EXON SHIPPING COMPANY

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A.ELMER PRESIDENT

October 31, 1990

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Gentlemen:

The attached document provides Exxon Shipping Company's comments on the 1990 Damage Assessment and Restoration Plan for the Valdez spill. Some of the principal points are summarized below.

Under the law, the restoration of the area impacted by the spill should be the Trustees sole objective. In order to carry out this objective, the Plan should identify impacted resources in need of restoration projects and develop cost-effective restoration plans to meet those identified needs. The 1990 Plan does not meet this legal standard.

There has been substantial, and nearly complete, recovery of the principal resources and the services they provide. The abundant fishing harvests in 1990, wildlife surveys, and water quality and shoreline studies conducted by both government agencies and Exxon document the vitality of the wildlife and habitats impacted by the spill. This should not come as a surprise since the principal resources in those areas impacted by previous oil spills have recovered rapidly. The extensive cleanup conducted by Exxon as well as the natural resilience of this area have substantially restored the resources.

The Trustee Council's Plan does not properly consider the recovery that is taking place, although we believe that many of your studies are providing such evidence. Instead, the Plan concentrates on a microscopic examination of selected aspects of the affected area. As a result, it contains many unnecessary studies not justified under the law and of little relevance to the NRDA goal of restoration.

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For example, more than half of the studies are designed to find minor biological differences between oiled and unoiled areas. These studies ignore the fact that such differences could be expected in any two parts of a given ecosystem, even if both were unoiled. Such differences arise from the natural variability caused by subtle differences in habitat, populations, weather, and other factors. Consequently, differences uncovered by these studies will not necessarily indicate an unhealthy ecosystem, correlate to oil effects, or lead to justified restoration programs.

Several other studies have a clear basic research focus unrelated to identifying meaningful restoration activities. One describes laboratory research on mink reproduction which does not appropriately duplicate field conditions. Others involve radio-tracking of bears and otters, a study of premature pupping of sea lions outside the impacted areas, and the measurement of insecticides in peregrine falcon eggs. These are not related to the spill or restoration.

The restoration component of the Plan is also misdirected. Instead of using the results of the environmental studies to identify needed restoration work, the program is investigating restorative techniques for resources which are recovering naturally and do not need active intervention (e.g., seeding of Fucus, fauna, and beach grasses). Until the Trustees recognize the extent of natural recovery and focus their efforts on the identification of the need for human intervention to assist recovery, the development of a cost-effective restoration plan will be impossible.

The 1990 Plan also lacks the perspective needed to accurately communicate spill impacts to the public because of its misdirected, microscopic emphasis. The current studies may identify subtle differences between oiled and unoiled areas, but without a perspective for explaining such differences and their significance, the public will be misled into believing the area has not recovered.

Finally, the contention that the assessment is being conducted in accordance with the DOI regulations is indefensible. The Plan was issued after the work was conducted, thereby, preventing participation in the process. Most importantly, the opportunity for the potentially responsible parties to participate meaningfully, as required by the regulations, is foreclosed.

Sincerely,

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THE 1990 STATE/FEDERAL NATURAL RESOURCE DAMAGE ASSESSMENT AND RESTORATION PLAN FOR THE EXXON VALDEZ OIL SPILL

> REVIEW COMMENTS OCTOBER 31, 1990

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PART 1

EXECUTIVE SUMMARY

This document provides Exxon Shipping Company's (ESC) comments on <u>The 1990</u> <u>State/Federal Natural Resource Damage Assessment and Restoration Plan for the</u> <u>Exxon Valdez Oil Spill</u> ("Plan") published by the NRDA Trustee Council. The Introduction to the 1990 Plan states that it supplements plans and studies described in the 1989 Draft Plan issued by the Trustee Council. It covers assessment activities commencing March 1, 1990 and proceeding for several years, depending upon the study. The 1990 Plan was announced in the Federal Register on September 17, 1990 and made available to ESC on September 24, 1990.

The statutes and regulations controlling the Natural Resource Damage Assessment (NRDA) process clearly require that studies and work undertaken by the resource trustees should focus on restoration of injured natural resources. The Clean Water Act establishes that the cost of restoring, replacing, or acquiring the equivalent of the injured resources is the measure of natural resource damages recoverable from an oil spill. The D. C. Circuit Court of Appeals in <u>Ohio v. Department of Interior</u> held that restoration is the primary objective of the NRDA process as prescribed in the Department of Interior's (DOI) regulations.

Thus, the 1990 Plan must be judged by its ability to identify requirements for, and reasonable costs of, restoration of injured resources. It is against this backdrop of law and regulation -- and in the broader context of Exxon's continuing resolve to deal responsibly with the impacts of the spill -- that ESC has evaluated the Plan's merits and offers the following summary comments. <u>Studies incorporated in the Plan are not aimed at defining restoration</u> requirements.

The Plan recognizes that restoration is the "fundamental purpose" for conducting the NRDA (p. 333). Had this principle been followed, the assessment program would not be the one described in the 1990 Plan.

The Plan describes 51 technical, economic, restoration, and archeological studies to be implemented in 1990 at a total cost of \$37.3 million. Some studies have components relevant for identifying possible restoration needs. However, the overall program focuses on basic scientific research, traditional agency studies or management activities, or possible preparation for litigation. There is no need for such studies in an assessment process intended to identify and measure cost-effective restoration requirements.

For example, the Plan includes several studies which "take" a variety of birds, otters, seals, sea lions, mink, and deer for various research purposes. This is particularly dismaying given the extraordinary efforts Exxon undertook to rescue and rehabilitate wildlife affected by the spill. Moreover, it seems entirely unjustified based on the apparent health and vitality of the various species. The Plan also describes laboratory research on mink reproduction and the toxicity of polar compounds; radio-tracking of eagles, bears, and sea otters; study of premature pupping of sea lions in areas outside the impacted habitats; the measurement of insecticides in peregrine falcon eggs; and numerous other activities with no apparent relevance to restoration requirements.

Likewise, the Plan includes studies and surveys conducted by agencies in their normal stewardship programs: salmon run surveys; humpback and killer whale censuses; bird and seal/sea lion surveys; and the gathering of recreational-use data. Such activities may be an appropriate part of the agencies' business, but they are not required to determine NRDA restoration needs.

1990 NRDA Plan Response

More than half the technical programs focus on finding evidence that some biologic parameter is statistically different between oiled and unoiled areas. The study descriptions do not indicate how such findings relate to restoration or how differences can be ascribed to the presence of oil. This information has limited relevance in assessing the need and type of restoration that might be effective.

The Plan ignores dramatic evidence of ecological health.

Because the 1990 Plan focuses on potential injury at a microscopic level, it overlooks broad indications of minimal or no damage to many species and habitats of primary concern. The overall conclusion that may be drawn from many area-wide observations and much available information is that the broad ecosystem was not significantly affected and the impacted resources are well on their way to recovery. For example:

- <u>Fish</u>. Convincing evidence supports the continued vitality and productivity of fishery resources. No fishkills were reported in 1989, and the commercial herring catch rate and pink salmon harvests in Prince William Sound (PWS) reached record levels in 1990. Subsistence food surveys conducted jointly by the agencies and Exxon in 1989 and 1990 looked closely at the risk of eating fish and shellfish from throughout the impacted areas. These surveys identified no problems with the finfish stocks anywhere in the region. Shellfish were noted safe except in those very few areas with obvious oil remaining.
 - <u>Birds and Wildlife</u>. Agencies and others have conducted numerous surveys to judge the general population and health of birds and wildlife. Mature otters and pups are repopulating areas that were heavily oiled in 1989. Bird surveys indicate that species density and diversity are returning to pre-spill norms. In addition, the USFWS conducted extensive surveys of eagle nests in the spring and

summer of 1990; results are encouraging. In the spring, more than 1,000 active nests in previously oiled areas were inspected. Ongoing monitoring of approximately 10 percent of these nests during the 1990 cleanup indicated expected, normal numbers of live chicks. Moreover, the positive results from the subsistence study and the overall clean shorelines bode well for the eagles' food supply and habitat.

<u>Shoreline conditions</u>. The agencies and Exxon conducted a number of joint shoreline surveys and studies to plan 1990 cleanup activities. One study, the Net Environmental Benefit Analysis (NEBA), looked specifically at additional cleanup response activities that might be implemented to remove remaining small amounts of oil from shorelines using mechanical equipment. It concluded that "there is evidence that recolonization is proceeding (even in areas having subsurface oil)."

Fu her assessment work should be focused on those areas, if any, where in cations of significant injury are apparent and active restoration program ma be warranted.

It ight be argued that these broad observations and results were unavailable the Council commenced its NRDA program in 1989. That is precisely the wh t. Instead of using existing information to plan a restoration-based po ram, the Council immediately embarked on a microscopically-focused set of pr ies costing over \$70 million. A more reasonable and effective approach st. d have been to follow the guidance in the NRDA regulations and start WO: ific intensive scientific studies only if their need were justified after sp ob rving the effects of cleanup and natural recovery.

1990 NRDA Plan Response

The Plan does not include 1989 results or build on prior spill experience.

The Plan says results from the 1989 program directed efforts in 1990. However, these data and results are not presented, and there is no indication that the 1990 Plan studies are more focused than those in 1989. To the contrary, the 1990 studies seem more directed toward microscopic effects. Without some clear indication of injuries that warranted more intensive study, the detail of the program should have been reduced and its perspective broadened to consider the viability of the ecosystem as a whole.

Support for this approach comes from studies of prior oil spills conducted over the past 25 years. There is little evidence to suggest the highly speculative technical program described in the 1990 Plan is warranted to either identify restoration needs or to assess the longer-term health of the ecosystem.

The Plan does not conform to Clean Water Act requirements.

The Act, the existing regulatory framework, and applicable legal principles require studies that look at issues related to restoration. Accordingly, the Plan should show how the information gained from the vast array of technical studies will answer questions related to the incremental benefits provided by restoration alternatives. The 1990 Plan does not address this issue.

Likewise, the Plan describes several restoration feasibility studies, but there is no connection to the economic work to evaluate the need for restoration and to determine if any of these projects might be supportable in comparison to natural recovery. If there is no linkage between a planned technical or restoration study and the economic analysis of restoration, then the technical or restoration project is likely not warranted under the NRDA process.

The Plan's economic methodologies are incorrect or inadequate.

The Plan's economic studies have nothing to do with the CWA's statutory standard of assessing damages for restoration expenditures. Beyond that primary error, the studies themselves are deficient in the following respects:

<u>Double counting of losses</u>. Study descriptions indicate that economic losses will be double or triple counted, violating both the statute and the regulations. For example, losses to natives are to be determined in three separate studies covering subsistence, intrinsic, and archeological uses. The Plan does not say how the economic components will be segregated in these three related and overlapping studies. Similarly, the recreational use study seeks to determine losses associated with fishing, sea kayaking, charterboating, private boating, sightseeing, and other tourist activities, without any means for separating these into discrete categories.

The Plan also fails to show how inclusion of private claims will be avoided. Since private claims are not properly the subject of the NRDA, the studies must be designed to exclude private damages and avoid double counting.

- <u>Available substitutes ignored</u>. There is no indication the studies will consider the availability of substitutes for services impacted by the spill. Numerous areas of Alaska, Prince William Sound, and the Gulf of Alaska are untouched by the spill and provide services comparable to those in affected areas. Any valid economic analysis of services affected by the spill must consider the losses in the context of the vast availability of substitutes.

<u>Contingent valuation methods invalid for this application</u>. The Plan proposes to use contingent valuation methods (CVM) to measure both use and non-use losses. CVM is an unproven and controversial device of questionable utility for assessing losses. All evidence suggests it cannot provide valid or reliable estimates of damages in the circumstances of this case.

The state's economic studies are improperly excluded from the Plan.

The Plan specifies that it covers only the economic studies to be conducted by the federal agencies; the state's studies are excluded. As a result, the state's economic studies are inadmissible in determining NRDA damages. Additionally, since the federal program covers virtually every possible category that might be relevant to the spill, the state's programs presumably overlap, and, therefore, double count the losses measured by the studies described in the Plan.

The restoration scoping and feasibility studies are premature.

The Plan's restoration program contains several elements aimed at scoping out and testing a broad array of potential restoration or replacement projects the agencies might employ. As such, the restoration program is proceeding along a path parallel to the technical and economic studies.

This parallel approach appears to ignore an important fact: restoration studies are necessary only if technical studies show that a resource will be adversely affected for a prolonged period. Restoration studies conducted <u>before</u> the results from these studies are available are forced to conjecture that <u>all</u> resources are injured and require active restoration. This leads to the prospect of expenditures for feasibility studies when no active restoration is required. For example, this approach results in major literature searches and public meetings to draw up long lists of potential projects and feasibility studies to restore resources (e.g., <u>Fucus</u> and intertidal fauna) that are known to be rapidly recovering naturally. This approach may shorten implementation time at the end of the NRDA process, but it represents an expensive and unwarranted use of resources with little, if any, ultimate benefit.

The Trustees are responsible for defining restoration needs.

ESC fully supports the goal of informing the public about the spill's impacts and required restoration steps. However, the selection of cost-effective restoration programs is the Trustees' responsibility. While the public may have an understandable interest in the outcome of this process, its active participation is not productive unless the public has an appropriate information base. In this case, the public has no independent knowledge or information about injuries or restoration needs. Consequently, its judgement about restoration is likely premature and potentially biased by misperceptions. Moreover, public meetings to develop lists of restoration ideas create expectations not justified by the true state of the environment.

The 1990 Plan does not comply with the Department of Interior's NRDA regulations.

In Volume II of the 1990 Plan, the Trustee Council asserts it has followed the general provisions of the NRDA regulations. That assertion ignores the numerous and serious deviations contained in both the 1989 Draft Plan and the 1990 Plan. The Trustee Council has embarked on an assessment that irrevocably forecloses any claims of conformance with the regulations. The Plan departs from the regulations in at least the following three fundamental respects:

- As was the case in 1989, the 1990 Plan was not issued for comment until September, after virtually all field work and financial commitments for the studies were completed. While the Trustee Council argues that emergency action was warranted in 1989 (although this, too, remains subject to challenge), no such rationale exists

for conducting most of the 1990 program before publishing the Plan. The regulations clearly intend that the potentially responsible parties (PRPs) and others be allowed to comment on assessment projects <u>before</u> they are implemented.

The Trustee Council continues to ignore the special role of the PRPs in designing the type and scope of the assessment program ahead of public involvement in the process. Soliciting PRP comments on a program after the work has been done does not satisfy this requirement. The refusal of the Trustee Council to cooperate in any fashion with the PRPs is remarkable in light of the positions taken by the Department of Interior in its rulemaking on the regulations, by the Department of Justice in defending DOI in <u>Ohio v. Department</u> <u>of Interior</u>, and by the Circuit Court decision in that case. All three recognize the beneficial effect that cooperation between the Trustees and PRPs will have on resolving NRDA claims.

The 1990 Plan continues to focus studies and resources on areas not covered by the Clean Water Act or NRDA regulations. Damages relating to commercial fishing and tourism are subject to private claims, not the public NRDA process. Archeological resources are man-made by definition and, consequently, not covered by the NRDA process.

The studies contain numerous other deviations from the provisions in the DOI NRDA regulations.

Additional comments.

Additional comments about the technical, economic, and restoration programs and the legal aspects of the Plan are contained in Parts 2 through 5 of this document. Comments on individual studies are provided in the Appendix.

COMMENTS ON INJURY DETERMINATION/QUANTIFICATION STUDIES

The Injury Determination/Quantification studies described in the Trustee Council's 1990 Plan are inadequate to meet the overall goal of the NRDA process: to restore the natural resources and services those resources provide.

<u>Trustee Council's Damage Assessment Process Meets</u> <u>Neither Practical Nor Regulatory Tests</u>

Plan ignores obvious indicators of ecological health.

The 1990 studies ignore obvious indicators of overall ecological health that have become increasingly prevalent throughout the past year. The 1990 Fish/Shellfish studies, for instance, continue to search for presumed injuries on a microscopic level despite such positive indicators as 1) the absence of any recorded fishkills following the EVOS, 2) the findings of the 1989-90 Subsistence Study, together with an FDA report, which indicated essentially no problems except possibly for shellfish in a very few obviously oiled locations, and 3) the record 1990 commercial fisheries harvests for both Pacific herring and pink salmon.

The planned expenditure of over \$9 million on Coastal Habitat studies disregards the findings of the Net Environmental Benefit Analysis (NEBA) undertaken to evaluate the advisability of using such intrusive cleanup techniques as mechanical rock washers. In the case of Sleepy Bay (one of the most heavily impacted areas in PWS), for instance, the NEBA report concluded, "Overall, the intertidal biological community of Sleepy Bay is relatively healthy and clearly showing signs of recovery."

Another incongruity between the objectives of the 1990 studies and the increasing evidence of ecological recovery are Alaska's game-management strategies. Studies covering Sitka black-tailed deer and black and brown

bear seemingly disregard the obvious good health and abundance of these game animals; the state still permits hunting of these animals in the areas impacted by the spill. In addition, the state has not modified the waterfowl hunting season, also indicating a harvestable surplus.

The continued study of eagles is also unwarranted given the results of the eagle nest surveys conducted by the USFWS during the summer of 1990. These identified more than 1000 active eagle nests in previously oil-impacted areas. This points to the rapid recovery of this species and the general health of the environment they inhabit.

Studies are not aimed at defining reasonable restoration requirements.

The goal of the NRDA process is the implementation of the cost-effective restoration of natural resources and the services they provide, whether by natural recovery or by human intervention. However, the 1990 studies are not designed to determine injuries for which damages, based on restoration can be calculated. This is a result of their microscopic approach to damage assessment. This deficiency applies to all of the marine mammal studies. Despite the lack of documented evidence of injury to either whales or pinnipeds, studies continue in 1990 (MM1, MM2, MM4, MM5). And although sea otters were injured by the <u>Exxon Valdez</u> oil spill (EVOS), none of the 1990 sea otter studies (MM6, MM7) are likely to provide information useful for damage assessment and restoration purposes. In the face of an obviously rapid recovery process for impacted resources like otters, studies of minor differences between area populations will not contribute to defining a restoration need or strategy.

<u>Inadequate consideration is given to natural recovery as a viable restoration</u> <u>alternative</u>.

The DOI regulations specifically require that a "no action natural recovery" alternative be included in the development of a restoration methodology plan. The scientific literature is also replete with historical evidence from previous spills which underscores the viability of natural recovery as a

legitimate and preferred restoration approach. Despite these regulatory requirements and historical evidence, the Trustee Council's 1990 technical studies inadequately consider the role of natural recovery in the restoration process. In light of the extensive natural recovery which has already occurred, it appears that natural recovery is the most practical and environmentally sound restoration alternative.

Emphasis of studies appears to be on detecting differences between oiled and non-oiled areas and not on understanding the causes of these differences.

Many of the Fish/Shellfish studies suffer from a fundamental flaw: a study design based primarily on detecting differences between oiled and non-oiled areas cannot necessarily attribute the causes of those differences to EVOS-related effects. It appears that little, if any, consideration has been given to distinguishing the effects of the oil from a host of other natural factors that can influence population sizes, productivity, or physiology.

Similar inadequacies also exist in the sea lion (MM4) and harbor seal (MM5) studies. Populations of these species have been dramatically declining for unknown reasons several decades. The existing study design will not distinguish effects of the spill from the factors shaping population trends for these marine mammals during the last 20 years.

The peregrine falcon study (B5) is another example of focusing on differences, with no reference to understanding causes. In this study, the site occupancy and productivity of PWS falcons will be compared to those of a different sub-species of falcons residing in Norton Sound, several hundred miles away near Nome. Occupancy and productivity differences identified between the two sites will apparently be ascribed solely to the effects of the EVOS. Such a linkage is inappropriate.

<u>Studies are not based on a logical exposure pathway to spilled oil from the</u> <u>EVOS</u>.

Several studies assume a clear and obvious exposure pathway to oil from the EVOS where none has been established. This is the case for Fish/Shellfish studies FS7, FS8, and FS22 where no evidence of contamination exists for either the water column or traditional spawning areas to presuppose injury to these species.

Although Terrestrial Mammals studies TM1, TM3, and TM4 are continuing for a second year, there are no documented mortalities of deer, river otters, or brown bears in the 1990 study descriptions. It is unlikely that populations of these animals, as well as the black bear and mink of studies TM2 and TM6, could have been significantly impacted by the EVOS and would warrant continued study. The cetacean studies (MM1, MM2) are also examples where evidence of exposure is lacking.

The 1990 studies have also failed to consider sources other than the EVOS as possible pathways of hydrocarbon exposure. Hydrocarbons are ubiquitous in the marine environment and result from a number of natural sources, including those of biogenic (e.g. plant waxes) and petrogenic (e.g. natural seeps) origin. The coastline of southeast Alaska and the GOA just outside the entrance to PWS are documented regions of natural seep activity. Human activity is another source of hydrocarbons which the 1990 studies do not consider. PWS supports a large commercial fishing industry. With heavy vessel traffic comes the associated problem of sheens. Exxon's sheen surveillance program demonstrated that over half of all sheens reported within PWS during the summer of 1990 were due to vessel activity. Furthermore, 95% of the total volume of all reported sheens was attributable to non-EVOS sources (i.e. vessel traffic or other sources). With the prevalence of these non-EVOS sources, it will be difficult to link presumed injuries to continued exposure to EVOS-related sheens.

Studies are neither cost effective nor reasonable in light of anticipated damage.

The relevant law requires that the anticipated costs of the assessment be less than the anticipated damage amount determined, for the costs of the assessment to be reasonable. This requirement is violated by many of the studies. The Terrestrial Mammals studies are an excellent example. It is highly unlikely any significant injuries to these animals occurred as a result of the EVOS.

Insufficient Detail Provided

<u>Plan contains insufficient detail to permit adequate technical review.</u>

As was endemic with the 1989 Draft Plan , the studies described in the 1990 Plan lack sufficient detail to permit an adequate and comprehensive technical review. The Plan fails to provide sufficient details to allow for a thorough evaluation of most aspects of the studies, including but not limited to: 1) the number and representative nature of sampling sites, 2) the number and quality of samples to be collected and analyzed, 3) a full description of the methods for collecting, preserving, shipping, identifying, preparing, analyzing and reporting of samples, and 4) details of the statistical design for results interpretation. Incorporating such details in a study design is not only a sound scientific approach, but also a requirement of NRDA regulations.

Omission of 1989 study results is inexplicable.

Although the 1990 Plan says the 1989 NRDA study findings influenced the 1990 program, no details are provided to substantiate this claim. The reviewer is unable to determine the justification for the studies described in the 1990 Plan without understanding the bases for them, as established by prior measurements.

Studies Not Focused on Damage Assessment

Many of the studies are predominately research-oriented.

The 1990 Plan has major components of scientific research, the results of which will not lead to the identification of injuries for which active restoration steps can be defined and damages calculated. Such research is clearly outside the scope of costs compensable under the NRDA regulations. If justified on its own merit, such research should be funded by alternative means. An example of such a study in the 1990 Plan is the use of mixed function oxidases (MFO) levels in fish tissues to assess hydrocarbon exposure and, hence, injury. The use of MFO in this manner is an unproven technique which has been shown to yield a great deal of variability between different life cycle stages, seasonal factors, and food sources.

Additional examples of research-oriented studies include: 1) using mussel tissue to assess hydrocarbon contamination -- in particular, for determining hydrocarbon concentrations, pathways, or their effects (FS13); 2) the laboratory toxicity study of mink (TM6), which is an inappropriate laboratory simulation of the actual environmental conditions; and 3) a study to determine whether the level of pesticide in peregrine falcon eggs from the impacted area differs from levels which are known to cause reproductive failure in other areas (B5).

Several aspects of the proposed eagle assessment program (B4) also appear to further the cause of general research more than that of damage assessment. For example, eagles from the Copper River Basin are included in the survival and productivity portions of the program, based on the speculation that these eagles may winter in PWS. The Copper River Basin is clearly well outside the zone of influence from the EVOS and eagle demographic data from that area are not relevant to the assessment of injury.

Studies may provide useful information, but are not needed for damage assessment.

Many of the studies may provide data, possibly useful for better population management, but of little relevance to EVOS-related effects. For example, a better understanding of the general ecology and population dynamics of PWS fish species has long been the goal of fishery scientists working in both the private and public sectors. Many of the Fish/Shellfish studies will provide data useful to long-term management goals but not directly related to oil spill impacts (FS2, FS5, FS5, FS7, FS8, FS10, FS17, FS23, FS27, FS28).

This lack of relevance to EVOS-related effects is also evident in several of the Marine and Terrestrial Mammals studies (MM1, MM2, MM4, TM1, TM3, TM4). For example, the river otter study (TM3) will provide abundant information on habitat use and movement patterns of the species, but it will not measure any population impacts.

Another study with little relevance to the determination and quantification of injuries is the mass balance of the spilled oil in AW6. The data generated will be insufficient to construct an accurate mass balance of the spilled oil. It is extremely unlikely that a mass balance, even if approximately precise, can be developed; much less one sufficient for quantifying of injury to natural resources.

Deficiencies in Study Design

<u>Natural variability is not adequately considered in study design.</u>

Many natural variables clearly affect life-cycle events of various species. It is not apparent that the sampling programs will capture the information necessary to prove that a statistically significant portion of the expected biological variability is a function of hydrocarbon contamination versus numerous other natural factors (e.g. FS1, FS3, FS8, FS13, FS17, TM1, TM3, TM4).

Historical population trends and estimates of variability are largely unavailable for the parameters being measured in the Marine Mammal studies. Specific examples are humpback whale distribution (MM1), killer whale natality and mortality (MM2), pathological examination of pinnipeds and sea otters (MM4, MM5, MM6), and population sex/age structure of sea otters (MM6).

Furthermore, a description of the normal histology for most of the animals being studied is unknown. This is particularly true for the invertebrates and fish and, to a lesser extent, for the birds and mammals being studied. Sufficient information cannot be gained by the examination of a few control specimens. Hence, determining that a condition is "abnormal" and specifically demonstrating that this abnormality is a direct result of exposure to the EVOS will be difficult, if not impossible.

Variations in historical population dynamics will make any observed effects impossible to correlate with extremely low hydrocarbon levels.

A review of population dynamics in PWS clearly illustrates that there was substantial variability in resource levels prior to the EVOS. Even obvious factors affecting salmon population dynamics, such as major interactions between wild and hatchery stocks, are not clearly understood by the fisheries managers of the area. Annual recruitment to fish and shellfish populations is highly variable from year to year, resulting in equally variable commercial catch statistics and escapement numbers. Most of the Fish/Shellfish and Bird studies do not adequately consider this high degree of variability or the lack of reliable baseline data; with the result that statistical detection of differences specifically due to oiling will not be possible (FS3, FS8, FS15, FS17). Furthermore, it will be impossible to develop sufficient data to describe the subtleties of historical population dynamics and even more difficult to relate any potential responses to extremely low hydrocarbon levels (FS3, FS4).

1990 NRDA Plan Response

Historical data are either misused or ignored.

The use of historical data is preferred from a cost effective standpoint only if the data are relevant. In the case of historical mussel and sediment contamination data for PWS, the data may not be relevant (CH1). No information is provided on the locations of the 10 historical sites from which mussel and sediment contamination data have been collected. Therefore, it is not known if they are from areas affected by the oil spill. The 1990 Plan states that these sites are in low-energy, low gradient beaches, often at the head of embayments. They are not, therefore, typical of most oiled sites in PWS. Further, for valid comparisons to be made, the analytical methods for detection of petroleum hydrocarbons in the mussel tissues must be the same for both the historical samples and the post-spill samples. It is unclear from the study description whether this is the case.

The Marine Mammals studies have apparently ignored historical data in the site selection process. A specific example is the sea lion premature pupping study (MM4) where Cape St. Elias is being considered as the potentially spill impacted site. The representative nature of this site is surely questionable given that pre-spill records show premature pupping incidence has historically been much greater at Cape St. Elias than at other sites in the Gulf of Alaska. Perhaps even more troublesome is the fact that Cape St. Elias is approximately 100 miles east of PWS and, thus, well out of the potentially spill impacted area.

In yet another misuse of historical data, aerial surveys designed to provide census and seasonal distribution information for birds (B2) will be compared with historical data taken in 1971. It is improbable that the 1971 data are representative of that earlier time period without 1) data from the surrounding years and 2) a comparison of the survey techniques used. It is inappropriate to expect that this limited set of historical data is representative of the "baseline condition" existing prior to the EVOS.

<u>Use of non-specific, non-standard indicators of hydrocarbon exposure cannot</u> <u>be used as reliable indicators of injury</u>.

Many of the 1990 studies rely on either non-specific or non-standard indicators to correlate evidence of hydrocarbon exposure to presumed population impacts. Such an approach will not lead to technically conclusive results. Examples include biochemical measurements of bile fluorescent aromatic hydrocarbons concentrations and enzyme level changes in fish (FS18, FS24). Such measurements are highly variable due to purely natural causes, and cannot be directly correlated with EVOS-related causes.

In the same vein, sediment traps are not appropriate for measuring transport of particulate hydrocarbons to offshore sediments (AW3). Sediment traps measure the concentration of particles in the water column, but yield poor predictions of the rate of flux of suspended particles to the bottom. If mounted near the bottom, they may measure mainly sediment resuspension. Any attempt, therefore, to relate these hydrocarbon levels to population impacts on benthic organisms would be inappropriate.

Demonstrating population level impacts that may result from EVOS depends on the use of reliable, reproducible techniques and valid measurement standards or criteria. Although sophisticated chemical analyses are referenced in TSI, apparently extensive use will be made of one method (UV fluorescence) that is not always conclusive in distinguishing between aromatics from the EVOS and petrogenic or biogenic aromatic hydrocarbons from other sources. Similarly, it is unclear whether the gas chromatograph methods described in TS1, and possibly used for some samples, can be used to distinguish weathered EVOS oil from oil from other sources (AW2, AW6). Finally, the criteria for determining oil-induced lesions in invertebrates and fish were developed for species exposed to the <u>Amoco Cadiz</u> spill and may not be applicable to species from PWS (Appendix B - Histopathology Guidelines).

In study B5, feather samples from peregrine falcons will be analyzed by means of instrumental neutron-activation analysis to determine the levels of vanadium and nickel. This approach suffers from the following deficiencies:

1) it is not clear that levels in the feathers can be correlated with levels elsewhere in the body, 2) levels of nickel and vanadium toxic to peregrines have not been established, and 3) more importantly, the normal values for these elements in peregrine falcons in the spill area are unknown.

From the above examples it is obvious that results from studies which incorporate these particular techniques (as well as others not specifically mentioned) will be subject to scientific dispute.

Inadequate sampling design of field programs will yield biased data for testing hypotheses and statistical effects models.

Although more detail is provided on statistical design in the 1990 Plan than in the 1989 Draft Plan, in general it is still inadequate to ensure that the studies will yield unbiased data for use in modeling efforts. For example, the objective to "measure the incidence of histopathological conditions and external lesions in selected species of birds, mammals, finfish, and shellfish collected by NRDA studies" cannot be met because there is insufficient replication in most studies (TS2).

<u>Criteria for the selection of oiled and non-oiled sites are poorly described</u> <u>and possibly biased</u>.

In most cases, inadequate information is provided to document that selected control sites are ecologically similar to test sites. As in the 1989 Draft Plan, methods are not given for random site selection. Additional sites were selected nonrandomly in 1990. The inclusion of these nonrandom sites may make the whole sampling design nonrandom. Because the stratified sampling design may no longer be completely random, it could be difficult to "extrapolate impact results to the entire spill-affected area" (CH1).

Another example of site selection deficiency is that the criteria used to select the streams and sampling sites for the Fish/Shellfish studies do not include evaluation of the level of oiling. All selection criteria are based on non-oil related phenomena (i.e. large adult return, past history of fry digs, part of aerial survey project, can be sampled safely). Since these studies are being conducted to evaluate the effects of oil on egg-to-fry survival, it is essential to include a quantitative assessment method to measure the degree of oiling in the site selection criteria.

Confounding the site selection process further is the fact that oil distribution within PWS, even immediately after the spill, was extremely variable with respect to both space and time. Areas to be sampled in several Fish/Shellfish studies are broad and necessarily represent a wide range of extremely low level hydrocarbon exposures within an area. Given the highly variable nature of these exposures, it is extremely unlikely that the sampling design will be able to relate observed biological responses to any particular hydrocarbon concentrations (FS1, FS3, FS8, FS18, FS22, FS28).

Studies are not integrated and may be duplicated elsewhere.

It is apparent that the Trustee Council's 1990 Studies are not fully integrated and will likely result in the duplication of results. For example, it is unclear as to whether studies of petroleum hydrocarbon concentrations in CH1 and AW6 represent duplication of effort or if the results from the different studies will be used to address different components of injury determination. In addition, the three Air/Water studies (AW2, AW3, AW6) are not well integrated internally, with each other, nor with the Coastal Habitat study (CH1).

This lack of integration is also generally true for the Bird survey studies (B2, B3, B4, B5) in which there appears to be no attempt to correlate census or distribution data with factors other than the presence of EVOS oil.

Additional comments on individual studies can be found in Appendix, Sections A through G.

PART 3

COMMENTS ON ECONOMIC STUDIES

This Part gives a summary of comments on the economic studies contained in the Trustee Council's 1990 Plan. The economic studies have no apparent relevance to the statutory standards set by the CWA for measurement of damages based on cost of restoration. The studies represent attempts to estimate foregone use and non-use values with no apparent intention of applying the results to the only purpose for which they are legitimately applicable, namely, the determination of whether cost of restoration is grossly disproportionate to the value of the injured resource or the identification of the most cost-effective restoration alternative. Under the CWA, the Trustees are not permitted, contrary to the assumptions that underlie the economics studies in the 1990 Plan, to recover for lost use values. Beyond this fundamental defect, the economic studies are flawed as outlined below and described in further detail in the Appendix, Section I.

State economic studies are not included.

Economic studies conducted or planned by the State of Alaska are not included in the Trustee Council's Plan. This indicates that federal and state studies are not coordinated, a condition certain to inflate assessment costs, further deteriorate study quality, and contribute to additional double counting. Failure to describe the state studies violates applicable law and regulations and makes meaningful comment on federal studies virtually impossible, since one cannot understand the complete research program. In any event, studies not included in the Plan are clearly not reimbursable or admissible in the NRDA under federal law.

Inadequate study description is provided.

The Plan contains insufficient description of study objectives and methodology to permit thorough evaluation. No milestones or schedules are included.

Studies repeat 1989 plans.

Every 1990 economic study plan incorporates all of the assumptions, objectives, and tasks cited in the 1989 Plan. This indicates that little or no progress was achieved in 1989 studies which had proposed budgets totaling \$2.8 million. The status of the 1989 studies and the corresponding expenditures should be available for evaluation of the 1990 study plans.

Studies are included to assess noncompensable damages.

Several economic studies purport to assess alleged damages that are not compensable under the laws and regulations governing natural resource damage assessment. Examples are cited in the Appendix and include commercial fisheries losses covered by private claims, alleged research losses, alleged damage to archeological resources, hypothetical effects on value of public land absent committed transactions, and others.

Studies incorporate substantial double counting.

The economic studies continue to include numerous cases of double counting of alleged damages. Examples include: attempts to estimate non-use^{*} losses of natives in three separate studies; attempts to identify changes in property values include separately measured use value effects; attempts to estimate separately alleged losses in sport fishing and charterboat operations; and inclusion of duplicate non-use values. Although the response of the Trustee Council to comments on the 1989 plan recognizes the requirements to eliminate double counting, the economic study plans make no reference to such

The Trustee Council's 1990 Plan uses the term "intrinsic value" to mean existence value, option value, and bequest value. As explained in comments on Economic Study Number 7, economists generally use the term "intrinsic value" to define inherent worth that natural objects possess independent of any values held or perceived by humans. Economists agree that principles of economics do not extend to such concepts. The comments on economic studies here and in the Appendix apply the term "non-use values" to any values independent of use. Such terminology is consistent with definitions contained in the DOI regulations.

requirements. Nor do they provide methods to properly account for double counting.

Several studies depend significantly on an unproven and controversial method.

Extensive reference is made in the economic study descriptions to use of contingent valuation, a methodology that cannot be applied validly or reliably to assessment of compensatory damages for non-use value injuries in the circumstances of this case.

Studies are not integrated.

There is no apparent relationship between the economic studies and the studies of injury determination or restoration planning. Furthermore, there appears to be no coordination among the economic studies as indicated by the degree of double counting and the absence of plans for economic studies undertaken by the state.

Studies include unnecessary data collection.

Many of the economic studies include expensive efforts to collect data which should be available routinely and without cost from government and business sources. Examples include demand for cruise ship tours, subsistence use data, identification of research studies under way before the spill, fisheries quantity and quality data, and others.

PART_4

COMMENTS ON RESTORATION PLANNING

The Restoration Planning Project has a total budget of \$1,762,900. Included in this budget are eight feasibility projects and studies. Three of the eight are technical support projects, totaling \$236,500, which provide for peer review, analyzing and mapping beach segment data, and travel and other support to develop new feasibility studies. The remaining five studies, totaling \$326,400, are divided between assessing the feasibility to restore <u>Fucus</u>, fauna, and wildrye grass and preparing for land acquisition by determining upland habitat and land use. Also budgeted for Restoration Planning is a total of \$1,200,000 to be spent on overhead, public meetings, workshops and a literature review.

Insufficient information provided for adequate technical review.

Insufficient information is provided to adequately review and comment on the Restonation Planning Project. This includes objectives and field, analytical, and statistical methodologies.

Program does not have a restoration emphasis.

In contrast to the statement "Restoration is a broad term," (p. 334) the terms of "restoration," "replacement," and "acquisition of the equivalent" are given definite meanings in decisions interpreting the Clean Water Act and the NRDA regulations. In both, restoration is defined as actions undertaken to return an injured resource to its baseline services. Any measures taken must be cost effective and natural recovery must be selected if it is the cost-effective alternative.

Much of the Restoration Planning Project is not focused on restoration. In fact, significant portions of the Restoration Planning section are focused on preparing for acquisition activities (Project 2, Studies 4 and 5). Any efforts concerning off-site acquisitions may be considered only if it is demonstrated that impacted resources and their respective services cannot be restored or replaced. The Plan offers no evidence that the impacted resources cannot be restored or replaced. Consequently all acquisition-based studies are premature, unfocused, and unwarranted.

Program is not coordinated with technical studies.

The Restoration Planning Project is not coordinated with the other technical studies described. Although the restoration planning studies briefly mention they are related "to various NRDA studies," no information is given to what extent, if any, the results of the technical studies were considered when creating the program objectives. This is particularly alarming since all restoration efforts should focus on injured resources, which are shown by the technical studies to require restoration. Performing restoration studies before the need for restoration is demonstrated is premature and contrary to the statutory and regulatory requirements.

Efforts are not focused on injuries which require active restoration measures.

Active restoration should only be implemented for those resources that have a proven injury and which will benefit from an active effort relative to natural recovery. The restoration feasibility studies (covering <u>Fucus</u>, infauna, and wildrye grass) are aimed at resources that are rapidly recovering naturally and are thus without merit. The oiling of shores was very segmented with unoiled and oiled sections immediately next to each other. Cleanup techniques were designed to minimize any further injury to shores, and good recruitment is already occurring. Therefore, it is likely that natural recovery will overwhelm any restoration efforts that may result from the feasibility studies.

The Trustees are responsible for identifying restoration projects.

Project selection, based on identification of resources needing active restoration beyond natural recovery, is the sole responsibility of Trustees.

The emphasis on public participation in restoration project selection is not cost effective and has distracted the program from focusing on the factual information developed in the technical studies. Relying on public perception and desires rather than an objective analysis of technical studies designed to assess injury and quantify service reductions to define needed restoration efforts is clearly contrary to the requirements of the NRDA process.

Studies are of a research nature.

Many components of the program are of a research nature and should not be funded as part of the NRDA effort. In addition, the program develops and tests new and unproven methods (such as the murrelet dawn detection technique) which are not focused on restoring the ecosystem and may be more useful for non-spill related activities.

Refer to Appendix, Section J, for additional comments.

PART 5

LEGAL AND REGULATORY ISSUES

This Part of ESC's response addresses major deficiencies and errors in the 1990 Plan with respect to both the Clean Water Act (CWA) and Department of Interior (DOI) regulations for Natural Resource Damage Assessments (43 C.F.R. § 11). Most of these deficiencies can be traced to the fact that the Plan does not comply with either the Clean Water Act's standard of measuring damages or the substance or procedures of the DOI regulations. Instead, the 1990 Plan continues to improperly focus upon the potential injuries to the natural resources, without an adequate analysis of the need for restoration, and if restoration is required--how to restore damaged resources, replace those that cannot be restored, or acquire equivalent resources. Consequently, the Plan cannot provide a reasonable basis for the recovery of damages under the Clean Water Act (CWA) or the DOI regulations. Since the DOI regulations still serve as a basis for judging the reasonableness of the Plan's approach, a detailed listing of the regulatory deficiencies and errors for each Plan study is contained in the Appendix to this response, in addition to the major discrepancies noted below.

The 1990 Plan is Invalid Because it is Not Focused Upon Restoration, Replacement, or the Acquisition of Equivalent Resources.

Despite the statement on page 1 of the 1990 Plan that they are "acting . . . as provided by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Clean Water Act (CWA), and other state and federal authorities," the Trustees can properly proceed only under the CWA. In no event are the Trustees authorized to conduct an assessment under "other state and federal authorities." Moreover, to the extent that aspects of the DOI regulations might be applicable, the Plan fails to comply with these regulations. The clear language of Sections 311(f)(4) and (5) of the CWA makes the cost of restoration, replacement, or acquisition of equivalent resources the exclusive measure of damages. The CWA does not provide for the recovery of lost use values. It follows that, under the statute, natural

resource damages must be based upon the cost of restoring the damaged resource, the cost of replacing them if they cannot be restored, or the cost of acquiring equivalent resources if the replacement is not cost-effective. The 1990 Plan ignores this fundamental concept.

The Plan will improperly calculate damages.

The Plan's approach to the calculation of damages and the funding of restoration ignores the clear language of § 311(f)(4) of the Clean Water Act (CWA). That section of the CWA provides that:

"The costs of removal of oil . . . for which the owner or operator of a vessel . . . is liable under subsection (f) of this section shall include any costs or expenses incurred by the Federal Government or any State government in the restoration or replacement of natural resources damaged or destroyed as a result of a discharge of oil . . . in violation of subsection (b) of § 311."

Section 311(f)(4) specifies the "costs or expenses" entailed in achieving "restoration or replacement" of natural resources damaged or destroyed in an oil spill; it does not impose any general liability upon owners or operators of vessels for natural resource damages, apart from restoration or replacement costs. Consistent with § 311(f)(4) of the CWA, § 311(f)(5) of that Act empowers the President or a representative of a state to act as "trustee of the natural resources to recover for the costs of replacing or restoring such resources." Further, any sums recovered under § 311(f)(4) and (5) "shall be used to restore, rehabilitate, or acquire the equivalent of such natural resources." Thus, under the CWA, the Trustees are not permitted, contrary to the assumptions that underlie the 1990 Plan, to recover for lost use values. Instead, calculation of such lost use values should be solely for the purpose of determining whether proposed restoration techniques are grossly disproportionate to the value of the injured resource and/or determining the cost effectiveness of the various alternative means of achieving restoration, including natural recovery.

Additionally, both the CWA and DOI regulations only refer to the "acquisition of equivalent resources." The 1990 Plan mistakenly attempts to expand this concept to include the acquisition of "equivalent services." The Plan's Introduction refers to "acquir(ing) the equivalent of the injured resources and services" (p. 1) and acquiring the equivalent of "these goods and services" provided by the injured natural resources (p. 3). Nothing in the statute or the DOI regulations provides for the acquisition of equivalent goods or services.

The Plan calculates damages independent of the cost of reasonable restoration activities.

The 1990 Plan states on page 333 that "The Trustees recognized from the beginning that restoration of the ecological health of areas affected by the oil spill is the fundamental purpose for conducting the NRDA." However, the Plan's damage assessment approach directly contradicts this "fundamental purpose." For example, the third paragraph of the Introduction (p.1) states "These (1990) studies are designed to determine the nature and extent of the injuries, loss or destruction to resources and will lead to a determination of damages. The assessment of damages for injury to natural resources requires consideration of (1) the nature of the resources at risk, (2) the nature of the oil in the aquatic environment, (3) the exposure of the resources to the oil, and (4) oil-related damages to important resources. The data provides a base for developing a restoration plan." This approach clearly contemplates the calculation of natural resource damages independent of the cost of reasonable restoration activities required to effect the recovery of the natural resources impacted by the spill. Consequently, this approach does not provide for the calculation of damages based upon the cost of reasonably required restoration activities or the selection of the cost-effective restoration plan.

The Plan's emphasis is on showing differences which will best be resolved by natural recovery.

The Plan improperly focuses on assessing the damages based upon the injury to natural resources affected by the oil spill, regardless of the prospects for natural recovery. As a result, many of the studies are designed only to show differences between oiled and non-oiled areas without any consideration of whether it would be necessary or desirable to correct with restoration activities the differences which may be detected or even whether the difference results in lost use. And even if meaningful differences are detected, it would appear that natural recovery is likely to be both the most cost-effective and most environmentally sound restoration alternative in light of the extensive recovery which has already occurred in the areas impacted by the oil spill.

The Plan must focus on restoration alternatives, especially natural recovery.

Given the Plan's stated purpose of restoration, the holding in <u>Ohio v.</u> <u>Department of Interior</u>, 880 F.2d 432 (D. C. Cir. 1989) that the primary purpose of natural resource damages is to fund restoration, and the CWA's exclusive reference to restoration, replacement, and acquisition of equivalent resources, the Plan's focus must be redirected toward identifying alternative restoration strategies, including the "No Action Natural Recovery" alternative. The present Plan continues to place a disproportionate emphasis on injury determination without adequate consideration of whether active restoration is necessary or desirable. Despite massive evidence of a robust environment, the program outlined in the 1990 Plan continues to assume that all resources were injured and that additional research is needed without regard to the restoration activities which might be undertaken. Such research cannot be squared with the restoration goal.

The Trustees must conduct a cost-benefit analysis in evaluating restoration alternatives.

The Trustees are compelled by both general legal principles and the DOI regulations to conduct a cost-benefit analysis to determine whether to proceed with active restoration in lieu of natural recovery. <u>Puerto Rico v.</u> <u>S.S. Zoe Colocotroni</u>, 628 F.2d 652 at 675 states "the appropriate primary standard . . . is the cost reasonably to be incurred . . . to restore or rehabilitate the environment . . . without grossly disproportionate expenditures. The focus . . . should be on steps a reasonable and prudent sovereign . . . would take . . . with attention to such factors as . . . regeneration as is naturally to be expected . . . " The regulations promulgated by the Department of Interior to provide a means of assessing damages contemplated by § 311(f)(4) contain detailed procedures for calculating damages when using a restoration or replacement approach. These regulations also require the selection of the cost-effective restoration alternative and the use of a cost-benefit analysis to make that determination. Section 11.81(f) unambiguously states that:

"The damage amount as measured by restoration or replacement is the cost to accomplish the cost-effective alternative that provides the lost services."

<u>The Plan does not incorporate cost-effectiveness criteria in its restoration</u> <u>plan</u>.

The 1990 Plan has not incorporated cost-effectiveness criteria in the evaluation of restoration alternatives. At page 333, the Plan states an "objective" of the Restoration Planning Project is "identify(ing) the costs associated with implementing feasible restoration measures" without any reference to the "benefits" associated with such measures. And in the preceding paragraph D, when making one of the few references to "natural recovery" in the document, the Plan states that it will determine when active restoration measures "may be <u>warranted</u> and when it may be <u>appropriate</u> to rely on natural recovery." These terms clearly signal the intention to use
discretion instead of cost-benefit analysis to determine whether to proceed with active restoration in lieu of natural recovery.

The parameters used for selecting the feasibility study projects on page 336 include "the need to initiate the particular study as soon as possible, the ability to implement the study in a short-time frame, reasonable likelihood of success, identified public concern, relationship to other NRDA studies, and budget priorities." Absent from this list is any reference to the requirement that the restoration alternative be more cost effective than natural recovery. The coastal habitat study, which is by far the most expensive of the 1990 studies, "is designed to document injury to resources" and "to assess damages for the loss of services provided by the (studied) habitats." (p. 2). Missing is any reference to conducting the study for the purpose of determining appropriate restoration techniques and/or assessing the effectiveness of natural recovery.

<u>Restoration is complete when the services provided by the resources are</u> <u>restored</u>.

Contrary to the assumptions underlying at least some of the studies described in the Plan, neither the CWA nor the regulations envision a return to a "pristine" environment or the calculation of damages based on the perturbation of such an environment. See Puerto Rico v. S. S. Zoe Colocotroni, id., and 43 C.F.R. § 11.81(c). Section 11.81(c) of the regulations limits restoration or replacement "to those actions that restore or replace the resource services to no more than their baseline " The "baseline" within the meaning of § 11.72(b)(1) " . . . should reflect conditions that would have been expected at the assessment area had the discharge of oil . . . not occurred, taking into account both natural processes and those that are the result of human activities." Section 11.71(e) provides that "services include provision of habitat, food, and other needs of biological resources, recreation, other products or services used by humans, flood control, ground water recharge, waste assimilation, and other such functions that may be provided by natural resources." Thus, restoration is complete when these services are restored to their baseline levels even if there remain differences between oiled and

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non-oiled areas. Moreover, the "proper measure of services is inextricably linked with the economic methodology selected in the Damage Determination phase," and "damages can only be claimed for natural resources with committed use as defined in this rule." This suggests, consistent with the language of § 11.72(e), a definition of restoration that focuses on the services provided by those resources. The cost-benefit analysis required by § 11.35(c) for restoration also plainly requires a focus upon human use: "The benefits of restoration or replacement . . . shall be the value of the restored uses "

The Plan fails to focus upon a return to "without spill" resource service level.

Underlying much of the Plan is the concept that the natural resources must be restored to a "pristine" condition. Aside from the difficulties in defining and applying that term, the CWA or the DOI regulations only require restoration of the services provided by the injured resources. By assuming that the objective of restoration will be a "pristine" condition, the Plan fails to focus upon a return to "without spill" resource service levels. Had the Trustees not made this error, both the content and methodologies utilized by the Trustees' studies would have been far different; instead of focusing on injured resources, the studies would have emphasized whatever impairment of services provided by those resources may have occurred.

The Plan Will Result in Double Counting of Damages.

The Plan contains seven economic studies to assess the economic value of injury to natural resources associated with the oil spill. In addition to the major objection noted above that the Plan solely focuses on the injury to resources with virtually no consideration of their restoration, these studies will result in double counting of damages in violation of the Clean Water Act and the DOI regulations. Nearly all of the double counting is attributable to the 1990 Plan's emphasis on the calculation of speculative lost use values. If the 1990 Plan economic studies were designed to calculate the reasonable cost of restoring the injured natural resources, replacing those that cannot

be restored, and acquiring the equivalent of the natural resources which cannot be replaced, double counting would not occur. Since the "restoration" approach uses actual costs, it ensures that sufficient funds will be available to accomplish the primary objective of restoration, that the funds will be properly allocated between the respective Trustees (i.e., funds are allocated to the Trustee implementing the restoration project), and that only claims properly within the scope of natural resource damages are funded. By comparison, the 1990 Plan's emphasis on lost use value results in at least three categories of double counting which will result in an inflated damage award in excess of that required for actual restoration of the injured resources.

The economic studies overlap.

The first category is the overlapping nature of the economic studies themselves. For example, Economic Study 7 purports to measure the loss of intrinsic value of the natural resource attributable to the oil spill. There is no explanation as to how this study will exclude all of the lost public land values, recreation values, subsistence values, research values, and archeological values purportedly being measured by Economic Studies 4, 5, 6, 8, and 9. Other specific examples of overlap are contained in the Economics Comments of this response.

The State economic studies are not included.

The second category of potential double counting arises from the fact that the State studies which are designed to assess the economic value of the injury to natural resources are excluded from the Plan. This deprives ESC of making even a tentative guess as to whether the State's studies overlap with the Federal Trustees'. The description of the Federal economic studies did not include any information that would lead one to expect that the studies are designed to exclude injuries and values encompassed by the State economic studies. In fact, the opposite is implicit in the description of all of the 1990 economic studies. For example, Economic Study 7 states that a nationwide survey will be conducted (p. 329) implying that this study will encompass all

claims for loss of intrinsic value. Given the breadth of subjects and resources covered by the Federal economic studies, there would appear to be complete overlap with--and thus, double counting of--the areas covered by the State's economic studies.

The economic studies include claims other than natural resource damages.

The third category where the Plan results in double counting of damages is its inclusion of studies of damages not relevant to a natural resource damage assessment. The CWA only allows reimbursement to the federal and state governments of the costs incurred in the restoration or replacement of natural resources damaged, while CWA § 311(f)(4 and 5) and CERCLA § 107(f)(1) make clear that natural resource damages shall be available only to sovereigns, not to individuals. However, the Plan includes studies to determine impairment of archeological sites, research programs, and the commercial value of public land, as well as stating that "natural resource slander" is being considered as an element of damages. Also included in the Plan are commercial fishery and recreation studies which are encompassed by pending private damage claims.

The inclusion of damages to archeological resources assumes that the artifacts are natural resources without giving any consideration to the fact that these objects are man-made. For example, the 1990 Plan states at page 308 that the archeological study will focus on "Impacts on artifacts" and "Occurrence of theft or vandalism on sites." At page 331, the Plan states that "Archeological information and artifacts have value" and "Oil impacts could substantially reduce those values." Clearly, it is the damage to the objects, not to the natural resources, that is the subject of this study.

The research program study states that it will account for the cost of resources expended on affected research programs, focusing on research-based expenditures made or committed to before the spill (p. 330). It is perfectly clear that such expenditures may be the basis of a private claim by the sponsor of the research program, not by the Trustees.

By the same token, although the allegedly injured party is the Federal or State government in its capacity as land owner, the purported losses measured by Economic Study 4 are not of natural resources, but instead, loss of the commercial value of public lands affected by the spill if sold to third parties. Nothing in the CWA nor the DOI regulations supports the recovery of such damages.

On page 111 of the Volume II: Appendix D of the Plan, the Trustees state that they "have not made a final determination regarding whether 'Natural resource slander' is an appropriate element of damages in this case." There is no basis either in the CWA or the DOI regulations for such a damage claim. Even consideration of such a claim is inappropriate in a natural resource damage assessment. Finally, both the commercial fishery and recreation damage studies fail to account for how these studies do not include damages which are the subject of private damage claims. Unless these studies can be defined to exclude private economic losses (and Trustees give no indication that they can), double counting will occur. Damages based, as the CWA and the DOI regulations require, upon the "restoration" approach avoid these difficulties.

The 1990 Plan Fails to Comply with DOI Regulations.

The 1990 Plan fails to state unequivocally whether the DOI regulations will be adhered to in conducting the damage assessment. The response to comments on the 1989 Draft Plan (pages 8 and 19 of Volume II: Appendix D) continues to avoid stating whether the DOI regulations are being followed for purposes of determining natural resource damages. It states that the Trustees "are considering use of the NRDA regulations on an issue-by-issue basis" and that they "decided to leave open the option of whether to follow strictly the regulations." The Trustees may not pick and choose from the DOI regulations on an "issued by issue basis." The DOI regulations were drafted as a comprehensive scheme, with integrated procedural and substantive components. Trustees are not free to select those portions of the regulations which inflate their claim (e.g., reliance on contingent valuation) while ignoring other portions of the regulations (e.g., the willingness to pay methodology) that DOI used to place appropriate bounds on contingent valuation techniques.

For that matter, even in the area of contingent valuation, the Plan states the intention to deviate from the regulations. Page 107 of Volume II: Appendix D states that the use of "willingness to accept" is being considered in the contingent valuation study. The DOI regulations clearly provide that "willingness to pay" is the only acceptable methodology to estimate damages with the contingent valuation technique. § 11.83(d)(7). Also, the Trustees have failed to follow the DOI regulations in regard to the most important procedural safeguards afforded to PRPs; adequate PRP participation in the assessment process and a meaningful opportunity to comment on the Plan. The Plan departs in the following respects so fundamentally from both the procedures and substance required by the DOI regulations, that the Trustees have foreclosed the option of conducting an assessment in compliance with those regulations.

Adequate participation of the PRPs in the assessment process has not been afforded.

The Plan avoids the clear requirements of the regulations concerning the development, content, and timing of an Assessment Plan, completely frustrating the cooperative process between Trustees and PRPs envisioned by the regulations. The DOI clearly recognized the special role of early involvement by the PRPs in effective resolution of damage cases and designed the assessment process accordingly. The portions of the DOI regulations providing for the PRPs special role in the assessment process were recognized and upheld in <u>Ohio v. Department of Interior</u>. The regulations do not contemplate publication of the Plan for comment by PRPs and the public <u>after</u> assessment studies were well underway.

Section 11.32(a)(2)(iii)(A) directs PRPs to participate "in the development of the type and scope of the assessment and <u>in the performance</u> of the assessment." No such invitation was extended to the PRPs in this case; they were, instead, on June 6, 1989, simply invited to participate in the "assessment process." Exxon Shipping Company ("ESC") accepted that invitation and, pointing to § 11.32(a)(2)(iii)(A), stated that it wished to participate "in the development of the type and scope of the assessment and in the

performance of the assessment" in its letter to Trustees on July 5, 1989. The Trustees responded on August 22, by requesting ESC's comments on the 1989 Draft Plan on exactly the same basis as members of the public. This treatment of ESC continued after ESC filed its extensive and detailed comments on the 1989 Draft Plan. ESC was invited, as were other commentators, to attend a "hearing" which limited commentators to clarifying their written comments. No opportunity was afforded the commentators to engage in meaningful dialogue with the Trustees' representatives. Such actions are inconsistent with active participation in the development and performance of the assessment. In these circumstances, the Trustees clearly have not complied with § 11.32(a)(2).

Further evidence of the Trustees' failure to afford adequate participation by the PRPs is contained in their response to comments on the archeological portion of the 1989 Draft Plan. Page 96 of Volume II: Appendix D states "the specific procedures employed may produce damage estimates used in litigation. They therefore constitute confidential information unavailable during the study process." This is clear evidence of the withholding of information vital to meaningful participation and comment.

Finally, the Plan fails to document the decision not to allow implementation of the Plan by the potentially responsible parties as required by § 11.32(d). Restricting the PRP involvement to commenting on the Plan during the public comment period, in addition to withholding of information, indicates a decision not to let the PRPs participate in the implementation of the Plan.

The regulations require that studies not be commissioned until after publication of an Assessment Plan.

The very fact that the 1990 Plan contains many studies, for which data-gathering is complete, demonstrates that the Plan does not comply with § 11.31 of the regulations. As is made clear at § 11.31(a), the Assessment Plan is to be used to inform PRPs and the public "of the scientific and economic methodologies <u>that are expected to be performed</u> during the Injury Determination, Quantification, and Damage Determination phases . . . [Emphasis added.]" One of the basic purposes of an Assessment Plan is to provide "a means of evaluating whether the approach used for assessing the damage is likely to be cost-effective and meets the definition of reasonable costs," within the meaning of the regulations (§ 11.31(a)(2)).

Here, instead of performing these functions, the Plan presents to the PRPs and the public a <u>fait accompli</u> reporting the scientific and economic methodologies that have already been commissioned and upon which millions of dollars have already been expended thereby depriving them of a meaningful opportunity to comment. The Plan cannot meet the basic regulatory purpose for which it is intended.

Contrary to the position taken by the United States Department of Justice on behalf of the Trustees, letter from Diane Kelly to John Seddelmeyer (ESC attorney), dated September 29, 1989, the studies described in the Draft cannot be justified on the basis of § 11.22 of the DOI regulations. That section permits only the preliminary collection of field samples or the initiation of site visits to preserve data and material likely to be lost. § 11.22(b). Manifestly, it does not contemplate the expenditure of vast sums of money, such as has occurred in both 1989 and 1990, to survey injury to all resources possibly affected by a spill, to analyze such data, and to base an injury determination upon it.

The response to comments on the 1989 Draft Plan again attempts to excuse publication of the Draft Plan after the 1989 studies were initiated as necessary due to the need to collect data for studies as soon as possible. But there is no similar excuse for the failure to publish the 1990 Plan in advance of the initiation of the 1990 studies, given the long lead time involved. In particular, there appears to be no justification for initiation of the economic and restoration studies before review and comment on the 1990 Plan is completed, since these studies are not based upon field sampling of the natural resources affected by the oil spill. The <u>post hoc</u> justification for studies nearing completion was criticized by many commentators in 1989. There is no justification for the Trustees to publish the 1990 Plan after the studies were initiated (if not completed) nor have the Trustees provided one.

The Plan gives no assurance that restoration costs will not be unreasonable.

In light of the court's decision in <u>Ohio v. Department of the Interior</u>, restoration costs must be compared to use values to determine if the cost of restoration is grossly disproportionate to the use value. The Plan gives no assurance that this principle will be respected. Moreover, if as required by the regulations, the No Action - Natural Recovery Alternative is selected when it is the cost-effective alternative, as ESC believes will be generally the case, restoration costs will be always be less than lost use values. But if the Trustees contemplate that there is a chance that some resources may require active restoration, the Trustees should calculate lost-use values only as to those few resources, and as to those resources, only to ensure that the cost-effective restoration alternative is selected and that the selected alternative is not grossly disproportionate to those values. It is unreasonable to expend large sums on the studies of lost use values before a determination of whether natural recovery will be the selected alternative.

The Plan combines Injury Determination and Quantification phases in the assessment process.

Section 11.13(a) of the DOI regulations envisions a planned and phased approach to the assessment of natural resource damages. Section 11.13(e) first requires an injury determination phase to establish whether natural resources have been injured, followed by a quantification phase focusing only on those resources as to which injury occurred. The studies attached to the Plan blur the distinction between the various phases of the assessment process. As a result, funds may be expended in the quantification of damages to resources that were not injured. Also, by combining injury determination and quantification, the Plan eliminates the post-injury-determination-phase review of the Assessment Plan required by § 11.32(f)(1).

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The studies described in the Plan are not limited to resources with committed uses.

The court in <u>Ohio v. Department of the Interior</u> upheld the requirements that "only committed uses . . . of the resources or services over the recovery period will be used to measure the change from the baseline resulting from injury to a resource," § 11.83(b)(2). As DOI made clear, this requirement prevents an award of damages for "speculative uses." 51 Fed. Reg., p. 27722. The Plan's description of the 51 studies does not recognize this significant constraint on the NRDA process. To the contrary, it appears that in many instances significant sums have been committed for the study of resources for which uses are speculative and as to which a committed use cannot be shown--e.g., Economic Uses Studies 4, 8, and 9. The response to comments on the 1989 Draft Plan admits that these studies will not measure committed uses. Page 114 of Volume II: Appendix D states "E/S Nos. 4, 8, and 9 will quantify losses to potential, not speculative, uses." Setting aside what the distinction between speculative and potential uses may be, it is clear that neither is a "committed use" as that term is defined in § 11.14(h).

The Plan fails to select a discount rate.

DOI's regulations provide that a 10% discount rate shall be used in calculating lost use values, § 11.84(e), a requirement that was specifically upheld by the court of appeals, 880 F.2d at 464-65. In the response to comments on the 1989 Draft Plan, it is recognized that the DOI regulations require the use of the 10% discount rate (page 105, Volume II: Appendix D). However, no indication is given that this rate is being used nor any explanation how it can be disregarded in compliance with the regulations.

Some studies in the Plan are designed to prove a non-injury hypothesis.

Section 11.23(b) of the DOI regulations states that the pre-assessment screen "should ensure that there is a reasonable probability of making a successful claim before monies and efforts are expended in carrying out an assessment." Marine Mammals Studies MM1 and MM2 both are designed to show that humpback whale and killer whale mortality rates have not changed since the oil spill. In other words, these studies are designed to show that there is no damage to these resources. The same is true of many other studies. Given the probability of no damages, the inclusion of these studies in the Plan violates § 11.23(b) as well as § 11.61(e)(3).

The other points developed at length above demonstrate further departure from the DOI regulations.

For example, the failure to utilize the appropriate restoration methodology in a study whose "fundamental purpose" is restoration and the use of the natural resource damage assessment process to calculate what are essentially commercial damages. There are, in addition, many other respects in which the Plan deviates from the regulations that are described in the Technical, Economic, and Restoration Comments and the Appendix of this response.

The Trustees have embarked on a procedure for assessing damages that does not comply with the regulations and accordingly will not have the benefit of the rebuttable presumption given to a study that is conducted in accordance with the regulations or the right to recover assessment costs. CERCLA § 107(a)(4)(C); 43 C.F.R. § 11.10.

Summary

The 1990 Plan fails to address its stated "fundamental purpose" of restoring the ecological health of the areas affected by the oil spill. The 1990 Plan will not determine what, if any, cost-effective restoration activities, including natural recovery, are required to restore natural resources injured by the oil spill. The 1990 Plan will result in the double counting of natural resource damages as well as the inclusion of inappropriate claims. The Trustees' actions and the 1990 Plan have so fundamentally departed from both the substance and procedures required by the DOI regulations that they have foreclosed the option of complying with those regulations. As a result, the 1990 Plan will not lead to a calculation of damages that can be supported under the CWA or the DOI regulations.

APPENDIX

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COMMENTS ON INDIVIDUAL STUDIES

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INTRODUCTION

This Appendix contains summary comments for each of the technical areas: Comprehensive Assessment, Air/Water, Fish/Shellfish, Marine Mammals, Terrestrial Mammals, Birds, Technical Services, and Archeology. Immediately following each area summary are comments on each technical study within that area which provide additional observations about the proposed studies.

Comments on the studies in the Restoration and Economic areas are also included in the Appendix. Summary-comments applicable to these areas are contained in the main body of the report.

The individual study comments are generally similar in format and address study objectives, methods, injury determination methodology, and regulatory deviations. The set of study descriptions provided in the Plan cover a variety of topics, contain varying levels of detail, and reflect the efforts of a number of investigators. Accordingly, the responses in this Appendix focus on individual study objectives where it is believed appropriate. In other cases, broader comments are provided to more suitably encompass and discuss study objectives.

For conciseness, the regulatory deviations identified in each study are referred to by a letter designation (i.e., A, B, C, etc.). On page K-1 of the Appendix there is a Regulatory Deviation Table that gives definitions for each of the letter designations.

APPENDIX - SECTION A Detailed Comments on COASTAL HABITAT STUDIES

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A. COMMENTS ON COASTAL HABITAT INJURY ASSESSMENT

The 1990 Plan describes a single study costing a total of \$9,269,700 (not including analytical costs). The Coastal Habitat Study for 1990 is nearly twice as large as the Coastal Habitat Study for 1989 (Cost for 1989 was \$5,440,000).

The study is divided into three components. Phase I - Site Selection - is intended to select study sites based on a purported stratified random design. Phase II, Part A - Injury Determination - is a comprehensive study of the chemical and biological condition of the intertidal, supratidal, and subtidal zones of each study site. Phase II, Part B - Hydrocarbons in Sediments and Mussels - is a comparison of hydrocarbon residues in mussels and sediments collected in monitoring programs in Prince William Sound prior to the spill and in mussels and sediments collected since the spill.

The study ignores the positive state of ecological health and recovery evident throughout the intertidal communities.

Observations and available information have consistently demonstrated that the flora and fauna of the intertidal communities of Prince William Sound and the Gulf of Alaska are healthy and thriving throughout the oil-impacted areas. The preponderance of positive evidence seriously questions the justification behind the entire Coastal Habitat study.

Phase I - Site Selection

Insufficient information is given to determine if the stratified random design is technically valid.

As in the 1989 Draft Plan, methods are not given for random site selection. Additional sites were selected nonrandomly in 1990. Addition of these sites may make the entire sampling design nonrandom. This could limit the ability of the investigators to extrapolate results to all possible oil spill sites. It is not clear how many of the sites sampled in 1989 are among the sites

sampled in 1990. From the limited description, it appears that criteria for selection of control sites may not have been rigorous enough to ensure that they will really be comparable to the oiled sites.

It is not possible to determine the true scope of the program..

The study description does not provide enough detail to identify the total number of sites sampled in this study, their distribution between control and oiled sites, among Prince William Sound, the Kenai Peninsula, and Kodiak Island, or among the five shoreline types. The five shoreline types are not identified. The Plan does not indicate whether any sites were sampled more than once in 1990 or how many sites were sampled in both 1989 and 1990.

Phase II, Part A - Injury Determination

Insufficient details are provided to determine the technical soundness of the study.

Only a general list (table of contents) of methods with no details is provided. The number of transects per site and the number of tide levels sampled at each site are not described. Methods for sampling and analysis of biota and sediments are not given. The types of biological tests of biological conditions and community function are not described. It is not possible to ascertain whether all the different types of biological and chemical analyses were performed on samples from all sites.

Because biological and chemical study methods are not described, it is not possible to determine what methods will be used to study recovery or to assess the potential for restoration. Biological restoration will occur naturally and has already progressed substantially in 1989 and 1990.

<u>Study designs violate basic statistical assumptions thus negating ability to</u> <u>extrapolate results beyond sample sites.</u> Apparently, only one level of oiling (moderate to heavy) is being compared to control conditions. Since the shoreline treatment procedures have not been considered in site selection, the "responses to varying degrees of oiling and subsequent clean-up procedures" cannot be measured. Extrapolation is further questionable as a result of the lack of randomness mentioned previously.

Phase II, Part B - Hydrocarbons in Sediments and Mussels

<u>Historical mussel contamination data for Prince William Sound may not be</u> `<u>useful for injury assessment</u>.

The Plan proposes the continued use of ten historical sites to assess potential mussel and sediment contamination. No information is provided on the locations; therefore, it is not known if they are in areas affected by the oil spill. The Plan states these sites are on low-energy, low gradient beaches, often at the head of embayments; therefore, they are not typical of most oiled sites in Prince William Sound. It is not stated if analytical methods for petroleum hydrocarbons in mussel tissues and sediments were the same for the historical samples and the post-spill samples. The presence of petroleum hydrocarbons in tissues of sentinel organisms like mussels should not by itself be considered injury unless it can be demonstrated that these tissue residues are causing biological damage.

Sediment studies duplicate studies performed elsewhere.

Studies of petroleum hydrocarbon concentrations in sediments are part of Phase I, Part A of this study and also of Air/Water Study 6. It is unclear whether this represents duplication of effort or whether the results from the different studies will be used to address different components of injury determination.

Study Title:COMPREHENSIVE ASSESSMENT OF INJURY TO COASTAL HABITATSStudy Number:COASTAL HABITAT STUDY NUMBER 1Study Cost: \$9,269,700

This study attempts to document and quantify injury to intertidal, subtidal, and supratidal biological resources in Prince William Sound and the Gulf of Alaska. Methodology includes chemical and biological sampling at sites characterized as randomly and nonrandomly selected.

Study Objective(s)

PHASE I

<u>Objective 1</u>. Insufficient information is provided to determine if a statistically valid study plan was developed.

<u>Objective 2</u>. No criteria are provided to understand how potential study sites were "ground-truthed".

<u>Objective 3</u>. The criteria used to select the 57 sites, apparently carried over from 1989, are never described. It is not clear if the same criteria were used to select sites in 1989 and 1990.

PHASE II - Part A

<u>Objective A</u>. The study plan provides only a general list (table of contents) of methods used to estimate the quantity, quality, and composition of trophic levels. None of the methods used for injury determination are described in sufficient detail to determine the technical soundness of the program.

<u>Objective B</u>. None of the methods used to determine hydrocarbon concentrations in sediment and soils are provided. The study plan uses the term "estimate" rather than measure when stating this objective.

<u>Objective C</u>. It is impossible to establish the biological response to "varying degrees of oiling" when only one level of oiling (moderate/heavy) will be compared to control sites. The plan specifies that light and very lightly oiled shorelines were eliminated. It may not be possible to demonstrate any biological response unless all control sites in their stratified random sampling study were randomly selected.

<u>Objective D</u>. It will not be possible to extrapolate possible impact results to the entire spill-affected area because all control sites may not have been randomly selected; lightly oiled sites were eliminated, moderately oiled sites were combined with heavily oiled sites, and none of the statistical procedures needed to detect differences are described.

<u>Objective E</u>. Estimation of recovery rate requires several site visits over time. The CH1 study plan does not define how many sites were sampled in both 1989 and 1990, nor if any sites were sampled more than once in either year. In addition, the study does not define how natural seasonal changes will be handled for estimating impact/recovery, or even what parameters will be used to predict recovery rate and their potential for restoration.

PHASE II - Part B

<u>Objective A</u>. None of the laboratory methods for analysis of tissue and sediment samples are provided. No description is provided of how the original ten sites used for historical sampling, or the ten new sites chosen after the spill were selected.

<u>Objective B</u>. Insufficient information is provided to determine whether the field sampling or laboratory analysis methods used to collect the 1977-1981 data are the same as those used in 1989-1990. No information is provided on how differences measured over time will be attributed to the oil spill rather that to natural or other anthropogenic changes.

<u>Objective C</u>. Although this study may establish differences between these specific oiled and non-oiled sites, it will not be possible to extrapolate

measurements from nonrandomly selected sites such as these, to the total universe of all such sites.

Field Methods

It is impossible to identify the total number of sites sampled in this study, or their distribution between: oiled and control sites, geographical regions, or habitat types. Furthermore, the habitat types examined in the stratified random sample (SRS) design are not provided, nor are the degrees of oiling clearly defined.

Although the study purports to use an SRS design, neither the 1989 Draft Plan nor the 1990 study plans describe the methods for random site selection, even though this was pointed out to the Trustee Council in 1989.

The historical mussel and sediment data were collected at ten nonrandomly selected sites which were not representative of the shoreline in PWS or the western GOA (all low energy, low gradient beaches located at head of embayments). Furthermore, it is uncertain how many of these sites are in areas affected by the spill. No site selection criteria are provided for the additional ten sites selected after the spill occurred.

The study plan does not describe how information collected at subtidal sites can be related to the SRS sites, since subtidal sites were selected independently of the supra- and intertidal sites.

The study plan does not address chain of custody or QA/QC issues.

Analytical Methods

Insufficient information is provided to determine whether the analytical methods are based on standard and widely accepted techniques. The study plan provides only a general list (table of contents) of field and laboratory biological methods with no details. None of the methods for the sampling and

chemical analysis of biota and sediment are named, described, or referenced. Further, the study plan does not address chain of custody or QA/QC issues.

Injury Determination Methodology

No information is provided on the statistical methods which will be used to determine injury, or how it is planned to extrapolate from specific SRS sites to the universe of all possible sites in a given category.

It is unlikely that CH1 will result in an objective quantification of injury and subsequent recovery since lightly oiled shorelines were eliminated from study, and moderate and heavily oiled shorelines were apparently combined into one oiling category for the SRS study.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, G, H, I, J, K, L, M, O, P, Q, S, U, V, X, Y, DD, EE, FF, HH, and II. Further deviations appear to exist between the study plan and regulations Z, AA, BB, and CC.

APPENDIX - SECTION B Detailed Comments on AIR/WATER STUDIES

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B. COMMENTS ON AIR/WATER INJURY ASSESSMENT

The 1990 Plan describes three studies costing \$2,190,300 (not including analytical costs) to evaluate injury to water and sediment resources. This is about the same cost as the 1989 AW studies (\$2,306,400). The 1989 studies on hydrocarbons in air and petroleum distribution on the water surface were not continued in 1990. Study AW4 on Injury to Deep Water was combined with Study AW2.

The major focus of the studies is to monitor the concentrations, chemical composition, and toxicity of petroleum hydrocarbons and their degradation products in subtidal sediments, and to monitor concentrations of petroleum hydrocarbons in the water column through analysis of hydrocarbon residues in sentinel bivalve mollusks. An additional objective of one study is to construct a mass balance budget of the fate of the spilled oil.

Inappropriate methods are used for hydrocarbon analysis.

The method used most frequently to measure petroleum hydrocarbons in water and sediments (UV fluorescence) is specific for aromatic hydrocarbons and is not always conclusive in distinguishing between aromatics from the oil spill and aromatic hydrocarbons from other sources. The gas chromatographic methods described in Study TS1 may not accurately distinguish weathered EVOS crude from oil from other sources.

The bioassay method is inappropriate for estimating sediment toxicity.

The Microtox bioassay, based on the response of a marine bacterium to methylene chloride extracts of sediments (used in Studies AW2 and AW6) is not an appropriate method for estimating the toxicity of in-place oiled sediments to marine organisms. Recent studies of sediments from Puget Sound show that results from Microtox bioassays of methylene chloride sediment extracts do not correlate with the toxicity of the sediment interstitial water or to concentrations of polycyclic aromatic hydrocarbons in the sediments. The

Microtox bioassay is considered a poor indicator of the toxicity of lipophilic organic compounds, such as petroleum hydrocarbons.

Studies are research oriented and not cost-effective.

Major components of all three studies, particularly Study AW6, are research. Methods proposed for trace hydrocarbon analysis (AW2) and toxicity testing (AW6) are neither standard nor accepted for this purpose and many new methods will have to be developed as part of the studies.

Sediment traps are not appropriate for measuring transport of particulate hydrocarbons to offshore sediments.

Sediment traps measure the concentration of particles in the water column, but yield poor predictions of the rate of flux of suspended particles to the sediments. If mounted near the bottom, they may measure mainly sediment resuspension.

A mass balance of the fate of the spilled oil is not useful for injury determination.

The data generated in other parts of this program will be insufficient to construct an accurate mass balance for the fate of the spilled oil as part of Study AW6. A mass balance cannot be used to estimate and quantify injury to natural resources.

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<u>Study Title</u>: PETROLEUM HYDROCARBON-INDUCED INJURY TO SUBTIDAL MARINE SEDIMENT RESOURCES

Study Number: AIR/WATER STUDY NUMBER 2

<u>Study Cost</u>: \$800,300

This study attempts, first, to determine the distribution, composition, persistence and toxic effects of petroleum hydrocarbons in subtidal marine sediments, second, to determine if these effects did and will continue to cause changes in macro-benthic biota. Additional study components attempt to determine the maximum potential for biodegradation of the oil and provide background for mass balance calculations on the fate of EVOS oil in the marine environment.

Study Objective(s)

<u>Objectives A-H</u>. The low number of sites and the method of their selection are such that it is unlikely that the major objectives will be realized in a manner that will permit them to be extrapolated to the region as a whole. Therefore, it will not be possible to obtain one of the main goals in the study which is to "evaluate the extent of subtidal hydrocarbon contamination in PWS, along the LKP, and near Kodiak Island".

The Microtox measurements proposed will be unable to attribute dose-response relationships to an EVOS component.

The analytical methods described for AW2 and TS1 are insufficient to identify the various sources of hydrocarbons in sediments. The unstated and invalid assumption is that all of the extracted hydrocarbon compounds are from the EVOS.

Field Methods

The field program is very inefficient and is therefore not cost effective. The total number of sites, the manner in which they were selected, and the

numbers of samples to be collected may be inappropriate for a statistically based study. Nonrandom site selection can yield biased results.

The sample design for the intertidal zone is insufficient to establish a relationship between subtidal and adjacent intertidal oil.

The biological sampling plan for the intertidal zone (along a 30m transect parallel to the shoreline in the range +1m to -1m relative to mean lower low water) is inappropriate due to the pronounced stratification of biota in that zone.

Analytical Methods

Proposed analytical methods are inappropriate to distinguish various hydrocarbon sources from EVOS.

The Microtox bioassay is an EPA water quality test and its application to sediment extracts is inappropriate.

Statistical tests of hypotheses are vaguely defined and it is not clear how abundance and biomass are to be tested.

It is unlikely that the statistical analysis of the benthic infauna will have much meaning considering the numbers of both oiled (6) and unoiled (6) sites to be sampled. Furthermore, because the geochemical techniques being employed will not discriminate the various sources of hydrocarbons (biogenic, pyrogenic, and other petrogenic) the statistical analysis will be unable to correlate any effects observed with EVOS oil or its weathering products.

Injury Determination Methodology

It is proposed that this will be accomplished by correlating the results of the chemical analyses (HPLC) with the Microtox measurements (as a measure of toxicity) and with the deep benthos biological statistics for oiled and unoiled sites. It will be impossible to determine EVOS-imposed injury in

1990 NRDA Plan Response

this manner because: (1) it will not be possible to quantitatively discriminate an EVOS signature from other hydrocarbon sources, and (2) the Microtox tests are invalid tests of toxicity as explained above.

The site selection procedure, the number of sites selected, and the hydrocarbon chemistry methods to be used preclude the use of deep benthos infaunal species diversity, species abundance and total biomass from being used to assess EVOS-related injury to subtidal marine resources. Further, the site-selection procedure precludes extrapolation of the site data to the entire region.

Regulatory Comments

This study deviates from the regulations as described by paragraphs A, B, C, E, F, G, H, I, J, K, L, M, O, P, Q, S, U, V, X, Y, CC, DD, EE, HH, and II.

<u>Study Title</u>: GEOGRAPHIC AND TEMPORAL DISTRIBUTION OF DISSOLVED AND PARTICULATE PETROLEUM HYDROCARBONS IN THE WATER COLUMN

<u>Study Number</u>: AIR/WATER STUDY NUMBER 3 <u>Study Cost</u>: \$520,000

This study attempts to measure injury to the water column and nearshore environment using sediment traps and caged mussels.

<u>Study Objective(s)</u>

<u>Objective 1</u>. Sediment traps are not appropriate for determining particulate transport of hydrocarbons in shallow-water environments.

<u>Objective 2</u>. The objective does not relate ambient water quality nor mussel hydrocarbon burdens to EVOS.

Field Methods

The geographic distribution of study sites is not adequate. Only 5 of 20 sediment-trap sites are listed and referenced figures for caged-mussel sites are not included in the document. The use of sediment traps for measuring flux to the subtidal region is not a valid or standard technique in shallow-water environments. The sediment trap-design is not described nor are the periods of deployment. No field chain-of-custody is described nor are QA/QC procedures for field-extraction of the particulates.

Analytical Methods

The field-extraction method for the sediment trap samples is not described. Other than attempting to determine differences in hydrocarbon concentrations between samples and sites, no methods are described how, or if any, of the results from these efforts can be attributed to EVOS.

Injury Determination Methodology

These injury/pathway studies do not attempt to differentiate hydrocarbon burdens found from EVOS, pyrogenic, natural sources (seeps), nor other (boating) sources. No methodology is provided which will tie differences in hydrocarbon concentrations in the sediment traps and mussels to resource injury and lost services. The few sites which are proposed to overlap with studies CH1 and AW2 will not "provide a comprehensive picture of damage" as stated. How this study is specifically linked to the other injury-related studies is not apparent. Only two control sites are listed for the caged-mussel studies and none are specified for the sediment trap deployments makes it impossible to evaluate if baseline determination will be adequate.

Regulatory Comments

This study deviates from the regulations as described by paragraphs A, B, C, E, F, G, H, I, J, K, L, M, S, V, Y, DD, EE, FF, HH, II, and JJ.

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Study Title:FATE AND TOXICITY OF SPILLED OIL FROM THE EVOSStudy Number:AIR/WATER STUDY NUMBER 6Study Cost: \$870,000

This study attempts to determine the presence and toxicity of polar oxidation products of crude oil in oil-contaminated sediments and interstitial water and estimate their contribution to the toxicity of whole weathered crude oil in sediments. In addition, it is planned to construct a mass balance for the fate of the spilled oil.

Study Objective(s)

<u>Objectives A-C</u>. The study is of limited value in estimating injury from weathered crude oil in sediments. Because of the study design, these objectives will not be accomplished in a scientifically defensible manner.

<u>Objective D</u>. This study cannot be performed in a technically sound fashion and is of no use for identifying restoration needs or quantifying injury to natural resources.

Field Methods

Only the toxicity study (objectives A through C) includes field methods that are a part of this study plan. Sampling is restricted to the intertidal/ subtidal areas of 20 heavily oiled sites and, therefore, probably is most representative of the worst case situation. Samples for whole animal sediment toxicity tests are not the same as those used for extraction, fractionation, and testing with the Microtox bioassay. Therefore, the results of these two phases of the project cannot be compared and extrapolations cannot be made about the contribution of polar degradation products of petroleum to the toxicity of oiled sediments to marine animals.

Analytical Methods

The UV fluorescence method for quantifying petroleum in sediments is not appropriate. The Microtox bioassay (a bacterial test) of organic extracts of sediments has not been adequately validated for complex mixtures (like oil) in sediments. Results of this test cannot be extrapolated to predict toxic effects of oiled sediments to marine plants and animal.

Results of other studies conducted by the Trustee Council and information from outside experts and the scientific literature will be used to construct the mass balance. However, the distribution of the spilled oil in various environmental compartments and the amount degraded will, at best, be only very roughly approximated.

Injury Determination Methodology

There are no control (baseline) measurements, so it will not be possible to compare toxicity of polar fractions of organic extracts of oiled and unoiled sediments. Therefore, the increment in toxicity of sediments due to oil cannot be measured. The analytical methods will not allow definitive identification of EVOS oil as the material causing toxicity in sediments. Therefore, there will not be a clear link established between the injury (toxicity of intertidal and subtidal sediments) and the EVOS.

There is no statement in the study plan as to how the mass balance would be used in restoration or injury determination and quantification. Because of the imprecision of the fate estimates, the results of this mass balance will not be useful for injury determination.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs B, C, E, F, G, H, I, J, K, L, M, R, S, U, V, X, Y, Z, DD, EE, FF, HH, and II.
APPENDIX - SECTION C DETAILED COMMENTS ON FISH/SHELLFISH STUDIES

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C. COMMENTS ON FISH/SHELLFISH INJURY ASSESSMENT

The 1989 Draft Plan included 30 separate fishery studies which have now been condensed into 17 studies in the 1990 Plan at a total cost of \$6,700,000. Of the four new studies added to the plan, three address salmon populations.

Most of the 1990 fish/shellfish studies provide more detail than the 1989 Draft Plan. However, details are still inadequate to support a comprehensive review of study design, field methods or results interpretation. Many of the studies are apparently now better designed and include a more detailed statistical analysis. Unfortunately there remain several key unresolved concerns which question the justification and content for several of the studies. These key points are discussed below.

Extensive fishery studies are not warranted in light of the record 1990 fishery season and the positive indicators of ecological health.

The 1990 commercial fishing seasons for Pacific herring and pink salmon both established all-time harvest records. The herring season yielded over 8300 tons in a 20 minute season establishing a record catch rate and the salmon harvest produced 44.9 million fish, over 160% above the predicted goal and well above the previous record of 29 million fish caught in 1987. Since herring do not die after spawning but live to spawn in several successive years, most of the 1990 spawning population was present in PWS in April 1989 during the period of maximal potential exposure to oil. Since the 1989 PWS herring season was entirely closed, this harvestable surplus was not taken, thus resulting in an even larger fish population present in 1990. This surplus should have further reduced concerns over population level impacts from the spill and resulted in reductions to the study program. Similarly the 1990 adult pink salmon catch consists entirely of fish which were present in PWS as sensitive juveniles in April 1989. The record catches of both species in 1990 provide most convincing information of the lack of significant injury to these fish populations, thus precluding the need for extensive study of potential oil impacts. Furthermore, results of the 1989-90 subsistence sampling program conducted jointly by NOAA, ADF&G and Exxon provide convincing

evidence that fish from throughout the spill-impacted area do not contain hydrocarbons above background levels. Further, no problems exist with shellfish, except for those collected from the very few obviously oiled areas. Even then, risks for consumption are extremely low, if any.

Studies will not provide the necessary link to restoration.

It is not at all apparent how the results of the fish/shellfish studies will provide useful data to direct any restoration efforts. The lack of significant injury as evidenced by the record fishing season and the population management focus of many of the studies will not guide a reasonable restoration strategy (FS1 to FS30), if, in fact, restoration is warranted.

Numerous studies may provide useful population management data but are not required for damage assessment.

Many of the fishery studies will provide key data, long-sought for better population management but of little relevance to oil spill-related effects. A better understanding of the general ecology and population dynamics of PWS fish species has long been the goal of fishery scientists working in private and public sectors. Many of these studies will provide data which may be useful to long-term management goals but are not required to assess oil spill impacts (FS2, FS5, FS7, FS8, FS10, FS17, FS23, FS27, FS28).

<u>Statistical study designs are not likely to distinguish differences between</u> <u>oiled and unoiled areas</u>.

The fundamental study design for many of the fish/shellfish studies contains a common flaw: A design based on detecting differences between oiled and non-oiled areas cannot attribute the causes of those differences to EVOS or nonspill-related effects. Many of the fish/shellfish study designs suffer from statistical problems in identifying the effect of oiling, physical location and timing. Following data analysis, it will be very difficult and, in many cases, impossible to determine if a statistically significant effect

was due to EVOS or natural biological variations in time and location (FS2, FS5, FS13).

Studies do not adequately consider the high degree of annual variability in historical baseline fishery populations.

A review of salmon population dynamics in Prince William Sound indicates a high degree of variability between stocks. Since differences between wild and hatchery stocks are not clearly understood by the fisheries managers of the area, it will be impossible to provide the input necessary to describe the subtleties of historical population dynamics and even more more difficult to relate responses to extremely low hydrocarbon levels (FS3, FS4, FS5, FS13, FS17, FS27).

Annual recruitment to fish and shellfish populations is also highly variable from year-to-year, resulting in equally variable commercial catch statistics and escapement numbers. Most of the fishery studies do not adequately consider this high degree of variability or the lack of reliable baseline data with the result that statistical detection of differences due to oiling will not be possible (FS15, FS17, FS8, FS3).

Several fish/shellfish studies do not adequately consider the myriad of other natural variables which clearly affect key life cycle events of these species. It is not apparent that the sampling programs will capture the information necessary to prove that a significant portion of the expected biological variability is a function of hydrocarbon contamination versus numerous other natural factors (FS1, FS3, FS8, FS13, FS17).

Inadequate design of field programs will yield biased data for testing of statistical effects models.

Testing procedures are inconsistent in that mixed, fixed, and nested effects models are planned for data coming from the same field sampling protocols. In most cases researchers have not determined the appropriate testing model before taking samples and, thus, the sampling effort required could not be

predetermined. Error terms for testing are infrequently documented; often the proposed error term is incorrect. Procedures for estimating the total effect of oil over the area impacted are not described; biased and highly variable estimates will likely result. Clark and Bernards' (1987) procedures, as planned for tagging studies (FS3), are inappropriate and will reject the hypothesis of no effect far too often (FS1, FS2, FS4, FS5, FS11).

Field sampling strategies do not adequately consider the high degree of variability in trace oil distribution throughout the impacted areas.

Oil distribution within PWS, even immediately after the spill, was extremely variable with respect to both space and time. Areas to be sampled in several fish/shellfish programs are broad and necessarily represent a wide range of extremely low level hydrocarbon exposures within an area. Given the highly variable nature of these exposures, it is highly unlikely that these sampling designs will be able to relate observed biological responses to any particular hydrocarbon concentrations and thus most results will likely further describe the well-known high level of biological variability seen in these systems (FS1, FS3, FS8, FS18, FS22, FS28).

Many studies are based on the development of data from oiled and control "unoiled" sites. In most cases inadequate information is provided to document that selected control sites are ecologically similar to test sites to provide adequate baseline information.

<u>Proposed methods for the measurement of sublethal, chronic effects are not</u> <u>validated</u>, are research-oriented, and cannot be correlated with population <u>level impacts</u>.

The use of mixed function oxidase (MFO) levels in fish tissues as a means of assessing hydrocarbon contamination is clearly research. The use of MFO to demonstrate injury is an unproven technique which shows a great deal of variability between different life stages, seasonal factors, and food sources. The use of mussel tissue as a means of assessing hydrocarbon contamination is

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not appropriate for determining hydrocarbon concentrations, pathways, or their effects.

Biochemical measurements, such as bile fluorescent aromatic hydrocarbon concentrations and enzyme level changes, are non-specific indicators of hydrocarbon exposure, are highly variable due to purely natural causes, cannot be directly or positively related to EVOS, and cannot be correlated with population level impacts (FS18, FS24).

<u>Study Title</u>: INJURY TO SALMON SPAWNING AREAS IN PWS

<u>Study Number</u>: FISH/SHELLFISH STUDY NUMBER 1 <u>Study Cost</u>: \$391,500

This study attempts to evaluate the effects of oil on the intertidal spawning behavior of pink and chum salmon in Prince William Sound. Methods include visual observations, aerial photography, and hydrocarbon analyses of mussel tissues, with surveys planned in almost 140 streams.

Study Objective(s)

<u>Objective A</u>. The methodologies--visual observation, aerial photography, and hydrocarbon analysis of tissue samples from intertidal mussels at stream mouths--are not appropriate for determining hydrocarbon concentrations, pathways, or their effects.

<u>Objective B</u>. Documenting the physical extent of oil distribution on intertidal spawning areas is not sufficient to determine hydrocarbon concentrations, exposure pathways, or their effects.

<u>Objective D</u>. No selection criteria are presented which ensure that the streams selected will be representative of other PWS streams.

<u>Objective E</u>. The correction factor for one stream does not encompass the variables which allow that correction to be applied to 138 or 218 other streams.

<u>Objective F</u>. This objective will likely be compromised through the use of biased criteria for determination of in-stream residence time of young salmon.

<u>Objective J</u>. Recalculating historical escapement from 1961 to 1988 is of little relevance to impact assessment for a 1989 spill. The assumption that survey and environmental parameter estimates based on conditions that have prevailed for the past two years can be applied as a correction to the past 30 is invalid.

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Fish/Shellfish

<u>Objective H</u>. No apparent attempt is made to identify or measure other variables which may affect or limit available spawning habitat.

<u>Objective I</u>. A catalog of aerial photographs and detailed maps of spawner distribution is not necessary for use in designing sampling transects.

Field Methods

This study indicates that a sample of mussels from the intertidal area will be analyzed to document the impact of oil on that stream. The relationship between hydrocarbon data from these intertidal mussels and salmon exposures in the stream is highly questionable.

Stream life for this study will be evaluated by a variety of techniques. The study plan does not identify the selection criteria or a plan for developing criteria to select the appropriate technique.

The number of fish tagged weekly (80) to determine stream life is static. This number may be inappropriate to reliably determine streamlife for streams in which the weekly escapement can vary by several thousand fish.

The study plan indicates that visual observations will be used to define levels of hydrocarbon contamination and categorize stream zones. This methodology for categorization in 1990 is clearly inappropriate.

The criteria used for separation of streams based on their exposure to oil is not clear. In one place the Plan says this will be based on visual inspection, and in another section the Plan says this will be based on levels of hydrocarbons in mussel tissue sampled near each stream. Both of these methods have weaknesses that will affect the basic categorization of streams for the purposes of this study. This categorization is the basis upon which the data will be evaluated.

Analytical Methods

Statistical procedures are vaguely defined. It is not clear how effects of EVOS are to be estimated and tested.

Sampling effort may not be appropriate to meet objectives. The probability of declaring an effect when there really is not one (Type 1 error) is not given. The probability of failing to find an effect when there really is one (Type 2 error) is not given.

It will be difficult, if not impossible, to determine if a statistically significant effect is due to EVOS or natural variation due to time and location.

Criteria for selecting treatment and control sites are not given.

In general, the type of data that will result from this study have large variances among sites and times. The study methods and analytic approach do not seem to address, or attempt to control for, these potential analytic problems.

Injury Determination Methodology

The injury determination for this study is based upon the evaluation of 138 streams. This number of streams appears to be quite high considering that only 411 appear to be in the affected area. A reasonable evaluation of potential damage to spawning area could have been performed based on a much smaller sample size and good statistical sampling design at a much lower cost.

The study plan does not indicate whether or not other variables which clearly affect spawning activity are being considered in this evaluation. It is not apparent that the sampling program will capture the information necessary to prove that a significant portion of variability in escapement is a function of oil contamination versus other factors.

Regulatory Comments

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This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, K, L, Q, S, V, Y, DD, EE, FF, HH, and II.

Study Title:INJURY TO SALMON EGGS AND PRE-EMERGENT FRY IN PWSStudy Number:FISH/SHELLFISH STUDY NUMBER 2Study Cost: \$302,800

This study attempts to estimate mortality of pink salmon eggs over the winter incubation period and to estimate incremental mortality caused by EVOS. Methods include fry tissue hydrocarbon analysis, field measurements of egg and fry densities in 48 streams, and estimates of over-winter mortality.

Study Objective(s)

<u>Objective 1</u>. No apparent effort is made to identify the level of accuracy expected from density estimates or to determine whether the damage resulting from sampling exceeds that which might be attributed to EVOS.

<u>Objective 2</u>. No apparent effort is made to identify the level of error associated with mortality estimates or to identify factors other than oil which might contribute to over winter mortality of eggs.

<u>Objective 3</u>. This objective reflects an assumed increase in over-winter mortality in oiled streams. The significance of this mortality cannot be determined since no methods are presented for estimating adult returns.

<u>Objective 4</u>. The use of mixed function oxidase (MFO) levels in eggs and alevins as a means of assessing hydrocarbon contamination is clearly research. The use of MFO to demonstrate injury is an unproven technique which demonstrates a great deal of variability with given different life stages, seasonal factors, and food sources. The use of mussel tissue as a means of assessing hydrocarbon contamination is not appropriate for determining hydrocarbon concentrations, exposure pathways, or their effects on the salmon species being studied.

Field Methods

The alevin samples collected for tissue analyses have no apparent controls for comparison. The samples are being collected in a manner which does not preclude contamination; thus no accurate background or control values can be expected.

This study indicates that a sample of mussels from the proximity of the stream bed will be used to determine the amount of hydrocarbon impacting the stream. There is no apparent attempt to test the assumption that hydrocarbon levels in nearby mussels are representative of fish exposures to hydrocarbon levels in the stream bed. This methodology is not an appropriate means of measuring hydrocarbon contamination and undermines the basis upon which the data are being evaluated. Degree of oiling by visual assessment is not an appropriate means of defining levels of hydrocarbon contamination for measurement of impact assessment.

Analytical Methods

Statistical procedures are vaguely defined. It is not clear how effects of EVOS are to be estimated and tested.

The level of effect due to EVOS and effort needed to detect that effect were not given. Sampling effort may not be appropriate to meet objectives.

Injury Determination Methodology

The injury determination methodology is not clearly stated. Mixed function oxidase analyses of eggs and fry is an experimental methodology for determination of oil impact and is not appropriate for injury assessment.

There is no evidence that sufficient parameters are being considered with which to identify major proportions of variability in egg to fry mortality. It is not apparent that the program will capture sufficient information to make an accurate assessment of oil effects versus other environmental factors.

Generalization of results from this study to all 900 anadromous streams in PWS will not be appropriate since the streams used in this study represent the better, more consistent salmon producing streams.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, K, L, O, P, Q, S, V, X, Y, DD, EE, FF, HH, and II.

Study Title:SALMON CODED-WIRE TAG STUDIES IN PWSStudy Number:FISH/SHELLFISH STUDY NUMBER 3Study Cost: \$1,990,000

This study attempts to estimate the survival and harvest rate of five species of hatchery salmon and wild pink salmon through tag and recapture studies. The field methods are based on the use of coded wire tags implanted in juvenile fish prior to release and subsequent documentation of returns taken by the commercial fishery.

Study Objective(s)

<u>Objective 1</u>. It is unclear how this objective will be used to evaluate effects of the spill on hatchery-released salmon. The data gathered for this objective will be of considerable use to hatchery managers, but are not valid for injury assessment. The tie to oil effects is nebulous, simply stated as "Outmigrating smolt and returning adults from these facilities [hatcheries] are exposed to oil at varying degrees."

<u>Objective 2</u>. While it may be possible to obtain a rough estimate of the catch of wild stock pink salmon using these tag results, it is not likely to produce information on spill-related effects.

<u>Objective 3</u>. Field methods are not sufficiently detailed to evaluate the validity for this study.

<u>Objective 4</u>. Comments for this objective are covered in FS4.

<u>Objective 5</u>. The results will provide little insight into the effects of the spill on any differential in survival rate that may be detected. There are inadequate baseline data for historical comparison and there is no measurement of exposure to oil.

Field Methods

The tagging methods are straight-forward, but have little application for evaluating effects of the oil spill. The methods to be used to capture wild stock pink salmon fry, which are extremely sensitive to handling, are not specified and could have significant effects on the success of the program.

The study proposes tagging coho from Valdez, Esther and Fort Richardson hatcheries (the latter for release at Whittier and Cordova), and chinook salmon from Esther Hatchery. None of these releases are in oil-affected areas. Thus, it will be difficult to attribute results to oiling or lack of oiling.

Analytical Methods

The analytical methods are those normally used to evaluate tag return data, but have little application for evaluating effects of the oil spill.

Injury Determination Methodology

The results will provide little insight into the effects of the spill. There are inadequate baseline data for historical comparison and there is no measurement of exposure to oil.

The utility of these data for assessment of spill related damages is doubtful. Inter-annual and inter-facility variation of survival for hatchery stocks has been so large that any observed differences will be difficult to interpret. It is not likely that any observed differences in survival among stocks could be ascribed to a spill effect, even if the observed survivals fit a pre-defined pattern based on the possibility of effects.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, Q, S, V, Y, Z, AA, CC, DD, EE, FF, HH, and II.

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Study Title:EARLY MARINE SALMON INJURY ASSESSMENT IN PWS
Part I: Impacts of Oil Spill on Migratory Behavior and GrowthStudy Number:FISH/SHELLFISH STUDY NUMBER 4Study Cost: \$150,000

This is Part I of a two-part study and attempts to distinguish between the effects of oil and other factors on growth and migration of salmon fry by resampling areas examined in 1989.

Study Objective(s)

<u>Objective A</u>. The study assumes that all fry released together remain together and that all members of the group grow at proportional rates. The analysis can be biased if groups of fish from a single release move into different habitats and grow at different rates. Additional bias can arise if there is a nonrandom distribution of sizes along the migration corridor, which is quite likely. Sampling one segment in an oiled area and another segment in an unoiled area could produce erroneous conclusions on relative growth rates.

<u>Objective B</u>. The study as described is unlikely to provide data of sufficient precision to detect the differences in migration speed and patterns caused by oil-related effects.

<u>Objective C</u>. No information is given on how hydrocarbon content of tagged fry captured in 1989 will be determined.

Field Methods

The methods state "Recovery of these [CWT] salmon at later times and in different places will allow relatively accurate measurements of growth, and reasonable estimates of migration paths and migration speeds." The methods used to determine growth, migration paths and migration speeds are imprecise and are based on a number of assumptions regarding behavior and swimming speed that are likely to be invalid. The inherent variability of these estimates will likely be too great to assess changes caused by EVOS.

The study states that differences in migration distance and pattern will be analyzed with ANOVA, but no information on how these parameters will be quantified is given. These parameters are likely to be highly variable and are likely to be of marginal use for evaluating spill-related effects.

The estimates of migration rate will be strongly influenced by the sampling frequency. Insufficient information is provided to evaluate the appropriateness of this method.

Analytical Methods

There is no indication how differences caused by geographical effects will be separated from "oiled" versus "unoiled" effects, where the primary definition of "oiled" and "unoiled" is based on geography. In addition, the study design, as described, introduces a stock related bias that is not controlled or tested. Further, since most of the oiled areas occur in one part of the Sound and unoiled areas occur in another, there are factors other than history of oil exposure that would affect the variables measured by this study. There are many potential stock-area interactions that are not controlled or tested with the described study design.

Injury Determination Methodology

The injury determination methods are weak, consisting of testing for differences in growth, migration speed, migration distance and migration pattern between "oiled" and "unoiled" areas. The criteria used to define "oiled" and "unoiled" are not described. Similarly, the definitions used to describe growth, migration speed, distance and pattern, are either deficient or not given.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, K, L, Q, S, V, Y, DD, EE, FF, HH, and II.

1990 NRDA Plan Response

<u>Study Title</u>: EARLY MARINE SALMON INJURY ASSESSMENT IN PWS Part II: Impacts of Oil Spill on Juvenile Pink and Chum Salmon and Their Habitat

Study Number: FISH/SHELLFISH STUDY NUMBER 4 Study Cost: \$400,000

This study attempts to analyze the abundance and overall habitat utilization of juvenile pink and chum salmon. Methods include field sampling of fish and fish food organisms via tow and seines.

Study Objective(s)

<u>Objective D</u>. The detailed measurements and analyses being proposed to evaluate for effects on abundance, distribution, habitat utilization, size, growth rate, feeding habits, and migratory behavior, are all governed by the appropriateness of the field sampling program, which may not have adequately included geographic effects or other natural variabilities.

<u>Objective E</u>. The abundance and distribution of copepods is dependent on many factors other than oil. This study does not address sufficient variables to adequately determine either species abundance or distribution with any degree of statistical significance.

<u>Objective F</u>. The abundance and distribution of meiofauna is dependant on many factors other than oil. This study does not address sufficient variables to adequately determine either abundance or the reason why they are in a particular area with any degree of statistical significance.

Field Methods

The estimates of migration rate will be strongly influenced by the sampling frequency. Insufficient information is provided to evaluate the appropriateness of this method.

Analytical Methods

See comments in Part I of this study regarding potential stock and location effects that are not controlled by this study design.

Injury Determination Methodology

The study design does not indicate that other variables which clearly affect these biota and/or biological endpoints are being considered to the extent that a cause and effect attributable to oil can be established.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, K, L, S, V, Y, Z, DD, EE, FF, HH, and II.

1990 NRDA Plan Response

Study Title:INJURY TO DOLLY VARDEN CHAR AND CUTTHROAT TROUT IN PWSStudy Number:FISH/SHELLFISH STUDY NUMBER 5Study Cost: \$290,000

This study attempts to examine potential impacts of oil on the survival and growth rates of Dolly Varden char and cutthroat trout. Field methods are based on the tagging of fish as they leave freshwaters and, subsequently, monitoring growth and survival of returning tagged fish.

Analytical Methods

The analysis will not be able to attribute differences in survival or growth rate to oil-related effects. The analytical methods state that "Differences in average growth rates between control and treatment groups will be attributed to some external disturbance so long as initial length of fish is used as a covariate." The analysis assumes that pre-spill growth and survival rates were similar in both control and "treatment" streams and that any differences are entirely caused by spill-related effects. There is no consideration of natural variability or geographical differences.

Injury Determination Methodology

There is no indication of how the results will be analyzed to demonstrate linkage between survival or growth differences and oil spill effects. There are likely to be differences in survival and growth because of natural differences between the studied populations. Data are not being gathered to analyze for spill-related effects. There are no baseline data to demonstrate that populations in all study areas had equal growth and survival rates prior to the spill.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, K, L, Q, S, V, Y, Z, CC, DD, EE, FF, HH, II, and KK.

<u>Study Title</u>: INJURY TO PINK/CHUM SALMON SPAWNING WITHIN LOWER COOK INLET AND KENAI FJORDS

<u>Study Number</u>: FISH/SHELLFISH STUDY NUMBER 7a <u>Study Cost</u>: \$117,600

This study attempts to evaluate the effects of oil on the intertidal spawning behavior of pink and chum salmon in Lower Cook Inlet. Field surveys of the number and distribution of spawning adult salmon will be conducted on 9 area streams.

Study Objective(s)

The objectives do not justify the extent of the field work; substantially more work is proposed than is needed to fulfill the objectives.

Field Methods

Some of the tagging methods appear questionable and could lead to significant data loss. Non-typical tagging methods include 1) wrapping adhesive tape around the caudal peduncle and 2) placing a rubber band around the caudal peduncle, which would then hold a strip of surveyor's flagging.

The methods used to estimate stream life are not likely to produce results that will allow an unbiased estimate of escapement. Tagging during a restricted portion of the run (over an 11 day period) is not likely to provide a representative stream life estimate. The methods used to determine stream life in this study are not consistent with those used in FS1 and FS7b.

Analytical Methods

Analyses of the data are dependent upon hydrocarbon classifications provided by 1989 visual observations and analyses of mussel tissues from 1989 and 1990. None of these methods are appropriate for adequately quantifying hydrocarbon concentrations. This undermines the basis for data evaluation.

Injury Determination Methodology

This study does not capture sufficient information to determine what, if any, impacts are attributable to EVOS. This area has suffered low wild stock returns for several years prior to EVOS. The reasons for those low returns are not understood and it is not clear that the findings can discriminate differences previously observed from possible EVOS effects.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, K, L, Q, S, V, Y, Z, DD, EE, FF, HH, and II.

Fish/Shellfish

<u>Study Title</u>: INJURY TO PINK SALMON SPAWNING AREAS WITHIN THE KODIAK AND CHIGNIK AREAS

<u>Study Number</u>: FISH/SHELLFISH STUDY NUMBER 7b <u>Study Cost</u>: \$460,300

This study attempts to determine optimum escapements to pink salmon spawning streams in order to evaluate effects of the large escapements in 1989. Field surveys will be conducted on several Kodiak and Chignik area streams to estimate numbers and distribution of spawning salmon.

<u>Special Note</u>. This study is designed to determine what, if any, effects result from overescapement and to enhance fisheries management information. These goals are not related to EVOS impact assessment. Overescapement is the direct result of fishery management decisions and not related to EVOS.

Study Objective(s)

<u>Objective 1</u>. The determination of pink salmon escapement for 44 streams in Kodiak and 18 in Chignik to examine effects of overescapement has nothing to do with impact assessment from EVOS.

<u>Objective 2</u>. The mapping of streams and determination of spawner distribution for index streams in Kodiak is related to improving fisheries management. It is unrelated to impact assessment from EVOS.

<u>Objective 3</u>. The estimation of spawning habitat in Kodiak and Chignik streams is related to improving fisheries management. It is also unrelated to impact assessment from EVOS.

Field Methods

These field methods were developed to perform fisheries research unrelated to EVOS. Pink salmon overescapement was a result of fishery management decisions and is unrelated to EVOS.

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Analytical Methods

There is no control for, or measurement of the effects of tagging on stream life. The method of determining mean stream life assumes that the distribution of individual stream life is normal. No evidence is provided that this is true, and the study is not designed to test this assumption.

Injury Determination Methodology

The determination of injury in this study has no relation to EVOS.

Regulatory Comments

This study is attempting to evaluate the effects of fisheries management decisions and is not related to EVOS. Notwithstanding this objection, this study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, L, O, P, S, U, V, Z, AA, CC, DD, EE, FF, HH, and II.

<u>Study Title</u>: INJURY TO PINK AND CHUM SALMON EGGS AND PRE-EMERGENT FRY WITHIN LOWER COOK INLET AND KENAI FJORD

<u>Study Number</u>: FISH/SHELLFISH STUDY NUMBER 8a <u>Study Cost</u>: \$71,000

This study attempts to measure the mortality of salmon eggs and fry during the winter incubation period and to identify incremental mortality caused by the oil. Field methods include hydraulic pumping of salmon eggs and fry from several index streams on the Kenai Peninsula.

Study Objective(s)

<u>Objective 1</u>. No apparent effort is made to identify the level of accuracy expected from these density estimates or to determine whether the damage related to sampling exceeds the potential damage from EVOS.

<u>Objective 2</u>. No apparent effort is made to identify the level of error associated with winter mortality estimates or to identify factors other than oil which might be responsible for over winter mortality.

<u>Objective 3</u>. The fishery in this area has exhibited a very low wild stock return in the past several years. This study does not consider the evaluation of why returns have been low in the past or provide evidence that enough factors are being considered to separate variability related to oiling from other factors.

Field Methods

The criteria used to select the streams do not include evaluation of the level of oiling. All selection criteria are based on non-oil related phenomena (i.e. large adult return, past history of fry digs, part of aerial survey project and can be sampled safely). Since the study is being conducted to evaluate the effects of oil on egg to fry survival, it would seem appropriate to include the degree of oiling in the site selection criteria.

1990 NRDA Plan Response

The selection of study streams will not allow application of the results to area-wide salmon production since the streams chosen are biased to represent the most productive and important for management.

Methods used are different than those used in parallel studies conducted in Prince William Sound (FS2) and Kodiak (FS8b). The design of the transects is inconsistent with the other studies. Sample sizes vary among studies.

Analytical Methods

Data from egg and fry digs are extremely variable. There is no indication that the sample sizes will be sufficient to produce statistically defensible results.

The application of MFO analyses to eggs and fry is not appropriate. See comments on study FS2.

The use of visual assessment to establish degree of oiling within spawning area sediments is inappropriate.

The analysis does not account for natural variability in survival rates among streams and years.

Injury Determination Methodology

The study as designed will not allow an injury determination. The data being collected will not support a valid statistical analysis. The measurements used to establish the degree of oiling (visual assessments of adjacent beaches and hydrocarbon content in nearby mussel beds) are unrelated to the level of hydrocarbons in the streambed sediments containing the embryos and alevins.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, L, O, P, Q, R, S, U, V, X, Y, Z, DD, EE, FF, HH, II, and JJ.

Study Title: INJURY TO PINK SALMON EGGS AND PRE-EMERGENT FRY IN THE KODIAK AND CHIGNIK MANAGEMENT AREAS

<u>Study Number</u>: FISH/SHELLFISH STUDY NUMBER 8b <u>Study Cost</u>: \$149,300

This study attempts to measure the mortality of salmon eggs and fry during the winter incubation period and to identify incremental mortality attributable to overescapement. Field methods include hydraulic pumping of salmon eggs and fry from several index streams on Kodiak Island the the Alaska Peninsula.

Study Objective(s)

<u>Objectives 1-5</u>. Each of the study objectives is designed to provide key data on several aspects of the early life history of pink salmon. The field methods proposed to achieve objectives are relatively well standardized and have historically been used to develop data to guide fishery managers decisions in population management topics. Each of the objectives; measuring egg deposition, fry density, egg to fry survival and additional fry index data will all yield data of only marginal use in determining injury attributable to EVOS.

Field Methods

These field methods were developed to perform fisheries research unrelated to EVOS. Pink salmon overescapement is a result of fishery management decisions and is unrelated to EVOS. Additionally, the study methods do not provide data useful for correlating oil exposure with any potentially observed biological effects.

Injury Determination Methodology

The determination of injury in this study has no relation to EVOS.

Regulatory Comments

This study is attempting to evaluate the effects of fisheries management decisions and is not related to EVOS. Notwithstanding this objection, this study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, L, P, S, U, V, Z, AA, CC, DD, EE, FF, HH, and II.

Study Title: INJURY TO PWS HERRING

<u>Study Number</u>: FISH/SHELLFISH STUDY NUMBER 11

<u>Study Cost</u>: \$558,400

This study attempts to develop the data needed to refine estimates of herring biomass in Prince William Sound. Field sampling will include measurements of herring spawn deposition, adult age, weight, length, and growth, as well as egg survival and egg loss estimates. Data will then be summarized in an attempt to increase accuracy of biomass estimates and relate any observed effects to EVOS.

Study Objective(s)

<u>Objective 1</u>. This objective is to increase the biological sampling related to the herring biomass so that the biomass can be estimated to within +/-25% of the true value 95% of the time and to be able to estimate age, weight, and length of the stock to within 10% of the true value. It is very unlikely that determining biomass to within +/-25% of the true value will provide the sensitivity to determine the impact of EVOS.

<u>Objective 2</u>. The oil level information on beaches from maps and analyses of mussel tissues do not adequately represent hydrocarbon exposure of herring in PWS. These parameters will not be useful in determining the impact on herring attributable to EVOS.

<u>Objective 4</u>. Mortality of eggs in the field is a function of density dependent survival and natural factors. The goal of this work appears to develop egg loss information with which to better manage the herring resource.

<u>Objective 5</u>. The evaluation of embryonic and larval tissue for MFO is an experimental technique. It displays a great deal of variability depending upon season, life stage, food type, etc. Oil impact assessment should not be used as a forum for developing experimental techniques. NOAA found that DNA/RNA ratios did not provide any significant endpoints in 1989, there is no reason to repeat this effort in 1990.

Field Methods

The field methods indicate that the already unacceptable +/-25% biomass estimation could be further compromised by logistical problems. The Plan indicates that this work augments the ability to manage the resource so that EVOS damage can be predicted. Resource management augmentation does not fall within the purview of NRDA damage assessment.

The biomass which will be estimated in 1990 will not include the fish which are the product of 1989 egg production. The plan indicates that there were no significant 1989 adult mortalities. Therefore, it appears that this is necessary for herring resource management, but has little to do with determining EVOS impact.

The field program includes the estimation of fecundity. It should be pointed out that the literature provides no evidence of fecundity effects on adult fish from one acute exposure to hydrocarbons.

The study plans to investigate growth. The measurement of growth will not be able to discriminate differences with regard to EVOS. It appears that growth is a parameter necessary for better management of the herring resource.

Egg loss will be measured in the field. Herring exhibit density dependent survival. There is no apparent relationship between herring spawning biomass and subsequent recruitment, so the death of eggs is meaningless in the context of this study.

Analytical Methods

The statistics seem to be geared toward the development of models with which to manage the resource. It is unlikely that they could detect the impact attributable to EVOS.

Injury Determination Methodology

The methodology appears to focus on modeling the population based upon the number of eggs which are laid. The number of eggs will be determined and the contribution of the 1989 year class estimated. The size of the 1989 yearclass will be estimated and compared with what it might have been based upon measurements of 1989 egg loss.

This could prove to be impossible because eggs numbers do not equate directly to fish numbers. Numbers of eggs spawned, within the range observed in PWS, will explain only a minor part of the variation in abundance among brood-years, due to density dependent survival.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, L, O, P, Q, R, S, U, V, Y, Z, CC, DD, EE, FF, HH, and II.

Study Title: EFFECTS OF HYDROCARBONS ON BIVALVES

<u>Study Number</u>: FISH/SHELLFISH STUDY NUMBER 13 <u>Study Cost</u>: \$229,200

This study attempts to determine the effects of oil contamination of intertidal sediments alone, and in combination with mechanical treatment of shorelines on the survival, growth, tissue damage, and recruitment of three species of intertidal clams. Methods proposed for use include digging and sampling of mollusks from specific transects in intertidal areas at low tide periods. Additional clams will be transplanted to previously oil-impacted shorelines and subsequently sampled for hydrocarbon uptake as well as growth measurements.

Study Objective(s)

<u>Objectives A-D</u>. While the stated objectives do consider the available scientific literature on effects of oil on intertidal clam populations, the study design greatly underestimates the natural variability in all the biological and chemical parameters that will be measured. Therefore, it is unlikely that the stated objectives will be attained.

Field Methods

The field sampling strategy is flawed. Sediments and clams for hydrocarbon analysis and growth determinations are collected from the lower intertidal zone along transects oriented perpendicular to the shore. Samples from all positions along the transects are composited into single samples, obscuring any gradients of chemistry and biological response at different levels on the shore, and increasing sample variance.

The amount of sample replication at each site may not be sufficient to detect, statistically, any but the largest differences among sites. Likewise, it will be difficult to distinguish differences due to natural causes from those due to the presence of oil in the sediments or the clam tissues.

Analytical Methods

The term necropsy analysis (gross examination of dead tissues) apparently is improperly applied to mean histopathological examination. Necropsy would be unlikely to yield useful information.

Methods for counting live and dead clams are not valid. It is not usually possible to accurately estimate how long dead shells have been in the sediments. Therefore, the presence of dead shells cannot be used to estimate the number of clams killed by the oil spill or subsequent cleanup effort.

Injury Determination Methodology

The parameters being measured are quite variable over small temporal and spatial scales. Because of this, it will be difficult to adequately characterize the baseline condition. Quantification of injury attributable to the spill or subsequent cleanup efforts may be difficult. Generally, background histopathology is poorly understood at best and thus it will not be possible to ascribe any potentially observed effects to EVOS. Moreover, relationships between observed histopathology and oil-related effects on survival potential of natural mollusk populations have not been accurately established, thus the significance of observed effects is further questionable.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs: A, B, C, E, F, H, I, J, K, L, O, P, Q, R, S, U, V, Z, CC, DD, EE, FF, HH, and II.

Study Title: INJURY TO PWS SPOT SHRIMP

Study Number: FISH/SHELLFISH STUDY NUMBER 15

Study Cost: \$65,000

This study attempts to evaluate possible injury to spot shrimp populations by developing comparisons of abundance, size distributions and reproductive potential between previously oiled and unoiled sites within Prince William Sound. Field collection methods include the use of commercial shrimp pots. Measurements of sex, length, weight, reproductive state will be made and tissues will be sampled for hydrocarbon concentrations.

Study Objective(s)

<u>Objective D</u>. It is stated that the study will "test the hypothesis that the level of hydrocarbons [in tissues and eggs] is not related to the level of contamination at a site." The methods do not describe any plans or procedures for collecting water/sediment samples to define the level of contamination at the site.

<u>Objective E</u>. It is stated that the study will "document injury to tissues and compare differences between oiled and non-oiled sites...." The methods do not describe what "injury to tissues" specifically means, what tissues will be studied, or how injury will be determined.

Field Methods

Insufficient information is provided to document that selected control sites are sufficiently similar to test sites in terms of baseline production of shrimp, as well as the numerous other environmental factors that could affect the results of the study. Aside from CTD water column profiles, no information is provided which indicates that such environmental data will be collected as part of the study.

Test sites identified as "oiled" (Herring Bay, Chenega Island, Green Island)

describe large areas with varying degrees of actual exposure to floating and stranded oil. Insufficient information is provided regarding the criteria for selecting impact and control sites or how the sites actually chosen within these areas will be documented with respect to the specific level of oiling or degree of exposure.

The sampling gear described as commercial shrimp pots is designed to catch adult shrimp of commercial market size and is inadequate for achieving the stated objective of determining "whether the 1989 year class suffered a high mortality rate in areas of high oil impact relative to other year classes" in the 1990-91 study year.

No information is provided regarding how samples for hydrocarbons and fecundity will be handled and preserved in the field to ensure sample quality and integrity are maintained until analysis in the laboratory.

Aside from tissue hydrocarbon measurements, no information is given as to what criteria will be applied for attributing differences to oil and what levels of effects will be tested. The probabilities of statistical Type I and Type II errors which will be used are not given. Sampling effort may not be appropriate to meet statistical analysis objectives.

Chain-of-custody and QA/QC procedures are not discussed in the study write-up.

Analytical Methods

Insufficient information is provided regarding what will be sampled for tissue hydrocarbon analysis: whole body, muscle, organs, etc. The number of individuals required per sample, as well as the interpretation of the results will vary greatly depending upon what is sampled.

Insufficient information is given regarding how composited samples for hydrocarbon analyses will be treated in the analysis of results.

Chain-of-custody and QA/QC procedures are not discussed in the study write-up.

Injury Determination Methodology

Inadequate information is provided to determine what statistically significant differences will be detectable within the study design.

The stated objectives and methods do not indicate that the study will lead to an objective quantification of the baseline condition of the resource, the level of injury, the variance in the degree of injury in space, the length of time over which injury will persist, or the likelihood and rate of recovery. As indicated above, there is no indication that the study will establish a clear link between EVOS and injury to resources. There is no indication that a pathway of exposure will be documented.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, O, P, R, S, U, V, X, Y, DD, EE, FF, HH, II, and JJ.
<u>Study Title</u>: INJURY TO DEMERSAL ROCKFISH AND SHALLOW REEF HABITATS IN PWS AND ALONG THE LOWER KP

Study Number: FISH/SHELLFISH STUDY NUMBER 17 Study Cost: \$109,000

This study attempts to evaluate injury to rockfish and their habitat by assessing levels of hydrocarbons in sediments, food organisms, and rockfish bile in reef habitats in Prince William Sound and the lower Kenai peninsula. Methods include sampling at eight sites with associated hydrocarbon concentration measurements in stomach contents, tissues, prey organisms, filter feeders and sediments.

Study Objective(s)

<u>Objective C</u>. There are no explanations in the study methods or data analysis sections which describe how "Toxicological analyses of effects on growth and reproduction," will be conducted.

<u>Objective D</u>. This goal is to "Determine the feasibility of using otolith microstructure to evaluate depressed growth as a result of oil contamination" implying that this is an experimental technique and, thus, is of a research nature.

<u>Other</u>. The study premise that "demersal rockfish complexes are relatively sedentary" and have a high degree of fidelity to their habitat is contradicted by the reference to Rosenthal (1980) which cites seasonal variations in abundance in nearshore habitats. Thus, continued studies of reef habitats in search of histopathological and other long term effects may be invalidated by mixing of populations.

Field Methods

Sampling locations are not specifically identified. The appropriateness of sampling sites as controls and test sites cannot be evaluated adequately, particularly with respect to the influence of other important variables, such

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as alternate sources of petroleum hydrocarbons. Further, the degree to which test sites are representative of the entire resource cannot be assessed. Criteria given for the selection of sampling sites do not indicate appropriateness, from a scientific control or baseline determination standpoint.

Sampling design is inadequately addressed and biased to improperly sample target fish species.

The level of effect due to EVOS which will be tested for, and the probabilities of making Type I and Type II errors are not specified with respect to experimental design, sampling strategies and statistical significance. The appropriateness of sample sizes specified cannot be evaluated. It is not explained how the different levels of variability (geographic, oiling, reef communities) will be handled in the analysis. No information is provided regarding how samples for hydrocarbon analysis will be handled and preserved in the field to ensure that sample quality and integrity are maintained until analysis in the laboratory. Chain of custody and QA/QC procedures are not discussed in the study write-up.

Analytical Methods

Determination of the presence or absence of EVOS hydrocarbons in demersal rockfish (Objective A) cannot be accomplished by analysis of bile, which is nonspecific to hydrocarbon source and may be subject to interference by other exogenous as well as endogenous compounds. Identification of EVOS hydrocarbons by tissue analysis is also questionable due to the efficient, and possibly selective, metabolic functions in fish.

Inadequate information is provided regarding specific techniques for determination of hydrocarbons in sediments and tissues. There is no information regarding how "contamination" will be defined and determined.

It is not clear how descriptions of otoliths are to be interpreted.

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<u>1990 NRDA Plan Response</u>

Fish/Shellfish

Inadequate information is provided to determine how otolith derived age composition and mean length-at-age data are to be used.

Chain of custody and QA/QC procedures are not discussed.

Injury Determination Methodology

It is not among the stated objectives, nor tacitly implied in the methods, that this study will in any way result in quantification of injury to resources. The study objectives are split between simply attempting to document exposure (tissue and bile hydrocarbons, enzyme activity) and identifying aspects of injury (absence of fish, pathological conditions, embryo development), and there is no indication that damage will be assessed beyond testing the statistical significance of its occurrence, or in any way related to EVOS.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, L, O, P, S, U, V, X, Y, Z, AA, BB, CC, DD, EE, FF, HH, and II.

<u>Study Title</u>: PRINCE WILLIAM SOUND TRAWL ASSESSMENT <u>Study Number</u>: FISH/SHELLFISH STUDY NUMBER 18 <u>Study Cost</u>: \$186,000

This study attempts to evaluate possible injury to pelagic and demersal fish in Prince William Sound by assessing exposure to and accumulation of petroleum hydrocarbons. Sampling is planned in five areas and includes such fish as halibut, flathead sole, pacific cod, and walleye pollock.

Study Objective(s)

<u>Objective C</u>. Fish specimens with "abnormalities of any type" will be preserved for analysis. No information is provided as to types of abnormalities which might be observed in the field, what types of analyses might be performed, the protocol for estimating the proportion of fish with abnormalities, nor the means by which abnormalities will be ascribed to EVOS as opposed to other possible causes.

Field Methods

The sampling areas as described are very broad and sites are not determined to be either control or test (oiled). Statistical analyses of the data are not described such that the sampling strategy can be evaluated. There appear to be no controls or experimental design constraints as such.

No information is provided regarding how samples for hydrocarbon analysis and stomach contents will be handled and preserved in the field to ensure that sample quality and integrity are maintained until analysis in the laboratory. Chain-of-custody and QA/QC procedures are not discussed in the study write-up.

Analytical Methods

Analysis of bile for fluorescent aromatic contaminants (FACs) is not specific to the types and sources of the compounds measured, and cannot be directly or positively linked to EVOS as the source. Analyses of hydrocarbon

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concentrations in stomach contents do not necessarily bear any direct relationship to concentrations of FAC's measured in bile.

Injury Determination Methodology

The objective of this study is apparently to conduct widespread screening for possible exposure. There is no indication that this data can or will be used to quantify injury to the resources. There is no indication that the study will document baseline conditions of the resource.

The ability of the study to establish a clear link between effect and EVOS, much less between real injury and the spill is not apparent.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, H, I, J, K, L, O, P, R, S, U, V, X, Y, CC, DD, EE, FF HH, II, and JJ.

<u>Study Title</u>: INJURY TO CRABS OUTSIDE PWS

Study Number: FISH/SHELLFISH STUDY NUMBER 22 Study Cost: \$110,000

This study attempts to estimate possible injury to Dungeness crabs along Kodiak Island and the eastern Alaskan peninsula by examination of tissue contamination, reproductive potential, and larval settlement. Eight sites will be sampled by divers with field measurements of various crab parameters, tray collection of larval settlement, with associated laboratory analyses of organs, eggs, and sediments.

Study Objective(s)

<u>Objective E</u>. The study plan provides no information on potential methods and strategies for restoration.

<u>Other</u>. The introduction states that "the data will also contribute to the long-term data base for management of fisheries and assessment of future oil spills." This is beyond the scope of EVOS NRDA objectives.

Field Methods

Collection of crabs by divers is non-quantitative for analysis of population parameters.

Insufficient information is provided regarding sites selected to document that control sites are similar to test sites and to explain the uneven allocation between oiled and unoiled sites.

Design of the ANOVA (or its non-parametric equivalent) is not addressed. The level of difference to be defined as an effect due to EVOS which will be tested for, and the probabilities of making Type I and Type II errors are not specified with respect to experimental design, sampling strategies, and statistical significance. The appropriateness of sample sizes cannot be evaluated.

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Fish/Shellfish

Insufficient information is provided regarding study design to document that sufficient control of the larval settlement study exists to account for inherent natural variability.

No information is provided regarding how samples for hydrocarbon analysis will be handled and preserved in the field to ensure that sample quality and integrity are maintained until analysis in the laboratory. Chain-of-custody and QA/QC procedures are not discussed.

Analytical Methods

No explanation of how size-dependent variations, especially in reproductive parameters, will be assessed. Insufficient information is provided to document that sufficient control exist in the study design to assess the effects of naturally occurring variables on development or reproductive differences between sites.

Injury Determination Methodology

No indication is given of how the proposed study will or can be used to provide an objective quantification of injury to resources. No information is provided which would indicate the availability of baseline resource data.

Establishment of a clear link between injury to resources and EVOS spill is questionable, particularly in light of the presence of the many natural variables which are not controlled in the experimental design.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, L, O, P, R, S, U, V, X, Y, Z, DD, EE, FF, HH, and II.

<u>Study Title</u>: ASSESSMENT OF OIL SPILL IMPACTS ON FISHERY RESOURCES: MEASUREMENT OF HYDROCARBONS AND THEIR METABOLITES, AND THEIR EFFECTS, IN IMPORTANT SPECIES

<u>Study Number</u>: FISH/SHELLFISH STUDY NUMBER 24 <u>Study Cost</u>: \$450,000

This study attempts to evaluate possible injury to several species of fish inside and outside Prince William Sound. Measurements will be made at 14 sites of a broad spectrum of biological and biochemical parameters to assess possible degree of exposure to EVOS and the resultant effects.

Study Objective(s)

<u>Objective A</u>. It is stated that "representative sediment samples will be taken from each sampling site for subsequent chemical analysis" but no sampling description is provided to ensure that the highly variable sediments will be adequately sampled to represent any given area.

<u>Objective B</u>. The techniques described cannot distinguish between the occurrence of metabolites of EVOS hydrocarbons and petroleum hydrocarbons from any one of several alternate sources in the enormous area described for study.

<u>Objective C</u>. Analysis of enzyme induction is subject to the same interferences as described for objective B.

Field Methods

The level of difference to be defined as an effect due to EVOS and tested statistically is not specified. The appropriateness of study design and sample size cannot be evaluated.

The effect of oiling, location and time are interrelated. It will be difficult, if not impossible, to determine if a statistically significant effect was due to EVOS or to natural variation due to time, location and alternative sources of hydrocarbons.

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Many of the fish species to be sampled or analyzed have great mobility and low fidelity to the collection site. How their geographic range can be accounted for in assessing the significance of apparent exposure is not adequately described.

Chain-of-custody and QA/QC procedures are not discussed.

Analytical Methods

The analytical methods described are not specific for the source of the hydrocarbons which may be metabolized. Similarly, aryl hydrocarbon hydroxylase (AHs) activity in liver and measurement of cytochrome P-450IA1 are not even specific to hydrocarbons but may indicate a response to any number of natural and anthropogenic contaminants.

Concentrations of metabolites in bile have been shown to vary with recent feeding behavior of the fish. There is no indication in the methods that this source of variability can be accounted for.

The time lag inherent in detection of metabolites in bile and, to a greater extent, enzymatic activity in liver, may preclude any attempt to correlate exposure to effect. Analysis of stomach contents and sediments for hydrocarbons to document exposure is of dubious value for more mobile species.

Reproductive impairment is to be assessed on two species: Dolly Varden (intertidal), and Yellowfin sole (shallow subtidal). There is no documentation offered that these species constitute dominant species in the finfish resource.

<u>Injury Determination Methodology</u>

There is no basis for extrapolating the effects measured (bile metabolite, enzymatic activity) with biological resource injury. The methods section states that "injury will be determined using statistical and simulation models which will be developed as part of these proposed studies."

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These models clearly have not been validated if they have not yet been developed and are more properly referred to as research.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, L, O, P, R, S, U, V, X, Y, CC, DD, EE, FF, HH, II, and JJ.

Study Title: SOCKEYE SALMON OVERESCAPEMENT

<u>Study Number</u>: FISH/SHELLFISH STUDY NUMBER 27 <u>Study Cost</u>: \$392,000

This study is designed to determine what, if any, effects result from overescapement. Overescapement is the result of fishery management practices and thus this study not an EVOS impact assessment study. Additionally, the study methodology does not provide data useful for correlating oil exposure with any potential observed fishery effects.

Study Objective(s)

<u>Objectives 1-2.</u> The determination of number, age, and size of sockeye salmon juveniles in selected freshwater systems is of very marginal use in possibly determining injury attributable to EVOS since no oil ever reached this freshwater spawning habitat.

<u>Objective 3</u>. The large escapements resulting from fisheries closures are a result of fisheries management decisions.

Field Methods

These field methods were developed to perform fisheries research unrelated to EVOS. Sockeye salmon overescapement was a result of fishery management decisions and is not related to EVOS.

Injury Determination Methodology

The determination of injury in this study has no relation to EVOS.

Regulatory Comments

This study is attempting to evaluate the effects of fisheries management decisions. Notwithstanding this objection, this study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, L, P, R, S, U, V, X, Y, Z, AA, DD, EE, FF, HH, II, and JJ.

Study Title:SALMON OIL SPILL INJURY MODEL AND RUN RECONSTRUCTIONStudy Number:FISH/SHELLFISH STUDY NUMBER 28Study Cost: \$175,100

This study attempts to develop both life history and run reconstruction models for use in determining impacts attributable to EVOS.

<u>Study Objective(s)</u>

Life History Modeling

<u>Objective 2</u>. A review of salmon population dynamics in Prince William Sound suggests that the "status quo" is not stable, but is transitional. Since even obvious factors affecting salmon population dynamics such as interactions between wild and hatchery stocks are not fully understood by the fisheries managers of the area, it will be impossible to provide the input to describe the subtleties of historical population dynamics.

<u>Objective 3</u>. A summary of the effects noted as oiling values for parameters suggest that only negative values are being considered.

<u>Run Reconstruction</u>

<u>Objective 1</u>. The comprehensive timing model of Schnute and Sibert (1983) may not represent the salmon dynamics of Prince William Sound.

<u>Objective 2</u>. Testing the model parameters against a single year class will not be adequate to prove that the model works.

Field Methods

There are no field methods specific to this program.

Analytical Methods

Neither the model nor input data are sufficiently described to determine if this modeling procedure is technically sound. It is necessary to know what EVOS effect the model is intended to detect and with what Type I and II errors.

The utility of these and similar models is, at best, to provide a representation of a range of possible future conditions. Models of this type lack precision. Managers have had the data and information necessary to construct similar models for years and have chosen not to do so because of the limited validity and application. The Plan states that these models will be useful for establishing harvest policies and for allocating fishing activities among areas and times. Such objectives are not congruent with an NRDA assessment study.

Injury Determination Methodology

The investigators' approach appears to be focused on the development of data useful for guiding fish allocation policy decisions and not on NRDA impact assessment in their approach.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, F, H, I, K, L, O, P, S, U, Y, Z, AA, CC, DD, EE, FF, HH, II, and JJ.

<u>Fish/Shellfish</u>

<u>Study Title</u>: DATABASE MANAGEMENT

Study Number: FISH/SHELLFISH STUDY NUMBER 30

Study Cost: \$120,000

Although described as a study, the objective of this program is to develop the computing capacity and facilities to manage historic and spill-related data for the Trustee Council's efforts in the Fish/Shellfish area.

Study Objective(s)

<u>Objective 1</u>. The construction of a database system to maintain both historical and spill related data is not under the purview of NRDA regulations.

<u>Objective 2</u>. The structural facilities to house the above database system is not under the purview of NRDA regulations.

Field Methods

There is no field program.

Analytical Methods

There are no analytical methods.

Injury Determination Methodology

There is no injury determination methodology.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs B, H, I, DD, EE, HH, and II.

APPENDIX - SECTION D DETAILED COMMENTS ON MARINE MAMMAL STUDIES

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D. COMMENTS ON THE MARINE MAMMALS INJURY ASSESSMENT

The 1990 Plan describes six studies to evaluate the injury to marine mammal resources costing approximately \$1,930,300. Two studies focus on field observations of humpback (MM1) and killer whales (MM2) at costs of \$92,000 and \$255,800, respectively. Two studies focus on seal (MM5) and sea lion (MM4) reproduction at costs of \$171,200 and \$159,300, respectively. The remaining two studies evaluate short-term (MM7) and long-term (MM6) impacts on sea otters at costs of \$147,000, and \$1,105,000.

This program does not take into consideration that evidence of injury to some of these resources (whales, seals, sea lions) is unsubstantiated. In comparison to the 1989 Draft Plan, the 1990 marine mammal studies are presented in greater detail. However, significant inadequacies are still present in the new study set and are discussed below.

Study descriptions are inadequate for technical review.

This inadequacy pertains to many aspects of all marine mammal studies: objectives, field methods, and analytical/statistical methods. Specific examples include the following: location descriptions in the cetacean (MM1, MM2) and sea otter (MM6) studies; DNA content, sperm morphology and haptoglobin binding analyses in the sea otter study (MM6).

Study results of little relevance to spill effects.

Distributional data on migratory whales (MM1, MM2), and reproductive data on sea lions outside the impact area (MM4) will provide no data relevant for spill damage assessment.

Natural variability and quality of pre-spill database not adequately considered in study design and analysis.

Population trends and spatial or temporal variance are largely unavailable for the parameters being measured in each of the marine mammal studies. The availability of adequate pre-spill baseline population data will severely limit the ability to detect post-spill differences. Attributing measurable differences to the oil spill will be technically unachievable. Specific examples are humpback whale distribution (MM1), killer whale natality and mortality (MM2), pathological examination of pinnipeds and sea otters (MM4, MM5, MM6), and population sex/age structure of sea otters (MM6).

Study results incapable of establishing a cause and effect relationship.

Populations of sea lions (MM4) and harbor seals (MM5) have been dramatically declining for unknown reasons over the last several decades. The planned study designs will not allow a separation of the effects of the oil spill from the numerous natural factors which have been shaping population trends over the last 20 years. Additionally, any differences detected in distinct sea otter subpopulations will fail to establish the spill as the cause since sea otter subpopulations typically have site-specific age, sex and growth characteristics. Numerous other known significant impacts on marine mammal populations such as high seas drift net mortality are ignored in the study designs. Causal relationships for chemical residue data and pathologic observations will also be difficult to establish in studies investigating tissue hydrocarbon levels and/or histologic changes (MM4, MM5, MM6, MM7).

Studies are predominately research oriented.

Each of the marine mammal studies contains significant components that rely heavily on untried, non-standard or novel methods (i.e. research) to detect potential injury. This reliance will undoubtedly result in costly trial and error methods development as well as poorly formed conclusions that relate low level hydrocarbon exposures with any observed biological effects. Specific examples include the cetacean distribution data (MM1), the sea lion and harbor seal reproductive data (MM4, MM5), and the sea otter sublethal damages data (MM6).

Hydrocarbon exposure cannot be correlated with the spill or population level impacts.

Each of sublethal or chronic endpoints being proposed for use as hydrocarbon exposure indicators is non-specific at best. Observed changes in these end points can be due to numerous sources such as localized diesel fuel or hydraulic oil spills and, thus, cannot be positively correlated to EVOS. Also most of these endpoints are subject to a high degree of variability due to numerous natural reasons such as nutrition, sex, non-specific stress, etc. These points are particularly relevant to the sublethal damages, such as DNA content, sperm morphology, and haptoglobin analyses, being investigated in the sea otter study (MM6).

Historical data ignored or misused.

In general the marine mammal studies do not appear to have properly taken historical data in account. A specific example of a fundamental design flaw is in the sea lion premature pupping study (MM4) where Cape St. Elias (approximately 100 miles east of PWS) and not impacted by oil is being considered as the potentially spill impacted site and Chirikof Island (approximately 75 miles south of Kodiak) is being considered a control site. Pre-spill records show that premature pupping incidence has historically been much greater at Cape St. Elias than at other sites in the Gulf of Alaska and, thus, its choice as an oiled site is totally inappropriate.

Exposure pathway not established.

Exposure to biologically meaningful concentrations of oil for many of the mammals being studied is doubtful. In view of the rapid return to background levels of hydrocarbons in the waters of Prince William Sound and the lack of evidence of substantive contamination of fish or other food species it is doubtful that an exposure pathway can be established (MM1, MM2).

Studies not cost effective or reasonable.

A high level of effort is planned in order to meet the study objectives for many of the marine mammal studies, due largely to the deficiencies in the baseline data and the large natural variation present in the population parameters being assessed. Specific examples include the determination of humpback and killer whale natality/mortality (MM1, MM2), determination of sea otter population size (MM6), and determination of seal and sea lion reproductive performance (MM4, MM5). The study costs are unwarranted in light of the unlikely population impacts on species other than otters. Available literature data also suggest that sea otters have a remarkably rapid rate of natural recovery.

Inappropriate statistical design will bias data for interpretive and modeling efforts.

The design and application of statistical models for testing of effects are vaguely defined and it it not clear how EVOS effects are to be estimated in many of the studies. For particularly mobile species such as the marine mammals, it is apparent that the field sample observations will be unable to distinguish effects of oiling, location, and timing. Thus, it will be impossible to determine if any statistically significant effect was due to EVOS or natural biological variability in the population. Additionally, quantification of field search effort for cetaceans is unclear (MM1, MM2). Location, time, and level of oil are important variables in all studies and criteria for selecting study sites are not given.

<u>Studies are highly intrusive on the subject marine mammal species and impose</u> <u>unnecessary stresses on individuals.</u>

Several of the studies are based on the capture of individual mammals and subsequent surgical tissue sampling procedures and radio implantation techniques. All of these obviously represent severe stresses to individuals and could result in incremental effects including mortalities. These

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incremental stresses are unnecessary in light of the lack of data demonstrating injury to these populations and the known rapid rate of natural recovery documented for sea otters.

<u>Study Title</u>: EFFECTS OF THE EVOS ON THE DISTRIBUTION AND ABUNDANCE OF HUMPBACK WHALES IN PWS, SOUTHEAST ALASKA, AND THE KODIAK ARCHIPELAGO

Study Number: MARINE MAMMAL STUDY NUMBER 1 Study Cost: \$92,000

This study attempts to evaluate possible effects to humpback whale populations by measuring and comparing distribution, abundance, natality, and mortality. Observations will be made from small boats deployed from shore-based camps in Prince William Sound, augmented by sightings by private boats and aircraft.

Study Objective(s):

<u>Observations A-D</u>. The study description lacks sufficient detail to allow for a thorough critique. Nevertheless, the following observations can be made:

The stated objectives do consider the availability of existing information, but objectives B, C, and D cannot be achieved by a study that does not have sufficient baseline data or include reference area surveys.

The title of the study implies that data will be gathered in Southeast Alaska and the Kodiak Archipelago but the field methods only indicate surveys in Prince William Sound.

The need for this work is questioned by available literature which indicates that oil spills represent little hazard to whales. Further, results of 1989 pathological examinations failed to establish the spill as an added mortality factor for whales in Prince William Sound.

Field Methods

The study description provides inadequate detail with regard to study methodology, sampling locations, survey design, and data types to be compiled, as exemplified but not limited to the following:

- It is unclear how mortality data will be collected.
- The study plan does not state whether the age, sex, location, activity or other germane data will be recorded.
- There is insufficient information to determine whether sampling methods are adequate for statistical analysis.
- QA/QC issues are not addressed.

The change in methodology resulting from the addition of the non-professional sighting network to the 1990 program will make comparing the data to that from previous surveys (including the 1989 survey) of questionable value. The disturbance and harassment caused in the efforts to obtain photographs may bias results.

Analytical Methods

The results of this study will not likely be statistically valid, because, among other deficiencies, neither suitable nor relevant reference areas are included. Further, there is no indication of how perturbations such as cruise boats, clean-up, air traffic etc. will be factored into the data analyses.

The analytical methods and statistical procedures to be used in the study are inadequately described. Descriptions are limited to vague reference to conducting duplicate computer matching analyses of color patterns in whale flukes. The types and number of analyses are also not described and QA/QC issues are not addressed.

It is not clear how the effects of the oil spill are to be estimated and tested statistically. The level of effect being tested and the effort (i e. number of transects, replicate surveys, etc.) needed to detect that effect are not given. The probability of declaring an effect when there really is not one (Type I error) is not given. The probability of failing to find an effect when there really is one (Type II error) is not given. It will be difficult, if not impossible, to determine if a statistically significant

effect was due to the oil spill or to natural variations. Criteria for selecting impact and control sites are not given.

Injury Determination Methodology

This study is more of a research effort than a damage assessment. The study, as described, will not likely result in quantification of injury. Instead, the study will most probably yield equivocal results due to the incomplete nature of both control and baseline data on humpback whales for the spill-affected area.

The study description implies that the oil spill is the only factor capable of altering population status. In fact, PWS humpback whales are wide-ranging migratory animals. Individual whales travel thousands of miles between their winter habitat in the southern Pacific and summer habitat in Alaskan waters. Factors potentially affecting their abundance, distribution, and reproductive performance include a multitude of environmental conditions which can exist in that wide geographical area.

Regulatory Comments

The study deviates from the regulations, as described by paragraphs A, B, C, H, I, J, K, L, O, P, Q, S, U, V, X, Z, AA, CC, EE, FF, HH, II, and KK.

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<u>Study Title</u>: ASSESSMENT OF INJURIES TO KILLER WHALES IN PWS, KODIAK ARCHIPELAGO, AND SOUTHEAST ALASKA

<u>Study Number</u>: MARINE MAMMAL STUDY NUMBER 2 <u>Study Cost</u>: \$255,800

This study attempts to measure potential oil related effects on killer whale populations by measuring seasonal distribution, abundance, natality, and mortality. Methods to be used include visual observations from small boats deployed from shore-based camps as well as aircraft sightings. Photographic identification of individual whales will attempt to relate to the historical photo database.

Study Objective(s)

<u>Objectives A-E</u>. This study does consider existing information; however, it will not achieve its objectives. Historical killer whale movements and populations dynamics are too poorly understood to allow for meaningful comparisons with post-spill data. The normal distribution pattern for this species in PWS has not been sufficiently established.

Beyond data limitations, the study appears to contain technical deficiencies. For example, data will be collected only in PWS. No data will be gathered in Southeast Alaska or Kodiak. Also, the assumption that the absence of a killer whale for one year indicates mortality of the animal is highly debatable and has not been established as a valid assumption.

Field Methods

The study plan provides inadequate detail with regard to study methodology, sampling locations, survey design and data compilation to allow a proper technical review. These shortcomings are exemplified but not limited to the following:

- Sampling locations are described only as areas "known for whale concentrations".

- The boat survey effort is described as "comparable to the 1989 season," in spite of the inclusion of a non-professional sighting network.
- Besides photographs, it is not indicated that sex, age or activity data will also be gathered.
- There is insufficient detail to determine whether sampling methods are adequate for statistical analysis.
- No QA/QC issues are addressed.

The change in methodology resulting from the addition of the non-professional sighting network to the 1990 program will make comparing the 1990 data to that from previous surveys, including the 1989 survey, more difficult. Also, the disturbance and harassment caused by photography efforts may bias results.

Analytical Methods

Analytical methods are not well described. There is no definition of "pod integrity" or descriptions of how distributional data will be analyzed. The types and number of analyses are not described and QA issues are not addressed. Methods for determining mortality and natality rates are not provided.

Objectives A, B, and D seem to depend on the probabilities of whale sightings being constant over the survey route. In reality, these probabilities are usually highly variable, being dependent on various environmental factors such as local prey densities, bathymetry, etc. This problem will be compounded by the addition of the sighting network.

Injury Determination Methodology

Given the limited description, it is unclear how this study will be able to assess killer whale abundance, distribution and reproductive performance in PWS. Further, it is highly unlikely that the results of this study could be used to demonstrate any measurable impact on killer whales related to the spill for at least three reasons.

First, the study implies any change from pre-spill represents damage from the oil spill. In fact, a considerable number of environmental factors other than the spill could be responsible for any effects on killer whales. No apparent effort is being made to examine the impacts of non-oil environmental factors or fishery conflicts on killer whales.

Second, the study indicates that the investigators will confirm whales are absent if they cannot be located in PWS. This assumes that individual killer whales could only be in this area. Absence will ultimately be interpreted as mortality. These are clearly indefensible assumptions with respect to a highly mobile species.

Third, baseline data are insufficient. The availability of pre-spill natality and mortality data is essential to the success of this study as proposed. Natality and mortality rates for cetaceans are not well understood.

Regulatory Comments

The study deviates from the regulations, as described by paragraphs A, B, C, H, I, J, K, L, O, P, Q, S, U, V, X, Z, AA, CC, EE, FF, HH, and KK.

Study Title:ASSESSMENT OF INJURY TO STELLER SEA LIONS IN PWS AND THE GOAStudy Number:MARINE MAMMAL STUDY NUMBER 4Study Cost: \$171,200

This study attempts to evaluate possible injury to Steller sea lion populations in Prince William Sound and the Gulf of Alaska by measuring tissue damage and premature pupping rates. Premature pupping surveys are planned at two haulouts and pup production surveys will be conducted at six haulouts.

Study Objective(s)

<u>Objectives A-B</u>. The objectives of the study, while they consider available information on sea lions, will not be achievable by the methods described. Further, This study is part of an ongoing research effort into sea lion biology and is not an appropriate NRDA study.

<u>Objective C</u>. No substantive, acute oil spill effects on sea lions in 1989 were reported, and effort associated with this objective seems unwarranted.

Field Methods

Field methodologies are inadequately described. The descriptions of sample size and survey design are insufficient. There is little indication of how pupping will be monitored. Chain-of-custody, QA and QC issues are not addressed.

Analytical Methods

Statistical procedures are inadequately defined. The level of effect being tested and the effort needed to detect that effect are not given. The sampling effort may not be appropriate to meet objectives. It will be difficult to determine if a statistically significant effect was due to EVOS or to natural variation.

Injury Determination Methodology

The study site selections are inappropriate for a damage assessment. First, the site "close to the oiled area" actually lies roughly 100 miles to the east of PWS where there was no oil impact, and thus, the chances of the spill impacting the sea lion population at that site are remote. Second, this site is not comparable to other sites under normal conditions. Cape St. Elias is an area that historically has had an abnormally high incidence of premature pupping. Third, the study and control sites are too distant to expect comparability. Even if appropriate study sites were selected, determining whether spill-related premature pupping has occurred could be impossible since premature pupping frequencies are historically known to vary between years and between sites.

As designed, this study will not be able to separate spill effects from the effects of other environmental factors. Sea lion populations have been dramatically declining over the last several years. Despite considerable research efforts, the cause for the declines are unknown. In light of the poor understanding of the cause to these declines, it is highly unlikely to expect the effects of the oil spill on sea lions to be successfully measured and understood.

Regulatory Comments

The study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, L, Q, S, U, V, X, Y, Z, AA, CC, DD, EE, FF, HH, II, and KK.

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Study Title:ASSESSMENT OF INJURY TO HARBOR SEALS IN PWS AND ADJACENT AREASStudy Number:MARINE MAMMAL STUDY NUMBER 5Study Cost: \$159,300

This study attempts to evaluate possible injury to harbor seal populations in Prince William Sound and adjacent areas by measuring distribution, abundance, pupping rates with associated histopathology and tissue analyses. Boat and aerial surveys will be conducted at 25 haulouts and in oiled and unoiled areas.

Study Objective(s)

<u>Objectives A-B</u>. While the study design does consider use of available information, the objectives may be impossible to achieve through the methods described. Cause of death will be difficult to establish, because the link between tissue petroleum residues and pathological conditions is not often clear. To date, no clear cause and effect relationship has been established between petroleum hydrocarbon exposure, tissue burdens, and pathologic effects. Oil spills can cause pathologic changes that are not associated with increased residue levels. Conversely, residue levels can be increased in the absence of any pathologic condition. Tissue burdens of petroleum hydrocarbons can be rapidly metabolized.

Given the difficulties with the program design and the fact that demonstrated impact on the seal population in 1989 was minimal, the collection of additional seals in the 1990 program is unwarranted.

<u>Objectives C-D</u>. Differences between oiled and unoiled areas may be observed, but attributing such differences to oil as opposed to natural variability will not be possible. This study is part of an ongoing research project investigating the cause of the dramatic declines in harbor seal populations which have been occurring in the northern GOA for the last several years. It is not an appropriate study under NRDA regulations.

Field Methods

In general, the field methods are inadequately described. Nevertheless, the following observations can be made:

- The field methods will not detect distributional changes. Any changes in distribution will appear to be changes in abundance.
- Although chain-of-custody issues for biological specimens are addressed, QA/QC issues are not addressed.

Analytical Methods

Descriptions of the analytical methods to be used are not sufficiently detailed to allow for proper evaluation.

Sample sizes for the exposure/pathology work are inadequate, especially for the reference sampling ("one or more seals" collected from non-impacted area). The use of reference seals from Southeast Alaska is inappropriate.

The analysis strategy appears to assume that sample collection locations are analogous to home ranges and that pathologic findings will correlate to tissue residue data. These are not valid assumptions.

Statistical procedures are vaguely defined. It is not clear how the effects of the oil spill are to be estimated and tested statistically. The level of effect being tested and the effort (i.e., number of samples, replicate subsamples, etc.) needed to detect that effect are not given. The sampling effort is not appropriate to meet objectives. The probability of declaring an effect when there really is not one (Type I error) is not given. The probability of failing to find an effect when there really is one (Type II error) is not given. It could be impossible to determine if a statistically significant effect was due to the oil spill or to natural variation. Criteria for selecting impact and control sites were not given.

Injury Determination Methodology

The 40% decline in abundance which was observed in the trend counts was only based on two years of data. This is insufficient for establishing any meaningful baseline, trends, or natural variation. Since the cause of these declines is not known, it is unlikely to expect any impact of the oil spill on harbor seals to be detected by this study.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, L, P, Q, S, U, V, X, Y, Z, AA, CC, DD, EE, FF, HH, II, and KK.

<u>Study Title</u>: ASSESSMENT OF THE MAGNITUDE, EXTENT, AND DURATION OF OIL SPILL IMPACTS ON SEA OTTER POPULATIONS IN ALASKA

Study Number: MARINE MAMMAL STUDY NUMBER 6(A, B, C) Study Cost: \$1,105,000

This study has three separate components identified as 6A, 6B, and 6C. Component 6A has 28 individual objectives primarily concerned with 5 general areas of investigation as follows; boat surveys, pathologic/toxicologic studies, pup/adult studies, adult male studies, and population modeling. Component 6B studies beached carcasses. Component 6C consists of carcass drift experiments. Methods employed include boat surveys of distribution, transmitter implants, sampling of captured otters for tissue and blood hydrocarbons and drift experiments with simulated otter carcasses.

Study Objective(s)

Study 6A does consider available background literature information and might yield much useful information on the ecology of Prince William Sound otters. The objectives to assess spill impacts on otters are largely unachievable with the design and analyses described. There is no reference to the magnitude of the physical and ecological differences between the impacted (Knight I.) and non-impacted (eastern PWS) study areas. Sea otter densities will generally be very different between any two sites due to naturally occurring factors, independent of oiling. This comment has implications for numerous aspects of the study including population, sex and age structure, and the reproductive history determined from carcass evaluations.

Field Methods

STUDY 6A

In general, the study description lacks sufficient detail to allow a proper technical review of the program. Examples of important information that was not disclosed are as follows:

- The sampling locations and site selection criteria are inadequately described. Reference sites are vaguely identified but oiled sites are not well identified.
- The time of day that surveys are to be conducted is not indicated. Feeding behavior can vary significantly between subpopulations.
- The Plan does not indicate how sexes are distinguished for adult animals.

Technical deficiencies of the program are exemplified by, but not limited to the following:

- The methods proposed will not distinguish between distributional effects and population declines. Movement patterns of otters in the spill impacted area are too poorly understood to enable valid comparisons between impacted and reference sites.
- Boat survey sampling frequencies are too low to detect differences in density over time. There is only one pre-spill estimate of population size. This is insufficient to determine trends or variance.
- The study proposes to compare hematology data between areas. There are no pre-spill hematology data from otters in the study areas. Historical differences have been attributed to variations in habitat quality.

Many of the sublethal parameters being evaluated are not standard methodologies for wildlife, for assessing spill impacts, or for assessing population level impacts and are, thus, of a research nature.

STUDY 6B

The control areas are not well described in the Plan or in the baseline reference. Assessing oil spill impact from changes in the age structure of beached carcasses requires a full understanding of trends and variation in the population and subpopulation age structure dynamics.

STUDY 6C

The carcass drift experiments will greatly overestimate the direct spill related mortality, because distressed otters are very likely to haul out on land thereby increasing likelihood of being found. No such behavior will occur with the drift buoys. This component of Study MM6 is inadequately described and gives insufficient information on locations, deployments, and extent of any follow up efforts.

Analytical Methods

The population modeling technique discussed in 6A is inappropriate since it requires a far better knowledge and understanding of population status and trends than are currently available for PWS sea otters. In addition, in 6B, Spring 1990 carcass count and age structure data will not have valid predictive value for estimating long term impact.

Statistical procedures are vaguely defined. It is not clear how the effects of the oil spill are to be estimated and tested statistically. The level of effect being tested and the effort (i e. number of samples, replicate subsamples, etc.) needed to detect that effect were not given. The sampling effort is not appropriate to meet objectives. The probability of declaring an effect when there really is not one (Type I error) is not given. The probability of failing to find an effect when there really is one (Type II error) is not given. It will be essentially impossible to determine if a statistically significant effect was due to the oil spill or to natural variation. Criteria for selecting impact and control sites were not given.

Injury Determination Methodology

The studies as described will not accomplish the objectives. For study 6A, the baseline data are too limited. The sample sizes are too small. The assumptions regarding population status are unsupportable. The clinical

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laboratory and residue analysis data will be inconclusive and have little bearing on the effects of the spill.

The sublethal effect investigation is research-oriented and will not be useful in an NRDA injury assessment. The methods being employed are not routine for wildlife field work, or oil spill impact assessment. Several of the techniques are of questionable biological significance. None of them are meaningful in the context of the oil spill's possible impact on sea otters at a population level. Apparently, novel injury endpoints are being studied instead of more traditional endpoints such as population size, distribution, reproduction, habitat usage. The mechanism by which the oil spill could cause chromosomal damage to otters is remote, given the toxicity of crude oil, its environmental fate, and the levels of polycyclic aromatics in otter prey as a result of the spill.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, E, F, H, I, J, K, L, Q, V, X, Y, DD, EE, FF, and HH.
<u>Study Title</u>: ASSESS THE FATE OF SEA OTTERS OILED AND REHABILITATED AS A RESULT OF THE EVOS

Study Number: MARINE MAMMAL STUDY NUMBER 7 Study Cost: \$147,000

This study attempts to estimate the survival and reproductive potential of sea otters cleaned and rehabilitated by the wildlife centers. Methods include radio transmitter implantation, tracking, and monitoring of sea otters, necropsies, and tissue analyses for recovered carcasses.

Study Objective(s)

<u>Objectives A-D</u>. The study is inadequately described, and the objectives cannot be achieved. The objectives ignore the fact that translocation of the otters will likely play a larger role in otter survival than will oil exposure. Several cases have shown that translocation can have a large impact on otter movements and survival.

Field Methods

Field methods are inadequately described. The frequency of relocation of instrumented animals is not given. The health assessment criteria are not described. It is unclear how adult females will be distinguished from males during counts of the study populations.

Analytical Methods

Methods are insufficiently detailed. Sample sizes may be too small to allow for meaningful analysis. A total of 45 rehabilitated otters with such diverse characteristics (i.e., collection site, sex, level of oiling, time of exposure, nature of exposure, etc.) is too small to detect differences that could be extrapolated to the rehabilitated otter populations.

Injury Determination Methodology

Study objectives are compromised by the fact that otters were captured, maintained in captivity, stressed and translocated. Oil exposure is only one of a number of significant factors potentially impacting the otters. In fact, several of the animals were judged to be unoiled by otter center workers when they were admitted to the rehabilitation facilities. The most likely conclusions from this study will pertain to effects of captivity and translocation on sea otters.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, H, I, J, K, L, Q, V, Y, DD, EE, HH, and KK.

APPENDIX - SECTION E Detailed Comments on TERRESTRIAL MAMMAL STUDIES

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E. COMMENTS ON TERRESTRIAL MAMMAL INJURY ASSESSMENT

The 1990 Plan includes five studies on the assessment of injury to terrestrial mammals, costing a total of \$741,900. None of the studies deal with restoration or lost use issues. Also, these studies do not properly reflect an understanding of the positive state of ecological health evident throughout Prince William Sound and the Gulf of Alaska. The need for any studies of terrestrial mammals should have been motivated by 1989 data wherein injury to mammal populations, sufficient to merit further study to define restoration needs, was documented. Since it is very unlikely any such injury to terrestrial mammal populations was documented, the justification for these studies is highly questionable.

One study (TM3) represents a sizeable effort to determine if the EVOS will have a measurable effect on river otter populations in PWS (\$347,600). Two other smaller studies (TM1 and TM4), also looking at possible effects on populations, are concerned with Sitka black-tailed deer in PWS and the Kodiak Archipelago (\$124,600) and brown bear on the Alaska Peninsula (\$125,700). A fourth study (TM6) is a laboratory toxicity investigation of the effects of ingested weathered Prudhoe Bay crude oil on reproduction of mink (\$134,000). A fifth study (TM2) is a literature search on intertidal habitat use by black bear (\$10,000).

Insufficient details are presented to permit scientific evaluation.

Although the study descriptions are improved over those provided in 1989, the 1990 studies are inadequately detailed to make a proper scientific evaluation. The omission of results from related 1989 studies (TM1, TM3, TM4, TM6) makes it difficult to understand the justification for their continuation into 1990. Recognizing the lack of mortalities, substantial indications of injury would be necessary in order to justify these studies.

<u>Planned studies ignore overall ecological health</u>.

Proposed studies on the impact of the spill on Sitka black-tailed deer (TM1), black bear (TM2), and brown bear (TM4) appear to disregard the obvious good health of these terrestrial mammals, as confirmed by the continued permitted hunting of these animals in the areas impacted by the spill. Continued sport hunting is a clear acknowledgement that a harvestable surplus exists. Also, had there been a sizable mortality of terrestrial mammals or a significant exposure potential to petroleum hydrocarbons, these species would have been investigated under the joint NOAA, ADF&G, and Exxon subsistence program.

Study results are not relevant to spill-related effects.

The studies on Sitka black-tailed deer (TM1), river otters (TM3), and brown bear (TM4) will provide data for improved population management of these terrestrial mammals, but are of little relevance to EVOS-related effects. For example, the river otter study (TM3) will provide abundant information on habitat use and movement patterns of the species, but it will not measure any population impacts related to the spill.

Exposure pathways to spilled oil are not established.

Although studies TM1, TM3, and TM4 are being continued for a second year, there are no discussions of documented mortalities of Sitka black-tailed deer, river otters, or brown bear in the 1990 study plans. It is extremely unlikely that populations of these terrestrial mammals, as well as the black bear and mink (TM2, TM6), could have been impacted by the EVOS.

Natural variability is not adequately considered in study design.

In the studies on Sitka black-tailed deer (TM1), river otters (TM3), and brown bear (TM4), it will be be extremely difficult, if not impossible, to determine if statistically significant population changes are due to the EVOS or to natural variability. Many natural variables, such as severe winters, predator/prey relationships and disease, clearly affect key life cycle events

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of various species. It is not apparent that the sampling and methods programs described for these studies will capture the necessary information to show that a significant portion of the expected biological variability is related to oil contamination rather than to natural factors.

Studies are research-oriented and not cost-effective.

The mink (TM6) and black bear (TM2) studies are research-oriented, are unrelated to NRDA injury assessment and hence do not meet the cost-effectiveness criteria of NRDA assessments. In the laboratory toxicity study on mink (TM6), it will be impossible to apply laboratory findings of the study to the field since continuous ingestion of oil over a prolonged period did not occur for mink or any other animal.

In the black bear study (TM2), the literature search on intertidal habitat use by black bears is unrelated to natural resource damage assessment. The cost of this study is unwarranted because the probability of damage to black bear populations is extremely low and this literature should have already been searched and reviewed through existing state and federal wildlife monitoring activities. Furthermore, if no injury is documented to Prince William Sound bears, a literature search can only lead to speculation.

<u>Study Title</u>: ASSESSMENT OF THE EFFECT OF THE EVOS ON THE SITKA BLACK-TAILED DEER IN PWS AND THE KODIAK ARCHIPELAGO

<u>Study Number</u>: TERRESTRIAL MAMMAL STUDY NUMBER 1 <u>Study Cost</u>: \$124,000

This study attempts to evaluate possible effects to Sitka Black-tailed deer populations in Prince William Sound and the Kodiak Archipelago by measuring and comparing deer distribution, abundance, mortality; presence of rumen in lungs of dead deer; and presence of hydrocarbons in tissues and rumen. This work will be done via aerial and land field surveys, along with associated necropsy and histopathology.

Study Objective(s)

<u>Objectives A-B</u>. It is highly unlikely that oil contamination will be found in tissues and rumen contents. The presence of oil in tissues, while unlikely, will not be a measure of effect - only of exposure and does not translate to injury.

<u>Objective C</u>. Estimating the number of dead deer per unit area on an oiled and an unoiled beach may not give meaningful results because the total number of dead deer may be so small that it will be impossible to detect differences. Densities of deer relative to the length of shoreline on the two islands will be different and therefore population of deer using the beaches may be quite different on the two islands.

Field Methods

Freezing tissues for histopathology is not the preferred preservation technique. It is not clear from the discussion that all carcasses will be fresh.

Analytical Methods

Sample sizes are not provided. Methods are inadequately described and statistical procedures are only vaguely defined. It is not clear how the effects of the oil spill are to be estimated and tested statistically. The level of effect being tested and the effort (i.e., number of samples, replicate subsamples, etc.) needed to detect that effect were not given. The sampling effort does not appear to be appropriate to meet objectives. The probability of declaring an effect when there really is not one (Type I error) is not given. The probability of failing to find an effect when there really is one (Type II error) is not given. It will be difficult to determine if a statistically significant effect was due to the oil spill or to natural variation. Criteria for selecting impact and control sites were not given.

Pellet counting has severe sampling problems and may not give accurate indices of deer densities.

Injury Determination Methodology

The islands in the Sound with the greatest deer populations (Hawkins, Hinchinbrook, and Montague) were not impacted by the spill. This study is not cost effective, considering the reproductive capacity of the deer and the percent of the PWS population potentially exposed, and considering that studies with other species have shown that oral exposure to weathered crude oil is not a significant hazard.

Regulatory Comments

The study deviates from the regulations, as described in paragraphs A, B, C, E, F, H, I, J, K, L, O, Q, U, V, Y, EE, HH, and KK.

Study Title:REVIEW OF LITERATURE ON INTERTIDAL HABITAT USE BY BLACK BEARStudy Number:TERRESTRIAL MAMMAL STUDY NUMBER 2Study Cost: \$10,000

This study is a literature search and review to determine the importance of the intertidal habitat to black bear.

Study Objective(s)

Determining the "importance" of the intertidal habitat for black bear, as stated in the objective, cannot be achieved. Determining how much time black bear likely spend in the intertidal habitat might be achieved through a literature search, but not the importance of the habitat.

Analytical Methods

The cost of this literature search on black bear intertidal habitat use is unwarranted for the following reasons:

- the probability of injury to black bear populations is extremely low;
- this literature should have already been searched and reviewed through normal wildlife monitoring activities; and
- can only lead to speculation about exposure and injury.

Regulatory Comments

This study deviates from the regulations, as described in paragraphs H, J, K, and DD.

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<u>Study Title</u>: ASSESSMENT OF THE EFFECT OF THE EVOS ON RIVER OTTERS IN PWS <u>Study Number</u>: TERRESTRIAL MAMMAL STUDY NUMBER 3 <u>Study Cost</u>: \$347,600

This study attempts to evaluate possible effects to river otter populations by measuring and comparing distribution, abundance, mortality, and habitat use of river otters. Study methods include surveys at latrine sites, checking food habitats and prey remains, radio tagging and monitoring, necropsies, histopathology, and tissue hydrocarbon analyses of carcases.

Study Objective(s)

The study's overall objective, that of determining if the EVOS will have measurable effects on river otter populations, cannot be achieved given the absence of valid pre-spill population data. Some of the specific objectives associated with food habits and habitat use may be achievable. However, observations of differences in certain parameters cannot be related to potential impacts from the EVOS.

This study is not cost effective. The study will only assess short-term impact. There will be a quick recovery from any short-term impact on otter density. River otters mature rapidly and have relatively large litters. The "takes" planned in this study will probably result in more otter fatalities than have been observed since the EVOS. Very little of this study will relate to natural resource injury.

Field Methods

Study locations are not described well. The radio transmitter and radioisotope implant techniques are also described inadequately.

Analytical Methods

Statistical procedures are vaguely defined. It is not clear how the effects of the oil spill are to be estimated and tested statistically. The level of

<u>1990 NRDA Plan Response</u>

effect being tested and the effort (i. e., number of samples, replicate subsamples, etc.) needed to detect that effect were not given. The sampling effort is not appropriate to meet objectives. The probability of declaring an effect when there really is not one (Type I error) is not given. The probability of failing to find an effect when there really is one (Type II error) is not given. It will be difficult to determine if a statistically significant effect was due to the oil spill or to natural variation. Criteria for selecting impact and control sites were not given.

Injury Determination Methodology

It is inappropriate to compare an impacted site to a reference site for density comparisons when, in all probability, neither site has any valid pre-spill data on population trends or variance.

Regulatory Comments

The study deviates from the regulations, as described in paragraphs A, B, C, H, I, J, K, O, P, Q, S, U, V, Y, CC, DD, EE, FF, HH, and KK.

<u>Study Title</u>: ASSESSMENT OF THE EVOS ON BROWN BEAR POPULATIONS ON THE ALASKA PENINSULA

<u>Study Number</u>: TERRESTRIAL MAMMAL STUDY NUMBER 4 <u>Study Cost</u>: \$125,000

This study attempts to evaluate possible effects on brown bear populations by measuring and comparing bear distribution, abundance, and mortality, and ingestion of hydrocarbons by bears. Study methods include live bear capture, radio transmitter implantation, aerial surveys, fecal analysis, necropsies and histopathology on dead bears that are found, and analyses of blood from live bears.

Study Objective(s)

<u>Objectives A-C</u>. These are concerned with possible physiological effects and mortalities of brown bear due to the EVOS and cannot be achieved primarily because no direct exposure pathway to spilled oil is outlined. Also, there is insufficient information on how tissue and feces analyses are to be related with mortality.

<u>Objective D</u>. Estimating the adult population density of the study area has nothing to do with natural resource damage assessment, particularly since no historical database exists.

Field Methods

Study areas in the Katmai National Park, on Kodiak Island and near Black Lake are not described as to exact location and study area size.

Analytical Methods

Population estimates for only two years, 1990 and 1992, certainly cannot be used to predict any trend or identify any impact from EVOS on brown bear populations on the Alaska Peninsula.

Two assumptions used in the model to estimate adult population levels are very weak:

- The brown bear population is geographically and demographically isolated.
- All brown bear have equal capture probabilities that are constant over time.

Statistical procedures are vaguely defined. It is not clear how effects of the EVOS are to be estimated and tested statistically. The level of effect being tested and the effort (i. e., number of samples, replicate subsamples, etc.) needed to detect that effect are not given. The sampling effort is not appropriate to meet objectives. The probability of declaring an effect when there really is not one (Type I error) is not given. The probability of failing to find an effect when there really is one (Type II error) is not given.

The significance of hydrocarbons in fecal samples, particularly as it relates to ingestion, is not discussed in sufficient detail to determine its validity. No literature is cited as to how this technique has been used with previous spills.

No explanation is given why blood is to be analyzed for packed cell volume and percent hemoglobin. These measurements are not likely to establish any impact on the bear from spilled oil.

<u>Injury Determination Methodology</u>

The spill area site in the Katmai National Park is not a good choice for determining injury to brown bear from the EVOS. The bear population age structure, particularly for old males, would be quite different in Katmai because the bears are protected, not hunted. This contrasts with the control areas where hunting is permitted. As a result, some population difference might be improperly assigned to oil spill effects.

Terrestrial Mammal

Regulatory Comments

The study deviates from the regulations, as described in paragraphs A, B, C, E, H, I, J, K, L, O, P, Q, S, U, V, Y, Z, AA, BB, CC, DD, EE, FF, HH, and JJ.

<u>Study Title</u>: INFLUENCE OF OIL HYDROCARBONS ON REPRODUCTION OF MINK (<u>MUSTELA VISION</u>)

<u>Study Number</u>: TERRESTRIAL MAMMAL STUDY NUMBER 6 <u>Study Cost</u>: \$134,000

This study attempts to measure acute toxicity and chronic toxicity effects of ingested weathered Prudhoe Bay crude oil on mink reproduction. Both short-term (7 days) and long-term (4 months) tests are planned on 20 animals. Tissue and blood samples will be collected for several analyses and various physiological parameters of kits will be monitored.

Study Objective(s)

The stated objective of this laboratory toxicity test, to determine if oil ingestion affects mink reproduction, cannot be achieved. As with most laboratory studies, results are almost impossible to transfer to the field or to extrapolate to real-world populations.

Analytical and Laboratory Methods

The analytical results on tissue and blood samples for histopathology, hydrocarbon contents, and liver cytochrome P450 levels, obtained from these laboratory-exposed animals, cannot be carried over to the field situation. The experimental design is flawed since oil that is only slightly weathered (seven days at room temperature) will be used. Also, the concentration of oil is unrealistically high (100 ppm) in the food consumed by the animals and the animals have no choice to reject oil-containing food.

Statistical procedures are vaguely defined. It is not clear how effects of EVOS are to be estimated. Sampling effort is not adequate to meet study objectives.

Injury Determination Methodology

This laboratory toxicity study is very much research oriented and impossible to relate to natural resource damage assessment. Hence, it is not cost effective.

Using mink as a model species to determine effects of the EVOS on reproduction is unrealistic, since mink's delayed implantation is not typical of the reproductive biology of the majority of terrestrial mammals which might be impacted.

Regulatory Comments

The study deviates from the regulations, as described in Paragraphs A, B, C, E, F, H, I, J, K, L, Z, AA, BB, CC, DD, EE, HH, and KK.

APPENDIX - SECTION F Detailed Comments on BIRD STUDIES

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F. COMMENTS ON BIRD INJURY ASSESSMENT

The 1990 Plan includes seven studies related to the assessment of injury in birds, costing a total of \$2,262,800. Of the seven projects, one represents a large modeling effort designed to provide an estimate of the total bird mortality (\$598,000). Five others are directed primarily towards measuring a change in population status, specifically for seabirds in general (\$471,000), nesting colonies (\$251,100), bald eagles (\$675,000), peregrine falcons (\$107,700), and for passerines (\$10,000). A hydrocarbon intake study in seaducks (\$150,000) is also included.

Studies are inadequately described to allow for technical review.

Although the project descriptions were improved over those provided in 1989, the projects are still not outlined in sufficient detail to permit a proper critical review. For example, the description of survey techniques used in several of the studies (B2, B3, B4, B5, and B13) is inadequate to evaluate whether stated accuracy objectives could be met. The model to be used in the modeling study (B1), probably the most important component of that study, is only vaguely referenced. Throughout the studies, sampling approaches (sample locations/sites, numbers of samples/plots, numbers of replicates, etc.) are only defined in general terms. While there is some discussion of the application of statistical models to the data, such descriptions are usually brief and incomplete.

Studies will fail to measure injury.

With the exception of the modeling project (B1), the planned projects will not produce estimates of injury. For example, the survey projects (B2, B3, B4, B5, and B13), as designed, may be able to measure change from previous measurements of the subject populations. However, the studies fail to identify and consider the other variables that could be impacting the bird populations, such as severe seasonal weather, food supply, disease, commercial fishing activity, etc. Consequently, there is no way to determine

Studies do not adequately consider the high degree of annual variability in historical baseline bird populations.

Many of the projects will have difficulty even establishing a reliable level of change for the subject populations. Historical baseline data available for comparison are outdated or extremely limited in many cases, so pre-spill conditions are poorly understood. For example, data from aerial surveys in study B2 will be compared to 1971 data. Further, little information is available to indicate the levels of natural variation or the amount of data necessary to establish a reliable baseline. Without a valid baseline, no reliable determination of change can be made nor can changes be related to EVOS.

Studies more appropriate for research are included in the Plan.

The peregrine falcon study (B4) is unwarranted, given that no population impact on the species has been demonstrated and that no suitable baseline data are available. Population surveys, observations of prey remains, and tests for pesticides and trace metals will provide useful ecological data for peregrines but serve no purpose for relating to any EVOS effects.

Several aspects of the eagle program (B4) are also research oriented. Population survey, radio-tracking, and productivity survey efforts pursued well outside of the oil spill area will not serve NRDA purposes.

Control site selections are inappropriate.

While the nature of control sites is not disclosed in many cases, some control sites are clearly inappropriate. In study B5, PWS/Kenai (Peale's) peregrine falcons are being compared to a different subspecies of peregrine falcon inhabiting Norton Sound, many hundreds of miles away. In study B3,

the Semidi Islands are used as a control site, although they are not representative of the habitat in the spill area.

Plan ignores obvious indicators of rapid ecological recovery.

Prioritization of efforts and associated expenditures for avian studies ignore the well established world-wide literature which indicates that bird populations recover extremely rapidly following an oil spill. These study plans also ignore the obvious evidence of bird recovery throughout Prince William Sound and the Gulf of Alaska which confirm healthy density and diversity of resident and migratory species. Additional evidence from USFWS confirms that the eagle population has successfully re-colonized previously spill-impacted areas and waterfowl hunting has not been closed indicating a harvestable surplus.

<u>Study Title</u>: AN ASSESSMENT OF DAMAGE TO SEABIRDS IN PWS AND THE WESTERN GOA RESULTING FROM EVOS

<u>Study Number</u>: BIRD STUDY NUMBER 1 <u>Study Cost</u>: \$598,000

This study attempts to estimate direct injury to seabirds in Prince William Sound and the western Gulf of Alaska using beached bird data and trajectory models. Methods include necropsies of unoiled carcasses to examine for oil ingestion, carcass drift tests to estimate losses at sea and modeling to estimate total injury.

Study Objective(s)

<u>Objectives A-D</u>. The 1990 program is improved over that described in the 1989 Draft Plan. However, any mortality estimate will probably be, at best, an order of magnitude approximation in view of the uncertainties and assumptions that modeling will require. Additionally, Objectives B and D are not distinguishable as written.

Field Methods

Radio tagging studies of drifting carcasses, while useful, may not indicate anything except sinking rates. Trajectories followed by floating birds can be controlled largely by weather patterns and, hence, may be specific to prevailing weather conditions.

Information provided with regard to the carcass drift study is insufficient for critical review, as exemplified by, but not limited to the following:

- The source of carcasses for the drift study is not indicated.
- The source of information (or the methods used to generate the information) describing the initial state of oiling and decomposition of the carcasses is not disclosed.
- The locations of carcass release are not described.

- The number of samples to be used in the study is not described.
 Consequently, one cannot determine if at-sea loss rates can reasonably be determined on the basis of species, degree of oiling, degree of decomposition, etc.
- The nature of the transmitters (for example, buoyancy or transmitter range) is not adequately explained.

The assumption that transmitters remain upright and exposed may be weak, particularly if the sea state is moderate to heavy.

The use of decoys as a calibration tool has several weaknesses, including not matching birds in profile and assuming that decoys not found have drifted out of range.

The study, as described, may show disregard for sensitive resources like eagle nests, seal and sea lion haulouts, and seabird colonies. The stated 500' ASL flight altitude to be used in flights "near the beach" could violate the 1000' ceiling and 1/4 to 3-mile buffer zones established by USFWS, NMFS, and ADF&G.

Analytical Methods

In general, the analytical procedures are not documented adequately. A proper review cannot be made given the vague description provided for the model, the heart of this injury determination effort. More information is needed with regard to application of the model, the model's input parameters, and its underlying assumptions.

The source and nature of the historical bird density data to be used in the trajectory modeling effort are not disclosed.

Although two options for pursuing model sensitivity analysis are presented, the criteria to be used for choosing between these options is not disclosed. Further, the sensitivity analysis options are not well described.

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- The assumption that the "average lineal density of carcasses for a given beach type in the unsampled area was the same as that in the sampled area in a given sector" is unsubstantiated.
- The intended use of a 10% sample of freezer-stored birds to reflect the oiled/non-oiled distribution of birds on unsearched beaches may not be appropriate.
- The intended use of bird carcass notes and logbooks to indicate level of effort is improper, since it may not indicate effort applied at other locations where birds were not found.
- While necropsies of non-oiled birds are being made to check for hydrocarbon ingestion, no necropsies are planned to check oiled birds. This implies that any bird carcass with oil on it expired as a result of that contact; it ignores natural mortality and post-mortem oiling.
- The assumption that carcass disappearance rates increase as the birds enter the nearshore environment is questionable.
- Further, effects of the intensive search effort must be accounted for.

Injury Determination Methodology

As described, this study will be used to approximate spill-related injury. However, given the range of and lack of precision for input variables and the many assumptions to be made, it will necessarily lead to non-definitive mortality estimates.

<u>Regulatory Comments</u>

This study deviates from the regulations, as described by paragraphs B, H, I, R, U, Y, DD, FF, HH, and II.

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<u>Birds</u>

1990 NRDA Plan Response

<u>Study Title</u>: SURVEYS TO DETERMINE DISTRIBUTION AND ABUNDANCE OF MIGRATORY BIRDS IN PWS AND THE NORTHERN GOA

Study Number: BIRD STUDY NUMBER 2

<u>Study Cost</u>: \$471,000

This study attempts to evaluate changes in abundance and distribution of migratory birds in Prince William Sound and the northern Gulf of Alaska following EVOS. Data obtained in aerial and boat surveys will be compared to historical data.

Study Objective(s)

<u>Objectives A-B</u>. It is absolutely impossible that a valid appropriate determination of injury can be made on the basis of a comparison between 1990 and 1971 aerial data. (Objective A.2)

A causal relationship between the observed change and the spill may be impossible to establish. Additionally, Objectives A.3 and B.3 cannot be met without long-term studies and they will be compromised due to the natural variability in waterfowl and waterbird populations.

Field Methods

With regard to boat surveys, the study plans do not indicate whether the level of effort, observer experience, and other critical factors affecting survey accuracy will match those in earlier surveys or whether similar protocols will be used for collecting these survey data.

There is no discussion of count replication or other survey strategies to indicate that a 95% confidence limit would be achieved for the survey data. It appears that the sampling effort would be inadequate to account for natural variability, perhaps precluding comparisons with historical data.

The description of the sampling design is inadequate for proper review.

Birds

<u>1990 NRDA Plan Response</u>

Data from the boat surveys are to be compared to unpublished USFWS reports, making proper review impossible since the methodologies followed in the earlier studies cannot be adequately compared to those of the proposed studies, nor can the reliability of the older studies be assessed.

The methodology used to identify the "presence or absence of oil" during the boat surveys is not disclosed. In addition, it is not clear that other variables that can influence bird distributions and densities are being recorded.

With regard to aerial surveys, the assumption that visibility bias affecting surveys in different years with different conditions and different observers is similar is likely not correct.

The aerial surveys, as described, may show disregard for sensitive resources like eagle nests, seal and sea lion haulouts, and seabird colonies. The stated 150' ASL flight altitude to be used in flights 200m offshore appears to be in conflict with the 1000' ceiling and 1/4 to 3-mile buffer zones established by USFWS, NMFS, and ADF&G.

The study plan appears to place unjustified emphasis on the more variable spring and fall migration surveys.

Analytical Methods

In general, statistical procedures for data comparisons are vaguely defined in the study plan. It is not made clear how the effects of the EVOS will be estimated and tested.

The use of 1971 data as a baseline in the aerial survey work is inappropriate since environmental and other unaccounted for changes occurring within the long intervening time period could result in large changes in population status. These environmental effects cannot be separated from the effects of the spill using the available data.

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Birds

Injury Determination Methodology

It is not made clear how studies at Naked Island (Pigeon Guillemot and Marbled Murrelet) reflect on injury elsewhere. Further, while these studies might estimate changes in local density, they will not establish a causal relationship between such a change and the spill.

For Marbled Murrelets in particular, the ability to even measure a change is open to question. The available historical data are from the period 1979-1981 and may be less useful because of their age.

The proposed Kodiak Island shoreline transect surveys do not appear to have any baseline data for comparison. If so, this work cannot be used to determine injury and only serves to provide basic science (research) data.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, H, I, O, Q, S, U, V, X, Y, DD, FF, HH, and II.

<u>Study Title</u>: POPULATION SURVEYS OF SEABIRD NESTING COLONIES IN PWS, THE OUTSIDE COAST OF THE KP, BARREN ISLANDS, AND OTHER NEARBY COLONIES

Study Number: BIRD STUDY NUMBER 3 Study

This study attempts to determine whether seabird numbers in attendance at nesting colonies have been reduced following EVOS. Study sites include the Barren Islands, Kenai Peninsula, and other Gulf of Alaska locations.

Study Objective(s)

The stated objective, measuring a possible decrease in numbers compared to historical data, might be achieved, at least for some species. However, the study as proposed will not be able to demonstrate a causal link between any measured change and EVOS.

Field Methods

It is not clear that the proposed census study properly accounts for the diurnal variability in nest attendance of the various species that occurs even during the stated study hours of 1000 to 1600 hours.

The use of boat and land-based surveys is problematic in that the different levels of reliability of such surveys may make relative comparisons questionable.

Analytical Methods

The use of the control site at the Semidi Islands is questionable since the Semidi Islands are relatively far removed from many of the study sites and are affected by different oceanographic conditions and environmental influences.

<u>Study Cost</u>: \$251,100

1990 NRDA Plan Response

While some historical data do exist at the proposed colony sites, much of the information is too dated to be valid. As such, the ability to measure recent change for some species populations will be limited. Consequently, it will be difficult to link any change in population status to the spill.

Statistical models are vaguely defined. It is not clear how the effect of EVOS will be measured, particularly considering natural variation due to time and location. The probabilities of Type I and Type II errors are not given.

Injury Determination Methodology

While some change from past data may be established for some species, the data generated in this study will likely not be able to show any causal link to the EVOS. For many species, even a reliable measurement of change will not be possible because of natural variation.

<u>Regulatory Comments</u>

The study deviates from the regulations, as described by paragraphs A, B, H, I, Q, S, U, V, X, Y, DD, FF, HH, and II.

Birds

Study Title:ASSESSING THE EFFECTS OF THE EVOS ON BALD EAGLESStudy Number:BIRD STUDY NUMBER 4Study Cost:\$675,000

This study attempts to evaluate the impact on bald eagle abundance, distribution, productivity, and survival by a combination of aerial population surveys, helicopter-based productivity surveys, radio tagging, and necropsies of dead eagles.

Study Objective(s)

<u>Objectives A-C</u>. Insufficient information is provided to determine whether the project objectives A, B, and C can be met, at least to the stated degrees of accuracy and certainty. Even if the objectives are met, the poor understanding of the baseline may make determination of injury difficult.

<u>Objective D</u>. The highly weathered and non-toxic state of EVOS oil in 1990 suggests that costs and capturing activities associated with this objective are likely not warranted.

Field Methods

A. POPULATION SURVEYS

The 1982 data to be used as baseline information are too dated to be valid and may not be reflective of pre-spill conditions. Also, the study plan does not indicate whether steps are being taken to ensure that new data will be collected in a fashion comparable to that of the 1982 data.

The locations of "oiled" and "non-oiled" sampling areas are not described, nor is it indicated what criteria will be used to distinguish these areas.

1990 NRDA Plan Response

Plot selection criteria are not adequately discussed. Further information regarding plot selection methodology, the number of plots, etc., are required for a proper review.

The inclusion of areas well outside the spill zone (e.g., Malaspina Glacier) seems inappropriate in a damage assessment. The relatively large distance (250 miles) of these areas from the affected area makes such use subject to question. Acquisition of these data is more of a research effort than one associated with assessment of injury.

B. PRODUCTIVITY SURVEYS

Collection of data on Copper River Basin eagles are more research-related than NRDA-related. While the Copper River Basin is not too distant geographically, the differences in habitat, food supply, and the timing of egg-laying may be sufficient to exclude its use as an appropriate control area.

Comparison of productivity in widely separated areas such as PWS and Southeast Alaska is not valid.

The application of "home range" used in the study implies two assumptions that may not be correct: (1) the level of use of the shoreline is constant throughout the home range and (2) eagles lack the ability to avoid oil.

C. SURVIVAL STUDIES

Inclusion of the Copper River Basin eagles in the survival studies is more of a research effort than assessment of injury. Localized habitat for these individuals differs significantly from Prince William Sound in numerous key respects including feeding ecology and nesting habitat, thus posing serious questions about the study design to compare eagle data from the two areas.

The Plan proposes that the survival of 15 adult eagles from oiled and 15 from non-oiled areas will be compared. These samples are too small to ensure that random samples across the age structure of the population are obtained.

The proposed radio-tagging program does not account for the natural dispersal of immature eagles and could potentially increase the risk of mortality to fledglings, thus leading to study bias.

How failure of the radio tags will be taken into account is not apparently accounted for in the experimental program.

The "oiled" and "non-oiled" sampling areas in this program area are not described adequately to allow proper review.

D. TOXIC/SUBLETHAL EFFECTS

The number of blood samples to be collected was not disclosed, nor was the means of selection of the individual eagles to be tested.

Post-mortem changes occurring in dead eagles may invalidate the results of any hydrocarbon analyses performed on recovered carcasses.

The "oiled" and "non-oiled" sampling areas in this program area are not described adequately to allow proper review.

Analytical Methods

The statistical analysis to be used in this study was only vaguely defined. Study sites are not disclosed, nor are they described adequately. The probabilities of Type I and Type II errors are not given.

Injury Determination Methodology

The determination of injury in this study is heavily dependent on a comparison of the proposed survey data to similar data collected eight years earlier. While the study may measure a change, it cannot demonstrate that the change was related to the spill, since a host of other natural environmental influences may could have affected eagle populations over the last eight years.

The inclusion of the productivity study component does not seem to consider the fact that (1) the oil remaining in the environment is highly weathered and of low toxicity and (2) short-term reductions in productivity have little impact on eagle population.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, H, I, P, Q, S, U, V, X, Y, DD, EE, FF, HH, and II.

Study Title:IMPACT ASSESSMENT OF THE EVOS ON PEALE'S PEREGRINE FALCONSStudy Number:BIRD STUDY NUMBER 5Study Cost:\$107,700

This study attempts to estimate the EVOS impact on the abundance, distribution, and productivity of Peale's peregrine falcon. Methods include boat and helicopter surveys, collection of eggs, collection of feathers from adults and fledglings, and analysis of prey remains for hydrocarbon contamination.

Study Objective(s)

<u>Objective A</u>. The study will not substantiate that lower (or higher) nest site occupancy and productivity rates were realized "in the project area as a result of EVOS." This study will not be able to establish whether a population change occurred or whether any perceived change was related to EVOS.

Field Methods

A. POPULATION/PRODUCTIVITY SURVEYS

The survey methodologies to be used in this study are vaguely referenced. Further, it is not clear what steps will be taken to ensure that the surveys of PWS, etc., will be comparable to those in Norton Sound.

Differences in the survey platforms (helicopter or boat) used in the Gulf of Alaska may make comparison to control population surveys difficult.

The taking of a substantial number of eggs (10) for pesticide testing may interfere with productivity in the project area and is not appropriate for an NRDA study.

1990 NRDA Plan Response

B. FEATHER SAMPLES (Nickel, Vanadium)

Given that no negative impact on the peregrine population has been established, the human contact and disturbance caused by the collection of feather samples is unwarranted. Further, such disturbance may affect the results of the productivity survey.

C. PREY REMAINS

Sample handling procedures are inadequately described to evaluate QA/QC measures. The study plan indicates only that samples will be handled "carefully".

D. PESTICIDES

The collection of ten (10) fresh eggs from nests, and the attendant disturbance, is unwarranted given that no negative effect on reproduction has been observed and is clearly research, and is not related to EVOS.

Further, while the pesticide program may help separate pesticide effects from non-pesticide effects, this is only one of a large number of factors that could influence productivity.

The egg sampling program is inadequately described with regard to the number of sampled nests and the criteria used for nest and sample selection.

Analytical Methods

A. POPULATION/PRODUCTIVITY SURVEYS

It is not clear that any PWS-area baseline information useful for comparison purposes exists or what the age of that information might be.

Comparison to a population in Norton Sound (near Nome) is inappropriate, considering the large distance (over 500 miles) separating sites, the different habitat and climatic regimes, the probable difference in population age distributions, and the different falcon sub-species in the two locations. Further, such a comparison ignores the natural year-to-year variability, which appears to be large on the basis of data from the Aleutian Islands.

The statistical approach planned to compare the Norton Sound and PWS population of falcons is invalid.

The description of the study site locations is inadequate to allow critical review.

B. FEATHER SAMPLES (Nickel, Vanadium)

The levels of Ni and V that are toxic to peregrine falcons has not been established and concentrations of these metals in crude oil are extremely low. Also, elevated Ni and V levels in feathers may be indicative of the general, highly mineralized environment and is not necessarily oil-related. The control sample location(s) for the trace metal study ("elsewhere in Alaska") is not sufficiently described to allow review. This project appears to be fundamental research.

C. PREY REMAINS

The prey remains sampling program is inadequately described with regard to the number of sample sites and the criteria used for site selection.

Injury Determination Methodology

This study will provide no direct way to demonstrate a causal relationship between the study observations and the oil spill. Differences between PWS-area and Norton Sound peregrine falcons cannot be attributed to the oil spill.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, H, I, J, L, O, Q, S, U, V, X, Y, Z, AA, CC, DD, EE, FF, HH, II, and JJ.
Birds

Study Title:INJURY ASSESSMENT OF HYDROCARBON UPTAKE BY SEA DUCKS IN PWSStudy Number:BIRD STUDY NUMBER 11Study Cost:\$150,000

This study attempts to estimate the effects of hydrocarbon uptake on seaduck morbidity, mortality, and productivity. Approximately 150 Harlequin ducks will be collected from oiled and non-oiled sites in Prince William Sound and histopathologically examined, with gut samples and tissue samples also analyzed for hydrocarbons.

Study Objective(s)

<u>Objective A</u>. It does not seem appropriate for an NRDA study to be developing a database for food habits of five species of seaducks in Prince William Sound.

<u>Objectives B-D</u>. The objectives of correlating hydrocarbon gut and tissue data and morbidity data to predict mortality and reproductive effects on a broader population seems unattainable given the scope and design of the program.

Field Methods

The study design may be biased in that it states "Seaduck collection... will be integrated with (other data)... to demonstrate that seaducks feed... on contaminated prey."

Based on the proposed study plan, it appears that well over 150 ducks will be collected in 1990. This fact and the fact that permitted hunting of waterfowl has been allowed to continue suggest that the seaduck populations are healthy and that a harvestable surplus exists. As such, the cost effectiveness and reasonableness of this study are subject to question.

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1990 NRDA Plan Response

The study and control sites within PWS are not defined. The methodology used in selecting the individual seaducks to be collected at each site is not described. The number of samples to be collected at the control sites is not disclosed.

The use of a control site in Southeast Alaska is inappropriate. This site is not likely representative of the spill zone, considering the large distance separating the sites.

Analytical Methods

The predictive models for estimating the effect of oil on morbidity, mortality, and reproductive potential are not described.

Although the description was vague, the relatively small sample sizes will not justify the planned statistical work.

Integration of data from other studies (e.g., coastal habitat) will likely be virtually impossible due to the high degree of spatial variation that is present even on a small scale.

Injury Determination Methodology

Injury is to be assessed using a "predictive model", which will be subject to an inherently large degree of uncertainty due to the ranges of reasonable variables used for input. The model is not described. Beyond technical considerations, the use of a predictive model in this fashion represents the use of non-standard and not widely accepted technique for injury determination and is not in accordance with regulations.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, E, F, H, I, O, Q, S, U, V, X, Y, DD, EE, FF, HH, and II.

Birds

F-21

<u>Study Title</u>: PRELIMINARY SURVEY OF PASSERINE BIRDS IN PWS TO ASSESS IMPACT OF THE EVOS

Study Number: BIRD STUDY NUMBER 13

<u>Study Cost</u>: \$10,000

This study is a preliminary reconnaissance study to establish if more rigorous studies are needed of passerine birds.

Study Objective(s)

<u>Objectives A-C</u>. The simple objectives listed (to compare 1990 data between oiled and non-oiled areas and to compare 1990 data to historical data) might be accomplished, however, the validity of those comparisons and their relevance to EVOS will be questionable.

This study is unnecessary for several reasons since a very small number of passerines were recovered following the spill in comparison to the millions of passerines that use the area, and since few of the passerine species are linked to the intertidal zone where oil impacts occurred.

Field Methods

The survey locations, the number of locations, and the criteria used in picking the locations were not disclosed. The criteria used to identify oiled and non-oiled sites were not disclosed.

The survey methodologies and the comparability to previous surveys were not adequately discussed.

The control sites are located on the same island as the oiled sites. Because of the patchy nature of the oiling and the assumed close proximity of survey sites, individual birds are free to pass between oiled and non-oiled sites.

Analytical Methods

F-22

1990 NRDA Plan Response

Historical data to be used as baseline information are not referenced. It is not clear whether such data are sufficient to establish a baseline or the level of natural variability.

The analytical procedures to be used in the study are not disclosed.

Injury Determination Methodology

It will not be possible to determine injury from the results of this study. Any changes observed cannot be linked to EVOS.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs A, B, C, H, I, J, L, O, P, Q, S, U, V, X, Y, Z, DD, EE, FF, HH, II, and JJ.

APPENDIX - SECTION G Detailed Comments on TECHNICAL SERVICES

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G. COMMENTS ON TECHNICAL SERVICES AND APPENDICES A AND B

The 1990 Plan proposes technical services in three areas that are designed to support the assessment studies. Hydrocarbon analytical services, budgeted at \$2,003,400, includes generation, archival, and retrieval of analytical chemistry data. The histopathology program, budgeted at \$100,000, addresses the need for quality assurance for histological methods used in diverse NRDA studies. The mapping services, with a cost of \$792,200, includes building and managing a geographic information system to archive and process data collected in NRDA studies.

Insufficient details provided for review.

The 1990 plan is little changed from the 1989 Draft Plan, except that progress has apparently been made towards implementing some improvements as first identified in the 1989 Draft Plan review process. However, as with the 1989 Draft Plan, the Plan contains insufficient details for adequate review. For example, in Technical Services Study 1 (TS1) and Appendix A, insufficient information is given to allow evaluation of the analytical methods, the adequacy of number of samples analyzed, or of sample identification procedures. Proposed histopathology and mapping efforts are also lacking in detail.

Similarly, the proposed audits of field and laboratory procedures, as described, are incomplete. Only chemistry audits are mentioned, neglecting key audits of other areas such as sample analysis, biological observations, database input, chain-of-custody, or mapping.

The Quality Assurance plan may discard valuable, perhaps irreplaceable data.

The QA plan for chemical analyses in TS1 and Appendix A states that "unacceptable performance [in the intercalibration exercise] will result in the discarding of the associated data." It is not clear what this means. Application of such intercalibration criteria, after samples have already

been analyzed by a laboratory, could result in discarding valuable data and biasing results. Under these conditions all data should be reported with appropriate qualifications, not discarded.

The minimum list of calibration compounds in TS1 is insufficient to distinguish EVOS from hydrocarbons due to numerous other sources.

This list focuses on C12-C20 alkanes, while ignoring the C21-C31 alkanes that can indicate whether sediment hydrocarbons are predominantly biogenic and not from EVOS.

Lack of adequate baseline histopathology data will prevent accurate assessments of any oil-related effects.

For histological services, a key deficiency in outlined plans is that the range of normal histological parameters is not determined or known. For the invertebrates and fish, in particular, and to a lesser extent for birds and mammals, the range of normal histology and parasitism is not known for the species being studied. This information cannot be gained by examination of a few control animals as outlined in Appendix B.

The objective to "measure the incidence of histopathological conditions and external lesions in selected species of birds, mammals, finfish, and shellfish collected by NRDA studies" will not adequately be met since there is insufficient replication in most studies.

1990 NRDA Plan Response

Technical Services

<u>Study Title</u>: HYDROCARBON ANALYTICAL SUPPORT SERVICES AND ANALYSIS OF DISTRIBUTION AND WEATHERING OF SPILLED OIL

Study Number: TECHNICAL SERVICES STUDY NUMBER 1 Study Cost: \$2,003,400

This study serves as a coordination program overseeing all analytical chemistry performed for NRDA programs.

Study Objective(s)

<u>Objective A</u>. Analytical methods cannot be judged since no details were provided other than a minimum list of compounds, which are probably calibration standards (wording unclear).

<u>Objective B</u>. Details of the QA/QC plan for sample collection procedures were not provided and thus cannot be fully evaluated. It is also not clear how the sample labeling plan guarantees "unique" sample numbers across the entire program contained in the 1990 Plan.

<u>Objective C</u>. Data should not excluded or discarded simply by applying unnecessarily tight performance standards. Valuable data can be lost if so discarded. It is not clear what the "associated data" are that are to be discarded.

<u>Objective D</u>. The proposed audits are incomplete.

<u>Objective E</u>. The minimum list of calibration standards provided in the Plan is inadequate for some types of analyses.

<u>Objective F</u>. Constructing a material balance on the fate of spilled oil is a very complex task that is not adequately described in the Plan. The use of data generated by possibly inadequate analytical techniques will compound this already virtually impossible task.

Analytical Methods

As pointed out above, details of the analytical methods were not provided, making evaluation impossible.

The number of samples to be analyzed by various methods is not specified, making it impossible to determine if this is a cost-effective exercise.

As written, the study plan shows potential exists for discarding valuable, perhaps irreplaceable data. The QA plan for chemical analyses in Appendix A states that "unacceptable performance [in the intercalibration exercise] will result in the discarding of the associated data." It is not clear what this means. If the analysis of even one analyte out of the many tested is viewed as "unacceptable", it could be viewed as invalidating all data from the laboratory or only the low values, whose precise quantification becomes more difficult near the detection limit. Application of such intercalibration criteria after samples have already been analyzed by a laboratory could result in discarding valuable data and biasing results. Under these conditions all data should be reported with appropriate qualifications, not discarded.

The minimum list of calibration compounds in TS1 is inadequate for alkane analysis.

Regulatory Comments

The study deviates from the regulations, as described by paragraphs B, E, F, DD, EE, FF, HH, II, and JJ.

<u>1990 NRDA Plan Response</u>

<u>Study Title</u>: HISTOPATHOLOGY: EXAMINATION OF ABNORMALITIES IN TISSUES FROM BIRDS, MAMMALS, FINFISH, and SHELLFISH EXPOSED TO THE SPILLED OIL

Study Number: TECHNICAL SERVICES STUDY NUMBER 2 Study Cost: \$100,000

This study has the responsibility to conduct histopathology for selected species in the various NRDA studies.

Study Objective(s)

The objective to "measure the incidence of histopathological conditions and external lesions in selected species of birds, mammals, finfish, and shellfish collected by NRDA studies" cannot be met because there are insufficient baseline data describing normal tissue histology and insufficient replication in most studies.

Field Methods

"Standard methods" will be used for collection, preservation, processing, and interpretation of biological samples for histopathological examination. Methods are supposed to be described in Appendix B to the 1990 Plan, but the "standard" histological methods are not described. It is essential to describe the methods since they will determine in large part the technical validity of the histopathology program. References are provided in Appendix B for methods for finfish and shellfish histopathology, but specific methods are not given for marine or terrestrial mammals or birds in Appendix B.

Analytical Methods

The same comments apply as given above under Field Methods. Further, histopathology examinations must be converted to quantitative measures. No methods are given how this will be done.

Injury Determination Methodology

For all the invertebrate and most of the fish species to be examined for histopathology, a general baseline of information on the range of normal histological and natural incidence of histological lesions is not known. This information cannot be gained by examining a few specimens from control sites.

The histological indices of petroleum-induced damage, developed for fish and mollusks during the <u>Amoco Cadiz</u> oil spill may not be applicable to species from Prince William Sound. Further, no criteria are given for oil-related lesions in birds and mammals.

Given the small sample sizes from each control and oiled sampling site in most studies, it will not be possible to make definitive statements about changes in prevalence of various histopathological lesions and then attribute them to effects of oil exposure. Therefore, histopathology studies will be of limited value in estimating injury to natural resources.

Regulatory Comments

The study deviates from the regulations, as described in paragraphs A, B, C, P, E, CC, and II.

1990 NRDA Plan Response

<u>Study Title</u>: IMPLEMENT AND MANAGE A GEOGRAPHIC INFORMATION SYSTEM (GIS) TO RECORD AND PROCESS NRDA DATA

Study Number: TECHNICAL SERVICES STUDY NUMBER 3 Study Cost: \$792,200

This technical services study presents plans to produce and disseminate maps and analytical products for participants in the NRDA process. It is also stated that the effort will create and maintain a database pertinent to the overall assessment process in a way that it will be accessible to all agencies.

Study Objective(s)

<u>Objective 1</u>. Insufficient information is given regarding the specific types of maps and analytical products to determine if this program will provide products of value in monitoring geographic distributions of data pertinent to assessing injury from EVOS.

<u>Objective 2</u>. The specific objective as to type of database(s) to be developed and data organization for the database to be provided is not given.

<u>Analytical Methods</u>

Insufficient information is provided to allow determination of adequacy of quality control on data input to the mapping process. No information is provided to show how the data in the mapping database, once input, compares to the original data.

No information is provided on statistical treatments used (if any) to average data values for input to the mapping process. For the database quality control, similar concerns exist. Insufficient information is provided to allow determination of adequacy of the program proposed for quality control of data input.

Injury Determination Methodology

Insufficient information is given to determine if the work will contribute to objective quantification of injury to resources, including assisting in clarifying cause and effect relationships. It cannot be determined from the plan description whether objective, "multi-thematic atlases of pre-spill data" exist on the same scale as needed for comparison with post-spill data. It is not possible to determine whether this work will be cost-effective based on the information given.

Regulatory Comments

The study deviates from the regulations, as described in paragraphs H, and DD.

APPENDIX - SECTION H Detailed Comments on ARCHEOLOGY STUDIES

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H. COMMENTS ON HISTORICAL PROPERTIES AND ARCHEOLOGICAL RESOURCES ASSESSMENT

The 1990 Plan has a total budget of \$1,232,000 to identify and quantify the injury to cultural resources by assessing the impacts on soil chemistry, soil structure and inclusions, artifacts, site vegetative cover and stability, and incidences of site theft or vandalism.

Assessment of cultural resources is not covered by NRDA regulations.

Although cultural resources may have been impacted by the EVOS, they do not fall under NRDA. Cultural resources are not natural resources as defined by the NRDA regulations and are covered by other state and federal laws such as the Archeological Resources Protection Act. Therefore, this program should not be funded as part of an NRDA effort.

Insufficient information provided for adequate technical review.

Insufficient information is provided to adequately review and comment on the cultural resource assessment program. This includes objectives and field, analytical, and statistical methodologies.

<u>Resulting information generated by this study is available elsewhere.</u>

Much of the desired information generated from the work described is already available to the Trustee Council. Exxon, as part of its clean-up operations, extensively surveyed the beaches in the impacted area. These surveys, as well as the final reports documenting the identification of sites, are available to the Council. Therefore, the survey and site selection efforts described in the program needlessly duplicate existing information.

<u>Study Title</u>: ASSESSMENT OF DAMAGE TO HISTORIC PROPERTIES AND ARCHEOLOGICAL RESOURCES

Study Number: ARCH STUDY NUMBER 1

<u>Study Cost</u>: \$1,232,000

This study attempts to identify and quantify injuries to natural resources and to develop the foundation for a program to restore and rehabilitate archeological resources.

Study Objective(s)

<u>Objectives A-E</u>. Much of the proposed work including surveys and site identification, has been performed already and is available to the Trustee Council under Exxon's permit obligations.

This study plan does not make it clear why investigations will be made of sites in non-oiled areas. Potential site injury is a function of many factors including shoreline type, stratigraphy, location, degree of oiling, cleanup techniques, and artifacts present. Given the uniqueness of individual sites, the range of distribution, and the diversity of time span it is inappropriate to extrapolate these "control sites" to oiled areas.

The cost of this study appears excessive.

Insufficient detail is provided to perform a thorough evaluation.

Field Methods

Notwithstanding the applicability of this study, sufficient information is not provided to evaluate if the methods employed meet the standards and guidelines for archeology and historic preservation per 48 Fed. Reg. 44716-44740, September 29, 1983.

This study does not provide sufficient information to evaluate how the significance of historical properties, topologies, site investigations,

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1990 NRDA Plan Response

impacts resulting from interviews, soil column physical characteristics and analysis, radiocarbon aging of artifacts and vandalism and erosion rates will be determined.

Insufficient information is available to evaluate how oil spill response workers and government employees will be interviewed to ensure no bias is created. Also not provided is information on how results will be used to quantify injury.

Analytical Methods

This study does not provide sufficient information to evaluate if the methods employed meet the standards and guidelines for archeology and historic preservation per 48 Fed. Reg. 44716-44740, September 29, 1983.

Regulatory Comments

Cultural Resources are not "Natural Resources" as defined by the applicable statute and are not subject to the NRDA process. Therefore this entire study should not be included in the Plan. Additionally, the study states that "increased access of personnel to remote areas may have increased the knowledge of site locations and potentially may accelerate vandalism, theft of heritage resources, and damage to the scientific value of the sites" (p. 310). Vandalism and theft are intentional criminal acts. The resulting damage is caused by those acts, not by exposure to oil. Notwithstanding these objections, this study deviates from the regulations, as described by paragraphs B, C, H, I, J, K, R, S, U, V, DD, EE, and II. APPENDIX - SECTION I DETAILED COMMENTS ON ECONOMIC STUDIES

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PROGRAM SUMMARY CONTAINED IN PART 3

Study Title: COMMERCIAL FISHERIES LOSSES CAUSED BY THE EVOS

Study Number: ECONOMICS STUDY NUMBER 1 Study

<u>Study Cost</u>: \$229,000

This study focuses on alleged reductions in quality of salmon due to harvest in terminal areas. The assumption of the study is that salmon consumers experienced losses due to reduced quality. The objective of the study is to "measure the economic loss to seafood consumers." No description of the methods to be used is provided. Reference is made to development of conceptual models of consumer preferences and market characteristics. The need for an unspecified methodology for statistical analysis of changes in level and quality of harvest is mentioned. A data collection and analysis effort is included. The study appears to be an attempt to estimate demand functions for seafood products and to determine the effect of changes in quality and quantity, if any, on consumer surplus. The following comments apply:

Alleged losses not compensable.

The alleged losses which this study purports to measure are not compensable under the laws and regulations which govern natural resource damages. If any losses were incurred at any level of participation in commercial seafood markets, from fisherman through processor, wholesaler, retailer, and consumer, such losses are private losses, not losses of public resources.

<u>Alleged losses are negligible.</u>

The alleged losses which this study purports to measure are known, without further study, to be negligible. As discussed below, for reasons completely unrelated to the spill, salmon supply increased significantly in 1989 and prices decreased. These factors combined to substantially increase consumer surplus for the end consumer. Any quality decrease associated with increased terminal harvest in PWS and Kodiak would have, if any, an undetectable influence on consumer surplus.

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The description of Economics Study Number 1 states that models would be used to estimate, among other things, the "price changes associated with the spill." It is known that the spill had no impact on 1989 salmon prices. The Alaska Department of Fish and Game report that, because of a record catch, the 1989 harvest provided the second highest value for Alaska salmon fisheries in history, even though prices were lower. ADF&G states: "In 1989, salmon prices were calculated to be one-half to one-third lower than those paid in 1988. Factors contributing to these low ex-vessel prices include the reduced buying power of the Japanese yen (20% less than the previous year), surplus salmon inventories in Tokyo that were over 100,000 metric tons greater than existed the previous year, increased Japanese hatchery production of chum salmon, and increased sales of internationally farmed salmon on the open market" (Savikko and Page, 1990). The spill is not cited as a contributing factor.

Incorrect assumptions used.

The description of Economics Study Number 1 further states that models would also be used to estimate the "effects of seafood quality and quantity changes on consumers." Alaska production of salmon increased by 37% from 1988 to 1989. Worldwide production increased 23%. The major markets for the Alaska salmon harvest are in fresh/frozen red salmon and canned pink salmon. Worldwide production of fresh/frozen red salmon increased 39% from 1988 to 1989. Worldwide production of canned pink salmon increased 100%. Hence, quantity was substantially higher at every market level, including processing, wholesale, retail, and consumption. The State of Alaska assured that no deficient quality seafood reached the market through its rigorous quality assurance program.

Double counting of losses.

Claims by the Trustee Council for losses, if any, incurred by consumers "at every market level" would constitute double-counting of private claims already made by individuals, businesses, and classes.

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Other errors made.

There appears to be no relationship between Economics Study Number 1 and the numerous fish injury assessment studies contained in the Plan. The statement in Fish/Shellfish Study Number 2 that "results...will be used in Economic Uses Study 3" (now deleted) is illustrative.

Much of the data required to estimate commercial fisheries losses, if any, is available from state and federal sources (e.g., Savikko, Herman, and Tim Page, "1989 Preliminary Alaska Commercial Fisheries Harvests and Values," Regional Information Report No. 5J90-07, Alaska Department of Fish and Game, Juneau, Alaska, May 1990 and others). Therefore, a costly, duplicative data collection effort is not appropriate.

Study does not comply with DOI regulations.

In addition to departures cited above, this study deviates from the regulations as described by paragraphs E, I, J, K, L, S, U, Y, DD, EE, FF, GG, and HH. Furthermore, the study does not comply with definitions of compensable use losses as specified in § 11.83(b)(1) nor does it incorporate methods to avoid double counting as prescribed in § 11.84(c)(1).

Study Title: EFFECTS OF THE EVOS ON THE VALUE OF PUBLIC LAND

Study Number: ECONOMICS STUDY NUMBER 4 Study Cost: \$180,000

This study is intended to assess alleged losses in market value of public lands attributable to the oil spill. Description of the study methodology is exceedingly vague and lacks sufficient detail for evaluation. However, based on the description provided, the following comments apply:

<u>Alleged losses not compensable as natural resource damage.</u>

Reduction in land value, if any, is not compensable as a natural resource damage. Rather, land owners, including governments acting as proprietors, have recourse to private claims for such alleged damage. Therefore, this study is not appropriate as part of the natural resource damage assessment process.

Study does not identify affected lands.

The study description does not identify the public lands to be included in the assessment. Damages cannot be claimed for lands not directly impacted by oil.

Multiple influences on land values ignored.

The study objective is stated to be "determine the change in market value of public lands." However, the study cannot assess spill effects by merely estimating pre-spill and post-spill prices. Many factors completely unrelated to the spill could cause a difference between pre-spill and post-spill land prices, e.g., interest rates. No indication is provided as to how such influences will be isolated.

The study must include effects of spill-related increases in land values.

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Land values in the affected area are influenced by the dominant role of public lands, use restrictions, low population density, access problems, and severe weather. The study method is deficient because it does not contain a methodology for determining whether the lands affected by previous spills are comparable to lands in the subject area. It is further deficient because it does not set out a methodology for determining the comparability of previous spills with the <u>Exxon Valdez</u> oil spill.

Study will lead to double counting.

This study will contribute to double counting of damages because damages for some uses of public lands are covered by other studies. For example, Economics Study Number 5 purports to estimate recreational use damages. The value of land directly reflects the services provided by the land, such as recreation. To the extent that foregone use of such services is included in other studies, Economics Study Number 4 will result in double counting. The study plan must be more specific about how double counting will be avoided.

Hypothetical losses not compensable.

Reduced land values become actual losses only to the extent that sales actually take place during the period of depressed value, if such a period occurs. This study must focus only upon losses incurred in actual transactions, not hypothetical losses which would have occurred only if sales had taken place.

The study plan incorrectly implies that losses in sales prices of public land leased or sold in 1989 will apply to all public land in the affected area.

Substitutes ignored.

There is a vast supply of near substitutes for almost any parcel of land in Alaska. In addition, most of the allegedly affected area consists of state and federal lands and is rarely subject to sale. Therefore, compensable

damages to land values are expected to be very low. Consequently, study costs are unlikely to be reasonable.

Project description incorrect and incomplete.

It is unclear what is meant by "paired-<u>scale</u>" data in the third paragraph of the study method description. If this refers to "paired-<u>sale</u>" data, it is incorrect, as noted above, to compare pre-spill and post-spill selling prices.

No provision is made to account for recovery in land value which results from cleanup and restoration.

The study premise and objective remain the same as the 1989 study. This indicates that little or no progress was made in 1989. Status of the 1989 study and corresponding expenditures should be available for evaluation of the 1990 study plan.

Study does not comply with DOI regulations.

In addition to the departures cited above, this study deviates from the regulations as described by paragraphs E, I, J, K, L, S, U, V, Y, DD, EE, FF, GG, and HH. No indication is provided that the study will use appraisal methodology in conformance with the Uniform Appraisal Standards as specified in § 11.83(c)(2). Furthermore, the study does not comply with definitions of compensable uses losses as specified in § 11.83(b)(1). It does not comply with requirements for committed uses as prescribed in § 11.84(b)(2) nor with the requirement to incorporate methods to avoid double counting as specified in § 11.84(c)(1). In addition, it does not indicate methods for accounting for substitutability as specified in § 11.84(f).

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1990 NRDA Plan Response

Study Title: ECONOMIC DAMAGES TO RECREATION

Study Number: ECONOMICS STUDY NUMBER 5

<u>Study Cost</u>: \$294,000

This study is intended to assess damages, if any, incurred by recreational users of resources allegedly affected by the <u>Exxon Valdez</u> oil spill. It attempts to estimate changes in consumer surplus for recreational users who chose substitutes or who experienced a reduced level of satisfaction. Although the study plan provides several lists of tasks, it contains no detail about what methods will be used or how they will be used, nor does it include milestones and schedules. However, based on the description provided, the following comments apply:

Substitutes resources ignored.

The assumptions of the study ignore known facts that would, if properly included, influence study design and scope. For example, the most popular sea kayak and charter boat destinations (the College Fjords and Columbia Glacier areas) were unaffected by the spill. Also, increased escapement due to closure of commercial salmon fisheries led, in all likelihood, to increased sport fishing catches.

Contingent valuation methods invalid for this situation.

Contingent valuation is cited, without necessary detail concerning application, as a method to be used in estimating alleged use losses incurred by sea kayakers. CV is an unproven and highly controversial methodology; without details of the method of application, it is impossible to ascertain whether it can provide any valid or reliable results.

Study improperly focuses on commercial services.

It is not clear whether the study is intended to also estimate damages or benefits to commercial providers of recreational services (equipment rental

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businesses, charter boat services, tour boats, guides, etc.). Damages should only be considered for non-commercial recreational uses of the resources. Compensation is available to public trustees for foregone public use of publicly owned natural resources only.

The study plan gives no indication of how the effect of the spill on demand for cruise ship tours to PWS will be determined.

Losses will be double counted.

The study provides extensive opportunity for double counting of damages. Within the study, for example, it is not clear how double counting of recreational fishing and boat charters for sport fishing will be avoided, or sea kayaking and boat charters for kayak transportation. Furthermore, alleged damages included in this study duplicate, in part, alleged damages included in Economics Study Number 4.

Study description is inadequate.

The lack of descriptive detail concerning study methodology makes it difficult to evaluate how substitution will be accommodated.

The entire description of the 1989 plan is repeated within the 1990 plan. This indicates that no work was carried out in 1989 or that no progress was achieved. It is particularly important that data for this study not already available from conventional sources be collected while still accurately recalled by the source.

No citation is provided of what specific "existing model for recreational fishing in the KP area" will be investigated, what criteria will be applied to determine its applicability, what will be done if the model proves inadequate, or what geographical area will be examined.

Study duplicates existing government programs.

Much of the data required for this study is routinely available, or will be available, from federal and state government or business sources. Examples include cruise ship bookings, cruise line capacities, visitor rates, hotel occupancy rates, sport fishing catch rates, rail passengers, and many more. A costly, duplicative data collection effort is not required.

Study does not comply with DOI regulations.

In addition to the departures cited above, this study deviates from the regulations as described by paragraphs E, I, J, K, L, S, U, V, Y, DD, EE, FF, GG, and HH. Furthermore, the study does not comply with guidance for nonmarketed natural resource methodology as provided in § 11.83(d). It does not incorporate essential measures to avoid double counting as prescribed in § 11.84(c)(1) nor does it indicate methods for including the extensive available substitutes as specified in § 11.84(f).

Study Title: LOSSES TO SUBSISTENCE HOUSEHOLDS

<u>Study Number</u>: ECONOMICS STUDY NUMBER 6 <u>Study Cost</u>: \$885,000

Economics Study Number 6 is directed toward losses allegedly incurred by subsistence communities due to (1) foregone subsistence use, (2) local inflation, (3) property damage, and (4) loss of "intrinsic" value. Documentation of the study plan is inadequate. The statement of objectives is a list of tasks without explicit statement of the study objective. No description of methods is provided. Milestones and schedules are not included. The following additional comments apply to the limited description provided:

Double counting of losses likely.

This category of alleged losses is the subject of other claims, including claims by native groups, which indicates a potential for double counting.

Alleged losses of non-use values by subsistence communities is also included in the subjects of Economic Studies Number 7 and 9. No method is provided to distinguish subsistence populations from the relevant populations included in Study 7. No method is provided to quantify the archeological-based non-use values referenced in Study 9 and reduce the non-use values estimated in other studies accordingly. Double counting is an inevitable consequence of the lack of study integration.

Contingent valuation invalid for this situation.

There is no discussion of the goods or amenities which will be the subject of analysis by either market or non-market methods. Reference is made to use of non-market survey methods similar to those cited in Study 7. This presumably means contingent valuation. As mentioned in comments on Studies 5 and 7, contingent valuation is unproven and controversial. Insufficient details are

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given to determine whether this method could conceivably lead to valid or reliable data.

Mitigation efforts not considered.

There is no indication of how the study will accommodate mitigation efforts or income effects that offset losses. ESC undertook successful efforts to deliver food and materials to subsistence villages and to provide accurate information to subsistence populations. Furthermore, income gains from employment in the cleanup effort, which might have contributed to local inflation, might result in net benefits and explain (through revealed preference) why subsistence households ceased to rely on traditional sources.

Reduced subsistence harvesting might be, in part, a result of increased employment opportunities. Members of subsistence households might have chosen to forego some harvesting activities in 1989 to take advantage of income opportunities provided by the cleanup. The study plan contains no indication of how such choices will be identified and evaluated.

Study description inadequate.

The study plan duplicates all parts of the 1989 study. This indicates that little or no progress was made in 1989. Status of the 1989 study and corresponding expenditures should be available for evaluation of the 1990 study plan.

Study does not comply with DOI regulations.

In addition to the departures cited above, this study deviates from the regulations as described by paragraphs E, I, J, K, L, S, U, V, Y, DD, EE, FF, GG, and HH. The study does not comply with definitions of compensable use losses as specified in § 11.83(b)(1). It does not follow the specifications for nonmarketed natural resource methodology provided in § 11.83(b)(2) and § 11.83(d) nor the rule of assessment of existence and option values prescribed in § 11.83(b)(2). The study does not incorporate essential

measures to avoid double counting prescribed in § 11.84(c)(1) and does not indicate methods for including substitutability as required by § 11.84(f).

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Study Title: LOSS OF INTRINSIC VALUES DUE TO THE EVOS

Study Number: ECONOMICS STUDY NUMBER 7 Study Cost: \$2,010,000

This study purports to estimate the loss of "intrinsic" value of natural resources allegedly affected by the <u>Exxon Valdez</u> oil spill. The study description applies the term "intrinsic values" to mean existence value, option value, and bequest value. The concept of damages for injuries to non-use values and the devices advocated for their measurement are new to economics and law. Economists generally use the term "intrinsic value" to define inherent worth that natural objects possess independent of any values held or perceived by humans and agree that principles of economics do not extend to such concepts. No legal basis exists for damages based on "intrinsic value". Among the most apparent study deficiencies are the following:

Bequest, option, and existence value concepts do not apply.

Due to the naturally degradable characteristics of crude oil and the ability of nature to restore itself after bulk oil removal, full restoration of the natural resources will occur within a relatively short period. There will be no reduced endowment for future generations. Therefore, bequest values will not have been reduced. Similarly, the physical injuries are neither permanent nor irreversible. There cannot be losses of existence or bequest values for temporary injuries to natural resources. Also, option values represent the expected discounted value of future use. Because future use is not expected to be adversely affected by the spill, option value losses must be confined to small effects, if any, experienced prior to recovery.

Concepts of non-use value losses have been confined in the literature, to permanent, irreversible injury to unique resources. The extension of such concepts to temporary injury to resources for which there are vast numbers of substitutes is contrary to the basic principles of the concept.

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Option losses double count other categories.

Furthermore, because option values represent the expected discounted value of future use, it would be double counting to include option values as a component of value, and to separately include the present discounted value of future use within the category of use value losses. Natural resource economists generally no longer consider option value to be a separate source of value.

<u>Contingent valuation methods invalid in this situation</u>.

The study depends entirely upon the highly questionable validity and accuracy of contingent valuation. As mentioned in commentary on other economics studies in the 1990 Plan, contingent valuation is unproven and controversial. All evidence suggests that it cannot provide valid or reliable measurements of non-use values in the circumstances of this case.

Among the shortcomings which invalidate use of contingent valuation in Economics Study Number 7 is the difficulty of separating the use and non-use components of a contingent valuation response. Double counting will result to the extent that losses, however measured, include components of losses (e.g., use losses) which are accounted elsewhere.

Reference made to use of willingness to accept measures.

In response to comments on the 1989 plan, the Trustees state that "The use of both willingness to pay and willingness to accept will be considered in the contingent valuation study." (1990 Plan, Volume II: Appendix D, P. 107). Use of willingness to accept measures would constitute a clear deviation from the DOI regulations which provide that acceptable contingent valuation methodology requires use of willingness to pay measures. § 11.83(d)(7).

Study description is inadequate.

Description of the study plan is inadequate. No milestones or schedules are provided. Methods are described in exceptionally vague terms. The entire research plan for this \$2-million study is confined to less than a single page.

Statistical design and quality assurance provisions of the study are not described. No indication is given of how the sample population was defined or how a representative sample will be drawn.

No information is provided to explain the size of the budget. Of particular interest is the unexplained requirement for \$670,000 for supplies and equipment.

Like the other economic studies, the plan for Study 7 contains every component of the 1989 study plan. This indicates that little or no progress was made in 1989. Status of the 1989 study and corresponding expenditures should be available for evaluation of the 1990 study plan.

Study does not comply with DOI regulations.

In addition to the departures cited above, this study deviates from the regulations as described by paragraphs E, I, J, K, L, S, U, Y, DD, EE, FF, GG, and HH. Furthermore, the study does not conform with the rule for assessment of existence and option values prescribed in § 11.83(b)(2) and § 11.83(d)(5)(ii). It does not include methods to avoid double counting as required by § 11.84(c)(1) nor does it indicate how substitutability will be accounted for as specified in § 11.84(f).

Economic Studies

<u>Study Title</u>: ECONOMIC DAMAGE ASSESSMENT OF RESEARCH PROGRAMS AFFECTED BY THE EVOS

<u>Study Number</u>: ECONOMICS STUDY NUMBER 8 <u>S</u>

Study Cost: \$51,000

Economics Study Number 8 is intended to assess alleged economic losses resulting from effects of the <u>Exxon Valdez</u> oil spill on research projects. The study plan is essentially the same as the corresponding 1989 plan. The similarity extends to the lack of description of study methods and the absence of milestones and schedules. The 1990 plan includes reference to the need to identify research projects which might have been affected by the spill, a need apparently overlooked in the 1989 plan. The following comments apply based on the limited available description:

Study covers noncompensable losses.

The plan contains no indication of what part of applicable statutes or regulations are being interpreted to extend trustee responsibility to assessment of research losses. Researchers and research institutions have recourse to civil claims for such losses, if any. Losses identified with alleged reductions in the knowledge available to mankind are very small compared with increases in knowledge provided by spill-related research.

Study description inadequate and incomplete.

No identification of research activities delayed or cancelled as a result of the spill is provided. It is, therefore, not possible to determine if study costs are reasonable.

The study plan does not describe the criteria to be applied to assure that assessment is directed to committed use of the resource.

<u>1990 NRDA Plan Response</u>

The study plan provides no information about how "total project costs, extra sums expended and amounts spent on each study" will be used to evaluate research losses.

The study plan repeats all parts contained in the 1989 plan. This indicates that little or no progress was made in 1989. Status of the 1989 study and corresponding expenditures should be available for evaluation of the 1990 study plan.

Study does not comply with DOI regulations.

In addition to the departures cited above, this study deviates from the regulations as described by paragraphs E, I, J, K, L, S, U, Y, DD, EE, FF, GG, and HH. Furthermore, the study does not comply with definitions of compensable use losses as specified in § 11.83(b)(1) nor with requirements for committed uses as prescribed in § 11.84(b)(2). Insufficient information is provided to show compliance with guidance for nonmarketed natural resource methodologies contained in § 11.83(d). The study plan provides no methods to avoid double counting as required in § 11.84(c) and does not state how substitutability will be accommodated as prescribed in § 11.84(f).

<u>Study Title:</u> QUANTIFICATION OF DAMAGES TO ARCHEOLOGICAL RESOURCES

Study Number: ECONOMICS STUDY NUMBER 9 <u>Study Cost</u>: \$50,000

This study is designed to identify and assess economic damages to archeological sites allegedly affected by the spill. The following comments apply:

Archeological damages not covered by NRDA.

There is no information in the plan which explains how the definition of natural resources is extended to include the remains of past human activity.

Losses will be double counted.

Although statements in the trustee response to comments on the 1989 Draft Plan repeatedly assure that double counting will be eliminated from all aspects of the assessment, no methods are identified to assure that this necessary objective is achieved. Economics Study Number 9 incorporates several clear examples of double counting. First, alleged loss of value of archeological resources as tourist attractions is cited. Such losses are also counted in Economics Study Number 5. No methods are cited by which alleged tourist sightseeing losses identified in Study 5 will be segregated into different sightseeing purposes with account taken for the duplicative estimates of archeological sightseeing obtained in Study 9. Similarly, no method is described by which archeological science value will be excluded from Study 8. As mentioned elsewhere, "intrinsic" values held by native groups are triple counted unless some unidentified method is available to divide "intrinsic" value into a complex array of subcomponents (e.g., existence values for archeological resources, differentiated from existence values for cultural heritage, and differentiated from culturally-derived "intrinsic" values held by native groups as members of the general population).
Study description inadequate and incomplete.

The plan contains no information or discussion whatsoever of any methods for measuring economic damages. There is no indication of how allegedly damaged sites will be valued. The section of the plan entitled "Methods" merely enumerates possible sources of value for archeological resources with no reference to how the values would be quantified or how alleged damages would be valued.

The study plan refers to "unique or spectacular archaeological sites [which] have value as tourist attractions," but does not identify those sites.

As for all other economics studies, the 1990 plan for Study 9 contains everything originally planned for 1989. This indicates that little or no progress was made in 1989. Status of the 1989 study and corresponding expenditures should be available for evaluation of the 1990 study plan.

Study does not comply with DOI regulations.

In addition to the departures cited above, this study deviates from the regulations as described by paragraphs E, I, J, K, L, S, U, V, Y, DD, EE, FF, GG, and HH. The study does not comply with definitions of compensable use losses as specified in § 11.83(b)(1) nor with requirements for committed uses prescribed in § 11.84(b)(2). Furthermore, the study does not make use of guidance for nonmarketed natural resource methodologies contained in § 11.83(d) and does not comply with rules for estimation of option and existence values specified in § 11.83(b)(2). The study plan includes no provisions to avoid double counting as required by § 11.84(c).

APPENDIX - SECTION J DETAILED COMMENTS ON RESTORATION STUDIES

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PROGRAM SUMMARY CONTAINED IN PART 4

<u>Study Title</u>: PEER REVIEWER PROCESS FOR RESTORATION FEASIBILITY STUDIES Study Number: PROJECT NUMBER 1 Study Cost: \$75,000

This technical support project attempts to provide for ten selected individuals to peer review the design, implementation, and evaluation of the 1991 restoration feasibility studies and review the 1990 feasibility study results.

Study Objective(s)

The Introduction states "an additional more formal round of peer review is not possible" implying that the "comments received at the technical workshop and series of public meetings" were part of a review process. These meetings were part of an information gathering effort and not a review process.

As described with the little information provided, the peer review process appears flawed and may generate biased comments. Some of the peer reviewers may have a vested interest in the outcome since they are "already involved in the NRDA process". No information is provided on who the reviewers are, their scientific credentials, their areas of expertise or other information needed to ensure that a thorough, unbiased, and high quality review will be performed.

The statement, "Due to the limited time available...(a) more formal round of peer review is not possible", suggests that the projects were conceived and initiated in haste. Most 1990 projects should have been conceived and planned over the winter, thereby providing plenty of time for review by interested parties.

Regulatory Comments

Insufficient information is given to determine whether the study complys with the DOI regulations. The cost-effectiveness of the certain aspects of this study (i.e., review of 1990 feasibility study results) is highly questionable in that this study reviews projects which are not justified.

Study Title: ASSESSMENT OF BEACH SEGMENT SURVEY DATA

Study Number: PROJECT NUMBER 2

Study Cost: \$25,000

This technical support project attempts to prepare a restoration portion of the NRDA database by integrating information derived from the fall and spring surveys and NRDA studies (e.g., CH1). The resulting database is in a form useful to the Restoration Planning Project.

Study Objective(s)

This project is intended to compile shoreline survey and assessment data for use in restoration planning.

Obtaining, translating, and analyzing data for all the major resources, and not concentrating on only those resources that need restoration efforts causes this project to be neither focused nor cost effective. Portions of this project support the off-site habitat acquisition efforts. Any work concerning off-site acquisitions should only be considered if it is proven that related impacted habitats cannot be restored. Therefore, this study is premature and should not be funded as part of the NRDA effort at this time.

Analytical Methods

No information is provided to evaluate the type, amount, or usefulness of the information to be integrated, the procedure used, or any quality assurance checks employed. Further, it is unclear if natural recovery processes will be properly incorporated and used in the final result.

Regulatory Comments

Insufficient information is given to determine whether the study complies with the DOI regulations.

Study Title:DEVELOPMENT OF POTENTIAL FEASIBILITY STUDIES FOR 1991Study Number:PROJECT NUMBER 3Study Cost:\$136,500

This technical support project provides \$136,500 to set up ad hoc committee meetings, including agency, peer review and external expert personnel, to "more fully develop the study plans and proposals". Particular emphasis is placed on supporting travel by experts to meetings and visits to off-site restoration projects.

Study Objective(s)

The overall approach to identify and develop restoration plans is neither focused nor cost effective. It is not apparent that the ability of the ecosystem to naturally recover has been adequately considered and the select number of resources which needs to be restored properly identified. Moreover, the study is being undertaken before injuries requiring restoration have been identified. There is no basis in the NRDA regulations for this type of scoping study.

Insufficient information is provided to evaluate the nature and content of the meetings or how future restoration project plans will be more fully developed.

It is unclear if and how cost-effective criteria will be considered and whether the focus is on restoring only oil spill related injury (Example: Listed is an artificial reef project for fish, yet any injury to a reef is highly suspect; oil did not impact reefs, there are no confirmed fish kills, and water quality is good).

Regulatory Comments

This study deviates from the regulations, as described in paragraphs Y, and LL.

Restoration Planning

Study Title:RE-ESTABLISHMENT OF FUCUS IN ROCKY INTERTIDAL ECOSYSTEMSStudy Number:STUDY NUMBER 1Study Cost:\$150,000

This study attempts to document the extent and magnitude of <u>Fucus</u> recruitment, develop and field test techniques to seed or transplant <u>Fucus</u>, and estimate cost to implement a full scale program to restore <u>Fucus</u> in the ecosystem at a later date.

Study Objective(s)

It is inappropriate and not cost effective to evaluate the establishment of <u>Fucus</u> until it's ability to recover naturally is known and it is determined that restoration efforts are necessary. Strong evidence from previous research on other spills, coupled with observations in PWS/GOA this year and last, supports that <u>Fucus</u> recovery on rocky shores occurs naturally in a very short time frame.

The majority of this study appears to be of a research nature and should not be funded as part of an NRDA effort. At best, objectives B, C, D, and E should only be considered if objective A reveals there is a definite need. Initiating all objectives at the same time is not cost effective.

Objective A may overlap or duplicate work performed in AW2 or CH1.

The objective to demonstrate large scale seeding techniques is confusing since <u>Fucus</u> has spores and not seeds. Further, the statement that the "dispersal of seeds is limited (< $1 \text{ m} \dots$)" is not correct and appears to conflict with the need for seeds (sic) to remain in suspension "for at least two weeks" to assure their viability. Any seeds (spores) remaining in suspension naturally for two weeks would certainly disperse farther than 1 m.

Insufficient information is provided to determine how the extent and magnitude of <u>Fucus</u> recruitment will be globally assessed from the described methods.

Field Methods

Insufficient information is provided describing the field test methodology to evaluate and comment. While three methods are referred to in the field tests, only two are specifically mentioned. The lack of detail on habitat types, measured parameters, and statistical methods will likely leave the findings of this study subject to challenge.

Analytical Methods

Insufficient information is provided describing the laboratory experiments to evaluate and comment.

Injury Determination Methodology

The Introduction states that <u>Fucus</u> populations "were reduced over large areas (100-1000 m of shore line)". This statement fails to consider the vertical distribution of <u>Fucus</u>. Most of the <u>Fucus</u> below the lower intertidal would have had little impact from oiling or cleanup and remains a diversified source of spores for recruitment.

Regulatory Comments

This study deviates from the regulations, as described in paragraphs Y, LL, MM, NN, OO, and PP.

Restoration Planning

<u>Study Title</u>: RE-ESTABLISHMENT OF CRITICAL FAUNA IN ROCKY INTERTIDAL ECOSYSTEMS

Study Number: STUDY NUMBER 2

<u>Study Cost</u>: \$75,000

This study attempts to document the rates of recovery of rocky intertidal communities with different key faunal species present, demonstrate that key faunal species can be added to habitats, and estimate cost to implement a full scale program to establish key faunal species in the ecosystem at a later date.

Study Objective(s)

It is inappropriate and not cost effective to evaluate the establishment of fauna until their ability to recover naturally is known and it is determined that restoration efforts are necessary. Natural recovery of fauna in previous oil spills has occurred rapidly. Also, techniques used in the EVOS cleanup operations were designed specifically to minimize any further injury, leaving a good source of fauna available for recruitment.

Insufficient information is provided to adequately evaluate how the study will determine and statistically verify "the feasibility of enhancing colonization of key species" and the "rates of recovery".

This study is of a research nature and should not be funded as part of the NRDA effort.

Field Methods

Insufficient information is provided as to how the feasibility of demonstrating the colonization of key faunal species will be assessed. Further, no information is presented to comment on the source or the selection of limpets as grazers and <u>Nucella</u> and <u>Leptasterius</u> as predators to be the key intertidal species used as a yardstick to measure recovery.

Analytical Methods

No information is provided to evaluate and comment.

Regulatory Comments

This study deviates from the regulations, as described in paragraphs Y, LL, MM, NN, OO, and PP.

<u>1990 NRDA Plan Response</u>

Restoration Planning

<u>Study Title</u>: IDENTIFICATION OF POTENTIAL SITES FOR STABILIZATION AND RESTORATION WITH BEACH WILDRYE

Study Number: STUDY NUMBER 3

<u>Study Cost</u>: \$28,100

This study attempts to document the number and location of beaches that will require wildrye restoration, select sites for a wildrye restoration pilot project, and estimate cost to implement a full scale program to restore supratidal stands of beach wildrye.

Study Objective(s)

This study fails to consider the ability of any identified potentially injured site to recover naturally. Good grass growth is apparent throughout the impacted region, even in oiled areas. In addition, cleanup techniques were designed to minimize any further injury to this resource leaving plenty of growth available for recruitment. Natural recovery should overwhelm this restoration effort, thereby eliminating the need for this study.

No information is provided on the "well established techniques for restoring rye grasses". Therefore any restoration methods considered cannot be evaluated.

Insufficient information is provided to judge the cost effectiveness of this study. Even if this study was deemed necessary, a sound scientific approach would require a phasing of the objectives requiring that objectives B and C only be initiated if results from objective A determine that a problem requiring restoration actually exists.

The information to be learned from this study is not sufficient to justify a full-scale beach wildrye restoration project. Also, it is not appropriate to identify and prevent erosion which may occur for reasons not related to the EVOS.

Field Methods

Little information is provided to evaluate the criteria used to establish the site potential for beach wildrye restoration.

The documentation of oil present during the site visits does not necessarily represent injured beach rye grass that needs restoration. Good growth of rye grass has occurred even in the presence of oil.

Analytical Methods

No information is provided to evaluate and comment.

Injury Determination Methodology

No information is provided to evaluate and comment.

Regulatory Comments

This study deviates from the regulations, as described in paragraphs Y, LL, MM, NN, OO, and PP.

<u>Study Title</u>: IDENTIFICATION OF UPLAND HABITATS USED BY WILDLIFE AFFECTED BY THE EVOS

Study Number: STUDY NUMBER 4

<u>Study Cost</u>: \$23,300

This study attempts to develop methods to locate and characterize breeding birds and nest habitats in upland areas away from where the spill occurred. Further a proposal outlining the cost and parameters of a feasibility study and a full scale upland habitat restoration project will be generated.

Study Objective(s)

This study is premature and the cost of finding ways for "protection of upland wildlife habitats from further degradation" that is not related to the oil spill should not be funded as part of the NRDA effort at this time. Any efforts concerning off-site habitats should only be considered if it is proven that impacted habitats cannot be restored.

This study appears to be of a research nature and should not be part of the NRDA activities. Evaluating new research methods such as the "dawn detection technique" for marbled murrelets is not appropriate.

Insufficient information is provided to assess whether the monitoring of two species of birds can provide sufficient data to adequately develop a feasibility study or a full-scale restoration project.

Field Methods

Insufficient information is provided to adequately evaluate and comment.

Analytical Methods

No information is provided to evaluate and comment.

Regulatory Comments

This study deviates from the regulations, as described by paragraphs Y, LL, MM, NN, OO, and PP.

Restoration Planning

<u>Study Title</u>: LAND STATUS, USES, AND MANAGEMENT PLANS IN RELATION TO NATURAL RESOURCES AND SERVICES

Study Number: STUDY NUMBER 5

<u>Study Cost</u>: \$50,000

This study attempts to summarize and map existing information about the land status, uses, and management plans in the oil spill and adjacent areas for use in possible acquisition projects.

Study Objective(s)

This study is premature and the cost to summarize existing information for purposes of restoration should not be funded as part of the NRDA effort at this time. Any efforts concerning off-site acquisitions should only be considered if it is proven that related impacted habitats cannot be restored.

Developing maps for all the major resources listed without knowing which, if any, natural resource should be considered for acquiring off-site habitat, is neither focused nor cost effective.

This study appears to develop tools (maps) which can be used by the Trustee Council for purposes other than NRDA. Mapping natural resources such as vegetation, fish and wildlife populations, habitats, sensitive areas, recreation, and commercial forestry may be more useful for their non-spill related activities than for purposes of off-site habitat acquisition.

Analytical Methods

No information is provided to evaluate and comment.

Regulatory Comments

This study deviates from the regulations, as described in paragraphs Y, LL, MM, NN, OO, and PP.

APPENDIX - SECTION K Detailed Comments on REGULATORY EXCEPTIONS

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LEGAL AND REGULATORY SUMMARY CONTAINED IN PART 5

REGULATORY EXCEPTIONS

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<u>Exception</u>	Comment
А	Insufficient information is provided to determine if the injury results from the discharge of oil based upon the exposure pathway, as required in § 11.61(a), and not as the result of other non-oil spill related phenomena.
B	This study provides an inadequate description of the statistical analysis employed to evaluate the data. Thus, it is impossible to evaluate whether the injury determination will be based on a statistically significant difference in the biological response between the impacted and control areas, as required in § 11.62(f)(3).
C	Insufficient information is provided to evaluate whether this study can adequately determine the exposure pathway, as required in § 11.63. This requires that the following are considered: chemical and physical characteristics of the discharged oil, rate or mechanism of transport, combination of pathways, and demonstration of the presence of oil.
D	Insufficient information is provided to assess whether modeling methods satisfy specific requirements in § 11.63(d).
Ε	Insufficient detail and lack of documentation of testing methodologies make it impossible to determine whether the methodologies meet criteria listed in § 11.64(a)(3)(i-iv). Only those methodologies shall be selected: a) for which performance under conditions similar to those anticipated at the assessment area has been demonstrated; b) that ensure testing and sampling performance will be cost effective; c) that will produce data that were previously unavailable and that are needed to make the determinations; and d) that will provide data consistent with the data requirements of the Quantification phase.
F	Insufficient detail and lack of documentation make it impossible to determine if specific factors listed in § 11.64(a)(4)(i-vi) were considered when the testing methodologies were selected. These factors include a) physical state of the discharged oil; b) duration, season, and time of the discharge; c) detection limits, accuracy, precision, interferences, and time required to perform alternative methods; and d) costs of alternative methods.

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Regulatory Exceptions

<u>Exception</u>	Comment
G	This study does not provide sufficient information to evaluate if the testing and sampling methods for injury determination meet the requirements of § 11.64(b). These requirements include: adequate description in the Assessment Plan, use of analytical methods which are generally accepted or have been scientifically verified and documented, and use of sampling methods which are generally accepted.
Η	Insufficient information and lack of documentation make it impossible to determine whether the study will adequately quantify any injury, as required in § 11.70(a-b).
I	Insufficient information and lack of documentation make it impossible to determine whether the extent of injury, baseline condition, baseline services recoverability, and reduction in service that may result will be adequately estimated, as required in § 11.70(c).
J	Insufficient information is provided to evaluate whether this study satisfies § 11.71 guidelines on service reduction qualification contained in subparts (b), (c), and (f).
К	The determination of the reduction in services is not consistent with the selected economic methodology as required by § 11.71(a).
L	Lack of documentation makes it impossible to determine whether the testing methodologies selected for the Injury Quantification phase were selected based on the consider- ation of the following factors: a) degree to which a particular resource or service is affected by the discharge; b) degree to which a given resource or service can be used to represent a broad range of related resources or services; c) consistency of the measurement with the requirements of the economic methodology; and d) technical feasibility of quantification of changes in a given resource or service at reasonable cost (§ 11.71(d)(1-4)).
М	This study does not adequately determine the services provided by the surface water or sediment, as required by § 11.71(h).

Regulatory Exceptions

<u>Exception</u>	Comment
N	Insufficient information is provided to evaluate whether this study can adequately meet service reduction requirements according to § 11.71(j). This includes determining geographical areas affected, degree of impairment, and period of impairment.
0	The methods used for population estimates are not described in sufficient detail to determine whether standard, widely accepted techniques are employed, as required in § 11.71(1)(5)(i).
Ρ	Insufficient information is provided to determine whether reliable baseline age structure data are available for the population being assessed, as required in § 11.71(1)(5)(ii).
Q	Insufficient information is provided to assess whether mortality estimates follow the regulations in § $11.71(1)(5)(iii)$. Mortality from single incidents may be used to estimate changes in populations only when baseline population data are available, and when corrections can be made for potential sampling biases. This study provides no information on how the correction factors are determined. Thus, it is impossible to evaluate if they adequately adjust for sampling biases. Additional correction factors may need to be considered. It is also impossible to determine that the adaptation of § $11.71(1)(5)(iii)(A)$ methods for measuring mortality are adequately documented, as required in § $11.71(1)(5)(iii)(B)$.
R	This study does not describe any baseline services deter- mination as would be determined in the general guidelines of § 11.72.
S	Insufficient information is provided to determine whether baseline data are selected according to the general guidelines in § 11.72(b). These guidelines require that the baseline data 1) reflect conditions had the release of oil not occurred; 2) include the normal range of physical, chemical, or biological conditions; 3) are accurate, precise, complete, and representative of the resource; and 4) are collected by comparable methods. Also, the baseline data collection is restricted to those data necessary for a reasonable cost assessment.
T	Lack of documentation makes it impossible to determine if baseline data will be obtained as required by § 11.72(b)(2).

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<u>Exception</u>	Comment
U	Insufficient information is provided to assess whether the historical data accurately represent baseline conditions, as required in § 11.72(c).
V	Insufficient information is provided to assess whether the areas unaffected by the oil spill, i.e., control areas, satisfy requirements of § 11.72(d). This includes selecting control areas based upon their similarity to the assessment areas and lack of exposure to the release of spilled oil, demonstrating comparability to the assessment area, establishing the normal variability in the characteristics being measured, using comparable methods for the collection of data, and demonstrating values reported are comparable to literature values.
W	This study does not adequately follow the baseline services determination guidelines listed in § 11.72 and, specifically, the surface water resource additional guidelines in § 11.72(g).
X	In addition, insufficient information is provided to assess whether additional guidance on determining baseline services for biological resources under § 11.72(k) is being followed.
Y	Insufficient information is provided to assess whether the resource recoverability analysis will satisfy requirements of § 11.73. This includes estimating recovery time if no restoration efforts are undertaken beyond the response actions, evaluating the technical feasibility of restoration efforts, and estimating the recovery time with any restoration efforts.
Z	The biological response under consideration is not a commonly documented response resulting from oil exposure as required under § 11.62(f)(2)(i). Biological responses, caused predominately by other factors should be excluded.
AA	The biological response under consideration has not been documented to occur in natural ecosystems as a result of oil exposure as required by § 11.62(f)(2)(ii).
BB	This study fails to meet the requirements of § 11.62(f)(2) (iii) in that biological responses, documented only under controlled experimental conditions are insufficient to establish correlations with environmentally realistic exposure levels.

<u>Exception</u>	Comment
CC	The measurement of the biological response fails to meet the criterion of § $11.62(f)(2)(iv)$ which requires that the measurement method (1) must be adequately documented in the scientific literature, (2) must produce reproducible and verifiable results and (3) must have well defined and accepted statistical criteria.
DD	The Assessment Plan fails to meet the requirements of § 11.31(a)(1) in that it fails to identify and document the use of <u>all</u> scientific and economic methodologies employed in the Assessment.
EE	The study fails to meet the requirements of § 11.31(a)(2) in that it lacks sufficient detail to serve as a basis for evaluating whether the damage assessment approach is cost effective under § 11.14(j) and meets the reasonable cost definition of § 11.14(ee).
FF	The study fails to provide adequate descriptions for geographical areas, sampling and survey designs, types and numbers of samples, analyses, and the preliminary determination of the recovery period. § 11.31(a)(2).
GG	Information sufficient to demonstrate coordination, to the extent possible, with other studies or investigations performed pursuant to the NCP or any other remedial investigation feasibility study is lacking. § 11.31(a)(3).
HH	The Assessment Plan fails to contain procedures and schedules for sharing data, split samples, and results of analysis, <u>when requested</u> , with <u>any</u> identified potentially responsible party. § 11.31(a)(4).
II	The study does not contain sufficient information to determine if it complys with quality control and quality assurance plans required by § 11.31(c)(3).
JJ	Sampling and testing objectives have not been defined as required by § 11.64(a)(2).
KK	The objectives, as defined, do not reflect consideration of (1) information from response actions, (2) the resource exposed, (3) characteristics of oil, (4) potential physical, chemical or biological reactions, (5) potential injury, (6) exposure pathway, and (7) the injury resulting from that pathway. § 11.64(a)(2).

Exception	Comment
LL	There is no indication that the restoration or replacement measures are limited to only those actions that restore or replace the resource services to no more than their baseline. § 11.81(c).
ММ	There is no indication that alternative methods to achieve the restoration or replacement of the resource services have been developed. § 11.81(d)(1).
NN	Selection of the cost-effective restoration or replacement methodology has not been documented. § 11.81(d)(2).
00	There is no indication that the costs of the alternative restoration or replacement methods have been evaluated in accordance with the provisions of § 11.81(e).
РР	There is no indication that the restoration methodology will ensure that the restoration alternative is cost effective or technically feasible. § 11.81(f).



15,02.02 CONTROL NO. L. R. Raymond (Epston) 1990 State/Fed. Natural Resource Damage Ass. and BATE DUE BATE REFERRED (1) 64) LSW-FVI BATE MERLY BENT TO MALE MANY PERAL PROPERTY ACKNOWLEDGED - BATS AND WER MELDED via . (Esplain in remarks) PA Form \$180-1 (6-72) CES PERSA FORU TE AND TEXNICA BAT BET BE MALD. (Remove this says only, do not separate re LAIL CONTROL SCHEDULE CC. OI CC 000 1001

SENT BY EXXON CORPORATION

EXXON-DIRECTORS-ELSA NRDA-LITI SLPRT:# 1/ 2

L. R. RAYMOND President

November 1, 1990

Children and South

The Honorable Clayton Yautter Hr. Donald W. Collinsworth Secretary Commissioner Department of Fish & Game United States Department of Agriculture State of Alaska 14th Street and Independence Avenue, S. W. P. O. Box 3-2000 Washington, D. C. 20250 Juneau, Alaska 99802 The Honorable Manuel Lujan, Jr. Mr. John A. Knauss Under Secretary for Oceans and Atmosphere/ Secretary United States Department of the Administrator National Oceanic and

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Gentlemen:

Exxon Shipping Company recently submitted comprehensive and detailed comments to the Trustee Council on the 1990 Valdez Damage Assessment and Restoration Plan. An Executive Summary of that response is attached.

While Exxon Corporation is not a Potentially Responsible Party, we would nevertheless like to call your attention to some of the serious concerns raised by the Exxon Shipping Company response. We believe this year's Plan will not provide the information needed to define necessary restoration activities. Therefore, it fails to satisfy its only statutory objective.

The Plan ignores the obvious signs of recovery while engaging in a technically oriented search for phantom damages. The ecological health of the affected area is clear when viewed from virtually any parspective. The fishing seasons in Prince William Sound were record breaking and observations of wildlife demonstrate a robust population. Studies of the small amount of remaining oil demonstrate it does not pose a risk to wildlife. Furthermore, the remaining oil is in isolated locations and is undargoing further degradation and accommodation by natural forces. The effect of the cleanup and natural processes is evident from the near recovery of the principal resources and the services they provide.

As opposed to the appropriate broad view, the current plan takes a microscopic view toward injury assessment without regard to its relevance to restoration needs. It includes numerous studies of a research nature which will not provide definitive information and are not needed. Roughly half the studies are aimed at defining minor differences in biologic activity between oiled and unciled areas. Such differences will almost certainly not be directly attributable to oil effects and more importantly, do not relate to effects which could be significant enough to warrant restoration programs.

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As a consequence of ignoring the real ecological conditions and focusing on subtle distinctions, the entire program lacks appropriate direction. After twenty months of effort, assessment costs incurred by government, Exxon, and other entities have almost certainly exceeded recoverable damages. If this effort is to provide useful information on needed restoration, a major change in program direction is required.

The opportunities for jointly resolving issues have been seriously compromised by the government's actions. Exxon has been available to participate in the assessment from the outset. We actively participated in joint science meetings immediately following the spill; government participation was curtailed by the government's anticipation of litigation. Exxon Shipping Company pledged \$15 Million as study funding in April 1989 in anticipation of being a part of the process; both it and we were denied such a role. Exxon Shipping Company's comments on this year's Plan were solicited along with the public's after the field work was conducted. It is apparent that the studies, and the process of which they are a part, are focused on litigation, whereas the emphasis should be restoration.

Sincerely,

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Attachment