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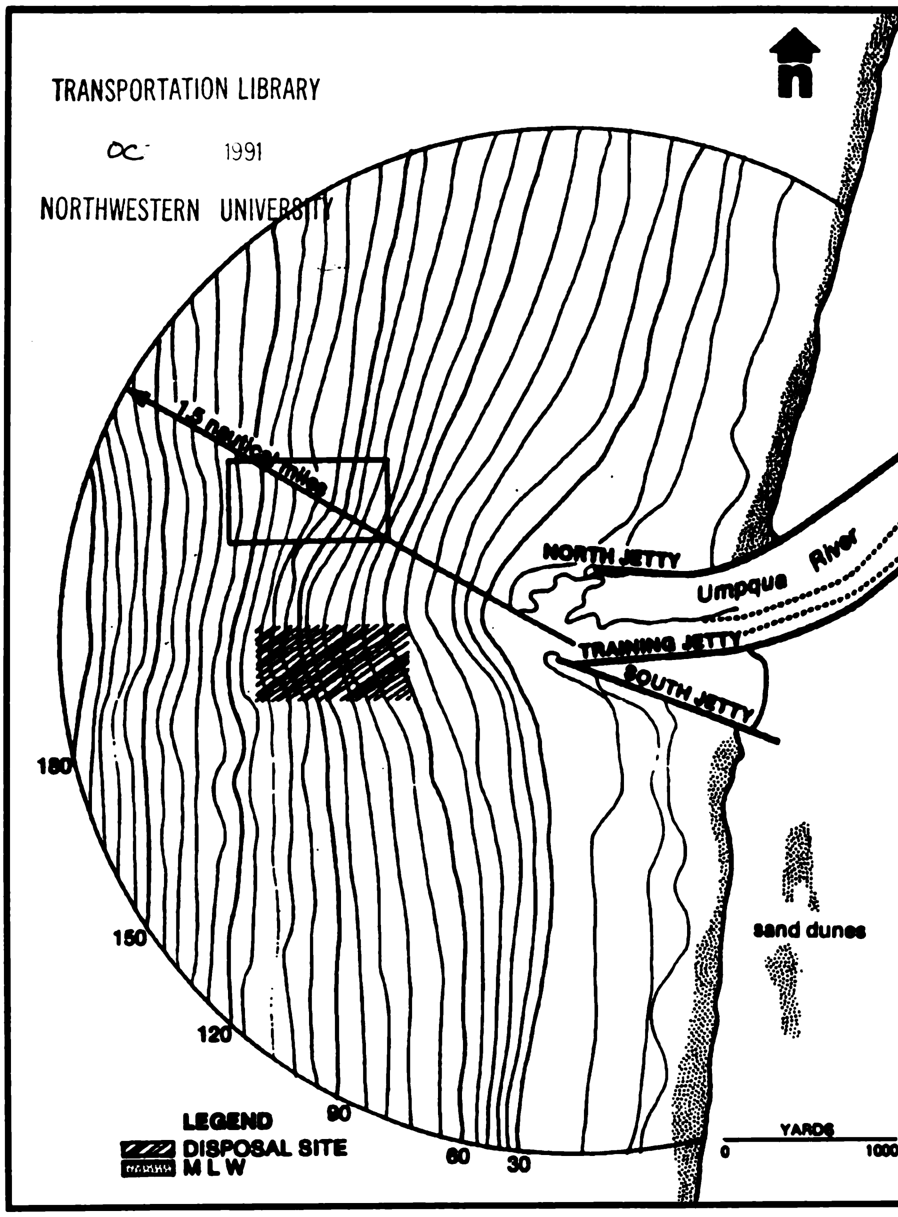
Environmental Protection Agency	1200 Sixth Avenue Seattle WA 98101	Oregon Washington
Water Division	Water Resources Assessment	August 1991

Umpqua, Oregon Dredged Material Disposal Site Designation

Draft Environmental Impact Statement



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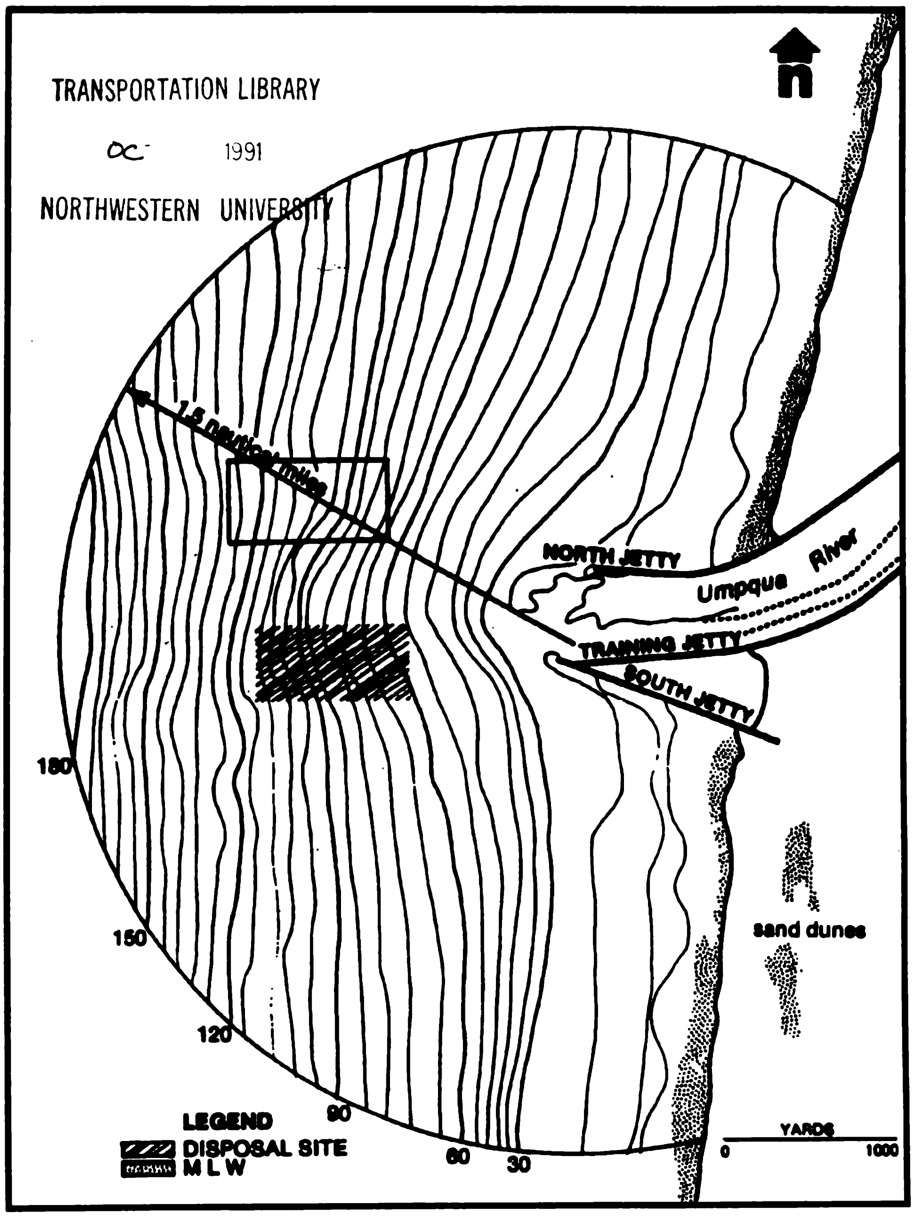

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

UMPQUA OCEAN DREDGED MATERIAL DISPOSAL SITE (ODMDS) DESIGNATION

Prepared by

U.S. ENVIRONMENTAL PROTECTION AGENCY (Region 10)

With Technical Assistance From

U.S. Army, Corps of Engineers
Portland District

August 1991

COVER SHEET

Draft

ENVIRONMENTAL IMPACT STATEMENT

UMPQUA OCEAN DREDGED MATERIAL DISPOSAL SITE (ODMDS) DESIGNATION

Lead Agency: U. S. Environmental Protection Agency, Region 10

Responsible Official: Dana Rasmussen
Regional Administrator
Environmental Protection Agency
1200 Sixth Avenue
Seattle, WA 98101

Abstract:

This draft EIS provides information to support designation of an ocean dredged material disposal site (ODMDS) in the Pacific Ocean off the mouth of the Umpqua River in the State of Oregon. The proposed ODMDS is an adjusted site lying north of the present interim site. Both interim and adjusted ODMDS are located approximately one nautical mile west of the mouth of the Umpqua River Entrance. Site designation studies were conducted by the Portland District, Corps of Engineers, in consultation with Region 10 EPA. Realignment of the approach channel to the estuary placed it directly over the interim site. An adjusted site was identified to avoid navigational conflicts. Designation will allow continued deposition of sediments dredged by the Corps of Engineers to maintain the federally-authorized navigation project at the Umpqua River, Oregon and other dredged materials authorized in accordance with Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA). No significant or long-term adverse environmental effects are predicted to result from the designation. Designation of an ODMDS does not constitute or imply approval of an actual disposal of material. Before any disposal may occur, a specific evaluation by the Corps must be made using EPA's ocean dumping criteria. EPA makes an independent evaluation of the proposal and has the right to disapprove the actual disposal.

Public Review and Comment Process:

This EIS is offered for review and comment to members of the public, special interest groups, and government agencies. No public hearings/meetings are scheduled. Comments received on this draft EIS will be addressed in the final. All comments or questions may be directed to:

John Malek   Telephone: (206) 553-1286
Dredging and Ocean Dumping Specialist
Environmental Protection Agency
1200 Sixth Avenue, WD-128
Seattle, WA 98101

Deadline for Comments:

EXECUTIVE SUMMARY

Site Designation. Section 102 (c) of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended, 33 U.S.C. 1401 et seq. (MPRSA), gives the Administrator of the U. S. Environmental Protection Agency the authority to designate sites where ocean dumping may be permitted. On October 1, 1986, the Administrator delegated the authority to designate ocean dumping sites to the Regional Administrator of the Region in which the site is located. EPA has voluntarily committed to prepare EISs in connection with ocean dumping site designations (39 FR 16186, May 7, 1974).

This draft Environmental Impact Statement (EIS) was prepared by Region 10, EPA, with the cooperation of the Portland District, U. S. Army Corps of Engineers. This draft EIS provides documentation to support final designation of an ocean dredged material disposal site (ODMDS) for continuing use to be located off the mouth of the Umpqua River, Oregon. This document evaluates the interim and an adjusted ODMDS based on criteria and factors set forth in 40 CFR 228.5 and 228.6. This EIS makes full use of existing information to discuss various criteria, supplemented by field data to describe environmental conditions within and adjacent to the site.

As a separate but concurrent action, EPA will publish a proposed rule in the **Federal Register** for formal designation of the adjusted Umpqua ODMDS.

Major Conclusions and Findings. The preferred ODMDS for final designation is a location approximately one nautical miles west from the Umpqua River Entrance. When designated, the ODMDS will be used for continued disposal of sediments dredged by the Corps to maintain the federally authorized navigation project at Umpqua River, Oregon and for disposal of other dredged materials authorized in accordance with Section 103 of the MPRSA. The adjusted ODMDS proposed for designation is more suitably located than the interim site in terms of navigational safety considerations.

Disposal of the dredged sediments is a necessary component of maintaining the navigation project. An evaluation of disposal alternatives was conducted. No less environmentally damaging, economically feasible alternative to ocean disposal for material dredged from the entrance to the Umpqua River projects was identified. In addition, use of ocean disposal by other dredgers may be expected to increase as other disposal options are exhausted. Designation of an ODMDS is necessary to accommodate this need.

Three alternatives for ocean disposal were considered for the Umpquae ODMDS:

1) Termination of ocean disposal at Umpqua;
2) Designation of the existing interim ODMDS; and
3) Designation of an adjusted ODMDS.

Based on the evaluation of need and an assessment of environmental impacts from historic dredged material disposal, termination of ocean disposal at Umpqua was not considered prudent or reasonable. Evaluation focussed on the existing interim ODMDS, an adjusted ODMDS, and consideration of an ODMDS beyond the continental shelf. The procedures used to evaluate the ODMDS consisted of evaluating each of the five general and eleven specific criteria in 40 CFR 228.5 and 228.6. Use of an ODMDS beyond the continental shelf provided no environmental advantages and incurred significant economic costs.

The interim site, or areas in the same vicinity, have been used by Portland District since 1924. To date, over 14.5 million cubic yards (cy) have been disposed at sea, over 3.5 million cy of which have been disposed in the interim ODMDS. The site received its interim designation from EPA in 1977 (40 CFR 228.12). It was entitled "Umpqua River Entrance" and was given the following corner coordinates (NAD 83):

43° 40' 06" N	124° 14' 22" W
43° 40' 06" N	124° 13' 46" W
43° 39' 52" N	124° 13' 46" W
43° 39' 52" N	124° 14' 22" W

The approximate location of this site is one nautical mile from the Umpqua River entrance, with dimensions of 3600 feet by 1400 feet and an average depth of 90 feet. The site occupies approximately 116 acres.

The U.S. Coast Guard raised some concern with the location of the interim site with respect to the marked approach channel. The approach channel was re-aligned in response to changes made in the entrance jetties in 1982. As a result, the approach channel became aligned directly over the interim ODMDS. Potential conflicts could occur between the dredge or tug-and-barge activity and local ships during disposal. Additionally, navigational problems could develop if mounding were to occur at the interim disposal site. As a result, an adjusted location was defined and is proposed for final designation. It has the following coordinates (NAD 83):

43° 40' 34" N.,	124° 14' 26" W.,
43° 40' 34" N.,	124° 13' 50" W.,
43° 40' 20" N.,	124° 13' 50" W.,
and 43° 40' 20" N.,	124° 14' 26" W.

The adjusted site is located 2,800 feet to the north of the interim site in slightly deeper water, with an average depth of 105 feet. Its dimensions are identical to the interim site, occupying approximately 116 acres.

After applying the five general and eleven specific criteria, designation of the interim adjusted Umpqua ODMDS was selected as the preferred action. Continued use of the interim ODMDS has the potential for serious conflicts with navigation although it would not be expected to cause unacceptable environmental effects. The adjusted ODMDS avoids the navigation conflicts and is therefore considered to be the better site.

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

This draft Environmental Impact Statement (DEIS) was prepared by Region 10, U. S. Environmental Protection Agency (EPA), with the cooperation of the Portland District, U.S. Army Corps of Engineers (Corps). Section 102 (c) of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended, 33 U.S.C. 1401 *et seq.* (MPRSA), gives the Administrator of the EPA the authority to designate sites where ocean dumping may be permitted. On October 1, 1986, the Administer delegated the authority to designate ocean dumping sites to the Regional Administrator of the Region in which the site is located. EPA has voluntarily committed to prepare EISs in connection with ocean dumping site designations (39 FR 16186, May 7, 1974).

Disposal site studies were designed and conducted by the Corps, in consultation with EPA, and the *Umpqua Ocean Dredged Material Disposal Site Evaluation Report* (1989) was prepared and coordinated by the Corps. The final Site Evaluation Report described conditions in the vicinity of the interim and proposed for designation ocean dredged material disposal site (ODMDS) at Umpqua River, Oregon. The existing interim ODMDS at Umpqua received its interim designation from EPA in 1977 (40 CFR 228.12). The MPRSA requires that, for a site to receive a final ODMDS designation, the site must satisfy the general and specific disposal site criteria set forth in 40 CFR 228.6 and 228.5. The Corps Report recommended that a adjusted ODMDS be designated by EPA instead of the existing interim ODMDS due to potentially serious conflicts with navigation. The report also documented compliance of the interim and adjusted ODMDS with requirements of the following laws:

Endangered Species Act of 1973,
National Historic Preservation Act of 1966, and the
Coastal Zone Management Act of 1972, all as amended.

That document was submitted to EPA for review and processing for formal designation by the Regional Administrator, Region 10. The Corps' Site Evaluation Report was used as the basis of the draft EIS. Technical Appendices from the Corps' report are included in this draft EIS.

II. PURPOSE AND NEED

General. This draft EIS provides documentation to support final designation of an adjusted ocean dredged material disposal site (ODMDS) for continuing use to be located off the mouth of the Umpqua River, Oregon. The currently interim-designated ODMDS would be dedesignated. This document evaluates the adjusted and interim Umpqua ODMDS based on criteria and factors set forth in 40 CFR 228.5 and 228.6 as required by the Ocean Dumping Regulations (ODR) promulgated in the **Federal Register** on January 11, 1977, in accordance with provisions set forth in Sections 102 and 103 of the MPRSA. This EIS makes full use of existing information to discuss various criteria, supplemented by field data to describe environmental conditions within and adjacent to the site.

The preferred ODMDS for final designation is an adjusted ODMDS north of the existing interim site. Both sites are located one nautical mile (nmi.) west of the mouth of the Umpqua River. The adjusted site, when designated as the final ODMDS, will be used for continuing disposal of materials dredged by the Corps of Engineers to maintain the federally authorized navigation projects at the Umpqua River, Oregon, and for disposal of dredged materials authorized in accordance with Section 103 of MPRSA. The adjusted site proposed for designation is located in the area best suited for dredged material disposal in terms of environmental and navigational safety factors.

Location. The Umpqua River enters the Pacific Ocean near the town of Reedsport, Oregon, approximately 180 miles south of the Columbia River (Figure 1). The river constitutes a navigable approach to Winchester Bay, Reedsport and Gardiner. The Umpqua River has the third largest drainage basin on the Oregon coast after the Rogue River and Columbia, and has the fourth largest estuary, covering 6,430 acres. The estuary is fed by two rivers, the Umpqua and the smaller Smith. The watershed encompasses part of the Coast Range, with the Umpqua River extending into the Cascades. The estuary is fed mainly by the Umpqua River, which drains 4,560 square miles.

Need. The Corps is responsible for the Umpqua River project which is authorized for the following purposes:

- To decrease waiting times for vessels crossing the bar;
- To provide a protected entrance for tugs, barges and commercial fishing vessels;
- To provide mooring facilities for small boats which take advantage of project facilities;
- To permit barge and small boat traffic upstream to river mile 11.7; and
- To provide a harbor of refuge.

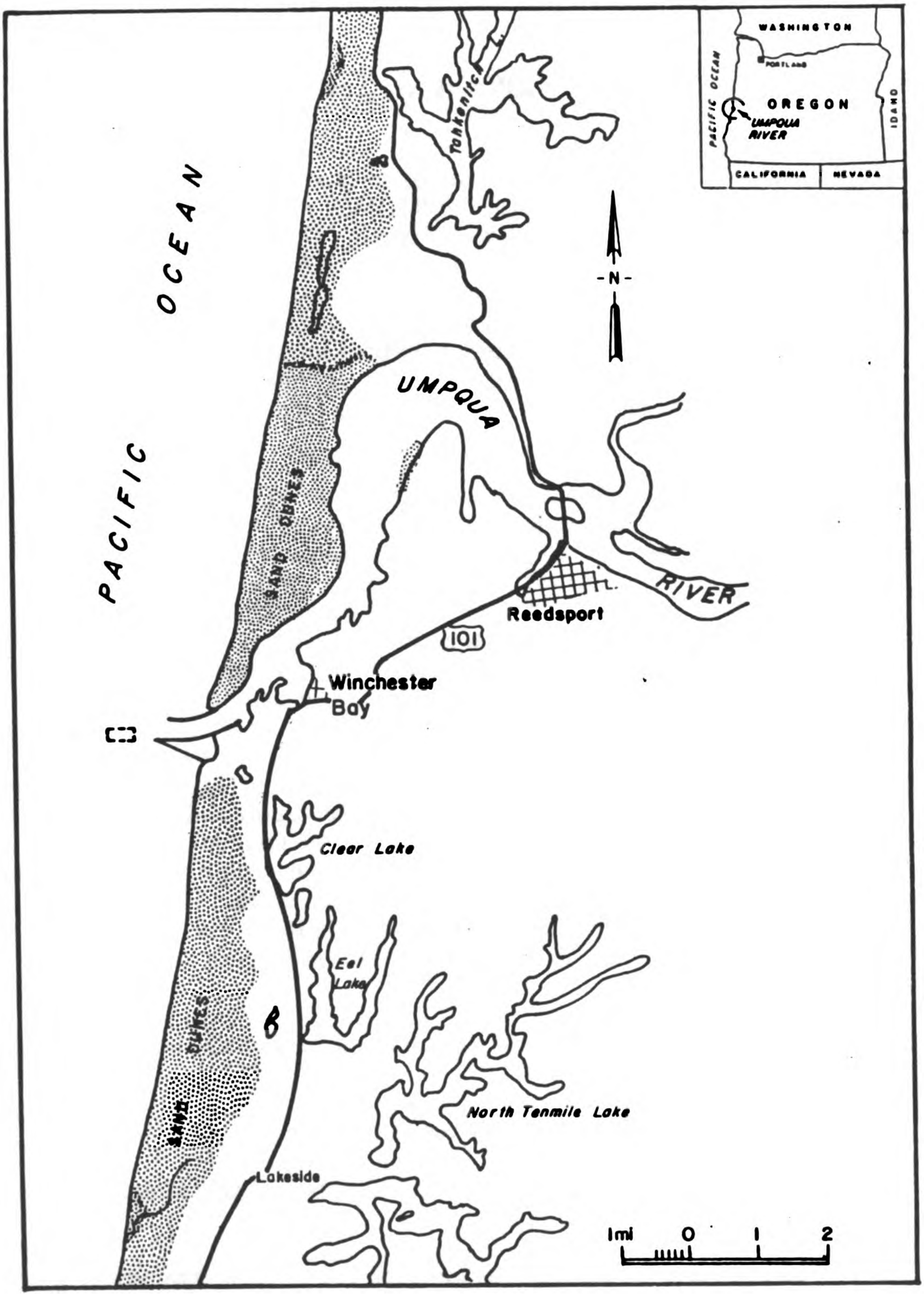

Figure 1
General Location of Umpqua River

Maintenance of the navigation channel to authorized depths is critical to keeping the river and harbor open and sustaining these vital components of the local and state economy. Portions of the authorized project considered in this report are:

- An entrance channel 26 feet deep and 400 feet wide.

- A river channel 22 feet deep and 200 feet wide to RM 11.0.

- A turning basin 22 feet deep, 600 feet wide, and 1000 feet long at Reedsport.

- A side channel 22 feet deep and 200 feet wide from the main channel at RM 8 to a turning basin 22 feet deep, 500 feet wide and 800 feet long at Gardiner.

- The Winchester Bay project, which includes a channel 16 feet deep, 100 feet wide and 3,100 feet long; a turning basin 12 feet deep, 175 ft wide and 300 feet long; an east boat channel, 16 feet deep, 100 feet wide, and 500 feet long, then 12 feet deep, 75 feet wide and 950 feet long; and a west boat channel 16 feet deep, 100 feet wide by 4300 feet long.

Disposal of dredged sediments is a necessary component of maintaining the authorized project. An evaluation of disposal alternatives was conducted and is contained in Section III Alternatives. No less environmentally damaging, economically feasible alternative to ocean disposal for material dredged from the entrance to the Rogue River was identified. In addition, use of ocean disposal by other dredgers may be expected as other disposal options are exhausted. Designation of an ODMDS is necessary to accommodate this need.

Project History. Navigation on the Umpqua obtained early importance because of the gold rush in southern Oregon during the 1850's. Channel improvements began in 1871. Due to navigational problems caused by strong rotary currents within the mouth of the Umpqua, construction of an 8,000 foot north jetty was authorized in 1922, with construction of a south jetty being authorized in 1930. Subsequent dredging began in 1924. In 1980, a training jetty was completed on the south side of the channel. Also, to take advantage of the deep water off the south jetty and reduce maintenance, the entrance to the channel was realigned to the south in 1982. Besides the jetties, the presently authorized project includes entrance channels and turning basins.

Since 1924, over 14.5 million cubic yards (cy) have been disposed at sea with over 3.5 million cubic yards disposed in the designated offshore site. Between 1968 and 1988 annual disposal has averaged 147,349 cy, with a maximum of 313,632 cy and a minimum of 500 cy. Dredging that contributes to offshore disposal is done to maintain the entrance channel 26 ft deep and 400 ft wide. Maintenance of the areas have been via hopper dredge. Shoaling occurs between the jetties from river mile (RM) -0.5 to about -0.8, and outside the jetties at about mile -1.2. The training jetty built on the south side of the channel in 1980 is intended to alleviate the shoaling between the jetties.

In-water disposal sites have been used within the estuary at river miles (RM) 8.9, 6.8, 5.0, 3.1, 1.6, and 0.8. For the period 1968-1988, an estimated annual average of 312,000 cy was disposed in these estuarine sites. Actually, because of potential environmental conflicts, in-water disposal within the estuary has been limited, with an annual average disposal of 180,000 cy in the estuary during the last 5 years.

Historical ODMDS Use. The interim site, or areas in the same vicinity, have been used by Portland District since 1924. The interim site was designated an interim site by EPA in 40 CFR 228.12. The site designations in 1977 were an attempt by EPA to document and establish coordinates for historically used Corps of Engineers disposal sites. Interim designations are to lead to final designations or termination of their use, pending completion of required studies for final designation. This study will report on these requirements and request final site designation for an adjusted site from EPA.

The site designated interim in 40 CFR 228.12 was entitled, "Umpqua River Entrance" and has the following coordinates:

43° 40' 06" N.,	124° 14' 22" W.,
43° 40' 06" N.,	124° 13' 46" W.,
43° 40' 52" N.,	124° 13' 46" W., and
43° 40' 52" N.,	124° 14' 22" W.

The approximate location of this site is one mile from the Umpqua River entrance, with dimensions of 3600 feet by 1400 feet and an average depth of 90 feet.

The U.S. Coast Guard raised some concern with the location of the interim site with respect to the marked approach channel. When the approach channel was re-aligned in 1982, in response to changes in the entrance jetties, the approach channel became aligned directly over the interim ODMDS. Conflicts could occur between the dredge or tug-and-barge operation and local ships during disposal activities. Additionally, navigational safety could be impaired if mounding developed at the interim site. Based on these concerns, data and information within the ZSF were reviewd and another potential site located 2,800 feet to the north of the interim site. This adjusted site is located in slightly deeper water, with an average depth of 105 feet. The coordinates of the adjusted site are (NAD 83):

43° 40' 34" N.,	124° 14' 26" W.,
43° 40' 34" N.,	124° 13' 50" W.,
43° 40' 20" N.,	124° 13' 50" W., and
43° 40' 20" N.,	124° 14' 26" W.

The dimensions of the adjusted site are the same as the original interim site, 3,600 feet by 1,400 feet, also occupying 116 acres. This adjusted site is recommended for final designation.

III. ALTERNATIVES

General. Under the MPRSA, designation of ocean dumping sites follow specific requirements. In conjunction with the MPRSA, the Ocean Dumping Regulations, as well as related EPA and Corps of Engineers policies, must be followed. Guidance for the evaluation process has been provided by the joint EPA/Corps workbook (1984). This process generally involved three major phases. Phase I includes delineation of the general area or Zone of Siting Feasibility (ZSF), i.e., disposal is economically and technically feasible. The ZSF is determined by establishing the reasonable haul distance, considering factors such as available dredging equipment, energy use constraints, costs, and safety concerns. Existing information on resources, uses, and environmental concerns are reviewed and critical resources and areas of incompatibility identified. Phase II involves identification of candidate sites within the ZSF based on information evaluated in Phase I. Additional studies can be conducted to further evaluate environmental and other factors, such as disposal site management considerations. Phase III consists of evaluation of candidate sites and selection of preferred site(s) for formal designation by EPA. Preparation of this EIS and the designation rule is part of Phase III (Figure 2).

Definition of the Zone of Siting Feasibility (ZSF). Dredging of the coastal ports is limited to a season from April through October. That limit is imposed by the weather and sea conditions that predominate in the Northwest. The rough seas and storms create unsafe conditions for dredges and tug-barge combinations outside the relatively sheltered estuaries. As previously noted, dredged material disposal at in-water estuarine sites has occurred in the past. However, recognition of the importance of these habitats and historic, often wholesale, alteration of estuarine habitats has severely limited such disposal.

The size of the ZSF is controlled by the capability of available dredging equipment as allocated among the nine Oregon, one Washington, and four California coastal projects, and the hauling distance from the dredging site. The limited operating time available for completing the maintenance dredging along the Oregon coast, therefore, requires a combination of government and private dredges which operate on the Pacific coast. At Umpqua, most of the maintenance dredging is done with government-owned dredges. Portland District is limited by congressional action on the number of days which it can operate the government-owned dredges. Currently, 230 days are authorized each year and must be allocated between most of the West Coast ports. This allocation will vary each year depending on how much shoaling is incurred by each port.

An analysis was done of the availability of dredging work on the West Coast and of contractor dredges available. Given the relatively small volumes of material to be dredged annually at Umpqua (in comparison to other, larger jobs) it is unlikely that more than two pieces of contractor equipment would be available in any given year for this project. Often there may not be any contractor-owned equipment available during the "dredge season" permitted by favorable weather and sea conditions.

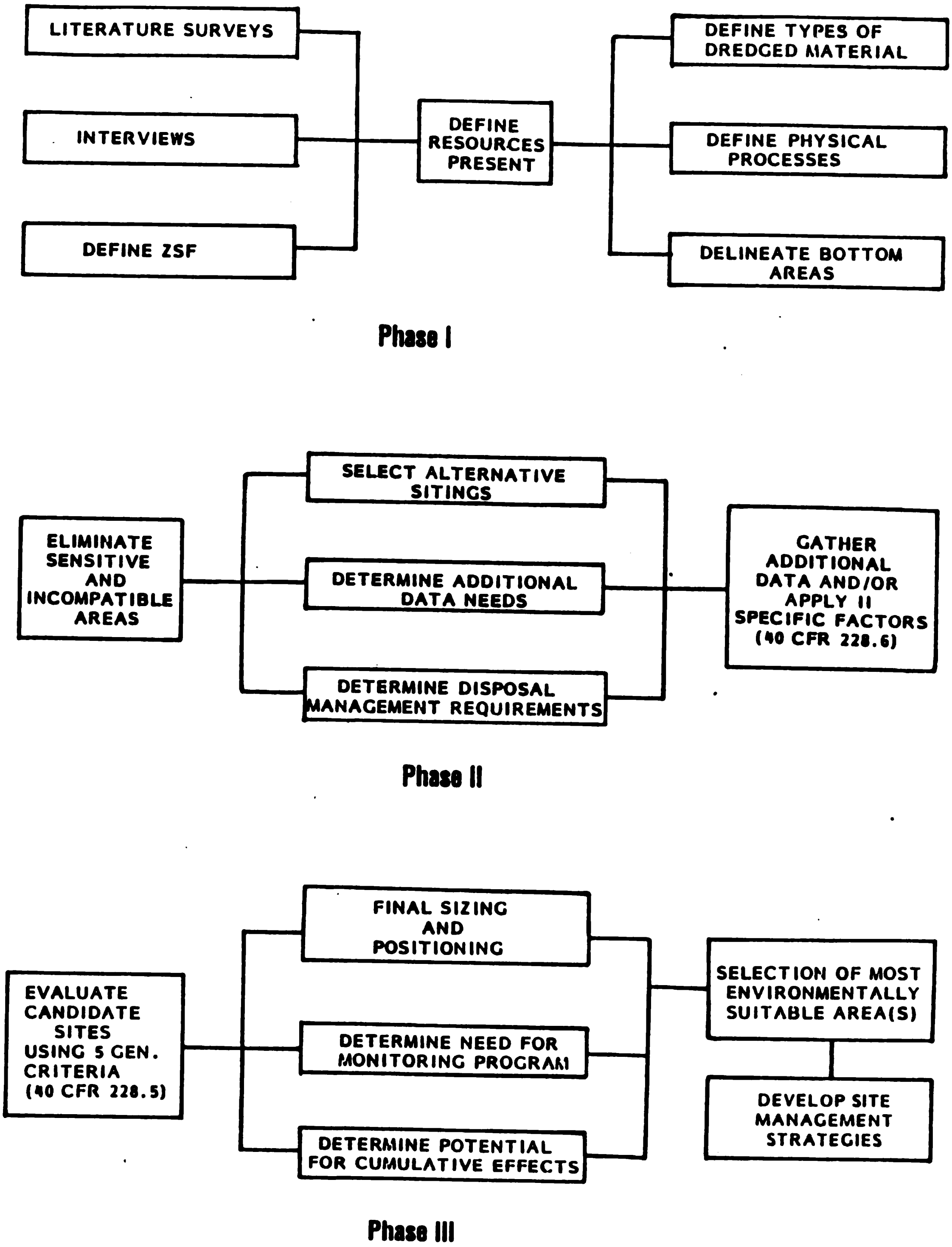

Figure 2
Overall Process for ODMDS Evaluation

Based on these factors, the Corps developed a practical ZSF for the Umpqua projects of 1.5 nmi. In a typical year, the Umpqua project requires production of about 20,000 cy per day to complete maintenance dredging within the time allocated. The Corps' dredge, *Yaquina*, can achieve this production provided the haul distance is no greater than 1.5 nmi. Longer hauling distances of dredged material increase vessel operating costs and reduce production, thereby increasing the time required for completion of the work. Loss of production time due to adverse weather conditions must also be anticipated.

Resource Considerations. The natural and cultural resources of the area within the ZSF were identified from information obtained through review of literature, interviews with resource agencies and local users, and through site-specific studies (appendix A). Critical information was evaluated and mapped to identify areas of resource conflict. The selection of resources to use for this determination was dependent on whether the resource was considered limited. A coast-wide resource, i.e., a flatfish spawning area, was not considered a limited resource and was not included in the overlay evaluation technique.

Equipment Considerations. For much of the Corps maintenance work, a hopper dredge must be used because the sea conditions encountered at the entrance are not suitable for safe operation of a pipeline dredge. In recent years, use of mechanical dredges in combination with ocean-going tugs and barges has increased. This has somewhat enhanced flexibility for scheduling of dredging activities along the Pacific coast; however, limited availability of equipment, as explained above, remains a controlling factor.

With both a hopper dredge or barge, dredged material disposal would normally occur at an in-water site. There are sites in the estuary that have been used in the past for disposal of dredged material (i.e., in-water sites at RM 8.9, 6.8, 5.0, 3.1, and 0.8). Dependance on estuarine sites is discouraged by EPA and other resource agencies because disposal inside the estuary carries greater risk of adverse environmental impacts. Estuarine habitats are generally more productive and far less extensive than are nearshore oceanic habitats. Disposal of the material inside the estuary would also increase the risk of the material eroding and reshoaling in the channel, potentially increasing dredging requirements.

Consideration of Upland Disposal Options. Upland disposal of entrance channel material typically is not feasible for economic and environmental reasons. Upland sites with large capacities seldom exist at such locations. More distant upland sites incur substantially greater costs for rehandling and transportation of the material, and alteration of the sites normally involves some environmental impacts. Pipeline dredging of entrance reaches is usually unsafe. Because of the use of hopper dredges or clamshell dredge and barge, it would be necessary to rehandle materials to use upland sites. Creation of an in-water sump in the estuary would require one be dredged and material bottom-dumped into it, then pumped ashore with a pipeline suction dredge. Creation of a upland dewatering and rehandling area also may be necessary which could further alter marine or estuarine habitats. This would be very costly and also would increase adverse environmental impacts of the project. Another adverse impact of upland disposal is that naturally occurring sediments would be removed from the littoral system and could cause erosion of nearby shorelines over the long term.

The local sponsor for the Umpqua project has not been able to identify any upland disposal options at this time; although beneficial uses of the dredged material is currently under investigation. The project is bordered on both sides by the Oregon Dunes NRA and county parks.

Ocean Disposal Options. Three alternatives for ocean disposal were considered for the Umpqua ODMDS:

(1) Termination of ocean disposal at Umpqua;
(2) Designation of the existing interim ODMDS; and
(3) Designation of an adjusted ODMDS.

Based on the evaluation of need and an assessment of environmental impacts from historic dredged material disposal, termination of ocean disposal at Umpqua is not considered prudent or reasonable. The need for the navigation project is not at issue and is beyond the scope of this evaluation. Termination of ocean disposal would be considered if the activity were causing significant unacceptable adverse effects. In evaluation of previous disposal activities, no significant adverse effects were noted. Accordingly, evaluation focussed on the existing interim ODMDS and an adjusted ODMDS, and consideration of an ODMDS beyond the continental shelf. The procedures used to evaluate these options consisted of evaluating each of the five general and eleven specific criteria as required in 40 CFR 228.5 and 228.6.

Application of General Criteria. The proposed disposal site has been evaluated in terms of the following general criteria (Table 1).

Table 1
General Criteria for the Selection of Ocean Disposal Sites

The dumping of material into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation.

Locations and boundaries of disposal sites will be chosen so that temporary perturbations in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.

If at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet criteria for site selection set forth in Sections 228.5 - 228.6, the use of such sites will be terminated as soon as suitable alternative disposal sites can be designated.

The sizes of ocean disposal sites will be limited in order to localize, for identification and control, any immediate adverse impacts and to permit the implementation of effective monitoring and surveillance programs to prevent adverse, long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation study.

EPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.

Minimal Interference with Other Activities. The first of the five criteria requires that a determination be made as to whether the site will minimize interference of the proposed disposal operations with other uses of the marine environment. This determination was made by overlaying several individual maps presented in the Technical Appendices onto a base map, giving bathymetry and location of the interim and adjusted disposal sites and the ZSF. The following figures were selected to be included in the evaluation of resources of limited distribution.

- Navigation Hazards Area/Other Recreation Areas
- Shellfish Areas
- Critical Aquatic Resources
- Commercial and Sport Fishing Areas
- Geological Features
- Cultural and Historical Areas

Figure 3 is a composite of all of the above areas and indicates by various patterns, the relative amount of total usage within the ZSF. As the figure shows, the interim site is located over the approach channel where disposal activities would conflict with navigation. The adjusted site lies within a minimal conflict area. Disposal operations occur from May through October of each year. Ordinarily disruption of navigation would be considered more of an inconvenience than a major conflict. Disposals from hopper dredges or barges are not continuous operations. At Umpqua, however, the jetties extend to within 850 feet of the interim site, severely constraining maneuvering room. Additionally, the hazards associated with wave refraction should mounds develop at this location are potentially extreme, especially for small craft. Bathymetric surveys in 1988 showed some mounding which may be attributable to the above average volumes disposed that dredging year and the mild wave climate experienced during the winter of 1987-88. Past surveys had not shown any mounding. However, prudent management argue that disposal patterns be changed or that the site be relocated. Commercial and recreational salmon fishing occurs in the area of the interim and adjusted ODMDS. These activities are not limited, occurring over a wide nearshore area. Disposal operations and the salmon fishing season do overlap, however, communications with ODFW personnel (Appendix A) indicate no observable conflicts between the two uses. Appendix A provides a discussion of all potential conflicts within the ZSF with living resources, and concludes that there have been no major conflicts in the past or predictable conflicts in the future.

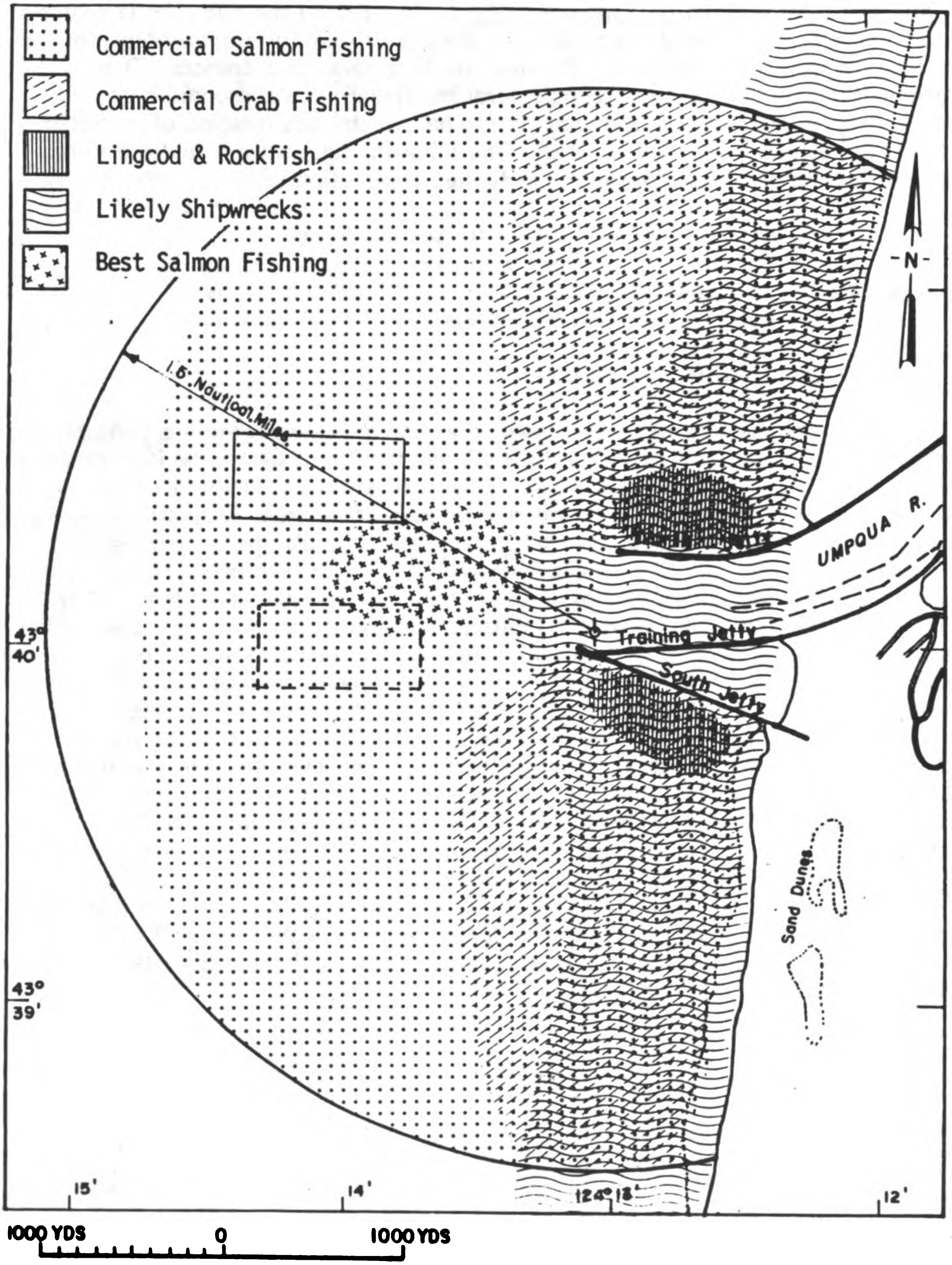

Figure 3
Overlay Evaluation of Individual Resources in ZSF

Minimizes Changes in Water Quality. The second of the five general criteria requires that changes to ambient seawater quality levels occurring outside the disposal site be within water quality standards and that no detectable contaminants reach beaches, shorelines, sanctuaries, or geographically-limited fisheries or shellfisheries. The nature of material has already been discussed; no contaminants or suspended solids are expected to be released. Accordingly, there should be no water quality perturbations that might move toward a limited resource. Bottom movement of deposited material is discussed in Appendix B and, in general, shows a net offshore movement of the finer fractions. The coarser material appears to remain in the general area where deposited.

Interim Sites Which Do Not Meet Criteria. Evaluation by the Corps and EPA indicates that the adjusted site would meet the criteria and factors established in 40 CFR 228.5 and 228.6. A arguable exception is that the site is not located off of the continental shelf. Because of the realignment of the approach channel, the interim ODMDS is considered to not meet the criteria and factors due to potential navigation hazard. Adjustment of the site out of the navigation lane is a prudent measure. No reported problems or complaints have been received by the Corps or EPA on use of the interim site. Because of their proximity, both sites are considered environmentally acceptable for the types and quantities of dredged material that have historically been discharged. (See evaluation of Sites off the Continental Shelf following.)

Size of Sites. The fourth general criterion requires that the size, configuration and location of the site be evaluated as part of the study. The adjusted site, which is proposed for designation, is 3600 feet long by 1400 feet wide, occupying an area of approximately 116 acres. It is similar in areal size to other Oregon ODMDS sites and is of identical size to the interim site which it would replace. Both the interim and adjusted disposal sites are dispersive. Although volumes of material going to Oregon ODMDS are expected to increase slightly in the future as alternative disposal options are exhausted, this increase is not expected to seriously impact site capacity or resources outside the ODMDS. All Oregon ODMDS are jointly managed and periodically monitored by the Corps and EPA. Public notices issued for ocean disposal operations, as required by MPRSA, have not generated concerns about significant impacts from their use. Also, no comments have been received about the size, shape, or location of the interim disposal sites. The Umpqua adjusted site is located close enough to shore and harbor facilities that monitoring and surveillance programs, as required, can easily be accomplished.

Sites off the Continental Shelf. Potential disposal areas located off the continental shelf in the Umpqua River area would be at least 15 nmi. offshore, in water depths of 600 feet or greater. The haul distance to any potential site beyond the shelf is much greater than the 1.5 nmi. limit of the Umpqua ZSF, making the project economically infeasible. While there may be some flexibility in operations that could increase the haul distance somewhat, the minimum 15 nmi. haul to utilize a continental slope disposal site is economically prohibitive. Further, significant environmental concerns about disposal in such areas make off-shelf disposal questionable.

The purpose of the off-continental shelf site preference is to minimize environmental impacts from ocean dumping. In this instance, evaluation of historic ocean dumping of dredged material at the interim site does not reveal actual or potential resource conflicts or unacceptable adverse environmental effects due to ocean dumping that would argue for use of another site. Disposal into the deeper water far offshore would remove large quantities of natural sediments from the nearshore littoral transport system, a system that functions with largely non-renewable quantities of sand in Oregon. Disruption of this system's mass balance could alter erosion/accretion patterns, adversely impacting beaches, spits, wetlands, and other shoreline habitats.

Benthic and pelagic ecosystems near the shelf contain important fishery resources and processes effecting them are not well understood. Fine grain sediment and rocky habitats would be directly covered in disposal operations. Lower density silt/clay and organic components of sediments could remain suspended in density layers of the pycnocline, with potential transport inshore and to the surface in seasonal upwelling events. Deposited sediments could be transported long distances downslope. Bottom gradients can be 5 percent to 25 percent on the continental slope, making accumulated unconsolidated sediments susceptible to slumping. Also, offshore transport by nearbottom currents could occur.

Designation of a site beyond the shelf would require extensive seasonal site characterization studies and monitoring to understand the system and evaluate disposal impacts. Distance offshore and depth of required sampling would add further to the time and expense of such a program.

In summary, use of an ODMDS off the continental shelf did not offer any environmental advantages over a site located closer to the shore but did involve substantially greater economic disadvantages.

Application of Specific Criteria. The interim and adjusted ODMDS were evaluated in terms of the following specific criteria (Table 2). The discussions of each criterium which follow are analytic in nature, as each is evauated in detail in the technical appendixes.

Table 2
Eleven Specific Factors for Ocean Disposal Site Selection

Geographical position, depth of water, bottom topography, and distance from coast.

Location in relation to breeding, spawning, nursery, feeding or passage areas of living resources in adult or juvenile phases.

Location in relation to beaches or other amenity areas.

Types and quantities of waste proposed to be disposed and proposed methods of release, including methods of packaging the waste, if any.

Feasibility of surveillance and monitoring.

Dispersal, horizontal transport, and vertical mixing characteristics of the area, including prevailing current velocity, if any.

Existence and effects of present or previous discharges and dumping in the area (including cumulative effects).

Interference with shipping, fishing, recreation, mineral extraction, desalination, shellfish culture, areas of special scientific importance and other legitimate uses of the ocean.

Existing water quality and ecology of the site, as determined by available data or by trend assessment or baseline surveys.

Potential for the development or recruitment of nuisance species within the disposal site.

Existence at or in close proximity to the site of any significant natural or cultural features of historical importance.

Geographic Location. Figure 4 shows the location of Umpqua interim and adjusted ODMDS, along with bottom contours. The interim site lies in 60 to 114 feet of water, approximately 1.0 nautical mile offshore of the entrance to the Umpqua River. The adjusted site lies in 66 to 130 feet of water, approximately 2,800 feet north of the interim site. Both sites have a center line on a 270 degree azimuth. Bottom topography within both sites is varied and is presented in detail in appendix B. Coordinates are (NAD 83):

Umpqua interim site:	43° 40' 07" N.,	124° 14' 18" W.,
	43° 40' 07" N.,	124° 13' 42" W.,
	43° 39' 53" N.,	124° 13' 42" W., and
	43° 39' 53" N.,	124° 14' 18" W.
Umpqua adjusted site:	43° 40' 35" N.,	124° 14' 22" W.,
	43° 40' 35" N.,	124° 13' 46" W.,
	43° 40' 21" N.,	124° 13' 46" W., and
	43° 40' 21" N.,	124° 14' 22" W.

Distance From Important Living Resources. Aquatic resources of the site are described in detail in Appendix A. The existing disposal site is located in the nearshore area, and the overlying waters contain many nearshore pelagic organisms which occur in the water column. These include zooplankton such as copepods, euphausiids, pteropods, chaetognaths and meroplankton (fish, crab and other invertebrate larvae). These organisms generally display seasonal changes in abundance and, since they are present over most of the coast, they are not critical to the overall coastal population. Based on evidence from previous zooplankton and larval fish studies, it appears that there will be no impact to organisms in the water column (Sullivan and Hancock, 1977).

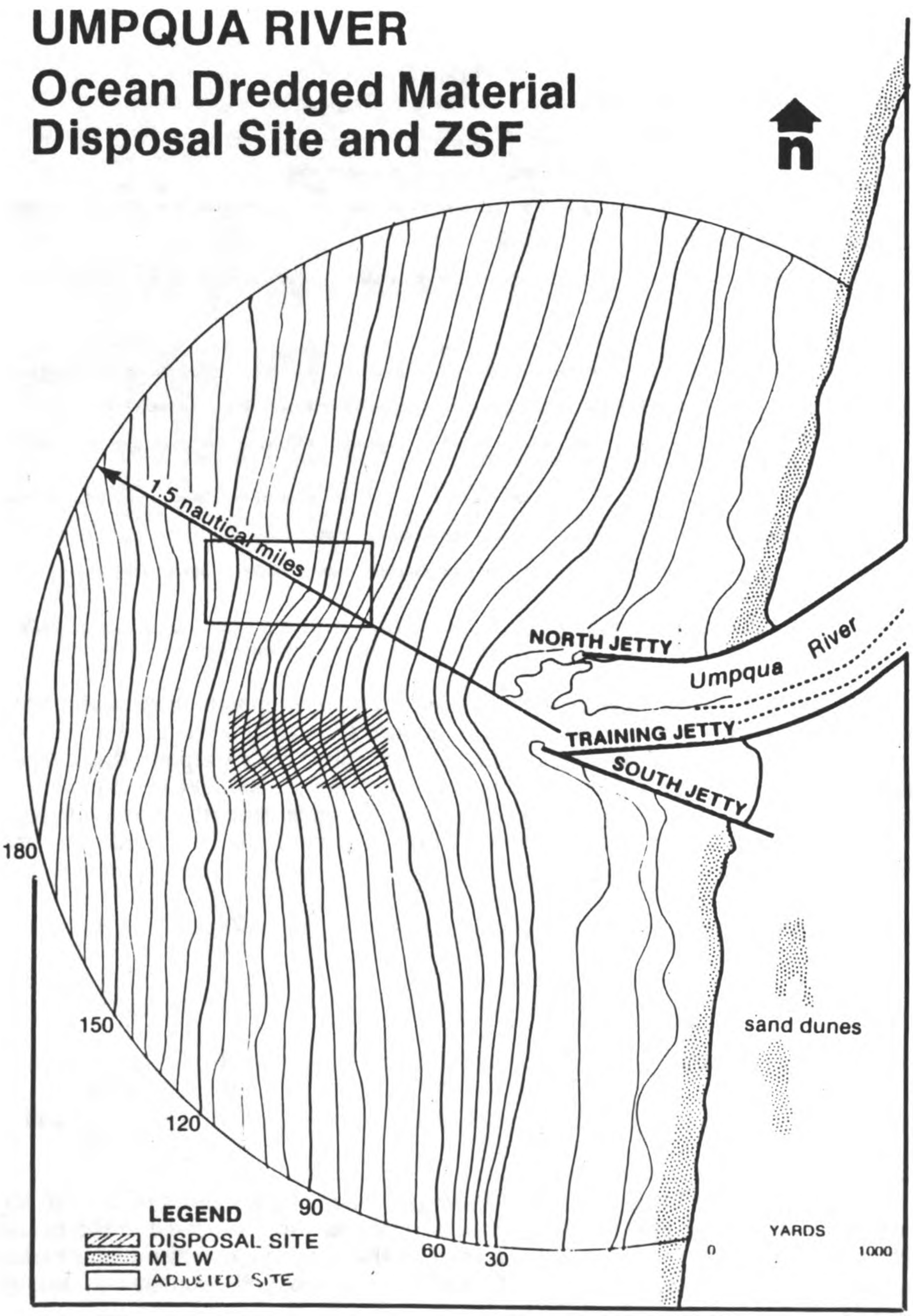

Figure 4
Umpqua River ODMDS and ZSF

Sediment in the interim disposal site consists of medium to fine sands, and fine sands outside the site (including the adjusted ODMDS). Benthic samples are discussed in detail in Appendix A. Benthic fauna of the area are typical of nearshore, sandy, wave-influenced regions that exist along much of the Pacific Northwest coast. These species are adapted to high energy environments.

The infaunal community is dominated by gammarid amphipods and polychaete worms (Emmett, *et al*, 1987). The species of invertebrates inhabiting the study area are the more motile psammnetic (sand-dwelling) forms which tolerate or require high sediment flux. Accordingly, continued use of the site for disposal is not expected to harm, but may enhance, these organisms. They are typical of other shallow water disposal sites such as Coos Bay sites E and F (Hancock *et al.*, 1981).

The dominant commercially and recreationally important macroinvertebrate species in the inshore coastal area are shellfish and Dungeness crab.

The nearshore area off the Umpqua River supports a variety of pelagic and demersal fish species. Pelagic species include anadromous salmon, steelhead, cutthroat trout, and shad that migrate through the estuaries to upriver spawning areas. Other pelagic species include the Pacific herring, anchovy, surfsmelt, and sea perch.

The disposal site is in an area where numerous species of birds and marine mammals occur in the pelagic nearshore and shoreline habitats in and surrounding the proposed disposal site.

Portland District requested an endangered species listing for the ODMDS from U. S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) as part of their coordination of the Site Evaluation Report. Based on previous biological assessments conducted along the Oregon coast, it was concluded that no impacts to threatened or endangered species are anticipated from the proposed designation and use. A letter of concurrance from the NMFS is contained in appendix F.

In summary, the proposed ODMDS contains living resources that could be affected by disposal activities. Evaluation of past disposal activities do not indicate that unacceptable adverse effects to these resources have occurred. Based on resource considerations, both the interim and adjusted ODMDS are considered acceptable for ODMDS designation.

<u>Distance from Beaches and Other Amenities</u>. The interim disposal site is 850 feet from the end of the jetties and 1,900 feet from the nearest beach. The adjusted site is 1,200 feet from the end of the jetties and 2,200 feet from the nearest beach. There are no rocks or pinnacles in the vicinity of either site.

<u>Types and Quantities of Material to be Deposited at the Site</u>. The disposal site will receive dredged materials transported by either government or private contractor hopper dredges or ocean-going barges. The dredges typically available for use at the Umpqua project have hopper capacities of 800 to 1,500 cy. Barges have a greater capacity, up to 4,000 cy. Thus, no more than 4,000 cy would be disposed at any one time. For steerage purposes, the ships would be under power and moving while

disposing. This would increase dispersion. Annual dredging volume averages just 180,000 cy. Disposal details are listed in Appendix B, Table B-1.

Material dredged for offshore disposal comes from bars forming at the mouth of the Umpqua. They consist primarily of marine sand transported into the river's mouth. The sand is medium to fine grained, and is slightly coarser than the native offshore sediments. The sand has been excluded in previous disposal activities from further biological and chemical testing as discussed in 40 CFR 227.13b. Appendix C gives the results of sediment analysis performed on sand presently ocean disposed. Tables C-6 through C-7 deal with contaminants. Appendix C provides grainsize information for the dredged area and the disposal sites (see figures C-5 to C-15). It also includes a discussion of physical and chemical characteristics of fines that might be considered for ocean disposal. Fine grain materials placed in the final site would receive chemical and biological testing, if appropriate, as outlined in the joint EPA/Corps national testing framework, supplemented by regional practices and best professional judgment. Periodic re-evaluation of sediment characteristics by the Corps and EPA occur as part of our management responsibilities.

Feasibility of Surveillance and Monitoring. The proximity of the interim disposal site to shore facilities creates an ideal situation for shore-based monitoring of disposal activities. Surveillance can also be accomplished by surface vessel.

Following formal designation of an ODMDS, EPA and the Corps will develop a site management plan which will address post-disposal monitoring. All Oregon ODMDS are periodically monitored jointly by the Corps and EPA already. Several research groups are available in the area to perform any required work. The work could be performed from small surface research vessels at a reasonable cost.

Disposal, Horizontal Transport, and Vertical Mixing Characteristics of the Area. The sediments dredged from the Umpqua River entrance are predominantly marine sands and fluvial gravels. Although the Umpqua River delivers a large sediment load, the bottom contours suggest a rapid distribution away from the river mouth. The beaches seem to be in equilibrium, suggesting that littoral transport is in balance. From the bottom current records, there appears to be a slight bias in transport to the south year-round, with some northward transport in summer only. The more probable sediment transport system at the disposal site is a general movement southward and deeper from the site, with a northward movement at greater depths. The constantly varying river outflow combines with tidal flows to produce a highly variable influence on the nearshore circulation.

Sediment movement in the littoral zone consists of two mechanisms depending upon the size of the sediment. Anything finer than sand size is carried in suspension in the water and is relatively quickly removed far offshore. The almost total lack of silts and clays within the Umpqua ZSF attests to the efficiency of this mechanism. Sediments sand size or coarser may be occasionally suspended by wave action near the bottom, and are moved by bottom currents or directly as bedload. Tidal, wind and wave forces contribute to generating bottom currents which act in relation to the sediment grain size and water depth to produce sediment transport.

Effects of Previous Disposal. Average annual volume of dredged material disposed offshore in the interim ODMDS from 1968 to 1988 was 147,349 cy. The maximum and minimum quantities of sandy material were 313,632 and 500 cubic yards respectively. Appendix B, table B-1 gives the volumes of material disposed of in the last 21 years. The adjusted site has not received any dredged material.

Detailed offshore bathymetry at the mouth of the Umpqua River shows a bulge in bottom contours between approximately -60 and -120 feet at the location of the interim ODMDS. The bulge is probably related to the combination of river discharge and ebb tide currents, which create an "ebb delta" of nearshore material. Ebb deltas are common in many areas of the world. The crest of the ebb delta runs through the interim disposal site. Historically there has not been mounding within the site, nor is there aggradation specific to the site. Figure 5 shows survey data for the past 5 years. A post dumping survey in August of 1988 indicates some recent mounding within the interim site. The recent mounding may be attributed to above average disposal during the 1988 dredge season and mild wave climate during the winter of 1987-88. A general seaward movement of contours between 1984 and 1985, as indicated in figure 5, may be the result of seasonal variation or the effect of changes induced by El Nino.

The interim site was surveyed in 1989 to determine the effects of the winter wave climate on the mound.

Interference with Other Uses of the Ocean.

Commercial and Recreational Fishing: Major commercial and recreational fisheries occur in and around the disposal site. Coho and chinook salmon are taken in a nearshore commercial troll fishery. Annual commercial harvests of coho and chinook salmon from 1980 to 1985 ranged from 0 (1984) to 533,563 (1982) and 43,310 (1981) to 227,780 (1985) pounds respectively (ODFW Pounds and Value of Commercially Caught Fish and Shellfish Landed in Oregon, Annual Reports). Salmon support a good recreational fishery centered off the Umpqua bar. Both commercial and recreational fishing seasons generally begin in June and run through October, subject to catch quotas set by ODFW. During this period, the potential exists for conflicts between the dredge and fishing boats. The Coast Guard and ODFW indicated that they are unaware of any instance where this has ever been a problem.

The recreational Dungeness crab fishery takes place mainly within Winchester Bay. Some commercial crabbing occurs within close proximity to the two disposal sites. Figure A-9 (appendix A) shows the general location of the commercial fishing areas. The offshore commercial crab harvest from 1980 to 1985 ranged from 374,470 (1983) to 1,200,730 (1980) pounds landed (ODFW Annual Reports). Mussels and shrimp support a small commercial fishery. Mussels are collected in nearshore areas, and shrimp are taken in deep waters well away from the disposal area. Annual commercial harvests of shrimp from 1980 to 1986 ranged from 430 (1984) to 689,707 (1980) pounds.

Offshore Mining Operations: Although deposits of heavy minerals containing magnetite, gold, platinum, chromite, and ilmenite are present offshore along the Oregon coast, no metallic mineral deposits in the immediate area are known. There have been no exploratory wells drilled offshore near the mouth of the Umpqua. Exploratory wells

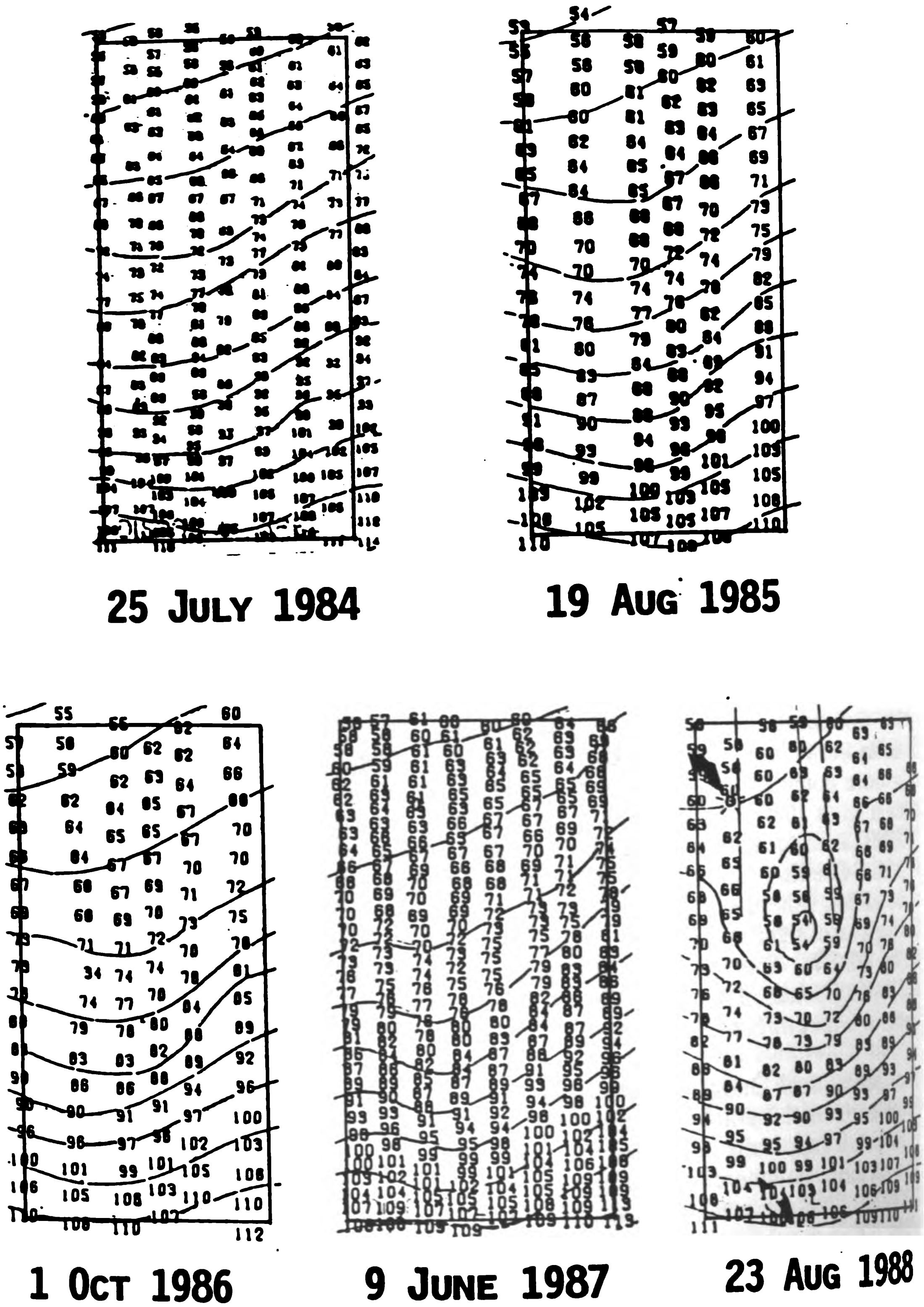

Figure 5
Umpqua River ODMDS Bathymetry

near Reedsport (on land) did not result in [illegible] production facilities would be placed near [illegible] hazard to navigation that would be created.

Navigation: No conflicts with [illegible] in the more than 60-year history of [illegible] conflict at the interim site was created when [illegible] was realigned directly over the site. Conflicts [illegible] to the light traffic in the Umpqua River area [illegible] marked approach channel. This situation is [illegible] potential navigational hazards are shown in figure [illegible]

Scientific: There are no known [illegible] could be impacted by the disposal site.

Coastal Zone Management: Local comprehensive [illegible] area have been acknowledged and approved by the [illegible] discuss ocean disposal and recognize the need to provide [illegible] disposal of dredged materials. In addition, this site evaluation [illegible] no significant effects on ocean, estuarine, or shoreland [illegible] 19 of the Oregon Statewide Planning Goals and Guidelines [illegible]

During coordination of the Site Evaluation Report, the Corps [illegible] consistency with Coastal Zone Management plans. EPA also [illegible] of the proposed site is consistent to the maximum extent practicable [illegible] coastal management program. A letter of concurrance with [illegible] the Oregon Department of Land Conservation and Development [illegible] management office. Their letter of concurrance is included in appendix F. [illegible] notes that the Department may reexamine the consistency issue if new information becomes available.

<u>Existing Water Quality and Ecology</u>. No pre or post-disposal water or sediment quality monitoring have been performed at Umpqua; however, analyses conducted at several other ODMDS are discussed in appendix C. Dredged material previously, and currently disposed of are physically and chemically similar to the sample collected in close proximity to the disposal site (appendices B and C). The elutriate analysis discussed in appendix C also showed minimal contaminant releases during simulated disposal operation with receiving water from the interim disposal site.

A general discussion of the ecology of the area based on availa[illegible] presented in Appendix A. The ODMDS and near vicinity is [illegible] Northwest mobile sand community. Monitoring studies have [illegible] adverse effects from historic disposal. Studies indicate a depr[illegible] infauna within the interim disposal site, but no impact to de[illegible] relative to the reference stations. Reasons for depression [illegible] the coincidence of the dredging activity and the benthic r[illegible] at the interim site is discontinued, the benthic densities [illegible] Shifting disposal activities to the adjusted site may re[illegible] site.

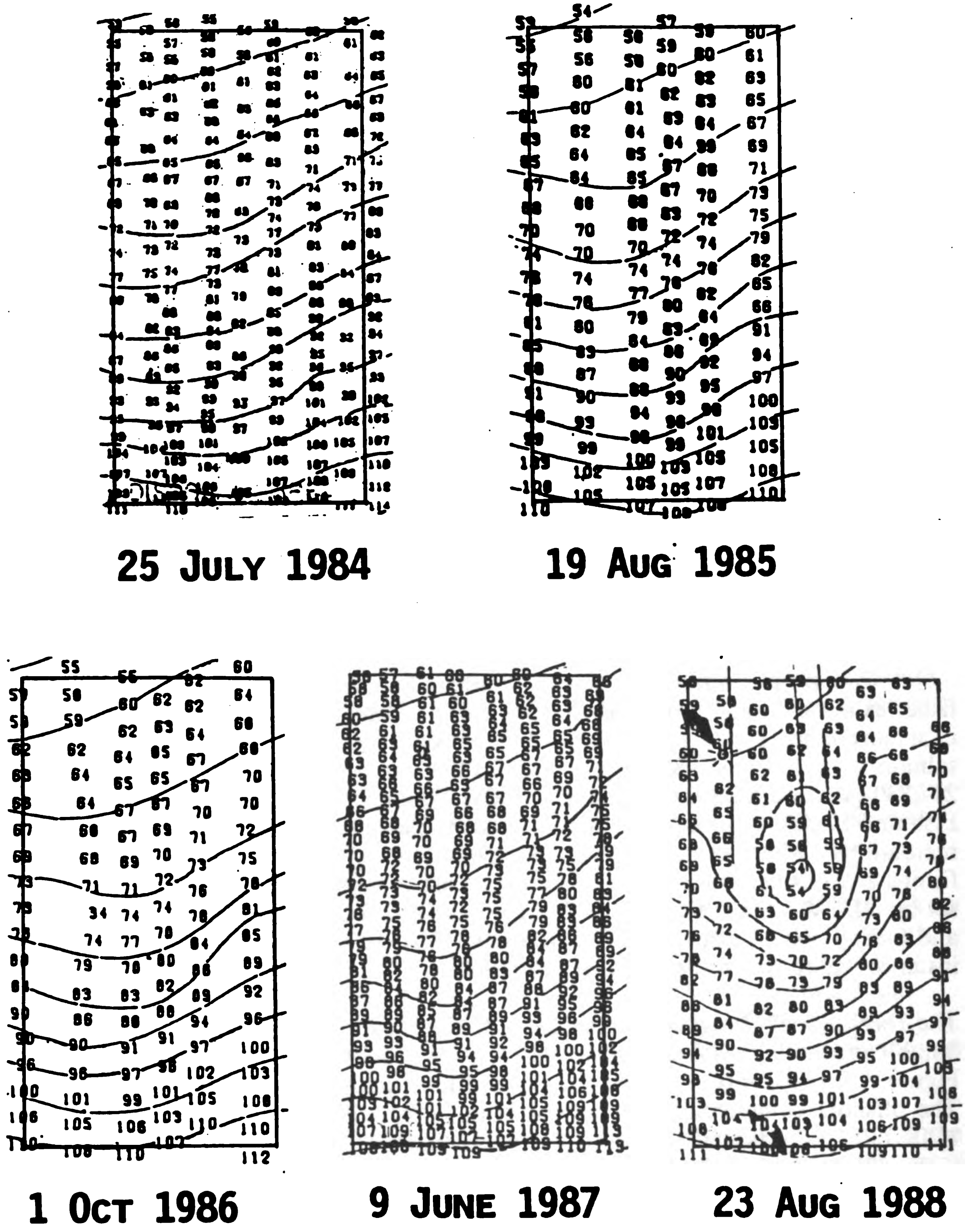

Figure 5
Umpqua River ODMDS Bathymetry

near Reedsport (on land) did not result in production. In any case it is unlikely that production facilities would be placed near the river's mouth or the ODMDS due to the hazard to navigation that would be created.

Navigation: No conflicts with commercial navigation traffic have been recorded in the more than 60-year history of hopper dredging activity. Thhe potential for serious conflict at the interim site was created when the navigation marked approach channel was realigned directly over the site. Conflicts at the adjusted site are not expected due to the light traffic in the Umpqua River area and the site's location away from the marked approach channel. This situation is not expected to change substantially. The potential navigational hazards are shown in figure 6.

Scientific: There are no known transects or other scientific study locations that could be impacted by the disposal site.

Coastal Zone Management: Local comprehensive land use plans for the Umpqua area have been acknowledged and approved by the State of Oregon. These plans discuss ocean disposal and recognize the need to provide for suitable offshore sites for disposal of dredged materials. In addition, this site evaluation document establishes that no significant effects on ocean, estuarine, or shoreland resources are anticipated, as Goal 19 of the Oregon Statewide Planning Goals and Guidelines requires.

During coordination of the Site Evaluation Report, the Corps made a determination of consistency with Coastal Zone Management plans. EPA also concludes that designation of the proposed site is consistent to the maximum extent practicable with the state coastal management program. A letter of concurrance with that finding was provided by the Oregon Department of Land Conservation and Development, the state coastal zone management office. Their letter of concurrance is included in appendix F. The letter notes that the Department may reexamine the consistency issue if new information becomes available.

Existing Water Quality and Ecology. No pre or post-disposal water or sediment quality monitoring have been performed at Umpqua; however, analyses conducted at several other ODMDS are discussed in appendix C. Dredged material previously, and currently disposed of are physically and chemically similar to the sample collected in close proximity to the disposal site (appendices B and C). The elutriate analysis discussed in appendix C also showed minimal contaminant releases during simulated disposal operation with receiving water from the interim disposal site.

A general discussion of the ecology of the area based on available information is presented in Appendix A. The ODMDS and near vicinity is typical of a Pacific Northwest mobile sand community. Monitoring studies have not shown any significant adverse effects from historic disposal. Studies indicate a depressed density of benthic infauna within the interim disposal site, but no impact to densities outside of the site relative to the reference stations. Reasons for depression in the density may be due to the coincidence of the dredging activity and the benthic recruitment season. If disposal at the interim site is discontinued, the benthic densities should recover to normal levels. Shifting disposal activities to the adjusted site may result in a similar depression at the site.

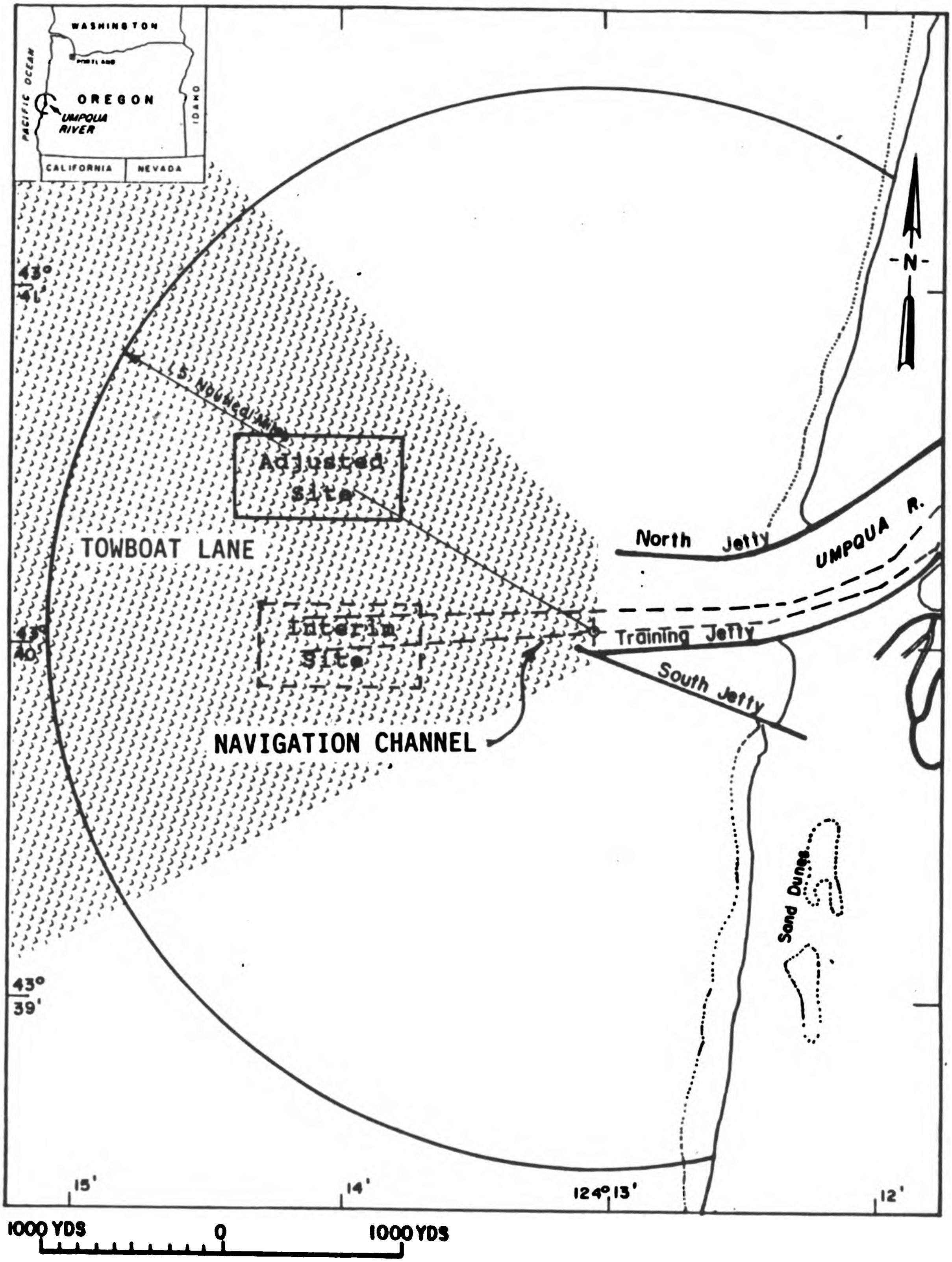

Figure 6
Potential Navigation Hazards

Potential for Recruitment of Nuisance Species. It is highly unlikely that any nuisance species would be transported to the disposal site. Nuisance species are considered to be any undesirable organism not previously existing at the disposal site and either transported or attracted there because of the disposal of dredged materials which are capable of establishing themselves there.

In the past, all materials dredged and transported to the interim ODMDS have been noncontaminated marine sands (appendix C) similar to sediments from the interim disposal site. While there are no immediate plans for the disposal of fine grain material, the possibility exists in the future. It is anticipated that the quantity of fine grain material would be small and infrequent (less then 40,000 cy every four years). Any fine grain material disposed in the site would be subject to specific evaluation by the Corps and EPA as previously noted. The high energy wave and current environment would tend to rapidly disperse fine sediments. Therefore, it is highly unlikely that any nuisance species could be established at the disposal site since habitat or contaminant levels are unlikely to change over the longterm.

Existence of Significant Natural or Cultural Features. The cultural resource literature search of the Umpqua River study area is described in appendix E. Due to the proximity of the disposal site, the resource that has the greatest potential for impact by use of the ODMDS is shipwrecks. The most likely areas for shipwrecks in the project area are in the shallow breaker zone and the Umpqua River mouth. Any wreck within these areas would experience damage from the high energy wave climate. Deeper water would buffer the high energy wave climate, thus shipwrecks in deeper water could have less damage. The shipwrecks in deeper water tend to have more cultural value, but tend to be fewer then shipwrecks nearshore. Included in appendix E is a table of all recorded shipwrecks in the project area. Historical records indicates there are not any shipwrecks within the interim or adjusted ODMDS.

Wrecks could occur in the project area that have not yet been discovered. However, based on previous investigations in other Oregon coastal settings (Yaquina Bay, Coquille, Mouth of the Columbia River, etc.), beaches, surf zones, and shallow waters are the most likely areas for shipwreck occurrence. The Umpqua ODMDS is removed from these areas.

A letter by the Oregon State Historic Preservation Officer (SHPO) concurs that no significant cultural resources will be affected by the proposed designation and use (appendix F) .

Selection of the Preferred Alternative. Once the general and specific site selection criteria were applied the proposed disposal site, a conflict matrix analysis was completed. Portland District developed the matrix format to simplify the criteria review process and has used the matrix for several ODMDS studies. Each area of consideration on the conflict matrix addresses at least one general and specific criteria. Table 3 contains comments pertinent to the criteria for the proposed site. In addition to the conflict matrix, operational constraints and cost were considered for the site.

The proposed action is the designation of an ocean disposal site for the disposal of dredged material. Designation of an ODMDS would not have any direct environmental effects, but it would subject the site to regular use as an ocean disposal area. This document has evaluated the past and likely future effects of disposal at the interim and adjusted sites based upon the Corps' maintenance dredging program for the Umpqua River navigation project and current regulatory program requirements. Separate evaluations of the suitability of dredged material and disposal impacts will be conducted for each proposed disposal action as required under Section 103 of the MPRSA.

Based upon the information contained in this DEIS, designation of an ODMDS off of the mouth of the Umpqua River, Oregon is considered necessary. After applying the five general and eleven specific criteria to the available options, designation of the adjusted ODMDS was selected as the preferred alternative. Continued use of the interim ODMDS was not expected to cause unacceptable adverse environmental effects, however, the absense of navigation conflicts made designation and use of the adjusted ODMDS the more purdent course of action.

Table 3
Conflict Matrix

UMPQUA Ocean Dredged Material Disposal Area Conflict Matrix
for Evaluating Potential for Conflict with Required Considerations
of the Marine Protection Research and Sanctuaries Act

AREA OF CONSIDERATION	CONFLICT	POTENTIAL CONFLICT	NO CONFLICT	BENEFICIAL USE	COMMENTS	RELEVANT SPECIFIC FACTORS (From Table 1 & 40CFR 228.6)	RELEVANT GENERAL CRITERIA (From Table 2 & 40CFR 228.5)
1. Unusual Topography			●			1, 6, 8, 11	a
2. Physical Sediment Compatibility		●			POSSIBLE DISPOSAL of FINES	3, 4, 9	b, c, d
3. Chemical Sediment Compatibility		●			TEMPORARY ELEVATION of SOME CONTAMINANTS w/ FINE GRAIN DISPOSAL	3, 4, 7, 9	a, b, c, d
4. Influence of Past Disposal			●			5, 7, 9, 10	a, b, d
5. Living Resources of Limited Distribution			●			2, 3, 6, 8, 11	a, b, d
6. Commercial Fisheries		●			SALMON	2, 8	a, b
7. Recreational Fisheries		●			SALMON	2, 8	a, b
8. Breeding/Spawning Areas		●			SNOWY PLOVER, MURRES.	2, 8	a, b
9. Nursery Areas		●			ENGLISH SOLE	2, 8	a, b
10. Feeding Areas		●			SANDERLINGS, PELAGIC BIRDS MARBLED MURRELETS, BROWN PELICANS	2, 8	a, b
11. Migration Routes		●			PELAGIC BIRDS, SHOREBIRDS, PEREGRINES GREY, HUMPBACK, BLUE, FIN, SEI, RIGHT & SPERM WHALES	2, 8	a, b
12. Critical Habitats of Threatened or Endangered Species			●			2, 8	a, b
13. Spatial Distribution of Benthos			●			2, 8, 10	a, b
14. Marine Mammals		●			HARBOR SEALS, NORTHERN & CALIFORNIA SEA LIONS, WHALE MIGRATION ROUTE	2, 8	a, b
15. Mineral Deposits			●			1, 8	a, b, e
16. Navigation Hazard		●			SMALL BOATS NAVIGATING AROUND DREDGE	1, 8	a, b, d
17. Other Uses of Ocean (cables, pipelines, etc.)			●			8	a, b, d
18. Degraded Areas			●			4, 6, 7	a, b, d
19. Water Col. Chem./Phys. Characteristics		●			SLIGHT INCREASE IN TURBIDITY IN SITE DURING DISPOSAL	4, 6, 9	a, b, d
20. Recreational Uses		●			INCONVENIENCE TO RECREATIONAL FISHING BOATS (NAVIGATIONAL DELAYS)	2, 8, 11	a, b, c, d
21. Cultural/Historic Sites			●			11	b
22. Physical Oceanography: Waves/Circulation			●			1, 3, 6, 7	a, b, d
23. Direction of Transport/Potential for Settlement			●			1, 3, 6, 7	a, b, d
24. Monitoring			●			5	c
25. Shape/Size of Site (orientation)			●			1, 4, 7	d
26. Size of Buffer Zone			●			2, 3, 4, 7, 11	b, d
27. Potential for cumulative Effects			●			4, 7	c, d

IV. AFFECTED ENVIRONMENT

General. A brief summary of existing conditions within the ZSF or specifically at the interim and adjusted ODMDS is presented below and is the basis for evaluating the suitability of the site for ocean disposal. More detailed information on the affected environment is presented in the appendices which were reproduced from the Corps' Site Evaluation Report. Information regarding the nature and frequency of the sediments dredged from the Umpqua River navigation project is also provided.

Physical Environment.

General. The estuary of the Umpqua River opens into the Pacific Ocean about 180 miles south of the mouth of the Columbia River. It lies within the Heceta Head littoral cell, which extends from Heceta Head south to Cape Arago. The estuary is fed by two rivers, the Umpqua, and the smaller Smith. The watershed encompasses part of the Coast Range, with the Umpqua River extending into the Cascades. The coastal zone of the littoral cell consists of a one to two mile wide plain covered by active and stabilized sand dunes backed by the mature upland topography of the Coast Range. The lower portion of the Umpqua River is bordered by broad alluvial flats. The continental shelf off the mouth of the Umpqua is about 20 miles wide. Just to the north it bulges outward, forming the Heceta Bank. Between Siuslaw and Yaquina, the shelf is at its widest along the Oregon coast, extending over 43 miles off shore. Sand covers the shelf at the Umpqua for about 2 miles out from the shore.

The Heceta Head littoral cell is the largest on the Oregon coast. Except for the headlands at both ends of the cell, the entire coast line is made of beach fronting sand dunes. Three major river systems enter the cell. From north to south these are the Siuslaw, the Umpqua (which is the largest of the three), and the Coos River.

Geology. The Heceta Head littoral cell and the larger part of the Umpqua River are in the southern portion of the Coast Range. The rocks of the Coast Range are marine and deltaic sediments, and volcanic rocks, mostly from the earlier half of the Cenozoic. During the Eocene the area was part of a large embayment of the ocean with an volcanic island arc to the west. The sea gradually withdrew to the west and north, so by the end of the Oligocene the southern portion was emergent. In the Miocene uplift began that transformed the area into the mountains present today.

There are no accumulations of heavy minerals or gravel along the coast in the vicinity of the mouth of the Umpqua River. While there have been exploratory oil and gas wells bored both to the north and south on the continental shelf, as well as inland of the entrance of the Umpqua, no significant quantities of oil and gas have been found. (Gray and Kulm 1985).

Circulation and Currents. Coastal circulation near the Umpqua ZSF is directly influenced by large-scale regional currents and weather patterns in the northwestern Pacific Ocean. During winter strong low pressure systems with winds and waves predominantly from the southwest contribute to strong northward currents. During the summer, high pressure systems dominate and waves and winds are commonly from the north. In both seasons there are short-term fluctuations related to local wind, tidal and bathymetric effects. Along the Oregon coast there is a southerly wind in summer which creates a mass transport of water offshore resulting in upwelling of bottom water nearshore. Figure B-7 (appendix B) shows the predominant Oregon coastal circulation.

The interim and adjusted Umpqua ODMDS are within 1 mile of the estuary entrance. The Umpqua River has the second largest drainage basin on the Oregon coast after the Rogue River and the third largest estuary. Minimum and maximum flows are highly variable. This constantly varying river outflow combines with tidal flows to produce a highly variable influence on the nearshore circulation. In the estuarine part of the river, the ebbing tide adds to the normal river discharge to produce a net ebb dominance. The Umpqua shows little or no longterm accumulation of fine sediments in the estuary and net bypassing of sand-size sediments into the ocean.

Water and Sediment Quality. Water quality throughout the ZSF is typical of seawater of the Pacific Northwest. There is no reason to expect significant chemical contamination in either the water of sediments as few heavy industries are located along the estuary. Basic water quality parameters were taken in field sampling during collections of sediment samples from the channel. All of the values were within normal ranges for the Oregon coast. International Paper Company (Gardiner) filed for a permit in 1963 for an ocean outfall located approximately 4 miles north of the mouth of the Umpqua River. The effluent from the outfall is from a log storage pond. Monthly reports are filed with the Oregon Department of Environmental Quality (ODEQ). Bioassay studies are preformed semi-annually and the results submitted to ODEQ. The presense of the outfall should not effect either the interim or the adjusted ODMDS.

Sediment from the Umpqua navigation project disposed at the ODMDS is medium to coarse sands with occasional gravels. It is coarser than that of the ODMDS but within acceptable limits. Bottom sediments in the Umpqua ZSF rannge from fine to medium sand. The aone of active sediment movement in the Umpqua area extends to a depth of about 150 feet. The thinness of the sediment layer over the basaltic bedrock indicates that there is no long term accumulation of sediment offshore from the Umpqua River estuary.

Biological Environment.

General. Aquatic resources of the ZSF are described in detail in Appendix A. The ODMDS sites are located in the nearshore area and are typical of oceanic habitat common to the nearshore north Pacific Coast.

Benthic. The benthos is typical of nearshore high energy environments. Benthic sampling in the vicinity of the disposal site indicates the sand environments are characterized by polychaete annelids and numerous species of cumaceans, gammarid amphipods, molluscs, and snails. The species inhabiting the sandy environments are generally more mobile types which tolerate or require high sediment flux. Juvenile crabs are also abundant in this environment. Dungeness crabs are also found in high densities.

Fishes. The nearshore area off the Umpqua River supports a variety of pelagic and demersal fish species. Pelagic species include salmon, steelhead, shad, Pacific herring, anchovy, smelt, and sea perch. Demersal species include a variety of flatfish, sculpins, and sea perch.

The predominant commercial fishery is for salmon, sole, and Dungeness crab. Recreational fishing is primarily for salmon and bottomfish.

Wildlife. Numerous species of birds and marine mammals occur in the vicinity of the proposed disposal site. Principal shorebird species found onshore include the western snowy plover, black oystercatcher, killdeer, and spotted sandpiper. Recent shorebird surveys along the Oregon Coast have shown that the northern portion of the Oregon Dunes National Recreation Area (ODNRA) supports some of the highest densities of wintering sanderlings in the world. Pelagic birds (e.g., shearwaters, murres) probably use the ZSF and adjacent waters for foraging. Marbled murrelets are generally located within 1 mile of sandy shores, typically just outside the breakers. Whales are known to occur throughout coastal waters during migration, but population estimates and information on areas of special use are not known.

Endangered Species. Portland District requested an endangered species listing for the ODMDS from U. S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) as part of their coordination of the Site Evaluation Report. Based on previous biological assessments conducted along the Oregon coast, it was concluded that no impact to either species is anticipated from the proposed designation and use. A letter of concurrance from the NMFS that no impacts to threatened or endangered species would be anticipated is contained in appendix F.

Socioeconomic Environment.

General. The Umpqua River enters the Pacific Ocean near the City of Reedsport, Oregon. Nigation on the river is critical to the local economy. The City of Reedsport has a population of 4,69 (1985); Douglas County's population is 93,000 (1985).

Natural Resource Harvesting (Commercial). Forest products in the form of lumber and raw logs have traditionally been the largest component of the local economy. Commercial fishing is the also among the largest industries of the area. Both depend on the Umpqua River project to some degree. Other important sources of income are agriculture and tourism. Sand, gravel, and crushed rock make up the bulk of commercial commerce out of Umpqua (based on short tons). No significant mineral or petroleum deposits have been identified in the vicinity of the ODMDS.

Recreation. The Umpqua River estuary, particularly the Winchester Bay area, is popular with recreationalists because of the coastal scenery and excellent fishing opportunities both offshore and in the River. The area is increasing in popularity as a small boat harbor and has excellent facilities for the many anglers who fish here annually. Clams are also recreationally harvested in the estuary.

Cultural Resources. Cultural resource investigations indicate that no significant archeological or historic resources exist in the vicinity of the disposal sites. A letter of concurrance from the SHPO is included in appendix F.

V. ENVIRONMENTAL CONSEQUENCES

General. The proposed action is the designation of a site to be available for ocean disposal of dredged material. Designation of the site itself is an administrative action that would not have any direct environmental effects; however, it would subject the site to use as an ocean disposal area. Although no significant impacts are predicted by this designation action, EPA has voluntarily committed to preparing and circulating EISs as part of the designation process. This EIS addresses the likely effects of disposal at the interim ODMDS based upon the Corps' current operation and maintenance dredging program for the Umpqua navigation project and regulatory requirements. A separate evaluation of the suitability of dredged material and disposal impacts will be conducted for each proposed disposal action by the Corps as required under Section 103 of the MPRSA. EPA independently reviews all proposed ocean disposals of dredged material.

Physical Effects. Continued disposal of dredged material at the proposed ODMDS would not have a significant effect on the physical environment. The material consists of clean sand, coarser than that present at the disposal site, but still compatible for disposal on the sandy bottom. In the past material dredged for offshore disposal has come from bars forming in the estuary and at the mouth of the Umpqua. Material dredged from the bar is medium to fine grained sand, and is slightly coarser than the native offshore sediments. The material from within the Umpqua estuary ranges in size from silt to medium sand. Most of the anticipated future dredged material will be sand, and would be comparable to the variation in sediment size found in or near the disposal site. In the event of fine grain material disposal, some increase in the *in situ* fine fraction may occur. The dredged material would disperse from the site in the littoral drift system with movement expected to be to the south and offshore during the winter with lesser movement to the south in summer and some northward transport. No mounding is expected to occur at the ODMDS with the average disposal quantities. As indicated by the 1988 bathymetry survey, above average disposal quantities may cause mounding.

Sediments proposed for ocean disposal require evaluation following the tiered testing guidance described in the joint EPA/Corps national framework, *Evaluation of Dredged Material Proposed for Ocean Disposal: Testing Manual* (February 1991). Sediment characterization, including chemical and biological testing as needed, has been a standard practice for several years in this region. The material dredged from the Rogue navigation channel meets the exclusion criteria defined in 40 CFR 227.13(b). Sediment characteristics are periodically reexamined by the Corps and EPA.

Biological Effects. Impacts on the biological environment would be primarily to the benthic community. Some mortality could occur as a result of smothering. Most of the benthic species present are motile and have adapted to a high energy environment with shifting sands. Therefore, most would likely survive the effects of disposal. In addition, rapid recolonization would occur from surrounding areas since the sediments would be compatible.

Larger, more motile organisms such as fish, birds, and marine mammal species would probably avoid the disposal activity or move out once it begins. They would likely be exposed to short-term turbidity at most. Therefore, impacts are expected to be limited to disturbance rather than injury or mortality.

No significant impact is anticipated from the designation or continued use of the ODMDS to threatened/endangered species.

Socioeconomic Effects. The designation and use of an ODMDS for dredged material off the mouth of the Umpqua River would allow the continued maintenance of the navigation channel. This would result in waterborne commerce remaining an component of the local economy. If a site is not designated, maintenance dredging may ultimately cease for lack of adequate disposal sites, or other, potentially more environmentally sensitive habitats (e.g., wetlands) would be used. If maintenance dredging of the channel ceases, the channel would shoal in and become unsafe or unusable. Shipping and fishing traffic would have to be directed through other ports and the local economy would suffer.

No known minerals of economic importance would be affected by designation or use of an ODMDS.

No impacts to recreation are expected to occur. Recreational fishery resources would be temporarily displaced during disposal operations. Time delays for recreational boaters caused by the passing of the dredge or an increase in navigation hazards during congested periods could occur. Conflicts such as these can be considered an inconvenience rather than a threat to recreational activity.

There could be a short-term reduction in aesthetics at the disposal site as a result of turbidity following disposal. The material would settle rapidly and not affect any areas outside of the disposal area. Minor impacts, such as changes in sand color, could occur on the adjacent beach, but these impacts would be short-term and would not be considered objectionable.

It is unlikely that any cultural resources are present in the proposed disposal site. Therefore, designation or use of the site is not expected to have any impact on cultural resources.

Coastal Zone Management. In reviewing proposed ocean disposal sites for consistency with the Coastal Zone Management (CZM) plan, they are evaluated against Oregon's Statewide Goal 19 (Ocean Resources). Local jurisdiction does not extend beyond the baseline for territorial seas and, therefore, local plans do not address offshore sites. Goal 19 requires that agencies determine the impact of proposed projects or actions. Paragraph 2.g of Goal 19 specifically addresses dredged material disposal. It states that agencies shall "provide for suitable sites and practices for the open sea discharge of dredged material which do not substantially interfere with or detract from the use of the continental shelf for fishing, navigation, or recreation, or from the long-term protection of renewable resources." Decisions to take an action, such as designating an ocean disposal site, are to be preceded by an inventory and based on sound information and on an understanding of the resources and potential impacts. In addition, there should be a contingency plan and emergency procedures to be followed in the event that the operation results in conditions which threaten to damage the environment.

Ocean disposal sites for dredged material are designated following guidelines prepared by the EPA (Ocean Dumping Regulations). Site selection is to be based on studies and an evaluation of the potential impacts (40 CFR Part 228.4 [e]). This meets the requirements of State Goal 19 for decisions to be based on inventory and a sound understanding of impacts. The five general and eleven specific criteria for the designation of a site presented in 40 CFR 228.5 and 228.6 outline the type of studies to be conducted and the resources to be considered. According to 40 CFR Part 228.5(a), ocean disposal will only be allowed at sites "selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation." Monitoring is to be conducted at ocean disposal sites. If adverse effects are observed, use of the site may be modified or terminated. The requirements of the ocean dumping regulations are broad enough to meet the need of Goal 19. Therefore, the designation of this site for ocean disposal of dredged material following the ocean dumping regulations would be consistent with Goal 19 and the State of Oregon's Coastal Zone Management Plan.

During coordination of the Site Evaluation Report, the Corps made a determination of consistency with Coastal Zone Management plans. A letter of concurrance was provided by the Oregon Department of Land Conservation and Development, the state coastal zone management office (appendix F). EPA also concludes that designation of the proposed site is consistent to the maximum extent practicable with the state coastal management program.

Unavoidable Adverse Impacts. Designation of an ODMDS would allow continued dredging and disposal of dredged material from the Umpqua navigation project with attendant effects.

Relationship Between Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity. Disposal of dredged material at the adjusted ODMDS would have a unquantifiable, but apparently minor short- and long-term effect of the productivity of the ocean environment. Use of the ODMDS would have a long-term beneficial effect on the economy of the City of Reedsport and Douglas County.

Irreversible and Irretrievable Commitments of Resources. Permanent designation of the interim ODMDS for disposal would commit the site and its resources primarily to that use. Other uses such as oil and gas explorations, and to varying degrees, mining, fishing, and use by certain aquatic species, would be constrained or precluded.

VI. COORDINATION

Coordination By the Corps of Engineers. Procedures used in this evaluation and the proposed continued use of the interim site were discussed with the following State and federal agencies by the Portland District, Corps of Engineers, to support their site designation studies and preparation of their Site Evaluation Report:

- U.S. Coast Guard
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service
- U.S. Environmental Protection Agency
- Oregon Department of Fish and Wildlife
- Oregon Department of Environmental Quality
- Oregon State Historic Preservation Officer
- Oregon Division of State Lands

The agencies were briefed on the proposed technique from the task force workbook and existing information was requested of them. Copies of the draft Site Evaluation Report were provided to them by the Corps and their comments on the draft were formally requested. Letters received are included in Appendix C.

The proposed federal action requires concurrence or consistency for three federal laws from the responsible agencies as indicated below.

- Endangered Species Act of 1973, as amended from U.S. Fish & Wildlife Service National Marine Fisheries Service

- National Historic Preservation Act of 1966, as amended, State Historic Preservation Officer

- Coastal Zone Management Act of 1972, as amended, Oregon Department of Land Conservation and Development

Consistency or preliminary concurrence letters from the above agencies are included in Appendix F. State water quality certifications, as required by Section 401 of the Clean Water Act, will be obtained for individual dredging actions as part of the normal permitting of federal project approval process.

Coordination By EPA. Coordination with the Portland District was maintained throughout the site designation studies and during preparation of their Site Evaluation Report. A copy of that report was reviewed by EPA. EPA has voluntarily committed to prepare and circulate EISs for site designation actions. The Site Evaluation Report submitted by Region 10, EPA, by the Corps was used as the basis for preparation of this draft EIS. A formal 45-day public review period will allow comments to be received from all State and local agencies, and private groups and individuals on this proposed designation by EPA. A list of those who received the draft EIS for comment may be requested. Many of the same agencies that reviewed the Corps' Site Evaluation Report will receive this draft EIS.

As a separate but concurrent action, EPA will publish a proposed rule in the **Federal Register** for formal designation of the adjusted Umpqua ODMDS and de-designation of the interim site. There is a 45-day public review period for the draft rule also. It is planned that the public review periods for the draft EIS and proposed rule be concurrent. However, comments will be accepted on either the draft EIS or proposed rule until the end of the latest 45-day period. Comments will be responded to in the final EIS and rule.

VII. LIST OF PREPARERS

Disposal site studies were designed and conducted by the Corps, in consultation with EPA, and a Site Evaluation Report was prepared by the Portland District, Corps of engineers. That document was submitted to EPA for review and processing for formal designation by the Regional Administrator, Region 10. The Corps' Site Evaluation Report was used by EPA as the basis of this draft EIS. The Technical Appendices from the Site Evaluation Report are reproduced as appendices to the EIS.

Preparation of draft EIS:

U. S. Environmental Protection Agency:

John Malek	Ocean Dumping Coordinator and Project Officer

U. S. Army Corps of Engineers, Portland District:

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Preparation of Site Evaluation Report and Technical Appendices:

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Geoffrey L. Dorsey	Wildlife Biologist
Steven J. Stevens	Landscape Architect
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APPENDIX A

APPENDIX A

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX A

LIVING RESOURCES

Introduction

1.01 Information on aquatic resources was obtained from a variety of sources including a field sampling program conducted by the National Marine Fisheries, Hammond, Oregon, Laboratory during September 1984 and January 1985. A variety of published and unpublished reports, thesis, and personal communications with the ODFW Marine Resources Division biologists were also used. Critical living resources were determined primarily by whether the resource was unique to the area or was in limited abundance along the Oregon coast.

Plankton and Fish Larvae

1.02 Distribution and abundance of inshore plankton species vary depending upon nearshore oceanographic conditions. In the summer when the wind is from the northwest, surface water is moving south and away from the shore. Colder, more saline, nutrient rich water then moves up from depth onto the shore. This upwelling phenomenon can extend up to 10 km offshore and last from days to weeks depending upon the strength and duration of the wind. Species present during this time are predominantly those from subarctic water masses.

1.03 In the winter the wind is primarily out of the west and southwest and surface waters are transported inshore. The zooplankton community during this season consists of species from the transitional or Central Pacific water masses.

1.04 No specific data is available for the area offshore from the Umpqua River. However, Peterson and Miller (1976) and Peterson et al. (1979) have sampled the zooplankton community off the Yaquina River and found copepods to be the dominant taxa. The species present varied with season, of the 58 total species collected, 38 were collected in the summer and 51 in the winter. Eight occurred commonly in both summer and winter while seven occurred only or predominantly in the summer and six in the winter. A list of dominant summer and winter species is given in table A-1. In general winter species are less abundant than summer species.

Table A-1

Dominant Copepod Species by Season in Decreasing Order of Abundance

Winter Species	Summer Species
Pseudocalamus sp.	Pseudocalamus sp.
Oithona similis	Acartia clausili
Paracalamus parvus	Acartia longiremis
Acartia longiremis	Calamus marshallae
Centrophages abdomialis	Olithona similis

1.05 Other taxa collected were less abundant than the copepods except for a few organisms during certain times of the year. A list of the other taxa collected is given in tables A-2 and A-3.

1.06 The other plankton species of importance is the megalops larval stage of the Dungeness crab (Cancer magister). Lough (1976) has reported that megalops occur inshore from January to May and are apparently retained there by the strong longshore and onshore components of the surface currents in the winter. After May, the megalops metamorphoses into juvenile crabs and settle out of the plankton moving into rearing areas near shore and in the estuary.

Table A-2
Other Taxa Collected

TAXA	TOTAL RELATIVE DENSITY			FREQUENCY		
	1969	1970	1971	69	70	71
Calanus nauplii	119.5	695.5	172.7	21	40	28
Other Copepod nauplii	43.1	68.1	52.3	10	20	20
Amphipods	8.5	18.5	15.7	5	15	14
Euphausiid nauplii	46.3	85.9	84.0	5	26	18
Euphausiid calyptopis	13.3	14.5	17.2	4	17	11
Euphausiid furcilia	30.2	13.6	17.7	14	20	10
Thysanoessa spinifera	35.4	4.0	87.3	2	7	11
Evadne nordmanni	73.7	58.9	9.8	17	26	2
Podon leukarti	2.8	115.3	5.2	2	12	1
Pteropods	10.2	24.6	60.6	11	22	35
Chaetognaths	89.4	50.3	30.8	25	33	34
Oikopleura	69.2	85.7	66.5	11	15	21
Ctenophores	6.0	2.5	34.9	7	5	19
Scyphomedusae	22.9	70.9	22.8	13	28	22
decapod shrimp mysis	142.7	52.6	45.3	16	24	22
barnacle nauplii	59.3	168.3	231.4	8	32	28
barnacle cypris	4.4	64.0	8.3	2	19	10
polychaete post-trochophores	16.2	20.1	21.4	5	23	15
bivalve veligers	170.5	258.9	68.3	20	40	27
gastropod veligers	28.9	79.2	42.2	16	33	23
hydromedusae	6.1	3.2	10.3	2	2	11
unidentified annelid without parapodia	8.2	23.1	35.8	3	3	16
pluteus	0.0	16.0	117.6	0	5	11
large round eggs (fish)	36.8	25.0	17.8	11	13	12
Calanus eggs	870.1[a]	168.7	226.1	10	28	25
euphausiid eggs, early	55.0	686.1	449.6	11	29	24
euphausiid eggs, late	70.0	57.5	39.6	2	16	14
other fish eggs	19.1	35.1	34.3	12	18	18

a = biased by a single observation of 760 individuals/m^3.

The following taxa were found in less than five samples: radiolarians, foraminifera, siphonophores, planula larva, trochophores, *Tomopteris*, heteropods, *Clione*, phoronid larva, ascidian larva, salps, auricularia larva, imm starfish, decapod protozoeas, unusual barnacle nauplii, *Stylocheiron abbreviatum*, anchovy eggs, and four miscellaneous unidentified meroplanktonic taxa.

Total relative density and frequency of occurrence of other holoplanktonic taxa and meroplankton taken within 18 km of the coast during 1969, 1970 and 1971 upwelling seasons. Table entries are sums of average abundances at each of four stations.[1]

Table A-3
Other Taxa Collected

TAXA	TOTAL RELATIVE DENSITY			FREQUENCY		
	1969	1970	1971	69	70	71
Calanus nauplii	119.5	695.5	172.7	21	40	28
Other Copepod nauplii	43.1	68.1	52.3	10	20	20
Amphipods	8.5	18.5	15.7	5	15	14
Euphausiid nauplii	46.3	85.9	84.0	5	26	18
Euphausiid calyptopis	13.3	14.5	17.2	4	17	11
Euphausiid furcilia	30.2	13.6	17.7	14	20	10
Thysanoessa spinifera	35.4	4.0	87.3	2	7	11
Evadne nordmanni	73.7	58.9	9.8	17	26	2
Podon leukarti	2.8	115.3	5.2	2	12	1
Pteropods	10.2	24.6	60.6	11	22	35
Chaetognaths	89.4	50.3	30.8	25	33	34
Oikopleura	69.2	85.7	66.5	11	15	21
Ctenophores	6.0	2.5	34.9	7	5	19
Scyphomedusae	22.9	70.9	22.8	13	28	22
decapod shrimp mysis	142.7	52.6	45.3	16	24	22
barnacle nauplii	59.3	168.3	231.4	8	32	28
barnacle cypris	4.4	64.0	8.3	2	19	10
polychaete post-trochophores	16.2	20.1	21.4	5	23	15
bivalve veligers	170.5	258.9	68.3	20	40	27
gastropod veligers	28.9	79.2	42.2	16	33	23
hydromedusae	6.1	3.2	10.3	2	2	11
unidentified annelid without parapodia	8.2	23.1	35.8	3	3	16
pluteus	0.0	16.0	117.6	0	5	11
large round eggs (fish)	36.8	25.0	17.8	11	13	12
Calanus eggs	870.1[a]	168.7	226.1	10	28	25
euphausiid eggs, early	55.0	686.1	449.6	11	29	24
euphausiid eggs, late	70.0	57.5	39.6	2	16	14
other fish eggs	19.1	35.1	34.3	12	18	18

a = biased by a single observation of 760 individuals/m^3.

The following taxa were found in less than five samples: radielarians, foraminifera, siphonophores, planula larva, trochophores, *Tomopteris*, heteropods, *Clione*, phoronid larva, ascidian larva, salps, auricularia larva, imm starfish, decapod protozoeas, unusual barnacle nauplii, *Stylocheiron abbreviatum*, anchovy eggs, and four miscellaneous unidentified meroplanktonic taxa.

Total relative density and frequency of occurrence of other holoplanktonic taxa and meroplankton taken within 18 km of the coast during 1969, 1970 and 1971 upwelling seasons. Table entries are sums of average abundances at each of four stations.[1]

1.07 Fish larvae are a transient member of the inshore coastal plankton community. Their abundance and distribution has been described by Richardson (1973), Richardson and Pearcy (1977), and Richardson et al. (1980).

1.08 Three species assemblages have been described off the Oregon coast; coastal, transitional, and offshore. In general, the species in the coastal and offshore assemblages never overlapped while the transitional species were from both groups. The break between the coastal and transitional groups occurred at the continental slope.

1.09 The coastal group is dominated by smelts (Osmeridae), (greater than 50 percent of the larvae collected), and to a lesser extent the English sole (Parophrys vetulus), sanddab (Isopsetta isolepis), starry flounder (Plantichthys Sordidus), and tom cod (Microgadus proximus). Maximum abundance occurred from February to July when greater than 90 percent of the coastal larvae were collected. Two peaks of abundance were present during this period, one in February to March (24 percent of larvae) and one following upwelling in May to July (68 percent of larvae). Dominant species during each peak are shown below (table A-4).

Table A-4
Dominant Fish Larval Species During the Two Peaks of Abundance

Species	February to March	May to July
Smelt (Osmeridae)	1.51*	4.12
English sole (Parophrys vetulus)	4.09	
Sandlance (Ammodytes hexapterus)	1.76	
Sanddab (Isopsetta isolepis)	1.73	2.21
Tom Cod (Microgadus proximus)		2.03
Slender sole (Lyopsetta exilis)		1.07

* Biological index - Ranking method that averages abundance and frequency of occurrence in samples. 5 to 1 in decreasing order.

1.10 The larval species present in the inshore coastal areas were similar and had the same peaks of abundance as those collected in the Yaquina Estuary (Pearcy & Meyers, 1974); however, the dominate species differed. In the bay two species accounted for 90 percent of the species collected, the bay goby (Lepidogobius lepidus) and the Pacific herring (Clupea harengus pallasi). Neither were present or common in the inshore coastal area. Some of the common coastal species such as English sole and starry flounder also use the estuary as juvenile rearing areas.

Benthic Invertebrates

1.11 Benthic invertebrates play an important role in secondary productivity of nearshore marine systems. Not only are they a direct source of food for many demersal fishes but play an active part in the shredding and breakdown of organic material and in sediment reworking.

1.12 Knowledge of the benthic communities off of the nearshore central Oregon coast is scant. A literature review conducted by the Portland District indicated that only six quantitative benthic studies have been conducted in nearshore coastal waters off Oregon.

1.13 Investigations include evaluating offshore disposal sites near the mouth of the Columbia River by Richardson et al. (1977), a quantitative study of the meiobenthos north of Yaquina Bay entrance (Hogue 1981) and an outfall study for an International Paper Company outfall near Gardiner Or. (Unpublished, n.d.). In addition, site specific studies of ocean disposal for the selection of the Coos bay (Hancock et al. 1981, Nelson et al. 1983, and Sollitt et al. 1984) and Yaquina Bay ODMDS have been completed (USACOE 1985 and 1986). Similar benthic studies have been conducted at seven other ocean disposal sites off of the Oregon coast and the data is being analysed for final site designation. These studies comprise the total benthic infaunal data base available for the Oregon Coast. All but one of the benthic studies were sponsored by the Portland District.

1.14 To provide site specific information on the infauna and epifauna to supplement the existing data and characterize the Umpqua interim and adjusted disposal sites, Portland District contracted with the National Marine Fisheries Service, Hammond Laboratory to collected and analyzed benthic samples as described in Emmett et al (1987).

1.15 Stations were located on the 60, 70, 80, 90, 100 and 110 foot depth contours along the center line of the interim disposal site and also along transects to the north (adjusted site) and to the south. Figure A-1 shows the location of the sampling sites and transects. Two reference transects were also sampled north and south of the disposal sites.

The reference transects were located far enough north and south to be out of the influence of disposal results at the interim site. Samples were collected during two seasons, Figure A-1September 1984, and January 1985. Six replicate bottom samples were taken from each of the 24 stations using a modified Gray-O'Hara box corer which sampled a 0.096 m area of the bottom. One sample from each station was sent to the CoE North Pacific Division Materials Testing Laboratory for determination of sediment grain size and organic content. The remaining five box-core samples were sieved through a 0.5 mm mesh screen; organisms retained on the screen were preserved in 10 percent buffered formalin. Infaunal organisms were then picked from the sediment, counted and identified to the lowest practical taxon.

Results

1.16 Sediments from all of the stations sampled in the region of the Umpqua River Interim ODMDS Site consists of medium to fine grained sand inside the disposal site (median d=0.3 mm), and fine grained sand outside of the interim site (median d=0.16 mm).

1.17 The species composition of the Umpqua interim ODMDS was found to be typical of nearshore high energy environments (Emmett, et al., 1987). The infaunal community is characterized predominately by polychaete worms and gammarid amphipods. In Sept(84), polychaete worms were the dominant taxanomic group with very large abundances at the north and south transect lines. In Jan(85), amphipods became the dominant group with densities over 4000/sq m at some stations. Depressed densities were recorded at the 70-110 ft deep stations which lie on the transect through the center of the interim disposal site, (stations U-2-3 to U-2-6). The species of invertebrates inhabiting the sandy portions of the study area,(Polychaete annelids and gammarid amphipods) are the more motile psammnitic (sand-dwelling) forms which tolerate or require high sediment flux. They are typical of other shallow water disposal sites such as Coos Bay sites "E" and "F" (Hancock et al., 1981).

1.18 Figure A-2 compares mean infaunal densities (for five replicate box core samples) at the four stations within the interim site, the adjusted site, the south transect and the north and south reference stations combined.

The transects to the north (adjusted site) and south of the disposal site and the reference stations had significantly higher densities than the interim disposal site. Depressed densities in the interim site were observed during both the Sept(84) and the Jan(85) surveys.Further, the nearshore stations in the interim site appear to have lower densities than the deeper stations. The survey indicates that past disposal of dredged material may have reduced the abundance of benthic infauna within the interim site, but not outside the site as indicated by the north and south reference stations. Dredged material disposal in 1984 occured during 23-28 August and 15-27 September; which coincided with the sampling date. Dredged material disposal in 1985 occured from 30 May to 30 September; this was three months before the sampling. These results appear consistent with our current and past hopper dredge disposal activities since the inner portion of the interim site receives more intense disposal activity than the deeper areas further offshore.

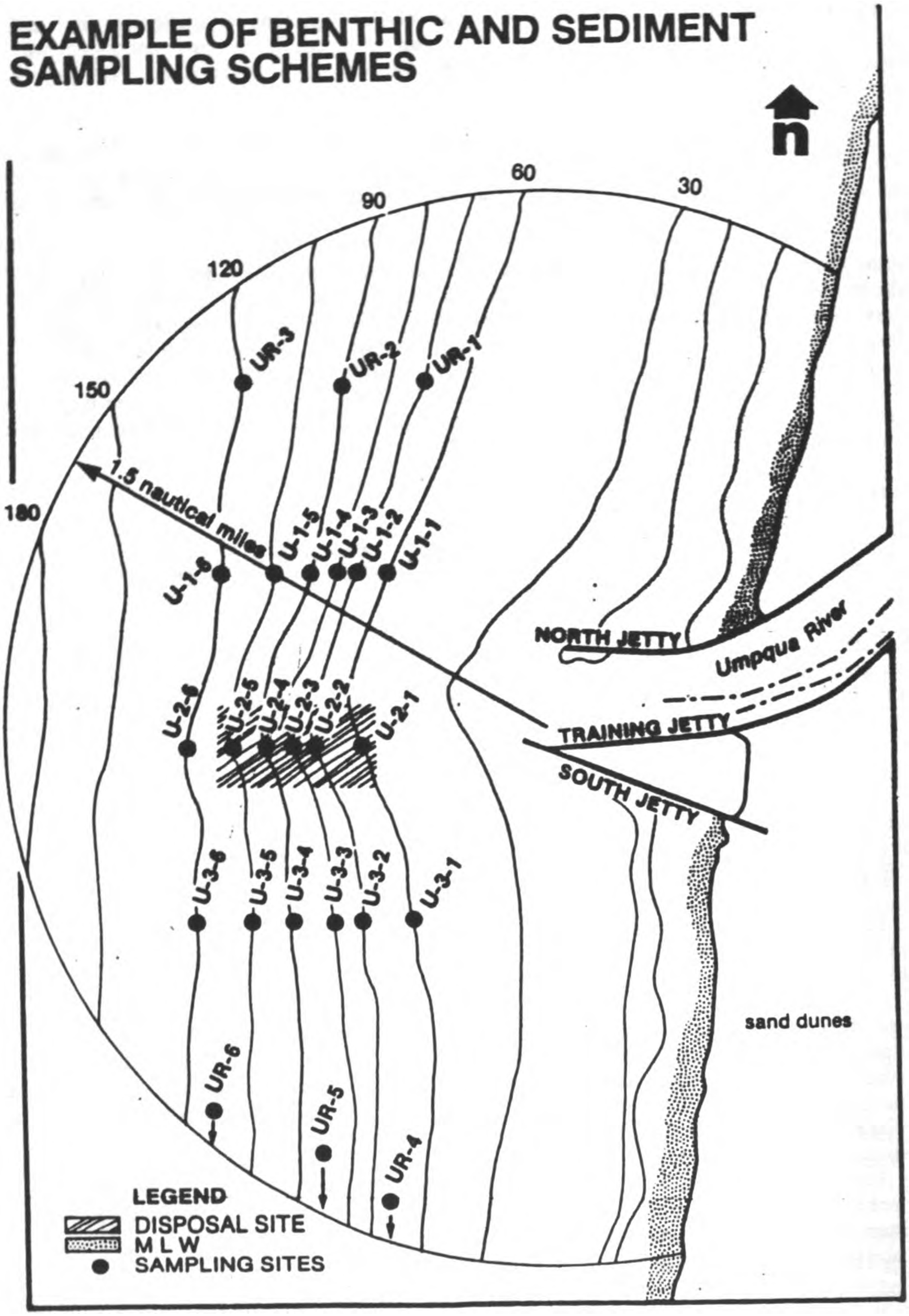

Figure A-1
Sample Site Locations

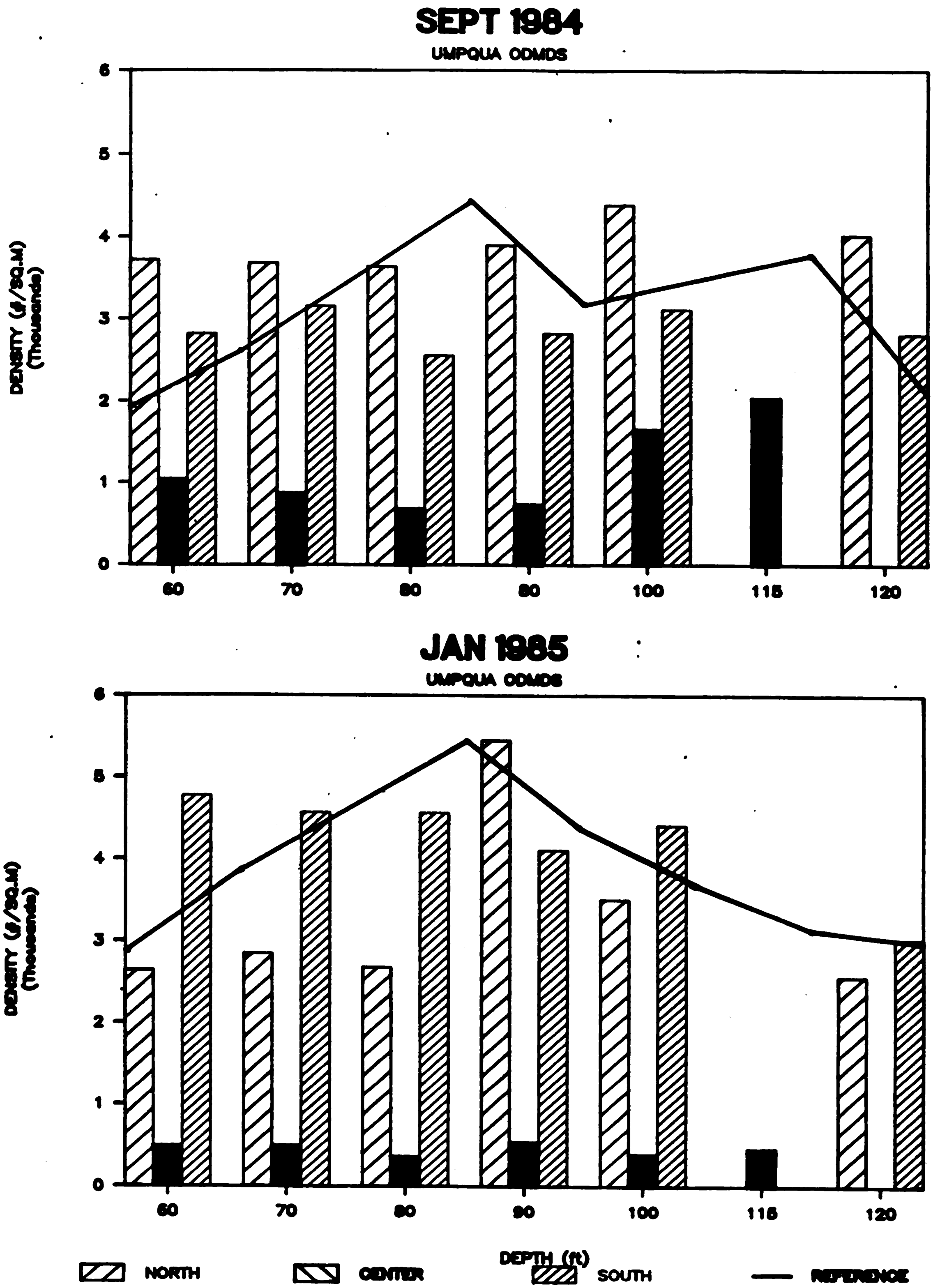

Figure A-2
Density of Benthic Infauna

1.19 Figure A-3 compares diversity (H') species richness and equitability (J') of benthic infauna by depth for the Umpqua interim offshore disposal site, the adjusted site, the south transect and the reference stations to the north and south. The values for each of these factors were found to be very similar for each station in the study area. However, values for the center transects suggest a reduction in standing stock from smothering, dilution or resulting from the observed shift to coarser grain size. Impacts outside the interimdisposal site were not observed.

1.20 Mean densities (#/m) along the northern transect (adjusted site) increase with increasing water depth, ranging from 3638 to 4381 organisms/m in September(84) and 2567 to 2846 organisms/m in January(85) The middle transect, (interim site), ranged from 683 to 2044 in Sept(84) and 365 to 540 in January(85). The southern transect ranged from 2808 to 3154 in September(84) and 3031 to 4777 in January(85).

Macroinvertebrates

1.21 The dominant commercially and recreationally important macroinvertebrate species in the inshore coastal area are shellfish and Dungeness crabs . Shellfish distribution is shown in Figure A-4. Razor clam beds are located north of the jetty along the beach. Recruitment to the inshore beaches comes from the subtidal spawning areas. Gaper, softshell, butter and bentnose clams are present in large numbers near the mouth and upriver in the estuary proper. Dungeness crab adults occur on sandflat habitat along the entire Oregon coast. They spawn in offshore areas and the juveniles rear in the estuary.

1.22 The Oregon Department of Fish and Wildlife (ODFW) has not identified a major squid spawning area off the Umpqua estuary.

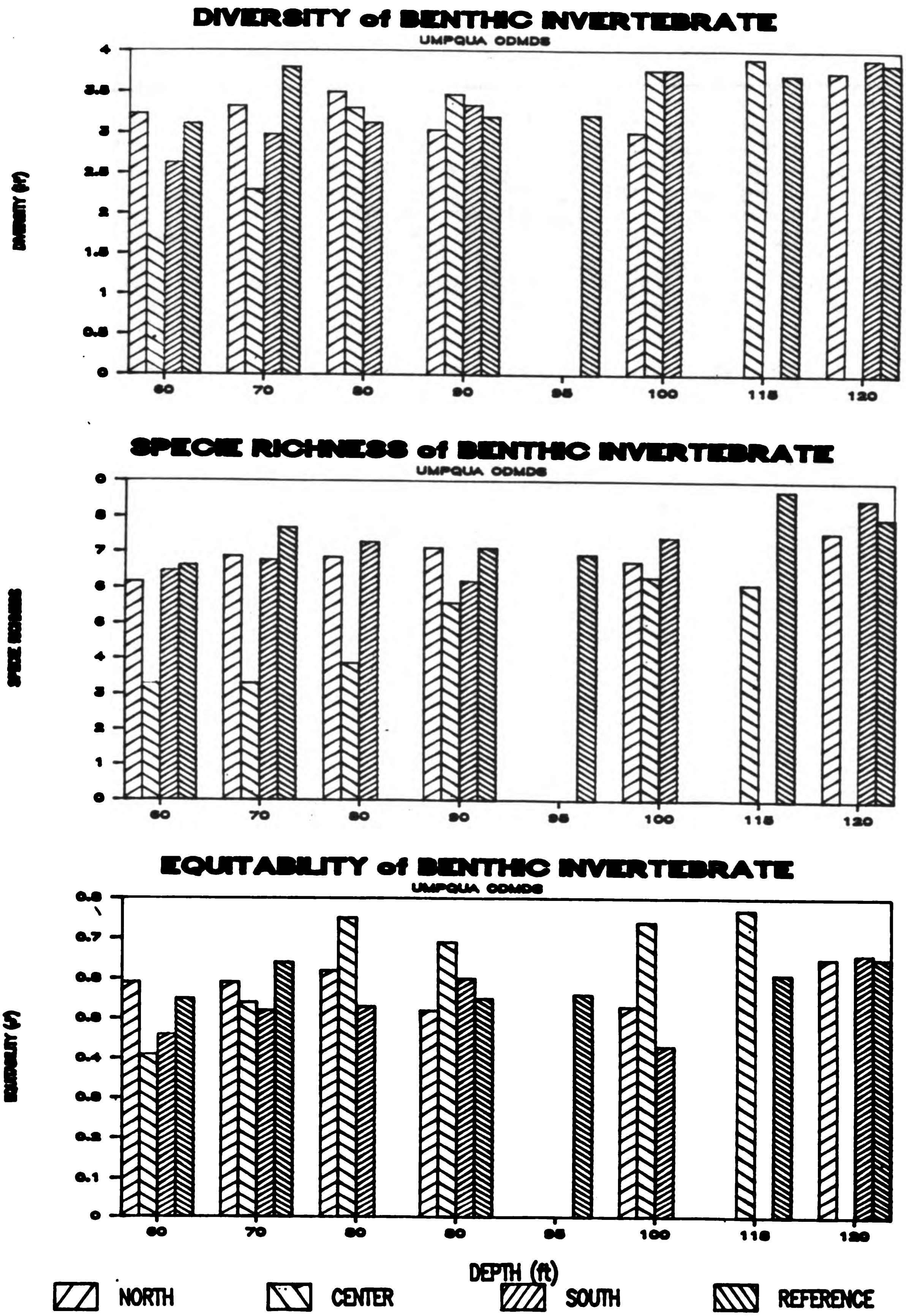

Figure A-3
Diversity, Species Richness and Equitability

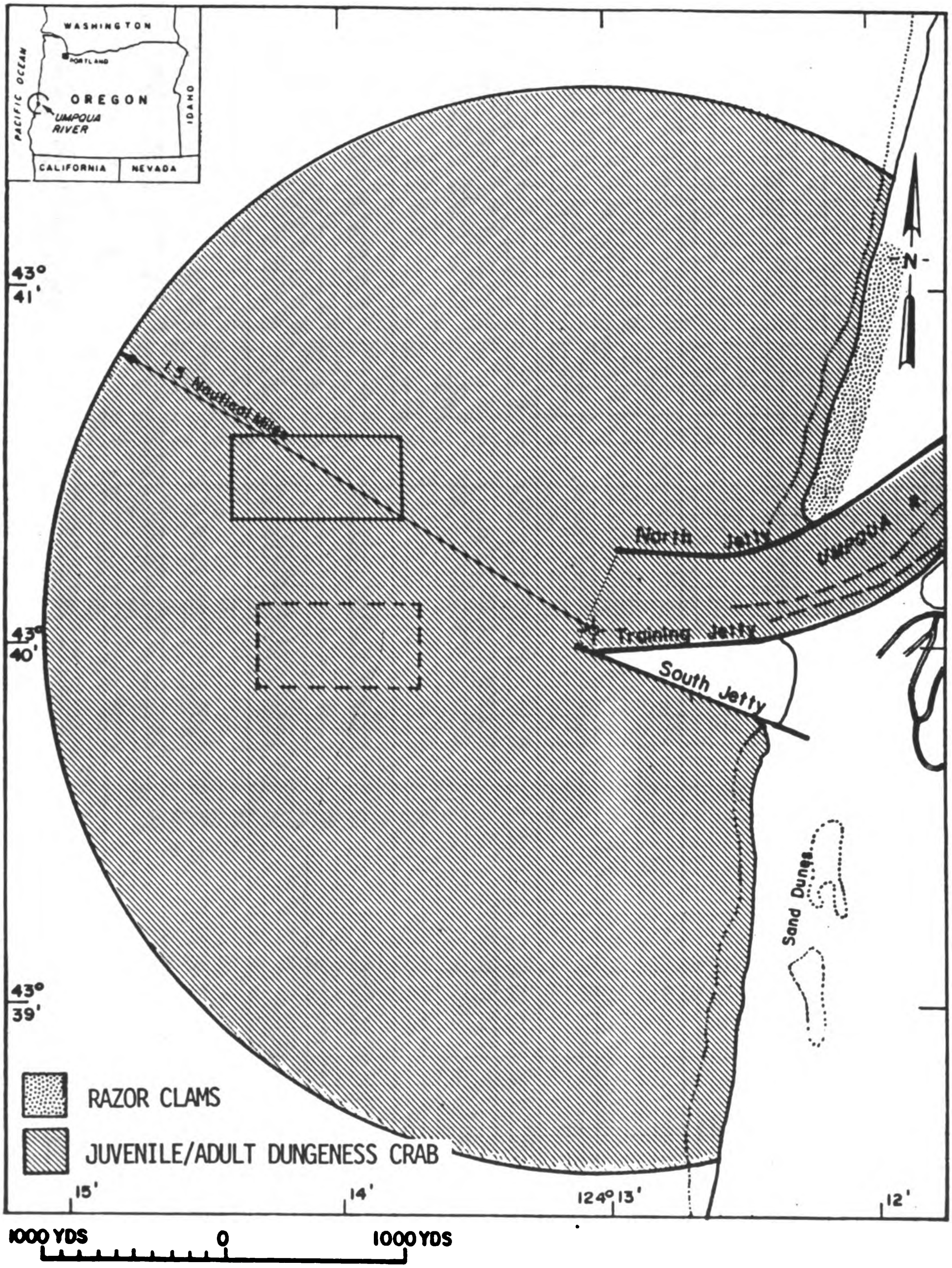

Figure A-4
Shellfish Distribution

Fisheries

1.23 The nearshore area off the mouth of the Umpqua supports a variety of pelagic and demersal fish species. Pelagic species include anadromous salmon, steelhead, cutthroat trout, striped bass and shad that migrate through the estuary to upriver spawning areas (ODFW, 1979). Other pelagic species include the Pacific herring, anchovy, surf smelt, and sea perch. Surf smelt in particular are in nearshore areas and in the estuary in large numbers during the summer (ODFW, 1979).

1.24 Though migratory species are present year-round, individual species are only present during certain times of the year. Figure A-5 shows the species of fish and their periods of occurrence off the Umpqua River.

1.25 Demersal species present in the nearshore area were sampled in September, 1984 and in January, 1985 by the National Marine Fisheries Service laboratory in Hammond (Emmett et al, 1987). Samples were taken with a 8 meter semiballon shrimp trawl with a 38.1 mm mesh main net and 12.7 mm cod end liner. One trawl approximately 10 minutes long was taken along the 60, 70, 80, 90, 100 and 115 depth contours of the mouth of the Umpqua (Figure A-6). Fish and macro invertabrate species collected and their density are given in table A-5. The most abundant species collected was the night smelt in Jan(85). Other dominant species included Tom cod in both surveys, Sandlance in Jan(85), prickle breasted poacher and speckled sanddab in Sept(84), and sandsole in Jan(85). The mean density of fish and crabs was significantly greater in January than in September, with more individuals collected in the shallower depths (60 to 70 feet) (Figure A-7). Diversity of species generally increased with depth though these relationships were not as consistent for the Sep(85) data (table A-6). Length frequency data indicated that most fish collected were juveniles (Figure A-8). Dungeness crab collected in September(84) were primarily young-of-year (< 25 mm), while in January they were larger and probably adults (> 100 mm).

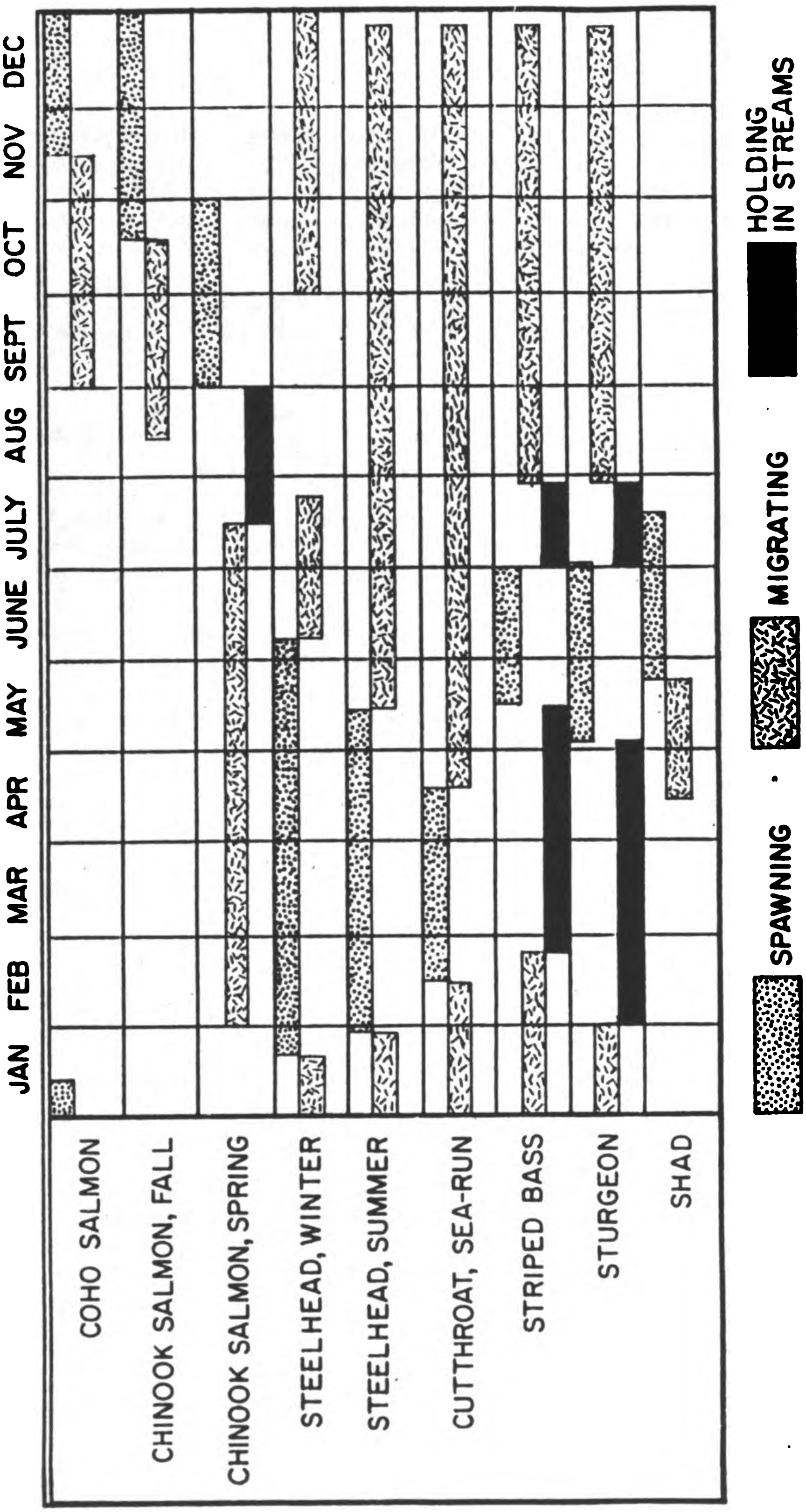

Figure A-5
Species of Fish and Seasonal Occurrence

Table A-5
Catch Data for Fish and Crab

Species	Survey 1 (SEPT. 84) Total number captured	Survey 1 (SEPT. 84) Mean number per ha	Survey 2 (JAN 85) Total number captured	Survey 2 (JAN 85) Mean number per ha
Spiny dogfish	0	0	1	1
Big skate	5	3	3	2
American shad	0	0	82	38
Northern anchovy	2	1	0	0
Whitebait smelt	0	0	7	3
Night smelt	9	6	6,131	2,766
Longfin smelt	0	0	1	1
Unid. juvenile smelt	1	1	1	1
Pacific tomcod	228	136	298	136
Larval groundfish	0	0	2	1
King-of-the-salmon	1	1	0	0
Bay pipefish	1	1	8	4
Shiner perch	4	3	37	18
Spotfin surfperch	0	0	35	16
Wolf-eel	3	2	0	0
Pacific sand lance	0	0	250	115
Lingcod	1	1	0	0
Pac. staghorn sculpin	3	2	56	27
Cabezon	0	0	1	1
Warty poacher	45	28	2	1
Tubenose poacher	21	13	5	2
Pricklebreast poacher	388	241	65	30
Pacific sanddab	0	0	24	12
Speckled sanddab	248	154	71	33
Butter sole	5	3	25	12
English sole	73	47	61	28
C-O sole	4	2	0	0
Sand sole	79	49	307	146
Larval flatfish	1	1	1	1
Dungeness crab	27	17	17	8
Red rock crab	1	1	0	0
Cancer gracilis	0	0	2	1
Kelp crab	1	1	0	0
Pugettia richii	1	1	0	0
TOTAL	1,152	715	7,493	3,404

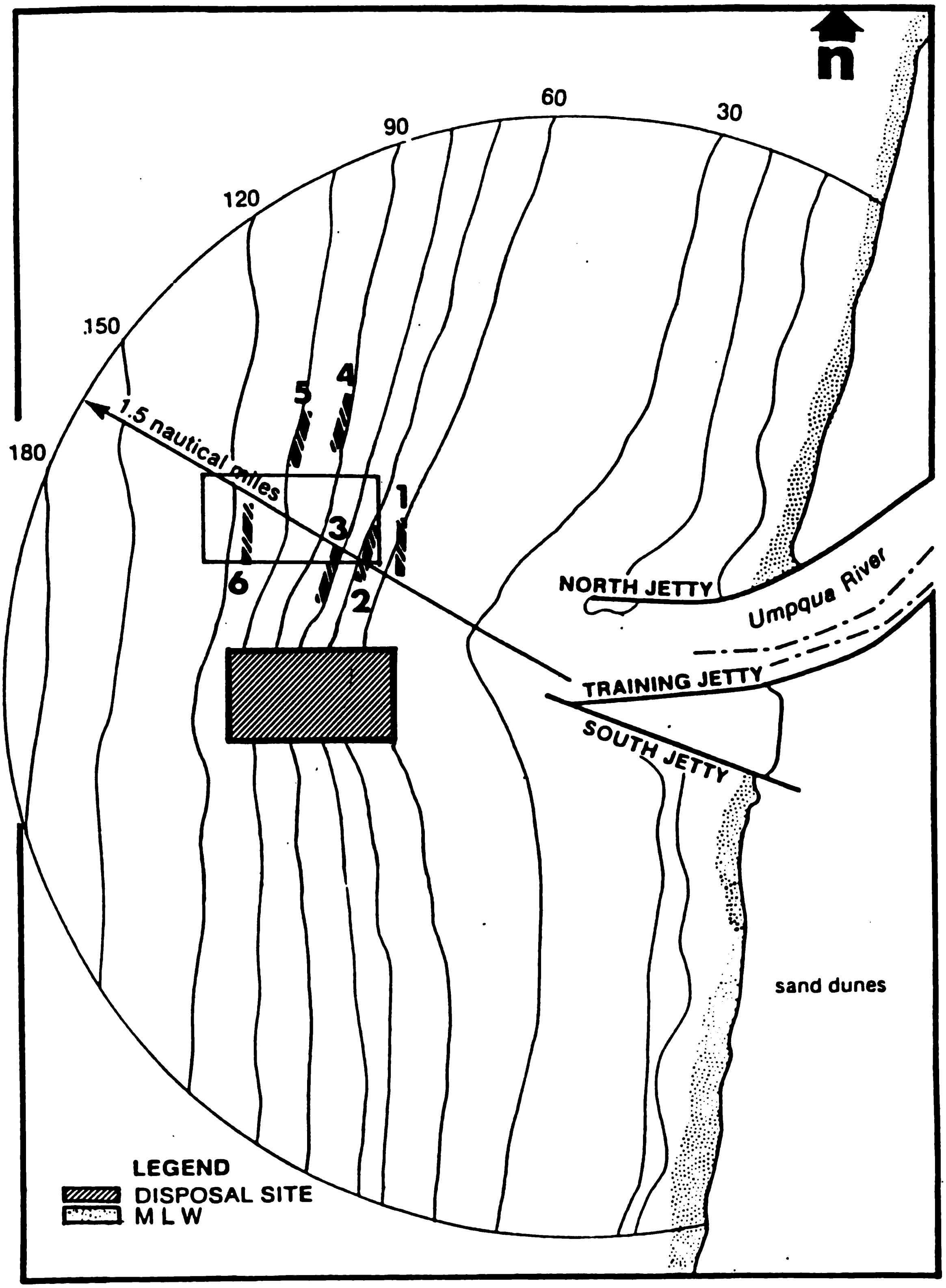

Figure A-6
Trawl Site Locations

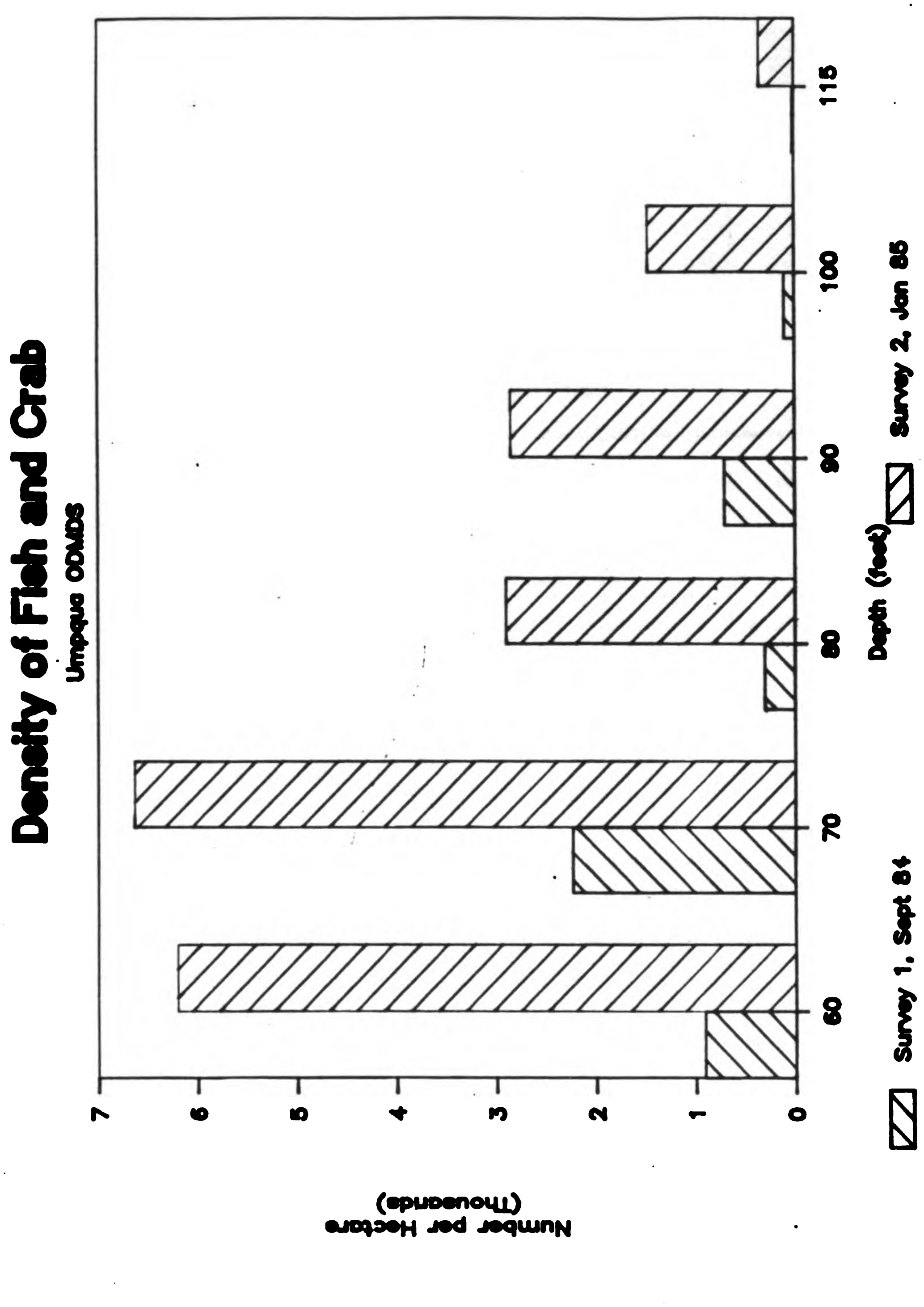

Figure A-7
Density of Fish and Crab

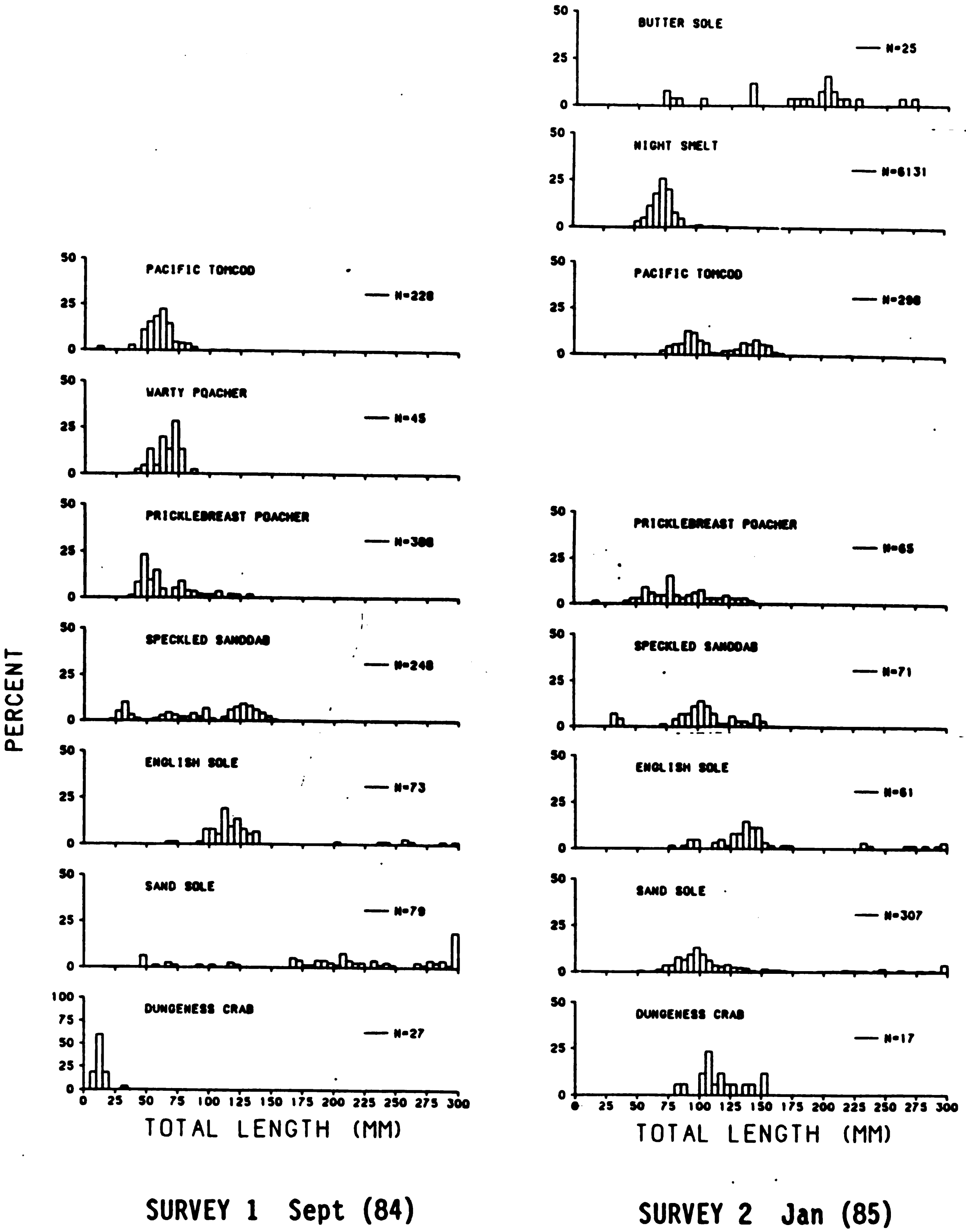

Figure A-8
Length Frequency Distributions Jan(85)

Table A-6
Summary of Trawl Data

Survey 1, September 1984

Station and Depth (ft)	Number of Species	Number per hectare	Density (g/ha)	H'	J	SD	SR
U-1 (60)	14	911	24,268	2.39	0.63	0.73	2.36
U-2 (70)	13	2,235	49,239	2.25	0.61	0.70	1.88
U-3 (80)	10	302	17,043	1.67	0.50	0.47	1.94
U-4 (90)	13	704	28,356	2.53	0.68	0.71	2.32
U-5 (100)	9	103	5,310	2.44	0.77	0.72	2.49
U-6 (115)	3	13	1,248	1.50	0.95	0.63	1.44
Mean	10	711	20,911	2.13	0.69	0.66	2.07

Survey 2 , January 1985

Station and Depth (ft)	Number of Species	Number per hectare	Density (g/ha)	H'	J	SD	SR
U-1 (60)	14	6,201	21,102	0.58	0.15	0.14	1.69
U-2 (70)	12	6,634	18,868	0.44	0.12	0.10	1.40
U-3 (80)	17	2,900	22,571	1.52	0.37	0.42	2.30
U-4 (90)	20	2,853	29,681	1.65	0.38	0.44	2.76
U-5 (100)	17	1,472	27,982	2.85	0.70	0.81	2.54
U-6 (115)	12	345	12,393	2.51	0.70	0.72	2.36
Mean	15	3,401	22,100	1.59	0.40	0.44	2.18

Commercial and Recreational Fisheries

1.26 Major commercial fishing areas are shown in figure A-9. The predominant commercial fishery is for salmon, Dungeness crab and bottom fish. Salmon trolling and crab fishing done over most of the ZSF.

1.27 Commercial landings for the Winchester Bay in 1986, as compiled by ODFW (1988) were:

Bottom Fish	758,984	lbs
Salmon	309,737	lbs
Dungeness Crab	465,544	lbs
Total	1,534,265	lbs

1.28 The principal recreational fishing that occurs off the Umpqua River is for salmon. Salmon fishing is done by charter and private boat and occurs in the same areas as the commercial fishery, but generally closer to shore.

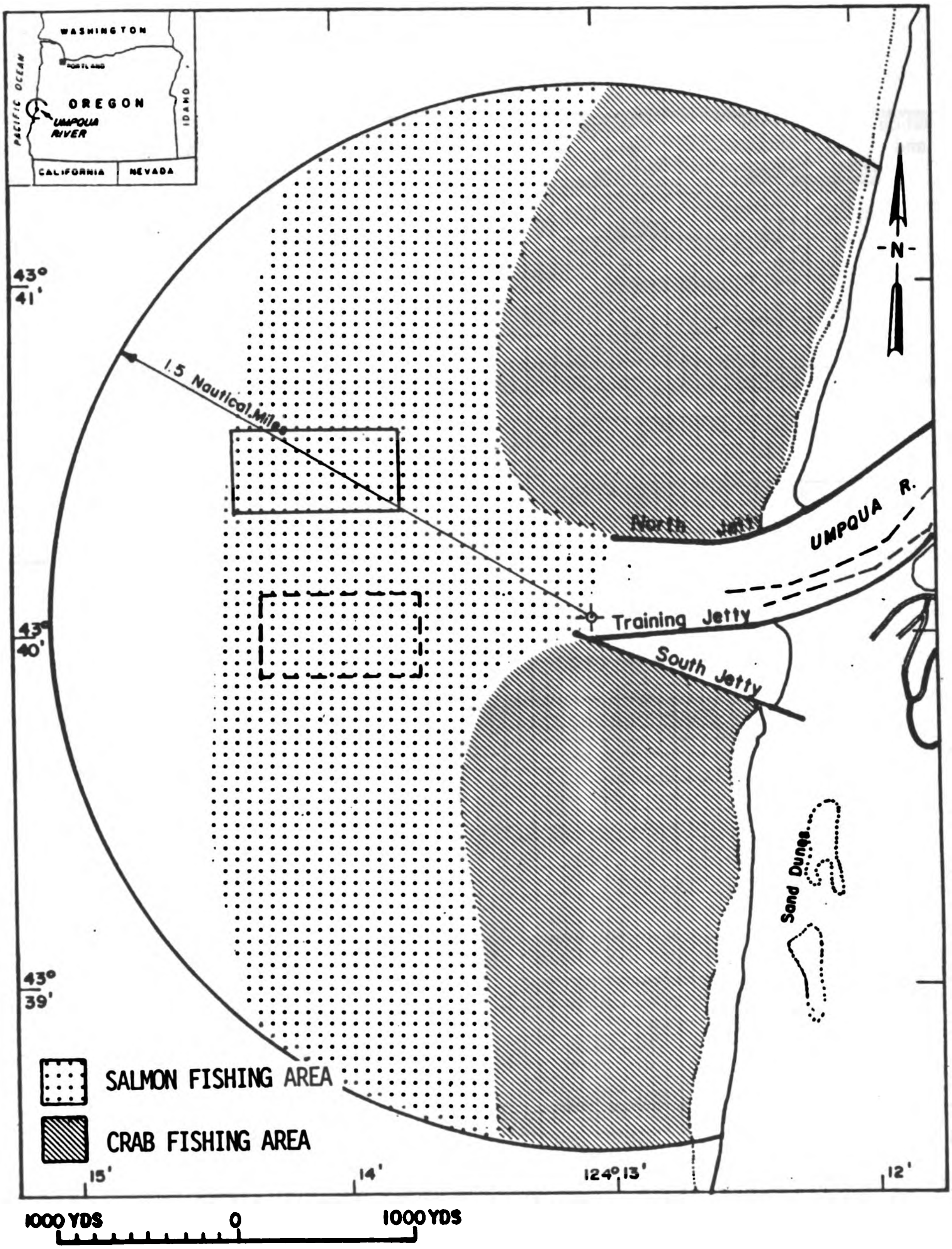

Figure A-9
Commercial Fishing Areas

Wildlife

1.29 Numerous species of birds and marine mammals occur in the pelagic, near shore, and shoreline habitats in and surrounding the proposed disposal site. Information on distribution and abundance of bird species is from the Seabird Colony Catalog (Varoujean 1979) and Pacific Coast Ecological Inventory (USFWS 1981), except as indicated. Shorebirds occur along much of the coast primarily as migrants and/or winter residents. A few species of shorebirds including western snowy plover, black oystercatcher, killdeer, and spotted sandpiper nest along the coast. Recent shorebird surveys along the Oregon Coast have shown that the northern portion of the Oregon Dunes National Recreation Area (ODNRA) supports some of the highest densities of wintering sanderlings in the world. Information on most species of shorebirds is lacking, therefore their abundance and distribution can only be addressed in general terms. Several species of special concern, bald eagle, peregrine falcon, marbled murrelet and brown pelican occur along the coast and may use the ZSF or the surrounding areas. Pelicans and peregrine falcons are often associated with spits, ocean beaches and offshore rocks. Pelagic birds (e.g. shearwaters, murres) probably use the ZSF and adjacent waters for foraging. Marbled murrelets are generally located within 1.5 km of sandy shores, typically just outside the breakers.

1.33 Data on marine animals is from the Natural History of Oregon Coast Mammals Maser et al. (1981), Pearson and Verts (1970), and the Pacific Coast Ecological Inventory (USFWS 1981), except as indicated. Except for seals and sea lions, information on marine mammals is extremely limited. Harbor seals and sealions are primarily transient in the project area. Hauling out occurs within the estuary and on the jetties. Whales are known to occur throughout coastal waters primarily during migrations, but population estimates and information on areas of special use generally are not available (reference biological assessment for whales).

1.34 Habitats and species within the ZSF (Figure A-10) may be affected, and include the area north of the Umpqua River which is used as a nesting and wintering area by the western snowy plover. Western snowy plovers are listed by the State of Oregon as threatened. Brown pelicans, a federally listed endangered species, use the north spit area at the mouth of the Umpqua River and forage in the estuary and nearshore areas. Murres, with young, dispersing from nesting colonies will occur in the ZSF; conflict with the disposal operations should be minimal due to the limited presence of the dredge.

1.35 Several important wildlife areas outside the ZSF potentially could be affected by disposal of dredged material. Western snowy plovers congregate and nest in the area around the mouth of the Tahkenitch River and the area from the Umpqua River south to Tenmile Creek. Beaches within the northern portion of the Oregon Dunes NRA which support high densities on sanderlings could possibly be impacted.

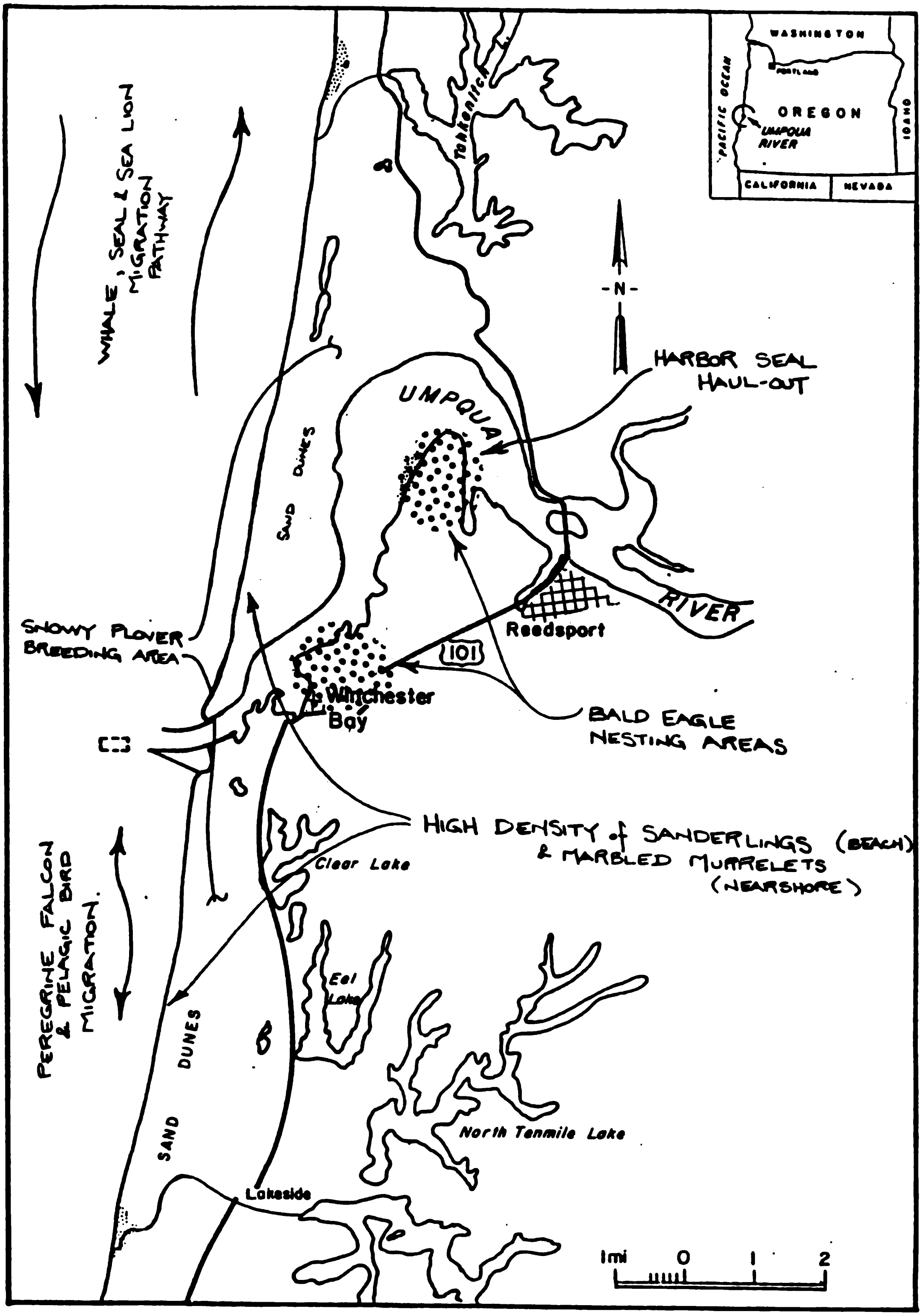

Figure A-10
Wildlife Areas

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APPENDIX B

APPENDIX B

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX B

GEOLOGIC RESOURCES, OCEANOGRAPHIC PROCESSES AND SEDIMENT TRANSPORT OF THE UMPQUA ZSF

GEOLOGICAL RESOURCES

Regional Setting

1.1 The esturary of the Umpqua River opens into the Pacific Ocean about 180 miles south of the mouth of the Columbia River. It lies within the Heceta Head littoral cell, which extends for 90 km from Heceta Head south to Cape Arago. Figure B-1 shows the location of the Umpqua littoral cell. The estuary is fed by two rivers, the Umpqua, and the smaller Smith. The watershed encompasses part of the Coast Range, with the Umpqua River extending into the Cascades. The coastal zone of the littoral cell consists of a one to two mile wide plain covered by active and stabilized sand dunes backed by the mature upland topography of the Coast Range. The lower portion of the Umpqua River is bordered by broad alluvial flats. The continental shelf off the mouth of the Umpqua is abut 30 km wide. Just to the north it bulges outward, forming the Heceta Bank. Between Siuslaw and Yaquina the shelf is at its widest along the Oregon coast, extending over 70 km offshore. Sand covers the shelf at the Umpqua for about 3 km out from the shore. From there a thin layer of mud (1 to 3 cm thick) mantle the surface (Kulm 1977).

1.2 The Heceta Head littoral cell is the largest on the Oregon coast. Except for the headlands at both ends of the cell, the entire coast line is made of beach fronting sand dunes. Three major river systems enter the cell. From north to south these are the Siuslaw, the Umpqua, which is the largest of the three, and Coos River.

Regional Geology

1.3 The Heceta Head littoral cell and the larger part of the Umpqua River are in the southern portion of the Coast Range. The rocks of the Coast Range are marine and deltaic sediments, and volcanic rocks, mostly from the earlier half of the Cenozoic. During the Eocene the area was part of a large embayment of the ocean with an volcanic island arc to the west. The sea gradually withdrew to the west and north, so by the end of the Oligocene the southern portion was emergent. In the Miocene uplift began that transformed the area into the mountains present today. Figure B-2 shows the coastal geology near Umpqua.

1.4 During the Pliocene and Pleistocene periodic ice ages and warmer interglacial periods caused major fluctuations in the sea level. Terraces were cut that, in conjunction with tectonic uplift, are now raised above sea level. Low stand of sea level allowed streams to cut below today's sea level. With the sea level rise that came with the end of the last glaciation these valleys were drowned, forming large estuaries, including the Umpqua's. Along the coast of the Heceta Head littoral cell the Flournoy Formation was eroded into a low coastal plain. The combination of favorable terrain and ample sediment supply allowed extensive dune fields, the Coos Bay dune sheet, to form. The sheet had its origin at the end of the last ice age. Its advance and growth is associated with the subsequent period of submergence. (Lund 1973, Cooper 1958).

1.5 The Umpqua River rises in the Cascade Range, and the upper reaches pass through Mesozoic rocks of the northwest corner of the Klamath Mountains. For the most part, though, it flows through Eocene formations of the Coast Range. The most inportant of these are the Roseburg formation to the east, the Flournoy Formation, the Tyee Formation, and the Elkton Formation. The Roseburg Formation was deposited in the early Eocene, and folded and thrust by subduction at the end of the Eocene. It consists of volcanics and interbedded sediments. The Flournoy Formation is probably middle Eocene in age, and is primarily composed of rhythmically bedded sandstone with thin layers of siltstone. The Tyee Formation, of late middle Eocene age, unconformably overlies the Flournoy. It is made of rhythmic graded bedding, with micaceous sand grading upward into siltstone. The Elkton Formation is also from the late middle Eocene, though younger than the Tyee. It consists of siltstone with minor amounts of sandstone. (Baldwin 1981, Baldwin and Beaulieu 1973).

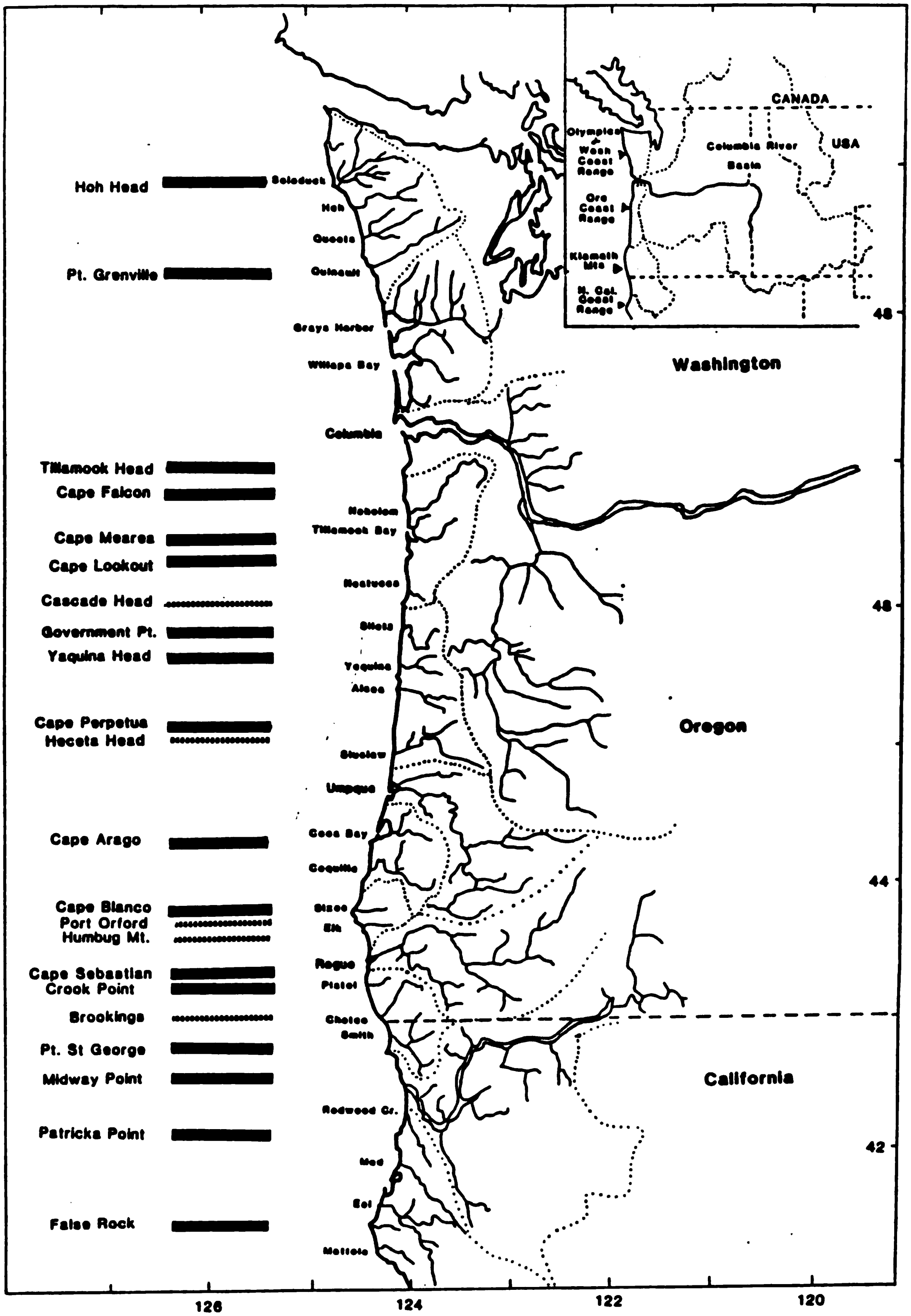


Figure B-1
Umpqua Littoral Cell Location

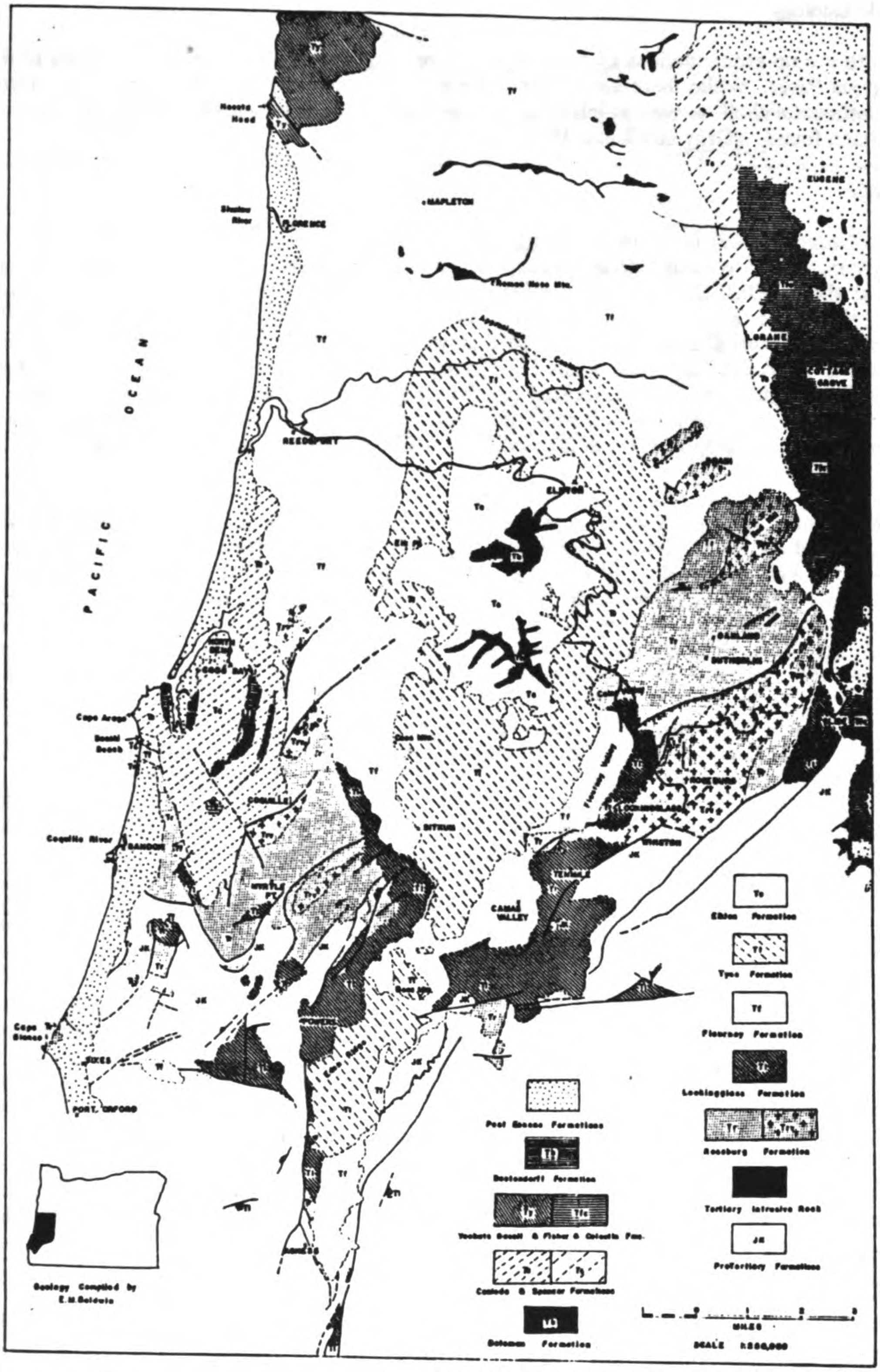


Figure B-2
Coastal Geology near Umpqua

Economic Geology

1.6 There are no accumulations of heavy minerals or gravel along the coast in the vicinity of the mouth of the Umpqua River. While there have been exploratory oil and gas wells bored both to the north and south on the continental shelf, as well as inland of the entrance of the Umpqua, no significant quantities of oil and gas has been found. (Gray and Kulm 1985).

Sediments

1.7 The Umpqua River is the major source for sediment in the littoral cell. It is fed by the Umpqua and Smith Rivers, with a combined drainage basin of 5,042 sq. miles. Mean monthly discharge is highest in January at about 18,000 cfs, and lowest in September at about 1,200 cfs. Mean annual discharge is about 8200 cfs, which gives a six hour mean discharge of 1.77x10^8 cf. The estuary of the Umpqua River covers 6,430 acres. The diurnal tidal prism is 16x10^8 cf, which divided by the six-hour discharge gives a hydrographic ratio of 9. This means that the estuary is fluvially dominated, and therefore that a large portion of the fluvial sediments will be transported out the mouth and into the sea. The Siuslaw River estuary has a hydrographic ratio of 6, so it too is fluvially dominated and should be a contributor of sediment to the cell. Coos Bay has a hydrographic ratio of 20, making it tidally dominated and a net sediment trap. (Peterson pers com)

1.8 Coastal erosion does not seem to be a significant source of sediment for the Heceta Head littoral cell. The coastline of the cell is generally stable. Only at Cape Arago and Heceta Head are there slowly retreating cliffs (USACE 1971, Stembridge 1976). The extensive sand dune fields along the coast constitute a large sediment sink. Sand is transported off the beach by wind and deposited on the dunes. Ironically, however, the stabilization of sand dunes by vegetation may leave them vulnerable to undercutting by waves (USDA 1975, SSWCC 1978). Still, the coast of the Heceta Head cell must be considered a net sediment sink. Rates and quantities of the material involved in either erosion or migration onto the land are not available.

1.9 Within the Heceta Head littoral cell there are three offshore dredge disposal projects. These are Coos Bay, which involves the largest quantities, Umpqua, and Siuslaw. The type of material contributed by dredging depends on both the location and hydrologic conditions. Dredging during or just after high flows is more likely to pick up fluvial sediments than dredging done during periods of low flow, when marine sediments have intruded into the mouth. By the same token the further upstream dredging is done the more likely it is that fluvial sediments will be encountered. Judging by the size of the material dredged from the Umpqua River, it seems that it is primarily fluvial in origin. Because the Umpqua is fluvially dominated most of the Umpqua's sediment load should eventually be carried out into the ocean. This means that the net contribution of dredging to the sediment budget is much smaller than the amount naturally carried offshore.

1.10 Offshore disposal of dredge material at Umpqua began in 1924. Since then, more than 14.2 million cy have been dumped at sea. Between 1968 and 1988 annual disposal has averaged 147,349 cy, with a maximum of 313,632 cy and a minimum of 500 cy (Table B-1). The dredging that contributes to offshore disposal is done to maintain the entrance channel 26 ft deep and 400 ft wide. Shoaling occurs between the jetties from river mile -0.5 to about -0.8, and outside the jetties at about mile -1.2. The training jetty built on the south side of the channel in 1980 is intended to alleviate the shoaling between the jetties.

1.11 In determining the importance of the various potential sources the mineral assemblages of the sediments and the sources can be useful. The Heceta Head littoral cell is differentiated from the neighboring cells by its orthopyroxene to clinopyroxene ratio of about 1:1. Of the rivers entering the cell, only the Umpqua has a similar ratio, indicating that it is the major source of sediment for the cell. A slight increase in the ratio around the mouth of the Siuslaw River shows that it contributes minor amounts of material. Coos Bay, in contrast, seems to be a sediment sink, trapping marine sands as well as fluvial sediments. (Peterson pers. com., Chesser and Peterson 1987)

1.12 The surface sediments of the Umpqua ZSF are clearly differentiated between the native sediments and the disposed dredge material. The native sediments are moderately to well sorted fine sand (0.19 to 0.125 mm). Within the disposal site the sediment is medium sand, with an average mean grain size of 0.33 mm,

Table B-1
Umpqua River Dredging History

	Quantities Dredged			Quantities Dredged	
Year	Total	Entrance Bar	Year	Total	Entrance Bar
1968	103,400	35,600	79	486,272	313,632
69	305,000	97,000	80	587,050	217,850
70	80,200	13,000	81	262,323	209,891
71	178,400	18,100	82	494,321	264,410
72	122,950	500	83	216,705	135,950
73	124,950	62,300	84	399,150	161,441
74	161,571	175,851	85	290,451	139,813
75	470,005	244,795	86	334,230	94,946
76	450,700	220,970	87	407,184	152,369
77	275,750	92,800	88	266,188	263,118
78	539,200	180,000			
			Total	6,556,000	3,094,336
			21 year average	312,190	147,349

and a range of variation from 0.26mm and 0.40 mm. The transition between the native and dredge sediments appears to be abrupt. For native sediments, there may be a slight tendency for fining with increased depth.

1.13 Two sediment sampling surveys using the same stations were conducted in September 1984 and January 1985. Figure B-3 shows the location of the sampling sites in relation to the Umpqua ZSF (zone of siting feasability). Change in the grain size was not consistent within the ZSF. Thirteen of the 18 stations outside of the disposal site showed a decrease in grain size, while 4 of the 6 disposal site stations increased in grain size. For the most part the change in grain size was inconsequential, with 11 of the external stations showing a change less than or equal to 0.1 phi. Only two changed more than 0.3 phi. Within the disposal site the change was usually greater. Two stations increased by more that 0.35 phi. Increase in grain size outside the disposal site was located in the deeper half of the ZSF adjacent to the site. In no case did a change in grain size bring the sediment outside the disposal site as close as 0.6 phi to the dredge material. From this information it is not possible to infer movement of dredge material from the disposal site. Conversely, blanketting of the disposal site by native sediments does not seen to have occurred. The material dumped at the offshore disposal site is dredged from the outer channel bar and the entrance of the Umpqua River. Samples taken from these areas in January, 1979, had median grain sizes of 0.30 mm and 0.225 mm. This is coarser than the native offshore sediment, a difference that is, as noted above, also seen in the offshore disposal area.

TABLE B-2
Umpqua River Entrance Samples

Sample	Date	D50	D90	%Fines
A	2/81	0.30	---	-
B	4/85	0.225	---	-

Note: Grain size given in millimeters.

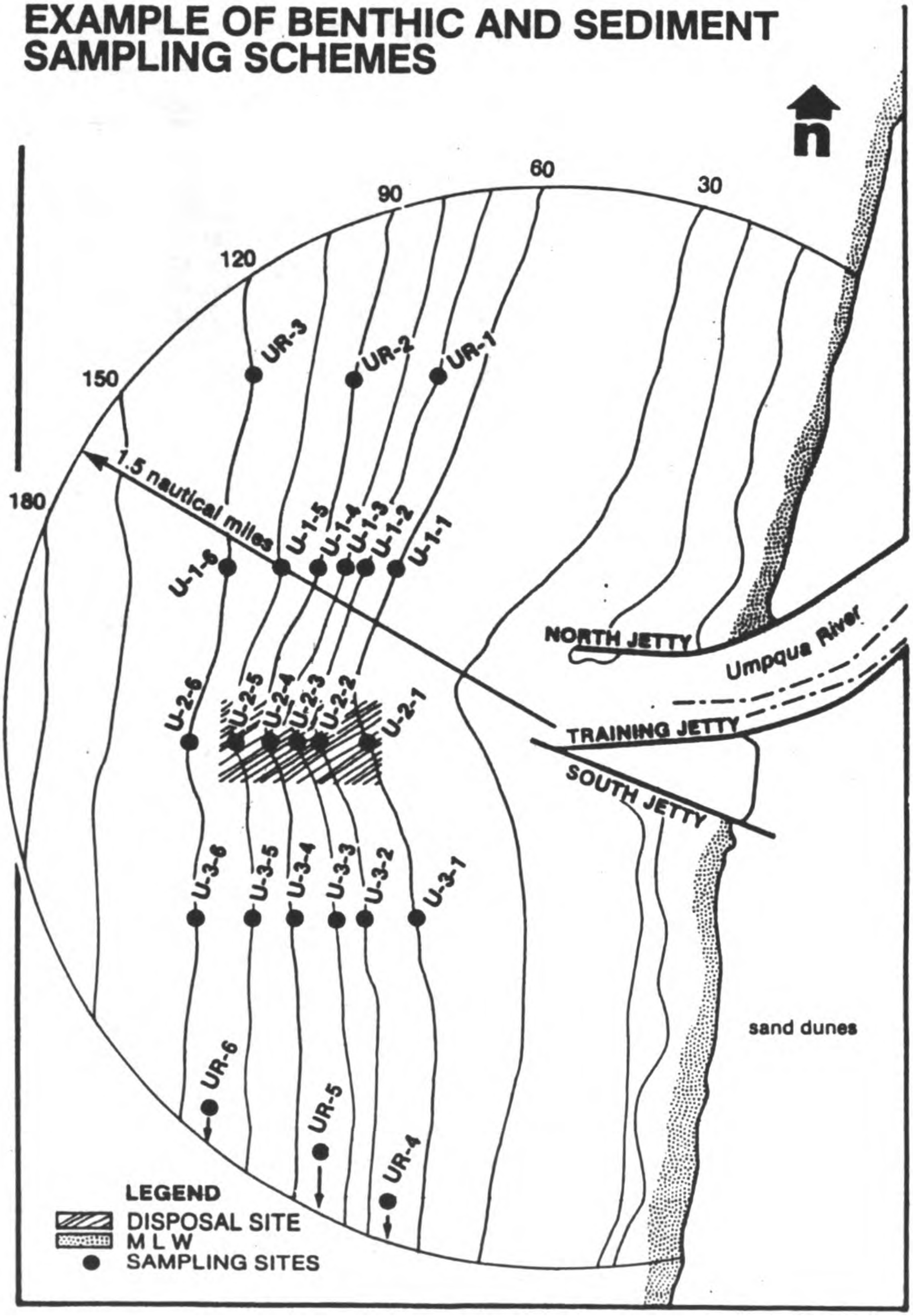


Figure B-3
Umpqua ZSF and Sample Locations

TABLE B-3
Umpqua Offshore Sediment Samples

Site	Mz	D50	D90	% fines	Date
ur-1	0.16	0.16	0.22	1	3 Sept 1984
ur-1	0.16	0.16	0.22	1	
ur-3	0.16	0.16	0.21	1	
ur-4	0.21	0.20	0.32	0	
ur-5	0.17	0.16	0.23	0	
ur-6	0.16	0.15	0.205	1	
u1-1	0.19	0.19	0.25	0	
u1-2	0.19	0.19	0.245	1	
u1-3	0.17	0.18	0.24	1	
u1-4	0.14	0.13	0.17	6	
u1-5	0.18	0.18	0.24	1	
u1-6	0.17	0.18	0.23	4	
u2-1	0.33	0.34	0.50	1	
u2-2	0.28	0.26	0.41	1	
u2-3	0.34	0.35	0.52	1	
u2-4	0.35	0.38	0.55	0	
u2-5	0.31	0.31	0.48	0	
u2-6	0.28	0.25	0.36	0	
u3-1	0.18	0.18	0.25	0	
u3-2	0.18	0.18	0.25	1	
u3-3	0.17	0.16	0.24	0	
u3-4	0.125	0.13	0.16	9	
u3-5	0.16	0.16	0.22	1	
u3-6	o.16	0.15	0.22	1	
ur-1	0.16	0.16	0.225	2	27 Jan 1985
ur-2	0.15	0.15	0.25	3	
ur-3	0.15	0.16	0.22	3	
ur-4	0.18	0.18	0.26	2	
ur-5	0.16	0.17	0.28	1	
ur-6	0.17	0.18	0.22	2	
u1-1	0.18	0.17	0.25	1	
u1-2	0.16	0.16	0.205	3	
u1-3	0.16	0.16	0.21	1	
u1-4	0.15	0.16	0.225	4	
u1-5	0.15	0.16	0.22	7	
u1-6	0.17	0.17	0.26	1	
u2-1	0.3	0.31	0.44	0	
u2-2	0.28	0.28	0.38	0	
u2-3	0.30	0.31	0.40	0	
u2-4	0.34	0.34	0.57	0	
u2-5	0.35	0.34	0.54	0	
u2-6	0.34	0.35	0.49	0	
u3-1	0.18	0.18	0.23	1	
u3-2	0.16	0.16	0.225	2	
u3-3	0.16	0.16	0.205	2	
u3-4	0.16	0.16	0.20	2	
u3-5	0.16	0.16	0.20	2	
u3-6	0.16	0.16	0.20	2	

Note: Mean grain size (Mz) calculated using Folk and Ward's (1954) parameters. Grain size given in millimeters.

Conditions in the ZSF

1.14 Bedrock is not exposed within the Umpqua River study area. However, the geologic map of the Reedsport Quadrangle (Beaulieu and Hughes, 1975) indicates that the study area is underlain by the Flournoy Formation of middle Eocene age, which consists of rhythmically bedded hard sandstone and siltstone. The sub-bottom profiles indicate these layers dip to the west beneath the study area. No faults have been mapped or projected into the study area from onshore mapping. Clarke and others (1981) recognized three acoustic units separated by unconformities in seismic reflection profiles across the continental shelf of Oregon. They are, in order of increasing age, Pleistocene deposits (Unit 1), late Miocene to late Pliocene Unit 2), and Eocene to middle Miocene (Unit 3). The offshore mapping of Clarke and others (1981) extends to within three miles of the ZSF. By extrapolation, it appears that Unit 1 overlies Unit 3 in the study area. A breached anticline trending N12W can be projected into the western edge of the study area. No faults identified in either onshore or offshore mapping are projected into the ZSF. (From USACE 1986)

1.15 The ocean bed in the vicinity of the Umpqua ZSF is characterized by a bulging outward of the bathymetric contours in front of the mouth of the Umpqua River, and an otherwise featureless slope that increases from the north to the south. A mile and a half north of the Umpqua's mouth the average slope is about 75 ft/mile between the 24 ft and 156 ft contours. Two miles south of the entrance the slope has increased to about 90 ft/mile. The slope also shows a general increase with distance offshore. The bulge in front of the mouth is evident to a depth of 130 ft, after which the contours are straight. The disposal site is centered on the crest of the bulge.

1.16 Six bathymetric surveys were made between 1979 and 1985. Based on these surveys 4 profiles were constructed for each of the dates and compared to observe changes through time. Three of the profiles were oriented downslope, one over the bulge and one each to the north and south. The forth profile crossed the bulge at right angles to the other profiles. Figure B-4 shows the location of the profiles. Most of the changes noted occurred after 1982. There was little net change along the north profile between 1979 and 1985. The south profile, however, showed net aggradation over its entire length of 1 to 4 feet. The bulge showed the greatest change, showing a maximum aggradation of 6 feet. The aggradation was evident from a depth of 66 ft down to the end of the profile. The cross sectional profile showed the greatest increase at the highest part of the profile. The correspondence between the depth of the aggradation of the bulge and the nearshore edge of the disposal site, plus the centering of the accumulation points towards disposal as being the cause of the aggradation of the bulge. The bulge itself is probably the ebb delta of the Umpqua River. The cause of the aggradation south of the mouth is uncertain. The absence of aggradation prior to 1982 has not been explained. In all probability it is the result of a combination of factors, including the amount of material disposed, the discharge from the Umpqua, and the wave climate between 1979 and 1982.

1.17 Figure B-5 shows the results of the 1984 sidescan sonar survey of the Umpqua ZSF. The area surveyed by sidescan sonar is primarily fine sand. Sand waves were observed extending from a couple of thousand feet north of the Umpqua's mouth to about a mile south, and to a depth of about 48 feet. A thin band of what is interpreted as "coarse sand/or gravel" is found both north and south of the mouth. No samples have been taken from these bands to confirm the interpretation, and the band may instead be sand dollar beds.

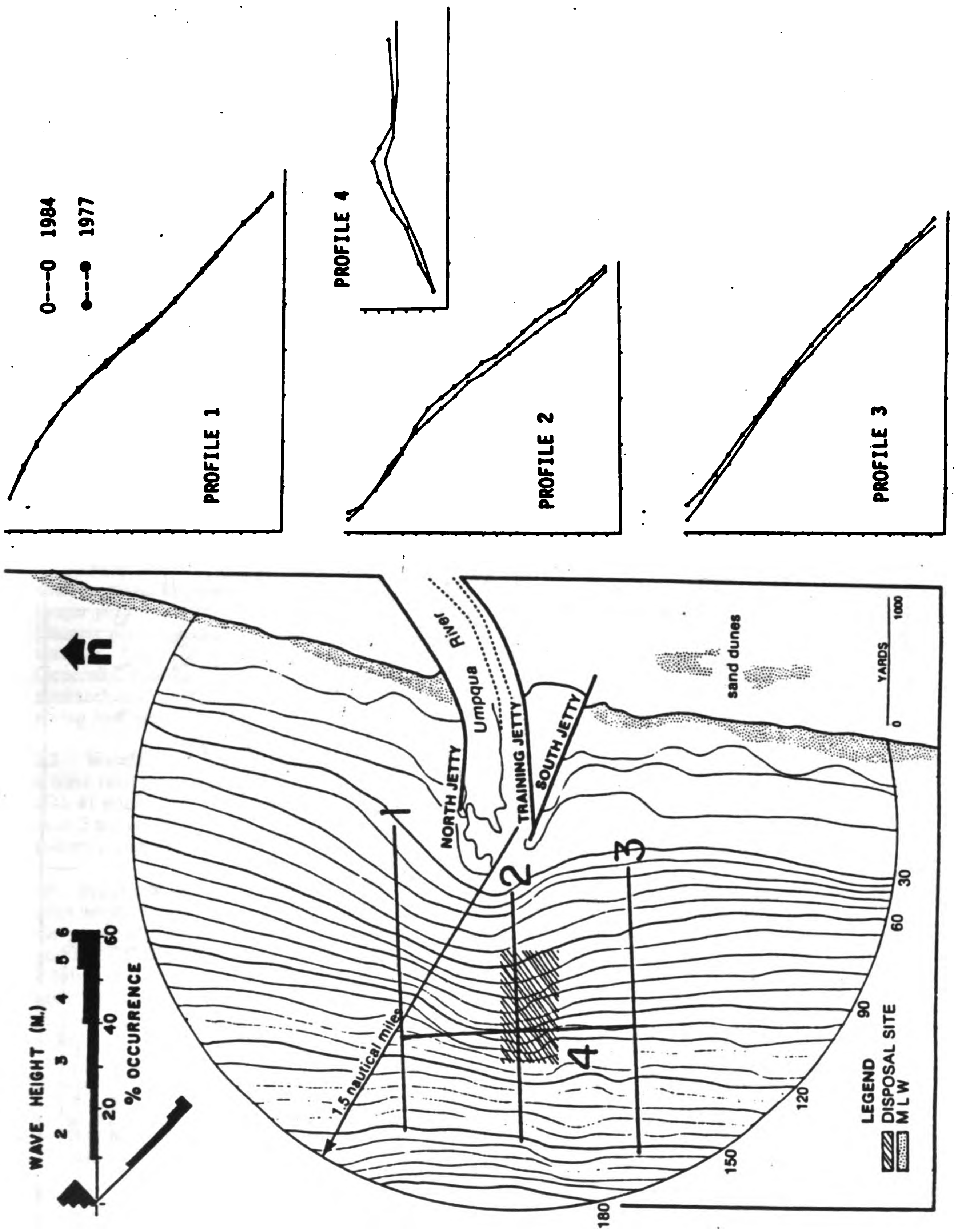


Figure B-4
Umpqua ZSF, Bottom Profiles

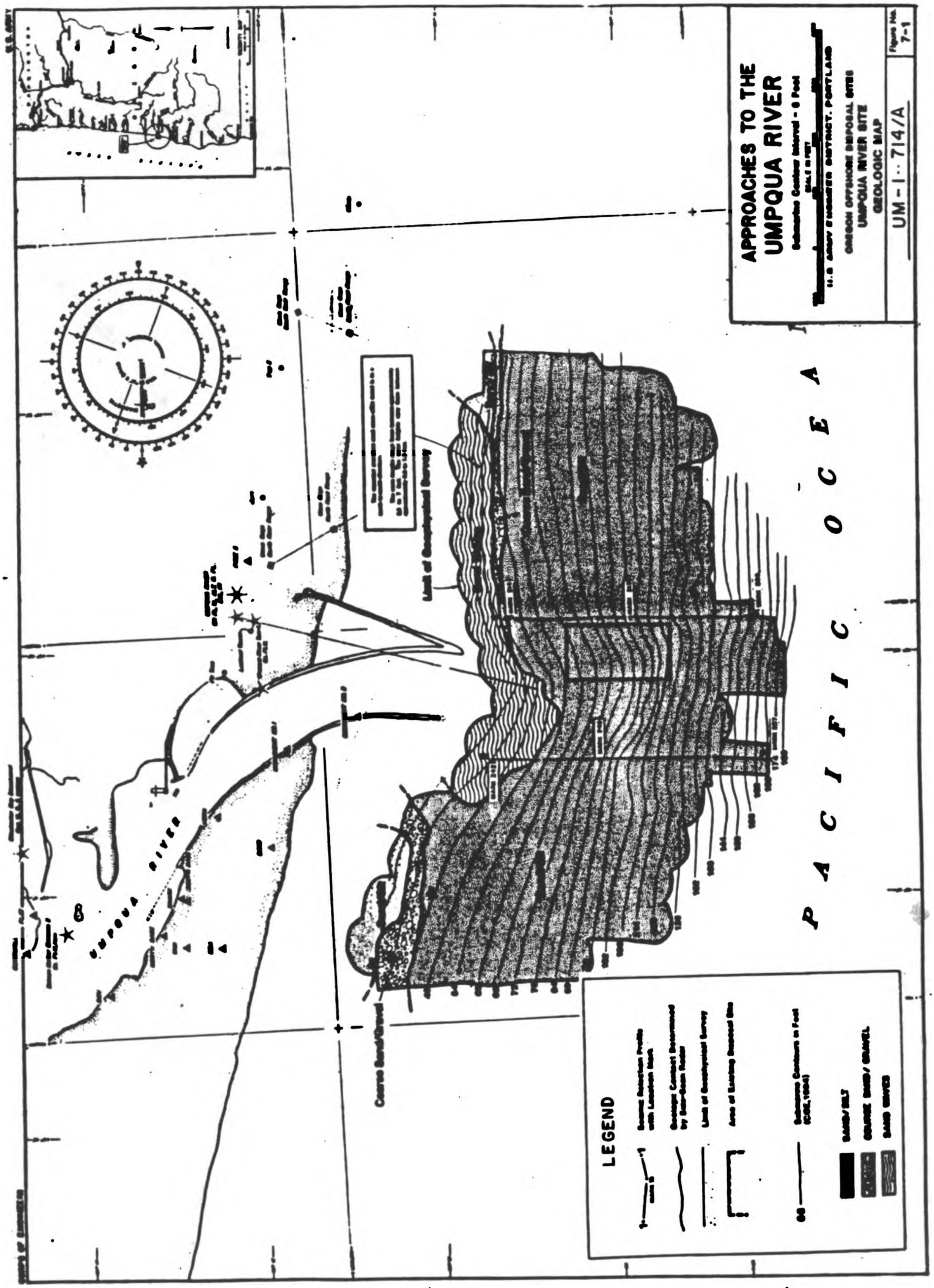


Figure B-5
Sidescan Map

1.18 Figure B-6 shows two seismic profiles which cross the study area from ENE to WSW, essentially parallel with the slope. The layer of unconsolidated sediment is quite thick, varying between 120 to over 150 feet thick. About halfway down to bedrock there is an intermediate reflector. This layer may represent a temporary change in the depositional environment, a thin layer of denser material such as ash, or overconsolidation of sediments by dessication during a low stand of sea level. The bedrock surface is fairly irregular.

OCEANOGRAPHIC PROCESSES

Coastal Circulation

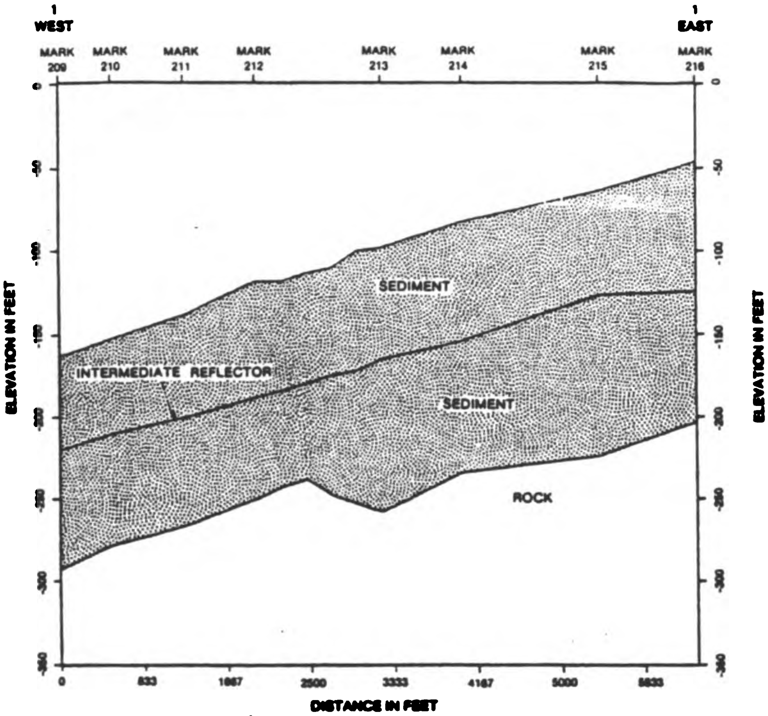
2.1 Coastal circulation near the Umpqua ZSF is directly influenced by large-scale regional currents and weather patterns in the northwestern Pacific Ocean. During winter strong low pressure systems with winds and waves predominantly from the southwest contribute to strong northward currents. During the summer, high pressure systems dominate and waves and winds are commonly from the north. In both seasons there are short-term fluctuations related to local wind, tidal and bathymetric effects. Along the Oregon coast there is a southerly wind in summer which creates a mass transport of water offshore resulting in upwelling of bottom water nearshore. Figure B-7 shows the predominant Oregon coastal circulation.

Ocean Waves and Tide

2.2 Ocean waves arriving at Umpqua are generated by distant storms and by local winds. Distant storms produce waves that arrive at the coast as swell which are fairly uniform in height, period and direction. The longer period swells generated by more distant storms approach generally from the NW-W or W-SW sectors. Longest period swell generally occurs during autumn while shortest sea and swell periods occur during the summer. Local winds produce seas which contain a mixture of wave heights, periods and directions. Generally, local seas have higher waves and shorter periods than incoming swell. Local seas generally approach the coastline from the SW-S sectors during autumn and winter but from the N-NW sectors in spring and summer.

2.3 Wave hindcast predictions from meteorological records from 1956-1975 near Umpqua are presented as a wave rose diagram in Figure B-4. Sixty-six percent of waves are from within 22 1/2 degrees of due west with 41 percent of the waves over 3 meters high. Only 7 percent of waves are from the southwest but all are over 3 meters high. Waves from the northwest occur 26 percent of the time with only 5 percent over 3 meters high. The larger waves are usually from the west-southwest and occur during winter months.

2.4 Superimposed upon the slowing-varying regional or seasonal circulation are periodic currents due to the tides which are very important nearshore. Tidal currents are rotary currents that change direction following the period of the tide. Thus the tidal currents generally flood and ebb twice daily. Direction and speed of nearshore tidal currents is highly variable. Tidal current speeds have been measured at lightships along the Pacific coast and reported by NOAA (1986). Hancock, et al (1984), Nelson, et al (1984) and Sollitt, et al (1984) summarize current meter data offshore of Coos Bay between May 1979 and March 1983. These reports substantiate the influence of tides on nearshore bottom currents. Bottom current records were found to be dominated by tidal influence with the maximum velocities associated with tides, including spring tide effects. These tidal influences were additive to currents produced by surface waves and winds. One station closest to the estuary was noticeably affected by the ebb current.



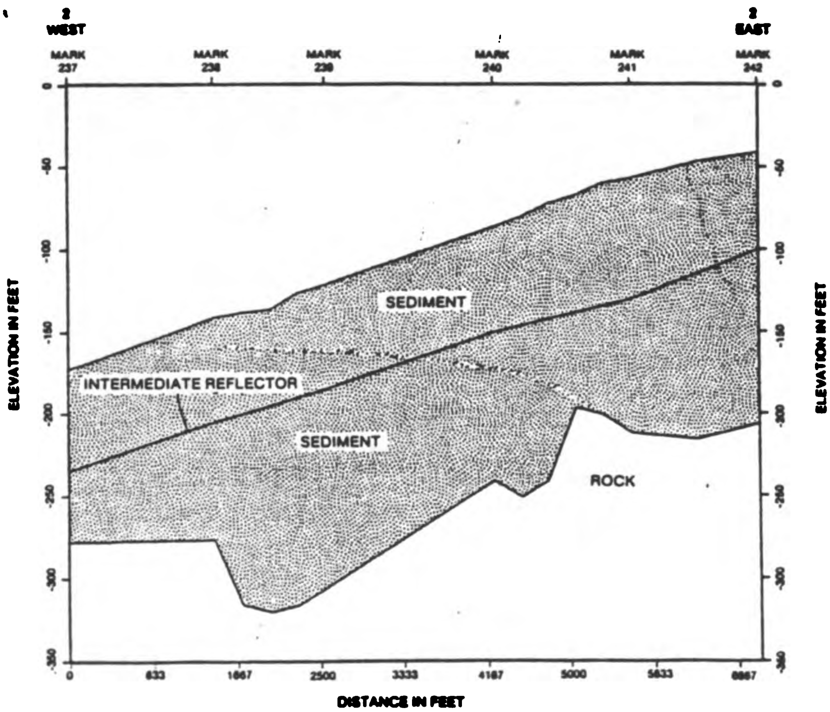
LEGEND

UMPQUA RIVER PROFILE NUMBER 1

ELEVATION DATUM IS MLLW
FROM FATHOMETER RECORDINGS

LOCATION BY PORTLAND DISTRICT, COE

NOTES ON BEDROCK GEOLOGY:
Bedrock probably consists of the Flournoy Formation - rhythmically bedded hard sandstone and siltstone (middle Eocene).



LEGEND

UMPQUA RIVER PROFILE NUMBER 2

ELEVATION DATUM IS MLLW
FROM FATHOMETER RECORDINGS

LOCATION BY PORTLAND DISTRICT, COE

NOTES ON BEDROCK GEOLOGY:
Bedrock probably consists of the Flournoy Formation - rhythmically bedded hard sandstone and siltstone (middle Eocene).

Figure B-6
Seismic Profiles

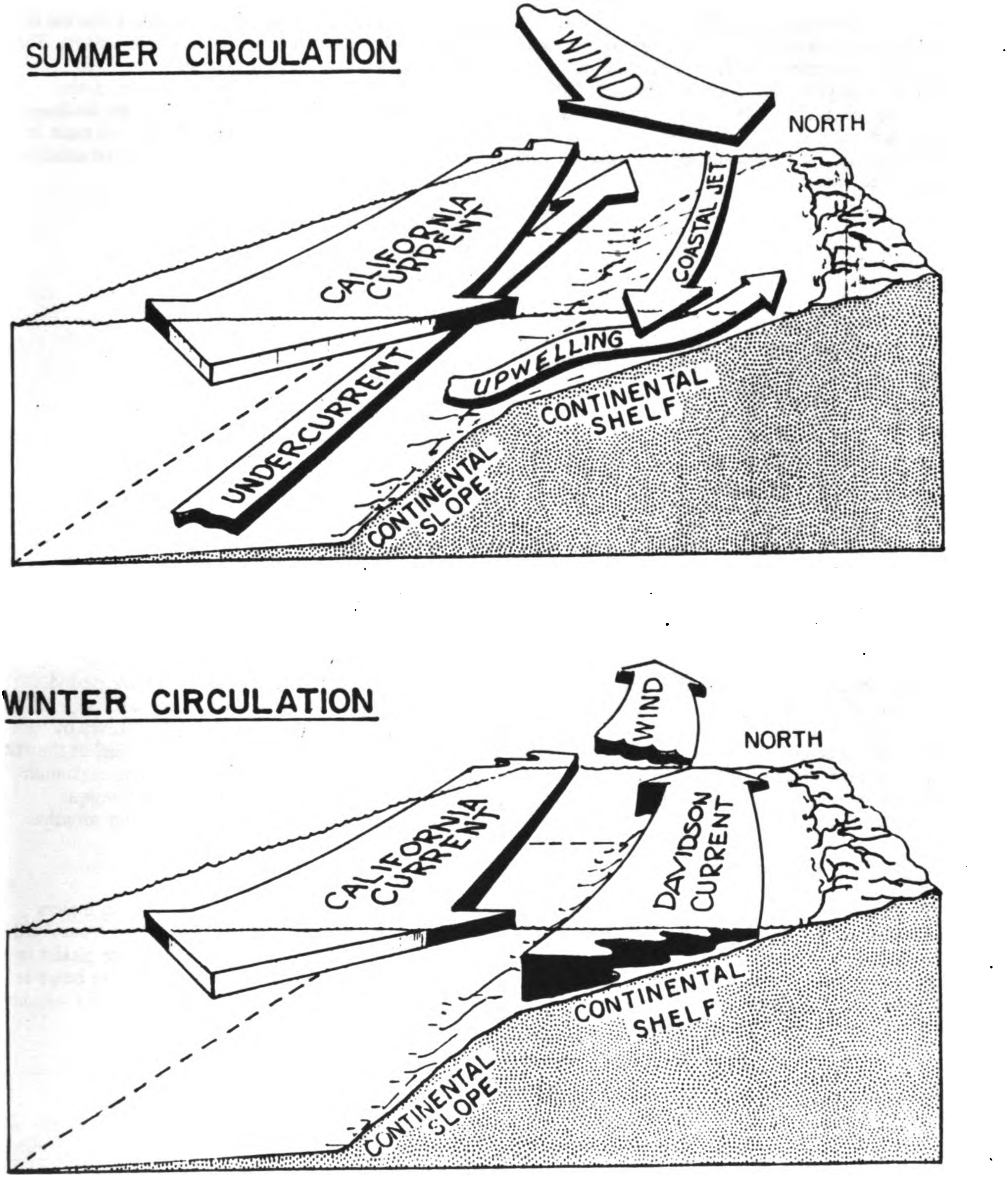


Figure B-7
Oregon Coastal Circulation

Local Processes

2.5 The Umpqua ocean disposal site is within 1 mile of the estuary entrance. The Umpqua River has the second largest drainage basin on the Oregon coast after the Rogue River and the third largest estuary. The Minimum and maximum flows presented in table B-4 indicate the highly variable in river flow. This constantly varying river outflow combines with tidal flows to produce a highly variable influence on the nearshore circulation. In the estuarine part of the river, the ebbing tide adds to the normal river discharge to produce a net ebb dominance. The Umpqua shows little or no longterm accumulation of fine sediments in the estuary and net bypassing of sand-size sediments into the ocean. Table B-4 lists important characteristics of the study area.

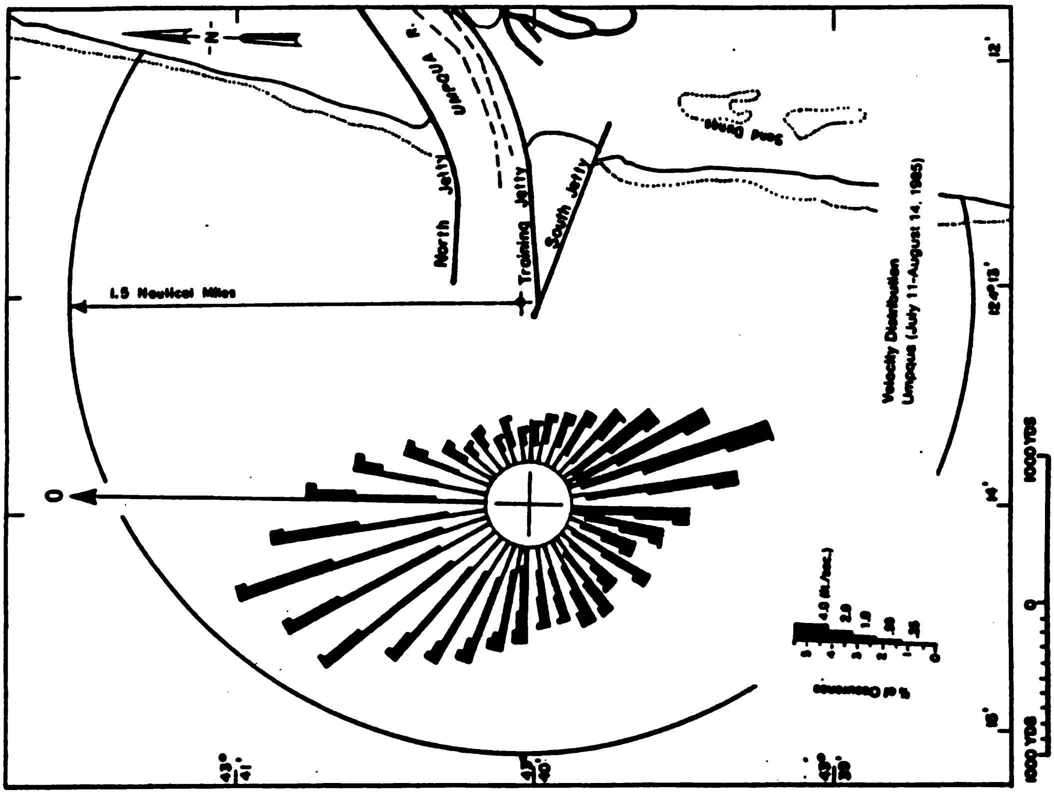
TABLE B-4
Physical Characteristics of the Umpqua River

Drainage Basin Area (sq. mi.)	5042
Estuary Surface Area (ft^2)	2.9 x 10^8
Mean Tide Range (ft.)	5.1
Diurnal Tide Range (ft.)	6.9
Mean Tidal Prism (ft^3)	12 x 10^8
Diurnal Tidal Prism (ft^3)	16 x 10^8
Minimum Annual Flow (cfs)	1200 (September)
Maximum Annual Flow (cfs)	18,300 (January)
Mean Annual Flow (cfs)	8,200
Extreme Discharge (cfs)	265,000 (1964)
Mean Hydrgraphic Ratio (HR)	9
Maximum Hydrographic Ratio (HR)	46

2.6 The numbers in table B-4 are from Percy, et al (1974), OSU (1971) and Johnson (1972). The Hydrographic Ratio is the tidal prism volume divided by the mean river discharge for a six hour period. Peterson, et al (1984) use the Hydrographic Ratio to compare the tidal prism with the river discharge for the same six hour period. The tidal prism is estimated as the volume of water brought into the estuary by each flood tide. The six hour river discharge is estimated from the annual average discharge. The higher the HR the more tidally dominated the estuary. For comparison Table B-4 lists two values for HR. The maximum HR only occurs during extreme low summer riverflows. The variation in HR shows that the Umpqua probably discharges sediment on an annual basis, but may trap marine sands during the summer months.

Site Monitoring at Umpqua

2.7 Current meters were deployed near the Umpqua ocean disposal site in 1985 and 1986. The meters were attached to moorings at depths from 78 to 95 feet. Bottom current records were obtained from April 12-May 9 and from July 11-August 14 in 1985 and March 27-May 5 in 1986. These periods were picked to represent typical winter and summer conditions, however, the transition to summer conditions can begin as early as April. Figures B-8 and B-9 shows the daily average bottom current speed and direction for summer and winter records.



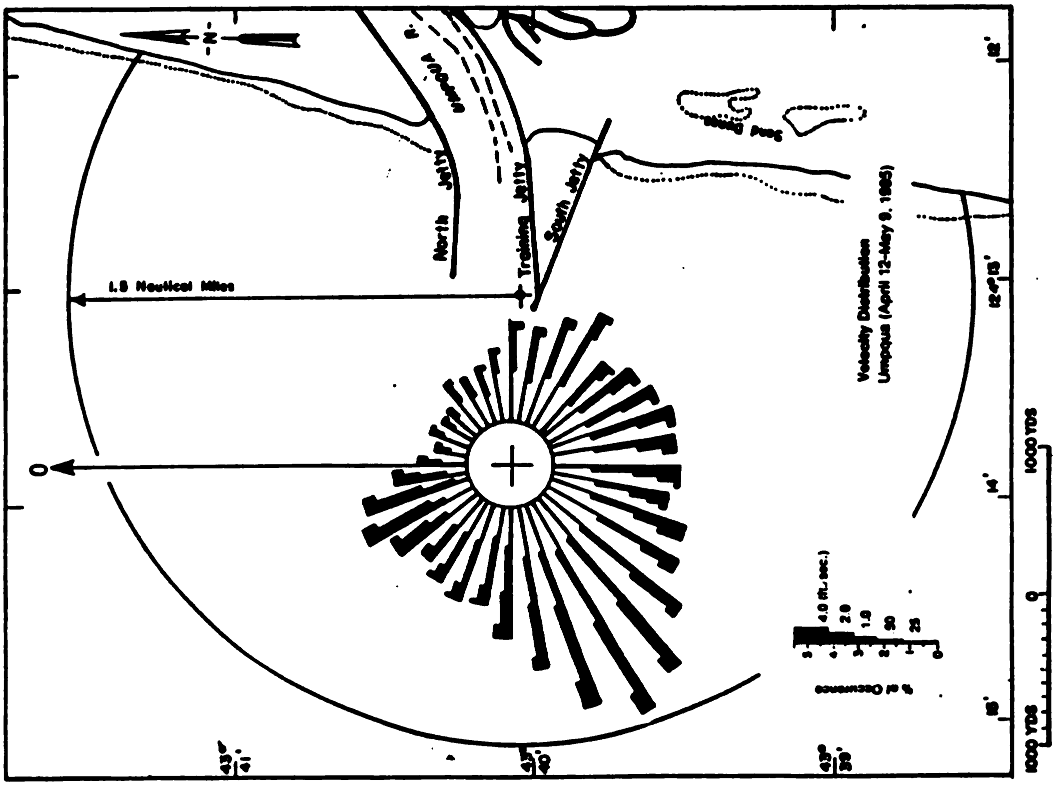
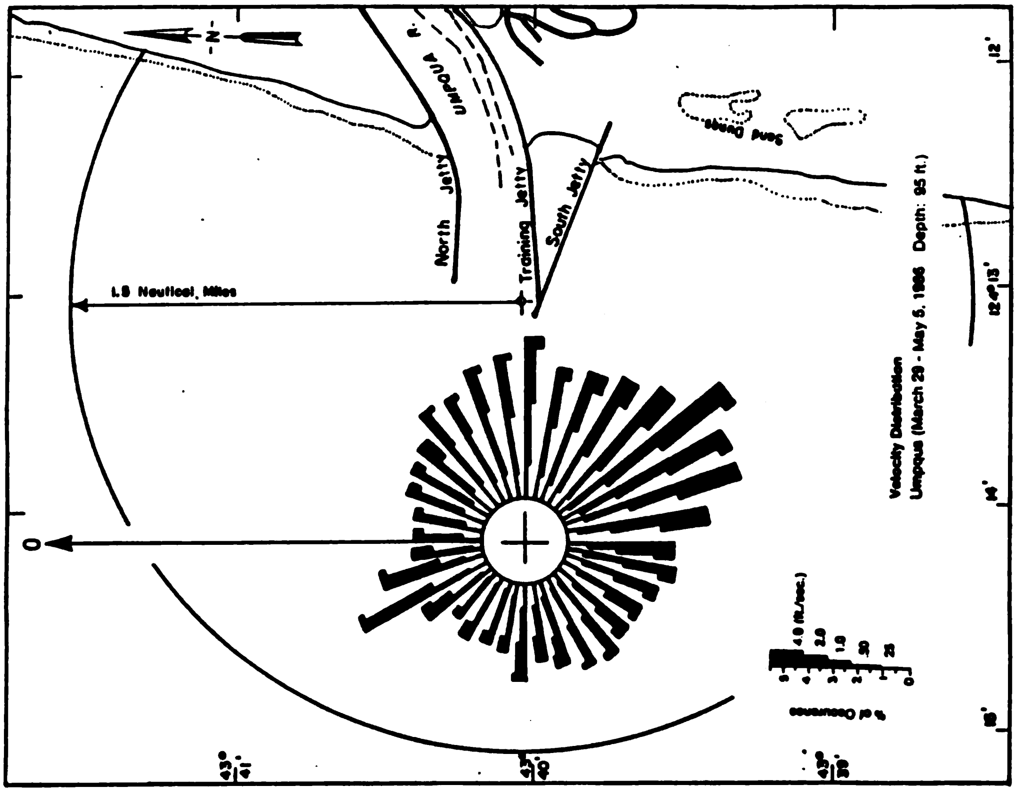


Figure B-8
Current Velocity for 1985



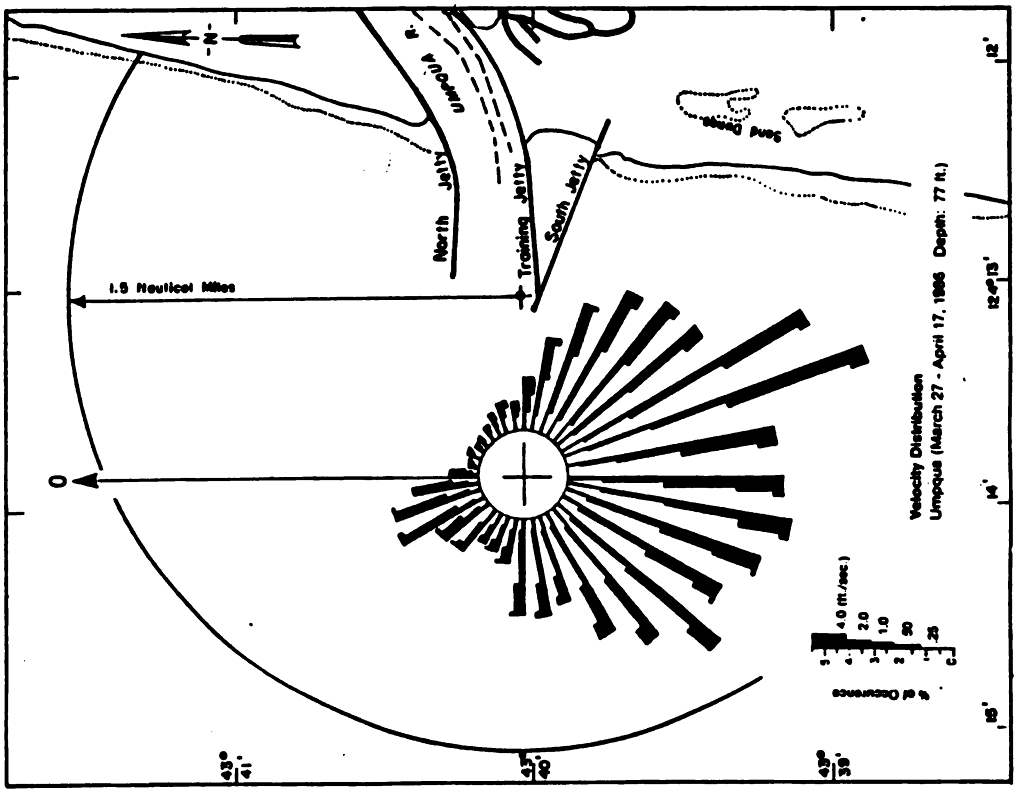


Figure B-9
Current Velocity for 1986

In the current rose, each bar represents the direction the current is moving toward. The length of the bar represents the percent of occurrence of the current in that direction, ie., the longer the bar, the more prelevant the current in that direction. The width of the bar represents the range of velocity, ie., the thicker the bar, the faster the current.

2.8 Summer currents in 1985 were more frequently to the north, but the strongest currents were to the south. There were minimal onshore-offshore currents. Bottom currents in winter 1985 had a strong offshore component and were frequently southward. During winter 1986 there were two meters at different depths. The shallow site had currents that were predominantly southward and offshore. The deeper site had currents that were predominantly southward and onshore. None of the winter records in 1985 or 1986 had a significant northward component.

2.9 There are several sources of wave data for Umpqua. Wave records near the ocean disposal site were obtained by OSU from March 17-30 and from July 12-24 in 1985 and from March 28-April 3 in 1986. Wave records were obtained by Scripps from May 1984 to June 1985 near the site at a depth of -130 feet. Wave data from Coquille for 1985 and wavemeter data from Newport from 1971-81 are also available for comparison. Figure B-10 shows the 10-year average monthly significant wave height from Newport compared with monthly averages for both Umpqua and Coquille. The monthly average at Umpqua is pretty consistently above Coquille and the 20-year Yaquina averages. The Umpqua and Coquille monthly averages show the same low in January and high in March of 1985. The daily histogram shows how variable wave height can be with peaks occasionally exceeding the monthly average.

2.10 Detailed current measurements have been obtained from another study conducted at Coos Bay, Oregon. Seasonal measurements made over two-week periods showed currents at the 25-m-deep disposal site averaged between 20 and 30 cm/s at one-third the water depth during the summer and between 30 and 60 cm/s during the winter and spring. Near-bottom currents were generally between 10 and 20 cm/s with downslope flow components predominating over upslope components. Near-bottom waters exhibited downslope movement to depths in excess of 40 m during the summer and deeper than 70 m during the winter. Similar conditions are expected to exist at the interim Umpqua disposal site since both sites are in similar depth regimes.

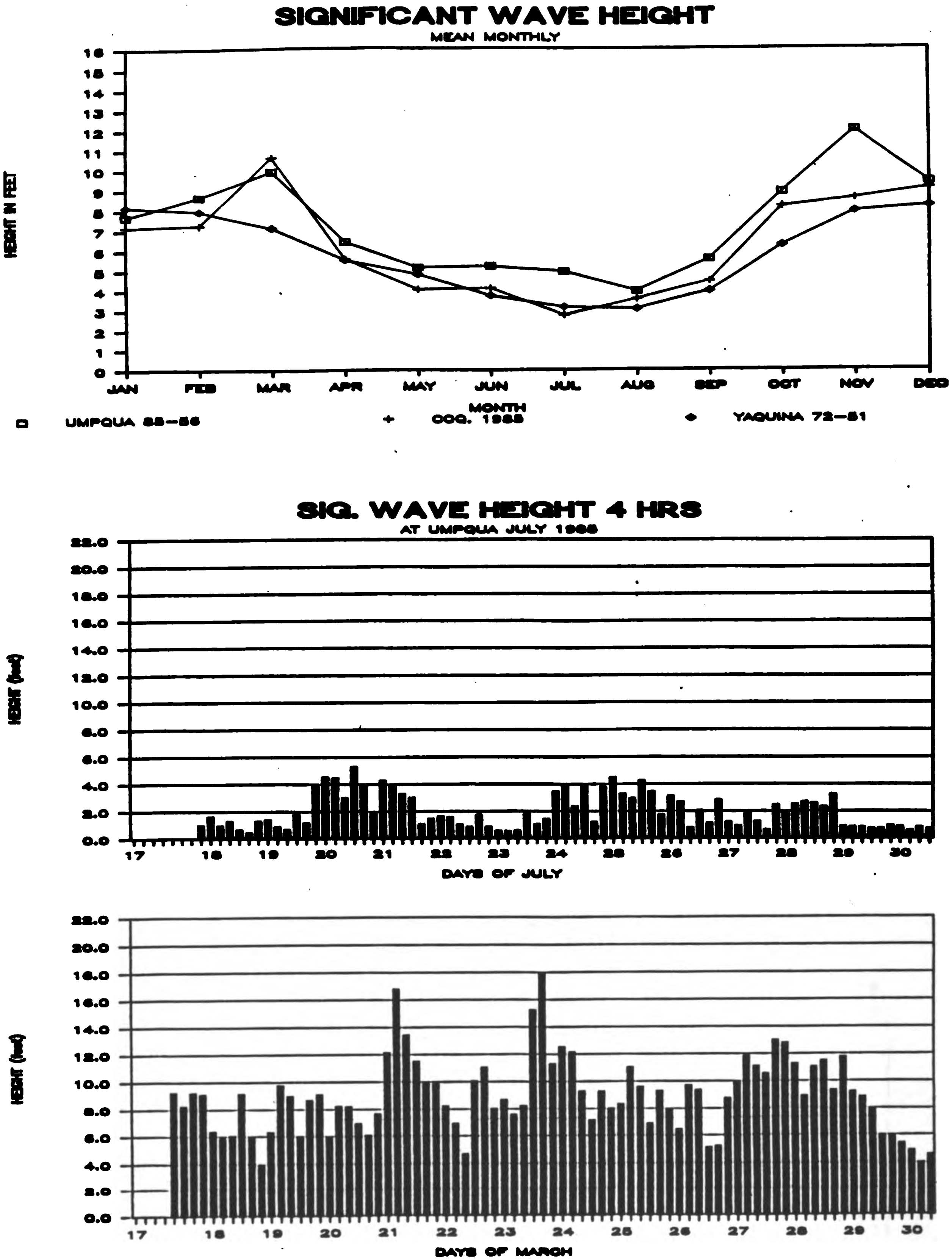


Figure B-10
Seasonal Waves for Coquille, Yaquina, Umpqua

SEDIMENT TRANSPORT

The Littoral System

3.1 At the Umpqua dredging project there is a need to locate an offshore disposal site to prevent the dredged material from returning to the entrance channel. This requires knowledge about the direction and rate of longshore transport as well as onshore/offshore transport. Sediment movement in the littoral zone consists of two mechanisms depending upon the size of the sediment. Anything finer than sand size is carried in suspension in the water and is relatively quickly removed far offshore. The almost total lack of silts and clays within the Umpqua ZSF attests to the efficiency of this mechanism. Sediments sand size or coarser may be occasionally suspended by wave action near the bottom, and are moved by bottom currents or directly as bedload. Tidal, wind and wave forces contribute to generating bottom currents which act in relation to the sediment grain size and water depth to produce sediment transport.

3.2 Hallermeier (1981) defined two zones of sand transport based on wave conditions. The inner littoral zone is the area of significant year-round alongshore and onshore-offshore transport by breaking waves. The outer shoal zone is affected by wave conditions regularly enough to cause significant onshore-offshore transport. Using Hallermeier (1981) and longterm wave data from Newport (Creech, 1981) the limit for strong longshore transport varies from -28 feet in summer to -51 feet in winter. Significant onshore-offshore transport occurs to depths of -83 feet in summer and to -268 feet in winter. Hancock, et al (1984) calculated the probability for wave-induced current velocities at various depths off Coos Bay. From other studies, a critical velocity of 20 cm/sec has been shown necessary to erode sediment in the 0.2 mm sand size, common off the Oregon Coast. Using the Coos Bay data the probability of wave-induced sand movement is very small beyond a depth of about 150 feet. Various sedimentologic studies have suggested an offshore limit of modern sand movement at the 60 foot depth, while others push this limit out to over 100 feet.

Umpqua Littoral Cell

3.3 Figure B-2 shows the Umpqua Littoral Cell which extends approximately 90 km north from Cape Arago to Heceta Head. The Umpqua is the dominant river entering this littoral cell, with an estimated 400,000 cubic yards of sand contributed annually (Karlin, 1980). Mineral assemblages of the Umpqua River correlates with the littoral sand mineralogies as well as terrace deposits within the littoral cell (Peterson, personal communication). This indicates that the primary source of sand within the cell has historically been from the Umpqua. Figure B-11 represents the type of litteral sediment transport system present at Umpqua.

3.4 The beach and dune area was described by Dicken (1961) as "in a state of near stability", whereas Cooper (1958) describes the dune complex around the mouth of the Umpqua as undergoing very slow erosion. Using erosion rates for similar shorelines in Lincoln County (Smith, 1978) would result in less than a foot of erosion per year but almost 400,000 cubic yards per year along the entire littoral cell. This is comparable to the potential sediment supplied by the Umpqua, not to mention any Siuslaw sedimentation.

Table B-5 identifies the possible sources and losses of littoral sediments in the littoral cell:

TABLE B-5
Sources and Losses in the Littoral Cell

Sources	Losses
1. Rivers	1. Coos Bay
Umpqua	2. Dune Growth
Siuslaw	3. Headland Bypassing
2. Erosion	4. Offshore Transport
Dunes	5. Ocean Disposal
Terraces	
Seacliffs	
3. Headland Bypassing	
4. Onshore Transport	

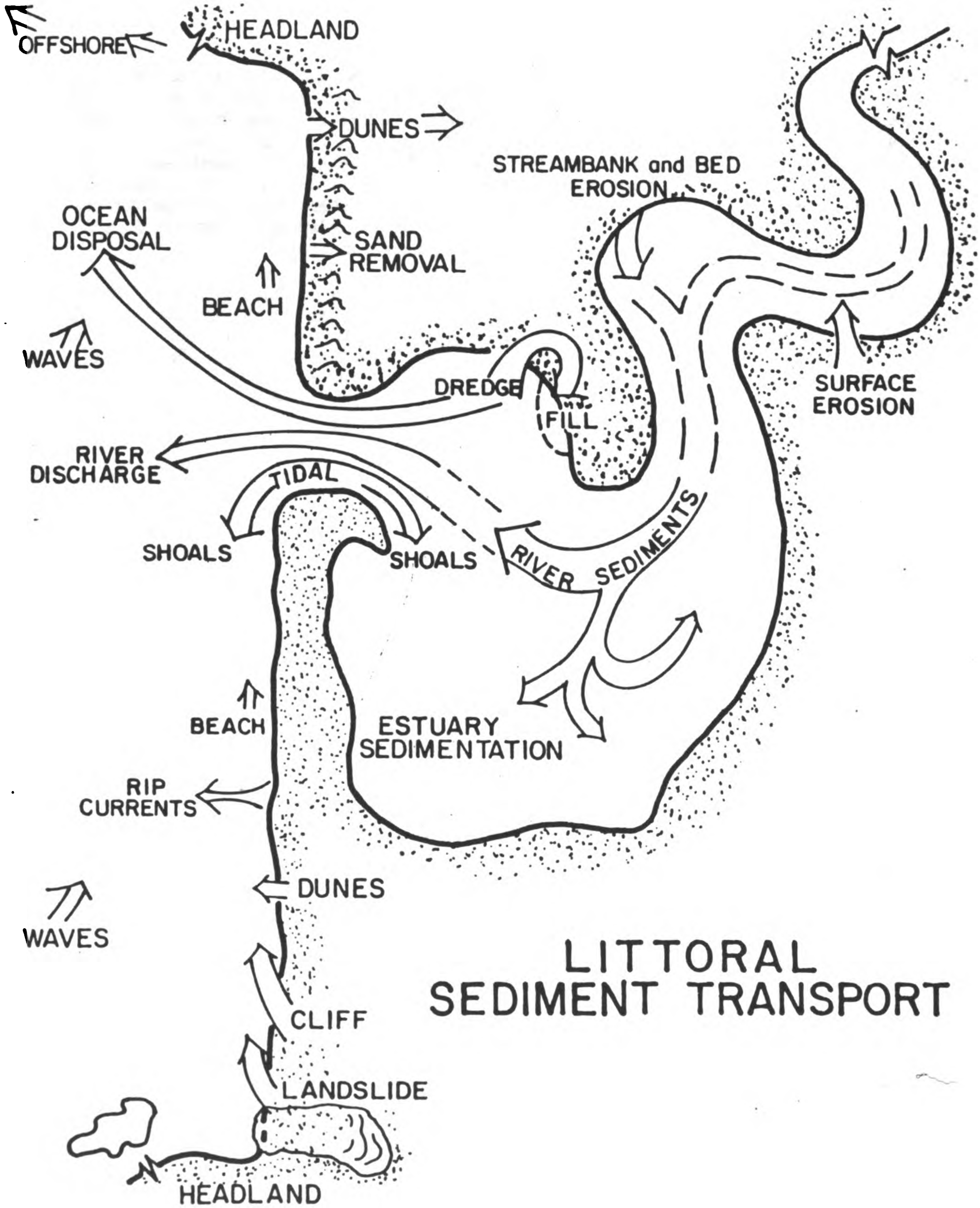


Figure B-11
Littoral System

Umpqua Sediment Transport

3.5 Although the Umpqua River delivers a large sediment load, the bottom contours suggest a rapid distribution away from the river mouth. The beaches seem to be in equilibrium suggesting that littoral transport is in balance. From the bottom current records, there appears to be a slight bias in transport to the south year-round, with some northward transport in summer only. This is also mentioned by Cooper (1958) as a factor causing the more massive sand dunes to occur south of the Umpqua. Peterson (personal communication) describes Umpqua sediment as dominant throughout the offshore indicating transport in both directions.

3.6 The OSU wave records were analysis for direction as well as period and significant height. The wave data and current data together with grain size and depth were used to compute a predicted sediment transport amount and direction. These were summed over the period of record and are shown on figure B-12. From 18-30 March, 1985, the predicted transport was 22 cubic meters to the north-northwest and 12 cubic meters to the south-southwest. From 28 March to 3 April, 1986, the predicted transport was 10 cubic meters to the southwest. Very little transport (0.5 cubic meters) occurred from 7-11 July, 1985 to the northwest. The length of vector, on figure B-12, is proportional to the quantity of transport.

3.7 Figure B-12 illustrates the probable sediment transport in the Umpqua ZSF. There is probably a net southward transport north of the jetties out over 30 foot depth which causes the entrance shoal at the north jetty. This southward transport shifts farther offshore south of the jetties, being influenced by the tidal discharges of the Umpqua River. Nearshore transport to the south is toward the south jetty. The interim disposal site is influenced by the tidal/river current, being inline with teh channel. The adjusted site, to the north, should be away from these southern trending currents. Consequently, any sediment transport from the adjusted site should be to the north or offshore.

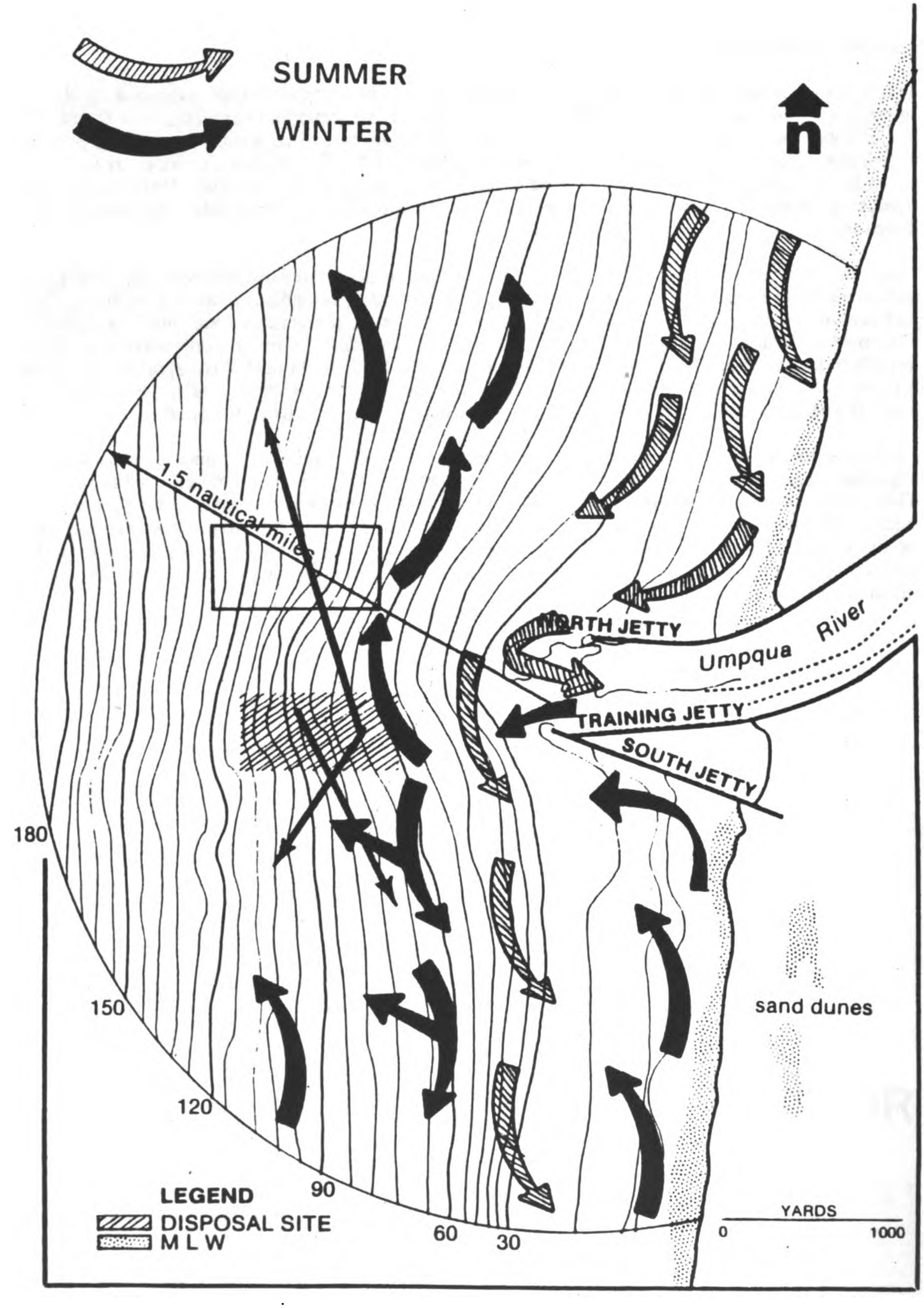


Figure B-12
Sediment Transport at Umpqua

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APPENDIX C

APPENDIX C

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX C

SEDIMENT AND WATER QUALITY

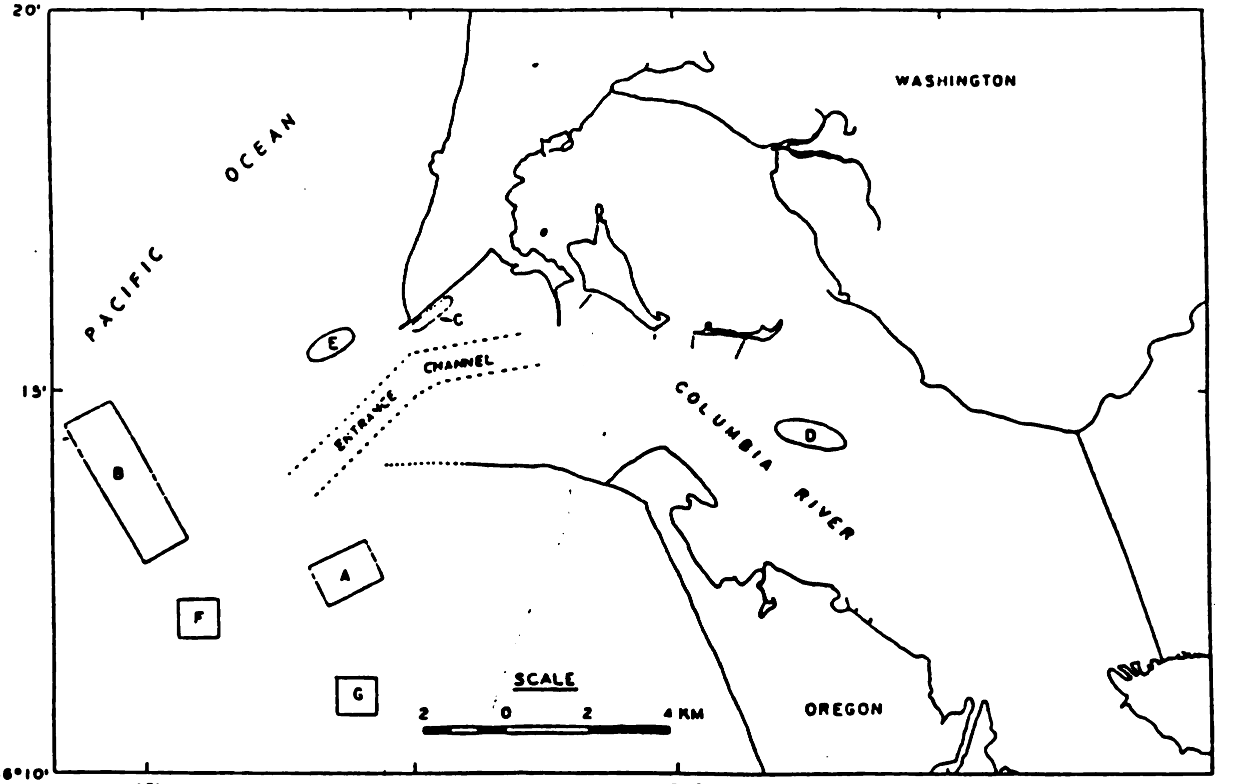
General

1.1 General criterion (b) and specific factors 4, 9, and 10 of 40 CFR 228.5 and 228.6 require sediment and water quality analyses indicative of both the dredging areas and disposal sites. Dredged materials placed in interim-designated ODMDS along the Oregon coast usually consist of medium to fine sands taken from entrance bar shoals and deposited on slightly finer continental shelf sands. Disposed sediments at Umpqua are similar in grain size to those at the disposal site. Because of their coarse nature, similarity to ODMDS sediments, isolation from known existing or historical contaminant sources, and the presence of strong hydraulic regimes, dredged sands from entrance bar shoals meet criteria for exemption from further testing according to provisions of 40 CFR 227.13(b). Some data are available from navigation channel sands and fines in the Umpqua estuary, however, and are presented in this appendix. Also, some chemical tests have been run in the past and are compared with water and sediment quality impacts associated with disposal of sands and silts at ODMDS for the two largest Oregon coastal navigation projects, the Mouth of the Columbia River (MCR) and Coos Bay. If fine sediments are ocean disposed at Umpqua, available data will need to be reviewed and possibly supplemented with additional chemical or biological testing to evaluate such an action.

1.2 The MCR project was one of the Aquatic Disposal Field Investigations conducted as part of the Dredged Material Research Program (DMRP) in the mid-1970's (Boone et al. 1978, Holton et al. 1978). The DMRP was a nationwide program conducted by the Corps of Engineers to evaluate environmental impacts of dredging and dredged material disposal. The MCR studies included work at an experimental ODMDS, site G, located south of the MCR channel at an average depth of 85 feet. Figure C-1 shows the Columbia River Entrance and the disposal sites. Following baseline physical, chemical, and biological characterizations of the site, a test dumping operation disposed of 600,000 cubic yards of medium to fine sands (median grain diameter = 0.18 mm) during July - August 1975. Sediments at the disposal site were a fine to very fine sand (median grain diameter = 0.11-0.15 mm).

1.3 Monitoring results indicated a mound of slightly coarser sediment within the site that gradually mixed with ambient sediments and dissipated over several months. Water quality monitoring during disposal showed no elevation of toxic heavy metals, including Cu, Zn, Cd, and Pb, with some nontoxic elevation of Fe and Mn. Nutrient fluctuations were associated primarily with tidal variations, as were chlorophyll and particulate organic carbon. Dissolved oxygen remained high throughout disposal operations. Sediment quality remained high, with slight but nontoxic increases in Pb (from 2 to 4 mg/kg) and Hg (from 0.008 to 0.05 mg/kg) recorded before and after disposal at area G. Oil & grease values in the sediments decreased slightly after disposal, while there were no elevations in ammonia. The authors concluded that there were no adverse impacts in terms of water/sediment quality or toxicity from disposal of MCR sands at area G. They attributed fluctuations in tested variables primarily to sediment and suspeuded particulate input from the Columbia River, biological activity and processes, and laboratory difficulties associated with repeated measurements close to analytical detection limits.

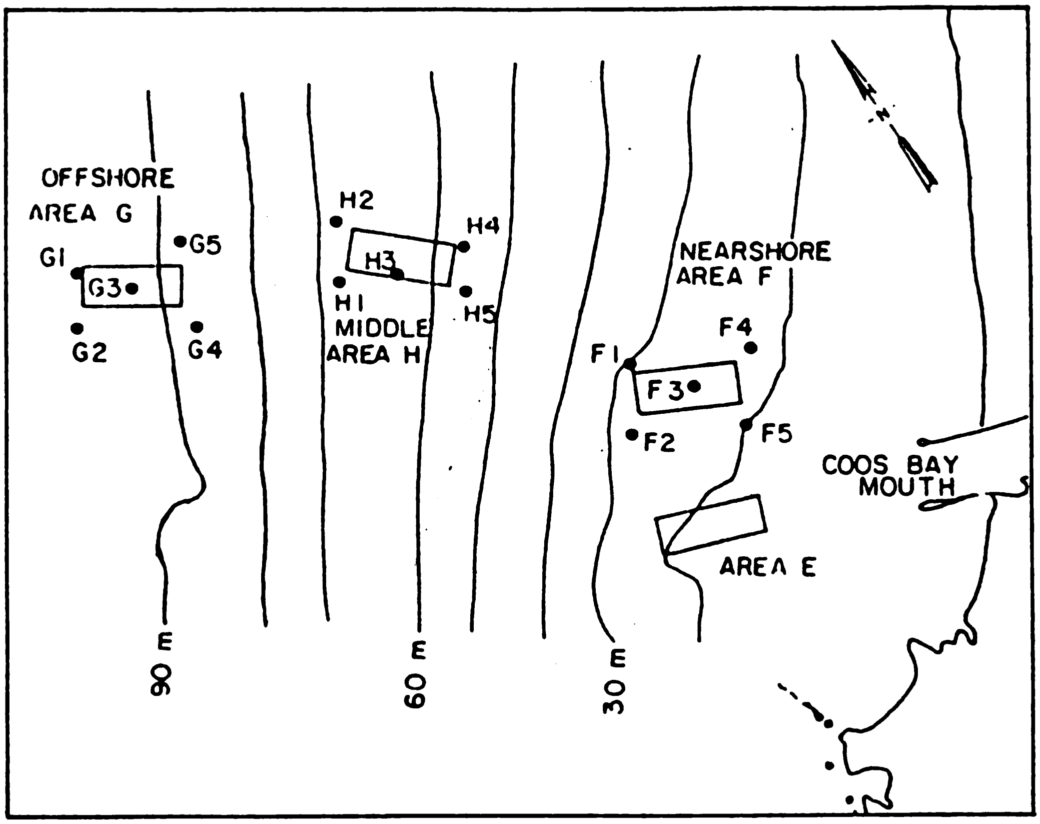
1.4 An evaluation of areas offshore of Coos Bay was conducted under Corps contract by Oregon State University researchers persuant to designation of a new ODMDS for fine grain sediments from upper Coos Bay and Isthmus Slough (Hancock et al. 1984, Nelson et al. 1984, Sollitt et al. 1984, U.S.A.C.E. Portland District 1984). The program, conducted in five phases during 1980-1984, included baseline physical, biological, and chemical surveys of offshore areas followed by selection of candidate sites and a test dump/monitoring study at proposed site H. Figure C-2 shows the location of the Coos Bay sample stations. This site was subsequently designated by EPA as the final site for fine Coos Bay sediments (51 FR 29927 - 29931, dated 21 August 1986).



Columbia River entrance channel and ODMDS, including experimental disposal site G (From Boone et al. 1978).

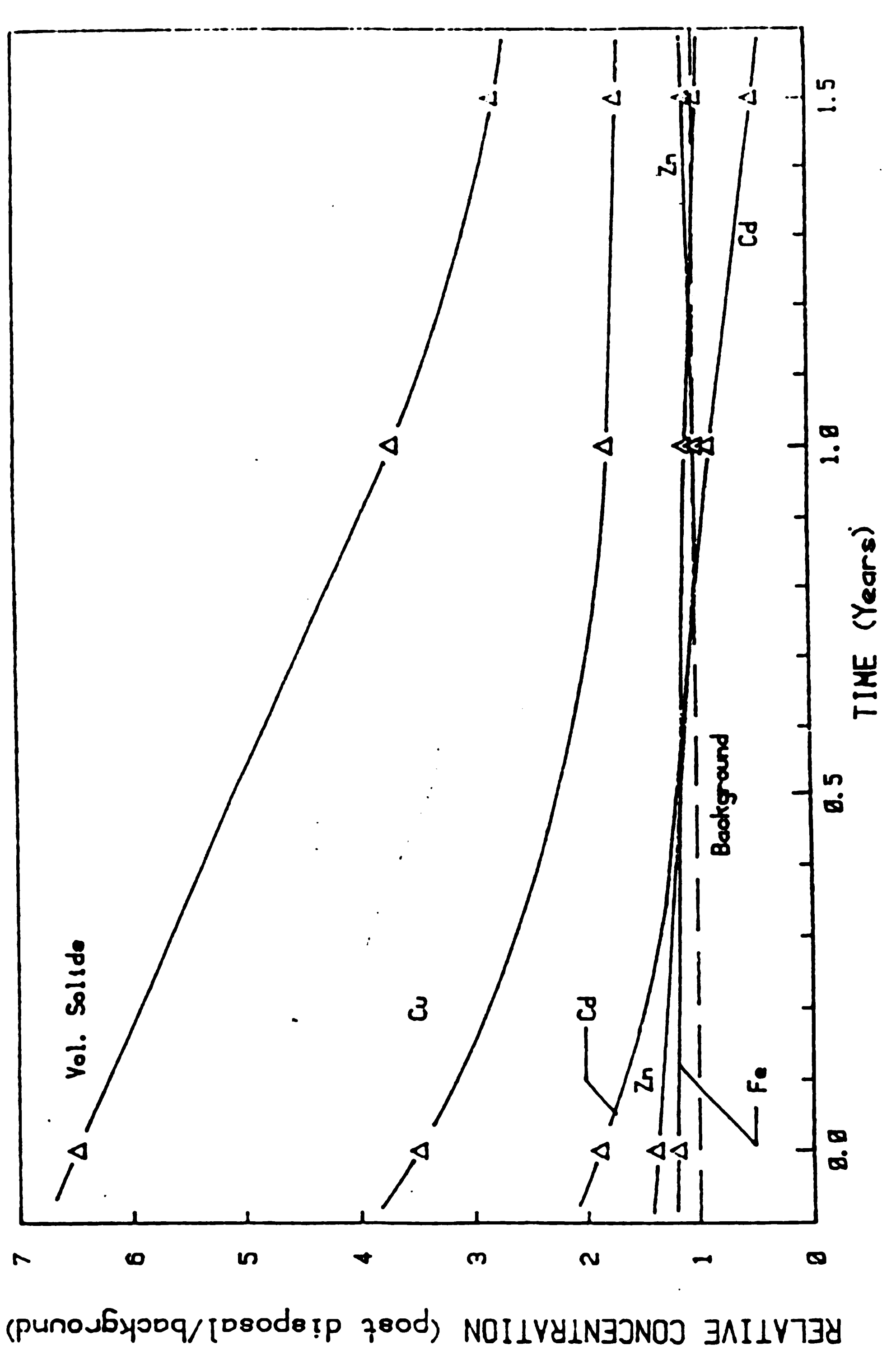
Figure C-1
Columbia River Channel Entrance and ODMDS

1.5 The dump/monitoring program at site H consisted of disposal of 60,000 cubic yards of fine sediments from Isthmus Slough, accompanied by water quality and benthic monitoring during disposal operations and followed by post-disposal monitoring of the site and adjacent areas over the next 18 months. Elevations in ammonia, Cu, and Mn were observed during disposal that in some cases were at the threshold of acute toxicity. However, these elevations were of short duration. No substantial elevations of other contaminants or changes in dissolved oxygen, oxy-redox potential, turbidity, or pH were observed. Sediments at the site showed elevated levels of volatile solids, fines, and heavy metals that gradually decreased over the next 18 months. Figure C-3 shows the results of the chemical test results. Total volatile solids was found to be the most sensitive and reproducible indicator of levels of contaminants and its use was suggested as a montoring tool to utilize during further disposal operations at site H.



Coos Bay sample station locations for chemical. biological, and physical studies at interim-designated and candidate ODMDS (From U.S.A.C.E. Portland District 1984).

Figure C-2
Coos Bay Sample Site Locations



Coos Bay ODMDS: Recovery of selected sediment chemical parameters at disposal site-samples containing dredged materials (From Sollitt et al. 1984).

Figure C-3
Coos Bay ODMDS: Recovery of Selected Sediment Chemical Parameters

Sediment and Water Quality of Umpqua Sands

2.1 Sediment samples from the main channel of the Umpqua Federal navigation project were collected by the Portland District, Corps of Engineers in October of 1980 as part of a coastal evaluation of authorized federal navigation channels. The offshore disposal site at Umpqua was sampled in January, 1985. Locations of these sampling stations are given in figure C-4 and table C-1.

Table C-1
Location of Sampling Sites at Umpqua

Site No.	Site Designation	Collection Date	Site Location Latitude	Site Location Longitude	Remarks
1	Umpqua RM 0.0	10-29-80	43° 40'09"	124° 12'11"	
2	Winchester Bay	10-28-80	43° 40'58"	124° 11'02"	mouth/boat basin.
3	Umpqua RM 2.4	10-28-80	43° 41'31"	124° 10'15"	
4	Umpqua RM 2.6	10-28-80	43° 41'38"	124° 10'00"	
5	Umpqua RM 2.8	10-28-80	43° 41'45"	124° 09'49"	

2.2 Physical sediment, bulk sediment, and elutriate analyses were performed on the samples for several organic and inorganic parameters. Details of the sampling, lab analysis and procedures can be found in U.S. Geological Survey open file report 82-922. A summary of results of tests from that publication appears in the following sections.

2.3 Basic water quality parameters were taken in the field during collections of sediment samples. Results of the field measurements, collected with an automated multi-parameter water quality analyzer, are given in table C-2. Measurements reported in the table were taken at Umpqua River mile (RM) 0.0, which is immediately inshore of the disposal site. The water quality parameters fall within the normal ranges expected for near shore ocean waters off the Oregon Coast.

2.4 Dredged materials deposited at the ODMDS come from the entrance bar, entrance to the Winchester boat basin, and in the main river channel up to RM 3. The grain size distribution curves for Umpqua River sediments from these areas show well-sorted fine sands with median grain sizes between 0.2 and 0.3 mm (figures C-5 - C-7). Disposal site sediments are also well-sorted fine sands with median grain size approximately 0.3 mm (figures C-8 and C-9). Thus, Umpqua dredged sediments are very similar to sediments at the ODMDS.

2.5 The percentage of volatile solids in the Umpqua River channel (table C-3) are within the range exhibited by offshore sediments. The percentages of volatile solids in the disposal site sediment samples, however, are all less than 0.8 (table C-4), which are less than those in reference transects (table C-5). The difference in volatile solids is probably related to the coarser grain size of the sediments at the disposal site and those dredged from the channel.

Table C-2
Water Quality Data, Umpqua River

River Mile / Parameter	0.0	0.0
Depth	S	B
Dissolved Oxygen (mg/l)	10.32	*
Conductivity (mmho/cm)	53.3	53.6
Salinity (g/l)	35.2	35.4
ORP	207	207
Temperature (°C)	12.7	12.7
pH	8.01	8.02
Turbidity (ntu)	0.7	0.4
Time	1022	1027
Fathometer reading		45

2.6 Sediments from both the channel and the disposal site are similar to those from reference areas (figures C-10 - C-15). Sediment and elutriate analyses showed sediments dredged from the channel to be clean sand, well within the background range expected at Umpqua (tables C-4 - C-7). Therefore, there should be no problem with designation of the offshore site for continued disposal of these sediments.

Table C-3
Volatile Solids in Dredged Material

Sample #	Date	Location	% Volatile Solids
2	Oct 1980	mouth of boat basin	1.44
3	Oct 1980	R.M. 2.4	1.37
5	Oct 1980	R.M. 2.8	1.73

Table C-4
Volatile Solids in Disposal Site

Sample #	Date	% Volatile Solids
U-2-1	Jan 1985	0.6
U-2-2	Jan 1985	0.7
U-2-3	Jan 1985	0.4
U-2-4	Jan 1985	0.7
U-2-5	Jan 1985	0.8
U-2-6	Jan 1985	0.7

Table C-5
Volatile Solids in Reference Transects

Sample #	Date	% Volatile Solids
UR-1	Jan 1985	1.1
UR-2	Jan 1985	1.4
UR-3	Jan 1985	1.5
UR-4	Jan 1985	1.0
UR-5	Jan 1985	1.3
UR-6	Jan 1985	1.3
U-1-1	Jan 1985	1.5
U-1-2	Jan 1985	1.4
U-1-3	Jan 1985	1.2
U-1-4	Jan 1985	1.3
U-1-5	Jan 1985	2.2
U-1-6	Jan 1985	1.2
U-3-1	Jan 1985	1.1
U-3-2	Jan 1985	1.0
U-3-3	Jan 1985	1.3
U-3-4	Jan 1985	1.2
U-3-5	Jan 1985	1.3
U-3-6	Jan 1985	1.3

Table C-6
Dissolved Chemicals in Native Water and Elutriates

[FOR TYPE OF SAMPLE, REFER TO CODES: NE-NATIVE ESTUARINE WATER, NH-NATIVE EURYHALINE WATER, NF-NATIVE FRESH WATER, EE-ELUTRIATE WITH ESTUARINE WATER, EH- ELUTRIATE WITH EURYHALINE WATER, EF-ELUTRIATE WITH FRESH WATER, BM-BOTTOM MATERIAL. THE NUMBER FOLLOWING THE TWO DIGIT CODE INDICATES: FOR NATIVE WATER SAMPLES, THE NUMBER OF SAMPLES ANALYZED AND FOR ELUTRIATES, THE RESPECTIVE MIXING WATER. VALUES = '--' INDICATE THAT A CHEMICAL ANALYSIS HAS NOT BEEN MADE.]

SITE NO.	SITE DESCRIPTION	CODE	DATE	CADMIUM (UG/L AS CD)	CHROMIUM (UG/L AS CR)	COPPER (UG/L AS CU)	IRON (UG/L AS FE)	LEAD (UG/L AS PB)	MANGANESE (UG/L AS MN)	MERCURY (UG/L AS HG)	ZINC (UG/L AS ZN)	CARBON, ORGANIC (MG/L AS C)	NITROGEN, AMMONIA (MG/L AS N)
1	UMPQUA RM 0.0	NE1	10/29/80	3	<1	5	120	2	30	<0.1	30	2.4	--
9	UMPQUA RM 7.8	NE2	10/30/80	2	<1	3	50	1	30	<0.1	20	2.4	--
2	WINCHESTER BAY	EE1	10/28/80	2	<1	9	160	2	220	0.1	40	7.6	1
3	UMPQUA RM 2.4	EE1	10/28/80	1	<1	3	170	<1	60	<0.1	20	11.0	0.9
4	UMPQUA RM 2.6	EE1	10/28/80	3	<1	3	170	2	30	<0.1	30	5.3	0.09
5	UMPQUA RM 2.8	EE1	10/28/80	1	<1	3	170	3	20	<0.1	30	3.3	0.26
6	UMPQUA RM 5.2	EE2	10/28/80	<1	1	3	90	3	190	<0.1	40	2.7	--
6	UMPQUA RM 5.2	EE1	10/28/80	3	10	3	200	2	240	<0.1	90	3.4	--
7	UMPQUA RM 6.4	EE2	10/28/80	1	3	2	60	4	110	<0.1	20	5.9	0.1
8	UMPQUA RM 6.5	EE2	10/29/80	1	2	2	60	4	70	<0.1	20	2.8	0.08
8	UMPQUA RM 6.5	EE1	10/29/80	1	2	2	120	1	130	<0.1	30	1.7	0.04
9	UMPQUA RM 7.8	EE2	10/29/80	1	1	2	100	1	670	<0.1	20	6.4	--
9	UMPQUA RM 7.8	EE1	10/29/80	1	2	3	200	<1	910	<0.1	40	5.1	--
10	UMPQUA RM 9.1	EE2	10/30/80	3	2	3	90	3	130	<0.1	30	2.8	0.22
11	UMPQUA RM 8.7	EE2	10/30/80	--	40	2	60	<1	90	<0.1	30	2.5	0.07
12	UMPQUA RM 9.1	EE2	10/29/80	--	2	2	60	2	1500	<0.1	30	3.9	2.4
13	UMPQUA RM 9.6	EE2	10/30/80	1	1	1	70	2	100	<0.1	20	3.6	--
14	UMPQUA RM 10.5	EE2	10/30/80	3	3	6	60	<1	220	<0.1	30	2.0	--
15	UMPQUA RM 11.4	EE2	10/30/80	2	3	4	50	4	100	<0.1	20	2.0	0.37
15	UMPQUA RM 11.4	EE1	10/30/80	2	3	3	110	4	120	<0.1	30	2.8	0.03

Table C-7
Dissolved Insecticides and Herbicides in Native Water and Elutriates

[FOR TYPE OF SAMPLE, REFER TO CODES: NE-NATIVE ESTUARINE WATER, NH-NATIVE EURYHALINE WATER, NF-NATIVE FRESH WATER, EE-ELUTRIATE WITH ESTUARINE WATER, EH- ELUTRIATE WITH EURYHALINE WATER, EF-ELUTRIATE WITH FRESH WATER, BM-BOTTOM MATERIAL. THE NUMBER FOLLOWING THE TWO DIGIT CODE INDICATES: FOR NATIVE WATER SAMPLES, THE NUMBER OF SAMPLES ANALYZED AND FOR ELUTRIATES, THE RESPECTIVE MIXING WATER. VALUES = '--' INDICATE THAT A CHEMICAL ANALYSIS HAS NOT BEEN MADE.]

SITE NO.	SITE DESCRIPTION	CODE	DATE	ALDRIN (UG/L)	AMETRYNE (UG/L)	ATRATONE (UG/L)	ATRAZINE (UG/L)	CHLORDANE (UG/L)	CYANAZINE (UG/L)	CYPRAZINE (UG/L)	DDD (UG/L)	DDE (UG/L)	DDT (UG/L)	DIELDRIN (UG/L)	ENDOSULFAN (UG/L)
1	UMPQUA RM 0.0	NE1	10/29/80	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.01	<.01	<.01	<.01	<.01
9	UMPQUA RM 7.8	NE2	10/30/80	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.01	<.01	<.01	<.01	<.01
2	WINCHESTER BAY	EE1	10/28/80	--	<.1	<.1	<.1	--	<.1	<.1	--	--	--	--	--
6	UMPQUA RM 5.2	EE2	10/28/80	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.01	<.01	<.01	<.01	<.01
6	UMPQUA RM 5.2	EE1	10/28/80	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.01	<.01	<.01	<.01	<.01
8	UMPQUA RM 6.5	EE2	10/29/80	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.01	<.01	<.01	<.01	<.01
8	UMPQUA RM 6.5	EE1	10/29/80	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.01	<.01	<.01	<.01	<.01
9	UMPQUA RM 7.8	EE2	10/29/80	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.01	<.01	<.01	<.01	<.01
9	UMPQUA RM 7.8	EE1	10/29/80	<.01	<.1	<.1	<.1	<.1	<.1	<.1	<.01	<.01	<.01	<.01	<.01

SITE NO.	SITE DESCRIPTION	CODE	ENDRIN (UG/L)	HEPTACHLOR (UG/L)	HEPTACHLOR EPOXIDE (UG/L)	LINDANE (UG/L)	METHOXYCHLOR (UG/L)	MIREX (UG/L)	PCB (UG/L)	NAPHTHALENES, POLYCHLOR. (UG/L)	PERTHANE (UG/L)	PROMETONE (UG/L)	PROMETRYNE (UG/L)	PROPAZINE (UG/L)
1	UMPQUA RM 0.0	NE1	<.01	<.01	<.01	<.01	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1
9	UMPQUA RM 7.8	NE2	<.01	<.01	<.01	<.01	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1
2	WINCHESTER BAY	EE1	--	--	--	--	--	--	--	--	--	<.1	<.1	<.1
6	UMPQUA RM 5.2	EE2	<.01	<.01	<.01	<.01	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1
6	UMPQUA RM 5.2	EE1	<.01	<.01	<.01	<.01	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1
8	UMPQUA RM 6.5	EE2	<.01	<.01	<.01	<.01	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1
8	UMPQUA RM 6.5	EE1	<.01	<.01	<.01	<.01	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1
9	UMPQUA RM 7.8	EE2	<.01	<.01	<.01	<.01	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1
9	UMPQUA RM 7.8	EE1	<.01	<.01	<.01	<.01	<.01	<.01	<.1	<.1	<.1	<.1	<.1	<.1

Table C-8
Total Recoverable Chemicals in Bottom Material

[FOR TYPE OF SAMPLE, REFER TO CODES: NE-NATIVE ESTUARINE WATER, NU-NATIVE EURYHALINE WATER, NF-NATIVE FRESH WATER, EE-ELUTRIATE WITH ESTUARINE WATER, EU- ELUTRIATE WITH EURYHALINE WATER, EF-ELUTRIATE WITH FRESH WATER, BM-BOTTOM MATERIAL. THE NUMBER FOLLOWING THE TWO DIGIT CODE INDICATES: FOR NATIVE WATER SAMPLES, THE NUMBER OF SAMPLES ANALYZED AND FOR ELUTRIATES, THE RESPECTIVE MIXING WATER. VALUES = '--' INDICATE THAT A CHEMICAL ANALYSES HAS NOT BEEN MADE.]

SITE NO.	SITE DESCRIPTION	CODE	DATE	ARSENIC (UG/G)	BARIUM (UG/G)	BERYLLIUM (UG/G)	CADMIUM (UG/G)	CHROMIUM (UG/G)	COPPER (UG/G)	CYANIDE (UG/G)	IRON (UG/G)	LEAD (UG/G)	MANGANESE (UG/G)	MERCURY (UG/G)
6	UMPQUA RM 5.2	BM	10/28/80	4	5	<1	<1	13	7	<0.5	7700	10	110	0.05
8	UMPQUA RM 6.5	BM	10/29/80	4	5	<1	<1	15	8	<0.5	9100	10	99	0.02
9	UMPQUA RM 7.8	BM	10/29/80	3	10	<1	<1	13	8	<0.5	7500	10	61	0.03
11	UMPQUA RM 8.7	BM	10/30/80	2	10	<1	<1	18	10	<0.5	13000	10	110	0.03
12	UMPQUA RM 9.1	BM	10/29/80	4	10	<1	<1	15	8	<0.5	9200	10	200	0.04
15	UMPQUA RM 11.4	BM	10/30/80	4	10	<1	1	13	10	<0.5	7300	<10	130	0.03

SITE NO.	SITE DESCRIPTION	CODE	NICKEL (UG/G)	ZINC (UG/G)	CARBON, INORGANIC (G/KG)	CARBON, INORG + ORGANIC (G/KG)	NITROGEN, NH4 (MG/KG AS N)	NITROGEN, NH4 + ORG. (MG/KG AS N)	PHOSPHORUS (MG/KG)
6	UMPQUA RM 5.2	BM	20	22	0.0	2	6	160	370
8	UMPQUA RM 6.5	BM	20	23	0.1	2	2	117	410
9	UMPQUA RM 7.8	BM	20	22	0.0	7	20	300	340
11	UMPQUA RM 8.7	BM	20	26	0.0	3	4	130	410
12	UMPQUA RM 9.1	BM	20	24	0.0	4	19	210	420
15	UMPQUA RM 11.4	BM	20	21	0.0	1	.2	110	440

Table C-9
Total Recoverable Insecticides and Herbicides in Bottom Material

[FOR TYPE OF SAMPLE, REFER TO CODES: NE-NATIVE ESTUARINE WATER, NU-NATIVE EURYHALINE WATER, NF-NATIVE FRESH WATER, EE-ELUTRIATE WITH ESTUARINE WATER, EU- ELUTRIATE WITH EURYHALINE WATER, EF-ELUTRIATE WITH FRESH WATER, BM-BOTTOM MATERIAL. THE NUMBER FOLLOWING THE TWO DIGIT CODE INDICATES: FOR NATIVE WATER SAMPLES, THE NUMBER OF SAMPLES ANALYZED AND FOR ELUTRIATES, THE RESPECTIVE MIXING WATER. VALUES = '--' INDICATE THAT A CHEMICAL ANALYSES HAS NOT BEEN MADE.]

SITE NO.	SITE DESCRIPTION	CODE	DATE	ALDRIN (UG/KG)	CHLORDANE (UG/KG)	DDD (UG/KG)	DDE (UG/KG)	DDT (UG/KG)	DIELDRIN (UG/KG)	ENDOSULFAN (UG/KG)	ENDRIN (UG/KG)	HEPTACHLOR (UG/KG)	HEPTACHLOR EPOXIDE (UG/KG)	LINDANE (UG/KG)
6	UMPQUA RM 5.2	BM	10/28/80	<.1	<1	0.1	0.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
8	UMPQUA RM 6.5	BM	10/29/80	<.1	<1	0.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
9	UMPQUA RM 7.8	BM	10/29/80	<.1	<1	0.2	0.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
11	UMPQUA RM 8.7	BM	10/30/80	<.1	<1	0.3	0.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
12	UMPQUA RM 9.1	BM	10/29/80	<.1	<1	0.2	0.1	0.3	<.1	<.1	<.1	<.1	<.1	<.1
15	UMPQUA RM 11.4	BM	10/30/80	<.1	<1	0.1	0.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1

SITE NO.	SITE DESCRIPTION	CODE	METHOXYCHLOR (UG/KG)	MIREX (UG/KG)	PCB (UG/KG)	PCN (UG/KG)	PERTHANE (UG/KG)	SILVEX (UG/KG)	TOXAPHENE (UG/KG)	2,4-D (UG/KG)	2,4,5-T (UG/KG)	2,4-DP (UG/KG)
6	UMPQUA RM 5.2	BM	<.1	<.1	<1	<1	<1	<.1	<1	<.1	<.1	<.1
8	UMPQUA RM 6.5	BM	<.1	<.1	<1	<1	<1	<.1	<1	<.1	<.1	<.1
9	UMPQUA RM 7.8	BM	<.1	<.1	--	--	<1	<.1	<1	<.1	<.1	<.1
11	UMPQUA RM 8.7	BM	<.1	<.1	<1	<1	<1	<.1	<1	<.1	<.1	<.1
12	UMPQUA RM 9.1	BM	<.1	<.1	<1	<1	<1	<.1	<1	<.1	<.1	<.1
15	UMPQUA RM 11.4	BM	<.1	<.1	<1	<1	<1	<.1	<1	<.1	<.1	<.1

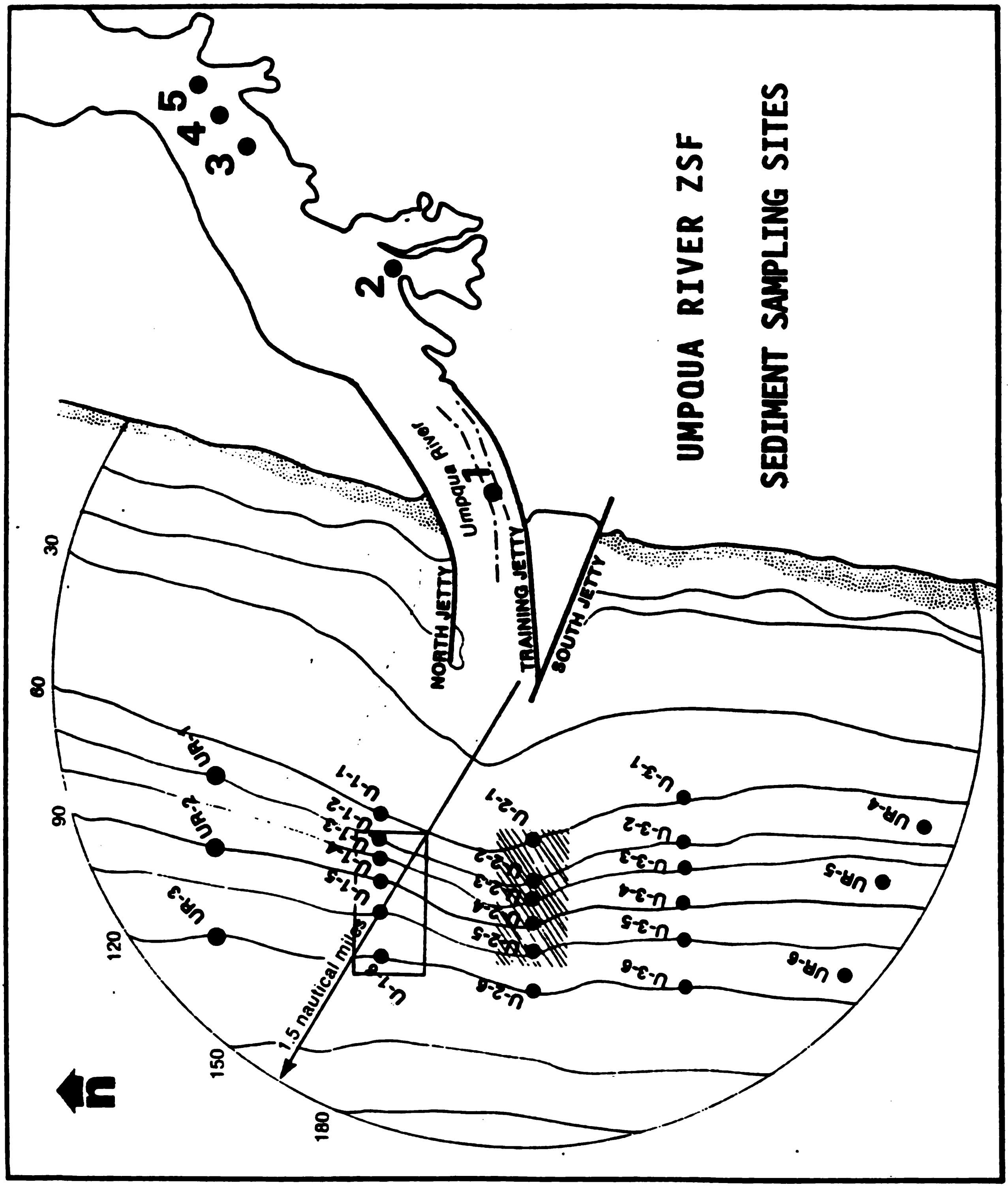


Figure C-4
Sample Site Locations

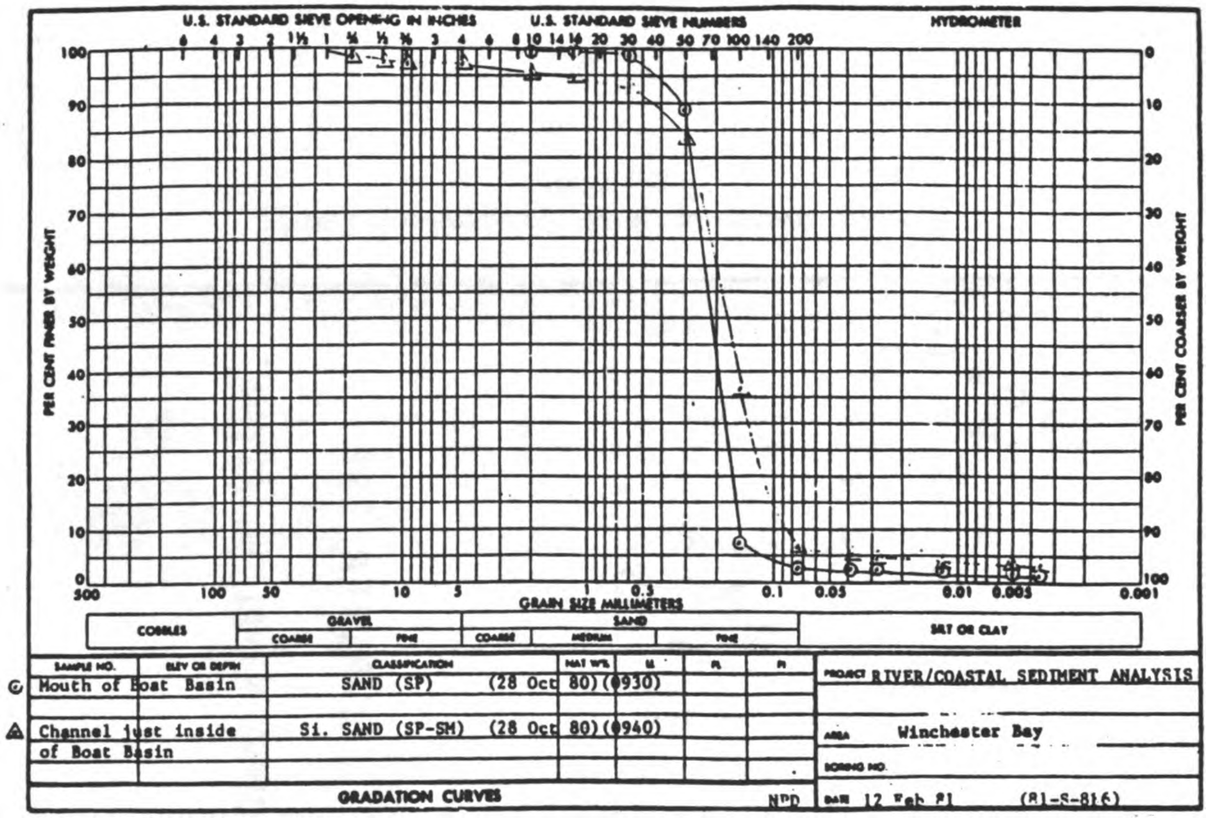


Figure C-5
Gradation Curves

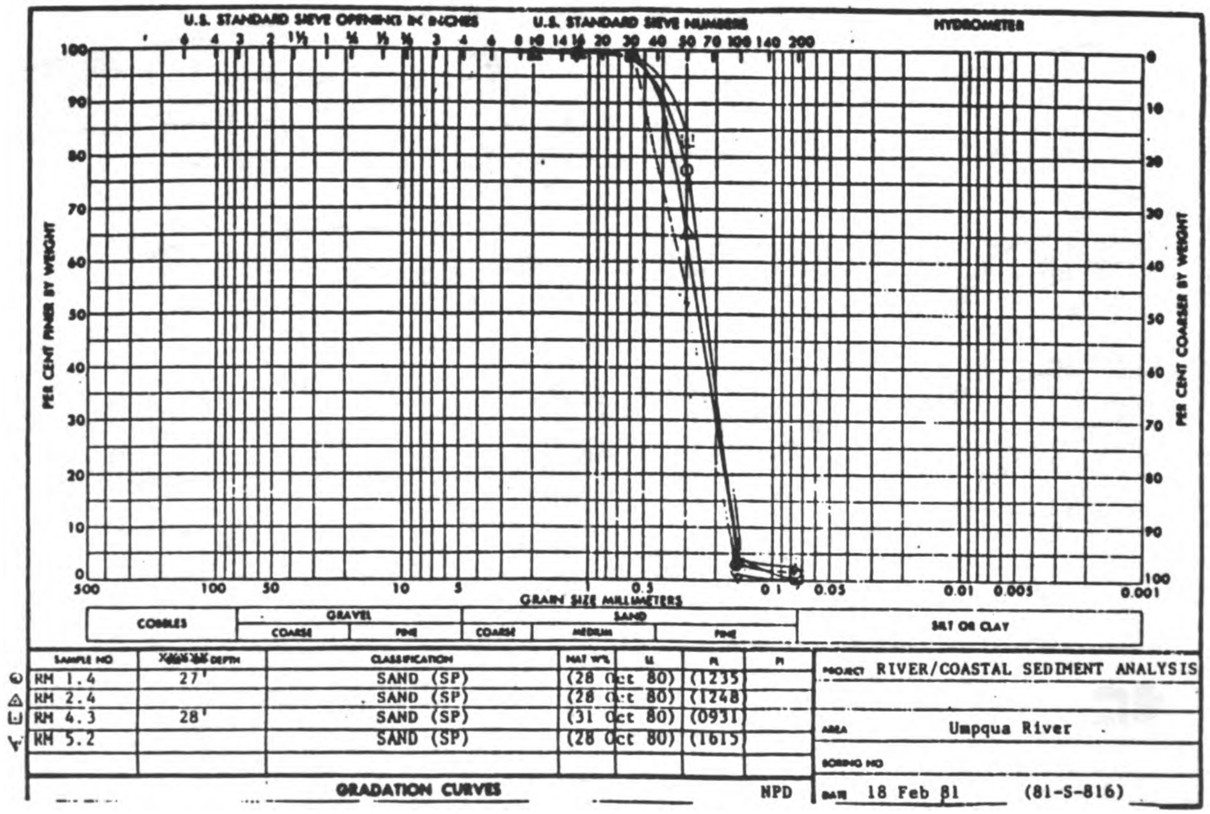


Figure C-6
Gradation Curves

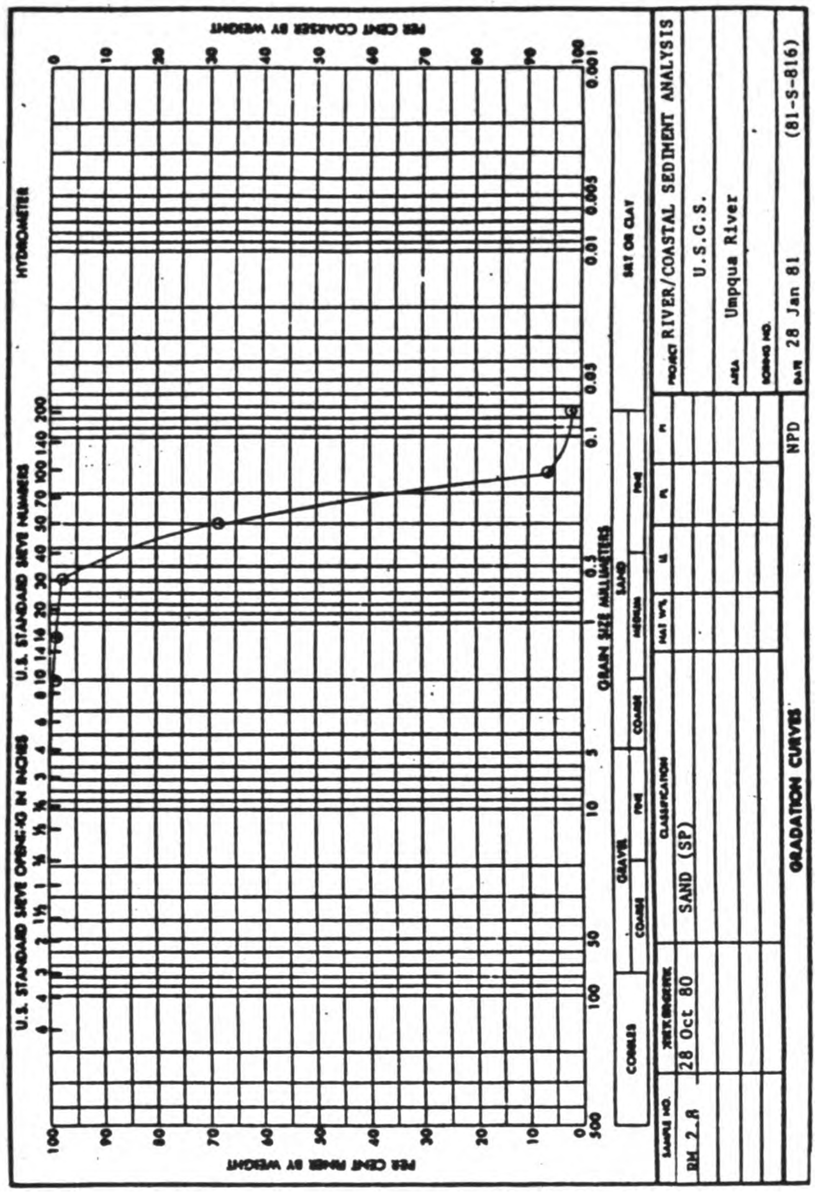
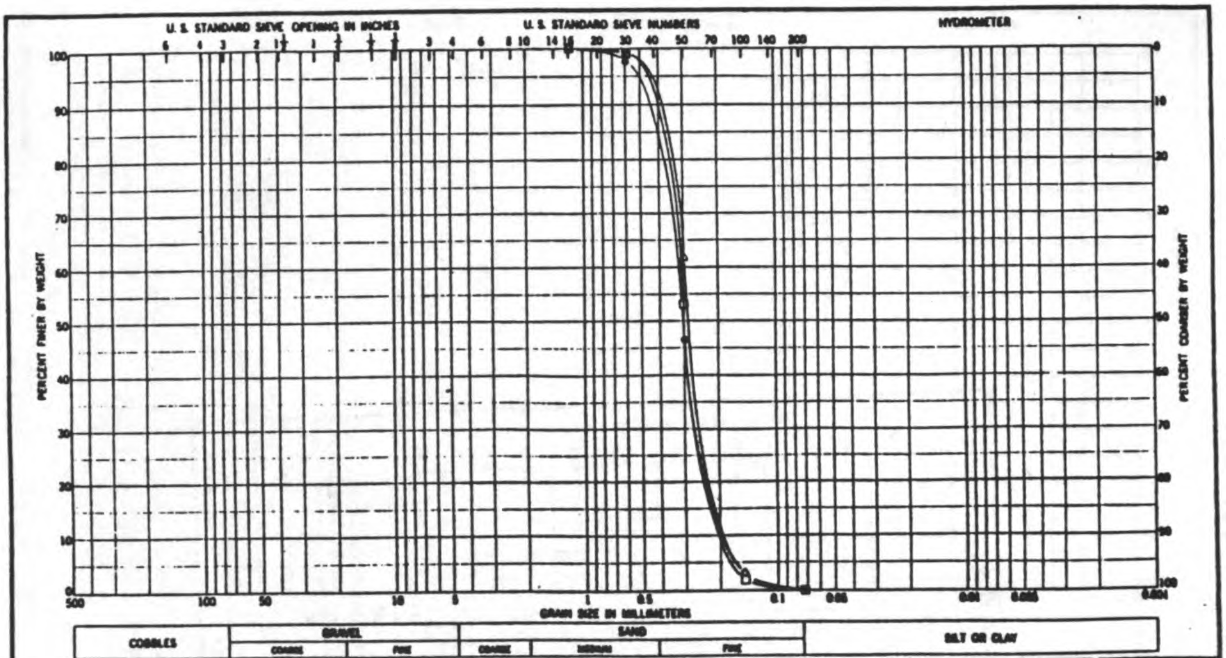


Figure C-7
Gradation Curves



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
			Volatile Solids, %			
U-2-1	o	Poorly Graded SAND (SP)		0.6		
U-2-2	Δ	Poorly Graded SAND (SP)		0.7		
U-2-3	□	Poorly Graded SAND (SP)		0.4		

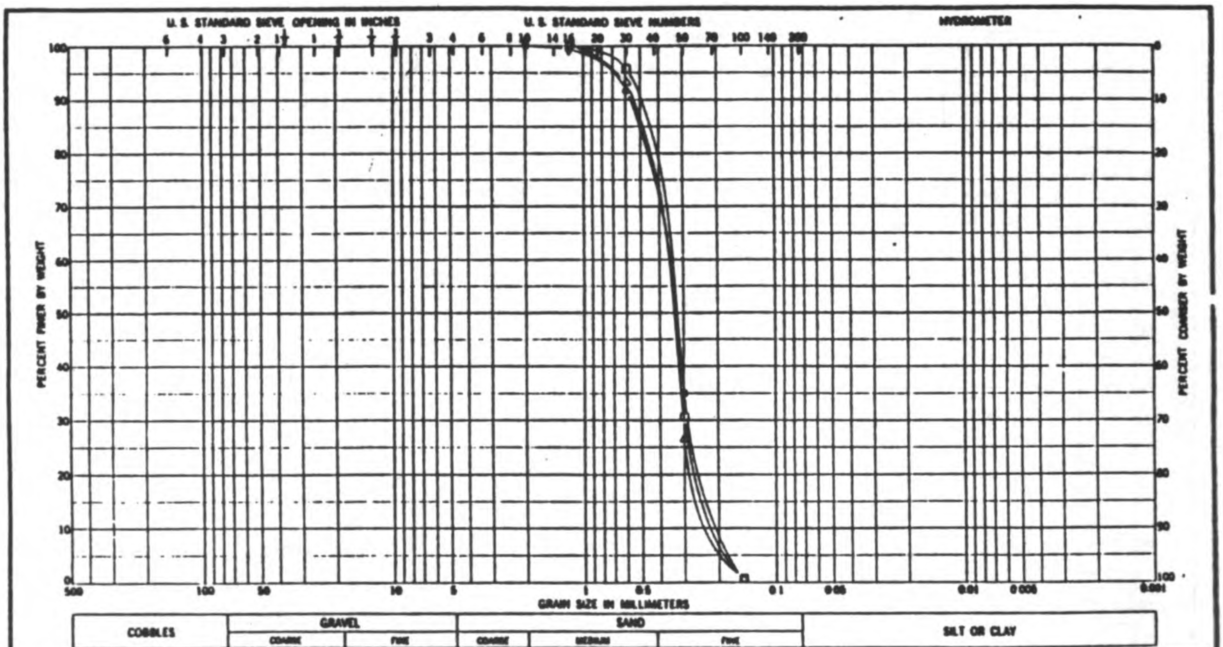
Project GENERIC OCEAN DISPOSAL SITES

Area Umpqua

Boring No. Sampled 27 Jan 85

GRADATION CURVES NPD Date MAY 8 1985 (85-SH-730)

Figure C-8
Gradation Curves



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
			Volatile Solids, %			
U-2-4	o	Poorly Graded SAND (SP)		0.7		
U-2-5	Δ	Poorly Graded SAND (SP)		0.8		
U-2-6	□	Poorly Graded SAND (SP)		0.7		

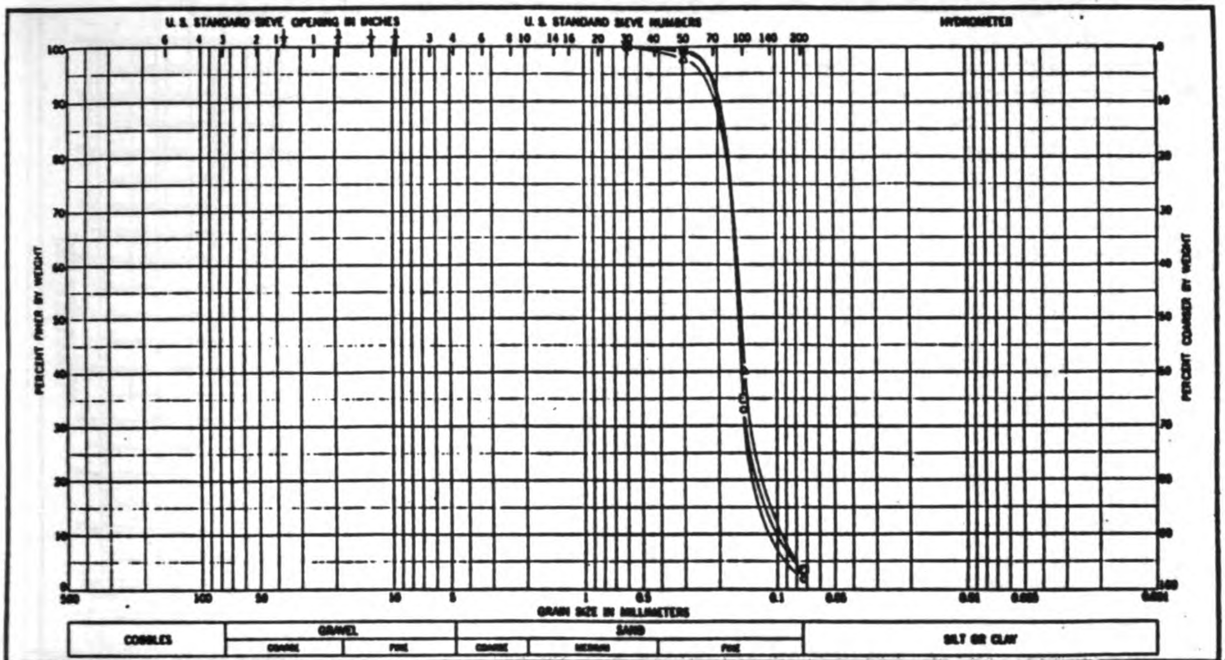
Project GENERIC OCEAN DISPOSAL

Area Umpqua

Boring No. Sampled 27 Jan 85

GRADATION CURVES NPD Date MAY 8 1985 (85-SH-730)

Figure C-9
Gradation Curves



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
			Volatile Solids,%			
UR-1	o	Fine SAND (SP)		1.1		
UR-2	△	Fine SAND (SP)		1.4		
UR-3	□	Fine SAND (SP)		1.5		

Project GENERIC OCEAN DISPOSAL SITES

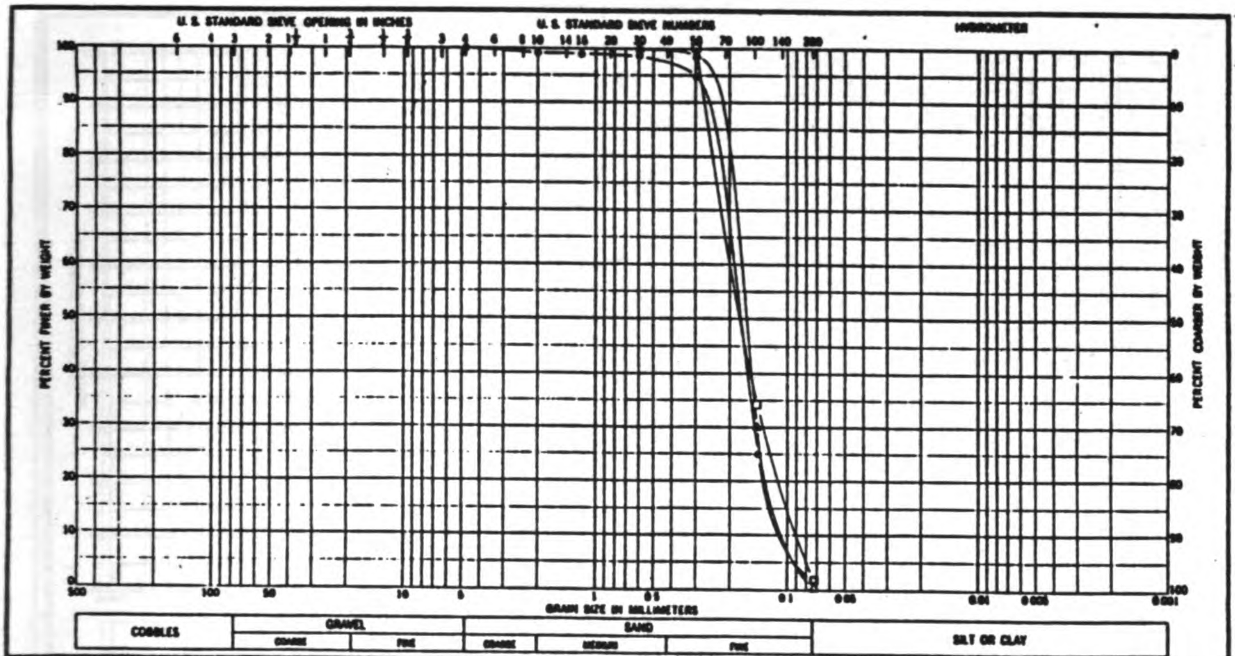
Area Umpqua

Boring No. Sampled 27 Jan 85

GRADATION CURVES NPD

Date MAY 8 1985 (85-SH-730)

Figure C-10
Gradation Curves



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
			Volatile Solids,%			
UR-4	o	Fine SAND (SP)		1.0		
UR-5	△	Fine SAND (SP)		1.3		
UR-6	□	Fine SAND (SP)		1.3		

Project GENERIC OCEAN DISPOSAL SITES

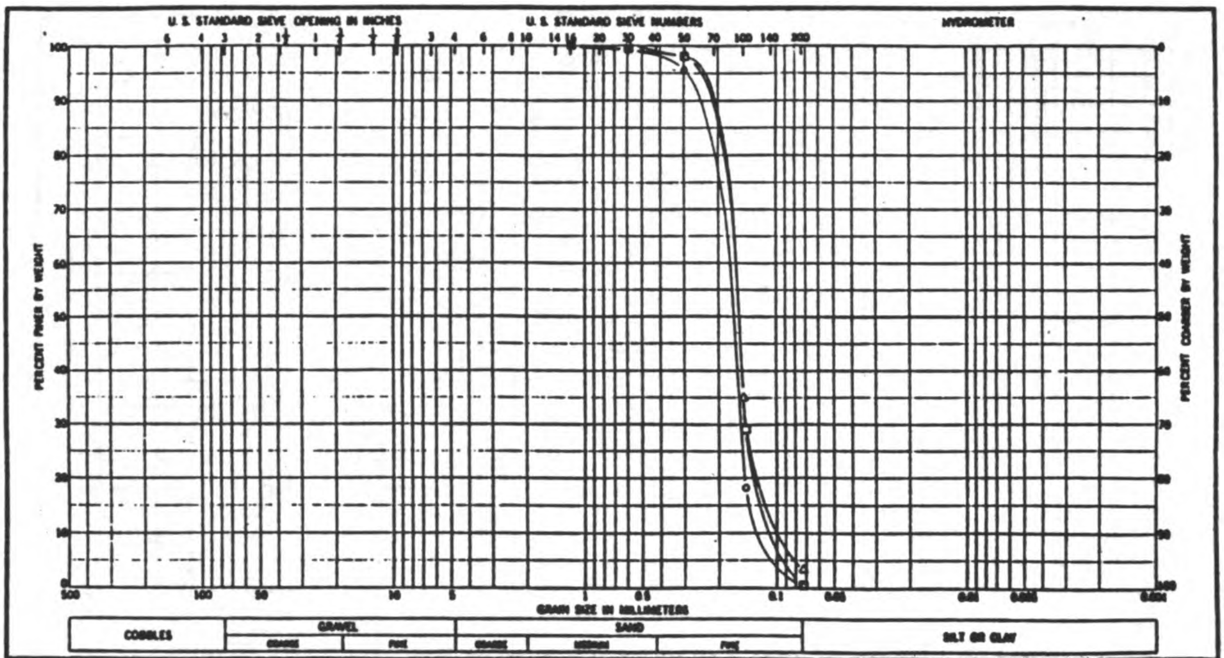
Area Umpqua

Boring No. Sampled 27 Jan 85

GRADATION CURVES NPD

Date MAY 8 1985 (85-SH-730)

Figure C-11
Gradation Curves

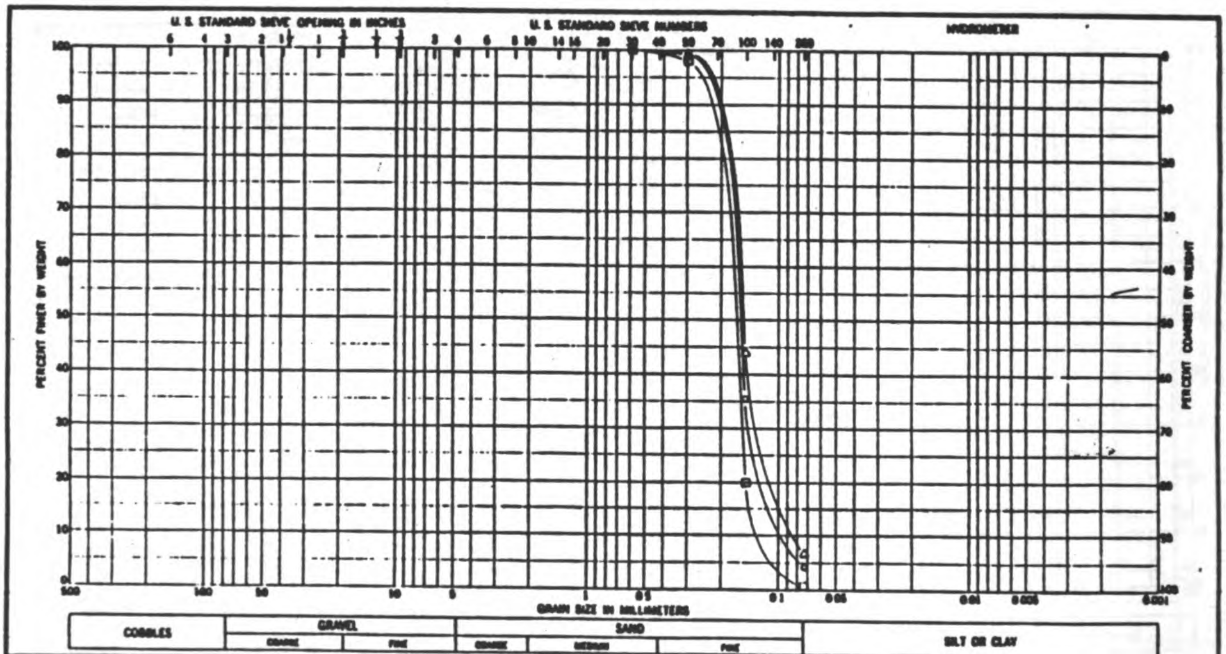


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
			Volatile Solids,%			
U-1-1	o	Fine SAND (SP)		1.5		
U-1-2	△	Fine SAND (SP)		1.4		
U-1-3	□	Fine SAND (SP)		1.2		

GRADATION CURVES NPD

Project GENERIC OCEAN DISPOSAL SITES
Area Umpqua
Boring No. Sampled 27 Jan 85
Date MAY 8 1985 (85-SH-730)

Figure C-12
Gradation Curves

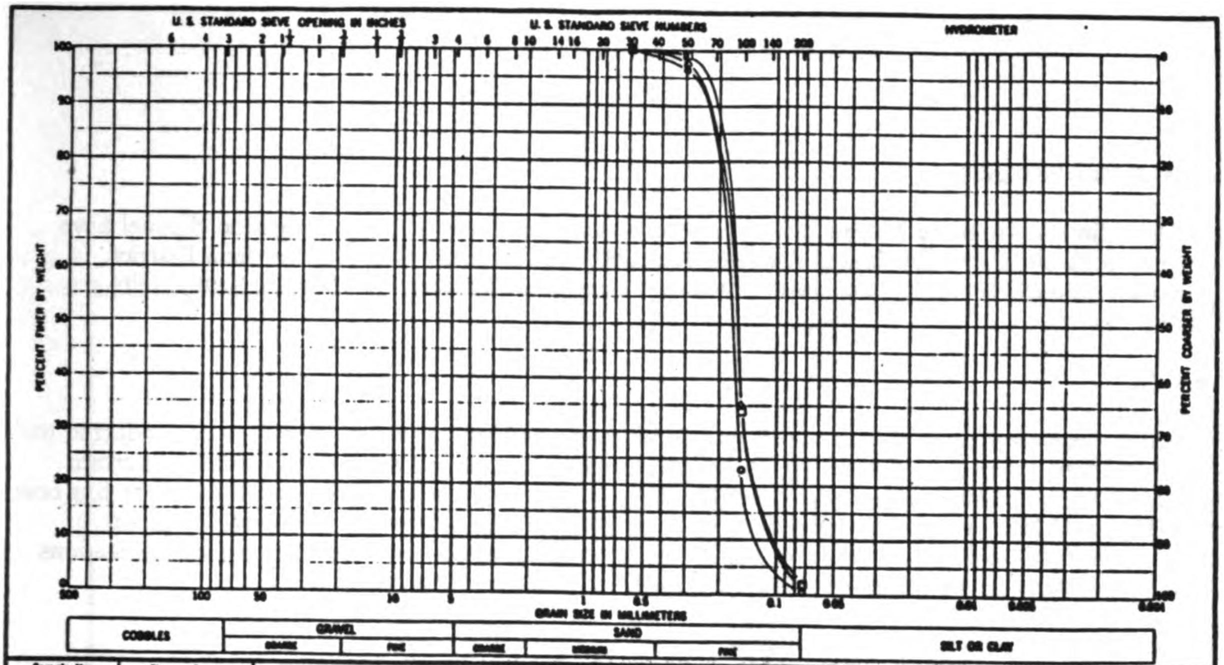


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
			Volatile Solids, %			
U-1-4	o	Fine SAND (SP)		1.3		
U-1-5	△	Silty Fine SAND (SP-SM)		2.2		
U-1-6	□	Fine SAND (SP)		1.4		

GRADATION CURVES NPD

Project GENERIC OCEAN DISPOSAL SITES
Area Umpqua
Boring No. Sampled 27 Jan 85
Date MAY 8 1985 (85-SH-730)

Figure C-13
Gradation Curves

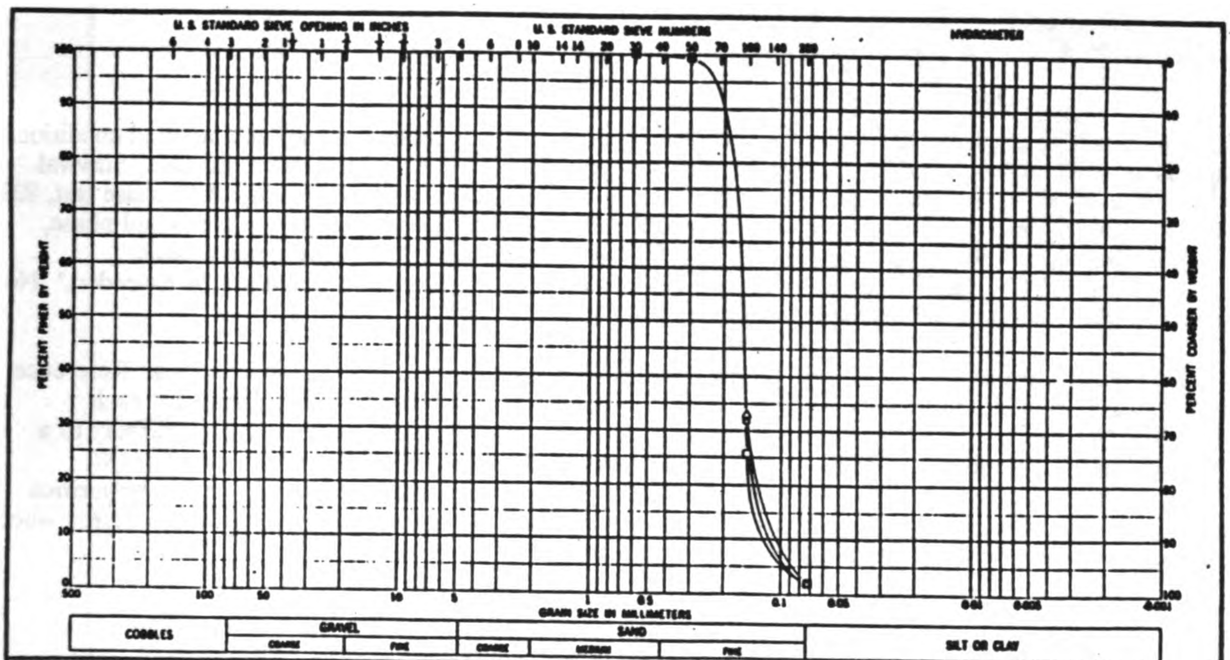


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
			Volatile Solids, %			
U-3-1	○	Fine SAND (SP)		1.1		
U-3-2	△	Fine SAND (SP)		1.0		
U-3-3	□	Fine SAND (SP)		1.3		

Project GENERIC OCEAN DISPOSAL SITES
Area Umpqua
Boring No. Sampled 27 Jan 85
Date MAY 8 1985 (85-SH-730)

GRADATION CURVES NPD

Figure C-14
Gradation Curves



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
			Volatile Solids, %			
U-3-4	○	Fine SAND (SP)		1.2		
U-3-5	△	Fine SAND (SP)		1.3		
U-3-6	□	Fine SAND (SP)		1.3		

Project GENERIC OCEAN DISPOSAL SITES
Area Umpqua
Boring No. Sampled 27 Jan 85
Date MAY 8 1985 (85-SH-730)

GRADATION CURVES NPD

Figure C-15
Gradation Curves

Quality of Fine Sediments

3.1 Fine sediments from the Federal portion of the Winchester Bay boat basin navigation channel have undergone both biological (Ecological Analysts, Inc. 1981) and chemical (USACE Portland District, unpublished data 1987) testing to evaluate potential for toxicity effects at the ODMDS. Test results are described below.

Bioassays

3.2 Liquid, suspended particulate, and solid phase bioassays and bioaccumulation tests were conducted under contract to USACE Portland District by Ecological Analysts, Inc., during April - August 1981. Surface sediments were collected by Ponar grab from five locations in the Salmon Harbor and Winchester Bay boat basins (Figure C-16). A single composite of the 5 stations was used as the test sediment, as agreed to between CoE Portland District and EPA Region 10. Reference sediments were collected from 3 stations immediately inshore of the interim-designated ODMDS. Test species included:

Liquid and suspended particulate phases:

Calanus pacifica -- copepod
Crangon franciscorum -- bay shrimp
Parophrys vetulus -- juvenile English sole

Solid phase:

Rhepoxynius abronius -- burrowing amphipod
Macoma inequinata -- filter-feeding infaunal bivalve
Abarenicola pacifica -- deposit-feeding polychaete

Bioaccumulation: *A. pacifica*

3.3 The liquid and suspended particulate tests were conducted for 96 hours under static, aerated conditions. Significant mortality occurred for C. franciscorum exposed to 100% liquid phase test sediments. Survival percentages were: reference control, 85%; liquid phase test, 45%; and suspended particulate phase test, 82% survival. The report authors attributed this mortality to lack of food for test animals in the liquid phase, which is filtered, rather than contaminant effects. It was estimated that "the limiting permissible concentration (LPC) of the liquid phase after initial mixing at the disposal site would not be exceeded." No other mortality was observed in these two phases.

3.4 Significant mortality was observed in flow-through 10-day solid phase tests for R. abronius. Reference survival was 91% while test sediment survival was 69%, averaged over the 20 replicates run for each condition. Net decrease in survival was, therefore, 22%. The report authors attributed the mortality to a combination of contaminants and physical incompatibility of the fine grained test sediments, since R. abronius prefers sandy substrates. No other significant solid phase mortality occurred. In the A. pacifica bioaccumulation tests, tissue accumulation showed no significant elevations of any contaminants tested when compared between dredging site and reference sediments.

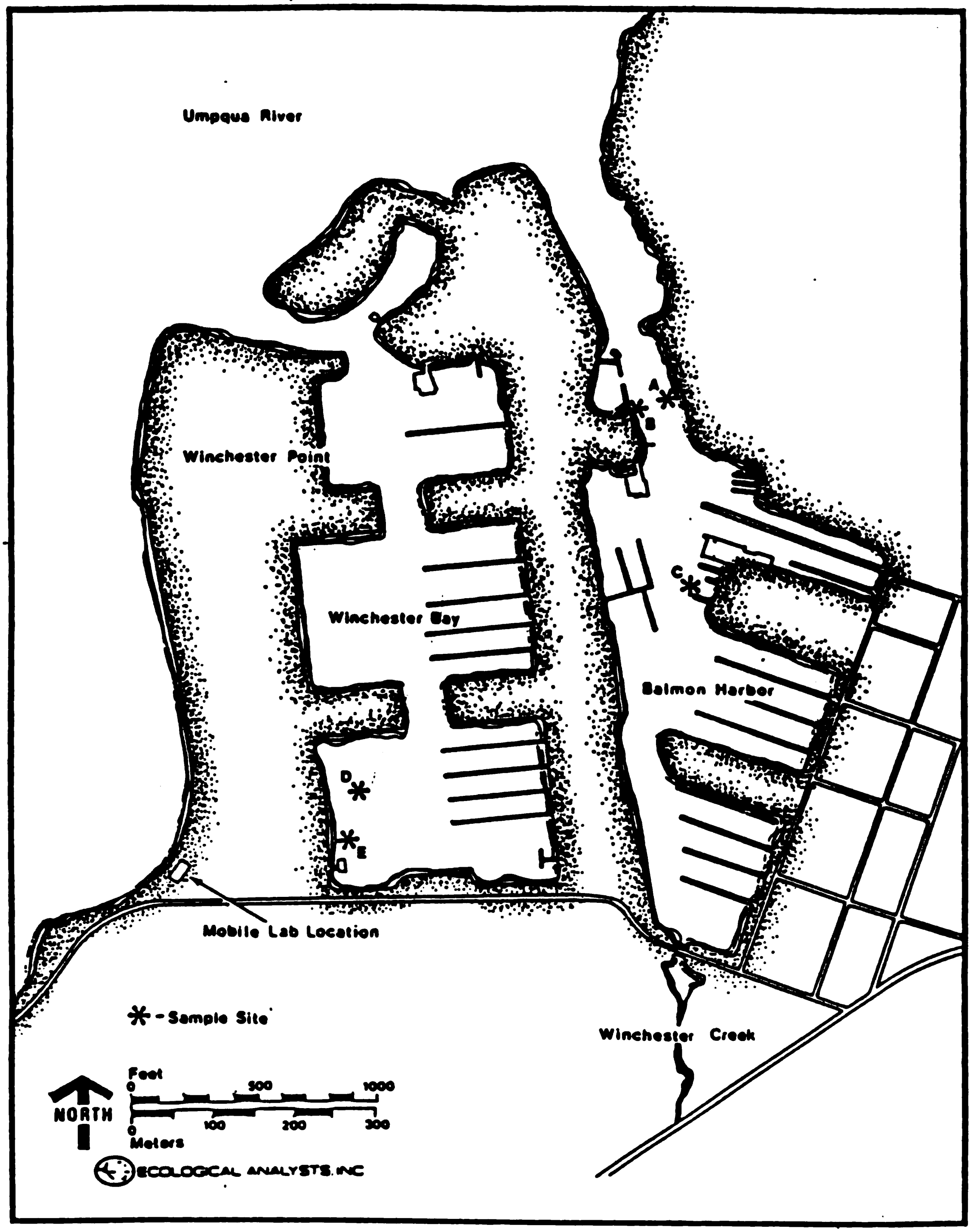


Figure C-16
Locations of the Dredge Material sampling sites at Winchester Bay, Oregon.

Physical/Chemical Testing

3.5 Sediment physical and chemical analyses were completed in July 1987 for samples from 12 stations in the two Winchester Bay boat basins (Figure C-17). Results showed a mixture of sediment types with coarser sediments located near the basin entrances and fine sediments inside (Table C-10). Some of the fine sediments have high organic and clay content, with several stations showing ranges of 7 - 15% organics and 8 - 24% clays. Coarse sediment areas are presently dredged annually with disposal in a nearby dispersive estuarine in-water site.

3.6 Bulk and elutriate chemical analysis results showed that sediments do not have high contaminant levels (Table C-11). The mercury value for WB-12, in the west basin, was somewhat elevated at 0.134 ug/g. However, toxicity effects for mercury at this level would not be expected at the recommended ODMDS. Chromium values for all samples were high, with a range of 36.5 - 75.2 ug/g, but showed no relationship with sediment type or proximity to moorage areas. Some Oregon estuaries have high background chromium levels and these data indicate a similar phenomenon at Umpqua. The same samples and composites were analyzed for organic contaminants, including pesticides, PCBs, and PAHs. None were detected in any samples.

3.7 While bioassay results indicated some potential for Winchester Bay sediments to cause mortality at the ODMDS, later testing results showed a lack of high contaminant levels in the Federal channel. Some of the original bioassays had to be rerun because of excessive reference and control mortality (Ecological Analysts, Inc. 1981). Therefore, mortality could have been caused by several factors related to test conditions as well as contaminants. Considering the dispersive nature of any location within the Umpqua ZSF for fine sediments, toxicity effects would not be expected from ocean disposal of Winchester Bay sediments.

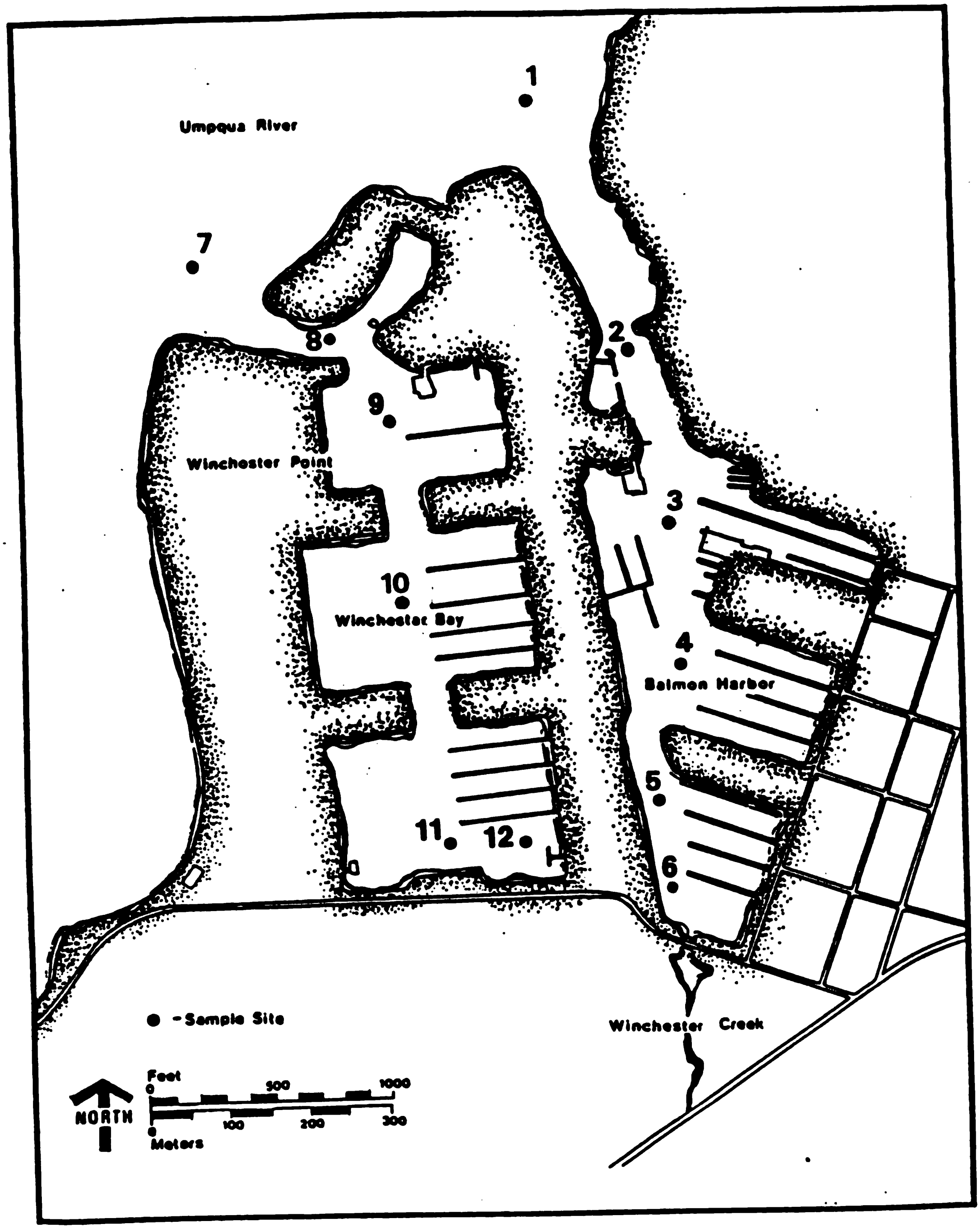


Figure C-17
Station Locations for 1987 Sediment Quality survey at Winchester Bay, Oregon

Table C-10
Physical Characteristics of Sediments Collected July 1987 at Winchester Bay, Umpqua Estuary

Sample No.	Soil Class.	% Gravel	% Sand	%(1) Fines	D50 (mm)	Organic Content	%(2) Clay
1	Sand	3.5	95.5	1.1	0.27	1.9	-(3)
2	Sand	0	95.3	4.7	0.17	4.5	-
3	Sandy Silt	0	30.0	70.0	0.031	13.4	15.1
4	Sandy Silt	0	17.5	82.5	0.050	6.9	7.7
5	Sand	0	95.7	4.3	0.25	1.6	-
6	Silt	0	8.6	91.4	0.013	11.7	23.9
7	Sand	0	99.7	0.3	0.20	1.4	-
8	Sand	0	95.7	4.3	0.16	4.2	-
9	Sandy Silt	0	32.5	67.5	0.032	15.0	12.2
10	Silt	0	13.3	86.7	0.015	9.9	20.5
11	Silty Sand	0	60.7	29.3	0.14	4.2	12.3
12	Silty Sand	0	62.7	37.3	0.12	5.5	11.0

Notes: (1) Silt/Clay <62u grain diameter
(2) Clays <4.5u grain diameter, clay content based on material suspended at end of hydrometer analysis.
(3) Clay not estimated due to insufficeint quantity of fines for a hydrometer analysis

Table C-11
Concentrations of Metals and Elutriates in Sediments from Winchester Bay, Umpqua Estuary

Concentrations of Metals in Sediments Digested by EPA Method 3050 for Umpqua ug/g Dry Weight (Fe in %)

Sample	Hg	As	Cd	Cr	Cu	% Fe	Mn	Ni	Pb	Zn
WB-364 comp	0.079	8.6	0.23	61.4	35.3	2.90	222	70.4	7.65	70
WB-5	0.064	5.6	0.17	47.9	27.4	2.48	187	57.8	6.25	62
WB-6 rep 1	0.082	8.6	0.19	66.1	39.2	3.38	267	75.4	9.13	84
WB-6 rep 2	0.079	6.6	0.20	63.8	39.2	3.26	252	80.5	7.76	86
WB-9&10 comp	0.074	7.4	0.22	59.3	37.2	3.08	227	70.4	7.42	76
WB-11	0.044	5.1	0.14	36.5	25.5	2.02	135	40.2	4.55	52
WB-12	0.134	7.8	0.16	75.2	47.1	3.50	232	83.0	8.84	90

pH and Concentrations of Metals and Ammonia in Recieving Waters Seawater and Sediment Elutriates for Umpqua ug/l (except NH(3) in mg/l)

Sample	Hg	As	Cd	Cr	Cu	Fe	Mn	Ni	Pb	Zn	NH(3)	pH
WB Receiving Water	0.0006	1.5	0.087	0.17	0.70	12.0	4.31	1.77	0.43	5.89	0.13	7.45
WB-6 Elutriate rep1	0.0013	14.5	0.006	0.31	0.31	384.0	1640.0	5.14	0.22	1.19	5.55	7.53
WB-6 Elutriate rep2	0.0012	15.9	0.003	0.25	0.25	519.0	2040.0	4.72	0.01	0.58	6.52	7.52
WB-11 Elutriate	0.0011	5.9	0.007	0.38	0.38	104.0	305.0	1.85	0.19	1.32	1.70	7.78

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APPENDIX D

APPENDIX D

TABLE OF CONTENTS

LIST OF FIGURES

APPENDIX D

RECREATIONAL RESOURCES

General

1.1 This section identifies the major recreational use areas within the zone of Siting Feasability (ZSF) at the mouth of the Umpqua River. Figure D-1 shows the ZSF in relation to the Umpqua River. The information was compiled to determine the potential impacts of disposal operations on recreation.

Recreational Use Areas

2.1 All ocean frontage within the ZSF is publicly owned, making this area popular with recreationists. Figure D-1 shows the major recreational use areas located within the ZSF. The Umpqua River and its associated offshore waters are known as one of the best salmon fishing areas along the Pacific Coast. Although the area receives recreational use year-round, the most popular months are from May through September. Preliminary activities include fishing, camping, beachcombing, off roading and sightseeing.

2.2 The coastal land north of the Umpqua River is part of the Oregon Dunes National Recreational Area. This portion of the Oregon Dunes has limited access and has no developed recreational facilities. The beach is open year round to motorized vehicles and off roading is a popular activity. The dune area behind the beach is popular among hikers who enjoy a more primitive hiking experience.

2.3 Directly south of the Umpqua River is public land administered by Douglas County. Camping and Picnic facilities are provided for public use. In addition, the county maintains a road which parallels the beach and provides access to the Umpqua Lighthouse State Park and sand dunes within the ODNRA (Oregon Dunes National Recreation Area). All of the recreation facilities at the state park are located inland away from the ZSF beach front.

2.4 Oregon Dunes NRA borders the state land and continues south along the coast to Coos bay. There are no developed recreational facilities in the ODNRA within the ZSF boundary. Unlike the beach area in the nothern half of the ZSF, the entire length of the beach in the southern half of the ZSF is closed to motorized vehicles. The most common activities occuring in this portion of the ZSF are fishing, beachcombing, sightseeing and hiking. The southern portion of the Oregon Dunes NRA has developed access, thus receives much higher public use than the area north of the river.

2.5 The Umpqua River jetty fishery is well known and accounts for a high number of angler use days. The south jetty is the principle fishing area because of the easy access. A popular place for fishing and crabing the entrance channel is off the old U.S. Coast Guard pier on the south side of the channel. Peak months of activity on the jetties are June, July and August. Most crabs are taken from the main channel by individuals in boats, although some are taken directly off the U.S.C.G. pier. The most popular months for crabing are June through September.

2.6 Salmon fishing is the most popular type of offshore recreation. Both private and charter boats fish the waters throughout the western third of the ZSF. A well known area lies just beyond the mouth of the river, where salmon fishing is productive. Bottom fishing is also popular but is limited to areas outside the ZSF. Sport angling occurs primarily during summer months when salmon are feeding nearshore before begining the fall spawning migrations.

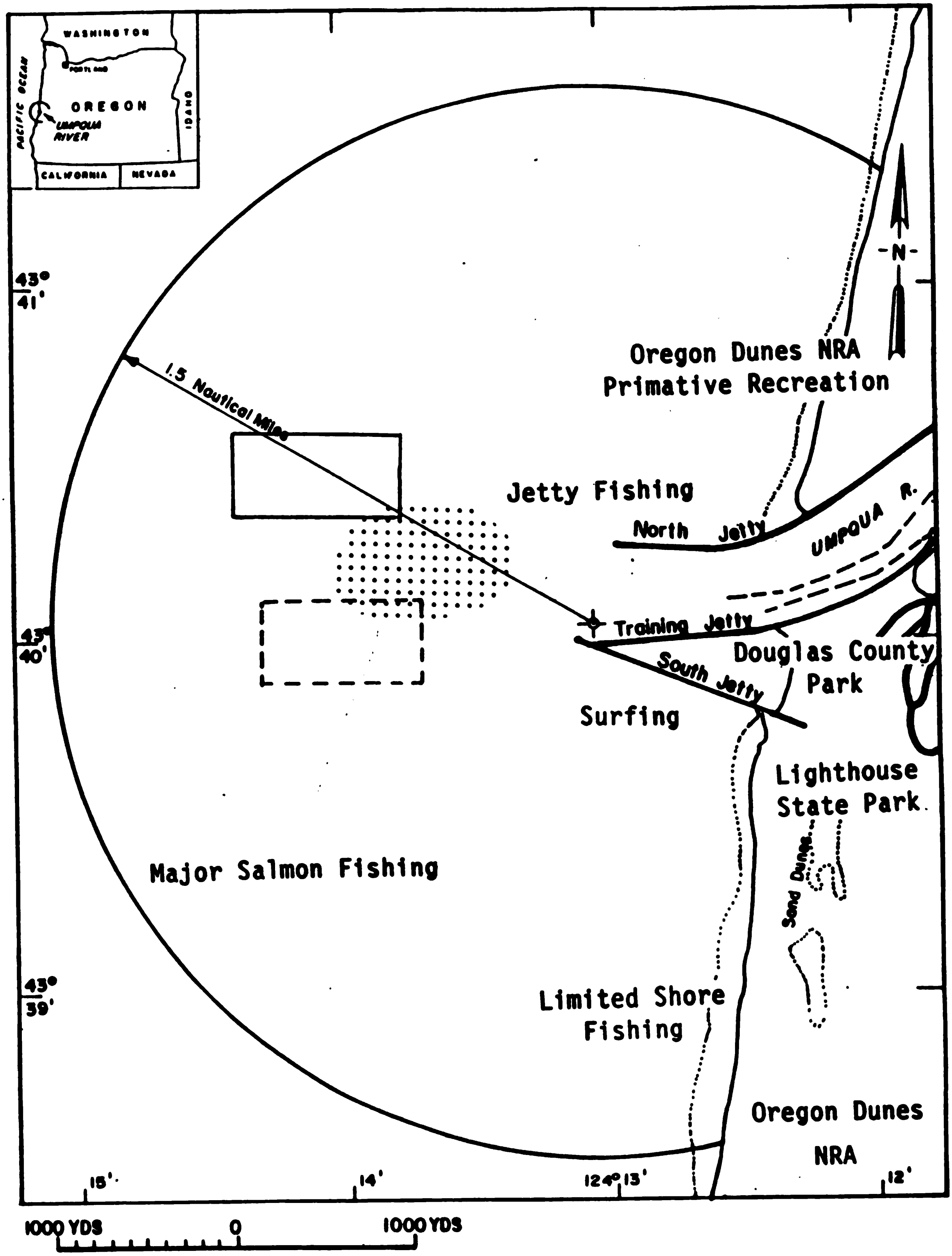

Figure D-1
Recreational Use Areas

Impacts of Disposal Operation

3.1 The disposal site identified on the map is located within a major salmon fishing area and is directly adjacent to one of the most popular and productive salmon fishing sites offshore of the Umpqua River. However, few conflicts are expected to occur between fisherman and disposal operations as long as the dumping of dredged material is restricted to the northeast corner of the dump site. Any conflicts between disposal operations and recreationists would occur as the vessel was in route to the disposal site. These conflicts could include time delays for recreational boaters caused by the passing of the dredge, an increase in navigation hazards during congested periods and disruption of fishing activity as the dredge passed through popular fishing areas. Most of these conflicts could be considered an inconvenience rather than a threat to the recreational activity. The only serious threat is the potential for collision between recreational boaters and dredge traffic. Confrontations of this type are rare because the dredge moves at a slow speed. Unless there is significant change in equipment or operational proceedures, the potential for collisions will remain low.

3.2 When the dredged material is deposited at the disposal site the surrounding turbidity will increase. This would result in reduced visual quality of the area and could possibly disrupt the feeding patterns of sport fish. Both of these situations would be temporary and normal conditions would return as soon as the disposed material settles.

3.3 Sediment deposition along the beach is another possible consequence of disposal operations that could affect recreational activity. The accumulation of dredged material on the beaches could potentially interfere with the free movement of sand which may affect the vegetative cover or modify the local topography. If the slope of the beach is altered significantly, it could interfere with the accumulation of driftwood and other items of interest to beachcombers. Another potential problem with beach nourishment is the accumulation of foreign material on the beach. If the dredge material had a different color or texture than the existing material, the results could be a reduction in the visual quality of the area.

Conclusion

4.1 Continued use of the current disposal site should have little impact on existing recreation. During disposal operations, water turbidity will increase. Any impact this may have on recreational fishing or visual quality of the area will only be temporary. Some inconveniences will be experianced by recreational boaters and fishermen, but overall disposal operations appear to cause no serious threat to recreation.

4.2 If future studies indicate the disposal operations are either detrimental to ocean fauna or disrupt sediment deposition along the coast line, further information should be collected to determine more specifically what extent the impacts have on recreation. However, until any of these impacts are observed, future disposal of dredged material at the present site is not expected to have any substantial effects on recreation.

APPENDIX E

APPENDIX E

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX E

CULTURAL RESOURCES

Introduction

1.1 The cultural resource statement for the Umpqua ODMDS is organized in the following manner. Prehistoric cultural resource potential is reviewed and evaluated first. Then follows a brief discussion of the areas historic settlement and development highlighting the major themes. This description is sketched with an emphasis on ocean going vessels and their use in exploration, trade with the Indians, settlement and development of the region. Following this section is a statement on shipwrecks as cultural resources, a Table listing the shipwrecks of the Umpqua vicinity and project area with a comment on the wrecks. A Shipwreck Locational Model is discussed next and used to evaluate the site for unreported wrecks. The report concludes with the results of the evaluation and a side scan sonar study (field investigation) of the proposed Umpqua Disposal Site.

Study Area

1.2 The Umpqua Study area incompasses an area of 1.5 nautical miles in radius with its center point at the entrance of the Umpqua River. This area is considered the zone of siting feasibility (ZSF), and is determined by the economic haul distance of the current dredges. Within this area is located the interim disposal site, and the adjusted disposal site. The interim disposal site is 1500 yards (east-west) x 500 yards (north-south); its SW corner is located approximately 2000 yards west of the end of the North Jetty.

CULTURAL RESOURCES

Prehistoric Sites

2.1 Analysis of the prehistoric cultural resource potential suggests two possibilities: (1) Sites from the early colonization of the "new world" by the antecedents of the American Indians and (2); sites or artifacts reflecting the procurement of food resources by more recent Indians in the shallow near-shore environments.

2.2 The initial colonization of the North American continent is thought to have occurred during the last phases of the Pleistocene. During the terminal phases of the Pleistocene, approximately 12,000 to 60,000 years ago, sea levels ranged from 60 meters to 300 meters lower than there present position, a consequence of the glacial phases of the Pleistocene. Lowering of the sea level left a broad exposed coastal plain which in many places extended miles beyond the present coastline. Archeologists concerned with the problem of the arrival of humans in the North American continent point to a coastal route as a likely path for these early migrants. (Fladmark, 1983:12-41) It is possible that some of the earliest prehistoric sites maybe present on the seabed within the nearshore environment of the Oregon coastline.

2.3 In order to initiate an offshore survey for early prehistoric sites, the following criteria should be met:

(1) early prehistoric sites should be present within a reasonable distance of the project area. Presence of early sites on land would at least give some basis for suspecting their presence in an offshore area.

(2) The study area should contain or be likely contain undisturbed sediments from this time period. Though some reviewers consider the possibility of site survival low as the sea advanced to its present elevation and shoreline (Aikens, 1984:70) there are scattered examples of inundated sites that have with stood the high energy of heavy surf and waves. (Cressman,1977:fig.20:48;179).

(3) the survey area should be within an area that would have been exposed during the expected time frame of the initial colonization of the North American continent.

2.4 (1) Review of site information for the Umpqua area does not include sites older than 4000 years, although a site estimated at 7000 years or more is located on the Rogue River, on the southern Oregon

Coast line. (Ross, 1986). These sites though of considerable antiquity still post date the end of the Pleistocene rise in sea-level. (2) Historic information indicates that the project area (the disposal site) is within a high energy, erosional area. An 1887 chart of the area shows depths averaging between 50 and 60 feet (U.S.C.G.S.,1887), while more recent surveys indicate depths of 90 to 120 feet (figure E-1). The disparity in depths suggests that substantial erosion of the area has occurred since the jetty's stabilized the channel and the Umpqua River outlet. And (3) though the seafloor within the project site would have been exposed 18,000 years ago (U.S.A.C.E., 1987:E-3), its likely that (given (2)) these depths are recent, and are not relic surfaces from 18,000 years ago. Consequently, the conditions for early sites are not present within the study area.

2.5 The probability is also remote that there are more recent prehistoric sites in the study area. Evidence gathered from archaeological sites located on coastal shorelines indicates that prehistoric Native Americans occupying the Oregon Coast line concentrated their subsistence activities within the estuaries and the near shore ocean environments. There is little evidence that these Indians engaged in an offshore fishery. Within the Umpqua estuary a prehistoric archeological site, the Umpqua-Eden, provides evidence of this use. Bone fishhooks, harpoons, and barbs from fishing spears, and a netweight were recovered during testing. Faunal remains from the site included "whale, stellar sea lion, harbor seal, and sea otter, while fishes included salmon and starry flounder...Shellfish...made up a large percentage of the midden deposit itself." (Aikens, 1984:74, citing Ross and Snyder 1979). Unlike the Indians of the northwest Washington and some further north, the Indians of the Oregon coastline did not hunt whales. The presence of whale remains in archeological sites are likely from scavenged beached whales. (Lewis and Clark, 1969:(3):309)

2.6 A number of places occupied by the historic lower Umpqua Indians are present within the estuary. Closest to the project area are two sites in the Winchester Bay vicinity. One of the sites is reported in Winchester Bay and the other near the outlet in the vicinity of the lighthouse. (Dorsey, 1890:231)

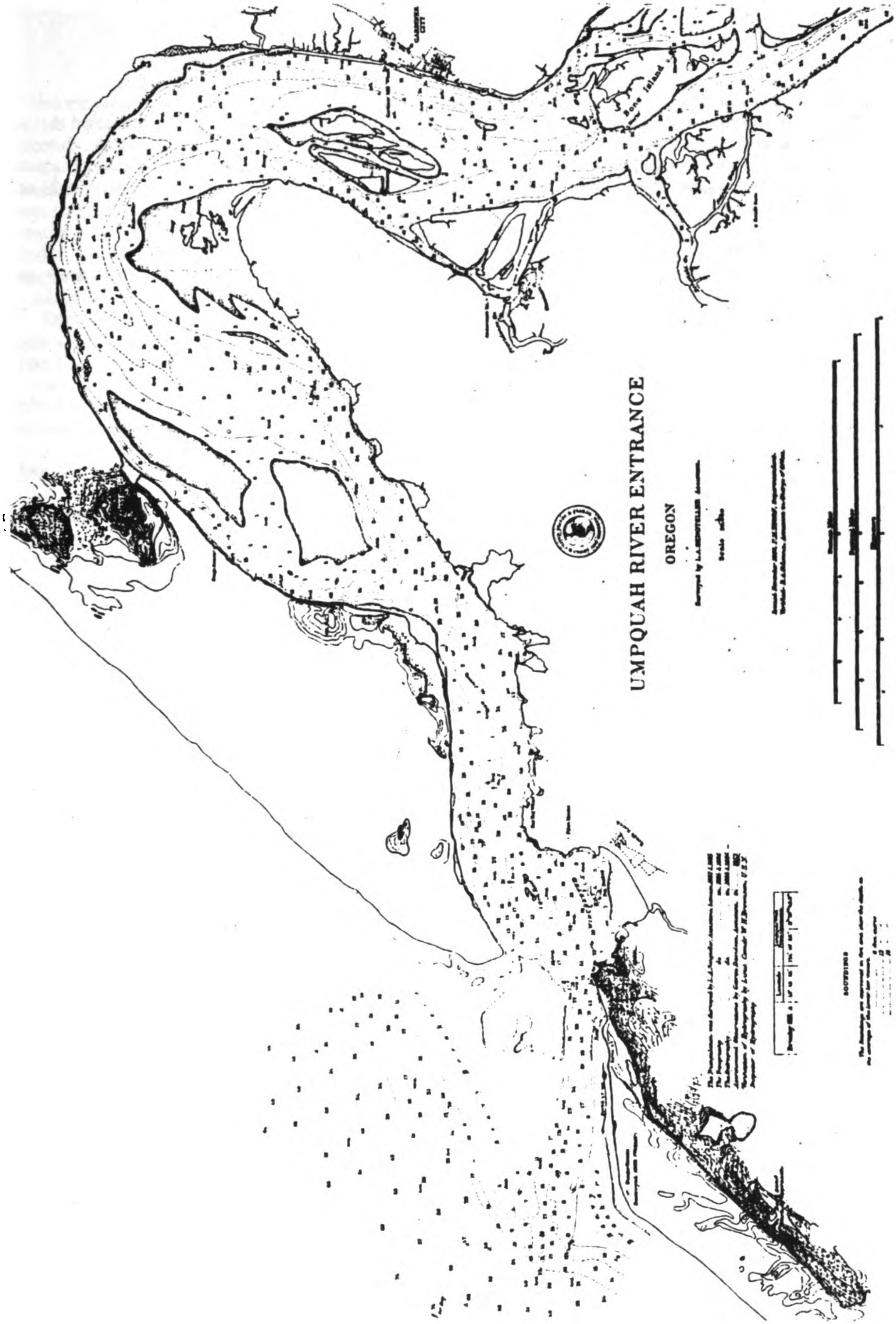

Figure E-1
Umpqua River Entrance in 1887, (USCGS, 1887)

2.7 The lower Umpqua Indians participated in a resource procurement strategy which emphasized the same resources as those recovered in the Umpqua-Eden Site. These included clams, flounder, mussels, chitons, barnacles, crabs, and salmon caught in fixed fish traps, weirs, where the fish were speared, clubbed or netted (Beckham, 1986:28); whales were also scavenged when they drifted onto the beaches (Beckham,1986:28 citing Frachtenberg, 1914)

2.8 It is very unlikely that prehistoric sites of more recent periods, (4000BP) or from the ethnographic/historic period are present within the project area. Subsistence activities within the study area were limited to procurement, and would not produce archeological deposits. It is possible that fishhooks, stone weights, and other non perishable elements of a near-shore procurement technology are present.

HISTORICAL CULTURAL RESOURCES

3.1 Two recent histories of the southern Oregon Coast have provided background for this report. Beckham (1986) has provided the definitive history of Douglas County and the Umpqua River drainage and Douthit (1986) has written a general narrative history of south coastal Oregon. Pertinent background for this report are those aspects of the areas history that involve the movement of people and goods by ocean going vessels.

Maritime fur trade

3.2 Following the exploring expeditions of Captain James A. Cook in the 1770's and the official report published in 1784 a maritime fur trade of relatively unknown dimensions developed along the northwest coast of North America. (Johannsen and Gates, 1957:31-34,37). By the mid 1780's the coast of Oregon was visited frequently by maritime fur traders in pursuit of sea otter and other furs. The trade for fur otter, was carried on by sailing vessels vessels whose masters and merchants bartered European manufactured trade goods with various coastal Indian groups. Successful traders became familiar with the coast, passages over bars into the bays and estuaries of coastal rivers, the types of goods the Indians preferred, how to conduct the barter, and transport of the furs to markets along the coast of mainland China.

3.3 The historic literature of this period, provides only a glimpse of the fur trade. The actual extent and details of the trade are relatively obscure. The maritime fur trade was characterized by an aggressive entrepreneurial spirit driven by potentially great profits. Each national group evolved its own separate manner of conducting the trade though they all operated under conditions of secrecy in order to protect their places of trade and methods from the competition. (Howay and Elliott, 1929:202)

3.4 Other factors also influenced the inherent secrecy of the trade.
Vessels under the British flag were forced by terms of government granted monopolies to the South Seas and East Indian Trading Companies to purchase licenses and to pay royalties to the companies when they traded for furs on the northwest coast and when they sold/bartered their furs to the Chinese.(Johannsen and Gates, 1957:40) In order to avoid royalty payments to the Trading Companies, some British trading vessels sailed under the flags of other nations without the benifit of trading licenses.

3.5 Absence of records was part of the operating procedures of the trade. Where documentation exists, it is rarely detailed. The purpose of the fur trade was profit, not knowledge. The primary sources of this period, the logs and journals of ship Captains and merchants, are the terse description of the trade with the Indians which do not provide the comprehensive statements found in later journals of expeditions such as, Lewis and Clark's, or others with a broader interest in the area.

3.6 Based on the above information, it is likely that wrecks of the maritime fur trade are present along the Oregon Coast. The number of vessels that participated in the fur trade is unknown. Johansen and Gates, state that "between 1785 and 1789 sixteen British vessels" operated along the coast (Johansen and Gates, 1957:41); between, 1784-1809, at least 70 American vessels participated in the trade. (Johansen and Gates, 1957:58) They also infer the presence of unregistered vessels participating in the trade. Lewis and Clark, discussed the trade with the Indians at the mouth of the Columbia River. The Indians provided them with some information on twelve vessels and traders who used Baker Bay as an anchorage.(Lewis and Clark, 1969:(3)306-307) This count does not distinguish between American or British vessels, nor how long these vessels engaged in the trade but it does indicate an active trade continuing into 1806. More detailed study of the historic record and field investigations to locate shipwrecks of the era will be necessary before an accurate estimate of the wrecks of the fur trade can be made.

3.7 By the late 1820's the target animal of the fur trade in the Pacific Northwest shifted to beaver. In order to maximize the return overland trapping brigades made up of fur hunters in the employ of fur trading companies carried out the hunt. Between 1820's and 1850's the Hudson Bay Company established and operated a major fur trading base, Fort Vancouver on the middle Columbia River. The operation also included smaller posts. One post, Fort Umpqua, was located at the confluence of Elk Creek and the Umpqua River. The labor of the trapping brigades was supplemented by a minor trade with the Indians.

3.8 The fur trading post, the trapping brigades, and the trade with the Indians was partially supported by supply vessels from Company headquarters in Great Britain and by overland freight canoes from fur trade depots in the Great Lakes region. As the trade grew the Hudson Bay Company, developed a policy requiring the major company bases to developed their own local agricultural farms to reduced dependence on supply vessels and expensive imported goods. An extensive farming network was developed and operated from Fort Vancouver. Local produce and cattle supplied the trapping brigades. Shipping was reduced mostly to transporting furs to various markets and importing of items that could not be grown or produced at the Forts.

3.9 American interests in the Oregon Territory continued to grow despite the presence of the Hudson Bay Company. In 1828, the American trapper and explorer, Jedidah Smith crossed the lower Umpqua River and camped near present day Scottsburg. The party incited the Indians over attempts to recover an ax stolen by an Indian from one of Smith's men. The lower Umpqua's attacked the party of 22 men leaving only Smith and two partners as survivors. The attack by the Indians initiated a period of increasing hostilities and conflicts aggravated by growing numbers of white settlers and miners that ended in the late 1850's with the establishment of the U.S. Army's, Fort Umpqua near the mouth of the River.(Beckham,1969) Indians from Umpqua River, Coos Bay and the Siuslaw were kept on a reserve in the vicinity of the Fort. (Douthit, 1986:119). Sailing vessels and steamers carried supplies and personnel to man the post. One of the vessels, the FAWN carrying supplies for the post wrecked off the Siuslaw River.(Beckham,1969) The Army's Fort Umpqua was abandoned in the early 1860's. The Indians were moved to reservations up the coast.

Settlement Period

3.10 Settlement began along then shorelines of the Umpqua estuary during the late 1840's and 1850's. The Klamath Exploring expedition entered the Umpqua estuary aboard the chartered schooner SAMUEL ROBERTS. (Schofield,1916:355-357) Members of the expedition platted the settlements of Winchester, Umpqua City, Scottsburg, and Elkton. The Expedition "explored" the Umpqua River and some of its tributaries noting the presence of small pioneering settlements and homesteads along Elk Creek (Beckham, 1986:73).

3.11 With the platting of the towns, settlement slowly emerged. One of the first commercial structures, The Gardiner Mill Company, a saw mill at Gardiner, was built in 1863 from timbers salvaged from the army's abandoned blockhouse at Fort Umpqua (Douthit, 1986:110). The local economy developed and expanded primarily around the timber resources of the region. In addition, mining, the commercial salmon canning industry and agricultural products provided some diversity within the regional economy. (Beckham, 1986:191-234). These products were transported to their various markets by vessels of the coastal trade. Numerous wrecks from this period are distributed along the Oregon Coast line.

3.12 The U.S. Army Corps of Engineers entered the history of the coast with its historic mission to promote regional development by providing and improving the commercial navigational system. In the 1870's the Corps of Engineers, at the urging of local concerns, attempted to improve the navigability of the Umpqua River by removing rock obstructions from the streambed. The work was undertaken to make it possible to operate steamboats from Scottsburg (head of tide water) to Roseburg. However, even with these improvements the river was to swift and shallow for commercial shipping. The next set of improvements involved the construction of the North Jetty (1930) and the South Jetty (1930) and a 22 foot deep ship channel to Reedsport (1933). The ship channel supported the shipping of lumber from the mills in Gardiner and Reedsport. (Willingham, 1983:141).

3.13 From the early maritime fur trade, the exploration period, the establishment of Fort Umpqua, the early settlement period, and the period of regional development, the principal means of moving people and commodities was by ocean going vessels. Ships, schooners and vessels of the coastal trade, carried explorers, traders, and supplies for the settlements, the pioneer communities, the loggers and the miners of the Umpqua region. In turn these vessels carried out the furs that were taken in trade with the Indians, information on the areas settlement potential from the exploring expeditions, and later the goods produced in the region: the sawn lumber, canned salmon, gold and agricultural produce of the settlement to the outside markets.

Cultural Resources

3.14 The majority of our background research has been directed at documenting the presence of historic cultural resources, specifically shipwrecks within the ODMDS study areas. This documentary effort forms the essential background for evaluating potential project effects on cultural resources by defining the most likely cultural resource(s) within the project area. Based on investigations of Ports along the Oregon Coast including studies at the mouth of the Columbia River U.S.A.C.E., 1987Oct), Yaquina Bay (U.S.A.C.E.,1987 Oct), Coquille River (U.S.A.C.E., 1985 April) and the Chetco River (U.S.A.C.E.,1988 July) historic shipwrecks are the most likely cultural resources present in the project area's offshore location.

3.15 A shipwreck data base has been developed from the information complied during background research. This data base contains records of shipwrecks from each coastal project area. The data base includes information on, vessel type, size, and cargoes. This information can be used as supporting evidence to confirm whether a wreck site is the vessel identified as wrecked in that location.

SHIPWRECKS OF THE UMPQUA RIVER

A Test of the Shipwreck Locational Model

4.1 Shipwrecks, the tangible remains of the trade, settlement and development periods are present within the study area. Location and study of these wrecks can provide insights into the periods of this regions history. For some aspects of the areas history, wreck sites maybe the only form of documentation, adding new and critical data. For others, wrecks will fill out our knowledge of the historic period informing us of the lifeways of the recent past.

4.2 The Umpqua River Shipwreck Data Base covers an area extending 2 miles south, 9 miles north, and 20 miles west of the Umpqua River mouth; in addition some wrecksites in the interior estuary of the Umpqua River are also included in the Data Base. Fify-one documented wrecks have occurred within this area. These wrecks are shown on Table 1.

4.3 These wrecks have the following distribution: 28 wrecks (55 percent) have been deposited on the beaches; 2 wrecks (3 percent) in the surf zones; 8 wrecks (16 percent) on the bar at the mouth of the Umpqua River; 5 (10 percent) offshore; 6 (12 percent) in the Umpqua River esturary; 1 on the jetty; and 1 wreck (the OREGON, 1854) has an unknown wreck province.

Table E-1
Shipwrecks of the Umpqua River

Vessels	Wreck Dates	Wreck Sites	Salvaged	Sources
ADMIRAL NICHOLSON	05/16/1924	bar	salvaged	Oregonian 5/17/1924
CABEB CURTIS	02/20/1851	bar	abandoned	Gibbs 1957:272, West Vol.1 n.d.:23
COLUMBIA	11/08/1858	bar	salvaged	West, Vol.1, n.d.:13
GLEANER	12/30/1917	bar	refloated	West Vol.3, n.d.:53
HUNTER	11/07/1902	bar	salvaged	West Vol. 2 n.d.:13
RALPH	10/05/1899	bar	salvaged	Coos Bay Times 02/12/1907 West Vol 1 n.d.:85
SAN GABRIEL	01/01/1913	bar?	refloated	West Vol.3 n.d.:16
ADEL	02/19/1949	bar????	refloated	Port Umpqua Courier
ALMIRA	01/09/1852	beach	abandoned	Marshall 1982:72 Wright 1967:42
BOBOLINK	10/??/1873	beach	salvaged	West vol.1 n.d.:24, Wright 1967:211
ENTERPRICE	05/23/1873	beach	salvaged	West Vol.1 n.d.:23
EVA	11/07/1915	beach	refloated	West Vol. 3 n.d.:38
FEARLESS	11/20/1889	beach	abandoned	West Vol. 1,n.d.:55-55 , Wright 1967:371
G.C. LINDAUER	05/16/1924	beach	abandoned	Oregonian 5/17/1924
GAZELLE	07/03/1922	beach	salvaged	Port Umpqua Courier 7/7/1922, 7/28/1922
LILY	10/21/1909	beach	salvaged	West Vol 2 n.d.:63
LOO CHOO	07/15/1855	beach	abandoned	Gibbs,1957:273 Wright 1967:68
LOUISE	04/14/1903	beach	refloated	West Vol.2, n.d.:15 Coos Bay TImes 2/12/1907
LUCY	4/14/1903	beach	Refloated	West Vol. 2 n.d.:15 Coos Bay Times 2/12/1907
MARY AND IDA	5/11/1893	beach	refloated	West Vol 1 n.d.:26

Table E-1 (cont)
Shipwrecks of the Umpqua River

Vessels	Wreck Dates	Wreck Sites	Salvaged	Sources
NASSAU	07/22/1852	beach	abandoned	West Vol 1 n.d.:5 Wright 1967:43
PEERLESS	02/12/1882	beach	salvaged	West Vol 1 n.d.:41
ROANOKE	02/02/1853	beach	abandoned	Wright 1967:49 West Vol 1 n.d.:6
SADIE	02/18/1906	beach	salvaged	West Vol 2 n.d.:35-36
SEA OTTER	08/22/1808	beach	abandoned	Gibbs 1957:71, 139-140
SPARROW	12/04/1875	beach	salvaged	Wright 1967:230 West Vol. 1 n.d.:31
TACOMA	01/29/1883	beach	abandoned	Wright 1967:313 West vol 1 n.d.:42-43
TRUCKEE	11/18/1897	beach	abandoned	Oregonian 11/19/1897
UNA	03/27/1892	beach	refloated	Coos Bay Times 2/12/1907 West Vol.1 n.d.:62
UNA	01/21/1893	beach	refloated	West vol.1 n.d.:65
WASHOUGAL	08/??/1936	beach	abandoned	West Vol.4 n.d.:53
WASHTUCNA	07/04/1922	beach	refloated	Port Umpqua Courier 7/7/1922, 8/18/1922
WILHEMINA	01/22/1911	beach	salvaged	West Vol. 3 n.d.:13 Marshall 1982:75
ZAMPA	11/11/1891	beach	refloated	Coos Bay Times 2/12/1907 West Vol. 1 n.d.:60
ALPHA	02/03/1907	beach	refloated	Marshall,1982:73
MELDON	03/16/1873	beach/bar	abandoned	Wright 1967:211:Marshall 1982:74
ADEL	02/10/1920	interior	abandoned	West Vol. 3 n.d.:61
JUNO	10/31/1906	interior	refloated	West Vol.2 n.d.:37
MARIE JOAN	8/18/1936	interior	salvaged	Port Umpqua Courier 8/21/1936
ORK	11/24/1864	interior	abandoned	Gibbs 1957:275 Marshall 1982:75
WASHTUNCA	08/18/1922	interior	abandoned	Port Umpqua Courier 8/18/1922
BOSTONIAN	10/01/1850	interior??	abandoned	West, n.d.:3-4 Marshall, 1982:73

4.4 Forty-seven of these wrecks have occurred within the ZSF study area. (An area of 1.5 nautical miles in radius centering on the mouth of the Umpqua River; not including the 6 interior wrecks in this sample, limiting further statements to only those wreck sites that might be affected by the projects. Of the 41 wrecks in the study area; 26 wrecks (55 percent) have occurred on the beaches; 2 wrecks (4 percent) in the surf zone; 8 wrecks (17 percent) on the bar; and 3 wrecks (6 percent) offshore; and 1 of unknown province.

4.5 Further analysis of the wrecks indicates that at least 21 of these wreck have been salvaged or refloated, leaving 23 for further study. Of these one vessel the CABEB CURTIS was reported wrecked and abandoned on the bar. Given that the bar has been the site of jetty construction maintance dredging and increased scouring through channelization of the current, this vessel is unlikely to have survived within the vicinity of the bar. In addition two of
the offshore wrecks are located a substantial distance from the project area. The PHIL SHERIDAN is reported sunk 15 miles off the mouth of the Umpqua and the FLORANCE, 20 miles off the mouth. Neither of these wrecks is within the project area. The other three offshore wrecks are too recent to be important cultural resources.

4.6 There are 18 potentially significant wrecks or remnants of wrecks within the Umpqua study area, however, none of these wrecks are within the area that will be directly affected by disposal of material dredged from the ship channel or the bar. These wrecks have the following distribution:

Beach	11	Surf Zone	2
Interior	4	Unknown	1

4.7 These wrecks range in age from the wreck of the SEA OTTER in 1808, through a group of vessels wrecked in the 1850s, to vessels wrecked in the 1980s. Wreck sites include good preservation contexts, the beach and surf zone. Wrecks in similar settings have include major structural elements, such as keels, frames, cargo hold(s), and associated cargo. Discovery of these features and artifacts will provide significant information on the fur trade, and the historic development of the Umpqua River region.

Shipwreck Locational Model

4.8 Data collected on known wrecks has been compiled and used to develop a general model predicting the likely location of wrecks along the Oregon Coast line (Figure 1). Analyzing this information has produced the following wreck site distributions: (1) The areas with the highest likelihood of historic wrecks are the beaches and past surf zones. (In some cases historic surf zones can be surprisingly distant from their current positions. In the Astoria area, the wreck sites of two vessels are considerably inland from the present surf zone.) (2) The next most likely areas are located in the shallow near shore environments, for example the present surf zones and in the vicinity of navigation hazards, such as reefs and areas of shoalling. (3) The least likely areas are those beyond the nearshore environment in places of increasing water depth. The wrecks of the Unpqua River Data Base support this distribution.

4.9 The majority of shipwrecks occur during particular seasons of the years suggesting that wreck sites are a product of natural forces which operate on a vessel after it has been damaged, looses power and/or steerage. The majority of shipwreck occur during the late fall-winter-early spring storm season. Research suggests that vessels are typically damaged while approaching the entrances of river Ports and landings along beaches. When vessels are damaged or loose power near the shoreline they are trapped by nearshore ocean currents and pushed by the predominantly onshore winds of the late fall-winter-early spring storm period into the coast and toward the beaches.

4.10 These causal factors also operate on that small set of special cases, the derelict vessels that drift from their point of damage whether its along the coastal waters of Japan or along the ocean trade routes miles off the coast. Though the absolute number of derelict vessels cannot be determined, when these vessels appear along the Oregon coast during the storm season, they too drift towards the shore carried by coastal ocean currents and are brought into the beaches and surf zones by the on shore winds of the storm season. It is my guess that the majority of derelicts are beached during the late-fall winter early spring storm season, rather than being randomly distributed throughout the year.

4.11 An important element of this study is determining the probable location of undocumented wrecks. Modeling shipwreck distributions and defining the causes is important for identifying the probable sites of undocumented wrecks. Though it is likely that the majority of wrecks sites are reported in the historic literature, it is certain that unidentified wreck sites are also present. The history of early exploration, fur trade and the colonization period indicates that many vessels operated in a manner that did not always leave documentation of there presence in a specific area. As examples: (1) Early exploring/fur trading expeditions operated along an unknown coast line. There may have been instances where these vessels, reconnoitering and trading on an unknown coast line, were wrecked and lost without witnesses or records. (2) In some cases fur traders pursuing profits operated illegally in other countries territorial waters or without proper authorization from their own countries. Little if any documentation would be available to demonstrate the presence or loss of these vessels except the location of wrecks of this period. (3) Though infrequent, there is some evidence of Spanish Galleons lost while on transoceanic routes from the far east to destinations along the southern California Coast line. These where secret crossing. It is possible that wrecks of Spanish Galleons and/or merchant ships are present along the Oregon Coast. (Beals and Steele,1981:24-26). (4) And in some cases vessels are lost along shorelines of their own coastal areas, become delict hulks and drift on ocean currents to foreign coastlines and beaches. For example, numberous Japanese cargo and fishing vessels (Junks) have drifted onto the shore of the northwest coast after being damaged along the islands of Japan. (Brooks, 1875).

4.12 Based on the locations of known wreck sites, the shipwreck model predicts a similar wreck pattern for undocumented wreck sites. In the case of undocumented shipwrecks the model assumes that the basic natural forces of ocean currents and winds as determined by the season are the primary causes of wreck distributions along the Oregon Coast. This pattern is probably a constant throughout the maritime history of the Northwest Coast.

Uses of the Model

4.13 The shipwreck model has two purposes: As a planning tool for the ODMDS projects or similar civil works the model can be used to guide the evaluations of work areas by excluding the high probability locations from planning studies. Used in this manner, the model can help reduce project costs by orienting work toward low probability areas and preserve cultural resources by avoiding them. (2) In addition the model can be used as a locational device to focus historical archeological investigations in areas where wrecks are likely to occur, or if a researcher desires to locate wrecks with the densest level of information to areas further offshore from the typical wreck site.

4.14 The model, however, cannot be used to avoid cultural resource investigations. Basically, the model predicts a general shipwreck distribution within each project area, however, each place has its own unique historic potential despite the fact that wrecks cluster on beaches and within shallow nearshore environments. Historic Preservation Legislation acknowledges the uniqueness of historic events by requiring evaluation of all project areas, not just the most likely areas. This requirement is important for the preservation of historical archeological resources. For example, shipwreck events are not as frequent as many popular accounts lead one to believe, especially when compared to the number of successful voyages.
Commercial shipping was a very successful operation with thousands of tons of goods reaching their destinations, the benefits clearly offset the small number of vessels that were lost. For preservation values, the absolute number of potentially significant shipwrecks is probably small.

4.15 In addition, the likelihood that wrecks will be preserved and will be available for future study is not necessarily assured. Wrecks are not only preyed upon by professional salvors, treasure hunters and pioneers who saw wrecks as a source of "raw" materials, but are also lost to marine organisms and broken apart by the mechanical forces of wave energy and ocean currents. Most shipwrecks on beaches and in near shore environments are probably reduced to remnants of major structural elements (keels, frames), although it is possible that artifacts are present, distributed around the wreck buried under beach sands (Delgado, nd.). At a minimum these wreck sites are significant as part of a comparative study collection with each wreck providing data on a particular aspect of shipping. This information may range from data on ship construction to places of trade or origin based on artifacts as simple as ballast material. The offshore wrecks, however, maybe in a class by themselves. These wrecks, relatively fewer in number are generally beyond easy accessibility and maybe in a preservation environment superior to those wrecks in more exposed locations. Archeological data at these sites will probably be richer, including a higher density of artifacts and, possibly, substantial remnants of a vessels wooden structure.

Project Site Evaluation

4.16 The proposed disposal site is unlikely to contain shipwrecks. The model indicates that shipwrecks are clustered on the beaches and in the surf zones. Figure E-2 shows the shipwreck frequencies for the Umpqua ZSF. This distribution is consistent with the known wrecks of the Umpqua River Region. In 1887 this area was beyond the beach, surf zone and bar of the Umpqua River.(U.S.G.C.S, 1887) Ships wrecked or damaged in the vicinity of the disposal area would more likely have been driven into the surf zone or onto the north or south beaches then to have sunk. The possibility that wrecks sunk in the vicinity or on the disposal site is also low. This location of the disposal site has under gone substantial erosion since the depth sounding of 1887. In 1887 depths in this area averaged, 50 to 60 feet (U.S.G.C.S., 1887), recent soundings indicate depths of 80 to 90 feet (Earth Science Assoc. and GeoRecon International, 1985); it is likely that this increase in depth is a consequence of the scouring of the area by the confinment of the Umpqua River between the south and north jetties. In my opinion, any wrecks in the area would have been (1) eroded out and moved by the current or (2) their visibility increased as the sediments where flushed away and the remnants of the wreck settled onto a new surface.

4.17 Side scan sonar evaluation of the disposal sites supports the assumptions stated above. Though the side scan sonar work was carried out primarily for environmental reason, any sonar images that indicated the presence of shipwrecks would have been noted. This evidence may include the presence of structural remains of ships, sediment mounding indicating the burial of vessels, and/or ballast or cargo remnants marking the site of a decayed vessel. No shipwreck signature or other evidence of a shipwreck was recorded by the sonar investigation. (Earth Science Assoc. and GeoRecon International, 1985)

4.18 Though the presence of a shipwreck in the disposal area is unlikely, there is a strong likelihood that remnants of wrecks maybe present north of the north jetty. This area, formerly a surf zone and beach is the location of numerous wrecks. In addition, the preservation context of this area has been enhanced by the construction of the north jetty; a substantial amount of sand has accretted in this area as a consequence of the constuction of the jetty. The area that is now beach includes both former beachlines and surf zones. Evaluation of this area by proton magnetometer may result in the location of known as well as undocumented shipwrecks.

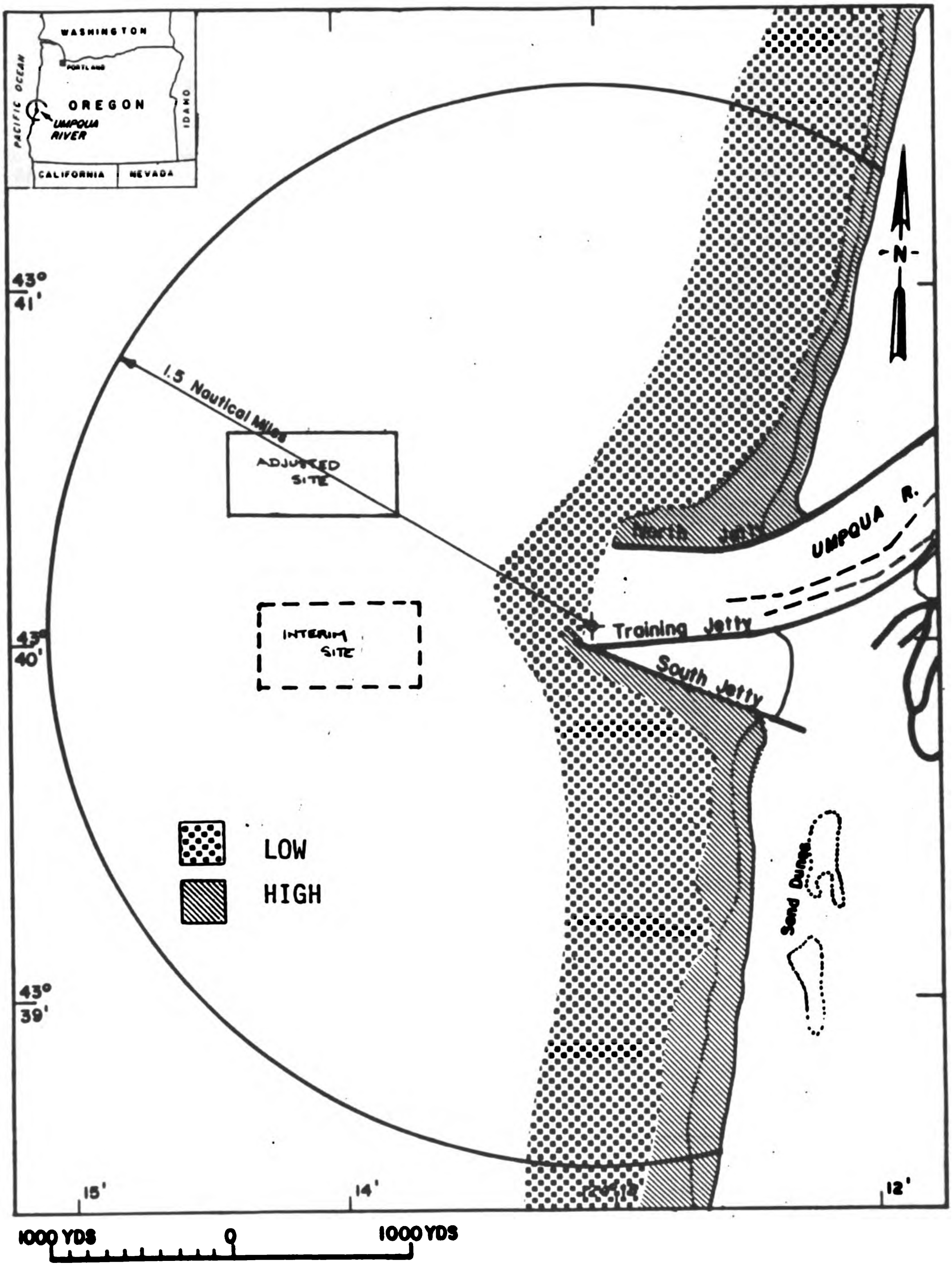

Figure E-1
Shipwreck Frequencies

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APPENDIX F

APPENDIX F

TABLE OF CONTENTS

LETTERS

Concurrence Letter from Oregon Department of
Land Conservation and Development

Concurrence Letters from United States Department of Commerce

Concurrence Letter from United States Department of the Interior

Concurrence Letter from Oregon State Department of Transportation
State Historic Preservation Office

APPENDIX F

COMMENTS AND COORDINATION

Comments

1.1 The Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) requires that, for a site to receive a final ODMDS designation, the site must satisfy the general and specific disposal site criteria set forth in 40 CFR 228.5 and 228.6, respectively. The final designation procedures also require documentation of recommended disposal site compliance with MPRSA and with the following laws:

National Environmental Policy Act of 1969,
Endangered Species Act of 1973,
National Historic Preservation Act of 1966, and
Coastal Zone Management Act of 1972, (all as amended).

1.2 The data provided in this document was compiled to satisfy these laws and has been coordinated with appropriate and necessary State and Federal agencies.

Coordination

1.3 The procedures used in this ODMDS final designation study have been discussed with the following agencies:

Oregon Department of Fish and Wildlife
Oregon Department of Environmental Quality
Oregon Division of State Lands
U.S. Coast Guard
U.S. Fish and Wildlife Service
National Marine Fisheries Service, and
U.S. Environmental Protectione Agency.

1.4 Following completion of the preliminary draft, statements of consistency or concurrence were sought regarding three State or Federal laws. The statutes and responsible agencies are:

Coastal Zone Management Act of 1972, as amended	Oregon Department of Land Conservation and Development
National Historic Preservation Act of 1966, as amended	Oregon State Historic Preservation Officer
Endangered Species Act of 1973, as amended	U.S. Fish and Wildlife Service National Marine Fisheries Service

1.5 Consistency or concurrence letters from these agencies are inclnded in this appendix. State water quality certifications, as required by Section 401 of the Clean Water Act, will be obtained for individual dredging actions.

1.6 A formal public involvement program designed to receive comments from all State and local agencies, private groups and individuals will be coordinated by EPA upon submittal of this document containing the request for final site designation.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N. E.
BIN C15700, Bldg. 1
Seattle, WA 98115

F/NWR3: 1514-04 js

OCT 25 1988

Mr. Richard N. Duncan
Chief, Fish and Wildlife Branch
Department of the Army
Portland District Corps of Engineers
P.O. Box 2946
Portland, OR 97208

Dear Mr. Duncan:

This is in response to your September 29, 1988, letter regarding endangered and/or threatened species that may be present in the vicinity of the Umpqua River Offshore Dredged Material Disposal Site.

Enclosed is a list of endangered and/or threatened species under the jurisdiction of the National Marine Fisheries Service (NMFS) that may occur offshore of the Umpqua River. Also, enclosed for your information is a special edition of Marine Fisheries Review entitled "The Status of Endangered Whales". There are no candidate species in this area under review by NMFS for proposed listing under the Endangered Species Act. Please contact Joe Scordino at (206) 526-6140 if you need any additional information.

Sincerely,

Rolland A. Schmitten
Regional Director

Enclosures

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

ENDANGERED AND/OR THREATENED SPECIES OFF WASHINGTON AND OREGON

under the jurisdiction of
NATIONAL MARINE FISHERIES SERVICE

MARINE MAMMALS

Gray Whale	*Eschrichtius robustus*
Humpback Whale	*Megaptera novaeangliae*
Blue Whale	*Balaenoptera musculus*
Fin Whale	*Balaenoptera physalus*
Sei Whale	*Balaenoptera borealis*
Right Whale	*Balaena glacialis*
Sperm Whale	*Physeter macrocephalus*

MARINE TURTLES

Leatherback Sea Turtle	*Dermochelys coriacea*

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N. E.
BIN C15700, Building 1
Seattle, WA 98115

FEB 13 1989

F/NWR3: 1514-04 js

Mr. Lauren J. Aimonetto
Chief, Planning Division
Department of the Army
Portland District Corps of Engineers
P. O. Box 2946
Portland, OR 97208

Dear Mr. Aimonetto:

This is in response to your December 8, 1988, letter regarding an Endangered Species Act (ESA) biological assessment as supplemented on February 6, 1989, for the Umpqua River Offshore Disposal project. We concur with your determination that populations of endangered/threatened species under our purview are not likely to be adversely affected by the proposed action.

This concludes consultation responsibilities under Section 7 of the ESA. However, consultation should be reinitiated if new information reveals impacts of the identified activities that may adversely affect listed species or their critical habitat, the identified activity is subsequently modified, or a new species is listed or critical habitat is determined that may be affected by the identified activity. If you have any new information or questions concerning this consultation, please contact Joe Scordino at (206) 526-6140.

Sincerely,

William L Robinson

for Rolland A. Schmitten
Regional Director

cc: F/PR - Nancy Foster

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Portland Field Office
727 NE 24th Avenue
Portland, OR 97232

RECEIVED
[illegible] 11 1987
NPPPL-FW

May 1, 1987

1-7-87-SP-92

Richard N. Duncan
Portland District Corps of Engineers
P. O. Box 2946
Portland, OR 97208-2946

Dear Mr. Duncan:

As requested by your letter, dated April 10, 1987, and received by us on April 16, 1987, we have attached a list of endangered and threatened species that may be present in the area of the proposed dredged material disposal sites located offshore of the Umpqua, Chetco, Coquille, and Rogue River entrances. From phone conversations with Geoff Dorsey of your staff, we understand these areas are located approximately one mile straight out from the river entrances in 60 to 90 feet of water and are about 1 square mile in size. The list fulfills the requirement of the Fish and Wildlife Service under Section 7(c) of the Endangered Species Act of 1973, as amended. The Corps of Engineers requirements under the Act are outlined in Attachment B.

Should your biological assessment determine that a listed species is likely to be adversely affected by the project, The Corps of Engineers should request formal Section 7 consultation through this office. Even if your biological assessment shows a "no effect" or "beneficial effect" situation, we would appreciate receiving a copy for our information.

Your interest in endangered species is appreciated. If you have any additional questions regarding your responsibilities under the Act, please call David M. Sill at our office, phone (503) 231-6179 or FTS 429-6179. All correspondence should include the above referenced case number.

Sincerely,

Russell D. Peterson

Russell D. Peterson
Field Supervisor

Attachments

cc: R1 FWE-SE
PFO-ES
ODFW (Nongame)
ONHP

RECEIVED
MAY 6 1987
REGULATORY BR.

5SP-92:05/01/87

Attachment A

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CANDIDATE SPECIES THAT MAY OCCUR IN THE AREA OF THE PROPOSED DREDGED MATERIAL DISPOSAL SITES LOCATED OFFSHORE OF THE UMPQUA, CHETCO, COQUILLE, AND ROGUE RIVER ESTUARIES
STATE OF OREGON
1-7-87-SP-92

LISTED SPECIES[1/]

Brown Pelican	*Pelecanus occidentalis*	(E)

PROPOSED SPECIES

None

CANDIDATE

None

(E) - Endangered (T) - Threatened (CH) - Critical Habitat

[1/] U. S. Department of Interior, Fish and Wildlife Service, Jan 1986. Endangered and Threatened Wildlife and Plants, 50 CFR 17.11 and 17.12.

Department of Transportation
STATE HISTORIC PRESERVATION OFFICE
Parks and Recreation Division
525 TRADE STREET S.E., SALEM, OREGON 97310

April 13, 1989

Lauren J. Aimonetto
Planning Division
Portland District of Engineers
PO Box 2946
Portland, OR 97208-2946

RE: Umpqua River Channel and Bar
Off-shore Disposal Site
Douglas County

Our office has reviewed the cultural resource report by Michael Martin for the Umpqua River off-shore disposal site which was surveyed using side scan sonar by Earth Sciences out of Palo Alto, California and GeoRecon International of Seattle, Washington. Since no shipwrecks or features were noticed that might indicate the presence of wrecks or wreck sites, we concur that the proposed project would have "No Effect" on sites on, or eligible for inclusion on, the National Register of Historic Places. If you have any questions you can contact Dr. Leland Gilsen at 378-5023.

Sincerely,

D. W. Powers, III
Deputy SHPO

DWP:LG:jn
BAR.LTR

NEIL GOLDSCHMIDT
GOVERNOR

Department of Land Conservation and Development

1175 COURT STREET NE, SALEM, OREGON 97310-0590 PHONE (503) 373-0050

March 16, 1989

Lauren J. Aimonetto
Chief, Planning Division
Corps of Engineers
P.O. Box 2946
Portland, Oregon 97208-2946

RE: Umpqua Ocean Dredged Material Disposal Site Evaluation

Dear Mr. Aimonetto:

Thank you for the opportunity to review the draft Ocean Disposal Site Evaluation for the Umpqua River Navigation Project. You have requested that the Department concur with the Corps' determination that the project is consistent with the Oregon Coastal Management Program (OCMP).

The site evaluation report includes findings against Statewide Planning Goal 19, Ocean Resources, which is the most applicable policy of the OCMP. The report does a commendable job of assessing the compatibility of continued dredged material disposal at the interim site with Goal 19 requirements and the criteria of the Marine Protection, Research and Sanctuaries Act. The Department concurs that final designation of the interim disposal site is consistent with the OCMP.

The Department understands that EPA will carry out a formal public involvement program during the final site designation process. The Department may reexamine the consistency of the project with the OCMP during the EPA process if new information is available at that time.

Thank you for the opportunity to review the document for consistency with the OCMP. Please contact Nancy Wittpenn of my staff if you have any questions.

Sincerely,

Craig Greenleaf
Acting Director

CG:NW
<per>

cc: Steve Stevens, COE
Glen Hale, DLCD

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E.
BIN C15700, Building 1
Seattle, Washington 98115

JUL 18 1991

F/NWR3: 1514-04-020

Robert E. Willis, Chief
Resource Protection and
Fish and Wildlife Section
Department of the Army
Portland District, Corps of Engineers
P.O. Box 2946
Portland, Oregon 97208

Dear Mr. Willis:

This is in response to your June 7, 1991 letter regarding a revised Endangered Species Act (ESA) Biological Assessment for the designation of an Offshore Dredge Material Disposal Site off the Umpqua River entrance. The revised assessment addresses potential affects on northern sea lions and Sacramento River winter-run chinook salmon, which have been listed since the time of the February 13, 1989 informal consultation on this project, and updates your December 8, 1988 assessment on gray whales. We have reviewed the revised Biological Assessment and concur with your determination that populations of threatened/endangered species under our purview are not likely to be adversely affected by the proposed actions.

Consultation should be reinitiated if the identified activity is modified or new information reveals impacts of the activities that may adversely affect listed species, or if a new species is listed or critical habitat determined that may be affected by the identified activity.

Also, please be aware that the proposed listing of Snake River fall chinook, spring/summer chinook and sockeye salmon under the ESA imposes new requirements on federal agencies to evaluate the potential effects of any federal action on these proposed species and to confer with NMFS if the action is likely to jeopardize the continued existence of any of the proposed species.

This concludes consultation responsibilities under Section 7 of the ESA. If you have any questions concerning this consultation, please contact Joe Scordino at (206) 526-6140.

Sincerely,

Rolland A. Schmitten
Regional Director

cc: F/PR2 - Pat Montanio
F/NWR5 - Merritt Tuttle

DEPARTMENT OF THE ARMY
PORTLAND DISTRICT CORPS OF ENGINEERS
P O BOX 2946
PORTLAND OREGON 97208-2946

Reply to
Attention of.

June 7, 1991

Planning and Engineering Division

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moehl disk

Mr. Rolland Schmitten
Regional Director
National Marine Fisheries Service
7600 Sand Point Way, NE.
BIN C15700
Seattle, Washington 98115

Dear Mr. Schmitten:

Pursuant to the requirements of the Endangered Species Act of 1973, we are forwarding an addendum to our biological assessment for species under your jurisdiction that could be impacted by the designation of an Offshore Dredge Material Disposal Site (ODMDS) off the Umpqua River entrance, Douglas County, Oregon.

We received a letter from you on February 13, 1989, which stated you concurred with our December 8, 1988, biological assessment which concluded "no affect" on listed species for this project, however, that biological assessment did not address impacts to northern sea lions or Sacramento River winter run chinook salmon.

Enclosed is our biological assessment for newly listed species as well as an updated assessment for gray whales. We have concluded that this project will have "no affect" on listed species.

Should you require any additional information, please contact Geoff Dorsey or Chris Moehl of my staff at (503) 326-6482.

Sincerely,

Robert E. Willis
Chief, Resource Protection and
Fish and Wildlife Section

Enclosure

CF: PE-RR FILE COPY (MOEHL)

BIOLOGICAL ASSESSMENT

FOR

GRAY WHALES, NORTHERN SEA LIONS,

AND

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON

AT

UMPQUA RIVER ODMDS

PROJECT DESCRIPTION

The proposed project involves the designation of a new offshore dredge material disposal site (ODMDS) at a location approximately 1 mile offshore of the mouth of the Umpqua River near Reedsport, Oregon. The site would be located approximately 2800 feet north of an existing interim site (Figure 1), at an average water depth of 150 feet. The dimensions of the proposed site are 3600 feet by 1400 feet with geographic coordinates at 43°-40'-35''N, 124°-14'-22''W; 43°-40'-35''N, 124°-13'-46''W; 43°-40'-21''N, 124°-13'-46''W and 43°-40'-21''N, 124°-14'-22''W.

Approximately 180,000 cubic yards of dredged material, derived from the maintenance of the Umpqua River Federal project channel, would be placed at the site annually. Chemical and physical analyses of the channel sediments were conducted in 1987 and 1989. These sediments consisted primarily of clean sand with some fine grained and detrital fractions. All concentrations of organic compounds including pesticides, PCB's and PAH's were below method detection limits. The concentrations of metals, oil and grease and ammonia were also typical of clean Oregon estuarine sediments with a moderate level of organic matter.

Dredging may occur from April through October although dredging actions primarily occur in May and June with followup work occurring later in the season. The limited timeframe for dredging is imposed by storms and rough sea conditions from November to April. Both hopper and clamshell dredges may be employed.

GRAY WHALES

Coastal waters of Oregon serve as a migrational corridor for gray whales moving to and from their breeding, calving, and assembly areas along Baja California, Mexico and their primary foraging areas in the northern Bering and southern Chukchi Seas (Darling 1984).

Southward migration occurs off Oregon between early December and mid-February, with pregnant females being the first to pass southward. (Herzing and Mate 1984). Southbound whales typically

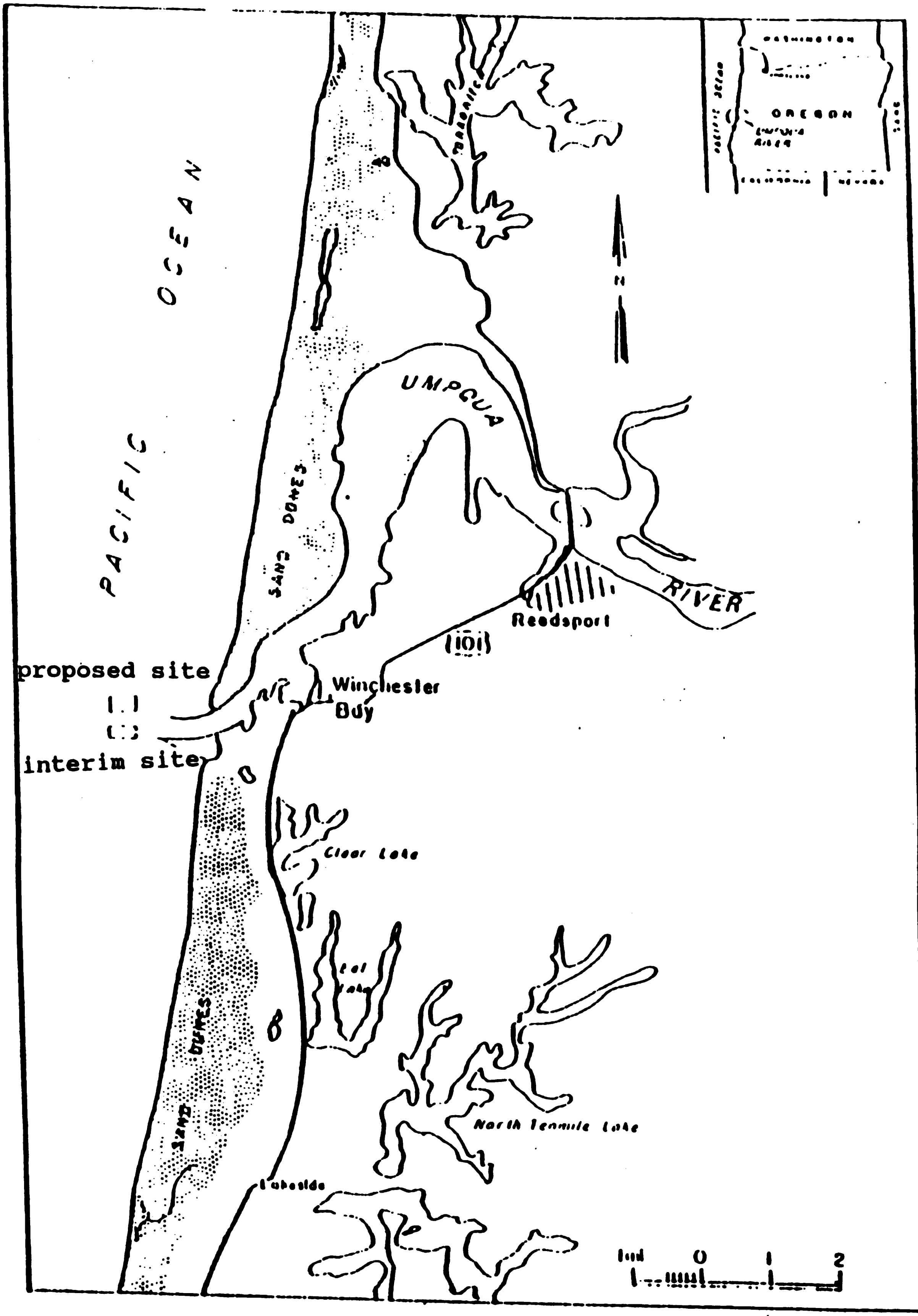

Figure 1

General Location of Umpqua River
and Ocean Placement Sites

occur off Oregon in water less than 90 meters deep, with the majority of migrants occurring in water 40-60 m deep, located between 1.6 and 3.2 km offshore (Herzing and Mate 1984).

The northbound migration is comprised of two groups of whales migrating in two phases. The first phase begins migration between mid-February and April and consists of whales without calves. The second group consists largely of whales with calves, with migration beginning between late April and May (Herzing and Mate 1984). Generally, whales comprising the first phase tend to migrate further offshore, with immatures showing a preference for migration closer to shore (Herzing and Mate 1984). Northward cow/calf migration typically occurs close to shore. Herzing and Mate (1984) observed that 90% of the whales migrating during the later phase, traveled within 800 m of the shore; during the final three weeks of migration, 90% traveled within 100 m of shore.

A portion of the eastern Pacific population of gray whales does not migrate to the northern seas; these whales spend summer offshore of California, Oregon, Washington and British Columbia. Mate estimated a summering population of 75 whales off the coast of Oregon in 1979 (Darling 1984). Current population estimates by Mate indicate an increase to 100-200 summering whales (B. Mate, pers. convers., 1990). Information regarding summering gray whale distribution off Oregon is patchy. It appears that most summering gray whales occur between Winchester Bay (Umpqua River) and Cascade Head, near Lincoln City (B. Mate, pers. comm., 1990). These summering gray whales occur in scattered, small groups or as individuals. There was reportedly a cow/calf pair summering off Coos Bay in 1990 (Jan Hodder, OIMB, pers. comm. 7-90). Three small groups have been reported elsewhere in Oregon during 1990 (Beverly Lund, pers. comm. 7-90); these include approximately 6 individuals between Boiler Bay and Yaquina Head, a group between the south Jetty of Yaquina Bay and Seal Rock, and a group at Gold Haven near Sea Lion Caves.

There are occasional reports of gray whales occurring in coastal estuaries including the Columbia River, Tillamook Bay, Yaquina Bay, Siuslaw River, and Coos Bay (B. Mate, pers. comm., 1990). Apparently it is not uncommon for gray whales to occur between the Highway 101 bridge and the jetties at Yaquina Bay; these observations include north and south bound migrants and summering gray whales. Summering gray whales have been observed in the mouth of the Siuslaw River between the jetties by Corps personnel and other observers have recorded them as far upriver as Mapleton on the Siuslaw. Operators of the charter boat Siggi-G out of Garibaldi reported a gray whale near buoy six, Tillamook Bay entrance channel, in late spring 1990; it is not known whether this represented a migrant or summering gray whale. A whale, species unknown, was observed just north of Tillamook Bay in June 1989 less than one-half mile offshore.

The most recent study of summering whales off Oregon was conducted by Sumich (1984). Summer sightings were defined as those which occurred between 1 June and 15 September. Sumich reported over 1200 gray whale sightings during a 1977-1980 study off coastal Oregon. A 100 km section of coastline from the

Siuslaw River to Government Point just north of Depoe Bay, appeared to be relatively important to gray whales. In 1977, 60% of the 460 observations occurred within this 100 km section. Sumich reported a maximum observed occurrence of 0.2-0.3 whales/km over the 100 km study area during the 1977 and 1978 studies. It was not determined whether whales were more numerous along this section, or simply easier to detect. Whale distribution within the 100 km section varied between 1977 and 1978; in 1977 whales were most commonly observed in the southern half of the study area, in contrast to 1978 when whales were more frequently observed in the northern half of the study area. Sumich noted that site specific use also varied daily; thus, a period of maximum occurrence was undetectable. Additionally, weather, sea state, observer effort, the presence or absence of strategic observation points, and the unreliability of aerial counts due to the predominant occurrence of gray whales in surf and foam lines (which makes them difficult to detect) also contribute to the large variation in observed abundance. Because of these factors, Sumich considered his abundance estimate of 0.2-0.3 whales/km to be conservative.

Sumich (1984) noted that the primary activity of summer gray whales off the Oregon coast appears to be feeding. Benthic infauna, primarily gammarid amphipods and polychaete worms are the principal food items of gray whales (Rice et al 1984). Migrating whales feed, to some extent, on benthic organisms at the mouths of rivers and estuaries (Nerini 1984). Pelagic foraging by gray whales is thought to be rare (Nerini 1984), though Sumich (1984), suggests that offshore sightings may be an indication of pelagic feeding.

Sumich noted that nearshore locations with silty sediments appear to be foraging areas for gray whales; presumably because of high amphipod populations in silty sediments (D. Hancock, USACE pers. comm., 1985). Gray whales also frequented surf or foam lines. A pod of whales summering near Boiler Bay, OR (1990), was reported to have been feeding in kelp beds (Beverly Lund, pers. comm. 1990).

Sumich (1984) postulates that whales which summer off Oregon may gain energetic benefit by shortening their migration. He further noted that the whales off Oregon consisted predominantly of immature or small mature individuals. Mate has also indicated that the majority of whales summering off Oregon appear to be immature (Beverly Lund pers. comm. 1990). Gray whales that summer off British Columbia have been documented to return to within 150 km of an established location, with some individuals reportedly having returned for up to 8 consecutive years (Darling 1984). As such, Darling argues that these whales are not cutting their migration short, but that they are intentionally seeking out and utilizing available "pockets" of habitat. Although a through investigation of the age structure of these whales has not been made, Darling (1984) believes that these populations may also be composed primarily of young individuals.

DISCUSSION

Disposal operations at the ODMDS will typically occur during the latter part, or after conclusion of, the second phase of the northward migration of gray whales. Dredging and disposal would not occur during the southward migration. Should disposal operations occur when whales are present, it is unlikely that gray whales would be impacted as disposal operations are intermittent in nature and confined to a limited area. Summering whales have been sighted near the mouth of the Umpqua River. We would anticipate some potential for avoidance of the immediate disposal area, but the proposed site is offshore of where summering gray whales would typically forage. As material to be disposed is not contaminated, we anticipate no impacts from contaminants on migrant or summering gray whales.

CONCLUSION

We conclude that designation and subsequent use of the Umpqua River ODMDS would have "no affect" on gray whales.

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NORTHERN (STELLER) SEA LION

Northern sea lions breed along the west coast of north America from Ano Nuevo Island off central California, to the U.S.S.R.'s Kurile Islands and the Okshotsk Sea in the western north Pacific Ocean. There is no evidence to indicate that there are separate populations throughout this range (NMFS 1990). The northern sea lion subpopulation which occurs off California has been declining since the 1920's, with a more rapid rate of decline since 1960 (Gentry and Withrow 1986). The Alaskan population has undergone an 60% decline since 1985 (ODFW 1990), prompting the emergency listing of the species throughout it's range.

Northern sea lions are year-round residents along the Oregon coast. The subpopulation off Oregon is second in size to the Alaskan subpopulation (Brown 1988). Northern sea lions are known to haul out at a minimum of ten sites off Oregon; two of these sites, Rogue and Orford Reefs, are rookeries. Other important haulout sites include Ecola State Park, Sea Lion Caves, Columbia River South Jetty, Three Arch Rock, Cape Arago, and Seal Rock. Weekly surveys of the Columbia River South Jetty between March 9, 1991 and June 4, 1991 have consistantly revealed approximately 100 Northern sea lions of mixed age class and sex to be hauled out at this location (Brian Herceg, Pacific States Marine Fisheries Commission, pers. comm. 1991).

In contrast to the Alaska and California subpopulations, statewide population counts for Oregon have remained fairly stable. In 1984 and 1985, year-round counts ranged from 769 to 2352. During this survey, peak counts (2352) were made on May 21 & 23, 1984 with haulout attendance greatest at Ecola State Park, Sea Lion Caves, Orford Reef and Rogue Reef (Brown 1988). Peak attendance at the two Oregon rookeries occurs during May, June and July. Sea lions begin to leave the rookeries in August. Males are the first to leave, followed by females within a few months (Gentry and Withrow 1978). The number of sea lions using Orford Reef has declined since 1986. It is not certain, but the decline may be related to a rapidly growing sea urchin fishery in the area (ODFW 1990). Seasonal shifts in the use of haul out sites is common among northern sea lions. Northern sea lion numbers appear to be lower off Oregon in the winter than summer, though it is not known where these animals may be migrating to or wintering. Northern sea lions forage at river mouths and near-shore areas along the coast. Roffe and Mate (1984) studied the feeding habits of pinnipeds, including northern sea lions in the Rogue River estuary, Oregon in 1984. It was determined that the sea lions fed most heavily on Pacific lamprey. A variety of environmental correlations were studied with respect to feeding, and it was determined that the factor which most affected feeding habits was proximity to the mouth of the river. Although sea lions have been accused of damaging the commercial salmon fishery in several locations along the West Coast, studies have shown that sea lions generally consume less of these fish than thought, and in fact, that salmon comprise a relatively small proportion of their diet (Gentry and Withrow 1978). Roffe and Mate (1984) determined that, of observed surface feeding, only 2% was on salmon. The main food items for northern sea lions in the Rogue River estuary appeared to be lamprey (26.8%) and non-salmonid fishes (32.4%) (Roffe and Mate 1984).

DISCUSSION

The proposed disposal site is situated approximately 30 miles from and between two northern sea lion haul out sites; Sea Lion Caves to the north and Cape Arago to the south. Abundance of northern sea lions at Sea Lion Caves is highest during summer and winter; and highest at Cape Arago during summer months (Brown 1988).

Some foraging by transient northern sea lions may occur in the project vicinity to a limited extent. The relatively distant proximity to the nearest haul out site, suggests that the Umpqua River mouth is not widely used by this species as a foraging area. It is unlikely that northern sea lions would be impacted by disposal operations though we would anticipate some potential for avoidance of the immediate disposal area. Material to be disposed of is not contaminated, as such, we anticipate no impacts from contaminants on northern sea lions.

CONCLUSION:

The project may result in some localized avoidance of the immediate dredging and disposal area by northern sea lions. However, the project should have "no affect" on the status of the population nor should the survival of individuals be affected by the proposed action.

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SACRAMENTO RIVER WINTER RUN CHINOOK SALMON

The Sacramento River winter-run chinook salmon is not expected to occur in significant numbers in the vicinity of the project. This species is thought to primarily occur offshore in deep water from Fort Bragg to Monterey, California (ECOS INC. 1990). Coded wire tag recovery information compiled by the Alaska Fisheries Science Center, National Marine Fisheries Service, indicates that tagged chinook salmon released in the Sacramento River drainage have been recovered from foreign and joint venture trawl fisheries off Oregon. These tagging programs involve fall chinook salmon, however they do serve as an indication that Sacramento River winter run chinook salmon may occur off the Oregon coast.

The limited extent of habitat affected by disposal operations, intermittent nature of disposal events, and lack of contaminants associated with the channel sediments indicate that the project will have "no affect" on Sacramento River winter run chinook salmon.

In addition to Sacramento River winter run chinook salmon, five salmonid species are listed as candidates for Federal classification as threatened and/or endangered species. Species proposed for listing are Salmon River sockeye salmon, Snake River fall, summer, and spring chinook salmon, and lower Columbia River coho salmon.

Miller et al. (1983) noted that the largest catches of adult coho salmon of Columbia River origin in the ocean fishery have been off northern California to southern Oregon. They also indicated that spring chinook salmon of Columbia River origin apparently migrate north for rearing. Discussions with John Williams of NMFS, Seattle, indicate that available information indicates that Snake river chinook and sockeye stocks migrate north for rearing. Information is preliminary and not complete, however.

CONCLUSION

The limited extent of habitat affected by disposal operations, intermittent nature of disposal events, and lack of contaminants associated with disposal materials indicate that the project will have "no affect" on Sacramento River winter run chinook salmon or on the candidate stocks. Most fish from runs of concern, except lower Columbia River coho stocks, are probably absent from the area.

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