship with the FY95 contractor conversion exercise, the Agency should press the case to complete the job of full conversion as soon as possible.

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[1]ORD estimates that roughly 600 of the 956 contract work years in the research laboratories (Table 4-22, May 3, 1994) are performing research functions that are appropriate for conversion. The FY 1995 Presidential Budget Request included 265 FTEs for conversion of contractors to federal employees.

3.5 Selecting an option for the laboratories

3.5.1 FINDING 5: There are competing forces driving the Agency to make a decision regarding an option for the laboratories.

As noted above, the Committee is troubled by the prospect of the Agency selecting an option to improve laboratory structure and function before the underlying research management dysfunction situation is addressed. In addition, the Mitre report in its present form, without a detailed analysis of the headquarters ORD operations and their relationship to the laboratories and other elements of the Agency, does not provide an adequate analytic basis for decisions on reorganization of the laboratories. At the same time, the Committee is aware that there is pressure on the Agency from outside sources to reach some conclusion in the near term.

3.5.2 RECOMMENDATION 5: The Agency should resist pressure to make a decision on the laboratories in the near term; however, at this point some modification of the Carnegie Commission option has more obvious positive features than any other.

Once there has been a clear articulation of the integrated mission of the EPA laboratories and an integrated research management system implemented, consideration of a realignment of the laboratories to carry out that mission would be in order. At this juncture, it is difficult to anticipate the best option for such a configuration. Certainly, the new AA for ORD, when approved, should be engaged in defining the best, ultimate option and putting it into place.

However, based upon the limited information available today, it appears that some variant of the so-called Carnegie Commission option[2] deserves the serious

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[2]This option was based on the a report of the Carnegie Commission on Science, Technology, and Government "Environmental Research and Development: Strengthening the Federal Infrastructure" December, 1992.

consideration. The Mitre report identifies many of the positive aspects of the Carnegie Commission option. The Committee would like to emphasize a few of them.

First, by organizing around central themes, the Carnegie Commission option provides a rational, focused structure to the laboratory enterprise, thereby encouraging strategic planning (Appendix A-4) and integration of the research effort. Second, the "mega-lab" concept could, but need not, be associated with any physical changes; e.g., new labs or movement of personnel and equipment. Third, the thematic-based structure would reduce the headquarters span of control, which would likely accrue to the benefit of both the laboratory scientists and headquarters managers. Coupled with greater responsibility and accountability for those lower in the organization, this arrangement could have a significantly positive impact on the productivity of research endeavors. Finally, the Carnegie Commission option might be modified by including a unit that fosters integration among the "mega-labs" themselves. Specifically, the Committee sees virtue in having another unit that would be devoted to both human health and ecological risk assessment (RA). A focus on RA would draw upon--and draw together--the efforts of the other mega-labs by keeping the Agency's mission of risk identification, mitigation, and elimination as a prominent, ever-present point of reference. In any event, the structure should be such that it strongly encourages interlaboratory, multidisciplinary collaboration so as to avoid the megalabs from becoming discipline-oriented fiefdoms.

4.0 ADDITIONAL CONSIDERATIONS AND GUIDANCE

In addition to the major findings and recommendations cited in Section 2, the Committee generated many additional insights and suggestions that the Agency should consider as they address the Mitre report and its implications. These points are presented below. Some of the discussion was prepared by individual members of the Committee but bear the endorsement of all members. Given the limited amount of time available for the preparation of this report, it was impossible to integrate these additional points in the format of findings and recommendations, but that should not detract from their value to the Agency.

4.1 Pertinent considerations in making managerial changes, including organizational changes, to promote science at the Agency.

a. Establish clear, declarative statements of the mission and objectives for the Agency and all its sub-units which will enable all Agency employees to understand their respective roles. Research issue management should be continued, developed and consolidated. Mission statements should include descriptions of the mutual role between all (each) lab(s) and customers Further, the statements should have been agreed to by the customers.

b. Maximize the portion of time that ORD scientists, both individually and collectively, expend in the direct conduct of research.

c. Provide for effective linkage and communication between the ORD laboratories and their customers: 1) the Administrator for long-term strategic research and 2) the program offices and Regions for nearer-term issues.

d. Create focused research teams as the primary ORD unit for carrying out cross-media, multidisciplinary research efforts. These empowered,

matrix-managed groups should be oriented toward problem-solving with a minimum number of supervisory/reporting links between the bench scientists and the Assistant Administrator for Research and Development. The groups should consist of federal employees, joined through effective partnerships with extramural personnel; e.g., from universities, private research organizations, states, other federal agencies, and industry. Such linkages should be oriented to solving scientific problems, not merely providing non-federal employee FTEs.

e. Provide for continual revitalization of the ORD work force through continual training, professional development, and recruitment of individuals with recent degrees and knowledge of contemporary research technologies. Resources should be available for scientists and engineers to maintain professional contracts through full participation in scientific societies.

f. Foster stable senior scientific management to pilot the "research ship," irrespective of changes in the political climate/leadership.

g. Multidisciplinary and multiagency activity will be a hallmark of future environmental research. EPA research funding and laboratory systems should facilitate and promote "multi-activity."

h. Any change takes time to accomplish and accommodate. Take this into account in moving ahead. Changes may have to be taken in steps, verifying value at each step.

4.2 The Agency's commitment to extramural research

There is a critical need for the Agency to rigorously assess the role of EPA-funded extramural research in achieving the Agency's mission and vision. At the present time only a very small portion of the Agency's funding resources are

used for grants and co-operative agreements awarded competitively for research directed to achieve the Agency's mission and objectives. The total level of support is so small that EPA is not recognized as being a significant player in the support of environmental research. Substantial expenditures are made for contracts and cooperative agreements that currently provides a non-federal work force on-site that is approximately equal to the number of EPA employees performing research on-sites.

EPA scientists, as well as university scientists, should be eligible, on a competitive basis to apply for unrestricted (unrelated to specific programs or projects) exploratory research funds.

4.3 The importance of a centralized research organization

The Committee recognizes that the issue of a centralized versus decentralized approach to performance of research and development has been debated from the beginning of the Agency, when the decision was made to centralize administratively the research and development function. The Committee endorses the continuation of this mode of operation. The Committee believes that centralized R&D will promote a strategic focus, as well as the overall efficiency and quality of research efforts. If program offices have concerns as to the responsiveness of the ORD program, their efforts need to be increased to make the program more responsive. ORD and program management could establish budget categories for program office support and the program offices could in turn contribute toward evaluating laboratory research performance. The answer is not to create research and development functions in the program offices. In this regard, the Committee is concerned by the February, 1994 H.F. Corcoran/S.G. Pressman (OGC) memorandum to Clarence Mahan (ORD) entitled "Funding of Extramural Research by Offices Other than ORD", which would appear to open the door for Program Offices to set up their own research and development programs, in part, utilizing funds currently supporting ORD efforts. Ad hoc R&D efforts dispersed throughout the Agency are likely to have a long-term negative impact on the Agency's overall R&D program. Likewise, installing an "AA for

Environmental Services" (a proposal which has intrigued the NAPA lab study review panel) is likely to make the conflicts worse, not better, especially if Environmental Services include research program support. There is no apparent justification for this organizational move that would counterbalance its highly probable negative effects; i.e., creating "new turf," .

The Committee believes that decentralization of the research mission through fiat or organizational design would destroy the viability of long-term quality science at EPA and urges the Administrator to see that this does not happen.

4.4 The need to focus research efforts

The Committee fully recognizes that the resources available to the Agency are not sufficient for it to have a research and development presence, let alone a meaningful impact, in all areas of legislative concern to the Agency. In short, the Agency R&D Program cannot be "all things to all people." This must be recognized by Agency management, the Congress, and the public. Therefore, the Agency must strive to achieve a critical mass of resources (budgetary and human resources) in selected areas of greatest concern, whose selection is guided, but not determined solely, by risk considerations. By so doing, it will be possible for the Agency to conduct significant research that is of exemplary quality and utility.

4.5 The need for additional contractor conversion

The Committee is of the opinion that the use of multiple control mechanisms such as human resources ceilings and special budget accounts; e.g., Program Research Operations (PRO) and Abatement Control and Compliance (AC&C), in addition to total appropriations/obligations authority, have led inexorably to systemic cases of poor research management. In part, the existence of these systems have led ORD to increase its use of what the Mitre report calls "extramural personnel," principally through the use of contractors and cooperative agreements. The Committee strongly urges that the laboratory work force be

converted to federal employees as soon as possible. The only exception the Committee would envision is the use of cooperative agreements when it is truly a cooperative venture with another institution, not simply a means for bolstering the work force through the on-site use of employees of a cooperating institution.

5.0 APPENDICES

Section A-1 Resolving conflicts between ORD and program offices

The program offices of the EPA, the major customers of ORD, generally have a short-term view of their scientific needs. In addition, ORD itself must conduct research of a longer term, strategic nature, dealing with possible future issues. These concerns are not easily supported by Offices, individually or collectively. Given the fact that ORD's resources are limited and always will be, conflict must inevitably develop between those who favor short-term and those who favor long-term research efforts. Such conflict can disrupt the research program and be of such a nature that ORD, by itself, cannot negotiate a settlement agreeable to all parties. In such a struggle, strategic (long-term) research, having no clear customer or "user," has little chance of being pursued at a reasonable and necessary level.

No simple organizational change will resolve these conflicts. The changes required for conflict resolution are inherent in management's practices and methods. The Committee identifies two aspects of this situation:

a. There is a lack of an identifiable customer for strategic research.
b. There is no systematic method for resolving the problems of allocating resources among competing customers.

As to the first problem, the Committee suggests that, since strategic research is aimed at problems of national and international scope and those involving multimedia consequences, the Agency itself is the customer, based on the broadest sense of its purpose and mission--environmental protection. Specifically, the Administrator of the EPA should be the customer, should so declare, and should so act on behalf of strategic research in planning, budgeting, and setting priorities. Only in this way will strategic research receive the attention it deserves among all the competing demands on ORD's resources.

As to the second problem, specific linkages are needed between the Offices and ORD. Each Office needing ORD's services should have a conflict resolution manager, or support manager, assigned whose function is not a) to represent the interests of the Office to ORD nor b) to represent the interests of ORD to the Offices, but rather to represent each to the other. The primary job of each such support manager would be to fit the needs of the customer to the capabilities of the supplier (ORD), to assist the supplier of resources in seeing the need to redeploy its resources, and to effect a marriage between needs and resources.

For a support manager to be able to work successfully, two things are needed: a) a clear agreement between customer and supplier as to how they will work with the support manager and with each other during the allocation process and b) a mechanism for elevating the issue to a higher level when the support manager cannot bring about a successful marriage.

The support manager may report "via a solid line" to the office and "via a dotted line" to ORD, or vice versa, depending on the sensitivities of the parties involved. The support manager, it must be remembered, is a link which is not at the Office/ORD interface, but rather is the interface.

Apparently there is a successful prototype of such a system at the Health Effects Research Laboratory (HERL) in RTP. This example should be examined closely and adopted as appropriate.

Section A-2 Use of partnerships to leverage EPA leadership in science

Environmental research is inherently complex, multidisciplinary and broad. It must address questions ranging from the molecular to the system-wide (e.g., global climate) level. EPA is only one of the many institutions conducting environmental research, and its efforts account for less that 10% of the federal environmental research budget. Thus, EPA cannot be expected to maintain in-house expertise in every area of environmental research. If EPA is to have a national leadership position in environmental science and research, it must develop more effective and strategic ways to partner with outstanding scientists in universities, other federal agencies, research institutions and states to develop multi-disciplinary research programs that can provide the new scientific knowledge needed for developing cost-effective environmental policies for the nation.

The most productive and effective scientific partnerships are those in which each partner brings a different and unique capability to the partnership. They are built upon mutual respect and trust. For EPA to succeed in partnering, it must first identify those areas in which it already has outstanding scientific capabilities to address EPA's mission, with particular emphasis on those areas in which there is no other institution with such expertise. It must also identify areas in which it lacks needed capabilities, identify those institutions which have outstanding scientific capabilities in those areas, and develop research partnerships with such institutions.

There are several existing mechanisms that EPA can use to develop such research partnerships; e.g., cooperative agreements, interagency agreements, contracts, and exploratory research grants. Rigorous and objective external peer review of all research partnerships is essential if the partnerships are to provide high quality and credible scientific bases for developing cost-effective environmental policies for the nation. The Exploratory Research Grants Program is an excellent example of EPA partnerships with outstanding university investigators to develop new scientific knowledge of the environment. The

research projects are subjected to a rigorous, objective peer review by scientists selected for their expertise on topics of the projects. The review panels also evaluate and highly weight the relevance of the proposed research to EPA's missions. This small program has been very effective in producing some of the more fundamental understanding of environmental systems needed by the Agency for planning applied research and, ultimately, developing scientifically credible environmental policies.

Some of the key characteristics that have led to the success of this partnership should be incorporated into the other kinds of research partnerships in which the Agency engages; specifically

a. Use of the most expert scientists in a given environmental field.
b. Rigorous, external peer-review of the scientific quality of the research.
c. Consideration of the relevance of the research to EPA's missions.
d. More long-term commitments of funding; i.e., more than one year.

In addition, the many bureaucratic impediments to such partnerships should be reduced.

In summary, if EPA is to have a leadership role in environmental research, it is essential that development of long- and short-term extramural research partnerships become an integral part of its strategic thinking.

Section A-3 Strengths and limitations of the Mitre report

The Mitre data collection program was comprehensive and the data have been organized into a database in such a way that it can be quizzed to address important questions about human resources, facilities, and laboratory capabilities. As such, it represents a unique source of information about the EPA labs that can and should be analyzed further in the months ahead.

However, the Mitre report has some limitations, and it can be improved. For example, it should carefully state that the data collection procedures involved asking the laboratories themselves to answer basic questions about their perception of their mission and their activities relative to the EPA mission. Anytime a conclusion or summary is provided it should be introduced with a comment such as "the laboratory personnel indicated that their activities were..."

One problem with this study is that it is being carried out largely by an independent contractor. The Agency would have been better served if they had more completely conducted the study themselves and only had contractor support to compile and analyze the data. The Agency management staff would have gained more insight into the workings and problems with their own organization if they had conducted the interviews so that they could have heard the responses and asked clarification questions.

In one sense, the approach to the EPA Lab Study seems reversed, in that Mitre had to work hard to define and clarify the missions of the Agency and the individual laboratories. The Agency needs to develop its own strategic plans with a clear delineation of missions and vision statements before it can begin to reorganize the laboratory systems to better address the Agency's missions.

Some of the conclusions in the report are misleading. For example, the comment in the mission analysis summary "...all current mission elements requiring science and technology are being met through three types of laboratories [ORD, program, and regional]." These three types of lab serve very different

functions and customers. Therefore, it is difficult to see how they can be treated in a similar manner. As it is, the quoted conclusion relies largely on Table E-2 Distribution of Laboratory Functions by Medium which identifies responses from individual laboratories in a matrix of medium and science and technology functions. However, many of these responses represent a very limited amount of FTEs applied to these activities and mission elements which are related to only a limited extent at best. This table would be more useful if it indicated the number of FTEs in each of the media and functions. With these data, it would be clear that the Agency is not meeting the mission elements with the laboratories.

The Committee requested more breakdowns of research staff by highest degrees, instead of by number of degrees. For example, the usefulness of Figure 4-18 through 4-20 would be enhanced if the data indicated the number of Ph.D.s and MS in each of the disciplines and if other tables in Appendix E indicated the number of personnel with advanced degrees who are eligible for retirement.

Section 6 of the Mitre report appears to be an excellent summary of the issues and management ills of the Agency. The Steering Committee should study and discuss this information in order to understand fully the problems for which they are seeking optimal solutions. The SAB Committee offered specific comments at the meeting on section 6.6.2 Systematic Responses which did not appear to be well developed. The concept of market-based competition is generally not compatible with the Agency's working conditions.

The ideas behind the "free market" and empowerment are carried too far in the Mitre report: only some aspects of empowerment are valid and the free market ideas are inapplicable within EPA. It is highly desirable that the lab managers have greater flexibility in pursuing the objectives set for them, within given budgetary constraints.

Figure 8.3 is very complex and hard to interpret. Perhaps a "status quo" base needs to be defined--or a clearer definition of the "baseline" case--so there is a

known base in which all characteristics are neutral (=0) and from which other alternatives may be compared more objectively (+,- or 0).

Section A-4 Strategic planning

The SAB has previously commented on the need for a comprehensive strategic plan that includes research which maps out the future directions of the Agency. In the last several years, the corporate world has made use of applied strategic planning models that incorporate new concepts, such as strategic intent and core competencies, as important aids for development of strategic decisions using analytical processes (see for example, the programs underway at AT&T, Colgate-Palmolive, 3M, Eastman Kodak and Northrup). There are a number of schools of thought on the best process, but the basic tenets are similar. They include not only what the plans should entail, but also how to involve the appropriate personnel in the process so that they are committed to implementing the plan once it has been formulated.

The Agency should take advantage of these advances in modern management theory and employ the basic tenets of these processes for strategic planning. We encourage the Agency to implement this activity on a continuous basis throughout the institution at all levels. From our perspective, it is especially important to institutionalize the strategic planning process for research in the Office of Research and Development with clear linkages to other elements of the Agency, many of which are ORD customers. This planning process should build on previous industry, academia and other government agency practice. The Agency's current approach to research, including its use of the research laboratories, does not appear to be a coordinated, planned effort, but rather a reactive series of seemingly disparate activities responding largely to the mandates of others. The Agency is again encouraged to take a more concerted and coordinated approach to strategic planning for research within an overall strategic plan for improving the efficiency and effectiveness of its research activities.

Section A-5 Human resource renewal and development

In evaluating the options for any modifications of the management or the organization of Agency laboratories and related research and other scientific and technical work, one of the principal criteria for consideration should be the degree to which such options enhance or detract from career planning and development.

Human resource renewal and development on a continuing basis are keys to excellence in EPA science and technology.
Human resource renewal and development, within a laboratory-based, scientific and technical establishment is accomplished through the management of technical personnel in order to achieve the necessary mixtures of skills and abilities needed to carry out the work of the organization effectively and efficiently, producing high quality products. To reach this goal requires continued attention to recruitment, placement, and career development of the individual staff members.

New hires, fresh from school (or some with experience) bring new ideas and technological and scientific approaches into an organization which, mixed with the existing reservoir of experienced personnel already on board, yields creative, high quality research and development.

Careful identification of the better staff, measured not only by their current performance but also their future potential in research and development and/or elsewhere in the Agency is the basis for pursuing individual career development. Targeted transfers within and between laboratories of such personnel should lead to planned, broadened experiences that will prepare them for broader tasks and responsibilities. Such a deliberate program will accrue to the benefit of individuals, the research and development organization, and the Agency as a whole.

The Committee envisions experiences that involve temporary transfers into different program offices at HQ, different laboratories (ORD, program, and regional), and into offices of different operating cultures; e.g., HQ, program, and

regional labs. It is especially critical that those who may in time become laboratory directors have the experience of being "on the other side of the fence." In any event, such transfers will enhance the individuals' understanding of the Agency and its mission, will increase their feeling of contributing to the Agency's efforts, and will enhance their view of being a part of the Agency and not just of the research and development organization. In time, career development efforts should identify individuals who have broad potential and who should be moved permanently to responsible positions within the Agency's offices. This kind of career development and improvement will "salt" the Agency with individuals who, from their own knowledge and experience, know what science and technology can do for the Agency and what it takes to produce high quality, relevant scientific and technical work.

Career planning can be facilitated by instituting the concept of functional management as separate from line management: a laboratory reporting to regional or Office management, or within ORD (line management) would have dotted line to a locus within ORD whose responsibility would be to keep track of the careers of scientists/technologists within all laboratories (and of those people "on loan" to Offices, etc.) so as to be able to act as advisors to line management on the career development, promotion, etc. of people under their line command. Agreement is needed by both kinds of management on this to make it work.

Because of current regulations and policies, transfers may not be as easily and flexibly achieved as is desirable for optimal career development. Where this is the case to a detrimental degree, some further reinvention of government is then needed. In short, there needs to be sound career development in order to meet the long term interests of the Agency.

Training can be an effective tool for improving performance. This includes training scientists not only in technical or administrative areas, but also training for scientists and engineers to better understand the many different aspects and diverse work of the Agency of which they are a part. Such training should be given at various times throughout individuals' careers, starting with a broad

orientation for new employees and regular refresher and update training. Management training, within a Federal context, should be directed at those in or destined for managerial positions.

Resources should be available for scientists and engineers to maintain professional contacts through publication and full participation in scientific and professional societies. Active participation and leadership in such organizations should be encouraged as part of one's job. This kind of professional interaction benefits not only the individuals maintaining their currency with their peers, but it also enhances the scientific credibility and reputation of the Agency.

To pursue the renewal and development of human resources, a focal point is needed in ORD specifically charged with this initiative which works with all levels of ORD management and supervision to develop mutually agreed-upon plans and personnel selections. In time, this same focal point could become a resource of broader utility throughout the Agency helping to identify individuals in program office or Environmental Services Division (ESD) laboratories for career development. In the latter activity, the ORD focal point would be a resource for, and provide an overview to operating management responsible for these non-ORD laboratories.

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