Steele

The 1990 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill

Volume I I: Appendix D

TD427
.P4A15
1990
v.2

VOLUME II: APPENDIX D

15427 • F4A15 1990 v.2
JAN 16 1996
LIBRARY
NOAA/CCEH
1990 HOBSON AVE.
CHAS. SC 29408-2623

APPENDIX D

TABLE OF CONTENTS

INTRODUCTION 1

Response to General Comments on the Plan 1

Response to Comments on Coastal Habitat Study 21

Response to Comments on Air/Water Studies 26

Response to Comments on Fish/Shellfish Studies 36

Response to Comments on Marine Mammals Studies 63

Response to Comments on Terrestrial Mammals Studies 73

Response to Comments on Bird Studies 78

Response to Comments on Historic Properties
And Archaeological Resources 93

Response to Comments on Technical Services 98

Response to Comments on Economic Studies 105

Response to Comments on Restoration 116

GENERAL

COMMENTS AND RESPONSES CONCERING THE DRAFT "STATE/FEDERAL NATURAL RESOURCE DAMAGE ASSESSMENT PLAN FOR THE EVOS"

The 1989 Draft Damage Assessment Plan was made available to the public for review and comment. Approximately 75 reviewers representing industry, environmental groups, public agencies and individuals commented on the plan during the written comment period and the follow-up oral sessions held in Anchorage, Alaska and Washington, D.C. Reviewers commented on the overall nature and content of the plan and provided technical remarks concerning many of the individual studies. All comments were considered by the Trustees during evaluation of the 1989 effort and formulation of the current plan.

This section provides a synthesis of the comments and responses thereto. Comments were not individually identified since many comments were either similar or duplicative. The comments and responses are organized into two basic categories -- those dealing with the general nature of the plan and those concerning a specific category of studies or individual studies.

Comments concerning individual studies that have been completed or discontinued in 1990 have not been addressed in this plan.

GENERAL COMMENTS

Comment: Reviewer had been wrongly identified as a "potentially responsible party" (PRP) as the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 USC. Sec. 601(14) expressly exempts "petroleum, including crude oil" as a substance to be considered under the provisions of that law, and liability extends only to the owner of the vessel from which the oil was spilled under the Clean Water Act (CWA), 33 USC. Sec. 1321.

Response: The natural resource damage assessment studies are not designed to determine the liability of a particular party, hence the term "potentially responsible party" is used. The focus of the process is to identify, quantify, and value injury to natural resources due to the EVOS, and to identify appropriate restoration measures. The Trustees are confident that the applicable laws have been interpreted correctly, including those relating to identification of PRPs.

Comment: The plan lacked sufficient detail to evaluate the adequacy of individual studies in assessing injury to natural resources.

Response: The objective of the 1989 plan was to provide summary information on individual studies, adequate for reviewers to understand the scope of the study and the interrelationships between studies, as well as the scope of the overall damage assessment program. Greater detail is included in the current

plan.

Comment: The plan lacked sufficient detail for reviewers to determine whether the statistical designs were adequate to produce valid results. The overall design of some studies would not produce valid results.

Response: All studies were fully reviewed in terms of statistical design and other factors. As a result of this review, some studies were discontinued and others were modified to ensure a statistically valid design. More detail on statistical methods is included in the current plan.

Comment: There was insufficient detail to determine whether the methods for collection, cataloging, storage, preservation and analysis of field samples and other data are adequate. There was also insufficient detail on the costs of the studies.

Response: A detailed protocol has been developed for the collection, cataloging, and storage of field samples and related data to ensure that a proper chain of evidence is maintained and that information is preserved. (All individuals collecting samples have been trained in these methods.) This protocol is described in the Quality Assurance/Quality Control Procedures for the damage assessment plan. (See Appendix A.) These procedures also describe the quality assurance methods for laboratory analysis. Costs of studies are detailed in the current plan.

Comment: There was insufficient consideration of the natural recovery of resources in the discussion of restoration. The goal of this process should be to restore the spill-affected area to a pristine condition rather than to restore necessary services.

Response: Natural recovery of resources will be considered in restoration planning. A review of literature will be completed to provide information about natural recovery from other oil spills, as well as other methods of restoration. The goal of restoration is to restore the affected area to a pre-spill condition where possible. More detail is provided in the restoration section of the plan.

Comment: There is no Restoration Methodology Plan or resource recoverability analysis in the plan.

Response: The primary objective of the 1989 effort was to examine the injury to natural resources as a first step in determining damages and appropriate restoration. Restoration planning was initiated in November 1989, and will include methodology planning. Details of restoration planning are provided in this plan.

Comment: There was insufficient information regarding design and costs of the studies to determine whether the costs were

reasonable, as defined in the NRDA regulations.

Response: Because of the need to gather information in a timely manner, studies were implemented in 1989 consistent with 43 C.F.R. Section 11.22 of the NRDA regulations. During the winter, all studies were reviewed in detail to ensure that study designs and costs were consistent with the regulatory provisions for reasonable costs. As a result, some studies were discontinued and others were modified. Greater detail is provided in the current plan.

Comment: There were errors in the chronology of oil spill events.

Response: The chronology has been reviewed where it has a bearing on the damage assessment process. The 1990 plan has eliminated the chronology.

Comment: The plan did not include sufficient study of animals that use beach habitat on Kodiak Island.

Response: See current plan for studies concerning Kodiak Island. In addition, beach animals are being studied in other locations. Findings from these studies will be extrapolated to other affected areas where appropriate.

Comment: The studies focus on the effects of oil on individual species and do not consider the interrelationships between species as well as interactions within the ecosystem as a whole. In addition, the damage assessment process is limited to an assessment of loss for human use and should include a consideration of use, non-use and loss of service to the ecosystem as whole.

Response: The studies are intended to provide a comprehensive assessment of injury to the ecosystems affected by the oil spill. For example, one objective of the coastal habitat study is to link effects identified in individual studies to the ecosystem as a whole. During the winter review of studies, several studies were modified and additional studies were included in the plan to further enhance analysis of the interrelationships among species. The Damage Assessment will evaluate the intrinsic value of resources as well as their use values, and will consider both services to humans and to other parts of the ecosystem.

Comment: The effects of natural variation cannot be considered adequately without long-term studies.

Response: As a result of the winter review, it is anticipated many studies will be continued.

Comment: The effects of cleanup need to be evaluated.

Response: Where appropriate, the 1990 studies including the coastal habitat study, have been modified to evaluate the effects

of cleanup.

Comment: The damage assessment studies did not include the potential effect of the spill on the tourist industry.

Response: The economic studies will consider effects on the tourist industry.

Comment: The plan lacks objectivity and focuses on the liability of Exxon.

Response: The intent of the plan is to determine injury to natural resources and assess appropriate damages as compensation. The plan has been reviewed by scientists outside the government to ensure objectivity. The plan is not intended to establish the liability of any potentially responsible party.

Comment: The plan does not adequately assess damage to natural resources in the GOA and CI.

Response: As a result of the winter review, some studies have been modified to better determine injury to resources in the GOA and CI.

Comment: All studies should be given adequate review to ensure that progress is satisfactory.

Response: The damage assessment process requires program managers to ensure the satisfactory progress of studies. Also, studies will be reviewed periodically by scientists from outside the government.

Comment: There is no study of toxicology in the A/W studies.

Response: A study of toxicology has been done as a part of response activities, and an additional study of toxicology in Air/Water #6 has been added to the damage assessment as a result of the winter reviews. See the 1990 study plans.

Comment: The damage assessment plan is a macro-evaluation of loss and should consider specific sites and industries.

Response: The studies provide an assessment of some specific sites and industries as well as a more comprehensive assessment of overall injuries.

Comment: There is no provision in the plan for long term studies to address chronic injuries.

Response: As a result of winter reviews, several studies will be continued in 1990. It is contemplated that after further review, some studies may be continued in future years which will assist in identifying chronic injuries.

Comment: Information on ocean circulation was not used in determining areas to be studied. Specifically, how far will studies extend along the Alaska Peninsula, and why were regions east of the peninsula eliminated from study?

Response: The spread of oil has been tracked by ADEC and NOAA and studies have been expanded to include the affected area. The assessment is intended to address representative areas that have been significantly contaminated by oil, although not every contaminated area is being studied.

Comment: Who in NOAA identified sensitive areas needing protection referred to on page 8, line 22 and when?

Response: In 1988, NOAA's Ocean Assessment Division published a set of maps for Prince William Sound that identified environmentally sensitive areas for biological resources by season and location. These maps were referred to extensively during early spill response activities.

Comment: There is a lack of modeling to tie measurement studies into a unified framework.

Response: Modeling has been incorporated, where appropriate, into particular studies.

Comment: The plan does not fully explain the sources of funding for the damage assessment studies.

Response: Exxon Shipping Company provided $15 million for the studies and the remainder of the cost has been provided by the trustee agencies. The Trustees have requested additional funds from Exxon. As of the date of this writing, no response to this request has been received.

Comment: Baseline data does not exist and this may affect the results of the studies.

Response: Where there is a lack of baseline data, non-oiled sites are being used as a control to compare with oiled sites. Greater detail regarding these methods is provided in the current plan.

Comment: How will the public be informed of opportunities to comment on the plan, study revisions, and changes in PRPs?

Response: A response to public comments on the 1989 plan has been included in the 1990 plan. The public may also comment on the current plan.

Comment: There is no summary addressing "the big picture."

Response: The objectives of the plan were presented in the

introduction to the document as well as in the introduction to major groups of studies.

Comment: Copies should be made available to Alaska libraries.

Response: Copies of the plan were sent to libraries in the vicinity of the spill. Also, the plan provided an address for individuals to request copies.

Comment: Participation by interested parties during the development of the plan would have produced a more accurate plan.

Response: The urgent need to begin an assessment of potential damages required the planning and implementation of studies in a short time frame. Nevertheless, participation has been provided through the comment and response process.

Comment: "Worst case analysis" methods should be used in determining injury.

Response: A worst case approach is not required or appropriate for damage assessment. An actual case approach is more appropriate.

Comment: The lack of coordination in collection of chemical and biological samples may cause problems in linking injury to Exxon Valdez oil.

Response: The Quality Assurance/Quality Control plan establishes the protocol for collection and analysis of samples. A chemical analysis group was established to direct and monitor sample collection, coordination, and priorities. Sampling sites for all studies have been mapped for reference and coordination by field investigators.

Comment: Damage assessment under the CERCLA guidelines will undervalue the losses to wilderness ecosystems.

Response: The economic studies collectively should address this concern.

Comment: The proposals are poorly designed, are scientifically and legally inadequate, and will produce flawed results. The studies should be reviewed by scientific experts and modified as necessary. There should be provisions for continuous review.

Response: The studies have been reviewed by scientists and others to ensure they meet both scientific and legal requirements.

Comment: A reviewer is not listed as a cooperator in the coastal habitat study.

Response: The reviewer is a contractor on the study. Most

contractors are not listed as cooperators.

Comment: Certain studies proposed by reviewers have been omitted from the plan.

Response: All studies have been reviewed and adjustments made in the current plan to ensure an adequate determination of injury to resources. Not all studies considered in the assessment process were conducted.

Comment: There is a need to qualify the use of models to extrapolate long term injuries from data collected over a short time period.

Response: The data base for modeling was evaluated in the review as reflected in the current plan.

Comment: Sample size and replication were not given adequate consideration in the statistical design of studies.

Response: Statisticians were consulted in the original design of studies and were involved in the review to ensure an adequate statistical design. More information on statistical design is included in the 1990 plan.

Comment: Investigators were limited to the analysis of 10 samples in evaluating the first year's results and decisions regarding the continuation of studies were based on these limited samples.

Response: The combination of time constraints and limited laboratory capacity required the setting of priorities and limiting the number of samples analyzed for each study in preparation for the preliminary first year review. These limits on data analysis were considered in the review. The initial submission of 10 samples per study has been supplemented by analysis of hundreds of other samples.

Comment: The plan did not address physical, social and psychological effects on humans, especially native Alaskans.

Response: As provided in CERCLA and the Clean Water Act, the plan addresses injury to natural resources. It indirectly addresses effects on humans by evaluating damages in terms of loss of use or intrinsic values as well as of services to humans.

Comment: Various reviewers expressed either support for or opposition to the Natural Resource Damage Assessment Regulations in 43 C.F.R. Part 11.

Response: The use of Natural Resource Damage Assessment Regulations in 43 C.F.R. Part 11 to assess damages for injury to natural resources as a result of a release of hazardous substances

or a discharge of oil is optional. See 43 C.F.R. Section 11.10 (1989). At the time of the spill and the formulation of the Draft Plan, certain portions of the regulations were challenged in litigation before the U.S. Court of Appeals for the District of Columbia. The Trustees decided to leave open the option of whether to follow strictly the regulations. The Draft Plan is consistent with the overall assessment procedure and guidance outlined in 43 C.F.R. Part 11. While the appropriate work identified in the Draft Plan was underway, the Court issued its decision in Ohio v. U.S. Department of the Interior and Colorado v. U.S. Department of the Interior and directed the Department of Interior to repromulgate certain parts of the regulations. The 1990 plan was developed in accordance with the Court's opinion.

Comment: There is not enough work being done on Kodiak Island; many of the effects there will be secondary and will be felt most acutely during the winter months.

Response: The Trustees believe that sufficient effort has been directed towards assessing injury to the natural resources on Kodiak Island.

Comment: The Plan does not provide adequately for documentation and preservation of field samples and other data to be collected. This will preclude meaningful review by other scientists to determine the validity of the study results.

Response: See QA/QC attachment in Appendix A.

Comment: The Plan should not take into account losses of natural resources uses to private parties, including research projects that were affected by the spill. Compensable damages are limited to those for "committed public uses" of natural resources. Notable exceptions are Economic Uses Studies Nos. 1, 2, 3, 4, 6, 7, 8, and 9; Fish/Shellfish Studies Nos. 1, 7, 11, 12, 15, 116, 22, 24, and 25.

Response: "Committed use," as defined by 43 C.F.R. Section 11.14(h), includes a current public use or planned public use. All comments concerning individual studies were considered during the review process.

Comment: Citations to scientific literature are virtually absent.

Response: The 1990 study plans include bibliographies of selected scientific literature.

Comment: The names and credentials of the scientists conducting the studies are missing. Accepted authorities in each field should be consulted in the design and implementation of the proposed studies.

Response: It is unnecessary to list the names of personnel conducting the studies for the purpose of reviewing the studies. Greater detail in the 1990 plans should assist reviewers in evaluating the quality of the studies.

Comment: The Trustees may be studying effects of injury that do not exist on an interim basis or that will be insignificant or speculative in the long run and, therefore, add unnecessarily to the cost of the Plan.

Response: The studies were designed to identify and quantify measurable adverse changes, either long-or short-term, to natural resources caused by the spill. Data collected from the first year's studies were reviewed and the studies were continued, discontinued, or modified, as appropriate.

Comment: Simply measuring injuries without having a unifying modelling framework will not produce any demonstrable losses within an acceptable statistical confidence due to natural variability spatially and temporally. Given this fact, most of the studies could be considered an unreasonable cost. Models should be employed to predict possible levels of effects over at least two to three generations of the longest-lived members of the ecosystem.

Response: Where appropriate, a modelling framework is being considered.

Comment: The Plan fails to study the presence of oil-degrading microbes or the possibility of oil trapped in sediments being reinfused into the system during winter storms.

Response: These elements are part of A/W #2.

Comment: Baseline data were not identified for each of the component studies.

Response: Where available, additional baseline data is supplied in the current plan.

Comment: All data should be placed in a central repository accessible by all interested parties.

Response: The Trustees have proposed such a central data repository.

Comment: Analysis of long-term effects should include direct and indirect causes of mortality of individuals as well as decreased fecundity and survivorship of age classes.

Response: Such analysis is being conducted, where appropriate. See the current plan.

Comment: A more comprehensive plan for measuring petroleum hydrocarbons needs to be developed. It should indicate what oil components will be screened and how they will be measured analytically. It is essential to perform a comprehensive analysis of the change in composition of the oil in the sediments in time by monitoring appropriate classes of hydrocarbon components of the oil. Individual components of the oil should be monitored throughout the study at selected sites covering a wide range of molecular weight size classes.

Response: A new study, A/W #6, will be initiated in 1990 and will address toxicological effects over time.

Comment: The Plan needs detailed studies of changes in microbial diversity, including changes in microbial populations at the spill site and examination of the influence of oil on this diversity.

Response: The A/W #2 has been modified to allow for examination of microbial populations at a variety of locations and depths in PWS.

Comment: The Plan should incorporate some short- and long-term toxicological effects studies.

Response: The A/W #6 will address toxicological effects over time.

Comment: A major scoping conference on the restoration planning process should be held in Alaska early in 1990, prior to the time it is finalized and before the next field season begins.

Response: See the Restoration Section of the current plan.

Comment: Impacts of the spill on the human environment (human health in particular) and on the interrelationships of human beings with other components of the biophysical environment are missing from the studies. In addition, impact on humans in the spill zone and who participated in the cleanup operations should be included in the damages assessment.

Response: The applicable legal authorities provide for recovery of damage for injury to natural resources, not human health. To the extent that health effects impair use of natural resources, this may constitute injury to natural resources and is being studied.

Comment: The NRDA strategy should take into account natural fluctuations in the ecosystem.

Response: The strategy is to take into account such natural fluctuations in the damage assessment process.

Comment: The studies should take into account the potential for freshwater stream discharges to influence fisheries and other

biota.

Response: The NRDA strategy is to distinguish spill impacts from such environmental influences.

Comment: The studies will unnecessarily stress animals. Samples should be limited to those taken from dead specimens, individuals, or taken by Natives.

Response: Such limited sampling would not produce an accurate account of the effect of the EVOS. Measures will be taken to avoid unnecessary disturbance while conducting these studies.

Comment: Studies should take into account the possibility of re-oiling and additional cleanup operations in assessing impacts on marine mammals as well as other parts of the ecosystem.

Response: Potential effects of re-oiling and cleanup operations are being considered in the current Plan.

Comment: The Plan should be expanded to evaluate steps being taken to assess the spill response measures with an eye toward improving response efforts during future spills.

Response: This is outside the scope of the damage assessment process. However, this evaluation is being undertaken by other agencies.

Comment: The overall budget should be increased tenfold to carry out the NRDA properly.

Response: The overall budget reflects what has been determined by the Trustees to be necessary to assess damages for injuries to affected natural resources at a reasonable cost.

Comment: There should not be a limit put on the number of samples analyzed for each study.

Response: An adequate sample size will be collected and analyzed for each study.

Comment: The Plan should include an assessment of the effectiveness of cleanup operations and additional injury occasioned by these operations, especially to archeological sites. The Plan fails to state which shoreline cleanup techniques should be continued or abandoned.

Response: See the current plan for the determination of damage to archaeological resources. Recommendations regarding the appropriateness of cleanup techniques are outside the scope of the damage assessment process; however, certain studies are designed to take into account cleanup impacts.

Comment: Studies fail to consider the impact that reduced sea otter populations will have on the movement of carbon through the affected ecosystems and the significance of this to wildlife and fisheries.

Response: The Trustees placed a priority in the injury determination process on direct and sublethal effects on sea otters. It is unlikely that studies on the impact on movement of carbon through the affected ecosystem due to a reduced sea otter population would provide meaningful information on injury. The role of otters in moving carbon through the ecosystem relative to the massive movement of carbon generated by all the other organisms in the spill area, would be difficult to measure.

Comment: Omitted from the Plan are the potential chronic teratogenic, mutagenic and carcinogenic impacts of the spill on wildlife.

Response: Greater detail is provided in the current Plan in the determination of sublethal effects upon natural resources.

Comment: The Plan is too heavily oriented, in terms of the number of studies and the budget, toward fish/shellfish studies. Very little emphasis is placed on studying terrestrial habitats.

Response: The Trustees have concentrated studies in those areas and upon those resources considered most likely to have been significantly affected by the EVOS.

Comment: Methodologies chosen for many of the studies will not produce statistically acceptable results.

Response: The studies have been reviewed, and where appropriate, have been revised.

Comment: The Plan does not indicate how cause and effect links will be made.

Response: More detail is provided in the current Plan.

Comment: Laboratory studies should be undertaken where field experiments are limited or non-existent.

Response: Where appropriate laboratory studies have been incorporated in the current plan. However, not all environmental conditions can be duplicated in laboratories.

Comment: It is impossible to review the proposed study objectives without knowing the results of data collected in 1989.

Response: The Trustees believe that sufficient information has been provided to allow adequate public review of study objectives.

Data is not required to conduct this review.

Comment: The Plan improperly assumes that all resources in the Sound were exposed to oil. The Trustees should confirm exposure of each of the resources to oil before undertaking studies of them.

Response: The resources targeted for study in 1989 were these determined by the Trustees to be most susceptible to effects from the EVOS. As indicated earlier, a review of these studies was conducted following the first year, which resulted in modification, completion or discontinuation of several studies.

Comment: The determination of the baseline should take into account the fact that ecosystems are not static and that natural forces, such as rainfall, currents and temperatures, can have an impact on the number of species in a given location, the extent to which a particular resource is used, and the mortality of individuals of different species. Given the lack of historical information that will be useful in developing a baseline, the Trustees should consider selecting "control areas" that will serve as bases for baseline measurements. Overall, the design for developing a baseline does not ensure scientific validity of the results.

Response: Where baseline data is nonexistent or inadequate, control areas were selected.

Comment: The use of predictive approaches, such as extrapolating short-term losses into the future, in determining the long-term impacts of the spill should be limited.

Response: The Trustees recognize the appropriate use of predictive approaches.

Comment: The Draft Plan lacks the appropriate focus on restorative measures and ignores the role natural recovery processes will have, and the cleanup efforts have had, in determining what those measures should be.

Response: Natural recovery processes are being considered in the NRDA.

Comment: The Plan is biased toward the conclusion that the spill resulted in harm to all natural resources because no consideration was given to the hypothesis that no damage occurred anywhere.

Response: The purpose of the NRDA is to assess the injury to natural resources that occurred as a result of the EVOS. The detailed study plans investigate the hypothesis that damage may not have occurred to the resources being studied.

Comment: The cover page distorts containment and area of the

spill.

Response: The cover page of the 1989 plan was an artist's rendition of the subject matter of the NRDA and was not intended to be a scientifically defensible depiction of the area affected by the EVOS or of the containment of the spilled oil.

Comment: The statement in the Introduction that glaciers send icebergs floating out to sea is incorrect since they never reach the North Pacific.

Response: This discussion has been deleted from the Plan.

Comment: The plan's description of the "Chronology of the Spill" and the "Fate and Effects of the Spilled Oil" contained several inaccuracies and misleading or prejudicial statements.

Response: The "Introduction to the Plan" no longer contains a discussion of the chronology of the EVOS events or of the fate and effects of the spilled oil. The latter subject is treated, however, in A/W No. 6.

Comment: The Plan does not identify the study participants.

Response: The Trustees do not feel that the names of the participants are necessary in order to evaluate the quality of the studies.

Comment: Several comments stated that the PRP's were denied the opportunity to participate in developing the scope and design of the NRDA Plan and that the assessment should be jointly undertaken. Furthermore, limiting PRP's involvement to commenting on the Draft Plan is contrary to the natural resource damage assessment regulations. Other comments stated that PRP's should not be involved in the assessment process.

Response: The PRP's were given equal opportunity to comment with all interested parties in the damage assessment process. It is up to the Trustees to determine the extent of the involvement of the PRP's in the damage assessment process. This approach is consistent with 43 C.F.R. Section 11.32.

Comment: PRP's should be required to provide funding for experts and consultants to conduct an independent assessment and restoration plan.

Response: No such legal requirement exists under the CWA or CERCLA.

Comment: PRP's participation should be limited to providing financial assistance for the assessment.

Response: The level of PRP participation has been consistent with the damage assessment regulations and has been determined by the Trustees to be appropriate.

Comment: Exxon's studies should not be incorporated within the assessment. Exxon should not be given any part of the assessment to implement.

Response: At this time, Exxon's studies are not incorporated within the assessment process. However, if the Trustees determine such studies would be helpful and an agreement is reached with Exxon, the studies could become part of the process.

Comment: Only government employees were permitted to participate in the process. Knowledgeable industry scientists should have been included.

Response: Knowledgeable scientists from outside the government were consulted in connection with review of the studies. Many of these scientists are consulted by industry with respect to similar matters.

Comment: All traditional tribal governments should be Trustees and should be included in the process.

Response: Certain tribal governments may be considered Trustees under CERCLA. To ensure tribal interests were represented, a Bureau of Indian Affairs representative rendered advice during the assessment process for 1989 and the current plan. Efforts are currently underway to ensure tribal interests and concerns are being addressed in Economic Study #6.

Comment: Most of the studies were in the process of being conducted before public review of the Plan. Thus, the Draft Plan was an after-the-fact description of research already completed and limited the public's opportunity to comment. This procedure has made it difficult to determine cost-effectiveness and is contrary to the NRDA regulations at 43 C.F.R. Part 11.

Response: To determine effectively the effect of EVOS on natural resources, the Trustees determined that it was necessary to begin collection of data for studies as soon as possible, i.e., before the Draft Plan had been summarized, edited and published for review and comment. Such actions are consistent with 43 C.F.R. Section 11.22.

Comment: The injury determination and quantification phases are being conducted simultaneously, in violation of the DOI regulations. Failure to do pre-assessment screening caused unnecessary and expensive studies to be done of resources that probably were not injured by the spill; these studies should be discontinued, e.g., Fish/Shellfish Study No. 24, Marine Mammals

studies relating to killer and humpback whales, and Air/Water Study No. 4. No further assessment costs (especially those relating to damages) should be undertaken until the Trustees have determined that "injury" has in fact occurred with respect to a particular resource. Nor should efforts toward quantification of non-injuries go forward.

Response: As stated earlier, use of the regulations is optional. However, a pre-assessment screen was conducted before proceeding with the process. All studies were reviewed and a determination was made by the Trustees whether to continue or modify them based upon data from the first year's studies.

Comment: The Plan should take into consideration views of the National Park Service since national park lands were affected by the spill.

Response: Views of the Park Service were, and continue to be, considered in the natural resource damage assessment process.

Comment: The Plan should make a formal effort to take advantage of the information that is being collected by outside persons.

Response: The Trustees are working on the creation of a public data repository to make available to the public scientific data collected by all parties.

Comment: The Plan fails to state what public review and comment will be considered in determining whether to continue studies after February of 1990.

Response: See current plan.

Comment: The plan should provide for the dissemination of data and results collected to private plaintiffs, and their outside experts, and other interested parties.

Response: The Trustees are currently considering the establishment of a public repository for data collected during this process. The public would have access to data in such a repository.

Comment: The public should have an additional right to comment once more specificity is presented.

Response: See current plan.

Comment: Prior public review and comment must be permitted during the development of study and restoration plans as well as the natural resource damage assessment, prior to decisions to terminate or change the scope or focus of study plans, and when settlement discussions with PRP's are initiated.

Response: The Trustees currently intend to provide public involvement throughout the assessment and restoration process. There is no requirement to involve the public if and when settlement negotiations are initiated.

Comment: If a study is aborted, its results should be released to the public.

Response: See earlier comments concerning the repository.

Comment: The Trustee Council should set up an independent scientific review committee exclusive of the state and federal experts.

Response: The Trustees have sought review by selected scientists and have carefully considered their comments on the study plans.

Comment: The Natural Resource Defense Council's experts should be incorporated within the peer review process.

Response: To the extent that NRDC's experts filed comments on the draft plan, they are involved in the damage assessment process.

Comment: The Trustees should allow the public to participate in the determination of whether the regulations will be followed in the damage assessment process.

Response: It is the Trustee's responsibility to manage all aspects of the assessment process, including the degree of public participation and use of the regulations. The public has and will continue to express opinions over the use of the regulations through the review and comment process, and those opinions will be carefully considered.

Comment: Because the potential risks of an oil spill were identified in an environmental impact statement, the State accepted this risk.

Response: The determination of liability or responsibility of particular parties is beyond the scope of the NRDA process. Further, without any identification of the environmental impact statement or the provisions referred to, it is impossible to respond to this comment.

Comment: The Trustees do not feel that they are obligated to follow the law because the Plan states that they have not decided whether, or to what extent, they will follow the Type-B damage assessment regulations.

Response: The Type B regulations are optional, and therefore there is no legal obligation to follow them. Nevertheless, the Trustees have followed a procedure that is generally consistent with the

regulations.

Comment: Since the damage assessment process will kill marine organisms, an environmental impact statement must be done.

Response: An EIS is not required to conduct a natural resource damage assessment. However, the permitting requirements of applicable environmental laws have been complied with.

Comment: Restricting the damage assessment process to natural resources is inappropriate.

Response: The legal authority for the damage assessment limits claims to those involving injury to natural resources.

Comment: The development and amendment of the NRDA Plan is subject to the Administrative Procedures Act's rulemaking procedures and therefore must follow notice and comment procedures. The decisions to be made by the Trustees regarding whether to continue certain studies should be subject to public input. To provide meaningful public input, the Trustees should make available the results of all studies done last year, provide greater detail on studies proposed for 1990, and do so in a time frame which makes public comment meaningful.

Response: Even assuming, arguendo, that the conduct of the damage assessment is an administrative process subject to the APA, the development and amendment of a plan for that process does not constitute final agency action and is not reviewable under the APA or otherwise. Nevertheless, the Trustees have provided notice to the public of planned assessment activities and have solicited public comment on the assessment plan. The Trustees believe they have provided a reasonable period for the public to comment on the assessment. The Trustees have carefully considered these public comments in making decisions regarding assessment activities, including discontinuation or modification of studies. The Trustees agree that scientific data should be made available to the public by all parties, and have asked the PRP's to contribute to a public data center.

Comment: The Trustees have failed to provide the public with access to data collected, results of analyses and sufficiently detailed research plans. This violates the National Environmental Policy Act and the Administrative Procedures Act.

Response: There are no requirements under either the National Environmental Policy Act or the Administrative Procedures Act to make this information public. Nevertheless, the Trustees have made descriptions of studies available to the public, and are working to try to ensure that scientific data is also made public.

Comment: The damage assessment process may require compliance with

Section 106 of the National Historic Preservation Act. The Section 106 process requires that native corporations be permitted to participate as property owners and available parties in joint state/federal actions such as the studies undertaken in the Plan.

Response: Where required, damage assessment activities will proceed in compliance with Section 106 of the National Historic Preservation Act.

Comment: The principles and procedures of the DOI NRDA regulations have not been incorporated in the Damage Assessment Plan. It would be prudent to follow the regulations even if this is not required.

Response: The Trustees are considering use of the NRDA regulations on an issue-by-issue basis. The Trustees believe they have been acting in a manner generally consistent with the regulations.

Comment: The Trustees' actions regarding public participation in the damage assessment process contravene the provision of the DOI regulations regarding timing of public review and inclusion of public comment within the Plan.

Response: The NRDA regulations are optional, and the Trustees are under no legal obligation to follow the regulations. Nevertheless, the Trustees believe their actions are generally consistent with the public participation provisions of the NRDA regulations. In fact, the Trustees have provided a greater opportunity for public review and comment than is outlined in the regulations.

Comment: The damage determination studies, e.g. Economic Studies Nos. 1, 2 and 4, ignore both the premise that third parties whose commercial or property interests are impaired as a result of an oil spill may not pursue natural resource damage claims and the regulatory provision against double recovery.

Response: The Trustees are seeking recovery of damages to public interests, not private commercial interests. The economics studies will be conducted to avoid double recovery.

Comment: There is no legal support for the notion that possible loss of research activities or damages to archaeological sites are appropriate subjects for damage assessment.

Response: Archaeological and research activities are public uses of natural resources that may have been impaired by the oil spill. The Trustees are entitled to recover the value of any lost public uses of natural resources resulting from the spill.

Comment: The Plan's focus on direct human use values to determine injury is illegal. Under statute and case law, all lost services provided by natural resources must be assessed, regardless of whether the services lost benefitted humans directly, indirectly or

benefitted the ecosystem as a whole.

Response: The damage assessment is directed to both loss in human uses and loss of services to the ecosystem.

COASTAL HABITAT

COASTAL HABITAT STUDY COMMENTS

Comment: The Coastal Habitat Injury Assessment should take into account impacts on Upper Cook Inlet and the west side of Cook Inlet.

Response: The study will assess injury to coastal habitats within the spill's primary impact area, which includes portions of Lower Cook Inlet.

Comment: The use of lightly oiled beaches in the study does not include the timing of such oiling as a parameter in determining the effect on the coastal ecosystem. In addition, several sites should be examined in greater detail.

Response: The Trustees have revised this study to focus on moderately and heavily oiled beaches. This decision eliminated lightly oiled sites from the study to allow for greater efforts in assessing potential biological impacts to coastal resources. The Trustees have adopted the recommendation that several sites be examined in greater detail.

Comment: Critical habitat sites for Stellar sea lions and harbor seals should be considered.

Response: During the winter of 1989-90, those responsible for the marine mammals studies, among others, were consulted to determine that the proposed coastal habitat sites adequately considered the habitat of these species. Further, since the coastal habitat study is based on a randomized design, adoption of particular sites is generally not appropriate, but extrapolation of results to these sites can be made.

Comment: The coastal habitat study should incorporate an evaluation of the fate of oil transported to the intertidal and supratidal zones and an assessment of the physical and chemical reactions of oil with the coastal sediments.

Response: The Trustees have added A/W No. 6 to the Plan to determine the fate of oil, including its persistence and toxicity in the intertidal and supratidal zones.

Comment: Fewer sites should be studied in greater detail in order to gain a more accurate picture of the extent of oil in the water column, sediment and organisms.

Response: The number of random study sites has been reduced and an increased emphasis will be placed on detailed analysis at selected sites in Prince William Sound.

Comment: The five representative habitat types that are incorporated into the study should be identified. Further, it is questionable whether data can be extrapolated to the entire spill area given the number of sites selected for study, the time period

available for the study, and the rapidity with which significant changes in physical, chemical and biological variables may occur in the affected environment.

Response: The revised study plan identifies the representative habitat types incorporated into the study and contains greater detail regarding the methodology of each component of the study. The study is no longer limited to one year. As noted in the response to the preceding comment, the number of random study sites has been reduced.

Comment: Efforts should be concentrated on sites where historical data exists.

Response: Sites for which historical data exists have been incorporated into the study plan where feasible.

Comment: The study should consider the possible re-oiling of shorelines.

Response: Re-oiling of shorelines will be taken into account.

Comment: An effort should be made to coordinate the results of the coastal habitat study with other studies.

Response: The coastal habitat study was coordinated with other studies. The revised study plan reflects this coordination.

Comment: The effect of hydrocarbon on sediments and benthic species, such as kelp, should be studied, including any effects on fish and shellfish.

Response: The coastal habitat study will examine the species present at each site. The presence of benthic species, therefore, will vary from site to site as well as seasonally. Kelp beds will be studied. Tissue samples from fish and shellfish are being taken simultaneously with the hydrocarbon sediment samples so as to link the persistence and concentration of hydrocarbons in sediments to selected benthic, fish, and shellfish species.

Comment: The study description lacked sufficient detail regarding the collection of samples, the selection of the location for transects for each sampling site, the methods of extrapolating the study results to the entire spill-affected area, the linking of ecological effects to oil, and the analysis of data.

Response: The revised study plan describes in more detail the methods and procedures to be used to implement the study.

Comment: Contamination of organisms at levels below those of state and federal standards may be injurious and thus comparison of water column exposure to oil to these standards will produce information only about gross contamination. These standards should not be the

bases for determining whether injury has occurred. All oil exposure should be documented.

Response: The exposure of organisms and plants to oil will be documented through plant and animal tissue analyses. All levels of hydrocarbon exposure will be documented.

Comment: The factors relied upon in developing a site selection and sampling strategy were not identified.

Response: Phase I of the revised study plan describes site selection methods.

Comment: The fifteen additional sites chosen for the study require reference sites.

Response: These study sites were added to provide a better picture of impacts at moderately/heavily oiled sites. Control (non-oiled) sites already existed for these new sites.

Comment: Information regarding resilience, resistance, stability and species diversity should be included in the coastal habitat study. Bioassays should be performed for species other than arthropods. In addition, acute and chronic toxicity for organisms from different trophic levels should be studied.

Response: The coastal habitat study is founded upon an ecosystem approach to determining injury. By examining biotic and abiotic links within the coastal habitat zones and by providing information to those responsible for other damage assessment studies, it is expected that a comprehensive, ecosystem-wide assessment of damages can be established. Bioassays on other invertebrates will be conducted in connection with A/W No. 6.

Comment: The proposed budget for the coastal habitat study is excessive given that the only feasible restoration strategy for coastal habitats is natural recovery.

Response: This study has been reviewed extensively by appropriate experts for design and cost-effectiveness and, where appropriate, has been revised accordingly. Further, it has been coordinated with other studies to ensure integration of collection methods and study results. The budget for damage assessment reflects the costs of work designed to determine the injury to coastal habitats resulting from the Exxon Valdez oil spill, not efforts to restore damaged habitats.

Comment: The period over which samples will be taken is not given, but representative samples should be revisited on an annual basis for several years and then periodic revisitation should be carried out for at least a decade.

Response: Coastal habitat data collection is scheduled to be conducted over a three-year period, which commenced in 1989.

Several samplings per year are being collected to assess potential injuries and recolonization rates by intertidal and supratidal flora and fauna.

Comment: Plants and algae should be censused and analyzed for hydrocarbon content.

Response: Vegetation from the supratidal zone and algae from the intertidal and shallow subtidal zones will be assessed for acute and chronic effects both through hydrocarbon contact and uptake.

Comment: An estimate of community function in coastal habitats should be made. Primary and secondary productivity should be assessed in the intertidal and nearshore water column and benthos. Benthic community respiration rates might produce useful information regarding impacted and control habitat function.

Response: Due to the extent of the spill-affected area and the study's primary objective (to estimate the quantity, quality, and composition of critical trophic levels in moderate-heavily oiled sites relative to non-oiled sites), an estimate of community function cannot be directly determined. The study, however, does take an integrated ecosystem approach to assessing the interrelationships between and within supra-, inter-, and shallow subtidal plants and animals.

Comment: It is unlikely, with so many sites and so short a time frame for study, that the data gathered can be extrapolated to the entire spill-affected area. Large and rapid seasonal changes in physical, biological and chemical variables constrain the sampling program.

Response: The current time frame for the study is three years and it is anticipated that this period of time will be sufficient to gather the necessary data for a complete extrapolation of impacts.

Comment: Without seasonal, annual, or pre-spill data, it is not possible to determine whether changes in critical trophic levels and interactions are oil-based.

Response: Seasonal and annual data has been integrated into the study design. However, pre-spill data is limited, and a parred comparison design of oiled and non-oiled study sites has been developed to measure critical plant and animal population changes.

Comment: A more comprehensive plan is needed for assessing the physical/chemical interactions of oil with the coastal sediments.

Response: See A/W Study #2.

Comment: The spatial resolution of the four vertical transects per site is not specified. Nor is any information given regarding how many of each type of measurement is to be made or the methods to be used.

Response: The details of transect design and randomized quadrate sampling along each transect are specified in the description of methods to be used to implement the study, which appear in the revised study plan.

Comment: The coastal habitat study does not describe any of the forty-five categories to be studied.

Response: The 1990 study plan contains this information.

Comment: The coastal habitat study needs to address algae, phytoplankton, zooplankton, microbiota and other organisms at the bottom of the food chain, but does not indicate at which trophic levels toxicity will be examined.

Response: Only algae and higher level organisms and plants are included in the coastal habitat study. Microbiota and other organisms are being examined in the Air/Water studies.

Comment: The mere fact that shorelines were oiled should be considered an injury in the coastal habitat studies.

Response: To the extent that oiling of shorelines has diminished economic, biological or intrinsic value of these resources, the impact is accounted for in the economic studies.

AIR/WATER

AIR AND WATER STUDIES COMMENTS

Comment: Information from these studies should be coordinated with coastal habitat studies and economic studies as well as the restoration plan.

Response: Air/Water studies support the information needs of a wide variety of NRDA studies, including those mentioned.

Comment: The Air/Water studies should examine continuing air emissions resulting from lingering oil, treatment or restoration activities.

Response: A/W study No. 5 was discontinued last summer because air quality had returned to normal.

Comment: Hydrocarbon analysis should go beyond determination of whether water quality criteria have been violated.

Response: Hydrocarbon analysis will not be limited to measuring water quality. Ocean bottom and beach sediment samples and samples taken from various biological communities will be taken and analyzed to determine if hydrocarbon contamination has occurred.

Comment: Plots and wildlife density studies of benthos should be used in the A/W studies.

Response: The type of study suggested is being conducted as a portion of A/W study No. 2. A portion of this study will involve documenting changes in the structure of biological communities in ocean bottom sediments.

Comment: A sampling program should be used for sediments, particularly those at more than 15 meters in depth, that would address the number of species present, the number of specimens of each species, the proportion that each species bears to total faunal density, oxygen content at the sediment-water interface and interstitial water, and the depth of the redox discontinuity layer using screen meshes of .3 mm or less.

Response: A/W study No. 2 does provide for infauna sampling of marine sediments in deep water. Species composition and hydrocarbon presence will be the main parameters documented.

Comment: The Air/Water study program did not take into consideration that the only feasible restoration of air/water resources beyond immediate shoreline cleanup is natural recovery.

Response: The Air/Water studies are designed to document resource injury in a large and complex ecosystem.

Comment: The lack of focus of A/W study No. 2 on the quantity of oil in sediment or intertidal areas and the focus of A/W No. 1 on quantities of floating oil would make it difficult to create an integrated model over time of the extent of oiling.

Response: The quantity of oil in supratidal and intertidal areas is being documented by the C/H study. A/W study No. 1 will be discontinued in 1990 as little free floating oil is expected this year.

Comment: The Air/Water studies should be used to create an integrated model of the fate of the oil and these should be internally consistent, i.e., focus on the same parameters (quantity, volume, concentration, distribution, persistence, composition, time).

Response: A/W study No. 6 is a new study designed to produce a "mass balance" or budget for the fate of the oil from EVOS.

Comment: It is not possible to discern whether these studies are necessary because there is no data in the Plan indicating whether spilled oil may have affected the marine environment below the upper level of the water column.

Response: At the time the plan was written, this data was not available. Such effects were considered likely based on the data provided by previous spills.

Comment: Air/Water studies focus on human use, rather than all, values. Presence of oil should be documented at all levels of the ecosystem rather than just valued resource species.

Response: The levels of oil found in the environment and its effects will be assessed for a wide range of natural resources and their habitats.

Comment: The Air/Water studies should include projects that would evaluate petroleum hydrocarbon persistence in intertidal and supratidal sediments.

Response: Both A/W study No. 2 and the C/H study, as well as others, address this issue.

Comment: The Plan does not consider effects on phytoplankton or zooplankton or marine bacteria in the water column or sediments. Nor does it consider marine plants which are important to the food chain.

Response: Phytoplankton and zooplankton were not studied per se. However, marine bacteria in sediments, as well as benthic algae and higher plants are being addressed in A/W study No. 2 and the C/H

study.

Comment: Oil spill trajectory models are not accurate for use in Air/Water studies.

Response: The selection of oiled and non-oiled locations for the conduct of sampling for these studies was based on direct observations of the presence or absence of oil.

Comment: Air/Water studies should examine the effects of dry flux of organic air pollutants on vegetation eaten by foragers and the long-term chemical changes in water affected by the spill, including effects on global and regional water chemistry.

Response: The Air/Water studies were designed to measure these types of impacts and their effects.

Comment: Water samples collected at depths of 15 meters and greater should be the emphasis of a monitoring program of oil-contaminated sediment stations. Oxygen content at the sediment-water interface and in the interstitial water of the sediment should be measured, and determinations of the depth of the redox discontinuity layer in the sediment that separates the upper oxygenated from the lower anoxic sulfide sediment should be made.

Response: The type of study suggested is being conducted as a portion of A/W study No. 2. A portion of this study will involve documenting changes in the structure of biological communities in ocean sediments. Species composition and hydrocarbon presence will be the main parameters measured.

Comment: The methods for Air/Water studies are questionable because satellite imagery is worthless for tracking oil. There is no method mentioned for tracking less concentrated and subsurface oil.

Response: The methods used to measure hydrocarbon presence in the water column and marine sediments are very sensitive. The determination of what is an oiled or non-oiled area for the purposes of these studies was made based on direct observations.

Comment: To the extent that the Air/Water studies focus on federal/state water quality standards as a measure of injury, they do not account for effects on other than human species.

Response: A number of marine species are being examined under NRDA studies to determine if they have been injured as a result of the EVOS.

Comment: The Air/Water studies fail to recognize that the only feasible restoration of air and water resources beyond cleanup activities is natural recovery. This program of studying air and

water resource damages is excessive and costly. It also fails to specify methodologies to be used.

Response: The marine habitats examined under the Air/Water studies are very large and support large biological communities. To ignore this portion of the environment in the NRDA studies would leave a large gap in oil spill impact documentation. The methodologies to be employed in their studies are described in the current plan.

Comment: The discussion of fate and effects of spilled oil is over-simplified and is therefore inadequate.

Response: A/W studies have been modified in the current plan to provide more information on fate and effects of spilled oil.

Comment: The Plan needs detailed studies of changes in microbial diversity, including changes in mocrobial populations at the spill site and examination of the influence of oil on this diversity.

Response: The A/W #2 has been modified to allow for examination of microbial populations at a variety of locations and depths in PWS.

Air/Water Study No.1

Comment: A/W study No. 1 does not identify which oil spill models will be used. Field studies should be done to provide information regarding detailed circulation pattern(s).

Response: A/W study No. 1 mapped the distribution of oil on the water as determined by visual observations and does not involve modeling. A mass/balance model will be prepared as part of the new A/W study No. 6. See 1990 study plan for details.

Comment: A/W study Nos. 1 and 2 should consider the effects of oiled infauna of intertidal and subtidal habitats on the grey whale.

Response: Grey whales found dead within oiled areas have been, and will continue to be, closely examined for evidence of oil contamination if their condition is suitable.

Air/Water Study No. 2

Comment: The cost of A/W study No. 2 is too high given the information it will provide. There is insufficient information provided regarding the method to be used while visually checking for oil in bottom sediments; this method is subject to bias. Nor is there any information given regarding the coordination of near-shore and intertidal sampling sites. Use of a manned submersible is an ineffective and costly means of checking for oil in bottom sediments. Neither geographic nor temporal trends between sediment samples can be determined from the Plan. The plan does not

indicate how TOC or grain size analyses will be conducted or how the samples on which they are to be conducted will be chosen.

Response: The benthic habitat areas involved with the spill are very large and support important biological communities. The current location of a significant portion of the oil still present in marine ecosystems may be found on or in bottom sediments where many organisms live and feed. To ignore this portion of the environment in NRDA studies would leave a large gap in oil impact documentation. The sampling of intertidal and subtidal sediments are coordinated between A/W study No. 2 and the C/H study. Standard sampling techniques will be employed. Although a manned submersible was used to conduct some limited surveillance and sampling in 1989, it is not part of the 1990 study plan. Visual observations of oil in bottom sediments cannot be relied on to document their presence. Chemical methods will be employed to determine if hydrocarbon contamination is present. The large scale sampling planned requires the use of standard sampling techniques.

Comment: A/W study No. 2 should collect water/sediments from depths greater than 2 cm to determine how oil has become incorporated in sediments.

Response: Depths greater than 2 centimeters are being sampled under A/W study No. 2.

Comment: A/W study No. 2 should be coordinated with the remaining Air/Water studies as well as the marine/mammal studies to ensure that secondary impacts on marine mammals will be assessed.

Response: The Air/Water studies are being closely coordinated among themselves and with other NRDA studies that depend on them.

Comment: A/W study No. 2 should be coordinated with marine/mammal studies to insure that food chain effects on marine mammals can be measured.

Response: The purpose of this study is to estimate hydrocarbon concentrations in nearshore water at sites where marine mammal prey may be located. The study has been reviewed by the persons conducting the Marine/Mammal studies.

Comment: A/W study No. 2 should include sites within CI, especially the west side.

Response: In 1989, NOAA sampled five sites in CI, particularly on the west side of the Inlet. Based on the results from these samples, the Trustees have determined that further sampling in that area is not warranted.

Comment: A/W study No. 2 does not indicate the number of samples to be analyzed. If the results will be used to support the C/H

study, the same sampling and chemical methods should be used.

Response: Although studies that are sampling very different types of environmental parameters may have to use different analytical procedures, the basic methodologies for collecting samples and analyzing samples to detect hydrocarbon presence have been standardized. These procedures are documented in technical plans that guide the activities of all damage assessment projects. The T/S No. 1 project provides for control and standardization of all hydrocarbon sampling and analyses conducted under damage assessment programs.

Comment: Measurement of hydrocarbon compounds in pore waters in A/W study No. 2 would permit a better estimate to be made of what is available to biota and what may easily be remobilized from sediment. Laboratory exercises on sediment samples would generate data on the actual flux of hydrocarbons out of the sediment and its bio-availability to marine organisms.

Response: While the scientific literature indicates that bioavailable fractions of complex contaminant mixtures may be mobilized through solution into pore water, the scope of the program to obtain large amounts of interstitial water needed for accurate determination of petroleum hydrocarbons makes such an approach impractical in these studies. However, a limited number of interstitial water samples will be taken and analyzed in 1990.

Comments: A/W study No. 2 will only be able to guess at oil spill movement since data from A/W study No. 1 will not have been analyzed.

Response: The selection of oiled and non-oiled sites for sampling under this study was based on the direct observation of the presence or absence of oil.

Comment: The study does not provide a method for distinguishing differences in sediment oiling that are due to geographic variation from those due to temporal variation, thus preventing determination of geographic or temporal trends.

Response: The primary objectives of this study require that resampling occur to detect changes in hydrocarbon contamination levels and in benthic community structure. This resampling to determine changes over time and the use of non-oiled control sites will allow an evaluation of the fate of oil as it relates to benthic habitats in marine sediments.

Comment: The study should be expanded to examine grey whale feeding areas, with biopsies of grey whales migrating through or residing in those areas.

Response: The Trustees are not aware of any generally recognized

grey whale feeding areas near locations of high oil contamination. Grey whales found dead within oil affected areas have been, and will continue to be, closely examined for evidence of oil contamination.

Comment: A variety of depths of sediments should be collected to determine how oil has been incorporated into sediments.

Response: A variety of depths was sampled in 1989 and will be sampled during the 1990 field season to ensure that the fate of the oil as it relates to marine sediments is documented.

Air/Water Study No. 3

Comment: The length of time for the caged mussel study, the depth of deployment, whether the same compounds would be analyzed as in water column studies, the number of replicates per cage and the number of stations used for the caged mussel study is questionable.

Response: The field experience gained in 1989, combined with biometric support for the study design, were used to develop the 1990 study plan for this project.

Comment: Sampling depths should have been selected on the basis of physical (i.e., pynocline depths) or biological (i.e., euphotic) factors.

Response: Standard depths for the bioaccumulator and sediment trap sampling in this program were selected as the best means to maintain comparability. The use of physical, biological or other factors to determine sampling depths would result in a highly varied sampling pattern among different locations.

Comment: Why were only areas west of PWS being considered?

Response: Areas to the east of PWS had no documentation of oil presence during the extensive oil location surveys conducted in 1989. Current patterns in the area make it unlikely that oil would drift to the east of the Sound. In order to cover adequately areas of known impact, areas to the east of the PWS were not included in the study plan.

Comment: Oil particulates could foul baleen plates of whales, and this study should be coordinated with marine/mammal studies to insure that information necessary for those studies is collected.

Response: Baleen whales are not being sacrificed under marine mammal studies. Any dead whales found are closely examined for oil contamination.

Comment: A/W study No. 3 does not specify the methods to be used to sample water at various depths. Precautions should be taken to

avoid contamination of the samples from surface slicks, sheens and vapor-phase hydrocarbons.

Response: The standard sampling procedures contained in the Quality Assurance Program ensure that samples will be protected from contamination.

Comment: In A/W study No. 3, the use of mussel cages is of little value more than a few weeks after a spill because hydrocarbons concentrations are low. The statistical design of the testing methods is necessary. Use of the source of experimental mussels in Southeast Alaska as control sites is improper. The variability of oil in the mussels before exposure to Sound waters needs to be known.

Response: The use of mussels as bioaccumulators is designed to allow the detection of highly diluted levels of oil contamination in the water column. Samples of mussels from Southeast Alaska were used as control as any samples from areas potentially affected by the spill may have been exposed to oil contamination. Information on the concentration of hydrocarbons in PWS mussels prior to the EVOS is available.

Comment: There is no indication in this study how bioaccumulation data will be interpreted.

Response: The levels of hydrocarbons that can cause immediate or delayed effects in certain organisms are known from studies that were conducted prior to the spill. If the study finds similar levels traceable to the EVOS, in waters these organisms are exposed to, this will indicate that the organisms are being injured.

Comment: A/W study No. 3 utilizes an inappropriate water quality standard (10 ug/liter).

Response: Water quality data will be evaluated to determine whether all applicable water quality standards are met. This is consistent with the NRDA regulations for determining injury to water resources. The Trustees do not believe it is appropriate to conduct an ad hoc review of the criteria in the context of the damage assessment.

Comment: Very large samples are needed to make the results of A/W study No. 3 accurate. Dissolved and particulate fractions need to be analyzed separately because of their high partition coefficients. This study ignores the sea surface microlayer of the water column, which is a location for locally high concentrations of hydrocarbons.

Response: The use of bioaccumulators in the form of mussels will be employed to document oil presence rather than to attempt to increase greatly the water sample size. Particulate concentrations

will be sampled in nearshore waters and dissolved fractions will be sampled over a range of depths, locations and times.

Comment: There is no information in A/W study No. 3 regarding how long the mussel cages will be deployed and at what depths and how many replicate clams per cage. The sea surface should be studied. Placing cages at so many stations may be unnecessary.

Response: Although the seasurface layer will not be specifically sampled under this study, shallow location of mussel cages will occur.

Comment: The sampling depths for A/W study No. 3 should have been based on physical or biological factors.

Response: Standard depths for the bioaccumulator and sediment trap sampling in this program were selected as the best means to maintain comparability. The use of physical, biological or other factors to determine sampling depths would result in a highly varied sampling pattern among different locations.

Comment: A/W study No. 3 should take into account the facts that dissolved and particulate hydrocarbon compounds in the water column may affect the distribution, abundance, and productivity of vertebrate and invertebrate species on which seals and whales thrive and that particulates may interfere with the filtering plates of the baleen whales or be ingested.

Response: Any dead whales found in the spill area are being closely examined for effects of oil. Marine Mammal studies will document any occurrence of displacement of whales in PWS.

Air/Water Study No. 4

Comment: A/W study No. 4 will study benthic infauna in depths of 20 meters or more even though it is very unlikely that oil will have precipitated in significant amounts to that level. This is an unnecessary cost.

Response: The benthic habitats of the areas affected by the spill are large and support many important organisms. To ignore this portion of the environment in damage assessment studies would leave a large gap in oil impact documentation.

Comment: A/W study No. 4 should investigate infaunal organisms and sediments. This study fails to indicate the number of grabs per station or frequency of sampling. Organisms should be evaluated for hydrocarbon content.

Response: This study is incorporated into A/W study No. 2 in the 1990 plan and the combined studies will include sampling for infaunal organisms and for sediments. A detailed description of

techniques is included in the 1990 study plan. The organisms sampled will be analyzed for hydrocarbon content.

Comment: The minimal and isolated effects on deepwater benthic resources does not justify the cost of the A/W study No. 4. There is no description of the sampling, experimental and analytical methods to be used in this study. Nor is the type and magnitude of change in the resources that will be used to define injury identified. There is no mention of how the stations will be compared. There is no specification of how petroleum concentration and composition, water depth, sediment grain size, sediment total organic carbon or other factors will be accounted for in determining whether changes in community structure are linked to oil.

Response: Experience with other spills indicates that a possibility of injury to benthic resources exists. As these resources are extensive within the spill area, it would not be in the public interest to ignore the potential for injury. See 1990 plan.

FISH/SHELLFISH

FISH/SHELLFISH GENERAL COMMENTS

Comment: The 26 Fish/Shellfish studies are generally inadequate for predicting long-term effects on populations; they are better suited for estimating the short-term and acute effects of the spill.

Response: The Fish/Shellfish studies are designed to evaluate both short- and long-term effects of the oil spill. Short-term effects such as mortality to a specific life history phase (e.g. egg, larvae, fry, adults) are being documented and quantified. Long-term effects are being evaluated using parameters such as decreased growth, decreased reproductive potential, decreased abundance, and increased incidence of developmental defects and disease.

Comment: Studies should continue for more than one year.

Response: Sixteen of the 26 Fish/Shellfish studies that were initiated in 1989 to assess impacts of the EVOS have been continued in 1990 and will be evaluated in the winter of 1990-91 for possible continuation in 1991.

Comment: Portions of studies 1-4 should be continued to document recapture of tagged fish.

Response: Studies 1-4 were being continued for 1990. The recovery of coded-wire tagged fish was a primary consideration for continuing studies 1, 3, and 4.

Comment: The number of sites studied in studies 1-4 and 7-9 seems excessive.

Response: All studies were reviewed during the fall and winter. As a result, some studies were modified to ensure a statistically valid design. Therefore, the number of study sites in studies 1-4, and 7 and 8 are justified and will continue. Study No. 9 was not continued.

Comment: Streams in either the eastern or Kamishak districts should be studied in studies 7, 8, 9 and 10.

Response: The selection of sites for studies 7, 8, 9 and 10 was made to provide an experimental design of paired comparisons to detect the impacts of oil on study species. Assessment of populations to detect changes in the productivity of fisheries associated with the result of the paired comparisons was based on different "study areas," either "oiled" or "non-oiled," or on different "study times" when there was historical data available on "oiled" populations of fish.

Comment: The Fish/Shellfish studies should evaluate ecosystem and food chain impacts. Fish food webs should be studied before and after the spill in conjunction with toxicity and habitat studies.

Response: While the individual studies primarily focus on impacts to individual species, it is anticipated that analysis and synthesis of the results of all NRDA studies (e.g. coastal habitat studies, air/water studies, fishery studies, bird studies, marine mammal studies, and terrestrial mammal studies) will provide an assessment of ecosystem and food chain impacts.

Comment: Additional testing is needed both within and outside of PWS, including a consideration of additional sites and varying concentrations of oil.

Response: All studies were reviewed during the fall and winter to ensure that they would produce statistically valid results. This review included an evaluation of the number of sites and extent of oiling. Based on this review, studies were modified where necessary to ensure statistically valid design.

Comment: Samples should be collected at least in triplicate to allow for estimation of variance at sites.

Response: Some projects are collecting samples in triplicate and other projects have been reviewed with this comment in mind.

Comment: Analysis of variance (ANOVA) is overused and is inappropriate for an analysis of sigmoidal relationships of toxicity curves or skewed bell shape of habitat preference curves. Consideration should be given to the use of non-parametric and multi-variate statistics. Data pertinent to food chain and ecosystem impacts should be analyzed using loop analysis.

Response: A biometrician has been assigned to each Fish/Shellfish study. An important component of his or her duties will be to investigate the appropriateness of any statistical test mentioned in the study plans. Underlying assumptions will be tested and alternative analyses will be considered.

Comment: The methods used for hydrocarbon testing may underestimate contamination; numerous (i.e., more than 15) samples of each age/size class to allow better regressions and avoid composite sampling is suggested.

Response: Sample sizes for hydrocarbon testing were not established solely to minimize a variance associated with an estimate of hydrocarbon presence. Collection goals of all projects were reviewed to meet multiple objectives, including timely sample processing and result reporting.

Comment: Studies should go beyond Unimak Island and in the west and east of PWS.

Response: The Fish/Shellfish studies do not go beyond Unimak Island in the west and east of PWS because all information received to date suggests that beyond these areas there has been little or no impacts from the EVOS.

Comment: No study evaluates impacts to primary and secondary productivity in impacted waters, particularly impacts to marine plants.

Response: Impacts to primary and secondary production (marine plants) are being studied by investigators in the Coastal Habitat study.

Comment: Many of the Fish/Shellfish studies go beyond what is necessary to identify and quantify damage and are, in essence, research programs to expand knowledge on the ecology and fisheries of PWS and adjacent waters.

Response: The Fish/Shellfish studies are specifically designed to identify and quantify adverse effects of the EVOS and identify appropriate measures for restoration. Each study undergoes an intensive annual review and approval process by professionals in multiple state and federal agencies. Scientific and technical peer reviews are conducted which provide ongoing input on objectives, methods, and analyses to the principal investigators for each study. The plans for these studies are also distributed for review and comments by the general public and the comments responded to. This process ensures that the studies are necessary and appropriate damage assessment studies.

Comment: The types of injuries to fish and shellfish being studied are inadequate because the studies almost totally ignore sublethal impacts on fish such as long-term changes in survival and reproduction, contaminant body burdens.

Response: Sublethal impacts to fish and shellfish from oil are being studied, receiving more attention during the second year of study. Parameters for sublethal impacts that are being evaluated include: (1) the presence of hydrocarbon metabolizing enzymes; (2) the interaction of metabolites with subcellular structures; (3) genetic abnormalities; (4) gross morphological abnormalities; (5) histopathological effects; and (6) physiological effects of exposure to oil from the Exxon Valdez.

Comment: The public review document indicates a lack of coordination between Fish/Shellfish injury assessment studies, economic value studies and restoration planning.

Response: Over the winter of 1989-90, the Trustees prioritized coordination among the various natural resource damage assessment investigators, economic investigators, and restoration planners to discuss preliminary results and plan for the continuation of studies. Study plans and results from the Fish/Shellfish studies have been made available for economic value studies, restoration planning groups, and the other study groups.

Comment: The fish studies given inadequate attention to prey species of principally studied fish.

Response: Species were selected for study based on their value as indicators of injury, their role as key species within the ecosystem, or their direct importance to man as components of subsistence, commercial, or sport harvest. Juvenile salmon and herring are considered two of the most important prey species for piscivorous fishes in the spill-affected area and are being studied intensively.

Comment: Fish studies 3, 4 and 9 would benefit from laboratory studies that could control marine variables, such as natural predation and mortality at sea.

Response: The addition of controlled laboratory experiments that could be conducted in conjunction with F/S studies 3, 4 and 9 has been considered. The Trustees believe that because of convincing evidence found during 1989 regarding reduced growth of fry exposed to contaminated water, it was important to continue to quantify impacts on the growth of unconfined fry residing in Prince William Sound. Studies at the Auke Bay lab have shown that growth is significantly reduced in fry exposed to water-soluble hydrocarbon; however, these results need to be confirmed for fry living in natural conditions.

Comment: Studies 1, 2, 7 and 8 would benefit from laboratory studies to support the impact on eggs and fry.

Response: The Trustees believe it is most important at this time to investigate possible impacts to eggs and fry in their natural environment.

Comment: The thrust of most of the Fish/Shellfish studies is to determine the impact to commercial fisherman which is not compensable under NRDA. Any remaining damages would be quite small and the study costs therefore may not be recoverable. The study ignores those species that appear to have only intrinsic values, such as fish that are important prey species.

Response: These studies are designed to identify and quantify injury to public resources from the EVOS and identify appropriate measures for restoration. Some of these fish and shellfish have commercial value. Others have value for their contribution to

sport, subsistence, and/or personal use fisheries. In addition, these fish and shellfish populations form integral parts of a vast and complex ecosystem which also includes various other invertebrate species (e.g. birds and mammals). For example, the various life history stages of Pacific herring are an important forage species for various piscivorous fishes (e.g. Pacific salmon, halibut, pollock, sablefish, cod, squid, and flatfish), birds (cormorants, gulls, mergansers, heron, eagles, loons, and kingfishers), mammals (sea lions, seals, porpoises, whales, bears, and humans), and invertebrates (crabs). All of the species selected for study have a value to the ecology of the area, which goes beyond their value to a particular sport or commercial fishery. The budgets of these studies are scrutinized very closely and any costs that are deemed excessive are either reduced to reasonable levels or are eliminated.

Comment: The study descriptions do not provide details of methods being used. Therefore, it is impossible to determine whether standard and accepted methods are used, possible biases are accounted for, and representative sites are sampled, and results will be statistically valid. The descriptions do not provide the statistical basis for comparing abundance levels and provide no methods to differentiate natural phenomena from spill effects.

Response: The 1990 study plans for Fish/Shellfish studies provide more detailed descriptions of methods, sample sizes, sampling sites, and statistical techniques that are being employed in each study.

Comment: Salmon are unlikely to have been adversely affected by hydrocarbons at concentrations that were documented in the water column and it is extremely unlikely that any long-term impacts on salmon stocks attributable to the spill can be documented.

Response: Such statements are premature and judgment will be reserved until the results of the studies are known.

Comment: The Plan should contain a study similar to Fish/Shellfish Study No. 19 for the fish larvae that were oiled as a result of the oil's movement through Shelikof Strait and other areas of the Gulf of Alaska.

Response: It is anticipated that results from F/S #19 can be used to evaluate injury in other areas.

Comment: The number of angler days identified in the introductory section of the F/S studies (p. 48) does not comport with that identified in F/S study No. 6.

Response: F/S study No. 7 has been discontinued. Hence there is no longer a description of this study in the Plan. The number of

angler days identified in the introduction for these studies has been reconfirmed.

FISH/SHELLFISH STUDY NO. 1

Comment: Historical data must be corrected to take into account factors such as timing, climate, harvest, recruitment, and water levels.

Response: The detailed analysis of historical data to assess the extent of damage due to the oil spill will be done in F/S study No. 28. Variations in migratory timing, harvest, and recruitment will be accounted for in that run reconstruction process.

Comment: Assessment of the damage due to loss of habitat should be estimated annually at least until the progeny of 1989's spawners return, i.e., approximately 1994.

Response: The studies will be reviewed during the winter of 1990-91 for possible continuation. F/S studies Nos. 1, 2, and 3 were designed so that they could be continued through the return years for adults originating from the 1989 brood year.

Comment: There should be microhabitat studies to determine whether mating females avoid lightly oiled areas or are less effective in mating redds in oiled areas.

Response: A detailed microhabitat study to determine the effects of oil contamination on redd site selection in salmon is beyond the scope of F/S study No. 1. However, this study will provide an estimate of numbers of fish spawning in oiled streams for comparison with historic data.

Comment: Suitable control sites may not exist in PWS; since salmon are highly mobile and have keen olfactory senses, there may be avoidance for the general area.

Response: It is possible that migratory patterns for all stocks in the Sound may have been affected but presumably effects at this level would be Sound-wide and would apply equally to all stocks. In that case, differential survival between stock from oiled versus non-oiled streams should still be detectible. The impact of possible Sound-wide avoidance should be detectable from an evaluation of pre-spill data.

Comment: Sublethal effects of oil, such as confusion of olfactory senses and reproductive impacts on adult spawners should be studied.

Response: These studies are not within the scope of this particular project. The results of other studies investigating

such sublethal effects will be considered in evaluating the data from this study.

Comment: The linkage between the oil spill and sockeye salmon spawning habitats is unclear since they are not known to spawn intertidally.

Response: While this study does include evaluation of impacts to sockeye salmon in the objectives, because pink and chum salmon are numerically far superior in the PWS, they are accorded much more attention in the study. As much as 75% of the pink and chum salmon spawning in PWS is intertidal. Therefore there is good reason to investigate effects on eggs and fry in the intertidal areas contaminated by oil. Sockeye salmon do not spawn intertidally but the smolt spend much time in nearshore estuarine areas adjacent to spawning streams and might be affected adversely by contamination. Closures of fisheries targeted on sockeye salmon may also result in larger than desired escapements. Subsequent fry production may exceed the carrying capacity of the fresh-water rearing area, leading to poor smolt production and fewer returning adults in subsequent years.

Comment: Given the number of variables potentially affecting this population, such as fishing pressure changes, all assumptions made must be clearly specified in the course of assessing results.

Response: The reviewer is correct. Fish populations experience a great deal of natural variability that must be documented and accounted for in the experimental design and data analysis. The study has been carefully designed to incorporate streams which have an extensive historical data base to document natural variability.

Comment: This study fails to improve and catalog baseline information on productivity of PWS salmon streams, which will result in an underestimation of the value of the resource.

Response: This study was designed to incorporate only streams for which there is an extensive historic data base. The study will greatly improve the ground survey data base for 138 streams and results from the ground surveys will also help in the re-evaluation of 30 years of historic escapement data from 211 streams included in the ongoing ADF&G aerial survey program.

Comment: There is no identification of "aerially surveyed index streams." If they are to be used determining salmon abundance, the length of time over which they have been surveyed should be studied.

Response: ADF&G conducts a systematic weekly survey of 211 salmon spawning streams in PWS using a fixed-wing aircraft flying at slow speed and low altitude (aerial survey) to estimate the number of fish present in each stream. Estimates of weekly abundance for

aerial counts can be used to estimate the actual spawning population (escapement). These estimates accurately reflect relative differences in abundance between streams and between years within a stream. We refer to this relative measure of abundance as an "index" of abundance and we refer to the streams included in the program as "index streams." Our weekly aerial survey program has been consistently conducted on the same 211 index streams for more than 30 years.

FISH/SHELLFISH STUDY NO. 2

Comment: Controlled laboratory studies should be considered for examination of the over-winter mortality of eggs and pre-emergent fry.

Response: In fact, many such studies have been done. The FRED Division of ADF&G has done many studies on the over-winter mortality studies on pink and chum salmon eggs incubated in a variety of conditions. The NMFS has also done an exhaustive series of experiments which document increased mortality in pink and chum salmon eggs when incubated in the presence of various hydrocarbon compounds at various dosages. Results from these studies will be considered in analyzing the data generated from F/S study No. 2.

Comment: If impacts are detected as a result of the analysis of hydrocarbon content in alevins, there should be an assessment of what these results will mean to future generations.

Response: The results of this study will be integrated with the results from F/S studies Nos. 1 and 2 to assess total loss of future production in PWS. This analysis will be completed as part of the new F/S study No. 28.

Comment: The relevance of this study for determining the impact of the oil spill is questionable because it is physically impossible for oil spilled in PWS to travel up current in a fresh water stream. Abundance and over-winter mortality for these species in inter-tidal areas cannot be extrapolated from the fresh water areas proposed for study in this project.

Response: The confusion here may lie in the fact that ADF&G refers to the egg and alevin (pre-emergent fry) states of pink and chum salmon life history as the "freshwater" portion. In fact, between 50% and 75% of the pink and chum salmon spawning in PWS occurs in the intertidal area. Sampling at each stream in this study occurs at three intertidal levels (1.8 m - 2.4 m, 2.4 m - 3.0 m and, 3.0 m - 3.7 m above mean low water). There is also one sample transect above tidal influence on each stream. The latter site is sampled for consistency with the historical data base and for comparison with stream variability not associated with oil contamination.

Comment: This study emphasizes coverage of a maximum number of streams rather than more complete documentation at fewer streams.

Response: The study actually emphasizes coverage of a maximum number of streams as well as complete coverage within streams. Maximizing the number of streams is important because of the variability between streams. There has been an attempt to reduce the effects of this variability in this study by incorporating a large number of streams. It is true that larger sample sizes within each stream would increase the precision of our estimates. Unfortunately, larger sample sizes could also make a significant impact on fry production in the streams. They would also require additional sampling time within each stream and lead to a reduction in the number of streams that could be sampled. The current sample sizes are a compromise that provides the necessary level of precision.

Comment: The location and duration of sampling are not described, and are potential sources of sampling error.

Response: Egg deposition sampling on 30 streams takes approximately two weeks at the end of September. Pre-emergent fry sampling on the same streams also requires about two weeks and takes place in late March. Each sample transect requires approximately one hour to complete and each stream requires approximately four hours to complete. Depending on the tides and hours of daylight, two or two and one-half streams can be sampled per day. The sampling error associated with sampling spread over this interval is not significant.

Comment: This study is completely research-orientated rather than a damage assessment-orientated.

Response: The study is designed to document reductions in survival of salmon eggs and pre-emergent fry as a result of oil contamination in the intertidal spawning areas of PWS and as such is an appropriate damage assessment study.

Comment: Two replicates of pre-emergent fry sampling is inadequate and sampling twice in April does not constitute replicate sampling with respect to pre-emergent fry.

Response: The term replicate may have caused confusion. Duplicate sampling was conducted in 1989 to look for gross differences in mortality prior to and immediately after the spill at contaminated streams.

Comment: More sites per stream should be sampled, and the sample design shows a significant potential for bias.

Response: The statistical design has been reviewed and adjustments made where necessary. The comment directed at sample size was

addressed earlier. An analysis of the historical data and the current data did not discover any bias associated with the sample design.

FISH/SHELLFISH STUDY NO. 3

Comment: Sampling three oiled streams and two non-oiled streams is inadequate for the pink salmon portion of the study since interstream variability will be high.

Response: This study underwent extensive review in the winter of 1989-90. The experimental design is considered appropriate for this study.

Comment: The pink salmon portion of the study should be repeated for two years (1990 and 1991) so that both even-year and odd-year runs are sampled.

Response: The project is intended to last for at least four years so two years in both cycles will be covered. This is contingent on funding.

Comment: The study of streams for pink salmon and watersheds for sockeye salmon is questionable.

Response: A large component of the pink salmon population in PWS spawns in the intertidal area of small streams. The intertidal areas of many streams were oiled. The pink salmon streams being studied are systems where most spawning occurs in the intertidal area. In addition, the near shore areas of PWS serve as the primary nursery areas for pink salmon fry. Destruction of this habitat could negatively impact pink salmon populations. This also holds true for sockeye systems. Although the lake systems which produce sockeye were not directly impacted by oil, the nursery areas may have been.

Comment: Examination of sockeyes during one year will not provide a good estimate for the other three age groups.

Response: Elements of this study were designed to continue at least until 1995. At least one cycle of year classes will be completed by then.

Comment: Smolt studies should be repeated for each age class.

Response: Elements of this study were designed to continue at least until 1995. At least one cycle of year classes will be completed by then.

Comment: Straying should be studied in only in other than outlying areas.

Response: The cost of examining straying in areas other than those adjacent to the study areas is prohibitive.

Comment: The study does not consider the effects of environmental factors such as circulation, water mass anomalies, winter stream temperatures and zooplankton densities as they influence the fisheries.

Response: It is assumed that the impacts of environmental variables will be equal between oiled and non-oiled areas.

Comment: The sample sizes in the study are too low, making it difficult to draw conclusions by comparing a limited number of streams and hatchery facilities, some oiled and some not.

Response: A statistician has been assigned to review this study. The sample sizes are considered to be appropriate for this study.

Comment: The study focuses too much on gross impact; fewer fish should be taken and examined more closely in a controlled environment. The study should look for more subtle differences such as small percentage changes in viability of eggs or fertility of sperm as this is the type of change that will have a profound long-term effect on the viability of the salmon population.

Response: In reviewing this study, modifications including controlled laboratory studies and a focus on sublethal effects were considered. They have been deemed inappropriate in this particular study, however results from other studies may provide useful data. Subtle effects are difficult to measure.

FISH/SHELLFISH STUDY NO. 4

Comment: The presence or absence of young salmon in known early marine rearing locations should be studied to help determine whether young salmon have been forced out of traditional rearing areas in oiled locations.

Response: As a part of this study, records of fry distribution are being made for a large part of the PWS. If differences occur between oiled and non-oiled years, they will be evaluated.

Comment: Alternatives for restoration should not be confined to locations now producing fish; rather, consideration should also be given to the diversification of hatchery production to include early run stocks for release at as-yet undetermined locations.

Response: Increased hatchery production of salmon is being considered as a means of restoration. Broodstock selection (i.e., run timing) and location of release are important parts of any hatchery plan.

Comment: It may be necessary to go outside PWS for representative samples.

Response: Fry were not collected outside of PWS due to the difficulty in obtaining specialized gear and vessels and cost limitations.

Comment: The fifteen individuals from each size category for each site should be tested for hydrocarbons.

Response: Many fry samples from many parts of PWS were collected in 1989 in a way that will permit hydrocarbon analyses at a later time.

Comment: There is no description of a sampling or assessment methodology that will provide an evaluation of impacts to fish food resources, especially planktonic food available to juvenile salmon.

Response: Studies by the University of Alaska and the NMFS, participants in this study have addressed this problem in the 1990 study plan.

Comment: It will be difficult to document fish kills or long-term impacts on the salmon stocks directly attributable to the spill.

Response: While it may be difficult, it is necessary and appropriate that this damage assessment attempt to identify and quantify injury to salmon stocks attributable to the spill.

FISH/SHELLFISH STUDY NO. 5

Comment: There is no evaluation of straying between streams; increased amounts of straying will bias results.

Response: The analysis will involve testing for significant mixing between streams and controlling for the mixing if it exists.

Comment: There is no evaluation of reduced fecundity or viability due to oil exposure.

Response: Growth is being measured as an indicator of sublethal effects. Data on sublethal effects from other studies will be considered in analyzing the results from this study.

Comment: Two oiled weir sites are inadequate; for statistical validity, a minimum of three per condition should be studied.

Response: Two sites per treatment group is considered sufficient for a statistically valid study.

Comment: Survival rates are a function of many factors such as temperature, abundance of food or predators, as well as oil

contamination. There must be a means of quantifying the effect of these factors separately in order to determine which effects are attributable to oil. The study assumes that survival rates in the survey and control areas were equal before the spill, which is unlikely since the control areas are on the southern sides of islands exposed to the GOA while the survey areas are all within PWS. Finally, the study description does not explain how large variations in the survival rates for different races will be accounted for.

Response: This study analyses the differences in survival rates of adult fish between the treatment and control areas. Because these are adult fish, the survival rate is essentially constant from year to year and between areas.

Comment: The objective of assessing the exploitation rates in recreational fisheries of dolly varden and cutthroat trout, over-wintering in oiled and non-oiled areas, is inappropriate in that both species over-winter in fresh water lakes, which were not oiled.

Response: While the dolly varden and cutthroats do over-winter in fresh water lakes, most of the feeding and growth occurs in the salt water where the majority of sport fishing effort occurs. The exploitation rates were obtained through F/S study No. 6, which targeted estimated catch rates of the marine sport fishery.

Comment: There is virtually no useful baseline data for comparison of the linkage between oil contamination and char; the linkage between oil contamination and char and cutthroat trout survival is vague.

Response: In instances where little baseline data exists, studies rely on current and future years comparisons.

Comment: The study does not assess impacts of the oil spill on prey of dolly varden and cutthroat trout.

Response: The study is not intended to or designed to assess the impacts of the spill on the prey of dolly varden and cutthroat trout. While this information would be beneficial, measuring growth of the fish will show damage more directly.

Comment: There should be an additional examination of fecundity of fish and survival of eggs through juvenile life stages between exposed and unexposed groups and inspection of fish for anomalies.

Response: Growth is being measured as an indicator of sublethal effects.

Comment: The objective of looking at exploitation rates is unnecessary and, unless accompanied by careful analysis and

supported by additional data, may provide misleading results since recreational fisheries are variable and influenced by many factors.

Response: The exploitation data will be analyzed very carefully. They will be checked only for any drop in exploitation rates above and beyond normal variation.

Comment: Chronic effects, such as disease, damage to organs and other sublethal impacts, should be studied, as should impacts on reproduction and analysis of body burdens of hydrocarbons and other spill-related toxins; the confounding effects of mobility of fish must be considered in assessing catch data.

Response: Growth is considered to be the best index of sub-lethal effects.

FISH/SHELLFISH STUDY NO. 7

Comment: This study should include upper CI.

Response: The Trustees would have preferred to examine all areas outside of PWS but were limited in 1989 by time, cost, and personnel. F/S study No. 27 will be initiated in 1990 and will examine possible impacts on sockeye salmon in upper CI.

Comment: Streams and other areas of LCI should also be assessed for damage.

Response: This study examined several of the major pink/chum salmon spawning streams, both uncontaminated and directly contaminated by oil, in the LCI/Kenai Fiords area.

Comment: The gross method of analysis employed, e.g. counting live and dead salmon and egg and pre-emergent fry densities, does not look at sublethal effects such as contaminant body burden, developmental abnormalities and egg and fry survival. These should be studied in a more controlled environment.

Response: Sublethal effects have been considered and the Trustees have incorporated the collection of this type of data into F/S study No. 8a.

FISH/SHELLFISH STUDY NO. 8

Comment: There is no indication whether this study also uses oiled and non-oiled areas for comparison.

Response: This study compares egg to fry survival for both oiled and non-oiled areas.

Comment: This study is completely research-oriented and therefore not a damage assessment study.

Response: A significant proportion of pink/chum salmon spawn intertidally in the LCI/Kenai Fiords area and, to a lesser degree, in the Kodiak area. These areas were affected by oil from the Exxon Valdez. This study is designed to examine potential differences in egg-to-fry survival between streams that have and have not been intertidally oiled. Thus, it is an appropriate damage assessment study.

Comment: Abundance and over-winter mortality for these species in intertidal areas cannot be extrapolated from the fresh water areas proposed for study in this project.

Response: Significant numbers of pink/chum salmon use intertidal areas for spawning in the LCI/Kenai Fiords area. These intertidal areas as well as the upstream portion of the stream, will be examined separately for overwinter survival.

Comment: A closer look at eggs and fry is needed to provide a greater measure of reliability.

Response: The reliability of the test for differences in egg-to-fry survival due to oiling was examined and the number of streams sampled was adjusted in order to obtain the best balance between historic data, logistical concerns, and statistical validity.

Comment: Juvenile fish should be subjected to a more thorough analysis of growth and examining the daily growth rings of otoliths to determine an estimate of daily growth rate, with comparisons drawn between growth of fish in exposed and unexposed groups should be considered.

Response: This project examines the effects of intertidal oiling on egg-to-fry survival, whereas F/S studies 4 and 9 deal with the effects of oiling on early marine growth. Fry samples were collected from each dig zone for analysis of sublethal effects.

FISH/SHELLFISH STUDY NO. 11

Comment: Sampling 160 transects seems excessive; the study description gives insufficient information on the size of the area to be surveyed.

Response: The number of transects needed to achieve the statistical accuracy desired was calculated in 1989 based on the extent of the 1988 spawn. It was not excessive considering the statistical design of the study. The size of the study area is not known exactly until the spawn occurs each year and miles of spawn is mapped; it is only estimated based on the previous year's extent and location of spawn.

Comment: There are no studies on what effect exposure to oil at an early age has on later development, fecundity, etc.

Response: The 1990 study plan includes an egg mortality study and increased fecundity sampling. These studies include analysis of effects of metabolism of oil on fecundity by examining year effects and looking at genetic aberrations in ovary tissue. The egg mortality project will address direct and indirect impacts of oil on egg survival, viability, hatching success, larval abnormalities and various sublethal and chemical laboratory tests that will quantify damage and establish oiling indices.

Comment: The investigators should consult with investigators for marine mammal studies to ensure that related information needs are identified and factored into the study design since herring likely are an important component of the diet of marine mammals.

Response: Marine mammal researchers that are involved in the NRDA process have consulted with the herring principal investigator on the possibility of contamination of the herring food source. They have complete access to the results of any tests that reveal oil content and contamination.

Comment: Kelp growth should be measured, since there have been reports of reduced kelp growth in oiled areas.

Response: Kelp growth is being studied in the coastal habitat studies.

FISH/SHELLFISH STUDY NO. 13

Comment: There is no rationale given for why the three species of clams were specifically selected in Study No. 13.

Response: The original study included Cockles, Littlenecks, and Butter clams because these species were important from a subsistence and personal use standpoint. Cockles were dropped from the study due to their limited abundance in PWS. Littleneck and Butter clams are particularly appropriate for study given their widespread abundance and considerable background information available concerning the species.

Comment: It is not clear from the project description how growth will be documented nor how examination of growth parameters and the abundance of bivalves two to four years old will give information about temporal changes in growth rates and recruitment between oiled and non-oiled beaches.

Response: Growth is documented by recording shell length for each annulus. Beaches will be resampled and the growth of clams since the spill will be recorded as length at each age. Growth curve parameters will be compared for differences in growth rates between oiled and non-oiled areas. Changes in recruitment will also be determined in four years by comparing numbers of clams within the appropriate size ranges.

Comment: Assuming that the condition being measured is a body condition index (volume of soft tissue to total volume of organism) condition should also be measured on a subset of individuals from the clam studies to provide information comparable to that obtained in the other bivalve studies.

Response: No measurements were taken to determine the condition index of clams at each site.

Comment: The study does not indicate whether bivalves will be allowed to void their gut contents prior to analysis for hydrocarbons (since the presence of hydrocarbons in material in the gut can dramatically alter whole body levels analyzed, the same approach should be used in all studies to obtain comparable information).

Response: Clams sampled for hydrocarbon analysis were removed from the substrate and placed in cleaned aluminum foil and frozen as soon as possible. All hydrocarbon samples were handled in the same manner.

Comment: The number of quadrants should be determined by variability.

Response: Clams from the tidal heights sampled can only be taken during a series of low tides. Because of the limited amount of time and resources available, beaches could not be surveyed beforehand to determine the abundance by tidal height. Estimates of variability could not be made prior to sampling.

Comment: How many individuals will be analyzed for hydrocarbons? Individuals should be analyzed, not as a composite, and numerous individuals should be tested per age class.

Response: Hydrocarbon samples are collected by transect (one composite sample per transect plus one environmental replicate for a total of four per site). The first two clams excavated from a quadrant that are between 2-5 cm are used for this sample. Hydrocarbon sample clams are left unwashed and placed immediately in a hydrocarbon free container (aluminum foil). Onsite aging of clams would be difficult due to time constraints and maintaining an uncontaminated sample. Hydrocarbon samples are determined by weight, and it takes several clams to acquire the 15 grams of tissue necessary to form a sample. Thus, hydrocarbon samples are collected by transect. Onsite aging of clams would be difficult due to time constraints and the need to maintain an uncontaminated sample.

Comment: No reason is given for including only little necks in the study of growth in age analysis. [Same comment was also submitted concerning F/S No. 21.]

Response: Littlenecks were found to have the widest and most abundant distribution through PWS. Extensive background information concerning age and growth of Littlenecks is available for many populations in the Pacific Ocean.

Comment: Monitoring of all sites should be done more often than once in the spring and once in the fall, perhaps monthly. [Same comment was submitted concerning F/S No. 21.]

Response: The present sampling plans require a crew of four to complete one sampling site during a minus low tide. Additional sampling would require more personnel and equipment. [Same comment was also submitted concerning F/S No. 21.]

Comment: Growth and age analysis should also include estimates of growth potential on temperature and contrast with real growth.

Response: Detailed temperature information by site and time was not collected from individual sites. Temperatures and salinities were recorded for each site, however detailed temperature information for sites over time was not collected from individual sites. In assessing the effects the oil spill had on growth, growth potential will be assumed to be the growth achieved by clams at a beach prior to the spill. Measurements from shells collected for length at age analysis prior to the spill provide a record of previous growth.

Comment: ANOVA is not appropriate unless it can be demonstrated that the relationships are at least monotypic and not either the typical bell shape or sigmoid that would be expected from these studies. [Same comment was submitted concerning F/S No. 21.]

Response: The appropriateness of an ANOVA test will be determined before it is employed. Non-parametric tests will be applied if justified. Tests for significance will be applied to each species separately.

Comment: The objectives of this study appeared to be inconsistent with the methods and analyses insofar as the objectives suggested that there would be a one-time sample of bivalves at selected beach sites while the methods and analysis section said that one heavily oiled beach will be monitored bi-weekly from May through September. The objectives should be redrafted to indicate that hydrocarbons will be monitored to determine how hydrocarbon contaminant levels change over time, and the monitoring design should be altered if there are sudden changes in the proportion of dead clams or cockles found on the beach being monitored.

Response: The objective of monitoring a heavily oiled beach over time is to determine hydrocarbon contaminant levels over time. The study design will be modified as necessary based upon ongoing monitoring.

Comment: The project description should be expanded to indicate what will be done if significant levels of hydrocarbons are still being found in bivalves or the survival and productivity rate of bivalves have not returned to prespill levels by the end of the study period. The study should be continued until detectable or potentially harmful levels of hydrocarbons no longer are present in bivalves.

Response: The investigators agree that studies should be continued if potentially harmful levels of hydrocarbons exist.

Comment: There should be a better description of how this study relates to M/M study No. 6, indicating how possible effects of bivalve impacts on sea otters will be detected and quantified.

Response: The 1990 study plan was established recognizing the importance of bivalves to otter and bear populations. Only beaches which are known otter or bear habitat are to be studied.

Comment: With respect to establishing the cause of death by necropsy analysis, sufficient baseline data may not be available to provide an adequate understanding of normal tissues to make such a determination.

Response: Necropsy samples were taken at both control and oiled sites.

FISH/SHELLFISH STUDY NO. 15

Comment: It is impossible to determine whether the sample size is appropriate and whether possible egg hydrocarbon content and survival should be assessed.

Response: Sample sizes have been set based on input from ADF&G biometricians using available data on size frequency and the NRDA protocol for hydrocarbon sampling. Hydrocarbon sample sizes were set in order to keep analysis costs down until presence of hydrocarbons is actually documented. Egg clutch hydrocarbon content is being measured and egg survival is being estimated by comparing average egg number just after extrusion to average egg number just before hatching. Egg survival is also being estimated by counting numbers of dead eggs.

Comment: ANOVA was misused in this study.

Response: During development of the detailed study plans all statistical analyses were reviewed by ADF&G biometricians. All statistical analyses being used are considered to be appropriate.

Comment: There is no indication in the study description of whether long-term effects of exposure on young shrimp are being studied.

Response: This study was planned to last for a three to five year period. This would allow time for young of the 1989 year shrimp to grow to the age where they recruit to the gear and could be sampled several times before the study ended. At that time, their relative abundance and level of hydrocarbon contamination could be determined.

Comment: This study should not be part of the damage assessment effort because only very low concentrations of oil have been documented in the water column, and adult shrimp are not particularly sensitive to such low concentrations in the water.

Response: Spot shrimp larvae were in the water column during the oil spill and are known to be very sensitive to oil. By extending this study until these animals recruit to the gear it should be possible to assess their relative abundance compared to previous year classes. Additionally, oil has been documented in bottom fish which inhabit depths similar to spot shrimp. It is therefore possible that oil is on the bottom in spot shrimp habitat, which could be particularly damaging to eggs which are carried externally and have a high oil content.

Comment: Any results generated by this study will be inconclusive in demonstrating an exposure pathway).

Response: Other studies of injury to larval animals, sediments, and other bottom dwelling fish and shellfish will provide supporting information to help identify the probable mechanism for contamination.

FISH/SHELLFISH STUDY NO. 17

Comment: Fish should be examined for parasites, oiled stomach contents and general condition and efforts should be made to determine the age of the fish caught in order to determine what proportion of the population is being counted and to demonstrate whether age-dependent effects are being observed.

Response: Fish will be examined for conditions such as these. Abnormalities in fish will be noted and age will be determined.

Comment: Organoleptic testing should included in other studies.

Response: Organoleptic sampling is being conducted by the Alaska Department of Environmental Conservation (ADEC) outside of the NDRA process.

Comment: Standard hydrocarbon analysis should be done on these fish in addition to organoleptic testing.

Response: Tissue samples for standard hydrocarbon analysis will be collected and analyzed where screening techniques indicate analysis is necessary.

Comment: There should be an estimate of density, growth and age structure of the population.

Response: Age structure will be estimated but, due to the objectives and design of this particular study, growth will not.

Comment: It is unlikely that this study will demonstrate an exposure pathway since only adult rockfish, which normally are in subtidal areas deeper than 20 meters, will be collected.

Response: Because rockfish were found to contain high levels of hydrocarbons, this year's study was expanded to include looking at the prey of rockfish in order to investigate this possible pathway.

Comment: There is insufficient information in the study description regarding the criteria used to select reefs to determine whether they adequately represent the PWS population.

Response: The ten reefs in this study were chosen because there was historical data on them and because they were representative of areas that were heavily oiled and areas not oiled over the geographic area of the Sound.

Comment: The organoleptic testing program needs to describe how the taste panels will be chosen and what criteria will be employed, stating that the study will not yield valid results unless trained taste panels are employed under rigorously controlled test conditions.

Response: Organoleptic testing was done by ADEC following well-established testing procedures.

Comment: The methodology of collecting rockfish by visiting the location of observed fish kills is inappropriate in that it is based on the presumption that the fish were found in the location where they were killed, which is unlikely.

Response: The results of the 1989 field study do not support this comment.

Comment: The use of long line gear for estimating changes in fish abundance is questionable.

Response: Long line gear will not be used for estimating abundance but rather for presence or absence and for the collection for fish of hydrocarbon testing.

Comment: This study appears to be well conceived, but there should be an assessment of the effects on reproduction as a result of hydrocarbon loading and impacts such as fecundity, egg and larval abnormalities and survival should be assessed. There should be research focusing on identifying any possible long-term, chronic effects that decrease survival of exposed fish.

Response: Some of these sub-lethal effects will be addressed in the 1990 field studies.

FISH/SHELLFISH STUDY NO. 18

Comment: There appear to be some discrepancies between the methodologies used in this study and those used in study No. 24. For example, stomach contents will be analyzed in No. 18 but not in No. 24, and bile analysis appears to be undertaken in study No. 24 but not in study No. 18. Bile analysis should be included in study No. 18.

Response: Current study plans for these projects both reference bile sampling and analyses. Study No. 18 is not currently scheduled to take stomach contents but will be reviewed to determine whether stomach sampling and tissue sampling are warranted. Study No. 24 will also be measuring other chemical presences and will record any abnormalities found in the fish sampled. Stomach samples taken under Study No. 24 will be analyzed for hydrocarbon presence if bile samples are found to be positive.

Comment: The study should include growth analysis.

Response: For a fast growing species or life stage of fish, growth rates area valuable indicator of injury. Growth measurements are being used in juvenile salmon damage assessment studies since these fish are growing rapidly. Most adult fish that have long lives grow slowly. For many species, growth rates are too slow to measure impacts over a short time frame.

Comment: It is unlikely that fish will live long if they are ingesting tar balls and the result will be an underestimate of fish populations.

Response: Tar ball ingestion has not been extensively documented in samples of fish taken to date. The sampling of fish in association with the 1990 studies should show some evidence of tarball ingestion if this is significant problem.

Comment: It is extremely difficult, if not impossible, to document an oil spill impact on stock size and year class strength of a commercial fishery species by conventional stock assessment techniques because there is too much natural variability in space

and time in these parameters. [Same comment was also submitted concerning F/S No. 24.]

Response: Large fluctuations in the natural survival rates of many marine fish and invertebrate species does make it difficult to determine injury resulting from oil contamination. For this reason. some of the fish stocks being studied are being examined only to determine whether the injury has occurred and not to determine the impact on stock size.

Comment: Measuring the incidence of tar balls in the demersal environments and in stomachs of ground fish is a seriously flawed objective since fish can swallow tar balls that are caught in the trawl. [Same comment was submitted concerning F/S No. 24.]

Response: The Trustees believe that this comment is without merit. Fish are stressed during capture and generally are regurgitating when brought on deck or put in live tanks. Organisms can be observed in the mouth or gill cover that may have been collected during capture, but there is no evidence from stomach contents that fish swallow items during capture.

Comment: The resources addressed by this study are commercial resources and therefore are not proper subjects of the damage assessment. [Same comment was submitted concerning F/S No. 24.]

Response: As noted above in the response to general comments, the resources addressed by these studies are public resources and are therefore appropriate subjects for damage assessment. Many of the fish species sampled are utilized by commercial fishermen, but some are used by subsistence and sport fishermen as well. Some of the species that will be taken by trawls and sampled are currently not extensively utilized in PWS but are an important link in the food chain.

Comment: Given the level of detail presented in this study, it is not possible to determine whether standard and widely accepted sampling, experimental and analytical methods will be used, whether surveys represent assessment areas, whether biases are accounted for and whether results are statistically valid. [Same comment was submitted concerning F/S No. 24.]

Response: The conduct of these projects will be carried out under strict guidelines for sampling and analysis. Survey and sampling plans are designed to be representative as practical considering the large geographical areas and diverse habitats involved. During the planning phases, project plans were provided to highly qualified peer reviewers to ensure that their design was sound in all respects.

FISH/SHELLFISH STUDY NO. 21

Comment: Clams are present in Kachemak Bay and the west side of CI and these areas should be included in the study.

Response: During the 1989 field season sampling was conducted in Jakalof and Seldovia Bays which are both part of the Kachemak Bay system. The major clam species on the west side of CI is razor clams. No razor clams were sampled during 1989, however studies in 1990 include razor clam sampling in CI.

Comment: Why razor clams were being studied in this study rather than little neck clams was not explained. The choice of species should be the same in this study as in study no. 13.

Response: The original study included Cockles, Littlenecks, and Butter clams because these species were important from a subsistence and personal use standpoint. Cockles were dropped from the study due to their limited abundance in PWS. Littleneck and Butter clams are particularly appropriate for study given their widespread abundance and considerable background information available concerning the species.

Comment: The number of quadrants should be determined by variability.

Response: Clams from the tidal heights sampled can only be taken during a series of low tides. Because of the limited amount of time and resources available, beaches could not be surveyed beforehand to determine the abundance by tidal height. Estimates of variability could not be made prior to sampling.

Comment: How many individuals will be analyzed for hydrocarbons? Individuals should be analyzed, not as a composite, and numerous individuals should be tested per age class.

Response: Hydrocarbon samples are collected by transect (one composite sample per transect plus one environmental replicate for a total of four per site). The first two clams excavated from a quadrant that are between 2-5 sm are used for this sample. Hydrocarbon sample clams are left unwashed and placed immediately in a hydrocarbon free container (aluminum foil). Onsite aging of clams would be difficult due to time constraints and maintaining an uncontaminated sample. Hydrocarbon samples are determined by weight, and it takes several clams to acquire the 15 grams of tissue necessary to form a sample. Thus, hydrocarbon samples are collected by transect. Onsite aging of clams would be difficult due to time constraints and the need to maintain an uncontaminated sample.

Comment: The beaches proposed to be studied in this project were impacted by weathered oil, therefore any possible effects to the bivalves would result from this weathered oil.

Response: The study is designed to test for differences between oiled and unoiled sites. The differences will be correlated with hydrocarbon levels whether from relatively fresh oil or from weathered oil.

Comment: With respect to the statement that necropsy analysis will establish cause of death, sufficient baseline data may not be available to provide an adequate understanding of "normal" tissues to make such a statement. Since uptake of oil can occur in dead invertebrate tissues, the presence of oil alone will not be conclusive.

Response: Necropsy samples were taken from live spcimens only. the necropsy analysis of dead clams was proposed as a contingency, however no dead clams were collected for necropsy analysis.

Comment: The study appears well designed but more details are needed to fully evaluate it.

Response: More details are provided in the 1990 plan.

FISH/SHELLFISH STUDY NO. 22

Comment: From the study description provided it is impossible to tell what the investigators plan to do.

Response: The 1990 study plan contains more details regarding sampling and analysis.

Comment: The expense of this project is not warranted since damage to the crab is likely to be minimal: it is unlikely that an exposure pathway can be demonstrated because oil in the subtidal regions is likely to be minimal and spotty outside of PWS and even if oil were present, it would be a highly weathered crude oil which would not be expected to cause injury.

Response: This comment ignores the fact that certain beaches on Kodiak Island and, especially on the Alaska Peninsula mainland, were heavily coated with oil. In some areas, oil was buried in the intertidal sands by heavy wave action. As Dungeness crab are closely associated with intertidal substrates and actually feed in them when they are covered by tide, the potential for them to contact oil coming off of active beaches is considered high.

Comment: Insufficient information is provided to determine whether the study can detect significant differences between effects due to natural phenomena and those resulting from the oil spill.

Response: Samples are being taken from oiled and non-oiled areas to provide control comparisons for the observation of physical characteristics the program will be documenting. The presence of hydrocarbons in the crabs will be determined by standard analytical procedures carried out on samples of sacrificed crabs.

FISH/SHELLFISH STUDY NO. 24

Comment: There appear to be some discrepancies between the methodology used in this study and in study number 18 in CI. For example, stomach contents will be analyzed in No. 18 but not in No. 24, while No. 24 states that it will analyze bile for the presence of PAH metabolites while this does not appear in the description in No. 18.

Response: Study No. 18 was adjusted to include several tissue types in addition to bile. The 1990 study plans for these projects both reference bile sampling and analysis as well as stomach sampling. Current study plans for these projects both reference bile sampling and analyses. Study No. 18 is not currently scheduled to take stomach contents but will be reviewed to determine whether stomach sampling and tissue sampling are warranted. Study No. 24 will also be measuring other chemical presences and will record any abnormalities found in the fish sampled. Stomach samples taken under study No. 4 will be analyzed for hydrocarbon presence if bile samples are found to be positive.

Comment: The methods for "biochemical analysis" should be clarified. There may not be any "standard" biochemical analyses to assess reproductive damage.

Response: This study seeks to determine whether reproductive impairment has occurred. Accepted scientific methodologies will be used. Samples of various tissues will be taken to document hydrocarbon presence and direct observation of reproductive organs and products will be made to determine abnormalities or dysfunctions.

Comment: The expense of this study is excessive and unreasonable since damage to these resources is likely to be minimal and it is unlikely that an exposure pathway can be demonstrated because oil in the subtidal regions outside of PWS will be minimal and spotty and even if oil were present it would be a highly weathered crude oil which would not be expected to cause injury.

Response: The Trustees have determined that the cost of the study was justified due to the likelihood that the resources addressed by the study were exposed to oil and therefore likely to be injured. Exposure to oil was confirmed by the 1989 samples. Based on these samples, the Trustees have been able to narrow the focus of the study in 1990. The study will be extended to determine whether there is continued exposure to oil. The marine resources of the

area affected by the EVOS outside of PWS contain large and valuable resources, many of which are important links in the food chain.

MARINE MAMMALS

MARINE MAMMALS STUDIES COMMENTS

Comment: There is no explanation of the choice to study only select marine mammals when other mammals, such as porpoises, have been identified as being potentially affected.

Response: Studies on Steller sea lions, harbor seals, humpback whales and killer whales were conducted in PWS during the 1989 field season. The selection of these four species was based on the fact that they were the only species from PWS for which a historical database exists that could permit a comparison of pre- and post-oil spill abundance and distribution. Past data on the abundance and distribution of harbor porpoise and Dall's porpoise were not available from PWS.

Comment: The description of the Marine Mammals Injury Assessment should note that a large number of North Pacific fur seals migrates through the spill area. It should also indicate the effects of cleanup activities from the spill on their survival and productivity rates.

Response: Fur seals are a pelagic species and their distibution is generally farther offshore than the areas affected by the oil spill. The Trustees believe the species most likely to be affected by EVOS have been selected for study.

Comment: Previous studies of the effects of oil on cetaceans do not justify the cost of the whale studies in the damage assessment.

Response: The Trustees anticipate comparing the results of prior studies to the responses that are observed in this study to determine the degree of injury as a result of EVOS, and have determined that the cost of this approach with respect to this species is justified.

Comment: The M/M studies will unnecessarily stress the animals. Samples should be limited to those taken from dead specimens or individuals taken by natives.

Response: No cetaceans were sacrificed. Samples were collected from dead pinnipeds and cetaceans found stranded on the beaches as well as from pinnipeds used for subsistence. However, non-oiled pinnipeds were also collected due to low sample size, unsuitability of many of subsistence animals, and the need to obtain samples immediately after sacrifice in order to determine the effect of hydrocarbons on animals that were oiled over time.

Comment: The studies do not indicate how data collected will be relevant to restoration; the only feasible method of restoration of marine mammals is shoreline cleanup and natural recovery.

Response: The question of restoration is not answerable at this time since the extent of injuries has not yet been determined. Once the extent of injury has been determined, the restoration working group will be considering a wide range of activities including retoration, replacement or acquistion of the equivalent marine mammal resources.

Comment: The budgets for the M/M studies are inadequate, particularly with respect to the cost of aircraft and boat survey support.

Response: The current version of the plan contains updated budget figures. Since most salaries are absorbed by government agencies and the figures appearing in the budgets comport with the Trustees' experience regarding similar costs in the past, the Trustees believe that the proposed budgets are the best estimate of study costs.

Comment: Only 10 samples per study will be analyzed; this number of samples is inadequate to identify injury in marine mammals.

Response: There is no limit on the number of samples to be analyzed. The ten-sample figure denoted a prioritization for initial analysis.

Comment: Greater emphasis should be placed on sublethal effects and prey species.

Response: The Trustees agree, and the current plan reflects this suggestion. A major focus of Marine Mammal Studies #1 and #2 is to document displacement of whales from areas heavily impactd by the spill. Such displacement could affect feeding patterns and other behavior.

Comment: Inadequate details for sampling, experimental and analytical methods are given in the study descriptions. Results of the studies should be centrally catalogued and made available to research groups and contractors.

Response: See the 1990 plan. The Trustees have proposed that the data gathered from studies they have authorized, as well as those conducted by the PRP's, be made available jointly to the public.

MARINE MAMMALS STUDY NO. 1

Comment: It is doubtful that this study is capable of determining whether observed changes in distribution, behavior or reproduction of whales can be ascribed to the oil spill.

Response: If an overt change occurs in the abundance, distribution or other life history parameters of the whales, the Trustees

believe that cause/effect relationships can be determined. If subtle changes take place, it may be more difficult to evaluate cause/effect relationships.

Comment: This study should be coordinated with studies of prey species, or additional studies of prey species should be undertaken, to assess whether the oil spill has caused observed changes in distribution or behavior.

Response: The findings from this study will be coordinated with those of other related studies. The Trustees agree that additional studies on prey species would be valuable, but implementation of such studies would be extremely difficult given the extensive oil spill area and the lack of baseline data and were thereore considered infeasible.

Comment: The effects of noise from cleanup activities should be evaluated.

Response: The studies on humpback and killer whales will document whether the animals have been displaced from their normal feeding areas. The logs of whale sitings will be examined to determine if any displacement is related to the location of observed vessel activity.

Comment: This study should be combined with the herring studies to reduce costs.

Response: The methodologies and logistics needs of these studies are too different to be effectively combined.

Comment: Studies of the effects of contamination of the food chain through methods such as biopsy, analysis for toxicants, and DNA biomarking, should be conducted.

Response: The Trustees agree that studies addressing the sublethal effect and the effect on whale prey species would be beneficial to the current study. Stomach content samples taken in other studies may document contamination of the lower level organisms in the food chain.

Comment: Surveys should be extended for five years in Prince William Sound, Southeast Alaska and the Kodiak Archipelago. Even though this suggestion may be beyond the scope of CERCLA and the Clean Water Act, it is within the areas of interest of the Marine Mammal Protection Act and the Endangered Species Act.

Response: The purpose of the damage assessment is to support claims for natural resource damages arising out of the oil spill. Therefore, studies that do not support such claims are not included in the damage assessment. They may be appropriate, however, for funding outside the damage assessment process. The Trustees agree

that this study should continue this year. The study will be evaluated at the end of the field season to determine whether it should be continued next year. Whale studies off Kodiak have been included this year, as suggested by the reviewer.

Comment: The value of line transect surveys and photo-identification methods of population census is questionable.

Response: Photo-identification methods have been used to estimate population size and recruitment. Line transect surveys were not conducted.

MARINE MAMMALS STUDY NO. 2

Comment: It is questionable whether this study is capable of determining whether observed changes in distribution or behavior of whales can be ascribed to the oil spill.

Response: If an overt change occurs in the abundance, distribution or other life history parameters of the whales, it is believed that a determination of cause/effect relationships can be made. If subtle changes take place, it may be more difficult to evaluate cause/effect relationships.

Comment: This study should be coordinated with related habitat and prey studies to assess whether the oil spill has caused observed changes in distribution or behavior.

Response: The findings from this study will be coordinated with those from other related studies.

Comment: Additional observations should be made in the spring and summer of 1990 to determine the effects of cleanup activities.

Response: This study will be continued in 1990. See current plan.

Comment: Studies of sublethal impacts of oil should be conducted on captive animals.

Response: Measuring the effects of oil on captive animals would require that they be injured or sacrificed. This approach would involve suffering of the animals and would be highly unpopular. Some non-injurious approaches using captive animals are currently being considered.

Comment: Additional study of the effects on killer whales of contamination of habitat and food chain through such methods as biopsy or analysis for toxicants is appropriate.

Response: This is being carried out by related studies in the plan. No whales are being sacrificed for biopsies.

Comment: The use of aerial surveys to determine population parameters is questionable.

Response: This study does not rely on aerial surveys. Past population levels of killer whales in PWS have been obtained through photo-identification techniques. Therefore, this study will emply the photo-identification methods so that a comparison can be made against existing data.

Comment: The scope of the study area should be expanded to include Kodiak because of movement of killer whales between Kodiak and Prince William Sound.

Response: Studies were conducted off Kodiak in 1989. Additional work off Kodiak is planned during the 1990 season.

Comment: Objectives C and D of Marine Mammals Study No. 2 are not feasible without long-term studies and sampling studies using biopsy techniques, DNA biomarking, and analysis for environmental toxicants.

Response: Other approaches using photo-identification of pod structure, behavioral observations and examination of stranded animals may also provide this information.

MARINE MAMMAL STUDY NO. 4

Comment: This study should also have an objective of determining whether observed changes in distribution, abundance, behavior, or productivity may have been caused by spill-related changes in the availability of preferred prey species.

Response: If F/S studies that will be providing information on prey find significant impacts, alteration to incorporate more detailed work on prey items will be considered.

Comment: It would be useful to specify the fish and shellfish studies that are expected to provide information on the effects of the spill and related containment and cleanup operations on sea lion prey species.

Response: This would be useful information and will be considered for inclusion in the next revision of the study plan.

Comment: Without several years of study, the effects of the spill on sea lions will not be apparent.

Response: This study will be conducted in 1990 and evaluated during the winter of 1990-91 for possible future continuation.

Comment: It is not valid to use aerial photography of use of sea lion haul-outs and rookeries because they yield point-in-time

counts only and the number of sea lions using any particular haul-out may vary greatly hourly.

Response: Counts using aerial photography were discontinued.

Comment: The study description inadequately describes methods and analyses including methods for measuring premature birth rates, methods for estimating pup production, methods for relating pup production to the impact of the spill, and the statistical design of the study such as the number of sites and the methods for assessing the precision and accuracy of the data collected by the photo surveys.

Response: See the study plan for 1990.

Comment: None of the pup mortalities can be attributed to the oil spill without the benefit of direct observation of the death and the immediate necropsy of the carcass.

Response: All mortalities that are observed will be examined and samples taken for hydrocarbon analysis and histopathology.

Comment: The study description does not indicate the size and adequacy of the "before" data existing on sea l ons.

Response: See the study plan for 1990.

Comments: How will effects of a pre-spill population decline be separated from the effects of oil contamination? Trustees should be careful of dismissing a reduction in numbers as the continuation of the trend rather than as a result of the spill. It will not be possible to determine the effects of the oil spill on the sea lion population in the northern gulf since little is known about their population dynamics and the continued decline in pupping found as a result of this study cannot be attributed to the spill since sea lions already are in a state of decline.

Response: Estimation of changes in total numbers is not an objective of this study. The decline in pupping that is expected from historical data will be modelled. The 1990 counts will then be tested to determine whether they are significantly lower than predicted by the historical model.

MARINE MAMMAL STUDY NO. 5

Comment: The study should also state an objective of determining whether observed changes in the distribution, abundance, or productivity of harbor seals may have been due to spill-related changes in food availability.

Response: If F/S studies that will be providing information on prey find significant impacts, alteration to incorporate more detailed work on prey items will be considered.

Comment: The study description should specify which studies are expected to provide information on the effects of the oil spill and cleanup operations on harbor seal prey species (28-18).

Response: This would be useful information and will be considered for inclusion in the next revision of the study plan.

Comment: The harbor seal and sea lion studies are essential in light of the declining harbor seal populations in western Prince William Sound. Several years of study are necessary to determine the effects of the spill on these long-lived animals.

Response: This study will be continued in 1990, and the results evaluated during the winter of 1990-91 for possible continuation beyond 1990.

Comment: It is not clear how the researchers will be able to distinguish the effects of the spill from other factors that have been causing the recent sharp decline in the harbor seal population. It will not be possible to attribute to the oil spill any additional decline in the numbers of harbor seals counted in 1989 given the recent decline in the number of seals. With the methods proposed in this study, it will not be possible to evaluate the effects of the spill on harbor seal distribution at haulouts, although there may be changes in distribution at haulouts, it will not be possible to ascribe that change either to the spilled oil or to other factors. The Trustee should be careful of dismissing a reduction in numbers as the continuation of this trend rather than as a result of the spill.

Response: The expected decline will be modelled using historical data, and counts in 1989 and 1990 will be tested to determine if they are significantly lower than predicted by the historical model. The objective of evaluating effects of the spill on distribution of harbor seals has been deleted from the study.

Comment: The study description provides no information on the statistical validity of the shoreline surveys. For example, there is no description of the number of sites, the location of sites sampled, the number of replicates obtained or the sampling design.

Response: See the study plan for 1990.

MARINE MAMMAL STUDIES NOS. 6 & 7

Comment: The study will not address the proportion of sea otter carcasses that were actually recovered after the spill relative to

the total mortality, the study may have underestimated the number of otters affected.

Response: In regard to carcass recovery, the agency has added an additional component, looking at drift and recovery of simulated carcasses, to the Year 2 study to gain insight into this question. The boat surveys reported in the first year damage assessment report included analysis of shoreline data only, due to time constraints. Revised analysis including offshore information is now available.

Comment: Cleanup operations, in addition to the spilled oil, could have adverse affects on the otters.

Response: The study participants will have records on cleanup operations for the different beach segments, and will take these into account in interpretation of results. Future boat surveys will look at the recovery of specific shoreline segments. Relationship between severity of beach oiling and cleanup operations with rate of recovery will be addressed at that time.

Comment: Instrumentation and handling of sea otters is inappropriate, represents harassment of the animals, and will not lead to meaningful results.

Response: The capture and surgery does mean that sea otters are subjected to additional stress. However, available data indicate that this stress has no long-term effects on either the survival or the reproduction of the implanted females. For example, of 58 sea otters implanted in eastern Prince William Sound in 1987, annual survival rate was 98%, which is extremely high for wild animals. Sea otters in Prince William Sound now provide a unique opportunity to evaluate acute and chronic effects of oil, both on individuals and on the overall population. The risk to the animals in the present study is not great, and is justifiable in order to assess damage from the oil and determine future contingency plans. Implantation of radio transmitters is necessary as this is the only way to keep track of individual animals over long periods of time (transmitters should function for almost three years). It is difficult, if not impossible, to continuously study individual animals otherwise, as sea otters are known to move and at times can cover relatively large geographical areas. To obtain estimates of survival and reproduction, repeated observations of individuals must be made. Color-coded flipper tags would be a less invasive way of identifying individual animals, but given the large areas involved, tracking individual animals by flipper tags would be extremely difficult. The same information on survival and reproduction could not be obtained by flipper tags alone. To insure the safest handling of the otters, the nets are checked at least hourly during capture (more frequently than is required by the USFWS Permit Office). If animals show obvious signs of stress or are not in optimal condition, they are released immediately.

Animals that are held are placed in covered kennels and kept in a quiet area until surgery. If animals are held for more than a few hours, they are provided with food. Captures are done by an experienced crew, and surgeries are performed only by a veterinarian approved by the USFWS Permit Office. When capturing pups, abandonment by the female is a concern. To avoid this, the female and pup are usually both caught and the female held until they are released together. When only the pup is caught, the capture crew is extremely careful about making sure the female stays in sight, and recordings of pup calls are played back, to keep the female close by. Pups are not captured in male areas, as males can distract the female while the pup is held. Females are palpated for pregnancy prior to surgery, and if a fetus is detected, the female is released without surgery. The surgical and drug protocols are time tested, and surgery is as near to sterile as field conditions allow. Infections or adhesions resulting from surgery have not been noted to be a problem in any of the telemetry studies to date (including the 1987 study).

Comment: There is a discrepancy between numbers of otters to be instrumented under the permit and the numbers listed in the study plan. There is no explanation of the need to handle and instrument so many sea otters.

Response: In the permit, the agency requested a take of 650 otters in order to obtain a total of 275 animals in optimum condition and of the correct sex/age classes for instrumentation. The agency does not plan to instrument more than 275 otters for this study, and in fact the final number implanted in the wild will likely be very close to 200. Many of the animals caught are released immediately (e.g., younger pups are not instrumented but released upon capture). Instrumented animals will not be repeatedly captured, as this is not the intent of the study. Some incidental recapture of previously handled animals may occur. The study calls for 50 otters in each group (females and pups, east and west), which is the minimum sample size required to obtain statistically significant differences in survival and pupping rates, using commonly accepted levels of significance for wildlife studies.

Comment: The monitoring of the instrumented sea otters must be at a high level.

Response: The quality of the study will depend on the frequency of monitoring of the instrumented otters, and the agency will track as frequently as possible. Some limitations will be imposed by the large area in which the otters may move and by severe weather in winter months. The agency plans to coordinate flying efforts between those two studies to increase the efficiency of radio-tracking.

Comment: There is no indication that the other assessment studies on prey species (shellfish, fish, etc.) would be evaluated in light of the sea otter studies.

Response: The results of assessment studies will be reviewed to evaluate how injury to sea otter prey species may affect sea otters.

Comment: These two studies overlap and duplicate earlier work.

Response: The animals in these two studies represent very different groups, given that those in the M/M Study No. 7 have been through oiling, capture, long-term holding and handling. Their clinical histories and capture locations are known. Monitoring these animals after release should provide extremely valuable information regarding the rehabilitation effort, and therefore this study is critical in terms of future management and oil spill contingency planning. However, the sea otters from the rescue centers are not representative of sea otters in the wild, and the NRDA process must examine wild populations living in areas affected by oil as well as the rehabilitated otters. Thus M/M Study No. 6 is also an essential study. Sea otters studied in an earlier (1987) project in PWS were located in the eastern part of the Sound, and were not exposed to oil.

Comment: There is a lack of detail regarding the statistical design.

Response: The statistical design was reviewed, evaluated and modified to assure statistical validity. The 1990 study plans reflect those comments.

Comment: There is no indication whether these studies are applicable to the restoration process.

Response: The data obtained in the sea otter NRDA studies will be combined with information on carcasses recovered in the oil spill zone and data from previous studies on otters in PWS to construct a population model. From this, a prediction of recovery rate of the population to pre-spill levels will be made. Monitoring of the sea otters and the quality of their habitat in PWS will be required to document the natural recovery process. Options for restoration for injuries to sea otters are being developed through the restoration planning process which includes public input and technical workshops. Addition information on level and type of injuries will be instrumental in sea otter restoration planning.

TERRESTRIAL MAMMALS

TERRESTRIAL MAMMALS COMMENTS

Comment: The terrestrial mammals injury assessment program fails to consider that the only feasible restoration of terrestrial mammal resources beyond immediate shoreline cleanup is natural recovery.

Response: Natural recovery is not the only possible approach to restoration. Alternatives could include: harvest management, transplants, artificial propagation, and protection and enhancement of critical habitats. These and other alternative restoration measures will be considered, as appropriate.

Comment: It is unlikely that the population studies of terrestrial mammals can demonstrate any spill-related injury, and that the methodologies described are incapable of establishing any exposure pathway. Therefore, the studies do not appear to be necessary or cost-effective.

Response: The terrestrial mammals chosen for intensive study were those judged by experts as likely to have sustained injury from the spill. Pathways for hydrocarbon exposure will be established by studies of prey contamination and through examination of tissues in dead and collected animals.

Comment: There are inadequate descriptions of the statistical analyses employed in the terrestrial mammal studies, and it is impossible to evaluate whether any results will be statistically significant.

Response: Public review study plans prepared for 1990 provide descriptions of statistical analyses.

Comment: Many mammals may have been affected by the oil spill, for which there are no injury determination studies, and, to fulfill their trust obligations the trustees must determine short- and long-term injury to all terrestrial mammals. The assessment plan should specify how injury to all mammals potentially affected will be determined.

Response: Terrestrial mammal species chosen for study were those judged by experts as most likely to have sustained injury and expected to provide indications of injuries to other related species.

Comment: There is so little money funded for these studies that it is likely that little effect will be detected.

Response: The most important factor influencing the likelihood of detecting an effect is the quality of study design. The studies were carefully considered with appropriate design a paramount consideration.

Comment: The study plan does not discuss studies of sublethal effects or methods of coordination among terrestrial mammals studies and with economics and restoration studies.

Response: Selection of terrestrial mammal species for study was based upon value to humans, likelihood of impact from oil, ability to identify and quantify injury, and ability to extrapolate information to species not selected for study. Sublethal impacts are a major portion of river otter, bear and mink studies. All three studies will look at impacts on reproduction, and the river otter study will also assess habitat use activity patterns and food habits. Coordination is being accomplished through frequent communications among investigators and meetings with economists and restoration planners, facilitated by administrative changes in the damage assessment program.

TERRESTRIAL MAMMAL STUDY NO. 1

Comment: Since no pathway of exposure to the spilled oil has been established, this study is not pertinent to the NRDA process and should not be included.

Response: The potential pathway of exposure is direct contact with oil or ingestion of contaminated food when deer are present in the intertidal zone. The greatest potential for exposure exists in late winter when deer commonly concentrate in this zone.

Comment: The timing and location (i.e., islands) of transect sampling for deer carcasses are not described.

Response: See study plans for 1990.

Comment: The use of only one affected island and one control island will limit the applicability of study results to other areas.

Response: Expansion to additional sites will be considered if evidence of mortality due to oil is found.

Comment: The current design of this study does not indicate whether the deer collected for tissue hydrocarbon analysis were exposed to oil since deer are not usually in the affected habitat (tidal areas) during August. Therefore, the study will be unable to demonstrate a clear cause and effect relationship.

Response: Deer use intertidal areas at all times of year. They will be collected on or near oiled beaches. It is reasonable to assume that abnormal concentrations of hydrocarbons in tissue are an indication of exposure to oil.

Comment: The need to determine the number of dead deer with rumen contents in the lungs is not explained.

Response: Small to moderate amounts of crude oil consumed by deer and other ruminants may cause direct mortality due to disruption of

the rumen fermentation process and aspiration of rumen fluid into the lungs.

TERRESTRIAL MAMMAL STUDY NO. 2

Comment: There are too many variables to be able to attribute a decline of black bear populations due to adverse changes in viability resulting from oil contamination. These include differences in habitat, food habits and population dynamics (especially dispersal) among oiled and control areas. The study description provides no statistical basis for inferring changes in the black bear population from a population model and no information on the sensitivity of the model to initial input conditions, nor is there information on the accuracy and precision of the model predictions. The Kenai Peninsula mainland cannot be used as a control area because habitats there are not comparable to habitats in oiled areas of Prince William Sound.

Response: This study was not implemented as described in the 1989 public review draft. For 1990, it will include a literature review only.

TERRESTRIAL MAMMAL STUDY NO. 3

Comment: The sampling procedures used in this study will likely result in more mortalities in these species than have been recorded as spill-related, and river otters and minks should be studied only if there is convincing evidence that they were exposed to oil and were injury.

Response: Spill-related mortality among these species is largely unquantified. However, significant impact is likely because of concentration of oil in intertidal areas where these animals feed. Collections are a necessary step in establishing exposure to oil.

Comment: The study plan does not describe specific sites, only general areas, of sample and control locations and there is no description of whether there is one site per area or several sites per area. Also, it is unclear whether Kenai and the Alaska Peninsula will be treated in the same way as sites closer to the spill.

Response: See study plans for 1990.

Comment: The objectives of determining mortality, documenting declines in populations, and determining changes in distribution and food habits in oiled and unoiled areas are not achievable because of the lack of baseline data.

Response: These objectives will be achieved by comparing oiled with non-oiled study sites. Certainly, availability of baseline data would be desirable. However, it is not considered essential to complete the damage assessment.

TERRESTRIAL MAMMAL STUDY NO. 4

Comment: The study description provides no statistical basis for comparing brown bear mortality, abundance or productivity between oiled and non-oiled areas, given that an inherent problem with monitoring programs such as this is an inability to detect statistically significant differences between natural effects and those resulting from man.

Response: See study plan for 1990.

Comment: The study description is insufficient to determine the validity of the study design. For example, it appears that there is no study of a non-oiled site for brown bear mortality, abundance, or productivity to be used as a control. Also, there is insufficient information on sample design and whether replicate samples will be obtained.

Response: See the study plan for 1990.

Comment: Mortality and productivity of brown bears in the oil-affected area and control area cannot be compared since habitat use and population characteristics of bears in two areas are likely dissimilar.

Response: The oiled and non-oiled study sites were chosen because of habitat and population similarities. Comparison of mortality and productivity to assess damage is therefore appropriate.

TERRESTRIAL MAMMAL STUDY NO. 6

Comment: This study is not cost-effective because 1) there is no justification for a two-year feeding program since there is no environmental scenario which a two-year study would mimic, and 2) minks' delayed implantation may not be representative of typical mammalian reproductive biology.

Response: An extended program is justified because oil is expected to persist for several years in the intertidal areas where mink feed. It therefore may contaminate food chains, be ingested, and potentially impact reproduction. Findings of this study will have direct application to the identification of injury to wild mink, as well as other mammals that have similar reproductive biology (including otter and bears).

Comment: This study cannot be justified unless there is accurate information available on the amount and condition of oil ingested by minks during the spill.

Response: The amount of oil ingested by wild mink will be estimated by determining hydrocarbon levels in tissue and bile and by measuring the contamination of food items.

Comment: Mammals in affected areas have been exposed to oil that has weathered over time; each stage of reproduction, therefore, has

not been affected by oil with the same characteristics, and the study description does not discuss differences in comparisons using weathered oil rather than fresh oil.

Response: Weathered oil will be used in this study.

Comment: There is no description of types of statistical analyses or of criteria for determining numbers of replicates overall (or even by type of assay to be completed).

Response: See the study plan for 1990.

BIRD

BIRD STUDIES COMMENTS

Comment: Bird study budgets appear to be insufficient given the number of bird tissue samples to be taken.

Response: Funds for hydrocarbon analysis for all damage assessment studies are allocated to T/S No. 1, Hydrocarbon Analysis. The bird study budgets, therefore, do not include funds to cover analytical costs.

Comment: Prior relevant research is not referred to in the background or objectives sections of the bird studies and should have been taken into account in designing these studies.

Response: Previous research factored significantly into the development of the bird study plans. The 1990 NRDA plan provides additional information and bibliographies to more fully inform the public of some of the prior research that was reviewed and considered in the development of these study plans.

Comment: The counting and collection of eggs, chicks and adults and performance of necropsies on dead specimens during nesting season is undesirable and will be conducted without proper control experiments.

Response: The Trustees recognize that some of the activities conducted during the NRDA process may result in some additional disturbance to wildlife. However, it is essential that this work be carried out to enable the Trustees to assess, as thoroughly as possible, the scope of injury to trust resources. Therefore it is essential that counts and collections of eggs, chicks, and specimens be carried out as described in the study plans. Every effort has been made to reduce further impact on wildlife species.

Comment: The tone of the Plan evinces a prejudice on the part of the authors about the results of the bird studies. Studies should continue for more than one year; dead birds should be examined for causes of death other than oil; pre-existing data should be used to assess reduced hatchability, decreased reproductive success and the delay of onset of breeding and decreased fertility of eggs rather than invasion of nesting sites; non-invasive measurement of control groups in local areas not affected by the spill should be undertaken instead.

Response: The intention of the Trustees was to outline studies needed to assess damages. In response to information needs and recommendations of the principal investigators, reviewers, and the public, seven of the bird studies are continued this year. Dead birds are being examined to determine, when possible, if causes other than oil caused death. Reduced hatchability will be assessed from various studies, including, but not limited to preexisting data. Appropriate control groups have been selected to increase

the accuracy of study results.

Comment: Methods for application of the bird study results to assessment of economic damage are poorly elaborated.

Response: The economics study team is in the process of developing a mechanism to apply the results of the bird studies, as well as the other NRDA studies, to assess economic damages. Various alternatives will be developed. It is not possible to elaborate more fully on that process at this time. Selection of an appreciate mechanism will occur after data on injury are available.

Comment: The studies will not address all injuries to all bird species potentially affected by the spill and the injury to be identified is too limited.

Response: The NRDA process is not intended to address all injuries to all species of birds potentially affected by the oil spill. The selection of the studies evolved from recommendations from knowledgeable scientists regarding species that were likely to have been significantly injured as a result of the spill. In addition, an effort was made to include representative species from which data could be extrapolated to a wider population of birds. The added benefit of attempting to identify specifically all injuries to all affected species of birds likely would not be cost-effective. Injury data will be used to estimate the period of time necessary for recovery of the species and will be synthesized into the restoration planning process as well as into the economic valuation process to determine an appropriate use value. Some data collected during the 1989 and 1990 oil spill years may indicate sublethal impacts such as the success of reproductive (clutch size, fledgling success). Consideration was given to conducting additional studies to identify sublethal impacts, however, the Trustees determined that the cost and feasibility of such studies weighed against the incorporation of such studies in the plan and that adequate evidence exists for determining injury. It was determined that refining estimates of active mortality (for example, B/S No. 1) and identifying impacts of colony population would provide more reliable and useful information in determining injury.

Comment: There is insufficient detail concerning the methods of restoring bird populations and habitat.

Response: Before effective restoration strategies can be identified, it is necessary to determine the extent of the injury. Based upon data collected from the 1989 season, the 1990 plan identifies possible restoration projects. Restoration projects require long-term planning and extensive data -- which were not available at the time the 1989 plan was published.

Comment: More information is needed regarding the qualifications

of the personnel conducting the studies.

Response: The principle investigators have been selected because they were qualified in both of two categories: 1) They have worked for a number of years in Alaska specifically with the species concerned with their project, and have published and presented their results in professional meetings, journals, and other venues. 2) They worked for either a federal or state wildlife agency and could therefore be put into the field at very short notice (a few weeks). Listing the qualifications of the personnel used in connection with the NRDA studies is irrelevant to the quality review of the studies. The 1990 study plans provide greater detail on the methodologies of the studies, which allow a better evaluation of the individual studies.

BIRD STUDY #1

Comment: Bird Study No. 1 does not explain how the "minimum mortality" will be used to estimate the "overall mortality" of waterbirds.

Response: The minimum mortality is the total body count. The purpose of bird study number 1 is to improve the accuracy of the estimate of total bird mortality by factoring in the ratio of birds recovered to the ratio lost by drift, sinking, scavenging, unsearched shorelines and failure to find. Results of field trials and information from last year's search efforts will be modelled to narrow the range of mortality estimates.

Comment: There is a lack of detail and inadequate presentation of the study proposal in the NRDA Plan. Concerns regarding methods, statistical reliability, confidence limits, sample sizes, and utilization of prior research were repeatedly mentioned.

Response: These concerns have been addressed in the 1990 Plan.

Comment: Objective A cannot be differentiated from objective B.

Response: Objective A refers specifically to total numbers of dead birds reported to all of the receiving stations. This number would have included birds collected by other agencies, State and Federal, and Exxon. Objective B refers to the number of dead birds picked up in standardized Beached Bird Surveys conducted by the FWS.

Comment: This study's use of the terms "mortality", "lost use" and "habitat" is unclear.

Response: Unless referred to as overall mortality, the term mortality is used to define fractions of the total number of birds which may have died as a result of the EVOS. "Lost use" refers to a loss of use of the defined resource by the public. Loss of habitat refers to a loss of the use of the defined habitat by

animal species.

Comment: The term "appropriate numbers" of beaches needs to be clarified.

Response: This term refers to selection of a statistically valid sample size.

Comment: Care needs to be exercised in the interpretation of drift experiments because confidence limits in the proportion of birds reaching the beaches will be large and vary seasonally.

Response: The 1989 drift experiment was considered a "pilot" project designed to gain insight into the statistical and logistical requirements of a large-scale drift project. These concerns have been incorporated into a drift study proposal for the 1990 field season.

Comment: It is unclear whether objectives A and B integrate data collected by Exxon boats.

Response: Birds collected by the Exxon fleets were turned in to receiving centers and were included in numbers of dead and dying birds reported by the FWS.

Comment: It is not clear whether there is adequate information on the historical beached bird survey efforts to draw accurate conclusions, as stated in objective D.

Response: This was unknown at the time the plan was written. After examination of the historical beached-bird data, it was shown to be inadequate to meet objective D and this objective was deleted from further consideration.

Comment: A single season of observations immediately after the spill will be inadequate to meet objective E.

Response: The 1990 study plan indicates that a longer study period is being considered.

Comment: Objective E, which is to calculate overall mortality in conjunction with bird population surveys and seabird colony censuses, presents the possibility that the external influences of these other studies will dictate correction factors and any mortality estimates will be nothing more than rough approximations.

Response: Objective E was rewritten to include consideration of numerous other variables in an overall estimate of mortality. It is agreed that present figures quoted as figures of overall mortality are considered preliminary estimates and require further study and analysis.

BIRD STUDY NO. #2

Comment: Bird Studies Nos. 2 and 3 rely on pre- and post-spill surveys for which adequate control sites may be difficult to establish. Instead, to determine cause and effect, these studies should incorporate chromatographic verification of petroleum contamination, gross pathology, histopathology and enzyme assays.

Response: Bird Studies Nos. 2 and 3 are not relying exclusively on pre- and post- spill surveys, but are also assessing results from other studies outside the spill zone that will serve as additional controls. Dead birds archived in frozen storage will be examined to provide additional information on petroleum contamination. Samples taken from fresh bird carcasses last year and from fresh bird carcasses that may be found this year will receive thorough necropsy examination and toxicological and histopathological analyses.

Comment: Blood smears should be taken from apparently healthy birds in B/S Nos. 2 and 3 to examine whether red blood cells exhibit lesions characteristic of hemolytic anemia induced by oil ingestion; collection of liver samples from sick and dying birds and liquid nitrogen assays to ascertain aryl hydrocarbon hydrogenase activity and other mixed-function oxygenase enzymes.

Response: Collection of hematological and liver samples were not part of the objectives of B/S Nos. 2 and 3 which surveyed birds along aerial and boat transects and censused seabird colonies, respectively. Blood samples taken from birds in the recovery centers have been analyzed. In addition, blood samples taken from bald eagles are being analyzed. Liver samples collected from shorebirds and from birds in the recovery center are in frozen storage.

Comment: There is not enough information available on the survey methods to be used in this study.

Response: The aerial survey portion of this combined air/boat Migratory Bird Population Distribution and Abundance Study was designed to determine whether differences in migratory bird population distribution and abundance could be found between historical (1971 survey by Haddock) and the 1989 oil spill year. Aerial surveys began immediately after the spill (within four days) and continued just ahead of the spreading oil. These data, along with later surveys during July and October, were compared in order to determine whether the oil spill caused a major decline in any of the migratory bird species or caused disruption of the normal use of oiled shorelines and nearshore waters by migratory birds.

This survey was designed as an index to migratory bird populations and was not designed to provide a total population of the study

area. The entire coastline in the study area was surveyed during March, May, and July. More than 80% of the shoreline was covered during the October survey which was cut short because of inclement weather. Two partial surveys of the shorelines being affected by the spreading oil were completed on April 8, 1989 and again on April 20, 1989.

This survey was intended only as a population index which covered the entire shoreline of the study area. It was not a survey of selected sample areas that would then be extrapolated to the total population of the survey area; therefore, statistical testing was not required. There were no "new" aerial survey techniques used during these surveys. All surveys employed time-proven, standardized aerial survey techniques used throughout the FWS for surveying migratory bird populations.

Haddock's survey of 1971 is the only baseline data available. That survey was done using the same methodology as the 1989 surveys, making the data reasonably comparable. Survey dates for the 1989 surveys were selected to coincide with the approximate dates of the 1971 surveys conducted by Haddock. Oceanographic factors were not integrated into the study design as the survey was designed to closely follow the timing and methods used during that historical survey of 1971.

Comment: Whether recovery rates will be observed accurately is questionable.

Response: Recovery rates cannot be accurately determined following the first year of the study (Objective C). These surveys may be continued for a number of years following the spill in order to identify any residual large scale effects to migratory bird populations and distribution caused by the oil spill. The aerial portion of the combined air/boat study plan did not consider the possibility that age of first breeding would be affected if a large proportion of adults died in 1989.

Comment: The methods of the study were "too briefly presented."

Response: More detail regarding methods is provided in the 1990 plan. Four surveys per year were conducted based on normal seasonal migration of waterfowl and waterbirds. The summer survey was conducted during late July and early August; the fall survey during early October; winter survey during late February and spring survey during May.

Weather parameters for each survey were restricted to a minimum 1,500 ft ceilings, 10 miles horizontal visibility and surface winds of 15 kts or less.

A total of four aircraft, three single-engine, fixed wing and one multi-engine amphibious aircraft were used for the survey in order

to complete the survey within a reasonable time period when fair weather could be expected. The fixed wing aircraft contained one pilot and one observer in a side-by-side seating arrangement. The multi-engine amphibious aircraft contained at least one pilot and two observers, one observer seated in the right seat beside the pilot and one seated on the pilot's side of the aircraft.

Single-engine aircraft were used for the shoreline surveys and near shore pelagic surveys. The multi-engine amphibious aircraft were used for pelagic surveys and a few shoreline surveys on distant islands where extended over-water flights were necessary to reach the survey area.

All single-engine, fixed-wing aircraft were configured for float operations. The aircraft were flown at approximately 150 ft above water level and 200 meters off shore, following the shoreline as closely as possible given the aircraft's capabilities, and maintaining an airspeed of 95 - 100 mph. The pilot recorded all birds and sea mammals observed within a 200 meter space out the left side of the aircraft. The observer was responsible for recording all observations within that 200 meter distance between the aircraft and the shoreline, including the immediate shoreline. Date, beginning and ending time of the survey, environmental variables, i.e. wind speed and direction, air temperature, cloud cover and type, ceilings and visibility were recorded for each survey date. Times were recorded on (or about on the hour) throughout each day's survey.

Comment: The planning horizon for these studies should be on the order of a decade rather than a year, and there was a lack of synthesis among studies.

Response: These concerns will be corrected in the 1990 plan by providing more detail. A mechanism is in place to share data among studies and to evaluate how the various studies might aid each other and avoid duplication.

Comment: The objective "Identify potential alternative methods and strategies for restoration of lost use, populations, or habitat where injury is identified" appeared in all proposals without further reference.

Response: This objective has been amended in the 1990 proposal for B/S No. 2. Restoration methods will be addressed after additional data is available to evaluate injury to bird species.

Comment: The budgets were unreasonable.

Response: Apparently, reviewers expected "travel" to include travel within the PWS, whereas, at least in B/S No. 2, it refers only to travel to and from the field. Travel costs within the Sound are contained in other categories, including contracts,

supplies and equipment.

Comment: The study should integrate the impacts of oceanographic factors that may have affected seabird distribution and abundance in 1989?

Response: Trustees cannot control such factors, but have attempted to limit their effects on population estimates with an adequate sample size, and by conducting the surveys three times during the summer in PWS. Such repeated sampling was not logistically possible on the KP or in Kodiak Island waters.

Comment: There is no identification of the baseline data to be used in Objective B.

Response: There are data from surveys in PWS in 1972, 1984 and 1985. There have been annual surveys in Kodiak Island waters for 10 years. These surveys do serve as an index to which post-spill data can be compared.

Comment: It will not be possible to determine recovery rates after one season, (and indeed, this may take years). The study design should take into account the possibility that age of first breeding will be affected if a large proportion of adults died in 1989?

Response: The best study design to account for all long-term effects is to conduct the surveys over several years.

Comment: This study and other similar studies appear to be research- oriented and unnecessary to assess natural resource damages as required by NRDA regulations?

Response: Trustees have determined that estimating populations of animals after the spill, and comparing these estimates to previous estimates, is necessary to assess damages and is not research oriented.

Comment: Insufficient information has been provided to evaluate whether this study can determine that any reduction observed in oiled areas represents actual mortality or simply movement out of the area.

Response: This study does not attempt to differentiate between mortality and movement out of the area. In any event, either eventuality might be a result of the spill, and thus considered injury.

Comment: The statistical treatment of the data provided in this study is inadequate.

Response: The 1990 study plan was written so as to avoid this criticism. The sampling design (random selection of transect

locations), sample size (i.e. number of transects) and analytical methods were determined using accepted statistical methods.

Comment: Due to the heterogeneity of the natural environment, it is difficult to make valid comparisons between oiled and non-oiled areas with a given year.

Response: One way to mitigate this problem is to use historical data. One can then ask whether a decline from pre-spill to post-spill years in the oiled area is also found in the non-oiled area.

BIRD STUDY NO. 3

Comment: There is need for multi-year work and there are problems associated with the brevity of a two-page proposal or plan.

Response: The 1990 Plan provides for a possible multi-year approach and a more detailed proposal of the study. This allows for a greater understanding of the actions to be taken and greater detail on the experimental and analytical methodology, a geographic scope, and statistical validity of this study.

Comment: Part A of objectives could not be performed without at least a 1990 census.

Response: If the change in population is large enough, a one year series of census may be informative and provide appropriate baseline data. Additional censuses are provided for in the 1990 plan.

Comment: The planning horizon should be a decade, not a year. This was not a "fascination for long-term research," but rather a recognition that the population effects must be dealt with on a time scale consistent with the generation time of the organism under consideration--hence the need for multi-year study projects.

Response: This is correct. As indicated in the 1990 plan, most, and maybe all, questions may need more than one year to find answers.

Comment: There is a lack of specific details concerning census methodology.

Response: The more detailed study plans for 1990 have additional information concerning census methods and data analysis.

Comment: Other control sites, such as Middleton Island, should be used rather than "non-oiled" colonies in PWS, as these colonies could also be suffering various, less obvious effects from the spill.

Response: Although not mentioned in the original study plan, the

agency did include data from 1989 work on Middleton Island murres in the February 1990 report. The results there paralleled those observed on the other control, the Semidi Islands. The Semidi Islands were chosen as a control site because they are located farther from the oil than the colonies in PWS, but not so distant as to be unrelated to the same food and biological factors controlling reproduction. Additionally, baseline data from the Semidi Islands is available for certain seabird species in the GOA.

Comment: The possibility exists that birds from non-oiled colonies are being exposed to and affected by oil on their staging or winter habitats, thus confusing comparisons between non-oiled and oiled colony sites.

Response: Ordinarily, this would be a valid concern for seabirds. However, the EVOS was kept relatively close to the shore by wind and current and impacted the winter and staging/migration ranges of seaducks, loons, and those diving seabird species that were present at colony sites (primarily murres). This is one of the reasons that the murres on Gull Island were not used as a control, because the flocks of murres in the vicinity of the Barren Islands may have contained some from other nearby colonies not directly in the spill's path. Murres tend to gather close to colony sites on the water in April and hence the Semedi Islands murres were probably the least likely of our control study sites to be compromised in this fashion.

Comment: The choice of study species is incorrect. Some burrowing alcid, such as Tufted Puffin, should have also been included.

Response: Some burrowing alcid (Pigeon Guillemot) and burrowing procellarid (Fork-tailed Storm-Petrel) species were examined along with the cliff nesting species. Bird Study No. 7 examined storm-petrels and evaluated changes in burrow occupancy. While the colony study (#3) did census pigeon guillemots in some areas, B/S No. 9 covers this species best at the one site where an excellent baseline exists. Over the whole range of the colonies affected by the spill, the examination of the species composition of the 30,000 dead birds recovered before August 1 showed that puffins constituted 0.9 per cent of the total while murres composed 73.7 per cent. There was a surge of immature puffins that died and were collected between August 1 and October 13, 1989. Since all species could not be evaluated, the Trustees chose species demonstrating the most likely effects (morgue) and those with the best baseline of data available (cliff nesters).

Comment: Murres are being excluded from the planned studies except for general abundance and distribution surveys.

Response: Murres do not have an intensive productivity study strictly oriented towards them because no murre colony in the oil affected area is conducive to the type of land-base observations

that this requires. However, the sites where this was possible, such as the Semedi Islands and, to a lesser degree at Puale Bay and Middleton Island, have had productivity studies done in 1989 (two by this study and one by another independent FWS group).

Comment: This study is more research oriented and not necessary to assess natural resource damages.

Response: The Trustees do not consider censuses/monitoring of cliff-nesting seabirds such as kittiwakes and murres as research. The term "research" implies that there is no general consensus of the proper techniques to census statistically these species. This comment 15 years ago would have been valid, but it is not now and this is recognized in the literature, professional societies (Pacific Seabird Group), universities, and government agencies.

Comment: This study focuses on cliff-nesters and ignores crevice- or burrow-nesters; there is an unstated assumption that cliff-nesters and burrow-nesters are affected equally by the spill.

Response: The study focused primarily on cliff-nesting seabirds for precisely the reasons discussed earlier: the methods are established, and it is not a research matter. As for the assumption mentioned, no such assumption is stated or implied in B/S No. 3. The important factor is not whether they are cliff- or burrow-nesters; rather it seems like diving birds and their presence or absence at crucial times is the key factor. So diving, burrowing, resident species like Pigeon Guillemot may have been affected negatively while a diving, burrowing puffin which had not returned to the colony until May would not. The same dichotomy could apply to cliff-nesting seabirds in terms of diving versus surface-feeding species. The species composition of the birds picked up from the beaches strongly suggest this. Any assumption underlying these studies is more likely to be based on these considerations.

Comment: Are one or two surveys conducted sometime during the previous 17 years adequate to calculate possible reductions in breeding colony sizes that can be related to oil spill effects.

Response: At least three of the study areas have been censused 6-12 years of the previous 17 years and may provide adequate information to evaluate change.

BIRD STUDY NO. 4

Comment: The study was flawed due to lack of pre-spill data.

Response: While Pre-spill data would have been helpful, it was limited. Comparable population surveys were conducted in 1979 and 1982. These benchmark surveys will provide a point of comparison.

Comment: What is the availability of data collected by Exxon?

Response: The data collected by Exxon in this study is available, but no data collected by Exxon will be used as primary data.

Comment: Is the number of surveys adequate?

Response: To clarify any misunderstanding concerning surveys, both weekly and monthly surveys were and will be conducted in 1990. The weekly surveys will be conducted over a smaller sample area while the monthly surveys will be conducted throughout the spill area. Clarifying language was added to the 1990 proposal.

Comment: There should be additional sites.

Response: The number of sites with comparable data are limited. Locations outside of Alaska will not be used due to the difficulty in demonstrating comparable habitat and ecological condition. The available data from Southeast Alaska and other coastal eagle populations will be used for comparison.

Comment: Details of some methods were not adequately supplied.

Response: More information is supplied in the 1990 plan.

Comment: Methods identified in the study may cause changes in behavior.

Response: Identical methods are used in experimental (oiled area) and control (non-oiled area) populations. Methodologies are standard field practice and unlikely to cause the differences observed between oiled and non-oiled areas.

Comment: Contaminants should be identified.

Response: The contaminants are hydrocarbons found in crude oil, heavy metals indicative of Prudhoe Bay Crude Oil (particularly vanadium and nickel), and other contaminants often found in birds of prey that may be responsible for the observed effects, but not from the spill (DDE, PCB's, and others).

BIRD STUDY NO. 5

Comment: This is a well planned study but preliminary data suggest that few peregrines were present in PWS in 1989 which may prevent completion of parts of this study.

Response: An adequate number of peregrines were present in 1989 to allow collection of data on most parts of this study.

Comment: A survey will have to be done in 1990 to determine whether more than two peregrines still exist in PWS.

Response: Surveys are planned for 1990.

Comment: Chlorinated hydrocarbons should be examined closely with the overall objective of determining which contaminants are responsible if reproductive failures do occur.

Response: Eggs will be collected and analyzed for presence of organochlorine pesticides to assess their possible role in any reproductive failure. See the 1990 study plan for details.

Comment: A small sample of fat should be taken from adults of the species since blood reflects only the contaminants consumed within the last few days, whereas fat reflects the contaminants that have been stored over months or years.

Response: Collection of fat samples was rejected because it is too intrusive and because no baseline data are available in the literature for comparison.

Comment: The information from this study is only marginally important to either damage assessment or recovery and since few of the raptors recovered after the spill were falcons and a substantial raptor study also exists. This study is not necessary or reasonable.

Response: The low recovery rate of falcons may have occurred because the birds died in locations other than on beaches where they likely would be discovered. Studies on other raptors will not provide direct information about impacts on this species.

Comment: It is impossible to determine from the study description if (a) standard and widely accepted methods are employed, (b) possible biases are accounted for, (c) surveys accurately represent assessment areas, (d) possible errors in scaling results are accounted for, and (e) results are statistically valid.

Response: See the study plan for 1990.

Comment: This study inappropriately evaluates new "suspected nesting territories" on which no historical data are available; it further uses new methods, such as helicopter surveys, rather than boats as used in previous surveys making any historical comparisons scientifically invalid.

Response: The study will not rely heavily upon historical comparisons within the study area because very little historical data are available. Therefore, evaluating suspected nesting territories will not be a problem. Helicopter surveys will be supplemented by use of boats to improve comparability to surveys outside the study area that were reported in the literature. See the 1990 study plan for more details.

Comment: Peregrines are not particularly easy to locate, therefore surveys need to be performed with particular care to avoid mistaken conclusions based on inadequate field effort.

Response: Surveys will be conducted by experienced, knowledgeable personnel.

Comment: The study description does not state how methodologies such as helicopter observation, trapping of adults in nets, blood sampling, and inspection of nests will be performed on control groups, which may make study results inconclusive.

Response: Results from the study area will be compared with data reported in the literature. In addition, concurrent and historical population surveys conducted in Norton Sound will provide a partial control.

Comment: The study description does not state how blood samples are to be handled, derivatives extracted and tested, and does not examine whether 20 birds will provide a representative sample or that the loss of blood will not act synergistically with other factors to raise mortality among the test group. The goal should be to collect the optimal minimum amount of blood necessary to run the proposed tests and that collection of more than two to three percent of body weight is strongly discouraged, even in healthy adult birds.

Response: Collection of blood has been deleted from the study.

Comment: A 1990 survey will be required to complete this study.

Response: A survey is planned for 1990.

BIRD STUDY NO. 11

Comment: This study is well-designed and potentially could be concluded successfully in 1989 because it concerns wintering birds, however, hydrocarbon analysis will require more time than the February deadline for completion.

Response: The study will be continued in 1990.

Comment: The term "reproductive potential" is not adequately defined and there is no indication in the methods description as to how this will be measured.

Response: Reproductive potential will not be measured by this study. See the 1990 study plan for details.

Comment: It is not clear what is meant by "intrinsic values" nor is it stated in the methodology how this will be measured.

Response: Intrinsic values will not be measured by this study, but will be considered in the economic studies. See the 1990 study plan for details.

Comment: How many birds will be collected and how will they be collected.

Response: See the study plan for 1990.

Comment: This study is research oriented and is not necessary to assess natural resource damage.

Response: This study is focused very specifically on damage assessment. See the 1990 study plan for details.

Comment: It is impossible to determine from the study description whether (a) standard and widely accepted methods are employed, (b) possible biases are accounted for, (c) surveys accurately represent assessment areas, (d) possible errors in scaling results are accounted for, and (e) results are statistically valid.

Response: See the study plan for 1990.

Comment: The study description does not state any methodology which would conclusively identify what the individual or population effects of the oil spill might be; the objective to "develop a data base describing food habits of sea ducks" is irrelevant to assessing oil effects.

Response: See the study plan of 1990.

Comment: There is no description of statistical analysis and without such analysis any results generated are inconclusive.

Response: See the study plan for 1990.

Comment: The February deadline will have to be extended in order to complete contaminant analysis on samples taken this winter.

Response: The study will continue in 1990.

Comment: There is no mention of results being statistically validated.

Response: This study was reviewed for statistical validity. Additional information is supplied in the 1990 plan.

HISTORIC AND ARCHAEOLOGICAL

ARCHAEOLOGY STUDY COMMENTS

Comment: Archaeological sites are not natural resources and therefore are not properly subject to the CERCLA damage assessment process.

Response: A valuation of the committed use of the cultural attributes of natural resources, as well as the natural components of cultural sites, is properly within the CERCLA damage assessment process.

Comment: The impact of oil on radiocarbon dating, soil chemistry, artifact analysis, and biological decomposition of artifacts should be considered.

Response: The study plan calls for excavation and analyses of soil samples and archaeological materials to identify chemical and physical changes caused by oil contamination. An experiment is planned to determine whether materials normally used for radiocarbon dating can be decontaminated in the laboratory once they have been contaminated by oil. The potential impacts of oil on microanalytical chemical studies is not a focus of the current study plan.

Comment: Surface and subsurface archaeological sites should be included in assessing the impact of oil on cultural resources.

Response: The study plan assesses injury to historic and prehistoric surface and subsurface cultural resources.

Comment: The economic value of replacing an affected archaeological site could not be estimated given that it is a nonrenewable, irreplaceable resource.

Response: The study plan speaks of restoration and rehabilitation of the archaeological resource; options for replacement or acquisition of the equivalent destroyed or injured resources, and an estimation of that cost, remains under review.

Comment: The impact of increased vandalism to archaeological sites should be considered. Similarly, baseline data regarding artifact movement or loss should be determined, and action taken to mitigate any injuries resulting from the vandalism.

Response: The study plan recognizes the occurrence of vandalism to cultural resources in the spill affected area in 1989 and the potential for further vandalism in 1990. The plan calls for site visits to gather baseline data on vandalism and to assess post-shoreline treatment vandalism at a sample of the known sites in the spill area. These data will augment information collected in 1989. Site protection is not an element of the current study.

It is more properly the focus of the Archaeological Resource Protection Act.

Comment: Surface artifacts in immediate danger of loss due to relic collection or natural erosion should be collected.

Response: The study plan calls for field surveys to improve the estimate of the total number of sites in the spill affected area. This project will include collection and curation of artifacts that are in immediate danger of loss through any means.

Comment: A hypothetical clean-up site should be constructed to determine the potential effect of various clean-up methods on archaeological sites.

Response: The cost of replicating an archaeological site in the laboratory is prohibitive and there is no assurance that subsurface field conditions could be duplicated accurately.

Comment: Native corporations should participate in the process of site selection and all data should be available to the corporations for review and comment.

Response: Should sites be selected, in addition to those selected for the 1990 study, the Trustees may consider recommendations from interested parties. The Trustees are considering making data public at an appropriate time, subject to applicable state and federal confidentiality requirements pertaining to archaeological sites.

Comment: The archaeological study should analyze whether the oil spill resulted in increased public knowledge of archaeological sites and whether increased long-term vandalism can therefore be predicted.

Response: The study plan recognizes vandalism as an impact and calls for its identification and quantification; it does not specifically address the long-term potential impacts on cultural resources caused by an increased public knowledge of them. Any prediction would be speculative.

Comment: Each cultural site should be studied individually and, in defining a representative sample, the study should recognize the uniqueness of each cultural site.

Response: The study recognizes that each site is a unique entity, but the limitations of time, personnel, and cost preclude examining each and every site in the oil spill impact area for injury.

Comment: Criteria must be developed to determine which archaeological tests will be performed at each site and to regulate entry onto private lands.

Response: The specifications for the special projects called for in the study plan will contain detailed descriptions of the tests and procedures to be used. Study plan activities do not include entry onto private lands.

Comment: The study should include a provision for the return of culturally sensitive materials that have been curated as a result of the studies.

Response: An objective of the study plan is to allow for the development of a program to restore and rehabilitate archaeological resources. The return of culturally sensitive materials curated as a result of the studies is more properly a subject for consideration during the restoration phase.

Comment: Damage resulting from marine erosion may have been aggravated by oil spill activities and should be addressed in the study.

Response: The study plan calls for investigating erosion which may have been caused or initiated by oil contamination or shoreline treatment activities.

Comment: The Alaska State Historic Preservation Office should be identified as the lead agency for coordinating archaeological injury assessment studies.

Response: The USFS as been designated the lead agency for managing the archeology damage assessment study plan. The State Historic Preservation Officer is the chairperson to the Archaeology Steering Committee, which is responsible for developing and implementing all projects undertaken through the revised study plan.

Comment: Injury to archaeological sites from oil spill clean-up activities should be made a part of the injury assessment process.

Response: The study plan recognizes that shoreline treatment activities may have affected archaeological sites and provides for the gathering of information on actual impacts.

Comment: The funds budgeted for the archaeological study are inadequate to survey the entire spill-damaged coastline.

Response: The study plan calls for a sample survey of the affected shoreline, not its total length.

Comment: A separate operating budget to study impacts to archaeological sites is not specified.

Response: The current study plan includes a separate operating budget.

Comment: The impact on archaeological sites should be included as a component of the intrinsic value study, and contingent valuation

methods should be employed to survey Alaska Native and scientist/archaeologist populations.

Response: Effects on archaeological resources may be included in the description of the environment affected by the spilled oil when surveys are administered under E/S No. 7. The stratification of the sample among sub-groups of the population, e.g. Alaska Natives, has not yet been determined.

Comment: Greater detail regarding the procedures to be used to value any damages to archaeological resources caused by the spilled oil and clean-up activities is needed.

Response: General information regarding the economic valuation of archaeological studies is provided in the study plan for E/S No. 9. The specific procedures employed may produce damage estimates used in litigation. They therefore constitute confidential information unavailable during the study process.

Comment: Native corporations should be consulted regarding the choice of experts who will conduct the archaeological study.

Response: The activities conducted to identify any injury to historic properties and archaeological resources will be performed by the contractor that responds to a request for proposals and is awarded the contract. The Trustees will consider informing native Trustees of the status of this process.

Comment: The NRDA Plan ignores possible damage to archaeological sites in low-lying coastal areas affected by the spill.

Response: The study plan provides for the assessment of possible damage to historic properties in submerged, intertidal, and shore margin upland zones along the coastal areas affected by the spill.

Comment: The number of archaeological sites affected by the spill should be determined and site sampling undertaken.

Response: The archaeological resource study provides for a determination of representative sites for historic properties and for sampling of these sites.

Comment: The methods and analyses of the economic studies should incorporate alternative analytical models that have already been developed to value archaeological resources.

Response: Alternative analytical methods and valuation methodologies will be considered.

Comment: The economic valuation of archaeological site injuries appears to consider only known sites.

Response: Economic study No. 9 includes an effort to estimate the population of affected sites.

Comment: Economic study No. 9 does not address compliance, quality control, ways to ensure preservation, or methods of evaluation; furthermore, it does not contain specific proposals that would permit a contractor to conduct a professional job.

Response: Economic study No. 9, as described in the NRDA Plan, is not intended to be a request for proposals from contractors. The archaeology study is designed to identify and quantify damage to historic properties and the study activities will be performed in a manner consistent with Department of Interior Standards and Guidelines for Archaeology and Historic Preservation.

Comment: Injury to archaeological resources should be included in the damage assessment plan.

Response: The 1990 plan includes a study of injuries to archaeological resources and an economic study to assess any damages.

TECHNICAL SERVICES

TECHNICAL SERVICES STUDIES COMMENTS

Comment: The list in Appendix A of petroleum hydrocarbon compounds to be considered for identification and quantification in water, tissue and sediment samples should include the known metabolites of crude oil, especially that from the North Slope.

Response: The Trustees believe that Appendix A contains the proper metabolites that can be identified through this process.

Comment: Appendix A of the Draft Plan omited Section 2.3 of the Quality Assurance/Quality Control Plan.

Response: Sample preservation and holding times are now discussed in Appendix A, Section 2.2 of the 1990 NRDA Plan.

TECHNICAL SERVICES STUDY NO. 1

Comment: The introduction to this study should state that chemical analysis is the only conclusive method for determining the presence and source of oil.

Response: The Trustees agree that in order to determine that a sample contains petroleum hydrocarbons, chemical analysis must be done. This notion is implicit in the plan.

Comment: Technical study no. 1 should extend to cultural resources and evaluate the effect of petroleum exposure on radiometric dating techniques.

Response: This is not a focus of T/S 1. However, an experiment to determine whether materials normally used for radiocarbon dating can be decontaminated, once they have been contaminated by oil, is considered in the Historic Properties and Archaeological Resource Study.

Comment: A defined protocol for sampling, preservation and labelling of samples, analytical practices and measures of quality control/assurance, and an analysis of inter-laboratory comparability is needed.

Response: Protocols for sample preservation, sample labelling, and transporting of samples appear in Appendix A. Analytical standards and quality control for chemical analyses are defined in the QA/QC Plan. The capabilities of individual laboratories are thoroughly reviewed and tested prior to selection for analytical chemistry work to ensure that precise and comparable analyses will be conducted.

Comment: This study should include analysis for the presence of dibenzothiophenes.

Response: All samples that are analyzed will be tested for the presence of dibenzothiophenes.

Comment: Fingerprinting of oil, through gas chromatography/mass spectroscopy of aliphatic and aromatic samples (not flame ionization testing), should be considered for litigation purposes.

Response: Fingerprinting of oil utilizing these methods was undertaken in A/W Study No. 1 in 1989. It is to be continued, as necessary, within T/S Study No. 1 in 1990.

Comment: The method of validating changes in analytical methodology provided for in this study does not permit others to review it so as to ensure that valid data will be generated.

Response: Any changes in analytical methodology will be approved through the use of check samples from the National Insitute of Standards and Technology.

Comment: This study is isolated from field studies in that it does not describe how intrasite variability is taken into account.

Response: Intrasite variability was one of the variables considered in formulation of the sampling scheme. In order to become certified, a laboratory must succesfully analyze the check samples and continue to analyze successfully such samples during round-robin analyses. Each data set is reviewed by QA/QC officers from NOAA and the FWS. No data is released or paid for until it has passed this QA/QC review.

Comment: Metabolites should be examined in all fish sampled for routine hydrocarbon analyses.

Response: Analysis of bile hydrocarbon metabolites will be undertaken on all bile samples from fish.

Comment: The standard protocols for necropsy and preservation of tissue samples should be made available to the public.

Response: The 1990 plan include Appendix B, EVOS Damage Assessment Plan Histopathology Guidelines.

Comment: Neither the "Methods and Analyses" section of this study nor the QA/QC documenting Appendix A contains sufficient information on sampling and analytical methodologies to permit the reader to determine whether analytical data of acceptable quality will be generated. Standard Operating Procedures and NIOSH standards should be made available to the public.

Response: Appendix A includes general information on Standard Operating Procedures for collecting and handling samples for hydrocarbon analysis. The study plan for the 1990 studies include

more specific information on procedures to be used in the collection of study-specific samples. NIOSH standards will be included in the report as results and are not included in the study plan.

Comment: The list of hydrocarbon compounds in Appendix A that are to be considered for identification and quantification is "insufficient," as a large percentage of the compounds listed is not found in petroleum at detectable levels or constitutes minor components thereof.

Response: The list of hydrocarbon compounds for which analysis will be conducted was developed carefully to include constituents of crude oil and metabolites that may occur in organisms. While some of these compounds may be minor constituents of crude oil, they may accumulate in organisms and therefore be significant.

Comment: There is no standard given in Appendix A for documentation.

Response: Standards for documentation are provided in the individual laboratory QA/QC plans, which are reviewed by the T/S 1 and the respective agency QA/QC representative.

Comment: There are no criteria identified for laboratory disqualification.

Response: Criteria for qualification of laboratories are defined. Disqualification results from failure to meet the qualification standards.

Comment: The budgets allotted to T/S Studies Nos. 1 and 2 are not sufficient to support a thorough, scientifically and legally acceptable assessment of the oil spill impacts.

Response: The Trustees believe that the budgets allotted to plan studies are sufficient to support the needed work.

Comment: Limitations put on researchers as to the number of samples that can be analyzed or the types of analysis that can be done is unacceptable. All field studies should incorporate standardized QA/QC programs.

Response: No limitations have been put on researchers as to the number of samples they may collect. Not all samples collected will necessarily be analyzed. If valid new analyses are identified, those conducting T/S study No. 1 will evaluate their applicability and adopt them, where appropriate.

Comment: Were appropriate sampling methods used prior to development of the QA/QC plan.

Response: The QA/QC Plan establishes procedures and standards with which the chemical analyses of all hydrocarbon samples must conform. The sampling methods utilized by individual projects may vary due to the large number of different sample types and methods that must be used. The validity of individual project sampling plans is established through a planning process that incorporates extensive peer review. Samples that do not meet the guidelines are annotated in the database.

Comment: Results from intercalibration exercises and data on field and analytical blanks should be included in reports resulting from this study.

Response: The Trustees agree and anticipate incorporating such results in reports. See 1990 plan.

Comment: The budget was too low for this study.

Response: The budget for T/S Study No. 1 is based on the annual workload anticipated for the project. The full funding of this project's needs is assured due to the vital support it provides for the NRDA program and the very high priority it has been given.

Comment: The analytical chemistry will not distinguish North Slope crude from natural seeps in the GOA or CI oil spilled from platforms.

Response: Analytical chemistry can differentiate between sources of oil in samples taken from the environment. In addition, control organisms will be analyzed to establish the concentration of petroleum hydrocarbons in areas not exposed to Prudhoe Bay crude oil from the Exxon Valdez.

Comment: The cost of the study, in view of the lack of a list of the number and types of analyses to be conducted, is enormous.

Response: The cost of this study is based on the projected number of samples that will be analyzed. Analyses with high standards for QA/QC are expensive.

Comment: There are no procedures for generating analytical data of acceptable quality, and review of procedures by the Analytical Chemistry Group is inadequate to provide accountability and assurance of satisfactory data.

Response: The procedures for producing analytical data are very demanding. Each laboratory must check samples correctly before samples are released to it and must participate in round-robin analyses. Furthermore, both NOAA and FWS have internal QA/QC programs and the data produced at contract laboratories must pass these checks before it is released to the data base or to the project leaders.

Comment: It cannot be determined from the description of this study plan whether sufficient replicate samples would be taken to account for intrasite variability.

Response: The number of samples taken, by site, to account for variability is determined for each project during study plan development. Projects are provided peer review and biometric support for sample design.

TECHNICAL SERVICES STUDY NO. 2

Comment: There is no description of how preserved tissues will be sampled.

Response: Methods for sampling tissues are described in plans for other studies.

Comment: More effort should be placed on documenting histopathological responses that may lead to long-term effects such as genetic abnormalities.

Response: A range of histopathological analyses is considered within the context of data needs for individual studies. Documentation of changes that may lead to genetic abnormalities will be considered, as appropriate.

Comment: It is questionable whether sufficient control samples will be taken to determine the range and various attributes of normal cells and tissues.

Response: Collection of control samples is regarded as important for determining the characteristics of normal cells and tissues.

Comment: Frozen tissues of oiled birds collected early in the spill should be examined.

Response: Examination of frozen tissues will be considered in the context of information needs for individual studies.

Comment: It is not possible to determine whether standard histological methods will be used.

Response: See the study plans for 1990.

TECHNICAL SERVICES STUDY NO. 3

Comment: The initial maps, as well as a time table for generation of subsequent maps and their distribution, should have been included in this study plan.

Response: Map documents cannot be included in study plans due to litigation confidentiality, cost, and the density of data, which

precludes an 8.5" x 11" format. Mapping in progress is dependent upon data supplied by other projects that have widely varying time tables and information needs. Therefore a timetable for generation of these maps is not possible.

Comment: The GIS should be "intelligent," i.e., it should be capable of incorporating dynamic models of future conditions and integrating different types of existing information into new types of information. There was no indication in the study plan that the GIS would be intelligent and would fully utilize state-of-the-art methods.

Response: "Intelligence" comes with the ability to combine the information layers and project scenarios. The planned GIS will do this.

Comment: The initial maps should have been circulated with the public review draft showing oil damage and movement, the locations of some of the field sites chosen for the coastal habitat study and A/W studies, and sites with historical data.

Response: Oil-induced injury is still being investigated. It will be determined as various studies reach their conclusions. The 1990 study plans will include a generalized map of the geographic extent of oiling. To the extent that the location of sites to be examined in the Coastal Habitat and A/W Studies is not confidential, it is contained in the description of the plan for these studies.

Comment: There should be a system for cataloging and making available to other investigators, as well as the public, the final reports by all the various researchers.

Response: This idea was discussed early in the damage assessment process as a "meta-database," a database index to all of the information databases. No decision has been made by the Trustees regarding the implementation of this concept.

Comment: Because of the lack of detail it cannot be determined what the products of this study will be and whether the study will be cost-effective.

Response: The study plan for 1990 discusses additional data layers that have been added. Products of this study will include maps of data from these data layers and others as requested by investigators and the Trustees. The ultimate products depend on the needs of data users and have not yet been specifically determined.

Comment: No information is given on scale of maps, whether the data base will be pertinent, whether the maps can be used to determine levels of hydrocarbons in the sediments or in the water column, and whether the maps will show the area and levels of

impact by chosen hydrocarbon levels.

Response: Maps have been produced in varying scales depending on users' needs. The data layers are discussed in the 1989 and 1990 study plans and are considered by the Trustees to be pertinent. The maps will have the capability of showing results of hydrocarbon analyses in a geographically referenced format.

ECONOMICS

ECONOMICS STUDIES COMMENTS

Comment: Economic studies should not go forward until the Trustees have estimated recovery time since damages for lost use values will be limited to the interim recovery period.

Response: Total damages for lost use value are composed of two elements. These are past lost use values and future lost use values. Future lost use values depend upon the length of time that use of a natural resource has been impaired. Therefore, calculation of future lost use value depends upon estimation of the length of time it will take for injured natural resources to recover. Calculation of use value losses that have already occurred does not involve estimation of recovery periods. There is no reason why these past lost use values cannot be studied at this time.

Comment: The appropriateness of discounting and the discount rate to be employed is questionable.

Response: The ability to compare directly costs and benefits which accrue at different points in time is essential to a comprehensive assessment of the damages attributable to the EVOS. Discounting permits the analyst to convert amounts payable or receivable at different dates into similar terms, i.e., equivalent current (or present) value. With respect to the appropriateness of discounting, in general, unless all relevant costs and benefits occur in the same year, it is necessary to discount the estimated impacts in order to place all attributable costs and benefits within a comparable context.

A specific discount rate has not been selected. The NRDA regulations (43 C.F.R. Section 11.35 (d) 5) state that the discount rate to be used in developing estimates of the expected present value of benefits and costs shall be determined in accordance with Office of Management and Budget Circular A-94 (revised). The Trustees recognize the Office of Management and Budget directive to employ a 10 percent real rate. However, the NRDA regulations are optional, and the Trustees recognize that there is considerable controversy and disagreement within the economics profession regarding the "correct" rate.

Comment: There were several comments on the lack of detail in the economics study plans.

Response: The economic study plans were intended to provide general notice of the types of economic studies that are contemplated. The Trustees believe that the descriptions of the studies are adequate for that purpose.

Comment: The discussion of economic valuation methodologies is inadequate and does not explain how the Trustees intend to

implement research methodologies aimed at restoration.

Response: Restoration is the subject of a separate section of the damage assessment plan.

Comment: The economic valuation studies do not state the time period during which damages will be measured.

Response: The period of damage measurement depends upon the time required for restoration or recovery of injured resources. This information will depend on the results of the scientific studies being conducted as part of the damage assessment.

Comment: The Plan is not structured so as to avoid double recovery with respect to such issues as reduced land values and interdependent services.

Response: This comment has been noted and the economic studies will be conducted to avoid double counting of natural resource damages.

Comment: The economic studies fail to take into account the effects of response actions.

Response: Where appropriate, the effects of response actions will be taken into account in determining damages for injury to natural resources.

Comment: Economic studies should be expanded to include evaluation of restoration, replacement, or acquisition of equivalent resources rather than lost use values.

Response: The economic studies are designed to evaluate the losses to economic values resulting from the oil spill. Restoration is the subject of a separate section of the Plan. The Trustees do not view recovery of restoration costs and economic losses to be mutually exclusive. Both restoration costs and economic losses can be recovered as part of a natural resource damage claim, and both of these aspects of the claim are being addressed in the Plan.

Comment: These studies do not account for the degradation in quality of life that will be suffered by the affected fishing communities.

Response: The damage assessment is designed to assess claims that may be brought by the federal and state governments as public trustees for injury to natural resources. To the extent "quality of life" is comprised in part of the intrinsic value of material resources affected by the spill, these issues will be considered in the economic studies.

Comment: The travel cost method of valuing losses to the

recreational resource must include participation figures from years beyond 1990.

Response: The decision whether to employ the travel cost method has not been made. Should the travel cost methodology be used, the appropriate time period for travel cost models will be addressed in the study.

Comment: Both willingness to pay for an Alaskan recreational experience and willingness to accept compensation for damage done to the recreational resource should be utilized in the contingent valuation studies.

Response: The use of both willingness to pay and willingness to accept will be considered in the contingent valuation study. The Trustees will use the method that provides the most accurate measure of value.

Comment: A single-point estimate of damages should not be the measure of these losses. Rather, the losses should be reported as distributions.

Response: Ordinarily, a claim for damages is expressed as a single monetary figure. The Trustees also may provide an estimate of the range of possible damages, where appropriate.

Comment: The economic uses studies should better define "economic value" to identify how resources with no commercial value will be valued.

Response: The focus of the economics studies is a comprehensive valuation of the market and non-market value of the goods and services provided by natural resources affected by the oil spill. A number of methods exist for determining the value of resources.

Comment: None of the economic uses studies adequately addresses the intrinsic value of the environment.

Response: Several of the economics studies, e.g., Nos. 5, 6, 7, and 9, will consider damages associated with the loss of intrinsic values in calculating damage estimates.

Comment: Restoration, replacement and the acquisition of the equivalent of injured resources should be the basic measure of damages, consistent with Ohio v. U.S. Department of the Interior; use value alone should not determine the extent of damages.

Response: Restoration is the subject of a separate section of the plan. The plan will evaluate both the cost of restoration and loss of use and non-use values.

Comment: With respect to losses to subsistence households,

addressed in E/S No. 6, the effects should take into account that subsistence users who turn to processed food are uninformed about dietary balance, or cannot afford the costs of maintaining a proper dietary balance with commercially produced foods and the loss of raw materials is not easily replaced by purchasing a manufactured equivalent. The handicraft industry, which relies on raw materials, cannot be replaced.

Response: The degree to which substitutes for subsistence uses are adequate will be addressed in the study.

Comment: Under the Plan the damages assessment of the loss of archaeological resources will be understated. Their primary value is intrinsic rather than economic. The impacts on these resources should be evaluated in other of the economic use studies such as numbers 7 and 8. The latter should focus on resource-based expenditures that are necessitated by the spill in addition to studies planned or begun before the spill. The former should specifically address these resources and develop contingent valuation methodologies for determining their value.

Response: The Trustees will consider methods of evaluating the intrinsic value of archaeological and cultural resources. The Trustees will also consider claims for increased resource-based expenditures resulting from the oil spill.

Comment: Economic study No. 7 should extend to cultural resources but protect against further vandalism.

Response: Protection of cultural resources from vandalism is an important regulatory task, but is outside the scope of the damage assessment except as a possible restoration measure for these resources.

Comment: The uniqueness of each archeological site should be considered in valuing these resources and each site should be studied individually. Objective standards should be applied in determining what constitutes a representative site. Criteria for archeological tests should be developed. Provision should be made for return of the studied sites.

Response: The Trustees will take the uniqueness of an archaeological site into account in conducting this study.

Comment: The economic use studies do not deal directly with the effects on tourism.

Response: Tourism is considered in the study of the effects of the oil spill on recreation.

Comment: Economic studies relating to fisheries do not specify the significance of fish prices vis-a-vis damages covered by NRDA.

They fail to address restoration. No valid economic or legal relationship exists between degree of competition in input and output markets and damages related to public trusteeship. The study confuses consumer surplus and product price concepts. These studies may overestimate damages if short-term biomass estimates are based on commercial fishermen's catch rate/harvest data since recreational fisherman experience net gains when commercial efforts are reduced.

Response: This study is intended to evaluate the effects of the oil spill on consumers' surplus in the fisheries market. Consumers' surplus is part of the public value of fishery resources, and is an appropriate part of a natural resource damage claim. The Trustees can recover for lost use values in addition to restoration costs. Restoration is the subject of a separate section of the Plan. In order to evaluate effects on consumers' surplus from the oil spill, study of the competitiveness of the market may be required. The Trustees do not believe that they have confused product price with consumers' surplus. Effects on recreational fisheries from reduction in commercial efforts should be reflected in studies of recreational fishing.

Comment: Economic study No. 4 will double-count losses since land values are based on property use and non-use values, reduction of which are being calculated in other studies. Reduced land values only become losses if sales actually take place before restoration is complete and if the natural recovery period extends beyond the period in which new uses will occur. Increased land values in other areas and lease/permit sales to spill-cleanup and research-related activities should be taken not account as offsets. Overall study costs are likely unreasonable since the compensable damages shown by this study will be very low owing to the low "scarcity value" of lands in Alaska.

Response: The NRDA as a whole will be designed to avoid or take into account any double-counting among individual studies. The Trustees disagree with the comment that losses to public land values accrue only on sale of the land. Like any other land owner, the Trustees are entitled to compensation for the decreased value of their land regardless of their immediate intentions for sale or exchange of land. The effect of recovery from injury on land values will be taken into account in the study. Compensating effects will also be considered. Gains to private individuals from, e.g. cleanup work are not an offset to public resources damaged by the oil spill. The Trustees disagree with the conclusion that the value of land comparable to that affected by the oil spill is likely to be low.

Comment: In E/S No. 5, contingent valuation methods are inappropriate because the recreational services are not unique and substitute options are available. Data on changes in recreational participation may be misleading since reductions in some areas may

be offset by increases in others and because short-term response to the spill may exaggerate the likely long-term effect.

Response: Where appropriate, substitution effects and long term losses will be considered in conducting this study.

Comment: Economic study No. 6 does not appear to take into account the fact that although some households were negatively impacted by the spill, others were able to supplement their income by participating in spill cleanup efforts. It ignores private litigation by native corporations and Exxon efforts to deliver food and materials to subsistence villages. Losses to subsistence households are not compensable to the Trustees.

Response: The Trustees are not seeking to make private claims, but to evaluate the damage to subsistence uses of resources as a result of the spill. The benefits provided to individual households by PRPs may be a setoff against private claims, but not against claims by public trustees for injury to publicly held natural resources.

Comment: Given the state of the art in contingent valuation survey work, it is improbable that a defensible contingent valuation study can measure intrinsic damages in a situation as complex as this one. The non-use value concepts that are listed in E/S No. 7 are not applicable to a situation like this one, where there is merely a short-term disturbance of the environment and damages may be reversible and subject to restoration.

Response: The Trustees believe that contingent valuation is an appropriate method of measuring losses to intrinsic values in this case. The characterization of the spill as a short term disturbance is unwarranted. While the duration of the effects of the spill may be relevant to determining the extent of losses in intrinsic values, effects need not be permanent to give rise to losses in intrinsic values.

Comment: With the exception of tagging fish, E/S No. 8 does not indicate which research activities were affected by the spill. Nor does it indicate how scientific study delays will be valued. Lost future opportunities do not constitute committed uses and their valuation would be entirely speculative. Furthermore, the spill has created a significant number of research opportunities.

Response: The Trustees are in the process of identifying research activities that were adversely affected by the oil spill. Additional out of pocket expenses caused by the spill will be calculated. Other valuation methods may be considered. Only actual studies are currently being considered. The Trustees disagree with the suggestion that the oil spill created benefits by necessitating study of how much harm it caused.

Comment: Economic study No. 9 does not indicate how damaged

archeological study sites will be valued. Suppositions regarding damages owing to upland site erosion or inland contamination appear to be unfounded.

Response: The Trustees have not made a final determination on how damaged archaeological sites will be valued. Damages will be based on actual injury, not supposition.

Comment: The study descriptions do not explain how the assessed damages will be collected/divided.

Response: If the PRPs do not pay the damages voluntarily, damages will be sought through litigation. The Trustees have not established a precise mechanism for determining how damage awards will be allocated among projects to restore, replace or acquire the equivalent of injured resources.

Comment: Researchers should use more than one valuation technique for resources that generate more than one good/service. "Natural resource slander" should be evaluated in analyzing losses that have occurred as a result of changes in human behavior. Valuation should take into account the current and future scarcity, as well as changes in quality, of the affected resources.

Response: Where appropriate, more than one valuation technique may be used for certain resources. The Trustees have not made a final determination regarding whether "Natural resource slander" is an appropriate element of damages in this case. Where appropriate, the Trustees may take into account the scarcity of resources in determining their value.

Comment: Economists and scientists should work together in evaluating the natural resources damages. The studies do not appear to be integrated with the restoration and scientific study plans.

Response: Economists and scientists have worked on the damage assessment plan, and will work together on the assessment.

Comment: A study of the economic damages caused to human health should be done.

Response: Human health is not, in itself, a natural resource. At the same time, use of natural resources may be impaired where they are contaminated to the extent that they pose a threat to human health. Thus, human health implications of the oil spill are addressed indirectly in the assessment by considering health effects of restoration measures, and in determining the loss in value of subsistence resources.

Comment: All of the losses to the commercial fishing industry should be calculated in E/S Nos. 1-3 so as to capture restoration,

residual, and lost consumer surplus costs that private litigants may not recover.

Response: This is the objective of these studies.

Comment: Economic study No. 4 should delineate methodologies and have them reviewed by qualified economists.

Response: All economic studies have been reviewed by qualified economists.

Comment: Economic study No. 5 does not identify which of the three methodologies it mentions will be utilized. It should estimate the growth in recreational activities that would have occurred without the oil spill rather than assuming that 1988 figures would have continued.

Response: A final decision has not been made on the precise methodology that will be employed. The Trustees will consider growth in recreation, to the extent that it can be adequately estimated.

Comment: Economic study No. 7 should be designed so as to capture all natural resource injuries, including the loss of pristine character and effects on the ecosystem as a whole in PWS. It should also attempt to calculate the uncertainty of long-term impacts of the spill so as to capture human perceptions of the oil spill's effects appropriately. Willingness to accept and willingness to pay approaches should both be used to calculate losses of intrinsic value. The study should be conducted throughout the United States, perhaps using subgroups such as Alaska residents, subsistence users and the remaining U.S. residents. The spill's impact on archeological sites should be a component of E/S No. 7. Otherwise a contingent valuation study specific to these resources should be undertaken.

Response: The Trustees will consider all these factors in designing the contingent valuation study.

Comment: A restoration plan that includes cost estimates based on restoration/replacement/acquisition values is not the equivalent of a restoration-based damages assessment. Acquisition of replacement habitats should be evaluated since restoration for individual species injured may not be possible.

Response: Restoration is a central focus of the Plan. The Trustees will consider acquisition of equivalent habitats where appropriate.

Comment: The Economic Uses studies have vague and probably unrealistically low budgets.

Response: The Trustees believe that the budgets for the economic studies are appropriate in light of their objectives and the overall needs of the damage assessment.

Comment: The Coastal Habitat study should explain how it will be coordinated with the economic studies and the restoration plan. The mere fact that shorelines were oiled should be considered an injury in the Coastal Habitat studies and assessed economically in E/S Nos. 5 and 7.

Response: Where appropriate, injury to coastal habitats will be taken into account both in restoration and in the determination of economic losses arising out of the oil spill. The precise method of measuring these losses depends on the results of the Coastal Habitat study.

Comment: The contingent valuation studies should take into account both biological and geophysical injuries.

Response: The Trustees will consider biological as well as geological factors in the contingent valuation studies.

Comment: Creating bioeconomic models outside commercial fishing would be useful for the economic studies.

Response: Thus far, commercial fishing is the only area where the Trustees have determined that a bioeconomic model may be useful and appropriate.

Comment: The focus of E/S No. 5 should be expanded to include existence, option and bequest values. Otherwise, the losses will be undervalued. This study fails to identify how a survey respondent is determined to be a recreational user or not.

Response: All aspects of intrinsic value will be considered in the context of the most appropriate economic study for inclusion in the intrinsic value study. Survey respondents could be identified as recreational users by asking them.

Comment: The economic studies attempt to reduce losses to subsistence uses to market values, but they are integral to the native lifestyle and hold non-monetary benefits that are not being valued.

Response: The Trustees will consider measurement of non-market values of subsistence resources.

Comment: In determining economic methodology to be used, the Trustees should have determined whether a restoration/replacement cost or a diminution of use value approach will form the basis of the measurement of damages.

Response: The regulations (43 C.F.R. Section 11.35 (d) 2) state, "If existing data are insufficient to perform the Economic Methodology Determination, this analysis may be postponed until the Assessment Plan review stage at the completion of the Injury Determination phase of the assessment." As stated earlier, use of the regulation are optional. Insufficient data to quickly value the natural resources impacted by the EVOS, due to its size and complexity, made it necessary for the Trustees to postpone the Economic Methodology Determination. Furthermore, the decision in Ohio v. U.S. Department of the Interior indicates that both restoration/replacement and diminution of use and nonuse values are elements of a natural resource damage claim.

Comment: Economic study No. 6 needs quantitative socioeconomic impact studies and ethnographic studies by anthropologists.

Response: Anthropologists will be involved in evaluation of damage to appropriate resources.

Comment: Appropriate E/S No. 1 should take into account other aspects of the 1989 commercial fishery - seafood prices declined worldwide as a result of the oil spill.

Response: Evaluation of market effects of the spill may require an analysis of world markets.

Comment: There is no assurance in the Plan that losses only to committed uses will be measured. It appears from the Plan that E/S Nos. 4, 8, and 9 will quantify losses to resources for which there are only speculative uses.

Response: Because the NRDA regulations are optional, there is no legal requirement that the damage assessment be limited to losses of committed uses in all of the economic studies. Nevertheless, it is the Trustee's current intention to focus on committed uses. E/S Nos. 4, 8, and 9 will quantify losses to potential, not speculative, uses.

Comment: Economics Study No. 4, which extends the trust responsibility to the role of proprietor, is not warranted by the Clean Water Act, CERCLA or the NRDA regulations.

Response: Under applicable law, the federal and state governments are trustees for public lands affected by the oil spill, and are entitled to the loss in value of public lands as a result of the spill.

Comment: Economic study No. 8 should focus on resource-based expenditures that are necessitated by the spill in addition to studies planned or begun before the spill.

Response: Resource-based expenditures necessitated by the spill

are not a focus of E/S No. 8. The objective of this study is to determine any injuries and economic loss from research investigations affected by the spill.

RESTORATION

RESTORATION STUDIES COMMENTS

The perceived lack of attention to restoration was a major theme of public comments on the 1989 NRDA plan. Significant changes have been made to the Restoration Planning Project (RPP) in 1990. The scope and budget for restoration planning have been expanded substantially, and it is expected that restoration planning will play an even greater role in the overall NRDA process next year. There is also a commitment to public involvement in the restoration planning process, and a variety of public events have already been held.

Comment: Although restoration was identified as the Trustees' primary objective, the Plan's restoration analysis has been severed from the damage assessment. It should be an integral part of the quantification of injury and determination of damages. The Plan fails to develop a restoration methodology plan or procedures for determining recovery periods or evaluating restoration alternatives or their costs. There should be a resource recoverability analysis showing the amount of time needed by each resource to recover to its baseline state before economic damages are measured.

Response: Although efforts in 1989 focused on the assessment of damages from injury to resources, the RPP is now in fully underway and is part of the NRDA. One of the products of the Restoration Planning Project will be a restoration methodology plan, and in developing that plan the Restoration Planning Work Group (RPWG) is evaluating restoration alternatives and costs. The RPWG is also exploring ways to predict and monitor natural recovery times and is considering how these relate to the selection of restoration alternatives.

Comment: Restoration alternatives should include cleanup and natural recovery as well as acquisition of replacement habitats and equivalent resources. They should include diversification of hatchery production.

Response: Restoration options which address injuries from both the oil itself and subsequent clean up activities are being developed. In determining the appropriate response to these injuries, a wide range of potential restoration projects will be considered, including replacement, acquisition of equivalent resources, diversification of hatchery production, and natural recovery. On-going clean-up activities, per se, are addressed through the response action rather than the restoration program. The Trustees recognize, however, that the long-term presence of oil residues in the environment is an effect of the EVOS that may have to be addressed following the formal clean up-response action.

Comment: Any restoration plan must include discussion of acquisition of equivalent resources for south central Alaska since

restoration for the totality of that environment is not possible and because restoration is often very costly given its results. Acquisition opportunities that might be time-limited should be identified. Acquisition of replacement habitats should be evaluated since restoration for individual species injured may not be possible.

Response: Under federal law, sums recovered for injury to natural resources must be used to restore, replace, or acquire the equivalent of injured resources. Consideration of the replacement of habitats and acquisition of equivalent resources will not be restricted to the immediate oil-spill area, and will include southcentral Alaska. Time-limited acquisition opportunities will be identified.

Comment: Restoration must be provided for each species within the class of species an indicator species represents.

Response: In some cases restoration alternatives will be directed toward individual species, including those represented by "indicator species." The primary focus of restoration planning, however, will be on projects that benefit multiple species and ecosystems.

Comment: The objective of restoration should be return to a "without spill" environment rather than a pristine or "pre-spill" environment. "Pre-spill" conditions should not be considered the baseline for purposes of assessing restoration costs owing to the fact that there is natural variance in resource levels, ecological succession and human activities which affect resource levels. The baseline should take into account the uncertainty of being able to establish a baseline.

Response: It is recognized that the environment is dynamic and that some ecological changes would have been occurring even without the EVOS. These factors will be taken into consideration in developing restoration alternatives. However, the Trustees also believe that where information about pre-spill conditions is available, those conditions are highly relevant to the determination of a baseline for restoration work.

Comment: The restoration goal of returning the injured elements of the environment to their pre-spill conditions is unrealistic since pre-spill conditions were not known for seabirds, otters and other pinnipeds, among others.

Response: The restoration goal is not unrealistic and must be evaluated on a resource by resource basis. Targeting indicator species and using an ecosystem approach are two ways of working with the existing baseline data.

Comment: The Plan focuses on lost use values but does not explain

how these are consistent with any restoration objective.

Response: The RPWG is working to identify projects to restore the environment as well as the services that the environment provides. Both direct impacts and lost-use and non-use values will be considered.

Comment: The restoration plan should have included preliminary categories of restoration activities and planning so that field and laboratory studies could undertake preliminary evaluations of feasibility and priority.

Response: In 1990, the RPWG has already identified a wide array of restoration alternatives; additional options will be identified on an on-going basis. The feasibility of a limited number of potential restoration projects is being tested in the field in 1990; we anticipate conducting additional feasibility studies in subsequent years.

Comment: The restoration process should recognize the importance of restoration to archaeological sites.

Response: The RPP considers cultural resources, including archaeological sites, to be appropriate subjects for restoration activities. The RPWG is working with concerned organizations and individuals to help identify appropriate techniques for restoration of these resources. Restoration Technical Support Project No. 3 includes development of a feasibility study regarding the stabilization and restoration of archaeological resources.

Comment: The material devoted to restoration planning should contain criteria by which the effectiveness of restoration plans can be analyzed and plans for monitoring/testing success thereof. There is no standard for adequacy of restoration plans.

Response: Criteria for evaluating and plans for monitoring restoration projects are being developed. Preliminarily, criteria against which a project will be considered for inclusion in a restoration plan include: (a) addresses natural resources injured by EVOS, (b) is technically feasible, and (c) is expected to be of net environmental benefit.

Comment: The restoration plan is vague, does not identify who will be responsible for restoration, and appears to plan for restoration only of commercially valuable species. Nor does it appear to be geared toward restoration as soon as possible after the spill. The Trustees should get a restoration plan underway as soon as possible even if it obscures the damage assessment, since the primary objective is to restore the environment.

Response: Although initial efforts focused on the assessment of damages from injury to resources, restoration planning is now fully

underway, and is the responsibility of RPWG, a state-federal interagency task force. Restoration plans will become increasingly detailed and substantive as the effort progresses. The RPWG is attempting to bring an ecosystem perspective to the process, and restoration efforts will not be limited to species commercially valuable. The RPWG is identifying restoration needs and opportunities that may be initiated as soon as funds are available. It is not desirable or necessary for restoration planning to obscure or preempt the damage assessment. Rather, the RPP is part of the NRDA. Combined with the results of the other NRDA studies, it should result in the presentation of a damage claim that is sufficient to implement the restoration plan.

Comment: Scant attention is paid in the Plan to restoration. A lead agency should be designated to focus on restoration.

Response: The ADF&G and the U.S. EPA are the lead agencies for the RPP. Restoration planning is now fully underway and will become increasingly important the damage assessment phase is completed.

Comment: The Plan does not indicate that restoration costs will be compared to use values to ensure their reasonableness, as the Ohio v. Department of the Interior case dictates.

Response: Any damage claim presented to the responsible parties will be consistent with applicable law.

Comment: Many of the investigations proposed provide static, rather than dynamic, data needed for assessing predictive changes and for development of a restoration plan. The plan may not be adequate because of the lack of modeling efforts and indications that statistical analysis will be incorporated. Traditionally, restoration planning activities would develop models to predict the fate of oil remaining in the environment and the expected population changes, both natural and oil-related. These models would include natural recovery as a viable restoration alternative.

Response: Natural recovery is being considered as a restoration alternative. The results of research, including modeling exercises, to predict population changes will be considered in development of the restoration plan.

Comment: The Plan will not assess restoration costs. It does not factor in all restoration costs, including non-use values. Specific restoration efforts may be unavailing if the ecosystem has not been restored first.

Response: One of the objectives of the RPP is to identify the costs of implementing potential restoration projects. Specific restoration projects will not be undertaken if the condition of the ecosystem is such that it cannot sustain the resource for which restoration is intended. In general, the RPWG is identifying

projects that aim to restore resources at the ecosystem, rather than species, level. Replacement and acquisition of equivalent resources will be considered.

Comment: Damages assessment must take into account restoration/replacement/acquisition costs. This Plan essentially adopts the "lesser of" approach rejected by Ohio v. Department of the Interior. "Lost use value" is an incomplete valuation method. A restoration plan that includes cost estimates based on restoration/replacement/acquisition values is not the equivalent of a restoration-based damages assessment.

Response: The NRDA, which includes the RPP, is taking into account the costs of restoration, including direct restoration, replacement, and acquisition of equivalent resources. The RPP does not follow the "lesser of" approach.

Comment: The restoration plan does not indicate how the coastal habitat and A/W studies will be used in support of the restoration efforts, particularly acquisition of habitat.

Response: As directed by federal law, the RPP seeks to identify restoration options for injured natural resources, including air, water, and coastal habitats. Injury to these resources will be addressed in the restoration plan. Results of the coastal habitat study will be especially helpful in identifying potential sites for restoration projects and by serving as an index to the health of intertidal ecosystems.

Comment: The Plan fails to describe in sufficient detail its scope and design of restoration so as to ensure that restoration of PWS will occur in a scientifically sound, well-organized and cost-efficient manner.

Response: The RPP is fully underway in 1990, and restoration planning will become increasingly detailed and substantive as the process continues.

Comment: The Plan should address methods of ensuring that restoration steps are necessary and avoiding the inaccuracies of relying on extrapolation of long-term damages from short-term impacts.

Response: The restoration methodology plan that will be developed by the RPWG will address methods for determining appropriate restoration steps.

Comment: The Plan states too cursorily the role that natural recovery may play in the restoration process and none of the restoration studies earmark funds for making this determination. Reference should be made in the Plan to the work that has been done in the past on this subject.

Response: Natural recovery is one of the alternatives considered in the restoration plan for each of the injured resources. Restoration Technical Support Project No. 3 includes the development of a feasibility study on "monitoring natural recoveries." Relevant existing information on natural recovery will be considered as part of this process. A literature search for restoration materials in underway.

Comment: Given the lingering effects of spilled oil, funds should be made available for at least ten years to study long-term effects on sea otters as recompense for natural resources, such as dead sea otters, that cannot be restored.

Response: A variety of mechanisms to carry out and support such a program may be appropriate. Replacement and acquisition of equivalent resources are also potential restoration projects that can be responsive to losses of sea otters.

Comment: Restoration objectives in the injury determination studies are inadequate for restoring populations or habitats.

Response: The restoration objectives in the injury determination studies are intended to ensure that field investigators provide appropriate information to the restoration planning group for use in restoration studies. The ultimate objectives of restoration will include restoration of injured populations and habitats.

Comment: There is no delineation of the methods for public input into the restoration planning process.

Response: See current plan.

U.S. GPO ★ 1990 794-976

NOAA COASTAL SERVICES CENTER LIBRARY
3 6668 00003 7608