Exxon Valdez Oil Spill Trustee Council

Restoration Office
645 G Street, Suite 401, Anchorage, Alaska 99501-3451
Phone: (907) 278-8012 Fax: (907) 276-7178

4/17/97
2:49 pm
DRAFT

RECEIVED
APR 24 1997
EXXON VALDEZ OIL SPILL
TRUSTEE COUNCIL
ADMINISTRATIVE RECORD

AGENDA
EXXON VALDEZ OIL SPILL SETTLEMENT
TRUSTEE COUNCIL MEETING
APRIL 18, 1997 @ 10:30 A.M.
645 G STREET, ANCHORAGE

Trustee Council Members:

1. Call to Order 10:30 a.m.
   - Approval of Agenda
2. Executive Session on Habitat Ne...
3. Technical Budget Amendment*
   - Project 97163 - APEX
4. Discussion of Chenega Shoreline...

* indicates tentative action items

4/24/97
This was the only handout for the 4/18 TC mtg. There will be another teleconference this Friday. R

Adjourn - Noon

raw

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TRUSTEE COUNCIL MEETING

APRIL 18, 1997 @ 10:30 A.M.
645 G STREET, ANCHORAGE

Trustee Council Members:

BRUCE BOTELHO/CRAIG TILLERY
Attorney General/Trustee
State of Alaska/Representative

MICHELE BROWN
Commissioner
Alaska Department of Environmental Conservation

DEBORAH WILLIAMS
Trustee Representative for Fish & Wildlife & Parks
U.S. Department of the Interior

PHIL JANIK
Regional Forester - Alaska Region
U.S. Department of Agriculture
Forest Service

STEVE PENNOYER
Director, Alaska Region
National Marine Fisheries Service

FRANK RUE
Commissioner
Alaska Department of Fish & Game

Chair Federal

1. Call to Order 10:30 a.m.
   - Approval of Agenda

2. Executive Session on Habitat Negotiations and Strategy

3. Technical Budget Amendment*
   - Project 97163 - APEX

4. Discussion of Chenega Shoreline Cleanup Project

* indicates tentative action items

Adjourn - Noon

raw

UNITED STAT— DEPARTMENT OF COMMERCE
National Oce and Atmospheric Administration
National Marine Fisheries Service
Office of Oil Spill Damage
Assessment and Restoration
P.O. Box 210029
Auke Bay, Alaska 99821

April 16, 1997

MEMORANDUM FOR: Molly McCammon
Executive Director

FROM: Bruce Wright
Projects Manager

SUBJECT: Transfer of Funds

The Principal Investigator (PI) of the Alaska Predator Ecosystem Experiment (APEX) project 97163H, Proximate Composition Analysis, has withdrawn from the project. The APEX project leader, Dr. David Duffy, has identified a shortfall of APEX funds to support the Pigeon Guillemot colony work, especially in Kachemak Bay. We request that the Trustee Council transfer the 97163H funds ($29.3K) for use in support of the Pigeon Guillemot work in project 97163M.

Early in FY97 several APEX PIs expressed concerns of significant shortfalls in field personnel necessary to collect Pigeon Guillemot feeding, growth, productivity, and energetics data. These shortfalls were due to loss of matching funds and need to collect additional data to support the APEX energetics work. To help remedy this problem some APEX projects will shift personnel to this area of high priority. The Nearshore Vertebrate Predator (NVP) project provided two personnel to support the collection of Pigeon Guillemot data needed for that project, and the Department of Interior projects will utilize volunteers where appropriate. Even with these changes, the APEX project has a shortfall in its Pigeon Guillemot component. The use of the $29.3K will go a long way to remedy the shortfall without increasing the APEX total project costs.

Proximate composition analysis data, such as was expected from 97163H, is still necessary to meet the APEX objectives. The FY98 APEX project includes funds for proximate composition analysis.

Proposed Resolution: Transfer NOAA funds ($29.3K) from project 97163H to project 97163M in support of collection of Pigeon Guillemot data.

Exxon Valdez Oil Spill Trustee Council

645 G Street, Suite 401, Anchorage, AK 99501-3451 907/278-8012 fax: 907/276-7178

MEMORANDUM

TO: Trustee Council

FROM: Molly McCammon
Executive Director

DATE: April 17, 1997

RE: Habitat protection status report

The following is the current status of active habitat protection activities as provided by the appropriate state and federal agencies:

Chenega: The surveys are completed. In order to do closing, HAZMAT surveys are still required. Closing is estimated to occur sometime in May.

Tatitlek: We are still moving forward with the Tatitlek proposal that is contingent on Citifor obtaining a negotiated contract with Mental Health Trust Authority for additional timber lands at Yakataga. The authority finalized their regulations in March. They anticipate going to their board for approval of a negotiated sale with Citifor in mid-May. The sale is still contingent upon a final timber valuation. Upon approval, the best interest finding would be immediately published, allowing for 30 days notice. Following that process, a shareholder vote could occur - possibly in July, with signing of the purchase agreement and closing to follow.

Afognak Joint Venture: Timber portion of the appraisal was reviewed, approved and given to landowner in late February. Land appraisal is still being reviewed and once approved will be given to landowner. Some preliminary discussions have been held between lead negotiator and AJV.

English Bay: Signing ceremony scheduled for May 19 in Washington, D.C. Negotiations on the purchase agreement are underway.

Eyak: The Eyak board has approved a package for negotiation purposes. Negotiations are scheduled for May 1-2 in Anchorage.

Port Graham: No action to report. However, once the English Bay deal is signed, DOI intends to renew discussions with Port Graham.

Koniag: No recent action to report.

Small Parcels: The Kenai Natives Association package will be signed in Washington, D.C. on May 13. The Roberts parcel has been included in the state supplemental budget bill, and is likely to go forward, but thus far, Overlook Park has not.

cc: Agency liaisons
Legal counsel

DRAFT **DRAFT**

Confidential draft document not to be released.

The "Total Values" in this document have been taken from the AJV Black-Smith appraisal which is being reviewed by the review appraisers.

Afognak Joint Venture
Value and Acreage by Parcel
April 17, 1997

Parcel #	Acres	Timber Value	Total Value	Per Acre Value
1A	20,004	$39,080,000	$41,327,000	$ 2066
1B	7,405	10,145,000	10,950,000	1479
2	2,091	2,305,000	2,514,000	1202
3A	10,251	37,300,000	38,727,000	3778
3B	2,969	11,065,000	11,486,000	3869
4	54,604	26,265,000	not appraised	unknown
7	2,454	-0-	353,000	144
8	13,246	11,700,000	13,089,000	988

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Exxon Valdez Oil Spill Trustee Council

645 G Street, Suite 401, Anchorage, AK 99501-3451 907/278-8012 fax: 907/276-7178

TO: *Exxon Valdez* Oil Spill Trustee Council

FROM: Molly McCammon
Executive Director

RE: EA for Chenega Shoreline Cleanup Project

DATE: April 17, 1997

<u>Summary</u>

The public comment period on the draft Environmental Assessment (EA) for the Chenega Shoreline Cleanup Project closed on Monday, April 7. The proposed action evaluated in the EA is the use of PES-51 to remove weathered oil on eight difficult-to-treat beaches near the village of Chenega Bay. These eight beaches constitute two miles of shoreline, less than one-half of one percent of the shoreline surveyed in Prince William Sound following the *Exxon Valdez* oil spill.

Five comments were received -- from staff at the Alaska Department of Fish and Game, Alaska Department of Natural Resources, U.S. Fish and Wildlife Service, U.S.G.S. Biological Resources Division, and the NOAA Hazardous Materials Response and Assessment Division in Seattle. The agency letters raise concerns about the toxicity and effectiveness of PES-51 and conclude that cleanup should be delayed until additional testing of PES-51 is conducted (Alternative 7 in the EA).

The few studies that have been conducted on PES-51 are not conclusive as to its toxicity and effectiveness. However, after consulting with the Trustee Council's Chief Scientist, the Senior Research Chemist at the NOAA Auke Bay Lab, and others, it appears that there are reasonable responses to the concerns raised in the agency letters.

In any oil cleanup process the question becomes whether more harm than good will likely result from a proposed action. In this case, oil remaining on the beaches -- in Chenega's grocery store, so to speak -- compromises subsistence and other uses. On the other hand, there is some small risk if we clean up the oil using PES-51. An important factor is that the residents of Chenega Bay appear to be comfortable with the use of PES-51. As active participants in the 1993 Sleepy Bay demonstration project, they saw PES-51 remove oil that did not respond to the conventional cleanup methods used during the spill response.

Discussion

1. Toxicity of PES -51

Lab and field results on PES-51 show varying levels of toxicity. For example, NOAA HAZMAT Report 94-2 (upon which the agency letters rely in large part) concludes that the decomposition of limonene, the active ingredient in PES-51, would result in something similar to the highly chlorinated toxaphene group of chemicals. Jeff Short, Senior Research Chemist at the NOAA Auke Bay Laboratory, strongly disagrees with this conclusion, and characterizes the toxicity of PES-51 as low. Another factor to take into account are that the solubility of PES-51 is low -- it floats on the surface of the water and can be readily picked up as opposed to dispersing in the water column.

2. Effectiveness of PES-51

There is disagreement about whether an Environment Canada study which measured the effectiveness of PES-51 in the laboratory provides an indication of how the product will perform in the field. In the laboratory, some other chemical agents showed greater effectiveness than PES-51. (For example, Corexit 9580 was somewhat more effective than PES-51. Others note, however, that the Corexit 9580 test used hot water -- which many critics of the EVOS cleanup consider extremely damaging; PES-51 uses ambient temperature water -- and that Corexit 9580 causes dispersion of treated oil, whereas PES-51 does not). Apparently the lab effectiveness tests are designed to compare and rank chemical products, not to measure how well the chemicals perform in real-world conditions. The agency representatives and Chenega residents present at the 1993 Sleepy Bay demonstration project made qualitative observations about PES-51's high degree of effectiveness.

3. Delaying Cleanup Pending Additional Testing

Conducting what would essentially be a "product test" of PES-51 on two beaches (a test and a control) is problematic from both a policy and a scientific standpoint. From a policy standpoint, to date, the Trustee Council has very purposely steered clear of spending restoration funds on developing response and prevention technology; a test of PES-51 with Trustee Council funds would be an abrupt departure from past practice.

From a scientific standpoint, according to the Chief Scientist and our Science Coordinator, limiting the test to two beaches would provide no opportunity to assess inter-beach differences (which there surely are) and would leave the exercise open to criticism on the basis of geographic differences in the sites. In addition, the suggestion that a test be conducted in June, and then, if the results are favorable, the balance of the project be conducted in September, introduces a temporal variable that would complicate interpretation of the test vis a vis the implementation phase. Such a schedule would also not allow adequate time for post-treatment sampling, which should occur immediately after treatment, as well as at intervals of 30 days and one year after treatment. Finally, the intertidal communities on the beaches proposed for cleanup are not particularly rich (e.g., low densities of mussels). Obtaining sufficient biological samples for a statistically-powerful scientific test would likely require an extensive, expensive effort.

Expanding the proposed monitoring program to more rigorously measure environmental impact, toxicity and effectiveness of PES-51 during its use on the eight project beaches would require funds beyond the $1.9 million authorized for this project, and would face some of the same difficulties noted above.

Conclusion

I recommend that the EA be finalized for your consideration as the next step in implementation of the Chenega Shoreline Cleanup Project. As required by NEPA, the final version of the EA will respond to the issues of toxicity, effectiveness, and the test beach alternative, as well as the additional points raised in the agency letters.

If the EA is signed by the end of April, as currently scheduled, and necessary permits are issued, beach cleanup could begin June 15. Before cleanup can begin, a water quality variance must be obtained from ADEC and a tidelands permit must be obtained from ADNR; these agencies will analyze the project in the context of their missions and regulatory requirements. The cleanup operation would shut down in mid-July when the purse seine season opens, and resume in September. Post-treatment monitoring would be conducted one month and one year after cleanup is complete.

STATE OF ALASKA

TONY KNOWLES, GOVERNOR

DEPT. OF ENVIRONMENTAL CONSERVATION

March 21, 1997

Dear interested parties;

The *Exxon Valdez* Trustee Council has conducted environmental analyses on a proposed project to reduce remaining oil on eight beaches impacted by the 1989 *Exxon Valdez* oil spill. Enclosed is a copy of the Environmental Assessment for the proposed Chenega-area Shoreline Oiling Reduction Project for your review.

The *Exxon Valdez* Trustee Council approved this project in June 1996. The environmental assessment discloses the effects of the proposed project and identifies other alternatives that were considered. Mitigation measures to minimize impacts are also identified. The Alaska Regional Forester for the Forest Service, one of the Federal Trustees, will determine if there are no significant impacts from the project or whether an environmental impact statement should be prepared before the project proceeds.

Please return your comments by the close of business, Monday, April 7, 1997. Mail written comments to: *Exxon Valdez* Restoration Office, 645 G Street, Anchorage, AK. 99501. For more information regarding this project or, if you have specific questions, please contact Dianne Munson at the Alaska Department of Environmental Conservation, (907) 269-3080.

Sincerely

Dianne Munson

Dianne Munson,
Alaska Department of Environmental Conservation, Project Leader

Enclosure

Environmental Assessment
for
Chenega-area Shoreline Residual Oiling Reduction

Exxon Valdez Oil Spill Trustee Council Project #96291
March 21, 1997

Responsible Agency:	USDA Forest Service Alaska Region 709 West 9th Street; Room 543 Juneau, Alaska 99802
Cooperating Agency:	Alaska Department of Environmental Conservation 555 Cordova Street Anchorage, Alaska 99501
For Further Information	Ken Holbrook U.S. Forest Service 3301 C Street, Suite 300 Anchorage, Alaska 99503 (907) 271-2819 or Dianne Munson Alaska Department of Environmental Conservation 555 Cordova Street Anchorage, Alaska 99501 (907) 269-3080
Location of Action:	Eight oiled beaches in Southwest Prince William Sound, near the village of Chenega Bay.

TABLE OF CONTENTS

1.0 INTRODUCTION **3**

2.0 PURPOSE AND NEED FOR THE PROPOSED ACTION **4**

2.1 Summary of the Purpose and Need for Action 4
2.2 Background 5
1989 - 1992 .... *5*
1993 - 1996 .... *5*
2.3 Permits Required 8
2.4 Public Notification 8
2.5 Issues and Concerns 9

3.0 ALTERNATIVES **10**

3.1 Alternatives 10
Alternative 1. No Action *10*
Alternative 2. The Proposed Action *10*
3.2 Alternatives Considered but Eliminated from Detailed Consideration 11
Alternative 3. Manual Sediment Removal *11*
Alternative 4. Mechanical *12*
Alternative 5. Nutrient Enhancement/Bioremediation *12*
Alternative 6. Other Shoreline Cleaning Agents Considered *13*
Alternative 7. Delay Action Until Additional Testing of PES-51 .... *13*
3.2 Comparison of Alternatives 14

4.0 DESCRIPTION OF EXISTING ENVIRONMENT **14**

4.1 Physical Environment 14
4.2 Biological Environment 16
Marine Environment *16*
Terrestrial Environment *18*
Threatened, Endangered or Sensitive Species *18*
4.3 Cultural and Socioeconomic 18

5.0 ENVIRONMENTAL CONSEQUENCES **20**

5.1 No-Action Alternative 20
5.2 Proposed Action--Application of PES-51© 20
Physical Environment *20*
Biological Environment *21*
Cultural and Socioeconomic Environment *24*
Other Resource Values Considered 25

6.0 CUMULATIVE IMPACTS **26**

7.0 SUMMARY OF MITIGATION MEASURES FOR THE PROPOSED ACTION **27**

8.0 MONITORING **28**

9.0 LIST OF PREPARERS AND PERSON CONSULTED **30**

List of Preparers 30
List of Agencies and Persons Consulted: 30

10.0 REFERENCES **32**

LIST OF APPENDIXES **34**

Environmental Assessment
Chenega-area Shoreline Residual Oiling Reduction

1.0 Introduction

This Environmental Analysis (EA) describes the environmental effects of a proposed project to reduce remaining oil on eight beaches impacted by the 1989 *Exxon Valdez* oil spill. The beaches are located near the village of Chenega Bay in Southwest Prince William Sound (see enclosed maps in appendix B). The cleanup project has been requested by the village of Chenega Bay who are the upland owners of all but one site which is managed by the Forest Service. The project will be performed by a licensed and bonded contractor that meets state of Alaska oil and hazardous substance pollution control statutes and regulations. The Prince William Sound Economic Development Council, the state sanctioned regional development organization for Prince William Sound, will also have a role to provide local involvement in the proposed project. The proposed method of treatment is application of the cleansing agent PES-51© in combination with cold water flooding and washing.

The *Exxon Valdez* Trustee Council approved this project in June 1996. This proposed action meets the restoration goals as defined in the *Exxon Valdez* Oil Spill Restoration Plan, (*Exxon Valdez* Trustee Council, 1994). The proposed action is consistent with the Alaska Federal/State "Unified Plan" for cleanup of stranded shoreline oil, (U.S. Coast Guard, EPA, ADEC, 1996) and the National Oceanic and Atmospheric Administrations "Shoreline Countermeasures" guidelines for shoreline cleanup, (NOAA Hazardous Materials Response and Assessment Division, 1994).

This Environmental Assessment discloses the environmental consequences of implementing the proposed action, and alternatives to the action. Mitigation measures to minimize impacts are also identified. The Alaska Regional Forester for the Forest Service, one of the Federal Trustees, will determine if there are no significant impacts from the project or whether an environmental impact statement should be prepared before the project proceeds.

The proposed action is not "connected" to or dependent upon any other action in this same area. It does not establish a precedent for other actions which may result in significant environmental effects.

2.0 Purpose and Need for the Proposed Action

2.1 Summary of the Purpose and Need for Action

Significant concentrations of surface and subsurface oil from the *Exxon Valdez* oil spill remain at locations in southwest Prince William Sound (PWS) near the village of Chenega Bay. The community of Chenega Bay has consistently expressed concern about this oiling and has repeatedly asked the Trustee Council to fund additional removal of the remaining oil at shorelines near the village. Experts say that the oil is not likely to disappear naturally in the near future, perhaps not for decades.

While much of the remaining oil is generally heavily weathered, oil sheens are still observed on tide pools and surface waters at many of the shoreline locations. In general, scientists have indicated that to the best of their knowledge, remaining shoreline oil is not currently affecting the health or populations of many injured resources, but may be affecting local populations of others (Residual Oiling Workshop Report, 1995). Village residents say that the continued presence of the oil affects their confidence in the use of subsistence resources. In addition a number of residents have said that the presence of the oil, whether or not it affects the health or populations of the resources, affects the use of the shorelines. Residents have a general concern that there is more oil than is generally acknowledged, and that it could potentially have a general, long-term, adverse effect on the ecosystem. Two summaries of these concerns have been stated by village residents as follows:

- "How would you like it if the supermarket you shopped at was filthy and contaminated? Would you buy your food there?" The resident said this was true at the beaches where they hunt and gather intertidal and marine subsistence food. Prince William Sound is the supermarket for Chenega Bay; it is where their food comes from. The fact that it is dirty makes a difference in their use, enjoyment, and possibly health" (Residual Oiling Workshop Report, 1995).

- "Beach and shoreline clean-up gave me a sense of relief. However, when they said the shorelines were clean of oil, it was like a slap in the face because I knew the oil still existed. I hunt and fish all around Chenega and I know the area. Oil still exists! I really would like to see continued clean-up. All of us in Chenega eat a lot of subsistence foods and I fear, deep within, that perhaps some or all of these foods are still contaminated. It's the long-term effects that worry me. I know all the residents of Chenega would feel more comfortable if shoreline clean-up continued, for cleaner beaches and peace of mind" (Kompkoff, 1997).

Additional removal of the oil near the village will increase confidence levels and improve subsistence participation residents say. It will also improve the visual appearance of some shorelines, thereby improving recreational opportunities for other users. Residual oil exists elsewhere in the spill area, but the oil near Chenega heightens the awareness and concerns of the village residents who use the shorelines and waters of the area.

2.2 Background

1989 - 1992

Shortly after midnight on March 24, 1989, the oil tanker *Exxon Valdez* ran aground on Bligh Reef in Prince William Sound, Alaska, spilling eleven million gallons of North Slope crude oil. That spring the oil moved along the coastline of Alaska, contaminating portions of the shoreline of Prince William Sound, the Kenai Peninsula, lower Cook Inlet, the Kodiak Archipelago, and the Alaska Peninsula.

During 1989, response efforts focused on containing and removing the oil, and rescuing oiled wildlife. Workers cleaned shorelines using techniques ranging from cleaning rocks by hand to high-pressure hot-water washing. Fertilizers were applied to some oiled shorelines to increase the activity of oil-metabolizing microbes, an activity known as bioremediation. The 1989 shoreline assessment, completed after the summer clean-up, indicated that a substantial portion of the oil remained on the shorelines. In the spring of 1990, the shoreline was again surveyed in a joint effort by *Exxon* and the State and Federal governments and land owners, with similar results. The principal clean-up method used in 1990 was manual removal of oiled sediment. Bioremediation and relocation of oiled beach material to the active surf zone were used in some areas.

Shoreline surveys and limited clean-up work occurred in 1991 and 1992. In 1992, crews from *Exxon* and the state and federal governments visited 81 sites in Prince William Sound and the Kenai Peninsula. They reported that an estimated 7 miles of the 21.4 miles of shoreline surveyed still showed surface oiling. The survey also indicated that subsurface oil remained at many sites that were heavily oiled in 1989.

On June 5, 1992 the Federal On-Scene Coordinator declared the "response" phase of the *Exxon Valdez* clean-up complete. At that time, state officials stated that additional clean-up work could be accomplished as part of the restoration process (ADEC, News Release, June 3, 1992).

1993 - 1996

The 1993 Shoreline Assessment, conducted by the Alaska Department of Environmental Conservation for the *Exxon Valdez* Oil Spill Trustee Council, identified 225 locations at 45 ground survey sites in Prince William Sound with surface oil. The average oiled location with surface oil residue, asphalt, or mousse was 160 square meters in size and had about a 23 percent oil coverage. The survey identified 109 locations with subsurface oil. A comparison of comparable sites between 1991 and 1993 indicated that the amount of subsurface oiling had decreased by about half. However, the survey showed that the remaining surface oil had become very stable. In fact, there was no measurable reduction in the remaining surface oil from 1991 to 1993. Much of the most significant oil remaining was shown to be located within close proximity to the village of Chenega Bay.

The question of whether to remove residual oil has been a difficult one for the Trustee Council. Scientists had indicated that treatment may not aid the resources, and may in fact set back recovery of intertidal areas. In addition, total removal of the oil is technically and financially infeasible, and it was unclear whether partial removal would satisfy those concerned about the presence of oil. As a result, the Trustee Council sponsored a workshop on Remaining Shoreline Oil in November of 1995 to attempt to answer the technical, social, and policy questions that surround this issue. The workshop addressed the benefits of additional shoreline treatment, appropriate treatment techniques, acceptable level of treatment, and the environmental cost of treatment. The workshop was designed to allow experts in the field of oil spill response and assessment, natural resource scientists, citizens of Chenega Bay, and other interested persons to discuss these issues and to provide the Trustee Council with information to allow them to decide whether or not to fund additional treatment.

Sixty-one people attended the workshop. The primary participants were 14 residents of Chenega Bay, and Dr. Ed Owens/Owens Coastal Consultants, Ltd; Dr. Jacqui Michel/Research Planning, Inc., and Dr. Jim Gibeaut/Consulting Geologist (Dr. Michel also presented information on behalf of Dr. Alan Mearns/ NOAA, who was unable to attend). Representatives of all Trustee agencies were also present at the workshop. The conclusions of the workshop were printed in a proceedings report entitled "Workshop Report: Residual Shoreline Oiling Restoration Project 95266, Final Report" and presented to the Trustee Council in May, 1996. A summary of the workshop findings on these main issues is summarized below. A complete list of workshop participants is presented in Appendix D.

Would additional treatment benefit recovery of injured resources? In general, scientists believe that residual oil is unlikely to be affecting the health or population of many of the subsistence resources such as harbor seals, shrimp, and deer. In some locations, the oil may be affecting local populations of harlequin ducks and sea otters. That possibility is under investigation in Trustee Council research projects. In discussions during the workshop and afterwards, Chenega Bay residents indicated that they understood that removing residual oil is unlikely to bring back prespill populations of harbor seals and some other injured resources. However, they also made clear that they still believe that the remaining oil has a sinister affect on the ecosystem, and that the remaining oil affects their confidence in the resources and enjoyment of the area.

What treatment technique is appropriate? The experts felt that if additional treatment was decided upon, PES-51© and the airknife technique that was tested on a beach near Chenega Bay in 1993 would be a useful treatment method and would probably be appropriate for many locations identified by Chenega Bay residents. The test took place at Sleepy Bay on Latouche Island in 1993, sponsored in part by Tesoro Alaska and the State of Alaska's Hazardous Substance Spill Technology Review Council. Tesoro Environmental, which then owned the rights to the product PES-51©, treated less than a 100 meter section of rocky shoreline by injecting under pressure the product into the substrate, then following with ambient-temperature wash under pressure. Residents of Chenega Bay participated in the treatment. Observers reported that product and flushing proved effective at removing surface and subsurface oiling that was stranded at the site since cleanup operations ceased there in 1990 (Rog, et al., 1994; Pearson, 1993). The residents of Chenega Bay stated that they support the application of PES-51© for removal of oil from the beaches. PES-51© impressed the residents during the 1993 test with its success rate in the removal of trapped oil, asphalt and subsurface oil contaminants.

What is the acceptable level of treatment? (How clean is clean?) Chenega Bay residents indicated that the treatment goals proposed by PES, Inc. (see Proposed Alternative, section 3.1) appeared acceptable. In addition, many residents and other workshop participants had been to the portion of Sleepy Bay where the PES treatment was conducted, and understood how the treatment objectives were accomplished. The residents of Chenega Bay appeared to have a ground-tested vision of what the goals meant for residual oil cleanup on the shorelines—a significant reduction but not 100 percent clean of oil.

What is the environmental cost of conducting treatment? The experts were unanimous in their opinion that surfactants such as Corexit 9580 and PES-51© are, at some level, toxic to intertidal life. In addition, the simple matter of bringing treatment equipment and people onto a beach, as described by the proposed treatment method, can be invasive to the local intertidal habitat. However, they were also unanimous that Prince William Sound is a big place, and the environmental cost of treatment at a limited number of locations may be more than outweighed by the benefits of the treatment to Chenega Bay residents. Put another way, assuming that treatment was appropriately applied, the experts had no objection to a limited program if, in fact, it would significantly benefit Chenega Bay residents or other shoreline users. A limited program could provide those benefits without incurring environmental harm. However, the experts also indicated that a large-scale treatment program, done throughout Prince William Sound, would incur cumulative environmental costs that could set back intertidal recovery. Thus, if the Trustee Council decides that the benefits are worth the costs, the program must be appropriately applied and be limited in order to avoid environmental harm.

Following the workshop, ADEC comprehensively reviewed Prince William Sound oiled shorelines. Significantly oiled sites were identified using data from the 1993 Shoreline Assessment, *Exxon Valdez* Restoration Project 93038, response data gathered before 1993, other information such as field visits since the 1993 survey, other restoration projects, and local knowledge of the residents of Chenega Bay.

Beach segments identified as having "significant surface or subsurface oil" were those that had surface oil with characteristics ranging from asphalt (AP) to surface oil residue (SOR), or subsurface oil with characteristics ranging from medium oil residue (MOR) to oil-saturated pores (OP). In addition, a segment classified as having "significant oil" must have the residual oil over a significant portion of the beach. This classification system used for characterizing shoreline surface and subsurface oil is explained in Appendix (H) of the Residual Shoreline Oiling Workshop Report, *Exxon Valdez* Restoration Project 95266 (Loeffler, et al., 1995).

Following ADEC's review, ADEC representatives reviewed the information with a committee of Chenega Bay residents. The village and ADEC representatives jointly discussed the sites that might require treatment. They focused on frequently used shorelines near the village in order to both maximize the effect on village use and to ensure a limited program. Eight sites were identified as being the highest priority.

In June of 1996, the *Exxon Valdez* Trustee Council voted unanimously to authorize expenditure of up to $1.9 million to fund cleanup of the eight priority beaches.

2.3 Permits Required

The Prince William Sound Economic Development Council, under contract to ADEC, is responsible for obtaining the following permits:

- Alaska Department of Natural Resources tidelands permit.
- Alaska Department of Environmental Conservation water quality permit.
- Alaska Division of Governmental Coordination coastal management consistency review which is required for proposed projects in or affecting coastal areas of Alaska.
- United States Forest Service uplands access permit for one beach, ER020B on Elrington Island (Chenega Corporation is the upland owner at the seven other beaches).
- No ADF&G permits are required because no work will be conducted within an anadromous fish stream. However, counsel was sought from ADF&G regarding anadromous stream constraints and commercial fishing activity.
- Counsel has been sought from the U.S. Fish and Wildlife Service regarding possible constraints for eagles nests.
- Counsel has been sought from the Chugach National Forest Service, and the Alaska State Historic Preservation Office, regarding possible constraints for cultural resources and historic properties.
- The Regional Response Team, a multi-agency committee that conducts response-related contingency planning and incident-specific response support, has indicated that they have no jurisdiction or authorized role in this project because it is a restoration activity, not an oil spill response activity.

2.4 Public Notification

The first step in the scoping process for this project was the Trustee Council sponsored workshop on Residual Shoreline Oiling held in November, 1995. The workshop was intended to facilitate discussion among experts in the field of oil spill response and assessment, natural resource scientists, and residents of Chenega Bay in an attempt to answer the technical, social and policy questions that surrounded the issue of conducting additional shoreline treatment. To ensure that people concerned about the issue had a chance to participate, a flyer announcing the workshop, and in most cases an agenda, was faxed to the Trustee Council Workforce, the Trustee Council's Public Advisory Group, and Village Coordinators for Tatitlek, Port Graham, and Nanwalek. Because of their interest in the issue, flyers and agendas were faxed to Cook Inlet and Prince William Sound Regional Citizen's Advisory Councils (RCACs). Finally, Trustee Council staff made phone calls to individuals expected to be interested in the issue, such as individuals active in the Trustee Council process who are knowledgeable and concerned about recreation and tourism in Prince William Sound.

Sixty-one people attended the workshop. The primary participants were 14 residents of Chenega Bay, and Dr. Ed Owens/Owens Coastal Consultants, Ltd; Dr. Jacqui Michel/Research Planning, Inc., and Dr. Jim Gibeaut/Consulting Geologist (Dr. Michel also presented information on behalf of Dr. Alan Mearns/ NOAA, who was unable to attend). Representatives of all Trustee agencies were also present at the workshop. The conclusions of the workshop were printed in a proceedings report entitled "Workshop Report: Residual Shoreline Oiling Restoration Project 95266, Final Report" and presented to the Trustee Council in May, 1996. A summary of the conclusions are discussed in the background section of this EA. A complete list of workshop participants is presented in Appendix D.

In December 1996, in response to concerns expressed by Trustee agency personnel, an expanded scoping phase was added to the EA process. A scoping letter, which described the proposed project, location, tentative schedule and its potential effects, was sent to over 160 organizations, individuals, and agencies to identify who may be affected by the proposed project or who might have an interest in the decisions made for this project. Recipients of the letter were asked to comment on or involve themselves in the analysis of the proposed project and its alternatives.

2.5 Issues and Concerns

Twelve responses to the scoping letter were received: A letter from the Prince William Sound Aquaculture Association regarding their spring fry release and commercial fishing operations, a letter from NOAA providing constructive comments on monitoring the effects of the cleanup, six letters expressing support for the cleanup (Chenega Corporation, Tatitlek IRA Council, Cordova city manager, Pete Kompkoff of Chenega Bay, Larry Evanoff of Chenega Bay, Walt Parker of Anchorage), one letter opposing additional cleanup with concerns about the release of oil into the water and, one letter expressing concern about product selection, benefits and envrionmental effects of the project, and letters from ADNR and ADF&G outlining concerns over the use of PES-51©. Based on the scoping process, the following list of the major issues and concerns was developed.

1) Effects on water quality

2) Effects on intertidal and subtidal plants and animals

3) Effects on fish species

4) Effects on human health and safety

5) Effects on commercial fishing

3.0 Alternatives

3.1 Alternatives

Alternative 1. No Action

The No Action Alternative would mean that none of the actions proposed in the Proposed Alternative would occur. Oiling conditions at the shorelines near Chenega Bay would likely remain as they currently exist for decades.

Alternative 2. The Proposed Action

The proposed project would apply the cleansing agent PES-51© using airknife injection technique in combination with cold water flooding and washing to eight beaches. The beaches proposed for treatment were identified as priorities by the residents of the village of Chenega Bay. The beaches are located near the village of Chenega Bay in Southwest Prince William Sound (PWS) (see enclosed maps in Appendix B). The project will be performed by a licensed and bonded contractor that meets state of Alaska oil and hazardous substance pollution control statutes and regulations. The PWS Economic Development Council, the state sanctioned regional development organization for PWS, will also have a role to provide local involvement in the proposed project. The project is scheduled to be conducted between May 1 and September 30, for daylight and weather factors. In addition, no work will be conducted during the purse seine fishery that occurs in the area between July 18 and September 6. One site will be treated only between June 20 and July 20 as a result of anadromous stream constraints.

The PES cleaning technique includes the following treatment goals:

Immediate

- Visually observable significant decrease in the amount of oil residue on the surface and in subsurface sediment.
- Significant decrease in the levels of measurable petroleum hydrocarbons in the sediment.
- No evidence of petroleum hydrocarbons being introduced into the water column.

Long Term

- Further visually observable decrease in the amount of oil residue on the surface and in subsurface sediments.

The PES Shoreline Treatment Process:

- Combines cold water flushing and manual treatment with application of PES-51©.

- Shoreline is double boomed below the treatment area for collection of displaced oil.
- Deluge Header System is placed above the upper intertidal zone to provide a continuous flow of ambient temperature sea water over the treatment area.
- Airknife Injection System uses air pressurized at 100 to 200 pounds per square inch to penetrate into the subsurface sediment.
- PES-51© is injected as an aerosol or liquid into the sediment.
- Flush hoses are used to directly apply ambient temperature sea water to the injection site during and after application of PES-51©.
- Displaced oil is collected with skimmers from the boomed area and pumped into a storage tank.
- Sorbents (materials that absorb oil) are used to collect oil from surfaces that do not drain to the shoreline. Oiled debris is stored in bags or drums for disposal.
- Water is decanted from the storage tank and returned to the shoreline. Oil is stored in drums for disposal.
- Oil and solid waste generated from the restoration work will be transported to Anchorage and disposed of at an approved environmental waste facility.

The airknife injection technique was tested using seawater instead of PES-51© during the 1993 test in PWS. Using the airknife technique with sea water alone proved inaffective in liberating the oil (Pearson, personal communication, 1997).

Alternative cleanup techniques such as mechanical tilling and relocation, manual removal and bioremediation would be less effective at removing the oil than the proposed action of using PES-51© along with standard shoreline washing operations.

3.2 Alternatives Considered but Eliminated from Detailed Consideration

Alternative 3. Manual Sediment Removal

Under this alternative, oiled sediments would be removed manually by use of hand tools (for example, hands, rakes, shovels) and placed in containers for removal from the shoreline. The oiled material would be transported and disposed of off-site.

Manual removal would be of limited utility due to lack of access to the oil stuck in tight areas amongst extremely large boulders or along bedrock shelves and outcrops. Manual removal would provide limited results and would not meet the treatment goal for this project "significant reduction of the remaining shoreline oil but not 100 percent clean".

Alternative 4. Mechanical

Mechanical cleanup falls generally into two categories: 1) basic mechanical agitation of sediments with conventional heavy equipment, 2) and beach material processing or cleaning machines.

The most often used beach cleaning machines are variations of farm implements and are designed for sand and other fine-grain sediment shorelines. They are not suitable for the pebble/cobble/boulder/bedrock substrates that dominate the shorelines in PWS (Taylor, Owens, Nordvik, 1994; Taylor, Belore, Simmons, 1995) and are particulary not for these eight beaches with their large boulders and bedrock. The Canadian government sponsored development of a prototype rock-washing machine (Ross, 1990), but it did not advance past the prototype stage. In any case, even if good rock washers did exist, they would probably not be optimal for conditions of the eight targeted beaches with their scattered sites, discontinuous oiling, difficult access, weathered mousse and asphalt.

Basic mechanical and mechanical-assisted cleanup, such as was used in Prince William Sound during the *Exxon Valdez* response, consisted primarily of backhoes rolling back boulders or pulling down oiled storm berms. These techniques would be of limited utility at this point, because of problems with access to sites, and partly because of the residual oiling is stuck either in extremely large boulders, or along bedrock shelves and outcrops.

Alternative 5. Nutrient Enhancement/Bioremediation

The objective of nutrient enhancement is to speed the rates of natural microbial degradation of oil by addition of nutrients (specifically nitrogen and phosphorus). Microbial biodegradation is the conversion by microorganisms of dissolved and dispersed hydrocarbons into oxidized products via various enzymatic reactions. Some hydrocarbons are converted to carbon dioxide and cell material, while others are partially oxidized and or left unaltered as a residue (NOAA Shoreline Countermeasures Manual, 1994).

Nutrients are applied to the shoreline in one of several methods: soluble inorganic formulations that are dissolved in water and applied as a spray at low tide, requiring frequent applications; slow-release formulations that are applied as a solid to the intertidal zone and designed to slowly dissolve; and oleophilic formulations that adhere to the oil itself. Thus, they are sprayed directly on oiled areas (NOAA Shoreline Countermeasures Manual, 1994).

Nutrient enhancement of asphalt and other weathered residual oiling is an unlikely choice of techniques for removal of residual oiling. Current research indicates that enhanced biodegradation techniques may be employed after the bulk of the oiling contamination has been removed, and only while oil is relatively fresh (ASTM, 1994).

Alternative 6. Other Shoreline Cleaning Agents Considered

Shoreline cleaning agents are beneficial when oiled shorelines need cleaning and the remaining oil is difficult to remove using conventional methods (NOAA Shoreline Countermeasures Manual, 1994).

Corexit 9580 and BP 1100X went through several sets of field trials during the *Exxon Valdez* response in 1989 and 1990. They are both, essentially, a dearomatized kerosene with some surfactants added. The proposed method of application is to spray the shoreline with the product, let it soak for 30-90 minutes, then follow with a warm-water wash. Both Corexit 9580 and BP 1100X were generally determined to be effective at removing surface oiling. However, field workers could not demonstrate proficiency at containing and collecting the oil-water-Corexit 9580/BP 1100X mixture once it was in the nearshore waters. Furthermore, they did not appear to be effective at removing subsurface oil. The products were never used outside of tests primarily because of difficulties in controlling and collecting the mix of oil and product that was flushed into the nearshore waters (Piper, 1993).

A recent major test of shoreline cleaning agents for which there are published reports took place in January, 1994 during the response to a spill of No. 6 fuel oil from the barge *Morris J. Berman* near San Juan, Puerto Rico. The Regional Response Team (RRT) authorized testing of three products (Corexit 9580, Corexit 7664 and PES-51©) in combination with water washes at various temperatures and pressures. The RRT chose to consider only those products that were on the National Product Schedule, that had shown 20 percent removal effectiveness using the Environment Canada lab tests, and had shown effectiveness in field trials (Michel and Benggio, 1995).

In Puerto Rico, they were not prepared to recover the treated oil and, thus, they considered dispersion as a solution to potential re-oiling. The main difference between the Corexit products and PES-51© seems to be the potential for Corexit to cause some dispersion of the treated oil, whereas PES-51© does not cause any dispersion (Michel and Benggio, 1995).

In this situation, where the addition of a chemical shoreline cleaning agent appears appropriate, it is believed that PES-51© is the better choice over Corexit, largely because PES-51© is more amenable to recovery than Corexit.

Alternative 7. Delay Action Until Additional Testing of PES-51

Extensive chemical and biological testing for toxicity and water quality sampling has been conducted including at least two extensive tests for which there are published reports on the effectiveness and environmental effects of the shoreline cleaner PES-51©. One in June 1993 at Sleepy Bay on Latouche Island in Prince William Sound and another during response to the *Morris J. Berman* Spill, in Puerto Rico in 1994.

Conducting additional tests would be redundant, expensive and would delay the proposed project. The things that would normally be tested for when considering the use of a chemical shoreline cleaner have already been done. Standard LC50 toxicity data are available. Effectiveness was tested using the same methods proposed on similar types of beaches.

3.2 Comparison of Alternatives

The selection of the shoreline cleaning agent PES-51© in combination with cold water flushing and washing was made after considering many elements. Treatment goal, effectiveness, environmental impact and the village of Chenega Bay's comfort with a particular technology were all examined and factored into the selection criteria. The eight sites identified as priorities by the residents of the village of Chenega Bay have some natural impediments to effective cleanup, which is primarily why they still have oil remaining. The setting, the location of the oiling, and the type of substrates involved all worked to limit cleanup effectiveness during the spill response action from 1989 to 1992. The remaining oil at the eight high priority sites generally resides in the upper middle intertidal areas and is stuck either among extremely large boulders, or along bedrock outcrops in areas protected from high tidal energy. Shoreline cleaning agents have proven beneficial when remaining oil is difficult to remove using conventional methods. Such is the case here, a cleansing agent will need to be used to effectively remove the weathered oil from the sites eight years after the spill.

Ideally, a product that is extremely effective and completely non-toxic would be chosen. However, no such products are known. Virtually all oil cleaners that can effectively remove oil have some properties that are toxic in the aquatic environment. Experts are unanimous in their opinion that surfactants such as Corexit 9580 and PES-51© are, at some level, toxic to intertidal life. However, experts at the Residual Oiling Workshop were also unanimous in their judgement that limited application and the environmental cost of the proposed project which is limited to eight relatively small, scattered areas may be more than outweighed by the benefits of the treatment to Chenega Bay residents. Because PES-51© has a short half-life, relatively low solubility and inability to emulsify, chronic exposures or impacts from its use are not expected. In addition, the oiling zone on the beaches proposed for cleanup is located mostly high on the shorelines or in settings where intertidal life is scarce. The usual measures used to mitigate potential damage, e.g., working with the tide, keeping waste out of the lower-intertidal, booming and collecting the oil/PES-51© mixture, will be employed. In this situation, where the addition of a chemical shoreline cleaning agent appears appropriate, it is believed that PES-51 is the better choice over Corexit 9580, largely because PES-51© is more ammenable to recovery than Corexit 9580 and because PES-51© has proven effective on weathered oil.

4.0 Description of Existing Environment

4.1 Physical Environment

This section describes the physical environment of the beaches chosen for the shoreline oil reduction project including substrate, presence of residual oil, water quality and general energy environment of selected beaches. The beaches are located near the village of Chenega Bay in Southwest Prince William Sound (PWS). One beach site is located on Elrington Island (ER020-B), two on Evans Island (EV037-A, EV039-A) and five sites are on Latouche Island (LA015-C, LA019-A, LA020-B, LA020-C, and LA021-A) (Appendix B).

The beach areas are generally characterized as moderate to high energy environments with the substrate of the beaches consisting mainly of boulder or cobble-boulder armor overlying gravel sediment. Large-grained sands typically fill the interstitial spaces on some of the beaches. The substrate of the subtidal zones off these beaches have not been documented. A summary of the substrate type and other available information about the selected beaches is listed in a Table in Appendix C. More detailed descriptions of these beaches can be found in the ADEC Shoreline Surveys (1992, 1993) and Appendix E of the Residual Shoreline Oiling Workshop Report, (Loeffler, 1996).

Oil pockets are still present in sediments in many of the Prince William Sound (PWS) spill areas beaches substrate. Studies detailing the oil types and general conditions of the residual oil found in the PWS area are summarized in Summary of Recent Studies on Subsurface Oil by Edward H. Owens (1995).

Site visits by the ADEC shoreline surveys conducted in 1992 and 1993 have documented the presence of residual oil located mainly in the upper and middle intertidal zones of the targeted beaches, typically located in sheltered crevices amongst the boulders. Asphalt/pavement (AP) and surface oil residue (SOR) have been identified in the upper and middle intertidal zones on the surface of all the targeted beaches (Loeffler et al 1996). The two beaches on Evans Island have oil residue extending to the high intertidal zone and one beach on Latouche Island has oil patches extending to the lower intertidal zone (Appendix C). The ADEC surveys found that these beaches also have subsurface oil residue generally located in the same intertidal zones. The subsurface oiling on beaches selected for restoration primarily exists as an extension of the surface oiling.

The waters of Prince William Sound are relatively pristine. The main concerns related to water quality were the initial presence of petroleum hydrocarbons from the *Exxon Valdez* Oil spill and possible secondary oil releases occurring during subsequent cleanup operations. Water quality studies conducted since 1990 in Prince William Sound have generally failed to find measurable oil concentrations remaining in the water column (EVTC 1994). According to Loeffler, et al (1996), by summer of 1990, oil entering the water column and concentrations of volatile oil fractions in the oiled beach substrate had greatly decreased since the spill and concentrations of oil in the substrate continue to decrease yearly due to microbial action and weathering.

The energy regime of beaches is generally dependent upon the water circulation patterns, tidal cycles, and wind energy. Circulation of Prince William Sound is strongly influenced by the counterclockwise-flowing Alaska Coastal Current. The general circulation is modeled as a flow inward through Hinchinbrook Entrance in the southeast and flowing outward through Montague Strait in the southwest (Galt et al 1991). The current within the study area would generally be flowing from north to south, onto the targeted beaches. The tides are of the mixed semidiurnal type, with a mean tide flux of about 1.8 meters and an extreme range of more than five meters. Strong northerly winds are common in the study area. The topography of Prince William Sound only minimally abates the winds from the North Pacific storms. This generates storm seas and chop that strike exposed shorelines such as many of the selected beaches with high intensity wave action during storm events (Houghton et al, 1996).

4.2 Biological Environment

Marine Environment

Flora

Plant life that could be exposed to the proposed project restoration activities/influence include the attached marine algae in the intertidal zones to be cleaned, subtidal attached algae in the near vicinity of the cleaning operation (for example, in the boomed area), and the phytoplankton in the water column where the released hydrocarbons and treatment materials will be gathered. The attached algae most commonly noted in the intertidal treatment areas is the brown alga *Fucus* sp. (rockweed). Other commonly observed algae in the upper and mid-intertidal zones in exposed rock/cobble beaches include *Endocladia* (nail brush) and *Ralfsia* (tar spot). Shallow subtidal flora could include eelgrass (*Zostera marina*) as is found in Sleepy Bay, Latouche Island (east of site LA019-A) as well as *Nereocystis, Laminaria, Agarum,* and associated brown and red algae (Jewett, S.C. et al, June 1995).

In addition to these larger forms of algae, microscopic and small fillamentous algae and diatoms as well as encrusting and erect coraline algae are also expected to be found on larger rocks and boulders in the intertidal and subtidal zones.

Phytoplankton in the cold temperature coastal waters typically are dominated by centrate and pennate diatoms and, to a lesser degree, flagellates and dinoflagellates. While present in the water column year round, in spring and early summer months, light levels support major growth blooms of phytoplankton. Depending on the availability of nutrients, a secondary bloom can occur during the fall.

Invertebrates

Intertidal invertebrates expected to be in the areas proposed for oil reduction treatment (high to mid intertidal) include chitons, barnacles, littorina snails, amphipods, isopods, and mussels (Jewett, S.C., et al, 1995). The substrate size and tidal/wave energy at the specific beach will determine the species found there and their abundance. Mussels and barnacles are filter feeders, obtaining their nutrients from planktonic organisms in the water column. Chitons and snails are grazers, scraping microscopic algae from the substrate. Amphipods and isopods are opportunistic feeders consuming organic debris in addition to feeding directly on algae.

Most beaches identified for cleanup are high intertidal areas with very limited flora and fauna. Harvestable-sized mussel beds are noted to occur on one beach--ER020-B. Chitons are noted to be important subsistence species on 6 of the 8 beaches scheduled for clean up -- ER020-B, LA015-C, LA019-A (near the 1993 PES test), LA020-B, LA020-C, and LA021-A. However, the intertidal zones targeted for cleanup are not expected to be major producers of chitons which are more commonly found in the mid to lower intertidal where their encrusting algal food items are supported (Loeffler, 1996).

Also expected to occur in the mid- to lower intertidal zones are polychaetes, sea stars, bryozoans, anemones, sea cucumbers, shore crabs, and other species of crustaceans. At high tide other, more mobile invertebrates such as fish and octopus move into the beaches feeding on polychaete worms, molluscs, and crustaceans. One of the proposed clean up beaches (EV039-A) is noted to be used by the residents for harvesting octopus.

Fish

Prince William Sound supports vast fisheries resources. These resources have economic, social, subsistence and recreational value to the people in this region. The intertidal and subtidal habitats in the project area are well described, mostly as a result of the *Exxon Valdez* oil spill investigations. The following resource description will be split into three sections: salmonids, herring, and demersal fish.

Salmonids. There are seven species of anadromous salmonids in Prince William Sound, but only four that are likely to be found along the shorelines in the project vicinity. These include pink salmon (*Oncorhynchus gorbuscha*), chum salmon (*O. keta*), cutthroat trout (*O. clarki*), and Dolly Varden char (*Salvelinus malma*). Of these, only pink salmon are likely to be found in appreciable numbers in the intertidal zone in the project area because of the lack of chum salmon streams in the vicinity (ADF&G, 1978). Site LA019-A is adjacent to the mouth of a pink salmon spawning stream (Stream No. 226-40-16780). The sites on the northeastern shores of Evans and Latouche Islands are likely to be utilized by inshore feeding/migrating pink salmon produced by nearby streams. The period of time when pink salmon are found in the inshore areas extends from April 1 through June 20 in Prince William Sound. Adults are found at the mouths of streams from June 1 through September 30, with spawning from July 20 through September 20 (ADF&G, 1996).

Herring. Herring were once abundant throughout Prince William Sound and, prior to the *Exxon Valdez* spill, provided a significant fishery in some years in highly specific spawning areas. While their abundance is returning, no herring spawning or fishing areas are identified to be close to the project areas (ADF&G, 1996). The northeast ends of Evans, Elrington and Latouche Islands are exposed, moderate to high energy environments and not suitable for herring spawning.

Demersal Fish. The intertidal and shallow subtidal areas at the proposed cleanup sites are typical of exposed high energy environments in Prince William Sound. There is one exception to this generalization. There is an area within Sleepy Bay that supports an eelgrass bed, suggesting a sheltered site with a sand bottom. Fish assemblages within a given geographic region tend to be very similar for similar depth and substrate. The fish assemblages from nearby and similar habitats to project beaches characterized by Jewett et al. (1995) found 61 species of fish representing 15 families including rockfish, sculpins, greenlings, pricklebacks, and gunnels.

Marine Birds

Marine birds utilizing the marine waters in the vicinity of the project area to forage include shorebirds, diving and dabbling ducks, guillemots, cormorants, and kittiwakes (Trustee Council, 1994; Agler et al., 1995, Arthur D. Little, 1991, Armstrong, 1990). Examples of shorebirds include the black oystercatcher (*Haematopus bachmani*), greater yellowlegs (*Tringa melanoleuca*), and black turnstone (*Arenaria melaocephala*). Diving and dabbling ducks in the vicinity of the project area include the harlequin duck (*Histrionicus histrionicus*), common merganser (*Mergus merganser*), oldsquaw (*Clangula hyemalius*), and the surf scoter (*Melanitta perspicillata*). The shorebirds utilize portions of the shoreline for foraging but the other marine birds will typically forage offshore and will spend little time in the project area.

Marine Mammals

Marine mammals expected to be found in the general vicinity of the project area utilize the offshore habitats to a greater degree than the intertidal habitat. The Steller sea lion (*Eumetopias jubatus*) and the harbor seal (*Phoca vitulina)* will use shoreline areas in Prince William Sound as haulout spots. However, a review of Alaska Department of Fish and Game (ADF&G) records show that none of the targeted beaches are used for haulout areas (ADF&G, 1996). The other marine mammals that are found near the islands specified in this proposed project typically stay offshore. These include sea otters (*Enhydra lutris*), killer whales (*Orcinus orca*) and Humpback whales (*Magaptera novaeangliae*). Local residents have identified areas off Elrington Island as containing a large sea lion population. Residents also note that beach ER020-B, on Elrington Island, was used as a seal pupping area before the spill. There have also been sightings of whales foraging off the coast (Loeffler et al 1996).

Terrestrial Environment

Birds

Terrestrial species that are expected to be found at or near the targeted beaches include raptors and eagles feeding in the area, and passerine birds that may use the area for foraging. Some of the species that could be affected by the restoration include various gulls, raptors, eagles, and passerines that may forage in the intertidal area (Armstrong, 1990; Trustee Council, 1994; Arthur D. Little, 1991; NBS, 1996). The bald eagle (*Haliaeetus* leucocephalus) and peregrine falcon (*Falco peregrinus*) may use the beach area or offshore areas to forage for prey species. Passerine species such as the Lapland longspur (*Calcarius lapponicus*) will utilize the shoreline to forage. The northwestern crow (*Corvus caurinus*) will also forage along the shoreline for dead fish and invertebrates.

Mammals

A number of terrestrial mammals in Prince William Sound use the shoreline and intertidal area to forage. Local residents have noted river otter dens near a number of the targeted beaches. Coastal winter habitat is present for Sitka black-tailed deer with concentrations occurring from November to April (ADF&G, 1996). Both deer and bear populations forage along the shoreline. Other species that may be in the area include mink (*Mustela vison*), red fox (*Vulpes vulpes*), coyote (*Canis latrans*), and river otter (*Lutra canadensis*) (Rearden, 1981)

Threatened, Endangered or Sensitive Species

In response to a request for project-specific information from ADEC to U.S. Fish and Wildlife Services (USFWS), USFWS indicate that the only sensitive species potentially to occur in the project vicinity is the protected bald eagle (*Haliaeetus leucocephalus*) (Eagle Protection Act). USFWS state "that there are no threatened or endangered species located in the project area." (letter to D. Munson, ADEC, from J.R. Nickles, USFWS, dated February 25, 1997) (Appendix E).

4.3 Cultural and Socioeconomic

This section addresses the cultural importance of the proposed project area and its social, recreational, and commercial uses. Native communities in the spill region of Prince William Sound have relied heavily on subsistence resources for many generations. Resources used include salmon, halibut, cod and other fish; marine invertebrates such as molluscs, shrimp and crabs; marine mammals such as seals; land mammals such as deer and bear; birds and bird eggs; and wild plants. Many families felt they could no longer trust the safety of their traditional foods after the oil spill, and the use of these subsistence resources declined significantly in some communities (EVTC 1994). The proposed oil reduction project has been requested by the community of Chenega Bay. The community members state that the continued presence of shoreline oiling affects their confidence in the use of subsistence resources and the use of the shorelines.

To reestablish confidence in the use of the subsistence resources, the EVOS Trustee Council formed the Oil Spill Health Task Force in 1990. This task force has conducted a subsistence species monitoring program. The results of these studies have found that all fish, deer, ducks, seal, and sea lions tested as part of the program have been considered safe to eat (Miraglia, 1995). The task force has recommended against using shellfish from beaches where oil is still present. Certain areas were not cleaned, such as certain mussel beds, based on the decision that the oil removal operation in these sensitive zones could be more harmful than leaving the oil in place (Miraglia, 1995).

In general, Trustee Council scientists believe that residual oil is unlikely to be affecting the health or population of many of the subsistence resources such as harbor seals, salmon, shrimp and deer. In some locations, the oil may be affecting local populations of harlequin ducks and sea otters because of the residual oil in mussel beds that have not been cleaned. Despite these published results, Chenega Bay residents believe that residual oil continues to exert a significant adverse impact on the Prince William Sound environment (Loeffler et al 1996).

The beaches targeted for this oil reduction project have served a multiple number of purposes for the residents of Chenega Bay (Appendix C). Chiton harvesting occurs at Elrington and Latouche beaches, at six of the eight proposed treatment beaches. Duck and seal hunting occur at all of the sites except one and subsistence bottom fishing occur at three of the Latouche Island sites. The site on Elrington Island (ER020-B) is located across the bay from Chenega Bay and has been a popular picnic site and the beach contains mussel beds. The Latouche Island beaches have been used as the access points for terrestrial uses of the island such as berry picking, wood gathering and bear hunting. Elrington Island has been used for deer hunting and Evans Island site EV039-A has been used for octopus harvesting (Loeffler et al 1996).

Commercial fishing in the Southwest region is limited to purse seining at the present time (ADF&G, 1996). The season extends from July 18 through September 6. Purse seining for pink salmon occurs during this period throughout Prince William Sound and includes areas off the northeast end of Evans and Latouche Islands. There are no hatcheries or acclimation/release facilities close enough to the restoration areas to be of concern from this project. The closest facilities are at Port Chalmers on Montague Island (chum) and Sawmill Bay (chinook) (ADF&G, 1996).

There is some recreational harvest of salmon and halibut in and around Sleepy Bay. Also fishing for rockfish occurs off the points, as close as boats can safely venture. Salmon are primarily taken from late July into early August. Halibut and rockfish are harvested during July and August (ADF&G, 1996)

5.0 Environmental Consequences

This section examines the potential impacts of two alternatives, the no-action alternative and the proposed action, the airknife application of PES-51© in conjunction with ambient water washes.

5.1 No-Action Alternative

The no-action alternative will result in no change in the physical aspects of the targeted beaches. The beaches will retain their present appearance and substrate characteristics; the levels of residual oil contamination on the beaches is not likely to disappear naturally in the near future, perhaps not for decades. Marine and terrestrial resources will exhibit trends based on natural inputs. EVOS Trustee Council scientists state that residual oil is unlikely to be affecting the health or population of many of the biological resources such as harbor seals, shrimp and deer. In some locations, the oil may be affecting local populations of harlequin ducks and sea otters due to oil contamination trapped in uncleaned mussel beds. Participants in the workshop on residual shoreline oil agree that the surface and subsurface oil remains on many beaches near Chenega Bay and that the oil is not likely to disappear naturally in the near future, perhaps not for decades. Weathering and microbial degradation of the residual oil is occurring but is degrading or dispersing very slowly on the target beaches. The main impact of the no action alternative is the perception of the local residents that the beaches are contaminated and that the continued oil presence affects their confidence in the use of subsistence resources and the use of the shorelines. No other effects on fish, intertidal and subtidal plants and animals, human health and safety, water quality and commercial fishing would occur under this alternative.

5.2 Proposed Action--Application of PES-51©

Physical Environment

This subsection discusses the potential impacts of the application of PES-51© to the physical environment. This includes physical and chemical impacts to the substrate and water of the targeted beaches.

There will be some temporary physical disruptions to the environment as a result of the restoration operation. This will be the result of equipment such as generators, hoses, and compressors on the beach, personnel walking around, and the treatment operation with the airknives. The boat operations nearshore will also result in some disturbances. The mechanical impact to the substrate of the targeted beaches will be minimal due to the size of the substrate. These beaches are comprised of boulder/cobble armoring over gravel. There is some smaller material, such as sand, in isolated pockets and in the interstitial matrix. This material is small enough to be washed down the beach but comprises a very small percentage of the beach and the ambient water wash is unlikely to move this material downslope because it will be applied as a low-pressure fountain of water rather than from a high-pressure hose. As long as the armoring function of the cobble and boulder fraction is not disrupted by the treatment activity, any impacts resulting from physical disruption will be short-termed. The treatment agent PES-51© will coat the rocks in a thin sheen to prevent recontamination by floating residual oil. This facilitates the removal of the oil by physical means such as washing. Because PES-51© degrades in 96 hours, any physical impact from this coating will be short termed. The toxicity issues of PES-51© and the residual oil are discussed below.

The results from the 1993 Sleepy Bay test program using PES-51© conducted through the ADEC's Hazardous Substance and Spill Technology Review indicate that the PES-51© application combined with the low-pressure cold water washes resulted in the removal of up to 70 percent of the residual oil on the test beach. The microbial test results indicated that the stranded oil left on the beach was made available to renewed microbial degradation which resulted in the reduction of residual oil of up to 90 percent of pre-treatment levels.

Water column samples were taken during the Sleepy Bay test of PES-51© in July 1993. There were no volatile organics or total petroleum hydrocarbon detected in the water samples collected, before, during, or after the application of PES-51©. This would indicate that the release of oil from the test beach substrate was not emulsified or chemically altered and did not enter the water column. The PES-51© is hydrophobic and has a 0.84 specific gravity to water at 25° C. PES-51© floats and is readily available for recovery by skimmers. It is noted that the PES-51© and crude oil mixture is less soluble than the oil by itself. The expected concentrations of PES-51© in the water column will be well under 200 ppb using the recommended application methods and rates and would degrade within 96 hours (Compendium of PES-51© Aquatic Toxicity Data). The water quality impacts from the restoration operations should be minimal and of short duration.

There will be short term impacts on air quality and noise quality from the generators, compressors and other activities of the project crew at the beach sites. There is the potential for diesel spills from the support boats and potential fuel spills from the equipment on the shore. Standard safety precautions and the presence of large amounts of oil skimming and oil capture material associated with the restoration action reduce the threat of potential contamination.

Biological Environment

Project affects to the biological environment can be categorized as either physical or toxicological in nature. Each of these categories of affects are presented below for the components of the biological environment that could be exposed to the proposed project.

Marine Environment

Flora. The nature of the proposed project could result in the physical removal or damage to some of the intertidal flora including the *Fucus spp.* and other non-encrusting species of algae. The removal and damage is likely to come primarily from the crew cleaning and at the few locations where the air knife will be inserted into the substrate. The washing action proposes using cold ambient water in a low-pressure fountain action, therefore, compared to the hot-water, high pressure beach cleaning operations used initially after the *Exxon Valdez* spill, there is expected to be little physical damage to most algae.

Because *Fucus spp.* may be able to withstand a fairly high degree of oiling (van Tamelen and Stekoll, 1996), it is not expected that there will be any adverse effects as a result of the planned restoration effort to *Fucus spp.* Subtidal flora abundances were not drastically different between oiled and non-oiled sites in heavily oiled areas (Dean et. al, 1996), therefore it is not expected that there will be any impacts as a result of this restoration activity. Most, if not all, of the oil liberated during the cleanup procedure will be collected through the use of booms and skimmers. The use of the cleaning agent PES-51© will have no affect on the flora community from a toxicity standpoint. The application rate and flushing procedures will be monitored closely so that the concentration of PES-51© will remain at low levels.

Invertebrates. As discussed above for marine flora, the proposed action may remove or damage some intertidal invertebrates through crews walking on organisms (barnacles and mussels) or by dragging equipment across them. The actual injection of PES-51© and washing action should result in minimal physical damage.

Liberated oil from the restoration effort will be collected by booms and skimmers. Any liberated oil that is not collected may have a potential impact on invertebrates in the project area. Mussels, crabs, amphipods, and other invertebrate species are expected to receive a single pulse of PAHs at low concentrations. Additionally, oil may continue to enter the water column from the beach area at even lower concentrations. Although there may be temporary adaptations (such as mussels closing up) of organisms to the initial pulse, there is not expected to be any long term effects at the community or population level. Visual observation of the macrofauna during the 1993 Sleepy Bay test program saw no acute impacts on the treated beach and no observable impacts were noted during the subtidal survey conducted in August 1993.

The application of PES-51© to the intertidal zone, applied at a minimal rate to achieve the desired effects, along with the tidal action and the addition of ambient water, will result in nondetectable concentrations of PES-51© in the water column as was found during the test application in Sleepy Bay in 1993. At the application rate of 1 gal. per 250 sq. ft, after pre-washing the beach with ambient water, followed by an immediate beach washing (ambient water), on a rising tide, it is expected that the concentrations of PES-51© in the water column will be well under 200 ppb. These levels are well below any levels known to cause toxicity in laboratory static toxicity tests. Invertebrate toxicity tests using the invertebrate species C. gigas (oyster) and *M. edulis* (mussel) indicate 48 hr LC50s of 18.7 ppm and 9.6 ppm, respectively (NOAA, 1994; Compendium of PES-51© Aquatic Toxicity Data). These toxicity tests use a combined survival and abnormal growth endpoint and are therefore sensitive to sublethal effects. In addition, the toxicity tests conducted on a mixture of oil and PES-51©, which simulate a more realistic exposure scenario, indicate the PES-51©/oil mixture was less toxic than PES-51©. This is due to the PES-51© ability to form an interfacial barrier that reduces the water soluble fraction that is toxic in the water column (Compendium of PES-51© Aquatic Toxicity Data). Therefore, tests with PES-51© alone indicate that these sensitive test species exhibit effects at a higher concentration than expected in the field.

Fish. The physical nature of PES-51© lends itself to easy removal. It's low solubility greatly reduces the likelihood of contamination of subtidal habitats. The primary mode of impact of restoration operations on fish are expected to be limited to physical disturbance of the beach.

As treatment crews land and work, they will disturb fish in the shallow intertidal zone such as pink salmon fry, sculpins, starry flounder, Dolly Varden, and others. Potential project impacts to pink salmon are greatly minimized by the timing of cleanup activities. Since proposed activities will not begin until June 15, virtually all of the pink salmon fry will be gone from the intertidal zone. The few pink salmon that may be present and other fish are highly mobile and will swim away from such activity. However, some species of fish may also be attracted to the area, at least on the incoming tide. As the crews work, the encrusting invertebrates such as barnacles will be stepped on and broken open thereby releasing a food source into the water. Also, small epibenthic organisms such as amphipods will be dislodged by the airknives and attract fish.

As with invertebrates, it is expected that there will be an immediate release of oil and PES-51© (albeit at very low concentrations) into the water downslope of the targeted beaches. Due to the hydrophobic nature of PES-51©, it is not expected that fish will be exposed to either PES-51© or the released oil. In addition, fish species have the ability to further reduce exposure potential by natural avoidance behaviors.

Static laboratory toxicity tests using the saltwater fish *M. beryllina* and *F. heteroclitus* were conducted on PES-51©. The 96 hr. LC50s for *M. beryllina* and *F. heteroclitus* were 100 ppm and 1425 ppm, respectively. These values are much higher than expected in-field concentrations of PES-51©. When PES-51© was combined with #6 Fuel Oil, the LC50 for *M. beryllina* increased (less toxic) to >1600 ppm. When PES-51© was combined with #2 Fuel Oil, the LC50 for *F. heteroclitus* increased to 5200 ppm (Compendium of PES-51© Aquatic Toxicity Data). Based on these results, it does not seem likely that any toxicity will result from exposure to either released oil or PES-51© under real world conditions in a nonstatic system.

There are a few species of fish that will attempt to hide in the interstices between cobbles and rocks, such as gunnels. Some of these fish may come directly in contact with PES-51© or be crushed by workers walking around on the beach. This effect is greatly minimized by the fact that treatment activities are focused on upper intertidal areas rather than further down the beach. These are very common fish throughout the region and along the coast down to Oregon. The potential loss to the ecosystem is minimal and recolonization of gunnels in the treatment beaches is expected to be rapid.

Marine Birds. Many of the shorebirds that utilize the project area will avoid the area due to disturbance from the proposed restoration operations. Therefore, there are no expected impacts from physical disturbances. Any toxicological impacts will be negligible because exposure will be limited during the periods of maximal oil or PES-51© concentrations due to human disturbance. The large foraging range of the avian species in relation to the size of the proposed beach cleanups, minimizes any impacts from exposure to oil or PES-51©. Following the beach cleanup, it is not expected that any impacts will result from exposure to residual oil. Historical studies have shown that there have been little or no impacts as a result of exposure to residual oil either directly or from ingestion of contaminated prey items (Agler et al., 1995; Arthur D. Little, 1991; Trustee Council, 1994). Any residual PES-51© will deteriorate within 96 hours, and the concentrations are expected to be below (order of magnitude) those known to cause effects in avian prey species (NOAA, 1994).

Marine Mammals. Most of the marine mammals such as harbor seals, will avoid the area of restoration operations due to the noise and human activity of the area. The threat of physical injury to these animals is minimal. The other species such as humpback whales or orcas will be far enough offshore that they will not be impacted by the treatment operations or they will probably leave the area once the proposed activities begins. Since only small areas will be briefly disturbed during restoration activities, adverse affects are considered unlikely. As with birds, exposure to potentially toxic compounds, either directly or through ingesting contaminated prey items is considered minimal due to the large foraging range of the mammals and the artifact of avoidance of the area by these mammals during restoration operations. Historical information has also indicated, as with birds, that there have been little or no impacts as a result of exposure to residual oil (Agler et al., 1995; Arthur D. Little, 1991; Trustee Council, 1994).

Terrestrial Environment

Birds. Physical stresses to avian species that may use the area to forage are loss of food resources in the restoration areas and potential toxicity as a result of ingesting organisms that have bioaccumulated compounds associated with the release of the oiled mixture. Since the area will only be briefly disturbed during restoration activities, it is not expected that there will be any adverse effects on the avian population since they can avoid the area. Any direct toxicity from ingestion of released oil is highly unlikely since the foraging area is small compared to the foraging range of the avian species that may use these beaches. In addition, previous studies in Prince William Sound indicate low community or population impacts as a result of ingestion of oil either directly or from ingestion of contaminated prey items (Agler et al., 1995; Arthur D. Little, 1991; Trustee Council, 1994). Under the brief exposure duration of this restoration effort, direct toxicity effects are not of concern, as is described for the marine birds.

Mammals. As with avian species, there is not expected to be any adverse effects to mammals that may frequent the proposed project area. Physical impacts to these beaches may temporarily reduce the ability to forage in this area, however, no impacts are expected at the individual, community, or population level as a result of reduced foraging opportunities because the foraging range of the mammals that may use this area are much larger than the project area and the impact is temporary.

It is not expected that there will be any toxicity effects as a result of the proposed restoration effort. As with birds, there will be minimal exposure due to the disturbance at the sites and the small size of the sites compared to the large foraging range of these mammals that are potentially affected by activities at the beaches. Under the brief exposure period of this restoration effort, direct toxicity effects, either through direct ingestion or ingestion of contaminated prey items, are not of concern as is described for the other vertebrate species.

Cultural and Socioeconomic Environment

The purpose of the shoreline oiling reduction project is to restore the confidence of the local residents in the quality of the subsistence resources on the beaches and in the general use of these beaches. A Chenega Corporation representative will be involved in the pre-treatment selection of restoration areas that will be designated for application of PES-51© as well as the post-treatment inspection to determine that the oil reduction operation meets the local residents expectations. The oil reduction project is expected to improve the visual appearance of the shoreline, thereby improving recreational opportunities for both local residents and tourists visiting Prince William Sound.

Human Health and Safety

PES-51© is listed on the EPA's National Product Schedule and has met the protocols established by the State of Alaska's Hazardous Substance Spill Technology Review Council to screen products for use in spill response. The product has met the requirements of the protocols which focus on the acute and chronic toxicity on marine biota. The short half-life of

PES-51©, relatively low solubility, low density and inability to emulsify act collectively to minimize the potential for exposure to fish or benthic life in the general vicinity. This minimizes the opportunity for this material to enter the food chain and create a risk to human health. Exposure to PES-51© on the beaches is of minimal risk, procedures for handling PES-51© will be addressed by the project health and safety plan and enforced by the site safety officer. The infield concentration levels of PES-51© is in the parts per billion range, while toxicity tests for fish and invertebrates show PES-51© levels to be in the parts per million to reach toxic levels and these concentrations exceed the reported solubility of PES-51©. When combined with the short half life, there is minimal risk to human health to both the clean-up crew and anyone using the beach, post restoration. Most of the hazards will probably be in the category of "trip and fall" and a health and safety plan has been prepared and a site safety officer and onsite first aid person will be present during operations. There will be some residual oil left on the beach after treatment that may be taken up by the fauna within the intertidal zone. It may be recommended that subsistence harvesting of these beaches be postponed until the following season.

Commercial Fishing

The potential for restoration activities impacting commercial fisheries is negligible. The proposed schedule for treatment ends before the commercial salmon fishery begins and the nearest salmon hatchery or acclimation facility is too far away to be affected. The chance that uncollected PES-51©/oil mixture materials will impact purse nets is remote. The double boomed containment system is designed to minimize escapement of PES-51© and the residual oil. The amount of material resulting from the shoreline oiling reduction project is small and the project will not be in operation during the purse seining season.

Other Resource Values Considered

Threatened, Endangered or Sensitive Species

Based on the response letter from the USFWS, there are no threatened or endangered species in the vicinity of the project; therefore, no project impact to threatened or endangered species will occur. The protected bald eagle is noted to nest in the vicinity of some project beaches and the increased human activities and associated noise of the proposed project could affect this protected species. To protect bald eagle mating and rearing activities, specific timing of project activities at the beaches where eagles are known to nest will be required. Additional details of these mitigation measures are discussed below in Section 7.

Cultural Resources

In compliance with Section 106 of the National Historic Preservation Act and 36 Code of the Federal Regulations (CFR) 800, counsel has been sought from the Chugach National Forest archeologist concerning the possibility of historic properties occuring in the restoration areas. If cultural or historic properties are identified during the acutal restoration work, all work will cease in that area and the State Historic Preservation Officer will be notified.

Wilderness

Beach restoration site ER020B is adjacent to National Forest Land managed as wilderness. No activities will occur above mean high tide thus there will be no impact to the wilderness other than increased noise, air emissions and activity associated with the restoration work on state land.

Subsistence

The purpose of the shoreline oiling reduction project is to restore the confidence of the local residents in the quality of the subsistence resources. There may be some residual oil left on the beach after treatment that may be taken up by the fauna within the intertidal zone. It may be recommended that subsistence harvesting of these beaches be postponed until the following season. No other effects to subsistence use in the project area would occur from implementing the proposed action.

Alaska Coastal Management Program Consistency

The Alaska Division of Governmental Coordination is conducting coastal management consistency review for this project. Alaska Coastal Managment Program Consistency is required for proposed projects in or affecting coastal areas of Alaska.

Wetlands and Floodplains

There are no wetlands or floodplains in the project area.

Irreversible or Irretrievable Effects

There is no foreseeable irreversible or irretrievable commitment of resources, nor significant adverse environmental effects of the proposed action.

6.0 Cumulative Impacts

Scientific experts attending the 1995 oiling workshop agreed that the environmental cost to implement active treatment in select areas in Prince William Sound would not result in significant environmental harm. A limited treatment program could provide benefits to Chenega Bay residents and other shoreline users. The short term disturbance of the restoration work is acceptable when considering the long term gains. Therefore treatment of a small area within Prince William Sound would be reasonable.

7.0 Summary of Mitigation Measures for the Proposed Action

There are three components incorporated into the proposed shoreline oil reduction project intended to mitigate the potential environmental impacts of this restoration effort: the proposed treatment techniques and treatment material; the timing of the beach treatments; and the extensive monitoring program that will be conducted before, and after treatment.

As described above in Section 3, PES-51© was proposed because of its perceived superiority at allowing the maximum amount of oil reduction with the minimum potential for releases of oil back into the environment and because it is effective and because the residents of Chenega Bay support its use. This treatment chemical can be used with ambient low-pressure washing and flooding and is considered to be lower impact techniques compared to other types of oil reduction methods previously used in Prince William Sound.

Specific mitigation measure related to the treatment material and techniques are:

- The shoreline will be double-boomed below the treatment area and oil-skimming materials will be plentiful to maximize the recovery of oil and PES-51© materials.
- Treatment will be conducted by working with the incoming and outgoing tide so as to use the shoreline waters to aid in the transport of the PES-51/oil mixture into the water for containment and collection. Treatment will not be conducted when the lower intertidal zone is exposed to reduce impacts to the lower intertidal areas not being treated, except at LA021A where the oil is located in the lower intertidal zone.
- Treatment is limited to a few beach segments throughout the islands.
- Airknife insertion will be as deep as possible to minimize the number of insertions in the beach and to minimize the disruption to substrate armoring.
- The shorelines selected for treatment have oiling occurring high in the intertidal where life is scarce.
- Ambient temperature, low-pressure washing will be used to minimize the physical impacts of the treatment.
- Equipment and personnel will be minimized to limit physical damage to aquatic life.

The timing of the beach treatments has been limited to that time of year (June 15 through July 18 and September) when impacts to biota can be minimized. Specifically:

- Salmonid fry are no longer found inshore.
- Bald eagle mating is concluded.
- Spring biological production is concluded.
- Commercial purse seine fishery is not in operation.

Some additional timing adjustments may be required if a bald eagle nest is found to be actively rearing young. USFWS will require that beach treatment within 660 feet of an active nest be postponed until rearing activities are concluded (until the young bird(s) has fledged). USFWS personnel will be consulted so that active nests can be identified and appropriate action taken to mitigate potential impacts.

An integral component to the proposed beach restoration activities is the monitoring program as detailed in Section 8 below. Those aspects of the monitoring specifically included to mitigate potential project impacts include:

- Pre-treatment identification of sensitive areas and during treatment direction to avoid such areas.
- Visual inspection of surface waters to insure materials are being adequately adsorbed/removed inside the boomed areas and releases are minimized to the environment outside of the boomed area.
- Use of a caged mussel toxicity testing protocol may be used to assess environmental effects of the project.
- Conductance of a mussel and chiton tissue accumulation study at proposed beaches to minimize exposure of humans to residual oils that may be accumulated in tissues immediately following treatment.

8.0 Monitoring

The overall goal of the monitoring plan is to assess the effectiveness of the oil reduction operations on eight targeted beach segments located on Elrington, Evans and Latouche Islands in meeting the objectives of the proposed action. Additionally, the monitoring plan is intended to provide data to evaluate the impacts to the biological systems resulting from treatment. The monitoring program consists of the following:

- A pre-treatment assessment of the beaches to finalize the plan and collect pre-treatment data.

- Post-treatment monitoring of the effectiveness of the program and the changes to environmental conditions from the action.

The detailed Monitoring Plan is included as Appendix A.

As described in Appendix A, the monitoring program will initially delineate the treatment locations and determine the pre-treatment levels of residual oil in and on the substrate. The main aspect of the monitoring program is to assess the effectiveness of the oil reduction program to reduce visually observable oil, determine the remnant oil concentrations on the beaches following treatment, and assess its environmental impacts. The monitoring program will include sediment and biological sampling before and after the oil reduction operations. Macroinvertebrate surveys will not be conducted because the natural variability of these populations could mask impacts from treatment.

A representative of Chenega Bay will be present during the pre-, during, and post treatment inspection to help guide the restoration activities (Appendix A) .

Because there is a fixed budget for this project, the interested parties (especially Chenega Bay representative) will be required during treatment to decide the effort to expend on each beach. This is especially important if the shoreline oil reduction program on any one beach takes longer than budgeted or requires repeated washing to meet expressed minimum requirements. If this occurs, the interested parties will need to reach an agreement on subsequent actions (i.e., whether to reduce the level of effort on each beach segment or to concentrate on fewer beaches).

9.0 List of Preparers and Person Consulted

List of Preparers

The following individuals participated in the formulation and analysis of alternatives, and the subsequent preparation of the Environmental Assessment:
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List of Appendixes

Appendic A. Monitoring Plan

Appendix B. Project Location Maps

Appendix C. Table of Characteristics of the Proposed Restoration Beaches

Appendix D. Residual Shoreline Oiling Workshop Participants

Appendix E. USFWS Guidlines on Bald Eagles and Threatened and Endangered Species

Appendix A

Chenega Beach Cleanup Monitoring Plan

Goals, Objectives, and Strategy of the Monitoring Program

Goals

The overall goals of the monitoring program are to assess the effectiveness of the oil reduction operations on eight targeted beach segments located on Elrington, Evans and Latouche Islands and document impacts to the physical and biological systems at these beaches. The effectiveness of the oil reduction operation will be determined by a visual reduction in the amount of oil observed in the substrate exposed to treatment and by chemical analysis of the levels of petroleum hydrocarbons in the surface and subsurface sediments. To assess the affects on the biota resulting from the oil reduction operations, mussels and chitons tissue from treatment beaches will be analyzed. To assess bioaccumulation and toxicity related to the treatment operations, a caged mussel experiment will be conducted. Additionally, visual impacts to the environment, either shoreline wildlife or intertidal or marine resources, will be documented during treatment.

Objectives

The objectives from the Workshop Report (Loeffler et al, 1996) and from PES, Inc. (1995) have been modified for use in this plan to include the following:

- **Objective I**: Significant reduction in visually observable surface and subsurface sediment.
- **Objective II**: Significant decrease in the levels of measurable petroleum hydrocarbons in the surface and subsurface sediment.
- **Objective III**: No significant environmental impact on biota and no evidence of petroleum hydrocarbons being introduced into the water column.

Strategies and Sampling Approach

The strategy and measurement objectives for each objective are discussed below.

Objective I

Objective I will be met by completing the following steps:

- The project Oversight Committee, consisting of representatives from Chenega, Alaska Department of Environmental Conservation (ADEC) and the onsite representative contracted to the Prince William Sound Economic Development Council (PWSEDC) will identify the treatment areas and document visual observations on oil survey forms (attached) before, during, and after treatment. The oil survey method has been the basis for a standardized method to characterize the level of remnant oil in both the surface and subsurface over time (Exxon, 1991; Gibeaut et al., 1995).
- The onsite representative(s) will extensively photograph and videotape the targeted beach segment before, during, and after treatment, the treatment operation at each beach segment, and each sample location during sampling. A photography form (attached) will be completed for each photograph taken.
- When the budgeted amount of effort (treatment days) has been expended at each beach site, the Oversight Committee will compare the pre- and post-treatment oil survey forms and readily available photo documentation of each treated beach segment to assess the level of oil reduction that was achieved. If the Committee finds that the oil reduction effort has achieved a 50 percent or greater removal success, the beach restoration will be considered completed. If the Committee elects to extend treatment at a beach beyond the budgeted level of effort, it will impact the level of effort expended at other target beaches. If any beach receives less than the budgeted treatment effort, the objective of 50 percent removal is not expected to be achievable.

Objective II

The endpoint of Objective II is to have significant decreases in the levels of measurable petroleum hydrocarbons in the substrate. NOAA criteria for effectiveness during the *Morris J. Berman* oil spill test of shoreline cleaning agents was greater than 20 percent removal. Results from the 1993 pilot test at Sleepy Bay using PES-51® indicated a 70 percent removal rate. The targeted removal effectiveness for this oil-reduction program is 50 percent.

To assess the percent reduction in hydrocarbons at each target beach, samples collected before treatment will be compared to data collected from the same location immediately following treatment (less than 6 weeks) and 12 months after treatment.

To accomplish this objective, the following will be performed for each beach segment:

- **Spot sediment samples** will be taken for before and after comparisons at each individual sample location, *not* for between-location or between-beach comparisons. As such, the locations will be specifically selected to include any especially oily areas, to be distributed roughly over the entire area to be cleaned, and to identify spots that are practical for sampling. An average of eight sediment sample locations will be selected for each beach. Enough information on each sample location will be recorded so that each location can be readily found again for the later sampling times. Most analysis of sediment samples will be by ultra-violet fluorescence spectrophotometry (UVF), a quick screening method (see Analysis section below). Comparisons will be made between the samples taken from a single location at the three sample times.

- **Vertical transect samples** will be taken to determine whether oil is simply moved down the beach instead of being cleared from the beach altogether. A single transect for each beach will be placed in a convenient and practical location extending from the area to be cleaned down slope into the low intertidal area. Approximately eight sample points will be selected along the transect. Analysis of sediment samples will be by ultra-violet fluorescence spectrophotmetry (UVF). Comparisons will be made between the distributions of HCs along a single transect at the three sample times.

- **Observations** made by the sampling team will be documented on a Sample Location Data Form developed for this project (attached). Information on site conditions (surface and subsurface), and the presence of hydrocarbon odor will be recorded during each sampling event. Sample locations will be photographed.

- All samples will be frozen as soon as retrieved from the beach, and brought frozen to the NMFS Auke Bay Fisheries Laboratory for analysis. Two different analytical methods will be used, an ultraviolet-florescence (UVF) quick screening technique and complete analysis by gas chromatography/mass spectrophotometry (GC/MS). All sediment sample HCs will be measured by UVF, in terms of μg total petroleum hydrocarbons (TPH) per gram of wet sample weight. This method is sufficiently accurate to compare HC concentrations on these beaches when calibrated with a GC/MS analysis of one sample per beach. This method gives results more quickly and far less expensively than GC/MS.

- The quantity of beach runoff captured in the water with skimmers will be measured as will be the volume of PES-51® used. These data should not be used as a quantitative measure of oil removal due to the difficulties of determining volume percents of oil residue, PES-51® and water in the field. This information will be obtained and recorded daily by the onsite representative. A typical oily water collection form is provided at the end of this section.

Objective III

Impacts to the biota from treatment activities will primarily be assessed through chemical monitoring for petroleum hydrocarbons in biological tissues from organisms found at the treatment beaches. Biological monitoring will also be conducted through the use of a caged mussel experiment and visual observations of impacts to wildlife and marine resources. The monitoring proposed to achieve Objective III is outlined below.

- Visual Observations. Any material escaping from the boomed area on the surface will be visually observed and action taken to prevent further escapement.

- Mussels (*Mytilus trossulus*) will be sampled during three sampling events; before treatment, one month following and one year after treatment, on as many of the eight beaches that have sufficient mussels to sample. The value of measuring the total petroleum hydrocarbons in mussel tissue before and after treatment comes from their tendency to concentrate compounds they are exposed to, which makes low levels of petroleum hydrocarbons in the water column easier to detect. As filter feeders, they process large volumes of water and integrate the contents over time and space. Finding petroleum hydrocarbons in mussels also demonstrates that those compounds are available in the food chain.

- Chitons (*Katharina tunicata*) will be sampled for petroleum hydrocarbon bioaccumulation. Chitons are listed as a subsistence resource on almost every beach segment targeted for treatment, indicating that they would be available for sampling at most beaches. The levels of petroleum hydrocarbons in chiton tissues would be of interest to the local residents as a demonstration of the final degree of "cleanliness" and usefulness of these beaches other than oil levels in the sediment. Hydrocarbons will be monitored to determine whether they temporarily carry increased hydrocarbon levels in the month following treatment and whether they are essentially hydrocarbon-free one year following treatment.

- All tissue samples will be frozen as soon as retrieved from the beach, and brought frozen to the NMFS Auke Bay Fisheries Laboratory for analysis. All biological tissue sample HCs will be measured by GC/MS, the only adequately accurate analysis available for HC's in tissues.

In addition to the proposed tissue monitoring program, a caged mussel test program will be conducted at one beach segment. The caged mussels will be conducted at one beach segment to evaluate bioaccumulation of petroleum hydrocarbons released into the water by the shoreline oil-reduction program. Caged bivalves were used in a number of studies as part of the *Exxon Valdez* oil spill and there is an extensive tissue PAH database available. Caged bivalves facilitate monitoring chemicals and associated effects over time and space. The caged mussels will be used here as a water sampling device, to measure HCs in the water column without the confounding factors of air exposure or direct contact with stranded floating material that will affect the indigenous mussels.

- As an additional measure of effects on resources, a wildlife impact form will be completed by the onsite representative observing any impact to birds, deer, otters, or other wildlife (see example form).

Methods

This section describes sampling methods recommended for sediment, water quality and biological sampling.

Sediment Sampling

- **Spot sediment sample** locations will be specifically selected to include any especially oily area, to be distributed roughly over the entire area to be cleaned, and for spots that are practical for sampling. Practicality includes two factors: presence of sediment fine enough to sample (grain size no larger than pea gravel), and patches of samplable sediment large enough to support nine sampling pits (at least $1000cm^2$ available, after any cobbles or small boulders having been lifted off of the sediment surface). Throughout this protocol, a "sample location" will mean one of these selected $\geq 1000cm^2$ patches of samplable sediment. An average of eight sediment sample locations will be selected for each beach. The sample taken from each location will consist of three sub-samples (approximately $30cm^3$ each) composited in one HC-free glass jar, along with three similar sub-samples taken from 10cm below the three surface sub-samples. Holes dug for removal of the deeper sub-samples will be refilled for a minimum of disruption to the sample location, and any cobbles or small boulders removed will be replaced. The three holes dug at each subsequent sampling time will be from the same sample location but will not necessarily coincide with the initial three holes. Enough information on each sample location must be recorded (field notes, GPS readings & photographs) that each location can be readily found again for the later sampling times.
- **Transect samples** will be taken along a single transect for each beach, placed in a convenient and practical location extending from the area to be cleaned down slope into the low intertidal area. Approximately eight sample points (fewer for a particularly steep beach, more for a very level beach) will be selected along the

transect. They will be approximately equidistant from each other, but most will almost certainly have to be adjusted up or down slope from the prescribed point to find a practical sample location. Sample location requirements are much like those for the spot sediment samples above, but smaller patches of sampleable sediment will be adequate because only surface sediment is needed in this case. Each sample will consist of three sub-samples of surface sediment composited in one HC-free glass jar.

- All sediment samples will be stored in coolers containing blue ice to maintain a cooler temperature of 2 to 6°C. Sample jars will be wrapped in bubble wrap to prevent breakage during shipping. Chain-of-custody forms will document the samples collected and will be signed by the sampler. The forms will contain information on the actual sample location duplicated and will be retained in project files. The cooler will be taped shut and custody seals applied before shipping to the analytical laboratory.
- The samples will be brought to the NMFS Auke Bay Fisheries Laboratory to measure total petroleum hydrocarbons.

Biological Sampling

Mussel sampling

1. Mussels (*Mytilus trossulus*) should be present at most of the targeted beaches, albeit in low densities. It is probable that individuals will need to be collected from a number of locations on the beach segment to obtain the volume needed. Mussels should be collected from throughout the areas designated for cleaning, and the areas directly down slope from them.
2. At least 20 individuals should be collected to be composited into a single sample. At least one beach segment, should have replicate samples collected to determine variability.
3. Record the locations of the sampling sites. These can include descriptions in field notes which include distance and bearing from identified landmarks, or marking the location on a site map or on aerial photographs.

4. All samples will be stored in coolers containing blue ice to maintain a cooler temperature of between 2 and 6°C and frozen within 12 hours. Sample containers will be wrapped in bubble wrap, if needed, to prevent breakage during shipping. Chain-of-custody forms will document the samples collected and will be signed by the sampler. The forms will contain information on the actual sample location duplicated and will be retained in project files. The cooler will be taped shut and custody seals applied before shipping to the analytical laboratory.
5. The samples will be brought to the NMFS Auke Bay Fisheries Laboratory to measure TPH by GC/MS.

Chiton Sampling

1. Chitons (*Katharina tunicata*) are listed as a subsistence resource on almost every beach segment targeted for treatment, indicating that they would be available for sampling at most beaches. It is probable, that individual Chitons will probably be found well below the areas designated for cleaning, and should be collected from throughout the areas directly down slope from areas to be cleaned.
2. Collect approximately 3 to 5 individuals and composite into a single sample, enough to supply at least 10 grams of tissue. At least one beach segment should have replicate samples collected.
3. Record the locations of the sampling sites. These can include descriptions in field notes which include distance and bearing from identified landmarks, or marking the location on a site map or on aerial photographs.
4. All samples will be stored in coolers containing blue ice to maintain a cooler temperature of between 2 and 6°C. Sample containers will be wrapped in bubble wrap, if needed, to prevent breakage during shipping. Chain-of-custody forms will document the samples collected and will be signed by the sampler. The forms will contain information on the actual sample location duplicated and will be retained in project files. The cooler will be taped shut and custody seals applied before shipping to the analytical laboratory.
5. The samples will be brought to the NMFS Auke Bay Fisheries, to measure TPH by GC/MS.

Caged Mussel Program

1. To address concerns about the release of residual oil and PES-51® into the water columns, it is recommended that a caged mussel program be implemented at one of the targeted beach segments. This work should be performed by an experienced contractor.
2. Approximately 500 mussels will be collected from a clean source in Prince William Sound, and caged in 5 groups of at least 100 mussels. The cages will be anchored with weights and floats that keep them approximately one meter below the water surface at all times.
3. Three groups will be anchored in water down slope from designated cleaning areas, and two will be anchored outside the direct influence of the cleaning process, one beyond each end of the area to be cleaned.
4. The cages of mussels will be deployed several weeks before the scheduled cleaning. Samples of 20 mussels from each cage will be collected four times, just before cleaning, during the cleaning process, shortly after the cleaning process and at the end of the summer.
5. All tissue samples will be stored in coolers containing blue ice to maintain a cooler temperature of between 2 and 6°C. Sample containers will be wrapped in bubble wrap to prevent breakage during shipping. Chain-of-custody forms will document the samples collected and will be signed by the sampler. The forms will contain three carbon copies such that the top two forms will be included with the sample shipment and the third copy will be retained by the sample team. The forms shipped with the samples will be enclosed within a large resealable bag that is taped to the inside lid of the cooler. The file copy will contain information on the actual sample location duplicated and will be retained in project files. The cooler will be taped shut and custody seals applied before shipping to the analytical laboratory.
6. The samples will be sent to an analytical laboratory, accepted by the Trustees, to measure TPH by GC/MS.

Monitoring Program

Table 6-1 summarizes the proposed monitoring program, indicating the measurements to be documented during performance of Phase II of the restoration project. The monitoring program will be completed in separate events, namely:

- Pre-treatment monitoring
- Monitoring during treatment
- 1 month post-treatment monitoring
- 1 year post-treatment monitoring

Table 6-1
Overview of Monitoring Program for Each Beach Segment

Objective and Measurement Approach	Pre-Treatment	During Treatment	1 Month Post-Treatment	1 Year Post-Treatment	As Observed
Objective I. Visual Reduction in Oil					
Record and photograph oil conditions at sampling locations	X	X	X	X	
Objective II. Oil Removal					
Measure petroleum hydrocarbons in sediment	X		X	X	
Collected oil - boomed area (daily)		X			
Collected oil - beach surface (daily)		X			
Objective III. Impacts					
Water column monitoring using caged mussels	X	X	2-10 days post	2-3 months post	
Biological survey	X		X	X	
Wildlife impact					X
Additional Information					
Daily area treated		X			
Daily PES-51® used		X			

Pre-Treatment Monitoring

- The project Oversight Committee will identify the areas to be treated, marking the boundaries with flagging.
- The treatment area data form will be completed (see example).
- The shoreline oiling form will be completed (see example).
- Photographs and videos will be taken of the general beach area at low tide to document baseline conditions. In addition, photographs and videos, detailing the conditions of the pre-treated areas will be taken. The purpose is to be able to pair up pre-treatment photodocumention with post-treatment photodocumentation to determine whether Objective I has been met. A photography form will be completed for each photograph taken. The locations of the treatment areas will be documented so that the pre-treatment locations can be reestablished for the post-treatment documentation.
- Each area will be investigated for presence of eagle nests because of the potential for eagle nests to be located at or near treatment areas. If a eagle nest is discovered within 660 feet of the treatment area, a determination by USFWS needs to be made as to whether or not the nest is active. If the nest is active, USFWS will need to determine when activity can take place within the eagle nest buffer.
- Sediment sampling as described in the methods section will be implemented.
- Biological sampling for mussels, chitons and the caged mussel program will implemented.

Monitoring During the Treatment

- The treatment process will be documented daily by photographs and videotape.
- The amount of PES-51® used, the amount of oil recovered in the containment area, and the size of the area treated will also be recorded on a daily basis. All monitoring information during treatment will be obtained and recorded by the onsite representative.
- A wildlife impact form will be completed by the onsite representative observing any impacts to birds, terrestrial or marine mammals or any other wildlife.

Post-Treatment Monitoring

- Immediately after completion of the shoreline oil-reduction program at a beach segment, the project Oversight Committee will visually inspect each treatment area to determine whether Objective I has been met.
- The treatment area data form will be completed (attached).
- The shoreline oiling form will be completed (attached).
- Photographs and videos will be taken of the general beach area at low tide to document post treatment conditions. In addition, photographs and videos, detailing the conditions of the pre-treated areas will be taken. A photography form will be completed for each picture.
- Sediment sampling as described in the methods section will be conducted approximately one month and one year following treatment using methods described above. Post-treatment sediment samples will be taken from the same sites as the pre-treatment sediment samples so that paired samples can be compared to determine levels of petroleum hydrocarbon reduction.
- Biological sampling for mussels, and chitons will be conducted approximately one month post-treatment and one year post-treatment using methods described above.

Analysis and Reporting

Analysis

The data assessment will address the following analyses:

Visual analysis of oil conditions. The principal assessment issue is the visual change in oily conditions in the beach segment from before to after treatment. The data documented in the oiling summary form before and after treatment and the photodocumentation of pre-and post-treatment will be compared to assess the type and magnitude of reduction in each treated segment. The assessment protocol follows the approach described in Gibeaut, et al. (1995).

Chemical analysis of oily sediment. The principal assessment issue is the change in oil concentrations in each beach segment before and after treatment. To address this issue, results for the same beach segment will be compared before and after treatment for TPH using UVF. These comparisons may be done by individual sites, transects, or through an aggregation of the results of a treated beach segment. The distribution of hydrocarbons along the vertical transects will be compared before and after cleaning to determine if oil has simply been moved down slope.

Biological survey. The principal assessment issue is the change, if any, in the petroleum hydrocarbon content of mussel and chiton tissues during and following treatment by PES-51®. Bioaccumulation analyses of mussels and chitons.

Reporting

Submit three copies of the draft project report to the Chief Scientist and one copy of the draft report to the Science Coordinator at the Restoration Office for peer review. (estimated at about 70 pages for the main text and 160 pages of appendices) will be submitted 4 months following the treatment of the final beach segment, approximately January 31, 1998. The preliminary outline of the draft report is based on the format required by *Exxon Valdez* Oil Spill Office and includes the following sections:

- *Abstract*: a one-page summary of the study history, abstract, key words, project data and recommended citation.
- *Executive summary*: a concise statement of the purpose, scope, methods, results, and conclusions of the report.
- *Introduction*: a description of the nature, scope and area of activities. It also will review the applicable reference literature, the methods, and the principal results.
- *Objectives*: a statement of the objectives of the activity.
- *Methods*: a description of the methods and activities.
- *Results*: a description of the results of the monitoring and other observations of the beach treatments.
- *Discussion and Conclusions*: an interpretation of the results, discussion of their significance, and a statement of the conclusions on the effectiveness of the restoration project.
- *Literature Cited*: the references for the reports.

- *Appendices*: the appendices will include a summary report on the beach treatment process, including methods, observations during treatment, total treatment time required per beach segment, and any activities that affected the project scope and schedule if applicable. Field notes and monitoring forms completed by the onsite representative and contract survey crews will also be included as an appendix, as will the laboratory data sheets. Selected photographs will be included to document site conditions of each beach.

All photographs will be maintained and logged in the project notebook.
4 months after the 1 year post-treatment sampling is completed a draft final report will be submitted to the EVOS Chief Scientist for review. After the final report is approved by the Chief Scientist, 32 bound and 4 camera-ready copies of the final report will be submitted to the Oil Spill Public Information Center (OSPIC) and 2 bound copies of the final report will be submitted to the EVOS Chief Scientist.

CHENEGA BEACH RESTORATION PROJECT
WILDLIFE IMPACT FORM
(to be completed if distressed wildlife is observed)

RECORDER NAME ________________________________

DATE________________

TREATED SEGMENT ____________ SUBSEGMENT ______________________

OBSERVATIONS ____

____

____

____

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CHENEGA BEACH RESTORATION PROJECT
SHORELINE OILING SUMMARY
(To be completed for each sampling location)

CHENEGA BEACH RESTORATION PROJECT
PHOTOGRAPH SUMMARY FORM
(To be completed for each photograph)

PHOTOGRAPHER ______________________________ DATE & TIME ________________

SEGMENT _______________ SUBSEGMENT ______________________________________

ROLL NUMBER _________ FRAME NUMBER ___________

PHOTO LOCATION ____

____

____

OBSERVATIONS ____

____

____

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CHENEGA BEACH RESTORATION PROJECT
SAMPLE LOCATION DATA FORM
(To be completed for each preliminary sample location)

SAMPLING TEAM ______________________________ DATE & TIME______________

PERSON COMPLETING THIS FORM ____

SEGMENT ______________ SUBSEGMENT ___________________________________

BLOCK NUMBER ___________ TIDAL HEIGHT ____________________

DISTANCE FROM SAMPLE AREA TO WATER AT LOW TIDE (m)________________

SURFACE CONDITIONS (rocks, sand, boulders, type, and coverage area; depth of rock removed)

____

____

____

OILY SMELL? ___ NO ____ YES

WAS SAMPLE COLLECTED AT LOCATION? ____ NO (end of form) ___YES (continue)

SEDIMENT CONDITIONS (rocks, sand, boulders, type, and coverage area; depth to bedrock, if reached in under 10 cm)

____

____

____

OILY SMELL? ___ NO ____ YES

APPROXIMATE SAMPLE VOLUME ________ ml

CHENEGA BEACH RESTORATION PROJECT
COLLECTED OILY WATER SUMMARY
(To be completed daily)

RECORDER NAME ______________________________

DATE ______________

TREATED SEGMENT __________ SUBSEGMENT ____________________

QUANTITY OF PES-51® USED ____________ gallons

QUANTITY OF OILY WATER REMOVED COLLECTED W/ SKIMMER ________ gallons

QUANTITY OF ABSORBENT PADS WITH COLLECTED OIL ______ pads

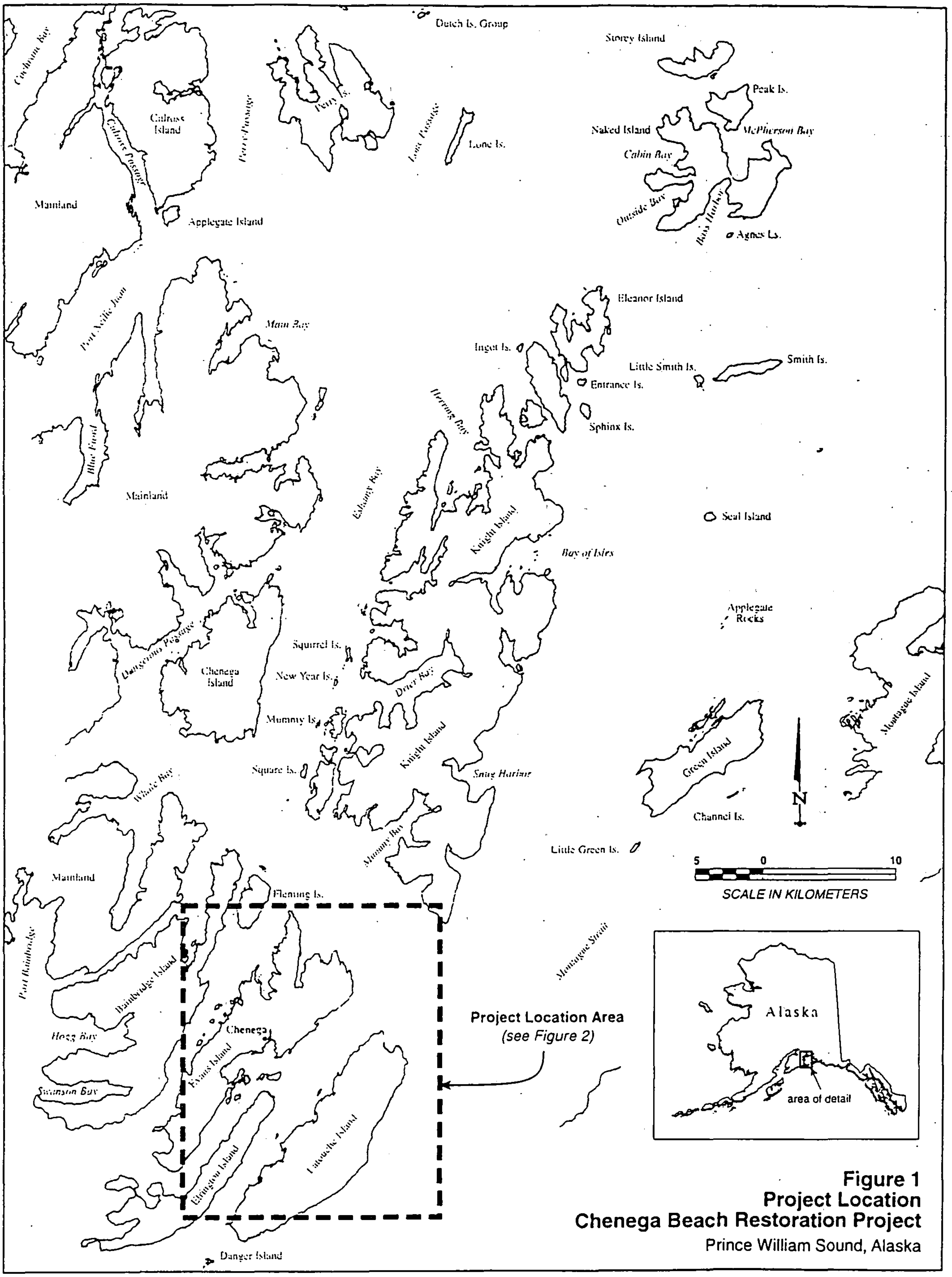

Figure 1
Project Location
Chenega Beach Restoration Project
Prince William Sound, Alaska

Source: *Oil95*, Alaska Department of Environmental Conservation, November, 1995.

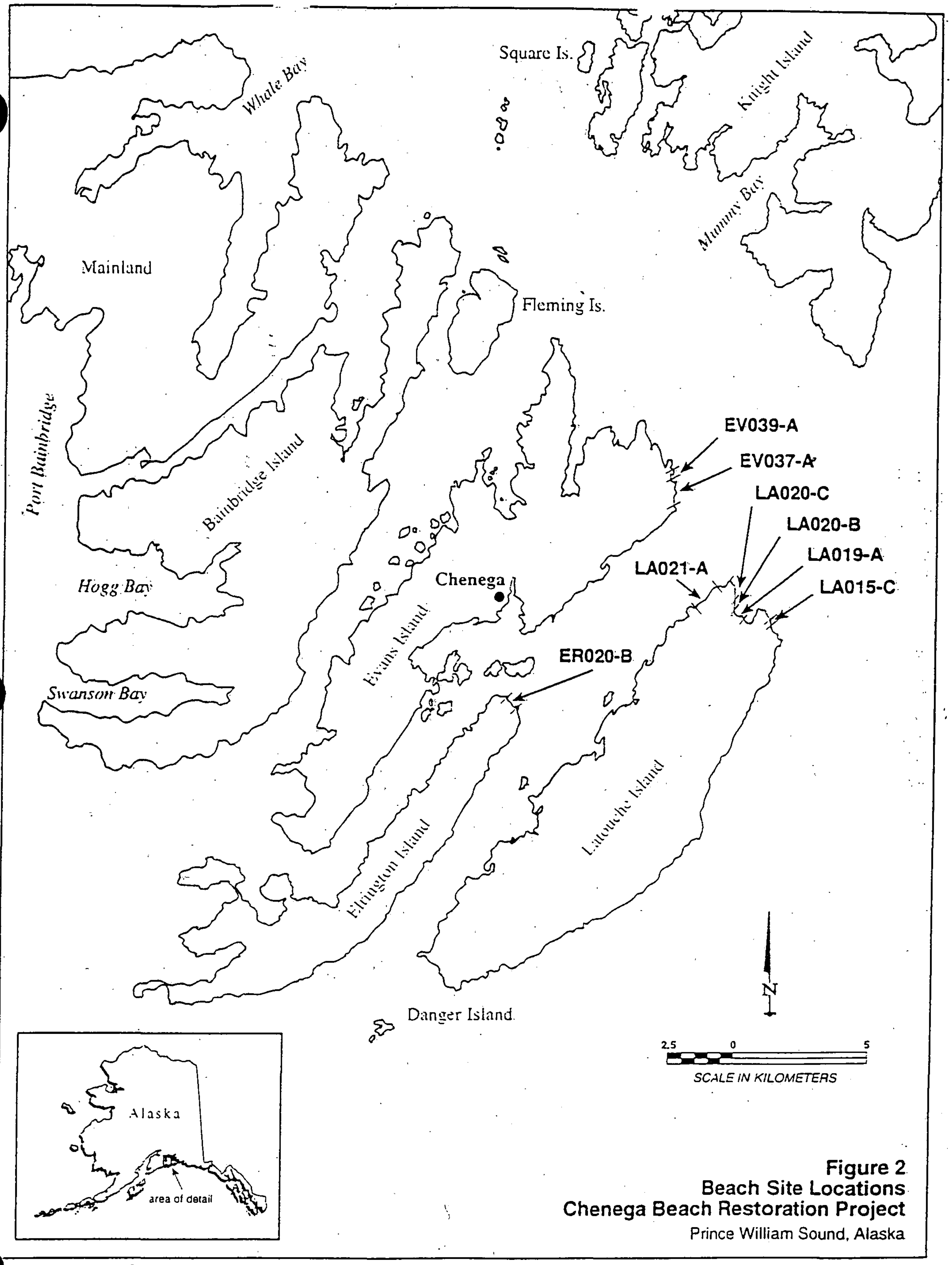

Figure 2
Beach Site Locations
Chenega Beach Restoration Project
Prince William Sound, Alaska

ource: *Oil95*, Alaska Department of Environmental Conservation, November, 1995.

APPENDIX C CHARACTERISTICS OF THE PROPOSED RESTORATION BEACHES

Location	Site	Environmental Sensitivity	Community Concerns	Substrate Type	Residual Oil	Square Meters	Comments
Elrington Island	ER020-B	Mussel Bed	Popular picnic area; large sea lion population; whale foraging; land otter dens; chiton harvesting; duck, deer and seal hunting; prespill seal pupping area.	Cobble and boulders over gravel sediment	Surface and subsurface oil residue, sheen in water pools and asphalt pavement in western and eastern pockets.	1,500; 4 work days	Subsurface oil appears to be decreasing with time. Site is within eye site of Chenega Bay. There are two locations at this site with heavy SOR amongst bedrock outcropings.
Evans Island	EV037-A	None	Duck and seal hunting.	Large boulders over gravel sediment	Asphalt pavement, as well as surface and subsurface oil residue, sheen in water pools	1,100; 3 work days	Majority of oil is AP and SOR between and under boulders at the high and supra intertidal zones
	EV039-A	None	Duck and seal hunting; land otter dens; octopus harvesting.	Cobble and boulder armor over gravel sediment, beach divided by stream	Asphalt pavement, tar patties, as well as surface and subsurface oil residue	2,000; 4 work days	A large area of soft and friable AP is present on the south part of the site. The AP is as much as 25 cm thick. Two other smaller and less concentrated areas of AP and SOR are also present in boulder and bedrock settings.
Latouche Island	LA015-C	Anadromous stream	Duck, seal, and bear hunting; chiton harvesting	Boulders over gravel sediment, stream near eastern border	Mousse on the underside of boulders, sporadic pockets of surface oil residue, tar patties and sheen in water pools	1,500; 3 work days	One area has significant oil remaining. High concentrations of AP and SOR occur interstitially between large immobile boulders and bedrock. No significant subsurface oil remains at this site.
	LA019-A	None	Duck, seal, and bear hunting; chiton harvesting, subsistence bottom fishing, popular wood collecting area; berry picking.	Boulder armor over gravel sediment	Asphalt pavement, mousse and surface oil residue among the boulders	3,700; 6 work days	The eastern 1/4 of the subdivision, is bordered by a prominent outcrop and large boulders. This natural border separated the site for the PES test. It has a concentrated area of AP/MS amongst boulders and cobbles. Subsurface oil coincides with surface oil.
	LA020-B	None	Duck, seal, and bear hunting; chiton harvesting, subsistence bottom fishing, popular wood collecting area; berry picking.	Cobble and boulder armor over gravel sediment, stream near northern border	Patchy areas of asphalt pavement, as well as surface and subsurface oil residue	1,000; 3 work days	Large Boulders with AP and SOR stuck in between.
	LA020-C	None	Duck, seal, and bear hunting; chiton harvesting, subsistence bottom fishing, popular wood collecting area; berry picking.	Boulder armor over vertically aligned shale bedrock and gravel sediment	Patchy areas of asphalt pavement, as well as surface and subsurface oil residue, sheen in water pools	14,000; 16 work days	Four large areas of significant oiling occur at this site. The oiling is primarily AP and SOR occurring in vertical shale and amongst boulders and cobbles. Subsurface oil is often an extension of surface oil.
	LA021-A	None	Fresh water; wood gathering; berry picking; chiton harvesting	Boulder cobble beach overlying shallow bedrock	Discontinuous light oil residue in subsurface soils	1,500; 3 work days	Oiling occurs as sporadic AP, SOR, CT, St. Subsurface oil is coincident with surface oil. Unable to locate oil in 1994. treatment should occur at a tide level of 3.0" lower.

Source: Works[illegible]eport - *Residual Shoreline Oiling Restoration Project 95266; Final Re*[illegible]Prepared by ADEC. November 15, 1995.

Appendix D
Workshop Participants

Chenega Residents

Paul Kompkoff, Jr.
Patti Totemoff, Chenega Corporation
Chuck Totemoff, CEO, Chenega Corporation
Charles (Peter) Selanoff
John Totemoff
Phillip Totemoff
Mike Eleshansky
Don Kompkoff, Sr., President, Chenega Village Council
Carol Ann Wilson, Board Member of Chenega Corporation and of Chenega Village Council
Gail Evanoff, Board Member of Chenega Corporation
Larry Evanoff, Village Council Administrator
Jewel Boyles
Peter (last name unknown)
Darrell Totemoff
Pete Kompkoff, Jr.

Expert Reviewers

Dr. Ed Owens, OCC Limited.
Dr. Jaqui Michel, Research Planning, Inc.
Dr. Jim Gibeaut, Bureau of Economic Geology, University of Texas, Austin
Kathy Frost, ADF&G
Dr. Bob Spies, Trustee Council Chief Scientist
Bruce Wright, NOAA
Stan Senner, Trustee Council Science Coordinator
Ernie Piper, Special Assistant to the Commissioner, ADEC
[Dr. Alan Mearns was invited, but family illness kept him from participating. He did send materials for presentation, and Dr. Jaqui Michel presented the results of his work.]

Trustee Council Staff

Bob Loeffler, Planning Director, Trustee Council
Sandra Schubert, Project Coordinator, Trustee Council
Dr. Joe Sullivan, ADF&G
Ray Thompson, USFS
Bud Rice, National Park Service
Eric Myers, Director of Operations, Trustee Council
Molly McCammon, Executive Director, Trustee Council
Dean Hughes, ADF&G
Cherri Womac, Trustee Council Staff
Catherine Berg, Department of Interior
Martha Vlasoff, Chugach Heritage Foundation, Public-at-Large, Public Advisory Group

Other Participants

Pam Brodie, Environmental Representative, Public Advisory Group
Chris Beck, Public-at-Large, Public Advisory Group
Rita Miraglia, ADF&G (Principal Investigator, Subsistence Planning & Coor. Projects)
Malin M. Babcock, NOAA (Also Principal Investigator for the Mussel Projects)
Brad Hahn, ADEC, State On-scene Coordinator
John Bauer, ADEC
Gail Irvine, NBS, (Principal Investigator, Shoreline Monitoring Projects)
Tex Edwards, PWS RCAC
Karl Pulliam, Seldovia Response Team
John Whitney, NOAA Scientific Coordinator
Dianne Munson, ADEC
Ann McCord, Executive Director, Cook Inlet RCAC
Name Unknown, Cook Inlet RCAC
Dr. Bill Alter, Petroleum Environmental Services
Steve Rogg, Petroleum Environmental Services
David Bruce, ADEC
Dick McKean, ADEC
Harry Young, ADEC
Leslie Pearson, ADEC
Marie Becker, CIRCAC-State Chamber
Joel Cusick, NPS
Judith Miller, Gallagher Marine Systems
Dan Mann, UAF
Carol Fries, ADNR
(Two other people attended but did not sign in.)

Appendix E
USFWS Guidlines on Bald Eagles & Threatened and Endangered Species

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. Tudor Rd.
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:
ESO

FEB 25 1997

Ms. Dianne Munson
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, Alaska 99501

Dear Ms. Munson:

This is in response to your request for operational guidance to avoid disturbing nesting eagles in the vicinity of the Chenega Area Residual Oiling Reduction Project near the village of Chenega Bay in southwest Prince William Sound. It is our understanding that eight beaches are scheduled for oil removal restoration in the spring and summer of 1997. Restoration work will include the use of a biosurfactant, PES-51, which will be injected into the subsurface soils using an airknife injection process. During the treatment process, ambient seawater will be flushed over the treatment area to move the displaced oil to the shoreline and nearshore waters where it will be collected with sorbents and skimmers. The treatment area will be surrounded with containment boom and sorbent boom during the process. Collected oily liquid and solid waste will be disposed in a manner that meets the appropriate disposal regulations.

In consultation with the Fish and Wildlife Service's, Ecological Services - Anchorage Field Office (Gary Wheeler, pers. com., 2/24/97), it was determined that based on previous Service surveys for Bald Eagle nests, there are nests located on and in the near vicinity of the targeted restoration sites on Latouche Island and Evans Island, and there is the potential for nests at the Elrington Island location.

Bald eagles in Alaska are protected under the Eagle Protection Act. Under the Act individuals are prohibited from taking bald eagles, their nests and eggs. Taking is defined in the Act as to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" (16 U.S.C. 688a). While the Service can recommend ways to avoid the take of eagles as defined by the Act, considerable discretion is left to the landowner or party responsible for the action as to what measures should be taken to ensure that the eagles are not disturbed. I am enclosing a copy of our booklet titled "Bald Eagle Basics - Alaska" which provides the Service's recommendations for avoiding disturbance to nesting bald eagles. Those recommendations most pertinent to your operation would include the following:

-- Avoid operation of all-terrain vehicles and concentrations of noisy vessels within 330 feet of an eagle nest during the nesting season.
-- Avoid operation of heavy construction equipment within 330 feet of an eagle nest during the nesting season.

-- Avoid obtrusive human activities within 330 feet of an eagle nest during the nesting season.
-- Avoid land-use activities that produce intermittent loud noise during construction within 660 feet of an eagle nest.
-- Aircraft corridors should be located no closer than 1000 feet from an active eagle nest during the nesting season.
-- Toxic chemicals should not be broadcast or widely applied in areas used by bald eagles.

All eagle nests should be considered active from March 1 through June 1. If by June 1 adults are not tending the nest, it may be considered inactive for the remainder of the breeding season, and activities may proceed near the nest. Activities near active nest sites should be limited to the nonbreeding season. The nonbreeding season begins when the young birds fledge from the nest (are capable of sustained flight). This date varies depending upon how early the eggs hatch and can range from mid-July to mid-September.

With regard to your additional request for a Threatened and Endangered Species, Section 7 Consultation, after consultation with the Ecological Services - Anchorage Field Office (Janey Fadely, pers. com., 2/24/97), it has been determined that there are no threatened or endangered species located in the project area.

Thank you for coordinating with us on these issues. If you have any further questions or concerns, please contact Catherine Berg at 786-3598. If you need additional copies of the booklet we would be happy to provide them.

Sincerely,

Jon R. Nickles

Jon R. Nickles
Chief, Ecological Services Office

Enclosure

cc: ES-Anchorage

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Office of Ocean Resource Conservation and Assessment
Hazardous Materials Response and Assessment Division
Scientific Support and Coordination Branch
7600 Sand Point Way N.E. - Bin C15700
Seattle, Washington 98115

Molly McCammon
Executive Director
Exxon Valdez Oil Spill Trustee Council
645 G Street
Anchorage, AK 99501

April 7, 1997

Dear Ms. McCammon,

Thank you for the opportunity to comment on the Environmental Assessment for Chenega-area Shoreline Residual Oiling Reduction (Project 96291). My comments are attached. Please feel free to contact me if you have questions or wish any further clarification. I can be reached at 206-526-6276.

Sincerely yours,

Rebecca Z. Hoff

Rebecca Z. Hoff

cc Claudia Slater, ADF&G
John Whitney, NOAA Hazmat

Environmental Assessment for Chenega-area Shoreline Residual Oiling Reduction

Exxon Valdez Oil Spill Trustee Council Project # 96291, March 21,1997

Comments by Rebecca Hoff, NOAA Hazmat

April 7, 1997

General Comments

Our main concerns in the Environmental Assessment (EA) center around issues of potential toxicity to marine organisms from the proposed application, and inadequacies in the monitoring program.

Though a well- thought out procedure was used to define the problem of residual oiling and choose the sites to be cleaned, NOAA still has concerns about the process used to select the particular product and technique proposed. Numerous shoreline cleaning agents exist of varying levels of toxicity and effectiveness, and any remedial application should make a thorough review of the available options before choosing one product or cleaning technique. Good reviews of shoreline cleaners include Walker et al. (1993), and Fingas et al. (1995).

Toxicity Issues

Despite at least two field trials involving PES-51, there are still no toxicity data from field applications using this product. Toxicity was not explicitly measured in the 1993 Sleepy Bay trial and there were no measurements of environmental effects of PES-51 during the Berman Barge spill in Puerto Rico.

It is stated numerous times in the EA that PES-51 concentrations are not expected to exceed 200 ppb during the proposed application. The report gives little indication of the origin of this figure, and in fact, if PES-51 is applied at full strength via air knife, intertidal and infaunal organisms will be exposed to concentrations ranging from full strength to partially diluted. Offshore subtidal concentrations are likely to be much lower than those in the intertidal zone, but are still unknown.

The EA relies on this assumption that PES-51 concentrations will not exceed 200 ppb, then extrapolates published data from laboratory toxicity studies to show that effects to marine organisms will be nonexistent or minimal. Use of these toxicity values are problematic for several reasons:

- older protocols for toxicity testing have been show to be inadequate for products of very low solubility (i.e. static conditions, reliance on nominal concentrations, unknown mechanism for toxicity). Newer protocols addressing these issues exist, but few products have been tested using them.

- thus, for insoluble products (such as PES-51) most laboratory derived toxicity values are difficult to extrapolate to field conditions since actual concentrations could be either much higher or even lower than those derived in the laboratory.

The environmental fate of PES-51 is unknown. The EA states numerous times that the product is insoluble, but that rocks in the intertidal will be coated with PES-51 which will prevent them from being re-oiled. This implies that PES-51 will concentrate at surfaces, such as the water surface, and sediment surface, and may thus contact attached intertidal organisms or other aquatic organisms living in these habitats. The environmental fate of the product, and thus the mechanisms for potential toxicity to marine organisms remain unknown.

Realistic assumptions

Though great care is planned in ensuring that all oil and PES-51 released will be collected, the EA should address outcomes that are less optimistic. It is desirable, but unlikely that 100% of all released oil and product will be collected. Notes from the NOAA observer at the 1993 test stated that there were problems collecting all the oil released (Hoff 1994). Environmental impacts from such scenarios should be considered and addressed.

The application rate of PES-51 may not be easily controlled in the field and this will affect its environmental concentrations. Tumeo et al. (1994) stated that "the amount of injection ... was operator-dependent" in describing the 1993 Sleepy Bay test. How were variable application rates and the possibility of repeated applications factored into the assumptions made in the EA about eventual PES-51 concentrations ?

Some of the released oil will disperse, even if in small quantities, since there is always a dispersed fraction under floating oil. Therefore, some increase in exposure to dispersed oil is likely to occur in organisms living in nearshore areas.

Sensitive Habitats

What measures will protect the following sensitive habitats at proposed cleaning sites: nearshore eelgrass bed in Sleepy Bay, mussel bed at ER020-B, and oiled lower intertidal zone at Latouche Island?

Effectiveness

This proposal relies heavily on the results from 1993 test in Sleepy Bay, which cite average effectiveness rates of 70% (Tumeo et al. 1994). This estimate should be interpreted cautiously, as it was derived from small sample sizes of highly variable data (TPH values in sediment). The sample design and statistical analysis used to produce this figure are unclear. It may or may not be possible to achieve rates of

70% removal in the current proposal.

Monitoring

Proposed monitoring of the application is inadequate in several areas. Since the results from this application will be reviewed widely both inside and outside Alaska, it is imperative that appropriate monitoring is done, with properly designed sampling and statistically defensible analyses. (See Mearns 1995, attached).

Toxicity Monitoring

The proposal contains no provision for monitoring toxicity to marine organisms, so current questions about toxicity from the proposed treatment will remain unanswered. As stated earlier, there are real concerns about the unknown environmental effects of PES-51 in marine systems. A component that measures both acute and chronic toxicity to intertidal and possibly subtidal organisms needs to be developed and incorporated into the proposal. This could include both simple laboratory tests and field studies. The proposed use of caged bivalves could be expanded to measure subtidal toxicity.

Monitoring - Objectives I and II

All the measures suggested to determine effectiveness will result in qualitative data-including the chemistry samples. How will "significant reduction" be determined, in the absence of statistical sampling methods? The experimental design proposed for sediment sampling will not allow quantitative determinations about the effectiveness of this application to be made, and will limit the usefulness of extrapolating these results to other areas.

Monitoring- Objective III

This objective proposes to sample mussels and chitons for bioaccumulation of petroleum hydrocarbons, and presumably to determine if a reduction in tissue contamination occurs over time. These samples need to include a control sample from an untreated area of the same beach for comparison purposes.

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VIEWPOINT

Elements to be Considered in Assessing the Effectiveness and Effects of Shoreline Countermeasures

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During an oil spill response the On-Scene Co-ordinators (OSCs) are faced with a bewildering array of physical, chemical, and biological methods for cleaning oiled shores. Proposals offer great promise that new products will safely remove the oil fast and at low cost. Yet upon closer inspection it is not so clear that a new product is safe, has been properly tested, or is even remotely applicable to the task at hand. Contributing to the confusion is a lack of standardized testing of the effectiveness and effects of various products and technologies.

Laboratory screening protocols have been developed for some types of products, such as bioremediation agents (e.g. Blenkinsopp *et al.*, 1995). However, for most cleanup methods there are few criteria for evaluating test results and no requirements that the screening protocols be adhered to at all. Even when these protocols are used to eliminate the most potentially hazardous or ineffective products, they cannot be used to predict what will happen when an 'acceptable' method is used on real shorelines.

Shoreline ecosystems are subject to changing conditions of oil state, geomorphology, temperature, tides, currents, wind, rain, waves, plankton blooms, and concentrations of marine plant and animal life. Shoreline biological processes—predation, grazing, metabolism, sediment-mixing, etc.—occur at all scales and are very dynamic (Sieburth, 1968; Thorson, 1971). These processes, carried on by surviving marine life, may inhibit or enhance the effectiveness of a treatment technology (Smith, 1968; Foster *et al.*, 1990; Mearns, 1993). Well designed and conducted laboratory studies provide only a vague idea how products might perform in the field. Actual effectiveness and effects of a technique can only be determined under real-world applications on real shorelines.

Thus, both producers and users of treatment data and information need 'comparable' results from field tests. There have been many pleas for conducting shoreline treatment testing, either at spills of opportunity or on intentionally oiled shores (Baker *et al.*, 1993). However, there are no standardized procedures describing how this field testing and evaluation should be conducted, reported, and reviewed. Though neither exhaustive nor perfect, this paper provides some of the needed guidance.

Considerations for Field Testing of Shoreline Treatment Methods

The point of field testing is to validate, in real environments, the findings, predictions, and claims from laboratory testing. The two primary measures of outcome in field testing of shoreline treatment methods are (1) effectiveness and (2) effects. Effectiveness, is the amount of oil removed, recovered, and/or degraded as a result of the treatment. 'Effects' is defined as the injury or impact on seashore life. For marine organisms, effects include death or other injuries as well as changes in their abundance, health, or level of contamination. Effects can be due to the application process and logistics as well as the product itself. A good treatment technology will be highly effective at removing oil with a minimum of additional environmental effect.

The imperatives of time and operational constraints of spill response do not preclude using a sound scientific approach to evaluate response alternatives. Experimental design can accommodate these constraints while still providing valid information at a level of detail appropriate for an OSC's operational decision-making.

What are the elements of a good field experiment for evaluating the effectiveness and effects of a treatment agent or technology?

Elements of a good test are:

- Clear objectives
- Meaningful exposure
- Meaningful endpoints
- An experimental design that includes:
  - Controls
  - Replication
  - Allocation of samples (stratification and equalization)
  - Randomization
  - Timing (frequency and duration)
- Quality assurance/quality control

The following sections define and delineate each of these elements. Also, see Mearns (1995) for additional details.

Clear objectives

It is critical to carefully define the question to be answered from the results of the experimental field test. The questions must be related to the kind and nature of data and information that the user/decision makers require. Are we comparing products or treatment alternatives? Are we determining benefits and effects of different doses or levels of energy and temperature of a given treatment technology? Are we comparing effectiveness among specific types of oil or a range of oils? Is weathering or emulsification a variable for determining both effectiveness and effects? Degree of difference and degree of certainty are important. In comparing response or treatment alternatives, what level of difference in effectiveness is being sought (two-fold, five-fold?) or what amount of variation (i.e certainty: 10, 50, 100%?) is acceptable?

Meaningful exposure

Is the technology or product to be applied to water or surfaces such as rocks, sand, sediment, or vegetation, and what is the possibility or hazard of extrapolating among these? How will 'dose' be determined, documented? If the treatment technology is a chemical or bioremediation agent, what is the real concentration of both product and the oil under test conditions, and how will they be measured? If it is a physical treatment, such as washing, what is the important measure? Mean compressor or tank pressure? Impact or force on the shoreline (Denny, 1988)? Volume or flow rate? And, for operational use, do we need to know what the relation is between compressor pressure and temperature and the forces and temperatures exerted on the shoreline?

Meaningful endpoints

What measures of effectiveness and effects are most appropriate and logistically feasible to monitor for the expected outcome or decision-making requirements? Endpoints must directly answer the questions posed. Should effectiveness be measured in terms of oil recovered or oil remaining—or both? By what kind of observation or measurement? How do you measure oil recovery during shoreline operations? Or, should the measure used be residual oil on shorelines regardless of recovered amounts? Are chemical ratios more appropriate for documenting degradation than total hydrocarbon measurements (Bragg *et al.*, 1994)?

Effects measures must be based on the abundance or variety of shoreline marine life remaining. Should less conspicuous organisms be monitored? Will an easily observed (and less expensive) biological index suffice in lieu of a more complicated measurement? Is toxicity or toxicity reduction an appropriate biological effects endpoint? Perhaps the biologists' tools of observation should be used to document how marine life is interacting with oil and treatment.

In some instances, qualitative data (observation of a color change or a simple list of species present at the site, etc.) may suffice, but if extrapolations are to be made, some kind of quantification is needed (frequency of a color change, numbers of species per unit area, etc.)

Experimental design

At a minimum, basic technology testing should involve replicate observations or sampling at both treated and untreated (control) areas before and after treatment (or any other specified or anticipated action).

A *control* is an untreated reference condition or location. It must be similar to the treated area in all ways except for the treatment. Several kinds of controls must be considered. Effectiveness, in terms of percent improvement or removal, can only be convincingly demonstrated by comparison with an untreated or unaffected control. Because nature plays many tricks (such as short- and long-term changes in temperature, precipitation, radiation, wave climate, etc.), it may not be sufficient, and may even be misleading, to use a site (before treatment) as its own control (after treatment). For treatment technologies that involve several components (i.e. application of a chemical followed by pressure washing) those components should be tested separately to determine which part of the process is most effective. Finally, untreated control of reference sites should meet all the physical and biological characteristics as the treated sites.

Replication is critical to consider. One observation can be misleading as it may represent a unique situation. Differences among treatment areas or actions can only be demonstrated by comparisons to differences within. There are published statistical guidelines for determining the amount of replication needed: all deal with the amount of variation expected and the amount of difference one wishes to detect between treated and untreated situations (e.g. Hurlbert, 1984). By definition, two replicates is minimum. The author urges considering a minimum of three. Each change in treatment conditions (new pressures, temperatures or chemical doses) requires replication. If necessary, reduce the size of the treatment areas to increase replication.

Considerable vigilance is needed to avoid a common trap: *pseudo-replication*. Pseudo-replication takes many 'replicate' samples from the same single test system or plot. This provides information about variation within one of several treatment situations, but provides no information about variation among treated plots or systems. Treating pseudo-replicates as replicates is a common violation of testing protocols in many past ecological studies (Hurlbert, 1984) and most of the field bioremediation studies done to date (Venosa, in press). Compositing pseudo-replicates into single samples, or taking only the mean of pseudo-replicates is sometimes a more appropriate method for representing a sampling event. The approach depends on the need: the more we want to extrapolate beyond the test area, the more we need to know to avoid pseudo-replication and increase true replication.

Allocation of sampling must be done carefully. Large areas need to be broken up into relatively homogeneous (stratified) sub-areas. Shoreline types vary: rocky, boulder-cobble, sand beaches, marshes. Conditions vary greatly by intertidal elevation. Further, some shorelines can be covered with surviving marine plants and animals while others are bare. Treatments that work in one area may be ineffective or even counter-productive in another. Thus, observations to document treatment effectiveness must be made among similar geomorphological and biological environments.

Consider taking similar numbers of samples or observations at both treated (or affected) and untreated (unaffected) areas, or in the same area before and after treatment. Consider the consequences of matching one untreated control with five treatment replicates compared to making them three each.

Randomization is the final act of objectivity and is necessary for statistical interpretation. Once replicate conditions are identified, treated and untreated control areas should be assigned randomly so that no particular bias is invoked. Such bias can come from geographic or temporal gradients such as from trends in along-shore salinity (which can alter chemical effectiveness) or gradients in marsh cover density (which can alter nutrient dynamics during bioremediation).

Obviously, the *duration* of a test and the *frequency* of sampling needs to be considered. How long is a 'soak' time for a chemical cleaner and how do effectiveness and effects vary with that? What is the relation between washing duration and effectiveness? Bioremediation is a slow process, so ample time (days, weeks) should be given to an extended monitoring program. And, even long after a short-term treatment it may be necessary to return to test sites to determine if, in the long run, treatment enhanced or delayed recovery of marine life (i.e. Houghton *et al.*, 1991; Mearns, 1993).

Statistical approach. When conducting sampling, there is no such thing as no statistical approach. The decision to take a single sample or observation is in fact a decision not to replicate. Consult a statistician ahead of time, not after the sampling.

A variety of statistical designs are available from the literature. Perhaps the most useful for shoreline testing is the randomized-block design, most recently used in a bioremediation study in Delaware (Venosa, in press). Each of several blocks contain one plot or test area for each treatment type and control. Treatments and controls are replicated in each additional block but within each block, treatments and controls are randomly assigned and not placed in the same order. Results are then compared using basic statistical procedures such as analysis of variance (Hurlbert, 1984).

Quality assurance

There are many reasons to be concerned about the quality of monitoring methods and procedures. Observers and equipment vary in their ability to measure; two labs will not necessarily produce the same numbers. Observers, samplers, and monitoring equipment should be periodically calibrated for precision and against accepted reference standards for accuracy.

Case Examples

To what extent have past studies adhered to these assessment principles and what are the lessons for the future? We can turn to several reviews and experiences.

Baker *et al.* (1993) reviewed results of a wide variety of field tests that have been done around the world to determine the effectiveness and effects of physical, chemical, and biological shoreline countermeasures. Results of past field studies have led to important recommendations about the use and limits of various technologies on various types of stranded oils and in different shoreline habitats. Thus, the preponderance of tests on exposed rocky shores suggests use of chemical cleaners (dispersants) offers no advantage over nature. However, there are also conflicting and unclear results that could be resolved with additional field testing. For example, good experiments are still needed on sheltered rocky shores to compare the effectiveness of flushing with and without chemical cleaners (Baker *et al.*, 1993).

Baker *et al.* (1993) did not critique variations in experimental design as a source of uncertainty, and time and resources do not permit a detailed review here. However, the information compiled by Baker *et al.* (1993), together with information from more recent studies, vendor proposals, and advertisements and other reviews such as Venosa (in press), lead to the identification of some important concerns.

Controls

Appropriate control situations are met in most studies: that is, the effectiveness and effects of a treatment are compared to similar untreated oiled plots or systems. There are exceptions. Many product advertisements received by OSCs show dramatic decreases in oiling at treated areas, but are often devoid of reference to untreated conditions: many simply show graphs documenting how their product decreased the amount of oil at a site with no indication of what was happening to untreated oil. In between these extremes are cases of poorly defined controls. For example, Tumeo *et al.* (1994) reported that use of a particular chemical cleaner was effective in dislodging and releasing oil stranded deep in an Alaska cobble shoreline. The product was used in conjunction with high-pressure air knives. However, there was no 'air knife control' from which one could judge the extent to which the physical purging was effective vs the chemical cleaner. Without separating the two components—the cleaner and the washing (as done by Shigenaka *et al.*, in press)—we do not know if effectiveness was due primarily to the chemical or to the use of air knives.

Replication

Replication has been weak to nonexistent in past studies. Of 31 field studies where Baker *et al.* (1993) noted replication effort, 14 (45%) had no replication, another 45% included two replicates and only 3 (10%) included triplicate plots per treatment. Poor replication can lead both to falsely concluding that a treatment was effective and safe when it might not be or that it is ineffective or unsafe, when it might be. Although many samples were taken in the chemical cleaner study recently reported by Tumeo *et al.* (1994), there was no true replication of treated and untreated shoreline segments. In the rush accompanying a spill response in Galveston Bay, Texas, two treated and two untreated segments of an oiled marsh were established to document the effectiveness and effects of a bioremediation treatment (Mearns *et al.*, 1993). However, inaccurate information about the rate of action of the product, excessive tidal flushing, and low replication precluded a meaningful conclusion about whether the product was effective or not (Mearns *et al.*, 1993). By comparison, in a study comparing biological characteristics of washed, unwashed and unoiled shorelines, Houghton *et al.* (1991) studied a minimum of three replicate sites per treatment category.

Venosa (in press) and EPA (1993) have determined that a minimum of 5 replicate plots per treatment was required to document the effectiveness of bioremediation. In a new study now underway at a spill site in the San Jacinto River, Texas, 6 replicate plots per treatment have been established (J. Bonner, Texas A&M University, personal communication).

Pseudo-replication

In a detailed review of past and recent field bioremediation studies, Venosa (in press) determined that nearly all past studies suffer from pseudo-replication. That is, numerous samples from unreplicated treated and untreated plots were inappropriately considered as replicate samples. This means that while there may have been statistically significant differences in effectiveness or effects between the treated and untreated plots, lack of true replication precludes extrapolating results of the studies to other locations.

Randomization

I did not review the extent to which randomization has been invoked in past studies. The studies of washing effects by Houghton *et al.* (1991) were done at a spill of opportunity during which it was impossible to pick treated and untreated shorelines at random because the untreated 'set asides' were chosen by political negotiation, not by a truly random procedure. On the other hand, the intentional spill bioremediation study in Delaware (DNREC, 1993) and Venosa (in press), and at the ongoing San Jacinto River, Texas, bioremediation experiment, treated and untreated plots were explicitly chosen at random.

Stratification

Few studies used stratification to account for variations in habitat or tidal elevation. For example, of 30 studies where different habitats were accounted for in the Baker *et al.*, 1993 review, 24 (80%) reported only one habitat type or intertidal elevation was studied: only one study (3%) accounted for 4 intertidal elevations. On the other hand, studies of the effectiveness and effects of high-pressure, hot-water washing reported at the *Exxon Valdez* spill site by Houghton *et al.* (1991), compared effects among three intertidal elevations (upper, mid and low) and also among three substrate types (rocky, boulder–cobble, and mixed sand and gravel). Likewise, in the Delaware bioremediation study, plots were divided so that effectiveness could be examined at upper, middle, and low intertidal zones.

Equalization

I also did not review in detail the extent to which equalization has been accommodated in past studies. In the recent studies, there are equal numbers of treated, untreated, and unoiled plots.

These are just a few examples of how past and ongoing studies accommodated some of the guidelines of a true monitoring and assessment framework. In summary, for several of the guidelines examined here, it appears that past and recent studies generally adhere to the requirement for untreated controls, but are often seriously deficient in true replication. The extent to which they adhere to the other guidelines has not been reviewed in sufficient detail. It also appears that monitoring guidelines applied to testing during spill response can be easily compromised.

Recommendations

Continue research at controlled release sites

Based on recommendations in Baker *et al.* (1993), coupled with the author's observations there remains a clear need for well-controlled field studies on:

- the effectiveness and effects of flushing with and without bioremediation and chemical cleaners on sheltered, rocky intertidal and mangrove shorelines;
- effective vs safe temperatures and pressures for washable shorelines;
- effectiveness and effects of flushing and tilling with and without bioremediation on cobble/pebble/gravel shorelines;
- the effectiveness and effects of tilling and bioremediation on marsh, sand, mud, and mangrove environments;
- the effectiveness of rapid solvent deployment on minimizing contamination of marsh sediment.

To maximize the scientific and cost benefits of these studies, they should be conducted in well-controlled intentionally oiled environments (see Lindsted-Siva, 1994).

Review past research

Current and past studies should be reviewed from a statistically based monitoring framework, such as outlined above, to establish the extent to which claims or conclusions of effectiveness and effects of countermeasures can be extrapolated.

Response planning and plans

A set aside policy and plan should be explicitly adopted in region and area contingency plans, with direct input from scientists who may be called upon to conduct studies on the effectiveness and effects of shoreline countermeasures. The set aside plan should include early identification of land ownership and, to the extent possible, land owner pre-approval for treatment technology testing.

Regional and area contingency plans should include shoreline treatment monitoring strategies that can be implemented early on during spill response and carried out during and beyond the course of the response.

During area planning, adopt these or similar monitoring strategy guidelines for site-specific testing of new or proposed countermeasures and also to evaluate proposals.

During response

Early in a response, implement set aside policies and shoreline treatment monitoring strategies and carry out tests during and beyond the course of the response.

During response, monitor the effectiveness and effects of treatment operations at an appropriate scale and frequency. Make the monitoring information available, and analyze and publish the results in conjunction with spill reports or following the spill.

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solely those of the author and do not necessarily reflect policy of NOAA or the U.S. Government.

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MEMORANDUM **State of Alaska**

Department of Natural Resources **Division of Land**
Oil Spill/Contingency Planning

To:	Exxon Valdez Restoration Office	Date:	April 4, 1997
From:	Mike Bennett Natural Resource Manager	Subject:	Chenega PES-51 Restoration Project

The following are ADNR's comments regarding review of the U. S. Forest Service Environmental Assessment for the proposed PES-51 application to eight Chenega area beaches, spanning approximately two miles of Prince William Sound coastline, during the summer and fall of 1997.

Page 3 - Introduction

The last sentence states that the proposed action does not establish a precedent for other actions which may result in significant environmental effects. PES-51 has not been approved for any widespread use since it's introduction - it was not used in the Berman Spill in Puerto Rico because it was more toxic than Corexit, and Environment Canada has not endorsed the authorization for use of PES-51. The wholesale use of the chemical PES-51 on approximately two miles of coastline, for the proposed restoration project, will establish a precedent for the use of the chemical in future oils spills in our area.

Alternative 6, Other Shoreline Cleansing Agents Considered

The document overstates effectiveness of PES-51 and understates its potential adverse environmental effects. Published data from field tests report equivocal results for both effectiveness and toxicity. The EA presents the impression that these studies give PES-51 a "clean bill of health" and that it would be safe for use in Prince William Sound. A report entitled Chemistry and Environmental Effects of the Shoreline Cleaner PES-51 (HAZMAT Report No. 94-2) published by NOAA presents a different picture. They state that "*PES-51 is toxic in aquatic environments at certain concentrations* and that its use *results in introducing stable chlorinated organic compounds into the environment, whose consequence is not entirely understood.* " It is clear from both this and other reports that the toxicological impacts of PES-51 at the proposed use levels on the biota of Prince William Sound are either unknown or poorly understood. It is therefore misleading to convey the impression that PES-51 is "safe".

Testing was conducted for PES-51, Corexit 9580 and Corexit 7664, as cleansing agents to be used during the spill of the barge *Morris J. Berman* in Puerto Rico, it should be noted that PES-51 was not used during the spill due to having a higher toxicity than Corexit 9580.

__Alternative 7, Delay Action Until Additional Testing of PES-51__

This alternative states that extensive chemical and biological testing has been conducted in two tests, and that conducting additional tests would be redundant, expensive and would delay the proposed project.

ADNR understands the needs of the Chenega residents and their desire to have the beaches restored to pre-spill conditions, but we are particularly concerned about the impact of the chemical to these local residents and to the environment of Prince William Sound. Any additional testing that could be performed on toxicity may confirm that the chemical is safe and not harm the environment. Testing should not be viewed as redundant and expensive when the environment of Prince William Sound is in question.

NOAA's Hazmat Report 94-2, entitled <u>Chemistry and Environmental Effects of the Shoreline Cleaner PES-51</u> addresses that in standardized lab tests conducted by Environment Canada, PES-51 failed to meet the minimum standards for effectiveness as a shore line cleaner. The publication references that there is some evidence that aquatic degradation products of limonene (PES-51) may closely resemble the pesticide toxaphene and its breakdown products. Limonene has been used as a stand alone herbicide and pesticide.

Alternative 7 is the department's recommended alternative because it provides an opportunity to test both the effectiveness, i.e., efficiency, and ecological effects of PES-51 in the field without unnecessarily jeopardizing marine and subsistence resources over a large geographic area. A pilot project should be designed to determine whether or not PES-51 will cause more environmental harm than the no action alternative that allows natural recovery to proceed without human intervention. The experimental design should focus on assessing the risks and benefits of PES-51 application. Two representative shoreline segments should be chosen using criteria that maximize similarities so that one could be treated and the other used as a reference. Criteria should include sediment characteristics, oil content and distribution. A monitoring program that includes appropriate toxicity testing should be designed by qualified experts. Results from a well designed field study will allow for objective evaluation of PES-51 and, hopefully, confidence for its future use

The department worked for over two years with state and federal agencies, other land owners, local governments, interest groups and the general public to develop the Prince William Sound Area Plan to manage the state owned uplands and tide and submerged lands, providing for recreational opportunities, protecting habitat and environmental quality, to make land available for multiple use, and to develop resources in the Sound including mariculture - Alternative 7 would help to ensure that the tidelands would be managed for these uses.

Section 5.0. Environmental Consequences

Commercial Fishing / Subsistence- The EA addresses that there will be some residual oil left on the beach after treatment, but does not address how long that period of time will be. It should be noted that the PWSEDC may be responsible for payment of any damages to purse nets as a result of treatment of the beaches.

Appendix A. Monitoring Plan

Objective I - Page A-2

The Project Oversite Committee lacks representation of the tideland landowner, ADNR on behalf of the State of Alaska and a habitat biologist, ADF&G, to monitor the activity. Due to the sensitive environmental nature of the treatment work to be performed on Prince William Sound beaches, ADNR, as the tideland owner reserves the right for ADNR and ADF&G representatives to be present on site and participate in the Project Oversite Committee on equal standing with the other members. The use of this multiple agency representation is much the same process that the department used during the cleanup of the Exxon Valdez spill, to address cleanup concerns and should be followed for restoration activities on these same beaches. The costs for staff time and other expenses would be borne by the project, through the applicant.

Objective III - Pages A-4 through A-9

Use of the chiton *Katharina tunicata* as a biological indicator in the monitoring program is probably a poor choice because this animal is not especially abundant in the area. Several taxa are better represented in the intertidal epifauna; these include limpets, periwinkles and predatory snails such as the drill (*Nucella-*). Use of more abundant species would allow for larger sample sizes and consequently more statistically significant results.

The proposed monitoring program includes a single caged mussel test program that will be conducted at one beach segment. Due to the sensitive nature of the treatment work to be performed and since the project will span from June through September, we request that additional testing be performed, with a minimum of two caged tests, one to be performed during the treatment of the first beach in June, and a second scaled back test to be performed during the September phase of the project.

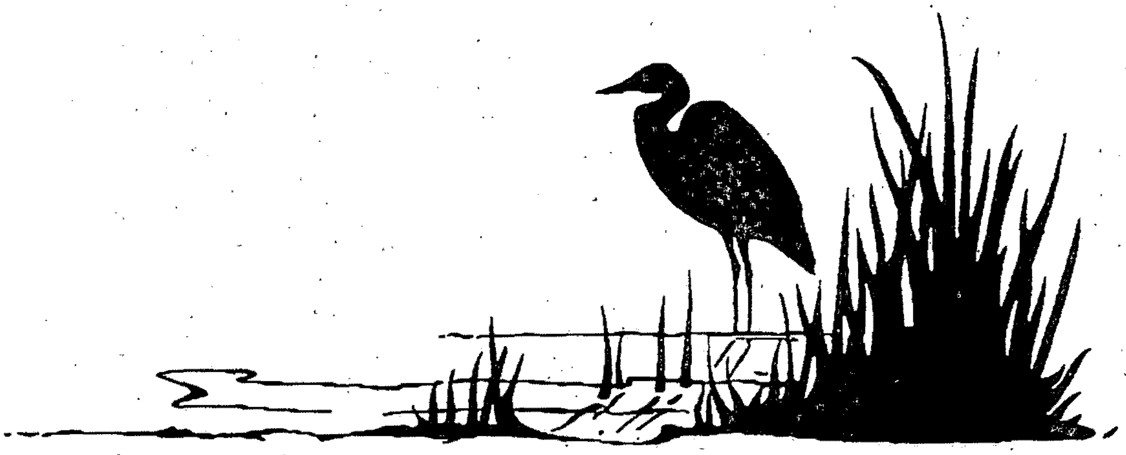
Reporting - Page A-14, As the owner/manager of the tidelands where the project is to be performed, ADNR requires that two additional copies of the draft project report be provided to the ADNR authorized officer (AO), the Chief of Production

Services, Southcentral Regional Office of the Division of Land. In addition, the authorized officer, will require two bound copies of the final report.

Additional Comments

The effects of PES-51 and its degradation products on subsistence resources and users is poorly understood. Moreover, Payton and Whitney (1993) report that: *Some of the personnel applying PES-51 complained of headaches after the first application and requested respirators...* Consequently, the state, as owner/manager of the tidelands must be held harmless or otherwise indemnified from having to compensate project participants or users of subsistence resources that may have been adversely affected by the application of PES-51.

Cc: Marty Rutherford, ADNR
Jane Angvik, ADNR
Rick Thompson, ADNR
Claudia Slater, ADF&G
Catherine Berg, USFWS
Dave Gibbons, USFS
Dianne Munson, ADEC



STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

Habitat and Restoration Division

TONY KNOWLES, GOVERNOR

333 Raspberry Road
Anchorage, AK 99518-1599
PHONE: (907) 344-0541
FAX: (907) 267-2464

MEMORANDUM

TO: Molly McCammon
Executive Director
Exxon Valdez Oil Spill Trustee Council

FROM: Claudia Slater *CS*
ADF&G Liaison
Habitat and Restoration Division
Department of Fish and Game

DATE: April 7, 1997

SUBJECT: Environmental Assessment for Project 96291

The Alaska Department of Fish and Game (ADF&G) has reviewed the U.S. Forest Service Environmental Assessment (EA) for Project 96291, Chenega-area Shoreline Residual Oiling Reduction. ADF&G recommends adoption of Alternative #7, which would delay action pending further testing of PES-51.

ADF&G appreciates the desire of Chenega Bay residents to have additional oil removed from beaches near the village. However, if a shoreline cleaner is used, we need to ensure that: 1) sufficient data are available on the effectiveness and potential environmental impacts of the product to make an informed decision on its use; or 2) the scope of the effort is limited to a pilot project and designed to collect scientifically valid data to address outstanding information needs. In the latter case, a decision can be made whether to proceed on a larger scale based on the results of the pilot project.

The proposed action in the EA does not correspond with either of these approaches for the reasons outlined below.

APPROACH #1 - SUFFICIENT DATA AVAILABLE

On page 13, the EA states that extensive testing has been done on PES-51, and any additional testing would be expensive and redundant. It cites the 1993 Sleepy Bay experiment and a 1994 test conducted on the *Morris J. Berman* spill in Puerto

Rico as demonstrating the effectiveness and environmental acceptability of using this product.

Our review of the literature indicates that data on PES-51 are actually limited and inconclusive, particularly with respect to potential environmental impacts.

Effectiveness: Tests conducted during the 1993 Sleepy Bay experiment indicated that treatment with PES-51 initially removed an average of 70% of the semivolatile petroleum hydrocarbon contaminates in the sediments, with further reduction over time (Tameo and Braddock, 1994). However, standardized laboratory tests conducted for Environment Canada measured PES-51 to be 20.6% effective as a remediation agent in salt water (NOAA, 1994). The differences in these data may be attributed to a variety of factors, including the small number of samples collected during the Sleepy Bay test. In any case, they illustrate that the effectiveness of PES-51 is not sufficiently understood. This conclusion is supported by literature on the *Morris J. Berman* spill. During that incident, the effectiveness of PES-51 and two other shoreline cleaners were evaluated based on visual observations. While PES-51 appeared to enhance oil removal, the Regional Response Team ultimately approved the use of another shoreline cleaner because it was less toxic and appeared to be slightly more effective (Michel and Benggio, 1995).

Potential Environmental Impacts: Information on the toxicity of PES-51 is also limited. Some laboratory data exist, but we were unable to find any field toxicity data on the use of this product. Microbial data were collected during the Sleepy Bay test , but these data were not gathered to determine toxic effects (Tumeo and Braddock, 1994). There was no sampling or analysis done during the Sleepy Bay experiment designed to address concerns about environmental impacts (NOAA, 1994). Similarly, there are no field toxicity data on PES-51 from the *Morris J. Berman* spill. As previously noted, another product was used during that incident, and the associated monitoring program evaluated the biological effects of that product.

With respect to laboratory tests, the EA cites toxicity data presented in a 1994 NOAA report to illustrate that no adverse biological effects are anticipated from the proposed PES-51 treatment. However, the EA fails to note that, because the toxicity tests are based on volumetric concentrations, and PES-51 is relatively insoluble, "it is virtually certain that the listed concentrations underestimate the true toxic concentrations for PES-51 (emphasis added) [NOAA, 1994]." In addition, if the product is injected into the substrate, as proposed in this project, it is "likely that both infaunal organisms (those living in beach sediments) and epibiotic communities (plants and animals attached to substrate surfaces) would be exposed to PES-51 concentrations that approach or exceed toxic levels (NOAA, 1994)."

There is also an important error in the EA, which may partially stem from previous ADF&G input to the Alaska Department of Environmental Conservation. On page 27, under mitigation measures, the EA notes that the scheduling of the beach treatments would be timed for a period when salmonid fry are no longer found nearshore. This is incorrect. Pink salmon fry are present in nearshore waters in the project vicinity from approximately early April through mid-July. The timing of this life phase was not included in my December 4, 1996 memo to Dianne Munson because I was updating information based on a timing chart provided to me. This life phase was not included on the chart, and I failed to notice the omission. I apologize for this oversight, but must advise you of the error now because it is germane to the evaluation of this project.

Results of PES-51 toxicity tests performed for Environment Canada and Tesoro yielded rainbow trout 96-hour LC50 values of 13.6 ppm and 98 ppm, respectively (NOAA, 1994; Michel and Benggio, 1995). While these data likely exaggerate the actual toxicity of the product on rainbow trout because the test is conducted using nominal concentrations, they are sufficiently high to raise questions regarding the potential effects of the proposed shoreline treatment on salmon fry. As noted above, pink salmon fry are present in nearshore waters during spring and early summer, and previous studies have shown that this life phase is particularly sensitive to contaminants .

In addition, the environmental fate of PES-51 is poorly understood. The EA indicates that any PES-51 entering the water column would degrade within 96 hours (page 21). However, there is some evidence that the aquatic degradation products of limonene, which is the primary constituent of PES-51, may closely resemble the pesticide toxaphene and its breakdown products. The wider implications of this are not known (NOAA, 1994).

In light of this information, ADF&G does not believe that sufficient data are available to endorse using PES-51 on the scale proposed in the EA (i.e., approximately two miles of shoreline).

APPROACH #2 - CONDUCT PILOT PROJECT DESIGNED TO FILL DATA NEEDS

As currently proposed, the restoration project will not satisfy this approach either due to its scope and deficiencies in the monitoring plan.

<u>Effectiveness</u>: As currently envisioned, effectiveness of the shoreline treatment would be determined, in large part, based on visual observations. While anecdotal information is useful, its limitations must be recognized. Sediment samples taken to measure effectiveness would be collected at sites that are practical and

convenient; rather than in a random, scientifically valid manner. Moreover, if these sampling sites correspond to the locations where PES-51 can most easily be injected into the substrate, the sampling program will almost certainly exaggerate the effectiveness of the treatment.

Potential Environmental Impacts: As currently proposed, very limited field data will be collected on the biological effects of the shoreline treatment. Mussels and chitons are the only proposed test species, and it is questionable whether sufficient chitons are present to provide a statistically valid sample. In addition, at least most of the sampling will focus on documenting bioaccumulation of petroleum hydrocarbons. While sampling for this is appropriate, it will not provide data on possible sublethal or acute toxicity. Moreover, the results of the sampling program will only become available after the treatment is concluded. If adverse effects occur, it will be too late to make appropriate adjustments in the project.

RECOMMENDATION - SELECT ALTERNATIVE #7, DELAY ACTION PENDING FURTHER TESTS OF PES-51

ADF&G recommends that the proposed restoration project be modified to: 1) reduce the scope of the effort to that of a pilot project; and 2) expand the monitoring/sampling program to collect scientifically valid field data on both the effectiveness and potential environmental impacts of using PES-51 to remove residual oil. The monitoring program should be designed in coordination with the federal and state trustee agencies, with guidance from qualified experts either within or outside the agencies. Based on the results of the pilot project, the Trustee Council can make a decision regarding whether to proceed with larger-scale remediation.

We believe this approach is necessary for two reasons. First, sufficient data are not currently available to make an informed decision about the potential benefits and environmental effects of PES-51. As previously mentioned, information on the effectiveness of this product is inconclusive, field toxicity data are completely lacking, and the environmental fate of limonene and its aquatic degradation products is poorly understood. Obtaining additional information on the latter two items is necessary to fully understand the potential biological effects of using PES-51 and ensure the wholesomeness of fish and wildlife harvested for consumption.

Second, this project will likely set the standard regarding what information is required on the effectiveness, toxicity, and environmental fate of shoreline cleaners proposed for use in Alaska. Although the EA states that this project would not establish a precedent (page 3), we disagree. If the trustee agencies fund a project that entails use of a chemical based on the data currently available on PES-51, other entities could argue - and rightfully so - that they should not be held to a different standard. Clearly, this project could have significant implications on future spill response and remediation decisions. Consequently, it is essential that we proceed in a systematic and scientifically defensible manner.

Thank you for the opportunity to review the EA. If you or your staff have any questions regarding our comments, don't hesitate to contact me.

Attachment (Literature Cited)

cc: Carol Fries, ADNR
Mike Bennett, ADNR
Dianne Munson, ADEC
Dave Gibbons, USDOA/FS
Byron Morris, USDOC/NOAA
Rebecca Hoff, USDOC/NOAA
Lance Trasky, ADF&G
Janet Kowalski, ADF&G
Frank Rue, ADF&G

LITERATURE CITED

1. Michel, Jacqueline and Bradford L. Benggio. 1995. Testing and Use of Shoreline Cleaning Agents during the *Morris J. Berman* Oil Spill. *Proceedings of the 1995 International Oil Spill Conference*, American Petroleum Institute, Washington, D.C.

2. National Oceanic and Atmospheric Administration (NOAA). 1994. Chemistry and Environmental Effects of the Shoreline Cleaner PES-51. HAZMAT Report No. 94-2. 22 pp.

3. Tumeo, Mark A and Joan Braddock. 1994. Effectiveness of a PES-51 in Removing Weathered Crude Oil from Sub-Surface Beach Material. Results of a Field Study at Sleepy Bay on LaTouche Island in Prince William Sound. Final Report. 24 pp. plus appendices.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. Tudor Rd.
Anchorage, Alaska 99503-6199

RECEIVED
APR 11 1997
EXXON VALDEZ OIL SPILL
TRUSTEE COUNCIL

IN REPLY REFER TO:

AES/ESO

APR 8 1997

Ms. Molly McCammon, Executive Director
Exxon Valdez Oil Spill Restoration Office
645 G Street, Suite 401
Anchorage, Alaska 99501

Dear Ms. McCammon:

We have reviewed the Environmental Assessment for Chenega-area Shoreline Residual Oiling Reduction *Exxon Valdez* Oil Spill Trustee Council Project #96291, near the village of Chenega Bay in southwest Prince William Sound. It is our understanding that the preferred alternative is Alternative 2--removal of oil from eight beaches during the spring and summer of 1997. Restoration work will include the use of a biosurfactant, PES-51, which will be injected into the subsurface soils using an airknife injection process. During the treatment process, ambient seawater will be flushed over the treatment area to move the displaced oil to the shoreline and nearshore waters where it will be collected with sorbents and skimmers. The treatment area will be surrounded with containment boom and sorbent boom during the process. Collected oily liquid and solid waste will be disposed in a manner that meets the appropriate disposal regulations.

Although we can understand the desires of the Chenega Bay residents to have an "oil-free" environment, we do not feel that at this time there is enough information regarding the potential toxicity of the compound PES-51 to intertidal organisms or the effectiveness of the product to recommend a full-scale clean up effort. We recommend a modified Alternative 7--conduct a pilot project with a rigorous biological sampling plan to ensure that introduction of this compound into the environment will not exceed toxic exposure levels for the organisms or the people that eat them. Our concerns are addressed in more detail in the comments that follow:

General Comments:

Existing data are insufficient to adequately determine whether PES-51 presents unreasonable risk to the local environment, including fish and wildlife resources. These uncertainties include extrapolation of laboratory toxicological results to the field, uncertainty surrounding the expected environmental concentrations, and limited knowledge of PES-51 effects in Alaskan waters.

Monitoring proposed in the study plan will not provide the information needed to assess both the efficacy of the product and any potential adverse ecological effects on Prince William Sound biological communities.

Issues raised in a 1994 report prepared by National Oceanic and Atmospheric Administration *(Chemistry and Environmental Effects of the Shoreline Cleaner PES-51™)* are applicable to the proposed action, and should be considered when the project plan is revised. Detailed comments are provided below.

<u>Specific Comments</u>:

Toxicological values presented by the manufacturer are based on nominal (not measured) concentrations, potentially biasing the study results. Due to the low water solubility of the product, actual concentrations causing toxicity would be expected to be lower than the stated nominal values. This makes it difficult to assess what toxic effects might be observed in a natural system.

Toxicity data presently available to the Fish and Wildlife Service is based on relatively short-term tests (24 hour to 96 hour LC_{50} values). Short-term, acute tests of lethality do not adequately reflect chronic effects of a compound, nor they do evaluate sub-lethal endpoints such as growth inhibition or reproductive impairment.

Contaminant effects are often mediated (either reduced or increased) in the natural environment. Many factors might influence field exposure including temperature, pH, chemical degradation, and chemical binding or transformation. Field testing (a pilot study) may provide information on chemical fate and transport, provided a rigorous monitoring plan is adopted.

A key assumption in the EA is that expected environmental concentrations of PES-51 in the water column will be less than 200 ppb (pg. 21). How was this value derived ? Environmental fate modeling ? Empirical evidence ? Toxicological values are of little use without realistic expected (likely) and maximum (worst case) environmental concentrations.

The study design calls for subsurface injection of PES-51 followed by an ambient water wash. This application method may expose infaunal organisms to relatively high concentrations of the compound, given the non-uniform distribution of the compound and the variable efficiency of the following seawater wash. Intertidal organisms are distributed in a variable manner and beach substrates will be heterogeneous. These factors "make it likely that both infaunal organisms (those living in beach sediments) and epibiotic communities (plants and animals attached to substrate surfaces) would be exposed to PES-51 concentrations that approach or exceed toxic levels" (NOAA 1994).

A primary constituent of PES-51 is limonene. "Aquatic degradation products of limonene may closely resemble the pesticide toxaphene and its breakdown products. Researchers studying limonene and related terpenes found that at low pH and when exposed to sunlight, aqueous mixtures produces complex polychlorinated compounds that had 'striking similarities' to the organochlorine pesticide toxaphene. Less extensive but still substantial chlorination also took place at higher pH or in the dark" (NOAA 1994). In these experiments, limonene was the most highly reactive terpene examined, and consistently produced highly chlorinated material (NOAA

1994). Given the documented toxicity and persistence of toxaphene in the environment, the above statements raise concerns about environmental release of this compound.

"In three toxicity tests in which the same organisms were used, PES-51 was more toxic than Corexit 9580 M-2" (NOAA 1994). Have less toxic alternatives been investigated ?

The EA states that "visual observation of the macrofauna during the 1993 Sleepy Bay test program saw no acute impacts on the treated beach (pg. 22)." This appears to have been based solely on a visual impression, not from actual effects monitoring. No long-term follow up was done after the application of PES-51 in this study. This existing information is not of sufficient quality to resolve the uncertainty raised above regarding potential toxicological effects.

The monitoring plan proposed in the EA should be expanded if there is a pilot application in the future. For example, there did not appear to be any monitoring outside the containment booms to measure or document that the booms were effective in stopping the oil/surfactant mixture. The Service strongly suggests that this be added to the protocol.

While the chiton, mussel and caged mussel studies will all be useful, the project proponents should consider additional ecological monitoring techniques including the use of transects to investigate impacts on the tidepool/epibiotic assemblages, and any other approaches which might help identify impacts on potentially affected organisms. Scientific peer review of the proposed monitoring plan should be conducted prior to initiating any fieldwork.

Treating beaches and liberating the hydrocarbon/PES-51 mixture may place the local environment at more risk than a no action alternative (leaving the weathered or asphalted oil in place). We recommend that project monitoring for the pilot project include the use of control plots (no treatment applied), to study natural recovery processes and to use as a baseline against which potential toxic effects of PES-51 can be judged. Separate control beaches which were never oiled would provide even more information on the effects of weathered oil and whether chemical treatment of this oil with PES-51 results in measurable toxic effects.

There is little information available on the effectiveness of PES-51 as a shoreline cleaner (NOAA 1994). Environment Canada tests measured a 20.6 percent effectiveness in saltwater trials, less than the minimum performance standards established by that agency. This is in contrast to the 1993 Sleepy Bay project, which found approximately 70 percent reduction in oil residues following the application of PES-51. Future monitoring should be designed to answer efficacy questions, including recommended field application rates and the amount of weathered oil removed by the procedure. We recommend that Chenega Bay residents be consulted after the pilot project to determine if the amount of oil removed met their expectations.

In summary, the Service recommends that prior to proceeding with a full scale cleanup that the Trustee Council fund a pilot project on one or two of the selected beaches. The pilot project should include rigorous biological and chemical sampling before, during and after treatment with the compound, PES-51. The sampling plan should be peer reviewed by the scientific community and appropriate agency personnel prior to approval of the pilot project. A pilot project with an adequate sampling plan should ensure that the treatment and cleanup will not exceed toxic exposure levels for the organisms or the people who subsist on them.

Thank you for the opportunity to comment on this document. If you have any questions, please contact Catherine Berg at (907) 786-3598 or Philip Johnson at (907) 786-3483. We appreciate your efforts in this matter.

Sincerely,

David B. Allen
Regional Director

cc: Special Assistant to the Secretary for Alaska

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
BIOLOGICAL RESOURCES DIVISION
Alaska Science Center
1011 East Tudor Road
Anchorage, Alaska 99503

IN REPLY REFER TO:

April 8, 1997

RECEIVED
APR 8 1997
EXXON VALDEZ OIL SPILL
TRUSTEE COUNCIL

Molly McCammon
Executive Director,
EVOS Trustee Council
645 G. Street, Suite 401
Anchorage, AK 99501

Dear Ms. McCammon:

We have reviewed the Environmental Assessment (EA) for Chenega-area Shoreline Residual Oiling Reduction, Restoration Project #96291. We have also reviewed the NOAA HAZMAT report NO. 94-2 which includes reports from the two tests of PES-51 in Sleepy Bay, LaTouche Island, Prince William Sound and Florida. Both of these studies are cited in the EA in support of Alternative #2, cleaning of eight beaches using PES-51 and the airknife injection technique.

We agree with reviewers from the U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game that not enough is known regarding the toxicity or potential environmental impacts of PES-51. The La Touche Island and Florida studies were conducted to evaluate only the efficacy of PES-51 as an oil removal product. Our concern is with the paucity of data to evaluate the toxicity of the chemical.

We do understand the wishes of Chenega Bay residents to have "oil free" beaches. The analogy comparing the oiling of their subsistence resources to our shopping in filthy grocery stores effectively illustrates the apprehension of residents to collect subsistence foods from oiled beaches.

While we do understand the residents' wishes, we are concerned about the use of the chemical on subsistence resources. Is the chemical labeled for use on food? If not, toxicity tests must be conducted prior to its introduction to subsistence beaches. We suggest pursuing Alternative #7. A pilot project must be proposed to evaluate the product's toxicity to potential subsistence resource users and the environment. The proposal must include a rigorous biological sampling component and it must undergo a full scientific peer review.

If alternative #7 is chosen, the USGS-Biological Resources Division would be willing to consult on the development of a biological sampling program.

Thank you for the opportunity to address the Environmental Assessment of Restoration Project #96291. If you have questions, please contact Lisa Thomas, Fish and Wildlife Biologist, at 786-3685. We appreciate your continuing efforts and consideration of our comments.

Sincerely,

William K. Seitz

William K. Seitz
Acting Director, Alaska Science Center

Copies to: Deborah Williams
Catherine Berg, USFWS

The Eyak Corporation
P.O. Box 340 Cordova, Alaska 99574
(907) 424-7161 Fax (907) 424-5161

April 16, 1997

Ms. Molly McCammon
Executive Director, EVOS
645 G Street, Suite 401
Anchorage, AK 99501-3451
Fax 907-276-7178

Dear Ms. McCammon:

I would like to voice the strong support of The Eyak Corporation for the Chenega Residual Oiling reduction Project. The cleaning of beaches near Chenega Village is important to not just the Village, but to all of Prince William Sound. Chenega has the support of The Eyak Corporation in their efforts to restore beaches damaged by the 1989 spill.

Thank you very much for your concern and assistance.

Sincerely,

THE EYAK CORPORATION

Brian J. Lettich
General Manager

BJL:ala

THE TATITLEK CORPORATION

P.O. Box 650, Cordova, Alaska 99574 • Phone (907) 424-3777

April 15, 1997

Ms. Molly McCammon
Executive Director, EVOS
645 G Street, Suite 401
Anchorage, Alaska
99501-3451

SENT VIA FAX #907-276-7178

Dear Ms. McCammon:

The Tatitlek Corporation strongly supports the Chenega Residual Oiling Reduction Project. The cleaning of these beaches near Chenega Village is extremely important to not just the Village itself but also to the whole Prince William Sound area.

Chenega has the support of The Tatitlek Corporation in their efforts to restore beaches damaged by the 1989 spill.

Thank you for your concern and your assistance.

Sincerely,

THE TATITLEK CORPORATION

Carroll Kompkoff

Carroll Kompkoff,
President

REF 97-051
CK/pkm

Chugach Alaska
CORPORATION

April 17, 1997

Ms. Molly McCammon, Executive Director
Exxon Valdez Trustee Council
645 "G" Street, Suite 401
Anchorage, AK 99501-3451

Via fax at (907) 276-7178

RE: Chenega Residual Oiling Reduction Project

Dear Ms. McCammon:

I understand that issues have been raised by several state and federal agencies with representation on the Exxon Valdez Oil Spill Trustee Council that have put the proposed Chenega Residual Oiling Reduction Project in jeopardy. This project was proposed by the village of Chenega as being very important to the restoration of many of the beaches used by its residents for subsistence purposes.

Chugach Alaska Corporation is a very strong supporter of this project and all other projects undertaken by the Trustee Council to restore oiled beaches in Prince William Sound. It is shameful that state and federal agencies have turned their backs on the residents of Prince William Sound so soon after acquiring their lands. Such actions bring to question the true motives of these agencies. I hope that you will do your utmost to ensure that this project is approved for action during the summer of 1997.

Thank you for your support and assistance with this matter.

Best regards,

Mark Stahl, Manager
Lands & Resources Department

560 East 34th Avenue Suite 200 Anchorage, Alaska 99503-4196 Phone 907-563-8866 Fax 907-563-8402

Alaska State Legislature

Official Business

State Capitol
Juneau AK
99801-1182

16 April '97

Exxon Valdez Oil Spill Trustee Council
645 G Street, Suite 401
Anchorage, Alaska 99501-3451

Members of the EVOS Trustee Council:

It has come to our attention that after several years of planning, and a lot of work by the people of Chenega Bay, there are efforts underway to stop a project to clean up some significant beaches near the village.

From what we understand, the involved beaches are protected from winter storms, and consequently, not undergoing the natural process of cleaning found elsewhere in the oil spill impacted areas.

We hope members of the Council will remember that it is the people of Chenega Bay, perhaps more than any other group of Alaskans, that have to live with the results of the '89 Oil Spill on a day to day basis. That fact was an important part of the decision to do this project.

On another level, a decision to quit this project in the twelfth hour will significantly affect the local villagers. Quite a number of them have been planning to work on the project this summer, and several local boats have been leased as part of the clean-up.

We implore you to move forward with this needed project. Although the environment is slowly cleaning up the oil, these beaches are among those that can use our intervention. As was mentioned earlier, to drop this project at this time will represent a hardship to a group of people who must deal with remnants of the oil damage daily.

Thank you for your consideration.

Sincerely,

Representative Gene Kubina

Senator Georgianna Lincoln

OFFICE OF THE MAYOR
April 17, 1997

Ms. Molly McCammon
Executive Director, EVOS
645 G Street, Suite 401
Anchorage, Alaska 99501-3451

Sent by facsimile to 907-276-7178

Dear Ms. McCammon:

I would like to voice the strong support of the City of Valdez for the Chengea Residual Oiling Reduction Project. The cleaning of beaches near Chegna Village is important not only to the Village, but to all of Prince William Sound. Chenega has the support of the City of Valdez in their efforts to restore the beaches damaged by the 1989 spill.

I am concerned with the process that is currently underway to review this project. It appears that some of the state and federal agencies oppose the methodology being proposed or even oppose the project outright by continuing to request additional information.

I am further concerned with the potential that state agencies are considering to fund their operations for reviewing the project from the original grant funds given by the Trustees. This takes much needed funds away from the project.

Again, the City of Valdez supports the project and respectfully requests that the EVOS Trustee Council continue to fund the project and ask the state and federal agencies to work cooperatively with the Chenega Village and the Prince William Sound Economic Development Council.

Sincerely,

David C. Cobb

David C. Cobb
Mayor

P.O. BOX 307 • VALDEZ, ALASKA 99686
TELEPHONE (907) 835-4313 • TELECOPIER (907) 835-2992

CITY OF CORDOVA

April 16, 1997

Ms. Molly McCammon, Executive Director
EVOS Trustee Council
645 G Street, Suite 401
Anchorage, Alaska 99501

Dear Molly:

I am writing in support of the Village of Chenega's request to have EVOS fund the Chenega Residual Oiling Reduction project. As you are aware, the Village of Chenega was tremendously impacted by the Exxon Valdez oil spill.

This clean up project is important to the Village of Chenega, and to all communities in Prince William Sound. Please support funding for this project. If you have any questions you may contact me at (907) 424-6200.

Sincerely,

W. S. Janke

Scott Janke
City Manager

1997 Restoration Workshop

January 23-25

Anchorage, Alaska

Exxon Valdez Oil Spill
Trustee Council
645 G Street, Anchorage, AK, 99501
Ph 907/278-8012 • Fax 907/276-7178

Special Public Educational Session

2:00 **Welcome to Special Public Educational Session**
Craig Tillery, State of Alaska Trustee

2:10 **Overview of Restoration Program and Update on Injury & Recovery**
Molly McCammon, Executive Director
Stan Senner, Science Coordinator

2:30 **An Ecosystem Approach to Restoration**
Dr. Robert Spies, Chief Scientist

2:40 **Scientists at Work**
Killer whales: Counting - *Craig Matkin, 96012*
Harbor seals: Biosampling - *Kate Wynne, 96244*
Clams: Hatchery Production - *Carmen Young, 96131*
Sockeye: Genetic Sampling - *Dr. Lisa Seeb, 96255*
Marbled Murrelets: Climbing Trees - *Kathy Kuletz, 96031*
Harlequin Ducks: Kayak Roundup - *Dan Esler, 96025*

3:30 **Alaska SeaLife Center**
Dr. John Hendricks, Executive Director

3:40 **For More Information—How to Get Involved**
Molly McCammon, Executive Director

3:45 **Panel: Questions and Answers**
Molly McCammon, Dr. Robert Spies, Stan Senner, and o[illegible]

4:15 **Adjourn**