Marine Oil Pollution: Federal Program Review

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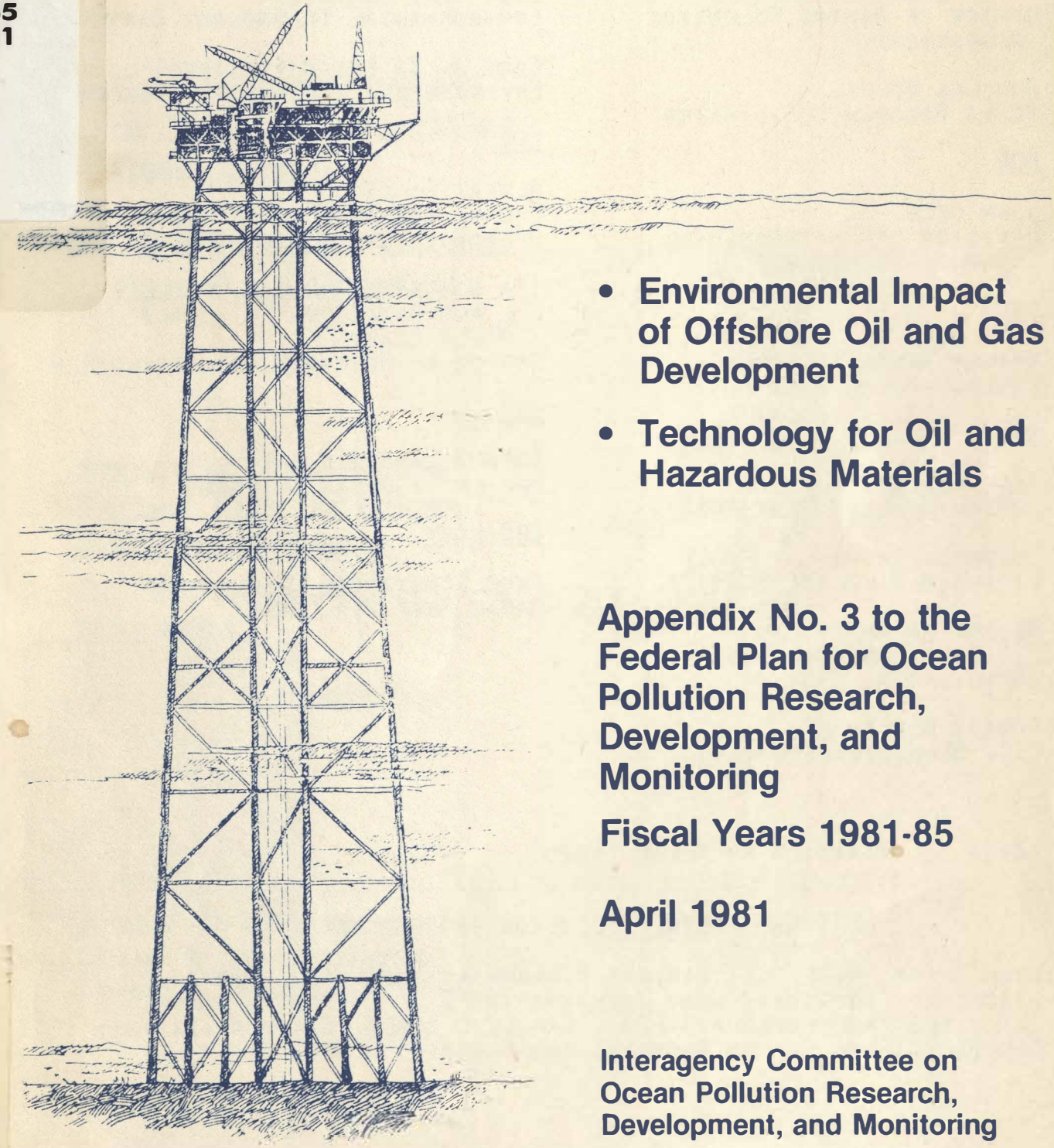

- Environmental Impact of Offshore Oil and Gas Development
- Technology for Oil and Hazardous Materials

Appendix No. 3 to the Federal Plan for Ocean Pollution Research, Development, and Monitoring

Fiscal Years 1981-85

April 1981

Interagency Committee on Ocean Pollution Research, Development, and Monitoring

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Interagency Committee on Ocean Pollution Research, Development, and Monitoring

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FOREWORD

By the 1970's many Federal agencies were engaged in marine pollution studies. Spilled oil, industrial waste disposal and a host of human encroachments into tidal wetlands at the edge of the sea were seen to threaten marine ecosystems and organisms that not long ago seemed serenely protected in their own world. But what was the real effect? How could damage be prevented? Can impacted areas recover, and if so, how fast? How much present and anticipated pollution could be prevented or cleaned up, and at what cost?

Often the organizations addressing these questions had little communication with each other. With the increasing complexity of pollution problems and the growing maze of Federal programs to address them came a need for careful planning, defining of goals, information sharing, and general coordination of related efforts throughout the Federal establishment. The Congressional response was the National Ocean Pollution Planning Act of 1978, designating NOAA as the lead agency in developing a series of comprehensive 5-year plans.

To assist the NOAA Administrator in carrying out this mandate, the President's Science Advisor chartered the Interagency Committee on Ocean Pollution Research, Development, and Monitoring (COPRDM) as a standing committee of the Federal Coordinating Council for Science, Engineering, and Technology. COPRDM is chaired by NOAA's Deputy Administrator and is made up of senior policy level representatives of the Federal organizations involved in ocean pollution studies (Department of Commerce, Environmental Protection Agency, Council for Environmental Quality, Department of Defense, Department of Agriculture, Department of Transportation, Department of Energy, Department of the Interior, Nuclear Regulatory Commission, National Aeronautics and Space Administration, Department of Health and Human Services, National Science Foundation). All except NRC, CEQ, DOA, AND NASA participated in this review.

COPRDM released the first 5-year plan in November, 1979. This plan, starting from scratch, could do no more than summarize all Federally funded marine pollution studies, briefly describing current programs and identifying research needs. This in itself was a formidable undertaking. But the second Plan, to be published in September, 1981, and successive plans to be released in the future, will go a step further. Each will include an examination in depth of a critical problem area in marine pollution, focusing on a pollutant or class of pollutants, a unique geographical area or marine ecosystem, or a particular marine pollution issue.

The subject selected for scrutiny in the 1981 updated plan was petroleum in the marine environment. The study examines current Federal programs as they relate to needs and goals for petroleum-related research, development and monitoring in the areas of environmental impact research and technology for prevention, control and clean-up of spills.

The form and format of this review of Federal oil pollution programs does not necessarily constitute a model for in-depth reviews accompanying future Plans.

INTRODUCTION

By far the largest portion of the Federal marine pollution research and development dollar -- 25 to 30% -- goes to programs related to effects of petroleum in the marine environment and development of OCS oil resources. In the 12 years since the first major oil spill, the Torrey Canyon, the U.S. government has spent well over $200 million on marine oil pollution studies.

The Torrey Canyon oil spill became the first ecological disaster media event and a large international public became aware of the dangers of oil pollution in general and major oil spills in particular. Subsequent, well publicized oil pollution events added to public awareness and concern by government officials for a better understanding of the effects of oil on marine life.

Assessments made about 10-12 years ago revealed that oil pollution in the world's oceans was increasing as a result of increased tanker traffic and as a by-product of the increased use of petroleum and petroleum derived products. Oil spills were becoming routine occurrences and tar balls were being found in previously uncontaminated open ocean water. Much scientific attention was focused on studying these problems. Now after more than 10 years of extensive study, it is time to assess the current state of knowledge and determine the most important remaining questions.

As part of its responsibility in assuring that the Federal marine pollution program is well coordinated and directed, the Interagency Committee on Ocean Pollution Research, Development, and Monitoring (COPRDM) organized a review to examine the elements of the Federal program that deal with petroleum pollution in the marine environment. Virtually all agencies that are concerned with marine pollution also are concerned with oil and are conducting research in one or more oil related problem areas according to their individual agency mandates. The entire program had never been viewed as a whole. Consequently, this review was undertaken for the purpose of determining the overall relevance and adequacy of current program directions. More specifically, the objectives of the review were: (1) to compare the goals and directions of current Federal studies in oil pollution research, development and monitoring with national needs in these areas; (2) to assess the extent to which these studies satisfy the most pressing needs; and (3) to recommend necessary changes.

A few words of caution are in order at this point. Oil is but one of many pollutants, and in many cases, not the most significant in terms of toxicity and persistance. Other organic materials and management practices may cause pollution problems far more serious than petroleum; thus it is important to view the results of this review in proper context. This document is intended as a tool for sharpening the focus of the Federal program for petroleum related studies. It will be one of many sources used to place oil pollution studies in proper context with all other marine pollution problems in the 2nd Federal Plan.

Organizing the Review

Steering Committee: The program review was conducted for the Interagency Committee for Ocean Pollution Research, Development and Monitoring (COPRDM) by COPRDM staff, the National Marine Pollution Program Office. An interagency steering committee was appointed to plan and direct the program review. (Its members are listed on the inside front cover). Composed of representatives from each agency with programs to be included in the review, the steering committee members were knowledgeable program managers with planning and budget authority for the programs of their agencies.

Program Categories: The Federal program in petroleum pollution is both sizable and complex. In order to provide more manageable elements for review, it was divided into two broad categories;

(1) Research on environmental impacts of oil pollution comprising:

(a) Generic studies
(b) Site specific studies

(2) Technology for oil and hazardous materials spill prevention, control and clean-up

Category (1) includes programs run by NOAA, EPA, NSF, HHS, and DOI dealing with ecological impacts as well as transport, transformation and biotic and abiotic fate of petroleum in the marine environment. Research in this category provides most of the information necessary for describing possible environmental impacts of oil development in the coastal zone. This research also develops the knowledge necessary to discern the extent of damage resulting from spills and is a necessary element in any management strategy for controlling oil pollution. The research segment of the program is by far the larger; it amounted to more than $60 million out of the estimated $65 million for oil-related studies in FY78.

Category (2)* consists primarily of programs carried out by the Coast Guard and EPA. The programs of both agencies are oriented toward development of spill clean-up hardware, research regarding prevention techniques and strategies, and detection and identification (by source) of oil and hazardous materials in water. Also included is research toward development of methodology for mitigating damage from spills. In addition to the Coast Guard and EPA efforts, the U.S. Navy, Department of Energy, NOAA and the U.S. Geological Survey also conduct studies related to oil spill clean-up and mitigation. The technology segment amounts to approximately 5% of the total Federal oil pollution program. Because of increasing focus in the Federal program on hazardous materials and the similarity of the technologies for oil and hazardous materials, this portion of the review was expanded to include hazardous materials.

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*In the technology category, the evaluation was organized in cooperation with the Research and Development Committee of the National Response Team (NRT). The NRT operates under the mandates of the National Contingency Plan; one of their responsibilities is to exchange information regarding Federal and other research related to oil and hazardous materials spills.

Evaluation Panels: Evaluation Panels were selected for each of the two program categories by the Steering Committee. The Panels (see lists of members p. II-iii and III-i) consisted primarily of members of the marine science, industrial and academic communities that were involved in environmental management as it relates to petroleum development in the marine environment. Some government officials were included where appropriate. The function of the Evaluation Panels was to objectively evaluate the program under review, drawing on their own expertise and guidance developed by the Steering Committee. Panel recommendations were submitted to the Steering Committee for comment and are published as part of this document.

Program Review Mechanisms: The Environmental Impact Studies review was conducted at a series of three conferences in the summer of 1980, held respectively at Boston, Seattle and Boulder, CO. The Boston conference hosted researchers on Atlantic Coast and Gulf Coast projects; at Seattle, Pacific Coast and Alaska based programs were reviewed; and at Boulder, generic research projects, such as fate-and-effects studies were presented. Locations were selected to minimize travel needs. Presentations at all three meetings ranged from specific descriptions of small insular projects to broad management overviews of comprehensive programs. Commentary from the interested public was also invited.

The Steering Committee had originally intended for the Environmental Impact studies evaluation panel to undertake a thorough scientific peer review of each individual program, considering the underlying premises and scientific merits of each. Because of the great number and complexity of programs, however, this was not possible. The evaluation focused instead on management oriented objectives, and attention was directed to an evaluation of products from the studies to determine how useful they were in resource management and regulation. It was organized around major policy issues, individual agency programs and ten major topic areas (Physical Oceanography, Chemical Oceanography, Air Quality, Geohazard Assessment, Biological and Coastal Characterization, Biological and Chemical Monitoring, Marine Birds, Mammals, Turtles and Endangered Species, Fate and Effects Studies, Socio-economic Studies, and Studies Management).

The technology panel conducted its review through presentations at the offices of EPA and the Coast Guard, the agencies with the most significant programs, over a four-day period. Presentations by U.S. Navy, DOI, NOAA, USGS, and Fish and Wildlife Service program managers also were reviewed.

This publication includes several discrete parts. Parts II and III are the environmental and technology evaluation panel reports; each contains a summary of all programs reviewed and the comments of Federal program managers in response to these reports. The opening section provides an overview of all portions of the review and the overall recommendations of the Steering Committee in both areas.

Names and affiliations of panel members are found at the beginning of Parts II and III. Listings of the presentations for each review session are found at the conclusion of each report (II-79 and III-27).

OIL POLLUTION RESEARCH AND TECHNOLOGY:

FEDERAL PROGRAM REVIEW

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EXECUTIVE SUMMARY

In 1978 the U.S. Congress passed the National Ocean Pollution Planning Act and designated NOAA as the lead agency in developing a series of comprehensive five-year plans. These plans are developed through the Interagency Committee on Ocean Pollution Research, Development, and Monitoring (COPRDM). The first such plan, published in November, 1979, listed and summarized all Federally funded marine pollution studies and identified future research needs. Each successive plan, including the 1981 updated plan, will be accompanied by an in-depth examination of a critical problem area in marine pollution. The topic under review in conjunction with the 1981 plan is the Federal program in oil pollution.

To carry out the Review, an Interagency Steering Committee was appointed by COPRDM (see inside front cover for list of members). The Review was divided into two parts: Federal research on the environmental impacts of marine oil pollution, and Federal programs in control and clean-up technology. Because of the growing seriousness of marine pollution problems resulting from hazardous materials other than oil, and the compatibility of treatment methods, the technology review segment is not limited strictly to petroleum, but addresses other hazardous materials as well.

The Steering Committee selected personnel to constitute an evaluation panel in each of the two categories*, and each panel conducted a program review during the summer of 1980. The reports of each evaluation panel (see Parts II and III of this publication) were completed late in 1980. The Interagency Steering Committee responded to each evaluation panel report (see responses at conclusions of Parts II and III).

The two-part review addressed major policy concerns in five separate issue areas: (1) need for improved planning and coordination of oil pollution studies; (2) need for a change in research emphasis toward determining the significance of long-term effects of drilling and production operations; (3) the role of non-Federal science advisory groups in research planning and design; (4) need for an improved system for information dissemination among the various collectors and users; and (5) the present response and clean-up program for accidental spills.

Specific COPRDM recommendations for action are: (1) that pre-lease environmental impact statements be limited to only those essential for identifying areas where OCS activities could result in unacceptable impacts on highly vulnerable resources; and (2) that a 10-year interagency research program be initiated to investigate the long-term, low-level effects of OCS and other ocean use activities. For this purpose, a subcommittee will be established under COPRDM, with the Bureau of Land Management in the leadership role. Clearly defined roles will be established for all participating Federal agencies and for private industry; and (3) that the managers of the spill response program be commended for their fine record. No further actions toward coordination of this program should be taken by COPRDM.

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*The Technology Review was carried out through the Research and Development Committee on the National Response Team (NRT).

STEPS TOWARD MORE EFFECTIVE OIL POLLUTION RESEARCH

Overview by COPRDM for the National Marine Pollution Program

The Petroleum Program Review has generated a number of reports and comments concerning the utility and quality of oil pollution studies as they are currently carried out by the Federal Government. The interagency committee, COPRDM, has reviewed and given careful consideration to the views and recommendations expressed in these documents and fully appreciates the thoughtful contributions made by the individuals who participated in the Review as members of the steering committee and evaluation panels. No such attempt -- to view the entire oil pollution program, as carried out by many agencies within the government, as a whole, -- has been undertaken in the past. And while there have been some shortcomings in this review, its execution has provided information that will assist COPRDM in its planning and coordination roles to assure that the overall Federal program, while truly meeting national priorities and separate agency obligations, is also greater than the sum of its parts.

Oil is but one of the many pollutants of concern in the marine environment. Historically, it has received the largest share of Federal concern. However, many years of study and the growing seriousness of other pollution problems have heightened awareness and led to the realization that these too must now receive high priorities for attention. Highly toxic hazardous materials, large volumes of municipal wastes and dredged materials, and increasing threats from diffuse nonpoint sources of pollution in coastal areas are problems that must also compete for Federal attention. The understanding that the Federal program must address all aspects of marine pollution was expressed in the review by organizers and participants alike. However, except for the portion dealing with accidental spill response and clean-up, which included hazardous materials, the review focused only on the oil pollution portions of the National Marine Pollution Program. Its conclusions and recommendations must be integrated and balanced with those for other problem areas to become part of the new National Marine Pollution Program, scheduled for publication in September, 1981.

The Review acknowledged that many of its conclusions are not new. Program deficiencies and implementation inadequacies had in many cases been recognized and expressed before. The principal difference with this Review is that there now exists a mechanism (P.L. 95-273) and an entity (COPRDM) with direct responsibility for planning and coordinating marine pollution studies across all elements of the Federal Government, thus leading to a direct means that did not previously exist for solving some of these problems.

Oil in the marine environment has been studied extensively for the past ten years. While there are still many unanswered questions that will remain the subject of research for many years to come, there are some conclusions that are generally accepted by those who have studied the problem.

Effects of spilled oil in the marine environment (in the short term) are by and large not catastrophic. While the impact in coastal areas, particularly marsh and shallow estuarine environments, may be disasterous and sometimes result in long-term ecosystem alteration and economic hardships, the number and extent of these vulnerable areas is limited, and impacted sites generally recover to maintain a population similar to that which existed before the spill within fewer than ten years. Furthermore, the frequency with which major spills occur is very low. The largest problems still to be resolved for oil in the marine environment relate to the long-term, low-level effects of OCS activities on entire marine ecosystems. These effects, the result of chronic exposure to low levels of oil and disruption from multiple sources, will most likely be subtle and obscure. They may or may not be significant, and effects are likely to be of most concern in sensitive coastal areas such as marshes and other wetlands and estuaries; there may be catastrophic effects on species already endangered by low population levels. Limited studies of long-term effects have been carried out in historic OCS areas. There is, however, considerable controversy surrounding the interpretation of results of these studies. While major adverse effects on marine resources have not been observed in these historic areas, the nature of longer term effects is questionable.

The National Academy of Sciences is currently revising its 1975 report, "Petroleum in the Marine Environment," to incorporate knowledge acquired since its original publication. This revision, scheduled for completion in 1982, should provide focused guidance for future research directions and should also resolve some of the controversy regarding the adequacy of research already reported.

Major policy concerns raised through the Review address five separate issues: (1) the need for better planning and coordination to assure that separate agency research programs will provide answers to the most significant national research questions; (2) the focus of future research programs; (3) the role of scientific advisory groups in research planning; (4) the need for improved information distibution; and (5) the fact that there is a successful interagency response and clean-up program for accidental spills.

Improved Planning and Coordination - As with most other portions of the national program, many Federal departments and agencies are engaged in oil pollution studies -- each to fulfill requirements for its own mission and obligations. Programmatic decisions within each agency are made as part of a framework of competition and trade-offs with its other high priority areas. Conduct of research within each agency must be related to agency mission, since it is this justification upon which budgets are argued and approved. The basis for the National Marine Pollution Program, however, is that all of these separate efforts, when thoughtfully planned and carried out, must do more than fulfill agency requirements; the combination of these separate programs must also more effeciently address the encompassing and overriding national needs. By assuring that important program elements are not overlooked because they fall between agency jurisdictions, and that related programs can be carried out cooperatively, a greater return on investment is realized than when these programs are carried out separately. Consequently, it is the responsibility of COPRDM to assure that this planning occurs within the National Marine Pollution Program.

Focus of Future Research Programs - In terms of funding, the largest portion of the oil pollution research program is that carried out by the Bureau of Land Management, under their Environmental Studies Program. This program, $35M in FY81, is designed to provide environmental information to Department of Interior personnel for use in making OCS oil and gas leasing decisions. Additional oil pollution related studies amounting to a total of $4.4M are carried out by several other agencies. Consequently, the focus of the BLM program is the largest single influence on the National program.

The present Environmental Studies Program addresses immediate concerns related to initial leasing decisions only, and does not address the still unanswered questions on long-term, low-level effects. In view of the conclusions discussed earlier, it would seem that the likelihood of large-scale adverse impacts resulting from inadequate environmental information being available during the leasing decisionmaking process is not high. Minimal studies directed at identifying the most vulnerable tracts for removal from the leasing schedule could suffice. Additional attention should be given, however, to areas where the significant questions remain. Studies to determine the significance of long-term effects of drilling and production operations must be initiated. Determination of significance will rely on investigations focused on reproduction, behavior and growth rates of populations and communities of marine organisms. Such studies are complex, require multidisciplinary research approaches, and are necessarily time consuming. Thus they will require longer term planning and budget commitments by government. The traditional approach to long-term effects studies involving baseline characterization in open ocean areas and in coastal areas with widely fluctuating natural conditions, has been widely criticized as being costly and ineffective. More innovative approaches to designing the research plans for studies of long-term effects must be sought.

The Role of Scientific Advisory Groups in Research Planning - The advice of non-Federal advisory groups has long been appreciated and valued as an important element in planning Federal research programs. Multidisciplinary projects requiring large budgets and coordination with various research organizations, need non-Federal scientific advisory groups to insure proper planning and execution.

Improved Information Dissemination - With respect to oil pollution studies as well as all other areas of the national marine pollution program, the need for improved information handling is recognized as a serious issue. In spite of the many information collection programs undertaken and data systems available, there are significant deficiencies in synthesizing this data and making it available in forms that can be accepted and understood by the non technical people who must use it. Recent changes within the BLM program have been toward encouragement of publications of work funded through that program. Other agencies are attempting to improve their capabilities for data analysis and accessibility; more attention, however, should and will be given to this concern. P.L. 95-273 gives leadership responsibility for addressing this problem to NOAA; actions are now beginning to establish a regional information network that should help to eliminate some deficiencies.

Response and Clean-up Program for Accidental Spills - A program that should be recognized as a particularly good example of a successful and highly productive interagency endeavor is the one addressing development of equipment and techniques for cleaning up and responding to accidental spills. This program, primarily carried on by the Coast Guard and EPA (Edison, N.J.) with some participation by DOE and Navy has cooperatively developed specialized hardware and methodology for the clean-up and mitigation of spills of oil and hazardous materials. Private industry has also played a significant role.

Conclusions reached through the program generally suggest that present technology for oil spill clean-up on open waters is reaching its practical limit within the context of existing knowledge on the behavior of oil in sea water. Except in specialized environments such as ice covered areas, existing equipment, while not ideal, represents an acceptable compromise between state-of-the-art and cost effectiveness. Such is not the case for hazardous materials, consequently the program emphasis has appropriately shifted in that direction over the past few years.

The program is well run and coordinated, addresses the most significant problems in the field, and shows remarkable productivity for its very modest and eroding budget base. Although there is always room for improvement, this program has demonstrated what can be achieved with careful management and cooperative planning. It is useful to keep in mind that of the approximately $40 to $50 million spent annually to assess real but mostly potential impacts of OCS activities and oil and hazardous materials spills, less than 5% is used to develop the tools necessary to clean-up or lessen the impact of actual spills that occur every day.

RECOMMENDATIONS FOR ACTION

(1) Pre-lease sale environmental studies should be limited to only those studies essential for identifying proposed lease sale areas where OCS activities could result in unacceptable impacts on highly vulnerable resources. These studies should be carried out over wide geographic areas with less resolution than that which is currently employed.

(2) A ten year interagency research program should be planned and implemented to investigate the long-term, low level effects of OCS and other ocean use activities. This program should be implemented by the Federal Government as OCS development takes place with the cooperation of private industry.

To assume responsibility for this endeavor, a subcommittee will be formed under COPRDM; it will be led by BLM with participation by all other agencies with relevant programs and interests. The subcommittee, with staff support from the National Marine Pollution Program Office (NMPPO), will select two study areas for investigation. One will be representative of a historic OCS area, the other of a frontier area. Experimental designs for both areas will be developed with the advice and review of non-Federal scientists and industry personnel as well as those representing Federal programs and interests.

The research plan thus developed will address concerns for long-term effects from all polluting sources; OCS activities, however, will be the primary focus. It should be organized so that funding can be committed in 3 to 5 year allocations and provide for periodic review and assessment so that research directions can be altered as necessary to reflect experience and new information. Clear roles should be defined for all participating agencies and for private industry. Provisions as integral parts of the plan should be made for adequate quality control, the use of monitoring where necessary, and for the synthesis of data and information resulting from the program, as well as its distribution.

Implementation of the plan will be carried out by BLM with cooperation in terms of funding and other resources by other Federal agencies as called for in the plan.

After several years, based upon the information and knowledge gained through this program, the necessity or desirability of extending these concepts through similar programs to other geographic areas should be evaluated.

(3) The managers of the spill response development program are to be commended for their fine record. No further actions toward coordination of this program will be taken by COPRDM; however, recommendations for appropriate budget allocations will be supported as necessary.

EVALUATION PANEL REPORT
REVIEW OF FEDERAL PROGRAMS
IN ENVIRONMENTAL IMPACT STUDIES OF
PETROLEUM IN THE MARINE ENVIRONMENT

Conducted for
Interagency Committee on Ocean Pollution Research,
Development and Monitoring

December 1980

National Marine Pollution Program Office
National Oceanic and Atmospheric Administration

PREFACE

PANEL SELECTION

This report represents the sincere and objective efforts of non-government scientists and managers to assess the applicability and quality of federal research programs directed toward determination of the implications of oil and gas exploration, production and transportation in the marine environment. An independent evaluation panel was chosen by the Interagency Steering Committee directing the program review. The panel is comprised of recognized experts in their disciplines. Many of them are members of the Scientific Advisory Committee for the Bureau of Land Management on OCS studies; others were chosen for their environmental management experience. The panel struggled with the approaches and mechanisms to be used in this evaluation and formulated a three part approach: general issues and recommendations, specific topic reviews, and individual agency reviews. The presentations prepared for the panel ranged from those with specific information on smaller programs, to broad management overviews of very large programs. Some agencies were not represented in the presentations (DOE) and not all the projects of each agency were included. The panel was faced with substantial variability in the quality of the presentations with respect to specific information available, illustration of material, information regarding duration and levels of funding for various programs, and scientific and management applications, and supporting materials for use by the panel. The time allotted for these presentations was necessarily limited to two-day presentations in Boston, Seattle, and Boulder, Colorado.

In spite of these problems, we feel that an adequate and accurate evaluation has been produced. The panel's recommendations should be most valuable to the coordination efforts of the Interagency Committee on Ocean Pollution, Research, Development and Monitoring and other appropriate federal agencies to improve the quality, quantity and direction of these research programs. A firm scientific understanding of the real problems associated with the development and transport of outer continental shelf oil and gas is very much needed so that these urgently required resources can be wisely utilized. We feel that the timely implementation of the panel's recommendations will facilitate acquisition of this knowledge.

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ABBREVIATIONS

ASTM	American Society for Testing and Materials
BLM	Bureau of Land Management
CEPEX	Controlled Ecosystem Pollution Experiment
COPRDM	Interagency Committee on Ocean Pollution Research, Development and Monitoring
DOE	United States Department of Energy
EPA	Environmental Protection Agency
EPA/MERL	EPA/Marine Ecosystems Research Laboratory
FWS	U. S. Fish and Wildlife Service
NAS	National Academy of Sciences
NMFS	National Marine Fisheries Service
NMPPO	National Marine Pollution Program Office
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NSF/IDOE	National Science Foundation/International Decade of Oceanographic Exploration
OCS	Outer Continental Shelf
OMPA	Office of Marine Pollution Assessment (NOAA)
ONR	Office of Naval Research
PRIMA	Pollutant Response in Marine Animals
PROBES	Processes and Resources of the Bering Sea Shelf
USCG	United States Coast Guard
USGS	United States Geological Survey

ENVIRONMENTAL IMPACT STUDIES

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INTRODUCTION, ISSUES AND RECOMMENDATIONS

1. INTRODUCTION

It is urgent that the United States develop a comprehensive, integrated national program for energy conservation and development that effectively weighs and considers the overall costs and benefits of different strategies to meet the nation's energy needs. Development of the petroleum resources of the outer continental shelf (OCS) is a recognized goal of U. S. public policy. Such exploitation must also minimize avoidable adverse impacts on associated natural and social environments. Although tradeoffs between petroleum resource use and environmental protection will occur, an environmentally sound development plan based on data that can withstand both legal and scientific scrutiny offers the best chance for acquiring petroleum resources at the least social cost. Such a plan must be based on a comprehensive statement of goals and objectives, and must identify and fill scientific information gaps in a timely manner. Federal efforts in marine petroleum pollution research, development, and monitoring, which were presented to the Evaluation Panel during this review, do not appear to fully satisfy these criteria.

Successful application of scientific findings to management decisions depends on basic scientific understanding of the phenomena to which the findings pertain, together with effective information transfer to, and adoption by, resource managers. The ultimate test of scientific quality is technical competence for which the established criterion is peer acceptance based on publication of results in the refereed, open scientific literature. Any scientific efforts undertaken in support of OCS petroleum resource development must, therefore, be based on a basic understanding of OCS environments. For scientific efforts to be credible and, therefore, useful in reaching sound and responsible leasing and other management decisions, it must result in publications of a quality equivalent to those in established refereed journals. Much, but not all, of the science described during this review meets this criterion.

A growing body of scientific results supports the following conclusions:

1. Oil spills associated with recovery and transport of oil have effects related to the size of the spill, type of oil, and environmental conditions; however, oiled environments in temperate areas generally appear to recover in one to 10 years to support communities similar to those extant before the spill.

2. Properly operated petroleum recovery operations in historic OCS areas of the U. S. have not resulted in major adverse effects on marine resources, but long-term ecological effects have not been adequately studied in a quantitative manner.

3. Oil spills can have long-term subtle sublethal effects on specific marine populations (especially birds and inhabitants of fine-grained intertidal habitats) and might have catastrophic effects in species already endangered by low population levels, e.g., whales and turtles.

4. Activities related to petroleum development can have major and long-lasting socio-economic effect, both positive and negative, on neighboring coastal regions.

The conclusions summarized above provide a framework for controversy about the nature, funding level, duration, and balance of research programs designed to provide information needed for appropriately informed decision making on OCS petroleum development and determination of acceptable levels of petroleum pollution. The absence of long-term studies on the implications of sublethal effects on marine ecosystems underlies much of this controversy and could be corrected by appropriately designed and quickly initiated long-term studies of frontier areas and studies of the cumulative impacts of long-term oil recovery activities carried out in historic OCS oil lease areas. The potential for controversy surrounding research and management decisions related to OCS development demands that funds for research be directed to real, rather than apparent, problems and, further, that the balance between areas of research be established only after careful, informed, and logical consideration of alternatives. Some aspects

of the federal petroleum pollution research program described during this review did not appear to be the result of such a balancing process.

The Evaluation Panel unanimously recommends that any federal plan for marine petroleum pollution research, development, and monitoring be developed with continuing evaluation by non-government experts fully informed about current federal activities. Limits of time forced the present review to be based on agency-determined selections of such activities.

2. ISSUES AND RECOMMENDATIONS

Issue 1: Competent scientific judgement must characterize federal decisions on both research priorities and management of petroleum resource development.

Although seemingly self-evident, this issue was identified by apparent weaknesses in the present system. Some notable examples follow: (1) Research priorities are established by agency mission rather than by assessment of overall information requirements, with a resultant waste of resources due to non-critical problems being attacked, duplication of effort, etc.; (2) The Bureau of Land Management (BLM) does not assign a high-ranking (GS 15 or above) scientist to head its OCS Environmental Studies Program; (3) Inappropriately extensive and burdensome reporting procedures discourage involvement of many of the nation's most competent investigators; (4) Data products are unduly difficult to acquire by local and federal managers attempting to consider alternatives and options to development proposals, and (5) several agencies have not adequately responded to past constructive criticism such as the National Academy of Sciences (NAS) report on the BLM OCS Environmental Studies Program.

Recommendation: The federal plan for marine petroleum pollution research, development, and monitoring should be developed with input from and continuing evaluation by non-federal experts fully informed about current federal OCS activites.

Issue 2: Procurement procedures interfere with optimum provision of scientific information needed for decision making at all levels.

Both contracting and interagency transfer procedures were severely criticized by federal and non-federal investigators as introducing research-inhibiting delays, inefficiencies, inflexibilities, and discontinuities to programs. Development of needed long-range research programs was generally viewed as impossible under current procedures practiced by NOAA, BLM, and EPA. Many federal scientists complained that even their base programs must be supported by inappropriately unreliable interagency transfers. Non-federal scientists at institutions (predominantly academic) that require multi-month lead times for researach initiation and uninterrupted personnel support for a project's duration, feel precluded from effective participation in federal marine pollution research.

Recommendation: Revise procurement and interagency transfer procedures to provide the timely and project-duration support similar to that usually achieved by such agencies as National Science Foundation (NSF), Office of Naval Research (ONR), Department of Energy (DOE), and the National Oceanic and Atmospheric Administration's (NOAA) Sea Grant Program, with long-established histories of effective procurement of information about the marine environment.

Issue 3: Effective interagency coordination is essential to a successful marine petroleum pollution research, monitoring, and development program.

The Evaluation Panel found evidence of unintended duplication of effort (e.g., studies of natural oil seeps, oil spill trajectory modeling, and oil biotic effect studies) that could have been prevented or mitigated by prior interagency communication. Also, the results of some studies are ignored in the design of others, e.g. studies on the possibility of drilling fluid distribution onto the Flower Garden Reefs in the Gulf of Mexico. General studies of hydrocarbon detoxification, biochemical impact, and genetic impacts could have been made more useful to petroleum development decisions by modest changes, such as the use of test compounds more characteristic of petroleum, if they had been developed with greater interagency communication.

Recommendation: The development of a coordinated federal marine petroleum pollution research, development, and monitoring plan should be used to improve interagency coordination.

Issue 4: The BLM's OCS Environmental Studies Program needs further evolution to effectively meet its objectives.

The BLM OCS Environmental Studies Program has improved substantially in response to recommendations made in the 1976 NAS report. The program has evolved from one dominated by a baseline and monitoring approach to environmental assessment to one based on conscious procurement of environmental information needed for management decisions. Unfortunately, the current program is susceptible to precipitous redirection in response to litigation (on both substantive and seemingly insignificant issues) and political challenges to proposed OCS leasing decisions. Further evolution of the BLM program to reassert scientific management responsibility for program development appears necessary.

Recommendation: BLM should retain managerial control of the OCS Environmental Studies Program, but should appoint a high-ranking (GS 15 or above) scientist to direct the Washington office, and GS 15-level scientists to direct the regional scientific programs. Together, these scientists and their staffs, along with input from the existing advisory groups, should develop and publicize a five-year information procurement program complementary to its existing five-year leasing schedule. The information procurement program should be updated with the same frequency as the leasing schedule.

Issue 5: Marine petroleum pollution research must be characterized by properly framed scientific questions studied with the best of modern technology.

The lack of overall planning of current efforts comprising federal activities in marine petroleum pollution research has allowed studies to be defined and initiated without being fully integrated with one another. For example, socio-economic studies, when conducted at all, are conducted without apparent integration with other research efforts. This general deficiency is of particular concern in a marine environmental program where much evidence shows that effective studies have almost always been interdisciplinary and based on sound conceptual models. In addition, some research efforts described are flawed by being unrelated to actual marine petroleum pollution conditions (e.g., unrealistic pollution exposure levels for bioassay testing and focus on water column processes unlikely to be impacted by petroleum pollution) or involve use of predictive models that are essentially unverified (economic) or of such generality as to be impractical for use in specific emergencies (oil spill trajectory). There is no regular scientific review of marine petroleum research efforts to assess scientific quality and data adequacy to determine overall program priorities, and to terminate low-priority efforts.

Recommendation: Improved planning and scientific review of federal efforts in marine petroleum pollution research should be required by the National Marine Pollution Program Office.

Issue 6: Results of environmental research related to marine petroleum pollution must be integrated, synthesized, made available, and used by resource managers.

While it is generally presumed that research results are effectively utilized by federal, state and local agency managers, the Evaluation Panel did not hear compelling evidence of this. The expense of marine data and the resource development rationale for much of their collection demands that greater efforts be made to assure their effective use. Efforts at ecological characterization and sensitivity analysis are a small part of the overall program, yet their products are of great utility to resource managers. Data products from existing entities such as the Environmental Data and Information Service appear inadequate for regular use by most practicing scientists. Problems include delay in obtaining data and lack of effective quality assurance. Resource managers also encounter inadequate interpretive information. Thus, there is need for coherent treatment of OCS and other marine pollution-related data to assure its statistical validity, adequacy, and reliability, to integrate it with existing and other newly collected information, and to present it in a manner appropriately interpreted for use by scientists and resource managers. Properly conceived and executed environmental impact statements, when they are encountered, can provide a useful model for output of such efforts.

Recommendation: A specific program should be initiated for determination of data adequacy and for regular integration, synthesis, interpretation, and presentation of environmental data needed for informed decision making by resource managers.

Issue 7: Research methodology in which environmental measurements are made to establish baseline conditions so that any changes can be detected by long-term monitoring (i.e., the baseline and monitoring approach) is generally unsuited to assessing the environmental effects of chronic low-level release of petroleum or other pollutants in marine areas.

Open water marine environments are characterized by great physical variability. This physical variability often has amplified effects on biotic variability by differential influence on the reproductive success of organisms with short life cycles. As a result, most biological aspects of open-water marine ecosystems vary greatly on time scales and in response to causes that are not currently understood. This lack of understanding makes it impossible to assess cause-and-effect relationships of chronic low-level pollution via a "baseline and monitoring" approach to organism distribution in open-water marine environments. There is value in establishing inexpensive programs to assess variability in abundance and/or pollutant distribution in easily accessible, long-lived populations of coastal organisms. However, the burden of proof for establishing the utility of expensive programs to assess impact of chronic low-level pollution on open-water marine ecosystems must be placed squarely on the proposers of the program. Public funds should not be spent without substantial and convincing evidence that variation caused by pollution effects can be statistically distinguished from natural variation. In other words, there should be the equivalent of a suitable signal-to-noise ratio anticipated.

Recommendation: Baseline and monitoring approaches to assessment of effects of chronic low-level pollution on open-water marine environments should be discouraged and, if proposed, should be supported only after a most rigorous scientific review.

Issue 8: Research to establish the environmental impacts of long-term, low-level addition of petroleum pollutants to marine habitats should be part of any marine petroleum pollution research plan.

Normal petroleum recovery operations in historic OCS petroleum lease areas have not resulted in demonstrable adverse effects on marine resources other than the obvious impacts associated with construction activities; however, the aggregate impact of subtle, sublethal effects on marine ecosystems has not been adequately evaluated. Research programs to correct this deficiency should be initiated. Two approaches suggest themselves: (1) assessment of the aggregate impact of petroleum development in selected frontier areas, particularly frontier areas which have significant and historic fishery resources and (2) careful assessment of petroleum-related changes in the organisms, populations, and communities present in historic OCS petroleum areas.

Recommendation: Research to assess the environmental impact of long-term, low-level addition of petroleum pollutants should be initiated promptly.

Issue 9: Increased emphasis should be placed on research directed to assessing and mitigating the socio-economic effects of OCS petroleum development and pollution.

Although some socio-economic research has been conducted to provide data for informed decision making about OCS development (e.g., economic impact modeling and prediction and socio-economic research in Alaska), there is clearly not a socio-economic effort comparable to the other facets of BLM's Environmental Studies Program. This hampers the design of appropriate pollution mitigation programs. Several key decision-making needs should be addressed by a revised socio-economic research program. For example, decision makers require knowledge of the scale, pattern, and variability of economic and non-economic losses produced by catastrophic spills and chronic long-term pollution loadings. They should be informed of public willingness to trade off pollution cost against other social goals. Information about differences between scientific and public perceptions of pollution risks will enable planners and policy makers to understand and more easily resolve conflicts between various pollution interest groups. Decision makers also need to be able to evaluate the utility of alternative strategies for coping with pollution.

Recommendation: A meaningful and rigorously enhanced socio-economic research program with a focused strategy should be developed as part of the federal marine petroleum pollution research, development, and monitoring plan.

Issue 10: Adequate funding for marine petroleum research, development, and monitoring plan activities should be provided.

The Evaluation Panel concludes that new activities should be accomplished as part of the federal plan for marine petroleum pollution research, development, and monitoring plan. Funds to support some of these new activities can be obtained by terminating some low-priority and/or flawed programs presently receiving support. However, the new needs may exceed the funds recoverable by project termination. Should this be the case, new funds should be committed to these efforts. It has not escaped the Evaluation Panel's notice that current federal expenditures for environmental studies associated with the OCS petroleum leasing program total less than 0.3 percent of the federal revenues derived from that program. Clearly, no more money should be spent on research than is necessary for informed decision-making, but prudence and environmental concern may appropriately dictate that a greater percentage of OCS revenues be allocated to providing the information needed for technically sound and environmentally responsible management.

Recommendation: Funding for the federal marine pollution research activities should not be allowed to be found shortsightedly inadequate; the urgent need to develop the nation's OCS petroleum resources responsibly dictates that the scientific research be done well so as to expedite credible and defensible resource management decision.

TOPIC REVIEWS

1. PHYSICAL OCEANOGRAPHY

1.1 Rationale

Knowledge of the transport and fate of petroleum in the outer continental shelf environment of the United States is of vital concern in oil and gas development, because of the potential damage to resources that can result from inadvertent losses of oil during development, transportation, and use. The study and prediction of transport mechanisms and fate of spilled oil in various environments is an essential element in determining the risks to natural resources associated with proposed development. Extensive effort has been aimed at determining where and how rapidly spilled oil moves on and within the sea; how fast it dissolves, evaporates, is absorbed by organisms or sediments; and the mechanisms and rates of chemical and biological degradation.

Studies of transport and fate have been conducted in all regions of the OCS now open for development. Based largely on predictive models, surface spill trajectories and sub-surface oil movement estimates depend on a thorough knowledge of hydrographic conditions and water circulation in the areas of concern; this information is generated by physical oceanographic and meteorological studies. In Alaska, and in the north, mid and south Atlantic, the physical oceanographic studies have been designed and are being conducted in such a manner that they are feeding useful information to the geological, chemical and biological studies presently underway.

1.2 Research Approaches

North and Mid-Atlantic Studies - The northwest Atlantic studies reported by the New York office of the BLM include three physical oceanography investigations of the north and mid-Atlantic OCS regions. Two of these take advantage of the long historical records of the mid-Atlantic and Georges Bank region, interpreting and analyzing data relevant to OCS needs. The third has the primary objective of identifying and quantifying the physical processes involved in the transport

and dispersion of suspended or dissolved materials over Georges Bank. The third study is a competent and imaginative study of an important problem: how completely does the Georges Bank eddy close, and can estimates be made of the length of residence time of contaminant materials on the banks. This study would profit by giving further attention to biological and chemical processes, as well as nutrient dynamics so as to allow a fuller assessment of the driving forces of the Georges Bank ecosystem, a system that might be influenced by oil and gas development.

South Atlantic Studies - The south Atlantic physical oceanographic program is an extensive effort designed to understand water circulation processes of the region and to supply supportive information to other disciplinary studies; it is funded by BLM under five separate contracts, at a cost of approximately $4 million. From the results of these studies, the lateral variation in position of the Gulf Stream boundaries and associated eddies on the outer continental shelf areas of Lease Sale 43 have been mapped. These studies were extended to include Cape Hatteras and part of the Blake Plateau in 1980, and provided information from environmental data buoys which is being synthesized with historical data. This program was coordinated, and to some extent integrated, with multidisciplinary studies conducted by DOE and the State of North Carolina. There is a synthesis effort underway to integrate the extensive physical studies to provide information input into the biological-geological studies and as an input into the oil spill trajectory models to make them more appropriate for management decision making.

Gulf of Mexico and Pacific OCS Studies - In the Gulf of Mexico, physical oceanographic studies have been limited to compilation of historical data and detailed studies of the Texas Flower Gardens and Florida Middle Ground in connection with sediment dynamic studies, particularly related to drilling mud problems. At present, it appears that the data demonstrates the improbability that any drilling mud could reach the active surface of the Flower Garden Reefs. Presently,

there are modeling studies underway in the Gulf of Mexico, for example in southwest Florida, to produce predictive oil spill trajectory models.

Physical transport studies off the Pacific coast have been limited to only three reported studies. The first was a study based on a computer model to predict the mixing and dispersion of discharged formation waters and to estimate water quality degradation. The second was the production of a climatological and oceanographic atlas for proposed lease areas, and the third, the establishment and operation of a west coast meteorological monitoring buoy network.

Alaskan Studies - Several regions of potential OCS development have been designated on the Alaskan outer continental shelf: three areas in the Gulf of Alaska, four areas in the Bering Sea, and three in the Arctic Ocean. The relatively unexplored nature of these frontier areas requires a major physical oceanography program.

In the Gulf of Alaska, studies of circulation and windfields have greatly aided in understanding transport mechanisms for contaminants in and through the system. Earlier suggestions of closed eddies on the continental shelf have been confirmed, and wind data are now available from enough remote locations for the development of standard oil spill trajectory models.

Physical oceanographic research in the Bering Sea has progressed from large spatial and temporal scale studies in the deeper Bering Sea to measurement of small scale phenomena required to understand the broader scale processes. Horizontal and vertical resolution in these studies has been improved by the abundant use of current meters for in-depth, timeseries hydrographic studies and broadscale sea ice studies; this has led to a high level of understanding of transport rates, frontal systems, and physical oceanographic processes controlling and influencing the biological environment.

Physical oceanographic studies in the Arctic have emphasized the prediction of oil transport under, around and within sea ice, along with studies of ice topography, characteristics and dynamics. Most studies thus far have been conducted in shorefast ice zones within the lagoon regions of the southern Beaufort Sea; less effort has been expended to understand the deeper waters of the Hope or Chukchi Basins due to the limited availability of ice-capable platforms and limited funding.

Summary of Regional Comparisons - In general, the studies in physical oceanography as they relate to the transport and fate of oil have been of high quality and in most cases, have measurably increased our knowledge and understanding of physical processes of the continental shelves. This is especially true in Alaska and the Blake Plateau, where relatively less was known. In the case of the southeast Atlantic and Bering Sea studies, a great deal of information was extracted because the OCS studies jointly sponsored by BLM, BLM/DOE and NOAA/BLM. The Bering Sea study together with that of Processes and Resources of the Bering Sea Shelf (PROBES), sponsored by Division of Polar Programs of NSF, have provided a unique set of multiple-year data which are being utilized in a multi-disciplinary investigation of energy flow through the trophic levels of the southeast Bering Sea. This type of integration is essential in all oceanographic studies concerned with environmental protection if progress is to be expected in understanding perturbations due to natural or man-made impacts.

1.3 Use of Information

The use of physical transport/oceanographic information is largely dictated by its timeliness. It can be used almost immediately for risk analyses, predictive oil spill models, and in general lease-sale decision making. Information concerning long-term processes and phenomena may be very useful in understanding the physical oceanographic regions of certain

regions, but from a management viewpoint, is able to contribute little to decision-making processes in lease-sale concerns. It should, therefore, be funded as an international and interagency task, rather than by BLM alone.

1.4 Deficiencies

Deficiencies in the physical oceanographic program are related to the following:

1. Lack of extended regional coverage of hydrographic and current data (particularly major flow data) sufficient to serve as a regional framework for modeling and process studies,

2. Lack of extended temporal coverage to describe and understand variability in hydrographic structure to estimate flushing rates, turbulence, distribution of pollutants, and seasonal biological changes,

3. Lack of information on wind fields influencing water and ice movement,

4. Lack of information on tidal currents and energy dissipation,

5. Lack of process studies related to the existence and behavior of oceanographic fronts .

1.5 Recommendations

1. Every effort should be made to assure that the high quality of work that has been done in the physical oceanography and meteorology in the OCS, especially the Bering Sea and southeast Atlantic, continues.

2. Studies must be initiated at an adequate level in the Chukchi Sea and Hope Basin in order to provide current, hydrographic and ice movement data for planned lease sales.

3. Physical oceanographic studies should be integrated with those in chemistry and biology so that measurements are made on the same spatial and temporal scale.

2. CHEMICAL OCEANOGRAPHY

2.1 Rationale

Most of the chemical oceanographic research has been in the area of analytical chemistry of sediments and biota for hydrocarbons and in some cases, trace metals, to establish a baseline level of the components prior to oil and gas development. The sensitivity, resolution and accuracy of these analyses makes these kinds of data valuable in assessing changes in concentrations of specific components brought into the environment by man's activities, but contribute relatively little understanding of the impact of these concentration changes.

2.2 Deficiencies

The lack of understanding of the oceans as a chemical system severely hampers the determination of the impact of contaminants on that system. There is great difficulty in predicting ecosystem impacts and the interaction of oil and gas development on ocean uses until a much clearer picture of the interaction of biological and physical components of the ocean is established.

The acute effects of oil in the environment have been related to physical contact in surface films on beaches and through absorption into the sediments. The long-term effects due to chronic exposure are of great concern. Understanding sorption and desorption rates on sediments and detritus, biodegradation and auto-oxidation rates, evaporation, and solution and dissolution rates will be necessary parts of future studies of long term effects. The ways in which specific ecosystems function chemically and biologically under both natural and perturbed conditions must be known before prediction of long term impacts on the environment is possible. There is an alarming lack of studies of this kind underway; perhaps more alarming is the apparent lack of realization of their importance to understanding how the ocean functions, and man's potential for adversely affecting the ocean environment.

2.3 Use of Information

Oil spill study information has been used in management decisions. Broader chemical oceanographic information that relates chemical data to ecosystem processes and possible prediction has not been used extensively, probably because long range research is relatively unused in management decisions.

2.4 Recommendations

1. Initiate studies designed to follow specific hydrocarbons from a source through the physical-chemical system of the ocean environment and into the biota and sediments.

2. Support basic chemical oceanographic studies on particles in the ocean; this is one area where our understanding is very limited.

3. Support fundamental interdisciplinary studies in biological and chemical oceanography to determine how organisms contact and transfer chemical components; this would aid in identifying probable pathways of hydrocarbons in the ecosystem.

4. Encourage ecosystem modeling studies which would identify critical stages in energy transfer where pollutants would most likely interact.

3. AIR QUALITY STUDIES

3.1 Rationale

Air quality impacts are obviously a serious concern for BLM in some areas, exemplified by the strong interest expressed in this matter by the State of California. Results from good predictive modeling efforts should go far toward making management decisions which would balance environmental losses with benefits to the nation of oil and gas development in an informed and responsible manner.

The only air quality research reported on is that concerned with Southern California; this work is being conducted under two contracts. The first contract is to analyze air quality impacts in relation to potential OCS oil and gas development on Lease Sale 68. The objective is to determine, using computer simulations, the level of increased onshore ambient air pollution levels, resulting from OCS development, and, if in excess of the increments allowable, what mitigation measures should be recommended.

The second contract is for a study of the Southern California air quality model validation. Of concern is the degree of onshore air quality impact from OCS development. Field studies will produce tracer data for developing correction factors for the simulation model to convert the existing land-based models for use in offshore situations.

3.2 Deficiencies

Since both projects started in August 1980, there were no results to evaluate; but several points are of concern. The two separate efforts simultaneously deal with the same problem in the same geographical area. The existing land-based models are apparently inadequate for the prediction of onshore impacts of offshore sources and activities. While the second contract is designed to "validate" existing models, modification or adaptation of the existing models for offshore use would be more appropriate.

The inadequacies of the existing model stem from lack of sensitivity to air quality changes (based on good quality land-based data), the input data from offshore sources, and the lack of consideration of nonconservative processes which may occur in a release from OCS activities. It is difficult to have confidence in any results reported from this model, or resulting mitigation measures.

The short duration of the two contracts will not apparently allow these inadequacies to be addressed in a substantial manner and corrected. In any case, the time frame for reporting of these two studies indicates that impact prediction and mitigation measures will be required before the existing model is validated.

Neither of these studies, or the air quality program in the Pacific OCS addresses the question of impacts of an oil spill on oceanic air quality; such an event could provide a large area source of hydrocarbons which would enter the atmosphere after volatilizing.

3.3 Use of Information

Since the efforts underway are in response to a serious concern of the State of California and are concerned with an area already experiencing major air pollution problems, the priority of such work is high. BLM must obtain credible and useful results, not only for planning purposes, but in the event of litigation. The simulation tools which are being developed could be used both on the California coast and in future lease sales elsewhere.

3.4 Recommendations

BLM personnel monitoring the conduct of this research should assure close coordination between investigators on these two research efforts. It would be highly desireable if the modified models resulting from the "validation" contract could be used in the prediction of onshore air quality impacts. BLM personnel should assure themselves that these particular short duration studies and model development efforts are those needed to support sound management decision making at all levels.

4. HAZARD ASSESSMENT

4.1 Rationale of Studies

Complex engineering undertakings at sea are inherently difficult and potentially hazardous. An appropriate facet of OCS lease programs and involves assessment of the hazards likely to affect petroleum exploration, recovery, production and transport. The hazard assessment programs focus on geological hazards (faults, biogenic gas accumulations, unstable sediments, etc.), storms, and, in Alaska, sea ice and subsea permafrost.

4.2 Research Approaches

Geological hazards are the subject of specific research efforts undertaken in each OCS region. In most cases these involve seismic sub-bottom profiling to assess and map areas of faulting, slumping and biogenic gas accumulation and side-scan SONAR use to assess distribution of bottom features. In all cases described to the Evaluation Panel, these studies are conducted by personnel from the U.S. Geological Survey (USGS).

Meteorological hazards are assessed from review of historic records, and some mention of such assessment is made. Environmental Impact Statements for OCS lease sales, rather than specific research projects, were described to the Evaluation Panel.

Ice and permafrost hazards are being assessed for OCS lease sale areas in Alaska. It is unclear to the Evaluation Panel how much of the sea-ice work is directly supported because of its relevance to OCS petroleum hazards assessment. Some of the work in the Beaufort Sea is conducted in parallel with Canadian researchers. The Bering Sea information is a lower priority extension of these studies. Since permafrost does not exist in the Bering Sea and sea ice hazards are much less severe there. Ice hazards are particularly severe in the Chukchi Sea, which is the only lease area on the Department of Interior leasing schedule which will be leasing only "if suitable technology is available". Much of the knowledge gained in site specific studies of local regions will therefore be needed.

4.3 Use of Information

The hazard assessment information is used in leasing decisions by the Department of Interior, the States and also by the petroleum industry in bidding on specific tracts and in designing structures. The Department of Interior has used this information to select and delete tracts from proposed lease sales, to develop specific stipulations describing how tracts must be developed so as to avoid hazardous situations, and to provide information for engineering decisions on petroleum platform design and construction.

4.4 Deficiencies

The scientific caliber of the geohazard assessment data collection efforts seemed adequate to the Evaluation Panel, although this conclusion must be viewed with caution since the panel did not include a professional geologist. The panel is not convinced, however, that sufficient interaction between the USGS Conservation Division, academic laboratories, state geological surveys, and industry has occurred. The Evaluation Panel's lack of expertise may be partially responsible for this perception, however, suspicions are raised when an internal division of the Department of Interior not only carries out the active investigations for BLM, but is also responsible for evaluating both the problem areas for investigation and the hazards themselves for relevance to lease sale decisions.

The publication record of the USGS itself is reasonable if open file reports are included, but there is a definite lack of publications in peer reviewed journals. Two exceptions are the exemplary publication record for USGS in Woods Hole, Massachusetts concerning research in the middle Atlantic OCS, and the USGS Office in Corpus Christi, Texas concerning work in the Gulf of Mexico.

The research on meteorological hazards is clearly of low priority to the Department of Interior. This may be proper in many OCS regions, but in some cases the low priority is clearly unjustified. Examples of deficiencies include lack of prominent mention of the possibility and potential impact of hurricanes in Draft Environmental Impact Statements for the South Atlantic region; and the lack of a good observational system in many parts of Alaska.

Ice and permafrost risk assessment is a new field but seems to be progressing reasonably well. It is apparent that prediction of small scale movement and dynamics of ice in the OCS is difficult; it appears the worst case situations must be appraised and development of engineering technology must progress if structures are to withstand potential ice forces wherever they occur. This requires the acquisition of a proper statistical data base on sea ice characteristics and dynamics. Future ice research should also concentrate on ice-gouging phenomena and on movement of spilled oil under and through ice.

5. BIOLOGICAL AND COASTAL CHARACTERIZATION

5.1 Biological Characterization

5.1.1 Rationale

Extensive effort in the BLM regional programs is aimed at characterizing the biota, community and population structure and environmental interrelationships in areas potentially affected by OCS activities. These studies do not specifically contribute knowledge of the effects of marine pollution, but nonetheless serve the purposes of (1) establishing an ecological framework in which to assess or predict effects and (2) delimiting unique, valuable or sensitive biological communities which warrent steps for protection.

The most extensive of these investigations was the BLM Benchmark Studies Program. This program was based on the premise that a statistically sound baseline could be developed against which changes during and after petroleum development could be compared. Realization of the considerable natural variability and temporal unpredictability in the populations studied (primarily benthos) caused this approach to be abandoned.

Current and planned biological characterizations concern (1) hard bottom communities in the Atlantic and Gulf of Mexico which are limited in extent but are of importance because of their rarity, commercial importance and presumed sensitivity to pollutants resulting from OCS activities; (2) intertidal communities in California and Alaska; (3) benthic communities in Alaska OCS areas not previously studied, and (4) functional ecological studies along the Beaufort Sea coast.

5.1.2 Research Approaches

The BLM-funded studies of hard substrate communities in the middle and south Atlantic and Gulf of Mexico exhibit very different approaches to biological characterization, due only in part to differences in the habitats. A study of the distribution of epibiota in the vicinity of submarine canyons along the Georges Bank and Middle Atlantic Bight was rather crude due, in part, to the technical limitations in making cogent observations from a

surface platform. The Living Marine Resource Study attempts to describe the biota of the so-called "live-bottoms" on the shelf off the Carolinas and Georgia. This study is ambitious and includes assessments of fish populations and their food habits, and quantitative sampling of the benthos. The approach appears to be inappropriately extensive and would be more effective if less rigorous sampling were done more broadly, and more intensive study were focussed on a few representative habitats. Studies of the biota of hard substrates atop diapiric intrusions in the Gulf of Mexico, particularly the Flower Gardens, have been conducted under BLM funding since 1974. These studies include biological components as well as extensive geological and physical oceanographic components; the biological components focus on the zonation of the epibiota, ecology of the reef-building corals and description of fish communities. Studies are proposed which will use EPA funds to focus on the ecological effects of drilling activities on reef fishes of the Flower Garden Banks.

Biological characterizations of the intertidal biota of California have been completed or are underway under BLM funding. These studies include mapping intertidal biotic communities using aerial photography. Although relatively vulnerable communities may be located by this approach, the studies are based on the tenuous assumption that they can be used to assess impacts in the event of an oil spill. Extensive studies of the intertidal biota in Alaska were conducted during the early phases of the OCSEAP program, and are essentially concluded. These studies have been useful in providing information on previously unknown communities. Although the resulting understanding will undoubtedly be useful in assessing general impacts of oil spills, they appear insufficient for rigorously quantitative impact assessment.

Characterization of benthic communities on the Alaskan shelf in previously unstudied OCS areas is continuing in the OCSEAP program. These characterizations are general surveys and not in the traditional "baseline sampling vein. These studies are aimed at elucidating the biotic and environmental interrelationships of key components of the biota to specific oil and gas development activities such as gravel island construction.

In-depth studies of community interaction in lagoon ecosystems in the Beaufort Sea have a novel approach in comparison to other BLM funded studies. This approach is "adaptive" in that the focus of the research may be changed as more information is accrued and conceptual models refined.

5.1.3 Use of Information

Although information resulting from BLM-funded benchmark studies and the more recent biological characterizations described above have been cited and discussed in Environmental Impact Statements, there are few apparent examples of the direct application of findings in leasing decisions by BLM or in other regulatory stipulations. Of notable exeption are the results of biological and physical oceanographic studies of the Flower Gardens which have resulted in reasonable conclusions about the potential for impacts by drilling fluids, regulation of the proximity of drilling, and stipulations about the mode of release of drilling fluids. Another exception is the extensive use made of the adaptive environmental assessment approach in the Beaufort Sea, where results of ecological process studies provided the nucleus of various biological stipulations attached to the joint state/federal Beaufort Sea sale in December 1979. The general impression drawn during the review is that the existing descriptive biological characterizations have not been used to their full potential in OCS decision-making.

The object of many of the recent studies is to characterize habitats of limited extent which are presumed to be sensitive to effects of oil and gas activities. These studies (except for experimental effects studies at the Flower Gardens) have done little to better define that sensitivity. Therefore, it is unclear how their results will be used in leasing decisions and regulation.

5.1.4 Deficiencies

These descriptive studies provide limited information on ecosystem function and community susceptibility and sensitivity. Future studies would be more useful if they focused more on key biotic constituents rather than just cataloging of the biota as has been done in the Beaufort Sea

process studies. There is a need for studies design to more directly bear on definitions of susceptibility and sensitivity.

Inappropriate effort may be focused on limited high diversity communities which may not be susceptible to impacts of oil and gas development, while soft sediment habitats which contribute more substantially to important living resources and may be more likely to be affected by development, may not be receiving enough attention.

The information gathered either through qualitative sampling or intertidal aerial surveys has limited applicability in the subsequent quantitative assessment of impacts of oil and gas development and should not be justified on that basis.

5.1.5 Recommendations

Research and imagination must go into the development of a strategy (or strategies) of biological characterization. Attempts to design approaches which are sufficiently inclusive geographically yet quantitatively intense, frequently yield results in which much information is redundant, but which lacks detailed information on important small scale patterns and temporal dynamics. A more appropriate approach would be to include a single general reconnaissance survey. This could be followed by geographically more limited quantitative surveys integrated with longer term intensive studies on community dynamics if warranted. These studies should be flexible enough to change as ecological concepts about the communities evolve.

Biological characterizations should emphasize biological and physical constituents of substantial importance in the maintenance of community structure (e.g., primary space occupiers on hard substrate, reef builders, keystone predators) rather than exhaustive faunial surveys. Studies should aim to elucidate key ecological interactions; those which estimate susceptibility of biota to oil and gas development should be emphasized.

5.2 Coastal Characterization

5.2.1 Rationale

The shoreline fringe probably is the area most susceptible to impact of oil spills. Commercial shellfish and finfish resources are found in the shallow waters; water and shore birds which are especially susceptible to oil are also found here. Because the location, abundance, and value of these resources are often better known than offshore resources, it is possible to compile resource data into summary maps and statements that translate scientific data into a management tool. This tool can be useful for protection of resources from development and oil spills, as well as directing cleanup efforts, and assisting in damage assessment.

5.2.2 Comparison of Studies

1. U.S. Fish and Wildlife Service Coastal Characterizations - These characterizations have been completed in Louisiana, Maine, Oregon, and Washington; characterization of other areas are in early stages of development. Their purpose is to characterize the coastal geography by habitat type using both biotic and abiotic factors, and to provide ecological process discussions to assist managers in making decisions on a wide variety of coastal zone activities.

2. Spill Vulnerability Assessments - Based on reconnaissance studies in Alaska and on various other sites throughout the world, oil spill vulnerability maps have been developed to assess sensitivity of shorelines to oil impact. Initially based on geomorphological characteristics alone, a biological component has been added to delineate especially sensitive habitats. The maps resulting from this process may be used in contingency planning and in planning cleanup alternatives during a spill.

5.2.3 Use of Information

Users for the information generated in these coastal characterization methods include NOAA, BLM, FWS, USCG, EPA, and state governments,

particularly in the area of contingency planning. Like the biological characterizations discussed above, this information lacks the detail necessary to make it useful in quantification of spill impacts, but can be useful for a variety of planning purposes.

5.2.4 Deficiencies

Deficiencies are not evident in the material that was presented to the panel. Users should understand, however, the aim of these assessments and the limitations of their use. Detailed analysis of the biological components must be carried out by local scientists to enhance the utility of the available information.

5.2.5 Recommendations

Duplication of coastal characterization and mapping efforts by federal and state agencies should be avoided. Coordinated or combined approaches may be more efficient and valuable.

Deficiencies of the data bases and ecological assumptions of coastal characterizations should be noted and solved where possible.

6. BIOLOGICAL AND CHEMICAL MONITORING

6.1 Rationale

Biological and chemical monitoring of marine ecosystems is pursued in order to understand the distribution of and changes in spatial and temporal concentrations of pollutants in the water column, sediments and biota. Because of our limited understanding of many of the basic ecosystem processes in the ocean, these programs have very specific and limited usefulness.

6.2 Research Approaches

There are three major approaches to monitoring currently used in U.S. marine waters. The first is EPA's Mussel Watch program which is designed to monitor the concentrations of specific contaminants in shellfish from a large variety of locations. The program is designed to monitor changes in distribution and concentrations of chemicals in both time and space. The second program is the Ocean Pulse program conducted by the NMFS Northeast Fisheries Center. This program is designed to measure a wide variety of chemical, physical and biological parameters overtime, in hopes of making correlations between changes in parameters at given locations and overtime. The difficulty with this program lies in the inability to interpret the results.

The third approach utilized is carried out by the fishing industry in its efforts to harvest marine products. Stock assessments and fisheries statistics, while always improveable, have provided a unique effort looking directly at the ultimate yield of the ecosystem. This type of program has an advantage in its inclusion of a large number of interested participants.

6.3 Deficiencies

Deficiencies in biological and chemical monitoring relate to the ability to identify specific pollutants, the sensitivity of instrumentation to changes in concentrations of contaminants, and the difficulty in interpreting environmental measurements to establish cause and effect relationships.

The differentiation of petroleum hydrocarbons occurring at low concentrations from biogenic hydrocarbons of similar structure is difficult. There are a number of laboratories developing increased competence in detailed characterization of hydrocarbon components at low concentrations, but it is necessary that their methods be subjected to scrutiny through consensus testing to determine sensitivity, scope, precision, and accuracy. The monitoring of contaminant levels has been most successful at high levels of contamination, i.e., in the identification of spilled oils utilizing the methods developed by the American Society for Testing and Materials (ASTM) on water analysis. The evidence produced by the use of these ASTM methods has been accepted by the courts in deciding responsibility in oil spill liability cases. Measurements of hydrocarbon contaminant levels in environmental organisms have been successfully made in heavily contaminated areas; but in areas of low contamination, including most offshore oil and gas producing regions, it is difficult to detect hydrocarbons which are clearly attributable to petroleum.

In programs such as Mussel Watch, it is possible to become aware of unexpected compounds, but there is no certainty that their appearance will be detected. In the Ocean Pulse program, there is inherent difficulty in establishing correlations between biological, chemical and physical measurements because our understanding of the marine ecosystem is so rudimentary.

There are some relatively stable marine systems (i.e., fixed populations on a coral reef, sea grass bed, long-lived macrobenthos, or in an intertidal rocky or marshy area) where a modestly funded long-term biological monitoring program may be of some use. This kind of monitoring, even in those situations where the communities are relatively stable, is still of maximum use when combined with concurrent studies of the processes that control stability and change. Enough information is known about systems occupied by relatively long-lived and fixed species that a modest monitoring of them for long-term changes could be justified. The more short-lived the species involved, and the more complex and variable their

spatial relationships, the more difficult it is to justify biological systems monitoring.

6.4 Recommendations

1. It is recommended that analytical methodologies be subjected to standardization and quality assurance through interaction with voluntary consensus groups such as ASTM. Adequate funding must be provided to continue development of sensitive analytical methods and establish the precision and reliability of results.

2. It is recommended that monitoring of stable marine ecosystems continue at modest funding levels, and that this monitoring be combined with studies of fundamental ecosystem functioning.

3. It is recommended that unfocussed programs using a "shotgun" approach should be terminated, or highly modified, in order to produce interpretable results.

7. MARINE BIRDS, MAMMALS, TURTLES, AND ENDANGERED SPECIES

7.1 Rationale

Public interest at national and international levels for marine mammals, birds and endangered species has resulted in legal mandates for protection, conservation, and mitigation of impacts to these organisms. Political and legal concerns have induced large allocations of funds for determination of the potential harm in prospective OCS lease areas. The lack of information concerning distribution and abundance of these animals in frontier areas has spurred the development of short-term surveys of organism distribution. While these surveys meet preliminary management needs, by delimiting use of an area by a particular species, they do not satisfy the need for basic biological studies. Studies focussing on ecosystem function are necessary for understanding and predicting the impacts of petroleum-related pollution. Only when this information is available can long-term management decisions balance the costs and benefits of exploring and protecting the environment.

7.2 Research Approaches

7.2.1 Population Assessments

Airplanes and ships of opportunity, while suitable platforms for gathering preliminary distribution and abundance data, tend to be unreliable and of limited use in population assessment. Differing in environmental conditions, observers, platforms, and organism behavior can cause great variability in the number of organisms observed and counted. Other limitations of aerial surveys include inadequate sampling, inability to assess importance of habitat to various species, and inability to assess significance of the locations of individuals at any one time. Caution should, therefore, be exercised in assessing the value of aerial reconnaissance surveys to obtain census figures.

7.2.2 Life History Studies

The basic biology of many marine birds, whales and turtles is known only superficially. To correct this deficiency, agencies with responsiblity for endangered species (e.g., the FWS and NMFS) should undertake

basic biological studies. BLM has, in the past, funded good basic biology research apparently because other agencies have failed to carry out their responsibilities.

While studies of distribution, relative abundance, morphology, physiology and histology can be carried out relatively rapidly, studies to answer questions about the impact of pollution on food resources, feeding behavior, movement patterns, reproductive rates, mortality, breeding biology and population size are not easily or quickly done. To make informed management decisions, however, the importance of interconnections between organisms and ecosystem functioning must be understood.

In general, studies that use surface platforms in areas where birds, mammals, and endangered species are concentrated will be more effective at providing needed basic information than will studies that only gather information as to distribution of these organisms.

7.2.3 Effects Studies

Birds, marine mammals and turtles may be killed by direct oiling; even small amounts of oil are known to affect survival and reproduction. Evidence suggests that some birds, marine mammals and turtles are attracted to oil spills and natural oil seeps, presumably to feed on prey species in the area. Field studies could quantify these interactions, but such studies have not been conducted. While both field and laboratory studies are apparently being conducted to determine the sublethal impacts of oil and dispersants on birds, marine mammals and turtles, they were not presented or cursorily presented to the panel, thus their adequacy cannot be evaluated.

Despite the general need for studies of pollutant effects, prudence should be used in developing and allocating money to studies of unknown significance. For example, it has been suggested that a major study to document noise levels from oil and gas development be undertaken. Since most birds and mammals become habituated to sudden or continuous noise, a preliminary small-scale study should be done to determine if there is any problem before any large-scale acoustical perturbations studies are

conducted. If a problem is discovered, a project can be designed to predict the spatial, temporal and spectral variation of noise from a known source within a region inhabited by a specific species and the degree to which this species is affected.

7.3 Deficiencies

7.3.1 Endangered Species Studies

The Endangered Species Act of 1976, Section 7, mandates that an agency considering any action that may adversely affect an endangered species must consult with agencies charged with protection of these organisms to determine what studies or mitigation measures are appropriate. The National Marine Fisheries Service (NMFS), for example, can mandate, design and execute studies that they determine are "necessary" to protect various endangered species. In the case of marine mammals, to meet legal requirements, BLM has transferred millions of dollars to the National Marine Fisheries Service to conduct surveys that NMFS itself determined to be required.

The performance of studies by agencies which are themselves the Section 7 regulators and which consequently mandate these studies raises serious questions of conflict of interest.

7.3.2 Principal Investigators for Marine Mammal Research

The need for marine mammal information currently exceeds the ability of qualified investigators to provide information. Federal support for whale research has increased so rapidly that many investigators with no previous experience or training with whales have been supported. These funds, if allocated at lower levels over a longer time, could provide greater opportunities for attracting well-qualified scientists to the field, resulting in more and better information in the long term.

7.3.3 Tagging Technology

Protecting birds, marine mammals and turtles which migrate over long distances from ocean pollution requires knowledge of the migration patterns

and life history of the species. BLM has spent and is spending considerable amounts of money developing tagging techniques with only moderate success. At least three tagging efforts are currently ongoing. It is felt that these funds spent over a longer period of time could be more effectively used to develop the appropriate technology, test techniques, and then begin tagging efforts.

7.4 Recommendations

A number of agencies have responsibility for endangered species, marine mammals, and birds. Apparently, little direction is given by these agencies as to just what information is required to evaluate the threat to endangered species in the lease area. As a result, many of the current studies are poorly focussed, and as a whole, are not well coordinated with one another on either national or regional levels. Such coordination would result if the agencies supporting such studies were in better communication. The panel recommends:

1. Agencies with responsibility for endangered species such as the Fish and Wildlife Service and the National Marine Fisheries Service should undertake basic biological studies.

2. Studies concerning marine birds, mammals and endangered species should be redirected to study community structure, ecosystem functioning and natural history. These studies, by necessity, will be long-term, and should be interdisciplinary, and address the importance of interconnections between organisms and the environment. Knowledge must be acquired to determine how the ecosystem responds to various physical and biological perturbations.

3. Plans for integrating Section 7 consultations, study definition and design, and study performance should be developed so as to reduce the potential or suggestion of conflict of interest by regulatory agencies.

4. Generally expensive aerial surveys should be used with caution for anything other than a preliminary assessment of the general distribution of a species.

5. Marine birds forage over variable areas and can serve as biological integrators and concentrators of pollutants within their foraging areas. This aspect of bird biology can be used to detect and map environmental perturbations that would not be observable by direct measurement. The opportunity to use this natural phenomenon in assessing marine petroleum pollution impacts should be incorporated into federal programs for pollution assessment.

8. FATE AND EFFECTS STUDIES

8.1 Chemical Transport and Fate Studies

8.1.1 Rationale

In the selection of tracts for leasing or in the event of a catastrophic oil spill, meaningful estimates must be made of the direction of travel and effects of spilled oil from various locations. For this purpose it is necessary to have available adequate trajectory models as well as information concerning (1) the properties and weathering rates of the oil, (2) the patterns of water and wind movements in the area, (3) the nature of the sediments and their dynamics, and (4) a well-developed sensitivity index of the coastal regions.

8.1.2 Research Approaches

Oil Spill Trajectory Modelling - The USGS Oil Spill Risk Analysis Model presented to the panel includes probability of spill occurrence, spill trajectories, locations of vulnerable resources, and calculates risks of spills from various locations at various seasons. The model is not as complete as it could be, considering the available data. For example, the model assumes that the spilled oil has essentially no continuous weathering characteristics; it assumes only that at three days toxic materials are lost, and that at 30 to 40 days the spill has dissipated. Sufficient laboratory and field data are available on weathering characteristics, and their relationship to oil properties, to be included in a useful model. Furthermore, the variability of currents, winds and so on, necessitates that this model cannot provide accurate predictions.

Sediment Transport Studies - Sediments are recognized as an important reservoir and transport mechanism for many pollutants. Sediment transport studies are being conducted in the Atlantic OCS areas and near the Flower Gardens in the Gulf of Mexico. The Flower Gardens research is a particularly vivid example of the importance of understanding the dynamics of fine sediments. The lack of coherent research in sediment transport such as those in the Atlantic OCS areas

appears to represent a deficiency. This is particularly the case in areas with extensive transport of fine sediments, for example, on the continental shelf of the northern and western Gulf of Mexico which is characterized by dynamic nepheloid layers.

Weathering of Oil - An impressive and thorough review of studies was presented on the many factors which together make up weathering of a spilled oil. This research is particularly important for a thorough understanding of transport and fate processes.

8.1.3 Use of Information

The trajectory models for use in prediction of movement of accidental oil spills and the risk analysis/trajectory models developed for tract selection for OCS leasing have different user demands. In the case of an oil spill, immediate information is needed by the On-Scene Coordinator in order to most effectively locate personnel and equipment for cleanup and mitigative measures. An immediately accessible catalog of data and appropriate models must be available, together with an experienced staff on call at all times. In the case of tract selection, immediate action is not an issue, but the thoroughness of the data and conclusions can have both an economic consequence in tract selection and perhaps a long-term impact of an incorrect selection is made.

8.1.4 Deficiencies

Although insufficient detailed knowledge is currently available on the weathering characteristics of oils in natural surroundings, there is enough information to be introduced into trajectory oil spill models. Use of the current USGS models in selecting lease tracts should be carefully examined since the economic consequences of the decisions based on an inaccurate model can be serious.

8.1.5 Recommendations

1. Oil spill trajectory models must incorporate presently available information on weathering characteristics of oils.

2. Studies, such as the current NOAA Oil Weathering Study, should be continued to obtain more precise data on weathering. As these data become available they should be incorporated into the trajectory models.

3. Sediment dynamics models need to be developed and related to trajectory models and weathering information and used to identify potential sites of deposition of pollutants.

4. A critical review of existing oil spill models should be carried out to determine which is the most effective for management decision making; this model should then be adopted for use by BLM and USGS.

8.2 Laboratory Effects Studies

8.2.1 Rationale

Laboratory studies presently being conducted on the toxicity of petroleum hydrocarbons are needed to understand the response of individuals of various species to high level, short term and low-level chronic exposures to petroleum compounds in water and sediments.

8.2.2 Research Approaches

Approaches used over the past ten years include:

1. Static and flow-through exposures to specific compounds or mixtures of oil with water to test for tolerances of organisms and their responses to sub-lethal concentrations

2. Exposures of benthic organisms to oiled substrates, and

3. Recolonization studies of benthic organisms in oiled (accidentally or experimentally) substrates

Regardless of the differences in organisms and oils, sufficient information has been obtained to allow estimation of the concentrations of

petroleum compounds in the water column required to produce mortality in various periods of time. The sublethal effects data, however, are much more difficult to interpret and often produce conflicting information. There is general agreement within the scientific community that the most sensitive and reliable approaches for determining effects at sublethal concentrations are probably growth, reproduction, behavior and biochemical transformations. Most of these approaches are applicable to the assessment of chronic contamination rather than addressing the effects of short term acute exposures such as those during spills (with the possible exception of sediment related impacts).

Experimental designs for the study of long-term sublethal effects are traditionally separated by the route of impact based on our knowledge of spill case histories. Laboratory investigations conducted to evaluate impacts of spills consider the following:

1. Seawater Surface - Initial problems associated with spills are generally surface-related (birds, mammals, turtles, and surface-floating eggs and larvae). Degree and duration of impact to these organisms is often difficult to measure. In particular, marine mammals research is severely restricted in this country due to difficulties in obtaining collecting permits and the low numbers of specimens allowed. Investigations in Canada and overseas may help provide information to overcome these problems. Impacts associated with populations of pelagic eggs and larvae are difficult to document although toxic effects on individuals are relatively well known.

2. Water Column - It is clear that there is little likelihood that oil concentrations in the water will be reached and maintained at levels required to produce significant mortality in most organisms. Studies in the laboratory have indicated that over the period of approximately four days, appreciable concentrations of soluble oil components (between 0.3 and 10 ppm) are required to produce this type of mortality. Any dilution of the material

which is generally at low concentrations even underneath the slick would tend to reduce the possibility of potential impacts within the water column.

Chronic contamination is perhaps the only exception to the general rule that water column effects are likely to be of low importance. Chronic contamination from rivers, stream systems, estuaries, urban storm system drainage, or point sources in the offshore environment could conceivably produce constant levels of pollutants, which would build up to the point that organisms might be adversely affected. An example is within San Francisco Bay where benzenes and associated aromatic compounds are present, as was reported by one of the programs. Examples of locations where there should be concern for oil impacts are major on- and off-loading terminals, both present and proposed. Proposed terminals in the Gulf of Mexico and the Pacific Northwest are much like frontier exploration areas that should be studied before, during and after petroleum activities. There are still questions regarding chronic pollution from petroleum production in the OCS environment. In the future, if there are indications that chronic levels of various pollutants have been reached in certain regions, chemical and biological investigations of the water column may be necessary.

3. Sediments - Long-term chronic effects are most likely from sediment-related impacts. Investigations have produced a considerable amount of information concerning the duration of contamination in intertidal and subtidal sediments. Little is known, however, about the mechanisms of transport of oil from sediments to organisms and the association of abnormal responses or mortality with specific concentrations of hydrocarbons in sediments. The mechanisms of transport to and release from oiled sediments and their uptake and subsequent effects on benthic and epibenthic organisms is an important area requiring further research. This type of transport and effect information would be

applicable to all marine environments. While temperature and sediment type will alter the toxicity values, the basic mechanisms of biodegradation and release within sediments and subsequent effects on benthic organisms could well be extrapolated to many situations in the marine environment.

While certain portions of this problem have been studied in detail, there has been no concerted effort to obtain a comprehensive overview of oiled sediment-biota interactions. A closer examination of the existing information and carefully designed future studies will aid in a more comprehensive determination of the magnitude and duration of sediment-related impacts.

8.2.3 Use of Information

While the utility of findings from field experiments is greater than those produced in the laboratory, it is necessary to examine field results more closely using laboratory experimentation. Historically, information from laboratory studies has been used in Environmental Impact Statements to document probability of impacts on biota. Ranges of 90-hour lethal toxicity values and concentrations of petroleum producing abnormal responses in numerous marine species provides an assessment of "worst case" situations, when combined with information regarding the fate and effects of hydrocarbons and their degradation products. These data should not be used as absolute values, since mobile organisms have the capacity to minimize exposure in the environment by avoidance.

8.2.4 Deficiencies

The primary deficiency in the laboratory effects program appears to be the lack of recognition of the need for constant and consistent funding of programs designed to develop the best techniques for measuring low levels of contaminants and determining subtle effects on organisms from low-level contamination. Currently, bioassay testing is frequently tied to a specific program in a specific region; this approach is wasteful, as much of the information generated in not regionally specific. Another deficiency is that the basic mechanisms of hydrocarbon transport in and out of organisms

and from sediments to organisms are not well understood. If the behavior of petroleum in sediments and organisms and the sequence of events producing toxicity were better understood, there would be no need for conducting regional, and often overlapping, research to determine potential impacts.

8.2.5 Recommendations

It is recommended that less attention be paid to possible effects from exploration and more emphasis be placed on the potential hazards from production transportation, loading and off-loading of petroleum. Experience has shown that the major impacts from oil in the marine environment are associated with large spills from vessels or multiple inputs in the inshore environment.

It is also recommended that the development of more sophisticated chemical and biological approaches continue so that information subsequently generated may be used as a more useful prediction and management tool.

8.3 Microcosm Experiments

8.3.1 Rationale

Microcosm experiments were initially developed because of the limitations of laboratory data and the impossibility of using large regions of the marine environment for toxicant testing. The use of microcosms is a convenient "halfway" step between the laboratory test-tube or aquarium and the vast marine environment. It is particularly useful in testing hypotheses developed during laboratory experiments and in assessing phenomena not easily measureable in the field.

8.3.2 Research Approaches

One approach currently pursued is the use of controlled oil spills which are, for example, being conducted in the Canadian environment in the Arctic Marine Oil Spill Program. These experiments are conducted in nearshore and offshore environments and emphasize the transport and behavior of hydrocarbons from spilled oil. Thus far, they have produced useful

information on the dilution and dissipation of slicks at sea. These studies have been planned, funded, and conducted with both government and industry cooperation.

The second and more prominent microcosm experiment is the use of large containers within the marine environment; the first example is the Controlled Ecosystem Pollution Experiment (CEPEX) program, which was conducted in Canada by NSF/IDOE. The CEPEX experiment results indicated changes first in phytoplankton species composition when pollutants were added to the system, primary productivity remaining fairly constant. This change in phytoplankton composition led to dramatic changes in the zooplankton community. These observations could probably have been made only within such a microcosm system. Similar studies have been conducted in Scotland where similar results have been obtained. Another successful containment system is the cylinders at the EPA/MERL facilities in Rhode Island. These appear to be particularly useful in determining the transport of petroleum components in systems environmentally similar to actual conditions. Problems with extrapolation from these containment devices result largely because of the confinement by the container regardless of its size. As long as a sound understanding of the limitations of these experiments is obtained, they can be very effective means of testing laboratory hypotheses and providing for the study of several trophic levels at one time, while observing important chemical changes within the water column and sediments.

A third type of containment used extensively in petroleum research is the "sediment tray". This type of container is useful in determining the alteration of petroleum components with time in the natural environment and recruitment and colonization of organisms in and on oiled sediments. Assessment of acute and sublethal effects of oil on transplanted organisms may also be carried out. When conducted under a sufficient number of environmental conditions, a better understanding of the chemical and biological recovery rates in the marine environment can be obtained.

8.3.3 Use of Information

Microcosm studies are valuable for management use, since they can more clearly describe what happens in the environment to organisms and spilled pollutants; they do not, however, provide a complete assessment. Questions which arise during microcosm investigations will require further investigation both under controlled laboratory conditions and in the environment. Emphasis on a combination of these three types of studies will clearly provide a better assessment of potential effects of oil in the marine environment.

8.3.4 Deficiencies

One major deficiency is the lack of universal sponsor acceptance of the utility of these approaches. Another deficiency associated with these approaches is the confinement of toxicants and organisms.

8.3.5 Recommendations

There is a need for a consistent level of funding to produce information on various OCS habitats such that we will have a sound base of information on which to base evaluations. Rocky intertidal areas are of lowest concern, since hydrocarbon retention is the shortest under these physical conditions. The panel, therefore, recommends that greater consideration be given to the use of microcosm field experiments. If this type of information were obtained in the Arctic environment and compared to findings in temperate zones it would allow extrapolation to a wide range of other situations. In addition, more studies involving manipulation of variables in the field are needed. When controlled and with sufficient replication, this type of experiment could be very useful.

8.4 Field Assessment of Fate and Effects of Oil Spills, Seeps and Discharges

8.4.1 Rationale

A significant portion of our knowledge of the ecological effects of oil in the marine environment derives from field assessments in chronically contaminated areas and after accidental spills, of communities, populations and hydrocarbon alterations. At once such studies offer great promise and

problems. Documented transport and transformation of oil and effects are obviously environmentally realistic. They are not based on hypothetical extrapolations from laboratory results. On the other hand, such field studies may suffer from the confounding effects of complexly interacting environmental factors and from large natural environmental variability. Furthermore, since most studies have been conducted around accidental spills, they frequently suffer from inadequate planning and study design. Recent federally sponsored research efforts have concentrated not only on accidental spills, but chronic discharges from natural oil seeps as well as coastal and offshore exploratory and production facilities.

8.4.2 Research Approaches

1. Oil Spill Investigations - The largest spill assessment effort ever conducted in the United States was in response to the recent IXTOC I blowout in the Gulf of Mexico. This offshore exploratory rig continued to discharge oil for several months. Investigations were conducted during this time by NOAA and subsequent followup work has recently been contracted by BLM. Although the details of this work were not presented to the Evaluation Panel, it was apparent that there are significant differences in approach and that interagency cooperation has been far less than ideal.

   A basic problem with oil spill assessments is the lack of sufficient time for planning. Frequently the study team is not assembled until after the spill has occurred and early sampling is done in great haste without careful planning. In an attempt to better coordinate scientific response to oil spills, NOAA has established an Oil and Hazardous Material Spills Response Team. This team is available to provide scientific advice useful in mitigating damage and facilitating effective cleanup. Although this team does attempt to provide some assistance in coordinating damage assessment, it does not have at its disposal significant funds to conduct such assessments.

2. Chemical Fate and Biological Effects Near Natural Oil Seeps - The presence of natural oil seeps near Santa Barbara provide the opportunity to assess the effects of chronic introduction of crude oil into the environment over very long periods of time. Currently, two studies are being conducted to assess the effects of these seeps on subtidal and intertidal benthic communities. In addition to assessing changes in population and community structure, these studies are also attempting to examine organisms for sublethal effects. Communities near the seeps do not appear to be significantly altered when compared to nearby control areas, despite significantly higher petroleum contamination of their environment. Data indicate somewhat higher concentrations of hydrocarbons in the tissues of the animals near the seeps. The animals near the seeps appear to have normal enzyme activity and to be able to withstand other stress factors in laboratory tests. Attempts have been made to determine whether populations are genetically different from those in control areas indicating some genetic adaptation to potential stress. The use of alternative hypothesis testing in these studies is commendable and is too infrequently employed elsewhere in oil pollution research.

3. Platform Monitoring Studies - A number of field investigations have been conducted in the vicinity of exploratory rigs or production platforms primarily in the northern Gulf of Mexico. These studies have typically included a wide variety of chemical and biological measurements, including determination of hydrocarbon contamination and assessments of benthic populations. Some of these studies have been conducted in extensive oil fields such as the Buccaneer Field off Texas and the Oil Patch off southeastern Louisiana, whereas other studies have focussed around a single rig or platform. In general, although the studies have documented some contamination of sediments in these areas of potential chronic discharge, they have not demonstrated significant biological effects except on a relatively localized scale.

Material introduced by these activities is complex and includes produced waters, drill muds, cuttings, deck drainage and human sewage. A common problem affecting these studies, again particularly in the northern Gulf of Mexico, has been the influence of other environmental factors such as the dynamics of the nepheloid layer, reduced salinities, low dissolved oxygen in bottom waters, etc., which make assessment of the biological effects difficult. Furthermore, it has been also difficult in many areas to find "control" sites uncontaminated by petroleum hydrocarbons.

In summary, the extensive studies have not succeeded in providing a sufficiently quantitative assessment of the long-term impacts of oil and gas exploration and production activities. Although the studies have not generally demonstrated significant and extensive biological effects, limitations in study design suggest that they would have been incapable of detecting less than catastrophic effects with statistical confidence.

8.4.3 Use of Information

In the case of oil spills the body of knowledge which has been accumulated about the effects of spills on shallow water biota has been used to define relative sensitivity of environments. This definition of sensitivity can then be used in control and cleanup strategies to mitigate damages. Beyond that, the information has generally reinforced the operative position that oil spills tend to be harmful enough to be avoided.

Information regarding the effects of chronic inputs either from natural seeps or oil field discharges has been used in a general way to document and support the argument that low-level discharges during normal operations produce no major deleterious effects. However, the limitations of these studies and questions about their extrapolatability have not allowed definitive resolution of the controversy regarding long-term effects of oil and gas production activities.

8.4.4 Deficiencies

Oil spill assessment continues to suffer from inadequate research planning, the lack of committed support for ecological damage assessment and the long response time before significant research effort can be mounted.

Studies of the effects of natural oil seeps are providing useful information which helps understand the accommodation of the marine biota to this historically available pollutant. Results need to be integrated with and reconciled with the information available from oil spills, other chronic discharges and experimental studies.

Oil field assessments have been hindered by inadequate and often unrealistic design in which seldom takes into account the dominant natural environmental processes; for example, sediment distribution, bottom sediment resuspension, river discharge patterns and currents.

8.4.5 Recommendations

Critical questions reflecting significant gaps in our knowledge of the effects of oil spills need to be identified. These questions should then be examined in light of actual spill conditions. Once a major oil spill occurs, the determination can then be made of what substantive scientific issues could be addressed in damage assessment. Those issues should be the primary focus of any such post-spill studies.

Good conceptual models of the dominant environmental factors and processes operating in chronic discharge areas have been used in oil seep studies, but in historic OCS areas these have not been developed. Research on the long-term effects of oil and gas activities should be posed within this conceptual framework. These studies should focus on the important transport and fate processes and on susceptible and sensitive components of the biota. Furthermore, they should not be constrained by conventional design criteria such as rigid radial transect sampling around platforms. The development of frontier areas from exploratory drilling to production and transportation allows the opportunity for a carefully designed program of study, aimed at documenting changes in the environment during each stage

of the development and production activities. Assessments should be based on a solid conceptual framework of dominant environmental factors and processes and susceptible biotic components.

8.5 Fate and Effects of Drilling Fluids and Cuttings

8.5.1 Rationale

Because the discharge of drilling fluids and cuttings is one of the first impacts to be realized in oil and gas development in frontier OCS areas, it has drawn particular attention. Although the basic components of drilling fluids are relatively inert minerals, these fluids do contain potentially toxic metallic and organic compounds. The USGS through its operating orders and the EPA through the NPDES permit process, may require special handling for these discharges, including barging of the wastes to shore at considerable expense and shunting the discharges below surface waters. Both the regulatory and the economic impetus to answer questions about the environmental effects of drilling fluids and cuttings are, therefore, indeed strong.

8.5.2 Research Approaches

Assessments currently employed include experimental laboratory studies of both the acute lethal and the sublethal effects of suspensions, eluants and deposits of drilling fluids, field measurements of the dispersion of discharges, monitoring of the chemical (mainly trace metals) and biotic components around exploratory drilling rigs. Studies of the toxic effects of suspended or dissolved components of drilling muds have not been generally able to demonstrate significant effects at concentrations approaching those observed in the field during discharges, and, consequently have come under much criticism.

The EPA has a coordinated program for assessment of the effects of drilling fluids which includes both laboratory and field experiments and field studies of the transport and effects of particulate discharges. The program is ambitious and has enlisted many competent investigators. However, many of the laboratory experimental portions of that agency's program appeared to the Evaluation Panel to employ unrealistic exposure conditions

and concentrations. Studies by NOAA on sediment dynamics near the Flower Gardens conducted as part of the EPA drilling fluids program did not appear to take into account previous BLM-funded studies which strongly indicated little or no potential for introduction of shunted drilling muds onto these calcareous banks. Although these studies employed different approaches, their objectives appeared to duplicate the more intensive and mostly completed BLM studies. Although other components of the EPA studies program appeared to have some merit based on the brief overview presented to the panel, they were not described in sufficient detail for reasonable evaluation.

The National Marine Fisheries Service in Galveston is commencing a multi-faceted study on the biota of the Flower Gardens and the effects of exploratory drilling discharges on this biota, particularly on reef fishes. Although study details were not provided, the program did not appear to be well integrated and most studies (e.g., studies on the population dynamics and movement of reef fishes.) offer little potential for definitive conclusions about the effects, or lack thereof, of drilling fluid discharges.

8.5.3 Use of Information

Existing information generated by industry and government sponsored field and laboratory studies has led this panel to the opinion that during exploratory drilling, disposal of conventionally employed drilling muds (excluding those which are petroleum based or have unusually toxic components) pose little threat to the marine environment, except in localized bottom habitats where the deposition of the particulate material may affect the benthos. Similar conclusions have been drawn by some management and regulatory agencies, notably in the Department of the Interior. Other agencies are apparently less certain of this conclusion.

The use of environmental information related to the fate of suspended sediments and the susceptibility of the biota to sediment-borne contaminants on the Flower Garden provides one of the few examples, other than those related to geohazard assessment, where environmental information has been used in resource management and regulation on the OCS.

8.5.4 Deficiencies

Because of the relatively low toxicity of most drilling fluids, many experimental effects studies are environmentally unrealistic. More realistic issues such as the bottom transport and deposition of drilling solids and consequent effects on the benthos are relatively understudied.

Considerable variations exist in the composition and toxicity of drilling fluids. There is some need to use standardized muds in studies, but there are still some problems of extrapolation of results of such studies.

The present federal research programs on fate and effects of drilling fluids and cuttings are not coordinated among agencies and appear to be driven by political needs rather than rational appraisal of significant scientific issues. The BLM has plans for expanded studies on drilling fluids, therefore careful interagency planning is required to avoid wasteful duplication.

8.5.5 Recommendations

The magnitude of funding and effort on studies of the fate and effect of drilling fluids may be disproportionate the to real importance of the problem. There are obvious areas of irrelevant research and duplication of effort. It is imperative that interagency coordination of research programs be instituted as soon as possible.

The Evaluation Panel strongly recommends that future studies on theoretically affected water column species utilize environmentally realistic concentrations of muds. Of even greater importance is the emphasis that must be placed on bottom transport of drilling fluids and subsequent effects on the benthos.

9. SOCIOECONOMIC STUDIES

9.1 Rationale

Marine pollution from OCS oil operations, tanker traffic, and coastal developments has a number of impacts on people and may result in substantial social costs. These impacts may include damages to commercial and subsistence fisheries, costs to recreational beach users, recreational fishermen and shell fishing, damages to personal property and property values, and reduction in tourism-related business. Cleanup costs can be considerable, and marine oil pollution can adversely affect the aesthetic and amenity qualities of coastal areas, resulting in social protests and actions by groups affected by what they view as an environmental insult.

The goal of marine pollution research, in an ultimate sense, is based on the impacts of marine pollution decisions on man. This concern is reflected in the National Marine Pollution Plan which requires (1) an assessment of the social and economic impacts of marine pollution, (2) the provision of information for the formulation of strategies to regulate or ameliorate the marine pollution, and (3) an improvement in the information base necessary for timely management and public decision making. Also, socio-economic considerations are an important part of the Secretarial Issues Document (SID), which is prepared for the Secretary of Interior prior to each sale of OCS leases. The SID contains a comparison of the benefits from OCS development with the associated costs of potential conflicts, including marine pollution. There is, thus, a clear mandate to include socio-economic considerations in marine pollution research, planning and management decisions. Despite this mandate, there has been a failure on the part of federal agencies to develop a significant socio-economic program, and socio-economic studies of marine pollution have received relatively little attention and support.

9.2 Research Approaches

Only three study areas formally identified as falling within the socio-economic realm were summarized during the program reviews:

(1) the regional economic model, (2) the commercial fisheries/offshore oil conflict study, and (3) an overview of the Alaskan socio-economic study program. Other socio-economic projects were mentioned but not discussed for evaluation, i.e., the proposed California recreational study and the coastal characterization research projects. Socio-economic effects are implicit in many other studies although apparently unrecognized or ignored by the investigators, e.g., oil spill response, fate and effects research, and the air quality research in Southern California.

9.3 Deficiencies

In general, there does not exist, either within the BLM or elsewhere in the federal government, a comprehensive socio-economic program strategy. There are two reasons for the neglect of social and economic studies of marine pollution. First, within the environmental studies branch in BLM in Washington, D.C., there is no environmental economist or social scientist of sufficient stature to influence and organize a well-conceived research program on social and economic issues. There are no Ph.D.-level social scientists in the regional offices of BLM, and social scientists are relatively under-represented on the regional technical working groups. Second, the criteria used by BLM to rank studies is structured so that projects that are legally mandated or designed to avoid law suits or accommodate political concerns are given high weights; other studies, especially those dealing with econmic or social issues, are unlikely to meet the cutoff for funding, given the ranking criteria presently employed. Relatively few socio-economic studies in support of marine pollution objectives have been funded. Only nine of 69 studies falling within BLM's FY 1981 funding level address socio-economic problems, all but three of these concern Alaskan regions. Only three of more than 50 presentations before the review panel focussed specifically on socio-economic studies. Little or no socio-economic research on marine pollution was reported by EPA, NOAA, or NSF.

Studies which have been undertaken are rarely well suited to meeting the objectives of the Federal Marine Pollution Plan. Some provide relatively generalized economic analysis of complex human issues. For example, the BLM appears to view the Harris econometric model as incorporating

virtually all socio-economic concerns resulting from OCS oil and gas operations. In many cases this model is applied in a mechanical fashion and the results convey little understanding of the scale and timing of impacts from offshore oil and gas activity. This regional model has a number of properties that make it useful for evaluating regional economic impacts (e.g. the detailed treatment of industries and geographic areas and the provision of a consistent framework for different OCS regions). However, the Harris model measures impacts that occur through the market; and the model cannot be regarded as incorporating all social and economic concerns resulting from OCS oil and gas operations. Identification and measurement of economic impacts per se is of limited value in assessing the sociological effects of OCS operations on communities, and impact studies are of no value in evaluating the costs of marine pollution or the relative benefits and costs of pollution mitigation measures. Moreover, there has been no systematic attempt to verify the predictive ability of the model. It is appropriate for BLM to verify the predictive accuracy of the model in order to enhance the confidence of users in the model results.

It is difficult to discuss in much detail the limited information made available on the on-going BLM study that examined conflicts between OCS oil and gas development and commercial fishing. These conflicts are perceived as important by coastal communities and it probably is useful to try to model offshore oil-commercial fishing conflicts. Such an effort, however, is fraught with data and conceptual problems and the general intractability of the issues. An alternative approach might be in developing local conflict resolution-mediation strategies.

Research presented to the panel reflected little appreciation of the full range of social and economic problems associated with marine petroleum pollution, or of the potential utility of social science expertise that is applicable to their analysis and resolution. This lack of appreciation is reflected by the following examples:

1. Analysis of differences between scientific knowledge and public perceptions of marine pollution can be a valuable tool in the formulation of effective lease sale strategies to include mitigation measures and tract deletions.

2. The development of social indicators of the impacts of marine pollution can provide a means for assessing important social consequences of pollution, particularly for those impacts that cannot be presented in economic terms.

3. There is no evidence that agencies are evaluating potential damages to health and property values caused by air and water pollution, fires, explosions, noise, and other aspects of marine petroleum recovery.

4. Studies are not undertaken to assess the differing socio-economic impacts of catastrophic oil spills and chronic, long-term pollution.

5. Inasmuch as socio-economic effects of marine pollution are primarily experienced by onshore populations, it is important to understand local infrastructure, organizational alignments, agency jurisdictional boundaries, and responsibilities which significantly affect the conduct of social science research and service delivery.

The BLM has displayed only slight, piecemeal and generalized concern for identifying and analyzing onshore impacts of potential offshore pollution except in Alaska. Furthermore, measurement of socio-economic impacts per se, are of limited value, as noted earlier. Although presently neglected by virtually all agencies, research on pollution mitigation strategies should have high priority. For example, tradeoffs between willingness to accept pollution and other social goals should be assessed. Effective mitigation requires analysis of institutional, legal, and administrative changes necessary to cope with the existence of, or the threat of marine pollution. Successful management of pollution will also depend in

part on the transfer of information and assistance from the federal government to state and local agencies responsible for preparedness planning and emergency management. Assessments of the readiness and effectiveness of such organizations should be an integral part of socio-economic pollution research. Evaluation of alternative management options is a similarly neglected and potentially valuable area of research.

Socio-economic research is not currently integrated with scientific studies of marine pollution. Such integration would provide managers with early opportunities to evaluate potential applications of scientific research and will improve understanding of potential conflicts and trade-offs. For example, managers could benefit from the ability to assign confidence values to regulatory or other decisions which are based on different types and amounts of scientific information. Close involvement of social scientists with other scientific research projects is a necessary first step toward the achievement of that goal. The following are some suggestive examples of areas where social science research could be integrated with scientific research:

1. It would be valuable to extend the oil spill risk analysis by attempting to evaluate, whenever possible, the economic and other societal damages resulting from a hypothetical spill. An economic assessment of damages will help separate the important from the less important categories of damages, will permit a comparison of the costs of mitigating pollution damages with the benefits expected to be achieved (i.e., damages avoided) and could aid in the determination of liability for compensation for damages. Fate and effects research in general would be enhanced greatly if extended to include economic and other societal considerations.

2. An evaluation of mitigating measures proposed for drilling muds and fluids disposal could benefit from an analysis of the relative costs and benefits of alternative requirements.

3. The study of endangered species and marine birds has not fully explored recent developments in the area of economic evaluation of non-market economic values of wetlands, wildlife, and recreation. It may be possible to begin the process of using non-market values to aid in the process of coastal area use classification. At a minimum, it would be valuable to prepare a state-of-the-art paper to assess the potential usefulness, approaches, data requirements and limitations of recent advances in the areas of estimating non-market values in the coastal zone. Such a document would aid in the assessment of how non-market value approaches can be used (if at all) to improve descriptions of coastal uses and values and provide a basis for improved management.

9.4 Recommendations

Based on the considerations outlined above, the following recommendations are made. Agencies responsible for studying and mitigating marine petroleum pollution must significantly expand and improve socio-economic research if they are to meet the objectives of the National Marine Pollution Program.

1. The numbers, quality, status, and responsibilities of social science personnel in Washington D.C., and regional agency offices should be increased as soon as possible. It is recommended that experienced, non-governmental social scientists be involved in agency activities at all stages of program planning and execution including study needs identification, research design, review, evaluation, and utilization. Such involvement should include, but is not limited to, participation in regular agency-sponsored symposia, workshops, and conferences concerning proposed, ongoing and completed social science research projects.

2. Expansion of membership and participation of social scientists in external advisory and liaison bodies such as the BLM's Regional Technical Working Group, should be encouraged.

3. Comprehensive, updated national and regional socio-economic studies program objectives and plans must be prepared and coordinated among all relevant agencies. Agency program managers need to identify and analyze the socio-economic implications of all OCS petroleum pollution studies within their area of responsibility.

4. Agency funding priorities need to be modified to increase the volume and quality of socio-economic research.

5. Agencies should provide a more sophisticated analysis of marine pollution problems by broadening the range of social science approaches used in support of oil pollution research. It is recommended that the Bureau of Land Management develop tests of the validity and predictive capability of socio-economic impact methodologies and compare and encourage development of a variety of approaches.

6. Agencies must develop a data management system which will provide for the storage, transfer, and rapid acquisition of socio-economic information pertinent to marine pollution.

7. It is recommended that the Interagency Committee on Ocean Pollution Research Development and Monitoring (COPRDM) initiate an effective procedure for ensuring that restrictive interpretations of agency missions and responsibilities do not hamper the early initiation of comprehensive onshore socio-economic research during the OCS exploration and development process.

10. STUDIES MANAGEMENT

A wide variety of government processes require environmental research information in order to make decisions and formulate options regarding the management of natural resources. These range from small, single purpose permits, such as those which are issued by the Army Corps of Engineers or EPA to major policy decisions such as the BLM's programmatic Environmental Impact Statement on outer continental shelf oil and gas development. Thus, adequate means must exist in the management process to translate and use research information for use in decision making. The uncertainties surrounding decisions related to man's use and management of resources require that scientists and managers interact at each step of the decision process: in problem definition, study design and execution, information translation and management decision making. This process is conceptualized in Figure 1.

Each agency involved in this review demonstrated differences in their emphasis on each of these steps. The differences are summarized in Table 1.

10.1 Problem Definition

Public perception of problems associated with local, regional, and national resource uses will often dictate the initial definition of management actions to be taken in any decision process. At this level, key variables and the spatial and temporal extent of the problem must be defined. Decisions must be made as to the level of information required to make decisions in a timely, cost-effective manner. Provision for regular communication throughout the rest of the project between the manager and scientist should be established. At this point in the decision process, the development of a conceptual model can be useful as a tool to refine the linkages between management and scientific needs, and can closely outline actions to be taken throughout the process.

Figure 1. CONCEPTUAL MODEL OF THE MANAGEMENT OF INTERDISCIPLINARY SCIENTIFIC RESEARCH

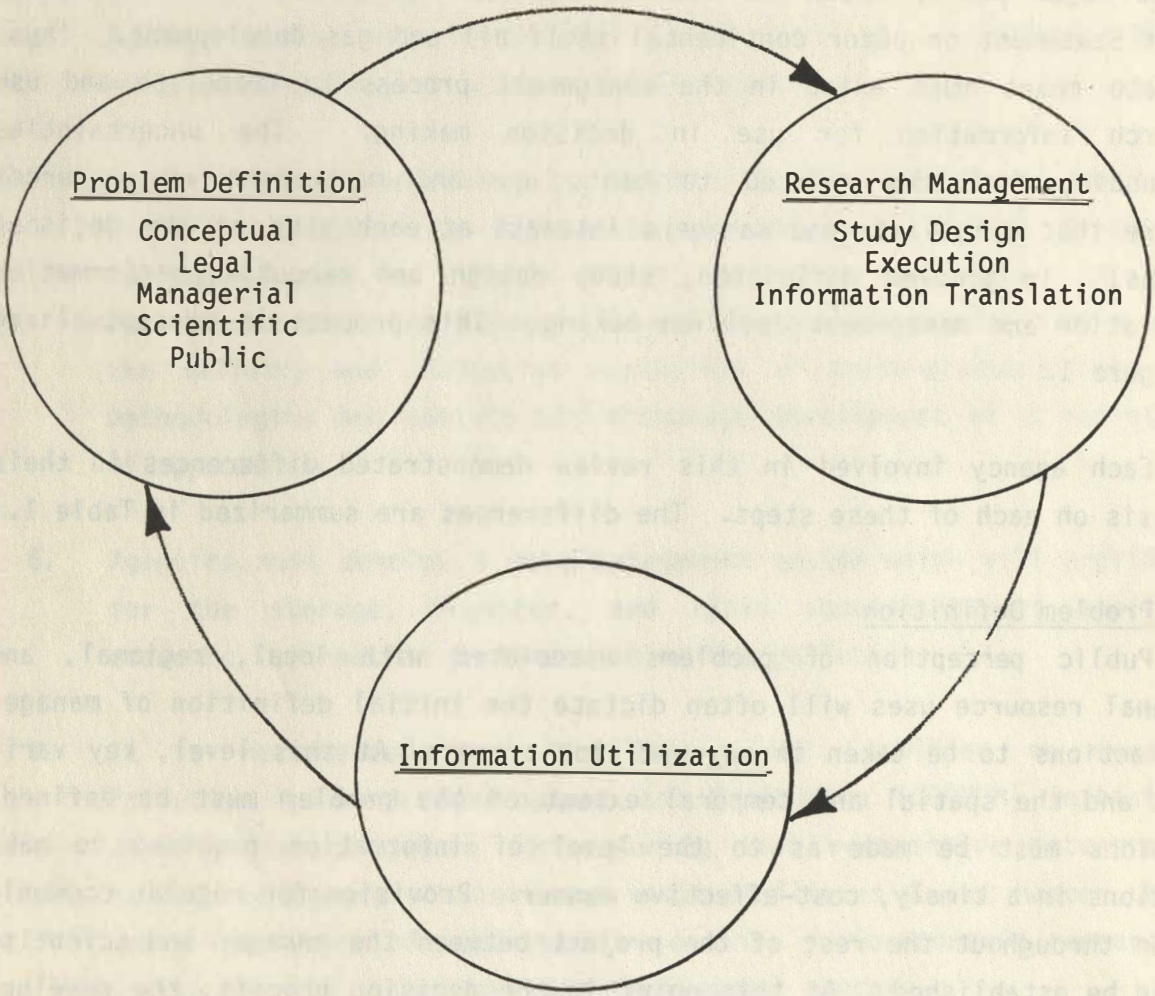

Table 1. MATRIX OF FEDERAL AGENCY ADHERANCE TO MANAGEMENT CONCEPTS

	Problem Definition	Research Management	Information Utilization
EPA	No evidence of a mechanism or established plan.	Insufficient evidence to reach conclusion.	Little evidence of substantial communication between Research and Development program and its operational programs.
NOAA			
• OCSEAP	Mechanisms have been established both from direction from BLM and internally. Note: Arctic studies use adaptive environmental assessment as a strategy.	Mechanism is established through procurement procedures. Flexibility is evident in administration and study design. Information translation is not evident.	Mechanism established through BLM area offices and decision documents.
• NMFS	No evidence of a mechanism or established plan.	Insufficient evidence to reach conclusion.	No evidence of a mechanism.
• OMPA	No evidence of a mechanism or established plan except for the oil spill response group.	Insufficient evidence to reach conclusion.	No evidence of a mechanism except for the oil spill response group.
BLM	Formal mechanism has been established through the "Blue Book" and advisory panels at regional and national levels	Mechanism is established through procurement procedures. Flexibility in administration and study design is not evident. Information translation is not satisfactory.	Mechanism established through BLM area offices and decision documents. Suspicion exists that information provided does not allow for significant improvement in "rational" decision making.

10.2 Study Design and Execution

Study design should involve all agencies and groups which have information needs in the OCS lease-sale process. The use of the conceptual model in study design can demonstrate the potential importance of certain aspects of a problem. Study designers can agree on the level of uncertainty to be tolerated in the data gathered, and will be able to justify both the need for longer term studies and for acute focus on specific problems. It is the panel's opinion that the current process of tract selection does not allow for adequate consideration of available environmental studies program results. With the five-year leasing schedule, a long-term study plan should be developed to ensure the generation of adequate information for input to tract selection. Input from the Regional Technical Working groups would enhance the involvement of all agencies in this process. In some cases, there may be a need to balance a management alternative with a scientific study program. If adequate flexibility is built into the study program, evaluation can be made after the commencement of a study to determine its time and cost effectiveness, and appropriate changes can be made. During the execution of a large study program, good management will involve continual monitoring and adaptation, based not on pre-set time limits, but on appropriate milestones in the projects. A series of workshops, like those carried out in the OCSEAP program, would be most helpful for enhancing manager/scientist communication. Problems can be identified and appropriate modifications to study design can be made to reflect the necessary changes in a timely manner.

Research acquired by federal government agencies all too often is purchased through rigidly established procurement procedures. The present BLM Request for Proposal and contractor selection system appears more suited to leasing helicopters or survey services than scientific understanding. As was pointed out by the NAS report, this problem can result in the stifling of creative talents of scientists who submit research proposals to BLM. While the BLM Blue Book offers a mechanism for problem definition, it does not offer assistance in study design. The present project design process instead appears to be a mixture of regional suggestions and BLM staff refinement. Potential bidders who are competent scientists and study

designers are not provided the opportunity to effect appropriate changes in project design; this problem has occurred in a number of whale studies. Although it was difficult to deduce from the formal presentations to the panel, the exact problems with the procurement procedures, informal communication with individual scientists as well as the panel's own experience indicate BLM's procurement process must be substantially revised if it is to be responsive to the need for scientific data.

Contract management by a number of funding agencies has been criticized because of an arbitrarily established and meaningless reporting requirement, the slowness by which contract changes are made, and substantial delays in funding. The panel recognizes that the funding agency must maintain a reporting system which provides adequate information by which to determine contract compliance. However, in most cases, reports are driven by the calendar (required quarterly, semiannually or annually) instead of by milestones established in the study design.

10.3 Information Translation and Utilization

The need for adequate information translation cannot be overemphasized. It is a primary responsibility of both the scientist and the manager to communicate the utility of information generated in studies programs to management needs.

Two major methods of information translation are currently being used. The first is publication in peer-reviewed journals; this method is reviewed elsewhere in this document. The other method is the Environmental Impact Statement (EIS) process. At its best, the EIS should be a vehicle for identifying trade-offs in management decisions based on available environmental data and information. Unfortunately, this is not always the case. The occurrence and frequent success of legal challenge of the EIS process reflects the inadequacy of the method in using information from completed and ongoing studies. As a result, much of the information used in an EIS may be obsolete or irrelevant by the time critical decisions are made by USGS, EPA, Army Corps of Engineers and others.

Although the panel asked for analysis of how the information generated by the study plan is used in the decisions of BLM and other agencies regarding impact mitigation and lease-sale strategies, little specific information was forthcoming from the presentations. The panel realizes that the redirection of the BLM study program is now based on decision-making processes. It also realizes that this process has, in fact, only been in existence for approximately one year. The panel recommends that a comprehensive study of the decision process be made to identify how information is used in each step taken from the existing BLM study plan or other federal agencies' studies and which information was used to make the Secretary's decisions. This study should especially evaluate the contribution of the studies program to the decision processes, and lead to an understanding of the efficiency of the studies program in management terms. This study could also make recommendations on not only how the studies program information is to be used by BLM, but what procedures should be followed to see that it is available to other federal and state agencies for their use in the management procedures.

10.4 Recommendations

1. EPA, NMFS, and OMPS should establish a research plan or problem definition mechanism for information development and utilization.

2. BLM should utilize the Blue Book concept as well as scientific conceptual modeling at both the regional and national level to develop problem definitions, and to improve communications at all levels of management.

3. BLM should establish in each of its regional offices, a GS-15 level scientist whose responsibility is to work with regional scientific advisory groups to develop problem definition and study design and be responsible for the implementation of scientific recommendations into contracts. The position should also manage the scientific compliance of the contracts under the milestone procedure and provide any needed staff scientific support.

4. The BLM OCS Policy Board and the Scientific Advisory Committee should establish criteria for evaluation of data needs derived from the Blue Book and conceptual models. The BLM Scientific Advisory Committee should develop criteria for evaluation of the adequacy of scientific research and data being developed with BLM funding.

5. A formal mechanism must be established to ensure that all federal and state agencies and private industry have full knowledge of all existing and planned research on oil pollution and of the type and availability of information from each program.

6. There should be established within the Departments of Commerce, Interior, and EPA, groups responsible for assessing the adequacy of oil pollution data already developed and planned within each agency. These groups should be reviewed and coordinated by COPRDM with the advice of a non-federal advisory panel. This should avoid duplication and reduce the time necessary to address problems so that where possible, oil exploration and development and transport can rapidly proceed, and expenditure of federal monies can be reduced.

7. The use of arbitrary reporting deadlines to satisfy contract compliance requirements should be altered to provide for reporting on the basis of milestone attainment.

8. The EIS process, as it is used by the BLM, should be carefully examined, perhaps by an outside agency, to determine how it can be improved so that the probability of successful legal challenge is lessened.

9. In areas in which there is at least one or more lease sales per year, an EIS should be prepared every three years. In those areas in which there is not a sale at least every three years, the existing EIS should be revised approximately every three years based on the information generated by the studies program and other sources.

AGENCY REVIEWS

AGENCY REVIEWS

1. The National Science Foundation

The NSF/IDOE program has been active in research on pollutants since about 1970. The initial chemical analytical program turned, in 1972, into a larger program utilizing numerous biological approaches to determine the fate and effects of pollutants. The Controlled Ecosystem Pollution Experiment (a field program) initiated in British Columbia, was coordinated with a parallel Biological Effects program involving primarily laboratory research. In 1976, NSF reorganized the entire pollutant program to form PRIMA to investigate basic responses of a few organisms to a range of chemical toxicants. Over the last decade, the IDOE studies have been quite productive in producing analysis of the responses of different marine organisms to a wide range of pollutants. The laboratory studies conducted both in the early biological effects program and the present PRIMA program increased the understanding of how organisms are impacted by pollutants and what mechanisms are involved in this toxic response. The CEPEX program while criticized by some, has provided important information on the responses of phytoplankton and zooplankton in meso scale studies, using very large bags in the natural environment. As with other NSF studies, there were no stringent contracting controls or reporting procedures involved in these programs. The primary output of the program has been publications in peer-reviewed journals.

2. Environmental Protection Agency

Two different types of studies were presented to the Evaluation Panel regarding EPA funded programs. The first included drilling fluids studies which have been reviewed in Section II of this report. The strengths of the program may be found in the number of well-qualified investigators contracted to do phases of the work on drilling fluids. This, however, is overshadowed by the use of extremely high and unrealistic levels of drilling fluids in many of the present studies. Drilling fluids dispersion information available from both industry and some federal research programs, is not being utilized in the design of these toxicity tests. Another factor contributing to the problems in these studies is the difficulty in

standardizing a drilling fluid or attempts to provide a "standard" drilling fluid may not be realistic. A more productive method of conducting these studies would be to conduct field experiments during the actual drilling operation to test for the effects of organisms at different distances and depths around the platform.

The other programs funded by EPA at the present time were previously funded through the Department of Energy. These programs involved long-term studies on the fate and effects of oil in both an oil seep area and in the northwestern coastal zone of the United States. The importance of examining the situation in a natural oil seep where a consistent level of exposure to marine organisms is provided cannot be over emphasized. Also valuable are studies incorporating field experiments and laboratory tests, which examine the impacts of oiled substrate and chronic exposures on organisms under realistic conditions.

It appears to the panel that the most significant and longest term impacts of oil are likely to be related to sediments, since there is a relatively short period of exposure in the water column. Both of the oil programs sponsored by EPA are studying these long-term effects and have produced a number of peer-reviewed publications on the subject.

3. NOAA/OCSEAP

The Alaskan program funded by BLM and conducted under the auspices of NOAA is providing valuable information in a number of fields. The management of the very large program appears to be adequate, and in keeping with the magnitude of the program's needs. While it is impossible to review all of the aspects of these extensive studies, the panel feels that the summaries given by management personnel indicate that the program is producing the type of information needed to evaluate the potential impacts of development in the Alaskan lease areas. In the transfer of funds for this research from BLM to NOAA rather major changes in the contracting requirements of principal investigators were observed. In the OCSEAP program, RFP's generally contain much less specific information and requirements, thus allowing the investigator to use initiative and imagination in

designing appropriate methodologies. In addition, information regarding the general level of funding available is given by OCSEAP. It is also important to note that principal investigators are allowed to discuss the program beforehand at workshops and develop approaches and questions needed to be answered. Later in the program, funding is provided for synthesis meetings to bring investigators together to respond specifically to management needs. All of these mechanisms are extremely important and funds for them are provided in the OCSEAP program. In some cases, excessive research dollars appear to go into data management instead of research. Reporting requirements and data base management should be streamlined and reduced.

4. Bureau of Land Management

The BLM program is extremely large. It is characterized by very stringent contracting regulations and reporting deadlines and a shortage of high level scientists within the Washington and/or regional offices. An important problem is the apparent need of the program to respond to emergencies, such as litigation or potential litigation regarding endangered species, whales and other regional problems perceived during the potential lease sale. This factor, plus the present studies priority ranking criteria, do not allow principal investigators to conduct long-term comprehensive studies on biological systems which would be most useful in determining the potential impacts of pollutants. Suggestions as to possible remedies for this situation have been made elsewhere in this document, but will be reemphasized here.

First, in the design of studies it is important to have criteria that will allow high priority for long-term investigations, and suitable contracting mechanisms set up to provide for the funding of these studies. The very rigid contracting procedure utilized at present, will simply not allow for continued long-term interdisciplinary research to understand how a marine ecosystem functions and, therefore, determine how pollutants might impact it.

Unlike OCSEAP, workshops and potential contractor meetings are not used to develop work statements on the most significant research questions, and

needed approaches. From the time the work statement is written to the time of funding, only BLM personnel are allowed to have input. Since the basic level of funding is not included, and the contracting officer has the final approval power, contract award is often influenced by differential costs. Rigid restrictions are incorporated into the request for proposal, such that imagination and experience are of no benefit. Reporting requirements emphasize data and timing, not integration or interpretation of findings (milestones). Publications of information in peer-reviewed journals is neither encouraged nor funded.

The differences between the BLM and NOAA/OCSEAP programs are surprising since the funds derived from the same source. Additional funds provided OCSEAP for workshops and synthesis meetings, combined with no more flexible contracting requirements and the extensive scientific staff at NOAA, have made a significant difference in the quality of the information produced by their programs.

5. The National Marine Fisheries Service

Various laboratories within NMFS have very different responsibilities relating to fate and effects of oil in the marine environment. Studies within NMFS include effects of petroleum on endangered species, birds, coral reefs, fish, invertebrates, and OCS monitoring. The panel feels that the least practical of all of these efforts is the monitoring effort taking place in the northeastern United States (Ocean Pulse). There is no scientifically valid reason to believe that the methods used will ever detect the impacts of pollutants in OCS waters. The most pertinent research is being conducted in the northwestern U.S. (including Alaska) regarding the fate and effect of contaminants using state-of-the-art analytical chemistry and rational biological approaches. While we are not able to judge the scientific capabilities of the Gulf of Mexico laboratory, the proposed study on coral reef effects from drilling fluids does not inspire our confidence. The fact that a large multiyear program was proposed to examine the effects

on coral reef fishes and other organisms at the same time it was reported that drilling fluids do not reach the living portion of the reef, leads one to believe that there is an inherent weakness in the program planning.

Regarding endangered species, marine birds, and mammals, there is a need for NMFS to conduct basic biological studies, coordinated with FWS and others. These studies should be directed toward understanding ecosystem functions and organism interrelationships. Section 7 consultations should be reorganized to restrict conflicts of interest by regulatory agencies.

6. United States Geological Survey

Studies conducted by USGS seemed, in general, to be of high quality and certainly of high priority in regard to the evaluation of lease sales. USGS appears to be most capable of meeting the needed deadlines for decision making regarding lease sales. While there is some unevenness in the information produced in the different regions of the U.S., there do not seem to be any glaring omissions in the total program. The weakest study discussed by USGS seemed to be its oil spill risk analysis modeling program which did not seem very useful in predicting impacts on the coastal environment under the wide variety of conditions which might occur.

ENVIRONMENTAL IMPACT STUDIES
EAST COAST-GULF PROGRAM REVIEW AGENDA
Boston, MA

July 27-29, 1980

July 28, 1980

Keynote Address: Dr. Jack (I. L.) White, BLM

Chairman's Charge to Conference: Dr. Paul Lefcourt, EPA

Principal Agency Speakers: NOAA: Captain Lawrence Swanson; EPA: Dr. Norman Richards; DOI, Dr. Piet deWitt

Session I: North and Mid-Atlantic

Management Overview: Mr. Frank Basile, BLM

Scientific Overview: Mr. Philip Thomas, BLM

Biological Task Force (Georges Bank): Ms. Ruth Rehfus, NOAA

Geological Studies: Dr. Harley Knebel, USGS

Physical Oceanography Studies: Dr. Richard Scarlet, EG&G

Biological Studies: Endangered Species: Dr. Howard Winn, Univ. of Rhode Island

Biological Studies: Submarine Canyon Assessment: Dr. Barbara Hecker, Lamont-Doherty Geological Observatory, Columbia Univ.

Drilling Muds Research: Dr. Norman Richards, EPA

Socioeconomic Studies: (Harris Model): Dr. Curtis Harris, Univ. of Maryland

Space Use Conflicts: Mr. Brad Ingram, Centaur Corp

July 29, 1980

Session II: South Atlantic and Gulf of Mexico

South Atlantic OCS Region: Mark Grussendorf, BLM; Chairman

Management Overview: Dr. Jesse Hunt, BLM (Definition of Sale Areas and Information Needs

Geological Studies: Dr. Jesse Hunt, BLM (Technical Product Use)

Physical Oceanography: Technical: Tom Lee, University of Miami; Product Use: David Amstutz, BLM

Biological Studies: Technical - BLM (20 min.) Rick Defenbaugh, BLM - MRRI Vic Burrell, State of S.C., Department of Wildlife and Marine Resources

Product Use - BLM (10 min.) Rick Defenbaugh, BLM

Overview Speaker: Mark Grussendorf, BLM (Relationship of past, present, and future studies)

Gulf of Mexico OCS Region: Bob Rogers, BLM; Chairman

Management of BLM: Richard Defenbaugh, BLM (Definition of sale areas and information needs)

Geological Studies: Technical: Henry Berryhill, USGS; Product Use: Jesse Hunt, Jr.

EPA (Flower Gardens): Suzanne Bolton, EPA; "Ecological Impacts of Drilling Muds": Norman Richards, EPA

"Effects of Energy Development of Reef Fish and Benthos Populations in the Flower Garden Banks of the Gulf of Mexico": Edward Klima, NMFS, Steve Piotrowicz, AOML

Coral Mapping: Eugene Shinn, USGS

Topographic Features: Technical: Thomas Bright, Rexak, McGrail, Texas A&M University; Product Use: Charles Hill, BLM

U.S.F.W.S. Studies: "Endangered Species and Marine Birds", Jimmie Johnston, USFWS "Coastal Characterization Studies"

Platform Studies: Rick Defenbaugh, BLM; Physical Oceanography: David Amstutz, BLM

BLM Overview: Bob Rogers, BLM (Relationship of past, present and future studies)

"Spill Response and Research Related to IXTOC": Bob Rogers, BLM

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ENVIRONMENTAL IMPACT STUDIES
WEST COAST-ALASKA PROGRAM REVIEW AGENDA
Seattle, WA

August 26-27, 1980

August 26, 1980

Program Review

Chairman's Charge to Conference: Paul Lefcourt, EPA

Pacific OCS Management Overview: Dick Wilhelmsen, Studies Staff Chief Pacific OCS Office

Geological Hazards: Jerome Foreman, Pacific OCS Office

Marine Birds and Mammals: Gordon Reetz, Pacific OCS Office

Ecological and Risk Assessment Studies: Martin Golden, Pacific OCS Office

Fate and Effects Studies: Fred Piltz, Pacific OCS Office

Air Quality Studies: Kevin Golden, Pacific OCS Office

Physical Oceanography Studies: Fred Piltz, Pacific OCS Office

Socioeconomic Studies: Tom Warren, BLM

Alaskan Program: Management Overview: Esther Wunnicke, Manager, Alaskan OCS Office

Overview: Marine Geology of Alaska: Edward Clifton, USGS

Socioeconomic Studies Program: Dean Yoesting, Alaska OCS Office

Endangered Whale Studies: Jerry Imm, Alaska OCS Office

Alaska Program Overview of the Outer Continental Shelf Environmental Assessment Program: Herb Bruce, Director, Alaska Field Office, NOAA, Office of Marine Pollution Assessment

August 27, 1980

Gulf of Alaska Program Overview: Jawed Hameedi, Lease Area Coordinator, Gulf of Alaska, OCSEAP; Geohazards; Transport; Biological Resources

Bering Sea Program Overview: John Calder, Lease Area Coordinator for Bering Sea, OCSEAP; Transport; Coastal Habitat Characterization; Commercial Fisheries; PROBES Interaction

Arctic Program Overview: Gunter Weller, Management, Arctic Project Office, OCSEAP; David Norton, Lease Area Coordinator, Beaufort Sea, OCSEAP; Ice-Permafrost; Barrier Island - Lagoon; Winter Studies

August 28, 1980

Evaluation Panel Meeting

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FATE AND EFFECTS PROGRAM REVIEW AGENDA
Boulder, CO

September 22-23, 1980

September 22, 1980

Chairman's Overview/Introduction: Paul Lefcourt, USEPA

The Use of Marine Animals as Models to Assess Mechanisms of Toxicity: John Pritchard, NIEHS

Overview of BLM: Dr. James Cimato, BLM

Overview of NOAA Program: Doug Wolfe, NOAA/OMPA

Overview of OCSEAP Program: Carol Manen, NOAA/OCSEAP

Fate and Effects of Crude and Refined Petroleum Products; Sensitivity of Crustacean Larvae to Drilling Muds: Stanley Rice, NMFS

Overview of NWFC/NMFS Oil Pollution Research: Donald Malins, NMFS

Determining the Nature and Extent of Petroleum Pollution: William MacLeod, Jr., NMFS

Effects of Crude Oil: Harold O. Hodgins, NMFS

Effects of Petroleum Components: Usha Varanasi, NMFS

Conclusion: Donald Malins, NMFS

Crabs: Bori Olla, NMFS

Overview of Petroleum Related Research in the N.E. Fisheries Center: Fred Thurberg, NMFS

Chemosensory and Behavioral Effects of Petroleum Hydrocarbons on Dungeness Crabs: Bori Olla, NMFS

Cytotoxic and Mutagenic Effects of Contaminants on Fish Eggs and Larvae: Arlene Longwell, NMFS

Physiological Responses of an Estuarine Resident, Striped Bass, to Low Level Sublethal Concentrations of a Variety of Environmental Contaminants, including Petroleum Hydrocarbons: Jeannette Whipple, NMFS

September 23, 1980

Effects of Oil Pollution on Marine Organisms: Jim Payne, SAI

Adaptations to Petroleum Exposure in Marine Organisms Living in Natural Oil Seep Areas: Dick Caldwell, Northwest Aquatic Sciences, Inc.

Effects of a Natural Oil Seep on Marine Life: Robert Spies, Lawrence Livermore Labs.

Review of NSF Funded Oil Pollution Studies: Roger Baier

Fate and Effects of Toxic Substances on Ecosystem Processes: Jack Anderson, Battelle Northwest Laboratory

Activities of MERL; Graduate School of Oceanography, Univ. of RI: Michael Pilsen, Univ. of RI

Tissue Structural Studies of the Bowhead Whale: Thomas Albert, Univ. of MD

USGS Oil Spill Trajectory Analysis Model: Kenneth Lanfear, USGS

Oil and Hazardous Materials Spills Scientific Response: John Robinson, NOAA; Edward Overton, University of New Orleans

Ecological Classification of Coastal Ecosystems: Erich Gundlach, Research Planning Institute

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FEDERAL AGENCY RESPONSE

The Interagency Steering Committee's response to the report of the Evaluation Panel on environmental studies was transmitted to the Committee on Ocean Pollution Research, Development and Monitoring (COPRDM) in a letter from Dr. Paul Lefcourt, Chairman of the Steering Committee, to Mr. James P. Walsh, Chairman of the COPRDM. Following is the text of that letter:

We, the Interagency Steering Committee established by COPRDM, have completed our assignment of organizing and implementing the first critical review of the Federal Government's R&D program dealing with the environmental impact aspects of offshore oil and gas development. Enclosed for COPRDM's use in developing the second "Federal Plan for Marine Pollution Research, Development, and Monitoring" is a copy of the Evaluation Panel's (Panel) report entitled Review of Federal Programs in Environmental Impact Studies of Petroleum in the Marine Environment.

We would like to discuss with you the major issues to emerge from the Review. Following that, we will try to give you our view and opinions on carrying out such a complex program review. The agency comments to the Panel report are provided as enclosures in the following order:

(1) Bureau of Land Management (BLM)
(2) Fish and Wildlife Service (FWS)
(3) Geological Survey (USGS)
(4) Environmental Protection Agency (EPA)
(5) National Oceanic and Atmospheric Administration (NOAA)

The Panel identified ten major Issues and Recommendations (See Report, Section I, Item 2). In the following we will address each of the issues in turn. Please note in the interest of brevity, we will not respond point by point to the paragraphs that follow the statement of the Issue in the Panel Report, but we will focus our comments on each Issue and the Panel Recommendation.

Issue 1: Competent scientific judgement must characterize Federal decisions on both research priorities and management of petroleum resource development.

Panel Recommendation: The Federal plan for marine petroleum pollution research, development, and monitoring should be developed with input from and continuing evaluation by non-Federal experts fully informed about current Federal OCS activities.

Steering Committee Commentary: We fully agree that competent scientific judgement should be an important part of Federal decisions on management of petroleum resource development. However, programmatic decisions must be made within a framework of competition and trade-offs with other agency high priority areas. Conduct of research in the Federal Government, by necessity, must be related to the agency mission as it is the basis for budget justification.

While non-Federal scientific input is solicited at the "program planning" level in all the agencies involved, it is truly at the "project planning" level where outside scientific advice is most needed and desired. Multidisciplinary projects, requiring large budgets, and coordination with various research organizations emphatically need non-Federal scientific advisory groups to insure proper project planning and execution. Examples of well functioning advisory groups are those associated with EPA's funded project on oil pollution microcosms at the University of Rhode Island, BLM's projects on whale research in the North Atlantic, and BLM's South Atlantic physical oceanographic projects, among others. Currently, the development of the Federal Plan for Ocean Pollution Research, Development, and Monitoring is accomplished through coordination provided by COPRDM. It may be beneficial to have input from representatives of the non-Federal scienfitic community dealing with oil pollution R&D planning and evaluation.

Steering Committee Recommendation: COPRDM should establish a subcommittee on OCS oil and gas development environmental studies. The subcommittee should be charged to communicate and/or coordinate those activities dealing with: (1) planning; (2) project implementation; (3) program evaluation; (4) the use of non-Federal scientific advisory groups in project planning and execution; and (5) synthesis and transfer of information.

Issue 2: Procurement procedures interfere with optimum provision of scientific information needed for decisionmaking at all levels.

Panel Recommendation: Revise procurement and interagency transfer procedures to provide the timely and project duration support similar to that usually achieved by such agencies as NSF, ONR, DOE and the NOAA Sea Grant Program, with long established histories of effective procurement of information about the marine environment.

Steering Committee Commentary: The Evaluation Panel's recommendation does not accept the necessity for mission-oriented research programs. The panel should recognize the real and important differences between mission-oriented research and the basic research which it has endorsed. Mission-oriented research programs are by necessity driven by certain

time constraints which require the timely supply of information to decisionmakers. The problems to which the Panel has alluded are more programmatic than procedural. The problems concern programmatic prerogatives such as research priorities, continuation of research efforts, and effective level of investment. None of the agencies involved in mission-oriented research has the luxury of continuing individual research efforts indefinitely. The decisions to terminate or reduce funding for specific research efforts are those of the program manager, not the contracting officer. We recognize that each agency has a different procurement philosophy, even though all agencies operate under the same set of procurement regulations. The Panel did not discuss this issue with contracting officers of any agency during the COPRDM review.

Steering Committee Recommendation: No action is necessary.

Issue 3: Effective interagency coordination is essential to a successful marine petroleum pollution research, development, and monitoring program.

Panel Recommendation: The development of a coordinated Federal marine petroleum pollution research, development, and monitoring plan should be used to improve interagency coordination.

Steering Committee Commentary: Although we do not agree that all of the specific examples cited by the Panel represent duplication of effort, we support the Panel's Issue and Recommendation.

Steering Committee Recommendation: This Issue should be addressed by the proposed subcommittee, described in our Recommendation to Issue 1.

Issue 4: The BLM's OCS Environmental Studies Program needs further evolution to effectively meet its objectives.

Panel Recommendation: BLM should retain managerial control of the OCS Environmental Studies Program, but should appoint a high-ranking scientist to direct the Washington Office and GS-15 level scientist to direct regional scientific programs. Together, these scientists and their staffs along with input from the existing advisory groups, should develop and publicize a five-year information procurement program complementary to its 5-year leasing schedule.

Steering Committee Commentary: We agree with the Panel's conclusion that the BLM program has improved significantly since the 1976 National Academy of Science's (NAS) report. Many of the recommendations forwarded by the Panel are currently being implemented. These initiatives include increased peer review and dissemination of studies results, development of study programs to complement the 5-year leasing schedule, and upgrading personnel. These initiatives coupled with increased communication with available advisory groups will guide the evolution of the program.

Steering Committee Recommendation: No action is required.

Issue 5: Marine petroleum pollution research must be characterized by properly framed scientific questions studied with the best of modern technology.

Panel Recommendation: Improved planning and scientific review of Federal efforts in marine petroleum pollution research should be required by the National Marine Pollution Program Office.

Steering Committee Commentary: We agree with the Panel's Recommendation. We believe that interagency reviews could be beneficial to research planning. In addition, we feel that the absense of these interagency reviews was due to the level of commitment of time, money and effort that is required. It should be noted, however, that COPRDM recognized the importance of such a review. The recently completed Review of Federal Programs in Environmental Impact Studies of Petroleum in the Marine Environment is, to our knowledge, the first review of a major Federal research program. The questions that remain are: (1) how effective was the review in assessing scientific quality and data adequacy, determining program priorities and identifying low-priority efforts; and (2) should the review be repeated, and if so, how often? We feel these questions should be addressed by COPRDM in the near future.

Steering Committee Recommendation: COPRDM should charge the subcommittee (described in Issue 1) to provide an analysis of the questions raised in the above commentary, along with making recommendations for any future reviews in the oil pollution R&D area.

Issue 6: Results of environmental research related to marine petroleum pollution must be integrated, synthesized, made available, and used by resource managers.

Panel Recommendation: A specific program should be initiated for determination of data adequacy and for regular integration, synthesis, interpretation, and presentation of environmental data for informed decisionmaking by resource managers.

Steering Committee Commentary: The need for improved information transfer is recognized by the member agencies of COPRDM. Various data systems, for example, NOAA/NODC, EPA/STORET, and USGS/OWDC, are attempting to improve their capability for data analysis and accessibility. BLM routinely requires the synthesis of information from its multi-disciplinary studies to facilitate decisions regarding OCS leasing. Much of EPA's results of published research has been synthesized into scientific criteria documents, which form the basis for regulations. NOAA is responsible for publishing an annual report to Congress on ocean pollution research as requested by Public Law 92-532 (the Ocean Dumping Act). COPRDM, as required by Public Law 95-273, produces a biennial update of inventories on all ongoing ocean pollution research.

Steering Committee Recommendation: The subcommittee, described in Issue 1, in the course of its deliberations, should review data synthesis, interpretation, and presentation of data as part of its overall charge dealing with information management.

Issue 7: Research methodology in which environmental measurements are made to establish baseline conditions so that any changes can be detected by long-term monitoring (i.e., the baseline and monitoring approach) is generally unsuited to assessing the environmental effects of chronic low-level release of petroleum or other pollutants in marine areas.

Panel Recommendation: Baseline and monitoring approaches to assessment of effects of chronic low-level pollution on open-water marine environments should be discouraged and, if proposed, should be supported only after a most rigorous scientific review.

Steering Committee Commentary: We agree with the Panel observation that open water marine environments are characterized by great physical variability which causes large fluctuations in biological populations and distributions. Because of this variability, it is very difficult to establish any kind of "baseline" reference on which to construct a monitoring program that can demonstrate the ecological perturbations resulting from offshore oil and gas development. We are in complete agreement with the Panel that only monitoring approaches encountering the most rigorous scientific review be considered for support. The primary utility of monitoring programs at this time is as an early warning indication of changes in the environment with no regard for cause and effect. It is worth noting that NAS is currently updating its report "Petroleum in the Marine Environment." Subsequent to that activity, the BLM plans to conduct a feasibility analysis to recommend monitoring program designs which would assess chronic low-level pollution.

Steering Committee Recommendation: COPRDM, through the proposed subcommittee described in Issue 1, should undertake a study of all oil pollution related monitoring programs supported by the Federal agencies. The study should be performed in conjunction with the BLM study mentioned above. The study should provide COPRDM with specific recommendations for oil pollution monitoring studies.

Issue 8: Research to establish the environmental impacts of long-term, low-level addition of petroleum pollutants to marine habitats should be part of any marine petroleum pollution research plan.

Panel Recommendation: Research to assess the environmental impact of long-term, low-level addition of petroleum pollutants should be initiated promptly.

Steering Committee Commentary: This issue is linked with the previous one that discussed "baseline and monitoring" studies. There is some confusion regarding our understanding of the Panel's use of the terms "monitoring" and "research" as used in the context of Issues 7 and 8. We consider "research" as laboratory and field studies that use rigorous controls, measure all essential parameters, and establish cause-effect relationships. "Monitoring" is considered to be a time series of chemical and biological measurements performed on environmental samples where cause-effect cannot be induced solely from the data.

It is our conclusion that the Panel, given the structure and nature of the review, was unable to enunciate clearly those research areas that need to be addressed to resolve environmental controversies. Above all, we feel a technical evaluation of the R&D program still needs to be done. In fact we are not convinced by the evidence at hand that there are serious environmental problems caused by oil and gas development in every OCS lease area. One possible approach to improve research planning would be a case by case analysis of current and planned research programs in an Adaptive Environmental Assessment* (AEA) mode. The AEA approach could first be performed at a selected OCS sale area to determine if the method clearly identifies critical needs for research. If the AEA approach shows promise, it would be applied to other areas.

Steering Committee Recommendation: COPRDM should charge the subcommittee identified in Issue 1 to address explicitly the Panel issue of research program balance, including the importance of long-term, low-level pollutant effects. As part of their deliberations, consideration should be given to performing an Adaptive Environmental Assessment of a major OCS oil and gas development area.

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*Holling, C.S. (Editor); Adaptive Environmental Assessment Management; John Wiley and Sons, New York; 1980.

Issue 9: Increased emphasis should be placed on research directed to assessing and mitigating the socioeconomic effects of OCS petroleum development and pollution.

Panel Recommendation: A meaningful and rigorously enhanced socioeconomic research program with a focused strategy should be developed as part of the Federal marine pollution research, development, and monitoring plan.

Steering Committee Commentary: The Panel should have been more specific in recommending topics for "meaningful and rigorously enhanced" socioeconomic research. COPRDM's recent exercise to define regional needs and priorities and BLM's annual reviews of regional study needs have failed to demonstrate strong support for socioeconomic studies in relation to other information needs.

Steering Committee Recommendation: No action is necessary.

Issue 10: Adequate funding for marine petroleum research, development, and monitoring plan activities should be provided.

Panel Recommendation: Funding for the Federal marine pollution research activities should not be allowed to be found shortsightedly inadequate; the urgent need to develop the nation's OCS petroleum resources responsibly dictates that the scientific research be done well so as to expedite credible and defensible resource management decision.

Steering Committee Commentary: The Steering Committee agrees that research on the pollution effects of offshore petroleum activities is important. However, offshore petroleum activities as a cause for pollution in the marine environment need to be put into perspective with other types of marine pollution. The charge to the Panel was not sufficiently broad to develop such a perspective. The lack of a realistic assessment of the probable extent and seriousness of oil pollution in the marine environment is a prime reason for the continuing controversy over the nature, funding level, duration and balance of environmental assessment programs related to oil in the marine environment.

Steering Committee Recommendation: Our recommendation to Issue 8 addresses these concerns.

This Review was probably the most comprehensive, in-depth Review ever carried out of a major R&D area encompassing programs of several agencies (NOAA, EPA, FWS, BLM, USGS, NSF). The Review was performed in an optimum manner considering the trade-offs among: (1) numbers and kinds of scientific disciplines represented on the Panel; (2) total time the agencies and the Panel could commit to the project; (3) amount of time available to complete the project; and (4) level of detail and analysis required of the Review.

The 15-member Panel devoted 11 days to the Review. The Review was performed using three separate two-day conferences where all the involved agencies presented their programs. Following the conferences the Panel deliberated a total of five days to arrive at their conclusions and draft their report.

From the inception of this project, the Steering Committee agreed there would be no interactions with the deliberations of the Panel except for responding to specific requests for additional information. We were sensitive (perhaps excessively so) to any future criticisms regarding interference with the Panel's deliberations. As a result of this attempt to produce an independent point of view, some errors and misconceptions appear in the Panel's report. The only commentary from the agencies on the Panel report are given in the enclosures.

I would like to end this letter by extending to you and COPRDM my personal thanks in allowing me the opportunity to organize this project. I have found it very rewarding to be doing something I felt to be of real importance to the oil pollution R&D field. In addition, the project has given me the chance to work, in a cooperative spirit, with the competent and enjoyable members of the involved agencies and a highly skilled, hard working Evaluation Panel.

Sincerely,

Paul Lefcourt

Paul Lefcourt, Ph.D.
Chairman, Steering Committee

IN REPLY REFER TO:

3331 (543)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

FEB 19 1981

Memorandum

To: Chairman, Interagency Committee on Ocean Pollution Research Development and Monitoring

From: Deputy Director, Bureau of Land Management

Subject: Comments on the Evaluation Panel Report - Review of Federal Programs in Environmental Impact Studies of Petroleum in the Marine Environment

The Bureau of Land Management has reviewed the subject report with great interest. This memorandum transmits our comments for inclusion in the final report.

The Bureau appreciates the opportunity afforded by this program to publicly review its Outer Continental Shelf (OCS) Environmental Studies Program. The Bureau also appreciates the considerable effort of the evaluation panel. We recognize that fully comprehending the complexities of such a large and diverse program in a short period of time required a substantial effort from these individuals. They are to be commended.

The Bureau does have some concerns about the conclusions of the evaluation panel. These concerns are principally programmatic and may have resulted from the short time afforded to the agencies for their presentations and from preconceived ideas brought to the panel by some of its individual members. These concerns are discussed below.

The Bureau's principal concern with the conclusions of the report centers on the apparent failure of the evaluation panel to fully appreciate the mission and legal mandate of the Environmental Studies Program. The Bureau expended a substantial amount of time and effort in redesigning the program in 1978 to make it more responsive to the information needs of decisionmakers involved in the OCS leasing process. The program's record of success since the redesign has been recognized not only within the Department of the Interior, but also by the public, the Office of Management and Budget, and the Congress. The program is designed to support OCS leasing decisions and to be responsive to the needs of decisionmakers at local, State and Federal levels. That commitment, to be responsive to the needs of decisionmakers, remains a fundamental part of the program.

The evaluation panel proposed that the Bureau devote more of its resources to comprehensive long-term studies of the OCS. The Bureau recognizes the value of long-term research but is not in a position to fund science for science's sake. The studies funded by the Bureau are designed to provide information to support OCS leasing decisions as they appear on the Secretary of the Interior's 5-year leasing schedule. Each study is funded with the expectation that it will

incorporate state-of-the-art techniques and will be carried out by competent and reputable investigators. The Bureau has programmatic and contracting procedures to insure that these expectations are met. The evaluation panel was incorrect in its criticism of the Bureau for not conducting comprehensive long-term research. The panel apparently overlooked the Bureau's support of the Flower Garden Banks Study (7 years), South Atlantic Physical Oceanography Study (5 years), Georges Bank Physical Oceanography Study (4 years), and California Marine Mammal Survey (3 years). All of these long-term studies were carried out under the existing system of establishing study priorities that the evaluation panel so vehemently condemned. The same criteria system consistently supported the orderly development of the Alaska socioeconomics studies program which was applauded by the panel.

The Bureau recognizes that several information needs associated with OCS activities can only be addressed through long-term definitive experiments. The Bureau has available to it the OCS Advisory Board Scientific Committee to assist in the design and review of such studies. That group of scientists will be required to insure that these experiments are relevant to the Bureau's mission, definitive, and generic in their application. The Bureau does not have the resources to conduct comprehensive research programs throughout the United States OCS. The Bureau's recognition of this situation resulted in the development of the ranking criteria which were discussed above. Those criteria, which were developed with the Office of Management and Budget, place a high priority on studies which provide legally-required or critical information to OCS decisionmakers. The criteria also consider the time required to adequately perform a study. The timing criterion supported the long-term studies listed above. This same criterion could support the long-term studies suggested by the panel as long as those studies produced relevant information to OCS decisionmakers.

The evaluation panel was also incorrect in its conclusion that workshops and similar public meetings are not used by the Bureau to assist in the design and evaluation of studies. The Bureau has established six Regional Technical Working Groups to advise it on research priorities for their respective areas and to define the scopes of studies to satisfy identified information needs. In addition, public meetings to discuss the status of on-going and planned studies are convened to insure that the program is satisfying local decisionmaker needs. These meetings generally include local officials and principal investigators. Finally, the Bureau has been an active participant in special workshops and public meetings on issues of generic concern such as endangered whales and drilling muds and fluids.

The panel was also incorrect about the Bureau's process of producing a statement of work for a specific study. The Bureau cannot divulge the contents of a statement of work to any potential bidders before issuance of the Request for Proposal. However, the Bureau welcomes and accepts any comments on the statement of work before issuance of the Request for Proposal. The initiator of the comment will not be informed of the Bureau's use of the suggestion until the procurement is publicly released. This avoids providing unfair competitive advantages to potential bidders.

The entire discussion of contract operations within the Bureau should be eliminated from the review. This was not an agenda item for the evaluation and no contracting official of the Bureau was asked to address the panel. The conclusions presented by the evaluation panel are relevant to the program as it existed prior to 1977. These conclusions are not relevant to the present contracting procedures and the Bureau questions their basis. We believe that the final review would be more appropriate if this discussion were removed.

The Bureau appreciates the evaluation panel's conclusion on publication. The Bureau has always encouraged publication of the results of its studies. However, the Bureau recently recognized that it should assume a more active role in the review, publication and dissemination of studies information. The Bureau is aggressively addressing this issue and will have implemented parts of its program before the end of this fiscal year.

The Bureau of Land Management appreciates this opportunity to respond to the conclusions of the evaluation panel. We trust that our comments will be helpful in preparing the final version of the National Petroleum Review. With the exception of the concerns addressed above, the Bureau concurs with most of the evaluation panel's conclusions. Perhaps the greatest benefit arising from their deliberations will be increased interagency cooperation. If such cooperation results from this effort, the investment will have been very worthwhile.

ADDRESS ONLY THE DIRECTOR,
FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OBS

FEB 12 1981

Memorandum

To: Chairman, Interagency Committee on Ocean Pollution Research, Development and Monitoring

From: Director, U.S. Fish and Wildlife Service

Subject: Evaluation Panel Report - Review of Federal Programs in Environmental Impact Studies of Petroleum in the Marine Environment

As part of our effort to assist you in the preparation of the second Five Year Federal Plan for Ocean Pollution Research, Development, and Monitoring Programs, Fiscal Years 1981 - 1985, we have reviewed the subject panel report dated December 1980. Our general and specific comments are attached. We appreciate this opportunity to provide you with this assistance.

F. Eugene Hester

Attachment

U.S. Fish and Wildlife Service

General Comments

The report is well written, appears to be accurate in most cases (see specific comments below), and many of the recommendations are excellent. While a number of points raised by the panel could benefit from expanded discussion, we recognize that the time constraints under which the panel was operating, the variation in quality of information presented, and the quantity of supporting information received by the panel may have greatly influenced the content and scope of the discussion in the evaluation report.

The U.S. Fish and Wildlife Service was not included in the Agency Reviews section beginning on page 72, although we did provide the panel with a presentation and supporting information. We recommend that the panel prepare a review of the Service's efforts and suggest that this new subsection should include at least the following items for review:

a. Coastal Characterizations
b. Ecological Inventories
c. Coastal Bird Surveys
d. Marine Mammal and Turtle Studies

In addition, as the panel prepares this new subsection the following points should be considered:

1. The mission of the U.S. Fish and Wildlife Service is to provide the Federal leadership to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of people.

2. The U.S. Fish and Wildlife Service has no formal ocean pollution program as defined by the charge to the panel. However, the Service does participate with other Federal agencies such as the Bureau of Land Management and the National Oceanic and Atmospheric Administration in the conduct of their programs when those activities would provide opportunities for improved protection, conservation, or enhancement of estuarine and coastal fish and wildlife resources and their habitats.

Specific Comments

Page 3, last paragraph

We assume that the call for long-term studies on the implications of sublethal effects on marine ecosystems includes those coastal and nearshore habitats identified in the third conclusion on this page. If it does not, we recommend that an additional sentence be added to identify this critical need.

Page 5, Issue 1

The intent of the panel regarding point (1) dealing with research priorities established by agency mission is not clear. Specific examples of resultant waste and duplication of effort should have been cited. Likewise, in point (5) those agencies which have not adequately responded to past constructive criticism should have been identified.

Page 8, Issue 4

The recommendation that an information procurement program complementary to the existing five-year leasing schedule be developed and publicized is excellent.

Page 10, Issue 6

This issue and its recommendations are excellent.

Page 13, Issue 9

We agree that a good socioeconomic research program is needed and that the current activities in this area may be inadequate in some cases. However, we question that the limited funding that BLM has for the environmental studies program should be decreased by additional studies of socioeconomic effects.

Page 14

Coastal and nearshore effects are not mentioned or considered as a separate issue in this section. We believe that this issue is as important as the other issues identified and should have received separate treatment. Evidently, the panel felt coastal and nearshore effects were important, since this issue was the basis for conclusions 1, 3, and 4 on page 3.

Page 16, South Atlantic Studies

The intent of the last sentence in this section dealing with a synthesis effort and management decision making is not clear. For example, when and how was this $4 million worth of information being used in management decision making?

Page 19, Recommendations

We question the rationale for this recommendation, since no wells have been drilled in the South Atlantic in over two years.

Page 20

We suggest the addition of a fourth recommendation calling for the conduct of physical oceanographic studies offshore Louisiana and Texas similar to those conducted for the South Atlantic OCS area.

Page 22, Recommendations

We question the bases for recommendations 1, 2, and 3, other than those which are academic. In addition, we fail to understand the rationale for recommendation 2. Why should emphasis be placed on basic chemical oceanographic studies when funding for other studies which are management oriented is insufficient? Simply because our understanding is limited should not justify this type of study.

Page 29, Research Approaches

On page 29 there is a criticism of the Living Marine Resource study which is being conducted off the Carolinas and Georgia. We question the charge that this study is "inappropriately extensive". Consideration should have been given to the fact that this study is pre-development and that there is a great paucity of detailed information about "live bottoms" in the South Atlantic. We knew such areas existed, were ecologically important, and would be sensitive to perturbation. However, neither the abundance and distributions of "live bottoms" nor the specific composition of associated animals and plants were known. Because all the information generated by this study was solely needed for management decisions (selection of tracts for proposed leasing, development of biological stipulations to protect resources, additional study needs, etc.), we believe the study was not too ambitious. We agree that after the study has progressed to the extent that some of the most pressing management questions can be answered, the study should be modified. This would probably mean focusing on a few representative habitats, as the panel suggested.

Page 30, Use of Information

On page 30 and elsewhere in this report the panel noted that the information generated by BLM's OCS Environmental Studies was not used to the maximum extent possible. We agree.

Page 32, 5.2.1, Rationale

The rationale is a good one.

Page 32, 5.2.2, Comparison of Studies

We question the basis for including Spill Vulnerability Assessments in this section. These studies are not coastal characterizations and should have been treated separately.

Page 33, 5.2.3, Use of Information

We question the validity of the statement that this information lacks necessary details to quantify spill impacts. Habitat maps (1:24,000 scale) provide this detail for quantifying spill impacts on communities. Also available from these characterization efforts are Community Profiles, 1:100,000 scale maps, seagrass and coral reef delineations, and a variety of socioeconomic information.

Page 33, 5.2.5, Recommendations

We recognize that the deficiencies of data bases represent data gaps which, incidentally, are highlighted in characterizations. However, the panel mentions limitations of use and deficiencies of ecological assumptions of coastal characterizations, but does not elaborate on what these are. This section with its cursory treatment of characterizations could have been improved substantially if the panel had expanded its discussion along these lines.

Page 36, 6.4, Recommendations

The recommendations are excellent.

Page 37, 7.2.1, Population Assessments

The criticism of using airplanes and ships of opportunity as platforms for gathering preliminary distribution and abundance data seems severe. Certainly the limitations listed by the panel are true, but proper analyses that consider these limitations should result in worthwhile conclusions. In some cases, the results of such surveys may be more cost effective than more sophisticated studies, especially if only population indices or trends are needed.

Page 38, 7.2.2, Life History Studies

We agree that for some listed species, basic biological studies are needed and that adequate funding could correct this deficiency. However, we wish to correct a misconception noted in this paragraph. The BLM has funded certain biological research for three reasons: (1) pursuant to Section 7 (a)(1) of the Endangered Species Act of 1973, as amended, all Federal agencies have a responsibility to utilize their authorities by carrying out programs for the conservation of Endangered and Threatened species, (2) pursuant to Section 7(a)(2) all Federal agencies are required to insure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of any Endangered or Threatened species, or result in the destruction or adverse modification of the Critical Habitat of such species, and (3) the species for which biological studies were funded by BLM were those which represented priorities for that agency.

Page 39, 7.3.1, Endangered Species Studies

The first sentence is inaccurate. The Endangered Species Act was passed in 1973, and subsequently amended. Also, we believe that the reference to the consultation mandate is more accurately reflected in the Interagency Cooperation Regulations, 50 CFR 402 (1979), than in Section 7 of the Act. The regulations require agencies to consult on any action that may affect (not may adversely affect) Endangered or Threatened species. In regard to "mitigation measures," it is the position of the DOI Solicitor that mitigating the adverse impact of an action which would still jeopardize the continued existence of a listed species cannot be viewed as satisfactory agency compliance with Section 7. We, therefore, recommend that the reference to mitigation be deleted.

The second paragraph of this section is inconsistent. If the panel believes that performance of studies by agencies which also regulate Section 7 (and thus mandate these studies) raises serious questions of conflict of interest, then why did the panel recommend (page 40, 7.4. Recommendations, No. 1) that these same agencies should undertake these studies. That statement needs clarification. The suggestion of conflict of interest by regulatory agencies appears inappropriate. The onus of developing information on impacts of an action on the affected species is on the agency authorizing, funding, or carrying out the particular action. Who that agency chooses to develop that information is determined by that agency.

Page 44, 8.1.5, Recommendations

In keeping with the discussion developed in the Rationale (8.1.1) for this section, we suggest that a fifth recommendation be included here regarding sensitivity indices as follows:

5. Sensitivity indices for coastal regions should be developed using coastal characterization information (Gulf of Mexico only). Indices for frontier OCS areas should be developed during exploration.

Page 48, 8.2.5, Recommendations

While the recommendation is a good one, we question whether the panel had considered a repeat occurrence of an "IXTOC" event during production drilling for inclusion in this section.

Page 51, 8.4.2, Research Approaches

We question the reason for including oil spill assessments in this report as these are not research. Clearly the spill assessment investigations described in the first two paragraphs under this heading belong in the Technology Review report. We, therefore, recommend that they be deleted.

Page 55, 8.5.2, Research Approaches

We question whether, as this section suggests, the real reason that studies of toxic effects of drilling muds have come under criticism is because there have been no demonstrable effects at concentrations approaching those in field discharges.

Page 56

The comments about the proposed study on the biota of the Flower Gardens, which is being planned by NMFS, are certainly accurate. According to the results of numerous studies by BLM and GS (studies done and analyses performed by contractors and by industry) which have cost several hundred thousands of dollars, drilling discharges have not caused observable changes in the Flower Gardens.

Page 75, Second Paragraph

This paragraph adds little to the discussion, and is tantamount to a self-serving endorsement of the NOAA/OCSEA Program.

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

In Reply Refer To:
EGS-Mail Stop 751

FEB 17 1981

Memorandum

To: Chairman, Interagency Committee on Ocean Pollution Research, Development and Monitoring, National Oceanic and Atmospheric Administration

From: Acting Director, Geological Survey

Subject: Additional comments responding to the Evaluation Panel Report: Review of Federal Programs in Environmental Impact Studies of Petroleum in the Marine Environment

We have reviewed the Evaluation Panel Report: Review of Federal Programs in Environmental Impact Studies of Petroleum in the Marine Environment, and we wish to commend the panel for their dedicated effort. Certainly we are pleased with the generally high regard expressed by the panel with Survey programs.

We wish to respond on two issues discussed by the panel that we feel need clarification of policy and of technical content.

In Section II, 4.4, the panel expresses concern that a subdivision of the Department of the Interior (the Geological Survey) not only carries out scientific investigations for BLM, but is also responsible for making recommendations regarding problem areas for investigation, and for advising the Secretary of the Interior regarding the relevance of geological hazards to the leasing of OCS tracts. These many responsibilities of the Geological Survey reflect the high professional regard in which the Survey is held both nationally and internationally. All the tasks described require that the capabilities for highest scientific judgment be within the U.S. Government. We believe that if the panel had included a professional earth scientist, the expressed concern could have been allayed, as implied in Section II, 4.4.

In Section III, 6, the panel, while generally praising the quality of the Survey's programs, declares that our oilspill trajectory modeling program is weak and not useful. We believe that this conclusion reflects some misconceptions and inaccurate information as described in detail in the enclosure.

Hillary A. Oden
for Doyle G. Frederick

Enclosure

GEOLOGICAL SURVEY COMMENTS

Under Issue 3, the panel describes unintended duplication of effort in oilspill trajectory modeling.

The USGS oilspill trajectory analysis (OSTA) model, all NOAA oilspill models, and most other agencies' models, are fully coordinated through the USGS/NOAA Coordinating Committee, Oilspill Modeling Subcommittee. This Subcommittee sponsored a "Workshop on Government Oil Spill Modeling Activities," November 7-9, 1979, Wallops Island, Virginia. Representatives of USGS, NOAA, BLM, NASA, EPA, U.S. Coast Guard, and other agencies were present.

Under Issue 5, the panel states that the generality of the OSTA model makes it impractical for use in specific emergencies.

The OSTA model is a stochastic model designed for use in environmental impact analysis. Real-time models, such as those employed in oilspill emergencies, require substantially different mathematical solution techniques, different software, and different hardware. The many NOAA models designed for the purpose of emergency response are coordinated with USGS to avoid duplication.

Under Section II, 8.1.2, "The (OSTA) model is not as complete as it could be, considering the available data. For example, the model assumes that the spilled oil has essentially no continuous weathering characteristics; it assumes only that at 3 days toxic materials are lost, and that at 30 to 40 days the spill has dissipated. Sufficient laboratory and field data are available on weathering characteristics, and their relationship to oil properties to be included in a useful model."

Present theories and data modeling oil weathering and dispersion are applicable only up to periods of about 4 days. Beyond 4 days, the only relevant parameter is time, which is, in effect, treated in the OSTA model. (See R. B. Wheeler, "The Fate of Petroleum in the Marine Environment," Exxon Production Research Company Special Report, August 1978, for a discussion of weathering and dispersion.) The panel's comments neglect another very important factor in analyzing oilspill weathering and dispersion: the nature of the release over time. USGS and BLM are jointly sponsoring a study of oilspill occurrence probabilities, which will provide additional data about the durations over which historic oilspills have occurred. We believe that modeling weathering and dispersion without considering this phenomenon would be meaningless.

In addition, the panel has presumed that the characteristics of any spilled oil are known. In many areas of the OCS, it is not even known that oil exists, much less what its characteristics are.

Under Section II, 8.1.2, "Furthermore, the variability of currents, winds and so on, necessitates that this model cannot provide accurate prediction."

The OSTA model is designed expressly to study, in a stochastic manner, the variability of the winds and currents. This fact was emphasized in both the oral presentation in Boulder and in three reference documents supplied to the panel.

Under Section III, 6, "The weakest study discussed by USGS seemed to be its oilspill risk analysis modeling program, which did not seem very useful in predicting impacts on the coastal environment under the wide variety of conditions which might occur."

This final statement implies that the panel believes the USGS OSTA model should predict socioeconomic effects after an oilspill reaches the coast. But this is not what our model was designed to do. The OSTA model, however, would be a necessary starting point for any model attempting to predict the socioeconomic impacts of spilled oil.

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

MAR 10 1981

OFFICE OF
RESEARCH AND DEVELOPMENT

Mr. James P. Walsh
Acting Administrator
National Oceanic and Atmospheric
Administration
Department of Commerce
Washington, D.C. 20230

Dear Mr. Walsh:

We have reviewed the COPRDM sponsored report "Review of Federal Programs in Environmental Impact Studies of Petroleum in the Marine Environment" and have found the report responsive to the objectives set forth by the COPRDM "Strategy" document describing the program review. It is our feeling that the Review's Steering Committee has fulfilled its responsibilities and the Evaluation Panel has produced a competent report that will be of value to interagency planning in this research area.

In our review of the Evaluation Panel's report we have kept in mind that irrespective of the degree of competence and dedication of the many active participants in a review of such large scope there will always be some errors or misunderstandings reflected in the conclusions of any outside review panel. We hasten to add that we agree with most of the conclusions and recommendations made in the report but for the purpose of overall program review clarity and utility we feel some comment is necessary on the EPA programs reviewed.

In the report section entitled "Agency Reviews," under the Environmental Protection Agency subheading, is the statement "This, however, is overshadowed by the use of extremely high and unrealistic levels of drilling fluids in many of the present studies." We would like to point out that in research studies of this type it is common to develop data describing the "effect" level of an environmental contaminant. Once the "effect" concentration is determined, it is possible to estimate the range of concentrations where no significant biological perturbation would be expected. The experimentally derived toxicity data used in conjunction with information describing the movement of the discharged drilling fluid (with respect to space and time) can provide an estimate of the degree of risk encountered by marine biota under actual field conditions.

The report also states that "Another factor contributing to the problems in these studies is the difficulty in standardizing a drilling fluid or attempts to provide a 'standard' drilling fluid may not be realistic." The report goes on to say that "A more productive method of conducting these studies would be to conduct field experiments during the actual drilling operation to test for the effects on organisms at different distances and

depths around the platform." We agree that it is difficult to standardize drilling muds for the purpose of developing environmental data, but it is also, probably, the only approach whereby adequate inter-laboratory comparisons can be made of a wide variety of experimental procedures. We also agree on the need for field studies, and are in fact supporting a study examining the impact of drilling muds discharged in the Texas Flower Garden region. We feel strongly however that field studies require an adequate back-up of laboratory based studies. Field studies by their nature provide little information on the mechanisms of toxicological action, and have great difficulty in demonstrating cause-effect relationships (mainly because of the lack of adequate controls) except in those cases where the biota suffer gross effects from a particularly severe environmental insult.

It should be noted that EPA is doing research on the environmental effects of drilling mud discharges as a response to the information needs of Section 403(c) of the Federal Water Pollution Control Act. Section 403(c) requires the issuance of a permit to all dischargers into the marine environment. The essential criteria for issuance of a 403(c) permit is that there shall be no significant harm to the environment from the discharge. The drilling mud research program was initiated following recognition of the lack of environmental information on the fate and effects of drilling muds discharged into the marine environment. Information resulting from the drilling mud research program is currently being used in making 403(c) permit decisions.

The report identifies ten issues and provides recommendations for their resolution. We generally concur with the recommendations for improving the management of this research program. In particular, we endorse the need, identified in Issue 3, to develop a coordinated federal marine petroleum research, development, and monitoring plan. While we recognize that considerable interagency cooperation and planning is occurring in this area, additional improvement is appropriate. We believe that COPRDM could make a positive contribution to interagency planning in the oil/OCS development research area by organizing a formal coordination mechanism.

Among several possibilities are: (1) the National Response Team's Committee on Research and Development is charged with coordinating research related to oil spills. Perhaps COPRDM can work with this Committee, on which most of the same agencies are involved, to arrive at a coordinated approach to oil spill research, or (2) with respect to other aspects of marine petroleum research, such as long-term chronic effects associated with routine offshore drilling and tanker operations, impacts of drilling muds, pipeline corridors, etc, COPRDM could organize a separate and parallel interagency planning group. COPRDM could devise procedures for coalescing and combining the results of both efforts.

Irrespective of specific suggestions for the planning mechanism, we recommend that COPRDM place this question on its agenda for the next interagency meeting and work diligently for an early resolution.

We appreciate having had this opportunity to comment on the Evaluation Panel's report. We look forward to our particpation on COPRDM and the implementation of the report's findings.

Sincerely yours,

Richard M. Dowd

Richard M. Dowd
Acting Assistant Administrator
for Research and Development

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OFFICE OF MARINE POLLUTION ASSESSMENT
Rockville, Maryland 20852 RD/MP1:FC

FEB 6 1981

TO: PP/OP - Paul Lefcourt

FROM RD/MP - William D. Barbee

SUBJECT: NOAA response to Environmental Studies Review

The NOAA Office of Marine Pollution Assessment has compiled the agency response to the Environmental Impact Studies Panel Review. That response is attached.

Composite responses are made to the ten issues and recommendations of Section I, as appropriate. Responses to the issues and recommendations in Sections II and III are in the form of annotations on your Summary of Evaluation Panel Recommendations and generally reflect comments from individual NOAA elements.

Comments were received and considered from the following NOAA elements:

OMPA

The importance of value of the review of Federal programs studying the impact of petroleum in the marine environment and the subsequent report will depend on what effect it has on the future conduct of such programs. As such, this report does not give new insight into what kinds of studies are needed and how they should be conducted. The deficiencies reported by the Evaluation Panel have been previously identified, however the recommendations for correcting these perceived deficiencies are not novel nor do they give any real direction on how to solve these deficiencies.

Oil pollution in the marine environment needs to be put into perspective with other types of marine pollution. The panel's review does not do this nor does it acknowledge the need to do so. Failure to realistically assess the probable extent and seriousness of oil pollution in the marine environment is the main reason for continued controversy about the nature, funding level, duration, and balance of environmental assessment programs related to oil in the marine environment. Also lacking is a convincing argument that significant and measurable long-term effects are likely from OCS oil and gas activities. A recommendation would be for COPRDM to preface this report with the relative ranking of oil pollution as a marine pollution problem referencing the marine pollution needs and priorities section of the second Federal Plan.

The report does acknowledge that oil and gas activities have not resulted in any adverse effects. The report then concludes that long-term ecological effects have not been adequately studied in a quantitative manner.

In summary, issues 1-10 are correctly identified and their recommendations are generally valid. The unanswered question is, how can these recommendations be implemented.

CZM

Among the four conclusions listed on page 3, the second conclusion states that long-term ecological effects have not been adequately studied in a quantitative manner. This call for long-term studies is contradicted on page 11 by a recommendation that public funds not be spent for the assessment of effects of chronic, low-level pollution. CZM supports the original conclusion that more research is needed in this area and suggests that the contradictory language be modified or deleted.

Issues and recommendations

Issue 5, page 9: Why is there no discussion of the role of the OCS Scientific Advisory Committee in the review of marine petroleum research efforts? This omission is unusual considering the composition of the Evaluation Panel.

Issue 8, page 12: CZM concurs with the recommendation to initiate more long-term research efforts on the impact of chronic pollution. However, as noted above, this recommendation directly conflicts with the recommendation on the previous page which should be modified.

Issue 9, page 13: CZM concurs with the conclusions concerning the lack of socioeconomic research and its importance on a comparable level with traditional marine science research.

Topic Review 7: Marine birds, mammals, turtles and endangered species

The research approaches described in the report only discuss the deficiencies of the three approaches listed and offer little guidance on the relative advantages of the different methodologies. The discussion of effects studies is too brief and, for some reason, regresses into a discussion of noise effects with the unsupported conclusion that birds and mammals become habituated to sudden noises. This section should be expanded to reflect the considerable Federal investment in biological ecological effects research and its importance in OCS decision making. Under the "Deficiencies" heading on page 39, the discussion on tagging technology would be more appropriately placed in the earlier discussion of research approaches. In addition, it is incorrect to state that NMFS can "...mandate ... studies they determine are necessary to protect various endangered species." NMFS recommendations for studies are only that and carry no force in law.

Topic Review 9: Socioeconomic Studies

As stated above, this research topic has been badly neglected in the past by the marine science community, including NOAA. As the effectiveness, costs, and benefits of environmental management strategies, both in general and for the oceans specifically, will increasingly be scrutinized, the need for this type of research grows more important. The statements on page 61 that "... research on pollution mitigation strategies should have high priority." and "... there has been a failure on the part of Federal agencies to develop a significant socioeconomic program, and socioeconomic studies of marine pollution have received relatively little attention and support" are significant and valid.

It is important to note that the three studies reviewed by the Evaluation Panel are a very limited sample of existing and/or potential socioeconomic studies related to marine pollution. For example, one need repeatedly implied in this section is for economic damage assessment. For the past two years ORCA has supported and participated in an economic damage assessment of the AMOCO CADIZ oil spill. The results of this project will significantly expand the capability of the Federal Government to assess the economic damages of petroleum in the marine environment, but no mention is made of this study. Other examples could easily be cited.

EDIS

The statement on page 74 that "In some cases, excessive research dollars appears to go into data management instead of research" is questioned. It is impossible to respond to this statement as specific cases where the Panel perceives this to be a problem were not identified. EDIS would like to request that if specific cases do exist,that they be identified, as they would sincerely appreciate the opportunity to improve any facets of this program element.

NMFS

The statements on page 39 that "the National Marine Fisheries Service, for example, can mandate, design, and execute studies that they determine are 'necessary' to protect various endangered species. In the case of marine mammals, to meet legal requirements, BLM has transferred millions of dollars to the NMFS to conduct surveys that NMFS itself determined to be required" and "The performance of studies by agencies which are themselves the Section 7 regulators and which consequently mandate these studies raises serious questions of conflict of interest" are challenged as being incorrect and a misinterpretation of the Endangered Species Act. It should be clarified that NMFS serves a consultative role identifying what information is needed or when insufficient information exists to respond to assessment questions. In this role, NMFS can only recommend studies and has no legal right to mandate, request, or require that the studies be undertaken.

In regards to marine mammal or endangered species research requirements relating to the petroleum programs, NMFS maintains constant dialog to coordinate its studies with BLM. However, BLM is under no obligation to fund studies recommended by NMFS nor do they specifically single NMFS out to be funded when a proposal is submitted.

NMFS would like to request that if the panel has uncovered specific cases of conflict of interest that these cases be explicitly identified so that a response can be made and action taken.

The panel's specific criticism of the Ocean Pulse Program (page 75) is inconsistent with other views expressed by the panel. The panel states that "the least practical of all of these efforts is the monitoring effort taking place in the northeastern United States (Ocean Pulse)". This conclusion is at odds with several other statements throughout the document. The panel notes on page 3 that "the absence of long-term studies on the implications of sub-lethal effects on marine ecosystems underlies much of the controversy..." and points out the inherent difficulty of assessing petroleum pollution. Further on page 11 of the document, the panel asserts that there is great value in establishing "inexpensive programs" to assess variability and abundance and/or pollutant distribution in easily accessible, long-lived populations of coastal organisms. After discussing issues 7 and 8 in detail (pages 11 and 12), the panel referring to issue 7, states "there is value in establishing inexpensive programs to assess variability in abundance and/or pollutant distribution in easily accessible, long-lived populations. In light of the foregoing statement, the panel displays an inconsistent view in its recommendation to discourage baseline and monitoring chronic low-level pollution effects on open water marine environments. Perhaps a clarification of "inexpensive" would resolve this apparent inconsistent finding. In Issue 8, the panel recommends that an assessment be made of petroleum-related changes in the organisms, populations, and communities present in historical petroleum areas.

The proposed study by the Southeast Fisheries Center's (SEFC) Galveston Laboratory on the effects of drilling fluids on the coral reef ecosystem of the Flower Garden Banks (page 56 of the Report) has garnered support and long-term funding from the U.S. Environmental Protection Agency (EPA) on a reimburseable basis. This project is an integral part of NOAA's energy and environment research program and is closely coordinated with related research conducted by NOAA/AOML, EPA, and the U.S. Department of the Interior's Bureau of Land Management (BLM) and the the U.S. Fish and Wildlife Service (USF&WS). Benthic fauna are especially well-suited for the study of the effects of drilling fluids produced by offshore petroleum activities because of their sensitivity to such additions. Reef fishes constitute a significant portion of the economically important species managed by the NOAA/NMFS Regional Fishery Management Councils. Research in the SEFC on the effects of petroleum activities on the species managed through Fishery Management Plans is crucial in the support, implementation and success of these plans. Currently there is no information available on the effects of drilling

platforms in close proximity to coral reefs. Given the current level of drilling activity at Mobil Platform 5950, located closest to the natural reef, the need for the proposed study is undeniable. This research has both short- and long-term benefits to NOAA, BLM, EPA and the F&WS.

NOAA Response to Section I Issues

In summary, the ten issues identified by the panel are appropriate and their recommendations are generally valid. However, all of these issues have been recognized previously, and recommendations similar to the panel's have been made before. It is important to ask how new policy might be formulated to effect the overall sense of the panel's recommendations.

The panel's report does not establish a context from which to assess the significance of petroleum pollution in the marine environment. Rather the significance of the issue is accepted as axiomatic. The importance relative to other activities of petroleum and related offshore activities as causes of marine pollution is a critical question that the panel might well have addressed.

The issues:

1. "The Federal Plan for Marine Petroleum Pollution Research, Development, and Monitoring should be developed with input from and continuing evaluation by non-Federal experts fully informed about current Federal OCS activities".

   The need for broad, informed participation in the formulation and development of Federal environmental programs is well recognized. Extensive examples can be shown of efforts to involve non-Federal experts in planning marine petroleum pollution research. However, non-Federal participation often must be balanced against agencies' requirements to address mandated program objectives. (e.g. BLM must respond to NEPA requirements for environmental impact statements).

2. "Revise procurement and interagency transfer procedures to provide the timely and project-duration support similar to that usually achieved by such agencies as National Science Foundation (NSF), Office of Naval Research (ONR), Department of Energy (DOE), and the National Oceanic and Atmospheric Administration's (NOAA) Sea Grant Program, with long-established histories of effective procurement of information about the marine environment."

   The panel should recognize real and important differences between program directed activities such as the marine petroleum pollution research funding supported principally by BLM and the NSF and other activities that they have endorsed. Program relevance would continue to be a criterion for evaluation and thus for funding continuation of projects in marine petroleum pollution. Further, funding levels will continue to be dependent on externaly-controlled overall funding levels.

3. "The development of a coordinated Federal marine petroleum pollution research, development, and monitoring plan should be used to improve interagency coordination."

This recommendation is obviously valid. However, it should be noted that bi-lateral and multi-lateral interagency agreements (e.g. the BLM/NOAA Basic Agreement concerning OCS environmental studies in Alaska) have been among the most effective instruments for achieving coordination. Such agreements should be encouraged along with development of the Federal Plan.

4. "BLM should retain managerial control of the OCS Environmental Studies Program, but should appoint a high-ranking (GS 15 or above) scientist to direct the Washington office, and GS 15-level scientists to direct the regional scientific programs. Together, these scientists and their staffs, along with input from the existing advisory groups, should develop and publicize a five-year information procurement program complementary to its existing five-year leasing schedule. The information procurement program should be updated with the same frequency as the leasing schedule."

NOAA will not comment on what is essentailly a BLM issue except to observe that the panel, after identifying a basic issue, has advanced a recommendation that addresses symptoms, not the issue and is overly specific.

5. "Improved planning and scientific review of Federal efforts in marine petroleum pollution research should be required by the National Marine Pollution Program Office."

As in issue and recommentation 3, in many instances planning and scientific review can best be addressed within individual programs or in the context of individual interagency agreements.

6. "A specific program should be initiated for determination of data adequacy and for regular integration, synthesis, interpretation, and presentation of environmental data needed for informed decision making by resource managers."

NOAA agrees. The elements identified have been explicit efforts in OCSEAP since that program's inception.

7. "Baseline and monitoring approaches to assessment of effects of chronic low-level pollution on open-water marine environments should be discouraged and, if proposed, should be supported only after a most rigorous scientific review."

No comment.

8. "Research to assess the environmental impact of long-term, low-level addition of petroleum pollutants should be initiated promptly."

This recommendation should not be considered within the limited set of Federal programs examined by the panel. Note that other parts of the Federal marine pollution program (e.g. Section 202 LREP) are to some degree, relevant to this recommendation.

9. "A meaningful and rigorously enhanced socioeconomic research program with a focused strategy should be developed as part of the Federal marine petroleum pollution research, development, and monitoring plan."

See comments from NOAA/CZM/ORCA.

10. "Funding for the Federal marine pollution research activities should not be allowed to be found shortsightedly inadequate; the urgent need to develop the nation's OCS petroleum resources responsibly dictates that the scientific research be done well so as to expedite credible and defensible resource management decision."

No comment.

EVALUATION PANEL REPORT:

REVIEW OF FEDERAL PROGRAMS IN TECHNOLOGY FOR

OIL & HAZARDOUS MATERIALS SPILL PREVENTION, CONTROL AND CLEANUP

Conducted by: The National Response Team
Subcommittee for Research & Development

Conducted for: Interagency Committee for Ocean Pollution,
Research, Development and Monitoring

September 20, 1980

National Marine Pollution Program Office

National Oceanic and Atmospheric Administration

NATIONAL RESPONSE TEAM

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TECHNOLOGY FOR OIL AND HAZARDOUS MATERIALS SPILL PREVENTION, CONTROL AND CLEANUP

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EXECUTIVE SUMMARY

Pursuant to P.L. 95-273 (National Ocean Pollution, Research, Development, and Monitoring Planning Act), requiring the Federal Government to develop a Plan for marine pollution research, the National Response Team (NRT) conducted a program review of Federally funded technology research and development programs dealing with oil and hazardous materials spill response in the marine environment. Included in this review were applied research programs funded by the U.S. Coast Guard, Environmental Protection Agency, Department of Energy, U.S. Navy, National Oceanic and Atmospheric Administration, U.S. Geological Survey and U.S. Fish and Wildlife Service. The purpose of this technological program review was to provide a comprehensive assessment and status report of the Federal Government's capabilities, strengths, and weaknesses with regard to this particular aspect of ocean pollution as it affects relevant jurisdictions of the United States.

Mechanically, this review was conducted by the NRT by forming an evaluation panel of experts from line operational government agencies, industry and academia. This invited evaluation panel held a four day series of site presentations by program managers representing appropriate government agencies. As a result of this review, the evaluation panel prepared a series of comments and recommendations which it feels highlights the present status of Federal priorities and programmatic direction with respect to applied problem solving research and development on oil and hazardous materials spill response. The following items represent the summary comments and recommendations to the NRT by the evaluation panel:

- Current program emphasis and direction by the representative government agencies recognizes the growing national needs; however, the panel feels that existing appropriated resources will not allow for evolving requirements.

- The present balance of programmatic efforts between oil-related and hazardous materials research (having shifted more toward hazardous materials in recent years) appears adequate and should be maintained.

- Current levels of funding and personnel are far too low compared to the magnitude of program responsibility and individual agency mandates, especially with EPA.

- The ability and mechanism to transfer results of technological research and development to the user, although occurring, needs expanding and stronger communication and liaison is required between the research community, the operating agencies, and the "user" community.

- The concept and implementation of the interagency OHMSETT effort is highly commendable and should be considered in the future for cold weather testing and hazardous materials R&D.

- There are several non-R&D items which appear to seriously impair the successful fulfillment of existing programs, thus affecting the overall effectiveness of technological research. These include:

    - current restrictions placed on travel by Federal employees involved in field research and development activities

    - federal permits and procedural bureaucracy required for field experimentations and testing; i.e., controlled experimental spills, "spill of opportunity," and dispersants research

    - coordination and communication of safety, training and educational exercises regarding pollution research

The evaluation panel is thankful for the opportunity to participate in this program review of current marine pollution technology and the organizational efforts on behalf of the National Marine Pollution Program Office. The ultimate success of this review will lie in the governmental reorganization of priorities to accommodate greater emphasis on this critical aspect of problem solving marine pollution research and development.

BACKGROUND FOR TECHNOLOGY PROGRAM REVIEW

The National Ocean Pollution Research, Development, and Monitoring and Planning Act of 1978 (P.L. 95-273) mandates that the Federal Government develop a comprehensive Plan containing a statement of national needs and problems related to ocean pollution; an assessment of the priority with which ocean pollution studies should be undertaken to meet these needs and solve such problems, and analyze the extent to which existing and planned Federal programs assist in meeting identified priorities. The Act also mandates that the Plan contain recommendations for programmatic reorientation and changes in the Federal effort, as necessary, to better address priority needs and problems. To prepare this Federal Plan, the National Oceanic and Atmospheric Administration (NOAA) has been designated as the lead agency. Assisting the NOAA administrator in carrying out his responsibility under the Act, the President's Science Advisor chartered the Interagency Committee on Ocean Pollution Research, Development, and Monitoring (COPRDM), as a standing committee of the Federal Coordinating Council for Science, Engineering and Technology.

Because oil and hazardous materials fate, effects and technological activities comprise a significant percentage of the total Federal marine pollution research budget, COPRDM requested that the National Response Team (NRT) conduct a program review of relevant technological research and development for inclusion in the current Federal Plan. This program review of Federally sponsored research and development on oil and hazardous materials spill prevention, control and cleanup technology was undertaken by the NRT by forming an evaluation

panel of experts from industry, academia and government and holding a series of individual agency program summary presentations in Washington, D.C. and Edison, N.J. during the week of June 16, 1980.

The NRT, operating under mandates of the National Contingency Plan, has the responsibility to establish and maintain a research and development committee to identify, provide and exchange information regarding Federal and other research related to oil and hazardous materials spills. In addition, it is the responsibility of the NRT to undertake planning and preparedness exercises by continually reviewing spill response plans with evaluations of technology and equipment readiness. The NRT is also responsible for identification and recommendation of strategies and techniques for spill response research, development and demonstration projects.

For purposes of this portion of the Federal program review, identification, organization and presentation of existing and planned research by participating government agencies was restricted to those activities related to application of scientific and engineering efforts dealing directly with the Federal Government's ability to respond to marine spill situations. As a result, several agencies involved in this program review, while they play a larger role in the overall Federal marine pollution program contribute only a small share to applied technology.

Applied technological research and development dealing with oil and hazardous materials spills in the marine environment, comprising less than 5% of the total Federal marine pollution program research budget, consists primarily of the programs carried out by the U.S. Coast Guard and Environmental Protection Agency (EPA). Of the $66 million dollars spent on oil pollution

research in 1978, less than 8% was spent on technology. The programs of both agencies are oriented toward research regarding prevention techniques and strategies, detection and identification (by source) of oil and hazardous materials in water and development and implementation of spill control and cleanup hardware. Also included is research directed at development of methodologies for mitigating damages from spills. In addition to Coast Guard and EPA funded efforts, the U.S. Navy conducts studies related to oil pollution control from shipping; the Department of Energy (DOE) is funding studies dealing with oil spill cleanup and mitigation alternatives; NOAA is sponsoring spill trajectory and predictive response efforts; U.S. Fish & Wildlife Service has been evaluating techniques for habitat restoration of spill affected environs and the U.S. Geological Survey is currently conducting studies related to offshore platforms and "down hole" technology.

The overall goals of this program review were to compare the objectives and direction of current oil and hazardous materials spill response technology research with identified national needs in the area; to assess the extent to which these efforts satisfy national priority needs, and to formulate recommendations for necessary changes.

To accomplish these goals during the review sessions three specific objectives were identified for the technology evaluation panel. These included:

1. Assessment of program emphasis and direction with identification of areas requiring greater or less attention.

2. Identification of specific opportunities for liaison and cooperative efforts with industry, and other non-Federal entities, including foreign governments.

3. Evaluation of the suitability of technological program resources comparing resources provided to required.

Structurally, these objectives were further broken down into a procedural framework which shaped the basic format for individual program evaluations. The following evaluation format was provided to both agency participants and evaluation panel members, in advance, in an effort to coordinate the presentations and provide a common basis for evaluation.

1. History of the research including legislative mandates.
2. Organization of the program, identifying specific research areas.
3. Distribution of program resources highlighting funding levels and personnel commitments.
4. Definition of problems requiring research.
5. Identification of the users and solutions for the problems studied.
6. Description of current state-of-the-art technology.
7. Identification of research conducted by others.
8. Identification of alternative research options.
9. Description of the status of current research programs.
   a. past efforts in terms of deliverables, accomplishments and cost to benefit ratio.
   b. present efforts identifying milestones and expected outputs.
   c. future efforts with regard to direction, goals and implementation schedules.

PROGRAMS REVIEWED

At the invitation of the NRT's research committee a panel of individuals with an operational knowledge of current technology and requirements pertaining to oil and hazardous materials spill response conducted a one week program review. Participating Federal agencies in this review included:

U.S. Coast Guard
Environmental Technology Branch
Washington, D.C.

Environmental Protection Agency
Oil & Hazardous Materials Spills Branch
Edison, NJ

National Oceanic and Atmospheric Administration
Hazardous Materials Response Project
Boulder, Colorado

U.S. Department of Energy
Environmental and Safety Engineering Division
Washington, D.C.

U.S. Navy
Naval Sea System Command
Supervisor of Salvage Operations
Washington, D.C.

U.S. Geological Survey
Conservation Division
Reston, Virginia

U.S. Fish & Wildlife Service
Ecological Services Division
Washington, D.C.

Program information summaries were made available to the evaluation panel prior to the review, along with a program guidance package. The following are encapsulated descriptions of the Federal technology programs reviewed by the evaluation panel.

U.S. COAST GUARD, ENVIRONMENTAL TECHNOLOGY BRANCH

The Coast Guard has the primary regulatory and operational responsibility for safe construction and maintenance of U.S. flag vessels, safe movement of all vessels on the navigable waters of the U.S. and adjacent high seas, and the quality of the marine environment as it is affected by the transport of oil and hazardous materials within U.S. port areas and waterways. Under legislative mandates, the USCG is responsible for preventing pollution from oil and hazardous substances and for mitigating discharges of these materials

into the coastal zone, ports and harbors, the Great Lakes or the outer continental shelf. The principal program areas within the USCG which support research and development dealing with the technology of ocean pollution and monitoring include Marine Environmental Protection, Commercial Vessel Safety and Port Safety and Security. Within the Environmental Technology Branch, 12 full-time professionals and approximately 24 part-time R&D Center staff conduct and administrate nearly 2.5 million dollars worth of applied research and development projects annually in three specific areas:

Oil Spill Cleanup Research

1. Open Ocean Pollution Response
2. Multi-Agency OHMSETT Tests
3. Cold Weather Pollution Response
4. Natural Dispersion of Oil Slicks
5. Prevention and Reduction of Spills
6. Recovery Device: Oil/Water Separator
7. Oil Spill Dispersant System Development
8. Oil Slick Burning and Flaring
9. Fast Current Oil Removal

Hazardous Chemical Discharge Amelioration

1. Personnel Protection
2. Sampling, Chemical Classification and Quantification
3. Prevention and Reduction
4. Hazard Assessment Modeling
5. Disposal
6. Containment, Treatment and Recovery

Surveillance

1. Pollution Identification and Sampling

ENVIRONMENTAL PROTECTION AGENCY, OIL & HAZARDOUS MATERIALS SPILLS BRANCH

The objectives of the EPA program are to develop, evaluate and demonstrate new or improved equipment, devices and systems for the prevention, detection, containment, control, removal and cleanup of spills or acute releases

of oil and hazardous polluting substances. The development of this hardware oriented technology is carried out beyond the prototype stage to the point where it is ready for field implementation by commercial users. Techniques are also being defined for the redevelopment and restoration of environs damaged as a result of spills and methodologies identified to mitigate effects of discharges. The program is responsible for demonstrating the technology for protecting the water, land and air milieu from accidental releases of oil and hazardous substances and to identify environmentally sound methods for disposal of contaminated wastes associated with cleanup operations. Another critical goal is to assess, prevent, control and abate environmental damages resulting from new, active and inactive offshore and onshore oil and gas production facilities.

Operating with a staff of 13 permanent people and an extramural budget of approximately 1.7 million dollars in FY80, the following programs are undertaken:

Oil Programs

1. Control and Cleanup
2. Shoreline Protection and Restoration
3. Prevention
4. Oil and Gas Production

Hazardous Materials Programs

1. Information Transfer and Processing
2. Prevention
3. Pre-Response Planning
4. Safety
5. Situation Assessment and Analytical Support
6. Containment and Confinement
7. Concentration and Separation
8. Ultimate Disposal
9. Restoration

U.S. DEPARTMENT OF ENERGY, DIVISION OF ENVIRONMENTAL AND SAFETY ENGINEERING

DOE is authorized and directed to establish program elements and activities to improve methods for prevention and cleanup of marine oil spills. As a consequence, DOE's Environmental and Safety Engineering Division supports assessments in areas not already adequately covered by the EPA, USCG, or other public and private efforts. Presently, these efforts are focused on spill control through the use of chemical dispersants and cleanup by innovative mechanical means. DOE's role relates to the safe movement of energy suplies. The agency makes preliminary investigation into the feasibility of proposed techniques and then confers with EPA and/or USCG on those techniques that have promise. Operating with a staff of two, funding is at a level of $200,000 - $300,000 per year.

Oil Programs

1. Spreading, Retention and Cleanup of Oil Spills
2. Assessment of Treated vs. Untreated Oil Spills
3. Combustion: An Oil Spill Mitigation Tool
4. Performance Testing of Three Offshore Skimming Devices (OHMSETT)

U.S. GEOLOGICAL SURVEY, CONSERVATION DIVISION

The USGS is charged with responsibility for classification of the public lands and examination of the geological structure, mineral resources and products of the national domain. Offshore oil and gas exploration and exploitation of the Outer Continental Shelf expands the Survey's responsibilities for assuring safe, pollution-free operations. These responsibilities further delineate internal guidelines including a research program as an integral part of its marine oil and gas operations. The USGS OCS program assesses R&D conducted by academia, industry and government and contracts for studies that offer

further assurances for improving safety and preventing pollution. For management coordination, the Survey's research programs are divided into three sections: structures and pipelines, well control, and environmental concerns.

NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

Federal mandates assign NOAA several responsibilities for spills which occur in the coastal zone, Great Lakes, and open ocean out to the 200 mile limit. NOAA initiated the Hazardous Materials Response Project in 1979 to coordinate its spill response activities. Working with a staff of six, NOAA spends approximately $800,000 annually for this program, which primarily focuses on:

1. Scientific Support Coordinator
2. Contingency Planning for Spills

Program Review Format

Organizational implementation of the technology program review involved four days of summary presentations by appropriate program managers from the responsible divisions of the participating Federal agencies. Presentations by the respective agency representatives were reviewed by the evaluation panel in the context of the objectives and format set forth by the NRT research committee. During these presentations, and afterwards, the evaluation panel met and prepared a series of comments and recommendations. The results of this program review are contained in subsequent report sections identified as Evaluation Panel Comments and Recommendations to the NRT. The following agenda highlights the basis for this technology program review.

EVALUATION PANEL COMMENTS

The opinions and comments by this evaluation panel are based on the material as presented during the program review.* The panel further acknowledges that comments resulting from this exercise reflect only those oil and hazardous material-related, mission-oriented aspects of the individual agencies involved and not their total research programs. Appearances of ranking accomplishment and/or program deficiencies are intended to enumerate and qualify the overall Federal Government's objectives and should not be interpreted as a valuation of one agency at the expense of another. The panel recognizes the justifiably proportional differences in mandates and achievement by the individual agencies dealing with the technology of oil and hazardous material spills. The perspectives which the panel wishes to reflect by its comments on this technology program underlies the user orientation of applied research and that expertise involved with commercial implementation of prevention, control and cleanup measures resulting from these government funded efforts.

The formulation of comments by the evaluation panel for this program are divided into three parts: categorical and specific comments (project by project), generalized observations and comments and identifiable program omissions. The basis for comparing and evaluating individual agency programs, involved the development (by the evaluation panel) of a calibration matrix allowing for standardized ranking of programmatic efforts. Bearing in mind the NRT's

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*As an aside remark, the committee must note that each agency had to discuss several years of work, millions of dollars of effort and numerous projects in a very short time period.

objectives and structural format, three key areas were considered during the evaluation process. These reviews focused on: 1) program desirability in relation to the total Federal mandate, 2) scope of technological activities as it pertains to the ability for accomplishment, and 3) funding in terms of internal agency support and extramural resources to achieve the desired objectives. A scale of 1 to 3 was used to rank each program summary, thus forming an evaluation matrix identifying a prioritized index for the Federal oil and hazardous material technology effort. For each of the three evaluation areas the panel used the following scale:

- DESIRABILITY:
  1) highly desirable activity
  2) adequate relationship to Federal mandate
  3) least desirable function
- SCOPE:
  1) narrow, mission-oriented approach
  2) adequate approach
  3) program too broad to accomplish objectives
  4) program redirection required
- FUNDING:
  1) resources limiting accomplishment of objectives
  2) funding adequate to achieve objectives
  3) resources too broad based; require some reorganization and redirection

Each panelist completed a program assessment on each of the technical presentations and results are given as the average value of ten individual reviewers. In addition to the matrix value, the consensus of specific comments by the panelists is included as a categorical comment.

Categorical comments:

The results of the technology program review are presented in the two following tables. The first table (1) shows the average values, by agency, as their contributions to the overall Federal technology objectives. In the

second table (2) individual program presentations were reviewed and the evaluation panelists' average values presented. In addition to the scaled evaluation matrix, panelists reported specific comments about each program. The consensus of the comments follow the matrix table.

Specific comments raised during the program review include the following:

USCG: Environmental Technology Branch

#5. Arctic and cold regions;
- More cooperation should be encouraged with Canadian Arctic programs.
- This program should be expanded, even at the expense of others.

#8. TSC Hazardous Materials Study
- Coast Guard should communicate more with EPA and industry before making decisions on direction.

#12. Control/Treatment/Recovery
- Liaison between USCG and EPA should continue in this area; USCG should deal with the offshore regions and EPA address nearshore environment.

#13. Disposal
- Oil testing should be coordinated more closely with Canadian programs.
- Increased emphasis should be placed on disposal methods.

NOAA: Hazardous Materials Response Project

- There should be more direct coordination between NOAA and other spill response agencies.

- Spill modeling efforts should be coordinated with the USCG HACS and EPA modeling efforts.

- Environmental vulnerability index mapping appears to duplicate other agency efforts.

- NOAA should assign its scientific support coordinators back to field and regional locations.

(continued on Page 21)

TECHNOLOGY PROGRAM REVIEW

EVALUATION PANEL's PROGRAM ASSESSMENT MATRIX

TABLE 1

Overall Agency Evaluation

Agency	Desirability*	Scope*	Funding*
USCG	1.4	2.0	1.6
EPA	1.4	2.0	1.6
NOAA	1.6	2.5	2.1
U.S. NAVY	1.9	2.0	1.9
USGS	2.0	2.2	2.2
USFWS	2.0	3.0	2.0
DOE	2.0	3.0	3.0

RATING LEGEND

Desirability

1. Highly desirable activity
2. Adequate relationship to Federal mandate
3. Lease desirable function

Scope

1. Narrow, mission-oriented approach
2. Adequate approach
3. Program too broad to accomplish objectives
4. Program redirection required

Funding

1. Resources limiting accomplishment of objectives
2. Funding adequate to achieve objectives
3. Resources too broad based; require some reorganization and redirection

*Please note that the rating scales are completely independent and ratings should not be compared across factors.

TECHNOLOGY PROGRAM REVIEW

EVALUATION PANEL's PROGRAM ASSESSMENT MATRIX

TABLE 2

Item	Speaker	Desirability*	Scope*	Funding*
USCG; Environmental Technology Branch**				
1. Surveillance	Lcdr. White	1.3	1.8	1.7
2. Dispersion & Fate	Dr. McKindra	1.8	2.4	1.7
3. T.S.C. Dispersant Study	Lcdr. Jurgens	1.1	2.0	1.1
4. Protected Water Skimmer	Mr. Goldman	1.8	2.0	2.1
5. Arctic & Cold Regions	Dr. McKindra	1.2	1.8	1.1
6. Burning/Flaring	Mr. Goldman	1.9	2.1	1.5
7. Fast Current Oil Recovery	Cdr. Leigh	1.7	2.0	1.9
8. T.S.C. Haz. Matl. Study	Lt. Tobbe	1.4	2.3	1.8
9. Haz. Assess. Comp. Syst.	Dr. Parnarouskis	1.6	2.1	1.5
10. Prevention	Mr. Sinclair	1.2	1.8	1.3
11. Personnel Protection	Lt. Rome	1.0	1.9	1.7
12. Containment, Treat., Rec.	Mr. Sinclair	1.2	2.0	1.5
13. Disposal	Mr. Sinclair	1.4	2.2	1.8
14. Samp./Chem. Classif./Quant.	Dr. Bentz	1.1	2.0	1.4
NOAA; Haz. Matls. Response	Mr. Robinson	1.6	2.5	2.1
DOE; Env. and Safety Engineering	Dr. Walter	2.8	3.2	3.0
US Navy: Sea Systm. Com.	Mr. Hayes	1.9	2.0	1.9
USGS; Conservation Div.	Dr. Gregory	2.0	2.2	2.2
US Fish & Wild. Ser.	Mr. Brown	2.0	3.0	2.0
EPA; Oil and Hazardous Materials Spills Branch				
1. Detection Equipment	U. Frank	1.8	2.0	1.9
2. Hardware Development	R. Griffiths	1.3	1.8	1.5
3. OHMSETT	R. Griffiths	1.0	1.4	1.1
4. Sorbents	L. McCarthy	2.0	2.1	2.1
5. Gels	U. Frank	1.7	1.9	1.9
6. Cold Climate Techniques	L. McCarthy	1.5	1.9	1.5
7. Disposal	J. Farlow	1.3	1.7	1.2
8. Dispersants	L. McCarthy	1.1	1.3	1.1
9. Shoreline Protection	L. McCarthy	2.0	2.0	2.0
10. Prevention (oil)	J. Yezzi	1.7	1.7	1.7
11. Oil & Gas Production	J. Farlow	1.7	2.7	2.0
12. Haz. Matl. Info. Transfer	F. Freestone	1.3	2.1	1.1
13. Prevention (haz. matl)	J. Brugger	1.3	2.3	1.6
14. Pre-Response	J. Yezzi	1.5	1.9	1.1
15. Safety	M. Royer	1.3	1.9	2.1
16. Situation Assessment	M. Royer	1.4	2.2	1.7
17. Containment & Confinement	J. Yezzi	1.1	2.1	1.4
18. Separation & Concentration	F. Freestone	1.2	2.3	1.4
19. Ultimate Disposal	J. Brugger	1.0	1.8	1.0
20. Restoration	J. Brugger	1.9	2.0	1.9
21. Aerial Surveillance	P. Lefcourt	1.2	2.1	1.6
22. Chemistry Support	M. Gruenfeld	1.3	2.0	1.6

**The Evaluation Panel apologizes for the inadvertent omission of the ratings on "Oil/Ocean Oriented Projects" and "Open Ocean Pollution Response".

RATING LEGEND

Desirability

1. Highly desirable activity
2. Adequate relationship to Federal mandate
3. Lease desirable function

Scope

1. Narrow, mission-oriented approach
2. Adequate approach
3. Program too broad to accomplish objectives
4. Program redirection required

Funding

1. Resources limiting accomplishment of objectives
2. Funding adequate to achieve objectives
3. Resources too broad based; require some reorganization and redirection

*Please note that the rating scales are completely independent and ratings should not be compared across factors.

DOE: Environmental and Safety Engineering Division

- Work being done is good but the panel questions whether specific projects should not be placed within other mission-oriented agencies.

US NAVY: Sea Systems Command

- Provides excellent support of the National Contingency Plan through judicious use of operational and research funds.

USGS: Conservation Division

- USGS involvement should be strengthened through a more direct participation in the NRT.
- The US record in drilling on the OCS does not support development of the "sombrero" device for oil recapture. If a major spill did occur for an exploratory well blowout, deployment would most probably be prevented by the burning rig collapsing around the well. The reason the "sombrero" appeared useful in the Gulf of Mexico was the collapse, suprisingly and fortunately, did not occur.

USFWS: Ecological Services Division

- While USFWS efforts in spill response are in accordance with the National Contingency Plan, little effort is directed toward the technology of spill response; most of their work is now in habitat mapping; some efforts should be directed at applied technology of habitat restoration after cleanup of a spill.

EPA: Oil and Hazardous Materials Spills Branch

#5 GELS
- Panel questions the economics of implementation of these efforts

#7 Disposal
- EPA must coordinate disposal strategies with states and even local government groups

#8 Dispersants
- Encourage EPA to carry dispersant research to completion so that data exists to make valid judgements for implementation
- May require more communication with foreign operators where dispersants are widely used

#11 Oil and Gas Production
- EPA should evaluate their work in this area critically in view of their overall mission; it might be wise to redirect efforts

#12 Haz. Matl. Information Transfer
- Must get reports of research to the "user" community; perhaps a stronger role for USCG/EPA liaison

#13 Prevention (haz. materials)
- EPA should direct its efforts in prevention towards new and innovative techniques and not simply evaluate off-the-shelf devices

#15 Safety
- Given major efforts and success by USCG in safety suit development, further work in this area ought to be done by them

#16 Situation Assessment
- EPA should seriously consider not proceeding with remotely operated vehicles; their utility is questioned; moreover, their ultimate cost would preclude significant use; remainder of program is good

#17 Containment and Confinement
- EPA must coordinate more with field units and industry; results must be operational in field situations

General Comments:

Generally, the Federal R&D effort dealing with marine oil and hazardous material spills reflects a high caliber of agency organization; contract management is good, and government staff display an intellectual and enthusiastic approach. The Coast Guard and EPA have especially well organized operations and each is meeting its respective mission objectives. All of the Federal agencies reviewed appear to recognize their individual role in the overall Federal plan, and, for the most part, identify the relationship between "state-of-the-art" and developmental implementation of research efforts. While the USCG and EPA have the leading role in these marine technology programs, the ultimate solutions to many present pollution problems will result by maximizing cooperative use of multi-agency resources. No single entity can completely solve these complex problems. Interdisciplinary communication and coordination of R&D must circumvent narrow, agency-identified

jurisdictions. Mission-oriented projects should be approached by pooling the respective technical resources of the participating Federal entities. The evaluation panel feels that the precedent for this has already been set by the organization and operation of the OHMSETT interagency test committee (OITC) at the OHMSETT facility. This is a highly commendable effort. Through continued and expanded cooperative interagency efforts, problem solving, testing and developmental programs can accomplish the desired goals in a cost-effective manner.

While cooperative interagency R&D efforts may result in the consolidation of some resources, the panel feels strongly that the total Federal allocation for applied technology support for oil and hazardous materials spill research is far too low compared to the magnitude of program responsibility and individual agency mandates. The panel feels that this is particularly true in the case of EPA, where it appears that less than 0.5% of the EPA research budget is devoted to oil and hazardous material spill technology. Funding for EPA's oil spills program has been on a steady decline the past several years. Though EPA's hazardous spills program has been level funded, increased operating costs have resulted in a net decrease in available resources. EPA especially needs a significant increase in funds to cope with their expanding mandate in hazardous materials handling.

In the context of the total technology program review, the panel feels that current Federal program emphasis and direction by the representative government agencies recognizes growing national needs but that existing and planned resources do not realistically reflect evolving present and future requirements.

Some re-direction within the Federal plan is required to make spills R&D commensurate with the increasing magnitude and complexity of oil and hazardous materials problems. The panel feels that the balance of Federal technology program efforts between oil and hazardous materials research appears adequate and dedication of resources should be maintained in accordance with realistic operational costs accounting for increases caused by inflation.

One element which the evaluation panel found lacking in much of the technology R&D was the ability to adequately transfer research results to the user in a fashion which would allow a genuine developmental implementation. While many research programs are well articulated, and have led to commercialization, i.e., EPA's field detection kit and its mobile physical/chemical treatment systems, the ability to successfully reproduce and demonstrate results under real conditions in a cost-effective manner is not always considered, and even with the above mentioned successes, more can be done. Also, direct liaison between government and industry research activities should be strengthened through judicious collaboration and cooperative "in the field" experimentation.

Throughout the technology review, the evaluation panel observed several situations where circumstances appear to impair or indirectly affect the successful accomplishment of research objectives. Present government restrictions on travel for Federal personnel seriously limit the effectiveness of topical conference workshop communications, as well as field experimentation. Agency policy and direction suffer seriously when management receives research results second and third hand.

There is a problem with lengths of time and costs in obtaining permits to conduct field experiments requiring a test discharge of oil or hazardous materials. Coast Guard, EPA and industry representatives indicate this problem is frustrating research efforts. There can be two types of EPA issued permits involved; exercises to take place seaward of the "baseline" and those activities inland of the "baseline." For seaward exercises, the testing agency must apply to EPA Headquarters for an Ocean Dumping Permit and for inland tests appropriate Regional EPA Administrators must issue a discharge permit required by 40 CFR 110.8. Ocean Dumping Permits are expensive, (costing as much as 30% of the entire test budget) and may take a half year or more to obtain. While blanket waiver by EPA would not be considered prudent or practical for international reasons, the evaluation panel feels it reasonable to suggest that EPA develop a faster procedure to expedite such permit requests. Perhaps annually EPA could issue advance permits to an interagency body such as the NRT R&D Committee or the OHMSETT Interagency Test Committee for further issuance to themselves or others for the sole purpose of research. A single hearing could then be held in EPA Headquarters for this "block" of permits, thus cutting issuance time to a matter of weeks.

A final comment which the evaluation panel made during the technology program review was the need to communicate, coordinate and standardize essential safety training and educational exercises regarding the proper conduct of oil and hazardous materials pollution research. Failure to take necessary precautionary measures during research will only delay solutions to these problems being investigated and could thwart the primary thrust of R&D efforts.

Technology research program gaps:

Based on the technology program presentations by the participating Federal agencies, the evaluation panel feels that certain essential oil and hazardous materials research is not being adequately addressed. The panel is cognizant of and recognizes that some R&D activities may be within the jurisdiction of other Federal entities and thus covered by other review phases in preparing the Federal Plan. Nonetheless, the panel feels it is important to identify what may be omissions in the overall Federal marine R&D technology effort. The following issues highlight the panel's concern:

- Transportaton related spill prevention R&D is lacking in certain modes. Railroad, trucking and pipeline activities appear to warrant greater attention than is presently being given.

- Offshore spills of packaged hazardous materials are not being adequately dealt with by present R&D. Response to accidents resulting from shipment of hazardous materials should be managed according to their chemical properties and underwater salvage efforts should address both bulk and packaged situations.

- There is a general lack of funding and emphasis of R&D for applied technology dealing with Arctic and cold regions. Stronger technical inroads and expanded international communications are required to deal with increased activities in the northern tier OCS.

- Not enough research is being done to deal with gas and vapor problems in connection with oil and hazardous materials. Present dilution, neutralization and pyrotechnic approaches may cause air problems with greater impacts than the spills themselves.

- While it may be an informational gap between government and industry, there appears to be a lack of communication and direction with regard to biological treatment of spills. In the future, more emphasis should be placed on understanding biological processes as a means of alleviating and disposing of spilled oil and hazardous materials.

- Although EPA and USCG have established communication and coordination in their applied technology efforts, there could be greater efforts made for cooperative efforts with other Federal agencies. Not enough direct interface exists between agencies resulting in some apparent duplications of effort.

- We suggest initiation of a project which identifies the physical conditions (weather, wind speed, sea state, wave or chop height, etc.) under which it is no longer practical to attempt to contain and remove oil. This condition could occur for one or both of two reasons: (1) Either it is unsafe or there is so much surface energy that there is no discrete slick or layer of oil, or (2) the oil is churned into the water column in the form of droplets or sheared off into airborne droplets, or both, thereby making containment and removal impossible.

EVALUATION PANEL RECOMMENDATIONS

This review of existing and future government activities in oil and hazardous materials spill control technology would be remiss if it did not include a careful assessment of the basic goals and priorities upon which such technology should be developed. More than a decade of concentrated effort by government, academia and private industry in the area of spill control planning has led to the now widely accepted priorities as listed below:

1) Human Safety
   Protection of life and limb from direct exposure to a spill and its consequences, and from unreasonable risks associated with any cleanup response activity.

2) Ecological Impact
   Protection of animals, plants and their environments from any direct or indirect effects of oil or hazardous materials and/or cleanup activities which would destroy those life forms or result in serious degradation of the environment.

3) Socio-Economic Impact
   Protection of property and other human or environmental resources which could result in social, cultural or economic impact as a result of an oil or hazardous materials spill.

The many objectives of a multi-agency R&D program involving US spill control technology must consider the above goals and priorities. These priorities should provide the direction for sound planning, funding and implementing of government-sponsored projects, and for the most efficient means of interfacing with academia, private industry and other countries. In light of these priorities and material presented during the program review, the evaluation panel feels the following recommendations are in order:

- Oil and hazardous materials technology R&D, especially within EPA, should be significantly increased and should at least be commensurate

with the growing numbers and complexity of spills, particularly hazardous materials. The immediate direction and emphasis of the overall Federal effort should be targeted toward applied problem solving R&D, even at the expense of long-term basic fate and effects studies. The Federal research program should continue to reflect solution-oriented development of prevention and protection capabilities, techniques and equipment to cope with the growing problems of a highly technological society.

- The utilization of OITC as a means of coordinating multi-agency technology R&D should be encouraged and expanded to include testing of hazardous material spill response equipment and cold regions technology. More Federal resources and extramural funds should be actively sought to participate.

- There is a critical need to increase "spill of opportunity" research based on solid preplanning guidance. More emphasis should be placed on field testing under actual conditions as a means of taking the results of research to the final phase. Again, stronger interagency coordination and government/industry cooperation should be encouraged. Research funds are needed to support these efforts.

- The guidelines for development of research programs, as well as the results of investigative efforts, must be communicated to the "user" community more efficiently, even though EPA has had major success in commercializing its developments. The transfer of technological information needs improvement and information access should be simplified, i.e., through a newsletter to the "user" community and an annual meeting with OSC's to review R&D programs.

- The USGS has a significant technological role in the OCS oil and gas program which should be articulated more effectively through the NRT.

- "The National Oil and Hazardous Substances Contingency Plan" in Section 1510.32(c) provides for organizations to be granted "observer status"; and in section 1510.32 (h) for the establishment of a Research and Development Committee. These sections should be developed to create appropriate "observer status" input from industry to the NRT. This would provide the proper industry (R&D) contact to establish an on-going dialogue with the NRT's R&D Committee. This will provide for the necessary coordination of industry and government R&D programs.

Finally, the evaluation panel feels that in order to be truly effective, the Federal Government, under NRT auspices, should continue technology program reviews every three to four years. Meaningful spill response goals and priorities will continually require updating. To insure a well-planned and coordinated R&D program, technological spill response strategies must periodically be revised to meet evolving national needs.

TECHNOLOGY PROGRAM REVIEW AGENDA

U.S. Coast Guard, Environmental Technology Branch

Washington, D.C.

June 16, 1980

Welcome and Introduction: Captain Robert Platt

Logistics; History and Overview: Commander Theodore Leigh

Oil Spill Response Research

Surveillance: Lcdr. James White

Natural Dispersion and Fate: Clayton McKindra

Oil/Ocean Oriented Projects: Lcdr. Chad Doherty

TSC Dispersant Study: Lcdr. William Jurgens

Protected Water Skimmer: Kenneth Goldman

Arctic and Cold Regions: Clayton McKindra

Burning/Flaring: Kenneth Goldman

Fast Current Oil Recovery: Commander Theodore Leigh

Hazardous Materials Amelioration

Hazardous Chemicals Overview: John Sinclair

TSC Study: Lt. Michael Tobbe

Hazard Assessment Computer System: Michael Parnarouskis

Prevention: John Sinclair

June 17, 1980

Personnel Protection: Lt. Dennis Rome

Containment, Treatment and Recovery: John Sinclair

Disposal: John Sinclair

Detection, Classification and Quantification: Alan Bentz

NOAA/Hazardous Materials Project: John Robinson, Jerold Galt

DOE/Environmental and Safety Engineering: Dr. Henry Walter

U.S. Navy/Sea Systems Command: James Hayes

USGS/Conservation Division: James Gregory

USFWS/Ecological Services Division: Columbus Brown

EPA Oil & Hazardous Materials Spills Technology

Program Review, Edison, NJ

June 18, 1980

Welcome and Introduction: Ira Wilder

Oil Program

Overview: John Farlow
Control and Cleanup

Detection Equipment: Uwe Frank

Hardware Development: Richard Griffiths

OHMSETT Testing: Richard Griffiths

Sorbents: Leo McCarthy, Jr.

Gels: Uwe Frank

Cold Climate Techniques: Leo McCarthy, Jr.

Disposal Technology: John Farlow

Dispersants: Leo McCarthy, Jr.

Shoreline Protection and Restoration: Leo McCarthy, Jr.

Prevention: James Yezzi

Oil and Gas Production: John Farlow

Hazardous Materials Program

Overview: Frank Freestone

Information Transfer: Frank Freestone

Prevention: John Brugger

Pre-Response Planning: James Yezzi

Safety: Michael Royer

Tour of Edison Field Equipment: Frank Freestone

June 19, 1980

Situation Assessment: Michael Royer

Containment and Confinement: James Yezzi

Concentration and Separation: Frank Freestone

Ultimate Disposal: John Brugger

Restoration: John Brugger

Aerial Surveillance Program: Paul Lefcourt

Chemistry Support: Michael Gruenfeld

Operations Office Perspective on R&D Programs: Royal Nadeau

Summary and Discussion: Ira Wilder

Tour of Edison Analytical Laboratory: Michael Gruenfeld

Travel to (and Tour of) OHMSETT: Richard Griffiths

FEDERAL AGENCY RESPONSE

The response of the Interagency Steering Committee to the report of the Evaluation Panel was transmitted through the National Response Team Committee on Ocean Pollution Research, Development and Monitoring (COPRDM) in a memorandum from Dr. Paul Lefcourt, Chairman of the Steering Committee, to Mr. Kenneth E. Biglane, Chairman of the National Response Team. Following is the text of that memo:

The steering committee has reviewed the subject document and feels that the evaluation panel has performed a commendable task in assimilating the vast amount of information presented to them and preparing such a comprehensive evaluation report. The time and effort the individuals on the panel have devoted to this project are very much appreciated; the constructive nature of the panel's criticisms and recommendations provide much thoughtful material for steering committee consideration.

For most of the issues addressed in the report, the steering committee fully endorses the comments and recommendations of the panel. In a few cases, however, the committee feels that panel comments are not entirely justified; a result in some cases of the fact that incomplete information was provided during the review and/or insufficient time was available for panel deliberations. Because of the structure of the review, programs of FWS, Navy and DOE may not have been adequately covered.

The following are areas in which the steering committee fully supports evaluation panel findings. Additional responses by several agencies who wish to submit further comments or correct factual errors are also attached.

General Comments

- The panel has rightly recognized the conscious shift over the past few years in program emphasis from technology development for oil cleanup and disposal to that for hazardous materials. We are pleased to note that this shift, a result of the increased awareness of the magnitude of the hazardous materials spills problem, was supported by the panel.

- The panel observed that Federal technology programs in the area reviewed are generally well defined, carefully administered and produced excellent value for the dollars spent. We concur with the panel's subsequent

consensus that, considering the magnitude of the oil and hazardous materials problem and the potential consequences of being unable to provide an adequate cleanup capability, current resources severely restrict the Federal program. This is true in spite of the significant role taken by private industry in related technology development.

- Within the resources available, emphasis and priorities are generally well placed. Cooperation between primary agencies is good and a successful mechanism exists for even further productivity with increased allocation of resources. The OHMSETT interagency test committee at the OHMSETT facility is an excellent device for interagency cooperative programming and has been well used as such.

- Testing programs of all agencies could be more efficiently run with expedited dumping permit procedures. The approach suggested by the evaluation panel is a reasonable one that could improve current technology development programs by allowing field testing under controlled conditions.

Technology Research Program Gaps

The evaluation panel points out research program gaps in seven areas. With the exception of the point on lack of adequate research dealing with the gas and vapor phases associated with oil and hazardous materials which is discussed in detail by the Department of Energy in their attached comments, the steering committee is in general agreement with all gap areas identified by the panel. Particular emphasis should be placed on the need for greater emphasis on arctic and cold region technology development as noted by the panel.

Evaluation Panel Recommendations

The steering committee agrees in general with the recommendations formulated by the panel, however specific points are discussed by agencies in their attached comments.

Attachments

(1) Steering Committee Members
(2) EPA Comments
(3) U.S. Coast Guard Comments
(4) NOAA Comments
(5) USGS Comments
(6) DOE Comments

Attachment 1

STEERING COMMITTEE
FEDERAL PETROLEUM PROGRAM REVIEW

Chairman: Paul Lefcourt
Environmental Protection Agency

Members:

EPA	Albert Galli Energy and Effects Division
	Ira Wilder Oil and Hazardous Materials Spills Branch
DOE	John Cece Division of Environmental Control Technology
HHS	Philip Janus Public Health Service
DOI	
BLM	Piet deWitt Environmental Studies Program
FWS	Columbus Brown National Oil and Hazardous Substances Spill Coordinator
	Albert Sherk OCS Environmental Studies Coordinator
USGS	Robert Schoen National Center
NAVY	Paul Schatzberg Naval ship R&D Center
NOAA	Capt. Lawrence Swanson Office of Marine Pollution Assessment
	Douglas Wolfe OCSEAP Program Coordinator
NSF	Robert Carney
USCG	Cdr. J.T. Leigh (retired) Environmental Technology Branch
	Cdr. Chad Doherty Environmental Technology Branch

Attachment 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: February 13, 1981

TO: Kenneth E. Biglane
Chairman
National Response Team

FROM: Ira Wilder
Chief
Oil and Hazardous Materials Spills Branch
Municipal Environmental Research Laboratory-Ci
Edison, NJ

SUBJECT: Additional Comments on the Evaluation Panel Report: Review of Federal Programs in Technology for Oil and Hazardous Materials Spill Prevention, Control and Cleanup

Under the auspices of the National Ocean Pollution Research, Development, Monitoring and Planning Act of 1978, and under the direction of the National Response Team (NRT), the subject evaluation panel, consisting of representatives from industry, academia, and government, reviewed the spills research programs of EPA, Coast Guard, and other Federal agencies. As you well know, the panel was favorably impressed with the accomplishments of the respective programs, especially in light of the very limited resources available for these programs. The panel praised the government agencies involved in spills technology research for their mutually supportive and non-duplicative efforts. The panel states in their report:

"Generally, the Federal R&D effort dealing with marine oil and hazardous material spills reflects a high caliber of agency organization; contract management is good, and government staff display an intellectual and enthusiastic approach. The Coast Guard and EPA have especially well-organized operations and each is meeting its respective mission objectives. All of the Federal agencies reviewed appear to recognize their individual role in the overall Federal plan, and, for the most part, identify the relationship between 'state-of-the-art' and developmental implementation of research efforts. While the USCG and EPA have the leading role in these marine technology programs, the ultimate solutions to many present pollution problems will result by maximizing cooperative use of multi-agency resources. No single entity can completely solve these complex problems. Interdisciplinary communication and coordination of R&D must circumvent narrow, agency-identified jurisdictions. Mission-oriented projects should be approached by pooling the respective technical resources of the participating Federal entities. The evaluation panel feels that the precedent for this has already been set by the organization and operation of the OHMSETT interagency test committee (OITC) at the

OHMSETT facility. This is a highly commendable effort. Through continued and expanded cooperative interagency efforts, problem solving, testing and developmental programs can accomplish the desired goals in a cost-effective manner.

While cooperative interagency R&D efforts may result in the consolidation of some resources, the panel feels strongly that the total Federal allocation for applied technology support for oil and hazardous materials spill research is far too low compared to the magnitude of program responsibility and individual agency mandates. The panel feels that this is particularly true in the case of EPA, where it appears that less than 0.5% of the EPA research budget is devoted to oil and hazardous material spill technology."

We fully agree with the panel report which clearly recommends significant resource increases in EPA's spills technology research efforts and a correspondingly expanded utilization of the OHMSETT facility. Ironically, however, our Agency is currently facing the prospects of terminating its oil spills research program in FY-82 and phasing out its OHMSETT facility this year. These actions will take place unless a recent OMB decision to cancel the program is reversed. Such actions would obviously be inconsistent with the recommendations of the subject report and would, likewise, be in direct conflict with the views of the panel of experts who were specifically called upon by the National Response Team to critique the program.

We, therefore, solicit the support of the NRT in our appeal to OMB to reinstate this very critical research program, and to continue the operation of the OHMSETT facility, which is not only vital to the oil spill research efforts of the EPA, but to those of several other NRT member agencies as well.

Attachment 3

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS: (G-DMT-4/54)
U.S. COAST GUARD
WASHINGTON, DC 20593
PHONE: (202) 426-1023

3913
Ser: 4-0460U
10 FEB 1981

Mr. Kenneth Biglane
Chairman, National Response Team
Environmental Protection Agency
Oil and Special Materials Control
Division (WH 548)
Washington, D. C. 20460

Dear Mr. Biglane:

My staff and I have reviewed the "Evaluation Panel Report: Review of Federal Programs in Technology for Oil and Hazardous Materials Spill Prevention, Control and Cleanup" and consider the report to be complimentary to our Coast Guard programs. We feel we have gained from both the interchange during the review and from our preparations for the review. We concur with the panel's recommendation that these reviews should continue every three or four years. We will be happy to work with the National Response Team on any future efforts in this regard.

Sincerely,

R. T. PLATT
Captain, U.S. Coast Guard
Deputy Chief, Office of
Research and Development
By direction of the Commandant

SPEED LIMIT 55
It's a law we can live with.

Attachment 4

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OFFICE OF MARINE POLLUTION ASSESSMENT
Rockville, Maryland 20852 RD/MP:MM

February 6, 1981

TO: Kenneth E. Biglane
Chairman
National Response Team

FROM: William D. Barbee
Acting Deputy Director
Office of Marine Pollution Assessment (RD/MP)

SUBJECT: Additional Comments on the Evaluation Panel Report: Review of Federal Programs in Technology for Oil and Hazardous Materials Spill Prevention, Control and Cleanup

The second paragraph on page four should be expanded. It should be noted that, "technological research and development....less than 5% of the total Federal marine pollution budget", is questionable. No background was provided on which programs were counted in that percentage or how this value was determined.

The table on page 14 also appears to be of questionable value. The matrix appears to be the average of each panel member's interpretation of the meaning and implementation of agency mandates. As a result, this section contains misinterpretations. In addition, the matrix is overly simplistic, and is not consistent with the emphasis in the text. It is therefore recommended that the table be deleted or modified to correspond with the text.

Only one NOAA program is addressed by this report, i.e., the Hazardous Materials Response Program. Other NOAA programs are involved in technology development and should have been addressed in the report including: Sea Grant in hardware development, the Data Buoy Office in buoy development, and the P.L. 92-532, Section 202 and P.L. 95-273, Section 6 programs.

The Hazardous Material Response Project (HAZMAT) has 3 FTPs assigned to the office, not 6 FTP's as stated on page 9. Because of insufficient personnel and lack of funding, the recommendation to move NOAA's scientific support coordinators back to the field or regional locations cannot be implemented. If you intend to recommend regionalization, you must recommend additional personnel and funding to support it.

The HAZMAT recommendations on page 17 are weak and vague. Without specifics, it is impossible to evaluate the comment concerning more direct coordination between NOAA, the Coast Guard, and EPA.

The content and use of NOAA's enviornmental sensitivity index has been misinterpreted and is not a duplication of effort with other agencies. These maps are large-scale (showing a very small area), maps which identify natural and economic resources of particular concern in oil spills. Types of resources, locations, and geographic features are presented in sufficient detail to allow selection and placement of equipment and personnel. The maps also indicate protection priorities which are based on geomorphologic characteristics and (in the newer maps) local choices and ability to protect. The CZM and USF&WS maps, on the other hand, illustrate species and activities present in a broad region. One possible area of lack of coordination between CZM, USF&WS, and HAZMAT does exist. This area is in information collection for input to these indices. Steps are being taken to rectify this situation.

Attachment 5

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

In Reply Refer To:
EGS-Mail Stop 751

FEB 12 1981

Memorandum

To: Chairman, National Response Team, Environmental Protection Agency

From: Acting Director, Geological Survey

Subject: Additional comments on the Evaluation Panel Report: Review of Federal Programs in Technology for Oil and Hazardous Materials Spill Prevention, Control and Cleanup

We wish to commend the individual members of the review panel for the donation of their time and effort in preparing this report. We have the following two comments.

With respect to the panel's comment on our research for subsea recapture of oil from a blowing well, there appears to be some misunderstanding of its purpose. The research described by the Geological Survey contractor attempts to define the conditions of two phase flow (gas-petroleum) in sea water in order to determine the feasibility of subsea oil recapture from a blowing well. The research is not involved in the development of a sombrero-like device which might be used by industry. Our research simply provides technical insight for the purpose of regulating an industry which is moving into less hospitable frontier areas that may contain unknown risks. For this reason, we must consider the panel's comment on the possibility of being able to use a sombrero-like device to be conjectural.

We are at a loss about how to respond to the panel's comment calling for a strengthening of the Geological Survey role on the National Response Team (NRT) because nothing on this matter was discussed at our presentation, hence we do not understand the context of the comment. It is true that the Department of the Interior is represented on the NRT by a member of the Geological Survey. NRT policy requires that representation be at the Department level only--not at the Bureau or lower level. Therefore, Geological Survey involvement on the NRT cannot be strengthened, as recommended by the panel.

Hillary A. Oden
for Doyle G. Frederick

Attachment 6

Department of Energy
Washington, D.C. 20545

FEB 1 2 1981

TO: Kenneth E. Biglane, Chairman
National Response Team

SUBJECT: Comments on the Evaluation Panel Report, "Review of Federal Programs in Technology for Oil and Hazardous Materials Spill Prevention, Control and Cleanup

We wish to take this opportunity to express our appreciation for the invitation to participate in the Technology Program Review of the Federal program for oil and hazardous materials spill prevention, control and cleanup held June 17, 1980, in Washington, D.C. Additionally, it seems appropriate to commend the evaluation panel for completing a very difficult, complex review.

The September 20, 1980, draft report of the evaluation panel has been reviewed. As a result of our Marine Oil Spill Prevention and Cleanup program being small compared to similar programs in other agencies, we are of the belief that the evaluation panel was not exposed to sufficient information to conduct their assessment of our program from a proper perspective, as reflected in their statement on the appropriateness of Department of Energy involvement in this area of research. We feel the following discussion may be useful in providing a more accurate perspective of our goals and activities.

The Department of Energy bears responsibility to provide adequate energy supplies to the citizens of our country. The Office of Environment (EV) offers guidance to the Department to be certain that energy options are safe for the citizens and do not insult the environment. The Environmental and Safety Engineering Division in EV evaluates the adequacy of control options (hardware and software) that may be used to protect the citizens and the environment; this evaluation is directed at all energy systems including coal, nuclear, oil shale, petroleum, and gas.

Throughout the past several years, the Environmental and Safety Engineering Division (ESED) has supported cooperatively a variety of assessment studies related to petroleum and gas safety. The overall purpose has been to prepare comparisons of the hazards and to identify mitigating measures that would reduce these hazards. Our activities directed at marine oil spills are conducted in response to Section 6(b)(3)(Q) of the Federal Nonnuclear Energy Research and Development Act of 1974 (PL 93-577) which authorizes and directs ERDA (hence DOE) to establish program elements and activities "to improve methods for the prevention and cleanup of marine oil spills." Realizing that the Environmental Protection Agency (EPA) and the U.S. Coast Guard have broad operational and regulatory responsibilities relating to marine oil spills, and further realizing that they fund prevention and cleanup studies, we held discussions early on with representatives of these organizations. As a result of these discussions, it was determined that there existed a need for an expanded research and

development program. Accordingly, a guideline established early was that the prime focus of an ERDA (now DOE) program should be in areas that were not being adequately covered by the Environmental Protection Agency, the Coast Guard or other public or private efforts. In accordance with this guideline, ERDA entered into an agreement with the Environmental Protection Agency, the Coast Guard, and the Navy to jointly fund several series of tests at the EPA Oil and Hazardous Materials Simulated Environmental Test Tank. A separate agreement with the Coast Guard supported their development of prototype sensors capable of continuous, automatic monitoring of oil on water.

We note that there were several significant research areas in which there was little, or no activity until such time as the Department of Energy initiated appropriate research efforts. These are listed below. Each project was fully discussed with the EPA and the United States Coast Guard before initiation and was purposefully designed to fill a research gap. Specifically, the Department of Energy:

- initiated a program to develop a suitable curriculum for training "oil" personnel to prevent and respond to oil spills. This was conducted by the Oil Spill Training School at the Texas Agricultural and Industrial University (now Corpus Christi State University) at Corpus Christi, Texas.

- identified, as a subject demanding early attention, the need for the evaluation of the utility of dispersants in the control and cleanup of marine oil spills. This program, conducted at the University of Rhode Island, is partially responsible for the Environmental Protection Agency relaxation of its total ban on the use of dispersants; further, this program is the forerunner to the present Environmental Protection Agency sponsored in situ dispersant studies to which the evaluation panel gave very high marks.

- initiated in fiscal year 1978 an assessment of the technical and environmental feasibility of burning spilled oil. Under joint United States Coast Guard/ Department of Energy sponsorship, a "source book" containing information regarding the burning of spilled oil has been prepared. Part I of the report is a practical guide oriented toward the needs of potential users; Part II contains the resource information from which the practical guidance is drawn. A follow-on investigation of crude oil ignition will be completed in fiscal year 1981. It should be noted that the current burning task sponsored by the Coast Guard received high marks from the evaluation panel.

- initiated a project to develop and/or consolidate guidelines related to prevention of spills at stationary facilities. This study is a consequence of the burning projects in that we realized that many fires or spill incidents are not accidental, but rather are the result of poor maintenance or of vandalism. This effort, which is filling a gap in the overall oil spill program, will be completed during fiscal year 1981.

Justifiably, the panel calls our attention to the lack of transportation related spill prevention research and development. The aforementioned project related to spill prevention at stationary facilities represents our understanding of

Kenneth E. Biglane

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and entry into this subject area. It is expected that our effort in this area will alert appropriate agencies and companies to the realization that there is much room for improvement in the subject of spill prevention. If this study is well-received by interested parties, it is our intention to cooperate with appropriate agencies to review transportation related spill prevention.

The panel also notes that "not enough research is being done to deal with gas and vapor problems in connection with oil and hazardous materials." This item surprised us because we sponsor a multi-million dollar program related to better understanding the downwind vapor hazards of and mitigating measures appropriate to hazardous materials (carry over to oil). Our program was not brought to the attention of the panel because we were under the impression that the subject was restricted to oil. This program has the specific objective to attain a better understanding or the dispersion (dilution) of vapors as they proceed downwind; included are studies of the ramifications of fire, explosion, asphyxiation, and poison. This overall program is funded mostly by DOE, but includes the cooperative support of the following:

U.S. Government Agencies: United States Coast Guard
Federal Railroad Administration
Materials Transportation Bureau
Federal Energy Regulatory Commission
National Aeronautics and Space Administration
Maritime Administration

Industry: The Fertilizer Institute
Gas Research Institute

In view of our contributions to date, we plan to continue to support cooperatively a directed oil spill program, provided funds are available and provided the legislative mandate to pursue these efforts remains intact. We trust that the supplementary information contained in this letter will help you better evaluate our research program in relation to the very specific ESED objectives and limited funds allocated.

William E. Mott

William E. Mott, Director
Environmental and Safety
Engineering Division
Office of Environment (EV-14)

H. McCammon, EV-34

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