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IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF ALASKA

UNITED STATES OF AMERICA, Plaintiff, vs. EXXON CORPORATION, EXXON SHIPPING COMPANY, ALYESKA PIPELINE SERVICE COMPANY, AMERADA HESS PIPELINE CORPORATION, ARCO PIPE LINE COMPANY, EXXON PIPELINE COMPANY, MOBIL ALASKA PIPELINE COMPANY, PHILLIPS ALASKA PIPELINE CORPORATION, BP ALASKA PIPELINES, INC., UNOCAL ALASKA PIPELINE COMPANY, and the T/V EXXON VALDEZ, in rem, Defendants. AND COUNTERCLAIM	Civil Action No. A91-082 Civ. NOTICE OF LODGING BY EXXON CORPORATION AND EXXON SHIPPING COMPANY OF SUMMARY REGARDING NATURAL RESOURCES

Please take notice that defendants Exxon Corporation and Exxon Shipping Company are lodging with the Court the attached summary and appended studies regarding natural resource injuries and recovery arising from the Exxon Valdez oil spill.

These materials, which have been publicly available for some time, are lodged to assist the Court in evaluating the pending consent decree and to provide the Court with information which both supplements and contrasts with views contained in the government summary of effects on natural resources filed on April 8, 1991.

DATED this 16th day of April, 1991.

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Attorneys for Exxon Shipping Company

By: Douglas J. Serdahely
Douglas J. Serdahely

DATED this 16th day of April, 1991.

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AFFIDAVIT OF SERVICE

STATE OF ALASKA)
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THIRD JUDICIAL DISTRICT)

Joy C. Steveken, being duly sworn, upon oath, deposes and says: that she is employed as a legal secretary in the offices of Bogle & Gates, 1031 West 4th Street, Suite 600, Anchorage, Alaska 99501; that she has hand served or sent overnight delivery on April 16, 1991 the following document:

Notice of Lodging by Exxon Corporation and Exxon Shipping Company of Summary Regarding Natural Resources

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SUBSCRIBED AND SWORN to before me this 16th day of April, 1991.

Patricia I. Olmstead
Notary Public for Alaska
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IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF ALASKA

STATE OF ALASKA, Plaintiff, vs. EXXON CORPORATION, a New Jersey corporation, and EXXON SHIPPING COMPANY, a Delaware corporation, Defendants. AND COUNTERCLAIM	)	Case No. A91-083 Civil

NOTICE OF LODGING BY EXXON CORPORATION AND EXXON SHIPPING COMPANY OF SUMMARY REGARDING NATURAL RESOURCES

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DATED this 16th day of April, 1991.

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IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF ALASKA

STATE OF ALASKA, Plaintiff, vs. EXXON CORPORATION, a New Jersey corporation, and EXXON SHIPPING COMPANY, a Delaware corporation, Defendants. AND COUNTERCLAIM	Case No. A91-083 Civil

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Joy C. Steveken

SUBSCRIBED AND SWORN to before me this 16th day of April, 1991.

Patricia L. Olmstead
Notary Public for Alaska
My Commission Expires: 5-11-93

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SUMMARY OF PUBLISHED STUDIES ON THE EFFECTS OF THE EXXON VALDEZ OIL SPILL ON NATURAL RESOURCES

April 16, 1991

Introduction

Following the grounding of the Exxon Valdez on March 23-24, 1989, Exxon commissioned scientific studies for publication on the consequences of the oil spill. These studies have been available to the public for some time and now form the bases for this summary. These and other published studies describing the state of the ecology in the affected area demonstrate, among other things, that the water is clean, fish are abundant and safe to eat, and wildlife is thriving. Taken together, these studies characterize the robust state of recovery of the area affected by the oil spill.

This summary addresses broad categories of natural resources by providing the conclusions reached by the named scientists and by appending full copies of their studies, which have been publicly available for sometime.

Water is Clean

Effects of the oil spill on the waters of Prince William Sound and the western Gulf of Alaska are of critical importance to Alaskans and visitors. They provide a habitat for large commercial and recreational fisheries and a source of subsistence foods for native villagers. Recognizing its significance, immediately following the spill a water quality study of unprecedented scope was begun. The study, conducted by five leading environmental assessment firms and led by Dr. Jerry Neff, provided a concise evaluation of water quality in the affected area in the months following the spill.

Results from over 5000 water analyses, covering the period from March 1989 through March 1990, indicated the average concentrations of potentially hazardous hydrocarbons in the water remained well below State of Alaska standards. Furthermore,

> "A comparison was made of the measured VOA (Volatile Aromatic) and PAH (Polycyclic Aromatic Hydrocarbon) concentrations in the water column and on the water surface (in sheens) of Prince William Sound with the published literature on the toxicity of petroleum to marine organisms, particularly Alaskan species. Average concentrations of petroleum hydrocarbon . . . are well below (approximately 10 to more than 1000 times below) concentrations that have been shown to be toxic or cause harmful sublethal effects in marine animals." [1]

[ ] Technical references listed in Attachment A.

In summary, Dr. Neff concluded that,

> "It is extremely unlikely that hydrocarbon concentrations resulting from the spilled oil have had or will have any adverse effects on plants and animals living in the water column of Prince William Sound and the western Gulf of Alaska, including commercial fishery species."

As noted below in the Fishery Resources section, subsistence foods were found to be safe to eat as would be anticipated based upon the results of the water quality study.

In response to public and agency concern about the sheens observed in Prince William Sound, Dr. Neff discussed a special sheen study in his report, conducted as part of the overall water quality effort. As background, Dr. Neff provided technical detail on sheens (i.e., their typical thickness and how their color indicates thickness), noting that they are very thin. For example, a sheet of paper is typically 450 times thicker than a rainbow-colored sheen. He also noted that a tablespoon of oil would form a sheen of 625 square feet. Further, he stated,

> "Oil sheens are patchy, short-lived phenomena in western parts of Prince William Sound. Surface waters covered with oil sheens derived from spilled oil washing off oiled shores contain low concentrations of highly weathered oil (crude oil which has lost its lighter, more toxic components)."

He further reported that,

> "Crude oil is not the only source of sheens in Prince William Sound. Natural organic material from decaying vegetation or from heavy schooling of some fish, such as herring, can cause sheens that are difficult to distinguish from oil."

He also noted that National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service had revealed that some Prince William Sound fisheries closed in 1989 because of sheens which were later shown to be caused by bilge oil, diesel oil, and hydraulic fluid -- not Valdez crude oil. He also observed that by late summer 1990 sheen monitoring reports showed that only a small percentage of the sheens observed were identified to be from the spill. He concluded,

> "It is unlikely that marine organisms in Prince William Sound are being adversely affected by sheens of spilled oil."

Habitat Recovery is Well Underway

The biologic habitat most acutely affected initially by the spill were those shorelines impacted by floating oil. The cleanup program conducted by Exxon in 1989 and 1990 under the direct supervision and approval of the U. S. Coast Guard, which incorporated advice of various federal, state, and local entities, dealt directly with the shoreline. The cleanup program on which Exxon has expended more than $2 billion was, like the water evaluation,

unprecedented in its extent. [19,20] Exxon's successful cleanup program along with the widespread use of bioremediation techniques hastened the restoration and recovery process.

Several observers have noted the obvious extent of nature's recovery. Drs. J. M. Baker, R. B. Clark, and P. F. Kingston in describing the biological recovery of shorelines in April and September, 1990, noted:

> "Only a portion of the shoreline had been oiled (by the spill in 1989) and, as with most other oil spills, the bulk of the damage had disappeared during the first year. The area has retained its natural beauty; there are abundant signs of plant and animal life, and recovery is well under way on even the most severely impacted beaches." [17]

> "The summer settlement and growth of the organisms we saw was good biological evidence that the sea and the shores were clean enough for recovery to take place. Mussels, barnacles and rockweed that were abundant on the shores as newly settled juveniles in Spring had become established as young adult populations by the Fall. Such development had taken place even where there had been no clean-up or there was still residual oil on the shore." [2]

This observation of recovery was confirmed by a July 5, 1990, NOAA report which found:

> "there was evidence of recolonization of biological communities and that the small amounts of remaining subsurface oil were not causing a serious impact on the environment." [3]

Dr. E. H. Owens has monitored recovery of the oiled shorelines since 1989. In spite of focusing on a set of study sites which were biased toward worse-case conditions, Owens found

> "The combined result of treatment and natural cleaning was that the majority of shorelines retained little or no oil by the end of the summer of 1990 . . . The combined average surface oil cover area of all the Prince William Sound study sites dropped drastically between May 1989, from 46 percent of the total observed area to less than 2 percent by September 1990." [6]

With respect to the general nature of recovery of shoreline biologic communities, he observed,

> "Key organisms were observed to be similar in abundance and distribution on most oiled and non-oiled sites in September 1990." [6]

In its consideration of 1991 cleanup requirements, NOAA stated, " . . . even where there is direct contact with weathered oil, intertidal organisms have shown remarkable recovery," in a report released to the Coast Guard on March 15, 1991. [4]

NOAA further observed in its report on its 1990 Shoreline Monitoring Program that, "Evidence of intertidal recovery was observed at all impacted sites." [5]

Fishery Resources are Abundant, Productive, and Safe to Eat

The Alaska fisheries support the state's second largest economic component, second only to the oil industry. As such, the potential impacts of the spill on fishing resources required evaluation. The water quality study provides strong evidence that those resources were virtually unaffected. Perhaps, the most persuasive indications of the viability of the resource are the record 1990 harvests of pink salmon and herring, the two most significant commercial fish in Prince William Sound. Over 44 million pink salmon were caught (51 percent of the state's total), far exceeding the prior record of 29 million fish. Similarly, approximately 8300 tons of herring, more than the entire year's "harvest quota," were caught in a 20 minute period although the season typically lasts several hours. Early reports on the 1991 herring fishery indicate another highly successful season.

Further, a number of experts have directly assessed the potential spill effects and have confirmed the view that impacts are likely minimal and the fisheries resources remain safe for human consumption. Royce, et al, in assessing the condition of the fisheries resources, stated that,

> "The potential long-term impact of the oil spill on fish is under careful study, but it is unlikely that any significant adverse effects on finfish populations will be discovered. Throughout 1989 and 1990, there were no confirmed reports of large fish mortalities, oil tainting, or contamination of commercial seafood products from the spill. In addition, long-term damage to finfish has not been documented in the hundreds of studies of earlier oil spills -- many of which were larger than the Exxon Valdez spill." [8]

Minerals Management Service (MMS) of the Department of Interior has summarized the results of studies of Exxon Valdez spill effects on herring in Prince William Sound. Robert M. Meyer with MMS delivered a paper to the International Herring Symposium in Anchorage in October 1990 noting,

> "Results from studies of herring eggs and larvae conducted following the Exxon Valdez oil spill indicated that the presence of spilled oil had no measurable effect on hatching success, occurrence of abnormal larvae, or larval growth and mortality rates (McGurk, 1990 a, b). These results suggest that the developing eggs and resulting larvae were exposed to levels of dissolved and dispersed oil less than that needed to elicit an acute response, i.e., death, deformity, or reduced growth rates." [7]

In commenting on the risks associated with an oil spill near Port Moller, MMS pointed out,

> ". . . the observation that spawning populations of Pacific herring are found in areas where chronic hydrocarbon pollution is endemic, i.e., San Francisco Bay, Pudget (sic) Sound, etc. suggests that herring populations are able to tolerate exposure to sublethal concentrations of hydrocarbons that exceed those expected to occure (sic) in Port Moller following an offshore oil spill."

This observation is obviously applicable where there is a transitory exposure, as was the case with the Valdez spill.

The NOAA report of March 15, 1991, found no evidence of residual oil causing sublethal effects by progressing up the foodchain. Results from their 1990 Shoreline Monitoring Program noted,

> "Chemical analyses of tissues from selected intertidal organisms indicated accumulation of hydrocarbons from the environment but no evidence of magnification through predator-prey interactions." [5]

Both NOAA and the Food and Drug Administration (FDA) have tested the safety for human consumption of subsistence foods (particularly salmon, bottomfish, and shellfish; but including seals, deer, ducks, and sea lions). Neither agency has identified unsafe foods from the impacted areas. [9]

<u>Wildlife is Abundant and Thriving</u>

With respect to seabird impacts, it is important to understand there are about 67 million birds in the Gulf of Alaska and Prince William Sound (NOAA, "The Gulf of Alaska, Physical Environment and Biological Resources", 1986). While the spill caused initial mortality of seabirds, the populations remain abundant. Moreover, the spill mortalities are well within the range of impacts frequently sustained by seabird populations due to natural events and chronic pollution without apparent long-term detriment. Drs. Baker, Clark, and Kingston note,

> "Seabirds are among the most conspicuous casualties of oil slicks and, as such, attract considerable public attention. But there is no reason to suppose that, from a biological point of view, this mortality is damaging to seabird populations. Arctic and sub-Arctic seabirds also suffer heavy mortality from natural causes and from fishery practices. Even the auks (family including murres), which because of their very low reproductive rate might be expected not to be able to make good these losses, have sustained their population; and there is no evidence that other seabirds with a greater reproductive potential have declined in numbers." [16]

Eagles and sea otters were the subject of much public concern after the spill. While both species suffered initial mortalities, there are strong indications that both are recovering quickly and thriving. [12,14] M. J. Gibson and Dr.

J. White, who worked on eagle and bird rehabilitation in 1989 and visited Prince William Sound in 1990 reported,

> "accumulating evidence indicates the area's eagle population is generally healthy and thriving" [11]

Moreover,

> "We observed numerous eaglets and recent fledglings throughout the area. In 1990, many pairs were not only occupying previously oiled territories, but they had also nested, laid eggs, incubated, and hatched chicks that had developed normally." [11]

With regard to sea otters, the observations in 1990 are also encouraging. More than 16,000 sea otters inhabited the portions of Prince William Sound and the Gulf of Alaska that were impacted by the oil according to A. R. DeGange in a U.S. Fish and Wildlife Service symposium in April 1990. Drs. T. M. Williams and R. W. Davis, who organized and worked in Exxon's otter rehabilitation program in 1989, visited Prince William Sound in 1990 to gauge the recovery of the otters in impacted areas. [10] From their observations they noted,

> "Large numbers of adults and pups were found in previously oiled areas, and they appear to feed and behave normally. These results suggest that many of the previously contaminated areas are able to support sea otters." [13]

Drs. Baker, Clark, and Kingston also commented on the recovery of sea otter populations,

> "Sea otters are abundant in Prince William Sound. With a potential for the population to grow at nearly 20% per year, we have concluded that whatever losses suffered in the oil spill are likely to be rapidly made good by natural reproduction." [2]

Ecological Overview

These observations on individual species and habitats are indicative of the health of the overall ecosystem in Prince William Sound and the Gulf of Alaska. Drs. Baker, Clark, and Kingston have commented on the relative rate of ecological recovery from their perspective which reflects the study of numerous past spills. They note,

> "There is a wealth of information about the recovery of cold water marine ecosystems following oil spills in various parts of the world. In all cases recovery events have been similar to those seen in Prince William Sound. If anything, because of the exceptionally thorough clean-up measures and natural cleaning processes, biological recovery has started sooner and proceeded further in Alaska than might have been anticipated." [2]

Dr. A. W. Maki, Exxon's lead environmental scientist on the Valdez spill, integrated the observations on parts of the ecosystem into an overall

assessment in his article in Environmental Science and Technology. Among his findings he noted,

> "Field counts of plants, fish, and mammals from throughout the spill area provide convincing data that wildlife species are surviving and reproducing, thus confirming that biological recovery is rapidly taking place." [15]

Recovery Consistent with Historical Observations

The quick and robust recovery of Prince William Sound and the Gulf of Alaska is consistent with scientific observations made following previous spills over the last 25 years. Dr. J. E. Mielke summarized the technical literature on spills in his 1990 Congressional Research Service report, "Oil in the Ocean: The Short- and Long-Term Impacts of a Spill." He found,

> "Short-term impacts on marine animal life are dramatic but recovery of species populations in almost every case studied has been swift." [18]

The recovery in Prince William Sound and the Gulf of Alaska conforms to this pattern. Drs. J. M. Baker, R. B. Clark, and P. F. Kingston have personally worked on many previous spills; they visited spill impacted areas in April and September, 1990, to assess the recovery in comparison to previous spills. They found,

> "Our examination of the spill area confirmed our expectations, based on knowledge gained from previous accidents, that natural recovery is proceeding in Prince William Sound and the Gulf of Alaska. We expect the recovery to continue and to be relatively rapid." [17]
>
> "Although isolated patches of weathered oil may still be found, nearly all of the beaches in Prince William Sound and the Gulf of Alaska are of clean appearance. Some small and isolated portions of the shoreline may retain oil for several years, but our investigations of previous oil spills indicate that the long-term impact on plants and animals should be minimal."
>
> "The recovery process is well under way. Once started, if it is allowed to proceed without interruption, it will continue and be robust, as it has been following other spills throughout the world."

Cleanup is Essentially Complete

The cleanup of the spill is also in an advanced state. Little additional work remains to be done. The Owens report cited earlier clearly portrays the rapid disappearance of oil from the shoreline [6] and, as early as July 1990, NOAA noted that, ". . . deeply buried subsurface oil (i.e., oil beyond the reach of near-term bioremediation and other less-intrusive cleanup methods) poses little risk of causing further significant environmental injury." In addition, in its March 15, 1991 letter to the Coast Guard, NOAA stated,

"We are rapidly reaching the point of diminishing returns where the amount of effort, and the associated impacts, required to further reduce the total amount of oil remaining on, or in, a beach cannot be justified based solely on the assumption that the presence of oil poses a threat to the overall health of the local environment." [4]

In addressing the environmental threat of remaining oil, NOAA states,

"The bulk composition of the remaining oil is comprised primarily of the residual or asphaltene fractions which have negligible solubility and little demonstrated toxicity, and thus pose little environmental risk to intertidal and water-column organisms, even if there were routine releases."

Given the minimum remaining oil, Drs. Baker, Clark, and Kingston addressed further cleanup from the perspective of those who have closely monitored past oil spills.

"There have been continuing public discussions about whether further clean-up of remaining oil on the beaches in Prince William Sound and the Gulf of Alaska is necessary." [2]

"Whether or not further clean-up measures to remove this residual oil are justified largely depends on the human use a beach is put to. Our judgement is that where recovery of animal and plant life is already well established, the residual oil is obviously doing no harm and the organisms established on the shore will hasten the final removal and degradation of the oil residues."

Conclusion

The extensive cleanup program conducted by Exxon, in combination with natural processes, removed the threat of further injury to wildlife by direct contact, substantially restored the aesthetic appeal of the area, and facilitated biologic recovery, particularly in the heavily oiled areas. Furthermore, the studies summarized herein demonstrate a rapid recovery of the impacted resources.

Attachments

Attachment A
Technical References

Water

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Ecological Overview

15. Maki, A.W. (Environmental Advisor, Exxon). "The Exxon Valdez Oil Spill: Initial Environmental Impact Assessment." Environmental Science and Technology. 25(1): 24-29; 1991.

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