ALASKA

SEA GRANT PROGRAM

PROCEEDINGS OF THE CONFERENCE WORKSHOP

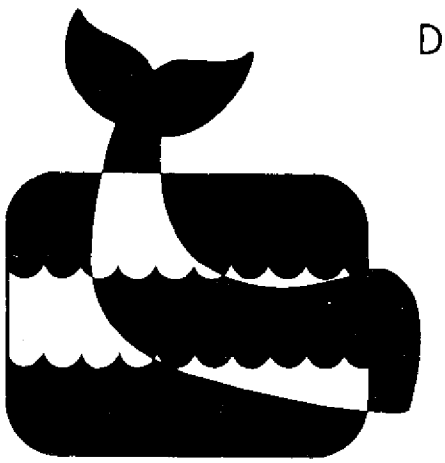
TO REVIEW THE DRAFT STUDY PLAN

FOR ENVIRONMENTAL ASSESSMENT

OF THE GULF OF ALASKA,

SOUTHEASTERN BERING AND BEAUFORT SEAS

DONALD H. ROSENBERG, EDITOR



University of Alaska

Fairbanks

SEA GRANT REPORT 75-4

APRIL 1975

SEA GRANT PROGRAM

University of Alaska

Fairbanks, Alaska 99701

Proceedings of the Conference/Workshop to Review the Draft Study Plan for Environmental Assessment of the Gulf of Alaska, Southeastern Bering and Beaufort Seas.

Donald H. Rosenberg, Editor

Sea Grant Report 75-4
April 1975

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

Support for this conference/workshop and for the preparation of these proceedings was provided by the U.S. Department of Interior, Bureau of Land Management under contract 088550-CT5-24 and by the U.S. Department of Commerce, NOAA, Office of Sea Grant under grant 04-5-158-35. The editor and convener would like to thank all who participated in the conference/workshop. Special thanks is extended to Ms. Willy Rensenbrink and Ms. Anna Morkal for their assistance in handling logistics, to Dr. Vera Alexander, Dr. Robin Muench, Dr. D. W. Hood and Mr. Sandy Sagilkin for chairing the workshop sessions, and to Ms. Brenda Melteff, who coordinated and typed these proceedings.

INTRODUCTION

The Sea Grant Program of the University of Alaska was invited by representatives of the Bureau of Land Management to host a public meeting to review a proposed study plan for environmental assessment of the Alaskan Outer Continental Shelf as related to future oil and gas development.

The public meeting was held February 18 through 21 at the Anchorage Westward Hotel, Anchorage, Alaska. The first two days were devoted to general presentations, comments, and a presentation of the draft study plan by NOAA. The final two days were used, by the means of workshops, to develop the recommended changes to the plan. At a final session the individual recommendations were presented and agreed upon by the participants.

This document represents a proceeding of that meeting. Individual presentations have been edited where possible. Much of the discussion regarding the study plan has not been included in the document. A copy of the original proceeding as recorded is available for review in the Alaska Sea Grant Program Office, University of Alaska, Fairbanks, Alaska.

OBJECTIVES OF THE CONFERENCE/WORKSHOP

The objectives of the conference/workshop held February 18-21, 1975, at the Anchorage Westward Hotel, Anchorage, Alaska were to review and formulate recommendations for changes to the draft study plan entitled "Environmental Assessment of the Gulf of Alaska, Southeastern Bering and Beaufort Seas" as developed by the U.S. Department of Interior, Bureau of Land Management and the U.S. Department of Commerce, National Oceanic and Atmospheric Administration dated January 1975.

RECOMMENDATIONS FOR MODIFICATION TO THE OUTER CONTINENTAL SHELF ENVIRONMENTAL STUDY PLAN FOR THE ALASKA OCS

The following modifications to the draft study plan entitled "Environmental Assessment of the Gulf of Alaska, Southeastern Bering and Beaufort Seas" and dated January 1975 were approved by the conference/workshop held February 18 through the 22 at the Anchorage Westward Hotel:

1. That the title be changed to read "Environmental Assessment in Relationship to Potential Outer Continental Shelf Oil and Gas Activities in the Gulf of Alaska, Bering, Chukchi, and Beaufort Seas."

2. That the objectives of the study plan be:

   A. Provide information for predicting and mitigating impacts of potential oil and gas exploration and development on the marine, coastal, and onshore environments of Alaska.

   B. Provide information about the natural and man-made marine and coastal environments that will enable federal, state and local agencies, and private interests to make sound management decisions regarding the potential development of the oil and gas resource of Alaska.

3. That a section be included on joint management of the study program. This section should be developed by NOAA and the State of Alaska taking into account that the ultimate impacts of the proposed oil and gas development will be upon state and local governments and private sectors in addition to federal interest.

4. That four basic regions, Gulf of Alaska, South Bering Sea, North Bering Sea and Chukchi/Beaufort Sea, be used in designing the research programs and the unique features of each region be taken into consideration when developing the final research program.

5. That reference to specific geographical areas (Gulf, Bering, Chukchi and Beaufort Seas) in tasks be restricted to those tasks relevant to specific areas. When no specific geographical area is given, then the task is understood to apply to all areas.

6. In order to best develop long term studies which may influence priorities for baseline research and leasing program, a study section should be added to the study plan entitled "Program for Development of Study Priorities." This section should address tasks to provide the following information:

   A. Estimate the potential, recoverable hydrocarbon reserves for specific proposed lease areas.

   B. Establish a best estimate time frame for development and production activities.

C. Determine the probable necessary support facilities to meet the above schedule, including production and transportation systems and onshore developments. Assess the environmental effects of these support facilities.

D. Under "best available level of technology," determine the probabilities and amounts of various discharges into the environment.

E. Critically review and evaluate "the state of the art" concerning spill prevention and clean-up operations, emphasizing conditions unique in Alaskan waters.

It is recommended that tasks under this section be accomplished on a priority basis.

7. That the study area of the Gulf of Alaska include coastal embayments, sound and fjords, and river mouths. Examples are Prince William Sound, Cook Inlet, the Copper River Delta, and Yakutat Bay.

8. That on page 11, question D be changed to E, and the following be inserted as D:

> What is the likelihood and the timing of recovery of populations of organisms or ecosystems from perturbation, either from contamination or other disturbance?

It is recommended that NOAA develop appropriate tasks to carry out this mandate.

9. That the Logistic Section of the study plan be rewritten to reflect the recommendation as presented in the report of the Logistic Working Group (Appendix A).

10. That a section be included on socioeconomic research utilizing the recommendations as presented in the report of the Socioeconomic Working Group (Appendix B).

11. That a high priority be given to Toxicity and Contaminant Effect Studies.

12. That the tasks in the technical section of the draft study plan be changed in accordance with the report of the two Physical-Biological Working Groups (Appendix C).

13. That NOAA insert an introductory narrative paragraph addressing the general features of water mass transport in the Chukchi Sea.

14. That the socioeconomic study consider the subsistence fishery (including marine birds and mammals) apart from physical-biological implications.

15. That the socioeconomic study address the potential impact of increased utilization of fish and wildlife resources in the coastal zone on the availability of those resources for subsistence use.

APPENDIX A

Report of the Logistics Working Group

DR. D. W. HOOD
Chairman

February 20, 1975

ATTENDEES

Robin Muench	IMS, University of Alaska
Richard LeFebvre	NARL, University of Alaska
G. F. McMahon	FAA, Alaskan Region
Peter Barnes	USGS
Karl Schneider	ADF&G
James Estes	USFWS
Philip J. Taetz	NOAA/NOS
Leonard Pickens	NOAA/NOS
Dave Drury	NOAA/EDS
Carl Abegglen	USFWS
W. M. Sackinger	FE, University of Alaska
Dave Friis	NOAA/ERL
Donald Hood (Chairman)	IMS, University of Alaska
William Stringer	Geo. Inst., University of Alaska

DEFINITION

Logistics in this case is considered to be those support facilities required for the scientific studies of the marine environment as generally indicated by the draft study plan.

It is realized that a larger logistic problem exists for OCS development and should be addressed at an early date. The group therefore resolves that:

> The Logistics Working Group recommends that the Socioeconomic Working Group consider that the broader aspects of support facility planning for OCS oil and gas development be considered, such as suitable ports, air navigation and rescue, communications and related onshore impacts.

(Unanimously approved)

Gulf of Alaska logistics considerations directed at Environmental Assessment Draft Study Plan

Recommendation:

1. That, in addition to the large sea-going vessels indicated in the plan, provision should be made for vessels capable of collecting a wide variety of scientific data in near shore waters, such as estuaries, fjords and coastal inlets. These vessels are best represented by the Acona, Cayuse; smaller vessels such as the Karluc and Natcheck would also be useful.

2. That additional shiptime be provided for projects with special scientific requirements, such as collection of marine mammals, birds, and fish.

3. That all coastal vessels be equipped with suitable navigational devices required by the project.

Bering Sea logistics considerations directed at Environmental Assessments Draft Study Plan

Recommendation:

1. That an ice breaker of the U.S. Coast Guard be assigned in support of Northern Bering Sea Studies during the winter season as dictated by project needs. An estimated time requirement is about two months per year.

2. That in the short term ice-capable vessels such as the Hero, Misar, or the Norwegian Sealer be considered, but in the longer term a newly constructed vessel designed especially for oceanographic work in the marginal ice zone be obtained for this service. It was recognized that there is a national need for a vessel capable of operating well within the marginal ice zone for support of U.S. oceanographic research assigned to full time service in Alaskan ice-covered waters.

3. That consideration be given to establishment of island- and land-based research stations in or near the Bering Sea at locations such as St. Lawrence, St. Matthews or St. Paul Islands, Nome and Unalaklet, for observations during periods of ice cover in order to enhance research capabilities for winter observations when other logistic support is ineffective.

4. That shallow draft vessels for estuaries and coastal studies in the Bering Sea be provided as project demands require. It is envisioned that vessels of the 30-50-foot class and also the 100-foot class will be required.

5. That a second support facility be provided in the Northern Bering Sea for storage of scientific equipment and scientific crew deployment.

Beaufort Sea logistics considerations are directed at the Environmanetal Assessment Draft Study Plan

Recommendation:

1. That an ice breaker of the U.S. Coast Guard be assigned in support of Beaufort Sea Studies during the late fall and late winter season as dictated by project needs. An estimated time requirement is about two months per year.

2. That, in the short term, ice-capable vessels such as the Hero, Misar, or Norwegian Sealer be considered but, in the longer term, a newly constructed vessel designed specifically for this service.

3. That shallow draft vessels for estuarine and coastal studies in the Bering Sea be provided as project demands require. These vessels should be of the 30-50-class and fitted for estuarine research.

4. That, to the extent feasible, logistic facility sharing with the Canadian Beaufort Sea program be developed.

5. That the program investigate the use and operational limitations of a hovercraft for support of scientific programs on the near shore ice zone.

6. That mobile camps and associated track vehicles be made available for scientific studies on the Beaufort and Chukchi coastal ice. Track vehicles may be Nodwells, Sno-Tracks, Weasel, Rolligon and snow machines. These facilities should have the most modern navigation and communication equipment.

7. That all logistic operations be coordinated with the Naval Arctic Research Laboratory. It is recognized that the Naval Arctic Research Laboratory is the only facility in the Alaskan Arctic dedicated to research support.

8. That, to the extent feasible, the logistics support of other Arctic activities be utilized to the extent possible, for example, private industry, AIDJEX project, and native villages.

General recommendations apply to all logistic activities. These are:

1. That the potential use of submersibles for a wide variety of scientific investigations be considered for deployment in all the Alaskan Arctic.

2. That all aircraft-remote-sensing-flights be coordinated through the NOAA Project Office in order to avoid duplication of effort and insure multi-use of flights.

The group adjourned at 1500 after approving all the above recommendations.

APPENDIX B

Report of the Socioeconomic Working Group

MR. SANDY SAGALKIN
Chairman

February 21, 1975

It is recommended that a Socioeconomic research study be undertaken to meet the following objectives:

A. Provide information for predicting and mitigating primary and secondary impacts of potential oil and gas exploration and development on the human environment of Alaska.

B. Provide information that will enable federal, state, and local agencies and private interests to make sound management decisions regarding the potential development of the oil and gas resources of Alaska and its outer continental shelf.

C. Assess the ability of existing management systems to respond to environmental, social, and economic consequences of potential OCS development and suggest improvements.

D. Establish a uniform data processing system.

It is further recommended that this socioeconomic research study include the tasks as given in Table 1.

The management of this research program will require a joint management mechanism involving all interested parties.

Attached is the initial list used to develop the research tasks.

TABLE 1
Socioeconomic Study Plan

A. BASE MODELS/STUDIES *

1. Regional and statewide economies, population and employment.
2. Comprehensive inventory of resources, human ecology, and natural processes, including recreation, subsistence, archeological and historic resources, etc. All resource values will be studied insofar as they relate to OCS development.
3. Rapid growth and social and cultural change, including analysis of previous impact effects.
4. Development of valuation systems and criteria; social and environmental indicators; measures of quality of life and environment.
5. Potential transport/staging/community sites for servicing OCS development.
6. Public and private resource development managerial needs and capabilities.
7. Data management and monitoring system.

* Studies will include non-OCS dynamics.

B. DYNAMIC VARIABLES: POLICY OPTIONS AND DEVELOPMENT VARIABLES *

1. OCS lease schedule: where, when, intensity and duration.
2. Oil and gas discoveries and development schedules.
3. Exploration and production technology.
4. Energy supply and consumption options.
5. Related industries: services, petrochemicals, fabrication, other energy-based industries.
6. Transportation systems for support and product (overland, marine, air).
7. Alternative resource valuations and overall resource management priorities.
8. Manpower, capital and material requirements vs. availability.
9. Alternative cost revenue programs.
10. Alternative management systems.

* Variables will be subject to sensitivity analysis.

C. IMPACT TESTS, EVALUATION, FORECAST *

1. Oil and gas production.
2. Systemic economic effects of accelerated development (e.g., inflation, workforce dislocations, supply shortages).
3. Comparative socioeconomic costs of lease/development alternatives.
4. Statewide, regional and local economic and population changes.
5. Community development.
6. Transportation.
7. Social, cultural, and environmental quality.
8. Land and resource management conflict
9. Public revenues and expenditures.
10. Management systems.

* Impacts will be analyzed in terms of the relationship of OCS development to other developments in Alaska.

APPENDIX C

Report of the Joint Physical-Biological Work Groups

DR. VERA ALEXANDER
Chairman

DR. ROBIN MUENCH
Chairman

February 21, 1975

ADDITIONAL TASKS

It is recommended that the following tasks be added to the original document:

On page 32--Insert Task 3

Task 3--Describe the ecosystem dynamics for the littoral biota of the principal shore types in each of the study regions with particular emphasis on potential immediate and long-term impacts of contaminants and disturbances in species populations dynamics, community composition, and productivity of the ecosystem. Impacts on immature stages of species not normally inhabiting the littoral zone as adults should also be assessed.

On page 32--Relable Task 3 as Task 4

On page 41--For Task 2 Substitute:

Task 2--Assemble and analyze historical records and remote sensing data to provide a comprehensive picture of the development and decay of seasonal ice in the Bering Sea including the maximum extent of ice cover.

On page 41--Relabel Task 2 as Task 3

On page 41--Relabel Task 3 as Task 4

On page 59--Add:

Task 2--Characterize, physically and chemically, sediment influx, transport, and deposition.

On page 83--Add:

Task 4--Study the occurrence, intensity and effects of extreme oceanic events.

On page 77--Add:

Task 5--Evaluate types of sea-floor instability that might be induced by petroleum development activity itself, e.g., slumping, slope failure, or other mechanisms of substrate redistribution caused by structural loading, excavations, etc. Evaluate the potential risk of this type of failure induced by petroleum activities in potential development areas.

TASKS TO BE CHANGED

It is recommended that the following tasks be changed to read:

On page 25--Task 6

Task 6--Determine distribution, relative abundance, and migratory routes of Arctic, Yukon, and Kuskokwim stocks of salmonid (i.e., salmon, char, sheefish and whitefish) in the Bering, Chukchi, and Beaufort Seas.

On page 45:

B. WHAT IS THE NATURE AND EFFECTIVENESS OF PHYSICAL, CHEMICAL AND BIOLOGICAL PROCESSES WHICH TRANSPORT POLLUTANTS AND OTHER MATERIALS?

On page 51:

Task 3--Evaluate large-scale, potentially applicable numerical models which will provide boundary conditions for small-scale models.

On page 52:

Task 7--Test and evaluate potentially applicable models for special areas such as those that are environmentally sensitive or of restricted circulation, such as fjords, to compare predicted oil-spill trajectories with trajectories inferred from field experiments carried out in these areas.

Task 11--Perform an oil-spill experiment in a potential impact area which will yield information on dispersion of materials in the upper-water layer or at the surface.

On page 55:

Task 1--Determine the role of selected microorganisms in the biodegradation of contaminants, including rates and limiting factors of this process on ice, under ice, in the water column, and in suspended and bottom sediments.

On page 56:

Task 2--Determine the role of microorganisms in the emulsification of contaminants including rates and limiting factors of this process on ice, under ice, in the water column, and in sediment.

Task 3--Develop a model for predicting the microbial contribution to the emulsification and biodegradation of spilled contaminants.

Task 4--Determine the products of biodegradation and emulsification of contaminents by microorganisms, with attention to potentially toxic compounds and the production of substrata for secondary colonization by potentially pathogenic microorganisms.

On page 60:

Task 1--Evaulate present rates of change in coastal morphology, with particular emphasis on rates and patterns of man-induced changes. Locate areas where coastal morphology is likely to be changed by man's activities and evaluate the effect of these changes, if any. The relative susceptibility of different coastal areas will be evaluated.

On page 63:

Task 3--Develop means to predict possible interactions between ice and oil and other contaminants in the event of oil or other contaminant discharges (e.g. to what extent oil is incorporated into ice during freezeup, how oil effects ice albedo, to what extent oil will spread under the ice, and how oil pools in the irregularities of deformed ice).

On page 67:

Task 2--Determine the acute and chronic effects of crude oil, its component fractions, and other petroleum-associated chemicals on physiological and behavioral mechanisms of selected Arctic and subarctic organisms of the marine environment until field and laboratory conditions.

On page 76:

Task 1--Search, evaluate, and synthesize existing literature and data related to sea floor instability (slumping, downslope movements, etc.). Determine those information gaps that need to be filled to characterize the existing instabilities of the sea floor, indicate their potential effect on petroleum development structures, and define those geographic areas of highest risk to development activities.

On page 77:

Task 2--Determine the types and extent of natural sea-floor instability. Compile maps indicating relative susceptibility to instability hazards.

Task 6--Summarize existing knowledge of tectonic history. Produce maps indicating present knowledge of location and intensity of seismic activity, earthquake epicenters and magnitude, and volcanic activity.

On page 78:

Task 7--Determine and map the distribution, mode of faulting, age of most recent movement, and magnitude of offset for major faults.

Task 8--Re-evaluate the present seismic and tectonic hazards in and peripheral to the lease areas. Produce new seismic and tectonic risk maps. Recommend additional onshore and sea-floor seismic monitoring stations as warranted.

Task 11--Initiate development of validation procedures for analytical and simulation models, to assess the rate at which subsea permafrost is forming or degrading in various coastal environments, and to enable prediction of the consequences of a man-made perturbation in the permafrost environment.

ADDITION TO TEXT

Page 31--Insert after Paragraph 2 (Littoral)

Additional studies are required to describe the dynamics of the littoral ecosystem. The studies should include the ecology of principal plant and animal species by shore type (e.g. sand, mud, gravel, and rocky beaches; salt marshes, estuaries, bays, fjords, and lagoons) and depth strata (e.g. splash, intertidal, subtidal), with particular emphasis on potential, immediate and long-term impacts of contaiminants and disturbances on species-population dynamics, community composition, and productivity of the ecosystem. Impacts on immature stages of species not normally inhabiting the littoral zone as adults should also be assessed.

TASKS TO BE DELETED

It is recommended that the following tasks be deleted from the text:

On page 51--Task 4

Task 4--Design and implement a water quality program for the study area.

On page 53--Task 1

Task 1--Identify and describe sources, pathways, fluxes, and fates of contaminants (trace metals and hydrocarbons) associated with offshore oil exploration and production.

On page 54--Task 4

Task 4--Determine the type and rates of physical and chemical decomposition of oil (weathering) in Arctic and subarctic regions.

On page 50--Task 5

Task 5--Evaluate the differences between pathways and fluxes in a "clean" sediment system, one that has been heavily fished for demersal fishes, and one that contains oil-bearing sediment particles.

On page 59--Tasks 1 and 2

Task 1--Conduct a thorough search for an evaluation and synthesis of existing sedimentary data in the Gulf of Alaska and the Bering and Beaufort Seas. Prepare recommendations with rationale for areas that require additional investigation of sediment transport and distribution.

Task 2--Determine the lithology and areal distribution of sediment and rock types present on the sea floor in the Gulf of Alaska and the Bering and Beaufort Seas, as indicated from the results of Task 1.

On page 60--Tasks 3 and 4

Task 3--Determine the mechanisms causing river discharges, sediment erosion, resuspension, transportation, and deposition of sedimentary materials.

Task 4--Determine the pathways and rates of bottom and suspended sediment transport.

INTERESTS AND RESPONSIBILITIES OF THE DEPARTMENT OF THE INTERIOR WITH RESPECT TO OUTER CONTINENTAL SHELF DEVELOPMENT

DR. DARIUS W. GASKINS, JR.
OCS Program Coordinator
Department of the Interior
Washington, D.C.

I'd like to briefly lay out where we are in terms of the leasing program, give you some indication about the thinking that went into the push to accelerate O.C.S. development, and try to make the point that we take these environmental studies very seriously. (We are going to listen to what you say, and will consider your recommendations in developing the program.)

Briefly, looking at the energy situation in a national perspective, the problem, as you all know, is that we have become increasingly dependent on unstable, expensive foreign supplies of energy. Oil now costs the U.S. about $11.00 a barrel. We are importing more than six million barrels a day, at an annual cost to the economy of more than 20 billion dollars.

As we looked over the alternatives to this expensive, unstable supply of imported oil, we found that if we can discover oil in the Outer Continental Shelf, it is the prime alternative. We know that there is a lot of potential for oil from shale. We know that, in the future, we can make anything out of coal that you can make out of oil, but unfortunately these other domestic energy sources are downstream requiring up to ten years to develop. They also are more expensive. The estimates out of Project Independence and other sources indicate that liquefied coal will cost about $13.00 a barrel. Substantial quantities of oil from shale can be produced for around $10.00 or $11.00 a barrel.

But fortunately for the nation as a whole, we do have a relatively inexpensive source in the Outer Continental Shelf. If we find oil, it's estimated that it can be produced in most areas of our Outer Continental Shelf for between $1.00 and $3.50 a barrel, in substantial quantities. In fact, the Project Independence blueprint indicates that we may be able to increase our domestic production from the Outer Continental Shelf by more than three and a half million barrels a day.

We may not be that fortunate. There are all kinds of things that can happen. There may not be as much oil there as we think, there may be all kinds of delays. Our best guess is that there's a lot of resource out there, and from an economic standpoint, at least, it's relatively inexpensive.

Now, at the same time the Department of Interior more or less came to the conclusion that the Outer Continental Shelf was a prime source of energy for the next decade, we also were fully aware that attitudes towards environmental protection have changed in this country and that society was no longer willing for us to plunge ahead without considering the impact on the environment. Our analysis indicates that, if you look at it from an alternative standpoint, O.C.S. oil, while there are risks and hazards, is less risky and less hazardous than the alternatives we're talking about. It doesn't do as much damage to the environment as liquefying coal does. It probably doesn't do as much damage to the environment as getting oil from shale. And there is a similar question associated with imported oil. If you look at the world as a total ecosystem, it's quite possible that producing oil from our Outer Continental Shelf does less damage to the ecosystem as a whole than importing oil in tankers with the associated risks concerned.

But just to make the argument that it looks like a good choice doesn't mean that we can't do something to further protect the environment, and that's the point of these Environmental Studies.

First let me lay out what the program is as far as we see it in terms of leasing, and then see if I can put in perspective the role of the Environmental Studies. The program as currently structured is that we hope to make the decision within a matter of months to accelerate the leasing of the Outer Continental Shelf. We will accelerate it by attempting to hold six sales a year between now and 1978. These sales will be arranged according to when we can get the Environmental Studies done and according to when we think industry is ready to go in and explore certain areas. But the sales will, in any case, be arranged so that we get at least one sale in all the frontier areas of the Outer Continental Shelf, so we get a chance to look at the broad range of prospects that are there by 1978.

We made a commitment when we started to consider this option of accelerated leasing to doing a thorough environmental analysis in each one of the frontier areas. Frontier areas are areas where you haven't leased for oil and gas before. We made a commitment to do a thorough environmental analysis in each of these areas before we started leasing. The first of these studies was started in the Mississippi-Alabama-Florida area. It commenced almost a year ago, and we had actually held a sale on that area. We held up exploratory drilling until such time as we got some preliminary base-line data from that environmental study. Now, there has been a lot of discussion about that study, and I'm sure there are a lot of things that could be improved about the study. But I think that it gives us a starting point, and it's an example of our commitment to do these studies as we enter into the exploration and production in the frontier areas.

Now, the way the environmental studies in, say, the Alaskan waters will impact the program are several. First, in terms of tract selection, when we get ready to put an area on the schedule, we will do an Environmental Impact Statement on each region that we are preparing for lease. And that Environmental Impact Statement will call on all the environmental data that's currently available. In

addition, to the extent that one of these environmental studies is ongoing, it will take advantage of any interim reports or final reports that are available, in order to come up with a determination of whether or not the oil and gas potential of the region is valuable enough, considering the environmental risks that we face. And I'd like to emphasize that there has been no decision to lease in any specific area at this time.

For example, if the environmental studies in Brisol Bay indicate that this area is too vulnerable from an environmental standpoint compared to the oil and gas potential that we see in that area, the Department will in fact not hold a lease sale there. We have it on a schedule, we have a sale schedule for Bristol Bay, so that we can start now doing the environmental studies so that we'll be in a position to make what we hope to be a correct, rational decision when the time comes. So the question of whether or not to hold a sale on a region is the first place where environmental studies come in.

Secondly, once we have decided on a sale within a region, we have to decide on specific tracts in that region. We have two sources of information. First, we go out to industry and ask them to indicate their interest in specific points in terms of oil and gas potential. Secondly, we call on the community at large, state and local planners and environmentalists to tell us about the particular hazards that they see in any one of these regions. And through this juxtaposition of the resource potential on the one hand and the environmental hazards on the other, we'll come up with a certain specified number of tracts that will then be studied thoroughly for almost a year by the Bureau of Land Management in the Environmental Impact Statement process. And so early on, if you have any information that would indicate that a particular area in a particular region is extremely vulnerable, undesirable from an environmental standpoint, we have a procedure, I believe, for taking that information into our decision process.

Now, after we've written -- or are in the process of writing the Environmental Impact Statement on a sale in a region concerning designated tracts, we will have a public hearing on the draft of that Statement. We will have a final Statement. The Department has made sort of informal commitments to the various coastal governors that we have consulted with to go once more to the states before there's a final decision and lay out our environmental analysis along with our resource assessment of the sale in question, to get the final state input as to whether or not we should hold the sale.

Further, when we hold the sale itself, each one of the leases can have separate stipulations written into it, how it can be produced. For example, in the Gulf of Mexico, when we sell tracts which are near areas of particular interest or unique qualities, we frequently put on stipulations about how drilling cuttings can be disposed of, where one can drill on a tract and where one can't, what kind of procedures have to be adopted in order to protect the unique environmental stituation. So again, all through the leasing process itself, the information generated by the environmental studies comes into play.

Now further, after the sale has taken place, of course, the Department of Interior through the Geological Surveys & Conservation Division continues to monitor production, how it takes place on the leased tracts. And in its monitoring phase, we stand ready to step in and interrupt production to make corrections, to require new safety procedures, if we find that the environment is being substantially degraded. This again is a place where the information from the environmental studies - to the extent that they give us a base line on the environment, to the extent that they can indicate to us that something adverse is happening - will provide the information for making appropriate adjustments in our operating procedures.

Now, that's the program more or less as it stands today, and I'd like to mention a couple of other things that the Department is considering in terms of the overall rationality of our leasing program. And perhaps this is not the right forum for input, but if anybody wants to talk to me afterwards at lunch about your attitudes towards these other possible modifications in our program, I would be willing to talk to you about them.

The first of these is the separation of exploration from production. A lot of the States, particularly on the East Coast, are concerned that the Department of Interior does not appropriately control the decisions to produce or not to produce. And they have pushed us to change our leasing procedures so that we have a decision, after there has been fairly thorough exploration in an area, before we allow production. And we have taken this under advisement. We have talked to our lawyers, and we find that under the law as we interpret it that governs the leasing of the Outer Continental Shelf, we can do precisely that. And we are seriously considering an alternative in which we will sell leases with a stipulation in them that says, "The owner of this lease has a unique right to produce it, if the Department deems that it's appropriate to be produced, but that there will be a decision point after a substantial amount of exploration has taken place at which time the secretary of Interior will decide whether or not the value of production to society exceeds whatever environmental hazards have been revealed in relationship to that particular lease."

Now, we have not instituted this procedure. We have the legal authority to do so. We do it somewhat informally now through our permit process, but it is an opportunity, if the citizens of the concerned communities, the local states, and environmentalists feel that this new process is of sufficient merit, the Department is certainly willing to consider it.

The second thing that we're currently studying (and again I'd like to emphasize this is only a study, it's certainly not Administration policy): we're considering a scheme to share revenues with impacted states. We recognize that one of the basic problems with developing the Outer Continental Shelf is that the economic benefits from this resource accrue to the nation as a whole. They accrue under the current system in the form of bonuses and royalty payments to the Federal Government. Unfortunately, the costs associated with O.C.S. development frequently

are borne by local States. For example, in the case of leasing in the Gulf of Alaska, a lot of the social costs, a lot of the aesthetic costs, a lot of the environmental costs will be borne by the State of Alaska. And so the Secretary of Interior has directed us to do certain studies about new plans that we might adopt to share some of the revenues from the Outer Continental Shelf development with the affected States. And this way we feel that we could more than compensate the States for the costs that they have to bear. Again, this is still an area of study; and, as you might imagine, there is some opposition within the Administration to any plan that depletes the Treasury in this manner.

That's basically a description of the process as I see it. I'd like to emphasize again that we do take these environmental studies very seriously, and we eagerly await the output of this particular conference.

THE BUREAU OF LAND MANAGEMENT ENVIRONMENTAL RESEARCH PROGRAM FOR THE OUTER CONTINENTAL SHELF

MR. EDWARD TENNYSON
Bureau of Land Management
Department of the Interior
Washington, D.C.

Good morning, ladies and gentlemen. I would like to welcome you on behalf of BLM to this workshop and conference. I hope that we will offer all of you a chance to comment and contribute to the NOAA Study Draft Plan. The two days of workshops have been scheduled so that more individual emphasis may be placed upon the design of these environmental investigations. It is hoped that this meeting will appreciably contribute to the study plans. I would like to assure you that all of your proposals, comments and criticisms will be reviewed before NOAA submits the study plan to BLM for approval.

NOAA has been given the role of program manager of BLM environmental research in the OCS. This document represents the results of a meeting in Seattle in January in which over one hundred scientists participated. To my knowledge, no relevant institution or group lacked presentation at those meetings. Hopefully, the integrated results of these meetings will yield the best practical research study plan for the environmental protection of Alaska.

BLM has received authority to conduct environmental studies on the outer continental shelf areas through:

1) the Outer Continental Shelf Lands Act of 1953;
2) the Submerged Lands Act;
3) NEPA of 1969; and
4) congressional appropriations bill of fiscal year 1975.

There are four major objectives for the BLM environmental research program:

1. To provide information about the OCS environment that will enable the Department of Interior, in concert with other Federal and State agencies, to make sound management decisions regarding the development of mineral resources.

2. To provide a basis for predicting impacts of oil and gas exploration and development.

3. To establish a basis for predicting impacts of oil and gas activities in the frontier areas.

4. To provide impact data that would result in operating orders or operating regulations. This would include the altering of operating permits to existing rigs if subsequent environmental analysis shows the rigs' effects to be harmful.

For management purposes, the program has been divided into four phases:

Phase One: The first step consists of summaries of OCS environmental knowledge and data gaps. This includes reviews of published literature, unpublished data, ongoing related programs, and proposed programs. These studies provide frameworks for subsequent baseline studies and special studies as well as for the environmental impact statement.

Phase Two: Our baseline consists of integrated, multi-disciplinary programs of environmental investigations to establish pre-development OCS environmental conditions and to aid in prediction of potential impacts of oil and gas activities. These investigations include a series of studies in which sediments, for instance, would be characterized as follows:

1. Characterization and quantification of benthos at selected stations.

2. Hydrocarbon content.

3. Trace metals.

4. Type and structure and stability of the sediments.

5. Other special characteristics of the sediments including permafrost, ice scouring, and others peculiar to the Arctic environment.

Water column studies normally include:

1. Description of the pelagic communities in the area.

2. Hydrocarbon content.

3. Trace metals.

4. Nutrients, dissolved oxygen, pH and other water chemistry.

5. Salinity and temperature.

6. General water circulation patterns.

7. Extreme event conditions.

8. Marine mammals.

9. Birds

Meteorology and surface studies include but are not limited to: local and large-scale conditions, ice coverage, sea state, and others.

Phase three or special studies are ancillary studies designed to address specific problems, such as descriptions of processes, dynamics and causal relationships. Specific studies on acute and chronic toxicities are good examples of this category. Others might include trajectory studies for the prediction of contaminant dispersion, socioeconomic effects on industry, recreation, public health, and studies of unique environments, archaeological sites, etc.

Phase four includes monitoring studies. Monitoring studies, obviously, will not be undertaken unless the decision to lease is made. These studies will give environmental data after exploratory drilling and production has started. These data will be used to determine environmental affects of offshore oil and gas activities.

The monitoring program would continue the same types of sampling as the base-line studies. In addition, site specific monitoring station arrays would be studied around specific rigs. These stations would enable point source effects to be studied. The stations should yield early indications of unacceptable effects of oil and gas activities. Questions to be addressed by these studies include the effects of:

1. Discharge of drilling muds.

2. Production of formation waters.

3. Disposal of drill cuttings.

4. Chronic discharges of hydrocarbons.

5. Platform placements, and others.

Monitoring studies are underway or will shortly be initiated in the MAFLA (Mississippi, Florida, Alabama) area of the Gulf of Mexico.

Baselines in south Texas, mid-Atlantic, southern California, Bering Sea (St. George Basin), Beaufort, and other Bristol Bay basins will soon be initiated.

Numerous special studies are underway in all OCS areas with more to follow.

In closing, I would reiterate that it is my hope, that through the workshops, the study plan can be completed with the inclusion of specific study proposals which will yield the best practicable study plan for the protection of the Alaskan environment.

THE ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN OUTER CONTINENTAL SHELF DEVELOPMENT

MR. RAYMOND MORRIS
Environmental Protection Agency
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The Environmental Protection Agency's Alaska Operation Office has responsibility to implement the National Pollution, Discharge & Elimination System Program here in Alaska. We will be writing the draft permit for any offshore oil development in O.C.S. waters in Alaska. The permit procedure requires that the applicants submit to our Seattle Regional Office a description of the discharge that they want permitted, and then the Alaska Operations Office has an opportunity to work with the applicant, the individual oil company that plans to discharge off of an offshore platform or temporary drilling barge or jack-up rig, or an onshore facility, such as a ballast treatment facility or a petrochemical plant. We work with the applicant for additional information, so that we can write a permit with effluent limitations that will protect the water quality.

Now, I'll have to say that there are in the mill some national guidelines for E.P.A. to follow which tells us what the standard of effluent will be throughout the United States. And these are in the process of being developed. They have not yet been put into effect. They're still in draft stage, and we're still hammering out what the final numbers will be for such things as mud discharge and for oil content in waste water that's to be eliminated.

The type of information that we're also looking for might be that which would allow us to step aside from the national guidelines, which tell us what the best practicable treatment at this point in time is, to those areas that are critical for protection of fish and wildlife. Here we get into a second stage of looking at effluents on the basis of water quality.

Let me give you an example as to how this works. The Valdez ballast treatment facility was proposed by Alyeska through a project description that was given to E.P.A. as far back as 1970. Having in hand the project description, rather than an overall plan, which is about what you're viewing today, you don't know specifically where these areas are going to be developed, nor do you have any idea what the owner company that's going to develop the area is going to put in out there. The type structure, the length of pipeline, the type of pipe, the sizing,

how it gets ashore, how it comes up out of the beach, where it goes after that, you don't have the foggiest idea at this point in time. But Alyeska came out with an idea early in the game as to generally what the program was going to be, and E.P.A. had some input early in that project to influence the design. On the basis of what we heard from Alyeska, we were able then to talk about ballast treatment discharges as far ahead as 1970. We had some lead time to work out what we felt was an effluent that we could live with, and Alyeska then also could muster up the technical talent that it took to design the facility to meet that effluent. We don't do this alone; we go out and coax the input from other interested Federal and State agencies, as well as individuals because, through our permit procedure, we have an open session where we hold hearings or go out to public notice and ask for comments that are considered before this effluent limitation is drafted and put into the final permit. With a project description, E.P.A. has something to work with. The Alaska Operations Office is looking for this type of timetable whereby we get some hardware in our hands.

On the basis of what we've seen in Cook Inlet and the development there, we can influence early in the game, if we get together with the right people at the right time, the type of equipment that is eventually installed. Because it's such a long timetable of programming for getting the money to update any new equipment that goes aboard any offshore platform, we like to get with them early in the game. I'd like to say that in this meeting, at least, E.P.A.'s influence as far as the Alaska Operations Office is concerned is to start talking about way down the line what we are able to foretell on the basis of what we know about the areas that are intended to be leased, what type of effluent we want to see discharged, and start influencing design way, way ahead of time.

Besides the N.P.D.S. permit system then which puts the numbers on the effluent, (and it can be as restrictive as that which protects the water quality for fish and wildlife, or any number is up for grabs). We also have a spill prevention control and countermeasure program, which speaks to the preventive requirements to keep oil out of the water in the first place. It will also be the responsibility of the owner-operator of the facility to prepare and implement this S.P.C.C. plan. Basically, it tells the owner-operator to take a look at his facility and decide for himself what he feels it's going to take, on the basis of some Federal guidelines, to keep oil out of the water. This plan is never submitted to E.P.A. We can go out and inspect it at the facility, but it's never submitted for our review and comment until such time as two visible sheens enter the water in one 12 month period, or a thousand gallons at one shot.

Once either of those two criteria are met, then the plan is submitted to E.P.A., and we take a look at it and see how it needs to be modified.

I might also say that the State of Alaska, Department of Environmental Conservation, also gets a chance to review this S.P.C.C. plan when either of these criteria are met. Then jointly we will work with the industry to correct that which caused the spill to occur in the first place, and maybe overhaul the plans so that we can prevent any occurrence from some other facet that may be able to produce an oil spill.

Alaska Operations Office has these two major roles in O.C.S. development. First, the N.P.D.S. permit system, which permits the effluent discharge that will be allowed from the waste water, from the cooling water, from the mud discharges, anything that's dumped into the water or proposed to be dumped. The second thing is the prevention program.

THE ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN ENERGY DEVELOPMENT

MR. L. H. OPPENHEIMER
Environment Protection Agency
Washington, D.C.

Like most Federal agencies which have a split between the Washington office and the District office, I think you'll see very clearly that we're like most of the others in that the District offices do things and the Washinton office talks about doing things. I want, with that caveat, to talk to you about doing things like the O.C.S. and how we in the Washington office look at the O.C.S. and its environmental impact.

Basically, the agency's position is that insofar as energy - overall energy - use is concerned, the nation just can't keep doing what it's doing now and continue its growth rate of energy consumption for the foreseeable future. The social, economic, and environmental costs are all too high. The Administrator has made several policy speeches in which he has said that, first off, energy conservation has just plain got to receive highest priority, as the most preferred policy alternative for the next 10 years or so. In addition to the energy that's going to be conserved because of higher prices, our analysis shows that a mandatory energy conservation policy could probably reduce energy needs in 1985 by about 15 percent. We think that from an environmental viewpoint that's very important because the environmental impacts of energy sources are a good deal higher than the average impact of energy production across the nation.

Secondly, our policy is that energy facilities, energy development, should receive what we call best available treatment on all new facilities. This best available treatment is specific to air and water pollution, but we also expect that the equivalent to "best available" should be applied to things like revegetation of soil, solid waste disposal, etc.

The third precept that the Administrator uses is that we've got to differentiate between the environmental impacts of alternative energy supply options. I guess it goes without saying that we'd like to encourage the good ones and discourage the bad ones. We have tried to prioritize some of these options.

There are, of course, a large number of supply options which are considered to be eminently acceptable. Most onshore development of oil and gas, for example, is acceptable without question. Tertiary recovery is acceptable. The Outer Continental Shelf is unique in that it really runs the gamut. You can develop the Outer Continental Shelf, in our opinion, in several very acceptable ways; and you can also develop it in some unacceptable ways. We'd like to be able to draw the line between the two, so that is receiving a great deal of our effort.

With respect to the Outer Continental Shelf, let me explain what we see the problem areas to be and what E.P.A.'s role is with respect to each of them. First off, I guess, is the development of an O.C.S. area just plain -- we'll always incur the risk of a cataclysmic spill, a massive oil spill, or something like that, which won't be very good for the environment. Our analysis says that the risk of a spill happening in the O.C.S. is considerably greater than the risk of a spill from importing the same amount of oil, barrel for barrel; we have a higher risk with the Outer Continental Shelf development. Of course, that depends really on how you produce the oil, what sort of geology you're producing it in, whether you pipe it ashore, whether you barge it ashore, things like that.

Secondly, a very large spill can be more burdensome on the environment than a spill from a tanker, especially if it continues for a matter of weeks or months like some spills will. This is because fresh oil being injected into the environment contains a proportion of very toxic compounds, which are in many cases prone to weather, and the weathering of oil from a spill of a tanker can limit the environmental impact of that spill; whereas if you have a continuous injection of a large amount of oil into the water, you will have continuous injection of the soluble aeromatic factions and things like that.

E.P.A. doesn't have the role to prevent spills, but with the Coast Guard we do have some role in cleaning them up once the spills occur.

The second impact is the continuous discharge of contaminants, pollutants, from a facility. Some of our biologists -- I guess the majority of our biologists -- have been concerned with this continuous impact to the environment and are more concerned with this than they are with the single cataclysmic spill because they feel that I can alter ecology in an irreversible manner. For example, we know that the ecology of the Gulf of Mexico has changed considerably in the last 20, 30, 40 years. We can't tell much about that change because we don't have a reliable base line, and we really can't say what was the cause of that change -- whether it was due to the discharge of contaminants or whether it was due to channelization and dredging of the Mississippi Delta for oil-drilling barges; but we do know that the change has been considerable and is probably irreversible.

Now, as Ray pointed out, E.P.A. does have a strong regulatory authority in this area, and we're in the process of formulating what we call effluent guidelines which will control and limit this.

The third impact, which may be of the most concern in Alaska, is the onshore impact. Our analysis for O.C.S. operations and for things like deep-water ports for receiving oil imports indicate that bringing oil into a coastal zone (and it's very much like a magnet) attracts a great deal of industry to process the oil, to support the industry that processes the oil, and you can expect a large influx of people into the area.

To E.P.A. this is very important because our air and water quality programs depend on the State plans which are gauged to meet air and water quality standards. When you have a large change and a large influx of new industry and new people into an area, those plans have to be changed considerably; and we've found in our experience that it's pretty difficult to retroactively change a plan and meet ambient air and water quality standards. So E.P.A.'s role there is to insure that when, say, an O.C.S. area is developed, the State plans have an opportunity to change, that they can assess what the potential impact is, and can act accordingly.

THE DEVELOPMENT OF THE DRAFT ENVIRONMENTAL STUDY PLAN FOR THE ALASKAN OCS

DR. JOHN ROBINSON
Environmental Research Laboratories
National Oceanic and Atmospheric Administration
Boulder, Colorado

I have been asked to give you a few words on how the study plan was developed, the study plans you have in front of you. I thought I might give you a little bit of the chronology of events that resulted in this plan and maybe a few words on some of the next steps.

Going back to May of last year, N.O.A.A. was requested by B.L.M. to take on an environmental assessment for the Northeast Gulf of Alaska. We developed that plan rather hurriedly; however, we did feel that we had quite a bit of good material from the planning work that we'd been doing for proposed studies in the Prince William Sound. So we put the plan for Prince William Sound - its major elements anyway - into effect in the Gulf of Alaska and began work there in July of this year. Since that time, we've conducted some very extensive planning for research along the coast of Alaska and for other parts of the United States. One of the first steps was to convene a group of 150 or so environmentalists within N.O.A.A., and we met several different times and considered what should be the major elements of a program of this nature. Those planning sessions resulted in what we called a "generic plan" for environmental studies related to O.C.S. development. That plan, by the way, is available for those of you who would like a copy. It laid out some of the basic principles that we thought should be involved in such studies; and, of course, its main shortcoming was that it was not oriented to any particular geographic area; and, from that standpoint, it was much too general to be implemented just as it was.

During that planning process, in about October, I guess, of last year, B.L.M. requested that N.O.A.A. take on studies for the entire Alaskan O.C.S. This last January we convened another group of scientists, this time about 110 or so, in Seattle to consider the specific aspects of the program for the O.C.S. region of Alaska. We met in Seattle for approximately a week or a little longer. Considerable material was turned in to us in a number of disciplines. That material was taken back to Boulder; and over the next week-and-a-half or two weeks, we developed the study plan that you have in front of you.

The meeting in Seattle involved people from the State of Alaska, the University of Alaska, the University of Washington, Oregon State, most of the Federal agencies, U.S.G.S., E.P.A., Corps of Engineers, Fish & Wildlife Service,

National Science Foundation and N.O.A.A. And I think this group represented most of the competence that exists in Alaskan marine research, certainly in the University community and among Federal agencies working there.

The plan that you have in front of you, then, was the result of that meeting and those deliberations.

Going on to some of the next steps that are involved here, last week we solicited proposals from approximately 40 universities to implement the program that's set out in that study plan. Now, we have forewarned these people that there are very likely to be changes that result from this meeting here over this week and that we will notify them immediately after this meeting as to necessary changes. We expect to have those proposals in our hands by about mid-March. We will then evaluate those proposals and compile them into a N.O.A.A. proposal to B.L.M. for the research to begin in approximately May of this year.

Some of the steps beyond that, that proposal will be evaluated by B.L.M. and will be forwarded to B.L.M.'s O.C.S. Research Management Advsiory Board. That Board is made up of representatives of the coastal states and from the major Federal agencies that are involved in O.C.S. research. The proposal will also be forwarded to the State of Alaska for consideration. B.L.M. will receive all the comments on the specific details of the proposal and make a final decision then as to whether to go ahead with the proposal as it's submitted by N.O.A.A. or to make some changes. If these steps all move along fairly smoothly, we would expect the research to begin, certainly the literature summary aspects of it anyway, in probably May of this year.

That's a few of the major elements that have gone into producing the plan you have here.

MR. WENNEKANS: I would like to get a better perspective of the workshop in Seattle. The subject matter covered by the workshop was the Bering Sea and the Arctic; nothing was said about the Gulf of Alaska, is that correct?

MR. ROBINSON: That's right.

MR. WENNEKANS: And I'd like to get some perspective from you on how the Gulf of Alaska was incorporated into the study plan after the work there was completed.

MR. ROBINSON: The workshop in Seattle did include only the Southeastern Bering and the Beaufort Seas. The material that's in the study plan related to the Gulf of Alaska comes from two sources.

First, an extrapolation of the material from the other two geographic areas, but more explicitly it resulted from a meeting the following week among the major investigators that are presently involved in the Gulf of Alaska program. They have considerable experience there, and we would look to them as our primary source of input as to the content of the second-year program in the Gulf of Alaska.

THE NATIONAL SCIENCE FOUNDATION PROGRAMS IN THE ARCTIC

DR. DONALD C. SHEPHERD
National Science Foundation
Washington D. C.

The National Science Foundation (NSF) is an independent agency of the Federal government that is charged with maintaining the health of basic science and research in the United States. In 1969, well before the oil crunch, the NSF was assigned by the Executive Office of the President to "extend the research activities of the Federal government in the Arctic region by accelerated scientific and ecological research."

The areas to be focused on and which are of particular interest to outer continental shelf (OCS) studies were: 1. The polar ice pack and its role in transportation and global weather; 2. Geological structures which lie under land and the polar sea as potential mineral sites and hazards for resource development activities; 3. Permafrost research; 4. The degradation of liquid and solid wastes in cold regions; 5. The balanced ecosystem of the Arctic; and 6. Man and his interaction with the Arctic environment.

Since the 1969 assignment, another research aspect has been included, mainly, the development of knowledge needed for the extraction and transportation of Arctic petroleum resources.

In view of the wide range of Federal Arctic research activities, the Inter-agency Arctic Research Coordinating Committee (IARCC) was established as an inter-agency committee whose purpose was to: 1. provide leadership in developing new avenues for scientific research through coordination among Federal agencies, and 2. for assuring the national development of Arctic research activities and the coordinated use of available logistic resources.

There are eleven Federal agencies on the IARCC including several represented here today, namely, 1. the Department of Commerce (NOAA), 2. Department of Interior (BLM, USGS), 3. Department of Transportation (US Coast Guard), 4. Department of Defense (Navy), 5. Environmental Protection Agency, 6. U.S. Army Corps of Engineers, and 7. National Science Foundation.

The National Science Foundation has been designated to chair the IARCC even though its funding level of Arctic research to date is only 1/5 of the current total Federal expenditure of Arctic research.

The Office of Polar Programs of NSF, which I am a member of, is responsible for directing the Foundation's Arctic research program. This program addresses research projects that are generally not a part of mission-oriented agencies. The objectives of the NSF Arctic research program are to: 1. increase the basic knowledge base on the Arctic environment, 2. improve man's ability to wisely extend his influence on the Arctic and 3. to otherwise encourage the intelligent use of Arctic resources.

Possibly, the most familiar program that NSF supports in the Arctic has, in fact, been underway since 1970. This program, called the Arctic Ice Dynamics Joint Experiment (AIDJEX), has been in the planning and pilot-study phases since 1970. In March of this year, the main phase of AIDJEX will begin. This consists of establishing four manned stations on the Beaufort Sea ice-spaced about one hundred kilometers apart and surrounded by a ring of unmanned data-buoy stations. This experiment, though not directly associated with OCS development, will provide essential data and theoretical models which will be used for future OCS studies. That is to say, AIDJEX will provide a better understanding of the interactions between sea and atmosphere in an ice-covered region and will enhance the capability of predicting ice conditions from simple meteorological observations -- a most important requirement for safe operations in the outer continental shelf.

A new NSF research program called "Processes and Resources of the Bering Sea Shelf" (PROBES) is scheduled to start in the near future. PROBES, a five year effort, plans to investigate the processes which regulate the high productivity of the Bering Sea - such things as transport of nutrients and human exploitation factors - and to identify the significant threats to the environment and the tolerance thresholds that the environment has towards these threats.

The program, as presently envisioned, will be carried out in three separate phases: 1. Develop ecosystem models to assess the important processes in a quantitative manner concurrently with developing an integrated proposal for field and laboratory work whose goal will be to clarify the critical processes in the region. 2. To organize the acquisition and appraisal of existing information on the ecosystem of the Bering Sea. 3. The analysis and presentation of results.

Th most recent research program that the National Science Foundation has developed in the Arctic is called the Arctic Offshore Program (AOP). The National Science Foundation has long been conscious of the need for a comprehensive, integrated program designed to cope with the problems and effects of Arctic development. The need to find acceptable solutions to such problems is a shared one between various agencies of the Federal government, the State of Alaska, the Native Corporations, and the petroleum industry. We cannot continue with the system of independent and random research programs aimed narrowly at problems which one party or another perceives. If an acceptable balance between the varied interests is to be achieved, we must develop and

carry out a joint and integrated program of research that not only obtains data but also will present it in forms that are useful to a wide spectrum of users.

In this regard, during the last 18 months, the National Science Foundation has been engaged in formulating a new research program focused on the Alaskan Arctic continental shelf area. This was done with the assistance of other Federal agencies, the IARCC, the University community, and the U. S. petroleum industry. This effort was undertaken in consonance with NSF's responsibility for the extension of Federal Arctic research.

The purpose of the Arctic offshore program is to obtain the data needed to solve the physical and environmental problems associated with petroleum exploration and extraction in the Arctic Alaskan continental shelf lying between the Bering Strait and the U.S.-Canadian border. As now planned, the effort will take seven years. In the first three years general investigations will be made to obtain data needed for environmental assessment. The following four years would then be devoted to quantitative studies and analyses aimed at developing design and regulatory criteria for the government to assess the safety and environmental impact of proposed outer-continental-shelf activities and to also develop forecasting capabilities and environmental monitoring baselines. The AOP has been divided into three categories: 1. ice and ice engineering, 2. marine geology, physical oceanography, meteorology, and related coastal processes, and 3. environmental assessment and ecological studies.

There will be seven projects related to ice and ice engineering, eleven projects in marine science, and five in the environmental and ecological studies. The initial effort of the AOP will be placed on a preliminary characterization of the outer continental shelf areas of the Chukchi and Beaufort Seas. Existing and accruing remote sensing data will be analyzed and field tests will be made to verify interpretation of aircraft and satellite-sea-ice imagery. Precise field measurements will be made of pack ice and corresponds to an area approximately 100 to 150 kilometers in width. The shear zone will be the region where the majority of outer continental shelf developmental and transportation systems will occur. Other initial activities of the AOP include measurements of the strength of ice and its tendency to adhere to structures and what this adhesion may do to increasing the ice loading and forces on such structures. In addition, geologic and bathymetric studies will be made of the seabed including offshore permafrost and the mechanical aspects of bottom scouring by ice. The physical and chemical characteristics of the water column will also be studied. And finally, biological productivity and variability with emphasis of areas of coastal upwelling will be included. A written description of the Arctic offshore program will be completed sometime next month and will be distributed to those that have an interest in conducting research in the area. Please contact me if you would like to receive a copy of this document.

Thank you very much for your attention. I will be happy to answer any questions.

MR. WENNEKANS: I would like to get a little bit of perspective on some of the scope of your programs. You've had AIDJEX, PROBES and AOP and those are classified as offshore programs. I was wondering what sutides does NSF plan to undertake in the coastal and the nearshore environment where most of the impacts are going to take place? Second, what coverage do you plan for the Chukchi Sea? And, third, do you have any kind of program that looks at basics for the interaction between oil and ice?

MR. SHEPHERD: Let me start with the last question. We have, in fact, been talking about an oil spill experiment which we would like to see started. But we feel at the present time this should not be undertaken until we understand a bit more about the degradation processes of oil as well as the possibilities of using some of the results that the Canadian program has currently underway. We understand that they, in fact, are going to be doing an experimental oil spill.

The research effort in Chukchi has not really been identified yet. The plan is to extend the remote sensing of the nearshore ice over as far as the Bering Strait and to try to provide forecasting information which would include the Chukchi.

With regard to nearshore studies, the only one that I'm currently familiar with and prepared to mention is an extension of the Tundra Biome Program. This study will be, unfortunately, not on the nearshore, but will be taking place more in the Meade River area and will be studying the effects of man's activities in that area on the tundra. One other possible study that should be mentioned is called Man and the Arctic. This is a social economics study which has been trying to assess what impact the development of the Arctic has been having upon the local residents.

THE RESPONSIBILITIES OF THE U. S. GEOLOGICAL SURVEY IN OCS DEVELOPMENT

DR. PETER BARNES
Office of Marine Geology
U. S. Geological Survey
Menlo Park, California

The responsibilities in the OCS for the U. S. Geological Survey are derived from the Organic Act of 1879 and the Outer Continental Shelf Lands Acts of 1953. From this the Director of the Survey is given responsibilities on the Continental Shelf as follows:

> First, to obtain fundamental knowledge of the regional geologic conditions and the processes involved in the formation of hydrocarbon deposits and to increase the capability for resource prediction and evaluation.
>
> Secondly, to target areas for mineral exploration and development.
>
> Thirdly, to identify regional geologic hazards.
>
> And, forthly, to provide general geologic information regarding resources and the environment as needed by federal, state, local and private planners, managers and others.

We provide open information on the geologic environment for the OCS. We're a non-policy-setting group in this respect.

Other responsibilities the USGS has are to conduct geological and geophysical and engineering investigation of mineral potential in areas of the Outer Continental Shelf for evaluation and selection of lease tracts, with BLM to supervise operations and enforce laws, regulations and orders incident to exploration, development and production of minerals and to collect royalties, the dollars in rentals due to the Government in these operations.

In order to implement these energy resource related responsibilities on the OCS, the USGS carries out some specific activities. These are regional earth science mapping and synthesis. Here we prepare maps and papers and synthesizing geological, geophysical, geochemical, seismilogical work on the OCS. The objective of these studies is to solve earth science problems and present conclusions relevant to mineral resource development, geologic hazards, changes in the environment and installations on the sea floor.

Another activity the USGS is involved in is resource analysis. We have a group called Resource Analysis Group (RAG) which appraises the overall mineral and mineral fuels resources on the Continental Shelf. These appraisals provide, in part, some of the long-range information used for Government planning.

Other basic activities include the development of new analytical and exploration techniques. We have the responsibility of developing new tools, techniques, and instruments in basic and applied research.

Another area of application involves studies that are directly in support of Department of Interior OCS leasing programs. These include geological analysis specifically for oil and gas and mineral potential and topical studies in basins or certain areas of mineral potential that may have geologic problems that will need solving. Additionally, we undertake studies on the geologic aspects of the environment. We have responsibilities for environmental analysis in cooperation with multi-disciplinary and multi-agency baseline monitoring surveys and studies. We do topical studies in addition to regional types of evaluations. We focus on specific problems which are unique to a given lease area, for instance, instability in the Mississippi Delta, the extreme earthquake hazard in the Gulf of Alaska, and the problems of ice scour and permafrost at high latitudes.

It should be noted that the USGS, acting on its own, can only incompletely carry out its mission. However, working closely with other Government agencies (BLM, NOAA, the Navy, Coast Guard) and very importantly, the academic institutions, can we fully meet our obligations and responsibilities.

In the Pacific Arctic branch at Menlo Park, we divided the responsibilities for the Alaska OCS into two groups. The resource assessment group is responsible for undertaking deep geophysical work and developing a regional geologic framework. The environmental analysis teams work on geologic problems and hazards associated with the sea floor.

STATE POLICY REGARDING OCS ENVIRONMENTAL STUDIES

DR. ROBERT B. WEEDEN
Office of the Governor
State of Alaska
Juneau, Alaska

On behalf of Governor Hammond, I want to express the State's appreciation for being invited to share in the formulation of a research program concerning proposed oil and gas development in Alaska's Outer Continental Shelf. We understand the long-term significance of recommendations stemming from this workshop. We look forward to continued participation as the research process gets under way and begins to nurture (and be fed by) OCS and coastal resource management programs.

All of you are aware of the serious reservations the State of Alaska has regarding the initial character of the federal government's accelerated OCS petroleum leasing program. We have spoken of these concerns publicly. Right now, Governor Hammond is attending the National Governor's Conference in Washington, D.C., where we expect to join other states in affirmation of the need for equal partnership between the federal government and the affected states in any potential OCS development. Although we recognize that these broader concerns are not yet resolved, we can nevertheless focus on the research issues to be faced under almost any OCS leasing scenario in northern waters.

Members of this Administration joined many university and federal scientists recently in a working session whose purpose was to develop the draft-research plan we have before us right now. These same State scientists have been involved in marine and coastal research for some time, either through specific state funded studies, such as the Kachemak Bay investigations and other wildlife or fisheries research of the Department of Fish and Game, or through coastal zone management programs. Drawing from this research and from an intimate knowledge of Alaska's natural and human environments, we must conclude that the Draft Study Plan reflects neither scientific nor managerial realities. Its scientific inadquacies stem mostly from the implicit decision to emphasize studies of the open ocean at the expense of nearshore, inshore, and coastal upland environments. In its refusal to address issues of community impacts, the economics of OCS petroleum development, and management systems, it turns its back on its own reason for existence.

OCS RESEARCH PURPOSES

Why, in these troubled economic times, are we contemplating the expenditure of millions of dollars on this research? Surely we will all agree that the underlying rationale is that before any responsible public servant can make a decision

on issues as far reaching as those relating to OCS resources, a certain minimum quantity and quality of information must be available.

The information must be in hand before the decisions have to be made.

The information must reduce the number and gravity of future unpleasant surprises, relating either to the functioning of natural systems, the interactions among marine resource activities, or the direct and indirect social and economic effects of OCS petroleum exploitation.

The information must stimulate and guide technologies of OCS petroleum development. (Note that I am not suggesting the use of research dollars to invent new hardware, but that research should take cognizance of existing technologic weaknesses and should reveal new technologic needs.)

The research should provide estimates of the worth of all OCS and coastal resources and environmental characteristics, to allow balanced resolution of conflicts and fair compensation for losses incurred.

The research should uncover needed improvements in OCS resource management institutions and systems. It should describe alternative management methods.

In our view, then, OCS research is but one aspect of OCS resource management. It cannot lag behind or stand alone or face in a different direction. OCS research strategies and work plans must be carefully dovetailed with oil- and gas-field-development plans, administrative systems and needs, continuing enforcement activities, legal issues, and state and federal socioeconomic policies.

OCS RESEARCH PRIORITIES: THE STATE VIEW

If one accepts that OCS research funded through the present BLM-NOAA program should be directly related to current and long-term management needs, what kinds of research should have priority?

Other members of state agencies will present more detailed proposals and comparisons with the Draft Study Plan in later sessions. I will only indicate the general areas of research that seem, in our view, to fit Alaskan and national needs best.

First, it is extremely important that the studies of biological and physical environments deal primarily with processes instead of things. We do not need a list of sea birds by geographic coordinates as much as we need an appreciation of what factors determine their distribution and densities, and how they interact with food organisms. We may have to pass lightly over the "whats" in order to uncover the "hows" and "whys." Management needs will be served better by a balanced study program which includes process-oriented research of lasting and general value, than by a series of snapshot inventories that are obsolete before they are published.

Second, at least as much emphasis, if not more, should be given to nearshore and shoreline ecosystems as to the biophysical systems of deeper waters. The inshore ecosystems will be stressed more often and by a greater variety of human actions than those of the bluewater regions on which the Draft Study Plan seems to lavish its attention.

Third, OCS related studies must include an examination of the overall implications of OCS petroleum exploitation to our statewide economy and social condition. This statewide perspective must be supplemented with regional and community level socioeconomic research. OCS is more than oil and fish. OCS development means a series of extraordinary changes (only a few of which we dare to label as good or bad) in Alaskan life, particularly for sparsely inhabited regions destined to host major onshore petroleum development facilities.

Fourth, the research program should analyze potential resource conflicts implied by a successful search for oil and gas on the Outer Continental Shelf. The obvious areas of probable conflict include the fishing industry, shipping, subsistence use of marine resources, marine sanctuary programs, onshore land uses such as ANCSA 17 (d) (2) National Interest Lands withdrawals and State designated "critical" habitat areas, recreation and tourism, and onshore oil and gas development programs of Native corporations and the State.

Finally, but of critical importance, the research program should include a comprehensive series of management studies. For example, we should examine the possibilities for major changes in traditional management of oil and gas resources such as separation of exploration activities from decisions to produce petroleum, or creation of joint federal-state management entities to carry out public interests in OCS development. Other, more specific management studies might include improved oil-spill-contingency planning, more efficient and effective permitting procedures and operational stipulations, systems for inspecting and licensing equipment, and examination of current and proposed liability and compensation concepts. We might profitably analyze the experiences of joint state-federal surveillance of the Alyeska Pipeline, up to now our most innovative approach to massive private industrial projects.

PROPOSED JOINT MANAGEMENT OF OCS STUDY PROGRAM

It must be clear to everyone that the State of Alaska will be so greatly affected by the proposed rapid exploitation of oil and gas resources of the Outer Continental Shelf that we have no choice but to strive for the fullest possible participation in every phase of the program. The research aspect is certainly no exception.

We ask this workshop to consider recommending that a joint federal-state OCS research management group be created and given full responsibility for

the supervision and coordination of Alaskan OCS studies. We are not content to be outsiders called upon occasionally to give advice on a research proposal. The stakes are too high for us to play that bit-part role. We do not think it is unreasonable for the State, as equal partner with federal agencies, to be involved throughout the life of the program in setting and modifying priorities, coordinating research components, supervising contractual studies, reviewing progress, and helping to insure research of high quality and pertinence to critical management problems.

In brief summary, we urge members of this workshop to consider changes in the Draft OCS Study Program that will increase its relevance to foreseeable management needs in the short run and on a long-term basis. Key changes should include greater emphasis on the dynamics of marine and coastal ecosystems, more attention to nearshore and onshore environments, a far greater emphasis on OCS effects on the State's human environment, and a searching look at existing resource management systems. We also urge creation of a joint federal-state research management group to insure beneficial interaction between research efforts and other aspects of OCS and coastal zone management.

A DISCUSSION OF POTENTIAL OIL AND GAS DEVELOPMENT IN THE ARCTIC OFFSHORE

Presented By

ALASKA OIL AND GAS ASSOCIATION
Anchorage, Alaska

EDITOR'S NOTE: The following four discussion papers were presented by the Alaska Oil and Gas Association to acquaint the conference/workshop participants with industry methods and safeguards for Arctic development. Slides and view graphs have not been included in the publication. For further information on the material presented, please contact the Alaska Oil and Gas Association, 308 "G" Street, Anchorage, Alaska 99501

INDUSTRY TESTIMONY AND INDUSTRY RESEARCH DIRECTED TOWARD THE ARCTIC OFFSHORE

MR. CECIL V. CHAPMAN
Atlantic Richfield Company
Anchorage, Alaska

On behalf of the Alaska Oil & Gas Association, I want to express appreciation for this opportunity to share with you our views on industry readiness and capability to explore for oil and gas in ice infested waters of the Arctic. We hope to assure you through this discussion that we are equal to the task. We want to remind you, however, that it takes more than just being ready and willing. We need leases; and, along with these leases, we need a permitting apparatus that is consistent, responsible, and timely.

First let's take a look at recent industry testimony. There have been several forums available in recent months, during which industry has supplied information relative to oil and gas exploration and development potential, research activity, and technological capability. I would like to share with you a few of these areas and these forums.

During the Federal Energy Administration Project Independence Hearing in Anchorage on September 9th and 10th, 1974, Dr. H. A. Slack of Atlantic Richfield Company and Mr. T. A. Hudson of Standard Oil Company of California presented independent testimony relative to industry technology and interest on oil and gas development in the Alaska area. Dr. Slack quoted a National Petroleum Council estimate of 47 billion barrels yet to be discovered in Alaska. He summarized the industry's position when he said, and I quote, "Industry has the technology to explore and produce safely in many of the high potential but yet unavailable areas, Alaska areas, now. Given a positive economic framework in which to operate, industry will safely and expeditiously explore for these reserves." He further indicated that the lead time from land availability to initial production may be up to ten years, with another three to four years to peak production.

Mr. Tom Hudson of standard of California stated, and again I quote, "The near shore area of the Beaufort Sea in water up to about 60 feet deep offers excellent opportunity for early oil development, because a large portion of this water bottom acreage can be directionally drilled now, from shore or from existing islands, using proven Arctic dry-land drilling technology. Areas under shallow water, that is, water up to 60 feet in depth, that are beyond the reach of shore based directional drilling, could be drilled within three years using terminology gained from offshore installations in Canada, in Cook Inlet, and from ongoing research. Areas under deeper water, that is, water 60 feet to 200 feet in depth, will require from five to ten years of active research and technology before drilling can start."

In another forum area, I call your attention to a study entitled, "The Alaskan Arctic Coast, a Background Study of Available Knowledge". In June, 1974, the Alaska District Corps of Engineers issued this study which was completed by the Arctic Institute of North America. This report is broad in scope and generally covers what is known and not known about the area. Although industry may not agree with all the conclusions, the report states as follows: "Industry believes, and the study team is inclined to concur, that current technology is adequate for exploratory drilling in the Arctic seas, out to at least the 20 meter depth contour."

Next I would cite a BLM report on responses received in reply to a request for comments on potential future Outer Continental Shelf oil and gas leasing. The request for comments was directed toward 17 Outer Continental Shelf areas, north, middle, and south Atlantic; east, central, and west Gulf of Mexico; southern California borderland, Santa Barbara, north and central California, Washington-Oregon, Cook Inlet, southern Aleutian Shelf, Gulf of Alaska, Bristol Bay, Bering Sea Shelf, Beaufort Sea, and Chukchi Sea. Industry was requested to rank the areas by order of oil and gas potential, geologic structures, estimated time period required to achieve initial and peak production after a discovery is made and to identify environmental factors constraining development. I should note that the industry responses were based upon consideration of the whole Beaufort Sea, insofar as that area was concerned. The improved ranking in the tables would be expected if responses had been limited to the shallower water, state water areas in which industry already has a developed, operating capability.

I won't dwell on the various rankings that were assigned in the study, but these are a matter of record and are documented in the BLM report. One other item in the report - and I think this is interesting to note - that the estimated timing for initial production after discovery ranged from three to ten years.

In another report entitled "Ocean Petroleum Resources, Interim Report of the National Petroleum Council," dated July 4, 1974, states with regard to offshore capability in the polar seas the following: "Part of the ocean floor potentially productive of oil and gas occurs under the polar seas. In these areas, ice poses special problems to petroleum operations. Nevertheless, the problems do not appear insurmountable. In the shallow margins of the Beaufort Sea, wells have been drilled from artificial islands composed of gravel and ice. Two other exploratory wells have been drilled from specially prepared ice islands."

With regard to timing, the report states further that, one, the capability for selective exploration drilling in the Beaufort Sea exists now. Certain specific areas may require some modification to existing equipment. And two, using present technology, production from gravel islands and island-type structures will follow four to five years after field discovery and delineation.

On January 23rd, 1975, slightly less than a month ago, the Alaska Oil & Gas Association was privileged to make a presentation to the State of Alaska regarding industry capability to operate in the Beaufort Sea. The report we are giving you today is a modified version of our report to the State. Copies of our report to the State are available through the Alaska Oil & Gas Association office.

In this connection, I should mention that substantial literature detailing present capability and requirements has been developed and can be obtained through the Alaska Oil & Gas Association. This was recently submitted during previously mentioned testimony to the Federal Energy Administration.

A possible timetable for exploration and production activities in shallow water areas near Prudhoe Bay, which has been cited in recent testimony, will be shown as our first view graph. This view graph shows a breakdown in timing associated with exploratory drilling systems, exploratory drilling, development and production structure, design and development, both onshore and offshore. I believe on Item 3, we have offshore and onshore reversed. Onshore should be one year, and offshore should be two years. Total time is shown at the bottom of the slide to initial production is four to eight years. Total time to maximum production is six to ten years. This, of course, assumes that a pipeline outlet is available.

Leaving the category of recent industry testimony, I would like now to discuss briefly research directed toward the Arctic offshore. Three industry associations cover the Alaskan and Canadian offshore in the Arctic. These are the Alaska Oil & Gas Association, which we sometimes refer to as AOGA, the Arctic Petroleum Operators Association, which we refer to as APOA, and the East Coast Petroleum Operators Association, which we call EPOA. The general functions of these associations are shown on the next view graph.

First is to develop operating technology for exploration and development of natural resources. Second is to establish mutual research on interest and problem areas. Third is to promote conservation studies on air, land, and water. Fourth is to provide liaison between industry and government, the universities, and other research agencies.

Let's move to the Alaska Oil & Gas Association for just a moment. The Alaska Oil & Gas Association or AOGA was formed in 1966 during development of Cook Inlet, to promote public understanding and governmental cooperation regarding all phases of the oil and gas industry, and to provide a forum for discussion of all matters which are of general interest to its members. On this view graph, we see the organizational structure of AOGA with its various committees. Much of the technical research for AOGA is handled by the Arctic Research Subcommittee, which is identified in the lower center. When the Prudhoe Bay field was discovered, attention was drawn to possible seaward extensions. The Arctic Research Subcommittee was formed in 1970 to assist in the development of research programs necessary to advance technology, first in the Beaufort, and

now also in the Bering and Chukchi Seas. The Arctic Research Subcommittee has some 18 member companies and provides both a forum to develop and a body of potential sponsors for offshore engineering research in the Arctic. Through meetings, technical literature and presentations, the Subcommittee also seeks to keep its members up to date with the latest technical developments in the Arctic offshore.

Industry research in the Arctic is usually undertaken through jointly sponsored research projects. Participation in these projects is voluntary and subject only to acceptance of the terms of the various participation agreements and not limited to AOGA members. A fairly standard form of participation agreement has developed, and the usual conditions include a minimum number of initial participants, a pro rata sharing of costs, a penalty for late participation, and a confidentiality agreement provide necessary incentives for companies to initiate and participate in research projects. These are projects which are proposed and developed on the basis of technical merit and industry requirements.

A booklet summarizing AOGA Arctic research projects to date is available through AOGA. A breakdown by category and cost is shown on the next view graph. The 23 projects undertaken to date cost some 44.6 million dollars and includes projects undertaken prior to the formation of the Arctic Research Subcommittee. They include literature searches and collections of available data on particular topics, marine transportation, investigations into shore-fast ice, soils and sea bottom scour, and support for the University of Alaska Sea Grant investigations into offshore permafrost and sea-ice dynamics. The results of the Sea Grant Program work are available through the Sea Grant Program, University of Alaska.

In Canadian Arctic research, APOA and EPOA coordinate industry research effort in the Canadian offshore and Arctic. APOA, which is the Arctic Petroleum Operators Association, was formed in 1970 with 15 members. Membership has now increased to 37 companies, with a combined permit acreage totalling some 350 million acres. APOA research in the Beaufort Sea, the MacKenzie Delta, and Arctic islands complements AOGA work offshore in northern Alaska. Many companies belong to both organizations, and AOGA and APOA now exchange Minutes, automatically offer reciprocal participation in all joint industry sponsored research projects.

As shown on this view graph, to date APOA has sponsored 75; this has been recently increased, I believe, to 78 projects at a total cost in excess of 10 million dollars. A booklet summarizing these projects is also available through the AOGA office.

Without the particular requirement to work in the Arctic offshore, EPOA has been somewhat less active in research than AOGA and APOA. Nonetheless, EPOA has sponsored nine research projects, to a total value of about half a million dollars. Much of the work is oceanographic or related to the problem of icebergs as can be seen on this view graph.

I would like to summarize the work of the three groups: We have AOGA, APOA, and EPOA summarized on this slide which simply accumulates the total work done through the three agencies. The combined expenditure of Arctic research, I believe, now totals about 55 million dollars.

Within the AOGA Arctic Research Subcommittee, a small liaison group has been formed to facilitate contact with other organizations active in Arctic research. This liaison group has: one, closely followed the University of Alaska Sea Grant Project, visiting Fairbanks and the research facility at Barrow; two, maintained contact with the Arctic Ice Dynamics Joint Experiment Program of the National Science Foundation, directed through the University of Washington; and three, has worked closely with the National Science Foundation during development of the Arctic Offshore Program. This program is a comprehensive research proposal for the deeper waters of the Beaufort Sea, and has projected funding in the 55 million dollar range over some five to seven years. It includes sections on ice related projects, marine geology, oceanography, and meteorology, ecological and environmental studies. It is expected that some of this work for NSF will be carried out through our own University here in the State of Alaska.

In summary, industry is actively involved in research related to the Arctic offshore area. We have the capability now to operate in this area using proven Arctic dry land drilling technology. We also believe that areas under shallow water, that is, water up to 60 feet in depth, that are beyond the reach of shore-based directional drilling, can be drilled within three years using technology gained from offshore installations in Canada, Cook Inlet, and from ongoing research.

I would be happy at this time to entertain any questions that any of you might have with respect to the two areas that I've discussed.

UNIDENTIFIED VOICE: What is the basis for the 60-foot depth?

MR. CHAPMAN: This appears to be an area where the ice islands seem to want to stop as far as the pack ice movement is concerned, and therefore it does, in effect, afford some protection from the pack ice movement.

UNIDENTIFIED VOICE: What is done with the data that are acquired from these various projects that the various associations have been obtaining? How are they distributed? Is it within the industry itself, or is this something which is relatively public?

MR. CHAPMAN: The data in some parts are of a nonproprietary nature. The Sea Grant data coming out of the Sea Grant Program, which we have offered support to, are an item in this category. There are other studies that fall in the public domain which the industry has supported, and therefore would be available to anyone. There are some studies, simply because of the tremendous cost associated with the studies, that are available to all, but they're available primarily for purchase at this point in time. But I would emphasize that they are available to those who pay. We do determine for each project a cost to each participant, and other participants are certainly welcome to help spread the cost basis for them.

UNIDENTIFIED VOICE: The program you outlined pertained primarily to the Arctic Ocean. I was wondering, do you have anybody that is going to give a presentation on the Gulf of Alaska and other areas on what you're thinking about in terms of technology and predicted technology? The second question I have is what research are you undertaking in terms of spill control, cleanup, and prevention with regard to oil and ice and how do you expect to explore in those offshore areas?

MR. CHAPMAN: If I may speak to the last question first, we will be speaking to those very points during Mr. Knowles' and Dr. Fall's presentation.

UNIDENTIFIED VOICE: I was looking at the amount of funding in those areas; it seems very small compared to the other tasks that you have undertaken. Do you feel that this is a minor problem or haven't you really addressed yourself to it?

MR. CHAPMAN: No, I don't think we would consider it as a minor problem in any respect. I think it's just an indication of the emphasis that's been placed to date, bearing in mind that there are no leases currently available in the areas. But certainly that we are interested in the areas, and we'll be emphasizing research in those areas.

With respect to the first question, the presentation that we're making through AOGA this afternoon will address itself primarily to the ice infested areas. Mr. Bob Iden will make a presentation for the Gulf of Alaska Operators Group on development in the Gulf of Alaska. Additionally, Mr. Clayton McAuliffe, from Chevron Research will be speaking of the Chevron oil spill in the Gulf of Mexico, which I think we'll find most interesting and quite relevant to this presentation.

UNIDENTIFIED VOICE: From the figures you have shown, it appears that the main thrust of the programs in the Canadian areas is environmental, but AOGA is about 95 percent engineering. Could you explain this dramatic difference in the emphasis?

MR. CHAPMAN: I believe in the Canadian areas they are more advanced than we are at this point in terms of activity in the offshore area. There were some transportation studies in the AOGA summary which influenced quite heavily the sums for the AOGA studies. The AOGA studies are in terms of total cost, five times the Canadian studies at this point.

A REVIEW OF INDUSTRY OFFSHORE METHODS WITH HIGHLIGHTS OF THE CURRENT ACTIVITIES IN THE CANADIAN OFFSHORE

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The increasing demand for petroleum has moved industry from dry land into deeper and deeper water, and then into harsher environments. Now, drilling and producing in the Arctic will require a solution to both of these problems simultaneously. Today with my presentation I would like to do three things: First, I'd like to outline the major steps which are required to produce petroleum. Second, I would like to discuss briefly the evolution of offshore exploration and development technology, and finally, I would like to pursue in more detail what industry is actually doing and accomplishing in the Arctic today. And my third item will be heavily concentrated on the Beaufort Sea area.

Producing petroleum requires five fixed major events. First, exploration - primarily the surface geology, geophysical work. This work has been going on in the Arctic for years. It has a minimum effect on the ecology and we will not discuss this further in today's presentation.

The next phase is exploration drilling. This is the drilling of the seismic highs to see if there are truly hydrocarbons in place in the ground. In this area, I will discuss briefly the evolution of industry's offshore experience and, as I said before, in more detail what industry is doing in the Arctic today.

Development drilling is the drilling of multiple wells to provide means to get this oil to the surface. Now, many of the exploration techniques that I will discuss are also applicable to development drilling. However, Mr. Richard Knowles will also discuss development drilling in much more detail.

Production operations are the producing of the oil to the surface, treating it, and making it ready to go to market. This is the daily routine production of oil. Again, this will be covered extensively by Mr. Knowles.

The final areas of transportation primarily involve the pipelines and the tankers to take this oil to the refinery. And although this subject is not directly in the scope of the presentation that you will hear today, I would like to comment that industry has undertaken a number of studies in this area. We have made studies on ocean shipping, ocean terminaling, ocean bottom ice scour, and many others. The technology does exist today to lay offshore pipelines in the shallow and the intermediate depths of the Arctic Ocean.

Let's now look briefly at the evolution of industry's offshore exploratory and drilling capability. The earliest non-land drilling was probably landfill islands or wooden pile piers in the Gulf of Mexico. However, as the economics of these land fill islands for deeper water became more questionable, floating rigs which could be moved from one location to the other were built.

The evolution of these rigs is shown schematically here. The first unit on your left is an early bottom-supported rig. It floats in shallow water into the location. Its flotation is flooded, it sits on the bottom and drills. Note that this was designed for approximately eight feet of water. It is for very shallow bays and marshy areas. The next one is a very similar unit designed for approximately 40 feet of maximum water. This particular unit was designed primarily for the shallower areas of the Gulf of Mexico.

In the center you will notice the jackup rig. It floats to location, jacks itself out of the water on its self-contained legs, and starts drilling from that platform. Next we see a semi-submersible, which has a large part of its flotation beneath the surface to give it added stability. And finally on the far right is a dynamically positioned drill ship which uses no anchors but employs an electronic position-indicating device coupled with a computer and controlled directional thrusters, to hold it on location.

Let's now assume that exploration has been successful in finding oil and look at a very brief history of the offshore methods of development of a field. Although increasing attention is being given to other methods, production islands for shallow areas and platforms for deeper water have been traditionally industry's development plan. This is one of the well-known development islands, which typifies the man-made, landfill islands of today.

As the water depth increases, steel template platforms are generally used. They have multiple slender legs and multiple slender cross bracings, and are generally pinned to the bottom with pilings. Note that as industry moved into deeper and rougher waters of the North Sea, the steel structures became heavier and more complex. Also, concrete gravity structures that utilize their own weight to remain fixed on the ocean floor began to appear.

It seems appropriate to mention at this time that industry has under construction a platform for 850-foot water depth in the Santa Barbara Channel off the coast of California. Its design is very similar to the Brent "A" platform which is shown here.

Industry's first ice-resistant platforms were installed here in Alaska in Cook Inlet. Their heavier vertical leg members are utilized to protect the wells by placing them inside of these legs. These platforms use simplified cross-bracings well below the ice-action zone.

Let's turn now to a major allied topic of prime importance, environmental safeguards. I would like to impress upon you that industry is equally concerned and is trying to keep pace with the technology to protect the environment. Our exploration and production accomplishments are impressive, but even more impressive is the fact that for the most part we have accomplished these with safety. From the millions of barrels of oil that have been produced offshore,

there has been only one spill in which significant quantities of petroleum reached the shore. Generally, our marine biologists agree that in this area no lasting damage occurred to the ocean community.

Let me list for you some of the many environmental safeguards that industry does employ. Crew training we put at the top of the list. Malfunctions of equipment are seldom and controllable. Malfunctions of people are more often found. So we think training people is the most important thing that we can do. Here we're particularly referring to the specialized training of the drilling crews on how to prevent blowouts and how to handle it after it occurs. A blowout preventer stack itself is a highly sophisticated unit of redundant valves to contain abnormal pressures, should they be encountered in drilling. Underwater television cameras are utilized at any time to survey the ocean equipment beneath the ship all the way to the ocean floor and to observe it while drilling. Pollution pans collect all the liquid runoff from the drilling ships and the platforms. Surface safety valves are placed on every well and every manifold; these are multiple; they are manual and automatic; so, if a surface malfunction occurs in any of the system, the wells are closed in automatically. Subsurface safety valves are placed below the ocean floor, such that if there is a surface catastrophe then the subsurface safety valve would close preventing a blowout.

It might interest you to know that the Exxon Company alone files over 140,000 reports per year on safety tests, such as the ones mentioned here.

Gentlemen, let's now leave our background study of exploration and development technology and move on to what industry is actually doing in the Arctic offshore. The Beaufort Sea presents a new challenge. However, industry has already made major investments in environmental research, and the elevation or progress is well underway.

Let's review what industry is doing in the Canadian Arctic. Four companies primarily dominate the Canadian Arctic activity. They are Imperial, Sun, Dome-Hunt, and Panarctic. Imperial has built a number of artificial islands which have been used to drill from, and they have demonstrated the technology of drilling in approximately 30 feet of Arctic waters. Sun has also used artificial islands and another technique, a sunken barge, which was supplemented by gravel around it. This is to reduce the quantity of gravel necessary. Dome-Hunt is building ice strengthened drillships which will operate in 60-foot and deeper water. They are also building a spud barge, which will precede the drillship to location to drill and set a 12-foot diameter by 50-foot deep caisson into the ocean floor to provide a below-ocean-floor housing for the blowout preventer stack. After setting a 30-inch conductor casing, cementing it in place, and setting the blowout preventer, the spud barge will move off, leaving the location ready for the drillship. Dome-Hunt is building two of the ice-strengthened drillships. They have a heavy armor steel on the outside to prevent ice crushing.

They also are building four ice-breaking supply ships to service the drillships. Their plan is to operate 112 days per year in the Beaufort Sea. This is approximately July 1st to October 20th. The cost of this flotilla was initially estimated at 135 million dollars.

Panarctic's experience of note was utilizing strengthened ice platforms -- a strengthened ice platform to drill in 400 feet of Arctic water. This was in the Canadian Arctic island complex eight miles off of Mellville Island. It was drilled to test an offshore extension of an onshore gas field. Here they pumped sea water onto six feet of existing ice, increasing the ice thickness to an average of 16 feet. They utilized proven industry equipment of a conventional North Slope land-type rig sitting on top of the ice and a conventional subsea blowout preventer and drilling riser to contact the ocean floor. With this, they drilled and tested a well in 42 days.

While discussing the various types of exploration, I'd like to digress a moment and show you another unique approach. This is a schematic of Imperial's monopod design. I present it only to show you that there are other designs being considered for the Arctic. This is a movable design for exploratory drilling. The base of the unit provides flotation. It floated into location, flooded, and sat on the bottom. Then if added stability is needed, bottom fill or sand can be placed on top of the base.

This view graph shows Imperial's Arctic offshore island locations. They are near the mouth of the Mackenzie River. Imperial has completed five islands and is constructing the sixth one. You will note from the discussion which follows that although the building of Arctic artificial islands is in its infancy, Imperial has already employed three different techniques in building these islands. Their first island is Immerk. This was built utilizing a suction dredge in 11 feet of water. It was constructed during two summer seasons. Their second island is Adgo. This island has a sandbag perimeter, a silt center fill. It was constructed using a barge-mounted clamshell unit. It is in 7 feet of water and was designed for one season's use. It was also designed with a self-destruct feature in mind, such that, shortly after abandoned, the natural wave forces will remove the island.

Pullen has a third unique design. Ice blocks were cut from the Arctic Ocean. Gravel was hauled by truck across the frozen ice, dumped into the open area. This was in a very shallow five foot area, and the island was designed for a single season's use.

The other islands are Adgo "2" in 7 feet of water, Netserk, 13 feet, and Netserk North in 23 feet of water.

Let's now switch to a look at some actual photographs for a few added details in Arctic Canadian offshore development. This slide shows Immerk Island.

This is a winter, aerial view. The operating problems in this area are a maximum ice thickness of 6 to 7 feet, frequent wind gusts to 70 miles an hour, and sea storm tides up to 10 feet. Design criteria for this first island was set at a two-year service life, a working area of one-and-a-half to two acres, and an elevation of the working area 14 to 15 feet above sea level. The island was designed to resist 7 feet of ice with a 400 psi ice strength.

Th next slide shows Immerk Island during the summer. This island was built with a suction dredge which dumped 5,000 cubic yards per day onto the island. It was built in two summer seasons. You might note at the back, the area that the barge is tied up, there is a sheet-piled dock. This allows summer supply of the island by barge. The construction of this island was initially delayed until July 15th, primarily because the area is a Beluga Whale breeding and migration area. An environmental impact study found that the suction dredge had no effect on the whales. Therefore, as soon as the area was ice free the next year, construction was initiated to complete the island.

This slide of Immerk shows the side slope above water line which is a five-to-one slope. It is covered with 80-foot by 90-foot overlapping pieces of filter cloth, which are held in place by the torpedo netting which is shown here.

Next we see Pullen Island. These are ice blocks, 5 foot by 6 foot by 8 foot, which were cut using a conventional "ditch witch." The next slide shows the constructed island, gravel was trucked over the ice and dumped into the area.

I've been asked a number of times, so let me answer it prior to the question, why is it so dark around the island? First, the snow is removed. This is a shallow area, as I mentioned - only 5 feet. The silt on the bottom is very dark and very black, so that we're primarily looking at the reflection of the silt below through uncovered ice in the area.

The next slide shows a close-up of the drilling rig on Pullen Island. I'd just like to point out that it's a conventional North Slope rig with standard winterizing.

Although no drilling has taken place off the Alaska Arctic coast from islands or from causeways, equivalent structures which could support drilling have been built. This is the Prudhoe Bay first dock. It extends into 5 feet of water and is 1100 feet long. It is in a semi-protected area of Prudhoe Bay. This causeway has been in operation for five years, and has had a very minimum damage from wave erosion and from ice damage.

The next slide shows the Prudhoe Bay second causeway. This was installed during the summer of '74. It will utilize a removable barge dock placed at the end of it for unloading cargo this coming year. This causeway is 4400 feet long, extends into 8 feet of water, and it is in a totally unprotected open-sea area.

In conclusion, industry has shown that exploration and development technology has been developed and demonstrated for the 30-foot shallower Arctic waters. Technology is available today to extend this up to twice that water depth. Further technology is rapidly being developed for the deeper Arctic waters, and always with safety and protection of the environment uppermost in mind.

UNIDENTIFIED VOICE: Has there been any consideration given to attempting to make an undersea tunnel where you would be able to put your rigs and start drilling?

MR. TAYLOR: I think many companies have looked at the concept. I don't think anyone has completed a full evaluation yet. I think the obvious first steps were indicated in the presentation today. With shallow water, you can't afford a tunnel. For deeper depths, it will certainly be looked at. As I tried to indicate, the history of our industry and experience is to progress gradually, moving out and getting one basic experience, and using it to project ourselves into others. Yes, I'll say we have looked at it. We've looked at some cost estimates. They've been rather cursory, but I don't think anyone would rule it out for some of the deeper water.

UNIDENTIFIED VOICE: In Canadian areas, what kind of consideration was given to the material sources, the availability to gravel as far as selection of sites to make it least damaging to the ecology? Also what are your views or the industry views in terms of cleanup and restoration of those sites that are used? By example, if one of those pads turn out to be a dry hole such that you have nothing to salvage, you have such a large amount of gravel and other things, is there a possibility to clean the gravel for re-use someplace else and also to remove all this steel netting?

MR. TAYLOR: Let me take your first question first. When Immerk, the first island that Imperial built, they wanted gravel, if possible, for greater resistance to the wave action. The Mackenzie Delta area is largely a heavy silt area. They did substantial seismic exploration, very shallow holes, looking for gravel beds. They had to go about a mile and a half away with a suction dredge before they found anything of a granular type material. The material was removed from the ocean floor, after removing a 10-foot silt cover. It's not a high-grade gravel, but it is a granular material. It is not the quality of your North Slope-Alaska gravel that we've been using. All of the islands that Imperial has built have been for exploratory purposes. They have had different designs as far as life expectancy. The first one was designed for basically a full two-year, year-round operation. If you'll remember looking at it, it had an erosion beach. This erosion beach has a calculated erosion pattern. The slope protection only was involved after you got up on to the island. The last island, the Netserk North, is also a longer term island, I understand, in their plan. But some of the others were designed for only a single-winter operation. In some cases, gravel was hauled from shore and dumped into the area. But each and every island does have a self-destruct feature.

MR. TAYLOR: With regard to the second question, I think that, you know, should you go back to that same area, you would certainly have probably some better grade of gravel in some cases. You remember some of the islands only had sandbag perimeters, and that silt from the ocean was pumped in there. The silt had to freeze. The silt has not enough compressive strength to be utilized any way you want forever. And the summer wave erosion would be a little bit precarious in some uses. So it was strictly a winter-type operation. All of them were designed with self-destruct features, and there is no plan in that area to recover the small amount of gravel that they're talking about. The quality of the gravel, as I say, even that which was hauled from shore is not a high-grade gravel.

DRILLING AND PRODUCTION IN THE ARCTIC OFFSHORE

MR. RICHARD KNOWLES
Atlantic Richfield Company
Anchorage, Alaska

I would like to talk about four main topics today, the industry's onshore experience for the last decade, the application of this onshore experience to the offshore areas in the Beaufort Sea, the design concepts involved in operating in the Arctic Ocean in general, and the logistics in production methods proposed to support a development drilling program.

May I have the first slide, please? Thank you. As most of us are aware today, the industry has operated in the Alaska north area since the early 1960's. The first scattered exploratory wells were drilled with pile supported rigs, during the winter months only. May I have the next slide, please? The pace quickened after the discovery of the Prudhoe Bay Stake No. 1, and in the winter of 1969 and 1970 saw the first development drilling in the known field area. The rigs now in use on the North Slope are the result of this decade of change to meet the harsh Arctic environment. This modification trend has involved two general types of rigs: One rig is an air transportable, highly mobile one, for winter exploratory work; and the second rig is a type that skids quickly on a land base for development drilling. The key to successful operation in either case is the quality of the rig's winterizing and its ability to conserve heat within the structure.

This next slide shows the Atlantic Richfield-Exxon Drill Site 1, which was the first development drilling in the eastern portion of the field. The present sustained development drilling program is kind to offshore operations in that a number of wells are directionally drilled from the gravel islands or drill sites on the tundra. The present development wells are between 9,000 and 13,500 feet in measured depth, with hole angles up to about 60 degrees. The rigs are moved from well to well by skidding intact similar to platform rigs offshore. Here the operations start to vary from conventional offshore operations, since the skid moves that we see on this drill site and drill sites similar to it are 100 feet or more, where on most offshore platforms you're talking about skidding just a few feet.

The drilling techniques have also experienced quite a modification from the early exploratory wells. Most of the development wells and many of the exploratory wells along the coastline are directionally drilled. Drilling fluids, casing design, survey techniques, and completion methods found in these present-day wells are unique to the Alaskan Arctic oil fields. Many of the other components of the drilling programs for these wells are drawn from the best modern petroleum technology.

The techniques and equipment that are being used in the present onshore development-drilling operations are immediately applicable to any beach location and all islands in the Arctic Ocean large enough to accommodate the drilling location.

May I have the next slide, please? This particular picture is Cross Island, taken in July 1963. This directional drilling technique would allow exploration of the area around such surface locations. Any discussion as to how far a well can be drilled out from the surface location depends on the location, the purpose of the well, and the application of sound drilling techniques.

For the purpose of today's discussion, let us pick a lateral reach of about a mile-and-a-half at a vertical depth of 12,000 feet, and a measured depth of about 14,500. If we're to define this geometrically, let us assume that an island such as this were at the apex of a 12,000 foot tall cone. The diameter of the circle at the bottom of this cone is about three miles. And any producing interval within this cone could be developed by normal directional drilling techniques. If the surface at the location were the beach, the directional drilling program could explore a 12,000-foot-deep wedge whose outer base would be a mile and a half offshore. This is not the description of a record-setting exploration directionally drilled well. What we're talking about is rather what is usually considered as the desirable limits for a development-drilling program. Any discussion of the maximum limits for exploratory wells would have to be treated on an individual basis. Some of the world-record directional drilling has taken place in Cook Inlet, where we're talking about lateral reaches in the neighborhood of 12,000 feet instead of 7,000 to 8,000 feet.

The greatest single problem in exploring beyond these present locations on existing leases is industry's inability to obtain permits to operate. Let us assume that any and all of the necessary permits were available on future leases through regular and consistent channels. If such an assumption were indeed a fact, a great deal of the near shore area of the Arctic Ocean would be open to immediate exploration and very early production.

Let's speak briefly about the design concepts that would be involved in stepping out into the Arctic Ocean. May I have the next slide, please? There are several controlling factors to be dealt with in the construction of artificial islands, platforms, or mobile structures for the near-shore areas of the Arctic Ocean. These are the temperature, logistics, permafrost, and sea ice. These are usually considered liabilities that are generated by the environment and the location. There are, however, several very plus factors in these same sources. The sea-water environment in the Arctic is not as corrosive as in more temperate climates. There is generally good-to-excellent sea-floor soils for construction, and the area is seismically inactive.

One of the most interesting areas of investigation we're presently involved in deals with the existence, extent, and nature of possible subsea permafrost.

The onshore research into this subject has expanded rapidly over the last five years. As a result, the industry's working knowledge of permafrost allows engineers to both describe and predict the behavior of this type of soil for a variety of imposed conditions. The existence and nature of subsea permafrost will have a direct bearing on the type of structure used for offshore drilling, as well as influencing the drilling program itself. Investigations on onshore permafrost will rapidly apply to the offshore area.

May I have the next slide, please? Another primary design factor is water depth. For the purposes of today's discussion, we can generally say that we're talking about depths of 60 feet or less. In general, increasing water depth is a liability, because it limits the type of usable structure, and exposes that structure to increasingly severe ice conditions. Mr. Chapman discussed the significance of the 60-foot contour as linked to the presence of massive ice islands and the deep keels of multi-layer pressure ridges that exist in water deeper than this.

May I have the next slide, please? It has been demonstrated at Prudhoe that travel causeways can be built out to at least a 6-to-8-foot water depth. Just as the first offshore efforts in other parts of the world were from causeways and docks, it can be expected that this technique could be well used in shoal areas of the Arctic Ocean. This method, when combined with sound conservation practices, offers the advantage of maintaining year-round ground support for the drilling operation.

May I have the first view graph? Carl Taylor spoke to you a few moments ago about the present technology of the Canadian man-made islands. The industry feels that this technology is immediately applicable to waters of about the 30-foot range. The islands in the Mackenzie River Delta have been constructed of dredged silts and sands. The construction technique starts with a structure that looks about like this. In essence, you're building a silt corral that you're going to fill at a later time.

May I have the next view graph, please? This view graph schematically shows the former silt fence that's been now filled with the sediments in the near area. This is a proven technique that would be even better suited to the areas, such as offshore Prudhoe, where the sea floor sediments contain much more sand and gravel.

May I have the next slide? The present technology of coffer-dam and bridge-pier construction utilizing gravel-filled sheet-pile structures has been used many places in the world in water out to the 60-foot depth in open seas. This approach would be another method that would be immediately applicable to about 40 feet of water in the Arctic Ocean. Application of these three construction methods will lead to orderly development of new concepts and new structures. It must be pointed out that the most important ingredient in any development program is operating experience. To get from today's concepts to tomorrow's structure takes actual field experience. The ideal area to develop this experience is near existing support facilities.

May I have the next slide, please? Earlier we spoke of the gravity platforms that have greatly extended our development techniques in the north Sea area. And this structure here is a ramification of a gravity structure. It couples both the high-density structural strength of a gravity concrete structure and the inverted bow of an icebreaker. This has been looked at in several model studies and several mathematical analyses. Once you get into a development program where you can economically justify this type of expenditure and you're in sea water that's deep enough to support the placement of this type of structure, this indeed is a sound structure. The technology of the early 60's in the Cook Inlet platforms in another approach that could be extended to the near shore areas of the Arctic Ocean. All of the items I've mentioned so far have been fixed structures. And just as we spoke of exploratory rigs as air transportable, we also need a highly mobile rig for exploration in waters that cannot be reached by conventional directional drilling techniques. The cost of this equipment is very high. Where a gravel island would cost several million dollars, a mobile drilling structure and its support equipment for use in the Arctic Ocean would cost over a hundred million dollars. The lead times are lengthy, and any such commitment would require firm leases and operating permits. These concepts have reached the planning stage for Canadian waters. The structures are air support vehicles, ice-breaking drilling vessels, ice-cutting monopods, bottom-supported ice-breaking barges, and ice-resistant jackups.

May I have the next slide, please? I'd like to speak very briefly about the logistics and the production techniques that would be required once you got into a development drilling program. Just as the industry started its first exploration drilling as a winter effort, so will the first Arctic Ocean locations be winter operations. This will lessen the supply problems and offer a longer operational season than the short marine approach. The technology required to operate consistently through the periods of breakup and freezeup in the Arctic waters are not yet at hand. The type of operation that is sustained from ice islands is highly improbable in the summer months, and the marine equipment will not immediately adapt to winter use in frozen seas. There is a strong possibility, however, that the man-made islands or platforms, as we have seen in the Canadian Arctic, can be supplied during the winter months in the Alaskan Arctic. The present network of gravel roads, drill sites, storage pads, were all constructed in the winter, as we see on this slide. The summer months have been used for the construction of operation centers, flow stations, and ocean docks. The offshore area would probably be developed in a similar manner. Present offshore islands would be prepared as drilling locations during the winter, while all the marine construction would have to be carefully planned and executed during the short summer months.

May I have the next slide, please? Just as an increase in water depth limits the type of drilling structure, so does it also limit the transportation method used in production. For production from the near shore islands, the experience

in Cook Inlet and the North Sea pipelines will be available for early use.

The next slide, please? As the water depth deepens, the industry will draw on its deep-water tehnology from other areas to solve the new challenges of the Arctic Ocean.

May I have the next slide, please? In summary, we can conclude that the petroleum industry has the technology to drill and produce the area within the 60-foot contour. A large research effort has been undertaken to develop this technology. With proper incentive, the technology will rapidly expand and be able to drill and produce beyond the 60-foot contour. The areas open to early exploration and development are logically those nearest the present operations associated along the Arctic coast. This area is expanding along the coastline in expectation of future leasing activities. The petroleum industry is literally poised and waiting along the edge of the Beaufort Sea.

UNIDENTIFIED VOICE: Could you give us a bit of perspective on your waste-handling problems you've had in the Arctic?

MR. KNOWLES: The present onshore areas have developed in essence a unique technology for our waste handling. We find ourselves one of the new evolving oilfields in a new and evolving age. You just don't go down to the reserve pit any more and burn your mud sacks. You have on location at all times an approved incineration technique. You have approved solid-waste disposal units, such as sewage plants. The offshore area would be very similar. As you recall our slide of Drill Site 1, that drill site is literally an island on the tundra. Ten feet away from that drill site with your back to it - and if everything were quiet on the drill site - you wouldn't know it existed. A great deal of effort goes into the cleanup operations after breakup every year, along these gravel causeways, along these islands, along the drill sites, along the roads. The offshore areas would not necessarily create any new problems from the solid-waste disposal problem. They would be easier to handle, for instance, than the solid-waste disposal problems in the North Sea because, as we start in the Arctic Ocean, we're going to be essentially a land-supported operation. We believe that technology is something that's evolved in the last five years, and those of you who have been involved with us in the solid-waste disposal problem can appreciate that.

ENVIRONMENTAL CONSIDERATIONS IN THE DEVELOPMENT OF THE ARCTIC OFFSHORE

DR. PAUL FALLS
Atlantic Richfield Company
Anchorage, Alaska

The above presentations have referenced the Arctic Ocean, and in particular the Beaufort Sea, and it seems appropriate that an environmentalist follow up these presentations illustrating industry's ability to operate in the Beaufort Sea and its awareness of the influence of the environmental concerns that have been referenced. Also demonstrated in these presentations, although perhaps not directly, was an awareness of the impact of developments on the environment, and that environmental safeguards are being engineered into the designs and operations. In addition to the research and engineering on better hardware, we attempt to use the knowledge available on the natural environment and to promote research where we feel like it's needed.

In January of 1974, the Arctic Institute of North America sponsored a symposium on the Beaufort Sea coastal and shelf research. For those of us who attended the symposium, it was illustrated that more knowledge about the Beaufort Sea environment existed and was available than most people had previously realized. The available knowledge was further developed or further brought together by a study by the Arctic Institute of North America for the Corps of Engineers that was referenced in the previous presentation, the Alaskan Arctic coast, a background study of the available knowledge. Industry participated in both of these projects.

The AOGA, the APOA, and the EPOA Programs were also referenced in the previous discussions. Although there is considerable knowledge about the Beaufort Sea available at this time, there is an obvious need for continued environmental studies. Of the studies in progress at this time, the Canadian Beaufort Sea Environmental Program, that is, a program by the Canadian oil industry, is of interest. What is learned from this program can be applied to the Alaskan Beaufort Sea development. These studies include the biological, chemical, geological, and physical oceanographic studies, studies of sea birds and marine mammals, evaluations of the effect of oil on the bioda and on the ice, behavior of spilled oil, and oil spill cleanup studies. Other studies of current interest in which the oil industry is involved include the extension of the Arctic estuary studies by the University of Alaska in to Prudhoe Bay, a fisheries study in Prudhoe Bay by the Alaska Department of Fish and Game, and the Coast Guard studies of cleanup techniques of oil spills in cold climates, which is apparently continuing and is being expanded to include cleanup techniques during breakup.

The industry, through the American Petroleum Institute, is maintaining a number of active programs, such as the fate and effect of spilled oil and improved oil-spill cleanup techniques. Encouraging to the industry are the plans for environmental studies in the OCS areas that are being formulated at this workshop. This represents what could be the interdisciplinary coordinated approach needed to avoid some of the confusion and the waste of our scientific resources that we've experienced in the past, but, more important, to provide us with some of the answers to the difficult questions.

Hopefully, the experience available from the industry and scientists can be incorporated into this effort, and the interpretations of the natural processes can evolve.

With reference to our operating capability, the oil and gas industry has acquired considerable experience to operate in an environmentally sound manner which can be transposed, first, to the shallow waters of the Beaufort Sea and, then, to the deeper waters. For example, we've been operating in Cook Inlet with ice and high tides for a number of years. The North Sea operations have provided experience for coping with the stormy northern seas. The experience of drilling from artificial islands, ice islands, and other platforms in the Canadian Beaufort Sea will also be applicable to the development in the Alaskan Beaufort Sea.

While similar to other offshore areas, the Beaufort Sea developments in shallow waters will be more analogous to the operations at Prudhoe Bay because of the shallow waters and the type of platforms that will be employed. At Prudhoe Bay, we've been operating in a concentrated manner for a number of years, and the industry was exploring many years before that. As a result, we have a good idea of what we can or cannot do for environmentally sound operations.

We also emphasize the unique character of our Alaskan waters. To assess the real impact of oil and gas development on these waters, we have several real-life laboratories that can provide us more information. The oldest of these laboratories is the Gulf of Mexico. Some studies that have recently been published by the Gulf University Research Consortium can provide us with some insight into the processes that might be involved.

Because of industry's experiences in the areas just mentioned, it has grossly improved its capability to operate in an environmentally safe manner in the past few years. This is largely because of research and engineering of the environmental safeguards, such as the blowout preventers. But there are other considerations. The oil companies are taking greater precautions than ever to protect the environment. That is, they have developed an environmental awareness. For example, prior to exploratory drilling in a new area, the practice developing within the industry is to have in effect an oil spill prevention plan and an oil spill contingency plan. Being developed by most operators are environmental training programs, which include training for environmental

awareness, training in the operation of pollution-prevention equipment, such as blowout preventers, and training in oil-spill prevention and cleanup techniques.

That, I hope, points out some of the environmental concerns that were brought out in the previous presentations.

SUMMARY

MR. CECIL CHAPMAN
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Today we have reviewed for you some of the recent industry testimony directed to the Arctic offshore area. We have looked at some of the industry activity in the area of Arctic research. We have looked at some of the industry offshore methods. We have looked at Canadian offshore activity. We have talked about drilling and production considerations and, finally, the environmental considerations.

This discussion allows us to draw several conclusions. First, using techniques applied successfully on the North Slope, offshore in the Mackenzie Delta, and as a result of industry sponsored Arctic research projects, significant quantities of offshore acreage in the Beaufort Sea are capable of early petroleum development.

Secondly, programs for exploration and production in water depths up to 30 feet can be initiated immediately. Present development in Canadian waters up to these depths has been from a network of artificial islands. Exploration and production in water depths from 30 feet to 60 feet are already technically feasible, but could benefit from some two to three years of additional development, based on some initial experience in shallow waters.

Even with an immediate start, no significant quantities of oil would flow to shore for several years.

I would emphasize again that industry is ready and willing. However, we need leases and, along with these leases, we need a permitting apparatus that is consistent, that is responsive, and that's timely.

I would encourage you to be in contact with the AOGA office for some of the printed matter that we have discussed this afternoon. Also if additional questions arise, please do not hesitate to contact the AOGA office, and we'll do our very best to answer them. We appreciate your interest and your attention and enthusiasm.

A DISCUSSION OF POTENTIAL OIL AND GAS DEVELOPMENT IN THE GULF OF ALASKA

Presented By

Gulf of Alaska Operators Committee

EDITOR'S NOTE: The following discussion was presented by the Gulf of Alaska Operators Committee to acquaint the conference/workshop participants with industry methods and plans for development of the Gulf of Alaska. Slides and view graphs shown during the presentation have not been included in this publication. For further information on the material presented please contact Mr. Bob Iden, Atlantic Richfield Company, P. O. Box 360, Anchorage, Alaska 99510.

TECHNOLOGY ASSOCIATED WITH OIL AND GAS DEVELOPMENT IN THE GULF OF ALASKA OUTER CONTINENTAL SHELF

MR. BOB IDEN
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The Gulf of Alaska is the most prospective, untested oil and gas province in the United States. This fact is recognized by both industry and Federal Government. An OCS lease sale has been scheduled for late 1975, and industry is making large capital investments in anticipation of this sale and subsequent exploration and production activity.

The first few slides really illustrate how it is that we have the data to rank this as such a highly prospective area. The area that I'll be talking about is the Yakutat shelf area, Yagataga shelf, and the Middleton shelf areas of the Gulf of Alaska. This is a vicinity map which shows also the population of the communities in the area. The area of interest is shown by the red line.

The next slide is a map of the Gulf of Alaska. Recently, calls for nominations went out to industry to sale of land areas up to the six-hundred-foot water-depth contour. Actually, the two-hundred-meter-water-depth contour, which is about 656-foot water depth.

For the past ten years industry has been conducting extensive exploration work, both collecting geological data and geophysical data. These are a series of slides showing some of the geologists at work, measuring sections of outcrop. This slide and the next slide are geophysical data being collected offshore. In addition to the data collection from the geologists and geophysicists, there have been a number of wells drilled in the Gulf of Alaska area, a total of about 26, which with the exception of the Katalla oil field, were dry holes. But they did provide important geological data.

This slide indicates the ranking of Gulf of Alaska as number one of the prospective OCS as ranked by 25 companies. And this shows the estimated potential by the USGS in 1974. The Gulf of Alaska could have up to 20 billion barrels of oil and a hundred trillion cubic feet of gas. Notice also, the low end of the potential is zero; there's a lot of risk involved.

There has been considerable discussion concerning the industry's ability to conduct operations in this harsh environment without causing substantial harm to the natural beauty of the area. The questions being asked seem legitimate when one looks at the environmental factors industry will have to deal with here. For example, wind velocities can be expected in the Gulf of

Alaska in excess of a hundred miles an hour. Wave heights up to one hundred feet may be encountered. The most promising structural features in the Gulf of Alaska are located near to an area which experiences considerable seismic activity. There is also the potential for ocean bottom soil instability associated with this seismic activity. The seismic activity also has potential for creating a tsunamic or great sea wave in the prospective area.

I would like to point out on this slide, however, in the area of interest here, there are considerably less frequent dots, or earthquake seismic activity than the Cook Inlet area, where oil producing platforms have been installed and operating since 1966.

Another problem, dense cloud cover for extended periods of time, is a commonplace occurrence in the Gulf of Alaska. The Gulf of Alaska is located at about 60 degrees north latitude. That is pretty far north relative to the Gulf of Mexico or the Santa Barbara channel. It gets cold here.

This sounds like a rough place for an oil operator to drill and produce. So the question, "What makes us think we can do it safely?" is appropriate. I would now like to discuss some of the things we have done and are doing in Alaska and other parts of the world that support industry statements that we have the capability of operating here without disruption to the environment.

Since 1964, Atlantic Richfield Company and others have conducted drilling and production operations in Alaska's Cook Inlet. While conditions here are not the same as we will encounter in the Gulf of Alaska, the Cook Inlet is further north, it gets much colder than in the Gulf, and we have to contend with extreme tides, currents, and heavy ice.

These are some slides of the Cook Inlet operations, showing the ice. This is a tanker at the Drift River facility. It's a tough environment to operate in, but we have been able to do so for over ten years without a significant oil spill.

The northern part of the North Sea has an environment very similar to that which will be encountered in the Gulf of Alaska. Exploratory wells have been drilled in water depths exceeding six hundred feet, and platforms are being erected in water depths up to 450 feet. Winds and waves from the North Sea are comparatively severe to those encountered in the Gulf of Alaska. This slide is a map of the North Sea area. This is a semi-submersible drilling rig operating in the North Sea.

Oil production operations in the North Sea are just beginning. A large number of exploratory wells have been drilled without significant environmental damage. Within a few years the North Sea will become one on the world's major oil producing areas.

I'd now like to discuss some of the industry activity directly associated with the Gulf of Alaska. About 1970, the Gulf of Alaska Operators Committee was formed to coordinate a joint-industry effort to gather data necessary to study the problems associated with oil and gas operations in this frontier area. The committee is now comprised of thirty companies, which represent most of the major oil producers and operators in the world. Through this committee, data gathering studies of the environment have been made as the first step in developing the technology required to operate here. This slide shows the Gulf of Alaska Operators Committee organization.

The most extensive of these studies was conducted in 1970 by Bendix Marine Advisors at a total cost in excess of one million dollars. The primary purpose of the study was to develop oceanographic, meteorological, and environmental data required to plan for exploration and production operations in the area. This effort was the most comprehensive oceanographic study undertaken to date by the petroleum industry in a prospective leasing area. The specific items included in the study were waves, currents, water temperature, surface elevation fluctuation, ice condition, winds, visibility, aircraft icing, factors affecting communications as well as a preliminary evaluation of coastal sites for oil producing logistics and support facilities.

Work of this nature is continuing. Marathon Oil Company is currently supervising a "wave rider program," a new program designed to gather additional data concerning wave behavior in the Gulf of Alaska. This work is on-going now, has been for several months, and will be conducted at a cost of about $850,000. There are clusters of three of these wave riders at five different locations scattered throughout the Gulf of Alaska.

Many of the Gulf of Alaska Operators Committee companies will share in the data developed and the cost of this program. These data will also be used to develop and test the weather forecasting service designed specifically for our needs when operating in the Gulf of Alaska. The system will be developed now so that when operations commence, it will be a proven service.

In order to pool both our financial and technological resources, Atlantic Richfield Company has entered into a contractual agreement with Shell and Mobil to conduct joint operations in the Gulf of Alaska. Each of these three companies is a member of the Gulf of Alaska Operators Committee. This Shell, ARCO, Mobil group, called the "SAM" group, has formed a series of task groups to conduct detailed technological studies of all the various aspects of oil and gas exploration, development and production in the Gulf of Alaska.

I will discuss the activity of these various task groups in some detail. The group titled "Task Group 2" was given the assignment of studying the exploratory drilling operations. This group is composed of engineers of both the drilling

research staffs and marine field operating areas of the three companies. Both the Bendix study and the North Sea operating experience were used as a basis for design criteria for a drilling vessel with the capability of operating in the Gulf of Alaska. This slide shows three different kinds of offshore exploratory vessels.

After considering several vessels of basically different design characteristics, the task group recommended and management subsequently approved a proposal to have constructed a semi-submersible drilling vessel capable of operating in water depths ranging from 150 feet up to a maximum of about 1,000 feet. The particular vessel selected, which is now under construction for the same group is a SEDCO 700 series semi-submersible rig, shown here.

These are some more shots of the 700 series rig. It's a pretty massive vessel. The deck area is a little over an acre. It's about 200 feet by 240 feet. The height is about 130 feet. It's shown here in drawing mode submerged to a depth of about 70 feet. The previous slide showed it in transport mode. It has its own power to move.

This vessel will include the latest technology available to assure that the operation is conducted in the safest, most efficient manner possible. For example, the blowout-preventor equipment used in the drilling operation will cost in excess of two million dollars.

The drilling operation will be monitored by computerized control and mud logging equipment that is the most sophisticated equipment of this type being built. This CDC system has a capability of measuring many downhole parameters important to close control of the drilling operation.

The vessel will also be equipped with a weather forecasting and recording system second to none. This system will have the capability of reading ceiling and visibility at night, which is an important asset to nighttime helicopter operations.

The vessel will also be equipped with television cameras for ocean floor observation and diving equipment will be onboard the rig at all times for immediate response to underwater problems that might arise. The total cost of this vessel with its drilling equipment will be about forty million dollars.

A separate task group was formed to review requirements for the support boats required in conjunction with the rig operation. Again, drawing on the Gulf of Alaska weather data and North Sea operating experience, which has been extensive in the area of boat operations, this task group developed design criteria for a combination tug, supply, and anchor-handling vessel that could effectively and efficiently operate in the Gulf of Alaska.

Incorporated in the design are items such as a reinforced-ice strengthened hull and an advanced design for the anchor handling system. The boats will also have 7,000 horsepower engines, which are as powerful as any boats of this type in the world. The boats will have controlled pitch propellers and bow thrusters for maximum maneuverability.

The water and bulk-material handling pumps are designed for rapid discharge so that we will take maximum advantage of all available favorable weather. Two of these boats are under construction for the SAM group at this time and will cost about eight million dollars each.

The technical group dealing with the selection of appropriate helicopter support drew again on expertise from the North Sea. However, in this instance, this group was also able to draw on expertise in Alaska. Atlantic Richfield Company in particular has had extensive experience in Arctic aviation operations and, of course, the FAA and military experience is available to us. Agreement has been reached to have constructed a Sikorski S-61N model helicopter which will incorporate the most sophisticated navigational aids available.

These navigational aids will make this the most well-equipped helicopter ever built for civilian use. Local FAA officials have described our program as the best "instrument flight rule" operation in the world. Individual items included in the navigational aid equipment are: 1) The best airborne radar equipment available for purchase -- a Bendix 1200 radar system. 2) Dual radar altimeters which will have the capability of indicating height above ground or sea level, accurate almost to the foot. 3) A TACAN system on the drilling rig will provide the helicopter en route to the platform with a precise bearing, and also the distance from the helicopter to the rig to an accuracy of approximately 1/10 of a mile. This equipment is not affected by weather as are other less sophisticated en route navigational aids. 4) A microwave landing system on the platform. This will allow landing in more adverse weather than can be accomplished with the TACAN system alone. The cost of this helicopter including the navigational aids will be about three million dollars.

A third task group was assigned the responsibility for locating and developing a base of operations for exploratory drilling. There is a protective bay at Yakutat, which is nearby the most promising structures in the Gulf. This is a slide of Monti Bay, and the City of Yakutat. This slide shows the existing Ocean Cape Cannery dock at Yakutat. This harbor is the same view as it quite often occurs with poor visibility and snow.

Land has been purchased by the SAM group at Monti Bay and construction of a shore base is about to commence. This work is proceeding, recognizing the unique characteristics of the City and the goals and desires of the citizens.

The total cost to operate the semi-submersible drilling rig together with its support equipment including boats, helicopters, and shore base will be in the range of eighty to one hundred thousand dollars per day.

One of the most demanding assignments from the technological standpoint is that of task group 4, which was formed to study platform design. This group has gathered together many experts in a variety of fields of study to consider this problem. This includes both engineers and scientists from the three SAM group companies and a number of outside consultants. Areas of investigation include the effects of earthquake activity in the vicinity of the potential oil operating area, ocean bottom conditions in the areas of interest, the effect of wind and waves on structural designs.

Alternative construction modes include the choice between steel pile structures and concrete gravity structures. This is a slide of a base of a concrete gravity structure being built for the North Sea. This is the same portion of concrete gravity structure being built and floated at the same time. This gives some idea of the immensity of the structures. This is a schematic of a complete concrete gravity type structure with some amount of oil storage provided in the base of the structure.

Among the conclusions reached by the task group at this time is that structures can be built that will withstand anticipated seismic activity and wind, wave, and current forces. Platform location and design will have to take into account the possibility of soil slumping in some areas. Concrete gravity structures may have application in some areas. The cost of platforms in the Gulf of Alaska will be in the range of eighty to one hundred million dollars each. The time required to build a platform will be four to five years after a discovery has been confirmed.

Task group five is investigating problems associated with marine pipelines and is also considering application of offshore storage structures and mooring buoys for tanker loading offshore. This shows a schematic of a pipeline laying barge. This is a schematic of a single-point buoy mooring. This task group 5 will consider the best way to handle oil production downstream from the platforms. Consideration will be given to the best way to get oil from the platforms to the tanker from the standpoint of cost, least disruption to the environment, and less chance of an oil spill.

In summary, we're confident that we can operate in the Gulf of Alaska on the basis of existing technology. Technology that is being developed as a result of North Sea activity and the on-going study effort associated with the proposed lease sale for the Gulf of Alaska will be used. We're sure that oil and gas deposits are present in the sediments underlying the Gulf of Alaska, and we're sure that we can find and produce them and, at the same time, leave this area as it is now -- truly one of the most beautiful in the world.

If you have any questions, I'll do my best to answer you.

UNIDENTIFIED VOICE: Is the semi-submersible vessel being built in Japan?

MR. IDEN: No, it's being built in California.

UNIDENTIFIED VOICE: On the building of your concrete gravity structure, will this be an off-site building if you build them, or would you build them in place?

MR. IDEN: We're conducting a study of possible sites for construction of such a platform. There are potential locations in Alaska and also in the Seattle area. And a choice would have to be made after some further investigations as to which would be the better site. Further investigations related to aggregate suitability primarily.

UNIDENTIFIED VOICE: Would Yakutat Bay be one of those sites?

MR. IDEN: No.

UNIDENTIFIED VOICE: Have there been any special considerations regarding the possibility of collision between ocean-going vessels and these platforms or terminals?

MR. IDEN: I think there has been made some mention of designation of shipping lanes, so there won't be conflict between location of platforms and pipelines and shipping. Of course, oil structures are going to be found where oil is found and we really can't move them. There is some potential for adjustment in the definition of shipping lanes. I think there will be definition of certain areas for shipping.

UNIDENTIFIED VOICE: In the event that at sea moorings are used to pick up the crude, what type of arrangement will be made for the natural gas?

MR. IDEN: That's a little bit beyond our study limits at the present time. Most likely, I would think that the gas would go ashore and possibly be liquefied. As far as I know, there's been no work done on any kind of offshore work associated with gas production. I think it would have to go ashore.

UNIDENTIFIED VOICE: What's the situation in the North Sea with regard to that?

MR. IDEN: It comes ashore through pipelines.

UNIDENTIFIED VOICE: You have gone through the technology as far as platforms for drilling quite adequately and I understand what you're facing here. But I'm a little confused as to what industry is doing regarding underwater pipelines and how you're going to face up to the problems involved with that type of operation? Could you say a few words?

MR. IDEN: I did mention we have a Task Group Five that has been assembled. This is the most recent task group to be formed. It was only formed late last year, and it is their charge to study what is done with the oil from the point of the platform to the point of the tanker loading facility. The study work that they are presently conducting is to investigate the offshore storage potential in concrete gravity type structures. A second study that is about to start is a pipeline study. In other words, what size pipelines would be needed for what certain rates? How would they be installed in compliance with the OCS operating orders?

UNIDENTIFIED VOICE: Can you give us a better perspective on the Yakutat staging area?

MR. IDEN: We would plan to make Yakutat a shore site for the support of the drilling vessel offshore. There will be some upgrading of an existing dock facility to support, in particular, the heavier loads that it will have to bear as compared to what it has done in the past. There will be some small amount of storage area for supplies needed to support the drilling vessels such as pipe, barite, mud, and miscellaneous well equipment. Fuel will be obtained from the Yakutat shore site. Water, potable water, industrial water for the rig, will be obtained there also.

UNIDENTIFIED VOICE: How many people do you have in mind?

MR. IDEN: To operate such a base?

UNIDENTIFIED VOICE: Yes.

MR. IDEN: It could be operated with about somewhere between ten and twenty people.

UNIDENTIFIED VOICE: Is this families or just people?

MR. IDEN: This is workers, many of which could most likely be employed from the local population.

UNIDENTIFIED VOICE: I'm interested in your concrete submersibles. First, am I correct is assuming that they have to be ballasted either with oil or water? And if I'm correct, how do you propose to separate oil from the debalancing water?

MR. IDEN: The storage portion of the facility you saw, the base, would provide storage for oil and you would displace the water there with the oil. You would expect to have some kind of treating facility to accommodate contamination of the water by the oil. That same treating facility could be used also for the treating of the ballast for the tankers.

UNIDENTIFIED VOICE: Do you have any idea how much area will be required for the debalancing facility adequate to debalance the incoming tankers?

MR. IDEN: No, I don't at this stage.

CHEVRON MAIN PASS BLOCK 41 OIL SPILL: CHEMICAL AND BIOLOGICAL INVESTIGATIONS

Presented By

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EDITOR'S NOTE:

The following is the complete paper, Dr. McAuliffe was able to only summarize the information during his verbal presentation at the conference/workshop.

CHEVRON MAIN PASS BLOCK 41 OIL SPILL: CHEMICAL AND BIOLOGICAL INVESTIGATIONS

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ABSTRACT

During a three-week period in 1970 an estimated 65,000 barrels of 34° API gravity crude oil were discharged from Chevron Main Pass Block 41C Platform, 11 miles east of the Mississippi Delta. Two thousand barrels of chemical dispersants were sprayed on the platform and surrounding water surface.

It is estimated that between 25-30% of the oil evaporated during the first 24 hours, 10-20% was recovered from the water surface, less than 1% dissolved, and less than 1% of the oil was identified in sediments within a 5-mile radius of the platform. The remaining oil emulsified and dispersed to undetectable levels. biodegraded, or photo-oxidized.

The highest measured concentrations in water at the platform and at 1 mile were: oil-in-water emulsion, 70 to 1 ppm; dissolved hydrocarbons, 0.2 to 0.001 ppm; dispersant 1-3 to unmeasurable (0.2 ppm).

Total extractable organic matter was highest in sediments near the Mississippi River Delta and in the inland bays.

Spilled oil, identified in bottom sediments by gas chromatography, showed rapid weathering after 1 week to 1 month and at the end of 1 year was reduced to a few percent of the amount after the spill. Spilled oil was not found in the sediment below 1.5 inches.

Over 550 species of benthic organisms were identified in 233 benthic samples. The number of species and number of individuals of benthic organisms showed low values in some samples near the platform. However, seasonal variations, bottom sediment type, and possibly other environmental parameters made it impossible to determine whether these locations had been affected by the spilled oil.

There was no correlation of number of species, number of individuals, or other biological parameters with the hydrocarbon content of the sediments for samples from within a 10-mile radius of the platform. This lack of correlation suggests lack of significant effect of oil on benthic organisms.

Extensive trawl samples showed no alteration in the annual life cycle of commercially important shrimp. Blue crabs were observed throughout the area, and the number of species of fish collected were comparable to a prior survey.

INTRODUCTION

Extensive chemical and biological studies were undertaken during and following the discharge of oil from Main Pass Block 41C Platform to determine the fate of discharged oil and to determine any adverse effects of the oil on the marine environment.

To answer these questions, hydrocarbon determinations were made of the water column, sediments, and selected tissue samples. Benthic organisms in numerous bottom samples were enumerated and identified. Numerous trawl samples were taken to collect various species of fish, shrimp and crab. Bioassays were made using two surfactants, the spilled crude oil and the oil and surfactants in combination.

Chevron Production Platform C, Main Pass Block 41, located about 11 miles east of the Mississippi Delta and 80 miles southeast of New Orleans caught fire Tuesday, February 10, 1970. Until March 10, most of the discharged oil and gas burned. On March 10, the fire was successfully extinguished and oil was discharged until March 31 when the last wells were brought under control. During this 3-week period, an estimated 35,000 to 65,000 barrels of crude oil were discharged.[1] Assuming the higher value, the rate of discharge the first 3 days was approximately 6,000 B/D, decreasing to 3,000 B/D, and then to 1,500 B/D during the final week as oil discharge from the various wells was terminated.

As a safety precaution during the fire and oil spill, 2,006 barrels of chemical dispersants were mixed in water and sprayed on the platform and surrounding water surface.

FATE OF DISCHARGED OIL

When oil is introduced to the marine environment, a variety of transformations involving physical, chemical, and biological processes occur. These include evaporation, spreading, dispersion, solution, emulsification, sedimentation, biodegradation, and chemical oxidation. As discharged oil weathers, the various dispersive and degradative processes shift from the more rapid physical effects to the slower chemical and biological modifications.

Evaporation

Most oil discharged from the Main Pass Block 41C (MP41C) Platform was 33-35° API gravity. Much of the oil sprayed high into the air favoring evaporation of the lower molecular weight hydrocarbons. Kreider,[7] in simulated laboratory experiments showed that oil 0.5 mm thick on a water surface lost all hydrocarbons through 12 carbon atoms in the molecule in 24 hours. If the film thickness was only 0.1 mm, hydrocarbons through 14 carbon atoms were lost during the first day. Using Kreider's data and the Bureau of Mines analyses of MP41 crude oil, petroleum fractions through the kerosene distillate (C_{12}) would have evaporated and 28% of the oil lost to the atmosphere in the first 24 hours.

Spreading and Dispersion of the Oil

Because MP41 crude was a low viscosity oil, it spread rapidly on the water surface. The surface oil moved under the combined influence of wind, waves, and surface currents. The surface oil, often in reddish-brown rope-like windrows, was generally water-in-oil emulsion or "chocolate mousse". On most days, the slick was about 6 miles in length and 1 mile wide. On 2 days, during relatively calm weather, the surface slick was observed 40 miles to the south and on another day extended a similar distance to the east.

Some oil was emulsified. This oil-in-water emulsion was observed as a widening creamy-yellow near-surface plume as it moved with the water from the platform. The emulsified plume became sufficiently dispersed so that at a distance of about 1 mile from the platform it became difficult to observe.

Amount of Oil Collected

Chevron's measurements indicated that during the first 10 days, 15,000 barrels of oil with contained water was recovered by skimming devices. As flow rate decreased, the amount recovered per day probably likewise

decreased. Assuming recovered oil (water-in-oil emulsion) averaged 1,000 B/D for 21 days and contained 50% oil, approximately 10,000 barrels of oil were recovered (15% of that spilled).

HYDROCARBONS AND SURFACTANTS IN THE WATER COLUMN

Water samples were collected during the last 5 days when the oil discharge was estimated at 1,500 B/D. Samples were collected in the immediate vicinity of the platform and outward at distances up to 30 miles. Water samples were collected from near-surface, mid-depth, and near-bottom.

Low Molecular Weight Hydrocarbons (C_1-C_9)

Water samples were analyzed for individual dissolved hydrocarbons having 1-9 carbon atoms in the molecule by a gas equilibration method[9] capable of measuring low molecular weight hydrocarbons in the sub ug/l (ppb) range.

On March 26, 28, and 29, water samples were collected in areas which visually had the highest concentrations of oil-in-water emulsion in near-surface waters. Samples were collected as near to the platform as safety would permit (900 to 1400 feet) and the emulsified oil followed outwardly until it could no longer be distinguished visually in near-surface waters.

Total dissolved hydrocarbons associated with the spill which exceeded .002 ppm in the collected waters are shown in Table 1. These are all located near the platform. About one-half the dissolved hydrocarbons were low molecular weight aromatics--benzene, toluene, xylenes, and trimethylbenzenes. In most instances, dissolved hydrocarbons were observed only in near-surface waters, although on March 28, hydrocarbons were observed in mid-depth and near-bottom samples from locations 37 and 38. When concentrations in Table 1 are plotted vs distance from the platform and extrapolated to the platform, the highest predicted concentration in the water was 0.20 ppm.

The percentage of hydrocarbons from the crude oil which dissolved in the water column can be estimated by taking an imaginary incremental one-foot thick vertical section through the oil-in-water emulsified plume and calculating the volume of water passing through this incremental section with time. Table 2 summarizes estimates made at various distances from the platform on the three days. These estimates indicate that an average of 0.14% of the oil dissolved during the first two-hour period. Because oil-in-water emulsion droplets are small, the rate of hydrocarbon dissolution was rapid and it is estimated that during the first 24 hours, less than 1% of the oil dissolved in water.

With time, these dissolved hydrocarbons either became extremely diluted by dispersion, biodegraded, photo-oxidized, or evaporated as predicated by the partitioning of hydrocarbons between water and the atmosphere.[10]

High Molecular Weight Hydrocarbons (C_{12}-C_{30})

Water remaining in sample bottles following the gas equilibration analysis was extracted with 1,1,1,-trichloroethane. A portion of the solvent was analyzed for hydrocarbon content by gas chromatography. The lower limit of detection by this method was about 1 mg/l or 1 ppm.

Only water samples in the vicinity of MP41C Platform contained oil emulsified in the water in excess of 1 mg/l. The oil contents are given in Table 3.

As for dissolved hydrocarbons, the amount of oil emulsified can be estimated by calculating the amount of oil passing through a one-foot thick vertical section (Table 4). It is apparent from the table that considerable variation existed. Amounts of emulsified oil varied from 4 to 65% calculated on the amount of oil spilled, or from 6 to 93% based upon partially weathered oil. With so few measurements, little reliability can be placed upon the estimates. The one value of 60 ppm (Table 3) is not representative for the assumed incremental section because it is unlikely that most of the oil was emulsified.

Surfactants

Waters that contained the highest oil content were also analyzed for surfactants.[6]

Determination of nonionic surfactants in waters at low concentrations is difficult. The method has a minimum detectable sensitivity of about 0.2 ppm with an uncertainty of about 0.2 ppm when analyzing standard solutions. Table 5 shows estimated concentrations of nonionic surfactants in several water samples. Values in the table are based on the surfactant "Cold Clean". The analytical method has a sensitivity for Corexit 7664 which is only 1/3 as high as for Cold Clean. If the surfactant in the water samples was only Corexit 7664, the values would be about three times higher. Only samples 1S, 2S, 37S, and 49S had detectable surfactant content.

HYDROCARBONS IN SEDIMENT SAMPLES

Samples of the bottom sediments were collected concurrently and adjacent to each site from which samples of benthic organisms were collected. Most sediment samples were collected by divers, except when water depths approached or exceeded 100 feet. Two-inch diameter by 12-inch long plastic tubes were pressed into the bottom sediment until the tubes penetrated about ten inches. The tubes were stoppered, returned to the surface, placed on dry ice, and maintained in freezers at -10°F.

In deeper waters, samples were taken by inserting two-inch by six-inch plastic tubes into the sediment sample obtained by Shipek dredge.

Total Extractable Organic Matter

The sediment sample in the plastic tube was extruded from the tube, and the upper 1.5 inches to be analyzed was excised with a knife. The sediment was air-dried one to two days and thoroughly mixed. Twenty grams were placed in teflon-capped glass bottles and extracted with carbon tetrachloride. The separated CCl_4 containing extracted organic compounds was analyzed by infrared spectroscopy. The detection limit was 1-2 mg/kg (ppm) of organic material in air-dried sediment.

Figure 1 shows sample locations and organic matter content of these samples. Locations having greater than 100 ppm organic matter are shown by a larger symbol. Locations whose values exceeded 100 ppm were primarily in near-shore bays and particularly in sediments surrounding the Mississippi River Delta. Some values around MP41C exceeded 100 ppm and probably were associated with the oil spill. High values around the Mississippi River Delta strongly suggest that the organic matter in these sediments originated from the Mississippi River.

C_{12}+ Hydrocarbons

The top 1.5 inch interval and occasionally the second 1.5 inch interval of selected sediment core samples were analyzed by hexane extraction, liquid chromatography to separate hydrocarbons from nonhydrocarbons, followed by gas chromatographic analysis, and gravimetric analysis of the separated hydrocarbons.

C_{12}-C_{33} Hydrocarbons Determined by Gas Chromatography

Figure 2 shows the amount of hydrocarbons having from 12-33 carbon atoms in the molecule in sediment samples as determined by gas chromatography. The highest values were observed in some samples taken near the MP41C Platform. Sediments deposited principally from the Mississippi River and those from some near-shore bays had hydrocarbon concentrations approaching average values for sediments collected near the platform. Hydrocarbon concentrations in sediment samples from Breton-Chandeleur Sound were considerably lower. The character of the hydrocarbons as determined by gas chromatography were also different in the various areas sampled.

Although there were variations, chromatograms of samples 25 through 34, 55, 56, and 57 were similar and have characteristics which resemble the MP41 crude oil. Figure 3 shows chromatograms of the crude oil and hydrocarbons from samples 30 and 136. Sediment hydrocarbons from sample 30 have characteristics similar to that of the crude oil, but weathering had already occurred as evidenced by loss of low molecular weight hydrocarbons and evidence of biodegradation of normal paraffins relative to the isoprenoids pristane and

phytane. Pristane and phytane, which biodegrade more slowly than normal alkanes, were higher than the corresponding n-C_{17} and n-C_{18} for sample 30, and only pristane and phytane remained in sample 136. These two samples were collected seven and 33 days respectively after the oil spill.

Additional evidence of weathering of the spilled oil was shown by the decrease in the C_{12}-C_{33} hydrocarbon content for samples 32, 57, and 129 collected in the spill areas after the spill and about one year later, Figure 2. The concentrations changed from 125 to 2.5, 63 to 6, and 51 to 4 ppm respectively. The hydrocarbon concentrations after about one year approached or were at background values showing the almost complete weathering of the crude oil.

Crude oil from the spill was not incorporated into the sediments below the top 1.5 inches, the interval analyzed. The second 1.5 inch interval for samples 31 and 32 had low concentration of hydrocarbons and the gas chromatograms did not show MP41 crude oil characteristics. Other samples which had the top two intervals analyzed were in the nearshore samples. The lower interval had hydrocarbons generally as high and sometimes higher than the first interval (Figure 2). This suggests that hydrocarbons have been continually added during the time required to add three inches of sediment.

Hydrocarbons in sediments discharged from the Mississippi River are exemplified by the chromatogram for core D38, Figure 4, collected off Southwest Pass. The chromatogram shows a lack of predominance of normal alkanes and a high unresolved envelope indicative of highly weathered hydrocarbons. The hydrocarbon content increases with molecular weight until the peaks start to decrease, probably due to incomplete vaporization in the C_{30}+ region after sample injection. The chromatogram shows evidence of hydrocarbons from biogenic sources indicated by the odd-to-even predominance of normal alkanes in the C_{25}-C_{33} range. Sample D38 is representative of samples 160, 162, 166, 167, D1, D2, D7, D10, D21, D26, D38, X13, X19, X21, X30, X31, WD4, WD5,WD6, WD6A, WD8, and WD10. The hydrocarbons apear to be from Mississippi River discharge and possibly from inland bays. Because biogenic sources of hydrocarbons are apparent from the chromatograms, it is not known what portion of the unresolved hydrocarbon envelope originate from petroleum and/or biogenic sources.

Samples collected in Chandeleur Sound away from petroleum operations, shipping, and Mississippi River discharge show markedly different chromatograms; sample 102, Figure 4, is typical. The hydrocarbon content is low and the principal hydrocarbons present are n-C_{25} through n-C_{33} with odd over even carbon number predominance, indicative of biogenic sources.

Hydrocarbons in Sediments Determined Gravimetrically

In general, the same relationship was found for total hydrocarbons as for the C_{12}-C_{33} hydrocarbon fraction, i.e., high values were found around the platform, in sediments discharged by the Mississippi River and in nearshore bays.

Lower values were found in Breton and Chandeleur Sounds. The contrast between areas, however, was not as great as for the C_{12}-C_{33} fraction due to the generally higher total hydrocarbon values in the sediments from the Sounds.

Additional evidence of spilled oil in the sediments near the platform was indicated by comparing the C_{12}-C_{33} hydrocarbon fraction to the total hydrocarbons in the sediments. The C_{12}-C_{33} fraction was 21% of the total sediment hydrocarbons in the platform vicinity, and averaged only 6.8% for the other locations.

Estimate of the Amount of Oil that Sedimented

Even though the residuum of the MP41 crude oil will not sink in seawater, its presence in the bottom sediments indicated that droplets probably attached to suspended particles, such as silt, in the water column and subsequently sedimented.

The amount of oil sedimented was estimated by taking average sediment oil concentrations, subtracting the estimated hydrocarbon background, and correcting for weathering. This is only an estimate because: sample coverage was not uniform, the area affected was not precisely known, the amount of oil spilled was not precisely known, and the actual degree of weathering was uncertain.

If a five-mile radius is assumed which includes samples 25 through 34, 55, 57, 121, 122, 136, and 137, the average hydrocarbon concentration in the C_{12}-C_{33} fraction was 31 mg/l. Subtracting a 1 mg/l background value, the amount of hydrocarbons in this fraction in the sediments would be 60 bbls. If the more highly weathered samples 121, 122, 136, and 137 are deleted, the amount of oil would be 71 bbls. If the C_{12}-C_{33} hydrocarbon fraction represents one-half of the crude oil and if this fraction is one-half weathered, it represents 0.4% and 0.5% of the total oil discharged from the MP41C platform.

A similar estimate can be made using total hydrocarbons measured gravimetrically in the same samples. The average of all samples was 151 mg/l (excluding the more weathered samples, 178 mg/l) with a background of 20 ppm. If the oil had weathered one-third, the amount in the sediments would be equivalent to 0.6% and 0.7% of the oil spilled. Both calculations reveal that less than 1% of the oil discharged was found in sediments within a five-mile radius of the platform.

HYDROCARBONS IN TISSUE SAMPLES

May trawl samples were made over an 11-month period from which samples of marine organisms were analyzed for hydrocarbon content. Using the gas

chromatographic technique which identified the spilled crude oil in the sediments, in no instance could hydrocarbons in tissue be identified with oil from the spill.

The hydrocarbon contents of shrimp, crab, and fish were generally low. Oysters from reefs, all of which were more than 30 miles from the platform, both on the east and west side of the Mississippi Delta located in shallow waters in the inland bays, contained appreciable hydrocarbon concentrations.

BENTHIC STUDIES

Benthic organisms spend the major portion of their life cycles living on or in bottom sediments. This mode of sedentary life confines movement of these organisms to relatively short distances and subjects them to both short and long term effects of environmental stresses. Because most benthic organisms do not have an avoidance ability, careful studies of benthic communities can frequently reveal whether extensive damage occurs from the presence of toxicants. As documented earlier, the highest concentrations of crude oil in bottom sediments were near the platform, and appeared to be predominantly restricted to within five miles and certainly within ten miles of the platform.

Evaluation of possible effects of oil on benthic organisms is not as straightforward as might first appear, because numerous environmental factors influence benthic communities. These include such factors as bottom type, season, temperature, salinity, and food availability.

Benthic studies were conducted over a large area to obtain samples from within and outside areas observed to have oil on the surface. Therefore, organisms were collected from a number of different environmental areas: near discharge points of the Mississippi River, near-shore bays, and the relatively nonsilted area of northern Chandeleur Sound. Because of the wide range in environmental conditions, the number and types of benthic organisms would be expected to vary widely. Changing conditions, which might occur over relatively short distances, make it difficult to distinguish natural variations from variations which might have been produced from the spilled crude oil. Thus, as shown later, only relatively large effects are measurable.

Benthic organisms were collected from a 0.3 m^2 area (three combined 0.1 m^2 samples) to a depth of 15 inches using a diver-held suction sampler.[3] Debris and organisms were separated from most of the sediment in a 1.0 mm mesh bag, brought to the surface, and washed through a 1.2 mm screen to remove additional sediment particles.

In addition to number of species and individuals, two mathematical expressions were calculated: (1) the Shannon-Weaver[14] diversity index $\bar{H}$; and (2)

Crustacean-Polychaete ration (C/P). If the crustacean group is more sensitive to oil than the polychaete group, the ratio should magnify any possible detrimental effects.

Discussion of Results

Because of the large number of benthic samples analyzed, only summary information is presented here. A wide variation in number of individuals was found in benthic samples ranging to a high of about 56,000 individuals per 0.3 m^2. The high number of individuals was caused by sampling colonies of small mollusca (clams) of the species Abra aequalis and/or Mulinia lateralis. The large variation in the number of individuals introduced an extremely high variance in subsequent statistical analysis of the benthic data involving a number of individuals. In an attempt to minimize the variation, two corrections were made. The first was elimination of these two species of clams from the nine samples which had these organisms present in numbers greater than 4,000. The second correction was made by removing from the sample one species if the number of individuals of that species exceeded 40% of the total number of individuals, two species if the individuals were present in an amount greater than 60%, and three species if present in an amount greater than 70%.

The Shannon-Weaver diversity index was calculated from the actual number of individuals and from the corrected number of individuals to give $\bar{H}$ and $\underline{H}$ (crrected). These corrections were made in an attempt to minimize variation to determine whether spilled oil had an effect on the number of individuals as well as whether there was a correlation of number of individuals with other environmental parameters such as date of collection, sediment type, and organic matter content of sediments. As shown later, this attempt was successful in some evaluations, but not in others.

Two statistical approaches were used to evaluate the benthic data. The first approach grouped samples according to distance from the platform, graphically presented the various biological parameters, and tested for significance using one-way analysis of variance. The second approach was stepwise multiple regression analysis to determine which parameters had effects upon the observed biological data.

Figure 5 shows the collection location for each benthic sample and the number of species in each (excluding the D samples). Locations having two values were resampled; the bottom value is for 1971. Benthic samples containing $\leq$ 35 species are indicated by an enlarged symbol. Such samples were concentrated near the Mississippi River Delta, many of the stations in the near-shore areas, and some of the samples along the Breton Island-Chandeleur Island trend. In addition, a few samples with low number of species were scattered in the vicinity of MP41C.

The lower number of species shown on Figure 5 in the near-shore areas was considered indicative of different environmental conditions compared with other areas. These differing conditions could include sediment type, salinity, and temperature.

1970 Samples Versus Distance from Platform

On the concept that higher concentrations of oil, documented by chemical analysis, occurred in sediments near the platform and decreased outwardly to extremely low values, benthic samples have been grouped as follows: near platform, 1-5 miles from platform, and 5-mile intervals thereafter.

Figure 6 is a plot of means of various biological parameters versus distance intervals from the platform. Analysis of variance revealed a highly significant effect between distance intervals for number of species, $\overline{H}$ and $\overline{H}$ (corrected) and a significant difference for Crustacean-Polychaete ratio. No significant difference was observed for number of individuals. In this paper * and ** represent statistical significance at the 5% and 1% probability level and are referred to as significant and highly significant; NS means not significant at that 5% probability level.

Correcting six samples for the high number of clams did not show statistical significance, $F = 1.55$. The difference in the means of the number of individuals was greatly reduced, but variance within groups was still large. Analysis of variance for number of individuals (corrected) gave an $F = 1.05$, also insignificant.

Although significant differences were shown for all biological parameters except number of individuals, it was not clear as to what environmental parameter or parameters may have caused the observed effects. The second statistical approach, multiple regression, permitted a more complete evaluation of the various environmental interactions.

Multiple regression analysis of the 1970 benthic data (165 sample locations with data for time of collection, distance from platform, sediment type, and organic matter) is shown in Table 6 with only significant correlations (t-values) given. The same effects for distance were observed as for the analysis of variance, except for number of individuals; the latter showed a highly significant decrease in number of individuals with distance from the platform. This was caused by the high number of individuals of some species (clams) in a few of the samples. Their removal resulted in no significant correlation except for a highly significant decrease with increase in organic matter content of the sediments.

Number of species showed a highly significant decrease with time of collection (seasonal variation) from April 6 through June 10 and a similar decrease with increase in organic matter content of the sediments. The observed

variation for species and individuals may not be due to organic matter, but related to changes correlating with organic matter in the near-shore environment, such as sediment type and salinity.

The C/P ratio decreased with distance from the platform and showed a highly significant increase for sandy bottom sediments as compared with mud. This confirms the general observation that Crustacea prefer a sand bottom, whereas polychaeta are more prevalent in mud or silt.

The Shannon-Weaver diversity index is a function of the number of species and individuals. It is presented for those readers who use this index or attach significance to diversity indices. In this paper, no detailed interpretation will be made using the index.

Multiple regression analysis of 1970 benthic samples indicated variation due to time of collection, sediment type, distance from the platform, and organic matter content of the sediment. These variations would be expected in near-shore marine environments.

Variations were also indicated by the fact that over 550 species of benthic organisms were identified throughout the study area, yet the number of species in any one sample ranged from 11 to 95 with a mean of 50. The number of individuals ranged from 25 to 56,000, with a mean of 1,390.

Comparison of 1970 and 1971 Samples

Fifty-one of the 1970 sample locations were resampled about one year later. Because resampled locations were taken as close to the original location as Raydist navigation permitted (10-15 feet), environmental factors other than time of collection may have been reasonably similar, and a comparison of 1970 and 1971 samples should give a measure of yearly variation.

Table 7 summarizes mean $\pm$ standard deviation for number of species and individuals for benthic stations sampled in 1970 and resampled in 1971 and gives a t-test comparison between years. There was a highly significant yearly variation for numbers of species and numbers of corrected individuals for all sample locations (47) east of the Mississippi River Delta. Correcting only three samples for high numbers of individuals resulted in a significant variation comparing 1970 and 1971 for numbers of individuals, whereas no significance was shown for uncorrected numbers of individuals.

Multiple regression analysis for these same samples by year, date of collection, distance, and bottom sediment type showed the same yearly effect, t for: species is 2.55**, individuals (3 corrected) is 2.17*, corrected individuals is 2.51**, and individuals not significant.

As shown in Figure 7, the number of species and corrected number of individuals (not shown) were lower for the first two distance intervals during 1970. Because of possible effects spilled oil might have contributed to the observed yearly variation measured for all sample locations discussed above, the lower portion of Table 7 statistically tests 1970-1971 variation for samples beyond 10 miles and the limit where oil from the spill was found in sediments. There was a highly significant yearly variation for number of species and number of corrected individuals. Correcting number of individuals for one sample in these 35 samples resulted in no significance. A year-to-year variation was clearly evident by these analyses.

The 1970 and 1971 resampled values for means of various parameters by distance are plotted on Figure 7. Because of fewer samples, a different grouping, as compared with all 1970 samples, was made with distance to obtain a sufficient number of samples within a group for statistical analysis. Groups by mile intervals were: 0-0.5, 5-10 (sample 169 was included in this group), 10-20, 20-30, and greater than 30. Analysis of variance showed no significance (although several approached the 5% level) for any of the biological parameters except a highly significant effect with distance for number of species in 1970. Multiple regression analysis (Table 8) for 1970 and 1971 for days, distance, and sediment type showed very similar results for biological parameters vs distance. Following the discussion above for Table 6, the correlations in Table 8 are self explanatory. Seasonal variation for the two years were different; number of species decreased with date of collection in 1970 but increased in 1971.

The 5-values for multiple regression analysis for all benthic samples (213) for 1970 and 1971 which had data for years, day of collection, distance from platform, and bottom sediment type are shown in Table 9. For species, there were highly significant correlations: higher number of species in 1971, decreasing species number with time of collection, increasing species number with increasing distance from platform, and higher number of species in silt and sand sediments as compared with mud sediments. The other biological parameters can be similarly evaluated as for species.

The above evaluations illustrate that several environmental factors cause variations in numbers and diversity of benthic organisms. Other factors not measured, such as salinity and temperature, can also have influence. Inspection of the Figures shows lower number of species and individuals in the platform vicinity, but considerable uncertainty remains as to whether these lower numbers were due to natural variations or to possible effects from the discharged oil. Correlation of hydrocarbon content of bottom sediments with benthos provided additional information.

Correlation of Hydrocarbon Content of Sediment with Benthic Organisms

Spilled oil measured in sediments was principally found within a five-mile radius of the platform and was probably restricted to within ten miles. The most diagnostic evaluation of the possible effect of oil on benthic organisms should be related with the oil content of the sediments measured at the same locations. Table 10 shows the simple linear regression coefficient, r, and the multiple regression results for the 28 samples located within ten miles of MP41C platform. None of the linear regression coefficients were significant for correlation of either C_{12}-C_{33} or C_{12}+ hydrocarbons with any biological parameter. Multiple regression analysis for both hydrocarbon fractions showed no significance with any biological parameter except $\bar{H}$, which increased with increasing sediment hydrocarbon content (opposite that expected if biological damage had occurred). All t-value for correlations with hydrocarbon content are shown to give the order of magnitude for whatever correlation existed. Only significant t-values are shown in Table 10 for parameters other than hydrocarbon content of sediment samples.

This direct comparison of benthic organisms with sediment hydrocarbon content strongly indicates no effect of spilled MP41 crude oil on the benthic community.

BIOASSAY STUDIES

Static bioassay tests were conducted with MP41 crude oil, the two dispersants used during the spill, and the combination of one part dispersant plus ten parts of oil using six test organisms. The bioassay procedure followed the method outlined by La Roche et al.[8] The test animals were Menidia beryllina (Tidewater silverside), Fundulus similis (Longnose killifish), Palaemonetes pugio (grass shrimp), Gasterosteus aculeatus (threespined stickleback), Fundulus heteroclitus (mummichog), and Artemia salina (brine shrimp).

Table 11 summarizes the results of the bioassay studies giving the median lethal concentration (LC_{50}) at the end of 96 hours. In all instances, the MP41 crude oil was relatively nontoxic to all test organisms with the exception of brine shrimp; it required 660 ppm oil to cause one-half kill.

Of the two dispersants, Cold Clean was more toxic, although grass shrimp appeared relatively resistant to this dispersant. Corexit 7664 was relatively nontoxic to three test organisms. The combination of one part dispersant plus ten parts oil showed little change in toxicity caused by Cold Clean, but increased toxicity of Corexit 7664. This toxicity increase has been observed in several studies including those recently conducted by Swedmark.[15, 16] Increased toxicity of the emulsified oil was probably related to the effective dispersion of the oil in water, but in open waters such as occurred at the Chevron spill, rapid dilution would compensate for increased toxicity shown in the bioassays.

The bioassays of the six test organisms indicate concentrations to cause one-half kill are very much higher than were observed at the time of the MP41C oil spill. The highest concentrations in the water column in the platform vicinity were 70 ppm oil, 1-3 ppm surfactant, and 0.2 ppm dissolved hydrocarbons. The observed concentrations decreased rapidly to very low values at the end of two hours. In all bioassay tests, the organisms were subjected continuously to the toxicants without dilution for periods up to four days. Based on these observations, it appears unlikely that the spilled oil from MP41C had a measurable effect on marine organisms such as fish, shrimp, and crabs.

Postulations have been made that egg, larval, and juvenile stages of organisms are much more sensitive than adult organisms to crude oil and surfactants. Recent investigations[4, 13, 16] have shown that these life stages of some marine organisms are quite resistant to oil and oil dispersions.

TRAWL FAUNA

From April 1970 to March 1971, 440 trawls were made using three boats and 15-foot Otter trawls to determine if there was measurable damage to commercially valuable species such as shrimp, blue crab, and fish. The trawling time was from two minutes to 2½ hours; most trawls were for ten minutes. Trawls were made throughout the study area, but were principally concentrated between Pass A Loutre and Black Bay to intercept shrimp which would have migrated through the oil spill area. The organisms were sorted, identified and enumerated in the laboratory.

Shrimp

The most common species of shrimp taken in trawls were brown (*Penaeus aztecus*) and white (*P. setiferus*). Small numbers of pink shrimp (*P. duorarum*) and seabob (*Xiphopeneus kroyeri*) were also collected, as well as 76 species of noncommercial invertebrates.

Both brown and white shrimp spawn and hatch in relatively deep water. The young migrate to estuaries, grow rapidly, and subsequently return to deeper waters to repeat the annual cycle.[2, 5, 11] Some of the shrimp would have passed through the oil spill area.

The number of shrimp collected per trawl and their sizes indicated that a normal annual life cycle occurred with no evidence that larval or post-larval shrimp were affected by passing through the oil spill area.

Fish

Trawl samples cannot quantitatively describe or measure the number of fish in an area. However, the number of fish collected and the 84 species collected

from the study area compare favorably with the 100 species identified by the Louisiana Estuarine Inventory[12] conducted from April 1968 through March 1969 along the entire coast of Louisiana. The bay anchovy (Anchoa mitchilli) and croaker (Micropogon undulatus) were the most abundant species obtained by trawl.

Blue Crab

Blue crabs (Callinectes sapidus) were abundant in trawls from throughout the sampling area with no evidence of a decrease in numbers.

REPORT AVAILABILITY

A report with the same title as this paper presenting much greater detail is available upon request from Chevron Oil Company, 1111 Tulane Avenue, New Orleans, Louisiana 70112. Also available are two volumes of appendices--a biological volume listing species and number of individuals for all benthic samples, and all trawl samples; and a chemistry volume presenting all chemical analyses, and gas chromatograms.

ACKNOWLEDGEMENTS

All field collections, separation of benthic samples, identification of some groups of benthic organisms and all trawl organisms, and hydrocarbon analysis of sediment samples were performed by Bio-Oceanic Research, Inc. The authors gratefully acknowledge the contributions of the many individuals who contributed to the studies.

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TABLE 1

TOTAL LOW MOLECULAR WEIGHT HYDROCARBONS DISSOLVED IN WATER SAMPLES. GAS EQUILIBRATION METHOD

Water Sample Location[a]	Date Sampled	Distance From Platform, Feet	C_1-C_9 Hydrocarbons, ppm
5 S	3-26-70	1400	0.010, 0.170
1 S	"	4100	0.125
2 S	"	4700	0.015, 0.18
3 S	"	6000	0.002
37 S	3-28-70	1200	0.022
37 M	"	"	0.021
37 B	"	"	0.010
38 S	"	2600	0.002
38 M	"	"	0.002
38 B	"	"	0.005
49 S	3-29-70	900	0.200
50 S	"	2900	0.002
50 M	"	"	0.002

[a]S= Near-surface; M = Mid-depth; B = Near-bottom

TABLE 2

ESTIMATION OF THE PERCENTAGE OF C_1-C_9 HYDROCARBONS THAT DISSOLVED IN THE WATER COLUMN DURING THE CHEVRON OIL SPILL

Water Sample Location	Date	Dimensions Of Assumed Increment Of Water, Feet	Measured Hydrocarbons Concentrations, ppm	Percentage of Spilled Oil Dissolved[a]
5 S	3-26-70	1x 300x10	0.090	0.17
2 S	"	1x1000x10	0.017	0.16
37 S, M, B	3-28-70	1x 200x40	0.018	0.13
38 S, M, B	"	1x 600x40	0.003	0.07
49 S	3-29-70	1x 150x10	0.200	0.29
50 S, M	"	1x 600x30	0.002	0.03
			mean =	0.14%

[a] Assumed current of 0.5 knot and an oil discharge rate of 1500 bbls/day.

TABLE 3

HIGH MOLECULAR WEIGHT HYDROCARBONS IN WATER SAMPLES
(SOLVENT EXTRACTION - GAS CHROMATOGRAPHIC METHOD)

Water Sample Location	Date Sampled	Distance From Platform Feet	Hydrocarbons as Oil From Platform MP41C ppm
1 S	3-26-70	4100	6
2 S	"	4700	2
5 S	"	1400	8, 60
37 S	3-28-70	1200	2
49 S	3-29-70	900	2

TABLE 4

ESTIMATION OF THE PERCENTAGE OF CRUDE
OIL SPILLED THAT WAS EMULSIFIED

Water Sample Location	Dimensions of Assumed Increment Of Water, Feet	Measured Oil Concentration, ppm	Percentage Oil Emulsified	
			Of Oil Spilled	Of Weathered Oil
5 S	1x 200x10	34	66	94
1 S, 2 S	1x1000x10	4	39	55
37 S, 49 S	1x 200x10	2	4	6

TABLE 5

CONCENTRATIONS OF NONIONIC SURFACTANTS
IN WATER SAMPLES COLLECTED IN OIL PLUME

Sample No.	Concentration, ppm	Sample No.	Concentration, ppm
1 S	1.0, <0.2	37 S	0.9
2 S	0.2	37 M	<0.2
4 B	<0.2	38 M	<0.2
5 M	<0.2	38 B	<0.2
5 B	<0.2	39 M	<0.2
7 S (3 mi. SW)	<0.2	49 S	0.6

TABLE 6

MULTIPLE REGRESSION ANALYSIS OF 1970 BENTHIC SAMPLES USING DATE OF COLLECTION, DISTANCE FROM PLATFORM, BOTTOM SEDIMENT TYPE, AND ORGANIC MATTER CONTENT OF SEDIMENT SAMPLE (165 SAMPLES)

Ratio of Coefficient in Equation to its Standard Error (t-value)

	Species	Ind.	Ind.[a]	Corr. Ind.	$\bar{H}$	Corr. $\bar{H}$	C/P
Days	-3.34**					-2.68**	
Distance	2.81**	-2.90**			3.20**	2.75**	-1.97*
Silt					2.16*		
Sand		-2.11*			2.71**		3.40**
O. M.	-3.79**			-3.34**			

[a] Six samples corrected for high number of clams.

TABLE 7

COMPARISON OF 1970 AND 1971 BENTHIC SAMPLES AND STATISTICAL TEST FOR YEAR-TO-YEAR VARIATION

	Mean + Standard Deviation 1970	1971	t
47 Locations East of Delta			
Number of species	49.5 ± 16.6	62.9 ± 17.1	3.84**
Number of individuals	1207 ± 3305	2478 ± 8177	0.99
Number of individuals[a]	735 ± 706	1036 ± 705	2.07*
Number of individuals, corrected	401 ± 263	742 ± 446	4.51**
$t_{05} = 1.66$, $t_{01} = 2.37$			
35 Locations beyond 10 miles			
Number of species	53.7 ± 15.4	63.8 ± 16.7	2.64**
Number of individuals	822 ± 741	2657 ± 9275	1.17
Number of individuals[b]	822 ± 741	1082 ± 746	1.46
Number of individuals, corrected	447 ± 266	748 ± 481	3.24**
$t_{05} = 1.67$, $t_{01} = 2.39$			

[a]Samples 126 (22,872), 126R (13,398), 132R (55,787) corrected for high number of clams.

[b]Sample 132R corrected.

TABLE 8

MULTIPLE REGRESSION ANALYSES FOR 47 SAMPLES COLLECTED IN 1970 AND RESAMPLED IN 1971

Ratio of Coefficient in Equation to its Standard Error (t-value)

	Species	Ind.	Ind[a]	Corr. Ind.	$\bar{H}$	Corr. $\bar{H}$	C/P
			1970				
Days	-3.83**	NS	NS	NS	-2.29*	-2.73**	
Distance	3.86**					2.66**	
Silt						2.20*	
Sand							2.14*
			1971				
Days	2.47**		[b]		2.60**		
Distance							
Silt	1.82*	3.49**				1.90*	
Sand	2.00*			2.10*			2.35*

[a] 1 sample corrected for high number of clams

[b] 2 samples corrected for high number of clams

TABLE 9

MULTIPLE REGRESSION ANALYSIS FOR 213 BENTHIC SAMPLES

Ratio of Coefficient in Equation to its Standard Error (t-value)

	Species	Ind.	Ind.[a]	Corr. Ind.	$\overline{H}$	Corr. $\overline{H}$	C/P
Year	2.55**	2.31*		4.59**			
Days	-2.42**		-3.47**			-3.99**	2.31*
Distance	3.69**	2.17*			3.40**	3.66**	-2.59**
Silt	2.92**	2.07*		1.86*	1.97*		
Sand	4.16**			3.32**	3.31**		3.89**

[a] Eight samples corrected for high number of clams.

TABLE 10

LINEAR REGRESSION AND MULTIPLE REGRESSION ANALYSIS OF 28 SAMPLE LOCATIONS WITHIN 10 MILES OF MP41C PLATFORM. CORRELATION OF BIOLOGICAL PARAMETERS WITH HYDROCARBON CONTENT OF SEDIMENTS

C_{12}-C_{33} Hydrocarbons by Gas Chromatography

	Species	Ind.	Ind.[a]	Corr. Ind.	$\bar{H}$	Corr. $\bar{H}$	C/P
Linear regression, r for:	0.090	-0.055	-0.042	-0.074	0.300	0.301	0.042
Ratio of Coefficient in Equations to its Standard Error (t-value)							
Year					-2.90**		
Days							
Distance						-2.26*	
Silt		1.80*					-1.74*
Sand					2.15*	-2.76**	
GC HC's	0.35	-1.08	0.17	-0.11	2.28*	0.88	1.17

C_{12}^{+} Hydrocarbons by Gravimetric Analysis

Linear regression, r for:	0.097	-0.108	-0.004	-0.094	0.284	0.341	0.112
Ratio of Coefficient in Equation to its Standard Error (t-value)							
Year							
Days					-2.89**		
Distance						-2.47*	
Silt							-1.98*
Sand		-1.94*			2.28*	-2.97**	
C_{12}^{+} HC's	-0.79	-1.55	0.15	-0.33	2.36*	0.89	1.35

[a] Two samples corrected for high number of clams.

TABLE 11

MEDIAN LETHAL CONCENTRATION (LC_{50}) AT 96 HRS FOR SIX ORGANISMS, SUBJECTED TO MP41C CRUDE OIL, TWO DISPERSANTS, AND ONE PART DISPERSANT PLUS 10 PARTS OIL

Test Animal	LC_{50} in ppm			
	MP41 Crude Oil	Dispersant	1 Part Dispersant + 10 Parts Oil[a]	Dodecyl Sodium Sulfate Reference
		"Cold Clean"		
Longnose killifish	39,000	110	80	1.8
Grass shrimp	3,000	3,700	130	13.8
Tidewater silverside	5,200	75	90	1.5
Stickleback	> 20,000[b]	70	66	0.51
Mummichog	> 18,000	130	135	1.25
Brine shrimp	660	28	30	1.48
		Corexit 7664		
Longnose killifish	18,000	13,400	320	0.51
Stickleback	6,500	2,600	89	4.2
Brine shrimp	> 10,000	130,000	320	5.6

[a]Concentration for dispersant-oil mixture is for dispersant, not the combination.

[b]Preliminary test.

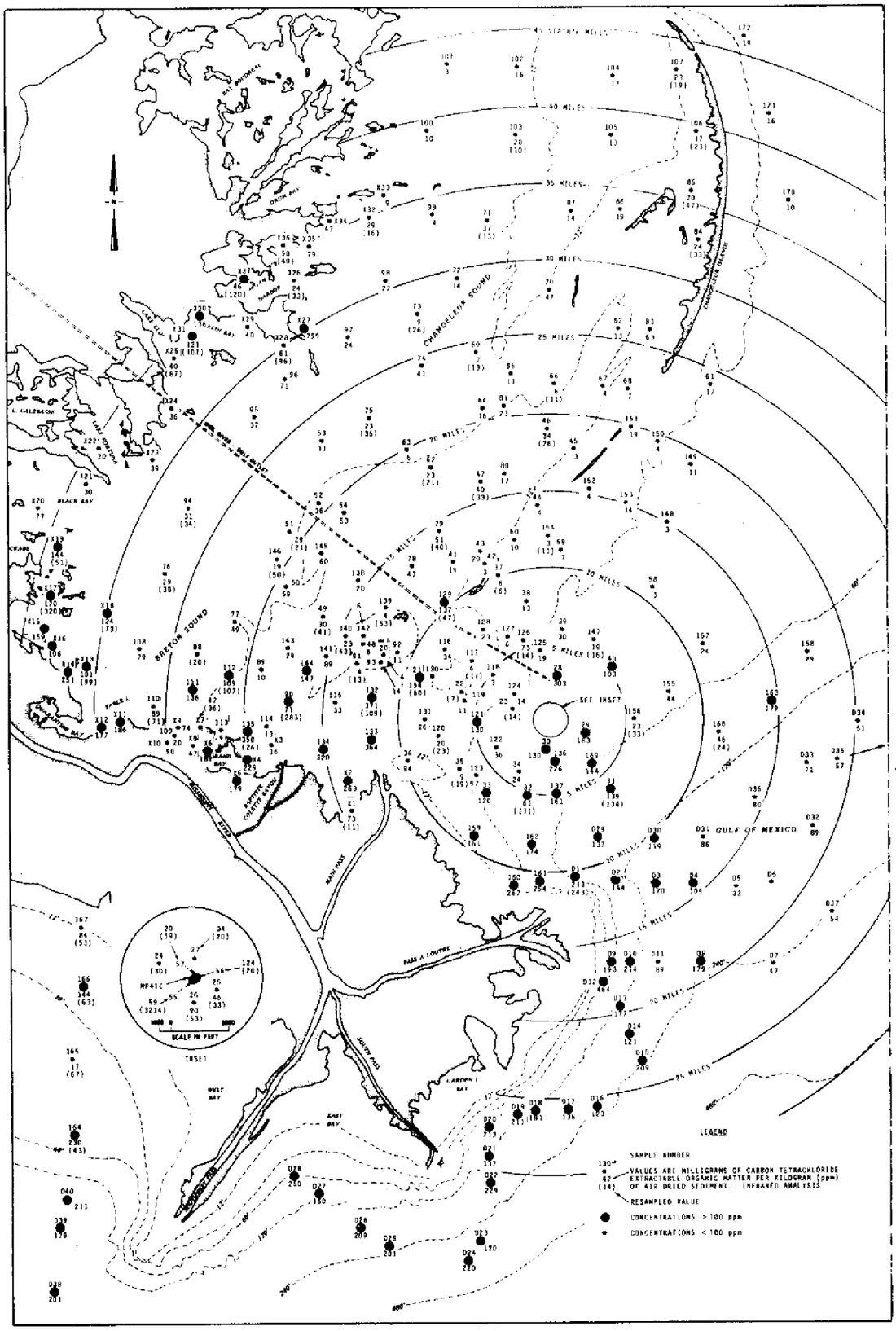

FIGURE 1: EXTRACTABLE ORGANIC MATTER IN SEDIMENT SAMPLES.

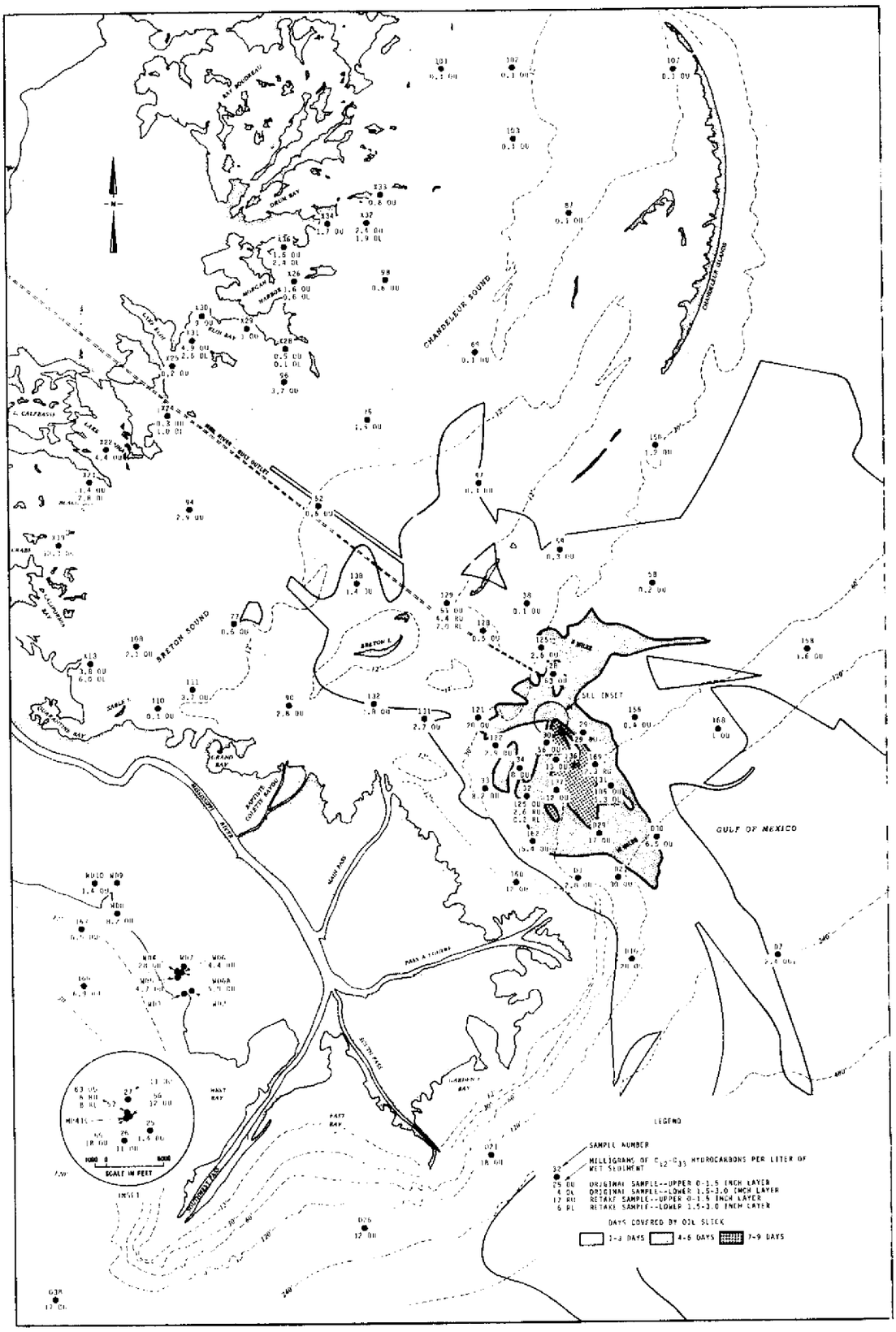

FIGURE 2: C_{12}-C_{33} HYDROCARBON CONTENT OF SEDIMENT SAMPLES MEASURED BY GAS CHROMATOGRAPHY.

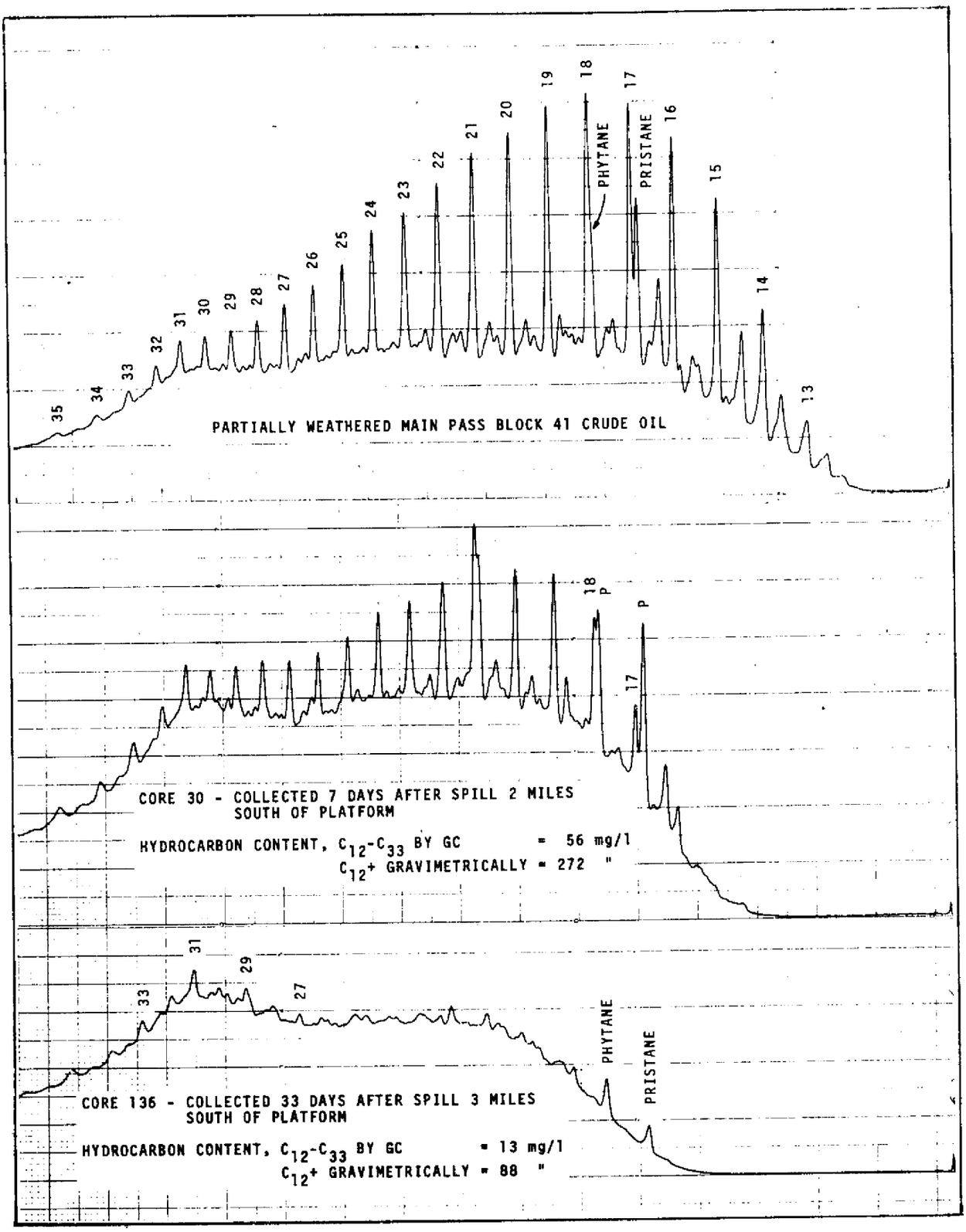

Figure 3: Gas Chromatograms of Partially Weathered MP41 Crude Oil and MP41 Oil in Two Sediment Samples Exhibiting Biodegradation of Hydrocarbons.

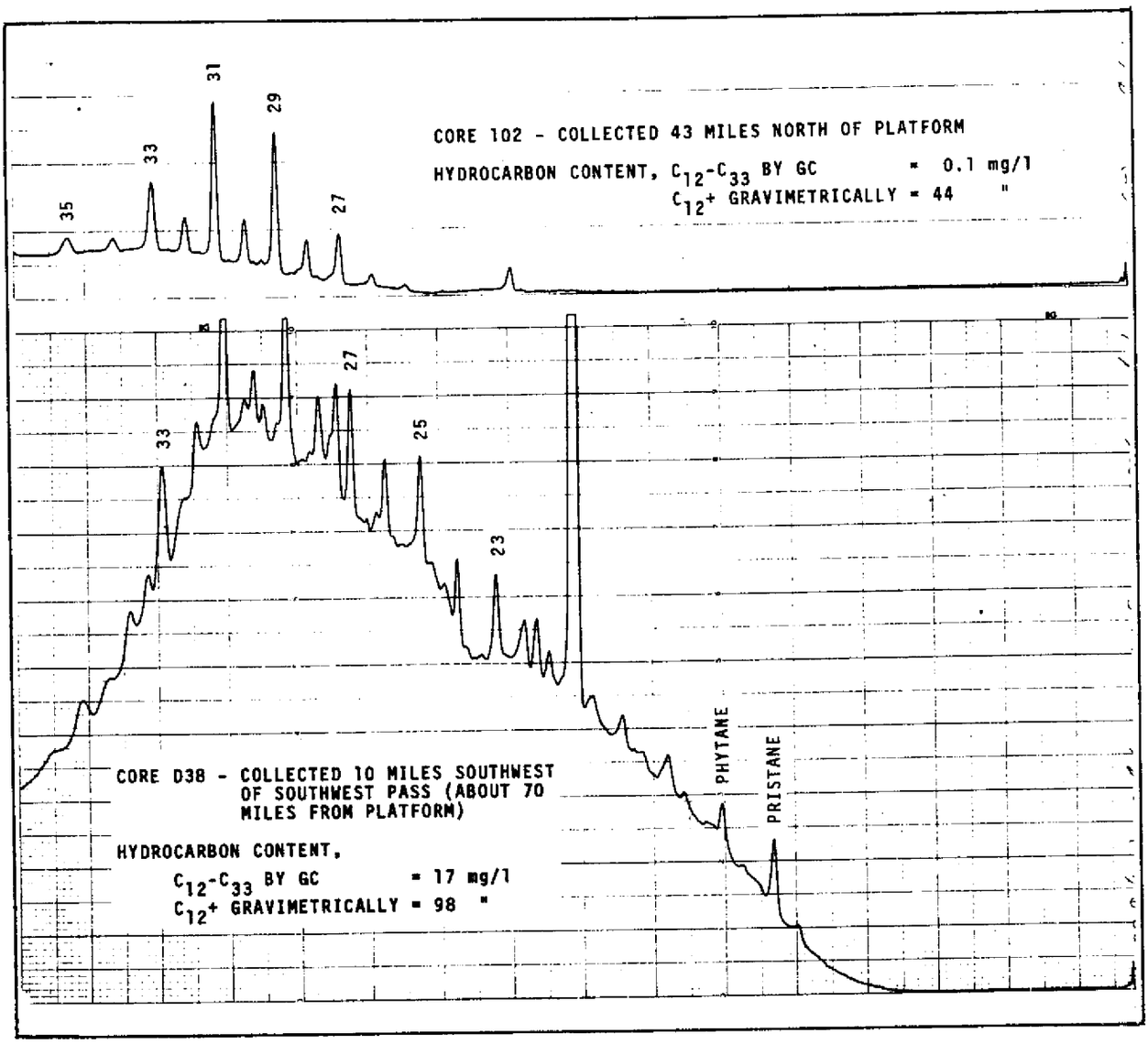

Figure 4: Gas Chromatograms of Hydrocarbons Typical of Those Found in Sediments Near Mississippi River Discharges and in Chandeleur Sound.

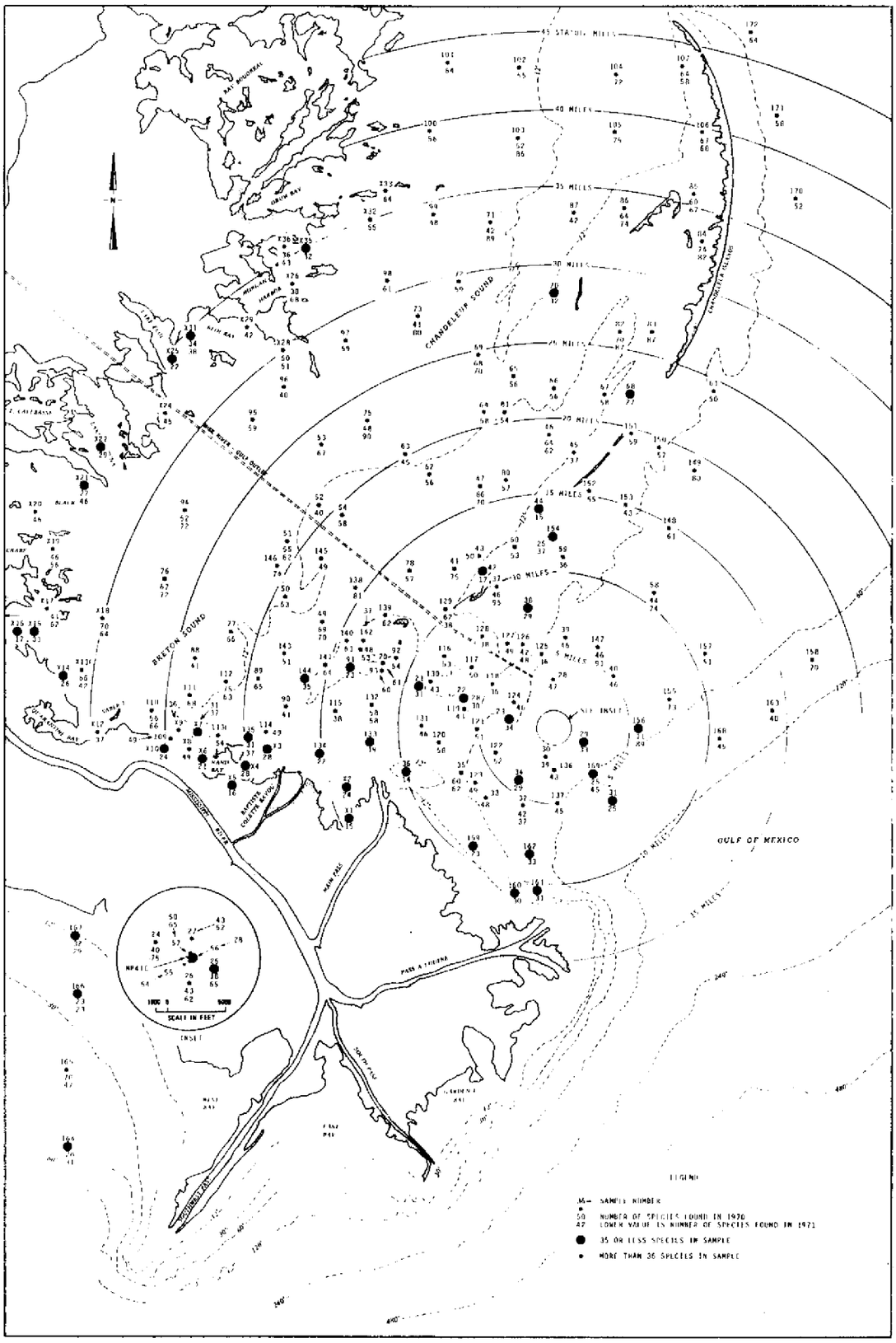

FIGURE 5: NUMBER OF SPECIES OF BENTHIC ORGANISMS PER 0.3 m^2.

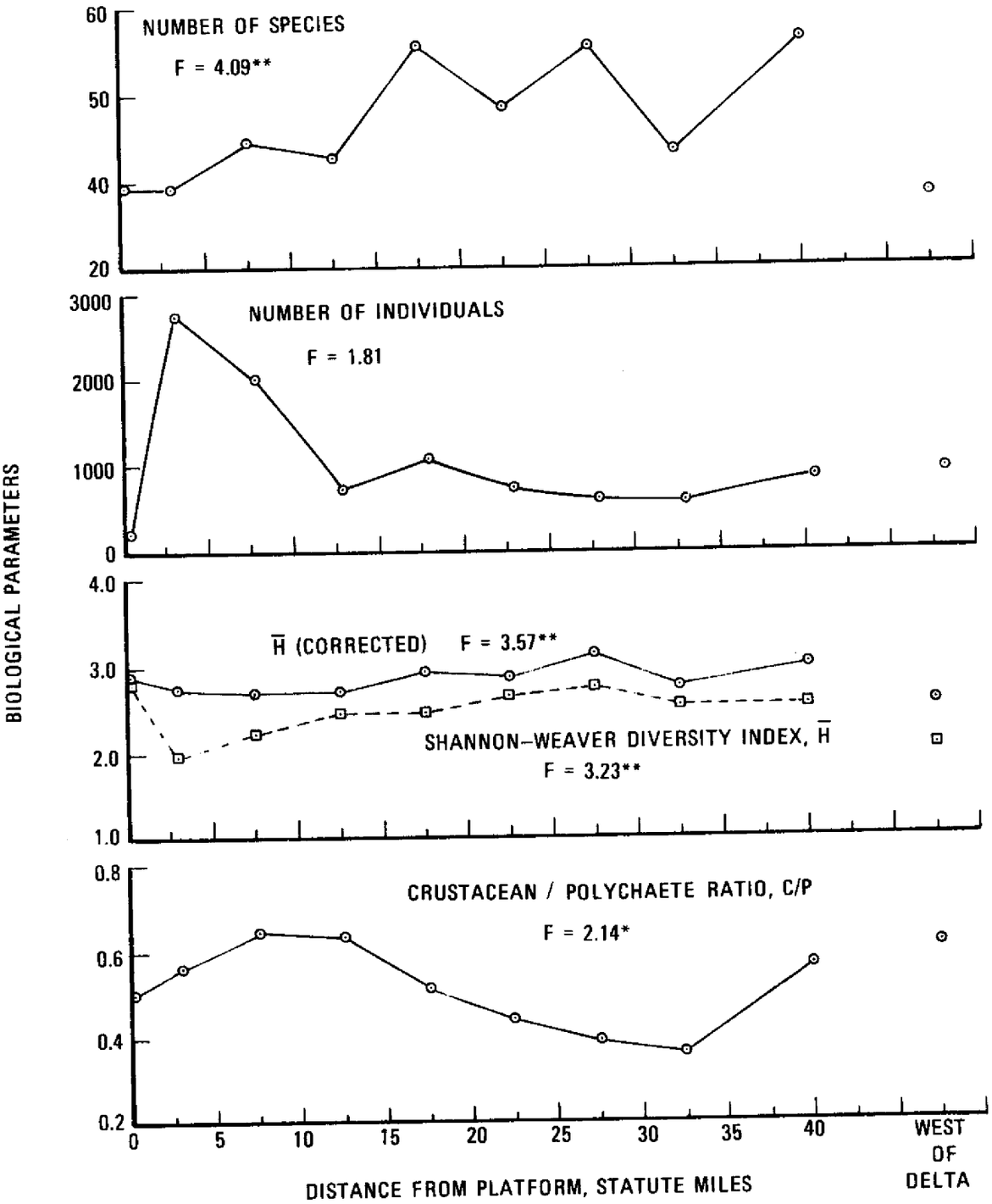

FIGURE 6

MEAN VALUE FOR 1970 BIOLOGICAL PARAMETERS AS A FUNCTION OF DISTANCE FROM THE PLATFORM.

LE 74–2703

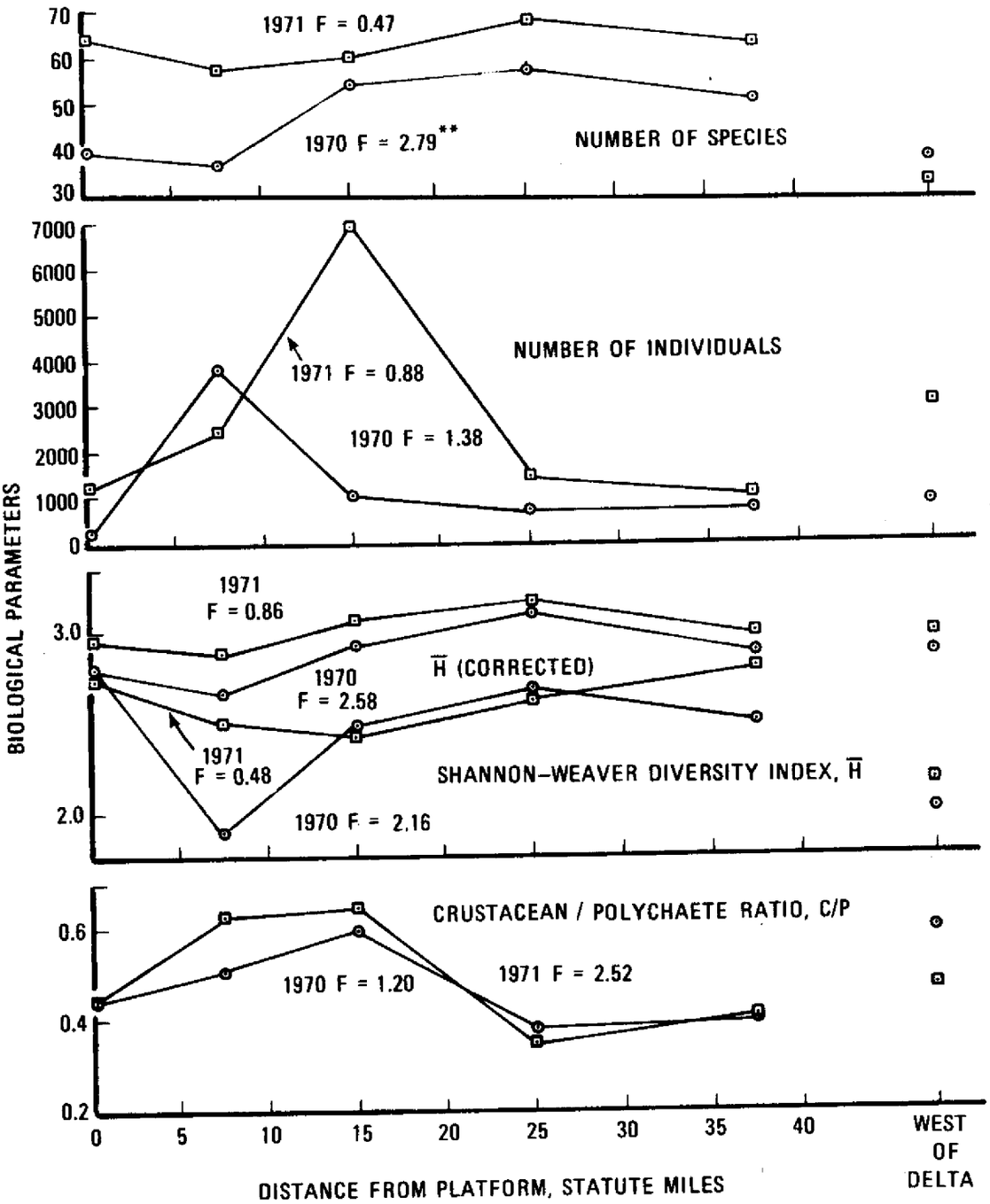

FIGURE 7

MEAN VALUE FOR BIOLOGICAL PARAMETERS FOR 1970 AND 1971 REPEATED SAMPLES AS A FUNCTION OF DISTANCE FROM THE PLATFORM.

DR. WENNEKANS: In the area where you had the spill, did you have very sharp halocline?

DR. MC AULIFFE: In this case, the water is only forty feet at the platform, then it became shallower as you approached the delta, and Chandler Sound is shallow, 12 feet or less. So there's probably no particular evidence of this. Now. I shouldn't say this because we didn't measure that.

DR. WENNEKANS: The question that I have is what kind of oil was found at depth?

DR. MC AULIFFE: In our column measurements that we did make, we could not identify emulsified oil at the mid-water depth, 20 feet. It was never there. It was somewhere between the 20 foot and the surface. Now, we know it dips down at least six or eight feet, but it was predominantly near the water surface. We did find dissolved hydrocarbons after two days at greater depths in near bottom samples but, of course, in very low concentrations. Again, the highest concentrations were in the surface.

STATEMENT OF
SENATOR KAY POLAND

Chairman of the Senate Resources Committee
Alaska State Senate

as read by
Senator Patrick Brody

As legislators deeply involved with the use and management of Alaska's resources, we're concerned by the ineptness thus far demonstrated by the Federal agencies administering the OCS leasing program. Most notably in the draft study plan as prepared by NOAA, even as we admit our lack of expertise in speaking to the technical aspects of the proposed study, we hasten to add our disbelief at the flagrantly non-perceptive outline ostensively designed to assess environmental impact on Alaska's waters and shores, resulting from OCS, oil exploration, and production. For example, not only have three dramatically different bodies of water been lumped into one overall study guide, but a most important aspect of environmental impact has been completely neglected, mainly the socioeconomic impact resulting from onshore support facilities. We, as legislators, are rapidly being made aware of the fact that we must direct our attentions to the OCS program for the protection of Alaska's resources. It is our fear that the resource pool is being forgotten in the interest of development of one non-renewable resource. We are not prepared to allow this to occur.

Therefore, we are prepared to use our legislative channels to insure that proper and adequate planning is forthcoming and that responsible and applicable studies are completed before the total of our marine and onshore resources are threatened with the uncertainties of the present planning effort.

We would hope that our concerns would be felt and that responsible decisions will replace the present planning inadequacies. We feel that it has been overwhelmingly demonstrated that the State of Alaska should be involved in the planning, study, and possible implementation of OCS development. We are convinced that a joint Federal-State management approach is required to: 1) insure competence of impact assessment; 2) allow for proper funding and fiscal management; 3) properly determine priorities; and 4) guarantee all petroleum development logistics.

If such a partnership between Federal and State agencies is not forthcoming, we will strongly encourage legislation to guarantee that all impact within our jurisdictions are properly studied and anticipated prior to their happening. We will also attempt to thwart any impacts within our jurisdiction, which we feel are a threat to our people, our culture, or any part of our inherited resources.

STATEMENT OF
REPRESENTATIVE NELS ANDERSON

Chairman of the House Resources Committee
Alaska State House of Representatives

as read by
Senator Patrick Brody

As one of the elected people responsible for the management and protection of the resources of the State of Alaska, I find the National Oceanic and Atmospheric Administration draft study plan on the environmental assessment of the Gulf of Alaska, Southeastern Bering and Beaufort Seas unacceptable in its present form. Although the stated purpose of the report is to outline a proposed study plan to gather environmental information, there are some very serious deletions that should be included in the study program. The basic glaring omission in the study plan is that there is no program or plan for socioeconomic study of the areas affected. This is an absolute necessity in the State of Alaska.

In the past the State has played the game of catch up regarding impacted areas during large programs, i.e., the Dew Line Project and the Trans Alaska Pipeline.

The areas that would be affected by the leasing of the outer continental shelf are traditional villages, which will depend upon the resource found in the areas that are being proposed for leasing. In an area like Yakutat, for example, where the increase of population could be from a present figure of approximately 260 to over four thousand with OCS leasing, what is the Federal Government going to do about impact?

In no way would an environmental impact study be complete without a comprehensive socioeconomic study of each of the areas to be affected.

The second omission in the draft study plan is that there is no provision for any work on cooperation with the State of Alaska in planning, impact, or land use. Although the leasing of the continental shelf area and the subsequent production of oil is in the national interest, the possible adverse effects upon the State of Alaska are a reality to its people and its officials. While the United States is looking for a relatively short-term benefit, from a short-term resource, we are thinking in terms of long-term resource utilization. Along these lines, serious thought should be given to petroleum development plan, which would involve joint State-Federal development and management commission.

This commission would develop and coordinate the planning, managing, and impact research prior to any Federal actions regarding oil leasing including outer continental shelf, maybe Pet 4, or any other petro leasing to be done in the State of Alaska.

The third problem with the draft study is lumping together three separate diverse areas of the State into one report. These areas are so totally different that a complete indepth study should be made of each one of them as follows: 1) Beaufort Sea; 2) the Bering Sea; 3) the Gulf of Alaska.

In summary, while recognizing that the report is a draft-study plan and that, hopefully, the intent was to do an indepth study before any leasing was done on the outer continental shelf, lack of any attention to a socioeconomic study to be undertaken, the lack of a plan to coordinate with the State of Alaska, the lumping together of such vastly different areas of the State all make this document unacceptable at this time. The future reports should be fully comprehensive, should be undertaken with the cooperation of BLM, NOAA, and the State of Alaska, and should be funded by the Federal Government, which will reap the benefits from the outer continental shelf leasing; and should consider every proposed leasing area as separate and distinct before any attempt of leasing is undertaken.

COMMENTS BY
SENATOR PATRICK BRODY

Senate Resources Committee
Alaska State Senate

I'm here today because members of the State House and the State Senate are very concerned with the work you're doing. I wish that more of us could be in Anchorage. The work that you're doing here today will determine what course Alaska's going to take in the future. I'm very concerned about coastal management, and I know all the members of the Senate Resources Committee of which I'm a member are also concerned. We're very interested in the work product that will come out of the committee, and they all send their best wishes.

In addition, Kay Poland, Chairman of the Senate Resources Committee, and Representative Nels Anderson, Chairman of the House Resources Committee, have two statements that they wanted me to read to you that I believe convey their personal feelings as well as the feelings of a number of legislators. Senator Poland is vitally concerned with our offshore resources as she represents Kodiak Island and a portion of the Aleutian Islands, and has for many years lived, in fact, she was born in the area. Representatative Nels Anderson is Chairman of the House Resources Committee. Representative Anderson is also a native Alaskan and a person who has lived in the coastal area, namely between the Alaska Peninsula and Norton Sound all his life.

I think that the statements of Senator Poland and Representative Anderson show the concern of the respective resource committee chairmen and, I think, the active concern of the vast majority of the legislature. We're all very concerned about what's going to happen in the Gulf. We've seen problems in Kenai, we've seen problems in Fairbanks, we've seen problems on the North Slope. Man's a rational animal, and we should be able to prevent any repetition; we should learn, and I think that's what we're all hoping, and I know that's what the people here are trying to accomplish.

Unquestionably, the socioeconomic question is very difficult to deal with. Fortunately, from an objective standpoint, the scientific questions are somewhat easier to deal with where a great deal of research is still required. But I would urge you to consider the socioeconomic areas. This is a question of vital concern to the State legislature.

Our social problems have simply been expanding faster than our ability to deal with them, especially with our budget. The people of Alaska have paid out of their own pocket for the development we've seen so far. The oil companies and

their support units have not paid their own way. It has created a tremendous socioeconomic problem in Alaska. We're seeing one in Juneau right now, where we're trying to figure out where revenues will be coming from in the next two years. I won't take up any more of your time, and I do thank you for your consideration and wish you the best of luck in completing this project.

STATEMENT OF
MR. JACOB ADAMS
VICE-PRESIDENT, LANDS

Arctic Slope Regional Corporation
Barrow, Alaska

Read By
Mr. David Hickok

Mr. Chairman, my name is Jacob Adams. I am Vice President for Lands of the Arctic Slope Regional Corporation, an Alaskan corporation created under the Alaska Native Claims Settlement Act of 1971. Pursuant to this Act the Arctic Slope Regional Corporation and village corporations are entitled to receive patent to about 5 million acres of land.

We have already selected over 3 million acres, and this selection involves the proprietary control of 364 miles of coastline along the Chukchi and Beaufort Seas. By way of contrast to Inupiat control of 364 miles of coastline, the federal government controls 436 miles and the State of Alaska 135 miles.

Back in February of 1974, we called upon the Alaska Sea Grant Program to help focus scientific inquiry in the Chukchi Sea and coastal area. We had thought that the Lake Wilderness Conference and the resulting Arctic Offshore Program had brought government realization to the need to relate science in the Arctic to the realities of resource development, both offshore and on-shore.

Arctic Alaska must be treated as one. The whales that pass Pt. Hope also pass Wainwright, Barrow, Nuiqsut, and Kaktovik. Similarly, the birds we harvest at Barrow come across from the eastern Beaufort Sea and continue along the Chukchi coast. Similarly, the behavior of winds, the currents, and the ice is all related.

Also, man's use of these seas is one. Along the Chukchi Sea coast we have selected acres of land for potential fossil fuel development. Exploration contracts between us and oil industry firms are already in force. Environmental studies related to energy transport are obviously necessary. As we reviewed this study plan we were very disappointed. It is much less complete than the previous plan for the Arctic Offshore -- although that also had deficiencies.

As a certain minimum of acceptance to us, the study plan for Arctic waters must:

1. combine the Chukchi and Beaufort Seas study efforts;
2. examine and relate on-shore energy developments to those offshore and address the problem of impact, both economic and environmental, upon our lands, some of which we may dedicate to development while other areas may exclude all developments even though potential exists;
3. provide for the conduct of those environmental studies necessary to regional transportation planning - both on land and sea. The governments present efforts in this regard have not been professional at all;
4. have a logistics plan that is practical and which recognizes that 1/3 of the Arctic coast is passing into private ownership and therefore the old ways of doing science in Arctic Alaska are over.

Finally, we recognize that everyone these days is very busy. So are we. Nevertheless, we are available for consultation with you, and we are most eager to see good knowledge of our lands and waters developed.

Thank you.

MR. DENNER: Do you know what Jake has in mind when he says that Arctic science is going to have to do business in a new way since the native control 1/3?

MR. HICKOK: I can only surmise that there has been discussion in their board meetings about user fees on their lands. They are charging industry for access and acquisition of knowledge. They may very well charge the Federal Government, I don't know. But logistics, I would think, may include some recognition of the use of private lands in this situation. I think we have a new dimension here. There is a third of this coast in private ownership, and we ought to recognize that it's a different ballgame. For that matter, it's going to be a different ballgame all the way around the whole coast of Alaska.

STATEMENT OF
MR. CECIL BARNE
PRESIDENT

Chugach Natives, Inc.
Anchorage, Alaska

My name is Cecil Barne, President of the Chugach Corporation which was organized under the Alaska Native Claims Settlement Act of 1971. I haven't had an opportunity to prepare a paper specifically addressing, as a matter of policy, some of the things that we would want to identify, such as the relationship of the enhancement of resources to the oil industry. However, there was a question raised by Mr. Denner. What Jake really meant? We might go back a couple of weeks when Secretary Hughes was in Anchorage and made basic commitments to the State of Alaska as to the Federal authority's responsibility to the State of Alaska. We all recognized that the OCS lands are outside the jurisdiction of the kinds of things that we're concerned about in Alaska. The revenue from the Federal lands out there the State will not receive. We do have an interest, but this is Federal land, supposedly.

But regarding shore-site impact and the federal authority for assistance to the State of Alaska, this is something that we're very concerned about. This relates to other resources unrelated to the oil industry, such as fisheries. These are the kinds of resources that the shore site impact will affect. I've fished on the Outer Continental Shelf. I grew up on the coast.

In any definite plan by Federal authority in assistance programs to Alaska for shore site impact, we definitely would want the various regional corporations who are affected as a result of this shore site impact to have some very serious input. The Federal authority in administering programs should give us maximum input to the kinds of things that affect us. Section 2B of the Alaska Native Claims Settlement Act does give the natives the opportunity to have maximum participation in decisions that affect their social and economic well-being.

And, of course, not only the natives but the State of Alaska, the citizens of Alaska, are very concerned about the affects of shore-site impact.

I think that Jake indicates here that we will not play a passive role in the activities as a result of something that may happen way out there. We're very concerned about these shore-site impacts. Not only to the natives, but to the State generally.

Many people may feel, whether it be Legislation relative to enhancement programs to the State under State law or programs under Federal law dealing with un-related resources to the oil impact, that the natives have had their claim and,

therefore, they have extinguished all rights and have gained 40 or 43 million acres of land. There is a provision in the Claims Act that does speak to that. However, let me give the legislative history of the Claims Act. You do have to go back a ways. Possibly back to the organized legislation of 1884, which left to be resolved by future legislations the question of the Alaska native claims. The act of 1974 was supposedly that future piece of legislation. But there are definite statutory requirements developed directly in the language of the act, and there are through the BLM and activities dealing with the natives and the State a kind of a tri-negotiated statutory requirement for limitation of the Claims Act.

We look at the past history of the legislation. Let's take a look at the problems which are not yet resolved relative to the lattice of proposed corridors across Alaska. Have we resolved those yet? I say no, we have not. We all know that they are not yet resolved.

We learned a lesson from our activities in these areas. Before the Claims Act, all of us, the State and the natives, along with the Federal authority, agreed not to litigate a question of the native rights in Alaska, but decided to go as partners to Congress and convince them of the necessity to come up with a resolution that was meaningful to all.

I think, in part, we're not satisfied with all parts of the Claims Act, but it does have a definite impact on what happens out there on the Outer Continental Shelf.

One of the things that we are aware of, in 1969, the Secretary imposed a Federal freeze on all lands in Alaska. The purpose was to reserve lands until we had the opportunity to sit down, as we are now, to try to evaluate by program or some other way how the best interests of all could be considered.

I think the State is in a very good position now to utilize an administrative freeze either by Executive Order or however it can be done to freeze all site preparation for Outer Continental Shelf development along the coast of Alaska until such time that we do identify the problem areas. Then let's take a look at the impacts to the fisheries and many other things before we make recommendations of just a yes or no.

I'm not a lawyer, so I don't know whether this is possible. But I think we could have learned a lesson from the Federal freeze on uplands and what that meant to the resolution of the problems of the Land Use Planning Commission under Section 17 of the Claims Act. It is a very meaningful section of the Act to allow inputs from all various kinds of interests in the development of Alaska.

I do support the Arctic Slope's position, and I think that we will elaborate on the position as time goes on. Thank you very much.

STATEMENT OF
MS. PEG TILESTON

Alaska Center for the Environment
Anchorage, Alaska

I would like to mention that the Alaska Center for the Environment is an organization which is of statewide stature. We are gaining membership day by day. At the moment we are over 300 members throughout the State, so that we do represent not only Anchorage-based environmentalists, but those throughout the State. We work as a coordinating center for the various organizations such as Sierra Club, the Alaska Conservation Society, Audubon and many of the special activities groups such as the Mountaineering Club of Alaska and so on.

Our outreach is considerable; and, when we are dealing with situations or plans such as the Outer Continental Shelf plan, we do bring in a number of people in the planning process or at least in the talking process. The Center, Sierra Club, and various chapters of the Alaska Conservation Society did respond to the BLM OCS draft environmental impact statement at the hearings that were held recently.

We support the efforts of BLM and NOAA to develop an assessment plan. However, we urge that the scope of the study be broadened considerably. If the study is limited to the primary environmental impacts, it will fall far short of what it should be.

Secondary environmental impacts often have much greater and longer lasting environmental consequences than primary ones. The national socioeconomic environmental situation that we are seeing currently, emphasizes the impossibility of pushing one button without immediate responses from all the others. Therefore, a broad indepth - emphasize indepth - study of the socioeconomic impacts of the OCS development is imperative.

In reviewing the BLM OCS impact statement, as we did awhile back, it was quite evident that management and regulations often were responsible for environmental degradation. So these processes should also be reviewed.

In short, limiting the study to those areas proposed in the draft plan will not protect the environment. And I assume that's what we're striving for. It is a beginning step, but only that. We strongly recommend a much broader study encompassing all aspects of impact: social, economic, management, the

regulatory, etcetera. Only by doing a comprehensive study of this nature, will we begin to approach the environmental protection that we seek.

Thank you for the opportunity. I might mention briefly that the various organizations and, certainly, the Center will be available for any type of input and communication that might be necessary.

WRITTEN STATEMENT

submitted by

MR. ROBERT BLAKE

Cordova District Fisheries Union
Cordova, Alaska

EDITOR'S NOTE:

This written statement was received by the Alaska Sea Grant Program after the conference/workshop. The material presented herein was not a part of the conference.

MAR 11 1975

Cordova District Fisheries Union

Headquarters: Box 939, Cordova, Alaska 99574 ~~Seattle Office: 810 Dexter Street~~

March 5, 1975

Dr. Donald Rosenberg, Director
Marine Advisory Program
University of Alaska
Fairbanks, Alaska 99701

Dear Dr. Rosenberg:

We appreciated your kind assistance to Knute Johnson, who represented us at the Sea Grant Workshop on Offshore Oil Development on February 18 thru 21. Some of our members have now had time to read the two documents which Knute brought back, namely Interior's Draft Study Plan for Environmental Assessment of The Gulf of Alaska, Southeastern Bering Sea and Beaufort Sea (Jan. 1975) and the Northeastern Gulf of Alaska Work Statements for FY1975.

We have not reviewed the first draft of the GOA Environmental Impact Statement since copies are not available in Cordova to our knowledge. We would appreciate any assistance you might give in procurring us a copy of the above.

Our summary and preliminay comments on the contents of the two documents mentioned in paragraph 1 are as follows:

1. The Draft Study Plan is unbelievably limited in detail on specific issues. The two pages on pelagic fish can hardly be bothered to mention salmon and herring interactions but rather emphasizes copelin, smelt, pomfret and sand lance as areas of particular concern. We are at a loss to understand such "ecological extremism" when the subject is "oil development to be conducted in public interest".

The entire draft essentially has the markings of pure oceanographer thinking as regards fisheries matters. That is, emphasis on species of particular interest to the U.S. fishing industry simply does not occur, but rather descriptions of the general ecosystem is the sole target.

The push by the President and the Interior Department for immediate offshore lease sales and development does not seem to match the casual, long range tone of the Draft Study Plan as far as protection of key resources on which the livelihood of our Alaskan community is nearly totally dependent.

2. Regarding the FY75 Workplan, we make the following observations:

(a) The State and State waters where primary impact of accidents will be felt seem to be left out of most work plans to a great extent. In view of the fact that anyone with cursory knowledge of the prevailing ocean currents and wind patterns should know immediately that the juxtaposition of the lease zone automatically insures that the Copper Delta and Inner Prince William Sound waters will be the primary impact zone from accidental spills, we can't understand the consistant sampling plans which deal only with offshore zones. This is particularly evident by the exclusion of all Prince William Sound waters inside Hinchinbrook and Montague Entrances.

(b) We cannot critisize the technical aspects of most of the baseline studies on physical oceanography, seismicity, hydrocarbon levesl, etc. in view of their obvious general need, but again we are concerned with the preoccupation with strictly offshore zones for sampling. (Are there unmentioned inshore programs which interact?)

(c) In regard to Dr. Feder's "Subtidal Biological Baselines", we do hope he is more successful in recording the distribution of commercially important species than occured with the same methods employed on the Port Valdez Baseline Studies for Alyeska. That is, species of high human interest such as king crab, dungeness crab and tanner crab, though known to be present, were hardly detectable in Feder's samples.

(d) The Montlake Laboratory "fisheries program", from a practical sense deals with species primarily of interest to foreign fishermen, i.e. ground fish not utilized by U.S. fishermen. While their trawl assessment methods are undoubtedly sound, a massive enlargement of this program to pelagic fishes and certain shellfish which are not trawlable, is mandatory.

(e) The intertidal sampling program is particularly deficient for its failure to work inside Prince William Sound in view of the enormous clam resource there, as well as the unique feature of 30-70 percent of the pink and chum salmon spawning in that zone.

(f) Though mentioned in the State's general outline, the federal program shows little interest in the evaluation of the commercial fisheries and general economy immediately inshore. Since the oil values are normally computed on a 25-30 year "life of the field" basis, a similar study is needed on a 25 to 30 year value of the fisheries. Using this technique, fisheries values by realistic estimation in the Prince William Sound area may approach the 1 to 2 billion dollar area. Using salmon, herring and shellfish only, the value to the fisherman, without taking inflation into consideration, would exceed $400,000,000.00, over a peroid of 25 years. Actual values should be first wholesale value, to compare with oil, not ex vessel, so the actual figure would be well over twice the 400,000,000 dollar mark quoted above, during the next 25 years.

(g) Finally, the current tanner crab fishery is superimposed on the lease area and all age groups of the five species of salmon utilized heavily in our fisheries migrate through the base zone seasonally. One of the West coast's major dungeness and razor clam resources is immediately inshore. We feel strongly that major emphasis in research needs to be added in these areas. There has been absolutely no mention of a conflict of area use between oil exploration and drilling and the commercial fishermens use of the same area. There are over 5000 tanner crab pots, 2000 dungeness pots and 500 plus gillnetters who also use this area.

Commercial fishermen observed that in previous oil exploration crab mortality in the pots was extremely high where seismographic charges were used in this area. Also, crab and bottom fish were observed in large numbers washed up on the beaches during and after exploration activities. Concern is also expressed by commercial gillnetters of effects of blasts upon the salmon in this area.

As we only had a short time to study the facts presented to us, these are the only comments we have to give you at this time. We would, however, appreciate the opportunity to have some input into the final draft of this subject.

Sincerely yours,

Robert Blake
President

RB/ed

PRESENTATION AND DISCUSSION OF THE DRAFT STUDY PLAN

EDITOR'S NOTE: Extensive editing of the presentations and discussions has been made. It is hoped that the general thought and theme were not lost in this editing. Further information on presentations containing slides should be obtained from the speaker.

INTRODUCTION TO THE DRAFT STUDY PLAN

DR. JOHN ROBINSON
National Oceanic and Atmospheric Administration
Department of Commerce
Boulder, Colorado

In view of the fact that there are a number of people here this morning who were not present yesterday morning, I thought that I might review for a few minutes how the study plan comes to be, then touch up on a couple of particular points of interest, and from that point we'll go on to questions.

Early in January, we held a week-long scientific workshop in Seattle to prepare the material that went into the plans that you have in front of you. The meeting was attended by personnel from the State of Alaska, University of Alaska, University of Washington, Oregon State University several of the NOAA laboratories, the USGS, the U.S. Fish and Wildlife Service, the Corps of Engineers, the National Science Foundation, and EPA.

That week resulted in a very comprehensive document that was grouped by scientific discipline, and it represented the concensus of what those people, approximately 110 of them, thought should be done in advance of petroleum development.

The following week, we convened a meeting of the principle investigators that are presently active in research in the Northeast Gulf of Alaska under NOAA/ BLM projects. They had been asked to prepare material for their recommendations for a second year program in that area. We took this combination of the Bering, Beaufort, and the Gulf material back to Boulder to work it into the study plan which you have.

The material was reviewed carefully in Boulder. We took the investigations that were proposed and grouped them along the lines of the four questions which make up the major organization of the study plan.

We removed considerable detail as to methodology. We wanted to be careful not to link specific objectives to particular investigators. In other words, not to necessarily adopt any particular investigator's methods in advance of solicited proposals.

We also felt that it was fairly important that the public review of the document be focused on the major objectives. In other words, we thought that you should see the forest and have a chance to comment on that before we started to give you all the individual trees.

We also looked at the material very carefully to make sure that we didn't promise more than we felt we could accomplish in four to five years. Some of you may feel that our final product was too conservative. But, we felt that we should, if we were going to make a mistake, make the mistake on the side of conservatism as to how far we could actually get in looking at the impact of oil and gas development.

The ground rule under which NOAA is operating in this program for BLM, is that we are to solely look at the primary impact of petroleum development on the marine environment. The question as to secondary impact, social economic studies and so on have been specifically not made part of the study.

We think the job we have been given is large, and we believe that the amount of money allowed, $25,000,000 a year, is about correct.

During our presentations, we'd like to touch on the area of processes in which there seems to be considerable uncertainty as to exactly what we have planned. Then following that, we would like to spend a few minutes on the area of hazard investigations.

COMMENTS ON PROCESS STUDIES

MR. HERB BRUCE
National Oceanic and Atmospheric Association
Department of Commerce
Juneau, Alaska

I'm going to speak specifically to the allegation that the study plan reflects a lack of attention, concern or understanding of the role of processes and that a disproportionate amount of effort and attention are being focused on what is commonly called baseline data. I quite frankly was a little bit surprised that this was highlighted as one of the primary criticisms of this study plan. The plan is, by design, general in nature. Perhaps it is too general. It is designed that way to provide for a conceptual framework for developing more thoroughly, detailed proposals.

There are many kinds of processes that occur in the natural environment. We recognize the importance of understanding physical, biological, and chemical processes in an environmental assessment program. We thought that we had included these in the general study plan. In developing the study plan, we chose instead of focusing on such things as specific processes, to focus on the types of questions that we think are posed by the OCS oil development and then tried to devise a general plan to get answers to these questions.

If you read the questions carefully, it is evident that three of them are directed rather specifically at processes. Many aspects of Question A, which addressed baseline, primarily has processes either stated or implied. I was a little bit concerned that, since we had emphasized rather strongly processes, we might be criticized for not having actually allowed for the acquisition and synthesis of sufficient baseline data to properly understand these processes. Adequate environmental description is a pre-requisite to the study of processes.

When looking at processes in the natural environment or a program of environmental assessment, we have to try to identify those processes which are specifically relevant to the questions asked.

The processes that we've identified in the study plan are of a rather broad general nature, and each one of these processes then breaks down into many subprocesses. It becomes a problem then of deciding what general processes must you address in order to get the answers to your questions and to what level of detail do you need to address these processes. You can carry them to the level of detail of looking at rather specific mechanisms controlling how the processes occur.

We certainly cannot expect to identify and study all of the processes, so one of the big tasks confronting us is to be able to identify those critical ecological environmental processes which we must understand in order to cope with the problem. We do not think it is possible to go much farther than this, in

describing the kinds of processes that this program should address before the proposal stage. The type of detail that you are looking for, the identification of a specific process, we feel, logically comes in the proposal stage in which you will have the process identified, you will have the method and approach to the study of the problem identified and described in some detail.

So, if I can summarize just briefly here. We are interested in giving adequate and proper attention to understanding relevant environmental processes and are quite aware of the importance of processes. We recognize that since this criticism has come up that perhaps we have not made the emphasis on processes as explicit as it should be, and we hope to correct that in this workshop. How well we correct that is going to depend to a large extent on how specific are your recommendations of the types of processes that should be studied and addressed by this project. Also, you must recognize that you have to provide sufficient supporting rationale as to why a particular process or processes are of sufficient importance that they should be given a higher level of priority in the overall study plan.

We are perfectly willing to do everything we can to make emphasis on processes more explicit.

COMMENTS ON HAZARD STUDIES

DR. GUNTER WELLER
National Oceanic and Atmospheric Administration
Department of Commerce
Fairbanks, Alaska

One important aspect of any environmental assessment of the outer continental shelf is to address the hazards that the environment poses to the activities of man and, by feedback, back on the environment.

This is quite specifically addressed in Question D of the study plan, which is phrased like this: "What hazards does the environment pose to the safety of petroleum exploration and development activities?" These hazards, of course, are of a wide variety and include the following: seismic and tectonic activity, severe storms, waves, tides, surges, storm surges, the stresses that the atmosphere and the ocean impose on any man-made structures, the sea floor instability, offshore permafrost, and finally the forces that the sea ice itself exerts on any man-made structures.

Now, these forces may impose serious hazards and stresses on man's activities. They could seriously damage platforms, pipelines, ship operations and what have you, and, therefore, lead to potential oil spills and other catastrophes, and should quite legitimately be considered in the context of this study plan.

The different areas around the Alaskan coasts are subject to different hazards. I think that seismic risk and sea floor instability are perhaps more important in the Southern Bering Sea. Tectonic activity is certainly a definite hazard in the Gulf of Alaska. Sea ice and offshore permafrost are probably the predominant hazards in the Northern Bering Sea as well as in the Beaufort and the Chukchi Seas.

In the design of the Cook Inlet platforms, sea ice forces were, for example, found to be the greatest potential hazards, exceeding any potential wind, wave, or even seismic forces that might be exerted on these structures.

On the other hand, in Cook Inlet, of course, sea ice is relatively thin, and stresses exerted by sea ice are far less than will be expected in the Beaufort Sea, where production of pressure ridges and actual ice forces are of a quite different order of magnitude.

Sea ice is therefore a great concern in the Beaufort Sea. To refresh your memory of what some of the problems and some of the sea ice features look like, I'd like to quickly go through a little pictorial exercise showing a few of the features that one encounters in the Beaufort Sea.

The circulation in the Arctic Ocean has one dominating feature that affects the Alaskan coast, the Beaufort Sea gyre which you see in the lefthand corner of the slide -- a circular clockwise movement that presses ice against the shores of the Canadian archipelago and the Alaskan Coast.

The next slide please. The data that were used to derive some of these large-scale circulation patterns in the Arctic Ocean come from drifting ice stations. Here you see the movement of Soviet, U.S. and other drifting ice platforms that over the years have resulted in a gross overall picture of what the circulation features are like.

The next slide please. This great circular ice motion, which is centered in the Beaufort Sea, creates a zone, the so-called shear zone, which is very close to the shore. The differential movement of the open pack ice against the fast ice close to the coast, creates a large ice shear. This results in the production of pressure ridges of monumental proportions, such as shown in the aerial photograph here.

Next slide. Some of the pressure ridges have an appearance such as shown here. They can be produced in irregular and so far unpredictable patterns and obviously pose a substantial threat to any man-made structures in the area.

The next slide. Closeup, I think they are even more impressive. The ice forces also produce open leads such as the big one shown here. In the background, you see one of the earlier AIDJEX camps.

Next slide, please. This slide shows the shear zone, the pack ice zone and the fast ice zone, close to the coast. This area has to be traversed by ships, such as tankers, going in and out of the coast.

Next slide. This is also the area where any potential drilling operations have to proceed.

Next slide. The extent of ice in these pressure ridges, the vertical displacement, is fairly substantial as you can see here.

Next slide. These pressure ridges, together with ice islands that come from glaciers, produce the markings in the sediments on the ocean floor that you can see in this photograph. This obviously poses quite a substantial disturbance to any structures on the bottom of the ocean floor.

This is just a brief pictorial presentation of some of the hazards that will be encountered. It is quite clear that hazards are a problem that deserve close attention. In the Beaufort Sea these hazards are particularly associated with the sea ice and glacial ice features.

MR. WENNEKANS: Do we have any information on the location of the shear zone in relation to the fields themselves? And, is the problem related to exploration of the field or is it primarily related to the actual ship traffic?

DR. WELLER: The shear zone is a dynamic feature. It is certainly not stationary; it has seasonal variations. Its extent is not something that can be considered a stationary effect. It also varies substantially from one part of the coast to the other.

Certainly in the area towards the McKenzie River Delta, the shear zone would transect the area that is of interest in exploration. I think, similarly, in the Chuckchi Sea that the shear zone may well transect the area of exploration. But, again it is a dynamic feature that has to be considered along the total coast and, therefore, is something that will directly impact on man's activity in the zone.

And, of course, tanker traffic or any other vessels have to move in and out through the shear zone, independent of where the exploration will be located.

DR. HOOD: I would like to have you address the question of logistics with respect to the scientific study. This is an area in which I feel a little bit uneasy. I think it would be worthwhile discussing.

MR. ROBINSON: The question is, what logistic facilities are going to be available to this study? We have allowed a sizable block of money to provide for logistics considerations. As far as ships are concerned, we have three ships that have been appropriated and are now being made readied, two in Seattle and one on the east coast.

The Miller Freeman, which is a very large trowler that has general oceanographic capabilities, will be available about the first of July. The Surveyor, which is primarily a geophysical ship with capability for a helicopter, landing craft and launches, will be available the first of April.

We are also considering bringing around to Alaska, the Discoverer, which is a sister ship of the Oceanographer, which is presently working in the Gulf of Alaska.

The USGS will provide the Lee as well as one or two other leased vessels.

We have discussed with the National Science Foundation, the possibility of bringing the Hero to Alaska. She is an ice-capable ship that would work along the edge of the ice and up into the Beaufort in the summer.

We intend to provide logistic bases in the north coast, and maybe Dr. Weller could answer a little more about what those bases exactly will look like and what capabilities will be there.

We anticipate a number of aircraft, probably one C-130 from our air fleet in Miami, as well as a number of other NASA aircraft, USGS aircraft, and so on, will be provided.

UNIDENTIFIED VOICE: Where do you plan to deploy your logistic base?

DR. WELLER: Let me say something about the logistics in the Beaufort Sea. The logistics in the Arctic is notoriously difficult, as everybody knows. The possibility of getting ships up there is remote, unless it happens to be a U.S. Coast Guard Ice Breaker, which will probably be very difficult to obtain.

Our philosophy was that, as far as possible, we would like to operate out of land base stations. One of these stations would be the Naval Arctic Research Laboratory at Barrow.

The other logistics facility that we would be interested in activating, would be at Point McIntire, which is an abandoned DEW line station that has been used intermittently by the Naval Arctic Research Laboratory. We would operate out of these bases with helicopters and fixed wing aircraft and try to deploy the scientists onto the ice. The intention was to do work off the ice as much as possible. We realize that this imposes fairly serious limitations on the amount of work that you can do.

One ship that will definitely be in the area will be a small boat operated by the United States Geological Survey. But, we have no assurances at the moment that there will be a large block of ship time - ice-breaker ship time - in the Beaufort Sea.

DR. BRUCE: Of course, the details have not been worked out; but certainly from the standpoint of major NOAA vessels, they will probably have their base of operations in Seattle. We are going to primary staging areas located in Alaska. We do not have a lot of choices here for ports that the ships of that size can get in and out of and that will have the type of services that are necessary. We expect the ships to operate primarily year around in Alaska, with only the major operation requirements taking them back to Seattle. We plan to utilize fully the Alaska-base staging areas for the storage of ship equipment, scientific equipment, the on-and-off loading of the scientific parties, and so forth. We expect to use Alaska quite heavily as the staging area, but exactly what ports depend upon the ship needs.

MR. SAGALKIN: I have a series of questions which are related to Dr. Weeden's presentation yesterday. They relate to what we consider as serious deficiencies in the NOAA study plan.

Some of the questions that I have range out of my area of expertise, and I am hoping that follow-up questions will be asked by people in the audience and officials of the State of Alaska. I know that some of these questions are not going to have answers, but we should see where the gaps are.

The first question I have is directed not just to NOAA, but also BLM. Is BLM planning any onshore social economic studies of the same magnitude at the present environmental assessment, as has been outlined today?

MR. ROBINSON: I might add one other point. NOAA is interested in that question through our coastal zone management program. We have requested a 3-million-dollar supplemental to the coastal zone management program to accelerate the development of State programs and also to conduct research in the area of secondary impacts. We have every reason to believe that the supplemental for this year will be approved and that a significant block of that money will be allocated to Alaska.

Research would be undertaken if the State of Alaska felt that it should be undertaken and grants would be made as part of the CZM program.

MR. SEGALKIN: I would just like to comment on Mr. Tennyson's answer. I think that the studies that he has outlined would be totally inadequate from the State's point of view. He mentioned the possible studies of Cordova and Yakutat. We feel that the onshore impact should be much greater than that. They are going to range throughout the State, in fact. They are going to cost the State substantial amounts of money.

The funding level that you have indicated for the environmental assessment is, roughly, 25 million dollars a year. This is substantially greater than the level of funds you are talking about for social economic studies. As far as the State of Alaska is concerned, this is a very serious impact that you are looking at, and one that we are going to have to absorb unless we receive help.

The second question I have is directed to NOAA. Do you feel management studies would make a good addition to your environmental study plans? Basically, we propose studies of development of alternative legal and administrative frameworks for management of OCS Resources, development of alternative methods of evaluating resource values on an equivalent base, and identification of conflicts with other resource management programs with means to resolve these conflicts. These are management studies; do you feel it advisable to include a section like that in your study plan?

MR. ROBINSON: Again, I guess the answer to that one is that we do not have the option within this program to include that. This program that we have been requested to undertake by the Bureau of Land Management deals solely with the primary impact on the marine environment.

So, within the context of this program, we do not have that option, nor do we have any separate funding approved that could be allocated to those types of studies.

MR. SEGALKIN: My question was a little different. My question was whether you feel management studies would make a good addition to a study plan of this type?

MR. ROBINSON: I think I personally feel, yes, it would.

MR. SEGALKIN: Do you agree that OCS will cause substantial onshore and coastal zone development; and if so, why aren't environmental assessments made of the onshore impact and the coastal zone impact? I am not talking about social-economic at this point, we covered that earlier. I am talking about environmental assessments of the coastal zone and the onshore areas.

MR. ROBINSON: We have included environmental assessments of the coastal area as far as the primary impact is concerned. It is contained within the study plan. It is certainly open to discussion, the priority that is given that part of the program; and I am sure that this group here should speak to that question and make recommendations on it.

Now, I am talking still about the primary impact and not the results of secondary development that might occur.

UNIDENTIFIED VOICE: Could you give us some kind of definition between primary and secondary impacts?

MR. ROBINSON: Well, I guess my simple definition is that we are looking at the impact of oil exploration and production, and not the impact which may result from refineries or influxes of population. The potential impact resulting from exploration and production is what we define as primary impact.

The extent that development may pose some potential hazard for the coastal area is covered in the study plan. The study plan does not establish the priority of these, or any other studies, however. If you feel it should receive a significant part of our emphasis, I hope you will recommend that in your workshop sessions.

MR. SEGALKIN: From the viewpoint of the State of Alaska, the social economics, coastal zone onshore impacts are going to seriously affect our state; and we want them considered in great detail.

My last question is on the objectives as stated by NOAA in their study plan. They seem to stand the objectives of BLM (from their environmental studies program) on their head and push the baseline studies to the top. I wonder if you could comment on that?

MR. ROBINSON: I do not believe that you can draw that conclusion from the material here. Question A relates to baselines primarily; we have three other questions that do not.

DR. BRUCE: Regardless of how important the study of processes are versus the baseline studies, there are certain amounts of baseline data and information that are prerequisite to being involved in any processes study. I do not see how the emphasis on baseline studies in this document goes beyond emphasizing those types of baseline data that must be gathered in order to approach the problem from the standpoint of processes.

It seems to me that the emphasis on baseline data is well balanced with emphasis on processes when you consider that you have got to have a minimum amount of baseline data before you can even consider the study of processes. Getting baseline data is not necessarily just going out and getting a number or a count; you relate what you find on baseline data to the processes that you are going to study.

MR. ROBINSON: In our Seattle meeting, there was no preliminary ground rule outlined that baseline should take a significant part of the emphasis. I think the recommendations that resulted here are very well scientifically based.

MR. SEGALKIN: Let me say that from the State's point of view as we have gone through your study plan, there seems to be undue emphasis on baseline studies. The thought is lost that what we were trying to achieve is a way to handle OCS impacts and to develop tools to handle these impacts.

MR. MULLER: There may be some misunderstanding as to exactly what we feel is important in terms of the relationship between transport processes or process type studies, and particularly data gathered for baseline information.

Perhaps the best way I can express that is to discuss a particular transport process study or a process study that we would like to see done relating to this program.

Say there is an oil spill at position X in the Gulf of Alaska. We need to hypothesize how much oil was going to spill. We, then, need to know where is that oil going, what happens to it along the way, and what effects does it have on biological populations. That, in our mind is a process type of study.

Now, based on some type of general physical model that you might have for the Gulf of Alaska, the Beaufort Sea or wherever, then the need for baseline information develops. Then you can specify exactly what baseline information is needed. But, what we see is a reversal of that process, where people are going out gathering baseline information, but not doing it based upon some structural model situation. That is our primary objection as to the way this plan is structured.

We recognize that there is a need for baseline data. We do not see a model development proposal coming out of this particular project. Perhaps, far down the line such is planned for development, but then we would be in the process of identifying additional data needs in order to refine that model. This sort of thing could go on forever.

What we are saying is that now is the time to put a handle on these model studies and through the model studies develop the need for additional baseline data.

DR. QUAST: The draft study plan as you see it is a first shot at this type of program. There are a lot of elements that are implicit in it, but not explicit. I would like to indicate what we are thinking on the modeling side.

One of the things we hope to end up with is a conceptual or a numerical model or a mixture of the two, that will give us a likely estimate of the potential oil damage from a spill, both direct (immediate) and indirect (long term).

The elements of the conceptual system or model would include trajectory of the oil released, i.e., the geographic path over time for the oil components from the surface to the bottom; and rates of attenuation of the release--the degradation of the components over time due to dilution, biodegradation, absorption, oxidation, and clean-up processes. Outputs will include the geographic distribution of impacts over time, i.e., exposure of water masses, bottom of ocean, and littoral zone to the oil components, decomposition products, or residues.

The model will allow us to estimate the immediate effects on principal animal and plant species, for example, removal of numbers by geographic regions and ecological subdivisions, and loss to fisheries. Estimating the degree of perturbation to the ecosystem would also be a goal for the model.

That is a general overview of the tentative model. We will obtain maps furnished by the circulation model which will lead to maps of the distribution of particular oil components. We will know from our assessment studies what species stages will be present in the particular areas where these trajectories would impinge. There may also be in these particular species stages, a level of fractions from previous contamination. In Alaska, presumably, it would be zero for a first spill, but in some areas where there is a low level of release for a long period, you may have a considerable contaminant level. These data then would contribute to physiological models on contaminant levels in the species from which we could infer what species and what stages would probably be killed and what would probably live and the expected proportions of each.

Another branch of the model would give direct or immediate mortality, which, of course, would subtract from the number of animals that were available to the next stage of a spill, and so on.

In terms of impact of the littoral zone, I would like to offer the following comment. The particular tasks we have in this draft study do not treat the dynamic processes sufficiently. The omission is inadvertent. All the other animal groups have appropriate tasks in dynamics mentioned. Somehow in the rush of getting the plan out, the dynamic, process, aspects, did not get included in the littoral tasks.

The process aspect, as far as contaminant levels and toxic levels to organisms and the transfer in the food chain, is also mentioned in the geology section and will receive emphasis later on.

DR. WENNEKANS: There are a couple of things that I think must be put into perspective when we talk about this study plan.

There is a time frame in which answers must be provided. There is also a time frame of the duration for the field studies themselves. The question is, how can we accomplish the tasks in terms of trying to provide the baseline information that is needed, when it is needed, to provide the level of protection that the area requires.

We have to include the context of time frames on some of the studies if they are to provide information which will be needed. There is a need to sit down with the people in the agencies that will be faced with the problem of trying to provide the control that has to be applied to be able to make this operation clean and safe. There is a need in the study plan for information to be made available to the agencies in a timely manner. We already have seen, for example, that the oil industries have almost a 5-year lead on us in their planning in the Yakutat area. In the Arctic area, the problem is not really an offshore problem; the problem is an onshore and close-to-shore problem.

MR. OPPENHEIMER: The Department of Interior has called for nominations on an area extending from the Pribilof Islands down in the Aleutian Chain, an area called the Saint George Basin.

Although it is scheduled for leasing in 1976, the leasing schedule used by the Department has the stipulation that in the event one of the lease sales scheduled for calender 1975 is delayed for some reason or another, they could as a last minute operation, substitute the Saint George Basin for sale as a replacement.

The purpose of my question is, what sort of data will be available in this study to support a final impact statement on the Saint George Basin in about November or December of this year?

MR. ROBINSON: The answer, generally, is very little. We will not begin operations and will be in a literature review stage during that period of time. So, we would assemble a considerable body of literature conceivably by that time, but not much further than that.

We may have some field operations conceivably, in the Bering this early summer, but I would rather doubt that the results of those investigations would be available.

DR. QUAST: I would like to make a comment on that. The Northwest Fishery Center in Seattle has commented on the use of the Saint George Basin for fishery purposes. The Center has commented on the EIS for the Alaskan Coastal Shelf in that respect also.

There is a tremendous amount of data on the use of that area for fisheries. In case of need, it could be assembled quite quickly. As a matter of fact, it already may have been assembled by the Northwest Fishery Center for their comments on the use of the Saint George Basin.

MR. EVANS: I want to go back to expand a bit on one of the questions Dr. Wennekens asked.

As to the appropriateness of studies directed at coastal processes, the study plan contains quite a bit of research to be conducted on oil and its impacts. We have some other impacts.

Yesterday in Dr. Wenneken's presentation, he emphasized the fact that one of the first things that occurs when you have OCS development (indiscernible), is the development along the coast.

Any coastal development, particularly in the Arctic, perhaps anywhere, is going to require tremendous amounts of gravel. People have been discussing this for a number of years with respect to the Prudhoe Bay development, but very little is known of the impact of gravel removal on the coastal processes, on fish and wildlife resources, or the basic productivity of the area. We do not really have a firm fix on whether a study of the impact of removal of fill materials on coastlines would be appropriate for this project?

MR. ROBINSON: The answer is that it should be. There is certainly no reason why that subject matter should not be a part of the study.

DR. BRUCE: Certainly that type of problem comes under the category that we all refer to as special studies. There may be some more emphasis needed on that aspect of it. But, certainly within the context of the general framework and study plan.

MR. BRODERSON: I would like to go back for a minute on the timing of the effects studies versus the baseline studies and clear up, at least in my mind, the time scale. I am wondering how one can take baseline data in this context without first doing physiological studies, such as which creatures you need to do assessment work on any great scale.

MR. ROBINSON: The physiological studies will begin immediately, and we have laboratory facilities in Seattle which are being brought up to speed to be able to take on that work. We are also trying to find a number of investigators to work in that area. The work would begin right at the initiation of the project. As far as the relationship of timing and selection of animals, maybe Mr. Wolfe would like to answer that.

MR. WOLFE: It is identified in the study plan that the initial effort on physiological studies will be devoted towards identifying those species that will exhibit the greatest sensitivities to contaminant associated with physiological development. And then, during subsequent years, there will be extensive studies on the different types of effects that might be exhibited in those organisms.

MR. BRODERSON: I would like to suggest some of the points to be brought out by the study plan are not too clear. Perhaps the study plan is trying to cover too big an area. It might be wise to split the plan to study the Gulf, the Bering Sea, the Beaufort and Chuckchi Sea, and do separate planning.

The emphasis in these various regions, we feel, really needs to be different, from one region to the other.

MR. ROBINSON: Well, there is an argument both ways on that one; and the fact is, the most consistent argument from the scientists in Seattle, is that all the geographic areas should be combined. I realize in certain subjects, for example, hazards, we are looking at an entirely different problem; and, conceivably, there we should have broken the thing up.

In the area of birds and mammal migrations, though, the scientists find it very difficult to write a plan for the Northern Bering without thinking about things going on in the Southern Bering.

I think the concensus among the people who are assisting us in putting this together is that it should be a more coherent plan involving all of the coastline.

MR. SEGALKIN: The State has raised a number of serious questions that they have regarding gaps in the study plan. You have answered for the most part that our concerns are covered in the study plan. Can't we have, please, one clearly drawn document, a statement that reflects our concerns and that are not just merely implied?

Later in this program, we will offer a substitute to the plan that does meet the concerns that we have expressed, and we hope at that time everybody will agree that these concerns have to be clearly outlined in a draft study plan. It is not enough just to say that they are implied and that they will be accomplished.

PRESENTATION OF A STUDY PLAN OUTLINE ENVIRONMENTAL ASSESSMENT OF THE GULF OF ALASKA, SOUTHEAST BERING, NORTHEAST BERING, CHUKCHI AND BEAUFORT SEAS

MR. PAT WENNEKANS
State of Alaska
Anchorage, Alaska

As you have gathered in the question and answer sessions that preceded my presentation, there are a number of issues and questions that the State is very much concerned about in terms of the implementation and the application of the proposed study as it concerns the State of Alaska. I would like at this time to reiterate what our position is, and then submit for consideration an outline of what we feel a plan should contain.

Dr. Weeden presented three major points, which are basic to the problems of OCS impact in Alaska.

I will read from his statement, "It is extremely important that the studies of biological and physical environment deal primarily with processes instead of things. Processes have been discussed at some length by NOAA, but again I want to reiterate. Processes are a very important factor which is of concern to us. We have to deal with processes. We may have to pass lightly over the 'whats' in order to uncover the 'hows and whys.' Our needs will be served better by a program which includes process oriented research of lasting and general values, rather than a series of snapshot inventories that are obsolete before they are published."

The important point we want to make is that in the State agencies in order to do proper planning for resource management and for balance between resource exploitation and conservation, we must have information that will allow us to take a very definite course of action. The need for process information is extremely real. The need for process information must be in a time frame to allow the formation of intelligent decisions on how to best address ourselves to the management of the resources.

The second point that Dr. Weeden made in his speech was that at least equal emphasis should be given to the near shore and shoreline ecosystem as to the biophysical system of the deeper waters. The inshore ecosystem will be stressed more often and by a greater variety of human actions than those of the blue water region on which the draft study plan seems to lavish its attention.

We want to reiterate that, from the State point of view and, actually, from a primary point of view, that the coastal and onshore impacts of the OCS activities are going to be a prominent feature for management purposes, in terms of conserving and protecting the values of the resources of the state, but also in being able to protect the people of the state themselves, which are a very important part of the equation of the environment. In many parts of Alaska, you cannot separate people and the environment because in many areas the people depend upon the environment for their subsistence. They are on a subsistence level much more interdependent with the resources of the coastline than other areas of the country.

Thirdly, the OCS related studies must include an examination of the overall implication of OCS petroleum exploitation to our statewide economy and social conditions. This statewide perspective must be supplemented with regional and community levels and research. Alaska is, for the most part, an untouched area. I want to reiterate that many people - they might be small in number - feel it is important to keep the environment in its prime and best condition and that all the planning be directed to preserve, maintain, and protect their way of life and the use they make of this environment. You cannot separate the people from the environmental aspects.

We have looked at the plan carefully. The questions raised were not a criticism of the people that put the plan together, but our feeling that certain areas were not really being come to grips with. We want to make sure that whatever is being implemented will take into account the concerns that we have.

We find that the document is somewhat amorphous. When you read the document, you find all items seem to have the same priority. There are obviously some very large differences in terms of the amount of work that must be undertaken versus the kind of work that must be done to understand the processes. The document as such does not really address itself to the user's need. What is the user going to get out of this information? How do they apply it?

At this time I would like to submit for consideration a draft outline of the State plan. Briefly, I'd like to go through the index of the document to show you the scope of the subject matter we think must be covered in any consideration of an OCS environmental study plan. Included in addition to introduction, general description of the study area, and objectives are sections on general studies, regional studies and resource management studies. Also included are sections describing program administration and logistics. This outline is therefore presented for review and discussion at this time.

EDITOR'S NOTE: The following pages contain the proposed outline as presented by the State of Alaska.

PROPOSED

STUDY PLAN OUTLINE

ENVIRONMENTAL ASSESSMENT

OF THE

GULF OF ALASKA

SOUTHEAST BERING, NORTHEAST BERING,

CHUKCHI AND BEAUFORT SEAS

* * * * * * *

By:

The State of Alaska

February 18, 1975

INDEX

GENERAL DESCRIPTION OF THE STUDY AREAS

A. The Geographic Setting

B. Marine and Coastal Zone Resources and Their Values

C. Land Tenure and Dedication

OBJECTIVES

A. Provide information for predicting and mitigating impacts of potential oil and gas exploration and development on the marine and coastal environments of Alaska.

B. Provide information about the natural and man-made marine and coastal environments that will enable federal, state, and local agencies and private interests to make sound management decisions regarding the potential development of the oil and gas resources of Alaska.

C. Develop management systems to cope with environmental, social and economic consequences of potential OCS development.

RESOURCE MANAGEMENT STUDIES

A. Development of alternative legal and administrative frameworks for management of OCS resources, including:

1. Permitting procedures
2. OCS stipulations
3. Oil spill prevention and clean up
4. Strict, unlimited liability for clean up and all damages flowing from oil spills
5. Enforcement procedures

B. Development of alternative methods of evaluating resource values on an equivalent base.

C. Identification of conflicts with other resource management programs and means to resolve these conflicts.

GENERAL STUDIES

The general areas of study should include the following:

A. Provide information to assess the impact of chronic and catastrophic discharges on marine environment, biota and flora.

B. Study of accumulative, long-term impacts of OCS development on statewide economy, including changes in economic structure and workforce, employment, and income levels. Quantify and assess secondary growth at distant support centers such as Anchorage.

C. Development of a model that will help predict how the OCS program will alter the social environment.

REGIONAL STUDIES

Areas - Gulf, S. E. Bering, N. E. Bering, Beaufort/Chukchi

A. Anticipated oil and gas development activities:

1. Potential reserves
2. Estimated rate of development and production
3. Production and transportation systems
4. Anticipated on-shore facilities
5. Community needs
6. Under "best available level of technology," what are the probabilities and amounts of various discharges into the environment?

7. Spill prevention and clean-up procedures

B. Development of regional models that will help predict the fate of chronic and catastrophic discharges resulting from this development - including physical transport, biochemical transport and residence time.

C. Regional environmental information required, in conjunction with general models, for control and management of the development and production of the OCS oil and gas resources:

1. Socio-economic, cultural
2. Physical
3. Biological
4. Historical, archeological

D. Natural hazards

MANAGEMENT OF THE STUDY PROGRAM

The ultimate impacts of the proposed oil and gas development will be upon state and local governments and private sectors in addition to federal interests; therefore, the management of this scientific program requires a joint management mechanism involving all interested parties. This joint management group must set priorities for the investigations carried out under this plan, supervise contractual studies, and conduct periodic reviews of the study plan.

LOGISTICS

Complete logistics support plans must be developed so that common support facilities are used to the maximum extent possible.

UNIDENTIFIED VOICE: Would a reasonable amount of the problems here be resolved if the document title had the words, "Marine Environmental Assessment" on the front cover?

MR. SAGALKIN: I don't think that would satisfy the State's intentions. The State wants an overall study plan. We're not necessarily concerned that NOAA perform all aspects of the study. But we want a single plan that includes all of the concerns and impacts, environmental effects and socioeconomic effects of the OCS program, in one place so that we know it will be taken care of.

UNIDENTIFIED VOICE: I'm simply raising the question in regard to the brown document versus the State's outline. I looked through the outline, and I recognize this as an attempt to come up with a series of answers to problems that the State of Alaska is particularly concerned with. I believe it covers a much broader scope of activities and interests than the specific marine environmental questions that were directed at the people who developed this plan. I'm not in any way raising the question as to whether or not it is appropriate for the State to be raising this point. But I wonder if, indeed, we shouldn't keep the difference between the white outline here and this in our mind. They were put together, I believe, with quite different objectives. This, I believe - the NOAA document - is a much more limited program. You are concerned from the State's point of view, with having some guarantee that considerably more than appears in this document actually is put down somewhere in a single document. I believe this is the case. But I do believe that for the discussion here, it might be appropriate if we try to make a separation between these two.

MR. ROSENBERG: I believe that's basically the intent of the question which I'm going to address to BLM to have answered before we break into individual workshops. The answer will lay the groundwork for what we have to accomplish. If we are just looking at the document that NOAA has presented and the marine aspects of it, or if we have to look at the total picture as presented by the State of Alaska will most certainly make a difference in the type of groups developed.

MR. MEYER: This particular meeting is the third type that BLM has conducted throughout the United States. The other two did not have a document around which to base their criticisms and, therefore, did not have a vehicle for developing a plan. In this case, NOAA, at the invitation of BLM, developed a plan, and one of the objectives of this particular conference is to review said document. The BLM is interested in not just the short-term

goals, i.e., one or two field seasons, but is interested also in receiving the public's input as to their thoughts as to what the long-term philosophy should be. It's my impression that the document which NOAA has prepared does, in a general sense, present a long-term philosophy as far as the biophysical aspects of the research are concerned.

I realize that a lot is implied in this document, and possibly through your recommendations it can be filled out. Does this answer your question?

MR. ROSENBERG: In some ways it does, but it still leaves me a bit of a dilemma. I have talked with Mr. Tennyson and you about this problem, and it is the consensus that we will go ahead and consider the socioeconomic aspects of the studies. I will take a modified version of what the State has presented and use it as an overall umbrella to develop the larger concept and incorporate what NOAA has developed under that umbrella. The two are not, in my opinion, incompatible. As a matter of fact, they do fit together. The NOAA plan does fit under the State's outline. The State is asking that a more comprehensive document be put together covering other areas. It will be the charge of this group, rather than to divide scientific disciplines, to take an integrated look at a larger overall plan that is needed.

MR. SAGALKIN: I just want to make one comment on what Mr. Rosenberg has just said in answer to the gentleman who asked the question. I think, basically, we're talking about two different things. One, we're talking about the scope of the environmental assessment. I would say that our concerns are not answered merely by addressing it as a marine environmental assessment. We want a total environmental and socioeconomic assessment of the OCS leasing program. The other side of the coin is that even the marine environmental assessment, as it's been presented in the study plan, has not addressed itself to the concerns of the State of Alaska as stated by Dr. Weeden, Comissioner Muller, and Dr. Wennekens. We must turn it around so it meets the management goals of handling OCS oil and gas development and impacts. And it's from that side that we want to approach the whole question.

UNIDENTIFIED VOICE: I think Sandy put it very well when he said that our objectives are to first take a look at the management implications of the Outer Continental Shelf oil drilling proposal. This was the State's position to start with. We felt the information that was generated should be valuable not only to the state but to other Federal and local management agencies. Also local government entities have a responsibility that must be addressed.

The owner of the shoreline in many of these areas is not going to be the state, it is not going to be the Federal Government, it is going to be the native corporations.

Their interests have to be addressed in this kind of a study. I think that we'll find if we take a look at Alaska's coastlines where the impact is going to be felt, it's not going to be on public land, it's going to be felt on private lands that are owned by the native corporations. And that they too should be taken into consideration. If you read the Alaska Native Claims Settlement Act, you'll find that that is required by developing interests, including the Federal Government, that native interests be considered in any proposals.

MR. MC MAHON: I think the statements made by the state are valid; and from the point of view of transportation, we know sooner or later that a federal agency will be involved. So it would be best at this stage that a good study outline be developed and the studies be undertaken as soon as possible.

APPENDIX I

LETTERS OF ANNOUNCEMENT AND INVITATION

SEA GRANT PROGRAM

University of Alaska
Fairbanks, Alaska 99701

January 24, 1975

The Alaska Sea Grant Program under sponsorship of the Bureau of Land Management will be holding a public conference/workshop to review and make recommendations for modifications to the draft environmental study plans which have been developed for selected areas of the Outer Continental Shelf (OCS) of the Gulf of Alaska, the southeastern Bering Sea and the Beaufort Sea. We are encouraging all interested parties to attend and participate in this conference/workshop.

The first two days will be devoted to a review of Federal and State responsibilities in OCS and a presentation of the NOAA draft environmental studies. The third and fourth days will consist of workshops to develop recommendations for change and/or additions to these studies. On the fifth day, these changes will be presented and discussed along with any other pertinent comments from the floor. The results of this conference/workshop will be published and a copy sent to each participant.

The conference/workshop will convene February 18 at 9:00 a.m. in the Alaska Room of the Anchorage Westward Hotel. Copies of the NOAA draft environmental studies or additional information can be obtained by contacting:

Ms. Ann Morkal
Alaska Sea Grant Program
University of Alaska
Fairbanks, Alaska 99701
(907) 479-7824

or

Ms. Willy Rensenbrink
Alaska Sea Grant Program
707 'A' Street
Anchorage, Alaska 99501
(907) 279-4523

Sincerely,

Donald H. Rosenberg
Director

DHR/am

UNIVERSITY OF ALASKA
Fairbanks, Alaska 99701

February 6, 1975

Attached is a draft study plan for the environmental assessment of the Gulf of Alaska, southeastern Bering and Beaufort Seas, published by the U. S. Department of the Interior (BLM) and the U. S. Department of Commerce (NOAA) as requested by you.

You will note that this draft is limited in scope to a discussion of the objectives in final tasks to be accomplished during the program. It does not cover the details of sampling, strategy, analytical message, etc. which will be formulated when proposals are received following our meeting at the Anchorage Westward Hotel on February 18-22, 1975.

We look forward to your participation.

Sincerely,

Donald H. Rosenberg/am

Donald H. Rosenberg
Director

DHR/am
Attachment

UNIVERSITY OF ALASKA
FAIRBANKS, ALASKA 99701

January 30, 1975

Dr. Frank Monastero
Bureau of Land Management
Department of the Interior
18th and 'C' Streets, N.W.
Washington, D.C. 20240

Dear Dr. Monastero:

The Bureau of Land Management has contracted with the University of Alaska's Sea Grant Program to organize a review of the draft environmental study plans for selected areas of the Alaskan Outer Continental Shelf (OCS). The specific objectives of the conference/workshop are to provide a public review of these study plans and to formulate recommendations for possible modification. The results of the meeting are to be published and a copy provided each attendee.

To provide the participants of the conference with sufficient background on the various federal responsibilities and roles in the OCS, I am scheduling a series of presentations by the federal agencies that BLM has indicated as having responsibility in the OCS. The conference/workshop will be held February 18th through the 22nd at the Anchorage Westward Hotel in Anchorage, Alaska. I have scheduled the morning of February 18th for the federal presentations.

I would appreciate it if you would arrange for an individual from your organization to make such a presentation for your agency. If you would please notify my office of your speaker, I will send him directly all information regarding the conference/workshop.

Should you need further information, please contact me at (907) 479-7824.

Sincerely,

Donald H. Rosenberg
Director, Sea Grant Program

DHR/am

APPENDIX II

AGENDA

AGENDA

A REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT STUDY PLAN FOR THE GULF OF ALASKA, SOUTHEASTERN BERING AND BEAUFORT SEAS

February 18-22, 1975

February 18 Tuesday	Anchorage, Westward Hotel, Anchorage, Alaska (907) 272-7411
8:00 A.M.	Registration - Alaska Room
9:00 A.M.	Introductory Remarks and Announcements
9:15 A.M.	Federal Agency Presentations
11:00 A.M.	State Presentation
12:00 Noon	Break
1:30 P.M.	Federal Agency Presentation
3:00 P.M.	Anticipated Technology, Environmental Safeguards and Procedures for Oil and Gas Development in the OCS - Industrial Presentation
5:00 P.M.	Adjourn
February 19 Wednesday	
9:00 A.M.	Announcements
9:15 A.M.	Presentation of the BLM/NOAA Environmental Study Plan
12:00 Noon	Break
1:30 P.M.	Continuation of Presentation by NOAA
2:30 P.M.	State of Alaska Presentation
3:30 P.M.	Workshop Breakdown Discussion
4:30 P.M.	Establishment of Workshops
5:00 P.M.	Adjourn
February 20 Thursday	
9:00-4:30 P.M.	Individual Workshops
February 21 Friday	
9:00-4:30 P.M.	Individual Workshops
February 22 Saturday	
9:00 A.M.	Presentation of Workshop Recommendation and General Discussion
12:00 Noon	Adjourn

APPENDIX III

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APPENDIX IV

PUBLICITY

Publicity for the conference was handled through two media. A general news release was issued by the Office of the President, University of Alaska on January 14. 1975 (Attachment I). This news release was sent to newspapers and radio/television stations listed in Table 1. Additionally, a general letter (see Appendix I) was sent to over 800 individuals, native corporations, oil companies, federal and state agencies, and scientific organizations in the Pacific Northwest.

An official announcement of the meeting was published in the edition of the Commerce Business Daily.

NEWS RELEASE

UNIVERSITY OF ALASKA

OFFICE OF THE PRESIDENT

contact: Gerald E. Bowkett phone: (907) 479-7272

RELEASE DATE:
Immediate

FAIRBANKS--Methods of assessing the environmental effects of oil and gas development on Alaska's outer continental shelf (OCS) will be the subject of a public conference and workshop scheduled Feb. 18-22 at the Anchorage-Westward Hotel in Anchorage.

Sponsored by the federal Bureau of Land Management (BLM), the conference and workshop will examine draft environmental assessment studies for selected areas in the Gulf of Alaska, the southeastern Bering Sea and the Beaufort Sea.

Personnel representing the federal agencies involved in the proposed studies will be on hand at the conference to discuss them. These studies were developed by a series of intensive scientific workshops that brought together leading scientists from many different fields.

The Alaska Sea Grant Program of the University of Alaska is organizing the February Anchorage meeting for the BLM.

"We are soliciting recommendations from the general public with regard to these scientific studies of the Alaskan outer continental shelf," said Donald Rosenberg, coordinator of marine programs of the Sea Grant Program. "These studies should provide major advances in our understanding of the marine environment of the Alaskan continental shelf and in understanding the effects on the marine environment of oil and gas development in the event leasing does occur. We encourage the public to take full advantage of this opportunity to advise the federal government on these research needs."

-more-

The draft environmental assessment studies include both baseline studies which are designed to describe the present oceanographic, meteorological and environmental conditions on the OCS and experimental studies which will aid in the prediction of environmental effects of oil and gas development.

Copies of the draft environmental assessment studies will be available on request after Jan. 31 at either the Anchorage (707 A St.) or Fairbanks (Resources Building, Fairbanks campus) offices of the University of Alaska's Sea Grant Program.

This is the fourth BLM-sponsored public meeting on environmental assessments of federally-leased lands. The other three were held in St. Petersburg, Florida (Gulf of Mexico OCS); College Park, Maryland (mid-Atlantic OCS), and Long Beach, California (Southern California OCS).

DR/GEB/1/14/75/04 -30-

TABLE 1

News Editor
All Alaska Weekly
Box 970
Fairbanks, AK 99701

News Editor
Eielson Times
Eielson AFB, AK 99702

News Editor
Fairbanks Daily News-Miner
P. O. Box 710
Fairbanks, AK 99701

News Director
KFAR Radion and TV
P. O. Box 910
Fairbanks, AK 99701

News Director
KFRB-KTVF Broadcast Center
P. O. Box 950
Fairbanks, AK 99701

News Director
Radio Station KJNP
P. O. Box O
North Pole, AK 99705

News Director
Radio Station KIAK
543 Second Avenue
Fairbanks, AK 99701

News Editor
Tundra Times
P. O. Box 1287
Fairbanks, AK 99701

News Editor
Yukon Sentinel
11Q Yukon Command
Ft. Wainwright, AK 99703

Marilyn Richards, Editor
River Times
102 Lacey Street
Fairbanks, AK 99701

News Editor
Anchorage Daily News
P. O. Box 1660
Anchorage, AK 99510

News Editor
Anchorage Daily Times
P. O. Box 40
Anchorage, AK 99510

News Editor
Bristol Bay By-Lines
P. O. Box 92
Dillingham, AK 99576

News Editor
Cheechako News
Drawer O
Kenai, AK 99611

News Editor
Chilkat Valley News
Haines, AK 99827

News Editor
Chugiak-Eagle River Star
Eagle River, AK 99577

News Editor
Cordova Times
P. O. Box 200
Cordova, AK 99574

News Editor
Cook Inlet Courier
Kenai, AK 99611

News Editor
Delta Midnight Sun
P. O. Box 132
Delta Junction, AK 99737

News Editor
The Frontiersman
P. O. Box D
Palmer, AK 99645

News Editor
The Great Lander
3110 Spenard Road
Anchorage, AK 99503

News Editor
The Homer News
P. O. Box 254
Homer, AK 99603

News Editor
Ketchikan Daily News
P. O. Box 79
Ketchikan, AK 99901

News Editor
Knik Arm Courier
P. O. Box 1166
Chugiak, AK 99567

News Editor
Kodiak Mirror
P. O. Box 1307
Kodiak, AK 99615

News Editor
Kotzebue News
Kotzebue, AK 99752

News Editor
Nome Nugget
P. O. Box 610
Nome, AK 99762

News Editor
The North Wind
Skagway, AK 99840

The Peninsula Clarion
P. O. Box 3572
Kenai, AK 99611

News Editor
The Pioneer
Information Office, Ft. Richardson
U.S. Forces, AK 99505

News Editor
Seward-Phoenix Log
P. O. Box 305
Seward, AK 99644

News Editor
Daily Sitka Sentinel
P. O. Box 799
Sitka, AK 99835

News Editor
The Sourdough
Information Office, Elmendorf AFB
U.S. Forces, AK 99506

News Editor
Southeast Alaska Empire
138 Main Street
Juneau, AK 99801

News Editor
Tundra Drums
Bethel, AK 99559

Mr. Stanton Patty
Alaska News Editor
The Seattle Times
Fairview Avenue, N and John Street
Seattle, WA 98111

News Editor
Valdez-Copper Basin News
P. O. Box 628
Valdez, AK 99686

News Editor
The Voice of the Brotherhood
423 Seward Street
Juneau, AK 99801

News Editor
Wrangell Sentinel
P. O. Box 801
Wrangell, AK 99929

News Editor
The Whitehorse Star
Whitehorse, Yukon Territory
CANADA

News Editor
Yukon Daily News
Whitehorse, Yukon Territory
CANADA

Associated Press
P. O. Box 2175
Anchorage, AK 99501

Associated Press
State Capitol
Juneau, AK 99801

United Press International
Sixth and Wall
Seattle, WA 98121

United Press International
State Capitol Building
Juneau, AK 99801

City Editor
Seattle Post-Intelligencer
Sixth and Wall
Seattle, WA 98121

News Director
Radio Station KSRM
P. O. Box 489
Soldotna, AK 99669

Mr. Carl McDonald
Alaska Construction and Oil Report
P. O. Box 71
Anchorage, AK 99501

Mr. Ed Fortier
Alaska Magazine
P. O. Box 4-EEE
Anchorage, AK 99503

Mr. Bill Fox
Alaska Industry Magazine
P. O. Box 4-AA
Anchorage, AK 99509

Editor
Countermedia
P. O. Box 2299
Fairbanks, AK 99701

News Director
Radio Station KYUK
P. O. Box 513
Bethel, AK 99559

News Director
KLAM Radio
P. O. Box 278
Cordova, AK 99574

News Director
KJZZ - FM
338 Denali Street
Anchorage, AK 99501

News Director
Radio Station KBYR
P. O. Box 1960
Anchorage, AK 99501

News Director
Radio Station KNIK-FM
P. O. Box 2200
Anchorage, AK 99501

News Director
KENI Radio and TV
P. O. Box 1160
Anchorage, AK 99501

News Director
KFQD Radio
9200 Lake Otis Parkway
Anchorage, AK 99507

News Director
KHAR Radio and TV
3900 Seward Highway
Anchorage, AK 99501

News Director
KIMO - TV
3910 Seward Highway
Anchorage, AK 99502

News Director
KTVA-TV
P. O. Box 2200
Anchorage, AK 99501

News Director
Radio Station KYAK
2800 East Dowling Road
Anchorage, AK 99507

News Director
Radio Station KRXA
Seward, AK 99644

Mr. Leo Lutchansky
Dillingham Radio
P. O. Box 502
Dillingham, AK 99576

News Director
Alaska Forces Radio Network
Elmendorf AFB, AK 99506

News Director
Radio Station KCAM
P. O. Box 125
Glennallen, AK 99588

News Director
Radio Station KJNO
P. O. Box 929
Juneau, AK 99801

News Director
Radio Station KINY
231 S. Franklin Street
Juneau, AK 99801

News Director
KTOO - FM
P. O. Box 1487
Juneau, AK 99802

News Director
KATV Radio Station
P. O. Box 1852
Ketchikan, AK 99901

News Director
KTKN Radio Station
P. O. Box 2347
Ketchikan, AK 99901

News Director
KVOK Radio
Kodiak AK 99790

Station Manager
Radio Station KOTZ
P. O. Box 78
Kotzebue, AK 99752

News Director
Radio Station KICY
P. O. Box 820
Nome, AK 99762

News Director
Radio Station KNOM
P. O. Box 988
Nome, AK 99762

News Director
Radio Station KIFW
P. O. Box 299
Sitka, AK 99835