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COMMENTS AND RESUME

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OF

PATRICIA A. LANE, PhD

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STATE/FEDERAL NATURAL RESOURCE DAMAGE ASSESSMENT PLAN FOR THE EXXON VALDEZ OIL SPILL AUGUST 1989-PUBLIC REVIEW DRAFT

> PLA RESPONSE TO FOUR MAIN POINTS October 13, 1989

1) IS THERE ENOUGH INFORMATION PRESENTED TO EVALUATE THE PROPOSED STUDIES PROPERLY?

Generally, only brief overviews of each study or sub-study are given. Although it is clear that many of the main environmental components have been identified for study, it is not so clear that the studies are designed well enough to provide the needed information to quantify damages rigorously. In particular, there is very little information given on sampling design and methods of data analysis and interpretation during the post-data collection phase. In most studies in which the quantitative details are not well specified in advance for both pre- and post-data collection study phases, there is a loss of usable information and a waste of time and resources. In PLA's report on environmental effects monitoring (1989a,b), we point out many of these pitfalls and show through an examination of world wide impacts of oil on environmental components, how poor field sampling designs have greatly contributed to the failure to document environmental effects attributable to a wide variety of oil production activities, including spills. These effects were undoubtedly far more significant than those quantified and documented.

The text of the Damage Assessment Plan does not read as if it were written by authors knowledgeable in these areas. This comment applies to both pre- and post-sampling and statistical data analysis, as well as modelling on the population and ecosystem levels. A few sentences are interspersed concerning statistical analyses and modelling but few details are given as to what types of data analyses and ecological models will be used and with what expected results (prediction time frame, accuracy, confidence level, uncertainty level etc.). The fact that the quantification aspects of the assessment were not given more initial attention is extremely worrisome and is expected to affect the final results.

A few general comments:

- a) It might be wiser to concentrate on fewer components and use particular species as indicators of damage for a broader group of species than to try to measure everything at such a gross level that all results are poor. At the very least, quantification efforts have to be detailed and rigorous for selected species representative of classes of damage. The existing baseline data for each component were not specified. Had this information been fully specified, it would have been clearer which components would be more useful than others to quantify at the various possible levels of detail. It was unclear if the authors themselves were fully cognizant of the state of the background data sets.
- b) There was almost no information on how the assessors were going to translate environmental effects (even if well measured) into economic



damages. This is part of the quantification problem but also the complete lack of an appropriate logic bridge from the ecological to economic areas of concern, as well as the lack of associated field and paper data collection exercises. Logic bridge refers to a set of steps that outline how one proceeds from the environmental measures in the field to estimating loss to a population or habitat. This estimate must take into account not only the short term acute event (such as the death of X number of individuals) but also the damage to the success (size) of the future population because of the loss of reproductive contribution of these individuals (and logically of their lost offspring) to future generations. The logic bridge must then proceed to link the environmental loss to its economic value. The assessment plan does not present a convincing logic bridge, which indicates that the priority was given to obtaining field measurements. Too little attention was paid to whether or not the data would be solid and maximally useful and whether the logic underlying the final damage estimates would be convincing in a legal milieu.

c) Although the use of a Geographic Information System (GIS) to represent the spatially-referenced impacts is commendable, it is only described as a tool to map the valued resources and oiled areas. A GIS is designed to store and manage large spatial data sets and to produce appropriate maps of these data. These functions, however, represent only part of the usefulness of this type of tool. In many cases, these functions may not be cost effective for a particular application. More importantly, if the GIS is "intelligent", that is, can take the spatially-referenced information and subject it to damage assessment functions, including ecological risk analysis, then the GIS can be made into an invaluable tool for achieving the damage assessment objectives. There was no evidence in the Damage Assessment Plan that the GIS would be "intelligent" and fully utilized with state of the art assessment methods. "Intelligence" here is used in the sense of providing more than a map of existing conditions either by 1) incorporating dynamic models of future conditions or by 2) integrating different types of existing information into new types of information and their habitats. For example, if bird populations were mapped in with a GIS, it would be possible to model these populations over time to produce "future maps" of the distribution and abundance of the species of interest and then to estimate longer term damage by calculating change with and without the oil spill to estimate longer term damage. In 2, other types of information (toxicity, physiology, behaviour) could be added to that of direct mortality of a species to illustrate future population size, or habitat damage could be modelled with recovery functions to illustrate how the mapped habitat would change over time.

Essentially, an "intelligent" GIS uses additional models to develop more useful types of information or to link future states to present states. The logic bridge discussed above can also be at least partially, if not wholly, incorporated into the analysis. This type of GIS is costly but would become cost effective in the context of a long term damage assessment plan. For the particular type of damage in Prince William Sound, a long term damage assessment capability is definitely needed.

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- d) The virtual lack of any detail on the restoration part of the plan also did not inspire confidence. There should have been at least preliminary categories of restoration activities and planning so that when the field and laboratory studies were conducted, preliminary evaluations of feasibility and priority could have been undertaken.
- e) The problems identified above indicate to us the haste with which the Damage Assessment Plan was probably assembled and the inherent difficulties in coordinating such a large set of activities under less than ideal conditions. While these comments cannot influence the data collection to date, there are still some things that can be done to insure that the data collected will be analyzed as appropriately as possible in the remaining time before results are generated. These "things" include taking stock of the overall objectives of the program and the array of quantitative techniques that are available to facilitate data analysis and interpretation, including the development of appropriate models where none presently exist. For example, if samples are pooled in particular ways during laboratory analysis, this will preclude some types of statistical Or if certain measurements are not taken, this lack of analysis. information may produce a logic bridge with a few key piers missing. As much as possible, any part of ongoing procedures should be improved to maximize the usefulness and reliability of the results to develop the long term damage assessment capability. Specifically, it would be desirable for all data to be placed in a central data analysis centre which could be accessed by computer network (normal phone lines) by interested parties. There should be a coordinated effort of the "data analysts" to standardize their "logic bridge or bridges" and formats of data collection, analysis and reporting.

Available software (models, statistical methods, etc.) should be assembled with one or more individuals to assist in their application and interpretation of results. In summary, it is important to coordinate and share resources and to communicate and integrate results among the assessors, as was done during the spill. The degree this coordination is possible and practical, gives a good indication as to how feasible it is to measure community ecosystem response and cumulative effects.

f) Figure 7 in the Damage Assessment Plan lists the use of "Impact Hypotheses" as one of the key steps in the logic bridge. Hypothesis is a word that is frequently used in science but it can have quite a different meaning when employed in impact assessment. Often it is not possible to "test hypotheses" in an impact assessment context, whereas this is possible in a controlled laboratory experiment. It is important to understand the differences and not to promote hypothesis testing when in fact that is not possible. (See P. Lane and Associates Limited 1989a, b).

In summary, we do not believe that the studies are detailed sufficiently. More worrisome than the actual description, which can best be portrayed as a fairly superficial "measure everything" approach, is the lack of

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evidence as to how the data will be integrated and analyzed in a rigorous, quantitative way to provide definite estimates of damage regardless of whether or not a GIS is used. Most of the environmental studies are organized on a per species basis. Whereas much of the damage assessment must focus on a per species basis, it will not be possible to simply add up damage caused to many populations and obtain a measure of "ecosystem damage on cumulative effects" for the Prince William Sound area.

In an ecological system, a change in one component can lead to changes in other components. Analysis of single populations precludes a rigorous delineation of indirect effects and effects of foodwebs. In addition, several pathways of effect can exhibit feedback relationships to populations of interest so that damage may be multiplicative, not simply additive. For example, $8 \times 10 = 80$ units of damage not 8 + 10 = 18 units of damage.

Methodologies given in Lane <u>et al.</u> (1988) for cumulative impact analysis give an overview of methods available to form an integrated cumulative effects assessment process for extended space (longer than local ecosystem) and time scales (longer than one year). This process undoubtedly will be the framework for understanding the damage to the soil and subsequent recovery of Prince William Sound. A cumulative effects assessment and management process should be an integral part of the management of Prince William Sound for the next several years, if not the next several decades.

2) WILL THE PROPOSED STUDIES (BASED UPON A COMMITMENT TO FEBRUARY 1990) PROVIDE A BASIS FOR PREDICTING LONG-TERM EFFECTS; IF NOT, WHAT STUDIES SHOULD BE INCLUDED TO DO THIS?

As the attached Figure 1.1(PLA, 1989a) illustrates, a variety of sublethal, subpopulation effects can impact a population months to years after the original contaminant release. At the population level all of these types of changes would be reflected in altered age-specific fecundity and survivorship schedules(See P. Lane and Associates Limited, 1985). Such a release can also have immediate impact on population through direct mortality following contaminant release. This direct mortality is quantifiable depending on the species, available field data and resources etc. However, the loss of those animals may well be more important in terms of their reproductive contribution to future generations than is the immediate loss of x individuals.

To be meaningful, long term effects much include both direct and indirect causes of mortality from the death of individuals as well as from lowered fecundity and survivorship of age classes. If this is not computed correctly, mortality can be underestimated by many fold. For example, a study of direct mortality might result in the recording of the death of a single individual, whereas a study that includes measures of indirect mortality could conclude that the loss of this individual from the population would result in the loss of 5 - 100 individuals in future generations. In addition, individuals living in very small populations may have trouble finding mates or receiving appropriate behavioral cues and other learning experiences needed for reproduction and survival. Small





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populations are also more vulnerable to chance events and therefore have a much higher probability of extinction.

All natural populations exist in ecosystems and although many key populations are of interest because of their direct commercial value, studying these populations in isolation usually will not produce a true representation of total environmental deterioration. Many populations are predators, competitors, or prey in regard to their interactions with other species in the terrestrial and marine foodwebs that exist in and around Prince William Sound. Indirect changes will come about not only from the sublethal and life history changes in the individual populations that inhabit the ecosystems, but also from the altered ecological interactions and foodwebs. A predator population can decline not only from the direct effects of oiled feathers or ingested oil, but also from the lack of a critical prey species that was killed previously by the oil spill. There is no evidence that an ecosystem approach will be taken to examine and quantify foodweb effects related to the oil spill. This is exceedingly unfortunate for two reasons. First, from an ecological point of view, in the final analysis it is the long-term persistence of the ecosystems of the planet that are of main concern, not just the few species that are associated with direct monetary benefits today. Secondly, focus on populations gives too marrow a definition of damage and must a priori lead to further underestimates in damage assessment. See P. Lane and Associates(1985) for an illustration of both population and ecosystem level risk analysis. Thus, if the guilty party were made to pay only for the number of birds or mammals directly killed by the oil spill, based for example upon a carcass count. the amount of true damage could be underestimated by orders of magnitude.

Long term damage is undoubtedly the most important in terms of both total amount of damage and in terms of ecosystem viability. The only way that long term damage can be assessed is through the wise use at both the population and ecosystem levels of appropriate models that would predict possible levels of effects over at least two-three generation periods of the longest-lived members of the ecosystem. Such models are described in PLA (1985) and Lane et al. (1988). Because of the uncertainty of long term predictions, the modelling tool should be able to handle various levels of uncertainty and to be corrected, based on further monitoring data. This particular oil spill will probably be visible for decades. There is no humanly possible way to assess total or long term damage based on data collected within a one year period following the spill. It is possible, however, within this time period, to develop the monitoring systems, the quantitative methodologies and other tools (GIS), the data baselines and an overall plan of damage assessment. In Lane et al. (1987) and Crowell and Lane (1988) we show how a ten minute spill of oil dispersant (Corexit 9527) and oil plus dispersant (each approximately one millimetre thick) produced environmental effects over two subsequent years. These effects included not only ecological measures such as population abundances and distribution of the dominant saltmarsh grasses, but also morphological. physiological and reproductive effects. Plans are underway to study the effects and damage of these miniature controlled spills in the fourth year of saltmarsh recovery.

It is unconscionable to terminate data collection and assessment at such a premature point (one year) when perhaps less than 10-20% of the total damage has been observable or quantifiable. There should permanent monitoring sites with a variety of data gathered, similar to the saltmarsh experiments but extended for a variety of ecosystems. A variety of measurements should be undertaken ac illustrated in Lane <u>et al</u>. (1987) and community recovery and recolonization of selected biota should be measured on a continuing basis over a period of several years.

1) ARE THERE OTHER IMPORTANT GAPS IN THE STUDIES PROPOSED?

Several important gaps in the studies have already been mentioned:

1) Lack of Quantitative Rigor

-both short and long term calculations -field and laboratory designs -statistical methods and validity of assumptions -modelling methods, especially ecological risk analysis -turning environmental results into economic measures

2) Little Evidence of Strong Logic Bridges (necessary to document cause and effect in regard to the following):

-relationships between individuals and populations and between populations and ecosystems

- -relationships between terrestrial and marine ecosystems
- -relationships between laboratory data (toxicity tests) and population and ecosystem effects
- -relationships between various time scales of offects in regard to generation times and time scales of other ecological events
- -relationships between sublethal and lethal effects
- -role and significance of habitat versus pure biological damage of an individual, population or ecosystem

-relation between environment and economy in a sustainable development context -relationships between various spatial scales of effects in regard to the

spatial patterns of the habitat types (this could be partially resolved with an intelligent GIS)

3) Cumulative Effects Assessment and Management-Sustainable Development

Cumulative effects result in large scale, regional patterns of environmental deterioration. Sometimes they come about from the "tyranny of small decisions" of many different human activities, each small in itself, over an extended ecosystem; sometimes cumulative effects arise from the multiple activities related to a large development; or in the case of Prince William Sound, cumulative effects arise from a catastrophic event. Examples of cumulative effects include global warming and climate change, acid deposition, habitat fragmentation and alienation, pollution of receiving environments, losses in soil quality and quantity, pollution of large aquifers, loss of biological diversity



etc. Recently P. Lane and Associates Limited(1988) have defined and categorized cumulative effects and methodologies for assessing and managing them. If we fail to have sustainable development on this planet, it will be because we have not been able to identify, prevent and reverse cumulative effects.

The Valdez oil spill has endangered the sustainable nature of the Prince William Sound ecosystems substantially. To understand and quantify this endangerment to sustainable development a cumulative effects analysis should be undertaken. Nowhere in the Damage Assessment Plan was this suggested. Unfortunately, cumulative effects are not just additive; they may also be multiplicative. To the degree that they are multiplicative and interacting, damage may again be greatly underestimated. For this type of a cumulative effects problem, the analysis should be based upon an "intelligent" GIS with appropriate environmenteconomic models to predict endangerment to sustainable development indicators.

APPENDIX A:

Detailed Notes on Some of the Component Studies

Comments on each component area generally reflect (i) a lack of background information that would enable the "public" to determine if sufficient studies were planned and carried out, and (ii) the inadequacy of a one year sampling program for assessing environmental damage.

- 1) COASTAL HABITATS Study #1, Phase 1: The affected coastline is to be categorized into five "representative" habitat types. What are the different types and how were they chosen? We believe they used existing coastal morphology schemes, but no references or details were given. Up to 150 sampling sites are to be chosen:
- 5 habitat types X 3 geographic regions X 3 degrees of oiling X 3 replicates

+ 15 more sites that were either lightly-, or moderately to heavily-oiled.

The statistical design is supposed to allow extrapolation of collected information to the entire affected area. With so many sites and the short time period available for study, it is very unlikely the data can be extrapolated to all other locations. Large and rapid seasonal changes in physical, chemical and biological variables in the sub-Arctic place severe constraints on the sampling program. Unless the data collection is carried out in a synoptic-fashion, comparisons to other sites, and between oiled and non-oiled sites are simply not valid. Lacking pre-spill data on most of these sites, it's also unrealistic to assess oiling-damage. Since there are some data available from the Valdez area (refs not given), why not concentrate on the few (?) sites that have some "history" and do lass-comprehensive studies on under-represented constal habitat types.

<u>Phase 2</u>: This part of the study purports to assess changes in "critical" trophic levels and interactions. Who decides what is "critical?" Secondly, how do they expect to determine whether changes in population biomass and productivity, community diversity, vigour and utility to other trophic levels are due to oiling without seasonal, annual, or pre-spill data? Can rate of recovery of these habitats be determined for short-term data collections? They also plan to "kill more animals" by doing on-site amphipod LC_{50} bioassays - is this really necessary?

2) AIR/WATER RESOURCES Study #1 - Floating Oil: This study is useful in that it actually confirms that oil slicks, etc., come from the EXXON VALDEZ, and monitors the spread of floating oil over time. All the analyses will take some time to complete and consequently this delay sets back other studies waiting for this information to plan their sampling projects.

<u>Study #2 - Oil in Subtidal Sediments</u>: Again useful for other studies, but lacking hard data from Study #1, any models projected for oil spill movement will really be guesses. A lot of sediment samples (and analysis time) may be taken

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from sites where projected likelihood of oil contamination was high, but received no oil.

<u>Study #3 - Oil in the Water Column</u>: Necessary data, but time consuming taking all of the vertical profiles in relatively shallow (well-mixed) waters. Mussel cages deployed at 12 sites in the Sound, and 18 outside, should be useful for long-term indications of water quality. However, the mussels are transplants from control sites in southeast Alaska - unknown influence on the results?

<u>Study #4 - Injury to Benthic Infauna:</u> As mentioned in the report, many of the samples taken will be archived pending receipt of subtidal oil data (see Study #2 and Technical Services Study #1). Time is an important constraint here.

Study <u>#5 - Volatile Organic Carbon Roloace</u>: VOC to be measured and along with air dispersion models (wind data required) used to reconstruct ambient VOC concentrations throughout the Sound over time. Prediction of "unhealthful" conditions (to humans) may tell us if terrestrial and marine animals were in any danger. Model loss rates also to be used in mass balance calculations on the fate of spilled oil - utility ??

3) FISH/SHELLFISH We have reviewed the 26 Fish/Shellfish studies (p. 48-111) and, in general, cannot recommend that the Feb 28, 1990 deadline is sufficient to assess the damage caused by the Exxon Valdez oil spill.

The 26 studies proposed are generally inadequate for predicting long-term effects on fish/shellfish populations. It is our opinion that these studies are better suited for estimating the short-term and acute effects of the spill.

We would suggest as a minimum requirement to assess the long-term effects of the spill that the time period be considerably extended for numerous studies. In single species studics, the minimal time period we would recommend would be equal to the average longevity of individuals of that species. This would allow following affected age classes till their demise.

Major gaps exist in the assessment in our opinion. There is no investigation into the sublethal and long-term effects (or delayed manifestations) on individuals or the duration of the damage by the oil spill. Behavioral avoidance studies have been neglected, as have effects of early exposure to oil studies and micro-habitat studies.

Furthermore, the approach taken has been an instantaneous examination of commercially important species only. Little, if any, attention has been focused on a community response approach. It is important to examine the food web that commercially important species are part of, along with such processes as bioaccumulation and bio-retention. The proposed short time frame precludes this. Study or the fish foodweb should be undertaken backed by loop analysis, a qualitative modelling tool. Foodweb structures before and after the spill could be compared supported by toxicity and habitat studies over a period of several years. It is also possible to determine a set of stability measures using loop analysis.









Considering the vast area contaminated by oil, both in the Sound and beyond, we find the proposed study design too limited. Some studies suggest less than 10 sampling sites for the whole area. We recommend a much greater amount of testing both in the Sound and beyond, at numerous sites with varying concentrations of oil contamination (not just 'oiled' and `non-oiled').

We also recommend that greater attention he given to statistical analyses. Samples should be collected minimally in triplicate. This would allow for estimation of variance at sites.

Many of the proposed statistical analyses are dubious due to the over use of ANOVA. Although surprisingly robust, the Analysis of Variance (ANOVA) is still limited to the analysis of monotypic data and has frequently been revealed as inappropriate for sigmoidal relationships of toxicity curves or the skewed bell shape of habitat preference curves. Other statistical analyses might perform these analyses better, such as non-parametric and multi-variate statistics.

Numerous studies make use of hydrocarbon testing. Methods suggested may result in underestimating contamination. Sampling numerous individuals (15+) representative of each age/size class would allow better regressions. Composite samples should be avoided.

Finally, we are uneasy with the use of such phrases as `standard methods' and `representative sample' that appear in some studies. Of even greater concern is the lack of quoting sample sizes or number of sample sizes by some studies and the absence of the rationale for deciding the sample size used.

Notes on 26 Fish/Shellfish Studies

Study #1 - What are "aerially surveyed index streams?"

If they are aerially surveyed streams for salmon abundance for how long have they been surveyed? (how many years?)

Historical data must be corrected for timing climate, harvest recruitment, and water levels

Damage estimates of the loss of habitat would have to be estimated annually at least until the progeny of 1989 spawners return, which would be approximately autumn of 1994. This would help account for changes in imprinting, degradation of oil, changes in microhabitat preference and unpredicted effects.

There is no mention of microhabitat studies to determine if redd mating females avoid lightly oiled areas or are less effective in making redds in oiled areas.

Suitable control sites may not exist in the Sound as salmon are highly mobile with keen olfaction; avoidance may be for the general area.







No mention was made of sublethal effects of oil on adult spawners such as: 1) confusion of olfactory senses - needed for navigation to some degree - needed for avoidance of mammalian predators such as bears (supposedly) 2) less effective spawners because a decrease or loss of key reproductive behaviours. Study #2 - two replicates - two does not say much, if anything First two weeks of April and last two weeks of April - depending on seasonal timing, are not replicates when we are talking about preemergent fry 4 zones/site, 1 transect/zone, 10 samples/transect 1 site/stream - suggest numerous sites/stream - as determined by variability of the data! - incredible potential for bias - should be repeated at least each and every year including the year that progeny of 1989 adults return and breed Study #3 - loss in production - directly by exposure - indirectly by food chain - indirectly avoidance not just by exposure! A. Marine survival and harvest of Pink Salmon - the use of only three oiled streams and two non-oiled is not adequate inter-stream variability will be high, hence will need to use more oiled and non-oiled streams - should be repeated for two years (1990 and 1991) so both even-year and cddyear runs are sampled B. Sockeye - proposed only two oiled and one non-oiled watersheds

- why use streams for pink salmon and watersheds for sockeye?
- sockeys generally live for four years and migrate considerable distances. Examination of available fish during one year is not a good estimate for other 3 age groups.
- C. Hatcheries
 - as in natural studies such a short time frame will not adequately predict the actions of unsampled age groups
- D. Smolts
 - should be repeated for each age class (0+, 1+, (2+))
- E. Straying - why only in outlying areas?

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This is a multi year study ~ tagged as fry, recovered as adults - clearly beyond Feb, 1990. Are all fishery projects exempt from this deadline?

Study #4

- may have to leave the Sound for representative samples
- hydro carbon testing study not adequately described; should comprise 15 individuals from each size category for each site

Studies 1-4 are about salmon - pink and sockeye. What about wild populations of chum, chinook and coho?

Study #5

There is no incorporation of straying between streams. Increased amounts of straying will bias results.

No estimate of reduced fecundity or viability due to oil exposure.

Are the trout in the area breeding after one sea summer? In some places they breed after 2-3 summers in the sea. I do not know about these popins.

2 oiled weir sites - statistically minimum number should be 3 per condition 2 non oiled weir sites

Study #6

There is no attempt outlined to determine pre-spill harvest, effort, distribution, etc. (except opening statement).

Angler 'perception' may be more important than accounted for.

Study #7

Object to produce catalog - no analysis Data base for other studies

Study #8 - Repeat of Study #2 but outside Sound - does this study also use oil and non oiled areas

Study #9 - Repeat of study #4 but outside Sound

Study #10 - Repeat of Study #5 but outside Sound - 1 oiled weir site and control weir site only! should be at least 3 and 3

Study #11

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

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This study should be repeated each year until 1989 spawn has an insignificant contribution to the population (6-8 years?)
Study #12 - Same comments as #11 Laboratory work should be validated with a field study
Study #13
Cockle, Littleneck and Butter Clam
Number of quadrants should be determined by variability (currently 7/transect)
Hydrocarbon analysis
"3 samples of specimens" - how many individuals?
Test individual! not as a composite. Should test numerous individuals size per age class
Growth and Age - why only littleneck? monitoring of all sites should be done more often than once in the spring and once in the fall - perhaps monthly should also include estimates of growth potential on temperature and contrast with real growth what happened to razor clams? ANOVA not appropriate unless it can be demonstrated that the relationships are at least monotypic and not either the typical bell shape, or sigmoid that would be expected from these studies!
Study #14 - CRABS - misuse of ANOVA again - no mention of long-term effects of exposure on young crabs Com. Topic Issue Sug. Sort 98 3 440 1
Study #15 - SHRIMP - same comments as #14
Study #16 - OYSTERS - Hydro-carbon testing and all other aspects of the study should continue for much longer than the six months proposed, especially if oysters are the indicator species as eluded to in the study!! (perhaps 7 years)
Study #17 - ROCKFISH - Would like to see an estimate of density, growth, age structure of popin - 1013 4470 1 all lacking from proposed study.
Study #18 - TRAWL - should include growth - unlikely that fish will live long if ingesting tarballs - result will be an <u>underestimate</u> ! Com. Fopic Issue Sug. Sort 2 1 2 2 2 3 4 4 3 4 4 4 4 4 4 4 4 4 4 4 4 4

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if there were sufficient data to enable assessment of oiling damages.

Study #2 - Histopathology: Necessary, but very time consuming. One can only hope sufficient "control" samples were taken to see the range in various attributes of normal cells and tissues. ----

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Study #3 - Mapping: Supposedly by June 19, 1989, the first map showing oil damage and movement was to be completed. This should have been sent along with the Public Review Draft, along with locations of some of the field sites chosen for the Coastal Habitat Study #1 and Air/Water Studies, and any sites with historical data.

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COMMENTS AND RESUME

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OF

HOWARD L. SANDERS, PhD

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COMMENTS OF DR. HOWARD SANDERS, WOODS HOLE OCEANOGRAPHIC INSTITUTE, ON THE DRAFT STATE/FEDERAL NATURAL RESOURCE DAMAGE ASSESSMENT PLAN FOR THE <u>EXXON VALDEZ</u> OIL SPILL (AUGUST 1989)

Sediments serve as the ultimate sinks for oil spilled or leaked into the water column. A not very extensive review of the literature revealed more than 30 citations documenting this very general phenomenon for a wide variety of crude oils and refined products. Findings from some of the more readily available papers are summarized in Attachment A. Some or all of these findings may well be germane and critically important to an understanding of the EXXON VALDEZ Oil Spill and spills generally. The incorporation of these processes into the study program offers a unique opportunity to make a highly appropriate and major contribution to the overall research program.

The relatively enclosed Prince William Sound is not a high energy, open ocean, coastal environment. The seafloor at depths of 20 or more meters in the Sound and fjords that project inland along the periphery of the coastline, to a major extent, are low energy, depositional habitats or "sinks" of fine-grained sediment composed primarily of silt- and clay-sized particles and an ample percentage of organic carbon. Under normal conditions, such depositional habitats have a lower oxygen content of water at the sediment-water interface and within the interstitial water of the upper oxidized sediment largely relative to higher energy sediment habitats. A highly probable response to the unusually large and potentially disastrous EXXON VALDEZ oil is that the "...Oil is likely to move

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deeper into the fjords rather than being flushed out. In general, this results in the oiling of increasingly sensitive environments, since the higher-risk, lower-energy environments are located deeper in the fjords and bays..." [See page 13, second paragraph, Public Review Draft.]

What, then, might we expect in regard to possible impacts to the Prince William Sound seafloor and its associated marine life from the massive spillage of Alaska North Slope crude oil that poured from the grounded tanker EXXON VALDEZ into Prince William Sound? Benthic infauna and epifauna living in and on the seafloor sediments are the most important accessible food resource available to commercially important stocks of demersal, bottom-dwelling fish stocks and larger invertebrate crustaceans. In Prince William Sound, this would include among others, halibut, pollack, sablefish, Pacific cod, as well as the Tanner crab, king crab, and the sidestripe shrimp that are worth several million dollars annually. [See Fish/Shellfish Study Number 18, pages 91 and 92 of the Public Draft Report. | If, indeed, large concentrations of the highly toxic North Slope crude oil reaches the seafloor, particularly those extensive areas that are composed of fine-grained, low-energy, organically rich, depositional habitats; then the deep-water benthic infauna and epifauna could well be adversely or fatally affected. [See Air/Water Study Number 4, page 44 of the Public Draft Report.] "... A manned submersible will be used in Prince William Sound during the 1989 field season to visually check for oil in bottom sediment." which is now probably over. [See Air/Water Study Number 2, page 40 of Public Draft

Report.] The resulting information that has accrued of sites or locations where North Slope crude oil has reached the Prince William Sound seafloor and entered the sediment, can then be used to establish vitally important sampling benthic stations that can monitor changes in chemical toxicity and successional benthic faunal changes over time at these oiled contaminated sites. The limited published information available on the effects of the EXXON VALDEZ spillage suggests that the Alaska North Slope crude oil may have been damaging or lethal to a significant and, possibly, a major fraction of the marine benthic fauna in the severely impacted western and southwestern areas of Prince William Sound. North Slope crude oil is highly toxic. Approximately 25 percent of the oil is composed of aromatics, "...which are generally considered the most toxic hydrocarbon components." The oil also "...contains significant quantities of toxic metals." [See Page 235, bottom paragraph of the Public Review Draft.] The massiveness of the oil spilled assures that some and, perhaps, a considerable quantity of oil may reach the seafloor and saturate the topmost centimeters of the sediment. Yet, because of the high toxicity of the North Slope crude oil and the sheer magnitude of the oil spill -- a worst case scenario of a major killoff or total eradication of the benthic invertebrates and demersal fish at the more heavily oiled bottoms and a resulting organically overloaded, contaminated, and anoxic seafloor -- may not be an unrealistic possibility. Although, information has accrued "...about the distribution of spilled oil from the EXXON VALDEZ on the water surface and in the intertidal areas of Prince William Sound

and the Gulf of Alaska.... <u>the extent</u>, <u>distribution</u>, <u>and patchiness</u> of oil and oil byproducts on the seafloor is <u>unknown</u>." [See page 96 of the Public Review Draft. (emphasis added)]

It may already be too late to obtain the crucial information on the impacts of the short-lived, volatile, extremely toxic, singleringed, aromatic hydrocarbons such as benzene and toluene on the flora and fauna in the water column and the depositional sediment habitats that cover most of the Prince William Sound seafloor and its peripheral fjords. Yet, if the pre-spill information on the concentrations of molecular oxygen present in upper oxidized sediment layer and the depth position of the Redox Potential Discontinuity Layer in the sediments are absent or unavailable, it will still be possible to effectively use a post-spill monitoring and assessment program at selected oiled, depositional, sediment stations with different degrees of oil concentrations and different benthic infaunal successional stages at any given period of time. Stations at sediment sites that were not oiled or very minimally oiled in the aftermath of the EXXON VALDEZ oil spill should serve as controls for the oil contaminated sediment stations. Indeed, it has become vitally important to initiate as soon as possible such a monitoring program over time and space with a particular emphasis on samples collected at water depths greater than 15 meters. In addition to the usual standard procedures normally used in taking bottom samples, the processing of the samples, determining the number of species present in a sample, the number of specimens that compose each species, and the percent composition that each species contributes to the total

faunal density, such a program should include both measurements of oxygen content at the sediment-water interface and in the interstitial water of the sediment and determinations of the depth in centimeters of the redox discontinuity layer in the sediment that separates the upper oxygenated from the lower anoxic sulfide sediment. Since the vast majority of the fauna present at the initial stages of succession are small post-larval animals that would readily pass through the standard 1.0 mm screen apertures, screen mesh sizes of .3 mm or less should be used in the processing.

A severe kill of benthic invertebrates on and in the sediment and a lesser kill of their predators, the much larger, more mobile demersal fish associated with the seabottom by the spilt North Slope crude oil has and could bring about a significant organic enrichment in these low-energy, depositional, sedimentary habitats. The elevated concentrations of sedimented organic matter would likely be. further augmented by a slowly sinking pulse of enormous numbers of dead, minute zooplankters, larvae of benthic invertebrates, and larval fish that settle onto and then are incorporated into the sediment after these organisms were poisoned in the overlying water column by the toxic crude oil. The much larger, heavier, contaminated carcasses of orders of magnitude fewer pelagic fishes would sink rapidly through the water column onto the bottom.

The organic matter in these depositional environments scavenge the available oxygen molecules from the interstitial pore water present in the upper centimeters of the sediment and at the sedimentwater interface. The oxygen uptake by the organic matter provides

the necessary requisite for maintaining the resultant processes of decomposition and decay. After a period of time, the interstitial water and the sediment-water interface, through excessive organic overloading, become devoid or nearly devoid of molecular oxygen. The Redox Potential Discontinuity and the underlying anoxic Sulfuric Layers move upward and the RPDL reaches the sediment surface or may even move entirely out of the sediment into the immediate overlying water.* At that stage, in the absence of molecular oxygen and animal life, the sediment goes totally anaerobic and azoic. At any given time over subsequent periods of alternating upward and downward migrations of the RPDL through the sediment, the depth position of the RPDL serves as a remarkably good indicator both of the available molecular oxygen present in the interstitial water in the uppermost aerobic layer of the sediment and the successional stage of the benthic fauna currently occupying the sediment. This insightful approach can be very effectively used for the ongoing EXXON VALDEZ Oil Spill study. Such an ongoing monitoring program would be most valuable and central to the evaluation of whether the more severely oiled areas of the seafloor have or will become long-term repositories "for hydrocarbon, contributing to chronic toxicity through mobilization of oil into the water column." (See Page 39 of Public Review Draft.)

From the now available Public Review Draft of the State/Federal Natural Resource Damage Assessment plan for the EXXON VALDEZ Oil

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^{*} A detailed discussion of the RPDL is included in Attachment B.

Spill itself, it has become clearly evident that pollution impact will almost certainly be long-term and severely damaging. Yet, inexplicably, the Executive branch of the Federal Government has recently decided to fund for only one year the largest and potentially most damaging oil spill in the nation's history of one of the most pristine, wild, and unspoiled ecosystems in North America. Unless this unexplained dichotomy is quickly, effectively, and constructively resolved, the fundamental objectives of the EXXON VALDEZ oil spill studies may well be profoundly compromised. If, indeed, such a scenario is realized, it will confound, distress, anger and antagonize the involved professionals dedicated to the study, the environmental movement within the United States and throughout the world, and a very significant percent of the informed, concerned, and responsible citizenry here and abroad.

Attachment A

In the area of the FLORIDA spill, off West Falmouth, Massachusetts, in Buzzards Bay, the light #2 fuel oil adhered to particulate organic matter and fine sedimentary particles in the water, and rapidly settled to the bottom (Blumer and Sass 1972). There, the oil degraded very slowly, and spread over the bottom, probably in part, by resuspensions months and even years after the spill.

Crude oil from the blowout at the Santa Barbara Platform initially reached the bottom sediments by the same mechanism operative off West Falmouth, and later spread along the bottom to cover much of the floor of the Santa Barbara Basin to water depths of 500 m (Kolpack, 1971). In the aftermath of the spill of heavy Bunker Oil C oil from the ARROW into Chedabucto Bay, Nova Scotia, the petroleum hydrocarbons dispersed widely throughout the water and in the subtidal sediment (Scarratt and Zutko, 1972).

In the massive AMOCO CADIZ spill off Brittany, fine droplets of light crude oil were absorbed by suspended sedimentary particles; a large quantity of oil reached the seafloor within two weeks (Cabioch, Dauvin and Gentil, 1978). Once on the bottom, this oil travelled along the seafloor with the silt (Spooner, 1978, p. 284). Toxic effects of the oil became manifest 90 km from the wreck five days after the spill began.

In the study of the TSESIS spill in the northern Baltic Sea, off Sweden, sediment traps were placed in the water column 20 m below the surface, to measure the quantity of heave #5 fuel oil absorbed on settling organic and sedimentary particles (Johnson, 1979). The #5 fuel oil composed as much as 0.7 percent of the sedimented matter recovered from the traps in the two weeks following the spill. Indeed, further very recent sediment samples collected from muddy, intertidal, fine-grained, depositional study sites revealed the presence of residues of Number 2 fuel oil 20 years after they were heavily oiled in the immediate aftermath of the oil spillage from the barge FLORIDA.

The FLORIDA and ARROW oil spill studies continued for several years. Oil residues from both accidents were still present in some of the bottom sediments a decade after the initial spills.

Oppenheimer, Miget and Kator (GURC/OEI, 1974) found oil residues present in each of eight zooplankton samples collected in the Gulf of Mexico off Louisiana. During the ARROW spill study of Chedabucto Bay, Nova Scotia, it was observed that the zooplankton ingested small globules of oil in the water column. Conover (1971) found that their faecal pellets contained as much as 7 percent Bunker C oil. He calculated that about 20 percent of the oil was sedimented to the bottom as zooplankton feces.

Wiebe, Boyd, and Winget (1976) measured the rate of sinking of zooplankton faecal pellets that sank at an average speed of 171

meters per day at a water temperature of 22° C and 151 meters per day at 5° C.

These three bits of information strongly suggest that zooplankton faecal pellets provide a major and rapid route for transporting oil through the water column to the seafloor at depths of 200 m and shallower.

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ATTACHMENT B

An anaerobic sulfide system underlies a covering of oxidized sediment in all aerobic marine subtidal soft-bottom environments [Fenchel and Riedl, 1970]. Interposed between the oxygenated and reduced layers is the narrow, transitional Redox Potential Discontinuity Layer (RPDL) where small amounts of both oxygen and reduced compounds are present. This three-tiered layering pattern is the manifestation of the one-way supply of free oxygen into the sediment at the sedimentwater interface. Once in the bottom, the concentration of free oxygen present in the interstitial water of the sediment progressively diminishes with depth until it disappears. The absolute depth of this oxygenated zone is controlled by a number of physical and biological conditions. However, there are two primary conditions, the amount and rate of organic matter imported into the sediment and the concentrations of free oxygen available for degradation. A low rate of organic import and a high availability of oxygen can extend the oxygenated layer as much as 25 or more centimeters below the sediment surface. Alternatively, a high rate of organic import and a low availability of oxygen can limit the aerobic layer to the uppermost few millimeters of sediment or, together with the Redox Potential Discontinuity Layer, it might be entirely displaced as the anaerobic layer pushed upward to the sediment surface.

Other conditions that move the RPDL upward or downward to narrow or broaden, respectively, the aerobic zone include both physical factors such as temperature, particle-size composition of the sediment and storm-generated waves that reach the surficial seabed and biological factors such as intensity of bioturbation and degree of mucus secretion. Conditions that raise the RPDL towards the surface are (1) high temperature; (2) low-energy depositional sediments, with relatively high organic content and predominantly composed of finegrained silts and clays, that reduce sediment permeability and scavenge available free oxygen; and (3) mucus secretions that bind sediment particles and form a substrate for bacteria. Conversely, conditions that move the RPDL deeper into the sediment are (1) low temperature; (2) high energy, erosional sediment environments with little organic content and largely composed of coarse-grained sands and gravel, that enhance permeability and allow penetration of free oxygen deeper into the porous substratum; (3) storm-generated waves that reach and disturb the underlying seabed and oxygenate the superficial sediments; and (4) bioturbation by benthic infauna through burrowing activity and tube-building that introduce free oxygen into the deeper sediments.

There is now an abundant documentation in regard to organic enrichment that related the depth of the Redox Potential Discontinuity Layer in the sediment to the successional stages of the benthic fauna. There is no attempt here to review the extensive relevant literature. Instead, the reader is referred to the important review article by Pearson and Rosenberg [1978] that provides an excellent synthesis of the subject and some mostly more recent papers [McCall, 1977; Rhoads, McCall, and Yingst, 1978; Yingst and Rhoads, 1980; Sanders et. al., 1980; Aller, 1980; Rhoads and Boyer, 1982; Larson and Rhoads, 1982] that have added further insightful dimensions to our understanding of this relationship. Benthic faunal succession remains remarkably similar independent of whether it is manifested along a temporal or spatial gradient. Temporal succession occurs in the aftermath of a severe disturbance or perturbation that significantly reduces or eradicates the resident benthic population. Examples include responses to a massive red tide outbreak [Dauer and Simon, 1976; Simon and Dauer, 1977], a deluge from a tropical storm that created near freshwater conditions in shallow water and deoxygenation in deeper water beneath the sharp halocline that was generated [Boesch, Diaz, and Virnstein, 1976], anaerobiosis through accumulations of drifted macroalgae and a covering of blue-green algae [Watling, 1975], dumping of dredge spoils [Rhoads et. al., 1978; Rhoads and Boyer, 1982] and an oil spill [Grassle and Grassle, 1974; Sanders, 1978; Sanders et. al., 1980]. Spatial succession is a response over distance to a chronic source of pollution. Examples, among others, are pulp mill waste [Pearson, 1975; Rosenberg, 1976] and sewage industrial waste [Reish, 1959 and 1971; Wade, Antonio, and Mahon, 1972] discharges. There are, of course, successional or regressional events that have both a temporal and spatial component such as the chronic release of petroleum at an oil rig complex from initiation of operations through the next few years [Addy, Levell, and Hartley, 1978].

The patterns that have emerged as a result of organic enrichment reveal faunal succession over time and space. At very high inputs of organic matter into the seafloor, the anaerobic layer rises to the sediment-water interface, the sediment is laminarly stratified, devoid of a benthic fauna and undisturbed in the absence of bioturbation. When the RPDL is limited within millimeters of the sediment surface, the initial successional stage is present. Its benthic fauna is usually characterized by small opportunistic polychaetes that are either tubiculous or motile and barely infaunal and are members, respectively, of the Families Spionidae and Capitellidae. The vast majority of individuals belong to one or two species (i.e., pronounced numerical dominance). The few pioneer species typically found are confined to the very narrow oxygenated surficial layer and exist under marginal and variable conditions that include low to minimal levels of free oxygen, high concentrations of sulfides and a low pH. These opportunistic species are eurytopic (i.e., wide physiological tolerances) and have broad, zoogeographic distributions. As products of the ephemeral nature of their environment, these resilient opportunistic species are small and rapidly achieve sexual maturity. Yet, this initial successional stage typically has very high numerical abundances that exceed those

that appear in any of the subsequent successional stages.* Because its species are limited to and feed as deposit-feeders from the surficial sediments or as suspension-feeders from the immediately overlying water, the sediment surface becomes pronouncedly pelletized. The fecal pellets, in turn, provide surfaces for microbial activity. Although the benthic faunal biomass of this primary successional stage is small compared to the relatively longlived, slow-growing, late-maturing and larger macrofauna present in the late successional stages, their brief life spans and the rapid turnover of multiple generations within the course of a single year are indicative of very high rates of annual organic productivity [J.F. Grassle and J.P. Grassle, 1974; McCall, 1977; and Rhoads et. al., 1978] that most likely will exceed production rates realized in later stages. Rhoads et. al. [1978] conclude that the pioneer species in Long Island Sound have individual and population growth rates that are 10 to 100 times higher than the equilibrium species that characterize the late successional stages.

Related to this phenomenon is the remarkably high colonizing potentials of these pioneer species as demonstrated with azoic sediment tray experiments carried out by J.F. Grassle and J.P. Grassle [1974] on an intertidal sediment of fine sand in the Wild Harbor River estuary of Buzzards Bay, Massachusetts and by McCall [1977] on a subtidal sandy silty sand bottom beneath 14 meters of water in Long Island Sound off Connecticut. Grassle and Grassle's study revealed that a density equivalent to more than 400,000 individuals per sq. meter of the polychaete Capitella capitata sensu lato were present after a one month interval. We now know that Capitella capitata is, in reality, a complex of very similar sibling species [J.P. Grassle and J.F. Grassle, 1976; J.F. Grassle and J.P. Grassle, 1977]. More than a single Capitella species colonized the Grassles' sediment trays. One species, Capitella type 1, grows from settlement to maturity in about 30 to 40 days, an adult female produces anywhere from one to several broods and breeding occurs at the study site throughout the year at water temperatures that range

* Samples collected from this successional stage and then washed through a screen with 1.0 mm-mesh aperture will retain about an order of magnitude fewer specimens -- primarily mature, adult animals -than would a screen with 0.3 mm-mesh apertures where the smaller postlarval specimens comprise the vastly greater percentage of the total fauna retained on the screen. Clearly the employment of screens having 0.3 mm-mesh apertures are decidedly more relevant and germane for the first and, to a lesser degree, the second successional stages of the benthic invertebrate infauna than for the later successional stages. Yet, 0.3 mm-meshed screen do retain nearly all the postlarvae of most of the species present in the later successional stages. The readily available postlarvae can be effectively used to measure the dynamics of growth in length and dry organic weight over time at selected stations that are sampled on a monthly basis. from -1.5°C in winter to more than 24°C in summer. In McCall's experimental bottom samples in Long Island Sound, the azoic sediments were immediately colonized. Within ten days, densities of the spionid polychaete <u>Streblospio benedicti</u> and the capitellid polychaete <u>Capitella capitata</u> sensu lato reached 418,315 and 36,120 per sq. meter, respectively [McCall, 1977]. Rhoads <u>et</u>. <u>al</u>. [1978] estimate the <u>Streblospio</u> produces 3 to 4 generations per year in Long Island Sound study site.

As products of the transient nature in time and space of their pioneer stage habitat, the opportunistic species experience very high mortalities as larvae in the plankton and throughout their postlarval benthic life. Their confinement to the oxygenated surficial sediment that may be only millimeters thick deprives them of the refugium of depth. Thus, they are most susceptible to predation by fish, decapod crustaceans, and other epifaunal carnivores.

Species that appear following a severe disturbance that defaunates the benthos, and explosively increase to reach extreme abundances during the first recovery stage and then go into an equally sharp precipitous exponential decline as the initial pioneer stage terminates, are few in number. Yet, most of the benthic fauna present during the initial colonization stage are members of such species. In North America and Europe where the vast majority of the studies on benthic faunal succession have been done [see Table 1 in Pearson and Rosenberg, 1978], this small group of opportunistic species mostly belong to the polychaete families Spionidae and Capitellidae. Species that best characterize this group are Capitella capitata sensu lato, and the spionids, Polydora ligni and Streblospio benedicti along both the Atlantic and Pacific coasts of North America and <u>Capitella capitata</u> sensu lato and the spionids Scolelepis fulginosa and Polydora ligni [=P. ciliata] in European waters. Other species associated with these prime opportunists are present at much lower densities and do not share their 'boom and bust' life history patterns. Unlike the ephemeral opportunists, they display much less temporal variability and usually persist to become members of some of the sequential successional stages where they are often more abundant.

Spionid polychaetes are one of the key colonizers of the pioneer successional stage. They form dense thickets or mattings of closely spaced, small diameter, vertical tubes. Aller [1980] demonstrated that the toxic compounds in the ambient pore water, that diffuse into the tubes from the surrounding reduced subsurface sediment, are flushed from the tubes into the overlying water where oxygenated water from above the tubes is drawn in as replacements. By means of these outflowing and inflowing fluid bioturbating activities and the high density of closely arrayed tubes, the spionid worms collectively are able to maintain adverse solutes such as NH_4 + or H_2S within their tubes at relatively low and constant levels. However, as a result of these pumping activities, the oxygenated water within the tubes also diffuses out into the surrounding subsurface sediment to stabilize and deepen the narrow surficial oxygenated layer and thus allow other early successional species to colonize the sediments.

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The later successional stages will be dealt with herein in a more cursory and general manner. Yet, sufficient information will be conveyed to provide the necessary frame of reference. For detailed knowledge and information on the later successional stages, the reader is referred to the papers and bibliographies of Pearson and Rosenberg [1976; 1978], Rhoads, McCall and Yingst [1978]; Yingst and Rhoads [1980], Aller [1978; 1980], Aller and Yingst [1980] and Rhoads and Boyer [1982].

Along the progression from the pioneer stage through the sequences of later successional stages, certain general trends become clearly evident. The RPDL migrates deeper into the seafloor, the sedimentary depth occupied by the macrofauna similarly deepens, the feeding mode gradually shifts from surface deposit-feeders and suspension-feeders to preponderantly subsurface deposit-feeders, the maximum size of the macrofauna, the degree of both fluid and particle bioturbation and the structural and ecological complexity of the infaunal assemblage increase. All these trends are intimately interrelated, interdependent, and highly correlated. If the progression of sequential succession from pioneer to equilibrium stage is undisturbed, which may or may not occur, changes in faunal composition will be persistently gradual and nearly continuous rather than disjunct and abrupt, with intervals of arrest and retrogression.

Bioturbation activities such as irrigation by sedentary or relatively sedentary infauna living in tubes, shafts or often deep semipermanent burrows that connect directly to the sediment surface and random burrowing by errant infauna increase the passage of free oxygen and dissolved nutrients into the sediments and the flushing of deleterious metabolites from the sediment that are orders of magnitude greater than molecular diffusion rates. The manifestations of such activities are the lowering of the RPDL and the enhancement of microbial activity, particularly at the discontinuity layer [Hylleberg, 1975; Aller, 1978; Yingst and Rhoads, 1980; Rhoads and Boyer, 1982].

Intense errant burrowing activity accelerates diffusion rates by increasing water content and homogenizing finer-grained sediments [Rhoads and Boyer, 1982]. Deposit-feeders void ingested sediments as feces in the form of organic-mineral aggregates that may form as much as 70% of the soft sediments [Johnson, 1974]. Such aggregations have two important effects. They significantly increase sediment porosity and thereby facilitate diffusion and the transfer and oxidation of reduced chemicals. Secondly, they enlarge the environmental space available for meio- and macrofauna and provide organic-rich surfaces for bacterial flora.

The deep semi-permanent feeding burrows, characteristic features of the later, mature, successional stages, are usually associated

intimately with the RPDL. The rapid and immediate vertical transfer of well-oxygenated, nutrient-rich water from above the seafloor to the immediate proximity of the RPDL that lines the burrow deep into the anaerobic, sulfidic sediment is brought about by the pumping activity of the burrow occupant, usually a large invertebrate. Such a behavioral strategy bypasses the route of slow diffusion downward through the sediment and the gradual attenuation of oxygen tension with depth. One variant of this pattern is the 'conveyor-belt' deposit-feeder that feeds head down in the sediment as exemplified by maldanid polychaetes as, for example, <u>Clymenella torquata</u> (Rhoads and Stanley, 1965]. In this position, the polychaete progressively 'mines' deeper into the seafloor and selectively ingests the fine sediment patches which are processed in the gut and discharged as unconsolidated feces at the surface. Highly irregular, threedimensional RPDL-lined water pockets are created by the intense feeding activities of these worms. The pockets, themselves, may protrude deep into the anaerobic zone to form localized aerobic areas. One of the ultimate results of such activities is the markedly increased microbial activity.

An essentially identical feeding pattern exists for a very different invertebrate, the infaunal holothurian echinoderm, Molpadia colitica [Rhoads and Young, 1971]. Like <u>Clymenella</u>, this sea cucumber lives head down vertically and feeds deep in the underlying sediment often 20 or more centimeters beneath the surface and deposits its unconsolidated feces upward onto the seafloor. Molpadia ingests only the fine-grained particles to create highly convoluted, threedimensional, RPDL-lined, aerobic voids or feeding pockets at depth within the surrounding unperturbed anaerobic sediment that considerably enhance microbial activity and chemosynthesis. Other feeding strategies have been utilized by deep-dwelling infauna occupying semi-permanent burrows. Hylleberg [1975] applied the term 'gardening' to describe the effects of feeding by the lugworm, Abarenicola pacifica. This polychaete, like other members of the Family Arenicolidae, lives in deep U-shaped burrows. By irrigating its tube, the worm pumps oxygen and nutrients from the overlying water into the feeding pocket. These, together with the animal's own feces, provide the stimulus for microbial growth along the RPDL lining the feeding pocket. The microbes so produced, as well as meiofauna feeding on this rapidly growing flora, serve as the primary food source for the lugworm.

Another example of 'gardening' has been demonstrated by Frey and Howard [1975] for the burrowing shrimp, <u>Upogebia litoralis</u>. This crustacean collects plant material on the sediment surface which it packs along the inner walls of the burrow. Then after incubation it 'harvests' or ingests the bacteria that grow on the plant detritus.

Microbiologists, for more than 32 years have know the Redox Potential Discontinuity Layer to be a site of significant microbial activity [Vishniac and Santer, 1957]. This relationship has been shown both in the water column [Sorokin, 1964; 1965; 1972] and in bottom The strong implication that logically flows from these observations is that wherever the RPDL is present, independent of sediment depth or successional stage, it becomes the site of chemosynthetic primary production. Thus chemosynthetic primary production must be an ever present phenomenon in the sediments of eutrophic marine environments that include the shelves and, in part, the continental slopes throughout the World Ocean except under the special conditions discussed earlier that permit the anaerobic zone to rise to the sediment-water interface and thus displace both the RPDL and the upper aerobic layer. The studies cited above that infaunal depositfeeders concentrate and feed at the RPDL indicate that chemosynthesis, currently unevaluated, may be an important and possibly dominant food source (as compared to photosynthesis) for the infaunal benthos.

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COMMENTS AND RESUME

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OF

MICHAEL KAVANAUGH, PhD

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October 20, 1989

To: Sarah Chasis From: M. Kavanaugh

Re: Review of State/Federal Natural Resource Assessment Plan for the Exxon Valdez Oil Spill

This review of the State/Federal Natural Resource Assessment Plan for the Exxon Valdez Oil Spill is limited to the restoration plan and the natural resource damage determination on pages 185 to 202 of the public review draft. The stated purposes of the studies are: (1) to support the development of restoration plans to promote the long-term recovery of the natural resources; and (2) to support the determination of damage claims presented to the responsible parties. An assessment that fulfilled these purposes could provide the trustees (and the public) with a statement of the harm done to nature by this spill and what could be done about it. Unfortunately, the purposes are unlikely to be fulfilled and an opportunity will be missed to assess the spill's damage and to evaluate responses because:

* There is a too much emphasis on studies to determine lost use value over studies to develop restoration plans. Analysis of restoring and purchasing equivalent resources elsewhere (restoration) is likely to be as important if not more important than studying lost use values. Determining how much polluters must pay for the restoration of the damaged natural resources is one of the purposes of the calculations. The calculation of use values is relevant for determining that portion of the damage claim to cover the diminution of use during the interim required to achieve restoration. If restoration is impossible, then use value studies take on added importance. But, it cannot be determined in advance that restoration is impossible.

* Neither the development of a restoration plan nor the conduct of a credible, professional assessment of the natural resource damages caused by the spill can be completed by February 28, 1990 (the deadline). The deadline may reflect lack of funding (See The Exxon Valdez Oil Spill, A Report to the President, Skinner, S.K. and W.K. Reilly, p.35). Nevertheless the same report calls for long-term...broad gauge, carefully structured...damage assessments (Executive Summary p. ES-2). The deadline may also reflect a desire to complete the assessment early, since the full extent of the damage will never be known





Page 1

with certainty. Nevertheless, the scope and complexity of the studies plus the need to sequence the studies makes it impossible to complete all of the studies by this winter.

* The description of the process to develop a restoration plan is too brief. At a minimum, the plan should contain both restoration and replacement strategies. The restoration strategies should provide estimates of how long the resources will take to recover given alternative levels of clean-up, as well as measures to promote long-term recovery such as requiring all tanker traffic moving through the spill area during the restoration period to move only in daylight hours and be doubledhauled or have the cargo containerized. The replacement strategies should consider replacement in-place (e.g., breed in captivity) and establishment of an environmental permanent fund to fund long-run efforts to restore the damaged resources or purchase equivalent resources (or the development rights) elsewhere (i.e., acquire and deed to the public resources such as land and shoreline outside of the spill area).

* The descriptions of the economic use studies:

- are too brief to allow a thorough review. It is unusual for the government to fund millions of dollars worth of research on the strength of descriptions like those contained in the public review draft. To complete the 9 proposed studies in 10 months means spending on the order of \$14,000 per day. Surely, someone has a better idea of how sums of this magnitude are being spent then is revealed in this document.

- show no appreciation of the problems that might be encountered and the special analytical techniques needed to value natural resource losses that:

- -- involve ecological losses for which existing evaluation methodologies are wanting;
- -- may be irreversible;
- -- may not be apparent for a year or more;
- may be catastrophic if endangered species are threatened or if there is loss of habitat; and
 will be subject to considerable uncertainty.

- contain no discussion of the applicability of existing literature and models. Most studies of tourism losses, for example, count these losses as transfers because there are readily available substitutes for a given polluted beach. There might not be available substitutes for an Alaskan experience and the existing literature and models may be misleading.

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- are silent about the choice of a discount rate. The spill and its effects will last many years. This coupled with the potential for irreversible (or extremely long-lasting) damage implies that the spill has transferred resources from future generations to current generations. The discount rate is the analytical parameter that allows inter-temporal comparisons. There is literature suggesting fair representation of future generations requires use of a zero or near zero discount rate. (See, Schulze and Kneese, <u>Risk Analysis</u>, 1981 and Schulze, Brookshire and Sandler, <u>Natural Resources Journal</u>, 1981).

- A. Economic uses studies:
 - 1. price effects;
 - 2. industry costs; and
 - 3. bioeconomic models.

Taken as a group and reading between the lines, these studies have the potential to estimate the damages caused by the spill to the commercial fishing industry and their customers during the interval necessary to restore the natural resources to their prespill condition. The studies, however, will not measure any degradation in the quality of life suffered by the fishing communities. This degradation can take many forms including increased alcoholism and violence.

The correct measure of the loss to the commercial fishing industry and its customers is loss is the discounted present value of current and future reductions in consumers' plus producers' surplus plus the value of the resources made idle by the spill. {The discount rate should be zero or near-zero to account for the long-term impact of the spill. Surplus refers to the difference between what people are willing-to-pay for a good or service and the amount of resources they have to forego to have the good or service. Analytically, it is the area above the supply curve and beneath the demand curve. The resources made idle by the spill are represented by the area under the supply curve. Measuring surplus requires, (a) defining demand curves for the products of the commercial fisheries in terms of their elasticity of demand, [presumably this is accomplished in #1], (b) describing the supply curves [presumably #2], and (c) estimating the shift in demand and supply curves caused by the spill in current and future years [parts of #2 and #3].}

Since in the first year of the spill almost all of the catch was lost, the measure of damage is the surplus loss plus the opportunity cost of the idled fishing boats and unemployed labor. This estimate is repeated for all subsequent years the spill influences commercial fisheries. The subsequent influence of the spill may take two forms. The first is a supply side effect. The continueb from p. 2

Page 3

spill may reduce significantly the fish population and require more fishing effort (e.g., boats have to be cleaned more frequently, travel farther to reach fishing grounds, and stay longer to catch a load of fish). Analytically, this is an upward shift in the supply curve. The second is a demand side effect. A stigma may attach to Prince William Sound product for years to come such that wholesalers, retailers and the public will consume Prince William Sound product only if they are offered a price discount. (For example, Prince William Sound product may be relegated to low value uses such as cat food.) Analytically, this is a downward shift in the demand curve. It is likely that in subsequent years the idled boats and fishermen will be reemployed. This is taken into account by reducing the charge in future years for the opportunity cost of idled resources.

Any claim the Frustees present to Exxon will be closely examined. (One concern I have is that the investigators in a rush to meet the deadline will use approximations that would not be needed if they took the time to make the estimates correctly. For example, the investigators may assume that fish are fish and not distinguish among different markets for and quality variations among fish. Not only might these shortcuts produce biased estimates of the loss, but the approximations may be so unacceptable so as to provide Exxon with the opportunity to render the estimates useless.

A second concern that I have is that the work is spread out over three-studies and this may create additional problems such as:

- * duplication of effort;
- * gaps in research as one investigator thinks another is responsible;
- * difficulty in integrating because the studies use varying regional definitions or time-frames or otherwise lack common denominators (groupings of fish, segmentation of the industry); and
- * unproductive effort as information is collected without a purpose in mind.

The description of the method and analyses mention that previous studies will be reviewed. What literature do they have in mind? By what standards are the investigators going to judge the literature? Who is going to integrate the studies? How are they going to insure that the studies will be compatible?

continued from

Page 4

(A third concern is the spill's effects on the quality of life in commercial fishing communities is not counted by surplus and idled resource measures. There are reports that communities have had their faith in the bounty of the environment shaken and their livelihood threatened. Mental health professionals report (e.g., J. Randal, <u>Washington Post</u>, 9/26/89) the spill has led to increases in alcoholism and violence. The trustee should be aware that the cost of community disintegration is not considered in these studies.

A fourth concern, again, is the deadline. Even if there were off-the=shelf, current models of the fishing industry that could be identified and used, the use of the models would have to await the completion of the injury determination studies (e.g., Fish/ shellfish studies #1-5; Marine mammal studies #4 & #5; and others). Either these biological studies will be finished long before the deadline or the economic study will not be completed by the deadline.

- B. Economic uses studies:
 - 5. Economic damages to recreation; and ~
 - 7. Study of loss of intrinsic values

These studies are likely to be the most important and expensive studies conducted. The recreation study proposes to use three methods to estimate the damage: travel-cost, contingent value, and unit day. The intrinsic value study will also use the contingent valuation method. The contingent valuation method may turn out to be the most appropriate method to estimate the value of the compensation for the damage. While the descriptions of these studies are more complete than the descriptions of the other studies, there are important topics that are not discussed. Finally, it is impossible to conduct either study by the deadline.

The travel cost method will be one of three methods used in the recreation study. It estimates demand curves (a relation between price and quantity) by using travel costs and an imputed value of time as proxies for price and recorded visits to the site (region) as a proxy for the quantity variable. This relation between price and quantity is estimated for the pre-spill and post-spill case. The difference in surplus between the two cases is estimated and used as a measure of damage. The problems the investigators face are: selecting sites (travel to Alaska may be a package and if part of the package is spoiled by the spill travel to other parts of Alaska may be forgone; in this way the effects of the spill spread to all parts of Alaska) and valuing time.









This oil spill is on-going; it is not an event. The travelcost method uses pre-spill and post-spill data on recreation use, tourism (prices and quantities) and hunting and fishing licensees. But, post spill data cannot be collected until the spill is over. The spill is not over. Data collected for the spring and summer of 1989 is data representing recreation during the spill. This is important to know. But it is equally important to know participation in recreation in the future. There is no basis for an assumption that tourism will return to normal in 1990. Unless the investigators have a method for estimating participation in 1990 and subsequent years then the travel cost approach has a potentially serious flaw.

The unit day approach relies on expert opinion to estimate WTP. It should be used only if no other method can be used.

The third approach used in the recreation study is contingent valuation (CV). CV solicits the willingness-to-pay (WTP) for an Alaskan recreational experience. CV methods take some time to perform correctly and cannot be done correctly by the deadline.

CV methods are also used in the intrinsic study. Individuals are asked about their WTP for pristine resources or their willingness-to-accept (WTA) compensation for the damage done to their natural resources. WTA estimates how much compensation is needed to restore the well-being of citizens to the pre-spill level. Society loses when an oil spill causes sorrow, outrage, and other feelings of despair. Individuals spend valuable resources to avoid feeling such emotions. The value of the compensation required to bear such feelings will only be captured in the intrinsic value study using contingent valuation methods.

Both a WTP and a WTA approach should be used in the CV studies. Under WTP, industry is assigned a quasi-property right to the resource because industry pays the government what the public would have been willing to pay to use the resource. Under WTA, the public is assigned a quasi-property right to the resource because industry pays to the government what the public would be willing to accept to let industry use the resource. For resources with close substitutes, WTP and WTA are approximately equal (See Willig, Am Econ Rev, p.589 1976 and Hausman, Am Econ Rev, p.662 1981), but for unique resources there may be large differences between WTP and WTA (Hanemann, Am Econ Rev, forthcoming). Since it is believed that it is easier to design WTP questions than it is to design WTA questions (Carson and Navarro, Nat Res Jour, p.815, 1988) and since if the resource has close substitutes the same approximate answer results, investigators tend to favor the WTP approach. The natural resources damaged in Alaska, however, may be unique and both WTP and WTA approaches should be used.

October 20, 1989

ee comment A on page 5



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Contingent valuation consists of using surveys to identify and quantify economic values that are contingent upon an actual market existing. In particular, markets for recreating and, separately, intrinsic Alaskan natural resource values are simulated using surveys. The survey results are susceptible to bias and questions must be designed and pre-tested to avoid bias. Often focus groups are used in the design and pre-test process.

There are two survey designs: iterative bidding formats and non-iterative formats. In both designs the amenity being valued must be described sufficiently so that the respondent knows what he is being asked. This description may include photographs, sketches, written description, videos, verbal descriptions and the like. In the iterative format the respondent is asked a series of questions to identify the value. For example, the interviewer may show the respondent a picture of a dog and then asked if he is willing to pay nickel for the dog? a dime? a dollar? with the amount increasing until the respondent indicates the highest price he would be willing to pay for the dog. In the non-iterative format the respondent is asked to either answer yes or no to a single state value ("Would you pay 50 cents for this dog?) or is asked to write down the amount he would pay (Please state on the line indicated how much you would pay for the dog.) It is generally acknowledged that the iterative interview method is more reliable.

In either format, the survey instrument will have, at least, two parts. The first to record bid information, the second to record demographic information.

Conducting a CV study requires several steps. First, the spill damage is assessed and described so that the respondent knows what he is paying to avoid or being compensated to accept. Second, questionnaires are developed and tested for biases such as anchoring and for misunderstandings. They may have to be revised. If the revisions to the questions are extensive, a second pretest may be needed. At this stage, a focus group might be given alternative descriptions of the spill to develop a robust description. The questions should have a wide scope. Individuals should be asked not only about their values for the loss of particular animals but also about how they value the loss of a pristine environment and unspoiled wilderness. Third, the population of eligible respondents is determined and sampled. For the Alaskan oil spill the eligible population to be sampled must see comment on p. 6

include all U.S. citizens and possibly residents of other countries. Fourth, the questionnaires are administered. This may take considerable time if the sample is large. The final steps are tabulation, aggregation, and interpretation of the results. It is plain that there simply isn't enough time to perform a contingent value study by the deadline.

Two other issues in assessing damage and making restoration plans are the speed of recovery and uncertainty. Some of the more important estimates the biologists and other physical scientists can provide are estimates of how long it will take the environmental and natural resources to recover from the spill. This information is important not only because it sets the period for claiming diminution of use values; but also, if the damage is irreversible, catastrophic, or has long lead times economists must consider a larger set of future uses. If, for example, the damage is estimated to last for 5 years, then the future uses of the resources may be considered as known (i.e., committed). If, on the other hand, the damage is estimated to last for 50 years, committed uses may impart little information about the future and more speculative uses must be considered in the analysis.

All of the estimates of damage are going to be subject to uncertainty -- uncertainty about magnitude and duration of the resources lost and damaged; uncertainty about how much compensation citizens need to restore them to a pre-spill level of well-being. This suggests that a single-point estimate of the damages should not be relied upon as the measure. Instead the results should be reported as distributions.

see count on p. 6

- C. Economic use studies:
 - 4. Effect on value of public land;
 - 6. Effect on subsistence households;
 - 8. Effect on research programs; and
 - 9. Effect on archaeological sites.

These are four studies of the impact on the spill on welldefined targets. Each has its own problems that are not addressed in the study descriptions.

* <u>Public land.</u> How are the investigators going to "project market demands for leases and sales in the area affected by the oil spill". This is the central analytical element. Are they going to use hedonic techniques? are they going to use the opinion of appraisers? both? It would seem that the results of economic study #3 "Bioeconomic models for damage assessment" would have to be completed prior to completing study #4 because there may be important effects on fishery resources that will be reflected in the value of public lands.

* <u>Research programs</u>. The tabulation may be able to be confined to a table listing project, amount, delay, and the funds put in jeopardy by the spill. The results will depend on the duration of the spill and its effects.

* <u>Archaeological study</u>. How are the investigators going to assess the economic damage to the site? will they use appraisers? CV methods? The description mentions a field survey. Unless it is already completed, then to perform the study by the deadline means doing a field study during the Alaskan winter.

* <u>Subsistence study</u>. This study looks well thought-out, but it cannot be completed by the deadline because the effects of the spill will still be occurring.

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COMMENTS AND RESUME

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OF

HOWARD LILJESTRAND, PhD

COMMENTS AND RESUME

OF

D.K. BUTTON, PhD

Coastal Habitat Study Plan: In general the assessment plan seems to lack a study related to the fate and transport of oil in intertidal and supratidal zones. In the Coastal Habitat studies, a more comprehensive plan for assessing the physical/chemical interactions of the oil with the coastal sediments needs to be given. This might be done by adding two additional projects to the Air/Water study plan such as: (1) Evaluation of Petroleum Hydrocarbon persistence in Intertidal Sediments, and (2) Evaluation of Petroleum Hydrocarbon Persistence in the supratidal Sediments. In the current description of the coastal habitat studies, it appears these areas are not covered or that the research plan is not given in sufficient detail to indicate that they are to be studied.

Measurement of Petroleum Hydrocarbons. A more comprehensive plan needs to be developed and included in the report, indicating what oil components will be screened and how they will be measured analytically. The only information given in the report (p40) states that analyses to be done are TPH/GC and PNA/SIM characterization of marine sediments, TOC on selected samples and size fraction analysis on representative samples. It will be essential to perform a comprehensive analysis of the change in composition of the oil in the sediments in time by monitoring appropriate classes of hydrocarbon components of the oil. Total Petroleum Hydrocarbon (TPH) analyses will not be adequate to assess the damage or to monitor remediation efforts. It is recommended that individual components of the oil be monitored throughout the study at selected sites covering a wide range of molecular weight size classes. This will be essential for assessing the potential damage and be necessary if one is to effectively monitor temporal changes and to determine how well natural, as well as, engineered remediation efforts are working.

Coastal Habitat Study, p. 31 - Mention is made that studies will be performed on 3 degrees of oiling; none, light, and moderate to heavy. It would appear that the *light* classification may be insufficient to clearly delineate the extent of the problem. For example, a section of shoreline might have been lightly oiled within a few days of the spill or it may have been contaminated two months later. The composition of the residual oil will have significantly changed over this time frame and therefore the environmental response may well be significantly different. It seems as though a time aspect to the contact must be included as well; i.e. whether it is contacted soon after the spill or not.

Air/Water Study 1, p. 37 - Mention is made that "Oil spill models will be used . . .". Such models will probably not have sufficient accuracy or spatial resolution to provide any basis for estimates of spill extent or volumes. The oil spill models will be only as accurate as the estimates of general circulation within the system and it is not made clear how this information will be generated. Only field studies would provide the sort of information required such as detailed circulation pattern. These studies need to be performed.

Coastal Habitat Study, p. 32 - States that "four vertical transects will be established on each of the 150 sites . . .". The spatial resolution of these transects is not provided. This should be a critical issue particularly in the breaker zone. It may be visualized that in the area of active sediment transport (which is near the location of wave breaking), oil will be entrained into the sediment much more readily than elsewhere. Depending upon tidal fluctuations, this may or may not encompass a significant distance across the shoreline. No indication has been given that these physical processes have been considered and the description provided, as elsewhere in the report, is simply insufficient to know whether or not this issue will actually be resolved by the sampling procedure described. It does seem likely, however, that with 600 transects, the spatial resolution of the sampling will be limited. In order to have better understanding several sites need to be examined in greater detail.







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list be expanded to other components of crude oil which have much lower reference contaminant levels than those of the monocyclic aromatics, and it is recommended that flux calculations for specific compounds be expanded to representative chemicals other classes. For example, while the ratio of the fluxes by evaporation to dissolution is about 6:1 for the monocyclic aromatics, it is about 20:1 for polycyclic aromatics.

The dry flux of organics to plants will be included, although the parameterization of the dry deposition velocities for the organic compounds has not been specified. This is an area of relatively large uncertainty. A careful evaluation of the range of possible of deposition velocities should be made.

The main approximation is how to couple the evaporative flux to the air pollutant concentrations. These approximations have not been identified. The simplest models assume either a constant, average flux (release rate) or a first-order removal and use Gaussian plume dispersion models. The most complex use heat balances and mass transfer coefficients which depend on the meteorology. The evaporative flux depends on the oil slick composition, either by Raoult's Law in the ideal case or with activity or fugacity corrections in the non-ideal case. A careful evaluation of the range of possible of evaporative fluxes should be made, and in general, the simple approximations should be avoided.

Finally, error propagation and error analysis should be performed on the cumulative model results.

Sincerely,

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Howard M. Liljestrand Associate Professor of Civil Engineering

Mr. Bob Adler Natural Resources Defense Council 1360 New York Ave., N. W. Washington, DC 20005

Dear Mr. Adler

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Review of the damage assessment and restoration activities associated with the Exxon Valdez oil spill is from the perspective of the status of the investigation at this point, and what should be done from from here out. Opinions were formed mainly from activities and results seen to date along with conversations with officials and workers in a number of areas.

1. Much focus has been on those effects which are visible and on the high end on the food chain; oil slick movement, oily and discolored beaches, and affected birds and mammals.

The progress of weathering, i. e. evaporation, dissolution and 2. effects microbial oxidation of the hydrocarbon distribution within the component of beached oil, and associated fertilizer effects, all of which relate to the quantity and quality of oil persisting, appears to be becomming well documented. Mechanistic aspects of the disolution process, particularly biodegradation, appears to be rathor low-tech with extensive repetition favored over complete modern, and thoughtful measurements based on sound principals of physical cemistry. A better balance between field work and the laboratory and theoretical support seems desirable in order to locate changes in the less-obvious relationships. Perhaps we can describe which components disappeared, but cannot tell to what they were converted, where they went, or why. Less obvious actors and bloconversions the process of blodegradation does not mean less important. For example half the oceans biomass is bacterial, yet measurements used are sensitive to only a fraction of a percent of these organisms. Efforts to understand biodegradation of mixed hydrocarbons in the oil phase, a key removal process in this instance, has not been attempeted. In laboratory culture, 70% bioconversion of aromatics can be to hydroxylated aromatics. compounds which account for most of the biochemical activity. carcinogenicity for example, of the parent compound, yet production of these compounds by bacterial action in the beaches remains unmeasured.

Seventy three miles of beach were treated with 40 tons of fertilizer without understanding these basic mechanisms affected. Well-controled laboratory experiments with structured mixtures of hydrocarbons, key components of which are radio-labeled as tracers are in order.

3. Documentation of the passage of particulate hydrocarbons to benthic biota appears to be progressing well.

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4. Significant efforts are underway to document changes in tissue chemistry and normal biochemical components in benthic fishes and offshore fishes related to the oil spill. While effects have also been measured on inshore fishes such as salmon, these investigations are more limited. Routes of contamination which involve dissolved hydrocarbons from the water column, as opposed to collection of particulate hydrocarbons by the benthos, are not understood.

Short-term laboratory studies of isotopic hydrocarbon uptake by fishes in bacteria-free systems could help decide if the hydrocarbons in salmon, for example, come from the dissolved phase through the gills, or from particulates firtst collected by their food organisms.

5. Induced changes in water chemistry appear to have been reglected even though the solubility and dissolution rates of light hydrocarbons and aromatics are known to be great. Sensitive measurements of the type required to document these changes were not implemented. It is too late to begin these now, but the technology should be in hand. Neither have measurements of metabolic products of the type documented in fishes (3 above) been attempted, yet their formation in the water column may be even more extensive. As alkylating agents, these are the bioactive components rather than the hydrocarbons as pointed out above.

Effects of the present spill as part of an accumulating load in marine systems due to the decade-to-century life times of hydrocarbons and their products appear not to be addressed. This is seen as a problem of scope, considering the spill as a regional problem when the impact is more its contribution to global changes in water chemistry. Since these changes are slow and cumulative, it is not to late to attend to the Alaskan contribution. The mainquestion is how an increasing load of hydrocarbons and their products affects the functionality of the ocean.

Required studies involve systems sufficiently well controlled so that effective concentrations can be sustained without losing them to bacterial activity, and thus get results over reasonable time frames.

In summary, the most significant damage impact not well addressed, in my opinion, is contribution of the spill to global change. Potential impacts are quite real. And, as in the case of egg-shell thinning from the products of DDT metabolism, careful investigations can establish cause/effect relationships. A significant fraction of the world ocean circulates through Alaska, and we add components to it that will be present for centuries. The fact that other nations may not be good world citizens does not relieve us from the responsibility of containing our discharges; someone needs to lead. The damage impact assessment seems to say that if the offending components leave Prince William Sound, which indeed they do in a few days or weeks, then they are not in fact of concern.

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COMMENTS AND RESUMES

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OF

STEVEN WRIGHT, PhD, KIM HAYES, PhD

AND TIMOTHY VOGEL, PhD

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Department of Civil Engineering

2340 G. G. Brown Building Ann Arbor, Michigan 40109-2125 313/764-8495 FAX: 313/764-4292 College of Engineering The University of Michigan

October 27, 1989

Robert Adler, Esq. Natural Resources Defense Council Washington D.C.

Dear Mr. Adler:

Professors Steven Wright and Kim Hayes and I have reviewed, the draft of the *Exxon Valdez* Environmental Impact Assessment Plan. In general, the proposed studies are described with a lack of sufficient detail for our assessment. Without evidence of the justification for the proposed research as is typically included in academic proposals (which include references to other published research), we cannot assess the level of science proposed. However, based on the scant information provided, we are able to make a few comments regarding some of the possible shortcomings of the assessment plan.

The studies are for only one year which precludes the examination of many phenomena that have longer time scales. Forcing scientists to do one year projects of long term phenomena is not appropriate. For example, the examination of areas that are "lightly-oiled" depends upon when they are lightly oiled. Some oiling of areas will continue after initial identification of lightly oiled areas (more details on attached page). Another example of the long term effect would be the mutagenicity and carcinogenicity of the oil spills on organisms.

Measurements described in the assessment plan seem suited to the expertise of the agencies personnel and not necessarily suited to best characterize the changes in the ecosystem. For example, little discussion about the effect of the spill on the microbial ecology is provided and then just briefly when referring to the benthic microorganisms. Measurements that cannot adequately cope with the heterogeneous nature of oil distribution will also suffer.

Since no discussion of time and money limits is provided and the spill area is clearly impossible to restore completely in a year or two, discussion of how the data collected will be used for partial remediation and accounting needs to be stated explicitly.

More detailed comments are attached.

Sincerely, Timothy M. Vogel

Assistant Professor

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COLLEGE OF ENGINEERING

THE UNIVERSITY OF TEXAS AT AUSTIN

Department of Civil Engineering • Austin, Texas 78712-1076 Environmental and Water Resources Engineering • (512) 471-5602

24 October 1989

Bob Adler Senior Attorney National Resources Defense Council 1350 New York Ave., N.W., Suite 300 Washington DC 2005

Dear Bob:

The proposed Air/Water Study Number 5 of the Exxon Valdez Natural Resource Damage Assessment Plan and Restoration Strategy on air pollution was sketchy, and the response to further questions provided only a few of the additional details needed to review the adequacy of the work plan. If this study had been proposed by an industry to a governmental agency for review, it would not be accepted in its current form. The proposal is still too vague.

The crucial questions are 1) which computer algorithms will be used, 2) what input data are available, and 3) what assumptions will be required to estimate the release of volatile organics from the slick and deposition flux of gaseous organics to the receptors. These determine the accuracy of the model predictions and are needed in order to perform error propagation and error analysis.

The specific computer algorithms for release, dispersion and deposition were not identified, only that they would be USEPA approved. The various dispersion models have different capabilities, and the specific model needs to be identified in order to evaluate its inherent limitations. In particular, most of the standard models do not properly incorporate dry deposition fluxes into the mass balance. That is, dispersion models with dry deposition added frequently do not conserve the mass of the pollutant. The commonly used short-term ISC regulatory model would not be adequate. A model that 1) uses the solutions of Rao for simultaneous dispersion and deposition, 2) includes corrections specific for dispersion in overwater boundary layers, and 3) includes corrections for dispersion in complex terrain is recommended.

The main inputs to the dispersion models are the meteorological data and the source fluxes. The meteorological inputs have not been identified, other than that the National Weather Service is the primary source and measurements were made on Coast Guard vessels. From these, the wind vector and climatological history will be reconstructed. While the data is available for the determination of the wind fields, it is not apparent that the data required to determine atmospheric dispersion characteristics exists, especially over the long trajectories between the source (the oil slick) and receptor (site of deposition and impact). The types and extent of supplemental data, beyond that normally monitored by the National Weather Service, from the source and receptor areas becomes important in order to miminize approximations and uncertainties. A careful evaluation of dispersion is needed for this case of intermediate range transport.

The VOC source flux will be modeled with specific modeling of the benzene, toluene, xylene, and ethylbenzene fluxes. These species are all of the same class, monocyclic aromatics. These volatile aromatics have been singled out for the hazard assessment, because these compounds should have had concentrations which could be detected analytically. In terms of hazard assessment, the reference is not the limit of detection, but the reference contaminant level which has a biological impact. It is recommended that the

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Detailed studies regarding microbial diversity changes as a result of the oil spill is necessary. An ecology cannot be examined without studying the bottom of the food chain. Laboratory studies examining the influence of oil on microbial diversity combined with measured changes in microbial populations at the spill location will aid in determining impact. In addition, long term studies regarding the recovery of microbial populations in the spill area are needed.

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Comments 140 to 142 are between comments 19 2. 20.

Comment 143 is between 114 3, 115

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October 26, 1989

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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

Trustee Council P.O. Box 20792 Juneau, AK 99802

KIM DUNN

Re: In re the EXXON VALDEZ Case No. A89-095 Civil (Consolidated) Comments to Federal/State Exxon Valdez Assessment Plan

Dear Sirs:

On behalf of the Plaintiffs' Coordinating Committee, representing all private party litigants in the consolidated federal and state actions currently pending in the United States District Court for the District of Alaska and the Superior Court for the State of Alaska, Third Judicial District, we set forth below our comments in accordance with 43 C.F.R. - to the Public Review Draft of the State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill (the "Plan") dated August, 1989.

We believe that the termination date of February 28, 1990 1. for all studies is excessively premature and that many significant damages to the interests of the plaintiffs represented by the Committee and the ecosystems of the impacted area will continue in subsequent years. In our view, in addition to the proposals set forth therein, the Plan should encompass at least some in-depth long-term studies of the economic and natural resource impact of this spill through, at least, the end of 1995. It is generally recognized by those scientists involved that, in the Amoco Cadiz oil spill which occurred off the coast of Brittany, France in March, 1978, the environmental impact continued for a number of years and that the ecosystems did not return to their prior state for a period in excess of five years. See, Ecological Study of the Amoco Cadiz Oil Spill, Report of the NOAA-CNEXO Joint Scientific



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Trustee Council October 26, 1989 Page 2

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<u>Commission</u>, US Department of Commerce, October 1982 at vii.^{1/} Further, the federal judge assessing damages to private and governmental plaintiffs in that case recognized losses incurred several years after the spill, including, for example, lost profits of oyster growers for 1979 and 1980. <u>In re Oil Spill by the "Amoco Cadiz" off the coast of France on March 16, 1978</u>, Findings of Fact, Conclusions of Law and Memorandum Opinion dated January 11, 1988, at 409-416.

We understand from scientific experts who have reviewed the Plan on behalf of certain plaintiff interests that the long-term impact of the Exxon Valdez spill both from an environmental and economic perspective will continue substantially beyond 1990 and that any assessment plan which does not contemplate further studies beyond next year would be incomplete and misleading. We therefore strongly urge the Trustee Council to expand significantly the scope of the Plan by including proposals for natural resource and economic damage assessment through, at least, December 31, 1995.

Part 1 of the Assessment Plan concerning injury deter-2. mination and quantification contains insufficient information regarding laboratory and field-work procedures, techniques and protocols to enable us to comment intelligently on the methodologies proposed to be adopted in the various studies. In many instances, the proposals lack sufficient detail on the availability of historical data, personnel and methodology to permit meaningful comments on the individual study's ability to meet stated goals or to interpret data. Furthermore, no information is provided on the qualifications of the scientists who will be conducting the projects and doing the laboratory analysis. Examples of some of the laboratory and field-work methodologies in respect of which detail is lacking include, but are not limited to, fingerprinting of hydrocarbons in sediment and tissue samples, preservation procedures for oil and water samples, visual recordation procedures.

¹/ The preface signed by the co-chairs of the joint NOAA-CNEXO Commission including Wilmot N. Hess, then Director of the Environmental Research Laboratories of the National Oceanographic and Atmospheric Administration, provides in pertinent part as follows:

> Today [October, 1982] many of the areas impacted by the [Amoco Cadiz] spill appear to the casual observed to be recovered from the effects of the oil. However, investigations have shown that differences still exist between some of the current ecosystems and those present prior to the spill. Hopefully, other studies will continue to watch and document the recovery processes.







BIRCH, HORTON, BITTNER, CHEROT AND ANDERSON

Trustee Council October 26, 1989 Page 3

for field and tissue sample collections, cataloging procedures and guidelines for field and laboratory notating procedures. We therefore reserve the right to supplement these comments in the event additional information is provided on, <u>inter alia</u>, (a) the methodologies to be used; (b) the availability of certain historical data; and (c) the qualifications and experience of the scientific personnel who will be carrying out the projects.

The lack of information regarding methodologies and 3. detail is especially apparent in the proposed economic studies set forth in Part III of the Plan. As regards these proposals (Economic Uses Studies, nos. 1-9), it is our view that substantially more detail regarding methods, analyses and objectives is required before we would be in a position to provide any meaningful comments regarding the actual studies proposed. Examples of gross inadequacies in the descriptions provided include, but are not limited to, the objectives, methods and analyses of the effect of the spill on commercial fisheries and fishing industry costs, methodologies to be adopted for the projections of market values of lands impacted by the spill, details regarding the surveys to be used in assessing loss of intrinsic value and methods by which the archaeological sites impacted by the spill have been affected and their injury assessed and valued.

It is also our view that the economic use studies are incomplete in that they omit consideration of the impact of the spill on tourist businesses and other commercial interests outside of those in the commercial fishing industry. There are many small and large businesses outside the commercial fishing industry that use or are directly or indirectly dependent upon natural resources injured by the spill. Those resources may include not only the biological resource, but also lands and waters that have been affected. Businesses omitted from any consideration by the Plan include, but are not limited to, guide services, lodges, taxidermists, water taxi operators, charter boat and aircraft operators, rental and retail firms for marine equipment and specialty equipment such as sea kayaks, fish transport businesses and other businesses which use or rely upon injured lands, waters, fish and wildlife. Because CERCLA at 42 U.S.C. 9651(c) requires that damage assessments shall take use value into consideration, we believe the economic use studies should include assessment of the impact of the spill on the foreging business interests. We strongly urge the Trustee Council to expand significantly the scope of Part III of the Plan to include the above-described business interests which, unquestionably, have suffered direct, tangible economic harm as a result of the spill.

4. We believe the Plan should include several toxicological studies of the spill both long- and short-term. Although we

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Trustee Council October 26, 1989 Page 4

understand Exxon has initiated a highly relevant marine toxicology study, no similar efforts appear to have been undertaken by state and federal government agencies and none appear contemplated in the Plan. In our view, such studies may generate significant data regarding the long-term impact of the spill on the marine environment and the economic interests affected and represented by this Committee.

5. The Plan does not encompass a study of the effects of the clean-up operations and the advisability or impropriety of certain shoreline techniques used following the spill. The Plan should include a proposal for such a study, including a comparison of contamination levels at sites which were treated as compared with those which were not, and an analysis of the appropriateness and potential effect on the environment of the shoreline clean-up techniques employed by Exxon and its contractors. An example of at least one subject for study could be the appropriateness of using dispersants with high-pressure hoses to clean rocks. Many other shoreline clean-up-related issues need to be addressed but are not contemplated by the Plan.

6. The Assessment Plan does not include a proposed study dealing with the social and psychological effects of the oil spill on the human population, particularly Native Alaskans. Our constituency includes the class of Native Alaskans impacted by this spill and, in our view, a social and psychological study of this nature is crucial to a complete overall assessment of the spill's impact.

7. On the whole, it would appear that the Plan is designed to meet CERCLA needs and adopt a regional approach to damage assessment and economic loss. Many of the proposals appear designed to develop macro-evaluations but do not deal with microevaluations which are site, locality or industry specific. We strongly urge the Trustee Council to consider a site/industry specific approach in addition to that adopted in the Plan.

8. Economic Use Study number 9 is too limited in scope. The study should be expanded to include other primary and secondary effects of the oil spill on archaeological, historical and cultural sites. These impacts may include, but are not limited to, an effect on the radiocarbon integrity of cultural sites due to the increased presence of hydrocarbons in the sediment, increased vandalism occurring as a result of the clean-up, unauthorized removal of artifacts, human remains or other material, and the effect of excessive pedestrian traffic due to the clean-up. Further, this study should be coordinated with the study recommended in paragraph 5 for an assessment of the shoreline clean-up operations on lands and resources. Finally, Study number 9 does not take into account the non-economic damages caused by the

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Trustee Council October 26, 1989 Page 5

violation of the integrity of cultural and archaeological sites on the physical and mental health and well-being of Native Alaskans.

9. The Plan does not contemplate the providing of data and results as collected to the plaintiffs. Clearly, plaintiffs and their scientific consultants must have timely access to data and results in order to monitor the progress of the impact and assess the appropriateness and reliability of the studies embodied in the proposed Plan.

The foregoing is submitted without prejudice to the rights of the plaintiffs herein and does not purpose to supersede or preempt the right of individual counsel to provide other or different comments from those set forth herein.

Very truly yours,

BIRCH, HORTON, BITTNER & CHEROT

By:

Timothy Petumenos, Co-Chairman Plaintiffs' Damages Committee of the Plaintiffs' Coordinating Committee

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September 20, 1989

Trustee Council P.O. Box 20792 Juneau, Alaska 99802

Dear Trustee:

I am writing to offer my comments on the draft "Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill." I am an avian physiological ecologist with expertise in the reproductive biology and energetics of high latitude plankton-feeding seabirds. I have extensive field research experience in both the arctic and antarctic, including Alaska.

The most glaring inadequacy of the Plan is the lack of a commitment to continue studies past February 1990. The cover letter that introduces the Plan states that "while related long-term research may be desirable . . . it falls outside the scope and intent of the plan." Damage assessment studies that encompass more than one breeding season post-spill can hardly be considered long-term. The deadline for completion of the assessment renders it essentially impossible to achieve most of the stated objectives of the planned studies. It will not be feasible to determine even the acute impact of the spill on many of the monitored species and species groups without at least one additional field season. For example, it has been documented, at least in the case of the <u>Amoco Cadiz</u> catastrophe, that high density aromatic hydrocarbons, a toxic component of crude oil, were present for at least a year after the spill.

Bird Study No. 7 entitled "Assessment of the Effects of Petroleum Hydrocarbons on Reproductive Success of the Fork-tailed Storm Petrel" is a plagiarized version of a proposal that I was invited to submit to the Alaska Fish and Wildlife Research Center of the U.S. Fish and Wildlife Service back in April 1989. (In fact, the second paragraph of the "Concern/

Justification" section, objectives B and D, and the last four sentences of the "Methods and Analyses" section are verbatim from my proposal). Consequently, I will review this study in some depth. Because Region 7 of the Fish and Wildlife Service had not originally intended on addressing objectives B and D, I am concerned that they will not be realized. I see no methods for measuring adult foraging efficiency or chick physiological condition (objective B). In fact, it appears that the proposed schedule of field work precludes these measurements.



Southern Illinois University at Carbondale Carbondale, Illinois 62901-6504

Cooperative Wildlife Research Laboratory 618-536-7766

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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

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Trustee Council Page 2 September 20, 1989

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The intent of the Fish and Wildlife Service for the 1989 field season was to spend only 2-3 weeks during the incubation period to find active nests and 2-3 weeks late in the nestling period to check "reproductive success." This schedule for field work will not yield information on the percentage of eggs that fail to hatch and why (i.e., were the eggs infertile, abandoned, addled, contaminated?), the percentage of hatchlings that fail to fledge and why (i.e., were nestlings abandoned, not fed sufficient food, fed contaminated food, covered with oil?), or fledging weights. Storm-petrel chicks generally carry large fat reserves when they leave the nest. Stored energy appears to be a critical factor in post-fledging survival. Chicks that have not attained large fat reserves prior to normal fledging age may either remain in the nest until the parents abandon them and/or die shortly after fledging. The proposal makes no mention of either measuring chicks (to estimate age) or weighing chicks (to estimate fat reserves) in the field. It would be desirable to determine growth rates of known-age chicks and measure their body fat content repeatedly (and nondestructively) using a TOBEC analyzer. The frequency and quantity of meals delivered to chicks by adults must be monitored in order to measure adult foraging efficiency (objective B), yet there seems to be no provision for collecting these data.

Because failure of the food supply and the resultant nesting failure are naturally occurring phenomena for most seabird species, it is not sufficient to just ascertain the percentage of nesting attempts that fail. It is necessary to document the cause of the failure and determine whether there is a link with petroleum pollution. The word from seabird biologists currently working in Alaska is that 1989 was a poor year for seabird reproduction throughout the Gulf of Alaska, and perhaps the Bering Sea as well. If so, the petroleum industry will quickly take advantage of any lack of documentation of oil-related impact to claim that all seabird reproductive failure in 1989 was a natural phenomenon. This underlines the importance of establishing the causal link between oil pollution and reproductive failure, should one exist.

This brings me to objective D which is extremely important and one of the primary reasons for focusing on storm-petrels as an indicator species. In order to determine the extent and persistence of petroleum hydrocarbon pollution in the marine environment, it is critical to continue collecting storm-petrel stomach oil samples from several locations until contamination reaches background (pre-spill) levels. Storm-petrels breed from Prince William Sound west to the Aleutian Islands and could be used to monitor petroleum residues throughout the affected area. Yet Bird Study No. 7 proposes collecting stomach oil samples from only one site (East Amutili Island) for one breeding season (1989). Why not monitor storm-petrels that breed on the Wooded Islands next to Montague Island in Prince William Sound or along the southern coast of the Kenai and Alaska peninsulas, areas that were hard hit by the spill? Also, there is no indication that the levels of petroleum hydrocarbons found in stomach oils of storm petrels from East Amatuli will be related back to sublethal (or even lethal) impacts on reproduction, as objective D states.

Bird Studies 2 and 3 essentially rely on surveys before and after the spill to quantify the impact on seabirds. Yet it is clear that complex oceanographic factors may be responsible for relatively low numbers of

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- Trustee Council Page 3 September 20, 1989

pelagic seabirds recorded during both offshore surveys and surveys at the breeding colonies in 1989. Relevant controls from unaffected areas may be difficult or impossible to obtain. Again, this emphasizes the critical nature of establishing cause and effect. Surveys can not do this; studies that incorporate chromatographic verification of petroleum contamination. gross pathology, histopathology, and enzyme assays can. It may be too late to obtain most of these data, but my guess is that, considering the sums of money involved, Exxon and Alyeska will contest the damages that are assessed as a consequence of the spill. If the Trustee Council intends to support the damage assessment so that it will stand up in court, the case needs to be adequately documented. Are blood smears being taken from seemingly healthy birds to ascertain whether red blood cells exhibit lesions characteristic of hemolytic anemai caused by oil ingestion? Are liver samples being collected from sick and/or moribund birds and immediately placed in liquid nitrogen for laboratory assays of aryl hydrocarbon hydrogenase (AHH) activity and other mixed-function oxygenase (MFO) enzymes? In short, judging from the draft Plan, I seriously question whether Region 7 of the Fish and Wildlife Service has the expertise, manpower, or inclination to perform an adequately documented damage assessment for migratory birds potentially impacted by the Exxon Valdez disaster.

I hope these comments assist you in preparing the final version of the **Plan.** Please let me know if I can be of any further assistance.

Best regards, Daniel D. Roby Assistant Professo

DDR:mlm

cc: Walter O. Stieglitz, Regional Director, Region 7 John D. Buffington, Deputy Assistant Director, Research

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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

Trustee Council P. O. Box 20792 Juneau, Alaska 99802

In reviewing the Public Review Draft of the Natural Resource Damage Assessment and Restoration Strategy Plan (hereafter the plan or document) for the EXXON VALDEZ oil spill forwarded by the Trustee Council, I found many obvious and rather glaring inconsistencies between the Restoration Plan and proposed studies found within the draft document. Among the proposed studies themselves, there was a noticeable absence of methods and statistics to demonstrate "conclusive" spill-related findings. This made it very difficult to evaluate any of the proposed studies under Part I of the plan except to say that, while the studies are certainly needed, not enough thought was put into them to merit review or funding based on that which is made available in the present draft document.

The following is a discussion of some of the problems I had with the document including statements regarding some of the general inconsistencies found between the Restoration Plan and the proposed studies; and the implementation and likelihood that these proposed studies will produce any "conclusive" results which could or could not be used to demonstrate an effect of the oil-spill. Also, I have included comments relative to other difficulties found while reading the document which hampered my evaluation.

RESTORATION STRATEGY-OVERVIEW

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On page 23, the criteria required for an acceptable study were briefly outlined and exerpted as follows:

1. The expected magnitude of injury or loss in services will be detectable and quantifiable.

2. The study design ensures high probability that resulting data will be conclusive.

3. The study is conducted in the most efficient, cost-

4. The study is ... coordinated with other studies for maximum effect.

The draft document, Part I, continually refers to the need of a statistically valid design for sampling coastal habitat injury. This should provide a basis for determining the extent of injury to the entire area affected by the oil spill. There is

Membership-supported Research and Education in Environmental Biology



little evidence outlined in the proposed studies (pages 112-175) which would indicate that this is nothing more than agency rhetoric. As I examined each proposed study, I never found a statistical plan outlined in any methods section. The authors continually refer to "standardized methods" or "established techniques" jargon without specifying the techniques. The most commonly outlined method was a comparison of oiled beach areas to unoiled beach areas (as controls) using a simplistic paired-test to measure differences between areas. To assume that the differences were the result of the oil-spill is statistically and biologically absurd. It is apparent that such a comparison will produce a significant difference between areas; however, these results will likely have nothing to do with the effect or amount of oiling but rather to the different biological characteristics within each area. Also, there will be differences among areas which were oiled. Such studies do not provide conclusive results, nor do they demonstrate (nor do they even suggest) cause and effect. One will not be able to make a statement as to the effect oil had on the variable being measured nor will you be able to provide any statement that oiling had no effect. Based on what we had to review, it is safe to state that the resulting data will be neither quantifiable nor conclusive. On only a few occasions was there any indication that enough thought was put into the statitistical methods used in the proposed studies to produce that level of veritable results.

Furthermore, the Restoration Plan (p.27) stated that it would focus on the long-term recovery of the ecosystem yet most studies were designed for early detection and determination of injury with a termination date of February 28, 1990. The Plan states that studies should determine and quantify the ... rate of recovery (page 29). It is sophomoric to think that this can be accomplished in such a time frame . Also, restoration alternatives focused on returning the damaged elements to "pre-spill" determination. With the exception of relatively clean, oil-free beaches, pre-spill levels of naturally occurring organisms are unknown. The numbers of seabirds that winter in Prince William Sound (PWS) and the production rates of seabirds, otters or other **pinnipeds** that were affected by the spill are only a few examples of those pre-spill levels that are unknown. It is unrealistic to focus on a pre-determined point that was not pre-determined.

SPECIFIC COMPLAINTS

The Marine Mammal Studies #1 and #2 are based on the ability to identify individual whales. This on its own seems adequate. The inadequacy lies in the agency's (NOAA/NMFS) hypothesis that the animals which have used PWS in the past but did not return, or animals that left PWS, might be interpreted as a result of the spill. Again, the resulting data will be inconclusive. This presence/absence evaluation and the interpretation of this evaluation is a completely inappropriate procedure to determine whether a demonstrated shift in whale distribution was spill related or the result of a more natural phenomenon, i.e. prey re-distribution. These whale-focused studies should be conducted concurrently with other proposed studies, i.e. Fish/Shellfish Studies







Numbers 11 and 17, to determine if a shift in prey might not have resulted in any change in the distribution of the humpback whales of PWS. In Glacier Bay, noise and disturbance from cruise ships were implicated in the decline of humpbacks in that area during the late 1970s. It has been since demonstrated that local increases in prey abundance elsewhere were a significant (if not the only) factor causing this shift. The cetacean studies outlined in the draft document should be more integrated with other investigations especially those which can attribute shifts in prey to whale movements. If not, then once again the study will produce less than conclusive information.

The study regarding the killer whale population (Marine Mammal Studie #2) is also filled with similar problems. The entire analyses and methods are based on a presence/absence of individuals and comparing that to pre-spill pod composition. Studies are recommended which would document the lethal impact of the spill but no methods are stated. Since the sublethal impacts of oil could only be demonstrated on captive animals, it is unlikely that the sublethal impacts of oil on killer whales will be possible within the framework of this study.

Finally, there are many studies which are being conducted by different agencies that could be combined, i.e. humpback studies (p. 113) and herring studies (p. 75). Because the level of interagency cooperative research is not there, it is unlikely that these studies are as cost-effective as they could be.

These are just a few of the obvious problems within my own area of interest. However, the entire document is full of glaring inconsistencies and holes. It seems that the plan was put together in a haphazard manner. While the intentions were good, the resulting data from such poorly-constructed studies will do little to evaluate the impact of the oil spill.

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P. Michael Payne' Marine Mammal and Seabird Studies

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P.O. BOX 221220, CARMEL, CALIFORNIA 93922

Trustee Council P.O. Box 20792 Juneau, AK 99802

September 21, 1989

Dear Trustee Council,

We have reviewed the Public Review Draft of the "State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill, August 1989", and our comments on this document follow. We are a non-profit organization representing over 5000 members concerned about the plight of the sea otter and its habitat.

Of greatest concern to us is the Plan's deadline of February 28, 1990. The Note between p. 28 and p. 29 indicates that funding for all field work and analysis activities through Feb. 28, 1990 is included in the Plan. The implication is that all field work and analysis will cease as of that date unless the Trustees have specifically approved continuation of some studies. Since the oil spill occurred on March 24, 1989, even studies that began as early as the day of the spill would not be "one-year" studies, as the Note suggests they would be. Many, if not most, of the studies described in the Damage Assessment Plan began long after the date of the spill, and some studies have still not been started (e.g. the radio tracking portion of Marine Mammals Study #6). How will studies which continue beyond Feb. 28, 1990 be funded? To achieve the goal of "determin [ing] injury to natural resources" as a result of the spill, studies must continue for years. For instance, if hydrocarbons accumulate in tissues of clams which are ingested by sea otters, there may be a slow accumulation of hydrocarbons in sea otter tissues which may eventually affect reproduction and The Damage Assessment Plan as presented may besurvival. sufficient to identify initial, direct damages but it certainly does not address long-term chronic damages, given the time frame allotted. We would like to see a clarification of how vital longterm studies will be handled, for Exxon ultimately should beresponsible for these studies, as well. Additionally, please provide us with a list of those studies which you have decided should be funded beyond the Feb. 1990 deadline.

On p. 18 of the Plan, you say that the Trustees are considering having the "responsible parties" participate in the damage assessment. We feel that it is completely inappropriate for the responsible parties to play a role in determining the degree of damage they have caused. Clearly, the responsible parties are biased and predisposed to find as little damage as possible. Damage assessment should be conducted only by independent parties.

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Our review of the Plan has focused on all studies that relate

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P.O. BOX 221220, CARMEL, CALIFORNIA 93922

directly or indirectly to sea otters. First, the estimate of the number of otters affected by the oil spill does not agree with the population estimates given in the permit application (PRT-740507) submitted by Dr. Tony DeGange of the U.S. Fish & Wildlife Service (USFWS) for studying otters affected by the spill. Dr. DeGange states that there are 7-8000 otters inhabiting Prince William Sound, more than 3000 along the Kenai Peninsula and over 4000 at Kodiak Island. Although Dr. DeGange does not specify how many otters in each population may have been affected by the oil spill, it seems likely that the total affected exceeds the number indicated on p. 14 of the Plan (5000 is implied in the Plan). The fact that 1010 dead otters had been retrieved by mid-Sept. 1989 alone suggests that many thousands of otters probably were influenced by the spill.

We have been supportive of the research on sea otters proposed in Marine Mammals Studies #6 and #7. We are aware of the objectives and methods of these studies, but we have not seen formal proposals for either of them. We, hereby, request copies of the proposals for these two studies.

Marine Mammals Study #6 has as its first objective to "determine the magnitude of injury to sea otter populations". How is injury defined? Injury should include mortality (both direct and indirect), behavioral disruption and decreased reproductive In addition to injuries caused by the oil, injuries success. caused by the cleanup effort also should be considered. Marine_ Mammals Study #6 is associated with Economic Uses Studies #5 and #7; if subsistence use of sea otters was affected by the spill, Economic Uses Study #6 also should be considered. The numbers of free-ranging otters to be implanted with radio transmitters in Marine Mammals Study #6 is not consistent with the number indicated in the permit application (PRT-740507) submitted by Dr. Tony DeGange of the U.S. Fish & Wildlife Service (USFWS) for this work. Two critical aspects of this important research- monitoring food habits of otters in oiled and unoiled areas and determining the cause of death for otters that die- can only be answered if there is very frequent monitoring of otters from a boat or from land. As we have indicated in letters and phone calls to the USFWS, the level of monitoring of implanted otters needs to be increased to 2-3 times per week instead of the once per two weeks currently established.

We have supported Marine Mammals Study #7 and urge that, as with Study #6, the goal of visual contact with each instrumented otter be increased substantially. The validity of both of these studies rests heavily on the quality of the monitoring of otters tracked over the long-term. The numbers of rehabilitated otters Com. Topic Issue Sug. Sort 656602









P.O. BOX 221220, CARMEL, CALIFORNIA 93922

fitted with flipper transmitters and surgically implanted (p. 127) is incorrect in the Plan: the correct numbers are seven and 45, respectively.

The two sea otter studies (Marine Mammals #6 and #7) should be listed as related studies under the following other studies, which investigate sea otter prey: Fish/Shellfish Studies #13, #14, #21, #22, and #26. USFWS should be included as a cooperating agency on all of these studies, as well. The effect of the oil spill on otter prey is crucial to determining the long-term effects of the spill on otters themselves. Results of all of these studies must be shared by the researchers involved to insure a complete ecosystem analysis of the spill's effects on otters and their prey.

The USFWS should be included as a cooperating agency in Restoration Study #1. For natural resources which cannot be restored (e.g. dead sea otters), an alternative recompense should be funding of long-term research to gain as much knowledge as possible about the injuries suffered by otter populations and about their natural recovery process. Based on other major oil spills in which oil has lingered in the environment for a decade or longer, research funds should be committed for a minimum of ten years to study the effects of the oil spill on Alaska sea otter populations. Studying the impact of the spill over the long-term on non-restorable resources must be treated equally in terms of funding with restoration of restorable resources.

The economic valuation of damages is a highly significant aspect of the Plan, and we find the information provided about the Economic Uses Studies insufficient for us to judge the validity ofyour approach. Economic Uses Studies #5 and #7 and possibly #6 all relate to sea otters, and we request copies of the proposals describing these studies. We would like to have the opportunity to comment on the specifics of these studies. We applaud the apparent intent behind the "Study of Loss of Intrinsic Values due to the Exxon Valdez Oil Spill" (Economic Uses Study #7). The worldwide outpouring of anger and sadness over the oil spill was certainly based on the intrinsic value which people give to pristine wilderness areas replete with wildlife. It is imperative that surveys of intrinsic value be distributed to people throughout the entire United States (and perhaps in foreign countries, as well), because many of us "outsiders", as those who live outside Alaska are known, put a very high value on simply knowing that untouched wilderness areas and wild animal populations exist.

We would like to receive a copy of the draft restoration plan once it is released for public review. We look forward to the chance to comment on the restoration plan.

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P.O. BOX 221220, CARMEL, CALIFORNIA 93922

In summary, our major points of concern are: 1) the inadequacy of the study period described in the Plan; 2) the level of monitoring of sea otters fitted with radio transmitters in the two sea otter studies; 3) the need for cooperative analysis of data gathered in the sea otter studies and in the studies of sea otter prey items; 4) the lack of details on specific methods for attributing economic value to natural resources lost or damaged by the spill (specifically, how will you determine how much is each sea otter worth?); 5) the lack of information on how recompense will be made for non-restorable resources that were lost as a result of the spill.

In this letter we have requested copies of: 1) the proposals describing the two sea otter studies; 2) the proposals describing Economic Uses Studies #5, #6 and #7; 3) the draft restoration plan; 4) a list of studies approved by the Trustees to continue beyond Feb. 1990. In addition, we request a clarification of your plans for long-term damage assessment (beyond Feb. 28, 1990).

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We appreciate the opportunity to comment on the Damage Assessment Plan, and we look forward to hearing from you on the above matters.

Sincerely,

Suman H. Shane

Susan H. Shane, Ph.D. Scientific Director

OC: Walt Stieglitz

HAND DELIVERY

September 20, 1989

Ms. Susan M. Lawrence, Acting Chief Branch of Permits Office of Management Authority U.S. Fish and Wildlife Service P.O. Box 3507 Arlington, VA 22203-3507

Re: Sea Otter (Enhydra lutris) Capture Permit Application, PRT-740507

Dear Ms. Lawrence:

Defenders of Wildlife (Defenders) is pleased to comment on a permit application to capture up to 650 sea otters from Alaska's Prince William Sound and adjacent waters. In my conversation with you and Sandra Bruce two weeks ago, you advised me that the comment period for this application was extended for two weeks. However, I was recently advised that your new Fish and Wildlife Service (FWS) Deputy Director and former Head of Research, Dick Smith, has supposedly gone ahead and prematurely issued this permit even before closure of the public comment period. I tried to verify this situation today, but my intern was unable to get a response from your office. If this is indeed the case, we find this at the very least a highly irregular and questionable practice. We would certainly hope that the FWS has not prematurely granted a permit for a program of this magnitude and expense.

There is no question that we need to conduct long-term studies on sea otters, and other wildlife for that matter, in those areas impacted by Exxon's oil from the Exxon Valdez to determine the overall effects of oil, oil spill by-products, and other contaminants on wildlife. However, as it presently stands, Defenders has some serious reservations and grave concerns about this permit application for sea otter capture, handling, and radio-tracking. From a short-term standpoint as of this writing, the in-hand body count of sea otters remains at around 1,000 animals from Prince William Sound (PWS), the Alaska Peninsula, Cook Inlet, and Kodiak Island. During my month's investigation in April and July in south-central Alaska, I certainly saw my share of otter mortality, stress, mishandling, improper feeding and care, and other problems related to otter rehabilitation and restoration. In addition, numerous Defenders' members, activists, and concerned citizens have related to me additional problems with otters and other wildlife. Stress in the form of human contact and oil contamination to those surviving animals continued all summer, and existing contamination will continue to kill otters this winter and beyond. As recently as three weeks ago, most of western PWS was covered with an oily sheen, and two weeks ago, major bays around Kodiak and Afognak islands were oiled with a sheen, and new bays previously unoiled were reported

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EXXON VALDEZ OIL SHILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD



with 4-5 inches of new mousse. The fact of the matter: these animals have been and will continue to be subjected to tremendous stress. Some of that stress has already shown up in the form of intestinal ulcers, inflamed mouth lesions, and shock. Pneumonia, exhausted adrenal glands, and death may result.

Having had considerable experience in immobilizing, handling, and radio-collaring various species of wildlife -- e.g., M.Sc. and Ph.D. research immobilizing and handling over 100 black (Ursus americanus) and several grizzly bears (U. arctos horribilis), and the radio-collaring and tracking of 35 black bears -- I am especially cognizant of problems related to drug overdose, allergic reaction to immobilizing agents, and stress. From a standpoint of stress alone, not to mention the need for a statistically significant sample size, the capture, immobilization, tagging, blood sampling, aging (premolar tooth sectioning), and transponder chip implantation of up to 650 sea otters seems extreme and far in excess of the necessary sample size. Knowing the personal difficulties in tracking 25 radiotagged black bears at one time -- including with the use of aircraft -- and the present difficulties that the FWS has had in tracking the few otters it radio-implanted this summer, how does the Service plan to conduct realistic tracking operations for 275 otters? This is unrealistic, probably unworkable (given otter daily movements of up to 60 or more statute miles), and perhaps logistically impossible.

Stress to the otters must further be factored into the research equation by the inclusion of the impacts of capture, later recapture(s), invasive surgery (transmitter and transponder chip implants), visceral fat biopsy, tooth extraction, tagging, handling, drug sensitivity, and oil spill impacts already affecting the animals prior to capture (e.g., emphysema, destruction of livers and kidneys, breakdown of immune systems, aplastic anemia, bone marrow toxicity, central nervous system damage, blindness, and other problems).

Stress, too, may result in the rejection or later abandonment of pups by their mothers. This is not satisfactorily addressed on p. 8 of the permit application. Capture can and has resulted in the drowning of pups with females, and this is nowhere addressed in this application (p. 9). I know of at least one drug-related otter mortality this summer, and nowhere is this addressed on pp. 9-10. No explanation is given why Cedar Creek Bioelectronic Labs were chosen to supply radio transmitters (e.g., Telonics is considered the best radio transmitter company for terrestrial wildlife collars; reference p. 10). No mention is made of the range of these radio transmitters, nor their known impacts on the body movements, behavior, breeding and feeding habits, and predator avoidance capabilities of these implanted mammals (p. 11). Is the capture, immobilization, implantation, and re-release of otters immediately following surgery the best and most advisable technique (as opposed to allowing surgical im-




plant recovery prior to release; p. 11)? It is unclear if all instrumented otters will be recaptured, nor now many times they will be recaptured, resulting in further stress (p. 12).

The explanation of impacts of the transmitters on otters is insufficient, given the unique nature of this study and the contaminated habitat in which it is being conducted. Although we are told that, "to date there has been a conspicuous absence of problems associated with the transmitter package and surgical procedures to implant those transmitters," (p. 12) no literature is cited (nor citations given elsewhere, for that matter) to verify this statement.

Regarding the actual research intent of this study (pp. 14-15), no mention is made of the importance of research gathered from non-radio telemetry studies which also need to be conducted in a detailed, systematic, replicated and careful way. These include population survey work, additional body counts and collections (with subsequent necropsies), behavioral studies of unimplanted animals, observations of pupping areas and breeding success, pup survivorship, etc. From my experience, "frequent monitoring" means far more than "at least weekly" observations How, too, will "detailed behavioral observations of (p. 13). marked individuals" be conducted, and why is it necessary to recapture individuals "in order to evaluate the effects of marking"? (p. 13) -- a seemingly unnecessary additional stress. So what if you recapture an otter only to find that it has lost its tag. You already stated that otter "temple tag" loss is high, and that coded transponder chips and radio transmitters are permanent (pp. 10, 11). The question -- of whatever significance it plays in this study -- is already answered.

Why is harassment (p. 13) listed as "not applicable"? It certainly would appear to be a problem, given some of the above concerns. This definitely needs to be addressed.

No budget was included in this application. Although Exxon may ultimately pay for this research, immediate funds will likely come from the American taxpayer. Budget information should be an intrinsic part of the application.

In conclusion, although this may be a well-intentioned study, it is overly ambitious, unnecessarily large, untenable, and likely will result in far more harm than good. Given the aforementioned concerns, if a study of this type is to be conducted at all, we recommend one of a much smaller scale, which still would provide statistically significant results with far less stress on the animals. Such a study should at most be no more than one-fifth the size recommended here (total capture of 130 otters, total transmitter implant of 55 animals). If this request is unacceptable, we ask for a public hearing on this issue to justify the need for such a large capture of sea otters, Com.TopicIssueSug.Sort2416602





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a verification that there will be no duplication of effort from other work on otters ongoing, that harassment will not occur, and that stress will be minimal.

Sincerely yours,

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Albert M. Manville, II, Ph.D. Senior Staff Wildlife Biologist Defenders of Wildlife

cc: John Turner Bob Smith Walt Stieglitz Tony DeGange

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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL

ADMINISTRATIVE RECORD

September 25, 1989

Re: State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill

Trustee Council P.O. Box 20792 Juneau, Alaska 99802

SANT. SYN

Dear Sirs:

I would like to comment on Economic Uses Study Number 9 of the Damage Assessment Plan titled "Survey of Archaeological Sites Impacted by the Exxon Valdez oil spill".

From May to August 1989 I was an archaeological consultant to Exxon assigned to a Shoreline Cleanup Advisory Team (SCAT) and worked in both Prince William Sound and the Kodiak area.

My concern is with the potential for continuing human impact on highly visible and critically sensitive historic and prehistoric archaeological sites especially in the form of relic collecting and intentional vandalism by individuals who have had increased awareness of, and access to archaeological sites in the oil spill area.

Perhaps the most visible and sensitive archaeological sites with the greatest potential for adverse impact are burial caves and rockshelters containing human remains. Even with intermittent archaeological monitoring one of these caves in the western part of Prince William Sound was vandalized during the 1989 cleanup even though the immediate site vicinity had been placed off limits to cleanup activity due to the sensitivity of the cultural resource in the area.

B. A. S. A. The State/Federal Damage Assessment Plan should specifically address the problem of educating oil spill workers and the public of the value, both cultural and scientific, of the archaeological sites in the impact area, and of the need for continued monitoring of the most visible and sensitive sites to evaluate the extent of human impact beyond the immediate cleanup phase of the oil spill.









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The following are some of the actions that should be continued through 1990 to mitigate or help minimize human impact to cultural resources in the aftermath of the oil spill cleanup.

- 1. Education of all beach workers and supervisors of the nature and sensitivity of cultural resources during employment orientation. Less than one minute of discussion of cultural resources in the 1989 Veco orientation program was not adequate. A short 15 minute video tape was made by the Exxon Archaeology Office but this tape was not used in the Veco orientation where it would have done the most good. At a minimum this tape or a similar presentation should be made part of the orientation program should cleanup activities continue into 1990.
- 2. Baseline pre or post-cleanup assessment of all known archaeological sites in the vicinity of oiled beaches. This should include video taping of the site condition, surface features and artifacts susceptible to disturbance. Vandalism which appears to have occurred prior to the oil spill should be carefully documented. A sample of known sites was documented and video taped during the post assessment phase in 1989 but lack of time did not allow adequate base line data to be obtained at all impacted sites.

<u>Placing of signs notifying the public of the</u> <u>presence of a sensitive cultural resource and</u> <u>the legal penalties for vandalism of archaeological</u> <u>sites.</u> This should be considered only for highly visible sites where the sign will not, in itself, increase the risk of vandalism.

<u>Periodic archaeological monitoring of known sites</u> <u>through the summer of 1990</u>. This would be done to detect evidence of vandalism and to evaluate the necessity for continued monitoring and/or other measures to minimize human impact to cultural resources on a site specific basis.

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5. Emergency collection and curation of surface artifacts in immediate danger of loss through relic collection or natural erosion. Artifact collection at highly visible archaeology sites should be used only as a last resort to avoid loss of diagnostic artifacts or significance cultural information.



Please consider including some or all of the above actions within the overall scope of Economic Uses, Study #9. Thank you very much.

Sincerely

obut C. Bills

Robert C. Betts, Archaeologist Vanguard Research



27 September 1989

Trustee Council P.O. Box 20792 Juneau, Alaska 99802

The State/Federal Damage Assessment Plan for the Exxon Valdez Oil Spill has been forwarded to me for review by the U.S. Department of Interior, Mineral Management Service. I serve on the OCS Advisory Board Scientific Committee.

I commend the committee that took on the task of assembling this report. It was a tremendous effort over a very brief time. My comments are kept within my area of experience, physical oceanography. First, in several places (in the letter to the reviewers and page 1 of the text) it is acknowledged that long term research will be necessary to determine the complete effects of the oil spill but that these studies will not address the long term needs. I don't understand who will if this study doesn't undertake this work now. This is a very serious fault with the plan. The study, as it stands, will only address the short term effects of the spill and the idea of completing the work by 28 February 1990 is unachievable. I also have some qualms about the lack of information on the ocean circulation in the determination of the impacted regions. For example, how far are the study regions going to extend along the Alaska Peninsula? On what basis were the regions east of Prince William Sound eliminated from consideration? - Some specific comments follow.

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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD





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Comment

- 26 The indication that the glaciers send icebergs floating out to sea is erroneous. While they do contribute ice to the waters of Prince William Sound, I have never seen reports of them in the open North Pacific.
- 7 Actually this could be increased to 320" of rain.
 - 22+ Who in NOAA identified sensitive areas and when?
 - The "lines of daily advance"suggest that the oil moved as a front which is incorrect.

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- 29 I think that a conclusion is being made here about the persistence of the oil that should wait until the studies are completed.
- 13

Prince William Sound is being identified as a fiord/estuary system. It is more

like an inland sea with throughflow. Water moves in through Hinchinbrook Entrance and out through Montague Straits. It is flushed by the largest freshwater system in the United States, the Alaska Coastal Current. This is the reason for the

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transport of the oil along the Alaska Peninsula.

15 14-15 Once again the long term effects are mentioned.

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- 16 8-9 It is concluded that certain areas are fouled by oil before the study has been carried out. Why?
 - The pathway through which pollutants reach the 30+ resources of concern in included in the Type B regulations, however I don't see any circulation studies or even summaries included in this plan. For example, what shores are or will be impacted? Remember that the oil is still being transported even today. What will be the maximum extent of the oiled shores? What are the durations of oiling? The Alaska Coastal Current has a reverse flow (eastward) offshore of the westward flow and this could bring the oil back to the sound to re-enter at a later date. What is the distribution of currents with depth? Oil now found at mid-depth could have a different pathway than that oil that remains on the surface or that that sinks to the bottom. What is the residence time of circulation in Prince William Sound, Alaskan shelf, and North Pacific? These questions will help assess where and when damage might occur; they are being ignored in this plan.
 - 4-5 How is one going to prove injury by the spill if there are no long term studies? We also have evidence of long term ocean temperature changes of about 1.5 C in this region that will affect the biota. This temperature effect needs to be monitored and eliminated as a possible cause of the observed changes of the biota.
 - 18-20 Once again, the distribution, transport and persistence of the spilled oil is mentioned without any strategy to assess it.
 - Again the distribution of spilled oil in space and
 - 4 Ongoing natural fluctuations in the physical environment need to be considered.

time is emphasized.

- 8+ Fortunately, there is a lot of physical oceanographic data available for Prince William Sound, but unfortunately it is in raw form and not analyzed since it was "bootlegged" on other programs.
- 18+ It might be mentioned here that UAF has done sampling in the sound and some samples were taken within a day or so of the oil reaching the shore.

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Once again, what is or will be the maximum extent of the spilled oil and how was it or will it be determined? It sounds like the extent is already determined. Who did it and by what criteria?

What consideration is being given to reoiling of the shores? Also, the freshwater influx in fall might protect a lot of the shore against reoiling. High runoff through porous beaches might also flush oil from within the cobble/sand.

35 4-5 I agree that the geographical and temporal extent of the oil spill is an important aspect of these studies but I question whether the methods are adequate (see below).

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- 35 14-15 While aerial surveys were SOMETIMES adequate during the initial phases of the spill, satellite imagery has proven to be almost worthless for oil tracking. How are the less concentrated and subsurface oil patches going to be tracked?
- 35 24-25 Once again, why are only the regions west of Prince William Sound being considered? (I realize that this is an antsafa.)
 - 27-30 I don't know of any oil spill models that presently can accurately determine the extent and volume of the spilled oil here. They also will need circulation DATA as input. Also, all beaches that might be impacted cannot be sampled.
 - 2-3 What is the rationale for selection of 1,3,5 and 9 meter depths? These sampling depths should have been determined from physical (pycnocline depths) or biological (euphotic) factors.
 - The benthic study participants need knowledge of the deep water circulation, that is, where the subsurface spilled oil is going.
- 48 Once again, why are the studies limited to Unimak Island to the west and why are no habitats east of the sound included?
 - How will physical factors such as circulation and water mass anomalies be considered as they influence the fisheries? Both studies 3 and 4 suffer in this aspect.

Time does not permit more detailed comments on the remainder of the plan but I would like to add that the freshwater discharge and its departures from normal might have a significant influence on the fisheries and other biota. The discharge immediately after the spill was very much below normal and influenced the spread of the oil and could have had an







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adverse influence on the salmon streams. The bottom line is that the [/] physical conditions must be put into the context as to whether they are normal for this region.

Thomas C. Royer Professor of Marine Science University of Alaska Fairbanks, Alaska 99775 (907) 474-7835/ Electronic Mail-Omnet/T.ROYER

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Arndt 17

Box 81369 Fairbanks, Ak 99708 27 September 1989

Trustee Council P. O. Box 20792 Juneau, AK 99802

Dear Sirs:

. . .

Thank you for the opportunity to review your draft "State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill, August 1989." The two proposed studies in which I have a particular interest are Economic Uses Study No. 6 (Losses to Subsistence Households) and Economic Uses Study No. 9 (Survey of Archaeological Sites Impacted by the Exxon Valdez Oil Spill).

I was very glad to see these important topics included in the draft plan. Both the proposed studies appear to be reasonably well conceived and practicable. Lacking specific budget information similar to that provided for other of the assessment studies, however, it is impossible to judge whether the costs of these efforts have been estimated in a realistic manner. In the final version of your plan I would like to see separate budget estimates for each of the economic uses studies.

With regard to Economic Uses Study No. 9 (Survey of Archaeological Sites Impacted...), I have two additional comments. First, the study as now described seems biased toward the assessment of effects upon prehistoric and/or buried cultural resources. I hope that damages to historic-age surface remains and structures will not be overlooked in the final assessment. Second, I would recommend deletion of the last two words on page 201: "or replacement." While some degree of restoration or mitigation of effects may be possible, it makes no sense to speak of replacing a nonrenewable, irreplaceable resource.

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Sincerely,

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Katherine L. Arndt

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Trustee Council Juneau Alaska 99802

I am a fisherwomen up here in Alaska. I travel alot in Alaskan waters. I see beautiful rafts of sea otters, seals, sealions, and all the other lovely sea creatures from Sitka up to Norton Sound.

It makes me feel very sad that our wildlife are going to have to go thru any more trouble than they have already been through because of the destructive oil spill.

Please I hope that you will reconsider your Animal studies on Marine Mammals. Please don't use them to gain money my good God they have suffered so much.

Can't you use samples from the dead ones you find on the beach and let everybody know that it is very important that they notify you when one is found. I know the natives kill the otters and seals, can't you take samples from them?

I have felt so helpless through this whole devistating oil spill I now feel helpless again to help these poor creatures who are at our mercy. Ibeg you people to please let these animals recuperate and get back to some semblence of their normal life. It's been so hard on us on land with our lives being turned upside down, We couldn't imagine how horible it must have been and might be for these creatures.

Please do a kinder form of reseach for these very special creatures of the sea. Compassion is something to be proud of and to honour.

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Respectfully yours, Nowiy J. Rott

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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

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Mrs. Nancy Rott Box 1428 Homer Alaska 99603

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Trustee Council Juneau Alaska 99802

I am a fisherwomen up here in Alaska. I travel alot in Alaskan waters. I see beautiful rafts of sea otters, seals, sealions, and all the other lovely sea creatures from Sitka up to Norton Sound.

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Please do a kinder form of reseach for these very special creatures of the sea. Compassion is something to be proud of and to honour.

Respectfully yours, Noring J. Rott Maring J. Rotte

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Mr. Richard D. Dederick P.D. Box 308 Kasilot, Alaska 99610 Sept. 20, 1989

Trustee Council P.O. Box 20892 Juneau, Alaska 99702

Dear Sir,

I am writing in regards to the scientific research on 650 Sea Otters; Marine Mammal Study 6, to be captured, drugged, tagged, blood sampled and injected with subcutaneous transponder chips. Up to 275 may be surgically implanted with radio transmitters and a biopsy of visceral fat will be taken for toxicity analysis. (permit # 740502).

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The ultimate objective, up here in Alaska after this devastating oil spill, is the restoration of the ecology of the effected areas, and to assure no more oil is spilled.

I can see no justification of this kind of study to only furthur impact the already ailing Sea Otters in the affected areas, and impact the fortunate ones who were not affected at all.

To injure an animal to make the assessment of injury to the animal shows incompetence and ignorance. This type of conduct has been the norm during this disaster for most all Federal and State agencies, and I am very disappointed and embarrassed at what I have seen.

To furthur this type of activity only adds insult to injury. What has happened to human dignity. What has happened to bona fide research, where humans retain their dignity at the same time gaining astounding information.

This type of invasive research and harassment will only gain us limited knowledge to questions which are right before our eyes. Which the Sea Otters showed magnificiently when they gouged their own eyes, and chewed off the ends of their fingers.

Please stop this horror of data collection. But that money towards research of containerized oil transport, or restocking Sea Otter habitat.

The Fish and Wildlife Service has got to prove that they are the protectors of our wilclife. This reseach permit proves otherwise. It proves the love of money.

We request that you deny this study and if you need more information to base your decision we request a public hearing to be held in affected areas of Alaska and Washington D.C.

Thank-you for your consideration.

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Senator Frank Murkowski Senator Ted Stevens President George Bush

cc: Congressman Don Young

Sincerely,

hand O. Dederich



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EXXON VALUEZ OIL SPILL. TRUSTEE COUNCIL ADMINISTRATIVE RECORD

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Thank you for the opportunity to review and comment on Economic Use studies Numbers 6 (Subsistence) and No. 9 (archeological impacts) of your Natural Resource Damage Assessment Plan. Since I am a professional archaeologist, I will confine my comments primarily to the latter document, although I have reviewed both.

With regard to the subsistence document (pp.196-197) I will only note that the objectives appear to be very ambitious and that the work plan lacks the specificity found in other plans in the document. Absence of a budget projection is also puzzling. What, specifically, is the anticipated investment of effort to be? Will all named communities be dealt with (a Herculean task) or will a sample be drawn? Objective A (literature review) is crucial, because this study must build on previous work by the ADF&G Subsistence Division if meaningful results are to be obtained in the time available. In Objective C the phrase "changes in subsistence use through time" is undesirably imprecise. Are we speaking of before and after the spill, or is_ a longer baseline intended. The question of budget and level of effort must be forthrightly addressed, otherwise this necessary project is likely to get only the scraps from the table, a clearly unacceptable outcome given the human needs and costs associated with this particular topic.

Many of the above comments also apply to the archaeological impact document (P.200-201). While the need for such evaluative work is very real, the plan again lacks specificity and there is no indication of the level of effort anticipated and, unlike other plans, no specific estimated budget appended. The probable outcome of this situation is drearily clear to me. If the subsistence studies receive the scraps from the table, the archeological impact studies will receive the crumbs from the scraps and not be funded at a level making achievement of the necessary ends possible.

The objectives stated , while very broad, are reasonable and necessary. Much of the methods and analysis section is undesirably vague however. The use of the term "model" in the first paragraph seems inappropriate to me. In my estimation a more precise term for what is needed would be <u>inventory</u>. To say that a "representative sample" (how drawn? how large?) will "be researched" (meaning, specifically, what?) and "archaeological tests [of what kind?] will be conducted" is too vague to provide a basis for planning.

The second paragraph is considerably better, although one wonders how artifact loss over time is going to be monitored in

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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

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the brief time available for this study. Baseline (in this case, pre-oil) data are badly needed, indicating that any sites for which such data is available (if there are any!) should be included in "the sample." I lack optimism that many "specialized data recovery techniques" can be developed in a crash program of this kind, although I would be happy to be proved wrong on this point.

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A final factor that badly needs consideration and monitoring is the impact (if any) of oil cleanup activities on sites. If any sites are located on "cleaned" beaches, they too should certainly be included in the sample. The task of placing a cash value on damage done to archeological sites will be an interesting one, breaking new and controversial ground at a most inauspicious time.

Finally I must repeat my projection that lack of specification of the intensity of effort (and associated expense) anticipated for this project and lack of a budget projection virtually guarantee that funding (hence effort) will be truly minimal.

Thank you again for a chance to say my piece. In the interest of getting these comments in while they will still perhaps do some good (I received the document yesterday) I have prepared them in haste and bypassed the customary retyping on institutional letterhead. They represent the best and most helpful comments I can give under the circumstances.

Respectfully submitted

Mim B. Witkman

William Workman Professor of Anthropology University of Alaska Anchorage



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P.O. Box 658 Homer, Alaska 99603 September 27, 1989

Trustee Council P.O. Box 20792 uneau, Alaska 99802

Dear Council:

Brown

I am a citizen of Homer, Alaska, and comment herein on your Public Review Draft-of the "State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill" of August, 1989. More specifically, I address Marine Mammals Study Number 6 (pgs 125-129) with regard to Impact on the Sea Otter.

-During April-August, 1989, I was hired by Excon to monitor daily otters brought into the Valdez Rehabilitation Center (April- une) and akalof Bay Rehabilitation Center (uly-August). The rehabilitation process was grueling and stressful to the otter, and was used more for research than healing an oiled otter. Of the 2-1/2 months I was in Valdes, only one out of many gave birth to a live pup, all others being still-born. This says a lot about human intervention with sea otters. It has been proven in records through necropsy/autopsy reports that stress to the otter causes ulcers, mouth lesions, and in many cases death. The rehabilitation process had the pros and cons, and still I cannot say with conviction that it was the best thing for the otter especially for those rehabilitated otters who have had surgically implanted radio transmitters. These otters' life will never again be normal or "in the wild". I have watched and listened with anguished heart the process of capture, drugging, holes punched for flipper tags, extraction of molar, implant surgery for transmitters, with the simultaneous screams of despir and fear of mother for her pup and the cries of otters reaching out to thir mate or bonding partner. These mammals do have intense feeling as a human would have if their young were to have a same process inflicted. When the research boats of Fish and Wildlife go out in pursuit of the otter for research, it will inflict stress and harm to the species in the name of research. This research will not benefit the otter as much as the "scientist".

Specifically, I oppose the intented research for the following reasons:

1. The method of capture is by tangle net, while requires a long and hard chase by motor power. It is extremely exhausting and durressful to the animal. When in the net, they will struggle with extreme stress.

2. Drugging can cause allergic or reactive effects, and in previous cases otters havedrowned when put back into the water after the reversal drug wore off.

3. Chances of abandonment by mother is extreme where her pup is captured, taken from her, and she is unable to retrieve her pup in a short periodof time. The pups will not be weaned, are still Dependent, and would have extreme difficulty and danger, if not impossibility, surviving on its own.

EXXON VALUEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD



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Trustee Council September 27, 1989 Page Two

4. Surgically implanted transmitters and transponder chips will adversely affect the otter for the rest of its existence, and is invasive.

5. The number of capture otters is excessive.

There is a discrepancy in the number of otters being used for this research. In the Assessment, it is stated that up to 100 mature females in oiled, 100 mature females in unoiled, 50 dependent pups in oiled and 25 dependent pups in non-oiled areas will be instrumented with radio transmitters to document survival and dispersal. Fish & Wildlifehas been granted a Permit to research 650 Wild Otters. This fact was ommitted from your Assessment. Such ommission seems to cover up or minimize the full and broad intentions of Fish & Wildlife and the extent to which research will be performed. Research on 650 Wild Otters is exfessive. Additionally, despite requests for public hearing on this matter before the Permit was issued, this Permit was approved without apprisal of all pertinent facts, data and information, and should be null and void.

Here we are, spending so much money on research and neglecting the real cause of concern. We should better be using this money to find alternative methods of energy so that we are not so dependent on oil, or to instigate oil tanker legislation so that our waterways are more protected, and how we can improve oil spill clean-up technology in the event this should happen again.

There is no money value one can put on a living animal in the wild; its intrinsicualue is priceless. We can best help the otter by keeping its environment clean by not fouling its water with oil and trash/waste than by cutting them open to learn more about them. Its a value system more in line with caring rather than destroying.

Nancy Brown

.....

The attached Petition was circulated for 1 week in Homer, to get an idea of how many people were aligned with my comments above. I give them to you for review.

cc: The Hon. Ted Stevens The Hon. Frank Murkowski The Hon. Don Young U.S. Fish andWildlife, Washington, DC

22 folle Senkins Red montain other center Homer Alasta 99603



My firs contact with sea atter come one maining very coulogin Caldan when Farrial at the imach unit" at the community schang at 6:00 con and was acked to montos attus consitio ir on intensine care unit. In a shart capile we all sicked up animal carriers and moved the cetters from that huilding to the Junion high school Jum . Sthen spent the day manitaring and fuding washed alled atters on noreans stages of good and bod health That night I helped dean ailed attas

at Dalding an aprilad of time I watched atter die ond atters gut with I know atter constatus into stayed with this patients through the appassing shift, taking cat naps to make sure these atten had the ust chance surviva possible future The aught experience Shad in Colden coas watching atters, this costo now stund to this normal state, taking This furt both in water which become a very dark lucion quickly Watching a partially rehabilitated attuin a spiral spin would melt the Calder heart

Otter care has come a long cases since Ply ward and heavy wire mech 'cagea, hartily

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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

milt by contertion carpentus, but laugh & soy the least. Anon-work with actus in the Kabolah Boy facility which hauses muy bearthy, happy, peaciful attas. When, two days ago, I saw a recent transfer from the Seward facility spusing and flippings loving the seamed she done through , which her per mater had emapped around them, I was sinkend to know this heautiful, intelligent, applichorate (with attus) non malent, play fal creature, who had survey against all adda from what I had heard larly on in Valdey, was now heing treated not an a creature returning wentually & freedon, lut apart of an experiment. She had a segualle radia termitter crister of sounds subsutances fat in her letty, and wanted have this foreun. She was to be tocked, cutainly, but why? and hig whom? That is, could personalize frindly then scientists tracklute courehu harm?

The stang you that attus must be trached. So as to know if they return to will dress. Why? are they to be re-callested and taken elsewhere tobe set free to do it all saw again. Others are good swimmus. another stay is that the information is to be used in Jutice ail spield. Save still,

to what end? Juing the uppurementus the Cenefit of the doult, what about the sea atter from the volding farility which une released with radio andmetter implants in July. are these not a large enough sampling from the papulation of capured ailed atters to give on indication of what they are allout? Our is The practicen that atters, like human livings are individuals. Some adapt to current surroundings, Some ga where food (work in humans) is to be found. Some would do any thing to retern to their place of lusth and from ongenhuo. Cenather reason for complete might be to see I there atters would be able to adapt and ____ reproduce in the and again. What is the diffuence liteaun groups of attur nating and reproducing (which they are doing) in pens, with each ather and with will male logue " unailed attles, and doing the some in a quatu space - Only the food sauce is apperent. The other has no contract. The fatalog Boy foulity has a semulated wild Uniconment. When a atter left recently a per hoving been left open posselle leg people who drew alove from her ond her pen mater willie in the day, She want plug hant striking and on her sion. Her penmater stayed put. Wand it not have been sensible

for These fine attens to have been released somewhere together so the independent one cauld help the athers faid ford and survive? Or go this separate magne. Winter is near. Sont let the Canquet sum for open over sume cont halt the Chargein Season . Oven one of these Strong onimals which has been resultion in augh to survive half how washing and forty minute rensings (after the trouma of heraming siled and capured) who has keen mused lieste to health by people who do save, might fince re- entry into the wild in fallow winter with a hearing cald alifust in his on here helley leas Than a honce in her continued attempts at surveral. What inprement? Con these conditions he likend to reality to anything I sinciale atter around being shart's Pather, is this not infliction of pain used an instiguation for the money spent by Caron under the genunment on this playest? Hagnit angene heen maiter, to are a hill presented (buld this not be histon, puhaper top-selated) cirtainly pro- sil explanation - ulated Masona gon this upperement; This strusing out, Dossilly shortening long tim partually threatening short-tem the leves of these innocent require from the reading ail spill

Sans at the scenario another way for a moment: imentices of your formily, Day-"hildren of two or three years have been harrichly lujured in a major disoster such as a nuclear up placion at a pour facility they three mild island. Day that children cure Jue deatment which musselevely seemed to creve them aut the scientisto who concented The cure wanted to make sure of long turn Survey infactene accouse They want to Continue ouce nuclear pour ond contingate Similar desortes elsewhere. How would gen ful about the surgesal inglantation of Toxio tommittes a your children's lettices, in your own helly? People more Iscenticto must have their deta, you are glateful the genunment has pair to hills, has cure you children, but do they now our than? Would you also not wont year children not returned to you, to this normal environment, as soon on possible to run and play in the Summer Run, to Manne from the monthis in a hospital 1000. Non snew will fall. This cent a froction of the bowen the sea others have fored, may pore Dorto you to consider the consequences confullio infore setting a present which may will wind one day to the greater population of the could. Klaatte.

ond 2 mean pre, not subject to a upiteme No and I there fakalag Bog sea atters file !-Hone you Alenber -----------4 . . . Fr. S. 4 and the state of the state . # 202 -..... -----

The Trustee Council P.O. Box20892 Juneau, Alaska 99702

To whom is involved in the damage assessment plan,

Trustee is defined as one to whom something in entrusted." Your agencies are entrusted to care for the health of and protect our wildlife populations. The studies pertaining to Marine Mammals do not do this. If you managed your budgets properly you would have enough money to perform your positions properly. we need enforcement out in the field, not this invasive surgery, and these studies to create jobs and bring in Exxon money into your coffers

THE ACTIVITIES PROCEEDING IN PRINCE WILLIAM SOUND MUST STOP IMMEDIATELY TO THE SEA OTTERSAND THE SEALS BEING KILLED, in the name of science.

The Fish and Wildlife Service and the Fish and Game Dept. have got to be under more control. These type of activities condoned by these agencies and done way out away from public view need an unbiased group who are not in cahoots with these opportunistic self interest agenc ies. I need a detailed justification of why you people feel justified in doing these kind of detrimental studies. If you make money on this information you may or may not gain, i request a detailed statement on where the money goes, and to whom, and proof that this money does indeed help out the impacted environment, not budget the researcher further torment of Marine Mammals or Terrestial animals. Or budget the beaurocrats sitting at their desks making biased decisions when they rarely get out into the disappearing wildernessto see first hand the effects of these decisions.

The scientific community has to open the club doors to concerned and rational people of the United States, and include the emotions of people to gain a well rounded balance of ideas as our Democracy proclaims

Use this damage assessment money more wisely to protect us against another oil spill. We are all well aware up here in Alaska that this impacted our Wildlife, and will continue to impact them as long as the oil is still in the water and on our beaches.

Demand a bill be passed now without further delay to assure us of this. Use the data you have already before you. I'm certain our court system isn"t so ignorant that it can't see the devistation.

If it is, we need a new court system



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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

With kind Regards,

al Helminshi BOX 4654 SOUDATNA AK

cc: Emanual Lujan, Secy Interior Senator Stevens Senator Murkowski Rep Don Young



EXXON VALUEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

Clease For I find it spalling that a permit may be essented for other research. Capturing to save others is acceptable but for research is northenhable not in the best interest of alasha of the natural habitat. The practices used for applice + mplat inplantation whe Our treatment of the orled otters was not humane in many instances It is anthinkable that the degradation continue for 650 balthy Ollers. upto J Maion Rooth P.D. Bex 2991 Homie AK 7-35-6308

Director, Fish and Wildlife Service Mr. John Turner Office of Management Authority Box 3507 Arlington, VA. 22203-3507 Dear Sir,

Dominion, as described in Websters new world dictionary states: Pule or power to rule; sovereignty.

The Dominion of government has rule or power over the people, imagine of there had been a nuclear power plant explosion, and radiation had been eromatted over a 200 square mile area, and a certain faction of this bovernment who had been designated the protectors of the people. This group of the government, decided to do experimentation over its people to test for the effects of the radiation over an 8 year period. The people had been badly burned by this and were highly impacted internally as well as externally. Their gardens and live stock were contaminated by radiation so e en what they ate was toxic. During the first six months following this tiseaster thousands of people died, mothers and fathers watched their children die. Children were abandoned by their dead mothers and left to starve to death. Neighbours watched each other suffer and or die in great pair and suffering.

magine that the government decided to do experimentation over these beoble while they were still just barely recovering yet doing the best they tould to regain some semblence of normalcy even though the disaster was et:'E lurking close around them. Imagine if the government decided to madvertantly capture women against their will while they were out proceny shopping and snatched the children off the playgrounds while their mothers were watching and sceaming to them in horror while the children cryed out to them for help. The mothers would be captured and restrained from protecting their young, one of the most powerful instincts shown to man or beast, to watch the barbaric, painful treatment their offepring would go through. This government who had decided on its own to give the definition of dominion to mean unlimited non restrictive power to proceed with any type of behavior it deemed necessary. This as remnent who was designated the protector and was thus named after the people. This government who were paid to be the guardian over the people. This certain faction of the government decided on a certain pecentage of the population to be their victims. Half would be dependent children who needed to be clothed fed protected and taught the ways of

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TRUSTEE COUNCIL ADMINISTRATIVE RECORD the world. The other half would be women in their prime reproductive years. A small percentage would be men. This research group forceably tyed these innocent children down, drugged them, pulled their teeth, punched inch sized holes in between their toes, making some individuals pleed profusely, and subcutaneously injected a pencil sized transponder under their skin. 100 of these children went through a surgical procedure whereby a transmitter the size of a quart sized milk carton was placed into the abdomen free floating with the other organs. The mothers screamed and sruggled to reach out to rescue their children. They saw their paties blood being shed to satisfy only the gnawing hunger of greed and morbid curiosity of this certain faction of the government. Two purces of fat was out out of the childrens stomach before being sewn up through four layers of tissue. Over 100 ml of blood was drawn from each of 300 children, sometimes after continual holes had been poked into the leds and necks of these children and women in search of the veins. Eventually the victims would be released sometimes to die of complications sometimes to go through painful recovery unable to live normally because of this heavy block of equipment in their abdomens or the painful plastic tags which had been pushed through the wounds of their feet. The women of reproductive age who were instrumented with these mile carton sized transmitters would undergo extreme pain during intercourse because of this huge piece of equipment in their abdomens pushing against the other organs and as they got pregnant and the fetus grew the uterus would push up against this thing causing great discomfort and deformities of their child due to the foreign object. This wasnt the end of this horror for these victims. Again and again at any time during the next 8 years of their lives, they would be yanked out of society and undergo this extreme treatment of capture, bloodtaking fat chunks taken, and tooth pulling. The transmitters would never be removed. The government would receive money for this research the people would receive nothing but the pain, agony, stress, and the knowledge that they had not only been impacted by the explosion but by the continual surgery and scientific research which was to prove what the victims were quite

aware of already. That they had been impacted by the explosion and it was quite detrimental in more ways then just the contamination caused by the nuclear explosion. They also learned how the word dominion had been pertrayed and defined by a certain self interest group of the government to mean unlimited, non-restrictive power to proceed unquestioned with any type of activity this certain self interest group had deemed proper and necessary in the name of science. This account is an analogy pertaining to the conduct of Fish and which is evice over our wildlife in Alaska. You may feel that this account is entotional or excessive and that is exactly the point. The conduct of the research group of the Fish and Wildlife service is totally unacceptable, and grossly excessive. It raises emotional, ethical, and philosophical duestions which need to be brought forth before the American people. Without entotions and ethics on this earth the human being would be but a riere robot. What a sheer pity that being emotional is downgraded in our society. The justifications of this proposed program to captue and torment 650 Alaskan Sea Otters is vague and shows a total lack of regard for the true victims of the oil spill, the Alaskan Wildlife.

This program is just a ploy to steal exxon dollars or draw much needed US treasury dollars for a useless study which we already know the answer to the questions searched for. Are the Otters impacted by the oil spill Open your eyes Fish and Wildlife, the evidence has been daily portrayed in its horror. To continue with additional horror and impact is criminal and totally unacceptable.

Sincerely,

Frank Pott

Box 1428

Homer, Alaska

99603

The sizes of transmitters are in proportion to the size of a child compared to the size of a pup. The length of years is due to the length of time an other lives compared to a human.

Dear



Sandra Thomas, M.D. Jakolof Otter Center Red Mountain Via Homer, AK. 99603

9-15-89

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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

Dear Sir or Madam,

Trustee Council

Juneau Alaska 99802

Box 20792

The Contract in the

I think that abdominal implants of radio transmitters into the sea otters who were victums of the Exxon Valdex Oil Spill and who have been rehabilitated and are currently healthy enough to be released should stop. These wild animals are being transformed from victims to research specimens for Fish and Wildlife Service of Alaska.

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Surgical implants are deleterious to them physically because of intitial risks including infection and long-term risks including inadequate physical assessment follow-up and possible fetal death if pregnant females are inadvertantly implanted.

The implants are delerious mentally/emotionally because of increased stress from added handling, pain, and post-surgical recovery, and because of maintenance of long-term human/otter interaction by proposed monitoring for two years from planes and boats.

Ethically, to pluck a wild animal out of it's habitat in the name of rescue with the goal of rehabilitating it back to the wild in the shortest possible time frame and then to change that goal mid-stream to make that animal a research subject and delay it's re-entry into the wild is to revictimize that animal. This is morally dishonest.

Scientifically, these rehabilitated searciters are not representative of typical wild sea otters and any correlations between behaviorial research on these animals and the general population of otters can not be made. The risk of surgical implantation of radio transmitters in these sea otters clearly outweighs the possible benefit of this research. This is not scientifically sound.

Thank you for your active participation in the prevention of unethical treatment of these Alaskan Sea Otters.

Sincerelv Sandra Thomas, M.D. 50 CARLI PHARM D DUM

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Sandra Thomas, M.D. P.O. Box 2724, Homer, AK. 99603

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9-5-89

John Turner Director of USFWS Office of Management Authority P.O. Box 3507 Arlington, VA 22203-3507

Dear Mr. Turner:

I urge you to conduct public hearings regarding Alaska Fish and Wildlife Research Center's Application for Scientific Research on Sea Otters, file No. PRT-740502.

The Sea Otter has a history of being THE MOST political sea mammal, the protection of which has created heated controversy among the commercial shellfish industry, environmental groups, wildlife managers, and animal protection groups. Because of the controversial nature of public response to sea otters, it behooves you, as director of a federal agency representing and serving the public, to invite public discussion of any experimentation on sea otters and especially this latest proposal by Tony DeGange.

Mr. DeGange's application is questionable on many levels. First, the sample size is about equivalent to the total number of dead otters retrieved from the world's largest oil spill. This number is excessive! Second, the application minimizes the side effects of the operation, of the drugs administered, and of capture/handling trauma to wild sea otters. It was well documented in the otter recovery centers in Valdez, Seward, and Homer, that otters developed hematomas and infections post-operatively, developed allergies to drugs with the worst side effect being death, and developed intestinal ulcers, depression, anorexia also leading to death as a result of capture/handling trauma.

Third, the application is filled with vague statements. For instance, #7b1 states "when possible, individuals will be recaptured in order to evaluate the effects of marking". Yet, Mr. DeGange never addressed what effects, even potential effects, of marking that he's looking for, nor does he state the frequency of recapture. Fourth, this application may violate the Marine Mammal Protection Act of 1972 by not providing bonifide scientific research and by duplicating existent or concurrent research.

Fifth, side effects of the operation including intrabdominal adhesions, subsequent inerference with future pregnancy in females and potential growth retardation in pups has not been addressed in the application.

Not only do I request public hearings because of all the above reasons, but also, I request that they be held in all of the Alaskan villages, towns, and cities affected by the Exxon Valdez oil spill.

Thank you for your attention to my request.

Sincerely,

Sandra Thomas, M.D.

Namery J. Hillstrand P.J.Box 674 Homer, Alaska 99603

Trustee Council Box 20892 Juneau, Alaska 99702

Greetings,

I have to question whether studies in this Draft Natural Resource Damage Assessment Plan and restoration strategy for the Exxon Valdez oil soill are fully justified scientifically; and are consistent with the ultimate objective of restoration of the ecology of the affected areas.

Marine Mammals Study Number 6 will not" identify potential alternative methods and strategies for restoration of lost use". How do you restore replace or acquire the equivalent of the damaged resources namely the Sea Otter. Can we accurately state that this proposed Sea Otter research does not on its own cause injury and damage to very nearly the same number of Sea Otters as were found dead on the beaches from the oil spill? To release an animal back into the wild with four substantial bleeding wounds constitutes injury under, any guise of justification put forth by this type of invasive research.

This proposed opportunistic study will be taking accentage of recuperating Sea Otters in obviously impacted areas with little regard for principals or consequences.

Boat and aircraft surveys for population estimates slong with Pup ratio counts to measure productivity, and necronsies performed on carcasses found to determine cause of ceath are commendable, tut to capture, drug, double tag take blood samples, milk samples, viseral fat biopsies, other tissue biopsies, inject live otters with subcutaneous transponder chips, and instrument these animals with transmitters coes not take into consideration the moral duty and obligation of the Fish and Wildlife Service duty to protect the resource and maintain the health and stability of the marine ecosystem.

The money used in the damage assessment studies should be used wisely and appropriate methodologies should be chosen for the assessment. This money should be used to research containerized transport of oil of safe overland transport not wasting time and money harassing an already ailing creature. Lets get down to the bare bones of this matter and snow some constructive intelligence.

This study needs definite independent review. This has been compiled without much forethought and needs an overseer to assure bonatide scientific research.

> With kind Regards, Sincerely,

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vancy J. Hillstrand

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EXXON VALDEZ OIL SHILL

ADMINISTRATIVE RECORD

TRUSTEE COUNCIL

Alaskan Wild Animal Rehabilitation Nancy J. Hillstrand P.O.Box 674 Homer Alaska 99603

Mr. John Turner, Director U.S.F.W.S. Washington D.C.

Greetings,

Pursuant to the Marine Mammal Protection Act of 1972, 16 U.S.C. 1361-1407 (as amended), and the promulgated regulations therein, I have to scrutinize the U.S. Fish and Wildlife research center's application for scientific research permit application, file No. PRT 740502.

In accord with 16 U. S. C. 1373, REGULATIONS ON TAKING OF MARINE MAMMALS, this states that" taking... will be consistent with the purposes and policies set forth in section 2 of this act." 16 U. S. C. 1361 (6) states "Marine Mammals have proven themselves to be resources of great international significance, esthetic and recreational as well as economic, and it is the sense of the congress that they should be protected and encouraged to the greatest extent feasible commensurate with sound policies of resource management and that the PRIMARY OBJECTIVE of their management should be to maintain the health and stability of the marine ecosystem."

The proposed Draft Natural Resource Damage Assessment Plan and Restoration Strategy for the Exxon Valdez oil spill describe " the studies that will be used to investigate the extent of natural resource injuries and of the corresponding damages to be sought from the potentially responsible parties, including the costs of restoring, replacing, or acquiring the equivalent of those injured resources." (see Federal Register Volume 54, No. 156). Can we accurately state that this proposed Sea Otter permit for scientific research does not on its own cause injury and damage to very nearly the same number of Sea Otters as were found dead on the beaches from the oil spill? To release an animal back into the wild with four substantial bleeding wounds constitutes injury under any guise of justification put forth by this permit.

The loss of the Sea Otters' lives cannot be restored or replaced. Any camages needing to be restored or replaced should pertain to the "health and stability of the marine ecosystem" (16 U. S. C. 1361 (6)), consequently the intertidal and nearshore subtidal habitats, and the benthic organisms used by Sea Otters as food. Research on the persistence of oil in these habitats will provide substantial evidence with regard to effects of the oil spill on the Sea Otter.



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Regulation 16 U.S.C. 1374 Sec. 104. (c) (1) states that any person authorized to take or import a Marine Mammal for purposes of scientific research, public display, or enhancing the survival or recovery of a species or stock shall furnish to the secretary a report on ALL ACTIVITIES carried out by him pursuant to that authority. For example is there a clause to state that research be suspended if say two animals die during research procedures. All activities have not been reported. We need more specifics. This application does not show detail of design. There are many questions left unanswered. Due to the lack of coordination shown by the conduct of the Fish and Wildlife Service in the handling of Sea Otters while in captivity from the oil spill, I stress the importance of scrutinizing this permit.

Regulation 16 U.S.C. 1374 Sec. 104. (3) A permit may be issued for scientific research purposes only to an applicant which submits with its permit application information indicating that the taking is required to further a bona fide scientific purpose and does not involve unnecessary duplication of research. First, I question the validity of bona fide research and second, there are ongoing studies of telemetry going on right now, which constitutes duplication of research. These questions need to be addressed.

Has the applicant demonstrated to the Secretary that the taking of these Marine Mammals under such a permit is consistent with this Act and the applicable regulations?

Regarding the 300 dependent pups, In the past there has been some trouble to these individuals due to the transmitters being implanted. We do not have enough information to prove that these transmitters are safe or have long term effects on this age group of individual. We must look further into this. Also it is unclear whether the mothers of the 300 dependent pups are part of the 650 to be captured or an additional 300 "incidental" captures which would take the number of Sea Otters impacted by this study up to 950 animals. Mothers and pups caught together can get so entangled as to cause strangulation, or crushing. Nets have had to be cut away from the entangled animals during capture.

Animals impacted by this study may be in bonded groups or pairs and the stress involved in breaking up bonded pairs is considerable as documented in records taken during captivity at the rehabilitation facilities This problem is not addressed in this application. Six different drugs are used in this study. Animals have died from the effects of drugs while in captivity due to allergic reaction and human



error, both of which are possibilities in a study of this magnitude.

We are already having some of our equinoxial storms, otters are in a transition period of weaning and instructing pups for indépendence, entering into the mating season, and preparing for Winter. To impact and weaken them at this time with chase, capture, surgery and excessive handling will disrupt a crucial stage of their life stage history.

It is stated in the application that harrassment is" not applicable". This permit to conduct these activities is continual harrassment of these animals: tangle nets can be very dangerous, and there is the possibility of inadvertently entangling other species of animals; the blood drawing, extraction of teeth, surgeries, and punching of 1/4 inch holes in the flippers for tags is extremely invasive and painful to them. Do we know the impact of oil on open wounds? Fish and Wildlife has proved through the capture process that they will harrass individuals by chasing them continually over periods of over a month. This has been documented by Exxon employees who were working on the outer coast beaches and were outraged at the conduct of the Fish and Wildlife capture crews during the capture operations.

These procedures also cause stress which in turn may cause intestinal ulcers, inflamed mouth lesions, pneumonia, shock and exhausted adrenal glands as was documented through the capture rehabilitation program. Much of the additional excessive handling in the rehabilitation centers was an added impact on the health of the "rescued" animals. It is certain that a number of animals died in those centers from this additional impact under the guise of the oil impact, but in reality it was due to poor design of medical protocol which evolved at the whim of the Fish and Wildlife" service and Veterinarian staff.

Due to these inconsistencies and lack of regard of these animals in captivity, i question the competence of a continuation of this type of activity. Without an unbiased professional Epidemiologist and Statistician to thoroughly analyze and scrutinize this program to assess the validity and design of this permit, I do not feel that this permit should be granted.

I feel that the magnitude and circumstances of this scientific research deserves a public hearing, and that the public comment period needs to be extended at least two weeks, if not until Sept 30th, to remain consistent with the public comment time frame of the proposed Draft Natural Resource Damage Assessment Plan's (Federal Register Volume 54, No. 156). Laiso request that the public hearings be held in the Alaskan towns



villages and cities affected by the Valdez oil Spill. Lappreciate your concern in this matter and Lam looking forward to hearing from you soon.

Sincerely, With Kind Regards,

Wancy J. 77.78 Seand

Nancy J. Hillstrand, Director Kachemak Otter Facility
MARINE MAMMAL COMMISSION 1625 EYE STREET, N.W. WASHINGTON, DC 20006

29 September 1989

The Trustee Council P.O. Box 20792 Juneau, AK 99802

Dear Sirs:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the August 1989 Public Review Draft of the State/Federal Natural Resource Damage Assessment Plan for the <u>Exxon Valdez</u> Oil Spill. We offer the following comments on those parts of the Plan bearing upon the assessment and mitigation of the impacts of the oil spill on marine mammals.

General Comments

The Draft Plan provides a comprehensive overview of the studies required to assess natural resource damage from the <u>Exxon</u> <u>Valdez</u> oil spill. With regard to marine mammals, it incorporates, at least in general, the elements of the oil spill response requirements identified and made known by the Commission shortly after the spill occurred (copy attached).

The Plan does not, however, contain sufficient information to judge the likelihood that the component studies will in fact provide a reliable assessment of natural resource damage, or whether the cost estimates are reasonable. For example, none of the study descriptions indicate precisely when, where, or how the planned studies will be done. Likewise, they do not identify or indicate the qualifications of the individuals who will be conducting the studies, or how the cost estimates were calculated.

To ensure development of the best possible Damage Assessment Plan, the Marine Mammal Commission recommends that, if it has not already done so, the Trustee Council: require development of comprehensive project descriptions, including detailed descriptions and justifications of study designs, sample sizes and cost estimates; have the detailed project descriptions reviewed by groups of knowledgeable experts not associated with the damage assessment program; and revise the Plan, as appropriate, to take account of the expert review. In addition, if it has not already done so, the Commission recommends that the Council make arrangements for periodic meetings of the principal investigators of the various studies to facilitate information transfer and cooperative analyses of study results as well as cooperative • planning.



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With respect to program planning, it is our understanding that some beaches in areas affected by the spill remain substantially oiled, that oil in beach sediments may leach into adjacent marine areas, and that there likely will be a continuation of clean-up efforts in the spring and summer of 1990. Leaching of oil into marine areas and related containment and clean-up operations may further impact marine mammals, both directly and through food chain effects. They also could provide an opportunity to verify hypotheses concerning such things as the ability of sea otters, seals, and whales to detect and avoid oil, and the effects of noise from containment and clean-up operations on the behavior, movements and habitat-use patterns of sea otters, seals, and whales. Therefore, if it has not already done so, the Council should direct that possible future oiling and containment/clean-up operations be considered and factored into the design of ongoing and planned studies to assess the impacts of the Exxon Valdez oil spill on marine mammals and other components of the ecosystems affected by the spill.

Specific Comments

<u>Page 1, par. 5</u>: This paragraph indicates that the Damage Assessment Plan has three major components--(1) determination and quantification of injury; (2) determination of damages; and (3) development of a restoration strategy. Efforts to document and to minimize and mitigate the impacts of the <u>Exxon Valdez</u> oil spill also should be assessed to determine steps that usefully might be taken to improve avoidance, assessment, and mitigation of impacts of future oil spills. Therefore, the Marine Mammal Commission recommends that, if it is not already doing so, the Trustee Council take steps to expand the Damage Assessment Plan or to develop a companion plan to indicate steps being taken to assess the response to the <u>Exxon Valdez</u> oil spill with the view to determining how response to future oil spills might be improved.

Pages 22-23 (Criteria for Study Evaluation): Use of the criteria listed in this section to select studies for inclusion in the Damage Assessment Plan likely will result in a Plan which will underestimate the impacts of the Exxon Valdez oil spill and related contaminant/clean-up operations on natural resources. That is, criteria 1 and 2, as we read them, would require that selected studies provide conclusive evidence of natural resource damage and that the damage be both detectable and quantifiable. Many damages may be subtle, difficult to verify, and impossible to quantify due to insufficient background data (i.e., pre-spill data), or without expenditure of more time and money than reasonably can be justified. Therefore, it should be recognized and noted that the Damage Assessment Plan will provide a conservative estimate of damages or, alternatively, the criteria and the Plan itself should be revised to provide for acquisition of data that may suggest, as well as conclusively document and quantify, natural resource damage.



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Pages 30-33 (Comprehensive Assessment of Injury to Coastal Habitats): Oiling and subsequent clean-up operations may have affected coastal areas that are important haul-out and pupping sites for Steller sea lions and harbor seals. If they have not already done so, the persons responsible for planning and conducting this study should consult the persons responsible for planning and conducting marine mammal studies 4 and 5 to insure that important harbor seal and Steller sea lion haul-out sites and habitat requirements have been identified and factored into the study design.

Pages 37-38 (Geographic Extent and Temporal Persistence of Floating Oil): This project description does not indicate how frequently surveys will be done to monitor the geographic extent and temporal persistence of floating oil from the Exxon Valdez. Available information indicates that the distribution and movements of sea otters, Steller sea lions, harbor seals, and other marine mammals may be quite variable depending upon the time of year, weather conditions, and other factors. Thus, the utility of the information generated by this study with respect to assessing both the immediate and long-term effects of the Exxon Valdez oil spill on marine mammals will depend, in part, upon the frequency of data collection. Therefore, if they have not already done so, the persons responsible for planning and conducting this study should consult the persons responsible for planning and conducting marine mammal studies to insure that temporal variation in the distribution and movements of marine mammals has been considered and, as appropriate, factored into the study design.

Pages 39-41 (Petroleum Hydrocarbon-induced Injury to Subtidal Marine Sediment Resources): This study and Air/Water studies number 1, 3, and 4 are critically important for determining the possible indirect (food chain) effects of the Exxon Valdez oil spill on marine mammals. If they have not already done so, the persons responsible for designing and conducting these studies should consult the persons responsible for designing and conducting marine mammal studies to insure that the studies collectively will provide all information needed to reasonably assess and measure or quantify the second order effects of the oil spill on marine mammals.

Pages 42-43 (Geographic and Temporal Distribution of Dissolved and Particulate Petroleum Hydrocarbons in the Water Column): Dissolved and particulate hydrocarbon compounds in the water column could affect the distribution, abundance, and productivity of vertebrate and invertebrate species that are important components of the diets of seals and whales that occur in areas affected by the Exxon Valdez oil spill. In addition, particulates may foul the filtering plates of baleen whales and/or be ingested during feeding. These possibilities should be noted in the project description. Also, if they have not already done so, the persons responsible for planning and conducting this study

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should consult the persons responsible for planning and conducting marine mammal studies to insure that related study needs have been identified clearly and will be met to the maximum extent possible.

Pages 74-78 (Injury to Prince William Sound, Kodiak, and Alaska Peninsula Herring): Herring likely is an important component of the diets of humpback whales and other marine mammals that inhabit Prince William Sound and adjacent areas seasonally as well as throughout the year. Thus, alteration of the size and/or productivity of the herring stocks in Prince William Sound, Kodiak, etc. may impact marine mammals as well as commercial fisheries. If they have not already done so, the persons responsible for designing and conducting this study should consult the persons designing and conducting marine mammal studies to insure that related information needs have been identified clearly and factored into this study design.

Pages 79-81 (Injury to Prince William Sound Clams): As noted in the first section of this project description, bivalve molusks are an important component of the food chain in Prince William Sound. Among other things, for example, they are important components in the diet of sea otters.

The objectives of this study, as presented in the project description, give the impression that the effects of the Exxon Valdez oil spill on bivalves can be determined by a one-time sample of bivalves at selected beach sites with no oiling, moderate oiling, and heavy oiling. The Methods and Analyses Section indicates, however, that one heavily oiled beach will be monitored biweekly from May through September. Thus, it would be appropriate to redraft the objectives to indicate that the level of hydrocarbons in bivalves at at least one beach site will be monitored to determine how hydrocarbon contaminant levels change over time and that the monitoring design may be altered if there are sudden changes in the proportion of dead clams or cockles being found on the selected indicator beach. In addition, the project description should be expanded to indicate what will be done if detectable/significant levels of hydrocarbons are still being found in bivalves and/or the survival and productivity rates of bivalves have not returned to pre-spill levels by the end of the sampling period--e.g., the study should and presumably will be continued until detectable or potentially harmful levels of hydrocarbons no longer are present in bivalves. Also, either this project description or the description of marine mammal study number 6 should be expanded to indicate how the possible effects of prey contamination on sea otters will be detected and measured or quantified.

Pages 96-97 (Undersea Observations): Sea otters are bottom feeders and could come into contact with, and be affected by, bottom deposits of oil and oil by-products. This possibility should be factored into the design of this study. That is, if they have not already done so, the persons responsible for designing and conducting this study should consult the persons

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responsible for designing and conducting marine mammal study number 6 to determine how undersea observations may contribute to assessing the magnitude, extent, and duration of oil spill impacts on Alaska sea otter populations.

Pages 112-113 (Marine Mammals Injury Assessment): This section does not, but should, note that a large proportion of the North Pacific fur seal populations that pup and breed on the Pribilof Islands may pass through areas affected by the spill during their annual spring and fall migrations. In addition, it does not, but should, reference studies that will be undertaken to determine the possible long-term food chain effects of the oil spill on marine mammals, and how noise and disturbance caused by containment and clean-up activities may have affected and still could affect the survival and productivity of marine mammals by increasing stress and/or causing animals to abandon or avoid traditional breeding areas, feeding areas, or other areas of similar biological importance.

Pages 114-115 (Effects of the Exxon Valdez Oil Spill on the Distribution and Abundance of Humpback Whales...): If this study is conducted as described in the project description, it will provide information on the numbers, distribution, and identity of individual humpback whales and their movements in Prince William Sound during and after the Exxon Valdez oil spill. It also may identify individually recognizable whales that moved from the Sound to southeast Alaska. It seems unlikely to meet Objective C -- to "quantify the extent of injury to the humpback whale population resulting from the oil spill." That is, the study, as described, should detect whether humpback whales left and remained outside of Prince William Sound following the oil spill. By itself, however, it will not provide information necessary to determine or judge why the whales left or, if they returned, why they returned. In this regard, the study, as described, will provide no information on changes in behavior, activity patterns, survival, or reproduction that may have been caused by exposure to oil, by consumption of oil contaminated prey, or by disturbance caused by containment and clean-up operations.

Humpback whales may have left and remained outside the Sound for some time to avoid contact with oil, to avoid noise from boats and aircraft involved in containment and clean-up operations, because of decreases in and/or contamination of food supplies, or other reasons. Therefore, if they have not already done so, the persons responsible for designing and conducting this study should consult and coordinate their efforts with persons responsible for designing and conducting Air/Water Studies 1 and 3, and Fish/Shellfish Studies 11, 12, and 19. Also, if further clean-up activities are expected to be conducted in the spring and summer of 1990, the possible value of measuring the underwater noise generated by such activities and conducting observations to determine how humpback whales and other marine mammals respond to such noise should be considered. Com.TopicIssueSug.Sort1331680X2

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Pages 116-117 (Assessment of Injuries to Killer Whales...): As described, this study, like the previous study concerning humpback whales, will provide distribution, abundance, and photoidentification data which may indicate changes, compared to past data, in the distribution, abundance and/or structure and size of killer whale pods in Prince William Sound and adjacent areas. It seems unlikely, however, that the study, as described, will provide information necessary to determine or judge the probable or possible causes of any observed changes. Therefore, if they have not already done so, the persons responsible for designing and conducting this study should consult the persons responsible for designing and conducting related habitat studies to assist in determining the possible cause-effect relationships. Also, the possible value of conducting additional observations in the spring and summer of 1990, in and near areas where further clean-up operations are being conducted, should be considered.

Pages 118-119 (Cetacean Necropsies): Among other things, this project summary indicates that: "[a]s a control, dead cetaceans observed southeast of the oil spill area will be sampled and tested for hydrocarbons." A number of laboratories may have frozen tissues from whales found dead before the spill occurred. It should be noted that these tissues could augument the proposed control, or provide an additional source of tissues for comparative purposes.

<u>Pages 120-121 (Assess the Oil Spill's Impact on Steller Sea</u> <u>Lions...)</u>: The first section of this project description indicates that the impacts of the <u>Exxon Valdez</u> oil spill on Steller sea lions could include loss or reduction of prey. The section entitled "Relationships With Other Studies" indicates that: "[i]nformation on abundance and contamination of sea lion prey organisms will be provided by a combination of several Fish/Shellfish studies." These points are not, but should be, reflected in the study objectives. That is, something like the following should added to the list of objectives--

. determine if observed changes in distribution, abundance, behavior, or productivity were [may have been] caused by spill-related changes in the availability of preferred prey species.

In addition, it would be useful to specify the Fish/Shellfish studies expected to provide information on the effects of the spill and related containment/clean-up operations on sea lion prey species.

Pages 122-124 (Assess the Injury to Harbor Seals...): This project description, like the project description concerning assessment of the effects of the Exxon Valdez oil spill on Steller sea lions, indicates that the effects could include loss or reduction of important prey species and that data on the abundance and contamination of prey species will be provided by other



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studies. It does not, but should, (1) indicate that one of the study objectives is to determine whether observed changes in the distribution, abundance, or productivity of harbor seals may have been due to spill-related changes in food availability, and (2) specify the studies expected to provide required information on the effects of the oil spill and related containment and clean-up operations on harbor seal prey species.

Pages 125-128 (Marine Mammal Studies 6 and 7): Information obtained from these studies can and should be used to evaluate and improve oil spill contingency plans designed to minimize the effects of possible oil spills on the threatened sea otter population in California. This should be noted in the study descriptions and the study design should be modified or expanded accordingly. In addition, it should be recognized that oiling and rehabilitation efforts may affect the subsequent productivity as well as the survival, movement, and behavior of oiled sea otters that were captured, cleaned, and released back into Prince William That is, the word "productivity" should be inserted after Sound. the word "survival" in the second line of objective A of study number 7 and the study design should be modified as necessary to ensure acquisition of information necessary to determine effects on productivity as well as on survival, movements and behavior.

Summary and Recommendations

In summary, the Commission believes that the draft Damage Assessment Plan provides a good general description of the studies that are being and should be done to assess the immediate and near term effects of the Exxon Valdez oil spill on marine mammals. However, the Plan does not describe the design and rationale of the component studies in sufficient detail to judge whether the program objectives are likely to be met or whether the cost estimates are reasonable. In addition, the program design does not appear to consider and take into account the possibility that some effects may be difficult to detect and to quantify and that some effects may not be evident for many years. For example, decreases in age-specific survival and reproductive rates, caused by decreased food supplies and/or exposure to low levels of petroleum hydrocarbons in food supplies, may not be evident for many years.

To ensure that the Damage Assessment Plan is as well conceived and as cost-effective as possible, the Commission recommends that, if it has not already done so, the Trustee Council require development of detailed study plans and make arrangements to have the plans reviewed by independent groups of experts not associated with the damage assessment program. The Commission also recommends that, if it has not already done so, the Council make arrangements for information transfer and program coordination meetings, and take steps to expand the Damage Assessment Plan or to develop a companion plan to indicate, based upon experience gained from the Exxon Valdez spill, steps that are

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being or should be taken to be better prepared to respond to future oil spills.

If the Council or its staff has any questions about the Commission's comments or recommendations, please let me know.

Sincerely,

Robert J. Hofman, Ph.D. Scientific Program Director

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Oil Spill Response Requirements Related to Marine Mammals

At least seven species of marine mammals inhabit or occur seasonally in Prince William Sound, Alaska. They could all be affected adversely by the oil spill and related containment and clean-up operations resulting from the grounding and rupture of the supertanker <u>Exxon Valdez</u> on 24 March 1989. The species include: the sea otter (Enhydra lutris); the northern or Steller sea lion (Eumetopias jubatus); the harbor seal (Phoca vitulina); the harbor porpoise (Phocoena phocoena); Dall's porpoise (Phocoenoides dalli); the killer whale (Orcinus orca); and the humpback whale (Megaptera novaeangliae). In addition, many more sea otters and several other marine mammal species, including the gray whale (Eschrichtius robustus) and the northern fur seal (Callorhinus ursinus), could be affected by oil now moving towards the Gulf of Alaska.

Some effects of the oil spill and related operations may be immediate and obvious, while others may be less apparent and occur over long periods of time. For all of the species, immediate effects may include mortality or morbidity due to:

- . contact with oil and/or chemical dispersants (most likely to affect sea otters and fur seals that depend upon fur to insulate them from cold water);
- inhalation of fumes as volatile components of the oil evaporate (could cause respiratory distress in all species);
- . direct ingestion of oil and dispersants or ingestion of oil- or dispersant-contaminated prey (most likely to affect sea otters that could ingest oil in the process of grooming and eating shellfish from contaminated shellfish beds, baleen whales whose food filtering baleen plates may be fouled by oil and cause large quanitities of oil and oil contaminanted food to be ingested, and seals and sea lions that feed on fish that may have become easier to catch because oiling affects their ability to evade capture);
- disruption of mother-pup bonds or transport of toxic substances from parent to offspring through the mother's milk and from the skin/fur of an oiled mother (nursing

seal, sea lion, and sea otter pups, and cetacean calves); and

increased vulnerability to predation (sea otters, sea lions, and seals preyed upon by killer whales, sharks, and eagles).

Long-term effects on all species may include such things as premature pupping, increased incidence of spontaneous abortion, congenital and genetic birth defects, mortality, and morbidity. These may be caused by such things as direct exposure to toxic dispersant and hydrocarbon compounds, eating fish and shellfish that have picked up and accumulated toxic compounds by absorption or ingestion of tainted prey, starvation due to reduction of food supplies, and destruction of kelp beds which may be essential for successful rearing of sea otter pups.

Needed Actions

Several different types of response action are required--

- where possible, animals in danger of death due to contact with oil must be located, cleaned, rehabilitated, and held until fit for release either at the original capture sites once the spill is cleaned-up or in new, uncontaminated areas;
- beach, boat, and aerial surveys must be conducted to document when, where, and how many animals may have been exposed to spilled oil, and how many are killed or debilitated by the contact;
- 3. complete necropsies--including histopathology, toxicological screens, and stomach content analyses-must be done on representative samples of all species found dead in or near areas exposed to oil or dispersants to document cause of death (this program should be initiated immediately and should be continued periodically until there is no discernible evidence of anthropogenic hydrocarbon compounds in tissue samples from animals found dead in areas affected by the spill, or in the marine food webs of which the various species are a part);
- 4. directed and opportunistic studies must be done to:
 - a. test and evaluate possible alternative methods for avoiding oiling and for capturing, handling, cleaning, and rehabilitating oiled sea otters, sea lions, harbor seals, and fur seals;

- b. determine how various species behave in the vicinity of spilled oil and containment/clean-up operations (e.g., do animals appear able to detect and avoid, or are they attracted or indifferent to, spilled oil and containment/clean-up operations; what happens to animals after they are oiled--do they remain in or move from areas where they were oiled, do they haul out on land, do they groom and ingest oil in the process, do they die and sink to the bottom or float);
- c. determine whether various species are more or less likely to eat oil contaminated or uncontaminated prey (e.g., are there any indications that oil affects fish in ways that make them easier to catch and more likely to be eaten by seals, sea lions, and cetaceans, or that any species refuse to eat oil-contaminated prey); and
- 5. long-term (five-, ten-, twenty-year) studies must be designed and carried out to determine: (a) the chronic, long-term effects of the spill on various species and key components of their habitat; (b) how the spill affected the demography and reproductive capacity of the various species; and (c) the manner and rate that the affected species and habitats recover from the impacts of the spill and associated activities.

Sea Otters

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Because oiling of a sea otter's fur compromises its insulative value and because sea otters depend upon fur for insulation, sea otters are the species most likely to be affected adversely by contact with spilled oil. In 1985, Randall W. Davis, Ph.D., and colleagues at the Hubbs Marine Research Institute in San Diego, California, carried out a study, under contract to the Pacific Office of the Minerals Management Service, to develop and test possible methods for restraining, cleaning, and rehabilitating oiled sea otters. The study results, described in a May 1986 report to the Minerals Management Service, indicate that oiled otters can be effectively immobilized for cleaning using a combination of meperidine hydrochloride and diazipam and that oil can effectively be removed from immobilized otters by washing for 40 minutes with a 1:16 solution of Dawn liquid detergent in water, followed by 40 minutes of rinsing with a shower head under moderate pressure.

Cleaning removes natural as well as foreign oils and, following cleaning, the otters must be dried, kept warm, fed, and given veterinary care to prevent or treat hypothermia, shock, and secondary disease, such as pneumonia. Recovery from the stress of oiling and cleaning takes one to two weeks, providing no secondary medical problems develop. This suggests that animals must be kept in warm water holding facilities for one to two weeks before release to insure a reasonable probability of post-release survival.

In addition to the fact that these restraint and cleaning techniques have not been tested under field conditions, there are other uncertainties. It is not known, for example, whether oiled otters are likely to remain in oil contaminated areas, haul out on land, or attempt to find and move to oil-free areas. It is also not known whether oiled otters can be captured effectively, using standard capture techniques, before they are so debilitated that successful rehabilitation would be unlikely; whether there is some critical time period after which rehabilitation efforts are likely to be unsuccessful; and whether otters that die as a result of oil contamination are likely to be found hauled out on remote beaches, found floating in the water, or not found at all. Consequently, there presently is no basis for predicting what proportions of oiled otters are likely to be found, either dead or alive, for predicting which animals are or are not likely to survive the additional stress of capture, cleaning, and subsequent holding, or for predicting what capture, cleaning, and rehabilitation techniques most likely will be successful.

To resolve these uncertainties, while at the same time capturing, cleaning, and rehabilitating as many oiled sea otters as possible, the following should be done--

- aerial and/or boat surveys should be conducted to identify (a) areas where sea otters have been and are being oiled, and (b) areas where sea otters have not yet been, but are likely to be oiled;
- 2. a representative sample of sea otters should be radio-tagged and followed in one or more areas where otters have not, but likely will be, contacted by oil to determine what otters do and where they go after they are oiled--e.g., do they haul-out on remote beaches, do they ingest significant quantities of oil while grooming, do they remain at sea and sink or float after death, are they eaten by eagles or killer whales (among other things, this is necessary to determine where to look for oiled otters and to estimate the number of otters killed but not found);
- 3. benthic communities should be sampled in one or more of the selected study areas, before and at periodic intervals after the areas are contaminated with oil, to determine how the quantity and quality of sea otter prey (food) species are affected by the spill and related activities such as the use of chemical dispersants;

containment booms should be deployed to prevent oil from reaching these areas (this and the succeeding task should be afforded high priority if oil threatens high density sea otter areas in Prince William Sound, the Kenai Peninsula, the Kodiak/Afognak Island area, or lower Cook Inlet);

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- 5. a contingency plan should be developed, and necessary authorization should be obtained, to capture and relocate large numbers of otters in the event that the spill approaches high-density sea otter areas in eastern Prince William Sound, the Kenai Peninsula, the Kodiak/ Afognak Island area, or lower Cook Inlet and thus threatens to jeopardize the continued existence and viability of these sea otter populations;
- 6. an additional facility or facilities should be established to clean and rehabilitate oiled otters (the Valdez facility may well not be able to handle all the animals that are oiled, and it may be useful to have a similar facility in Cordova to take care of animals nearer there);
- 7. scientists, technicians, and veterinarians, including the Fish and Wildlife Service's southern sea otter group, who are experienced in capturing, sedating, cleaning, and caring for sea otters, should be brought in to help staff the facility(ies), train volunteers, and assist in tagging, capture/transportation, and habitat assessment activities;
- 8. a sufficient number of boats and aircraft should be dedicated to searching for, capturing, and transporting oiled sea otters (and other marine mammals and sea birds) to designated rehabilitation centers; standard procedures should be established for reporting, recording, and responding to reports of oiled sea otters; and possible alternative methods for capturing, handling, sedating, cleaning, and caring for oiled otters (and other marine mammals) should be evaluated and kept under continuing review;
- 9. all otters handled should be marked with individually recognizable tags, and a subset of rehabilitated otters should be radio-tagged and followed after release to determine what proportion survive and whether any or all

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of the animals attempt to return to areas where they may again be oiled;

- 10. persons with first-hand knowledge of the distribution, movements, habitat requirements, and historic range of sea otters in Alaska should be consulted to identify areas suitable for releasing rehabilitated otters (in this regard, it should be kept in mind that releasing otters in areas already occupied could cause populations to be increased above carrying capacity, damage habitat, and result in more, rather than less, sea otter mortality);
- 11. a veterinary pathologist should be on site to do necropsies and properly prepare and preserve specimen materials for subsequent laboratory examination so as to try to document the cause or causes of death; additional veterinarians, experienced in sea otter biology and medicine, should be brought in, if needed, to assist with rehabilitation efforts and necropsies; tissue and stomach content samples should be collected, under the supervision of a veterinary pathologist, and be provided to the Fish and Wildlife Service's Veterinary Services Laboratory in Madison, Wisconsin, or other qualified, independent laboratories, to conduct histopathological and toxicological analyses; and this work should be continued until there is no evidence that oil or chemicals used to disperse the spill are causing or contributing to sea otter mortality;
- 12. skulls (or teeth) and reproductive tracts should be collected from all otters found dead in or near areas contacted by the oil spill; these should be marked with sequentially numbered tags indicating when and where they were collected; and they should be examined by qualified biologists to determine the ages, reproductive history, and reproductive condition of the animals at the time of death;
- 13. beaches where sea otter carcass counts have been conducted in the past should be identified and walked periodically to gather information on the number of animals dying or washing up dead on these beaches; these data should be compared with data collected previously to estimate the increase in mortality rate and total mortality possibly attributable to the oil spill; and
- 14. a planning meeting or workshop--to include outside experts as well as marine mammal biologists from the Fish and Wildlife Service, the National Marine Fisheries Service, the Alaska Department of Fish and Game, and the Marine Mammal Commission--should be organized and held within the next three to six weeks to (a) identify the

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types of studies needed to document the long-term effects of the spill on sea otters and other marine mammals, and (b) describe the time, money, and special logistic support needed to do the necessary studies.

Seals and Sea Lions

Harbor seals and Steller sea lions, which rely on blubber for insulation, are less likely to be affected by oiling than are sea otters and fur seals which rely on fur for insulation. As with sea otters, contact with oil may irritate the skin and eyes, and inhalation of volatile components may cause respiratory distress and death. In addition, odor seems to be the primary means whereby harbor seal and sea lion females identify their pups so that, if the spill is not cleaned up by the time the pupping season begins, oiling could disrupt the mother-pup bond and cause abandonment and death of pups. Further harm to pups may result from the ingestion of harmful compounds while nursing. In addition, aircraft overflights and containment/clean-up operations in the vicinity of pupping and breeding colonies may interfere with pupping and breeding, and cause stampedes in which pups may be killed or abandoned. Harbor seals, fur seals, and Steller sea lions may be affected adversely by eating oil-contaminated prey and by reduction of available food supplies.

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It is not known whether harbor seals, fur seals, or Steller sea lions, suffering from contact disorders, respiratory distress, or the effects of ingesting oil or oil contaminated prey, will haul out on land, remain in oil contaminated areas, or abandon those areas. It also is not clear whether affected adults and pups can be identified, captured, and rehabilitated successfully.

To resolve these uncertainties, while at the same time minimizing the possible adverse effects of the oil spill on harbor seals, fur seals, and Steller sea lions, the following should be done--

- 1. persons operating helicopters, small planes, and boats as part of the oil spill response effort (or to obtain photographs for news media coverage) should be advised that operations in the vicinity of harbor seal and Steller sea lion rookeries may cause adults to trample pups and to stampede into oil contaminated water and that such disturbance is illegal unless it has been authorized by the National Marine Fisheries Service as necessary for efforts to assess or minimize the possible adverse effects of the spill;
- 2. aerial and boat surveys should be conducted to:
 - a. identify haul-out areas that have been or may be contaminated by spilled oil;

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b. locate and, as appropriate, capture animals that appear to be distressed; and

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- c. observe animals in and near oil contaminated areas to determine if they appear to detect, avoid, be attracted to, or be indifferent to spilled oil;
- 3. facilities and protocols should be established for examining and treating fur seals, harbor seals, and sea lions that appear distressed (this should be done in cooperation with the sea otter rescue/rehabilitation program outlined earlier);
- 4. a representative subset of any harbor seals, fur seals, and sea lions found dead in and near areas contacted by oil should be collected and necropsied by an experienced veterinary pathologist to try to document the cause or causes of death. As part of the necropsies, tissue and stomach content samples should be properly collected, and preserved and then sent to qualified laboratories for histopathological and toxicological analyses. If necessary, blood samples and tissue biopsies should be collected from live animals, and/or a small subset of affected animals should be sacrificed, to verify tentative conclusions or hypotheses concerning the nature and etiology of oil-related effects. All animals handled and released should be tagged with individually recognizable tags. A subset of these animals should be radio tagged and tracked to assist in determining postrelease behavior and survival;
- 5. skulls (or teeth) and reproductive tracts should be collected from all animals found dead in or near areas contaminated with oil. These should be marked with sequentially numbered tags indicating when, where, and under what circumstances the animal was found, and should be examined by qualified biologists to determine the ages, reproductive history, and reproductive condition of the animals at the time of death;
- beaches near known harbor seal and Steller sea lion haul-out and feeding areas should be walked periodically to gather information on the number, sex, and relative sizes of animals dying or washing up dead on these beaches; and
- 7. as noted earlier, a planning meeting or workshop should be organized and held within the next three to six weeks to identify the types of studies needed to document the long-term effects of the spill on harbor seals, fur seals and Steller sea lions, as well as on sea otters and other marine mammals. This meeting should include outside

experts as well as marine mammal biologists from the National Marine Fisheries Service, the Fish and Wildlife Service, the Alaska Department of Fish and Game, and the Marine Mammal Commission. Meeting participants should: (a) identify the types of studies needed to document the long-term effects of the spill on harbor seals, fur seals, Steller sea lions, and other marine mammals; and (b) describe the time, money, and special logistic support needed to do the necessary studies.

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Cetaceans

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Killer whales, Dall's porpoise, and harbor porpoise are the cetacean species most likely to be present in significant numbers in Prince William Sound at this time of year. In the summer, significant numbers of humpback whales also may be present. As oil moves into the Gulf of Alaska, it could contact a large proportion of the eastern Pacific gray whale population as gray whales migrate through the Gulf to their summer feeding grounds in the Bering, Chukchi, and Beaufort Seas.

Experiments with captive bottlenose dolphins (<u>Tursiops</u> <u>truncatus</u>) suggest that oil contacting the external surface of cetaceans may have only transitory effects such as irritation of the skin and eyes. This may be in part because healthy cetaceans spend relatively little time at the water surface where they may come into contact with spilled oil or inhale volatile oil fragments, and because oil may be washed off as the animals dive and swim through the relatively clean water below the surface slick.

As a result, the greatest threats to cetaceans may be baleen fouling, ingestion of oil contaminated prey, or reduction of available food supplies. In this context, killer whales may be at greatest risk because they prey upon seals and sea lions which may be more vulnerable to predation if they are oiled, and which may retain relatively large quantities of oil on their pelage. Also, debilitated animals may spend more time at the surface and thus be more susceptible to problems caused by contact with oil and inhalation of volatile oil components.

The Prince William Sound oil spill should be used, to the gretest extent possible, to verify experimental results and assumptions concerning the possible direct and indirect effects of oil spills and related containment/clean-up operations on cetaceans. Towards this end, the following should be done:

- 1. aerial, boat, and beach surveys should be conducted to:
 - a. locate, identify, and determine the numbers and relative sizes of cetaceans present in and near areas affected by the spill;

- b. determine how various species behave in the presence of oil--e.g., look for evidence that any or all species can detect the presence of oil, avoid or are attracted to oil or containment/ clean-up operations, or are attracted to and feed upon fish, seals, sea lions, sea otters, or other cetaceans whose behavior and vulnerability to capture are altered by oiling;
- c. determine if behavior or apparent effects appear related to the quantity or characteristics of oil present (e.g., do behavior or effects appear different in areas covered with light sheens of unweathered oil compared to areas covered with thick coatings of weathered oil);
- d. when feasible and the possibility exists of either saving an animal or gaining valuable information, capture, treat, and/or collect samples from animals that appear to be distressed; and
- e. determine the number of dead cetaceans washed up on beaches or floating in and near areas affected by the spill;
- 2. protocols should be established and, as practicable, arrangements should be made for holding, examining, and treating animals that appear distressed;
- 3. all, or a representative subset of cetaceans found dead in and near areas contacted by oil, should be necropsied by an experienced veterinary pathologist to try to document the cause or causes of death. As part of the necropsies, tissue and stomach content samples should be collected and sent to qualified laboratories to conduct histopathological and toxicological analyses. If necessary, blood samples and tissue samples should be collected from live animals and/or a small subset of affected animals should be sacrificed to verify tentative conclusions or hypotheses concerning the nature and etiology of oil-related effects. All animals handled and released, dead or alive, should be marked or tagged to permit individual recognition if they are seen again, either dead or alive. If feasible, a subset of both live and dead animals left in the water should be radio tagged and tracked to determine what happens to them;
- 4. teeth or baleen, ear plugs, and reproductive tracts should be collected from all cetaceans found dead in or near areas affected by the spill and related containment/clean-up operations. These should be marked with sequentially numbered tags indicating when, where, and under what circumstances the animals were found, and

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they should be examined by qualified biologists to determine the ages, reproductive history, and reproductive conditions of the animals at the time of death;

5. as noted earlier, a planning meeting or workshop should be organized and held within the next three to six weeks to identify the types of studies needed to document the long-term effects of the spill on cetaceans, as well as on sea otters and other marine mammals. This meeting should include outside experts as well as marine mammal biologists from the National Marine Fisheries Service, the Fish and Wildlife Service, the Alaska Department of Fish and Game, and the Marine Mammal Commisison. Meeting participants should: (a) identify the types of studies needed to document the long-term effects of the spill on cetaceans and other marine mammals; and (b) describe the time, money, and special logistic support needed to do the necessary studies.

* * * * *

To summarize, the Commission's major short- and long-term concerns with respect to marine mammals relate to: minimizing the number of animals that are oiled; when appropriate, catching, cleaning, rehabilitating, and releasing animals that are oiled; documenting the numbers of animals killed and debilitated, now and in the future; documenting the cause(s) of death through proper necropsies and collection, preservation, and examination of specimen materials; collecting and archiving data and information in such ways as to maximize their value in future spill prevention and spill response efforts; and evaluation of containment, cleanup, and mitigation measures to effect improved responses in the future.

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DEDICATED TO THE STUDY AND CONSERVATION OF PACIFIC SEABIRDS AND THEIR ENVIRONMENT

REVIEW OF:

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

> D. MICHAEL FRY CHAIRMAN, PACIFIC SEABIRD GROUP

DEPARTMENT OF AVIAN SCIENCES UNIVERSITY OF CALIFORNIA DAVIS, CA 95616 (916) 752-1201

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EXXON VALUEZ OIL SPILL. TRUSTEE COUNCIL ADMINISTRATIVE RECORD

I. Introduction:

This review, because of the short time provided for public comment, represents the opinions of the Pacific Seabird Group (PSG) Chairman only, completed after limited informal discussions with several members of the PSG. The views here do not represent a formal poll of the PSG membership.

My expertise is in the area of avian physiology/toxicology with an emphasis in seabirds. This review and comment will be confined to studies relating to birds and residue analysis. I will address all my specific comments to Bird Studies 1-14, and Technical Services Studies 1 and 2. I additionally have some general comments on the overall Plan.

II. General Comments:

This document is outlined in a comprehensive way to individually address each component of the ecosystem which has been potentially impacted by the Exxon Valdez oil spill. The structure of the plan, with assessment of each component separately, but with coordination between studies and agencies, appears to be well designed and adequate for the task of environmental assessment. The Technical Services Studies are organized so as to demonstrate that the analytical components of the assessment plan are separate from, but coordinated with, the other aspects of the study.

1) The time frame of the Damage Assessment Plan is unrealistically short. It will be impossible to make a complete, or even an adequate, assessment of the damage within the time frame proposed. The designated time frame would require most field assessments to have been completed prior to November, when the weather will become quite inclement and preclude any further studies. For many organisms, especially birds, it will not be possible to monitor the extent of mortality until 1990. February 1990 is too early in the year to be able to make any assessment of the returning/rebounding populations.

The policy with regard to field studies should be changed so that all studies should be conducted at least through August 1990, unless there is complete and sufficient data for any individual study to justify earlier termination. Therefore, I disagree fundamentally with the position stated on Page i of the Executive Summary that: "no studies will be conducted after February 28, 1990 unless specifically approved by the Trustees...". I strongly feel that the position should be reversed; that is to say, all studies will continue unless individually terminated by the Trustees.

2) All of the studies in this report are currently in progress at the time of public review. No information was supplied to reviewers to indicate whether each study was initiated as planned, whether the data planned for collection has been acquired, or whether the study can be completed within the time frame allotted. Much informal information has been "leaked" to this reviewer indicating that many of the studies were begun months after their planned initiation, and data was not collected for many parts of several studies. If this is the case, review of this plan cannot be realistic. Why was data of this nature specifically been withheld from independent reviewers?

Damage Assessment Studies which exist, in part, only on paper parallel exactly the scenario of the Oil Spill Contingency Plan of Alyeska Pipeline Company. That plan was apparently constructed only to obtain Use Permits, and was not implemented in order to clean up oil. If segments of this Assessment Plan exist primarily on paper, but the studies are not fully conducted, the Trustees will be guilty of the same behavior as the Oil Industry. The time allocated for studies must be extended to allow for adequate completion.

3) 1989 may have been an atypical, cold water, year in the Gulf of Alaska. If this is the case, an additional year should be studied to be able to make even a "first guess" at the true impact of the oil spill in the context of an atypical year. If the drastically reduced number of seabirds breeding on the Barren Islands, for example, was confounded by a bad year as well as by spilled oil, an accurate assessment should be made.

4) The budgets for analytical chemistry of hydrocarbon residues appear to be inadequate for complete assessment of damage. Gas chromatography/mass spectroscopy (GC-MS) of aliphatic and





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aromatic samples may cost as much as \$800-1000 per sample to identify the hydrocarbon profile fingerprint of North Slope crude. Granted that many samples could be analyzed by GC-FID (flame ionization detector) and quantified at somewhat lower cost, but it may be important for purposes of litigation to be able to state the origin of the hydrocarbons in any given sample.

The number of samples to be analyzed for birds tissues alone is in excess of 300. A cursory review of the other studies indicates that several thousand samples must be analyzed for a reasonable damage assessment. \$2,300,000 is the total combined budget for both NOAA and USFWS, including travel and equipment. The total budget should probably be increased by 50% to be adequate.

5) Economics Uses Study 7: Study of Loss of Intrinsic Values:

The wording in this study plan is very general, but the public is most concerned that the Trustees take seriously the Federal Appeals Court decision of July 13, 1989 on NRDA and the will of Congress with respect to environmental pollution. This is probably the most critical part of the Damage Assessment Plan for the credibility of the Trustees. The logic and calculations forming the basis of any monetary loss derived from seabirds and sea otters must be completely and publicly delineated. Public review and comment should be required and sought prior to any agreement with the responsible party concerning monetary evaluation of environmental damage.

III. SPECIFIC COMMENTS ON BIRD STUDIES:

STUDY 1: BEACHED BIRD SURVEYS:

This is a very important part of the total evaluation of oil impact to seabirds populations. The study appears well planned, although more beach surveys are required to adequately assess the number of beached birds. Part E cannot be completed from data of 1989.

A thorough examination of beaches was conducted by capture boats employed by the Otter and Birds centers. Although these boats were employed by Exxon for recovery of birds and otters, is that data being integrated with Agency data? To what extent is Exxon derived data proprietary? Did the USFWS make adequate surveys on its own?

How will the Trustees estimate the proportion of carcasses to be found on beaches in Part C? Carter and Page (Point Reyes Bird Observatory) have some data, A. Burger in British Columbia has some, but no exhaustive studies have been conducted to evaluate floating times of many of the important species impacted in this spill.

Part D. I question how well the data of man-search-hours

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can be integrated into data of former years relative to the intensive searches done in 1989.

This study is critical, and was begun early in the spill cleanup, so that data could be very good, but only if data from Exxon capture boats is included.

BIRD STUDY 2: MIGRATORY BIRD SURVEYS:

Part A must have already been done. Was it done adequately? The timing of aerial surveys is critical for estimates of migratory birds.

Part C cannot be determined without a 1990 census. Furthermore, reduced hatching or fledging success of breeding species will not be able to be evaluated until the 1989 age class returns to breeding colonies, or, for some species, can be evaluated in winter or spring surveys. Age at first breeding is delayed for many species of seabirds, confounding the estimates. Additionally, if a large proportion of adult birds were lost in 1989, the age at first breeding of returning juveniles will be lower than normal, further confounding the data.

BIRD STUDY 3: SEABIRD COLONY STUDIES:

Part A cannot be completed without at least a 1990 survey. The aberrant nature of the 1989 breeding year is important. Was the year equally atypical throughout the oiled and unoiled areas? Did unoiled areas serve as adequate controls? Answers to both of these questions cannot in themselves be made without a 1990 census.

Using data from Study 14 to predict sensitivity of birds to oil is not realistic. The experimental portion of Study 14 is not a good study.

The methods and analyses of this study would be adequate if a second year were included in the plan.

BIRD STUDY 4: BALD EAGLES:

This is designed as a complete, well organized study, capable of providing sound data to assess oil spill effects. If executed it will be the best study of the group.

Part A plans to determine a RATE of change of the population and to determine the effect of the oil spill on that rate. If a rate is not already known from historical data independent of the oil spill, the effect of oil on the population change cannot be made.





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Part B could have been done with some accuracy. Was it? Was Exxon Eagle Team data integrated with USFWS data? Is Exxon data available?

Part F was conducted by Exxon Eagle Teams in Prince William Sound and coordinated by USFWS. Is the Exxon data available?

Were 30 adult and 30 fledgling eagles fitted with transmitters? If not, a 1990 survey will have to be conducted to provide alternate data on winter survival.

BIRD STUDY 5: PEREGRINE ASSESSMENTS:

This is also a well planned study, but preliminary data would seem to indicate that very few Peregrines were present in PWS in 1989, preventing completion of parts of this study. Part A could have been done, but Parts B and C could not have been completed, because no Peregrines occupied breeding sites in PWS in 1989.

A survey will have to be done in 1990 to determine whether more than two Peregrines still exist in PWS.

BIRD STUDY 6: MARBLED MURRELETS:

Marbled Murrelets are a good choice for assessment. Juveniles can be counted on the water after fledging, and potentially present a good index of local conditions with respect to alcid breeding and survival. The species may not be indicative of other alcid species, but is important in its own right. Are Kittlitz's Murrelets included in this study?

Part A: The patchiness of the Marbled Murrelet population is important to factor into this study. Does good pre-spill data exist for western PWS?

Collection of breeding Marbled Murrelets for contaminant analysis could provide useful data, although most oiled Murrelets would die. Many did this year. Externally oiled murrelets probably would not have bred in 1989. I think it would have been unlikely that birds could have been eating contaminated prey without becoming externally oiled, but data would be useful.

BIRD STUDY 7: FORK-TAILED STORM PETRELS:

The study is well planned and designed. Storm-petrels are a good indicator species, because they can be caught in their burrows and stomach contents sampled without injuring the adults or chicks (if chicks are hand fed to compensate for the loss of food taken from adults). However, according to my informal sources, this study was not conducted as presented. No visits to





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the island were made during early incubation.

If 1989 was an aberrant year, this study could not provide conclusive data on oil impacts on the population. The population must be assessed in 1990 against control sites.

Pristane is incorrectly spelled to make it a much cleaner compound.

BIRD STUDY 8: BLACK-LEGGED KITTIWAKES:

The study is well designed, and would provide much data on the effects of oil on these birds. The number of censuses are probably adequate to provide good data. Visual examination of birds is possible because they are white. Only their feet and beaks could not be assessed. The program is ambitious; was it conducted as presented?

BIRD STUDY 9: PIGEON GUILLEMOTS:

Guillemots are a good study species, because they are burrow nesters and accessible during the breeding season. They do not panic from cliffs as murres and cormorants do. Birds observed from a distance, however, will be very difficult to assess for small amounts of external oil, because their plumage is black. Rates of chick feeding can be assessed, and prey type can be identified in many colonies, because the adults like to show off their catches.

Guillemots would be good indicators of other alcid genera, but only to the extent that other species are breeding in the same areas. Puffins and Murres breed in dense colonies in other areas, and could not be "studied by proxy" by guillemots at these colonies.

In general, I believe guillemots are a good species to monitor for evidence of local oil conditions.

BIRD STUDY 10: GLAUCOUS-WINGED GULLS:

This study will probably not provide a good assessment of the impact of oil on Glaucous-winged Gulls. I believe Egg island is too far from the major impacts of oil to provide a good study. The few adult gulls which venture to Green I., Knight, or the Naked Island Group to forage will probably not be a representative proportion of the breeding population. Most breeding gulls would stay nearer to the colony than western PWS. Breeding gulls during the breeding season also do not scavenge to the same extent as during the rest of the year. Immature gulls, however, do not remain in the vicinity of the colony during the breeding season, and they do scavenge. Therefore, most of the

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gulls at risk would be immature birds not assessed in this study. I would predict that when the data of oiled gulls is examined, it will be found that most oiled gulls were immature.

BIRD STUDY 11: SEA DUCKS:

This study, because it concerns wintering birds, is one of the few with good potential to be concluded successfully this year. The study is well designed, and apparently can rely somewhat on samples already collected for its initial data base (food habits from stored stomach content samples). If field work can be conducted throughout the winter, time is ample for collections to be made for subsequent analysis. Hydrocarbon analysis, however, will require more time than the February deadline for completion. This study might be completed by April or May. Analysis of duck tissue samples this winter will provide good data on risk of contaminants to hunters, and will provide data on mollusks, especially mussels. The budget might be adequate.

BIRD STUDY 12: SHOREBIRDS:

This is a well designed study with good potential for providing data on the effects of oil on shorebirds.

I doubt that an adequate number of surveys were conducted in PWS and other staging areas during the spring of 1989 to be able to have good data for Parts A, B, and C. Part D probably could have been completed. Parts F, and G could have been done.

BIRD STUDY 13: PASSERINES:

This study would also have provided much information, but informed sources indicate that it was not conducted, or at best was conducted incidental to other work being done in affected areas.

If samples were collected, they will provide valuable data on secondary contamination by oil, both from histopathology and residue analysis.

BIRD STUDY 14: OIL EFFECTS, EXPERIMENTAL:

This study will be useful from the review of literature only. It is completely unrealistic to conduct experimental studies on oiling of raptors, waterfowl or seabirds for the budget proposed. This study is undesigned, not appropriate, and should not be conducted.

The \$10,000 budgeted for this study should be put into a literature review and synthesis, although the budget is too low for an adequate literature review.



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TECHNICAL SERVICES:

STUDY 1: HYDROCARBON ANALYTICAL SUPPORT:

This study plan appears adequate and sufficient for the task, with the probable difficulty that the budget is too low for the ambitious amount of work proposed. I feel the design, QA/QC procedures, and coordination are quite good. The analytical chemistry and identified compounds to be searched are adequate to identify oil and its toxicity, but probably not adequate to distinguish North Slope crude from natural seeps in the Gulf of Alaska or Cook inlet oil spilled from platforms.

STUDY 2: HISTOPATHOLOGY:

This is a straight-forward study of the effects of oil on exposed animals with very good potential for excellent results. I hope the USFWS staff at the Wildlife Health Laboratory will examine frozen tissues of oiled birds collected early in the spill when no Agency personnel were collecting samples. The budget should be adequate for a good overview of the problem.

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DULAC

September 28, 1989

Trustee Council Box 20792 Juneau, AK 99802

Dear Council:

Cook Inlet Seiners Association (CISA) has reviewed the Natural Resource Damage Assessment Plan and has the following comments in respect to studies in our area.

CISA is a fishermens organization that represents 75% of the salmon permit holders in Lower Cook Inlet. Our permit area includes the waters East of Resurrection Bay at Cape Fairfield to Cape Douglas at the Northern end of Shelikof Straits.

Our comments are specifically related to the following studies; Studies number 7, 8, 9, and 10, all dealing with oil impact on various salmon species as eggs, pre-emergent fry, juvenile and adults.

CISA is very supportive of the studies. Our concern is with the lack of detail on the location of the studies and the specific streams selected for each study. Only through contact with the Homer Department of Fish and Game were we able to obtain a detailed description of some of these projects. 7+8

The streams to be studied; Island Creek, Port Dick, Windy Left, Windy Right, Port Graham, Seldovia, Tutka, and Humpy were selected because of their history of pre-emergent sampling. CISA recommends that streams in other areas of Lower Cook Inlet also be assessed for damage. Additional areas in the Outer District would be Port Dick Middle, South Nuka, Delight and Desire. 7+8

No locations have been selected in either the Eastern or Kamashak districts for analysis. In the Eastern District Aialik and one or two streams in Resurrection Bay would be appropriate. In the Kamashak district little assessment has been done on oil impact and there has been only minor cleanup of oiled areas. CISA feels it is very important to determine any damage in this area due to its economic value. A minimum of two locations should be assessed, Sunday Creek and another in Southern Kamashak might be appropriate.

The lack of historic pre-emergent studies for these streams should not eliminate them as candidates for these studies. Checking these areas for hydrocarbon contamination using mussel analysis or another method would help document the presence or absence of Exxon Valdez crude oil. Furthermore this may be the start of a long period of study on the affect of oil

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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD







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contamination and it is important these areas be included in any future studies.

In study number 10 we were unable to determine the location of Wany streams selected for the Dolly Varden, Sockeye salmon study. ¹⁰ We feel Delight, Desire, and English Bay are potential locations for this study in Lower Cook Inlet.

We are aware of the problems of acquiring materials, short time frame and lack of data for some of these locations. The economic importance makes it critical that these areas be assessed for oil damage. Cook Inlet Seiners Association appreciates this opportunity to comment and hope we have been helpful.

Sincerely yours,

Chris Moss Evaluation Committee Cook Inlet Seiners Association Box 4311 Homer Alaska 99603 September 3, 1989



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T Y Director U.S. Fish and Wildlife Service Office of Management Authority P.O. Box 3507 Arlington, VA 22203-3507

Dear Sir:

Our organization has serious reservations about some aspects of the USFWS application to capture numerous sea otters in the Prince William Sound area for long-term research. (Although we support continuing research on the effects of the Exxon Valdez oil spill on sea otters, we believe that capture of as many as 650 otters, including tooth extractions, implantation of transponder chips, and other procedures, is more than is needed to accomplish the stated objectives of the study. This total number of animals sought and the implantation of radio transmitters in 275 otters appears especially excessive in view of the extenive disturbance and mortality sea otters already have suffered in Prince William Sound from the spill. Moreover, we understand that more than 100 otters have already been equipped with transmitters after release from rehabilitation centers. The research plan also recommends the repeated capture and handling of what seems like an inordinate number of pups and females.

Parts of sections 7 (page 12 and 13) of the application are inadequate. H We understand that there have been some adverse effects to otters 0 because of the stress of capture and handling. How many otters have M succumbed from complications related to surgical procedures? Section 7 F b? does not address at what level of adverse impacts procedures will be R curtailed or significantly modified. How many losses of otters due to capture, handling, surgery, drugs, infections, or other causes will be tolerated before suspending or reevaluating the project? Item 3 on page 13 totally circumvents the issue of "harassment" to local otter A populations. It is difficult to imagine no harassment involved with the S pursuit and capture of 650 otters. K

In sum we believe that the current application, which appears hastly written, should not be granted without modification and additional public input. Nothing in this application outlines what less intrusive research methods, such as behavioral observations and sustained censusing, will occur. Again, long-term research on sea otters is desirable, but we dispute the need for handling so many animals without considerably more justification than is provided. We request a public hearing to that the FWS can conclusively demonstrate its research needs and methods of achieving them, and the public should have an opportunity to voice its concerns for this species of special interest.

Sincerely,

Nina Fant

Nina Faust President



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EXXON VALUEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD John W. Hillstrand PO Box 674 Homer Alaska 99603

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Trustee Council PO Box 20792 Juneau, Alaska 99802

To whom it may concern;

I have fished up in these Alaskan waters for 32 years. I've seen alot of fluctuations in animal populations out on the water. There has been so much change go on in the past 49 years up here, it's hard to believe.

I've had my encounters with sealions biting my King Crab bouys, and lost over 30 700 pound pots from them. Now I use sealion bouys. Some kill them.

There is a cure to every problem, and an answer to every question. Most times more than one answer.

While you have access to this money, please put it to the best possible use. I wasn't able to fish this year. I have a great deal of money and my entire life invested in the fishing industry and I sicerely hope that our Fisheries are being protected, along with the natural inhabitants of the ocean.

You have a big responsibility on your heads and in your hands. It takes alot of forethought and even more Common Sense...

Steer clear of impacting animals any further and you'll gain respect of the people you work for. Show some innovative costructive people management. The creatures will do just fine. It's us they've got to worry about. Don't make them have to worry about you folks too.

Thank-you for your kind consideration.

Sincerely, John W. Hillotna

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DULAC

August 6, 1989

To:Carolyn McCormick, DVM Seward Otter Rescue From: P. Wunnicke, staff Re: Drawing bloods/implanting radio transmitters at Jakolof pre-release facility.

Carolyn, as you are well-aware ,there are serious questions about the propriety and necessity of subjecting the otters at the Jakolof prerelease facility to further trauma and stress associated with both the blood drawing process and the surgical implantation of transmitters.

Specifically, dipnet capture trauma (to teeth, gums, and nose due to lacerations from dipnet mesh), risk of adverse reaction to sedative or reversal drugs, internal injury from capture box handling, and the possiblity of accidentally dropping an otter are of utmost concern Further, I am concerned about the possiblity of veinous and arternal puncture and lacerations, to say nothing of the possible infection and complications inherent in the process of abdominal surgery.

Perhaps most vulnerable of all are the pregnant females now being held at Little Jakolof. Exposing them and their fetuses to the effects of drugs, undue handling and stress for the sake of completing a data set is poor husbandry practice and borders on the immoral. This sub-population has already been designated for "soft release" in Kachemak Bay, several pregnant females have already been released without blood draws, and the remaining pregnant females should be released in the same fashion ASAP.

As per professional consult with Dr. Glen Grady, DVM, the data necessary to determine the relative health of the Jakolof otter population vis a vis infectious disease can be obtained through a representative blood draw sample. Dr. Grady suggested a 25% population sample size.

This is good news if, in fact, it is true and if this means the release will now be accelerated so as to no longer compromise either the health or freedom of the tested otters now being held at Little Jakolof.

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EXXON VALUEZ OIL SPILL. TRUSTEE COUNCIL ADMINISTRATIVE RECORD



Representative samples are commonly used for precisely this type of research. I am not averse to cooperating with the U.S. Fish and Wildlife Service and the AK. Department of Fish and Game, to insure that the reintroduction of captive otters presents as few risks as possible to both the wild population and to those that have transitted the otter rehabilitation facilities.

The more invasive procedure of surgically implanting recovered otters with radio transmitters is of even graver concern. While the risks are high the possible benefits are dubious at best. The use of radio tansmitters, on otters in Valdez, to determine a "safe" release site was demonstrably valuable in protecting all the as yet to be released otters from being released too close to an oiled area. Fish and Wildlife has not been forthcoming with ANY evidence demonstrating positive impacts of radio tagging Jakolof otters either on an individual basis or for the benefit of the population as a whole. In point of fact, nothing we need to know to expeditiously and safely release these otters can not be determined from the results of the already tagged Sheep's Cove release.

Further, Fish and Wildlife has refused to come forth with any evidence or justifiable argument for radio implantation deeming such discussion "not open for public review." One must question whether this <u>public</u> agency really has a valid argument supporting its proposed administration of radio implantation or not.

Because of these concerns I strongly urge you to raise your voice in advocating for both full disclosure from the U.S. Fish and Wildlife Service and for the use of only absolutely necessary invasive veternary procedures that will CLEARLY benefit the otters. Man has caused enough trauma for these hapless creatures we must now mitigate the damage done not cause further harm.

Your consideration of this position and advocacy for the dignity, safety and freedom of these otters is much apprecitated.

Sincerely,--

- Tan Chuminke

Paul Wunnicke

Kapitana Bay Jeldonia alaske

DULAC

orth Pacific Fishery Management Council

Don W. Collinsworth , Chairman Clarence G. Pautzke, Executive Director

> 605 West 4th Avenue Anchorage, Alaska 99501

September 29, 1989

Trustee Council P.O. Box 20792 Juneau, AK 99802

Dear Sirs:

On September 26, the North Pacific Fishery Management Council's Habitat Committee met to review the draft <u>State/Federal Resource Damage Assessment Plan for the Exxon Valdez Oil Spill</u> dated August 1989. The Committee had the following technical comments:

- 1. A simple illustration or flow diagram is needed in the Introduction section that shows how all the studies interrelate with one another and with the major management questions being studied. The Committee could not readily see the linkage between the studies and the overall objectives, and thus found it difficult to judge the merits of the individual studies. The Committee believes that a flow diagram would be especially useful to the Trustees during their winter review of the technical, policy and legal aspects of the plan's study components as they evaluate each study for continual funding.
- 2. The plan includes a study of larval fish within Prince William Sound (Study #19) but does not contain a similar study in the Gulf of Alaska. Specifically the Committee is concerned that the oil that moved through Shelikof Strait and other areas of the Central Gulf may have seriously impacted pollock eggs and larval fish which are found in concentrated numbers in those areas. A larval study in this area should be included in the plan.
- 3. The Committee views the planned studies as critical to our knowledge on the effects of the oil spill on fishery resources and recommended that the planned studies move forward on schedule. It was stressed that the Trustee Council obtain an early commitment for funding in support of this research program through all phases to completion.

The Council Habitat Committee appreciates this opportunity to comment.

Sincerely,

Henry Mitchell Habitat Committee, Chairman



Mailing Address: P.O. Box 103136 Anchorage, Alaska 99510

> Telephone: (907) 271-2809 FAX (907) 271-2817

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EXXON VALUEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

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UNIVERSITY OF ALASKA, FAIRBANKS Fairbanks, Alaska 9978 99775-016

Institute of Arctic Biology September 27, 1989

CERCLA Trustee Council P.O. Box 20792 Juneau, AK 99802

Dear Trustees:

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I have been reviewing the Public Review Draft of the Assessment Plan the Council has issued. I am deeply concerned about several aspects of the Plan. Since my areas of expertise are anthropology and archaelogy, I will focus my comments on the related sections of the draft. However, I feel other segments of the plan may have similar problems, and I urge you in the strongest possible terms to reexamine and rethink your plan.

Let me begin by commenting on Economic Uses Study Number 9, the section devoted to archaeological sites. This section is much too vague to be reviewable. I have considerable experience in cultural resource management contracting, and no reputable contractor could or would perform research on the basis of this document in its current form. The proposed activities need to be specified much more clearly and carefully. For adequate accountability, both the contractor and the contractee must be able to tell when the work has been completed. There must also be a reasonable basis for evaluation built into the project statement.

Secondly, this section suffers because, unlike the studies proposed earlier in the plan, there are no specific costs attached to the work to be done. Here again, the vagueness of the study proposal is at fault. Without more specific proposals, "It is impossible to attach realistic dollar figures.

Together these two factors give the distinct impression that the area's cultural resources are not very important and are receiving second, maybe even third class, consideration by the Trustees. I feel relegating these resources to a lower status would be a grave mistake on your part. There are some very important archaeological sites in this area, resources with significance locally, statewide, nationally and even internationally, as evidenced by the recent major international Smithsonian exhibit, Crossroads of the Continents, for example. They deserve more serious consideration on your part than this plan demonstrates.



EXXON VALUEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD



UNIVERSITY OF ALASKA - FAIRBANKS

CERCLA Trustees September 27, 1989

There are two very important additional problems as well. Economic Uses Study Number 9 fails completely to address what will probably be one of the biggest, if not the biggest source of damage to archaeological sites as a result of the oil spill: vandalism. Many of the sites in this region have been protected for a long time by their relative obscurity. Now many more people are familiar with these areas and their cultural resources. Archaeologists working in the region, particularly on Kodiak, are already concerned about the level of vandalism/theft to archaeological resources. The increased familiarity brought about by clean-up activities is accelerating the vandalism

Economic Uses Study Number 9 must include research to investigate the amount of vandalism that has gone on, project the increased vandalism expected as a result of increased public knowledge of the sites, estimate costs for periodic monitoring of key sites and determine funding levels needed for future investigations and prosecutions under the Archaeological Resources Protection Act (ARPA). Although it is sad to say, it may take some successful prosecutions under ARPA to curb this illegal activity. On a more positive note, the assessment study should also work out a plan, including costs, for an effective public education program to discourage vandalism of the region's archaeological heritage. All of these costs are legitimate costs to the public resulting from the oil spill and must be assessed. The state and the federal agencies on whose lands these cultural resources occur have a mandate to protect them, and without adequate funds, they cannot carry out this mandate.

Finally, the deadline of February 28, 1990 is totally impractical. To be conducted adequately, the archaeological studies will require a summer field season. To maintain such a deadline for archaeological studies, and I suspect many other studies as well, is to say in effect, "Doing it right is not important." I don't think this message is what the Trustees should be communicating.

Let me now turn to Economic Uses Study Number 6, the proposals for subsistence studies. Many of the comments I have already made about the vagueness of the proposals and the lack of dollar figures also apply to these studies as well. Additionally, the subsistance studies should include another objective and that is to work with local people to determine what, in the absence of subsistence activities, is needed to support local values fostered and reinforced by subsistence.

Looking at subsistence losses, wage/labor patterns, income levels, inflation rates, effects of clean-up work, outside agency demands, industry demands and so on is all very important. But






CERCLA Trustees September 27, 1989

there are other very important issues that are harder to measure by numbers and statistics that also must be examined. Subsistence activities are extremely important in maintaining important local values. Although these values may be expressed in different cultural terms in different communities, they seem to come down to a set of basics: economic independence, protection of the land and environment, a sense of self-identity and control over one's own life, meaningful work, the ability to live meaningful lifestyles, and a sense of community and personal worth.

Assessing the spill's impact on these values will almost certainly require some skilled ethnographic research. Some literature review might be helpful as well to examine successful ways in which other northern communities have worked to preserve these values when other sources of income have supplanted subsistence. Devising alternatives and assessing their cost will require careful interaction with local communities. Local people often have good ideas and need to take charge of their own lives. What kinds of appropriate assistance with skills and resources can often allow them to solve their own problems, maintain their values? How much will they cost? If you want to get at the real impact of this accident on people's lives, over the long run, examining how these basic values can be preserved is one of the most important factors to be considered.

Finally, and very importantly, the subsistence research proposals should include some specific statements about local involvement in the research process. These studies should not be carried out on local communities but with local communities if they are to be most effective, and if the resulting damage awards are to have a positive impact.

I appreciate this opportunity to comment on the Review Draft. If you have specific questions or 1 can provide further input, please do not hesistate to contact me. My phone number is (907) 474-7039.

Sincerely,

lendy H. Arundale

Wendy H. Arundale Research Associate



UNIVERSITY OF ALASKA FAIRBANKS

INSTITUTE OF ARCTIC BIOLOGY Fairbanks, Alaska 99775-0180 U.S.A.

October 24, 1989 CERCLA Trustee Council P.O. Box 20792 Juneau, AK 99602

Dear CERCLA Trustees:

In late September I wrote to the Council with a series of comments on the Public Review Draft of the Assessment Plan for the Exxon Valdez oil spill. One concern I expressed in my comments was that the plan contained no indications of how local people would be involved in the assessment research effort. In my brief letter, it was difficult to make any specific suggestions for how this problem might be remedied. A colleague, however, has suggested the enclosed report, though aimed primarily at northern and northwestern Alaska, might have some information useful to the Council on this issue. I recommend section 3 on Local Involvement.

The enclosed report is a draft. There were some clerical problems in its production that will be corrected in the rinal version. Therefore, I must ask you to overlook the obvious clerical errors, and focus on the ideas the report presents.

lf l can provide any additional information, please do not hesitate to contact me.

Sincerely,

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Wendy H. Arundale Research Associate

Enclosure

(907) 474-7640

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Steve Kuchnicki Kitoi Bay Hatchery 99697 Kodiak, Alaska 99615

JAN 1 1 1994

EXXON VALUEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

I am an employee of the Alaska Dept. of Fish and Game's F.R.E.D. Division (fish hatcheries), also a longtime resident of Alaska, and am greatly concerned and disturbed by the proposed "scientific research" slated to be done on 650 Alaskan sea otters in the near future. This project, if indeed allowed to go ahead as outlined in permit PRT #740502, will involve disturbing at least as many of these animals as have already died as a result of the Exxon Valdez oil fiasco; quite a number of actual rural Alaskan residents, myself included, who come into contact with the area's otters and other marine fauna, realize that there is something definitely smelly going on here.

The Trustee Council

Juneau, Alaska 99802

P.O. Box 20792

Dear Sirs:

Could this possibly be another idea, not to say the word "scam", to get a few more easy bucks out of Exxon, for blood or conscience money, when the only ones to be harmed will be several hundred more of our state's natural inhabitants? An initial measly \$800,000 will be needed for this supposed necessary research. I have been sickened throughout this summer by the dishonesty and greed shown by a lot of my fellow Alaskans in the wake of this ecological nightmare, and say no way should this program be allowed to begin, at least at the present time. These animals, and all others of the Alaskan seacoast habitat, have already been impacted, threatened, tortured through ignorance and killed in great enough numbers this year. Let's let them get back to a normal existence now without endangering them further.

I found out about this project barely in time to get this let ter in the mail; if other Alaska bush residents HAD KNOWN ABOUT this proposed research, I am sure negative response to this and other unnecessary, harmful, pseudo-scientific information gatheringinvolving our state's wildlife would have been much greater.

see next p.

As it stands, I suspect that once again the rural residents of this state, people who are in daily contact with our natural resources and genuinely care about them, are about to be treated to a dose of Anchorage bureaueracy in action. Something as important as the welfare of a large group of the wild inhabitants of Alaska should be at least open to public discussion, and not shoved down our throats by some Anchorage "Acting Director" of this or that. This permit PRT #740502 should definitely be denied until further facts have been uncovered in this matter, and public discussions held; this could avoid more serious mistakes being made , and the risk of more negative future impact upon some of our most important, visible and sensitive Alaskan wild creatures.

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"Thanks very much for your time and consideration.

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cc:

Sincerely,

Steve Kuchnicki Kitoi Bay 9-24-89

Sec. of Interior Luhan Congressman Don Young Senator Ted Stevens Senator Frank Murkowski

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Mr.& Mrs.Norman Park P.O.Box 686 FRED Kodiak, Alaska 99603

The Trustee Council Box 20792 Juneau, Alaska 99802

Dear Sir:

I am writing pertaining to the Proposed Draft Damage assessment Plan, studies on Marine Mammals. The invasive capture and harassment of these studies must be ommitted from these studies. Studies may commence observing populations doing aerial surveys, population densities, and a softer style of gaining knowledge about: these animals.

We as United States citizens we demand that this degrading form of research be stopped immediately. Permit # PRT 740502 should be expeditiously revoked.

Your people should be out there surveying population densities with telescopes or binoculars, keeping completely clear of these creatures to assure that at least they can recuperate with some sort of dignity deserving of another being on this earth. Have some respect for these creatures. Add some compassion into your scientific formula it will gain you great credibility as the overseers of our wildlife.

Remember your organization works for the American people not for itself or for the approval of scientists or the scientific community. Any study should stand on its own merit. I don't believe this is bona fide research. Please stop it. Thank-you for your help.

Yours truly,

HI Park L. R. Pork

cc: President George Bush Interior Secy Emanual Lujan Congressman Don Young Senator Ted Stevens Senator Frank Murkowski

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Com. Topic Issuo Sug. Sort 3 1660 ×



EXXON VALUEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD Millie Gray P. C. Box 53 Talkeetna, Ak. 99676

TATLE AND THE PARTY AND ERAN CONCERN internet internet

Dean Sir: Here in Kodiak the fishing has been closed all Anna Jint col spill has been devastating to us. We hope and may for your lives to return to normal. Within the past two weeks more animals are rolling up on our beaches, 2700 birds

North replayed 5 Otters. North hear that in addition to the oil spill Financing our Wildlife and Fish the people designated to protect and provide for our Wildlife are going to Terrorize Hars imocentianimals for nothing more than to create jobs and net a mismoneve This is inexcusable. This must be stopped.

the states citizen demand that this Mannal Study number 6 pertaining to Sea Otters and the Since myorying the slaughtering of the 30 Seals be banned from the damane assessment plan. These type of studies are grossly Area we and demeaning, proposed by the J.S. Fish and Wildlife resear-incenter, and the State Fish and Game Dept.

Don't you care even think of doing something like this study shows studiety and foolish waste of money distant and the impact to the ecosystem, not to mass the Mindlife of Alaska any further.

These cupidous agencies are looking for any excuse The supposed stewards of our Wildlife. We're the incurrent you, Fish and Wildlife, and Fish and Game, and stor spull has only brought to the surface how shallow your

maps and the disgusted with you people. Protect our animals anaparticity reputations and DEMAND that bills be passed to as and that to more oil be spilled in our waters again ... period. Non-description Number 2018

pox Jour Sincerely, MARSIDE GEORGE BUSH

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SELDOVIA NATIVE ASSOCIATION, INC.

P.O. DRAWER L SELDOVIA, ALASKA 99663 (907) 234-7625 • 234-7890

September 5, 1989

Mr. John Turner: Director US F&WS: Office of Management Authority % Susan Laurence P.O. Box 3507 Arlington, VA 22203-3507

FAX: (703)358-2232 Re: Permit file #P.R.T. 740502

Dear Sirs:

This letter is to state the Seldovia Native Association's strong disapproval objection of the plans by the United States Fish and Wildlife and Service(US F&WS) to capture wild sea otters in the name of science.

It is our understanding the US F&WS plans to capture 650 wild sea otters, then pull their teeth, draw their blood and put radios in their bodies.

This plan is totally unnecessary and does nothing for the sea otters. It smells of an attempt to disturb our wildlife in an effort to get more EXXON dollars.

Sea otters are extremely sensitive and subject to shock and even death when harassed. Any capture efforts by the US F&WS will only result in unnecessary torture and possibly deaths of the sea otters that survived the EXXON Vaidez Oil Spill.

After all the hard work and dedication the volunteers gave to save sea otters after the oil spill, the US FEWS should recognize how fragile these mammals are.

We strongly object to this plan.

Further: we request public hearings in the affected areas, Seldovia, Port Graham and English Bay,



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EXXON VALUEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

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SELDOVIA NATIVE ASSOCIATION, INC. PAGE 2

The US F&WS has already treated the otters at the little Jakalof Bay site. That should be enough crueity to these mammals in the name of science.

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Sincerely, SELDOVIA NATIVE ASSOCIATION, INC.

ed H. Elvora

Fred H. Elvsaas President

cc: Senator Stevens Senator Murkowski Representative Young

KATHY HILL

P. O. Box 1988

September 30, 1989

Dear Trustee Council,

I appreciate the time and effort which you here put into the damage assessment document. Not only is it important for all to take a good strong look at this spill, but to know what can happen if and when another spill occurs.

Homer, AK 99603

I would like to express a strong feeling about the Marine Mammal Study *6 involving the sea otter. Of all the studies which you are proposing to do on animals this is the only one which is going to handle the animal by capturing and "intimately" studying by letting blood, putting in transmitters, etc. This animal has gone through an incredible amount of stress from the oil spill. Many were oiled, caught, and rehabilitated. Many were oiled, never caught, and are still living in the wilds. Others have just plain been dodging boats, aircraft, people, etc. for the whole summer. I find it inhumane to do any further study on this very vulnerable animal. None of the other birds and animals in your plan are going to be handled.

Pups and their mothers should not be touched. One cannot capture an otter without disturbing it and the others around. Capturing the otter means taking it away from its bonding group and its habitat. This, too, is inhumane at any time of the year, but particularly at this time of the year with winter around the corner.

I realize that my points are totally moot, as I am aware that the US Fish and Wildlife Service has had their permit approved to handle up to 650 otters! This agency is not capable of handling animals in a humane manner based on what went on this summer in the various centers in the state.

I hope that you will understand that this I strongly object to your otter proposal. Thank you for your attention to the above matter.

Kathy Hill





EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

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(907) 235-5352



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Founding Directors

Prentice Bloedel, II Friday Harbor, WA

.(enneth C. Balcomb, III Friday Harbor, WA

Dr. George Nichols Manchester, MA

Dr. Michelle Balcomb Glenwood Springs, CO

Ellen Bloedel Salt Lake City, UT

Officers

Prentice Bloedel. II President

Kenneth C. Balcomb, III Vice President, Secretary-Treasurer



1359 Smuggler's Cove Friday Harbor, WA 98250 USA (206) 378-5835

42

CENTER FOR WHALE RESEARCH, INC. a 501 (c)(3) non-profit organization

28 September 1989



Trustee Council P.O. Box 20792 Juneau, AK 99802

Dear Trustees:

Thank you for the opportunity to review the "State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill, August 1989 Public Review Draft". Recognizing that the studies proposed are necessary for an immediate determination of the extent and magnitude of injury to natural resources of Prince William Sound and the adjacent Gulf of Alaska as a result of the Oil Spill, I would like to offer the following comments on the Marine Mammal Studies Numbered 1 to 3 which fall within my area of expertise, and suggest several additional studies which might assist in your assessment.

Concerning Marine Mammals Study Number 1 on the effects of the Oil Spill on the distribution and abundance of humpback whales, the objectives A and B which deal with numbers and distribution of individual humpback whales identified in Prince William Sound and adjacent feeding areas are quite feasible given current techniques and knowledge concerning this endangered species in the North Pacific Ocean, and they should be encouraged and extended. However, objective C which would quantify the extent of injury to the Humpback Whale population, and objective D which would identify methods and strategies for restoration of lost use, populations, etc. leave me wondering a bit. I can see that with several years of the proposed surveys and photo-identification studies one could roughly calculate how





many whales don't appear again in the oil affected habitats; but, that is a far cry from quantifying the extent of the injury, it seems to me. For analogy, one might study the effects of tarring and feathering people in a community and determining whether they return to that community or go elsewhere; but, the effects of tarring may go deeper than those that are immediate and superficially observable, especially if the tarring included items consistently found in the victims' diet. Humpback whales feed upon great quantities of organisms (shrimp, herring, etc.) at lower levels of the food chain which are very likely to be affected or at least contaminated by oil in the habitat and in the water column. You should be very concerned about possible second order (food chain) effects of oil contamination on marine mammals in general and humpback whales in particular, but I don't see any application of state of the art studies in that respect (biopsy, analysis for environmental toxicants, DNA biomarking, etc.). The U.S. Marine Mammal Commission can probably advise you on current techniques to employ for best results insofar as direct and indirect sampling can offer. I urge you to consider such sampling studies to monitor and evaluate second order effects in humpback and other baleen whales in the oil affected areas and in adjacent areas. I further urge you to extend non-invasive studies (surveys, photo-identification) of humpback whales in Prince William Sound, Southeast Alaska, and the Kodiak Archipelago for at 👘 least five years to ascertain nuances of effects beyond the writs of CERCLA and CWA, but well within the Findings, Purposes, and Policies of both MMPA (Marine Mammal Protection Act) and ESA (Endangered Species Act). There is no question that a very important whale feeding habitat is at risk (approximately one hundred humpback whales make most of their annual living in oil affected areas) - you may not be able to do anything to "restore" it in a timeframe meaningful to the survival of some individuals, but it is prudent that someone learn as much as possible about the spill's effects (or non-effects) on the survivors so that the true impacts of a major spill on a pristine ecosystem can be evaluated.

Concerning Marine Mammals Study Number 2, the assessment of injuries to killer whales in Prince William Sound, the Kodiak Archipelago, and Southeast Alaska, I think objectives 1 and 2 are feasible in a quick-look such as you have proposed and funded through NOAA, but objectives C and D are simply not feasible without long-term studies AND sampling studies such as I've urged for humpback whales (biopsy, analysis for environmental toxicants, etc.). Killer whales, in particular, are very well known individually and demographically in the Pacific Northwest and Alaska. Approximately two hundred killer whales depend upon the food resources of Prince William Sound and environs for their livelihood. They are a priceless environmental treasure that cannot be replaced. They feed at higher levels of the food chain than do humpback whales, therefore there are more steps in the food chain which may go awry. They are very long-lived (50-80+ years), and much of their prey also lives in long cycles (eg. salmon which return to Prince William Sound this year and contribute to their diet were spawned two or more years ago and have spent most of the intervening time at sea). It is likely that any effects of introduced hydrocarbons in their habitat and diet may take years to manifest themselves in either their tissues or their demographic vigor; but, they are nonetheless worth looking for as quantifiable indicators in assessing damage from the Exxon Valdez Oil Spill. These whales are at the very top of any marine ecosystem and are excellent indicators of its accumulative health.

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With respect to Marine Mammal's Study Number 3, cetacean necropsies to determine injury from the Exxon Valdez Oil Spill, the objectives and methods sound precise, but in practice cetacean necropsies on remote beaches are extremely difficult, especially if the specimens are large and/or are not fresh. I think you are underbudgeted. On top of that, it seems that the enforcement overtones of the study severely limit what will actually be accomplished. Of course, necropsies should be done to learn about causes of death, etc. for as many animals as possible in the wake of the spill for the next several years. The difficulty I have is with having them performed only by "qualified veterinary pathologists", requiring evidential procedures, etc. which I suspect will render most of the potentially available material ineligible for this study or any study. recommend that you be less concerned with assessment of legally recoverable natural resource damages (ie. fines which are insignificant in terms of damage done), and much more concerned with the unprecedented learning experience of the spill. The earth is going to have hydrocarbons and habitats in conflict for the forseeable future, and it is simply not reasonable to have to ask the same questions every time a spill occurs, particularly if the questions are rote or artificially constrained by ad hoc legalisms. When faced with issues of such magnitude as assessing the damage to an ecosystem and evaluating steps toward its recovery, it is totally unreasonable to permit our thinking to be confined by law, press releases, and anthropocentric economies which are notoriously short-sighted. I think you should get out ahead of this one - get as competent and complete a series of necropsies as possible from any and all stranded and floating dead marine mammals (and other creatures) in the areas affected by the spill and outside of the spill for several years to objectively evaluate the effects of hydrocarbons in the system. This should be done for many species in conjunction with biopsy studies to ascertain the contaminant levels in the survivors.

I think that you should at least mention gray whales as a species of particular importance in Study Number AW2 (and AW1), because many of these whales feed upon the benthic infauna of intertidal and subtidal habitats which are likely affected by the Oil Spill. It would probably be useful to expand these studies to evaluate the degree of contamination and the percentage of gray whale feeding area affected, as well as conduct biopy studies of individuals migrating through or "residing" in these areas. This is entirely possible with current techniques, and it should be of concern considering the significant number of post-spill mortalities known for this species in the area. Gray whales are very important to lots of people, and they figure prominently in significant whale-watching commerce further south in their migrations.

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My final comment is that amongst all of the hype, hysteria, propoganda and publicity surrounding the Exxon Valdez Oil Spill from all quarters, I am left with an altogether uneasy feeling that our nation's elected officials and the bureaucratic custodians of our public natural resources are not properly doing their job with respect to careful and thoughtful consideration of our society's short term energy needs and its long term environmental needs. I think that the Trustee Council has an excellent opportunity to aggressively pursue a Damage Assessment Plan and Restoration Strategy for the Exxon Valdez Oil Spill that may start to reverse such feelings, but a meager 35 million dollar projected budget (especially compared to a billion dollar cosmetic cleanup budget), with no further studies to be conducted after February 28 1990, is ridiculously inadequate and short-sighted. Accepting that, I am left with the uneasy feeling and a sense of mourning for all of the creatures that have died and will die from neglect. I think you have to go to the administration and to Exxon and multiply the budget by ten or twenty and the time frame by five to ten to have anyone think you are serious about this massive problem of assessing the damage of the Exxon Valdez Oil Spill on the Prince William Sound and adjacent habitats.

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5	4	0208	X	0

Yours Sincerely,

Ken Balcomb Research Biologist



Founding Directors

- Prentice Bloedel, II Friday Harbor, WA
- enneth C. Balcomb, III Friday Harbor, WA
- Dr. George Nichols Manchester, MA

Dr. Michelle Balcomb Glenwood Springs. CO

Ellen Bloedel Salt Lake City, UT

Officers

Prentice Bloedel, II President

Kenneth C. Balcomb, III Vice President, Secretary-Treasurer



1359 Smuggler's Cove Friday Harbor. WA 98250 USA (206) 378-5835

CENTER FOR WHALE RESEARCH, INC. a 501(c)(3) non-profit organization

A FAX OF THIS PUBLIC RESPONSE WAS SENT TO YOU AT (907) 276-3697 ON 30 SEP 89 AT 1839 HRS. HEREWITH IS THE ORIGINAL 5 1989 OCT

American Association for the Advancement of Science

> SECTION ON SOCIAL, ECONOMIC. AND POLITICAL SCIENCES-K WILLIAM R. FREUDENBURG, Secretary

September 30, 1989

Don W. Collinsworth, et al. Trustee Council P.O. Box 20792 Juneau, AK 99802

RE: State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill

Dear Mr. Collinsworth:

I am writing to you in my position as the Chair of the Socioeconomic Subcommittee of the Scientific Advisory Committee, U.S. Minerals Management Service. I am not an employee of the Department of Interior or the Minerals Management Service, nor do these views represent official policy of the U.S. Minerals Management Service; on the basis of my discussions with other members of the Scientific Committee, however, I am confident these views would generally be shared by my scientific colleagues on the Committee.

While it is clear that a good deal of work has gone into preparing the study plan, and while my observations on the plan's omissions should in no way be taken as implying criticism of the great deal of work already done, at least one area of omissions is so obvious, and so striking, that it simply cannot be allowed to pass without comment. I refer here to the impacts of the spill and clean-up on the human environment and on the interrelationships of human beings with other components of the biophysical environment.

At the risk of stressing the obvious, it is now widely understood in scientific circles that the species <u>homo sapiens</u> is as much a part of the environment as any other -- if not indeed more so. Human beings depend on the environment both in a way that is relatively direct and physical, as in the influence of pollutants on obvious bodily functioning, and also through an additional set of interrelationships that are symbolic, emotional, intellectual, psychological, social, and cultural. While the two sets of interrelationships are often separated for intellectual purposes, moreover, they are difficult if not impossible to separate in practice; psychological health, for example, is a vital and unavoidable component of physical health more broadly. Despite these well-known facts, however, the study plan calls for only one study that deals in any way with the physical health impacts of the spill on human beings -this being an extremely narrowly conceived study, at that -- while inexplicably but completely ignoring the much broader range of other impacts on the human environment that are, in all likelihood, far more significant.

It is my general policy in letters of review such as this one to provide as much specific detail as possible; I sincerely regret to report, however, that in the present case, the lack of attention to the human environment is so complete that there's almost literally no content on which to offer commentary. For both legal and logical reasons, the impacts of the spill and

OCT 5 1989

DEPARTMENT OF RURAL SOCIOLOGY 1450 LINDEN DR., 350 AG. HALL UNIVERSITY OF WISCONSIN MADISON, WISCONSIN 53706 (608) 263-4893

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EXXON VALDEZ OIL SPILE TRUSTEE COUNCIL ADMINISTRATIVE RECORD

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clean-up on the human environment simply must be given adequate treatment in the final version of the damage assessment plan and in the studies that are actually done. If you would find it helpful, I would offer my services, at no charge, in helping you to identify more fully the studies that need to be done and/or to identify other persons who might be helpful to you in that process. The current version of the plan, however, unfortunately cannot be taken as even an approximation of adequate treatment of the impacts on the human environment.

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I thank you for your attention to this input, and I reiterate my offer to help you in whatever way you might find to be most useful.

Respectfully submitted

William R. Freddenburg

Chair, Socioeconomic Subcommittee MMS Scientific Committee and Secretary, Section K - American Association for the Advancement of Science

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HECEIVE Department of Law

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UNIVERSITY OF OREGON

September 27, 1989

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EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

Alaska Attorney General's Office 1031 West 4th Avenue, Suite 200 Anchorage, Alaska 99501 Attn: Barbara Hyder

Dear Barbara Hyder:

I write with reference to the State/Federal Natural Resource Damage Assessment Plan for the Oil Spill, dated August 1989. I focus on the lack of attention to possible damage to archaeological sites located in the lowlying coastal areas affected by the spill.

Although I recognize that damage to resources of archaeological value are not susceptible to correction in the same way that damage to fish and wildlife habitat may be, it is necessary to recognize that (a) deeply penetrating hydrocarbons may affect not only some artifactual material that is potentially recoverable through excavation, but more seriously (b) may contaminate organic materials to the place where it becomes absolutely impossible to conduct analyses of chemical attributes that permit estimates of food values of resources and of past diets, or to accurately measure ages by the radiocarbon method or by some other isotopic means. Such losses would be permanent and absolutely irreplaceable.

It is therefore imperative that studies of a sample of sites be initiated in order to assess the degree of this danger. Should oil seepage into the sediments be a problem that continues over even the near term, this must be determined within the test period in order to prepare for later mitigation of damage by speedy excavation of at least some threatened sites.

Yours sincerely

Don E. Dumond Professor and Director, Oregon State Museum of Anthropology

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Mark Reed 723 Broad Rock Road Peace Dale, RI 02879 October 2, 1989

Trustee Council P.O. Box 20792 Juneau, AK 99802

GCT 5 1989

EXXON VALUEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

Dear Sir/Ms:

I have just received and reviewed in some detail the State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill.

Although these comments will arrive a few days after September 30, I trust they may be taken into consideration.

In brief, the plan relies on a series of measurement programs to assess the damages. The published literature (examples enclosed) clearly shows that measurement programs without a unifying modeling framework cannot demonstrate losses within any acceptable statistical confidence. This is not simply my opinion, but a scientific fact arising as a direct result of magnitude of natural variability in space and time.

I strongly urge the Trustee Council to reconsider the scientific basis of the proposed plan. As proposed, the results of the studies will not stand up in or out of court, and the public will have received a second major disservice as a result of this oil spill, this time from the trustees of their own natural resources.

It is my understanding that a polluter, in this case Exxon, does not have to reimburse the trustees for unreasonable damage assessment costs. The vase majority of the studies in the proposed plan can clearly be shown to fall into this category.

Sincerely yours,

Mark Reed, Ph.D. J.

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PETITION

9/19/89

ALASKA FISH and WILDLIFE RESEARCH has applied for a Permit to conduct scientific studies on 650 WILD SEA OTTERS, and are asking permission to CAPTURE BY TANGLE NET, DRUG WITH FENTANYL CITRATE, AZAPERONE and VALIUM, TAG FLIPPERS by PUNCTURE HOLES, SAMPLE BLOOD, BIOPSY VISCERAL FAT, EXTRACT A MOLAR, INJECT SUBCUTANEOUS TRANSPONDER CHIPS, and SURGICALLY IMPLANT RADIO TRANSMITTERS in 300 Dependent PUPS, 300 Independent FEMALES, and 50 Independent Males for purposes of gaining damage assessment value to the harm caused by the Oil Spill on Alaska's Wildlife in pursuit of the State of Alaska's lawsuit against Exxon.

We, the undersigned, oppose such INVASIVE Research which harms the animal, causes extreme duress, and lays open very probable abandonment by Mother Sea Otter in having her Pup captured, and other various reasons and request by this Petition a Public Hearing be granted to the People of this State so that all facts and data can be reviewed before such Permit can be legally and humanely considered and/or approved:

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EXXON VALUEZ OIL SPILL. TRUSTEE COUNCIL ADMINISTRATIVE RECORD

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SEA OTTER RESEARCH FION CONTINUATION OF PROPOSAL TO STOP THE DAMAGE ASSESSMENT Study # 6 MARINE MAMANAUS Saskia Achilles Box 3000 Homer, Alaska 99603 Witfindlay Abboth A.O. Box 2454 Homen AK 99603 Strullar Traiah Balar 13 54 Homenellegter3 Sonna Malty 1316 ocean De Homer AK 9603 Meidi moorter PO Box 845 Homer AK 99603 Steve W. Knuegen Pors 10451 Aniloringe 19510 Pourel Comp Fits Bay Hethery Fodiate AB. 99697 to Culto C. KITOI BAY HATCHERY KODIAG AC. 99615 Lish Muith 7621 Footbull Dr. Arch. ak 99504 Ron Wensel P.O Box 876384; WASKLA AK 99687. priver Combetottic NANGY CHARLESDOTTIE BOX TH28, HOMER 99603 Grace P. Hickson Box 1326 Homen alorka 99603

FXX - POB0x 658 Homer, alaska 9960= Sept. 2, 1989 Director, US Fish's Wildlife Office of Management authority Do Box 3507 arlington, Virginia 22203-3507 Dear Sir, Daving just this date receiveda copy of Glaske Fish & Wildlife Research's Fermit application Las appearing in the Federal Register dated, lay. 8, 19897. said application requesting Permit Zo Capture, drug, tap, bleed for sample, extract molato, take blopsy of viscera! lat, insert transponder chip of radio Otransmitter, and monitor year-around up to 650 wild sea others, Srequest a public hearing to be held immediately to scrutinize your reasons and methods for fult ther invasive researchof this nather Steven Schulz P.O. Box 15166 FRitz CK. AK. 99603 (907)235-70 Nancy Brown POBOX 658, Homer, akgg603 Kathy Hill " P.O Bex 1988 Homer, AK 99603 907 235-5 Patricia King, Box 15012 Fritz Creek Branch, Homer, Alaska 99603235-72 Bonnie HErbold, POBox 365, Homer, Alaska 99603 -235 - 6: Jimmie H. Wiles Po Box 580 , Homev, Alaska 99603 Christine King PO Box 580 Homer, Alaska 99603 P.T.O SANARA Thomas P.D. Box 2724, Homen, AK. 99603



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October 9, 1989

Department of Anthropology Fairbanks, Alaska 99775

Trustee Council P.O. Box 20792 Juneau, AK 99802

Dear Sir:

I am writing to provide comment on the follow-up plan to study the potential damage of the Exxon-Valdez oil spill on archaeological sites. In terms of my own involvement, I worked on contract for the National Park Service for one week in April and for five weeks for Exxon from mid-June to late July. My primary motive was, and is, to protect and preserve the record of Native culture history of the region since this has been my central research area for the past decade.

I did not see oil lying directly upon upland sites or washing upon eroding midden fronts this summer. Moreover, I received no reports from colleagues on contract to Exxon or archaeologists from State and Federal agencies to the effect that they observed oil on sites or on erosion fronts. There is no doubt that eroded artifacts were covered with oil from time to time, but these artifacts are less important than in situ material. This is not to state unequivocally that oil did not contaminate some sites given the constipated information flow among colleagues throughout the summer. Yet, direct contamination of sites by oil seems to be less serious than other factors.

My view is that the most serious threat to sites is <u>not</u> directly attributable to oil contamination but to the documented and future damage resulting from site vandalism and marine erosion, factors which have been aggravated by the spill activity. If the professional archaeological community is serious about protecting and preserving archaeological sites, vandalism and erosion, mutually reinforcing secondary impacts, must also be addressed.

Thank you for the opportunity to express my views to the Trustee Council.

Sincerely. chard HTrdan

Richard H. Jordan Professor of Anthropology and Chairman

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TRUSTEE COUNCIL ADMINISTRATIVE RECORD



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Department of Anthropology Fairbanks, Alaska 99775

INIVERSITY OF A LASKA FAIRBANKS

Trustee Council P.O. Box 20792 Juneau, AK 99802

Dear Council,

October 9, 1989

I have just reviewed a portion of the public review draft of the State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill. As an archaeologist who conducted survey work in the spill area this summer, I find myself very dissappointed in the design of "Economic Uses Study Number 9: Survey of Archaelogical Sites Impacted by the Exxon Valdez Spill."

- The most conspicuous omission in the plan is the lack of attention to vandalism and theft. The oil spill and months of clean-up activity brought literally thousands of people into remote areas of Prince William Sound, Kodiak Island, etc. Many of these people were first introduced to archaeology during the clean-up. Despite Exxon's efforts at education, many of these people learned how to recognize artifacts, but not that it is illegal to remove them from State and Federal lands. There is increasing demand for illegal antiquities, and the oil spill may stimulate an increased level of theft from these archaeological sites. I strongly believe that sufficient resources (i.e., funds and skilled archaeologists and law enforcement personnel) should be directed toward monitoring known sites to document this illegal activity. Effort should be directed to apprehend some of these looters under the authority of the Archaeological Resource Protection Act. The USDA Forest Service (Southwest and Northwest Regions) have successfully brought such cases to trial, and could be consulted in the planning of such efforts. Sufficient publicity should be generated to serve as a warning to other would-be site vandals.

Vandalism was already a widespread and large scale problem in places like Kodiak, but as a consequence of the oil spill, hundreds of people have learned about the location and contents of archaeological sites. Over the next few years, we may see a dramatic increase in archaeological site raiding and vandalism. Because this theft of archaeological material can damage and even destroy such a large number of sites, I believe increased vandalism may be the most significant adverse impact of the spill. Any study of impacted archaeological sites must take this into account.

The State and Federal Government employ many skilled professional archaeologists, many of whom worked on spill-related activities this summer. I hope you will employ the expertise of these people in your revision of "Economic Uses Study Number 9." In addition, the next phase of the study should be accompanied by a budget that can realistically address the issue of vandalism.

Madonna L. Moss, Ph.D. Assistant Professor of Anthropology



EXXON VALUEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

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STATE OF CALIFORNIA

STATE LANDS COMMISSION

LEO T. McCARTHY, Lieutenant Governor GRAY DAVIS, Controller JESSE R. HUFF, Director of Finance GEORGE DEUKMEJIAN. Governor

EXECUTIVE OFFICE 1807 - 13th Street Sacramento, California 95814

CLAIRE T. DEDRICK Executive Officer

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EXXON VALUEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

September 28, 1989

Trustee Council c/o Deputy Director U. S. Fish and Wildlife Service 18th and C Streets, NW, Room 3340 Washington, DC 20240

Gentlemen:

The staff of the California State Lands Commission has reviewed the Public Review Draft State/Federal Natural Resources Damage Assessment Plan (Plan) for the Exxon Valdez Oil Spill as dated August, 1989. We appreciate this opportunity and submit these comments for your consideration.

The document indicates that Exxon has provided \$15 million for assessment studies; however, the total budget indicated in the plan is \$35 million. The means for covering the apparent shortfall is not clearly explained in the text. If participating agencies are not going to provide the missing support, the final plan should: 1) indicate the source of all monies necessary to implement the Plan; or 2) describe how the stated available monies will be allocated among a prioritized listing of the described studies.

The Plan is designed to measure effects of the spill through the end of February 1990 only. While recovery of damages which can be identified within the stated time frame should not be delayed by additional studies, some damages may not be evident during the first year. The final Plan should contain a reasoned, focused program of studies which could be necessary over a total evaluation period of five years. Com. Topic Issue Sug. Sort 1 4 0100 X 2



TRUSTEE COUNCIL, USFWS

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SEPTEMBER 28, 1989

We also have some concerns as to the definition of "economic value" of resources as stated in the Plan. Such value is to be based "...on the goods and services they provide humans." This concept should be better defined. For example, under the present definition, how will resources with no "accepted" commercial value (sea otters, raptors, etc.) be evaluated along with those of accepted commercial value (salmon, etc.)? In addition, how will the pre-spill level of the affected resources be determined?

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Thank you. We look forward to the publication of the final Plan.

Sincerely,

DWIGHT E. SANDERS, Chief Division of Research and Planning

DES:maa cc: Claire T. Dedrick, Executive Officer







F/V PRIVATEER

DAVE SCHEER & JEFF TRUHN PO BOX 611 262-1358 KASILOF, ALASKA 99610



EXXON TALVES UN SPILL

TRUSTEE COUNCIL

ADMINISTRATIVE RECORD

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Trastee Seancil PS Box 20752 Juneau, Alaska 99802

Sept. 30, 1989

Dear Courcil.

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I have reviewed the draft, Natural Resource Damage Assessment Plan and Restoration Strategy for the Exxon Valcez dilspill.

I agree 100% with all the studies presented and feel they are very important. I also agree that time is important, and these studies must happen now on very soon !

I would note that the Trustee Douncil would recommend <u>nining Alaskans</u> whenever possible during this study. I think this is very important, to utilize Alaska's workforce, especially those who are most affected by the oil spill.

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Thank you,

Davic Scheer

Cloud & Acheen

society for american archaeology

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808 17TH STREET NW #200 WASHINGTON DC 20006 TELEPHONE 202/223-9774

MSU MUSEUM Michigan State University East Lansing, Michigan 48824-1045

October 11, 1989

CERCIA Trustee Council P.O. Box 20792 Juneau, Alaska 99602

Dear CERCLA Trustees:

The Society for American Archaeology, the largest organization representing the archaeological community in the United States, has had the opportunity to review the Public Review Draft of the Assessment Plan for the Econ Valdez oil spill. Given the precedent setting nature of this initial CERCIA process, and the fact that significant archaeological resources are present in the assessment area, we feel it is imperative that archaeological resources be properly addressed in the Assessment Plan. We would, therefore, like to bring to your attention several areas of the Public Review Draft which we feel warrant modification to better accomodate the impact on archaeological resources.

Economic Use Study Number 9 has a section referring to archaeological resources. The proposed activities in this section must be more clearly specified, for purposes of proper research design formulation, as well as for purposes of accountability and project evaluation. It should also be noted that this section has no dollar values associated with the work to be accomplished. This differs from other sections of the plan where dollar values are specified. Clearly these are linked problems. The work plans need to be more specific so that appropriate funding can be allocated.

Economic Use Study Number 9 also does not address what has been a major issue for the Society for American Archaeology in recent years; looting and vandalism. As sites hitherto unknown to the general public become more visible, and as their locations become known, there undoubtedly will be an increase in the already high rates of looting that occurs at these locales. The SAA strongly feels that funding for assessment of looting impacts, and the regular monitoring of these sites to apprehend vandals, should be included in the Final Assessment Plan. Prosecution under the Archaeological Resource Protection Act may help to curb such activities.

As Economic Use Study Number 9 indicates, the deadline for completions of the archaeological component of this assessment is February 28, 1990. Archaeological work at this latitude requires a summer field season, which means that the time frame for completion should be modified accordingly. At a minimum the deadline should be extended through September of 1990 if not longer.

The Society for American Archaeology appreciates this opportunity to comment on the Public Review Draft of the Assessment Plan, and we hope that the Final Plan can be properly modified to accomodate the several concerns we



EXXON VALUEL OL SFILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD



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CERCIA Trustees page 2

have expressed. We believe that more in depth consideration of the archaeological resources in the assessment area is critical to evaluating the long term effects they will undergo from the oil spill event. I thank you for your attention. If I may be of further assistance feel free to contact me at 517/355-3485.

Sincerely, William A. Lovis

Chair, Government Affairs Committee Curator and Professor of Anthropology

cc: J. Sabloff, President P. Rice, Vice President CEHP, Inc. YAT I

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October 20, 1989

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Trustee Council P.O. Box 20792 Juneau, AK 99802

Dear Members of the Trustee Council:

Enclosed please find my comments on the August 1989 State/Federal Draft Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill. Please read them over carefully and integrate the recommendations into the Final Plan. I believe they are worthy of consideration.

Sincerely,

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Thea Liskamm 2731 1/2 Ashby Place #3 Berkeley, California 94705 415/848-1336

Enclosure



EXXON VALUEZ OIL SPILL. TRUSTEE COUNCIL ADMINISTRATIVE RECORD

MEMORANDUM

 TO: Trustee Council
 FROM: Thea Liskamm
 RE: Comments on August 1989 Draft Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill
 DATE: October 20, 1989

I. EXECUTIVE SUMMARY

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> In order to evaluate the Draft Plan I chose five major categories which merit attention, described their current status and provided a recommendation for the Final Plan. The five categories are: Internal consistency, relationship to key ecological concepts, linkage to policy choices, mechanism for public disclosure of findings, appropriate summary discussion and graphics. I chose these five categories because I decided they were particularly relevant to the process of environmental planning. There are, of course, many other areas for evaluation because any plan can always be improved.

> While evaluating the draft plan I had the opportunity to speak with a number of people who are working with the Trustees or have reviewed the document. My colleague Daniel Suman at the Boalt School of Law, Michael Herz of the Baykeeper, Professor Suzanne Scotchmer of the Graduate School of Public Policy have all been particularly helpful.

The Final Plan should incorporate the major recommendations given in this evaluation. Establishment of a control environment as a baseline for comparison studies will provide a clearer picture of the extent of the actual damage incurred. In order to

interpret the studies, more information regarding sampling sites and techniques is needed. The cumulative impacts on all categories should be addressed both systemically and programmatically. Information is needed regarding the linkages between the environment and the people who are devoted both economically, culturally and spiritually to the uniqueness of Alaska. Avenues for public input into the development of a restoration strategy should be more clearly outlined in the Final Plan. A full summary discussion would help emphasize the main goal of the damage assessment plan.

II. INTRODUCTION

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The March 1989 Exxon Valdez tanker spill dumped 11 million gallons of crude oil into the pristine environment of Prince William Sound making it the biggest spill in U.S. history. Exxon has thus far spent 15 million dollars in a massive effort to clean up the disaster. Towards the end of the summer the State of Alaska, joined with the participating federal agencies, the Department of Agriculture (DOA), Department of the Interior (DOI), and the Department of Commerce (DOC) as "Trustees", and the Environmental Protection Agency (EPA) worked together to produce the State/Federal assessment plan. The EPA is the overseer of the two acts which provide authority for the damage assessment and restoration activities: The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Clean Water Act (CWA).

The stated goal of the plan is to define the process by which damage to the environment is evaluated in order to seek payment from responsible parties for restoration.

The total cost for completion of the studies outlined in the assessment plan is estimated to be 35 million dollars through the end of February of 1990. The plan is broken up into three major categories: determination and quantification of injury, determination of damage, and development of a restoration strategy.

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The largest part of the draft plan (Part I) is composed of injury determination and quantitative studies. The stragegy for damage assessment uses scientific information to support the estimates of economic damage for lost or injured resources. Scientific information is needed to verify the nature and magnitude of the injury sustained, to provide proof that the injury was caused by the spill and to identify potential needs and approaches for restoring the resources. (p.20) Damage assessment is based on nine areas of study: coastal habitat, air/water, fish/shellfish, marine mammals, terrestrial mammals, birds, economic uses, technical services and restoration.

While the damage assessment plan seeks to evaluate damage it is not a restoration plan. According to the report, the evaluation of the studies will lead to the development of a restoration plan. Part II, Development of the Restoration Plans is only two pages long in the Draft Plan and summarizes only the rationale and potential costs associated with developing a restoration plan. The objectives of the restoration plan include the incorporation of ecological concepts, a review of natural resource/injury assessment reports, and an evaluation of restoration techniques and strategies. The Trustee Council will confer with scientists, agency representatives and the concerned public prior to the implementation of restoration activities. Lead agencies are the EPA and the State of

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Alaska, and the U.S. Forest Service (USFS), National Oceanic and Atmospheric Administration (NOAA), and U.S. Department of the Interior (USDI) are cooperating agencies.

Part III, the section on Damage Determination: Economic Value of Resource Use divides the economic value determination into nine categories: Commercial fisheries, fishing industry costs, bioeconomic models for damage assessment, effects of the oil spill on the value of public land, economic damages to recreation, losses to subsistence households, study of loss of intrinsic values, economic damage assessment of research programs and survey of archaeological sites impacted by the Exxon Valdez oil spill. None of these categories adequately address the intrinsic value of the environment. The study of loss of intrinsic values a survey method to document individual's intrinsic valuation of the resources in question, however the plan is not explicit about how it will use the information derived from the survey. Reversibility is assumed.

III. ANALYTICAL METHODS

A. Internal Consistency

Throughout the entire document there is a lack of baseline data for comparison. The post-spill damage assessment cannot adequately be completed without a clear idea of the status quo prior to the accident. Without sound baseline data, it will be difficult to determine the extremity of the damage. For example, how can the Trustees distinguish between population changes caused by the oil from changes as consistent with natural

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variability? The Draft Plan states that "Where possible, the basic approach of the injury determination/quantification phases is to compare conditions." and that "Pre-spill conditions have been documented for some ecosystems and sites in the Sound." "Where possible" and "some ecosystems" are vague terms and furthermore, the injury determination studies in the Draft Plan show little or no comparison to pre-spill conditions.

Figure 6, the diagram of The Damage Assessment and Restoration Process, (p. 19), shows the Assessment Report date as indeterminate. After the assessment report is completed a demand letter is sent to the responsible parties and later a settlement or reached. After this completed, the restoration award is process is strategy/planning/implementation takes place. The diagram shows a direct connection between the completion of the three studies and the restoration strategy as well as a direct connection between the results of the studies and the restoration strategy. Realistically, what will be undertaken prior to the settlement or award? The plan reads, "In concert with the studies, the Trustees will begin preliminary restoration planning so that final restoration can begin as soon as possible after recovery of the claim." (p.18) This is inconsistent with the diagram which implies that the completion of the studies will have a direct impact on restoration, prior to the assignment of responsibility and collection of settlement monies.

In addition, sampling strategies are addressed quite generally in the plan. An inaccurate or poorly chosen <u>sampling strategy</u> could potentially underestimate or overestimate damages. Regarding the patchiness of oil in Prince William Sound and other

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coastal areas, for example, the sediments near heavily oiled areas might show high concentrations of petroleum hydrocarbons, while those in less affected areas might display different results. Without explicit information regarding the specifics of the sampling techniques used it is difficult to evaluate data which is laboriously collected.

B. Relationship to Key Ecological Concepts

The damage assessment plan covers an extremely short period of time. The assessment plan is being addressed only six months after the spill occurred and does not even cover an annual cycle. A study completed hurriedly in the short-run cannot and will not address potential long-run damages. Natural resources are which are inherently renewable suffer damages far different than damages suffered by inanimate objects because long term natural variations can hide significant impacts to natural systems. A speedy damage assessment ignores the potential for ecosystemic consequences to continue for many years. It will be impossible to quantify long-term effects with only half a year's data. It will takes years and perhaps decades to fully understand the damage done to the ecosystem by the oil spill. Some say it is primitive and distasteful to measure the environmental impacts at this point in time and speculate that the damage assessment will grossly underestimate the actual natural resource damage done by the oil spill.

The plan does not consider the damage done to phytoplankton nor zooplankton, it considers only larvae of commercially important species (See Fish/Shellfish Study #19). It does not study the effects on marine bacteria in the water column or sediments. Daniel

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Com. Topic Issue Sug. Sort 6 3 1490 X 2 marine food chain and should not be overlooked in assessing ecosystem damage. In addition, there is no study of primary and secondary productivity in the waters. While marine algae and kelp are eaten by many fish, provide a key link in the food chain of subpolar Alaskan waters and are a habitat for many marine animals, the plan does not consider marine plants.

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C. Linkage to Policy Choices

As I understand it, there is currently a problem within the Trustee Council. The multiple Trustees are having trouble delegating the lead to one of the member agencies. While I believe it is a good idea to join together to form the Council, I am skeptical of the effects of such internal political confusion at a time of severe environmental crisis. While tradeoffs are inevitable, I sincerely hope the Trustees can come to a speedy decision without adversely affecting the natural resource damage assessment questions which they have joined together to address.

The Secretaries of the respective Departments are working with the Commissioner of the Alaska Department of Fish and Game on the damage assessment plans. Development of a restoration plan is contingent upon the findings outlined in the assessment plans. "Restoration efforts will begin as soon as practical after information is obtained on the extent of resource injury." (p.17) What policy choices does this leave the rest of us with? Clearly, both the environment and the public must wait until resource injury is assessed.

Is the situation reversible? The implicit assumption in the draft plan is that
eventually Prince William Sound and the biological life in the surrounding areas can and will return to pre-spill conditions. Policy choices are contingent upon this assumption and tradeoffs may be taken too lightly in the context of ultimate recovery.

D. Mechanism for Public Disclosure of Findings

The August 1989 State/Federal Draft Natural Resources Damage Assessment Plan for the Exxon Valdez Oil Spill is open for public review prior to the completion of the Final Plan. The deadline for comments has been extended from September 30 until October 31, 1989. Resource agencies, locals and interested parties are all welcome to send comments on the Draft Plan to the Trustee Council. Although public input has been incorporated into the restoration plan outline, there is no concrete information regarding the avenues for public input.

Potential responsible parties identified by the Coast Guard include the managers and representatives of Exxon Shipping Company, Exxon Corporation, and Alyeska Pipeline Service Company. Letters giving notice of intent to perform an assessment have been sent to the parties listed above. The draft assessment plan states that the list may be expanded upon further investigation. How will the public be notified of the expansion of the list?

E. Appropriate Summary Discussion and Graphics

Although there is an elaborate financial summary, there is no conclusive summary discussion in the draft damage assessment plan. The plan ends rather abruptly with a summary of fiscal needs. Why isn't the big picture addressed? Graphics are, for the most part, appropriately presented. Maps are provided of (1) North Central Gulf of

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Alaska (Figure 1a); (2) Western Gulf of Alaska (Figure 1b); (3) Map of Prince William Sound (Figure 2); (4) Major Currents in the Gulf of Alaska (Figure 3); (5) Movement of the Oil from the Exxon Valdez Spill, March 24-May 18, 1989 (Figure 4). Figure 5 shows the Behavior of Oil in the Alaskan Environment. Figures 6, 7 and 8 are diagrams of the planning process.

IV. RECOMMENDATIONS

A. Internal Consistency

Perhaps a baseline environment can be established for comparison which is similar to the status of Prince William Sound prior to the spill. Establishment of such a control environment will inevitably provide a clearer picture of the extent of the actual damage both now and in the future. Consistency between the diagrams in the document and the written report itself will allow for a more plausible final damage assessment plan. In order to provide accurate information, more information regarding sampling sites and techniques is needed. A glossary would be useful at the end of the report to further define terms certain readers may not be sure of.

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B. Relationship to Key Ecological Concepts

Establish a damage assessment plan which is open-ended and leave room for integration of damages as they are discovered. Integrate key ecological concepts such as complex linkages, density dependence, biological magnification, and stability boundaries. The Final Plan should address the ecosystemic impacts of the oil spill. The draft plan

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outlines the effect of the spill on the nine individual categories but the linkages between air and water and restoration, etc. as well as cumulative impacts on all categories should be addressed both systemically and programmatically. If the plan is supposed to be a comprehensive analysis of how the oil spill affected ecosystems in south central Alaska, then it should be comprehensive and as such include damage assessment studies of plankton, marine bacteria and algae. Some degree of ecosystemic forecasting is needed in order to estimate the long-term damage rather than relying entirely on data gathered from the six-month Alaskan summer.

C. Linkage to Policy Choices

What is the short and long-term impact of the environmental crisis on the local economy and culture? Many people move to Alaska because they believe in the cultural values of Alaska and Alaskans and yet the spill has adversely affected those values. Although there is a brief mentioning of Native allotments, tourism, etc. there is no information regarding the linkages between the environment and the people who are devoted both economically, culturally and spiritually to the uniqueness of the Alaskan environment. How will the oil spill affect future generations? What are the chances of irreversibility in certain parts of the ecosystem? These questions need to be addressed in the Final Plan. A lead agency must be established in order to continue to develop the restoration process.

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D. Mechanism for Public Disclosure of Findings

The Trustees should respond directly to the resource agencies and individuals

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submitting comments. Responses should refer to the integration of individual comments into the Final Plan. The public should have the opportunity to know as soon as possible after responsibility is assigned to key parties. Avenues for public input into the development of a restoration strategy should be more clearly outlined in the Final Plan.

E. Appropriate Summary Discussion and Graphics

A full summary discussion would help emphasize the main goal of the damage assessment plan. The big picture/long-term should be addressed. Graphics should be expanded to include maps of projected areas subject to damage in the long-run from the oil spill. Diagrams should also include the long-term in the planning process.



V. CONCLUSION

A restoration plan is needed now. Although the Alyeska Pipeline Servie Company is refusing to assume responsibility for any spill beyond an initial response, someone must pay for the ongoing restoration efforts. A damage assessment plan focused on individual categories or study areas does not change the fact that Exxon is primarily responsible for the cleanup, as well as the parties that did not enforce the oil spill plan requirement. CERCLA and the CWA give the EPA the authority to make sure the environment is protected and restored to it's pre-accident state. Determination of pre-spill conditions is imperative in order to set an ultimate clean-up goal. Development of a restoration plan is urgent and the plan must be open for ecological, social and political input indefinitely. The Alaskan environment, people and wildlife must not suffer any longer.

