
SECTION I

INTRODUCTION

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"Oil and Puget Sound" - to the consumer, it means the comfort of motorized transportation, heating, and mechanized leisure; to the oil industry, it signifies a profitable business; to the conservationist, it means a threat to the environment quality; to the commercial fishing industry, it represents a threat to the long-term benefits of its business; and to the tourism industry, it represents possible degradation to those attractions upon which its revenue and livelihood depend.

Five years ago, the topic of oil and Puget Sound drew nothing more than a passing comment or a two line article on page 46 of the local newspaper. In fact, not a single bill concerning oil-on-water issues in Puget Sound was introduced in the 1965 state legislative session.¹ Now, besides TV specials and front page headlines, literature ranging from sloganed leaflets to lengthy legislative acts are available on the subject.² Why this recent on-rush of public interest?

Environmental and petroleum demands have contributed greatly to the oil-on-water controversy. The concern in the late 1960's for the preservation of the environment led to publication of study upon study analyzing the air and water quality degradation.³ On the other hand, there is the realization that man's ever-increasing need for petroleum products has all but depleted the existing oil reserves, resulting in the relentless search for potential oil fields. By 1985, 45% of domestic oil production will have to come from reserves yet to be found.⁴

OIL SPILL STATISTICS

Man's increased consumption of oil has contributed to his productivity and wealth. This appetite has led to heightened oil production levels and heavy oil traffic on land and sea, which has helped cause near-saturation of the distribution channels. This enormous growth in the amount of oil transported and transferred has not as yet affected Puget Sound. Based on Corps of Engineer data, the quantity of oil transported annually on the Sound has ranged between 12.3 and 15.8 million short tons since 1965 with the 1970 volume at 12.9 million short tons (Section III-A). Projections for 1980, 2000, and 2020, accounting for the Alaskan oil effects, show 20.2, 32.5, and 55.3 million short tons transported, respectively. (Section II)

Since the predominant process of polluting water with oil is due to spillage, minimizing the number of shippings and transfers will have an impact on the frequency of potential spill incidents. Study team members attempted to accumulate data on frequency of shipments or transfers, number of spill incidents, and quantities of oil shipped, transferred, and spilled. This was pursued at the local, state, federal, and worldwide echelons. (Section II-A.) Surprisingly, very little of this data is available. For example, it is a known fact that collisions involving barges or tankers totaled 17 since 1965, in Puget Sound.⁵ But the quantity of oil spilled per incident is unavailable. A request to the Environmental Protection Agency (EPA) for both U.S. and worldwide oil spill statistics elicited a lukewarm response. Apparently, the data is for in-house use and stored in computers.⁶

Further research showed that well documented statistics were available for a British oil port, Milford Haven, Southwest Wales for the 1965-1970 period. Three oil refineries and one tank farm are located on the shores of this port, whose annual oil traffic is between 2.5-3 times that of Puget Sound, on a quantity basis. Though the incidents of oil spills have increased, the probability of a spill incident has not changed; in fact it is diminished slightly. The eight year average for amount of oil spilled is 0.00018% of the total oil transferred. (Section III-A.)

CONCERN FOR OIL SPILLS

Comprehensive mechanisms for regulating oil discharges into water have only surfaced in the past five years. International and national contingency plans were formulated to combat oil spills subsequent to the Torrey Canyon incident in 1967.⁷ These plans to cope with oil spills center on one theme: Man's efforts to clean up spills are controlled through legally responsible organizations. The procedures set forth in these contingency plans have been very general, and the inherent environmental quality criteria are very vague. Regulations governing oil discharge into navigable waters consider it illegal to "...cause a film or sheen upon...the surface of the water..."⁸ Attempts to obtain quantitative interpretation of such standards to those related to oil spill cleanup criteria did not clear up the situation.⁹

At the regional level, the Coast Guard has formulated a contingency plan which delineates the legal responsibilities and chain of command in

event of a spill.¹⁰ What is lacking are guidelines for on-scene decision making and operational controls. (Section III-B, Part 1, and Appendix 7.) The State Department of Ecology has been quoted having a response plan, but as of publication date, this document was in the developmental stages. They have published a document summarizing the Washington Statutes for oil spills.¹¹ (Appendix 2 critiques these statutes.)

Regulatory plans and standards applicable to one region are not universally applicable due to regional uniqueness. Thus, there is a need for local awareness of oil pollution. State, federal, and local agencies should seek a common definition for the environmental quality standards for Puget Sound, and base these on scientific analysis.

In the private sector, industry's stand on environmental quality is not clearly defined, and where its position is evident, it does not necessarily coincide with that of today's diverse society. Thus, a demand arises here for concern of oil pollution and its consequences, and this local awareness applies to all segments of society. All groups should adapt the "if you help me, I'll assist you" attitude, instead of the currently popular "don't tread on my territory, and I'll stay clear of yours" outlook.

OIL SPILL CONCERN IN PUGET SOUND

The discovery of oil in Alaska's North Slope has been a significant, if not the most important, catalyst of local awareness in Puget Sound. The breakthrough in the oil reserve crisis awakened the possibility of increasing the oil refinery industry in the Pacific Northwest. Using the oil transport values as substitutes for oil refinery output, volume has decreased from 15.8 to 12.9 million short tons between 1965 and 1970. Because of Puget Sound's close proximity to the Alaskan oil fields, plus its favorable conditions (deep water facilities and dependable inexpensive electrical power) for oil refining, it made sound business sense to propose transporting at least a portion of Alaskan crude oil to Puget Sound. With the addition of the ARCO refinery, oil transport figures for 1980 are projected at 20.2 million short tons. At the time of the Prudhoe Bay discoveries in 1968, this area had not experienced any major oil spill.¹² There was, however, a lot of discussion on the subject.

The Santa Barbara channel incident in January 1969,¹³ aroused local interest with respect to the beach and wildlife damage. The San Francisco Bay tanker collision in January 1971,¹⁴ cast the tanker traffic aspect into the forefront of the oil-on-water issue. Even in light of these disasters, there remained an air of optimism as to a possible oil spill occurrence in Puget Sound.

Fate finally turned its hand onto Puget Sound. Less than four months after the San Francisco spill, this area witnessed its first major oil spill, 242,000 gallons of diesel fuel at Anacortes.¹⁵ Less than one month before this accident, oil industry firms located in Puget Sound had formed a cooperative to clean up spills,¹⁶ and several third party contractors had pooled their resources to stockpile equipment.¹⁷ A regional contingency plan had also been drawn up for the Puget Sound area. How effective any or all of these efforts have been can be evaluated in the light of the following facts: of the 242,000 gallons spilled at Anacortes, less than 450 gallons have been recovered to date.¹⁸ Last but not least, no visible effort of any sort was made to divert the oil from the valuable sea life in the vicinity of the spill. Only after oil was sighted near valuable areas were attempts made to set up booms. (Appendix 12.)

In order for any model or plan to prevent and control¹⁹ oil spills effectively, a baseline²⁰ definition on what is being protected - the environment - must be fully understood by all parties (society as well as industry). Thus, there is an urgent need for this assessment in the Puget Sound region. Section II-A documents such an analysis. It is highly recommended that a continuous update and refinement of this or similar inventory be documented. Areas of critical economic and social value should be identified. Next, potential sources of oil spills on Puget Sound should be singled out. Included in these evaluations are the industrial, societal, and political consequences. Then, and only then, can optimal response plans for cleanup and prevention be realized.

The responsibility for maintaining the quality of marine environment in and around Puget Sound is currently vested among three organizations: United States Coast Guard (USCG), Environmental Protection Agency (EPA), and the Washington State Department of Ecology (DOE). This responsibility

includes the prevention and control of oil spills. Though broad guidelines and divisions of responsibility are established, the operational aspects of these directions are far from effective. (Section III-B, Part 1; Appendices 2, 3, and 7.)

It remains the task of both federal and state governments to iron out jurisdictional conflicts between each government's control over water pollution. For the Puget Sound area, this was evident in the oil spill at Anacortes. For this incident, DOE found United Transportation guilty of negligence in allowing oil to be spilled into water, and fined the firm \$15,000.²¹ It also ruled that Texaco was absolved of any blame. On June 26, 1971, the U.S. attorney's office filed suit against both firms for damages to the environment.²²

Thus, the federal government's efforts should strive to insure that in possible future oil pollution rulings, both its aim and that of the state are in concert.

Identification of potential spill sources is a necessary starting point for oil spill prevention. For each source, an evaluation of the economic and social consequences of a spill should be closely examined. From this information, water quality standards should be established by the responsible agency, and enforced utilizing state-of-the-art techniques. In certain situations, more than one agency may have jurisdiction. In these cases, the responsible parties should endeavor to search for an equitable solution for society, instead of striving for individual self-interests.

Section III-A of this report delineates the sources of potential oil spills for the Puget Sound region. In addition to the oil industry, vessels, municipalities, factories and plants, and private citizens discharge oil into the water. One other potential future source is submarine drilling, which is not presently active in the Sound. By identifying the source, necessary and proper action can be initiated to:

1. prevent spills from occurring, and
2. control any spill incidents that might happen.

Figure I-1 presents a simplified model of oil on Puget Sound. On the top

of the diagram are listed the potential sources. Prevention efforts will minimize, if not completely abate, the discharge of oil into the Sound. If oil does reach the water, then capability must be available to remove this discharge. Otherwise the varied resources of the Sound will suffer the consequences.

OIL SPILL PREVENTION

On the prevention side, there are presently several refineries and processing plants in the Puget Sound area that handle industrial and private waste oil. (See Section III-A.) DOE and organizations such as the Municipality of Metropolitan Seattle (Metro) have expended much effort on municipal oil wastes. (See Section III-A.) In addition, a comprehensive analysis on submarine drilling has been published.²³ Therefore, this report is primarily concerned with prevention of oil spills from waterborne traffic and oil transfer operations.

An analysis of past, present, and future commercial waterborne traffic in Puget Sound is presented in Section II-B. Data for ship movements, quantities of petroleum, and other relevant factors are documented. Results of statistical analysis for ship collisions and resultant oil spills also appear, with the model described in detail in Appendix 13. Trends in vessel size and capacity are also reported in Section II-B; they reveal the possibility of one million deadweight ton (dwt) tankers by 1980.

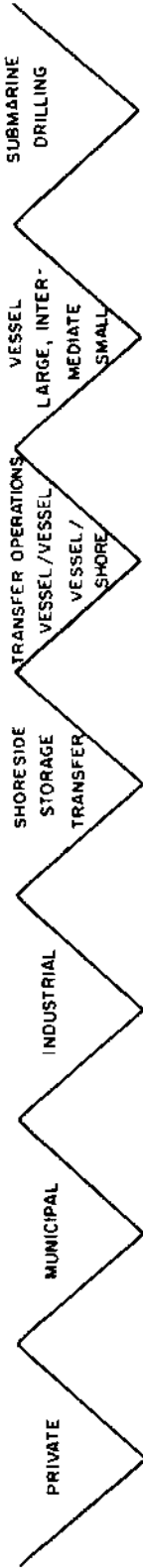
Prevention techniques for oil tankers and other vessels are relevant to Puget Sound from two viewpoints.

1. Tanker design, and
2. projected tanker operation on the Sound. (Section III-C, Part 1.)

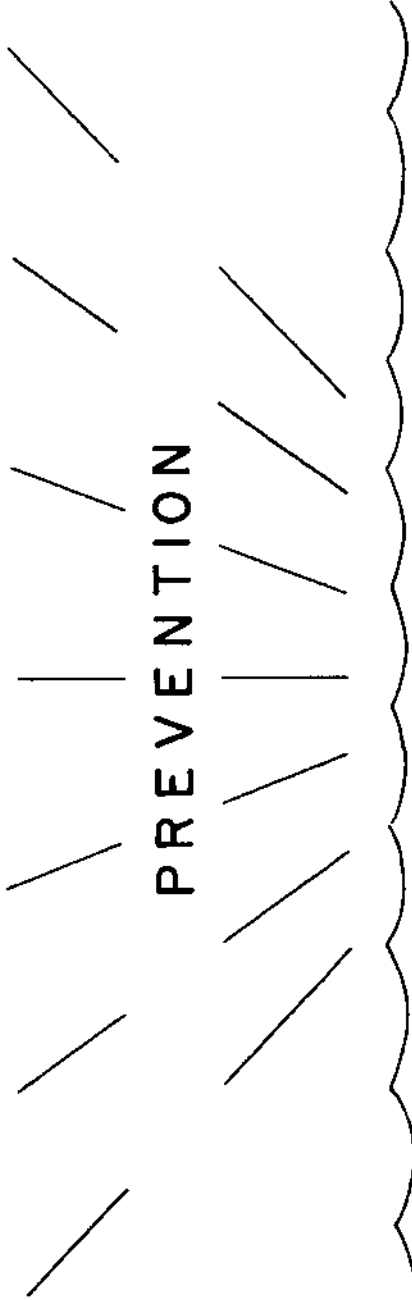
While a complete re-design of tankers is a long run solution, certain short-term measures can be undertaken to aid the cause. Standard Load on Top (LOT) procedures should be instituted in all oil carrying vessels. (Section III-C, Part 2.) Since LOT requires settling time to be effective, vessels primarily used for intra-sound cargo should be provided with waste oil reception facilities. One such plant has recently begun operation at Pier 91, Seattle.²⁴

The increasing concern, in recent years, for tanker and barge mishaps has signaled a need for a waterborne traffic control system, integrating

SPILL SOURCES



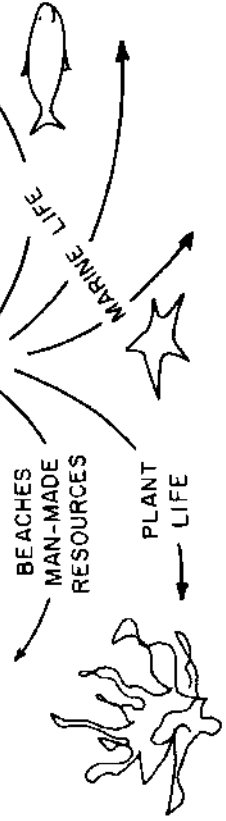
SPILL SOLUTIONS



EVAPORATION NATURAL BIODEGRADATION

AFTER SPILL, DAMAGE CAN BE MINIMIZED BY CONTAINMENT AND CLEANUP

OR



RESULTS

FIGURE 1-1
SIMPLIFIED MODEL -
OIL ON PUGET SOUND

commercial schedules and information, and existing marine traffic, to that of the oil industry. The ideal long term solution, as presented in this report, is an automated traffic advisory system tailored for Puget Sound. (Section III-C, Part 2; and Appendix 8.) Its value is in the future protection, after determination of cost effectiveness. Presently available measures include adapting international regulations to the Sound, improving dissemination of information, and updating seamanship techniques and equipment. (Section III-C, Part 2.)

Surveys of current operations at eleven Puget Sound oil handling facilities by the study group indicated compliance with Coast Guard requirements, but these measures were proven inadequate for preventing a dockside spill. (Section II-C, and Appendix 1.) Recommendations presented include revising regulations, using state-of-the-art devices and techniques, and training of personnel (Section III-C, Part 4). Most of the facilities surveyed are operated by oil firms and are responsible to the USCG, plus EPA; hence, a coordinated level of effort, utilizing manpower and funding, is imperative to the prevention of spills.

One other conclusion reached in the study is related to the oil industry's efforts in conserving the resources of Puget Sound. Available data on expenditures revealed that the industry's annual dollar outlay for this area is about \$1.4 million. When compared with the benefits gained from these efforts, the industry appears guilty of shortchanging the Pacific Northwest in favor of its other interests (Section II-E).

OIL SPILL CONTROL

Assuming that all the prevention measures have been implemented, one still must anticipate that an oil spill will occur. In the event of a spill, the authority and capability of each responsible party must be clearly and conclusively defined. This includes the operational personnel, as well as those in management roles. Once oil has been spilled into water, time is of the essence and jurisdiction questions cannot be argued. Furthermore, authority to act is not sufficient; one must also have the capability to act. This includes having the necessary skills, material, equipment, and manpower readily available. One also needs the authority to exercise judgement without fear of reprisal except under due process in a public tribunal. (Section III-B.)

At the present time, the capabilities of any one party to respond to an oil spill emergency of any magnitude in Puget Sound are essentially non-existent. (Section III-B.) The USCG has limited manpower and no specialized equipment. Similar conditions exist with EPA and the DOE.

A 1969 oil industry survey²⁵ revealed that, of the 54 reporting facilities, only four possessed on-site oil spill cleanup capability. In addition, 17 claimed to use third party cleanup services. There were five third party contractors listed. The Washington Oil Spill Cooperative - a collection effort of ten oil firms - has claimed capability and preparedness to cope with spills. As yet, no supporting evidence of these claims is evident.* The key to the solution once again lies with an integrated inter-agency effort, receiving the necessary financial and manpower backing. Several specific recommendations in this area are documented in Section III-B, Part 1.

In order to enhance a given emergency response, a suggested decision matrix for economic priorities in the Puget Sound area has been developed by the study group (Section III-B, Part 2). This will enable the responsible party to base his actions on technical information rather than hearsay or conjecture. The matrix can also be useful as an indicator of the social values placed on this region's resources.

An overriding factor to response effectiveness is the ability to track an oil spill. The state-of-the-art of oil detection is discussed in Section III-C, Part 3. Currently available techniques are not cost-effective. Appendix 8 presents a computer model with potential for predicting the behavior of an oil slick.

SUPPORTIVE ANALYSIS

To support the recommendations for oil spill response capability, evaluations of containment devices (Appendix 5) and cleanup devices (Appendix 6) were performed. A critique of the equipment and technology displayed at the 1971 American Petroleum Institute Oil Spill conference appears in Appendix 9. A theoretical discussion on booms (Appendix 10) supplements the discussion of containment devices.

The impact of international laws on oil pollution in Puget Sound are documented in Appendix 4. This discussion augments the state and federal

*See Endnote 26, this section.

statute analysis of Appendices 2 and 3. Together with the critique of the regional contingency plan (Appendix 7), the legal aspects of oil pollution in the Sound are well covered. In addition, two pollution abatement proposals related to vessels are evaluated in Appendix 10.

The effects of oil on water and the environment are detailed in Appendix 14. Included is a glossary of terms, and a conversion table relating the various units for measuring quantity of oil. Short- and long-term biological effects are discussed, primarily from a survey of the available literature. Appendix 8 presents a computer model predicting the behavior of an oil slick on Puget Sound. It is hoped that such a model could be integrated into an overall cleanup response concept.

The study group had the benefit of first hand analysis of two recent oil spill incidents, at San Francisco and Anacortes. Though the former was of interest, it did not directly apply to the Puget Sound study. Data on the response capability to cleanup the Anacortes spill and the subsequent damage assessment was accumulated by the study group. Appendix 12 presents a documentation of these events. This case analysis brings into focus those concepts covered in the bulk of this report. Needless to say, the Anacortes results are not encouraging. No attempt was made to analyze the causes of the incident.

The myriad of conclusions and recommendations are summarized in Section IV.

OBJECTIVE OF STUDY

It is the goal of the study team that each and every topic covered in this report be critically reviewed by all parties. It is further desired that those actions necessary to upgrade the water quality be immediately initiated. Only when these tasks are accomplished can the Puget Sound region enjoy an oil pollution free environment in the future. These efforts require the coordinated efforts of all responsible and capable parties. It is also hoped, as a residual benefit, that the gap between the various industrial and social standards of water quality be narrowed, and ultimately eliminated.

ENDNOTES SECTION 1

¹Legislative Digest and History of Bills of Senate and House of Representatives for Washington State, 39th Session, 1965.

²For the first half of the 1971 legislative session, fifteen bills had been introduced on pollution of water, of which six were addressed to the oil pollution problem. Source: Legislative Digest and History of Bills of Senate and House of Representatives for Washington State, 42nd session, 1971.

³An example is the extensive multi-volume study on Puget Sound and adjacent waters, published by the Puget Sound Task Force.

⁴"U.S. Energy Demands & Supply - 1960 to 1985", Ocean Industry, June, 1971, p. 15.

⁵Data provided by Commander Greiner, Jr., 13th Coast Guard District.

⁶A letter dated July 20, 1971, from Mr. G. Moeins of the Division of Oil and Hazardous Materials, EPA to the editor of this report, indicated that records of U.S. oil spills are stored on computers for that agency's internal use.

⁷The Torrey Canyon spill occurred March 18, 1967 off Lands End, England. The Intergovernmental Marine Consultative Organization (IMCO) published its resolutions for oil spill prevention in 1968 and 1969; the U.S. formulated its national Multi-agency Contingency Plan in November, 1968.

⁸18 C.F.R., Chapter V, Section 610.3.

⁹Numerous questions and answer sessions at the Oil Spill Conference sponsored by API, Washington D.C., June 15-17, 1971.

¹⁰Seattle Coastal Region, Oil and Hazardous Materials Pollution Contingency Plan, U.S. Coast Guard, dated December 1, 1970.

¹¹Laws and Oil Spill Emergency Procedure, Department of Ecology.

¹²A major spill for Puget Sound, as defined by U.S. Coast Guard, is one where more than 10,000 gallons are discharged.

¹³Union Oil platform blowout, Santa Barbara Channel, January 28, 1969.

¹⁴Collision of Arizona Standard and Oregon Standard tankers in San Francisco Bay, January 18, 1971.

¹⁵United Transportation barge leak at Texaco dock, March Point, Anacortes, April 26, 1971, during transfer of diesel fuel.

¹⁶Washington Oil Spill Cooperative.

17 Marine Oil Pickup Service, a joint venture between Puget Sound Tug and Barge and Pac-Mar Services, Inc.

18 "Stations Seattle Pollution Report #043-71", by C. M. Stone, LTJG, U.S. Coast Guard, Captain of the Port of Seattle, Washington, Enclosure (1), p. 60.

19 Control, as used in this report, is the containment and cleanup of spilled oil.

20 Baseline is defined as a starting point. With respect to resources, this means detailed knowledge of what exists (quantity and state) under nominal conditions.

21 Docket No. DE 71-141, In the Matter of Assessment of Penalty Against United Transportation Company, June 17, 1971.

22 U.S. District Court, Western District of Washington, No. 9779, Complaint for Injunction, Environmental Clean-up Expenses and Penalty for Unlawful Discharge, June 24, 1970.

23 Dolan, Savage, and Clark, Environmental Statement on the Proposed Leasing of Puget Sound Shorelines and Beds of Navigable Waters for Oil and Gas Exploration, 1970.

24 Chemical Processors, 5501 Airport Way South, Seattle.

25 Oil Spill Control Survey for Onshore and Offshore Facilities, American Petroleum Institute, March, 1970. Report No. 4023, Section V, Tables 5, 6, 7.

26 In a conversation on November 12, 1971 with Mr. John C. Doolittle of the Washington State Oil Spill Cooperative, the following information was obtained:

"In the last quarter of 1971 the Washington State Oil Spill Cooperative (WSOSC) has progressed toward their intended goal. They have committed \$100,000 toward the purchase of 1000 feet of off-shore Bennett boom and a 40-foot long Huskey SBG floating skimmer. This equipment is to be stored in the Port of Bellingham with the skimmer arriving in early November and the boom in late December. The Coop has also retained for three months a technical and managerial advisor/coordinator to provide the WSOSC membership with a three year illustrative budget and to draft an oil spill response plan. The contingency plan draft will be completed by late December. The Coop is currently considering hiring a full time manager to formalize the organizational plans currently being developed and to coordinate the activities in the oil spill response plan."