US Army Corps
of Engineers
Portland District

Coos Bay, Oregon
Volume I
FINAL REPORT

Feasibility Report On Navigation Improvements

With Environmental Impact Statement

January 1994

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

Reply to
Attention of:

COOS BAY, OREGON

NAVIGATION IMPROVEMENTS

FINAL FEASIBILITY REPORT

AND

ENVIRONMENTAL IMPACT STATEMENT

January 1994

EXECUTIVE SUMMARY

This study is conducted in response to a resolution of the Committee on Environment and Public Works of the United States Senate, adopted Nov. 2, 1983, which requested investigation of possible modifications to the navigation channel at Coos Bay, Oregon. Planning, Engineering and Design (PED) studies will be continued under this authority.

The existing project at Coos Bay provides an entrance channel that is 1 mile long and 45 feet deep. The channel, which is stabilized by jetties to the north and south, transitions to a 35-feet-deep inner channel extending 15 miles to the city of Coos Bay, Ore. The project provides access to docks and terminals at the Oregon International Port of Coos Bay, the non-Federal sponsor for the study. Coos Bay is one of the world's largest shipping ports for timber products. Future supplies of these products will be impacted by current environmental and political issues. A new import, nickel ore, has been a significant addition to commerce at the port. Existing channel depths constrain the draft of vessels able to use the port. Larger, deeper draft vessels would be able to take advantage of economies of scale to reduce transportation costs and a deeper channel could reduce vessel delay costs. Five deepening alternatives and other improvement measures were considered. Also, studies and recommendations for designation (by the Environmental Protection Agency) of permanent offshore disposal sites for dredged material from this deepening project and ongoing channel maintenance are included.

Alternative 2, with a total project cost of $13,697,900 (October 1993 price level), which would deepen the existing channel by 2 feet to 47 feet at the entrance and 37 feet in the inner channel, was the identified National Economic Development (NED) plan. Also, one of the two existing turning basins would be widened by 100 feet under this plan. This alternative, supported by the sponsor, would have total annual benefits of $2 million, and annual costs of $1.3 million, including increased maintenance costs. The annual net benefits are $0.7 million and the benefit-to-cost ratio (BCR) is 1.5.

A Baseline Cost Estimate has been prepared. Project construction is scheduled to start in fiscal year 1995. The fully-funded cost, based on this construction schedule, including inflation, is estimated to be $14,583,000. Of this amount, $3,776,200 would be the initial non-Federal cost share for 25 percent of the first cost for general navigation features (GNF) and 100 percent of the associated improvements. The initial Federal share of the first cost would be $10,806,800. In addition the non-Federal interest would pay an additional 10 percent ($1,440,900) less credit for any lands, easements, rights of way, relocations, and disposal areas (LERRD) plus interest over a period not to exceed 30 years.

COOS BAY, OREGON
NAVIGATION IMPROVEMENTS
FINAL FEASIBILITY REPORT

VOLUME I
CONTENTS

EXECUTIVE SUMMARY
FINAL FEASIBILITY REPORT
FINAL ENVIRONMENTAL IMPACT STATEMENT

VOLUME II
CONTENTS

APPENDIX A - GEOTECHNICAL INVESTIGATIONS
APPENDIX B - ENGINEERING ANALYSIS
APPENDIX C - ECONOMICS ANALYSIS
APPENDIX D - SEDIMENT QUALITY
APPENDIX E - OREGON GRADUATE CENTER SALINITY ANALYSIS
APPENDIX F - GEOLOGIC STUDY BY GEO RECON INTERNATIONAL, LTD.
APPENDIX G - DISPOSAL SITE "F" STUDY BY OGDEN BEEMAN ASSOCIATES
APPENDIX H - SALINITY WORKSHOP
APPENDIX I - CORRESPONDENCE
APPENDIX J - PORT OF COOS BAY FINANCING PLAN
APPENDIX K - DIFFERENTIAL GLOBAL POSITIONING SYSTEM SURVEY

COOS BAY, OREGON
NAVIGATION IMPROVEMENTS
FINAL FEASIBILITY REPORT

CONTENTS

Section		Page
1.	INTRODUCTION	1
	1.1 Study Authority	1
	1.2 Study Purpose and Scope	2
	1.3 Non-Federal Sponsor	2
	1.4 Evaluation Criteria	2
	1.4.1 Regulations and Guidance	2
	1.4.2 Engineering Criteria	3
	1.4.3 Economic Benefits	3
	1.4.4 Environmental Impacts	3
	1.4.5 Non-Federal Sponsor Interests	3
	1.5 Previous and Current Studies	3
	1.5.1 Prior Studies and Reports	3
	1.5.2 Reconnaissance Study	4
2.	DESCRIPTION OF THE STUDY AREA	7
	2.1 Regional Characteristics	7
	2.1.1 Location	7
	2.1.2 Coos Bay Estuary	7
	2.1.3 Climate	7
	2.1.4 Topography and Geology	7
	2.2 Resources	9
	2.3 Economic Base	9
	2.3.1 Demographics	10
	2.3.2 Commerce.	10
3.	PLAN FORMULATION	13
	3.1 Overview	13
	3.2 Existing Physical and Environmental Conditions	13
	3.2.1 Existing Navigation Improvements	13
	3.2.2 Project Maintenance	15
	3.2.3 Ocean Disposal Sites	16
	3.2.4 Environmental Conditions	20
	3.2.5 Port Facilities	23
	3.3 Deep Draft Commerce	24
	3.3.1 Existing Versus Future Without-Project Overview	24
	3.3.2 Existing Activity	24

CONTENTS--Continued

Section		Page
	3.3.3 Timber Supplies	27
	3.3.4 Timber Commodity Projections	27
3.4	Deep Draft Fleet	28
	3.4.1 Historical Trend	28
	3.4.2 Current Operating Practices	29
3.5	Problems and Opportunities	32
	3.5.1 Transportation Efficiencies	32
	3.5.2 Delays	32
	3.5.3 Disposal of Dredged Materials	32
3.6	Formulation of Alternatives	33
	3.6.1 Without-Project Condition	33
	3.6.2 Channel Modifications at Railroad Bridge	33
	3.6.3 Nonstructural Alternatives	33
	3.6.4 Channel Deepening	34
	3.6.5 Staged Construction	34
3.7	Beneficial Use of Dredged Material	35
	3.7.1 Beach Nourishment	35
	3.7.2 Artificial (Rock) Reef Creation	35
	3.7.3 Western Snowy Plover Habitat Development	35
4.	COMPARISON OF ALTERNATIVES	37
4.1	Design Considerations	37
	4.1.1 Design Vessel	37
	4.1.2 Channel Design	39
	4.1.3 Turning Basins	40
	4.1.4 Anchorages	41
	4.1.5 Dredging Quantities	41
	4.1.6 Rock Quantities	43
	4.1.7 Right-of-Way, Relocations	43
	4.1.8 Increased Annual Maintenance	44
	4.1.9 Associated Improvements	44
4.2	Project Costs	45
	4.2.1 Construction Cost Estimates	45
	4.2.2 Project and Investment Costs	46
	4.2.3 Maintenance Costs	47
	4.2.4 Annual Costs	47
4.3	Comparative Environmental Effects	48
	4.3.1 Water Quality	48
	4.3.2 Sediment Quality	49
	4.3.3 Salinity	49

CONTENTS--Continued

Section		Page
	4.3.4 Biological Impacts	49
4.4	Benefits Analysis	49
	4.4.1 Overview	49
	4.4.2 Incremental Analysis and Single Beneficiary Consideration	50
	4.4.3 Multi-Port Competition	50
	4.4.4 Last-Port-of-call Analysis for Lumber/Paper/Plywood	50
	4.4.5 Nickel Ore Projection	51
	4.4.6 Fleet Projections-Timber Products	51
	4.4.7 Nickel Ore	52
	4.4.8 Design Drafts and Vessel Operating Costs	52
	4.4.9 Destination Ports	53
	4.4.10 Transportation Benefits	54
	4.4.11 Delay Benefits	55
	4.4.12 Total Benefits	56
4.5	Benefit-to-Cost Evaluation	56
	4.5.1 Benefit-to-Cost Analysis	56
	4.5.2 NED Plan	57
	4.5.3 Sensitivity Analysis	57
5.	THE SELECTED PLAN	61
5.1	Plan Components	61
	5.1.1 Descriptions and Justifications	61
	5.1.2 Costs	65
	5.1.3 Construction Methods	65
	5.1.4 Operation and Maintenance	65
	5.1.5 Annual Maintenance	67
5.2	Ocean Disposal Site Selection	67
5.3	Environmental Impacts of Selected Plan	69
	5.3.1 Physical	69
	5.3.2 Water Quality	70
	5.3.3 Sediment Quality	70
	5.3.4 Salinity	71
	5.3.5 Biological Impacts--Coos Bay	71
	5.3.6 Biological Impacts--Disposal Sites	71
	5.3.7 Threatened and Endangered Species	72
	5.3.8 Cultural Resources	73
	5.3.9 Mitigation	73
5.4	Plan Benefits	74

CONTENTS--Continued

Section		Page
6.	PLAN IMPLEMENTATION	75
	6.1 Design and Construction	75
	6.1.1 Ship Simulator Studies	75
	6.1.2 Construction Period	77
	6.2 Cost Apportionment	77
	6.2.1 Fully-Funded Cost	77
	6.2.2 Non-Federal Cost Sharing	77
	6.3 Division of Responsibilities	79
	6.3.1 Federal Responsibility	79
	6.3.2 Non-Federal Responsibilities	79
	6.4 Sponsor's Support	81
	6.4.1 Sponsor's Views	81
	6.4.2 Sponsor Financing	81
7.	LOCAL COOPERATION AND AGENCY COORDINATION	83
	7.1 Public Views	83
	7.2 Agency Coordination	83
8.	CONCLUSIONS AND RECOMMENDATIONS	85

FIGURES

No.		Page
1	Existing Navigation Projects	8
2	Existing Channel Dimensions	14
3	Potential Ocean Disposal Sites	18
4	Docks and Terminals in the Coos Bay Area	25
5	Channel Deepening Quantities	42
6	Proposed Channel Dimensions	62
7	Existing and Candidate Ocean Disposal Sites	68
8	Project Schedule	76

TABLES

No.		Page
1-1	Previous Studies and Reports	5
3-1	Authorized Advance Maintenance in Coos Bay Channel	16
3-2	Offshore Disposal Site Characteristics	17
3-3	Docks and Terminals, Port of Coos Bay	24
3-4	Major Commodity Exports 1990 and 1991 (Short Tons)	26
3-5	Vessel Transits by Commodity in 1988	26

CONTENTS--Continued

No.		Page
3-6	Timber Commodity Projections	28
3-7	Vessels Outbound from Coos Bay with Drafts 33 Feet or Greater	29
4-1	Typical Maximum Operating Drafts for Channel Design	38
4-2	Maintenance Quantities Due to Deepening	44
4-3	Associated Dredging Requirements	45
4-4	Construction Cost Summary	46
4-5	Total Investment Costs	47
4-6	Increase in Maintenance Cost Over the Without-Project Condition	47
4-7	Cost of Alternative Improvements	48
4-8	Nickel Ore Vessel Loads at Alternative Channel Depths	52
4-9	Sample Loading and Operating Costs	53
4-10	Days at Sea and in Port by Commodity	54
4-11	Transportation Costs per Ton by Commodity, Year 2016	54
4-12	Incremental Transportation Benefits By Commodity	55
4-13	Incremental Delay Cost Reduction By Alternative, All Commodities	56
4-14	Incremental and Total Benefits for Each Alternative	56
4-15	Summary of BCRs and Net Benefits for Each Alternative	57
4-16	Commodity Projections with Risk and Uncertainty Analysis	58
4-17	Ore Quantities Required to Maintain NED Plan for Various Timber Commodity Scenarios	59
5-1	Federal/Non-Federal Costs, Alternative 2--37-foot Authorized Depth	65
5-2	Non-Federal Costs, Alternative 2--37-Foot Authorized Depth	65
6-1	Executive Cost Summary	78
6-2	Initial Construction Cost Share Amounts	79

EXHIBIT

Sponsor's Letter of Intent ..... Following Main Report

PLATES

No.		
P-1	Entrance Ranges	Following Main Report
P-2	Coos Bay Ranges	Following Main Report
P-3	Coos Bay & Empire Ranges	Following Main Report
P-4	Jarvis Ranges	Following Main Report
P-5	North Bend Turn	Following Main Report
P-6	North Bend Ranges	Following Main Report
P-7	Ferndale & Marshfield Ranges	Following Main Report

COOS BAY, OREGON
NAVIGATION IMPROVEMENTS
FINAL FEASIBILITY REPORT

1. INTRODUCTION

1.1 Study Authority

This investigation was authorized by Congress pursuant to local requests for navigation assistance. On Feb. 8, 1983, the Port of Coos Bay Commission passed a resolution describing navigation problems and supporting a feasibility study of improvements to its existing navigation channel. On Nov. 2, 1983, the US Senate Committee on Environment and Public Works passed a resolution which states:

> *...that the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby requested to review the reports of Chief of Engineers on Coos Bay, Oregon, published as House Document Numbered 151, Ninety-First Congress, First Session, and other pertinent reports, with a view to determining whether any modification of the existing project is advisable at the present time, with particular reference to providing increased depths and widths for the outer bar channel and the bay channel from the entrance to Isthmus Slough and increased clearances through the existing Southern Pacific railroad bridge to accommodate existing and prospective traffic.*

In 1993, the Board was disbanded as required by Public Law 102-580, Section 223. Responsibility for the review now rests with the Assistant Secretary of the Army for Civil Works.

A reconnaissance report was approved in December 1988, which formed the basis for initiating the feasibility phase of studies. The detailed studies leading to this feasibility report proceeded upon the execution of a Feasibility Cost Sharing Agreement (FCSA) between the United States of America (the "Government") and the Oregon International Port of Coos Bay (the "Sponsor"), dated Dec. 13, 1988. This report presents the results of the final feasibility studies in response to the resolution. Preconstruction engineering

and design (PED) activities would continue under the authority provided by the Nov. 2, 1983, resolution.

1.2 Study Purpose and Scope

The purpose of the investigation was to determine whether the existing deep-draft Coos Bay Federal Navigation Project should be modified, and if so, to identify a project for implementation. Additional investigations and Congressional authorization would be needed for project implementation. The scope of this feasibility study involves documentation of existing conditions, identification of opportunities for improvements, formulation and design of project alternatives, evaluation of their economic viability and delineation of their potential environmental impacts.

1.3 Non-Federal Sponsor

The Oregon International Port of Coos Bay is the non-Federal sponsor. It is southwest Oregon's principal outlet to the sea. Recognizing the port's importance to the State's economy, the Oregon State Legislature in 1987 established a new governance structure for the port. The port's new legislative charter was subsequently ratified by 71.5 percent of the voters in the port district. Formerly managed by an elected port commission but now managed by a commission appointed by the Governor of Oregon, the port is viewed by the State as a catalyst for economic development of southwestern Oregon. It has been assigned a large role in economic planning and development for the general region.

1.4 Evaluation Criteria

1.4.1 Regulations and Guidance. Authority for the Corps of Engineers to investigate the need for navigation improvements and to construct those improvements is derived from Federal legislation and executive orders. These laws and orders are implemented by regulations that establish the engineering, economic, and environmental criteria used to determine whether the Federal Government can participate in a potential project. The principal Corps of Engineers regulations that determine the scope of the present study are as follows: *Economic Principles and Guidelines for Water Resources and Related Land Resources Implementation Guidelines* (Water Resources Council, March 10, 1983); Engineering Regulation (ER) 1105-2-100, *Guidance for*

Conducting Civil Works Planning Studies; and ER 200-2-2, *Policy and Procedures for Implementing NEPA* (NEPA is the National Environmental Policy Act of 1969). The following paragraphs describe conditions placed by regulation on Corps of Engineers construction of navigation improvements.

1.4.2 Engineering Criteria. The project must meet local needs and Corps of Engineers criteria established by regulation. Projects should be adequately sized to meet user needs and provide sufficient depth and entrance dimensions for safe access.

1.4.3 Economic Benefits. National Economic Development (NED) benefits, defined principally as effects of a plan that increase the national output of goods and services, must exceed the combined Federal and local costs of constructing, maintaining, and operating the project. Benefits and costs must be expressed in terms of constant time and value of money. Benefits generally include items such as fuel savings, reduced labor costs, and reduced maintenance costs. Federal interest in the project exists if the benefits exceed the costs, resulting in a benefit-to-cost ratio (BCR) greater than 1.0.

1.4.4 Environmental Impacts. Federal law and environmental regulations require identifying forms of aquatic life and wildlife that might be impacted by the project, minimizing disruption of natural resources, maintaining consistency with the Oregon Coastal Zone Management Act and State and local plans, and using measures to protect or preserve existing environmental values. Social effects must be considered, and adverse effects must be minimized. The effects of each alternative on the social and natural environment must be defined, and that information must be provided to the public for review.

1.4.5 Non-Federal Sponsor Interests. The alternative must be acceptable to the non-Federal sponsor. The level of the sponsor's interest in and support for the recommended alternative must be assessed as well as the sponsor's financial capability to fund its share of the cost to implement the project.

1.5 Previous and Current Studies

1.5.1 Prior Studies and Reports. Before the first Federal navigation project was constructed in 1880, the original outlet channel of Coos Bay to the Pacific Ocean crossed a bar at the baymouth and was about 10 feet deep by 200 feet wide. Access from the

ocean to a natural harbor channel (about 22 feet deep) was obstructed by the baymouth bar and also by one river shoal a quarter-mile long and 15 feet wide. The Corps of Engineers first studied Coos Bay in 1878. Seeking to stabilize the bay entrance, Congress authorized the north and south jetties in 1879. Construction of the jetties began the following year. See table 1.1 for a list of previous studies and reports.

The deep-draft Coos Bay Federal Navigation Project, originally authorized by the River and Harbor Act of March 3, 1879, has been modified by subsequent River and Harbor Acts, the last on Dec. 30, 1970. This act authorized the improvements recommended by the Corps of Engineers in House Document 91-151, dated Sept. 3, 1969. These improvements are described in Section 3, Plan Formulation.

1.5.2 Reconnaissance Study. The reconnaissance phase study was completed in December 1987. That study examined eight alternative plans of improvement and concluded that several of them appeared viable and that a feasibility phase study was warranted. The more promising alternatives included a 3-foot channel deepening, both with and without a small anchorage, and the anchorage alternative alone.

Also investigated in the reconnaissance study was replacement of the Southern Pacific Railroad bridge, located at about river mile (RM) 9. The narrow passage for vessel traffic through the bridge (197 feet) causes delays for larger vessels, predominately wood chip vessels. The Coos Bay pilots do not attempt to navigate large vessels through the bridge at night or when weather conditions make it hazardous, primarily due to impaired visibility. The reconnaissance study found that replacement or reconstruction of the bridge was not economically justified. Replacement was estimated to be $27.8 million; $2.4 million annually. The average annual benefit was determined to be $656,000. The BCR was 0.27.

TABLE 1-1.--*Previous Studies and Reports; Coos Bay, Oregon, Federal Navigation Project*

Date Submitted	Recommendation	Reference
3 Sep 1969	Deepen outer bar channel to 45 feet and inner channel to 35 feet, new anchorage, modify turning basins.	H.D. 91-51
26 Apr 1948	Mooring basin and connecting channel at Charleston.	H.D. 80-646
24 Jul 1946	Deepen outer bar channel to 40 feet, inner channel to 30 feet, two turn-basins and two anchorages.	S.D. 79-253
26 Apr 1934	24-foot-deep channel from Pigeon Point Reef to Smith's Mill, and turning basin above Marshfield (now City of Coos Bay)	S. Com. Prt 73rd Congress 2nd session
13 Dec 1927	Channel 24 feet deep, 300 feet wide through Pigeon Point Reef, following a location along the westerly side of bay.	H.D. 70-110
29 Oct 1921	Coos Bay, Oregon and Isthmus Slough.	H.D. 67-150
29 Mar 1917	Entrance to Smith's Mill.	H.D. 65-325
19 Feb 1908	South Slough, Oregon, channel and bar.	H.D. 60-958
16 May 1891	Inner harbor channel.	H. Ex. D. 52-42
30 Sep 1878	Entrance bar improvements, north and south jetties.	S. Ex. D. 45-14

Note:

H.D. = House Document
S.D. = Senate Document
S. Comm. Prt. = Senate Committee Print
H. Ex. D. = House Executive Document
S. Ex. D. = Senate Executive Document

2. DESCRIPTION OF THE STUDY AREA

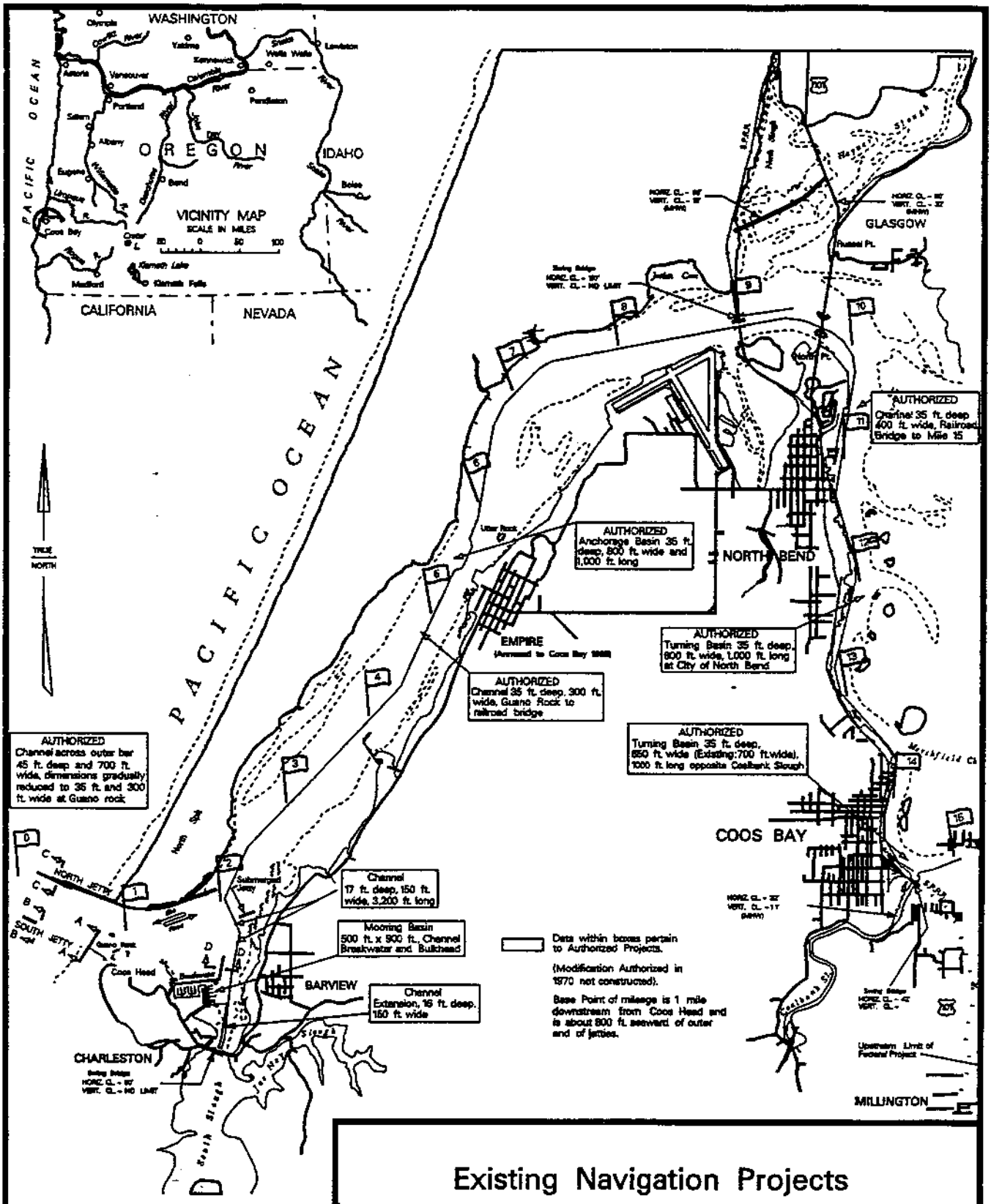
2.1 Regional Characteristics

2.1.1 Location. Coos Bay is located in Coos County, Ore., on the southern Oregon coast, about 200 miles south of the Columbia River mouth and 445 miles north of San Francisco Bay. It is the navigational approach to Charleston, Empire, North Bend, Glasgow, Coos Bay and Eastside (figure 1). The bay is formed by the junction of Isthmus Slough, Coos River, South Slough, Kentuck Slough, Haynes Slough and Winchester Creek, which rise on the western slopes of the Coast Range. Deep-draft navigation is limited to the lower 15 miles of the estuary.

2.1.2 Coos Bay Estuary. The surface area of the Coos Bay estuary is about 12,000 acres (about 19 square miles). Tidelands, situated primarily between the mouth and RM 15, about 1 RM above the city of Coos Bay, contain 20 percent to 30 percent of the estuary area. Between the entrance and RM 1, the estuary's depth varies from 25 feet to 45 feet below mean lower low water (MLLW). Upstream, the average estuary depth is 30 feet below MLLW. Within the present channel, water depth ranges from 35 feet to 45 feet below MLLW. The entrance of the estuary is fully exposed to waves.

2.1.3 Climate. The project area has cool, comparatively dry summers and mild, cloudy, wet winters. Average monthly temperatures for Coos Bay have ranged from a low of 44 °F to a high of 61 °F. Precipitation occurs primarily between October and April, with average monthly rainfall of 16 inches in January, the wettest month, and less than 1 inch in July, the driest month. Average annual snowfall is from 1 inch to 3 inches, and fog is experienced on an average of 43 days per year. The Coos Bay coastal area receives the full force of storms moving inland from the ocean, and winds can reach hurricane speed (greater than 74 miles per hour) during such storms. The most severe storms occur during the winter (November through March), come from the northwest, and can generate waves up to 15 feet high. In the daytime, sea breezes sweep up the river valleys; nocturnal winds sweep down the valleys.

2.1.4 Topography and Geology. The topography of the lower Coos River area is a combination of rugged mountain terrain, extensive sand dunes adjacent to the ocean, and relatively flat pasture land along the river. Terrain of the basin is quite rugged as



Existing Navigation Projects

US Army Corps of Engineers
Portland District

Coos Bay Navigation Improvements

Figure 1

Produced by GIS, Survey and Mapping Section, Geotechnical Engineering Branch

the mountains are relatively young, denoted by the typical narrow, sinuous valleys and steep side slopes. Relief varies from sea level to just under 3,000 feet National Geodetic Vertical Datum (NGVD); however, most of the land lies between 500 and 1,500 feet in elevation. The principal stream in the region is Coos River.

During the channel deepening performed in 1978-79, numerous sandstone layers were identified within the lower reaches of Coos Bay. Geological investigations performed in 1974 indicate the rock types to be claystone, siltstone and sandstone from RM 2 to RM 6, with outcrops from RM 0.7 to RM 0.9 and from RM 15 to RM 15.3 above the end of the navigation channel. All known rock sources produce rock that is considerably softer and much less resistant to erosion than basalt.

2.2 Resources

Western Coos County, the immediate area of the project, is generally considered rich in natural resources. Among these resources are an adequate water supply, wildlife, commercial and game fish, outdoor recreational opportunities, major timber stands and some agricultural land. Water is used for navigation, irrigation, recreation, fish and wildlife, and municipal and industrial water supplies.

Southwest Oregon, considered the hinterland of Coos Bay, includes five counties: Coos, Curry, Douglas, Josephine and Jackson. The Port of Coos Bay timber resource boundaries tend to vary with the commodity to be exported as indicated in Appendix C, Economics Analysis. The resource boundary for logs, for example, is estimated to be about 50 miles to 75 miles from the port, whereas for lumber the boundary is about 250 miles. Wood product exports from the Port of Coos Bay have remained essentially stable during the past 10 years. Environmental issues with regard to the Northern Spotted Owl and log exports will influence the future supplies of timber products in the region.

2.3 Economic Base

The Coos Bay economy is heavily resource-based, relying on timber and fish resources. The Pacific Northwest region has been cited as the greatest softwood timber growing region of the world. The lumber and wood product industry is the largest industry in

Coos County. The principal markets for forest products transported by waterborne commerce from the Coos Bay area include Asia, the South Pacific and Europe.

Commercial and recreational fishing are major industries in the Coos Bay area. In general, the commercial fishing resource area immediately attributable to the Port of Coos Bay extends 30 miles to the north and south of the mouth of the estuary and 30 miles offshore. The fishery resources of the area include salmon, tuna, sturgeon, cod, sole, clams, shrimp and crab. Numerous full-time commercial fishing boats are berthed in Coos Bay and operate from there. Charter operation and recreational boating are also popular activities.

2.3.1 Demographics. The Coos County population grew 6.6 percent between 1970 and 1990. It peaked at 64,000 in 1980, declined over most of the 1980s to a low of 57,500 in 1987, and grew again to 60,300 in 1990. Employment trends have been similar to population, with growth during the 1970s and a decline in the 1980s. Decreasing lumber and wood products employment opportunities were a factor in the population decline. The 1990 unemployment rate in Coos County was 8.9 percent.

2.3.2 Commerce. Outbound deep draft traffic through the channel consisted of 333 transits in 1988. Principal exports shipped from the Port of Coos Bay are wood chips, logs, lumber and other wood and paper products. Major imports consist primarily of petroleum products. Some containerized products also are shipped and received.

The port is used by commercial fishing vessels on a year-round basis, when bar conditions allow winter transit. It is used by charter, sport fishing, and pleasure craft seasonally.

In October 1992, the Glenbrook Nickel Company began to import nickel ore into Coos Bay from New Caledonia, a small island near Australia. From the Port, the ore is transported about 100 miles to the company's smelter at Riddle, Ore. The nickel ore facilities are discussed in more detail in paragraph 3.2.5.

In 1991, 4.6 million tons of commodities moved through the Port of Coos Bay. Export activity at the Port of Coos Bay is linked to the forest products industries of the region. The port did not provide data on other commodities for 1991; however, in 1989,

Waterborne Commerce of the United States data indicated less than 1 percent of exports were commodities other than forest products.

Deep-draft commerce is supported by excellent supplemental transportation facilities. Rail service is provided by the Southern Pacific Transportation Company. North-south and easterly highways serve the project area. The International Port of Coos Bay is connected to a network of well-maintained and recently improved State and Federal highways. U.S. Highway 101 serves the Port of Coos Bay by providing north-south access, and Interstate 5 is accessible by State highways 38 and 42. Highway 42 and Interstate 5 will be used to transport nickel ore to Riddle, Ore.

3. PLAN FORMULATION

3.1 Overview

Plan formulation involves a systematic process of identifying and analyzing water resource needs and problems, establishing objectives and developing and evaluating alternatives to meet those needs and problems. Plan formulation is guided by the Corps of Engineers' policy on multi-objective planning in accordance with legislative and executive authorities.

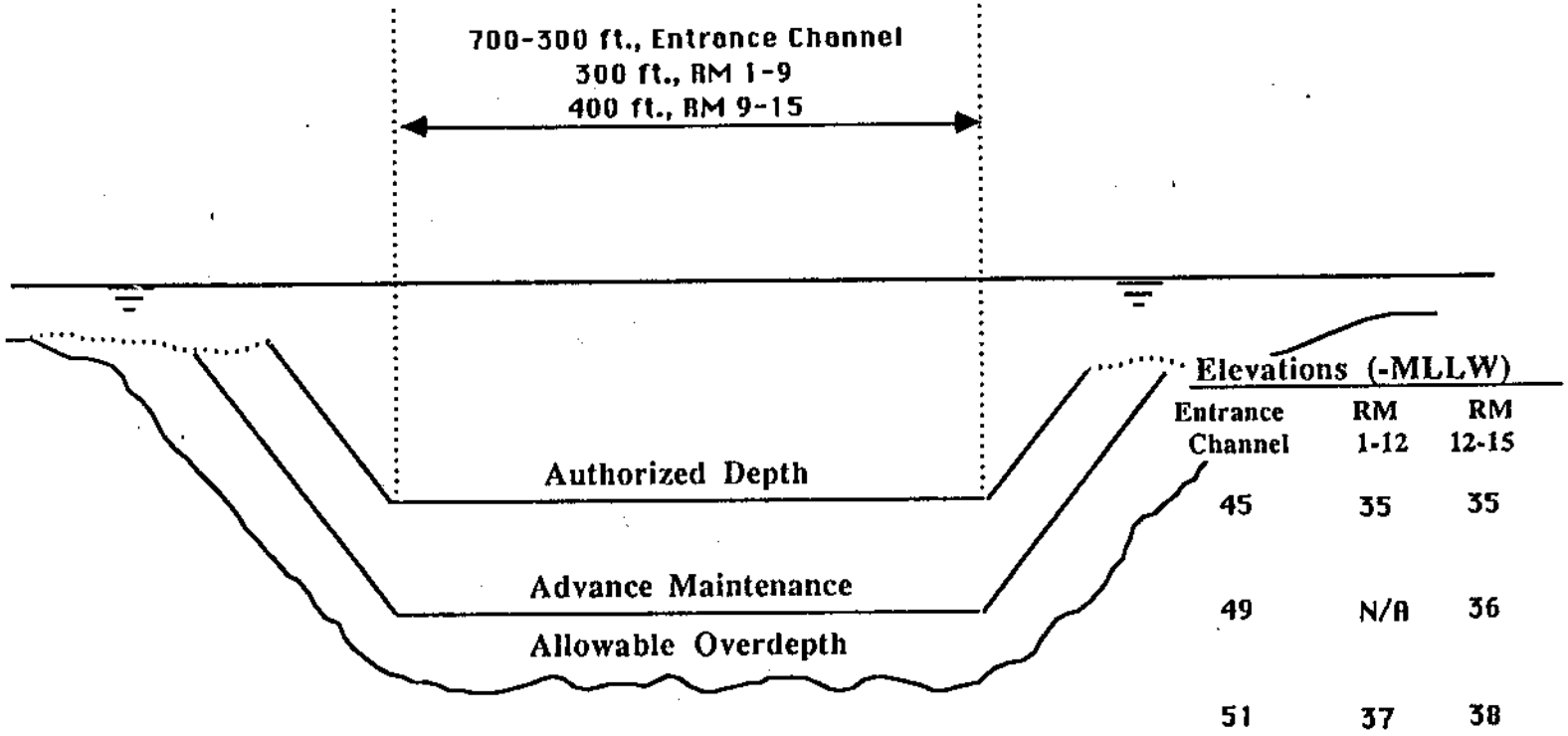
Baseline conditions with regard to the existing Coos Bay Federal Navigation project, timber supply issues, deep draft commerce, and the environment will be established in the following paragraphs. Problems and opportunities will then be identified and alternatives to address those problems developed for further evaluation.

3.2 Existing Physical and Environmental Conditions

3.2.1 Existing Navigation Improvements. The Federal Government constructed and maintains the existing Coos Bay Federal Navigation Project, consisting of the two jetties and the deep-draft navigation channel.

Jetties. The north jetty is 10,400 feet long; the south is 9,000 feet long. The south jetty was last rehabilitated in 1962-63, requiring 235,000 tons of stone. It is currently being monitored by Portland District, and is in good condition. The north jetty was rehabilitated in 1989 with about 96,500 tons of stone. This rehabilitation was primarily centered between stations 78+00 to 83+00, where a notch had developed and a breach was then thought to be imminent. The north jetty is being monitored. No problems are known to exist with the north jetty at this time.

Deep Draft Channel. The deep draft navigation channel, completed in 1979, is 45 feet deep, 700 feet wide outside the entrance bar, transitioning to 35 feet deep and 300 feet wide near Guano Rock (RM 1). The inner channel is 35 feet deep and 300 feet wide to about RM 9 (the Southern Pacific Transportation Company railroad bridge), where it widens to 400 feet wide to RM 15, the upper end of the project. A diagram depicting existing channel dimensions is shown in figure 2.



EXISTING CHANNEL DIMENSIONS
(NO SCALE)

US Army Corps of Engineers Portland District

Coos Bay Navigation Improvements

Figure 2

The channel is designed for one-way traffic. There is an 800-foot- wide by 1,000-foot-long turning basin at the city of North Bend (RM 12) and a 700-foot-wide by 1,000-foot-long turning basin at the city of Coos Bay (RM 14.7). Both turning basins are maintained to the project depth.

Anchorage. An anchorage area 35 feet deep, 1,200 feet wide and 2,000 feet long at RM 6 (near the community of Empire) was authorized. Subsequently, this anchorage was designated an emergency anchorage, relocated to RM 5.5, and reduced in size. This anchorage is 800 feet wide, 1,000 feet long and has no mooring buoys or dolphins. It is significantly undersized by Corps of Engineers' standards for a free-swinging single point mooring and its designated width spans the channel. It has not been used by the pilots, except for occasional turning of vessels.

A reconnaissance anchorage study was initiated under Section 107 authority in 1988 at the request of the sponsor. Subsequently, the study was terminated. Currently, a study of an anchorage does not have sponsor support. Therefore, funding has not been requested or provided; no work has been conducted to investigate the justification for an anchorage under this feasibility study.

3.2.2 Project Maintenance. The existing project is maintained to the authorized project depth, -35 feet MLLW, through a maintenance dredging program employing in-house dredging plant and contract dredges. Routine annual maintenance is normally required at the entrance bar and in the inner channel to RM 12. From RM 12 to RM 15, routine maintenance dredging is scheduled for alternate years. Advance maintenance is performed at the entrance and in the upper RM 12 to RM 15 reach. The authorized advance maintenance program is intended to assure that safe entrance channel depths with minimal delays are provided during the critical winter storm periods and for overall economy in maintaining the project. The advance maintenance program depths are displayed in table 3-1 and shown in figure 2. A complete discussion of the justification for the advance maintenance program is provided in Appendix B, Engineering Analysis, Section 2.2. Briefly, the advance maintenance program has been developed based on available dredging equipment for the District's overall west coast dredging program, costs to provide alternative maintenance programs, and assurance of project depths and safe operating conditions, particularly in the entrance during winter conditions. The program is justified based on costs of additional equipment mobilization and other costs which would be incurred for alternative maintenance programs.

TABLE 3-1.--*Authorized Advance Maintenance in Coos Bay Channel*

Location	Advance Maintenance Depth
Entrance Bar	4 feet, to -49 feet MLLW
RM 1-12	None
RM 12	1 foot, to -36 feet MLLW

A dredging tolerance of 2 feet is generally allowed in accordance with maintenance dredging regulations. Maintenance dredging is performed only where and when shoaling above the authorized channel depth occurs. In the inner channel, shoaling to depths less than authorized project depth can occur between dredging cycles but it will not be allowed to extend to the point of restricting vessel traffic, and the authorized depth is maintained as the controlling depth for vessel traffic. Where problem shoaling occasionally occurs in a critical area such as in the approaches to the railroad bridge, non-scheduled dredging by the hopper dredge *Yaquina*, or by contract clamshell dredge, has been performed to restore channel depths. In the entrance the intent is to maintain authorized depths through the winter when storms and wave effects can be expected to be most critical.

The Coos Bay channel is maintained by Portland District and contract hopper dredges below RM 12, and by contract clamshell dredges above RM 12. Pipeline dredging in the upper channel is no longer practiced due to lack of suitable upland disposal sites. Sea conditions normally limit dredging opportunities from May through October, extending into November with favorable bar conditions. The volumes of dredged material removed from the Coos Bay entrance channel from 1969 to 1992 are listed in Appendix B. The previous deepening project was constructed in 1977 through 1979. Since then, the average quantity of material dredged from 1980 through 1992 has been about 1.7 million cubic yards (cy) per year.

3.2.3 Ocean Disposal Sites. Generally, all material from maintenance dredging is deposited at three ocean disposal sites. A flow lane sump at RM 8.4 is also used to temporarily store material dredged by the District's hopper dredge *Yaquina* for later ocean disposal by contracted clamshell and barge dredging. This allows more effective use of the *Yaquina* by significantly reducing its non-productive time spent hauling loads to disposal. The round trip to the ocean disposal site from the channel above the

railroad bridge is more than 20 miles. A flowlane site just inside the entrance is used occasionally for disposal if entrance conditions are too hazardous for the dredges.

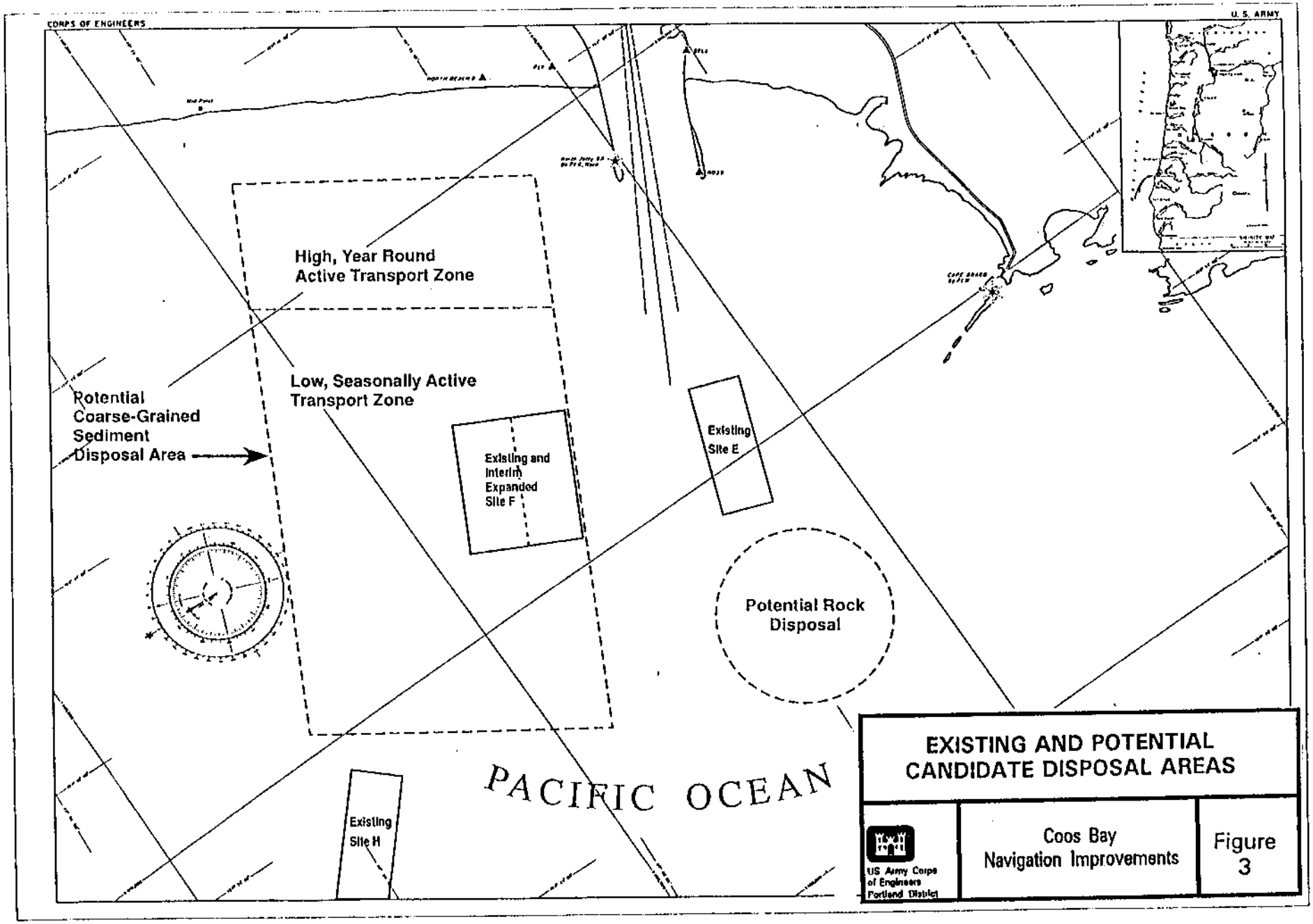
Three ocean disposal sites, identified as E, F and H respectively, have been designated by the Environmental Protection Agency (EPA) under authority of Section 102 of the Marine Protection Research and Sanctuaries Act (MPRSA). These sites are shown on figure 3. Specific dimensions and depths of these sites are indicated in table 3-2.

TABLE 3-2.--*Offshore Disposal Site Characteristics*

Site	Dimensions (ft)	Area (acres)	Ave. Depth (ft)
E	3,600 x 1,400	116	51
F	3,600 x 1,400	116	80
H	3,600 x 1,450	120	180

Sites E and F are used for disposal of sand material dredged from below RM 12. Site E is located about 1.5 miles southwest of the entrance channel. Site F is located north of the entrance channel about the same distance from the entrance. Mounding at site E has caused sharp curtailment of disposal at that site since about 1986. Disposal at site F was increased to compensate. Beginning in 1986 and continuing through 1989, almost 1 million cy have been deposited at site F annually. By 1989, persistent mounding had become apparent at site F. The site has been temporarily expanded (doubled) to the north under the Corps of Engineers' Section 103 authority to alleviate the immediate problem while disposal site studies were conducted. EPA will use the disposal studies to make a final designation of additional disposal sites to meet long-term needs. The capacity of the existing expanded site F is limited and may only be useable in its present configuration for two or three more years.

Site H has been used since its designation in 1986 for disposal of finer-grained sand and silt materials from above RM 12. Monitoring at this site indicates no adverse impacts or appreciable mounding. It is expected that continued use of site H for dredged materials, including suitable dredged materials generated by a new project, will not result in a need for expansion.


CORPS OF ENGINEERS
U. S. ARMY
High, Year Round
Active Transport Zone
Low, Seasonally Active
Transport Zone
Potential
Coarse-Grained
Sediment
Disposal Area
Existing and
Interim
Expanded
Site F
Existing
Site E
Potential Rock
Disposal
PACIFIC OCEAN
Existing
Site H
EXISTING AND POTENTIAL
CANDIDATE DISPOSAL AREAS
US Army Corps
of Engineers
Portland District
Coos Bay
Navigation Improvements
Figure
3

Disposal Studies. Site F has not proven to be adequate for long-term disposal. New or expanded disposal sites for sandy material are necessary for the long-term maintenance of the project with or without the channel modifications being considered in this feasibility study. The object of disposal site studies and designation is to establish sufficient site capacity and management to provide for disposal of dredged material for the life of the project.

The disposal area under consideration involves expanding the boundaries of site F to include areas nearshore (marked as potential coarse-grained sediment disposal area in figure 3). These nearshore areas are believed to have better sediment dispersal characteristics. The original sizing of site F was based on the assumption that, at the time of site selection, material disposed at this location and depth would also be dispersed, particularly by winter storm activity. A minimum "footprint" was designed based on the maneuvering capabilities of the disposal equipment with the intent to minimize the extent of immediate biological impacts.

A number of studies of the offshore area have been conducted and monitoring of conditions at disposal sites is ongoing. Three new studies have been conducted to develop disposal site requirements and determine impacts. The studies include an analysis of site F sediment dispersal and mounding conducted by Ogden Beeman and Associates, Inc., in 1989 (see Appendix G, Site F Study), a side-scan sonar and sub-bottom profiling by Geo Recon International, Ltd., in 1989 (see Appendix F, Geologic Study), and biological sampling and characterization conducted in 1992 by the National Marine Fisheries Service (NMFS).

Disposal Alternatives. The study area is shown on figure 3. Several alternative approaches have been considered. One would involve use of the nearshore area. This would place the material in a high energy, active wave environment where the material would be expected to readily disperse within the littoral system. Another alternative would be expansion offshore, next to site F. Because of the less active environment and experience with site F and its recent expansion, mounding would be expected and the size of the site would need to be designed accordingly. A combination of the nearshore and offshore expansion is the third alternative. This alternative would allow for more management options and flexibility for long-term disposal activities within a much larger site.

Biological Studies and Disposal Impacts. Several biological studies have been conducted since 1979 for site designation and placement of dredged material from Coos Bay. The latest biological sampling was initiated in 1992 for the current site designation study. Studies of invertebrates, fish and wildlife organisms and communities were conducted in the offshore areas prior to the designation of sites E, F and H. Impacts to benthic communities from the disposal activities were of primary interest. Surveys found the vicinity of site F to be generally of lower productivity than other areas surveyed further offshore and that no unique biological communities would be impacted. It was determined that the effects of disposal would be short term for benthic organisms and would be followed by rapid re-establishment.

Site H is described as a transition habitat supporting species from both the higher-energy near shore and deeper offshore environments. In general, species abundance and richness were higher at site H than at site F. The results of monitoring of benthic organisms at site H since disposal was initiated found minor or no impacts to most species.

To assess biological impacts for expanding site F for continued maintenance disposal and any materials resulting from potential channel improvements, additional sampling surveys have been conducted. One survey was conducted in April 1992 to characterize organisms in and around site F and in the nearshore area. A second survey of this area was conducted in October 1992. The results of these surveys were compared to surveys conducted in 1979 to determine whether there have been changes in these communities. Results of both samplings indicate that the area evaluated for proposed expansion of site F is similar in species composition to that described by the 1979 studies. Based on the 1979 testing and more recent confirmation studies, the proposed site (larger area) appears suitable for dredged material disposal.

A site for a one-time disposal of any rock materials excavated from the channel for deepening alternatives will be required.

3.2.4 Environmental Conditions. Environmental conditions of the Coos Bay estuary and offshore disposal sites are briefly summarized below. Complete descriptions of physical, biological and human resources are contained in the EIS, Chapter 3, and the appendices indicated.

Physical Features. Coos Bay is a typical drowned river valley estuary on the Oregon coast. It is relatively shallow with gently-sloping sides and a well-established deeper channel. During the rise in sea level which produced the estuary there was a great increase in sedimentation which produced the broad expanse of tidal flats and marshes now found. North Spit was formed from sand deposited by "long shore drift" or ocean currents running parallel to the shore.

Tides. Coos Bay tides are mixed semidiurnal. The mean tidal range to mean higher high water is 7.5 feet MLLW at the Coos Bay entrance and 7.3 feet above MLLW at the city of Coos Bay. The highest estimated tide is 10.5 feet MLLW. Extreme low water is estimated to be -3.0 feet MLLW.

Water Quality. Water quality in Coos Bay is generally described as mildly polluted, typical of an industrially-developed estuary. Various chemical constituents have been identified and are of general concern, particularly levels of tributyltin, a contaminant derived from marine paints. Water quality problems are also derived from the shallowness of the bay and low river flow into the bay in summer. Low dissolved oxygen, high temperatures and high coliform and turbidity levels are found at various locations. These problems are most prevalent in Isthmus Slough above RM 12. Turbidity levels temporarily increase during maintenance dredging above RM 12, but return to normal levels soon after the activity stops. Dredging in the upper bay also can bring about a temporary reduction in dissolved oxygen levels.

Sediments. Channel sediments vary from coarse-grained sand materials in the lower channel to finer grained sand and silts in the upper channel above RM 12. Levels of chemical and metal constituents in channel sediments are analyzed periodically in conjunction with maintenance dredging. The channel sediments have consistently been found to be suitable for unconfined in-water disposal under the guidelines established under Section 404 of the Clean Water Act and Section 103 of the MPRSA. Periodic testing, required for permitting of dredging of berthing areas adjacent to the channel, has yielded some higher level of contaminants, however, the levels have been such that the bulk of the sediments have been found to be suitable for in-water disposal. Sampling and testing performed for this study and other related studies are described in the EIS; the results are shown in Appendix D, Sediment Quality.

Hazardous, Toxic and Radioactive Waste (HTRW) Sites. Three existing hazardous waste sites in the vicinity of the project in the upper channel are noted. Two sites (Chevron USA and Chambers Oil) are bulk fuel storage sites with historical onshore fuel spills. The other site (Hillstrom's) is a former ship repair facility with onshore and sediment contamination from sandblasting, painting, and other repair activities. Levels of tributyltin are of concern at this site. Based on sampling data to date and location relative to the channel these sites are not expected to affect ongoing maintenance nor deepening of the channel. The berth at the Hillstrom dock would not be slated for deepening in association with a channel deepening project. It is noted however that in 1991 sediments in the berthing area adjacent to the channel were tested and found to be suitable for in-water disposal. A more detailed discussion of information on these sites may be found in the EIS, paragraph 3.2.f.

Salinity. The salinity regime of the Coos Bay estuary is generally described as a "well mixed" or "vertically homogeneous" system. This system is characterized by relatively thorough mixing of fresh and salt water throughout the water column, caused by the turbulence of tidal action and/or low freshwater flows. This is distinguished from a "stratified" system in which the denser salt water moves up and down the estuary in a "salt wedge." In a study by the Oregon Graduate Center, the water downstream of North Bend is described as typically saline, and freshwater mixing became increasingly important upstream. That study concluded that the estuary is vertically well-mixed for low river flows and only becomes stratified during infrequent high river flows. Refer to the EIS and Appendices E, Salinity Analysis, and H, Salinity Workshop, for more detailed information on salinity.

Biological Resources. A complete description of the flora and fauna biological resources of Coos Bay and offshore disposal sites are described in detail in paragraphs 3.4 and 3.5 of the EIS.

Threatened and Endangered Species. There are 15 Federally listed species, under the administration of NMFS, which may occur in or near the offshore disposal sites. These include gray, fin, humpback, blue, Sei, sperm and right whales; northern (Steller) sea lions; leatherback, loggerhead and green sea turtles; Snake River sockeye salmon, Snake River fall and spring/summer chinook salmon; and Sacramento River winter-run chinook salmon. These species, with the exception of northern sea lions, are not expected to occur in the Coos Bay estuary. They are normally present in offshore waters or occur in limited numbers on a seasonal basis.

Five Federally listed species administered by the U.S. Fish and Wildlife Service (USFWS) occur in the project area: brown pelican, peregrine falcon, bald eagle, western snowy plover and the marbled murrelet. Snowy plovers occur on beaches and upland dredged material disposal sites on Coos Bay North Spit. Brown pelicans forage within the bay and nearshore waters; this species also uses waters of the bay, headlands, beaches, islands, rocks and jetties for loafing. Brown pelicans are present from mid-late spring into the fall. Peregrine falcons may forage in the area, however neither site F nor the rock disposal site are considered significant foraging areas. Peregrine falcons generally occur in the Coos Bay area during spring and fall migration; a few wintering birds may be present. Bald eagles have established nesting territories in the Coos Bay area but occurrence of this species in the lower bay is infrequent.

Cultural Resources. The Coos Bay estuary and region contain extensive evidence of prehistoric occupation. Although only two prehistoric sites have been formally documented, at least nine other sites have been reported along the shoreline of the North Spit (from RMs 1 to 9). In addition, prehistoric sites have been identified on some of the low marshy mudflats and islands within the bay.

There have been 114 documented shipwrecks in the Coos Bay area. The majority of these wrecks occurred along the beaches and at the entrance to Coos Bay. Thirteen vessels wrecked within Coos Bay. Of these, nine vessels sank and were not salvaged and presumably are preserved within the sediments of the bay.

3.2.5 Port Facilities. There are 13 existing deep-draft berths from which ocean going cargo is received and dispatched. One deep draft terminal, Roseburg Timber Products, is located on the north side of the channel at about RM 8, just downstream of the railroad bridge. The remaining major deep draft docks and terminals are located upstream of the bridge on the west side of the channel between RM 11 and 15. The new nickel ore import facility is located at the Pierce Dock. Glenbrook Nickel Company has invested about $36 million in facilities. The installation at the port includes drying, crushing, loading and unloading facilities. The imported ore contains up to 2.3 percent nickel, whereas local ores contain from 1 percent to 1.3 percent. Ore processed at the dock is transported by truck to the company's smelter in Riddle. This is the only nickel smelter in the United States. Earlier test shipments of ore confirmed the compatibility of the imported ore with the existing smelter. Using imported ore will allow doubling of the smelter output.

These berths are listed in table 3-3 and located on figure 4. Of the 13 docks on the channel, 10 are public access docks.

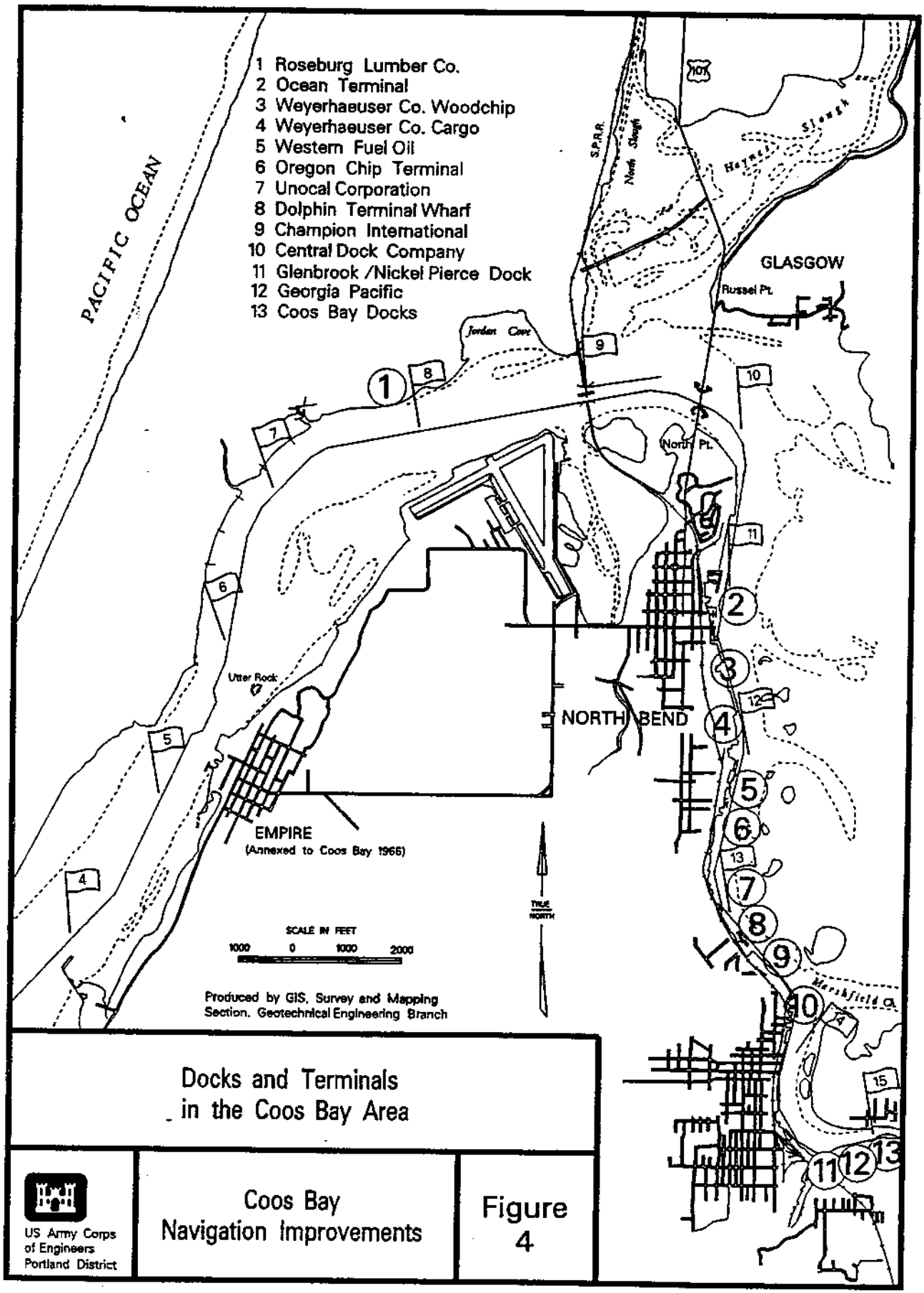
TABLE 3-3.--*Docks and Terminals, Port of Coos Bay*

Name	RM	Length	Width	Depth	Public Access
Roseburg Timber Products	8.0	1,000	100	39	yes
Ocean Terminal	11.5	700	100	38	yes
Weyerhaeuser Co. Wood Chip	11.7	800	100	36	yes
Weyerhaeuser Co. Cargo	12.2	1,400	100	35	yes
Western Fuel Oil	12.5	200	100	24	yes
Oregon Chip Terminal	12.8	1,000	100	36	no
Unocal Corp	13.2	800	100	35	no
Dolphin Terminal Wharf	13.4	700	100	37	yes
Champion Int.	13.6	690	100	35	yes
Central Dock	13.8	690	100	35	yes
Glenbrook Nickel/Pierce Dock	14.7	576	100	37	no
Georgia Pacific	14.8	660	100	36	yes
Coos Bay Docks	15.2	660	100	38	yes

3.3 Deep Draft Commerce

3.3.1 Existing Versus Future Without-Project Overview. The following paragraphs address issues involving existing and future supplies of timber, and their effect on commodities exported from Coos Bay. Timber product commodity projections were based on the analysis of past and future timber supply issues. These projections will be required to compare the without-project and other alternatives. To simplify the analysis, it was assumed that commodity projections would not vary with the alternatives.

3.3.2 Existing Activity. Coos Bay is one of the world's largest shipping ports for forest products. As discussed earlier, the primary commodities are wood chips, logs and lumber. Coos Bay's share of total wood product exports from the Pacific Northwest was about 20 percent for the last 20 years. Table 3-4 presents major commodity movements


1 Roseburg Lumber Co.
2 Ocean Terminal
3 Weyerhaeuser Co. Woodchip
4 Weyerhaeuser Co. Cargo
5 Western Fuel Oil
6 Oregon Chip Terminal
7 Unocal Corporation
8 Dolphin Terminal Wharf
9 Champion International
10 Central Dock Company
11 Glenbrook /Nickel Pierce Dock
12 Georgia Pacific
13 Coos Bay Docks
PACIFIC OCEAN
GLASGOW
Russel Pt.
Jordan Cove
North Pt.
Utter Rock
NORTH BEND
EMPIRE
(Annexed to Coos Bay 1966)
SCALE IN FEET
1000 0 1000 2000
Produced by GIS, Survey and Mapping Section, Geotechnical Engineering Branch
Docks and Terminals in the Coos Bay Area
US Army Corps of Engineers Portland District
Coos Bay Navigation Improvements
Figure 4

for Coos Bay in 1990 and 1991. The data was provided by the Port of Coos Bay. Appendix C, Economic Analysis, also presents data for the years 1976-1989, from the *Waterborne Commerce Statistics of the United States.*

TABLE 3-4.--*Major Commodity Exports 1990 and 1991 (Short Tons)*

Commodity	1990	1991
Wood chips	2,988,000	3,233,000
Logs	1,136,000	805,000
Lumber	522,000	462,000
Plywood	64,000	57,000
Paper products	19,000	75,000
TOTAL	4,729,000	4,633,000

In 1988, records indicate that 333 deep draft vessels transited the channel exporting timber products or importing petroleum. The numbers and percentages by commodity group are shown in table 3-5.

TABLE 3-5.--*Vessel Transits by Commodity in 1988*

Commodity	Number	Percentage
Wood chips	95	29%
Logs	91	27%
Lumber, Paper, Plywood	135	41%
Petroleum	12	4%
TOTAL	333	100%

To date exports have been much more significant than imports. Further, petroleum tankers have been relatively small; 12 in 1988 drafted between 21 feet and 28 feet, and 10 in 1989 drafted between 20 feet and 25 feet. There have been deeper drafts in the past, but tanker traffic is not expected to be constrained by existing channel depths. The existing channel depth is a factor with respect to the new imports of nickel ore, however.

3.3.3 Timber Supplies. The region's future timber supply is significant in developing the without-project condition and evaluating alternatives for improvements to the project. A number of sources and reports were reviewed to analyze the timber supply situation and develop commodity projections for the port.

Environmental and political issues involving old growth forests, listing of the Northern Spotted Owl as a threatened species and bans on log exports are very complex. A detailed discussion and analysis of those issues and anticipated impacts on exports from Coos Bay is presented in the Economic Analysis appendix. Data on timber supply issues, future domestic and foreign demand for timber products and the effects on exports from Coos Bay were collected from a number of sources. These include the report, *A Conservation Strategy for the Northern Spotted Owl* (the Jack Ward Thomas Report), by the Interagency Scientific Committee To Address the Conservation of the Northern Spotted Owl; the U.S. Forest Service (USFS); the Bureau of Land Management (BLM); the World Forestry Institute; the Oregon Economic Development Department; and the Office of Economic Analysis of the State of Oregon.

It is anticipated that setting aside old growth forest reserves for the spotted owl would result in a decline in supply of timber from public lands in the region. Several of the sources project that increases in lumber and finished product exports would partially offset reductions in log exports due to log embargoes and Spotted Owl timber set-asides.

3.3.4 Timber Commodity Projections. Overseas demand for timber products is expected to grow. The Pacific Northwest region competes with the southern United States and Canada for export of these products. Based on the collective information from the sources identified above, it is assumed that the price for regional products will remain competitive and that long-run market forces will prevent a dramatic change in the region's share of the export market. The Port of Coos Bay is expected to retain its

competitive position relative to other forest product exporting ports in the Pacific Northwest, as impacts of timber supply will be similar throughout the region.

After thorough review of all data available, the basic commodity projections were developed through discussions with USFS personnel. The USFS expert assessment projects that wood chip exports should remain relatively constant from 1996 to 2046, the economic period of analysis, with log exports declining by about 4 percent over the same period. For lumber products, the USFS projected a growth of about 10 percent over 50 years.

These trends were modified in the economic analysis in that the projections were considered reliable for the first 20 years to 2016. For the next 30 years, commodity exports were assumed to remain at their 2016 level. The timber commodity projections are summarized in table 3-6. Also, because of the current uncertainties with regard to timber supply issues and the effects on commodity exports from Coos Bay, a risk and uncertainty analysis and tests of the sensitivities of the projections were conducted. These analyses are summarized at the end of Section 4 and discussed in detail in the Economic Analysis Appendix.

TABLE 3-6.--*Timber Commodity Projections (metric tons)*

Commodity Exported	1985-89 Average Exports	USFS Projection to 2016
Wood Chips	2,538,200	2,538,200
Logs	1,155,000	1,131,400
Lumber, Paper and Plywood	368,100	385,000

3.4 Deep-Draft Fleet

3.4.1 Historical Trend. Response to the previous channel improvements in 1979, Coos Bay has seen an increase in the operating drafts of vessels calling at the port. This trend is evident in table 3-7 which shows the percentage of dry cargo vessels outbound from Coos Bay with drafts 33 feet or greater between 1976 and 1988. This increase

reflects the response to the deepened channel and a general trend toward more efficient, larger, and deeper-draft vessels to reduce transportation costs.

TABLE 3-7.--*Vessels Outbound from Coos Bay with Drafts 33 Feet or Greater*

Year	Number	Total Traffic	% of Total
1976	4	353	1
1977	2	316	1
1978	6	289	2
1979	53	321	16
1980	84	310	27
1981	52	269	19
1982	124	282	44
1983	96	267	36
1984	68	260	26
1985	112	259	43
1986	106	275	38
1987	101	287	35
1988	111	333	33

3.4.2 Current Operating Practices. Deep draft vessels are moved into and out of the Coos Bay project by five licensed pilots, members of the Coos Bay Pilots Association. All deep draft vessel movements into and through the Federal navigation project are the responsibility of the members of this association. The following information on operating practices has been developed primarily through discussions with them.

Historically, deep draft vessel traffic entering Coos Bay mostly consisted of empty or partially loaded cargo vessels and loaded tankers. The tanker vessels comprise a small fraction of the vessels and generally are relatively smaller in size and draft, and are not of concern with regard to deepening the project. The recent new imports of nickel ore is, however, a factor with regard to incoming vessel dimensions and drafts.

Outbound Transits. The outbound transit is the most demanding of the vessel movements on the project. The railroad bridge at RM 9 is particularly difficult to negotiate. The pilots plan outbound departures to reach the entrance bar by high-water slack tide. The departure on a rising flood tide provides a margin of safety from grounding should there be any delays or problems with the transit and provides a safer bar crossing for the vessel and its accompanying pilot boat. The incoming currents provide for steerage to maintain alignments through the turns in the upper channel, and

particularly through the bridges. Continuous turning maneuvers are used while approaching these structures. First, the vessel must be aligned for passing under the center of the highway bridge in the middle of the North Bend turn (see Plate 5). Then it must be aligned for passage through the narrow opening of the railroad bridge while completing the turn. Because of the turns and lower speeds required in the upper channel above the bridges, two tugs assist in all movements there, including turning and berthing. Under adverse conditions additional tugs are sometimes employed. At the very least, the pilots pass through the railroad bridge before the high water slack to avoid the reduced steerage while navigating through the bridges which would occur with an ebbing current.

Transit times for departing vessels average about 1 1/2 hours to 2 hours. This includes about 3/4 hour to 1 hour to reach the railroad bridge and another 3/4 hour to 1 hour in the lower channel to reach the entrance. As described in more detail in Section 4, vessels are normally turned upon arrival to avoid delays in the outbound transit. Transit speeds in the upper channel are about 5 1/2 knots to 7 knots, except when passing moored vessels, when speeds are reduced to 2 knots to 2 1/2 knots. In the lower channel, vessels travel at 9 knots to 11 knots. Another important factor affecting operating practices is the relative timing of the tides between the entrance and the upper channel. The average tidal variation is 7.5 feet. Tides in the upper river lag the entrance tides by about 1 1/2 hours. The departure window, transit time, tidal variation and lag combine to result in a typical maximum "useable" tide variation of about 4 feet for vessel departures.

Coos Bay pilots generally require about 3 feet of underkeel clearance at the dock for departure. The pilots indicate that conditions such as weather and pilot judgement may call for variances from this general "rule" on a case-by-case basis, which would be decided at the time of departure.

Inbound Transits. The inbound passage is less difficult, though the draft of the vessel and tides are a factor. It is estimated that annually about 25 incoming vessels are partially loaded to a draft where tides are used to provide adequate underkeel clearance. With projected nickel ore imports, this number would increase to about 50. Inbound vessels loaded to a deeper draft incur a greater risk during an ebbing tide if there are delays. Pilots will bring deeper draft vessels in with the tide and follow the

high water into the upper channel. The inbound approach to the railroad bridge is on a long tangent, so establishing and maintaining alignment for inbound passage through that structure presents no special concerns.

Railroad Bridge. Passing through the railroad bridge can be difficult for larger vessels and for all vessels during adverse weather conditions. The pilots' primary concern is visibility. Adverse weather conditions and the superstructure on some larger vessels can obscure the view for aligning and passing through the bridge. These factors can delay otherwise routine arrival and departures. This happens most often with larger wood chip vessels calling at Coos Bay. Visibility concerns in passing through the bridge preclude nighttime passage for some of these vessels. With the variation in the tidal cycles, these factors can cause varying amounts of delay. A notification by the pilots to shippers, dated March 9, 1990, regarding this condition is included in Appendix I, Correspondence.

Turning Basins. There are two authorized turning basins at the project. The larger, located at RM 12, is maintained to dimensions of 800 feet by 1,000 feet and the other, at RM 14.6 near the head of the project, is maintained to 730 feet by 1,000 feet.

The most common and advantageous operation is to turn inbound vessels facing outbound before docking. There are two predominant reasons. The first is a physical requirement; many of the dock facilities in the upper channel are designed for port-side berthing and loading. This is usually the situation for wood chip terminals as it is for the new nickel ore facility. The other factor is that, of the two transits, departure is the most critical with respect to the time available as discussed previously. The pilots prefer to have as much time available for the outbound transit as possible. About 1/2 hour is required to turn a vessel. Therefore, vessels are most often turned prior to docking.

As discussed in more detail in the Engineering Analysis appendix, while turning upon arrival is preferred, an estimated 40 to 50 vessels per year are turned after loading.

The turning basin to be used is dictated by proximity to the destination dock and size of the vessel. For all but the largest vessels, the breakpoint for use of a turning basin is generally at Dolphin Terminal, RM 13.4. Below that point vessels would use the lower

turning basin. About 60 percent of the vessels call at docks below that point. The upper basin would be used for docks above that point unless a vessel is too large, though the pilots report they have turned vessels of up to 700 feet in length in the upper basin.

3.5 Problems and Opportunities

3.5.1 Transportation Efficiencies. The Coos Bay navigation project channel depths limit the actual drafts of vessels that use the project to about 36 feet. Table 3-7 shows that the draft of the vessels in the fleet calling on Coos Bay has increased and that the channel depth is a constraint. Deepening and other improvements to the navigation channel at Coos Bay could enable larger, more efficient vessels to call on the Port and vessels to load closer to design drafts. Transportation of more commodities on larger vessels could reduce costs per unit of product delivered.

3.5.2 Delays. Delays for tides to provide underkeel clearances are necessary when the drafts of vessels are deeper than 32 feet. The pilots generally must delay transit until tidal conditions provide at least 3 feet of underkeel clearance, depending on vessel characteristics. In 1980, after the previous deepening, 84 vessels, 27 percent of the fleet calling on Coos Bay, had drafts of 33 feet or greater. In 1988, there were 111 such vessels, representing 33 percent of the fleet. The length of delay depends on the draft, the tides, and timing. Delays also are encountered due to the Southern Pacific Railroad bridge, as discussed in paragraph 1.5.2.

3.5.3 Disposal of Dredged Materials. As discussed in paragraph 3.2.3, permanent ocean disposal areas must be established for continued existing project maintenance, as well as for the alternatives developed in this study. There is an opportunity to consider beneficial uses of dredged material.

3.6 Formulation of Alternatives

The following alternatives were considered to address the problems and opportunities identified at Coos Bay. The alternatives are evaluated in accordance with Corps of Engineers criteria established by regulation.

3.6.1 Without-Project Condition. The without-project condition assumes no change to the existing Federal navigation project, which would remain at 35 feet deep for the inner channel and at 45 feet over the entrance. The without-project condition is used to evaluate the benefits which would result from other alternatives.

3.6.2 Channel Modifications at Railroad Bridge. As discussed in the reconnaissance report, the approach and passage through the Southern Pacific Transportation Company railroad bridge at RM 9 is hazardous and causes delays due to its restricted horizontal clearance of 197 feet. The reconnaissance study concluded, however, that replacing the bridge was not feasible.

Approaches to the railroad bridge were considered. Both inbound and outbound vessels are affected by tidal currents in approaching this bridge, particularly in the reach between it and the highway bridge below RM 10. Because of the relative proximity of the two bridges and the limitations of each with regard to clearances, there would be little opportunity for any meaningful realignment of the channel to improve the current condition. Off-channel underwater groins could potentially help with the adverse currents.

In spite of the hazards, there is no record of accidents involving deep draft vessels at the bridge. The Coos Bay Pilots, as the only pilots' organization on the bay moving all of the vessels that call on the port, have established the special procedures necessary to navigate this reach. The pilots do not anticipate any benefit from modifications. Another factor is the age and condition of the railroad bridge structure. The bridge will require reconditioning or replacement in the near future, though a time frame cannot be firmly established.

3.6.3 Nonstructural Alternatives. The most reasonable nonstructural alternative would be to maximize vessel loads and drafts through timing of vessel movements to coincide with optimum tidal conditions. Such a program, called "Loadmax," was developed for the Columbia River. The system employs a network of tidal gauges and tidal data to produce a precise schedule for transiting critical points in the 100-mile-plus channel to arrive at the entrance at desired slack tides. This automated system would not be warranted for only a 15-mile channel where the pilots already employ such a system using tide tables.

Use of additional tug assist is a potential alternative to increasing channel dimensions.

No other nonstructural alternatives were identified which would reasonably address the problems identified for this study.

3.6.4 Channel Deepening. All deepening alternatives would require investigations pursuant to designation and use of additional ocean disposal areas. All deepening alternatives also would consider requirements for other modifications to the existing channel dimensions and alignment.

Alternative 1. This alternative would increase the authorized entrance depth to taper from 46 feet deep (oceanward) to 36 feet deep at RM 1, and increase the authorized channel depth to 36 feet from RM 1 to RM 15.

Alternative 2. This alternative would increase the authorized entrance depth to taper from 47 feet deep (oceanward) to 37 feet deep at RM 1, and increase the authorized channel depth to 37 feet from RM 1 to RM 15.

Alternative 3. This alternative would increase the authorized entrance depth to taper from 48 feet deep (oceanward) to 38 feet deep at RM 1, and increase the authorized channel depth to 38 feet from RM 1 to RM 15.

Alternative 4. This alternative would increase the authorized entrance depth to taper from 49 feet deep (oceanward) to 39 feet deep at RM 1, and increase the authorized channel depth to 39 feet from RM 1 to RM 15.

Alternative 5. This alternative would increase the authorized entrance depth to taper from 50 feet deep (oceanward) to 40 feet deep at RM 1, and increase the authorized channel depth to 40 feet from RM 1 to RM 15.

3.6.5 Staged Construction. Staged construction of the 3-foot, 4-foot and 5-foot deepening alternatives was considered in response to a recommendation by the USFWS out of concern for salinity intrusion. The recommendation called for a 1 foot deepening every 5 years, with an evaluation of the effects. The difficulties inherent in excavating 1

foot of rock at a time, such as additional costs for mobilization and demobilization, larger contingencies and interest during construction costs, institutional difficulties with negotiation of local cost sharing agreements and provision of non-Federal funding, would make such a plan infeasible as it would be extremely impractical to implement. Also, the staged construction for the deeper alternatives would adversely impact the environment because each increment of dredging would re-disturb benthic organisms and habitat that had reestablished following the previous deepening. Staged construction was not favored by the sponsor and was not considered further.

3.7 Beneficial Use of Dredged Material

Beneficial uses of dredged material were considered for several purposes, but not included in any specific alternatives at this time, for the reasons indicated in subsections 3.7.1, 3.7.2 and 3.7.3.

3.7.1 Beach Nourishment. This has not been pursued under this study because, as indicated in the previous discussion on existing conditions, a need has not been identified. This, however, would be one of the potential effects of disposal in a nearshore berm or shallow water site, which is an alternative in the ocean disposal site designation process.

3.7.2 Artificial (Rock) Reef Creation. There is no perceived need for additional rock reef habitat in the area. In addition, the sandstone rock to be excavated would not be suitable for this purpose because it would be expected to weather rapidly.

3.7.3 Western Snowy Plover Habitat Development. Portland District, in conjunction with the resource agencies and potential local sponsors, is developing a environmental restoration proposal under authority of Section 1135 Water Resources Development Act (WRDA) of 1986 for using dredged material to develop nesting habitat on Coos Bay North Spit for the endangered western snowy plover. The North Spit location can be seen on figure 1. Through coordination of dredging actions (i.e., Section 1135 and channel deepening), substantial use of both new and existing project maintenance materials could be made to develop the habitat. This option was not included in the alternatives because of the added costs to mobilize additional pipeline

dredge equipment. This disposal option will be further considered for ongoing maintenance dredging.

4. COMPARISON OF ALTERNATIVES

4.1 Design Considerations

Each of the alternatives have been examined to establish design requirements to accommodate vessel traffic associated with each increment of deepening, construction methods and quantities, and maintenance requirements. Comparative cost estimates were then derived to be used in conjunction with the benefits for each alternative in evaluating the feasibility of making improvements to the existing project. Since release of the draft report, a Global Positioning Survey (GPS) study has been completed. The study was conducted by the Corps' Waterways Experiment Station (WES). The intent of the study was to verify conclusions herein, and to ascertain whether there were any navigation problems for which ship simulator studies should be conducted. The GPS summary report is provided at Appendix K. See Section 5, The Preferred Plan, for discussion of the GPS results.

4.1.1 Design Vessel. As indicated, the Coos Bay Pilots' general operating rule is to require 3 feet of underkeel clearance for a channel transit. For the existing 35-foot channel and a useable tide of 4 feet, a practical limit on departure drafts at the dock would therefore be 36 feet. Pilot information and historical data presented in the Economics Analysis appendix supports 36 feet as a practical limit on operating drafts under existing conditions. The data shows that vessel departures at a draft of 37 feet have occurred, but only rarely. On at least one of those occasions, when a vessel was loaded to 37 feet, pilots reported a delay of several days while awaiting conditions for a safe departure. Departure drafts in excess of 37 feet have not been recorded.

Economic Guidance Memorandum 93-4 was consulted to obtain representative vessel dimensions to be considered for design of the alternatives between the existing 35-foot project and the maximum 40-foot depth. This representative vessel was then compared to existing vessels calling on Coos Bay. Based on data in this document and for the existing project condition, a representative 40,000-dead-weight-ton (DWT) bulk carrier drafting 36 feet would be 612 feet long with a beam of 88 feet. A representative 50,000 DWT bulk carrier drafting 40.2 feet would be 680 feet long and have a beam of 99 feet.

Wood chip vessels calling at Coos Bay are typically specially designed for this commodity and represent the largest vessels in horizontal dimensions calling on Coos Bay. Twenty-one of the 26 wood chip carriers calling in 1988 for which length data was available ranged in length from 640 feet to 675 feet. Only one vessel was longer at 736 feet. The majority of the wood chip vessel beams ranged from 96 feet to 106 feet (14 of 18 for which data was available). Only one vessel was broader at 115 feet.

The design dimensions selected for channel design are based on consideration of the representative bulk carriers from Memorandum 93-4 and the representative wood chip vessels calling at Coos Bay, as follows;

Draft------ Channel depth plus 1-foot (see discussion below)
Length----- 680 feet
Beam------- 106 feet

The likely response to a deeper channel would be to increase vessel drafts, accordingly. Therefore, the existing 3-foot clearance operating rule of the pilots has been used in the analysis of alternatives in accordance with guidance of ER 1105-2-100, *Guidance for Conducting Civil Works Planning Studies*. Based on the tides and operating practices at Coos Bay, the following typical maximum operating drafts for channel design result.

TABLE 4-1.--*Typical Maximum Operating Drafts for Channel Design*

	W/O Proj.	1	2	3	4	5
Channel Depth, ft., MLLW	35	36	37	38	39	40
Typ. Max. Useable Tide, ft.	+4	+4	+4	+4	+4	+4
Avail. Max. Total Depth	39	40	41	42	43	44
Less Underkeel Requirement	-3	-3	-3	-3	-3	-3
Typ. Max. Operating Draft	36	37	38	39	40	41

4.1.2 Channel Design. During the last several years, about 300 deep draft vessels have used the channel annually. This number is not expected to increase over the life of the project to a point where there would be a general need to design for two-way deep draft
traffic.

Channel Depth. Channel depth requirements are based on the established operating practices, the useable tides for transiting, and the general 3-foot "at dock" rule of the Coos Bay pilots. Each succeeding alternative channel depth will provide for a typical maximum operating draft 1 foot deeper than the corresponding channel depth (see Appendix B, Engineering Analysis). At typical transit speeds, the 3-foot underkeel clearance at the dock (including any vessel trim) would provide about 1.5 feet for squat and 1.5 feet for safety clearance. In rock areas, the channel will be dredged an additional 2 feet to provide about 3.5 feet of safety clearance. The entrance depth requirement for each plan will be 10 feet deeper than the inner channel based on the existing condition.

The currently authorized advance maintenance program is described in subsection 3.2.2 and discussed in detail in Appendix B, Engineering Analysis, subsection 2.2. This program is assumed for each of the alternatives, because shoaling patterns are anticipated to be similar and the same considerations would apply.

Lower Channel Width and Alignment. The entrance channel was 900 feet wide before the 1978 deepening project. The existing entrance channel was then reduced to 700 feet wide at the outer bar and transitions to 300 feet wide at Guano Rock. This design was based on the sea, wave, tidal current and wind conditions and vessel characteristics, with input from the Coos Bay pilots. Even with the trend toward larger vessels, the pilots indicate that the existing width of the entrance channel is sufficient.

The lower channel to RM 9 is nominally 300 feet wide, but it varies considerably because of the use of wideners at bends. The pilots are satisfied with the existing width of the lower channel and do not recommend any changes. Results of GPS studies are discussed in Section 5, The Selected Plan.

Upper Channel Width and Alignment. The channel above the railroad bridge, RM 9 to RM 15, is nominally 400 feet wide. There are six major bends in the upper channel including the turn above the highway bridge and two turns which also involve turning basins. The straight reaches of the channel above the bridges were widened to 400 feet as part of the most recent channel modification project authorized by the River and Harbors Act of 1970. Wideners at turns in the upper channel were also increased, as were the width of berthing areas between the channel and harbor lines. A complete discussion of design considerations for the upper channel width is contained in Appendix B, Engineering Analysis, subsection 3.3.2. A summary of the conclusions is contained in Section 5, The Selected Plan. The alternative deepening plans have been developed assuming no change to the existing width.

4.1.3 Turning Basins. Reference is made to the previous discussion of turning practices in subsection 3.4.2 and the analysis of turning basin dimensions in the Engineering Analysis Appendix, section 4.1.

The pilots indicate that there have been little difficulties in operating within the existing turning basins and there have been no accidents associated with turning maneuvers. About 1/2 hour is required to turn a vessel. This includes the time for slowing the vessel in the channel, positioning the tugs as the vessel approaches the turning basin and the time to execute the turn. The pilots report that the turn itself requires about 10 minutes. During the GPS study, one of the vessels was monitored while executing a turn in the lower turning basin. The actual time recorded for the turning maneuver was 7 minutes. If only one turning basin were to be widened, the pilots indicate preference for the lower turning basin, as it is most used and the basin closer to the docks for the majority of the larger (wood chip) vessels.

Based on EM guidance, a turning basin of 1.5 to 2 times vessel length was prescribed. The revised draft EM indicates 1.2 to 1.5 times vessel length. For the design vessel, this would indicate a turning basin width of 800 to 1,000 feet. As reported in the Engineering Analysis appendix, in considering the costs, widening at RM 12 to 1,000 feet does not appear to be justified based on the limited opportunity to save time in turning in turning. Also, there would be no cost savings for tug assistance because this service would continue to be used for general operations in the upper channel. Further, additional tugs could be employed to assist with the larger vessels at a lower equivalent

annual cost than widening to 1,000 feet. Widening beyond about 900 feet also would encroach into biologically productive shallow tidal and intertidal habitat which is zoned as a "Natural Aquatic" area in the Coos Bay Estuary Plan. This would raise significant environmental concerns as discussed in the EIS.

Widening of the turning basin from 800 to 900 feet was evaluated in consideration of tidal current conditions, as recommended in the revised draft EM, and to provide an added margin of safety for turning the larger vessels. Widening to this dimension could be accomplished with only minor environmental impacts. This would provide a width 1.3 times the length of the design vessel, within the range of the revised guidance. Widening the lower turning basin to 900 feet appears to be feasible.

The upper turning basin is located in a very confined area (see Plate 7). Expansion of the turning basin would extend into upland areas, potentially impacting existing dock and storage yards, as well as other improvements. Expanding this basin in addition to the lower basin is not required as larger vessels can be turned in the lower basin as discussed in the Engineering appendix, and therefore is not justified.

Consideration of the appropriate depth for the additional width of turning basins beyond channel lines is discussed in the Engineering Analysis appendix, paragraph 4.1.3. The revised draft EM indicates that normally turning basin depths should be the same as the channel depths. Costs to deepen the full width of the turning basins are minimal and there would be no long-term maintenance cost savings. In consideration of the costs, turning and docking practices, and the number of loaded vessels arriving at the port, deepening turning basins to the same depth as the channel is justified.

4.1.4 Anchorages. As indicated in paragraph 3.2.1, anchorage modifications will not be studied under this feasibility study.

4.1.5 Dredging Quantities. Deepening would extend 1 feet, 2 feet, 3 feet, 4 feet and 5 feet respectively for each alternative below the overdepth prism of the existing channel through each reach. Figure 5 depicts dredging quantities for each alternative. Total material to be removed for each alternative was derived from fathometry (condition) surveys conducted during 1991 and are described in Appendix B, Engineering Analysis. Quantities for each of the alternatives were derived by deducting the without-

Common & Rock Dredging Quantities For Alternative Plans

PLAN	CHANNEL DEPTH (-MLLW)		ENTRANCE & TRANSITION	R.M. 1-10 COMMON *ROCK*	R.M. 12-10	R.M. 12-15	TOTAL COMMON QUANTITIES
	Entrance	Inner Channel					
Without Project	45	35					
1	46	36	81,500	133,500 *32,000*	44,500	367,100	626,600
2	47	37	182,400	367,600 *90,000*	131,100	684,100	1,365,200
3	48	38	316,000	661,600 *242,000*	264,500	1,012,400	2,254,500
4	49	39	480,700	1,004,100 *450,000*	425,700	1,353,300	3,263,800
5	50	40	674,100	1,351,400 *749,000*	600,400	1,704,600	4,330,500

NOTE: Common quantities for R.M. 1-10 do not include rock
All quantities are in cubic yards and includes allowable overdepth
RM 12-15 quantities include widening of the RM12 Turning Basin

CHANNEL
DEEPENING QUANTITIES

US Army Corps of Engineers Portland District

Coos Bay
Navigation Improvements

Figure 5

project (maintenance) quantity from the respective deepening prism. Turning basin widening quantities are in addition to the quantities derived from the surveys and are included in the figure 5 totals.

All alternatives involve deepening of the existing project within the existing horizontal dimensions plus widening the turning basin by 100 feet, as described earlier and depicted on plates 1 through 7. Channel side slopes are assumed to be 1 vertical on 3 horizontal, except for rock excavation where slopes would be essentially vertical.

4.1.6 Rock Quantities. Rock quantities were developed from estimates of the existing top-of-rock through comparison of rock probe data obtained prior to the deepening of the existing project, post-construction surveys from that project, and a series of recent fathometer surveys. Rock is found within channel excavation depths between about RM 1 and RM 6. All rock excavation would be performed to a required depth of 2 feet below the respective channel depths for each alternative. Rock quantities also are shown on figure 5. This would provide an additional 1-foot margin of safety for underkeel clearances in the rock areas and is necessary to assure the ability to maintain the new channel. An assumption of an average 1-foot of dredging tolerance for the rock excavation is assumed based on the material qualities, assumed mechanical excavation methods, and the previous deepening experience (see Appendix B, Engineering Analysis).

For each alternative, all common and rock quantities are assumed to be deposited in the ocean (see Section 5, subsection 5.2 for a discussion of disposal site designation).

4.1.7 Right-of-Way, Relocations. No additional right-of-way is anticipated for construction or operation of any of the alternative plans. All dredged material would be disposed at existing or new ocean disposal sites. A sub-marine cable crossing was identified near RM 5.5 (see plate 3). The reconnaissance study concluded that the cable would not be impacted by the deepening alternatives. Buried U.S. Coast Guard cable and Navy sewer pipes, both abandoned, were identified in the crossing. There are four cables buried at RM 9. They are owned by Southern Pacific Transportation Company, Western Union and Cen-Lincoln Public Utilities District. These cables were relocated to -45 feet MLLW during the previous deepening of the existing project. This is 3 feet

below the overdepth elevation for Alternative 5, the deepest alternative, and therefore the cables will not require relocation.

4.1.8 Increased Annual Maintenance. Analysis supporting the estimate of increased annual maintenance quantities due to the deepening is presented in Appendix B, Engineering Analysis. It is based on the maintenance history before and after the previous channel deepening considering shoaling sources and changes in maintenance practices. The analysis included comparison of 3-year average maintenance quantities and review of channel cross-sections before and after the previous deepening project.

No permanent change in maintenance requirements or quantities is projected as a result of the deepening alternatives. An initial increase in maintenance quantities is projected due to slope adjustments in the sand materials of the lower channel. The increased quantities will gradually reduce over time approaching the without-project maintenance condition. Table 4-2 shows the increased average first 3-year maintenance quantities for each alternative under this assumption. The curve displayed at figure B-2 in the Engineering Analysis appendix was used to project the decline in increased maintenance quantities over time for each alternative as side slopes stabilize.

TABLE 4-2.--*Maintenance Quantities Due to Deepening (cy)*

Alternative	First 3-Year Ave.	Total
1	60,800	454,000
2	121,700	907,000
3	182,500	1,361,000
4	243,400	1,814,000
5	304,200	2,268,000

4.1.9 Associated Improvements. The sponsor conducted surveys of existing dock owners to provide data for required improvements associated with the deepening alternatives. Improvements primarily involve deepening the adjacent berths consistent with the respective deepening alternative. At the Weyerhaeuser cargo dock, the owner reported a need for structural improvements at an estimated cost of $65,000. This information was assumed to be applicable to all alternatives. Other owners did not

report a need for structural improvements. Dredging quantities for the associated improvements are shown in table 4-3.

TABLE 4-3.--*Associated Dredging Requirements*

Alternative	Depth	Quantity (cy)
W/O Proj	35	-
1	36	15,700
2	37	31,300
3	38	47,000
4	39	62,800
5	40	78,400

4.2 Project Costs

4.2.1 Construction Cost Estimates. A baseline cost estimate has been prepared based on the selected alternative discussed in the following section. Information and unit costs developed in that effort are based on October 1993 price levels and have been used in the comparative cost estimates for each alternative plan. The barge mounted backhoe "Oski" was used to excavate rock in the previous deepening project for the existing channel. Unit costs for rock excavation were developed using information on production rates from that project for this study and through discussions with the contractor. It is anticipated that other equipment could be used for the mechanical excavation. Blasting was considered earlier in the study, but is not expected to be necessary based on the previous experience and would have a much higher unit cost. Blasting also would be opposed by environmental agencies, particularly where an alternative method is feasible. Detailed cost estimates for each of the alternatives are attached at the end of the Engineering Analysis appendix. Table 4-4 is a summary of the construction cost data from those tables, including contingencies. Dredging costs in this table refer to removal of all sand and silt materials.

TABLE 4-4.--*Construction Cost Summary* (October 1993 price level)

Alt.	Depth*	Mob/Demob Cost	Rock Exc Cost	Dredging Cost	Associated Cost	Total Const Cost
1	46/36	$1,177,400	$2,687,300	$1,521,500	$42,500	$5,428,700
2	47/37	$1,177,400	$7,557,800	$3,265,400	$162,900	$12,163,500
3	48/38	$1,537,200	$20,322,000	$5,342,500	$205,500	$27,407,200
4	49/39	$1,896,000	$37,788,800	$7,679,600	$248,300	$47,612,700
5	50/40	$3,840,000	$62,897,300	$10,132,700	$290,700	$77,160,700

* entrance/inner channel depth in feet below MLLW, typical for all tables

4.2.2 Project and Investment Costs. Total project costs include the construction costs above, as well as engineering and design (E&D), and supervision and administration (S&A). E&D and S&A costs for each alternative are shown on the detailed estimates in the Engineering Analysis appendix. The total investment cost for each alternative, which also includes interest during construction (IDC) is shown in table 4-5. The construction period is 6 months for Alternative 1, 10 months for Alternative 2, 22 months for Alternative 3, and 34 months for Alternatives 4 and 5. Production rates for the rock excavation are the critical factor in the duration of these construction periods. For Alternative 5, mobilization of additional rock excavation equipment is assumed to reduce the required construction period. As would be expected for alternatives of this nature, the differences in quantities are the factors that distinguish the alternatives. In this case, the differences in rock quantities and the high unit costs to remove the rock are critical to the differences between the alternatives. The rock quantities significantly impact the construction schedules, and thus the IDC cost for each of the alternatives as well.

TABLE 4-5.--*Total Investment Costs* (October 1993 price level)

Alt	Depth	Total Project Cost	IDC	Total Investment Cost
1	46/36	$6,542,700	$113,500	$6,656,200
2	47/37	$13,697,900	$441,500	$14,139,400
3	48/38	$30,107,200	$2,276,300	$32,383,500
4	49/39	$51,661,700	$6,314,000	$57,975,700
5	50/40	$82,623,000	$10,098,000	$92,721,000

4.2.3 Maintenance Costs. The cost for increased maintenance for each alternative must be derived from converting the initial maintenance quantities following deepening, as described above, to an equivalent annual cost over 50 years. A unit cost of $2.20 per cubic yard was used, based on weighted averages for dredging operations in 1991 and 1992. The resulting annual maintenance costs for each alternative is shown in table 4-6.

TABLE 4-6.--*Increase in Maintenance Cost Over the Without-Project Condition*

Alt.	Depth	Annual Maintenance Cost
1	46/36	$54,900
2	47/37	$109,800
3	48/38	$164,700
4	49/39	$219,600
5	50/40	$274,500

4.2.4 Annual Costs. Table 4-7 summarizes the estimated investment costs (total project costs plus IDC), the average annual construction cost, increased maintenance cost and total annual cost for each alternative evaluated. Costs were estimated at October 1993 price levels and amortized for a project life of 50 years at a current Federal interest rate of 8.25 percent.

TABLE 4-7.--*Cost of Alternative Improvements (Oct 93 price level, 8.25 percent interest)*

Alt.	Investment Cost	Annual Cost	Maint Cost	Total Annual Cost
1	$6,656,200	$559,800	$54,900	$614,700
2	$14,139,400	$1,189,100	$109,800	$1,298,900
3	$32,383,500	$2,723,400	$164,700	$2,888,100
4	$57,975,700	$4,875,600	$219,600	$5,095,200
5	$92,721,000	$7,797,600	$274,500	$8,072,100

4.3 Comparative Environmental Effects

The environmental impacts of the alternative plans are similar, as the nature of the construction and operation activities under each alternative are the same, only varying in degree and duration. Physically, each successively deeper alternative would involve disturbing more sideslope area beyond existing channel cutlines. Once the slopes stabilize, sedimentation and maintenance dredging for the alternative plans would all be similar and not unlike the without-project condition.

Each alternative would involve disposal of a successively greater amount of dredged material, thereby creating a one-time immediate impact over more area than is disturbed by the disposal activity under existing and future project maintenance dredging. Based on the average annual maintenance dredging volumes, this would amount to an increase in disposal volumes of 30 percent to 250 percent, between Alternative 1 and Alternative 5 during the year of initial construction. The deeper alternatives would be constructed over several dredging seasons, so the extent of disposal site impacts during any given year would not be as great as would be the case if it were all dredged in one season. A relatively small short-term increase in maintenance dredging material also is predicted for each alternative.

4.3.1 Water Quality. Dredging of the new channel and disposal of the materials, would cause temporary turbidity problems and re-suspension of silty organic materials above RM 12 in the estuary and at ocean disposal sites of increasingly longer duration for each successively deeper alternative.

4.3.2 Sediment Quality. Sediment quality evaluations indicate that no unacceptable environmental impacts from dredging and disposal for the alternative plans due to sediment contamination is expected. All sediments would be suitable for unconfined in-water disposal. Analysis of materials in berthing areas indicate that while some areas contain higher levels of contamination, the bulk of the material is also suitable for unconfined in-water disposal.

4.3.3 Salinity. A slight to moderate increase in salinity intrusion and estuarine salinity would be expected, depending on the alternative. The mixing zone could move further upriver for each successively deeper alternative. For the maximum 5-foot deepening alternative, however, increases in salinity upriver are predicted to be negligible based on the modeling studies. For details, see the EIS following this main report, Appendices E, Oregon Graduate Center Salinity Analysis, and H, Salinity Workshop.

4.3.4 Biological Impacts. Temporary water quality impacts on organisms would involve a greater duration for each successive level of deepening. A greater amount of benthic organisms and habitat for benthic and epibenthic organisms would be impacted by the construction of each successively deeper alternative as side slopes are disturbed. With stabilization of side slopes, communities will reestablish. Upriver salinity changes are predicted to be negligible and fresh water organisms would not be impacted.

Each successively deeper alternative would generate more disposal quantities. Disposal at offshore sites, therefore, would cover more previously undisturbed benthic organisms during the deepening activity. Most species would be expected to recolonize the area after the disposal activity was completed.

None of the proposed project alternatives are likely to adversely impact a Federally listed threatened or endangered species.

4.4 Benefits Analysis

4.4.1 Overview. Commodity and fleet projections were developed and combined with vessel operating costs to compare the without-project condition and the alternative plans beginning in 1996 and 50 years thereafter. For the without-project condition and each alternative plan, a projected distribution of tonnage of each commodity by operating draft is

developed. Based on a typical relationship between vessel operating and design drafts derived from the experience at the port for each commodity, the differences in costs to transport the commodities for the without-project and each alternative channel depth were calculated. The benefits resulted from the opportunity provided by the respective channel depths to employ larger, deeper design and operating draft vessels to transport the commodities at a lower operating cost per unit of product shipped. For each successive deepening alternative, a small benefit is also derived from reduced delays.

4.4.2 Incremental Analysis and Single Beneficiary Consideration. A reach-by-reach incremental analysis was not considered for this study. This type of analysis would not be appropriate as the 15-mile channel is relatively short, and all but one of the 13 terminals are located along the reach from RM 11 to RM 15. The Roseburg Lumber Co., terminal is downstream at about RM 8. Three facilities are clustered at the upstream end of the project, as shown in Section 3. Two of these provide public access. There are no single beneficiaries.

4.4.3 Multi-Port Competition . As discussed in the Economics Appendix, there is little or no competition with other ports for the same supply area for timber products, due to proximity of the supply area to the export port. There is no multiport competition for nickel ore due to the proximity of the Riddle, Ore., nickel smelter, which is the only nickel smelter in the United States.

4.4.4 Last-Port-of-call Analysis for Lumber/Paper/Plywood (LPP). Benefit evaluations for LPP presents a unique situation in that movement of these commodities is made up of small loadings at more than one port by liner and tramp charter operations. A number of calls can be made at various west coast ports before a shipment is transported to destination ports. Several possible responses to a deeper channel at Coos Bay could result. Deepening alternatives could cause shippers to load more cargo at Coos Bay or another previous port. Coos Bay could also become the last port-of-call more frequently. In general, the volume of these commodities which could be loaded on the fleet calling on Coos Bay could be increased incrementally with each depth. The loading would not necessarily have to be performed at Coos Bay in order to have NED benefits.

It was agreed at the Feasibility Review Conference that due to the time and expense of conducting a complete detailed multi-port analysis for LPP that would fully define potential

benefits, a last-port-of-call analysis would be substituted. It was recognized that some unquantified amount of benefits would not be accounted for with this approach. With this approach only the projected tonnage carried on vessels that call on Coos Bay as the last-port-of-call was used in the analysis. The resultant last port-of-call tonnage used in the analysis, determined from 1988 data which was considered to be representative, was 32% of the total tonnage projected.

It is noted that there was a significant reduction in benefits for LPP compared to the draft report, due in part to the last-port-of-call analysis.

4.4.5 Nickel Ore Projection. There is only one nickel ore smelter in the United States, located at Riddle, Ore. Importing nickel ore will be a significant addition to commerce at the Port of Coos Bay. Since it is a new import, no historical data exists for projections. Glenbrook indicates that it plans to import about 1 million metric tons annually initially, with potential to increase the volume in the future. Because these future plans are not firm, the economic analysis assumes nickel ore import quantities at the 1 million metric tons per year average over the project life.

4.4.6 Fleet Projections-Timber Products. Fleet projections for the study consist of a series of distributions of commodity tonnage by vessel operating drafts for the years 1996, 2006 and 2016 for the without project and each alternative channel depth. The fleet distributions were derived from judgement and experience based on the historical record of vessel draft distribution at Coos Bay in response to the previous deepening, the tendency to shift toward larger vessels and other factors, some of which would tend to keep drafts shallow. The shape of the distribution varies for each of the commodities based on the historic distribution of operating drafts, degree to which the current distribution is constrained by the existing channel and the expected response to a deeper channel. For example, data for 1988 indicated that the log and LPP fleet was constrained by channel depths, with 54 percent and 41 percent respectively of the tonnage departing at operating drafts of 33 feet or greater. The distribution of LPP tonnage is, however, much broader; 37 percent departed at an operating draft of 29 feet or shallower. Woodchips were not as constrained, in that in 1988 only 15% of the tonnage departed at 33 feet or greater.

The existing distributions and other factors were used to project tonnage distributions in response to the alternative channel depths. Some of the tonnage would continue to be carried

at shallow operating drafts with some gradually shifting to deeper operating draft vessels in varying proportions by commodity. Initially, a distribution was constructed for the 40-foot channel which would be considered relatively unconstrained. This distribution was then constrained downward for each of the other alternative depths.

4.4.7 Nickel Ore. No historical fleet distribution exists for nickel ore. Assumptions can be made, however, based on the projected shipments as previously described, and through information provided by Glenbrook. For the without-project condition and Alternatives 1 and 2, a foreign flag 46,000 DWT ton dry bulk carrier, with a design draft of about 37 feet and lightloaded accordingly, is assumed. For Alternatives 3, 4, and 5, a 55,000 DWT vessel could be used, also lightloaded for the shallower alternatives. Table 4-8 shows the loading of these vessels with each channel alternative. Metric tons are displayed for the ore quantities in this table to be consistent with the vessel DWT designations.

TABLE 4-8.--*Nickel Ore Vessel Loads at Alternative Channel Depths (metric tons)*

			Feet	
Alternative	Depth	Vessel DWT	Lightloaded	Load
W/O Project	35	46,000	2'	38,000
1	36	46,000	1'	39,900
2	37	46,000	0'	41,800
3	38	55,000	2'	47,100
4	39	55,000	1'	48,900
5	40	55,000	0'	50,600

4.4.8 Design Drafts and Vessel Operating Costs. For the timber products a relationship between operating drafts and design drafts was established. For each operating draft there would be a range of possible design drafts. While larger vessels (requiring a greater degree of lightloading) would be expected to continue to call, a typical design draft/operating draft relationship was established for each commodity to develop transportation costs. Logs and LPP are generally carried on foreign flag bulk vessels. Log vessels are generally loaded deeply and an average difference of one foot between design and

operating drafts was used. Based on 1988 data for LPP, the difference was estimated at 2-feet for vessels operating at a draft of 30 feet or deeper and 4-feet for vessels operating at 29 feet or shallower.

Due to the low density when loaded, woodchips are transported on vessels designed specifically for this commodity. The estimated difference between operating and design draft is 2 feet for vessels operating at 33 feet or deeper and 3 feet for vessels operating at 32 feet or shallower.

Operating costs for the vessels were obtained from Economic Guidance Memorandum No. 93-4, *Deep Draft Vessel Cost Estimates* (fiscal year 1993). Table 4-9 displays a sampling of data from the Economics Analysis appendix to illustrate how benefits were derived.

TABLE 4-9.--*Sample Loading and Operating Costs, Bulk Vessels.*

Design Draft (ft)	DWT (met tons)	Operating Costs in Port (daily)	Operating Costs at Sea (daily)
33	26,600	$10,300	$12,900
35	32,100	$10,800	$13,600
37	38,300	$11,300	$14,300
39	45,400	$11,900	$15,100

4.4.9 Destination Ports. A significant factor in the transportation costs is the destination of the specific commodities and the days at sea. Typical destinations are: wood chips to Japan; logs to Japan and China; paper to the Philippines and Japan; lumber to Australia and Europe; and plywood to Europe. Time in port also is a factor for each commodity. Wood chip and log vessels take on full loads and travel directly from Coos Bay to destination ports. Lumber, paper and plywood vessels may stop at several ports. A weighted average of the days at sea (based on the percentage of the commodity being transported to the destinations above) and typical days in port for each commodity is shown in table 4-10.

TABLE 4-10.--*Days at Sea and in Port by Commodity*

Commodity	At Sea	In Port
Wood Chips	27.2	6.0
Logs	26.7	17.0
Lumber, Paper, Plywood	21.4	15.0
Nickel Ore	33.3	10.0

4.4.10 Transportation Benefits. Transportation costs are derived for each alternative from the distributed tonnage by operating drafts, the corresponding typical design draft vessel and operating costs and the average days at sea and in port. The difference in total transportation costs to move the commodities for the without-project condition and each successive channel depth yields the transportation benefit for each alternative plan. Table 4-11 displays the differences in the average costs per ton to move each commodity in the year 2016.

TABLE 4-11.--*Transportation Costs per Ton by Commodity, Year 2016*

Alternative	Depth	Woodchips	Logs	Lumber, Paper Plywood	Nickel Ore
W/O Project	35	$12.47	$20.87	$19.01	$16.42
1	36	$12.45	$20.57	$18.81	$15.74
2	37	$12.44	$20.40	$18.70	$15.12
3	38	$12.44	$20.31	$18.63	$14.57
4	39	$12.44	$20.26	$18.58	$14.14
5	40	$12.44	$20.24	$18.57	$13.74

Note that the cost per ton for woodchips does not decrease for alternatives deeper than 37 feet. This is based on the assumption that, due to the low density of the commodity as it is loaded, vessel operating drafts are not projected to be deeper than 37 feet. For all

commodities, the improvement in cost per ton diminishes with each depth increment, reflecting the assumptions inherent in the fleet projections, which show that vessels will shift toward only moderately deeper drafts at Coos Bay, and will do so over time, not all at once. Because the expected increase in drafts is moderate, more benefits are recognized in the moderate increases in channel depth which would accommodate those vessels. Because the deepest alternative channel depths typically exceed the majority of expected vessel drafts, limited incremental benefits are attributable to the deepest incremental channel depths. Incremental transportation benefits for the various commodities and each alternative are displayed in table 4-12.

TABLE 4-12.--*Incremental Transportation Benefits By Commodity*

Alt.	Wood Chips	Logs	Lumber, Paper Plywood	Nickel Ore
W/O Proj.	-	-	-	-
1	$33,200	$273,600	$124,000	$680,000
2	$13,200	$145,500	$67,600	$620,000
3	0	$64,800	$41,200	$550,000
4	0	$31,900	$22,700	$430,000
5	0	$14,600	$8,700	$400,000

4.4.11 Delay Benefits. Delay benefits are derived from applying the pilots' operating requirements for 3 feet of underkeel clearance and, for departures, sailing on a rising tide to be at the entrance at high slack water. A loaded vessel would be delayed until favorable tidal conditions produced the required clearance. The delay costs are derived through an analysis of vessel drafts, the probability of delay based on tidal cycles and the average delay period, as presented in the Economic Appendix. Table 4-13 displays the incremental reduction in vessel operating costs due to the delay realized by each successive channel depth greater than the without-project condition.

TABLE 4-13.--*Incremental Delay Cost Reduction By Alternative, All Commodities*

Alt.	Delay Cost Reduction
1	$23,800
2	$17,800
3	$11,300
4	$ 5,600
5	$ 3,700

4.4.12 Total Benefits. The difference in total incremental vessel transportation and delay operating costs between the without-project condition and each successive deepening alternative constitute the incremental benefits for each alternative. Table 4-15 presents this information and the total benefits for each alternative.

TABLE 4-14.--*Incremental and Total Benefits for Each Alternative*

Alternative	Incremental Benefit	Total Annual Benefit
1	$1,134,600	$1,134,600
2	$864,100	$1,998,700
3	$667,300	$2,666,000
4	$490,200	$3,156,200
5	$427,000	$3,583,200

4.5 Benefit-to-Cost Evaluation

4.5.1 Benefit-to-Cost Analysis. Annual project benefits were divided by annual project costs to yield the estimated BCR. Annual project costs were subtracted from annual project benefits to yield average annual net benefits. BCRs and annual net benefits are summarized in table 4-15.

TABLE 4-15.--*Summary of BCRs and Net Benefits for Each Alternative (8.25 percent, 50-yr. project life)*

Alt.	Annual Benefits	Annual Costs	BCR	Annual Net Benefits
1	$1,134,600	$614,700	1.8	$519,900
2	$1,998,700	$1,298,900	1.5	$699,700
3	$2,666,000	$2,888,100	0.9	($222,100)
4	$3,156,200	$5,095,200	0.6	($1,939,000)
5	$3,583,200	$8,072,100	0.4	($4,488,900)

4.5.2 NED Plan. Alternatives 1 and 2 yielded BCRs above unity. With rounding Alternative 3 is just at unity. Alternative 2, yielding the greatest annual net benefits, is the NED plan. The NED plan is normally the preferred alternative selected for Federal implementation as it maximizes the benefits to the nation and the return on the investment.

It is noted that the Federal interest rate to be used in FY 1994 has been reduced to 8%. and that analyses in this report were completed based on 8-1/4%. It is further noted that the NED plan would remain the same under the new interest rate.

4.5.3 Sensitivity Analysis. In the Economic Appendix a number of scenarios are tested to determine the sensitivity of the 2-foot deepening NED plan. The scenarios employ risk and uncertainty modeling techniques for the timber commodity projections in combination with alternative assumptions with respect to nickel ore imports. Issues surrounding timber harvest are volatile and projections can vary widely. Current information is presented in the Economic appendix regarding developments in timber harvests including projections from the most recent forest plan announced by President Clinton in July 1993.

Discussion of the current (1993) market situation for nickel, in light of the temporary suspension of imports at Coos Bay, the history and prospects for that market in the future and the impact on the nickel ore imports at Coos Bay are discussed in detail in the Economic Appendix, Section 9.1.4. In summary, the current depressed nickel prices are expected to rebound. Short-term fluctuations occur in most commodity markets, and there have been two other historic declines in nickel prices, in 1975 and 1982. The market is expected to have recovered by the project-on-line date of 1996. The analyses detailed in the Economic appendix are summarized in the following paragraphs.

Risk and Uncertainty. In order to account for uncertainties due to environmental and political resource constraints, risk analysis modeling was applied to the timber commodity projections. The program @Risk was used to convert the projections into variable distributions. For each commodity projection, a range and distribution (shape) of potential variables was determined. From each projected range a mean value (expected value) is determined. For example, in considering recent developments in the region, the range of projections for future log exports includes the possibility of extremely low export quantities. The resulting mean value for log exports was about 24 percent less than the original projection. For LPP, the range of possible outcomes were based on a general consensus that lumber exports would not decline, but also would not increase dramatically. For woodchips, the range was based on assumption that future exports would not vary greatly from the original projection. The analysis for the latter two commodities resulted slight increases over the original projections. The results of the timber commodity projections analyses are summarized in table 4-16 which also displays the original information from table 3-6.

TABLE 4-16.--*Commodity Projections with Risk and Uncertainty Analysis (metric tons)*

Commodity Exported	1985-89 Average Exports	USFS Projection to 2016	Mean Value w/Risk & Uncertainty, 2016
Wood chips	2,538,200	2,538,200	2,553,200
Logs	1,155,000	1,131,400	858,200
Lumber, Paper, & Ply	368,100	385,000	395,500

The benefits derived from the resulting timber commodity values were used in conjunction with two nickel ore scenarios to test the NED plan. In the first scenario, it was determined that to sustain the 2-foot deepening as the NED plan with ore import quantities at an average 1 million metric ton annually, this quantity of ore would need to be imported for a minimum of 20 years. In the other scenario, the analysis shows that, if imported for 40 years, ore imports would have to average 800,000 metric tons annually to sustain the NED plan, given the timber values.

Additional NED Plan Sensitivities. Several other analyses were performed to determine the amount of nickel ore imports required to sustain the NED plan under selected

combinations of timber commodity export reductions. The nickel ore base projection is 1 million metric tons. These scenarios are displayed in table 4-17.

TABLE 4-17.--*Ore Quantities Required to Maintain NED Plan for Various Timber Commodity Scenarios*

	Timber Quantities (1,000 Metric Tons)			Nickel Ore (1,000 Metric Tons)
	Woodchips	Logs	LPP	
Base Projection: (1996)	2,540	1,150	370	1,000
Scenario	Assumed Quantity			Required Quantity
1	2,000	350	280	920
2	2,100	600	250	875
3	2,540	635	375	825

The NED plan would remain at 2 feet under each of the scenarios listed above. Scenario 1 represents a dramatic reduction in all timber commodities of 20 percent, 70 percent and 25 percent for woodchips, logs and LPP, respectively. The most realistic reduced export scenario is estimated to be number 3, as the log exports quantities are considered to have considerably more risk than the other timber products.

5. THE SELECTED PLAN

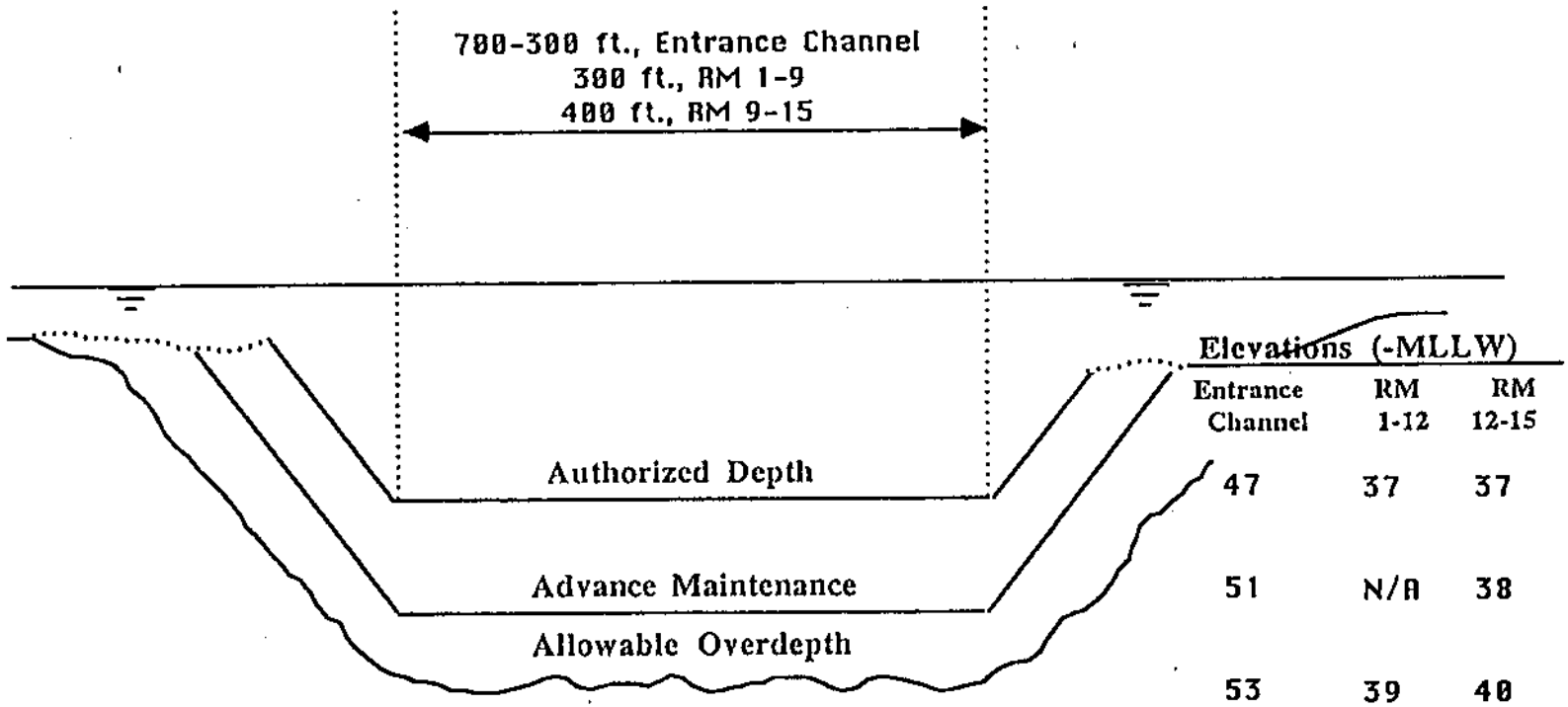
5.1 Plan Components

5.1.1 Descriptions and Justifications. Alternative 2 is the selected plan, as well as the NED plan. It would consist of a 2-foot channel deepening from the entrance to RM 15 (see plates 1-7). The new authorized depth at the entrance would be 47 feet and transition from 47 feet to 37 feet deep at Guano Rock (about RM 1). The depth would continue at 37 feet in the inner channel to the end of the project at RM 15. See figure 6. The width of the turning basin at RM 12 would be increased from 800 feet to 900 feet. About 1,365,000 cy of sand and silt materials and 90,000 cy of rock would be excavated.

Global Positioning Survey (GPS) Studies. The GPS studies were conducted during the summer of 1993. A summary report by the Waterways Experiment Station (WES) is provided in Appendix K. Four deep draft vessels, 3 outbound and one inbound, were tracked in the study. The overall conclusion by WES is that, while navigating in the channel requires constant attention, the pilots had few problems. Results of the GPS study showed that the four vessels monitored tracked consistently and well within the channel lines with one exception. At the turn between RM 1 and RM 2, the pilots tended to use the naturally deeper water on the outside of the turn. No dredging would be required to extend the channel lines in the turn to correspond with this track. A corresponding inward adjustment of the inside of the turn was not favored by the pilots out of concern that the additional shoaling would cause difficulties in the turn. See subsection 6.1.1 regarding the status of ship simulator studies.

Entrance Depth. To account for pitch, roll and heave effects, an additional 10 feet to of depth is required at the entrance to provide underkeel clearances for the design vessel. This is conservative based on potential wave conditions and consistent with past experience at this entrance and other west coast entrances.

Advance Maintenance. The currently authorized advance maintenance program is described in subsection 3.2.2 and discussed in detail in Appendix B, Engineering Analysis, subsection 2.2. As shown on figure 6, advance maintenance dredging program would be the same as in the existing without-project condition. The program should be maintained because shoaling patterns are anticipated to be similar and the same justifications are applicable.



PROPOSED CHANNEL DIMENSIONS

(NO SCALE)

US Army Corps of Engineers Portland District

Coos Bay Navigation Improvements

Figure 6

Upper Channel Width. In consideration of a number of factors discussed in detail in Appendix B, Engineering Analysis, subsection 3.3.2., it is concluded that the upper channel should be maintained. The analysis references guidance from the recently revised draft EM 1110-2-1613, Hydraulic Design of Deep-Draft Navigation Projects, dated 8 January 1993. Reference also is made to a paper entitled "Ship Navigation Considerations in Design of a Port or Harbor Waterway System, " by Leonard Van Houten. The analysis examines the width of the upper channel in both the straight reaches and bends in light of the EM guidance, effects on deepening and maintenance costs, potential impacts to navigation, safety and pilots' views.

The existing channel above the railroad bridge, RM 9 to RM 15, is nominally 400 feet wide. There are six major bends in the upper channel including two turns in which turning basins are co-located. From RM 10 to RM 15, above the highway bridge, straight reaches comprise about 32 percent of the upper channel. See Plates 6 and 7 attached at the end of this main report. The straight reaches above the bridges were widened to 400 feet as part of the channel modifications authorized by the River and Harbors Act of 1970 and completed in 1979. Wideners at turns in the upper channel also were increased, as were the width of turning basins and berthing areas between the channel and harbor lines.

The District Engineers' review report of 1969, upon which the authorization for improvements was based, cited difficult navigation conditions and safety hazards due to the then existing channel dimensions, larger vessels, congestion and the proximity of deep draft berthing spaces immediately adjacent and parallel to the channel. Near-groundings also were reported due to these conditions. In a consultants report to the Port of Coos Bay, completed prior to the District's report, it was reported that currents at entrances to tidal sloughs tended to set vessels against the banks. A retired pilot from that period was consulted who acknowledged the problems, noting in particular difficulties in negotiating the turn at the mouth of the Coos River (at RM 14) and a general concern with the growing size of vessels. The consultant's report also cited two of nine accidents occurring during 1962 and 1963 as being groundings attributable to the width of the channel. This accident data was not cited in the Corps' justification, however. Reducing the entire width of the upper channel by 100 feet (excluding turning basins) from about RM 10 to RM 15 could reduce initial construction costs for the selected plan by about 4 percent, or $500,000.

If the wideners at bends are maintained, construction costs could only be reduced about 1.2 percent or about $140,000. At best a decrease in maintenance costs of $22,000 annually in the straight reaches of RM 10 to RM 12 reach may be achieved. Maintenance costs in the upper RM 12 to RM 15 reach, however, could actually increase over time as the same quantity of sedimentation would be expected, but in a reduced channel cross-section. Estimating the impacts to navigation is difficult, particularly with regard to increased risks due to operating constraints and congestion. In consideration of the potential cost savings in the straight reaches, a simplified analysis shows that, based on vessel operating costs, a small increase in transit time of 10 percent could offset the equivalent annual costs of the construction and maintenance savings, without accounting for the greater risks and potential increase in maintenance.

The analysis presented in Appendix B demonstrates that the wideners in the upper channel are, in general, designed appropriately. Based on guidance, the width of the straight reaches is not found to be excessive under the conditions in the upper channel. It is recognized that it would be highly unlikely that a recommendation to increase the width of the upper channel from 300 feet to 400 feet would be made today without benefit of detailed studies, including possible simulator studies, due to the significant costs for widening and environmental concerns.

The channel was widened previously because of difficulties in navigation in this reach and the increasing size of vessels. It would not be prudent to abandon the existing width and increase risks unless it were demonstrated to be unnecessary and there would be a significant financial benefit. The cost of simulator studies would not likely be offset by savings to the project and could possibly identify alignment improvements which would increase construction costs.

Pilots must rely on extreme care and well established procedures for navigating the upper channel. While generally satisfied and able to operate safely under the existing channel conditions, they believe the reduction of width would be counterproductive with respect to the deepening project and are concerned modifications would return the upper channel to the pre-1979 difficulties and reduced margins of safety, particularly in light of even larger vessels. A letter from the pilots on this issue, dated May 29, 1992, may be found in Appendix I, Correspondence.

No adjustments to berthing widths are necessary. These were widened to 100 feet during the previous deepening project, which is considered sufficient. Only two docks are generally involved with loading from log rafts in the water and often onto vessels with beams less than 100 foot. These are transient operations and there have been no known navigation conflicts.

5.1.2 Costs. The total FY 1994 investment cost estimate of $14,139,400 for the selected plan is detailed in table 5-1. IDC computations for the plan are in the Engineering Analysis appendix. In accordance with the Corps of Engineers Engineering Circular (EC) 1110-2-538, a baseline cost estimate to implement the project, if authorized for construction, has been developed. Fully-funded costs and Federal/non-Federal cost sharing are discussed in Section 6, Plan Implementation.

Associated (non-Federal) costs would consist of dredging berths adjacent to the new channel. Non-Federal costs are shown in table 5.2. The Weyerhaeuser dock will require structural improvements. No other work is anticipated at this time. Sediment quality is discussed in subsection 5.3.2.

5.1.3 Construction Methods. Hopper dredges would probably be used in the entrance and inner channel below RM 10. A clamshell and barge operation is anticipated from RM 10 to RM 15. Rock excavation would be accomplished by mechanical means without drilling or blasting as was discussed in subsection 4.2.1 and the Engineering Analysis appendix. The plan anticipates that all materials excavated would be transported to one of three ocean disposal sites. The contract for the work would provide an option for the disposal of sand on the North Spit to provide nesting habitat for western snowy plovers.

5.1.4 Operation and Maintenance. ER 1165-2-131, *Local Cooperation Agreements for New Start Projects*, requires that where advance maintenance is practiced, the advanced maintenance quantities become part of the without-project condition. Removal of the material within the dimensions of the existing project should be treated as part of operations and maintenance. However, this principle applies only to that portion of the channel where advance maintenance dredging has been historically required for economic maintenance of the existing project.

TABLE 5-1.--*Federal/Non-Federal Costs, Alternative 2--37-foot Authorized Depth*
(October 1993 Price levels)

	Quantity	Unit Price	Amount	Contingency	Total Project
DREDGING					
Mob & Demob	1 Job	$981,200	$981,200	$196,200	$1,177,400
Hopper Dredging					
Exc & Disp (RM 1-10)	367,600cy	1.78	654,300	130,900	785,200
Exc & Disp. (Entrance)	182,400cy	1.23	224,400	44,900	269,300
Mechanical Dredging					
Exc.& Disp.					
Clamshell (RM 10-15)	815,200cy	2.26	1,842,400	368,500	2,210,900
Exc.&Disp. Rock (RM 0-5)	90,000cy	67.18	6,046,200	1,511,600	7,557,800
Total Construction Cost			$9,748,500		
Contingencies				$2,252,100	
FEDERAL/NONFEDERAL COST SHARED DREDGING TOTAL					$12,000,600
NONFEDERAL, NON COST SHARED (ACCESS DREDGING)					162,900
Engineering and Design					966,400
Supervision and Administration					568,000
TOTAL PROJECT COST					$13,697,900
Interest During Construction					441,500
TOTAL INVESTMENT COST FOR ALTERNATIVE 2					$14,139,400

TABLE 5-2.--*Non-Federal Costs, Alternative 2--37-Foot Authorized Depth*

	Quantity (cy)	Unit Price	Amount	Contingency	Total Project
NONFEDERAL, NON COST SHARED (ACCESS DREDGING)					
Ocean Terminal	1500	2.26	$3,390	$680	$4,070
Weyerhaeuser Co. Wharf	5200	2.26	11,750	2350	14,100
Dolphin Terminals Wharf	2600	2.26	5,880	1180	7,060
Central Dock Co. Wharf	10,100	2.26	22,830	4570	27,400
Pierce Dock (Glenbrook)	2,100	2.26	4,750	950	5,700
Geo. Pac. C.B. Dock	4,900	2.26	11,070	2210	13,280
Coos Bay Docks Wharf	4,900	2.26	11,070	2210	13,280
Subtotal			$70,740	$14,150	
NONFEDERAL ACCESS DREDGING, NON COST SHARED					84,900
NONFED DOCK MODIFICATIONS, NON COST SHARED			65,000	13,000	78,000
TOTAL NONFEDERAL (100% LOCAL COST)					$162,900

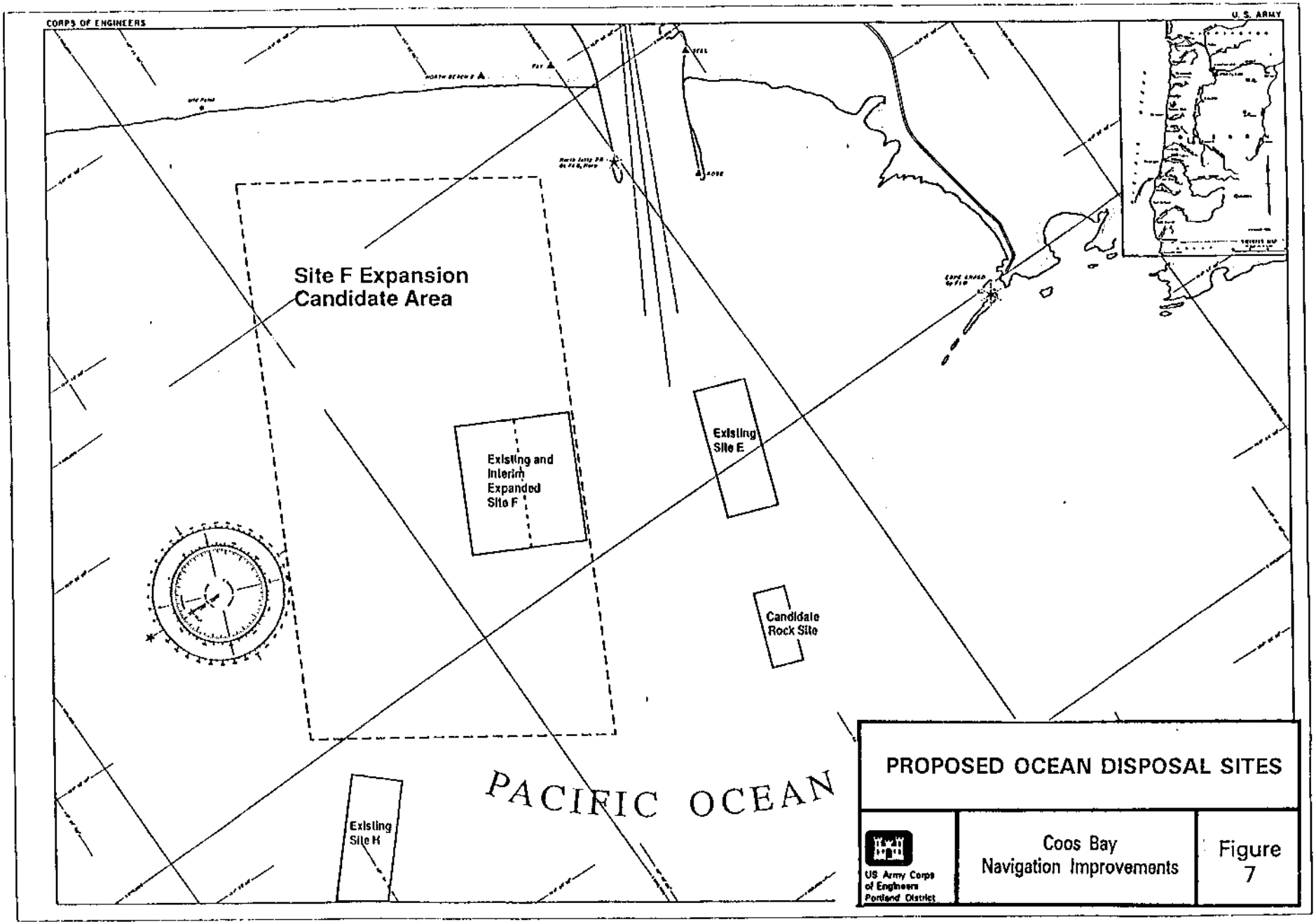
The deepening project would fund dredging quantities to the new channel depths, less the quantities of sediment in the channel which would be dredged for normal maintenance of the existing project. A calculation of maintenance quantities and costs would be performed before the dredging. The calculation would be based on usual pre-dredge survey and identification of maintenance quantities based on the shoaling condition at that time.

5.1.5 Annual Maintenance. After a period of slope adjustment, shoaling patterns and maintenance dredging requirements would be expected to be similar to the without-project condition, and current advance maintenance practices would be continued at the new level. The first three-year average additional annual maintenance quantities after deepening would be 122,000 cy, and declining thereafter. The equivalent total annual maintenance costs increase over the life of the project would be $109,800.

5.2 Ocean Disposal Site Selection

The combined nearshore and offshore site as shown on Figure 7 is the preferred site for disposal of coarse-grained material for the deepening alternative and long-term maintenance. Proposal of the large site represents a change in the approach to management of ocean disposal sites at Coos Bay. This approach is more consistent with disposal site management practices nationwide and provides an alternative which would ensure long-term disposal capability while minimizing the impacts of the activity. This site would provide the flexibility for long-term management of dredged material. It would take advantage of the dispersal capability of the higher energy nearshore zone and reduce or eliminate mounding further offshore, thus avoiding creation of potential navigation hazards. Material can be placed in a thinner layer over a broader area, reducing immediate impacts, providing a longer duration between disposal events at any particular location within the site, and allowing seasonal avoidance of particular locations within the site if warranted for biological or human-use reasons.

Designation of the site for disposal of coarse-grained dredged material for long-term maintenance and quantities generated by the selected deepening alternative, will be accomplished by the EPA under its Section 102 authority. EPA is a cooperating agency in the preparation of the EIS for this study and has been working closely with the Corps of Engineers in developing this alternative. The draft and final EIS for this study is


CORPS OF ENGINEERS
U.S. ARMY
Site F Expansion
Candidate Area
Existing and
Interim
Expanded
Site F
Existing
Site E
Candidate
Rock Site
Existing
Site H
PACIFIC OCEAN
PROPOSED OCEAN DISPOSAL SITES
US Army Corps
of Engineers
Portland District
Coos Bay
Navigation Improvements
Figure
7

anticipated to be used by the EPA in formal rule-making for the site designation process. After reviewing the results of the biological samples EPA will determine whether any additional data will be needed for final site designation. The formal Section 102 designation process by EPA, which will include development of management and monitoring plans for long-term maintenance disposal in accordance with WRDA 1992, also will be accomplished during PED. Study costs for the site designation process will be apportioned equally between existing project operations and maintenance and general investigation (GI) accounts.

In the event that final site designation by EPA were delayed and disposal of deepening and/or maintenance materials would exceed the short-term capacity of the existing and expanded site F, an interim site would be proposed by the District Commander under the Corps of Engineers' Section 103 authority. This interim use would provide for disposal of deepening and maintenance dredging materials.

Monitoring of disposal at site H indicates that no appreciable mounding has occurred from disposal over more than a 10-year time frame. Fine-grained sediments from the channel deepening and associated berthing areas would not contribute significant additional sediments over current maintenance dredging quantities. The existing site is therefore considered adequate for disposal of all fine-grained materials for channel deepening and future maintenance needs.

The area preferred for potential one-time rock disposal was selected initially on the basis of the physical bottom characteristics of substrate and depth. The substrate at this location is principally gravel and cobbles intermixed with coarse sand and rock outcrops. The depth is such that rock material placed at this location would either remain at the site or slowly move further offshore.

5.3 Environmental Impacts of Selected Plan

The EIS presents a detailed discussion of the environmental impacts of the selected plan. The following is a summary of that information.

5.3.1 Physical. Dredging for the new project would remove about 1.4 million cy of sand, silt and rock material from the estuary. An estimated 25 acres of previously undisturbed side slope area over the entire length of the channel and about 6 acres in the expanded turning basin would be immediately disturbed by the deepening. Disposal

of the 1.4 million cy of new material will cause a one-time increase in disposal volume of 76 percent based on average annual maintenance dredging volumes for the existing project. In the first years after the deepening, the estimated average increase in maintenance dredging volumes is estimated to be about 120,000 cy declining in subsequent years. The total estimated volume of additional material placed in ocean disposal sites due to the deepening, including initial and additional maintenance dredging, is about 2.3 million cy. For the life of the project, this would be a 2.6 percent increase in dredged material disposal over continued maintenance of the existing project.

5.3.2 Water Quality. Dredging of the new channel would cause a temporary increase in water turbidity similar to those experienced during annual maintenance dredging, but over a proportionally longer period. This generally occurs only above RM 12, where the material is fine sand and silt. Dissolved oxygen levels could decline temporarily due to resuspension of organic material during the dredging of the fine materials.

Turbidity at ocean disposal sites due to the initial deposits and subsequent reworking of material as it disperses also would be similar to existing maintenance dredging conditions. A one-time temporary turbid condition would also exist at the rock disposal site because of sediments that would be excavated with the rock.

5.3.3 Sediment Quality. Sediment quality evaluations indicate that channel excavation for the new construction would present no unacceptable adverse environmental impacts due to sediment contamination and that unconfined in-water disposal is acceptable. Sediment evaluations are discussed in the EIS and test results are displayed in Appendix D, Sediment Quality. The most recent series of testing of sediment materials in the upper channel (November 1993) was consistent with past testing and indicate levels of most metals and chemicals below concern levels. Tributyltin was detected at concern levels in some samples, however not at levels which would preclude unconfined in-water disposal under MPRSA. Contamination above established levels of concern have been observed in sediments located next to various docks adjacent to the navigation channel. Local dock owners have noted the higher levels when conducting sediment quality evaluations related to permit actions. Evaluations, including bioassays, indicate that the bulk of the material dredged by non-Federal interests associated with this project to be suitable for unconfined in-water disposal. Prior to dredging and disposal of sediments from berthing areas, dock owners

will require permits obtained through the usual regulatory permit process, including testing of the materials.

5.3.4 Salinity. The salinity distribution in Coos Bay is highly variable and dependent on river flow and tidal forces. The selected deepening plan would not alter the general well-mixed salinity regime and would cause only a slight increase in estuarine salinity. The upriver mixing zone could move farther upstream. Model studies predict that in the upper reaches of the estuary salinity increases would be less than one part per thousand, which is the level of accuracy for the model.

5.3.5 Biological Impacts--Coos Bay. There would be immediate impacts directly associated with dredging the channel. Benthic organisms within the channel and along the side slopes of the channel would be destroyed or displaced by the dredging operations. Following construction of the project, most areas would be expected to recolonize rapidly and be back to pre-dredge conditions shortly after dredging was complete. Impacts to epibenthic invertebrate populations and fish are expected to be minimal.

Organisms in the predominately freshwater part of the estuary, which would most likely be impacted by a change in salinity, are adapted to periodic episodes of salt water intrusion. Organisms that could be impacted by increases in salinity in the upriver areas are juvenile salmonids, striped bass, resident freshwater fish species and invertebrate and phytoplankton populations. Though the impact to these organisms is expected to be minor, a monitoring program will likely be conducted to verify the level of impact.

Increased salinity in the lower estuary may result in the increase in range of marine species and the upriver distribution of eel grass. Increase in eel grass populations could benefit many species since eel grass beds provide productive habitat for a variety of species.

5.3.6 Biological Impacts--Disposal Sites. In comparison to the other sites investigated in previous studies, the area near site F was the most suitable for location of new or expanded disposal sites. The nearshore transition zone supported the lowest average abundance of organisms and was the most homogeneous in species composition of the sites investigated. Expansion of the disposal area for coarse-grained material would impact areas previously undisturbed by dredged material disposal. Distribution of the material over a larger area, however, would reduce long-term impacts to a particular

site by allowing a longer time for recolonization between disposal events. Disposal over a larger area, either nearshore or offshore in a thin layer, would produce the least impact. The depth of coverage would be minimal and the material would disperse more rapidly.

Potential impacts to organisms, particularly benthic invertebrates, is greater at site H than at site F. However, as described earlier and in the EIS, the impacts from existing and ongoing maintenance dredging disposal are relatively minor.

Though data on the proposed rock disposal site is less extensive than site H, it is a preferred site biologically because it is located within the transition zone and should exhibit similar characteristics to site F. This conclusion is supported by samples from 1986 EIS studies. One-time disposal of rock would temporarily impact organisms in the immediate disposal site. Recolonization would begin shortly following disposal.

5.3.7 Threatened and Endangered Species. The selected plan would have no adverse affect on threatened or endangered species which may be present in the estuary or near ocean disposal sites. For species administered by NMFS, biological assessments have been forwarded (December 1990) and letters of concurrence have been received from NMFS (January 1991) for all species except loggerhead and green sea turtles and Snake River sockeye and fall and spring/summer chinook salmon. Biological assessments for these additional species have been prepared and forwarded to NMFS for concurrence. Previously submitted biological assessments have been resubmitted to NMFS for review and concurrence due to enlargement of the offshore disposal area and the length of time since they were prepared and their associated concurrence letters received.

Concurrence with the Corps' determination of no effect for the above listed species has been received from NMFS.

Biological assessments have been forwarded to the USFWS (May and June 1990) and concurrence letters received (July 1991) for all species administered by that agency except for marbled murrelets, which were only recently listed. A biological assessment has been prepared for murrelets and was forwarded to the USFWS in August 1993. Additional information has come to light since that submittal and therefore a revised biological assessment for marbled murrelets was forwarded to the USFWS in December 1993. The cover letter forwarding the marbled murrelet biological assessment

acknowledges some project-related changes (e.g. an enlargement of the offshore disposal site F; no consideration of blasting for rock-removal). These changes do not alter the (no effect) determination for bald eagles, peregrine falcons, brown pelicans or western snowy plovers made in the 1990 biological assessments. The December 1993 biological assessment concludes that the project is not likely to adversely effect marbled murrelets. A concurrence from USFWS has not as been received as of final publication of this report.

5.3.8 Cultural Resources. The generalized locations of shipwrecks within Coos Bay have been evaluated and it was determined that dredging activities would not impact known sites within the bay. The candidate ocean disposal site will require further cultural resource evaluation as part of the final site selection process.

5.3.9 Mitigation. Significant losses are not expected with construction of the selected plan. Habitat impacted in the channel and widened turning basin would recover naturally to near existing conditions and, therefore, no mitigation would be required. A small loss of shallow tidal habitat due to turning basin expansion would occur, however, the expansion has been minimized to reduce impacts. During construction, mitigative measures related to confining in-water work to a single season and avoidance of blasting for rock excavation will be employed.

The cumulative effects of ongoing project maintenance, related shipping and port facilities and operations, and the proposed deepening result in continued and potential future impacts in Coos Bay. The extent of impacts are not clear and mitigation beyond existing means is difficult to identify. Through continued discussions with resource agencies during PED, consideration will be given to potential measures such as in-bay disposal of rock or shell materials from dredging which might provide shallow subtidal habitat while saving disposal costs. Also, measures to provide environmental restoration under other authorities have been discussed and will be further explored with the resource agencies.

Mitigation for ocean disposal will be accomplished through reducing or avoiding impacts. No other form of mitigation is proposed. A larger ocean disposal site for coarse-grained material is preferred to minimize the impacts associated with dumping in a single location. Using a larger area would allow the material to be more thinly dispersed, reducing impacts to benthic organisms. Designation of a larger area also would allow an

individual location within the disposal areas more time for recovery before the next disposal event, and provide flexibility to avoid seasonally productive areas.

Monitoring the effects of ocean disposal will be implemented, as has been done at existing disposal sites. A site management and monitoring plan will be developed before site designation by the Corps of Engineers and EPA.

5.4 Plan Benefits

The selected 37-foot channel plan, the NED plan, would provide significant economic benefits related to waterborne commerce over the without-project condition. The plan would reduce commodity transportation costs by accommodating an increase in more efficient, deep-draft vessels. Improvements of the entrance and inner channel to Coos Bay would serve to sustain current levels of basic economic activity as well as encourage expansion. Transportation cost reduction over the existing without-project channel is estimated to be $1,957,000 annually. Delay costs would be reduced $41,600 annually. Total estimated average annual benefits are $1,998,700. With the estimated annual cost of $1,298,900, including operations and maintenance costs of $109,800, the BCR is 1.5.

6. PLAN IMPLEMENTATION

6.1 Design and Construction

A schedule for implementation of the selected plan is shown on figure 8. PED is scheduled to begin in February of fiscal year (FY) 1994 and construction in FY 1995. During the PED phase, primary activities will involve geological investigations to establish channel rock locations for construction, completion of the ocean disposal site designation, and preparation of plans and specifications.

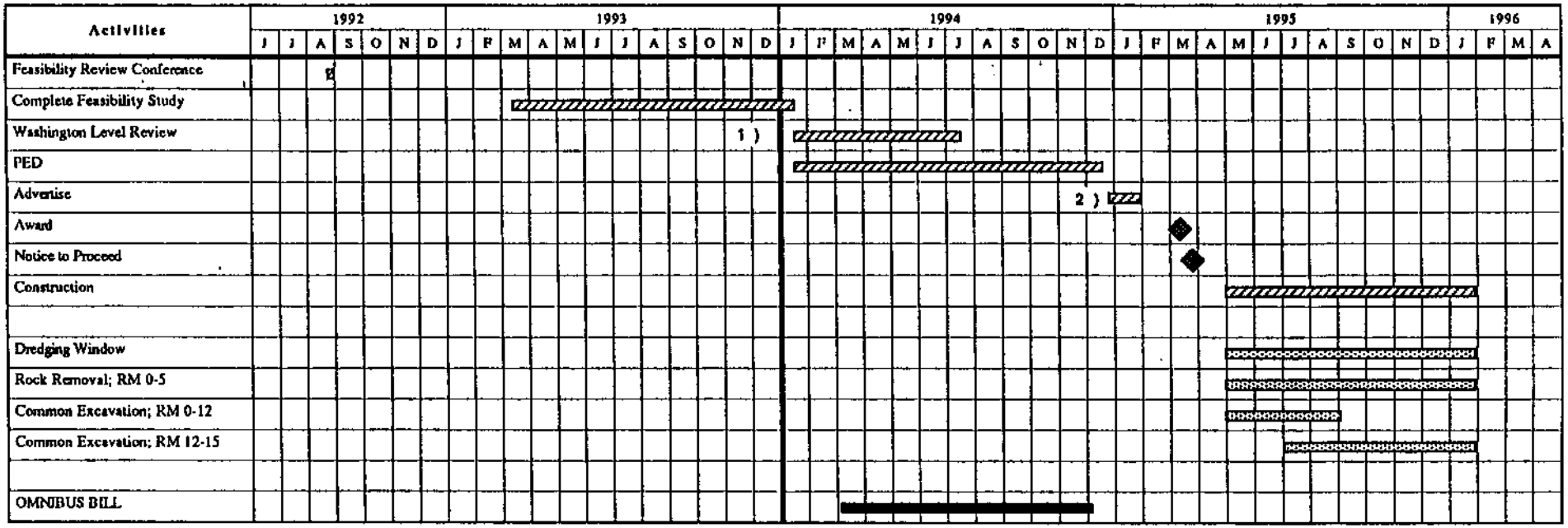
6.1.1 Ship Simulator Studies. ER 1110-2-1461, *Design of Channels Using Ship Simulator Techniques*, requires that ship simulator studies be conducted in the planning of navigation channels. As discussed in Engineering Analysis appendix, no adjustment to the alignment of the existing channel at the railroad bridge or elsewhere is proposed. During a site visit in April 1992, representatives from the Corps of Engineers Research Center, Corps of Engineers Headquarters, North Pacific Division and Portland District, identified several potential areas which may benefit from a model study. In addition to further consideration of the potential alignment adjustments mentioned above, the study also could provide information with regard to the width of the upper channel.

The opportunity to achieve meaningful benefits to the pilots navigating at the bridge is limited, however, and the pilots do not support reducing the width of the upper channel. It is possible that the study simulator, estimated to cost about $400,000, would not produce cost savings to offset the expenditure. For these reasons, coupled with the fact that there have been no deep-draft vessel accidents at the bridge, the District has requested a waiver from conducting the ship simulator study for this project. The cost for the study is not included in the estimates used to derive the selected plan.

From the GPS study, the Waterways Experiment Station concluded that, while requiring constant attention, the pilots had few problems navigating the channel and that there were not sufficient indications of significant navigation impacts with regard to the 2-foot deepening plan to warrant a simulation study.

The ship simulator study, if required, would be conducted during the PED phase.

Coos Bay G.I., Project Schedule Summary



1) Subject to higher level review, USACE, ASA
2) Start subject to OMB and Project Authorization

Project Schedule Summary		
US Army Corps of Engineers Portland District	Coos Bay Navigation Improvements	Figure 8

6.1.2 Construction Period. Construction is estimated to require 10 months to complete, with an assumed May through February schedule. In-water work periods for the selected plan have been negotiated with the resource agencies. Resource agencies have agreed to extend in-water work periods so the work can be completed in one season to minimize the duration of impact to the environment. The in-water work periods for the reaches are: July 1 to Jan. 31 for RM 12 to RM 15; May 1 to Aug. 31 for dredging below RM 12; and May 1 to Jan. 31 for rock excavation.

6.2 Cost Apportionment

The total FY 1994 project investment cost for the selected plan is estimated to be $14,139,400. See table 5-1 in section 5 for development of the investment cost.

6.2.1 Fully-Funded Cost. Table 6-1 is a reproduction of the Executive Cost Summary from the baseline cost estimate. The current fully-funded cost estimate for this project includes an estimate of inflation based on Office of Management and Budget guidelines and the tentative construction schedule. The Federal and non-Federal shares in the cost of the construction are derived from the fully-funded cost estimate.

6.2.2 Non-Federal Cost Sharing. For construction of general navigation features (GNF) between 20 feet and 45 feet in authorized project depth, the non-Federal cost share is 25 percent of the construction cost plus 10 percent additional cash with credit for any lands, easements, rights of way, relocations, and disposal areas (LERRD) applied against the additional cash. Based on the guidance provided in EC 1165-2-141, March 15, 1988, this cost share formula also applies to the entrance channel which is dredged to depths below 45 feet (to 47 feet, exclusive of overdepth). The increased depth is needed for safe passage in the entrance and therefore as provided in the EC, the cost sharing should be based on the deepest depths of the protected inner channels.

The non-Federal sponsor also would be responsible for 100 percent of costs for features or development in excess of that required for the NED plan, such as a deeper or wider channel.

As provided in Section 101 of the Water Resources Development Act of 1986, the non-Federal share consists of 25 percent to be paid during the construction and an additional 10 percent, less any LERRD, to be paid over a period not to exceed 30 years at an

TABLE 6-1.--*Total Project Cost Summary*

****TOTAL PROJECT COST SUMMARY**** PAGE 1 OF 1

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT FEASIBILITY REPORT, DATED SEPTEMBER 1993

PROJECT: COOS BAY CHANNEL DEEPENING — DISTRICT: PORTLAND

LOCATION: COOS BAY, OREGON ' — P.O.C.: PAT JONES, CHIEF, COST ENGINEERING BRANCH

CURRENT MCACES ESTIMATE PREPARED:		from 1990 to 1993				AUTHORIZ./BUDGET YEAR: 1994				FULLY FUNDED ESTIMATE				
EFFECTIVE PRICING LEVEL:		Oct-93				EFFECT. PRICING LEVEL: OCT 93								
ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
09 - - -	DREDGING	9,748	2,252	23%	12,000	0.0%	9,748	2,252	12,000	Sep-95	6.6%	10,391	2,401	12,792
	TOTAL CONSTRUCTION COSTS = = = = = >	9,748	2,252	23%	12,000	0.0%	9,748	2,252	12,000		6.6%	10,391	2,401	12,792
01 - - -	LANDS AND DAMAGES	N/A												
30 - - -	PLANNING, ENGINEERING AND DESIGN	823	144	17%	967	0.0%	823	144	967	Dec-94	3.4%	851	149	1,000
31 - - -	CONSTRUCTION MANAGEMENT	447	121	27%	568	0.0%	447	121	568	Sep-95	6.7%	486	132	617
	TOTAL COST = = = = = = = = = >	11,018	2,517	23%	13,535	0.0%	11,018	2,517	13,535		6.5%	11,728	2,681	14,409
	Non-Federal Dredge Cost to Private Docks	133	30	23%	163	0.0%	133	30	163		6.6%	142	32	174
	TOTAL PROJECT COSTS = = = = = = = = = >	11,151	2,547	0	13,698	0	11,151	2,547	13,698	0	0	11,870	2,713	14,583

TOTAL FEDERAL COSTS = = = = = = = = = > 10,807

TOTAL NON-FEDERAL COSTS = = = = = = = 3,776

THE MAXIMUM PROJECT COST IS = = = = = = = = = = 16,438

(EXCLUSIVE OF INFLATION)

interest rate pursuant to Section 106 of the Act of 1986. The fully funded cost estimate for the selected plan, inflated to mid-point of construction (September 1995), is $14,583,000. Table 6-2 indicates the estimated cost share amounts for this project.

TABLE 6-2.--*Initial Construction Cost Share Amounts*

Non-Federal, 100% (Associated Costs)	$ 174,000
Non-Federal, 25%	3,602,200
Federal, 75%	10,806,800
Total Fully Funded Costs	$14,583,000

The additional 10 percent cash contribution to be paid by non-Federal interests over a period not to exceed 30 years is estimated at $1,440,900 plus interest. No LERRD costs are anticipated.

6.3 Division of Responsibilities

In addition to the cost sharing responsibilities discussed in the previous paragraph, the following paragraphs outline additional Federal and non-Federal responsibilities in connection with development of general navigation projects, as mandated by WRDA 1986, Public Law 99-662, and other pertinent laws and policy guidance.

6.3.1 Federal Responsibility. The Corps of Engineers would be responsible for preparing detailed plans and specifications necessary to award a contract, and constructing and maintaining the project resulting from implementation of the selected plan. Congress would authorize the project and appropriate Federal funds for its construction.

6.3.2 Non-Federal Responsibilities. Based on guidance contained in ER 1165-2-131, *Local Cooperation Agreements for New Start Construction Projects,* non-Federal interests, in addition to contributing the funds described in paragraph 6.2.2, must:

a) Provide, without cost to the United States, all lands, easements, and rights-of-way, including upland dredge material disposal areas, and perform (or assure performance of) all alterations and relocations of facilities and utilities (except for highway and railroad bridges) necessary for the construction of the project and for aids to navigation upon the request of the Chief of Engineers. The project is not expected to require navigation aids.

b) The value of any lands, easements and rights-of-way, relocations disposal areas (if needed) provided by the sponsor would be credited towards their additional 10 percent payment described in para. 6.2.2, above.

c) Provide and maintain, at its own expense, all project features other than those for GNF needed to implement the proposed project (e.g. local access channels, berthing areas, docks).

d) Comply with the applicable provisions of the Uniform Relocation Assistance and Real Estate Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulation contained in 49 CFR, Part 24.

e) Maintain and operate all the non-Federal features after completion in accordance with regulations prescribed by the Secretary of the Army.

f) Assume financial responsibility for the cleanup of hazardous materials located on project lands and covered under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) without cost sharing.

g) Be responsible for operating, maintaining, repairing, replacing, and rehabilitating the project in a manner so that liability will not arise under CERCLA.

h) Provide berthing areas, floats, piers, slips, and similar marina facilities as needed for transient and local vessels, as well as necessary access roads,

parking areas, and other needed public use shore facilities open and available to all on equal terms.

6.4 Sponsor's Support

6.4.1 Sponsor's Views. The Oregon International Port of Coos Bay supports implementation of the 37-foot channel deepening plan and anticipates an expedited processing towards authorization and construction, as evidenced by the letter of intent dated January 27, 1994 attached as an exhibit to this report. The Port states that the proposed improvements provide a critical component in the development plans and capabilities of the harbor and the Port Authority. The letter sites new developments in ore imports and other commodities, as well as new mill construction to handle second-growth timber as evidence of its vitality and expansion potential beyond previous reliance on traditional forest products exports. The Port indicates it is clearly financially capable and fully prepared to perform its responsibilities as the non-Federal partner as prescribed in the report and draft Project Cooperation Agreement.

6.4.2 Sponsor Financing. The non-Federal sponsor has provided a statement of financial capability and a financing plan. This information is located at Appendix J, Port of Coos Bay Financial Plan. The plan has been reviewed and found to be in compliance with requirements for ensuring that the non-Federal sponsor has a reasonable plan for meeting its financial commitment. The Sponsor's plan is to fund the non-Federal share of construction and the additional 10% payment from the State of Oregon's Marine Navigation Improvement Fund (MNIF). A letter from the Director of the Oregon Economic Development Department that indicates the Port's eligibility to receive these funds is provided in the financing package. This fund was established by the Oregon Legislature for the express purpose of providing a long-term funding mechanism for ports and other entities to cost share the construction of authorized navigation improvement projects of the Corps of Engineers. MNIF funds for the current biennium (1993-1995) are committed for the non-Federal share of construction. The plan is to fund the additional 10% payment with MNIF funds from the next biennium (1995-1997). However, this portion cannot be committed during this biennium. Therefore, to assure financial capability at this time, the Port commits to provide alternative funding for the additional 10% payment through its bonding authorities.

7. LOCAL COOPERATION AND AGENCY COORDINATION

7.1 Public Views

Public meetings were held in connection with the study to obtain the views of local interests. In addition, area business interests were contacted individually to obtain their views on growth trends of industries dependent on water transportation; on alternative methods of improving navigation conditions; and on general trends in waterborne commerce. Local business interests appear to favor the project. Several written public comments were received during public review of the draft report and EIS. These have been reproduced and along with District responses are attached to the EIS. Some concerns were raised with the economic feasibility in light of timber supply issues and suggestions were made for alternative development in the lower bay in lieu of deepening the upper end of the channel. A meeting was held with the Oregon Natural Resources Council to discuss their comments, which were primarily directed at the economics of the plan. Additional concerns were raised with regard to effects of deepening on the integrity of the railroad bridge piers (by the Southern Pacific Transportation Company), while some comments were received regarding possible subsidence of land or erosion caused by the deepening project.

7.2 Agency Coordination

The U.S. Fish and Wildlife Service (USFWS) Coordination Act Report is attached to the EIS, along with the District's response to the recommendations therein. Region 10 of the Environmental Protection Agency (EPA) is a cooperating agency for this study. Agency responses to the District's scoping letter may be found in Appendix I. Early in the study, resource agencies expressed concerns over salinity intrusion and the methodology for rock removal, preferring mechanical excavation to blasting. A salinity workshop was held in July 1989, which was attended by state and Federal fish and wildlife agencies and EPA. Appendix H includes the minutes from the workshop. Resource agencies have indicated that they would like the work completed in the shortest possible time to minimize the disruption to habitat and species. Agencies also seek a balance between long-term ocean disposal requirements and minimizing the quantity of habitat impacted by the disposal.

The draft feasibility report and EIS were released for public and agency review in September 1993. Agency comments and District responses to the comments are attached

to the EIS. The USFWS had no additional comments on the recommended plan. Written comments from the EPA have not been received as of the publication of this report. Verbal communication with EPA staff indicates there are no major concerns. Oregon Department of Fish and Wildlife provided comments and a meeting was held with that agency to discuss impacts of the deepening plan, cumulative impacts, in-water work dates, and mitigation. Discussions will continue with that agency with regard to details of post-construction monitoring of effects, potential measures for habitat development in the bay through use of dredged rock or shell materials, and potential future investigations under other authorities with regard to cumulative impacts. Oregon Department of Environmental Quality (DEQ) commented on dredging and disposal of contaminated sediment materials and HTRW sites. Additional information was obtained on the HTRW sites in cooperation with DEQ. This information is presented in the EIS.

8. CONCLUSIONS AND RECOMMENDATIONS

I have given careful consideration to all significant aspects of this study in the overall public interest, including engineering and economic feasibility, as well as social and environmental effects. The selected plan for improvement described in the report provides the optimum solution for navigation improvements at Coos Bay, Oregon.

I have also assessed the Oregon International Port of Coos Bay's financial capability and ascertained that it is reasonable to expect that ample funds will be available to satisfy the non-Federal sponsor's financial obligation for the project. The Port's letter of intent to sponsor the project is included as an exhibit to this report.

For construction of general navigation features (GNF) between 20 feet and 45 feet in depth, the non-Federal cost share is 25 percent of the construction cost plus 10 percent additional cash with credit for any lands, easements, rights of way, relocations, and disposal areas (LERRD) applied against the additional cash. I have determined this cost share formula also applies to the entrance channel, which is dredged to depths below 45 feet (to 47 feet plus advance maintenance). The increased depth is needed for safe passage in the entrance and, therefore, as provided in the guidance provided in EC 1165-2-141, March 15, 1988, the cost sharing should be based on the deepest depth of the protected inner channel.

I recommend that the existing Federal navigation project at Coos Bay, authorized by the River and Harbor Act of 1970, be modified to provide a 47 foot deep entrance channel transitioning to a 37 foot deep inner channel near RM 1 and continuing at that depth upstream to RM 15, and an enlarged turning basin at RM 12 from 800 feet by 1,000 feet to 900 feet by 1,000 feet, with such further modifications thereto as in the discretion of the Chief of Engineers may be advisable. The total investment cost is estimated to be $14,139,400. It is further estimated that additional annual costs of $109,800 will be incurred for increased Federal maintenance dredging. Including maintenance costs, the estimated total project annual cost is $1,298,900. With estimated average annual benefits of $1,998,700 in commodity transportation and delay savings, the proposed project is economically feasible with a benefit-to-cost ratio of 1.5 and annual net benefits of $699,800, thereby warranting Federal participation.

The fully-funded cost estimate is presently estimated at $14,583,000, based on a scheduled construction completion in FY 1996. Accordingly, the non-Federal cost share

is estimated to be $3,602,200 for 25 percent of the general navigation features (GNF), $174,000 for 100 percent of associated improvements, and $1,440,900 plus interest for an additional 10 percent of GNF payable over a period not to exceed 30 years.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of national Civil Works Construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and/or implementation of funding.

Date: 25 Jan 94

Charles A. W. Hines

CHARLES A.W. HINES
Colonel, Corps of Engineers
Commanding

CENPD-PE-PF (CENPP-PE-P/Jan 94) (1105b) 1st End
Mr. Weaver/kb/(503)323-3826
SUBJECT: Coos Bay, OR, Feasibility Study

CDR, North Pacific Division, Corps of Engineers, P.O. Box 2870,
Portland, Oregon 97208-2870

01 FEB 1994

FOR CDR, USACE (CEWRC-WLR-M), Kingman Building, Ft. Belvoir, VA

I concur in the conclusions and recommendations of the District Commander.

ERNEST J. HARRELL
Major General, USA
Commanding

EXHIBIT

OREGON INTERNATIONAL PORT OF COOS BAY

Front & Market Streets • Coos Bay, Oregon 97420 • Telephone: 503/267-7678 • Fax: 503/269-1475

January 27, 1994

Colonel Charles A. W. Hines, District Engineer
U.S. Army Corps of Engineers
Portland District
PO Box 2946
Portland, OR 97208-2946

Dear Colonel Hines:

The Oregon International Port of Coos Bay is pleased to have reached this milestone in our joint efforts with the Corps of Engineers to complete the Coos Bay Channel Deepening Feasibility Study. At the same time, we are anxious to keep pressing for continued, expeditious progress toward final authorization of the report and project. As we have discussed many times, there have been significant challenges and tense moments along the way. We believe that more recent joint efforts and coordination have put those times in the past and that we are moving forward together.

The Port has thoroughly reviewed the Draft Report and EIS, and fully support the findings. Based on seven years of study and analysis, we believe the study and findings to be based on sound engineering, economic and environmental principles. The proposed improvements provide a critical component in the development plans and capabilities of the harbor and the Port Authority, which are of vital importance to the economy of this region, the State and the nation. At the core of the economic analysis and benefits is a clear shift and expansion from what was once an almost pure reliance on forest products cargo. The substantial development represented by ore and other dry bulk imports, exports, and handling facilities is strategic and beneficial.

While this traditional forest products community embraces new cargoes and manufacturing, however, we also see a resurgence in second-growth and secondary timber manufacturing represented by projects such as the Georgia-Pacific metric mill now under construction in Coos Bay. That project is significant for two major reasons: 1) It does not rely on an unstable federal timber supply, and 2) It is the first new mill built in Oregon by Georgia-Pacific in decades. Both of those elements demonstrate a new economic and strategic picture in Northwest forest products.

The Port finds the terms of the Project Cooperation Agreement acceptable at this time, and is fully prepared to perform its responsibilities as the non-federal partner, spelled out in the PCA and the feasibility report.

Please consider this letter our statement of intent and commitment to enter into a final agreement at the appropriate point in the construction phase of the project. Our financing plan clearly demonstrates that the Port has, and will have, the necessary funding in place to meet its obligation for cost-sharing the project.

Since surviving a very difficult period during this study, we have been encouraged by the focus and timeliness the Corps has demonstrated. Nevertheless, it has been a very long trip, and we anticipate an expedited processing of the report through Washington. As we have all been aiming for authorization this fiscal year, we know the Corps of Engineers shares our urgency, and that of our Congressional delegation. Our further commitment is to assist the process any way possible.

We speak for the maritime interests in this harbor and Oregon when we assure you that we look forward to continuing our association to a successful and timely conclusion of the authorization phase, as we move forward together toward full construction of the project.

Sincerely,

Allan E. Rumbaugh
General Manager

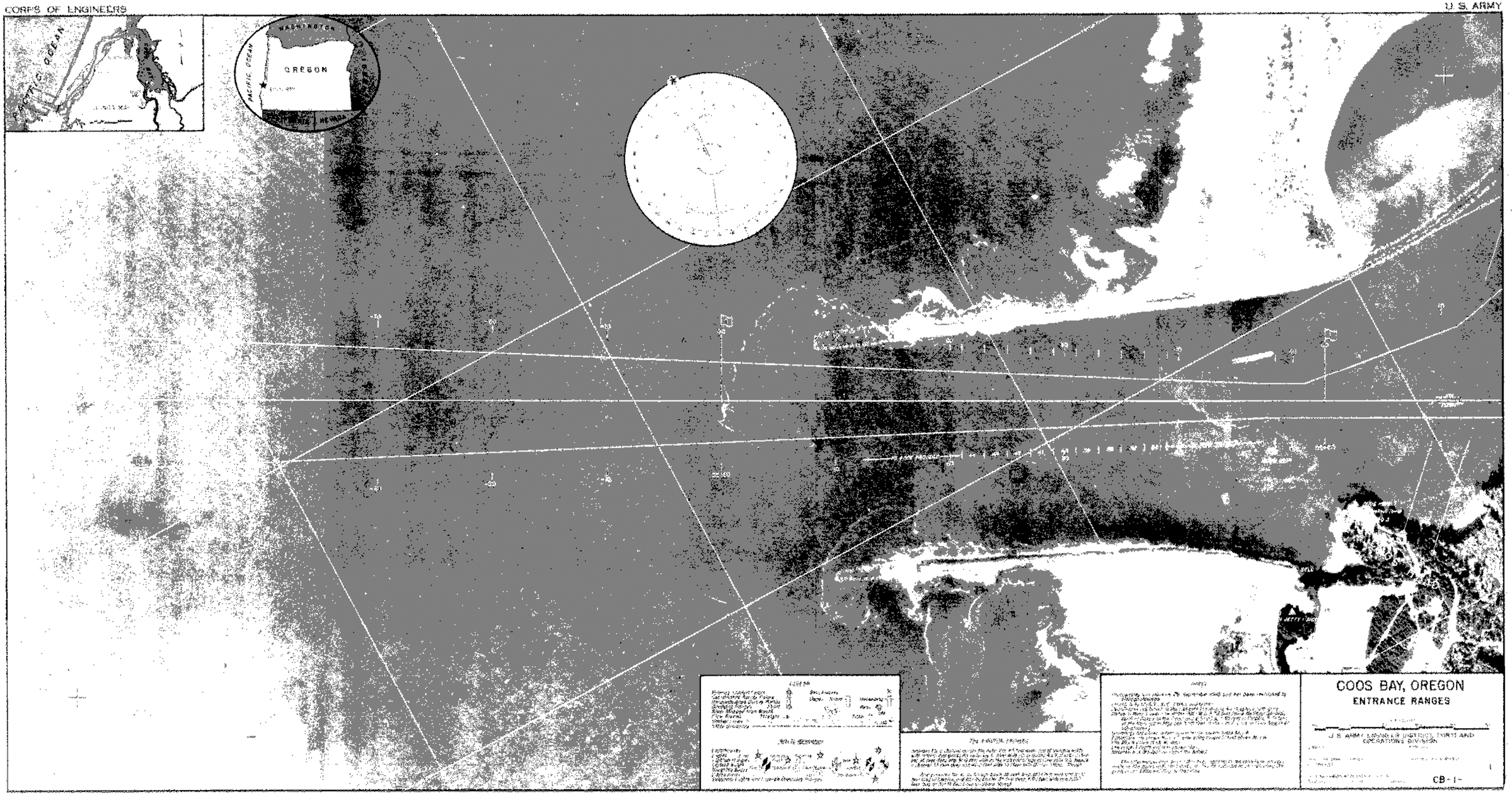
AER:dcb

cc Senator Mark O. Hatfield
Senator Bob Packwood
Congressman Peter DeFazio
Governor Barbara Roberts
Interested Parties

PLATES

CORPS OF ENGINEERS

U.S. ARMY



COOS BAY, OREGON

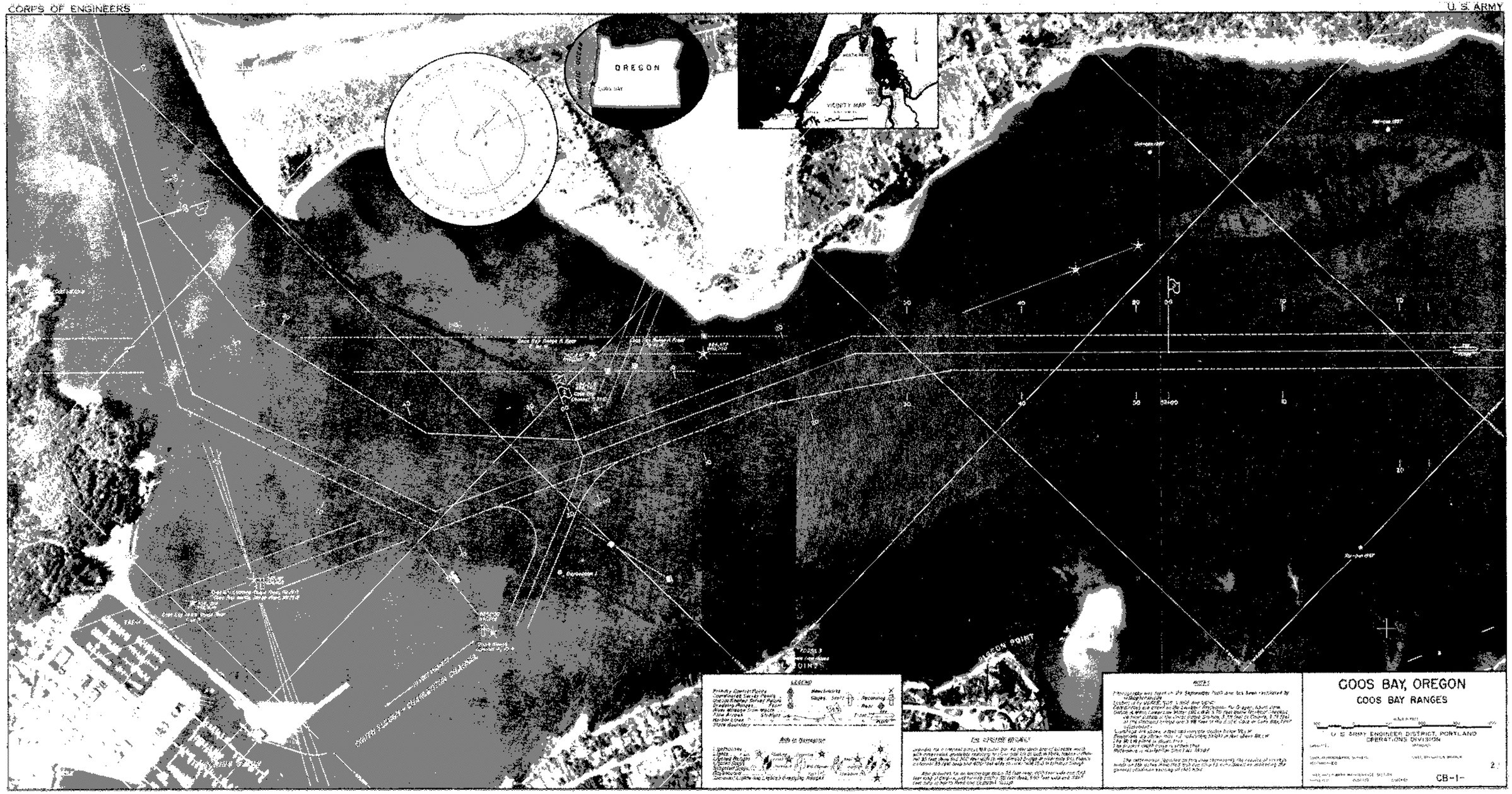
ENTRANCE RANGES

U.S. ARMY ENGINEER DISTRICT, PORTLAND
OPERATIONS DIVISION

CB-1-

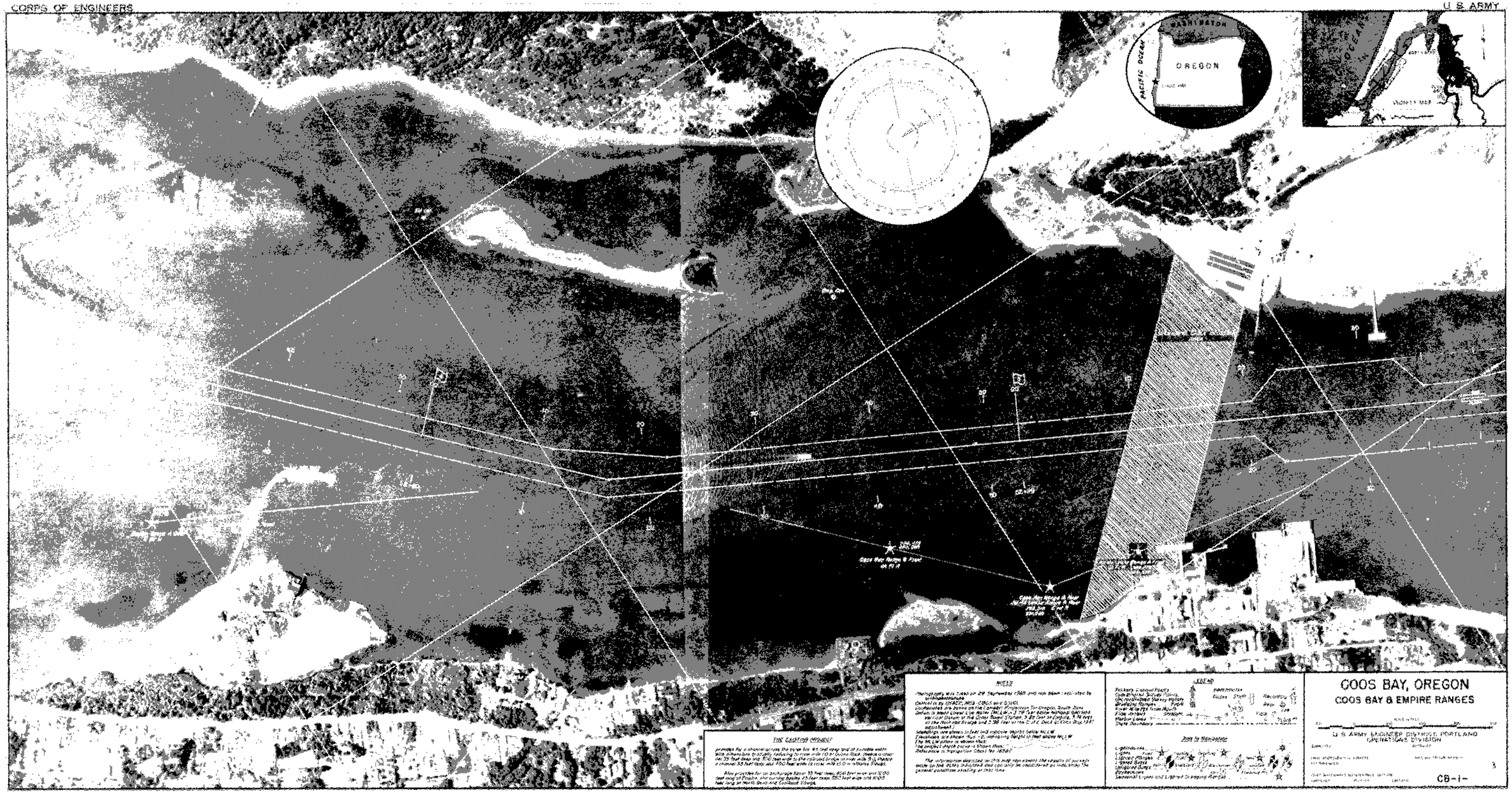
CORPS OF ENGINEERS

U. S. ARMY



CORPS OF ENGINEERS

U.S. ARMY



THE EXISTING PROJECT

NOTES

LEGEND

Aids to Navigation

COOS BAY, OREGON

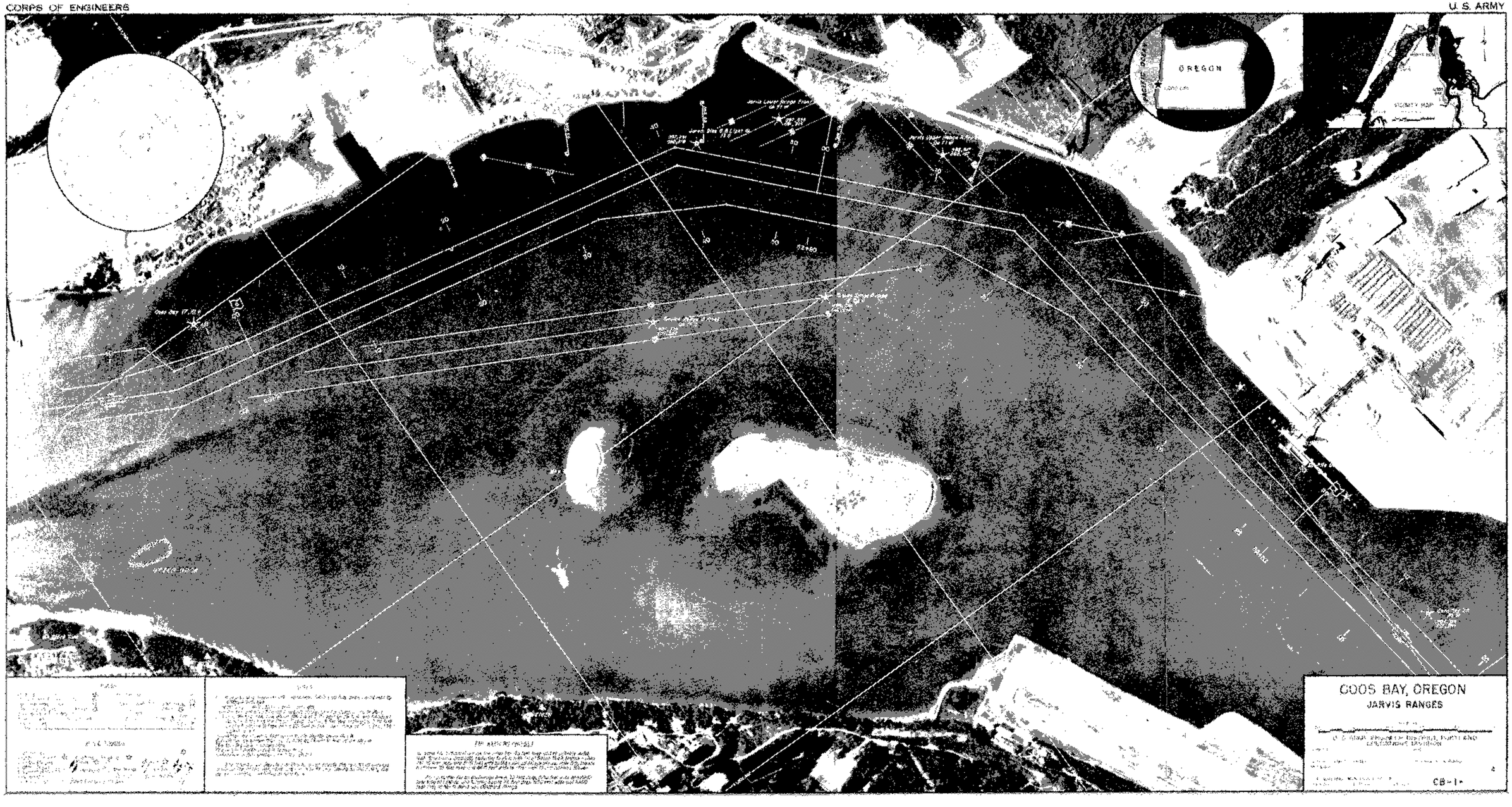
COOS BAY & EMPIRE RANGES

U.S. ARMY ENGINEER DISTRICT PORTLAND
OPERATIONS DIVISION

CB-1-

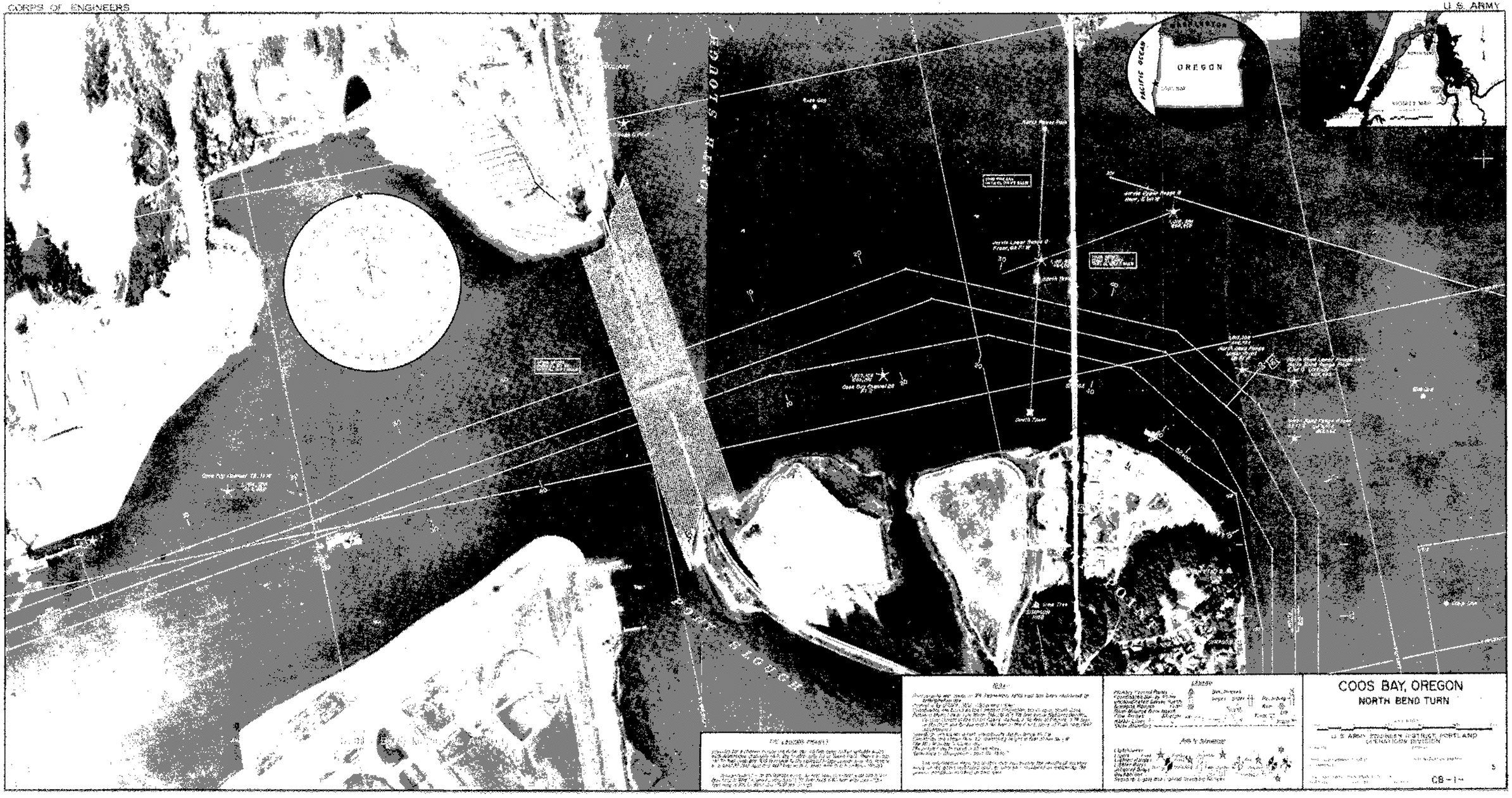
CORPS OF ENGINEERS

U.S. ARMY



CORPS OF ENGINEERS

U.S. ARMY



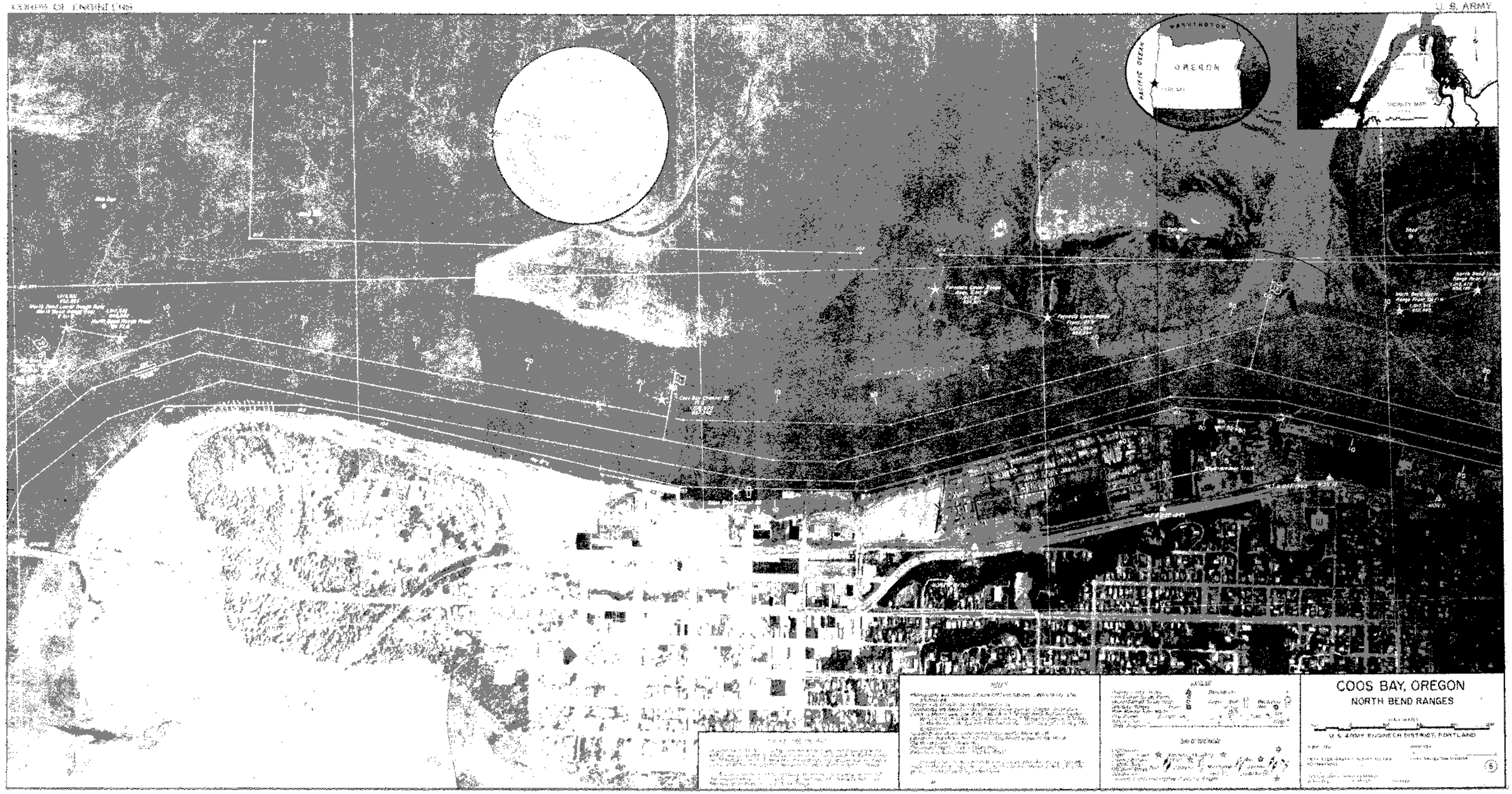
COOS BAY, OREGON
NORTH BEND TURN

U. S. ARMY ENGINEER DISTRICT, PORTLAND
DIVISION NORTH PACIFIC DIVISION

CB-1~

CORPS OF ENGINEERS

U. S. ARMY



COOS BAY, OREGON

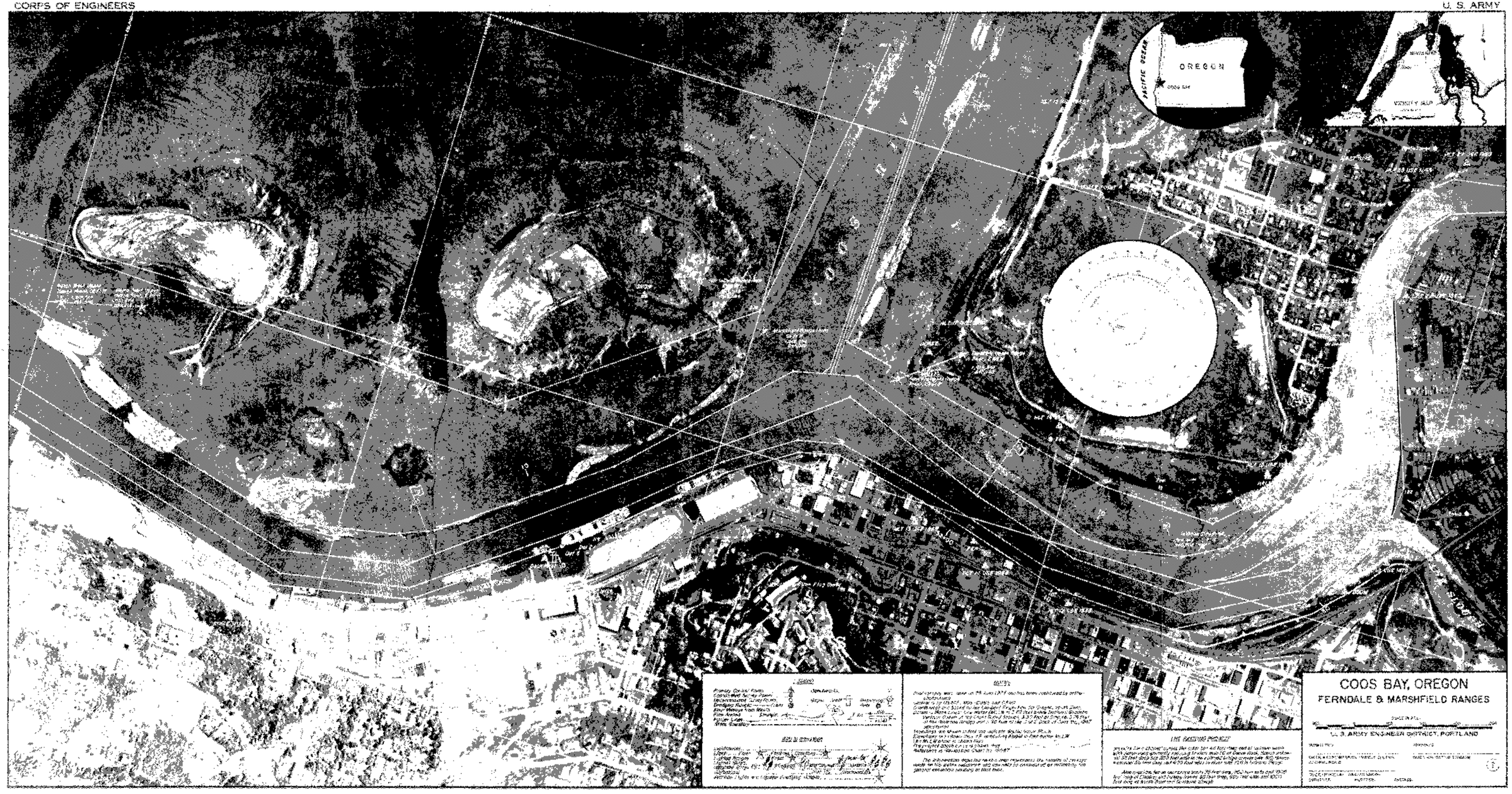
NORTH BEND RANGES

U.S. ARMY ENGINEER DISTRICT, PORTLAND

5

CORPS OF ENGINEERS

U. S. ARMY



COOS BAY NAVIGATION IMPROVEMENTS
COOS BAY, OREGON

FINAL
ENVIRONMENTAL IMPACT STATEMENT
FEASIBILITY REPORT

Prepared by
U.S. Army Corps of Engineers
Portland, District

In cooperation with
U.S. Environmental Protection Agency
Region X
Seattle, Washington

FINAL
COOS BAY CHANNEL DEEPENING
ENVIRONMENTAL IMPACT STATEMENT
FEASIBILITY REPORT

( ) DRAFT
(x) FINAL

SYLLABUS

Lead Agency. U.S. Army Corps of Engineers, Portland District.

Cooperating Agency. U.S. Environmental Protection Agency, Region 10.

Type of Action. Administrative.

Background. A significant part of the proposed action is the use of ocean disposal sites for the placement of material dredged from the proposed navigation channel improvements. The Environmental Protection Agency (EPA) has agreed to assist in the preparation of this Environmental Impact Statement (EIS) Feasibility Report because of their expertise and responsibilities in administering the provisions of the Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972 as amended. EPA and the Corps jointly prepared an EIS addressing the designation of existing ocean disposal sites for Coos Bay. The final EIS document was issued February 7, 1986. This EIS utilizes information from that document, as well as more recent studies, to assess impacts of placement of dredged material at the existing disposal sites as well as disposal at new or expanded sites. This 'tiered' approach conforms to the guidance provided by CEQ Regulations, 40 CFR Parts 1502.20 and 1508.28.

Description of the Proposed Action and Purpose. The Federal Government has constructed and maintains an outer bar channel 45 feet deep and 700 feet wide transitioning to a channel 35 feet deep and 300 feet wide entering the jetties and through to approximately River Mile (RM) 1, a channel 35 feet deep and 300 feet wide from river RM's 1 to 9, a 35 foot deep by 400 foot wide channel from river RM's 9 to 15 upstream of Coos Bay, Oregon. An anchorage (currently used as a turning basin) 800 feet wide by 1,000 feet long at Empire, Oregon, and two 650- by 1,000-foot turning basins at North Bend and Coos Bay, Oregon

are also authorized. The plan of improvement proposed by the Portland District Engineer consists of modification of the existing navigation project to provide for the following:

a. An outer bar approach 47 feet deep and 700 feet wide.

b. An entrance through the jetties 47 feet deep by 700 feet wide tapering to 300 feet wide by 37 feet deep.

c. A lower channel 37 feet deep by 300 feet wide to RM 9 and an upper channel 37 feet deep by 400 feet wide to RM 15.

d. Expanding the North Bend (RM 12) turning basin width from 800 feet to 900 feet.

The purpose of the proposed action is to improve navigation conditions for larger ships utilizing the channel and reduce transportation delays.

Summary of Major Environmental Impacts. The proposed action would alter present topography along the 15-mile length of the navigation channel and at the ocean disposal sites; remove or bury benthic organisms at these sites; disturb fish and wildlife habitat and food sources through dredging, mechanical rock removal, and disposal; temporarily increase estuarine turbidity; slightly increase estuarine salinity; slightly change estuarine circulation and sedimentation patterns; and slightly increase maintenance dredging requirements.

Final Copy. The final copy of this EIS was officially filed with the Director, Office of Federal Activities, EPA on MAR 08 1994.

Comments. Comments on the final copy of this EIS are due 30 days from the date of EPA's publication of Notice of Availability in the Federal Register which is expected to be MAR 18 1994. Such comments are to be addressed to the following:

U.S. Army Corps of Engineers
Washington Level Review Center
Kingman Building
For Belvoir, Virginia 22060

Copies of the draft EIS may be obtained from the following:

U.S. Army Corps of Engineers, Portland District
CENPP-PE-RP ATTN: Steven J. Stevens
P.O. Box 2946
Portland, Oregon 97208-2946
Phone: (503) 326-6094

SUMMARY

1. Major Conclusions and Findings. The preferred plan for the Coos Bay Navigation Project is to deepen the existing entrance and inner channel by 2 feet to reduce commercial shipping delays and allow full loading of ships. This plan, which is cosponsored by the International Port of Coos Bay, would have total annual benefits of $2 million, and total annual costs of $1.3 million.

Disposal of the new work and annual maintenance dredged material would occur primarily at currently designated or proposed ocean disposal sites. All channel dredged material is considered suitable for in-water disposal. Additional estuarine disposal is not considered environmentally acceptable by the resource agencies, and upland sites are extremely scarce and should be reserved for contaminated material, although none is expected from the proposed project.

2. Areas of Controversy. Comments on the draft EIS were received from Federal and State resource agencies, local agencies, one environmental group, local businesses, and individuals. Concerns expressed in their comments included impacts to benthic populations and habitat in Coos Bay; salinity effects on fish, clam, and crab populations; comulative impacts on the ecology of Coos Bay estuary; potential impacts on endangered species; economic justification for deepening; concern for channel slope stabilization and shoreline erosion; alternative port developments to be considered; possible introduciton of contaminated sediments into the water column; and commercial uses for dredged material. This EIS addresses all of these ocncerns, either in direct response to their letters or as revisions to the Feasibility Report/EIS.

The magnitude of these resource concerns is reduced as proposed channel depth decreases. The preferred 2-foot deepening represents a significant reduction in adverse impacts from the deepening of up to 5 feet addressed in the Coordination Act Report. A 2-foot deepening would likely not increase ship traffic but would increase shipping efficiency. In addition, no rock blasting

would be required under the preferred plan, which would eliminate a major concern identified by the agencies.

3. Issues to be Resolved. The primary issue known at this time to be resolved is the determination of long term ocean disposal site requirements. This EIS identifies sites suitable for new work and long term maintenance dredging. Information for new site designations for new work and maintenance dredging quantities is included in the EIS. Additional procedural issues remain to be completed to meet EPA requirements for final site designation.

Table of Contents

	Page
Syllabus	i
Summary	iv
Table of Contents	vi
Index	I-1

Paragraph

CHAPTER 1 - PURPOSE AND NEED

1.1	Purpose	1-1
1.2	Need	1-1

CHAPTER 2 - ALTERNATIVES

2.1	Introduction	2-1
2.2	Alternative Measures Considered	2-1
2.3	Plans Eliminated from Further Consideration	2-2
2.4	Alternatives Considered in Detail	2-2
2.5	Preferred Alternative	2-4
2.6	Alternatives Comparison	2-4
2.7	Existing Ocean Disposal Site Evaluation	2-6
	a. General	2-6
	b. Non-Ocean Disposal Alternatives	2-6
	c. Current Ocean Disposal Site Status	2-11
2.8	Ocean Disposal Candidate Site Selection	2-12
	a. General	2-12
	b. Continued Use of Site F	2-14
	c. Continued Use of Disposal Site H	2-17
	d. Rock Formation Disposal Site Selection	2-18
	e. Recommended Candidate Sites	2-18
2.9	Mitigation	2-21

CHAPTER 3 - AFFECTED ENVIRONMENT

3.1	Introduction	3-1
3.2	Physical Resources: Coos Bay Estuary	3-1
	a. General Description	3-1
	b. Geologic Setting	3-1
	c. Estuary Dynamics	3-3
	d. Riverflow	3-5
	e. Bathymetry	3-5
	f. Sediment Quality	3-5

Table of Contents

		Page
	g. Water Quality	3-11
	h. Salinity	3-11
	i. Sedimentation	3-12
3.2	Physical Resources: Ocean Disposal Sites	3-13
	a. Introduction	3-13
	b. Geographic Locations	3-13
	c. Geographical Characteristics	3-15
	d. Bathymetry	3-15
	e. Sediment Characteristics	3-16
	f. Sediment Transport	3-21
	g. Currents and Tides	3-24
	h. Surface Waves	3-25
	i. Wind Direction and Speed	3-26
	j. Water Quality	3-26
3.3	Biological Resources: Coos Bay Estuary	3-26
	a. Introduction	3-26
	b. Flora and Fauna of Coos Bay	3-33
3.4	Biological Resources: Ocean Disposal Sites	3-46
	a. Introduction	3-46
	b. Benthic Invertebrates	3-48
	c. Macroinvertebrates	3-58
	d. Fish	3-62
	e. Wildlife	3-64
	f. Threatened and Endangered Species	3-64
3.5	Human Resources	3-66
	a. Introduction	3-66
	b. Local Economy	3-66
	c. Waterborne Transport	3-67
	d. Population	3-67
	e. Land Use	3-68
	f. State and Local Use Plans	3-68
	g. Aesthetics	3-69
	h. Cultural Resources	3-69

CHAPTER 4 - ENVIRONMENTAL EFFECTS OF ALTERNATIVES

4.1	Physical Impacts: Coos Bay Estuary	4-1
	a. Predicting Future Changes	4-1
	b. Circulation Changes	4-2
	c. Salinity	4-3
	d. Water Quality	4-6
	e. Sedimentation and Sediment Transport	4-6
	f. Sediment Quality	4-7

Table of Contents

		Page
4.2	Physical Impacts: Ocean Disposal Sites	4-8
	a. Introduction	4-8
	b. Location, Size, and Geography	4-8
	c. Sediment Transport	4-9
	d. Water Quality	4-12
4.3	Biological Impacts: Coos Bay Estuary	4-13
	a. Primary Impacts	4-13
	b. Salinity Impacts	4-17
	c. Secondary Impacts	4-19
4.4	Biological Impacts: Ocean Disposal Sites	4-19
	a. Site E	4-19
	b. Site F	4-20
	c. Site H	4-20
	d. Rock Site	4-21
4.5	Human Resources Impacts	4-21
	a. Local Economy	4-21
	b. Waterborne Transportation	4-23
	c. Population and Employment	4-23
	d. Land Use and Land Use Plans	4-23
	e. Cultural Resources	4-24
	f. Aesthetics	4-24
4.6	Unavoidable Adverse Impacts	4-24
	a. Dredging Impacts	4-24
	b. Disposal Impacts	4-25
4.7	Cumulative Impacts	4-25
	a. Physical Impacts	4-26
	b. Biological Impacts	4-26
	c. Human Impacts	4-26
4.8	Relationship between Local Shot-Term uses of the Environment and Maintenance and Enhancement of Long-Term Productivity	4-26
4.9	Irreversible and Irretrievable Commitments of the Resources	4-27

CHAPTER 5 - REVIEW AND CONSULTATION REQUIREMENTS

5.1	Public Involvement	5-1
5.2	Compliance with Environmental Laws and Executive Orders	5-2
	a. Clean Air Act of 1970, as Amended	5-2
	b. Clean Water Act of 1977 as Amended	5-3
	c. Coastal Zone Management Act of 1972 as Amended	5-3
	d. Comprehensive Environment Response, Compensation and Liability Act	5-3
	e. Endangered Species Act of 1973 as Amended	5-3
	f. Estuary Protection Act	5-4
	g. Fishery Conservation and Management Act of 1976	5-4
	h. Fish and Wildlife Coordination Act	5-5

Table of Contents

		Page
i.	Marine Mammal Protection Act of 1972	5-5
j.	Marine Protection Research and Sanctuaries Act of 1972, As Amended	5-5
k.	Migratory Bird Conservation Act	5-5
l.	Migratory Bird Treaty Act (1918)	5-6
m.	Submerged Lands Act of 1953	5-6
n.	Cultural Resources Acts	5-6
o.	Analysis of Impacts on Prime and Unique Farmlands, CEQ Memorandum, 1976	5-6
p.	Executive Order 11990, Protection of Wetlands, 24 May 1977	5-6
q.	Executive Order 11988, Floodplain Management, 24 May 1977	5-7

Figures

Number		
2.1	Existing and Potential Candidate Disposal Areas	2-10
2.2	Proposed Ocean Disposal Sites	2-13
2.3	Existing and Candidate Ocean Disposal Sites	2-20
3.1	Coos Bay Area Map with Existing Deep Draft Navigation Project Information	3-2
3.2	Typical Daily Tidal Cycle for Mixed Semi-Diurnal Tide	3-4
3.3	Correlation Between Precipitation at North Bend and Flow at West Fork Millicoma River	3-6
3.4	Ocean Disposal Sites	3-14
3.5	Extended Off-Shore Area Median Grain Size Distribution	3-17
3.6	Extended Off-Shore Area Volatile Solids	3-18
3.7	Median Grain Size Versus Organics Content in Estuarine and Coastal Sediments	3-19
3.8	Median Grain Size Versus Volatile Solids with Site Average and Standard Deviation	3-20
3.9	Monthly Wind Vectors Observed at North Bend Airport and NOAA Off-Shore Data Buoys	3-27
3.10	Coos Bay Subsystems	3-30
3.11	Benthic Invertebrate Sampling Stations Along the Coos Bay, Oregon Navigation Channel	3-38
3.12	Coos Bay Off-Shore Study Area, 1979-1983	3-47
3.13	Locations of Benthic Invertebrate and Sediment Stations, Site F, April 1992	3-49
3.14	Existing and Candidate Ocean Disposal Sites	3-50
3.15	Numbers of Most Abundant Polychaetes at Stations within Sites F and H, April and October 1979	3-51
3.16	Numbers of Most Abundant Mollusks at Stations within Sites F and H, April and October 1979	3-53
3.17	Numbers of Most Abundant Crustaceans at Stations within Sites F and H, April and October 1979	3-54
3.18	April and October Trawl Transects	3-59

Table of Contents

	Page
3.19 Numbers and Lengths (in Parenthesis) of Dungeness Crabs for Each Trawl transect, April and October 1979	3-60
3.20 Numbers of Shrimp Caught in 15-Minute Trawls at Each Transect, April and October 1979	3-61
3.21 Coos Bay Estuarine Management Units and Shoreline Zoning	3-70

Tables

Number

2.1	Alternative Plans Evaluated	2-3
2.2	Comparison of Alternatives	2-7 thru 2-9
3.1	Sediment Accumulation Within Upper Coos Bay	3-13
3.2	Location of Alternative Disposal Sites	3-28 and 3-29
3.3	Chemical Analysis of marine Waters at Off-Shore Sites F, G, and H Coos Bay, Oregon	3-39
3.4	Polychaete Species from Site F, Coos Bay, Oregon, 1980-81	3-52
3.5	Most Abundant Demersal Fishes at Site F	3-63
3.6	Most Numerous Fish Species Caught in Trawls at Disposal Site H, May, August, and December 1980, and May 1981	3-63
3.7	Population 1970 to 1988	3-68
4.1	Relationship Between Available Data and Past Channel Changes	4-2
4.2	SALPLOT Salinity Modeling Result	4-5

EXHIBITS

Exhibit

1 List of Preparers
2 References
3 DEIS Comments and Responses
4 Section 103 Evaluation
5 CZM Consistency Determination
6 Fish and Wildlife Coordination Act Report
7 Endangered Species Coordination Letters and Biological Assessments

FINAL
COOS BAY CHANNEL DEEPENING
ENVIRONMENTAL IMPACT STATEMENT
FEASIBILITY REPORT

CHAPTER 1

PURPOSE AND NEED

1.1 Purpose. The purpose of the proposed channel deepening is to reduce shipping costs through reduction of delays and to permit larger vessels to use the port resulting in fewer ships carrying the same or increased cargo volumes at lower cost per ton. Channel deepening would also allow the port to maintain it's competitive position in the world market.

The purpose of this EIS is to address impacts of the proposed channel deepening and ocean disposal alternatives. Ocean disposal of the dredged material for this project is a critical economic and environmental component of the overall navigation improvement project. This EIS contains an evaluation of the proposed ocean disposal and alternatives based on the criteria and factors in the Ocean Dumping Regulations (40 CFR 228.5 and 228.6). This EIS also provides documentation in support of the Environmental Protection Agency's ocean disposal site designation process for continuing long-term use with the Coos Bay, Oregon, Federal navigation project and related dredged material disposal activities. Previous Environmental Impact Statements prepared for the Coos Bay navigation project include Coos Bay, Oregon Deep Draft Navigation Project SEIS, July 1975; Coos Bay Channel Maintenance Dredging EIS, August 1976; and Coos Bay, Oregon Dredged Material Disposal Site Designation EIS, February 1986. Several references to these environmental documents are made throughout this EIS.

1.2 Need. Coos Bay is Oregon's second largest port and one of the world's largest shipping ports for forest products. It is the point of departure for forest products from all over the northwest. Within the Coos Bay region, approximately 50 percent of the 20,000 available jobs are directly or indirectly dependent on shipping activities. In 1988, the total volume of

trade through Coos Bay was 5 million tons. A deeper channel would allow the Port of Coos Bay to operate economically and maintain a viable, competitive position as a West Coast import/export center primarily for timber products. Maintaining an active shipping trade is a necessary component for a healthy economy in the Coos Bay region. The economic justification for the proposed action is based on shipping vessel economies of scale and reduced delays. Detailed discussion of current and projected need for the deep-draft channel are described in Section 3 of the preceding feasibility report.

CHAPTER 2

ALTERNATIVES

2.1 Introduction. This section discusses the alternative actions studied during the reconnaissance phase, those eliminated from further study, and those studied in more detail during this feasibility phase including no action and the preferred alternative. The primary purpose of this section is to present a comparative environmental evaluation of the alternatives including any proposed mitigation plans, clearly describing the issues and trade-offs associated with each alternative.

2.2 Alternative Plans Considered. The reconnaissance phase of the study developed nine alternative plans related to channel modifications. The plans analyzed included deepening the Coos Bay navigation channel to various depths removing up to a maximum of 5 feet of sediments along its full 15-mile length, reconstructing the Southern Pacific railroad bridge, raising the Highway 101 bridge, dredging a shorter, deeper channel, constructing a small or large anchorage near RM 7, various combinations of the preceding, and a no-action alternative.

The no-action alternative is a continuation of the existing practice of maintaining the existing Federal channel to the authorized project depths of -45 feet at the entrance and -35 feet for the inner channel. Annual maintenance dredging is normally required for the entrance bar and inner channel to RM 12. Maintenance dredging is normally performed every other year from RM's 12 to RM 15. Overdepth dredging routinely occurs as part of channel maintenance practices. Overdepth includes 2 feet for dredging tolerances based on physical conditions and equipment used during dredging. Advance maintenance is also performed above RM 12 to assure that the authorized depths are provided for a long period between dredging cycles. Advance maintenance depths at Coos bay are 4 feet at the entrance and 1 foot above RM 12. Total dredging depth with overdepth allowances and advance maintenance are -51 feet at the entrance, -37 feet between RM's 1 and 12 and -38 feet above RM 12.

Current annual maintenance dredging quantities are presented in appendix B of the feasibility report.

2.3 Plans Eliminated From Further Consideration. Raising the highway bridge and widening the Southern Pacific railroad bridge proved to be prohibitively expensive and could not be economically justified. Dredging a shorter channel could not be economically justified as, at present, most facilities requiring a deeper channel are concentrated along the upper reaches of the authorized channel, between RM's 12 and 15. Moving existing facilities and attendant infrastructure from the upper channel reaches to the lower bay would likewise be prohibitively expensive. Development of additional deep-draft facilities in the lower bay could not be justified in the foreseeable future. Construction of an anchorage basin in the vicinity of RM 7 was also considered but was not economically feasible for depths greater than 35 feet. The reconnaissance report also included an evaluation of disposal site alternatives. Utilizing information contained in the 1976 Coos Bay Channel Deepening EIS and subsequent surveys, existing upland and estuary sites were determined to have limited capacity. The estimated 1.3 to 1.4 million y^3 of new dredged material, let alone subsequent maintenance dredging material, far exceeds the capacity of these sites. Potential ocean disposal sites were studied in further detail for disposal of both rock and sand sediments. Table 2.1 displays the features of the nine alternative plans evaluated in the reconnaissance report and three of the six alternatives being considered in the feasibility phase.

2.4 Alternatives Considered In Detail. The alternatives recommended in the reconnaissance report to be studied in detail during this feasibility study phase are deepening the channel by 1 to 5 feet from the entrance to RM 15, and disposal of the material in designated ocean disposal sites. Associated channel width in the vicinity of the railroad bridge, and widening the existing turning basin at RM 12 were also investigated with each alternative. Overdepth dredging allowances would remain as currently practiced. Dredging efforts would likely utilize a combination of hopper and clamshell dredge. Hopper dredges would remove the primarily sandy material from below RM 12.

TABLE 2.1, ALTERNATIVE PLANS EVALUATED

Alternative Plans, Reconnaissance Report										Feasibility Report Alternatives
	Entrance Channel			Bay Channel			Anchorage		Reconstructed Railroad Bridge	
	Depth in Feet			Depth in Feet						
Plan	48	50	52	38	40	42	Large	Small		▩
1	●			●			●		●	
2	●			●			●			
3	●			●				●		
4	●			●						●
5		●			●					●
6			●			●				
7							●			
8								●		
9 (no action)										●

▩ *47' entrance, 37' channel; 46' entrance, 36' channel.*

A clamshell dredge would likely be used to dredge the finer material upstream of RM 12. The rock material, located in the vicinity of and below RM 5, would be mechanically dug and loaded into bottom dumping barges. Sediments removed from the channel would be transported by barge or hopper dredge to one of three ocean disposal sites. Beneficial uses of dredged material such as the possibility of pipeline dredging in the vicinity of RM's 1 to 3 with disposal of sandy material for snowy plover habitat on North Spit is being investigated. Implementation of this measure will also be pursued under separate authority for restoration of habitat through the O&M dredging program. Commercial uses of dredged material were also investigated and determined that there is no current value or market demand for this material. Additional discussion of the alternatives investigated and the preferred plan is included in sections 3, 4, and 5 of the feasibility report.

2.5 Preferred Alternative. The preferred alternative is to deepen the channel by two feet from the entrance to RM 15 and widen the turning basin at RM 12 by 100 feet with disposal of the dredged material at designated ocean disposal sites. The preferred ocean disposal sites are expanded Site F for primarily coarse-grained material; existing Site H which would receive fine-grained material from above RM 12; and a site for one-time disposal of rock material removed from channel deepening. Existing Sites E and F lack capacity for the quantities of coarse-grained material currently disposed at these locations. Expanded or new sites would provide the necessary capacity to accommodate both new work and maintenance dredging sediments. Larger site capacity would also increase available site management options. Final site designation for expanded Site F will be developed through EPA's site designation process to meet long-term maintenance dredging requirements (paragraph 2.7). Removal of the sandy sediments and silts would be accomplished by clamshell and/or hopper dredge, and removal of rock would be accomplished by mechanical equipment and loaded on to barges for disposal.

2.6 Alternatives Comparison. The impacts of the channel deepening alternatives considered in the feasibility report would essentially increase in severity with increased depth. One- or 2-foot-depth increases would result in some additional adverse effects but not significantly different from

existing practices. A relatively small additional area of benthic habitat would be removed during dredging operations, estuarine salinity and circulation would essentially be unchanged, and, except for a new ocean disposal site for rock material and expansion of existing Site F for long-term maintenance requirements, disposal operations would not change from current practices. The 3- to 5-foot depth increases would, on the other hand, result in potentially moderate to severe impacts with greater benthic habitat affected by dredging, changes in estuarine salinity and circulation, additional disturbance to the estuary during construction, including greater channel sideslope effects, and more disposal area required for new work dredged material.

The 2-foot-deepening alternative was selected on the basis of achieving maximum national economic development benefits with minimal environmental impact. Ocean disposal is the only viable alternative for channel deepening compared to upland or estuarine disposal. Dredged material quantities for a 2-foot deepening, estimated at between 1.3 and 1.4 million cubic yards (y^3), are not significantly greater than the average of 1.2 million y^3 of sediments removed during one year of maintenance dredging. Estimated increase in maintenance dredging quantities is 122,000 y^3 on average for the first 3 years after deepening, decreasing to 2,000 y^3 in 20 years.

Maintenance dredging, with or without channel deepening, will require additional site capacity and further evaluation under EPA's site designation procedures. An evaluation of new ocean disposal site requirements for new work and maintenance dredging of the Coos Bay channel concludes that viable ocean disposal site capacity exists in the Coos Bay offshore area to accommodate dredged material disposal over the 50-year life of the project (1996-2046). EPA Region 10 concurs with this finding and has provided assurance that final site designation for long-term maintenance needs can be achieved in a timely manner. Additional discussion of the new ocean disposal site evaluations, including evaluation of existing disposal practices and alternatives, is included in the following sections.

Table 2.2 presents a summary comparison of environmental effects for each of the alternatives considered in detail including the no action alternative.

2.7 Existing Ocean Disposal Site Evaluation.

a. General. EPA designated the three current ocean disposal sites (E, F and H) in 1986 for disposal of channel maintenance dredged material. The selection and eventual designation of these sites, documented in the 1986 Site Designation EIS, was based on studies of the physical, chemical, and biological conditions of the Coos Bay offshore area (figure 2.1). The primary criteria used in selecting candidate sites were physical and chemical similarities of sediments; avoidance of impacts on unique biological communities; and avoidance of important human use areas. These three basic criteria constitute the significant elements of the five general and 11 specific Marine Protection, Research and Sanctuaries Act (MPRSA) site selection criteria.

General conclusions reached in these disposal site candidate studies were that the area in the vicinity of existing Site H was most suitable for disposal of fine-grained material dredged from above RM 12; the area in the vicinity of Site F was most suitable for disposal of coarse-grained material dredged from below RM 12; near-shore areas including Site F, were populated with aquatic organisms adapted to a high energy environment; areas further offshore, including Site H, contained higher densities of organisms adapted to a more stable environment.

b. Non-Ocean Disposal Alternatives. The 1986 Ocean Disposal Site Designation EIS and subsequent Section 103 Evaluation for expansion of Site F have evaluated the need for ocean disposal as well as alternatives to ocean disposal. Alternatives investigated included upland disposal, estuarine open-water disposal, and no action. The studies concluded that upland disposal sites are limited and should be reserved for disposal of contaminated materials, estuarine disposal was more environmentally damaging than ocean disposal, and no action would reduce navigation in Coos Bay to economically

Table 2.2

Coos Bay Channel Deepening Comparison of Alternatives

	No Action	Plan 1	Plan 2 (preferred)	Plan 3	Plan 4	Plan 5
Physical Resources: Coos Bay Estuary						
Sediment:	Approximately 1.7 million cubic yards annually in navigation channel.	Slight increase initially tapering to no additional sedimentation in 5–10 years.	Slight increase initially tapering to no additional sedimenttation in 5–10 years.	Slight increase with estimated 2% additional sediment accumulation primarily at entrance	Slight increase with estimated 2% additional sediment accumulation primarily at entrance	Same as Plan 4
Water Quality:	Current water quality described as mildly polluted, typical of industrially (wood products) developed estuary. Channel sediments are mildly contaminated (above RM12) or uncontaminated and suitable for ocean disposal.Short-term turbidity during dredging operation.	Short term turbidity during dredging operations. Minor release of contaminants above RM12.	Same as Plan 1	Same as Plan 1	Same as Plan 1	Same as Plan 1
Circulation:	Primary influences are riverflow (upper bay) and tidal propagation.	Slight increase in channel currents and volume of ocean water entering estuary.	Slight increase in channel currents and volume of ocean water entering estuary.	Same as Plan 2	Same as Plan 2	Moderate increase in channel currents and volume of ocean water entering estuary.
Salinity:	Salinity intrusion extends throughout the bay and sloughs and into the lower riverine systems, seasonally creating brackish conditions.	Slight increase in lower bay salinity intrusion.	Same as Plan 1	Slight increase in riverine and slough salinity intrusion	Moderate increase in riverine and slough salinity intrusion	Same as Plan 4
Physical Resources: Ocean Disposal Sites						
Bathymetry:	Site F avg depth 24 meters. Site H avg depth 55 meters. Rock site avg depth 37 meters. Contours generally trend N/S.	Slight change in bottom contours at Sites F and H, with mounding at Site F. Slight change at Rock Site.	Same as Plan 1	Moderate change in bottom contours at Sites F and H with mounding at Site F. Slight change at site. Expand Site F to reduce mounding.	Moderate change in bottom contours at all	Significant increase in mounding at Sites F and H. Expand Sites F and H to reduce mounding.
Sediment Transport:	Current mounding problem at Site F. Sediments move offshore at Sites F and H.	Sediments would slowly erode in offshore and longshore direction. Rock disposal to essentially remain in place.	Same as Plan 1	Same as plan 2	Same as Plan 3	Same as Plan 4
Water Quality:	Typical for marine waters of Oregon coast. Short-term turbidity effects from disposal of dredged material.	Slight turbidity during disposal Dissipating shortly after. Little or no impacts on esthetics, recreation or commercial activity.	Same as Plan 1	Same as Plan 1 Slightly extended duration.	Same as Plan 3	Same as Plan 3

Table 2.2 Con't.

	No Action	Plan 1	Plan 2 (preferred)	Plan 3	Plan 4	Plan 5
Biological Resources : Coos Bay Estuary						
Macroinvertebrates:	Current maintenance dredging has minor impact on shellfish species	Minor additional impact from initial and maintenance dredging. Some habitat removal with deeper channel.	Same as Plan 1	Same as Plan 1	Moderate additional impact from initial and maintenance dredging. Habitat removal	Same as Plan 4
Fish:	Current maintenance dredging has minor impact on fish.	Some minor impact on some resident species and habitat.	Minor impact to aquatic species.	Same as Plan 2	Potential major impact on some resident species if rock is blasted.	Same as Plan 4
Wildlife:	Current maintenance dredging has minor impact on birds and marine mammals.	minor impacts.	Minor impacts.	Same as Plan 2	Potential major impact with rock blasting	Same as Plan 4
Threatened and Endangered Species:	Maintenance dredging activities periodically reviewed for impacts on endangered species. No current problems.	Dredging activites would be controlled to avoid impacting endangered species. Deeper channel would have no measurable impact.	Same as Plan 1	Same as Plan 1	Same as Plan 1	Same as Plan 1
Biological Resources: Ocean Disposal Sites						
Macroinvertebrates:	Current ocean disposal has minor impact on shellfish species.	Minor additional impact from initial disposal at all sites. No impact on commercial species.	Same as Plan 1	Moderate additional impact from initial and maintenance disposal. Minor impact on commercial species.	Same as Plan 3	Same as Plan 3
Fish:	Current ocean disposal has minor impact on commercial and non-commercial species.	Short-term additional minor impact (primarily turbidity) during initial disposal. Rock disposal will slightly modify habitat.	Same as Plan 1 with additional habitat modification at expanded Site F	Same as Plan 2	Short-term moderate impacts during initial disposal. Minor additional maintenance dredging impacts. Habitat modification.	Same as Plan 4 with minor additional impacts during initial disposal.
Wildlife:	Current ocean disposal has minor impact on marine mammals and birds.	Minor additional impact from initial disposal.	Same as Plan 1	Moderate additional impact from initial and maintenance disposal.	Same as Plan 3	Same as Plan 3
Threatened and Endangered Species:	Current ocean disposal has no impact on endangered species	No impact.	No impact	No impact	No impact	No impact

Table 2.2 Con't.

	No Action	Plan 1	Plan 2 (preferred)	Plan 3	Plan 4	Plan 5
Human Resources						
Economy:	Coos Bay economy is highly dependent on wood products industries. Navigation channel is critical to transport of wood products	Maintain current economic conditions.	Same as Plan 1	Same as Plan 1	Potential for inducing additional economic activity	Same as Plan 4
Transportation:	Coos Bay served by major rail, highway and navigation facilities.	Ship traffic improvements. Accommodate larger ships.	Same as Plan 1	Same as Plan 1	Same as Plan 1	Same Plan 1
Population:	Current population trends show slight decline.	No Change.	Possibly help stabilize population.	Same as Plan 2	Same as Plan 2	Same as Plan 2
Land Use:	Land use patterns have been stable for the past 10 years. Some land use changes anticipated for North Spit. No other changes anticipated.	Minor impacts during initial dredging and disposal.	Same as Plan 1	Same as Plan 2	Same as Plan 2	Same as Plan 2
Esthetics:	Coos Bay environment is a mix of natural and highly industrial conditions	Minor noise impacts.	Same as Plan 1	Moderate impact (if blasting occurs) during initial dredging.	Same as Plan 3	Same as Plan 3
Cultural Resources:	Current maintenance practices have no impact on historical or archeological resources.	No impact to known historical or archeological sites, dredging and disposal.	Same as Plan 1	Same as Plan 1	Same as Plan 1	Same as Plan 1

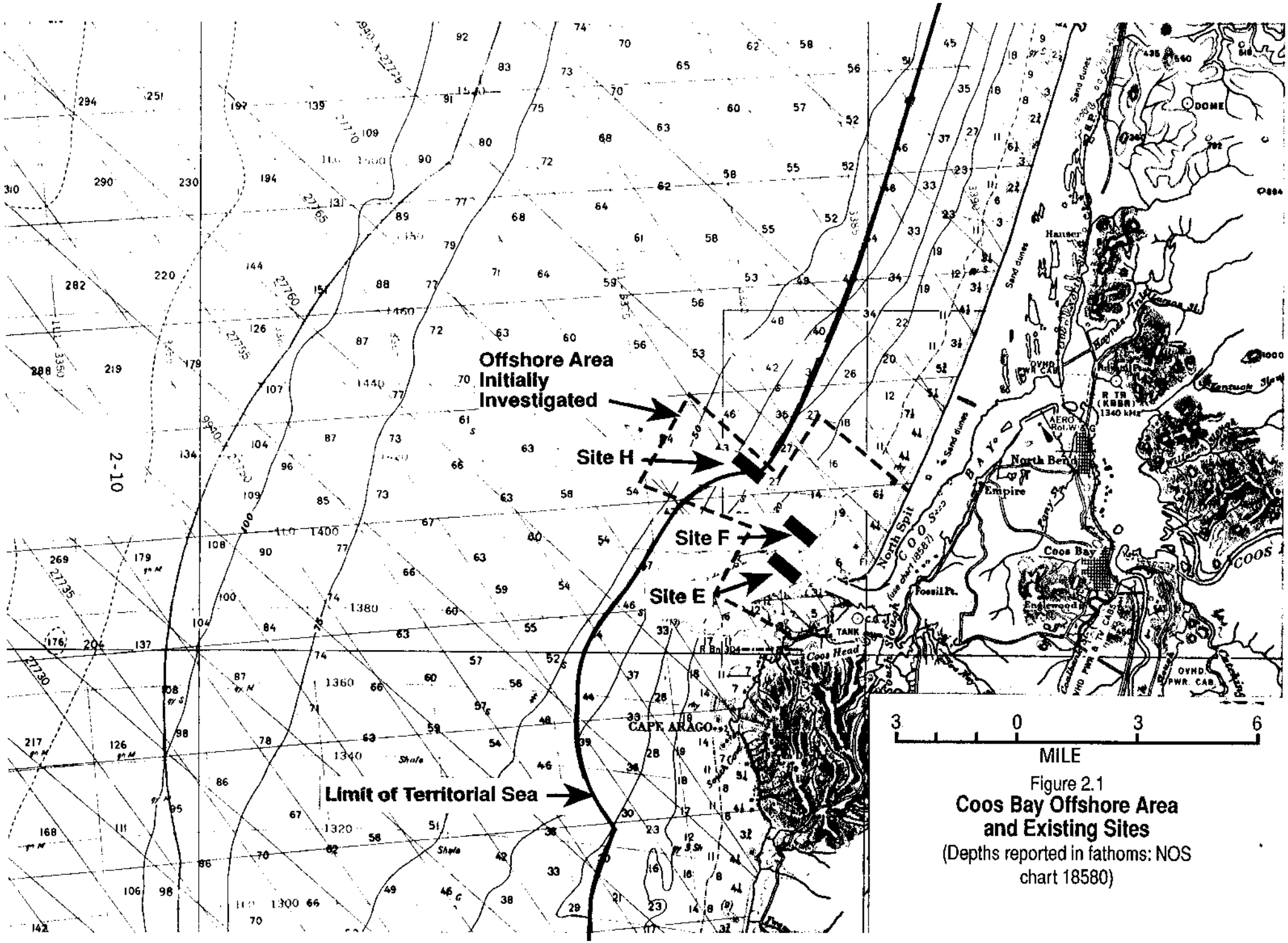


Figure 2.1
Coos Bay Offshore Area and Existing Sites
(Depths reported in fathoms: NOS chart 18580)

unacceptable levels. The Corps and EPA have reviewed these documents and concluded that these findings remain valid.

There are currently two estuarine disposal sites in Coos Bay which essentially supplement ocean disposal of maintenance dredging sediments. These sites include a flowlane site at RM 8.4 and Site G, a disposal site at RM 1.5 which is used as a backup site when rough sea conditions prevent ocean disposal. The flowlane site is used for temporary storage of material which is later removed and placed in ocean disposal sites when weather and sea conditions permit.

Approximately 68,000 y^3 have been disposed at the flowlane site annually, and disposal at Site G has totalled about 155,000 y^3 over the past 5 years. In-bay disposal is being restricted to minimize environmental impacts in the estuary and three previously used sites are no longer being used.

c. Current Ocean Disposal Site Status. The currently designated sites (Sites E, F, and H) have been used for disposal of channel maintenance dredged material for more than 10 years. Recent ocean disposal site studies (Ogden Beeman, 1989; Geo-Recon, 1989) and monitoring indicate that dispersion rates from Sites E and F have been much less than predicted in the earlier studies. Mounding at Site E has limited disposal to less than 100,000 y^3 annually due to its proximity to the entrance channel. The site is generally used only when sea conditions preclude use of Site F. Site F has experienced similar low dispersive rates and because of mounding conditions at the site, EPA granted interim approval for doubling the size of Site F in 1989 until more detailed studies could be undertaken to resolve final site capacity needs and ultimate final site requirements. Information currently being obtained through this channel deepening study will provide the data necessary to select and recommend final site candidates (paragraph 2.8). Monitoring at Site H indicates no appreciable mounding occurring at the site.

2.8 Ocean Disposal Candidate Site Selection.

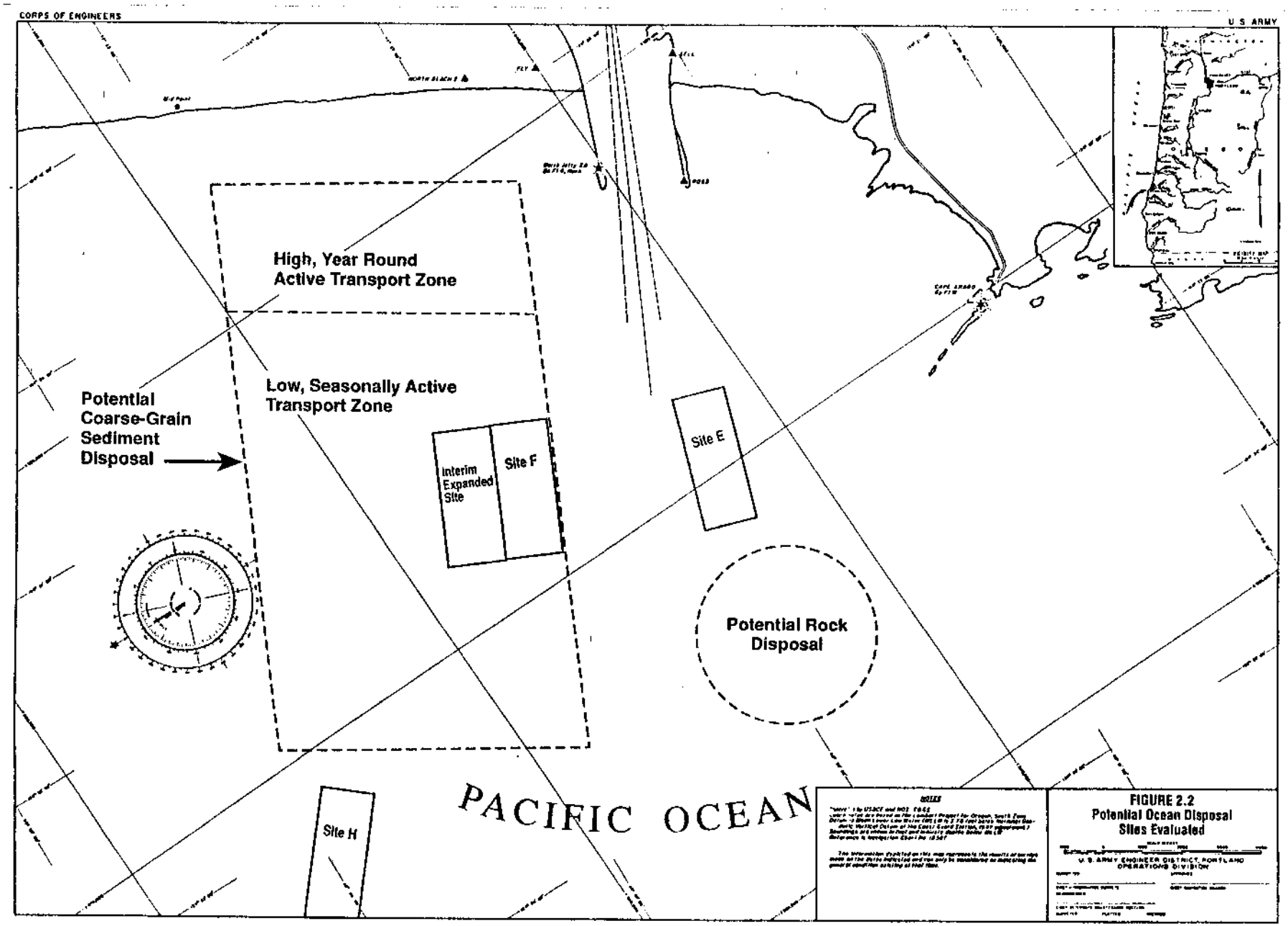
a. General. Ocean disposal site evaluation is required for the selection of a site for one-time disposal of rock material and review of existing site capacity and suitability for disposal of new work and maintenance dredging quantities.

The alternatives reviewed for channel deepening and long-term maintenance dredging ocean disposal are number, location and size of sites, including existing Sites E and F, primarily for disposal of coarse-grained material, evaluation of Site H for continued disposal of primarily fine-grained material, and location of a disposal site for rock excavated from the channel deepening (figure 2.2). Alternative site management practices such as limited disposal of coarse-grained material at Site H were also considered.

Location and size of sites for disposal of fine-grained and rock material involve a relatively straightforward process. An EPA-designated site (Site H) with long-term capacity currently exists for disposal of fine-grained material, and rock disposal is proposed as a one time event of limited quantity.

Modifying current management practices would entail implementing new measures such as use of a site designated to receive fine-grained material for disposal of coarse-grained material. The value of this practice is essentially untested. Evaluation of innovative site management practices such as technologies developed under the Corps' Dredging Research Program could provide results with greater site management flexibility.

Location and size of sites for disposal of higher volume, primarily coarse-grained material involves a more complex process of evaluation and selection. The currently designated Sites E and F are experiencing mounding problems and long-term capacity is limited. Projected quantities of dredged material, even without channel deepening, exceed the long-term capacity of these sites. The boundary outlined in figure 2.2 defines the area selected for evaluation of primarily coarse-grained sediment disposal. The principal factors defining


CORPS OF ENGINEERS
U.S. ARMY
High, Year Round
Active Transport Zone
Low, Seasonally Active
Transport Zone
Potential
Coarse-Grain
Sediment
Disposal
Interim
Expanded
Site
Site F
Site E
Potential Rock
Disposal
Site H
PACIFIC OCEAN
FIGURE 2.2
Potential Ocean Disposal
Sites Evaluated
U.S. ARMY ENGINEER DISTRICT, PORTLAND
OPERATIONS DIVISION

this boundary are physical substrate, biological communities and reasonable economic range of dredges as described in the 1986 Site Designation EIS.

The area investigated for potential rock disposal was selected initially on the basis of the physical bottom characteristics of substrate and depth. The substrate at this location is principally gravel and cobbles intermixed with coarse sand and rock outcrops. The depth is such that rock material placed at this location would either remain at the site or slowly move further offshore. Biological productivity is fairly uniform throughout the area and at these depths.

Ongoing evaluation of Site H shows that it remains a highly suitable disposal site. No appreciable mounding has occurred and biological communities remain as productive as pre-disposal conditions at the site.

b. Continued Use of Site F. The disposal site area required for primarily coarse-grained sediments dredged for channel deepening and future maintenance dredging was evaluated based on the Ogden Beeman study and further evaluation by the Corps (see chapter 3 for further discussion). The results of the Ogden Beeman study indicate that an area three times the size of current Site F, and continued use of Site E at present levels, would provide sufficient capacity for the estimated quantities dredged for the next 25 years. The study does not, however, address the potential navigation hazard caused by disposal within this area and eventual creation of a mound from the original bottom elevation of -24 meters up to -15 meters. The estimated usable life of the existing site, based on current disposal quantities and dispersion rates is 2 to 3 years. New site designation would be required for an expanded Site F with or without the channel deepening.

Mounding problems and possible navigation hazards at Coos Bay and at the mouth of the Columbia River have modified previous assumptions of dispersal rates from coarse-grained sediment disposal sites. Current data indicate that very slow dispersion from sites at depths greater than 18 meters should be assumed. Disposal mounds should have gradual side slopes and preferably not exceed

-17 meter elevation to minimize wave generation and navigation hazards. Much higher dispersion rates are expected to occur within the nearshore area at depths under -18 meters. Mounding should be minimized in this area as well although it is outside navigation lanes and within the active wave environment. Using this criteria, with continued use of Site E at present levels, disposal site requirements for primarily coarse-grained material are evaluated for the area described in figure 2.2.

The physical substrate at this location is principally coarse-grained sand with depths varying from 8 to 46 meters. Disposal within this depth range would essentially keep this sandy material within the littoral zone similar to that occurring under natural conditions. The area can be divided into 2 basic sediment transport zones, with active, year-round transport within the 8- to 15-meter zone, and a less active zone from 15 to 46 meters with transport gradually diminishing with season and depth. Biological communities within this area have generally adapted to a high energy and transient environment.

Alternative disposal site options evaluated included nearshore active transport zone, offshore low dispersion zone and a larger combination area including both zones.

Nearshore dispersive site depths which are feasible for hopper dredge disposal range from approximately 8 to 15 meters. The northerly extent for the dispersive site area is based on a reasonable economic range of hopper dredges from the entrance extending for approximately 2 miles. Sediment disposal within this active transport zone would disperse rapidly both onshore and alongshore. Mounding would be minimized by disposal over a larger area. A small portion of sediments could redeposit in the entrance channel. From a physical perspective, a disposal site within the 8 to 15 meters depth range extending approximately 2 miles to the north could potentially be used indefinitely at estimated dispersion rates.

The offshore zone at depths ranging from 15 to 46 meters is progressively less dispersive with greater depth. Mounding would occur over time at any location within this zone if the site area is restricted. Generally speaking, sites

further from shore would require a larger disposal area than sites closer to shore. The estimated minimum site area within this offshore zone for the 50-year timeframe would be twice that required for the nearshore zone to avoid unacceptable mounding conditions.

Another option considered is that of combining disposal at nearshore and offshore sites. This option would encompass a larger area, allowing for a smoother and thinner distribution of sediments. This option would avoid creation of mounding features; would increase flexibility of disposal site management; and would also affect a larger area of ocean bottom than the more limited site options. The estimated site area under this option would occupy a minimum of about half to a maximum of the full site area shown in figure 2.2.

General evaluation of biological effects from disposal at these locations are based on the 1986 EIS and related studies and more recent site characterization studies conducted by the National Marine Fisheries Service (NMFS) for Portland District (Hinton, et al, 1993). Disposal of primarily coarse-grained sediments at the 8-46 m depths would disturb or destroy benthic organisms by smothering from direct burial and modification of the benthic communities with temporary bottom elevation changes. Increased management options over a larger site area would avoid or minimize these impacts. Most of these organisms and communities which are adapted to a higher energy environment tend to recolonize quickly following the disposal operation. No unique biological communities would be impacted at any of the potential sites.

Each of the disposal site options have more than adequate capacity to absorb sediments from channel deepening and projected maintenance dredging over the next 50 years. Estimated channel deepening sediment quantity for this location is 735,000 y^3. Subsequent maintenance dredging quantities will remain virtually at current levels. Selection of one option over another or identifying a preferred option entails a process of comparing physical, biological and human resource effects and identifying tradeoffs between shallow depth active transport sites, deeper, less active transport sites or combination of these over a wider area.

The deeper, less active site option is an extension of current practices with disposal at similar depths and in a similar physical and biological environment. The advantages of this option are wider dispersion of sediments with each disposal operation, unlikely return of sediments to the entrance channel and predictability of impacts. The disadvantage is creation of mounding features at disposal sites if disposal area is limited.

The active transport site option is a departure from current practice with disposal in a shallow depth environment. The advantages of this option are that more of the sediment would disperse and remain in the littoral system and is available to replenish the Coos Bay-Umpqua beach/dune system, and a somewhat smaller site area would be required. The disadvantages are that some of the sediments may return to the entrance channel and would require redredging, and the immediate vicinity of the disposal site would be more heavily impacted during disposal.

The combination option is also a departure from current practice at Coos Bay in that it entails disposal over a wider area rather than seeking the smallest possible area. The advantages of this option are that impacts at any one location are reduced and recovery time between disposal events is increased, disposal management options are increased, and bottom topography effects are reduced. Possible disadvantages include disposal impacts which would cover a wider area and nearshore sediments potentially returning to the entrance channel.

Although biological impacts would occur with any of these options, long-term effects would not be severe and none of these options would impact unique biological communities. All of the options would involve site management practices (principally timing) to avoid impacts to areas which may be seasonally productive and commercial fishing activities. The larger site option would allow for greater site management flexibility.

c. Continued Use of Disposal Site H. Ongoing monitoring of disposal at Site H indicates that no appreciable mounding has occurred from disposal over more than a ten year timeframe. Fine-grained sediments from the channel

deepening, estimated at 585,000 y^3, would not contribute significant additional sediments over current maintenance dredging quantities. The existing site is therefore considered adequate for future disposal needs. Continued disposal of fine-grained sediments at Site H would have short-term impacts on benthic organisms during and following disposal operations.

d. Rock Disposal Site Selection. Selection of a rock disposal site utilized information from the 1986 Site Designation EIS and supporting studies to initially select an area potentially suitable for disposal and then to evaluate alternative disposal sites within that area (figure 2.2).

One-time disposal of the estimated 90,000 y^3 of rock would temporarily impact organisms in the immediate disposal site. Recolonization would begin shortly following disposal.

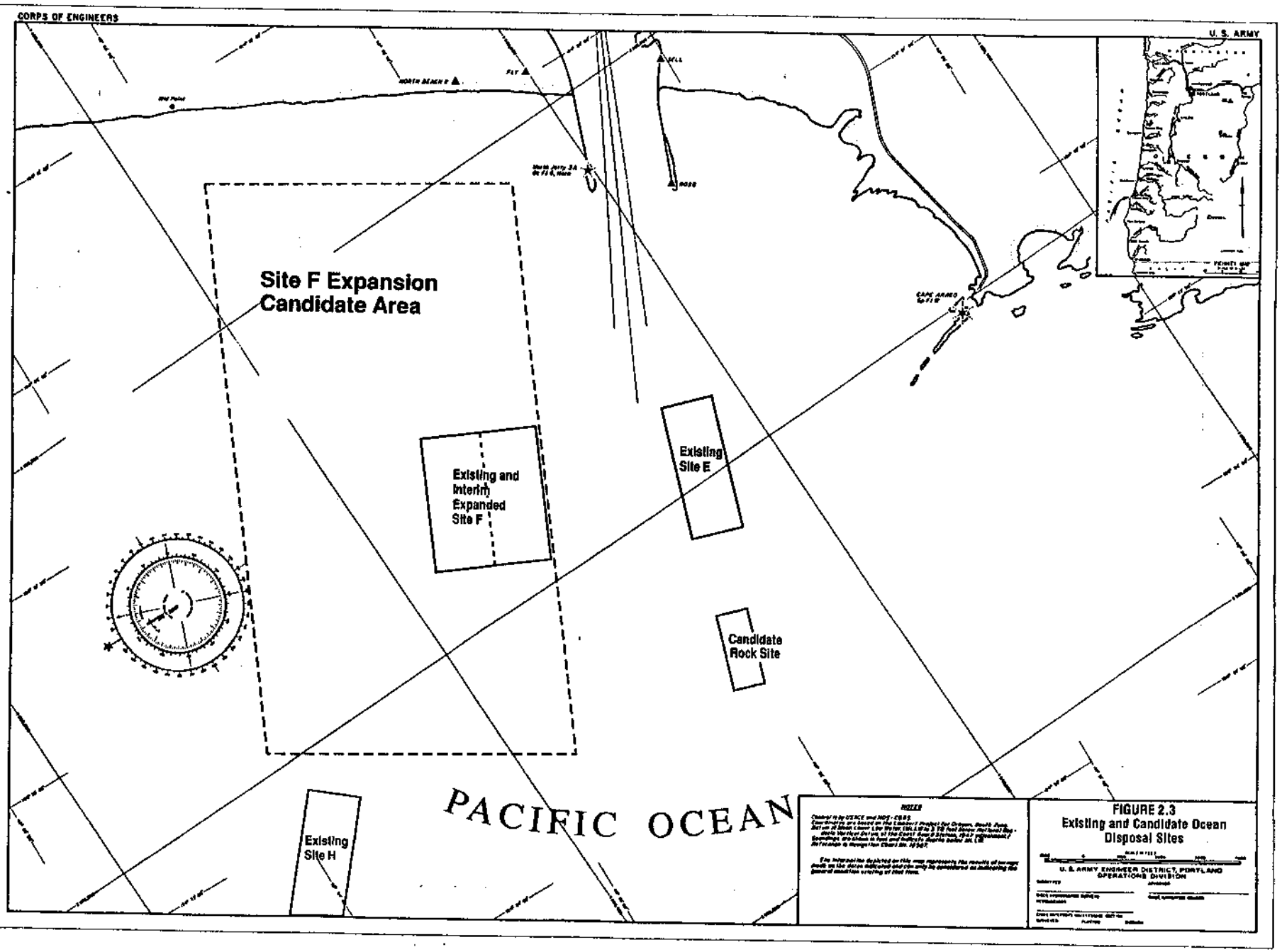
Potential for beneficial use of the rock such as building a reef to improve habitat productivity was also considered. Generally, the rock is relatively soft sandstone and is not considered durable enough to last any appreciable length of time before deteriorating. The rock would provide some structure and benefit to aquatic organisms at least temporarily. The candidate site was selected based on similar sediment (rock) characteristics, offshore dispersion from the site and lower biological productivity compared to the surrounding area.

e. Recommended Candidate Sites. Formal designation of ocean dumping sites will be the responsibility of Region 10, EPA, under Section 102 of the MPRSA. EPA is a cooperating agency in preparation of this EIS under NEPA and has been working closely with the Corps in design of designation studies and evaluation of data.

The final selection of sites for disposal of dredged material from initial construction and subsequent maintenance dredging of the federal navigation project (including berthing areas) occurs through application of the 5 general and 11 specific criteria in the MPRSA. Additionally, the recently enacted Water Resources Development Act of 1992 (WRDA 92) requires that all new ocean

dumping sites must include site management plans as part of the designation package. While the Corps and EPA are in agreement that specific new or expanded site(s) will be designated for the long term requirements of this project, at this time, data analysis has not been completed to confirm final long-term site locations and size. The October 1992 data confirms the results of the April 1992 data and the earlier studies conducted by Oregon State University for designation of existing sites. Additional analyses, if needed, would be conducted during the Preliminary Engineering and Design Phase (PED) prior to initiating any action and discussed in a joint Corps/EPA EIS supplement. If it is determined that no additional studies would be required, then the results and completed evaluation of candidate sites could be incorporated in the Final EIS for this project. EPA site designation rulemaking, along with site management and monitoring plans in accordance with WRDA 92, would be completed during the PED phase and prior to initiating any new work.

Existing or candidate sites identified for disposal of channel deepening new work and long-term maintenance dredging requirements are shown in figure 2.3. In projecting for long-term capacity, it is expected that Site H will be able to contain anticipated volumes of fine-grained sediments generated by initial construction and maintenance dredging as well as suitable material dredged from port berthing areas and permit actions; however, development of a site management plan per WRDA 92 will occur during PED. A separate site for disposal of rock from the project is necessary and has been identified based on the estimated quantity of rock. The most apparent shortcoming in capacity over the long-term is for the coarse-grained material. Existing Sites E and F have limited remaining capacity. Several alternatives, described earlier, are under consideration to meet the need to develop additional long-term capacity and improved site management. The candidate area, which is proposed for final site selection and eventual designation, is identified as Site F Expansion Candidate Area in figure 2.3. The long-term viability of Site E will be re-evaluated during the final site selection process.


CORPS OF ENGINEERS
U.S. ARMY
Site F Expansion Candidate Area
Existing and Interim Expanded Site F
Existing Site E
Candidate Rock Site
Existing Site H
PACIFIC OCEAN
NOTES
FIGURE 2.3
Existing and Candidate Ocean Disposal Sites
U.S. ARMY ENGINEER DISTRICT, PORTLAND
OPERATIONS DIVISION

A preliminary Section 103 Evaluation addressing the disposal of channel deepening and subsequent maintenance dredging sediments at existing and candidate ocean disposal sites has been prepared and is provided as Exhibit 4 to this EIS. The evaluation concludes that these sites are suitable for disposal of these sediments.

2.9 Mitigation. Significant impacts to fish and wildlife resources in the project area are not expected to occur from either the dredging or disposal activities. Most aquatic habitat in the channel which would be directly impacted by the project would recover naturally to preconstruction conditions; therefore, mitigation would not be required. A small loss of shallow subtidal habitat would occur in the area of the proposed turning basin expansion, however, the size of the turning basin has been minimized in order to reduce impacts. This area would also recover to similar conditions following project construction. Other mitigative measures such as timing of in-water work to minimize impacts to aquatic resources and human use activities such as fishing and clamming in the estuary and the ocean disposal sites, would be continued to the maximum extent practicable.

The cumulative effects of dredging the existing channel, the proposed 2-foot deepening, and related shipping and port facilities and activities would result in continued and potential future impacts to Coos Bay aquatic resources. The extent of impact is not clear and appropriate mitigation beyond existing methods is difficult to identify. The State of Oregon Department of Fish and Wildlife has recommended monitoring as a means to identify the extent of some of these impacts. The feasibility of conducting a monitoring program is being reviewed by Portland District. Other proposals suggested to reduce impacts from channel dredging include in-bay disposal of rock or shell material at specific locations to improve habitat, or various means to create additional shallow subtidal habitat. These proposals would most likely be evaluated under other authorities such as Section 1135 of the Water Resources Development Act of 1992, as amended. This authority allows for environmental restoration at existing projects.

Larger ocean disposal sites are also being considered in order to minimize the impacts associated with confining placement to a single location. Using a

larger area would allow the material to be more thinly dispersed reducing impacts to benthic organisms. Having a larger area would also allow individual disposal areas more time for recovery before the next disposal event and would provide greater flexibility for avoiding seasonally productive areas or commercial fishing activities.

Monitoring the effects of ocean disposal will be implemented as has been done at the existing disposal sites. Monitoring at the selected ocean disposal sites will be conducted using a monitoring plan to be developed in accordance with the requirements of WRDA 92. The Corps and EPA are currently working on the development of site management plans. Fine-grained sediments to be disposed at Site H would continue to be monitored on a 3- to 5-year cycle to identify any changes in contaminant levels. In the interim, monitoring will conform to currently agreed upon Corps/EPA monitoring program which includes annual bathymetric surveys and may include periodic benthic surveys.

CHAPTER 3

AFFECTED ENVIRONMENT

3.1 Introduction. The Coos Bay estuary encompasses an area of approximately 12,380 acres. The bay itself averages a mile in width and is 15 miles in length to the head of deep draft navigation. The bay receives an average annual runoff of approximately 2.3 million acre-feet, two-thirds of which is derived from the Coos and Millicoma Rivers. The main embayment, to the east of the cities of North Bend and Coos Bay, contains most of the bay's 6,200 feet of tidelands. Other tidal areas are in North, South, Pony, and Isthmus Sloughs and Haines Inlet. The Coos Bay estuary has undergone extensive change since settlement and subsequent development was initiated in the 1850's. The following section describes the current condition of Coos Bay's physical, biological, and human environments relevant to the development of the navigation channel.

3.2 Physical Resources: Coos Bay Estuary.

a. General Description. Coos Bay is a typical drowned river valley estuary of the Oregon coast. It is relatively shallow with gently-sloping sides and a well established deeper channel. During the rise in sea level which produced the estuary there was a great increase in sedimentation which has produced the broad expanse of tidal flats and marshes now found. North Spit was formed from sand deposited by "long shore drift" or ocean currents running parallel to the shore. Coos Bay is the largest estuary on the Oregon coast excluding the Columbia River. It covers over 12,000 acres of which almost 9,000 acres are tide flats and tidal marshes. There are some 30 tributaries with the largest being the Coos River draining over 400 square miles. The total drainage area for all tributaries is about 600 square miles of Coast Range forests (see figure 3.1).

b. Geologic Setting. The Oregon Coast owes much of its present form and topography to the submergence of coast valleys by the release of water from

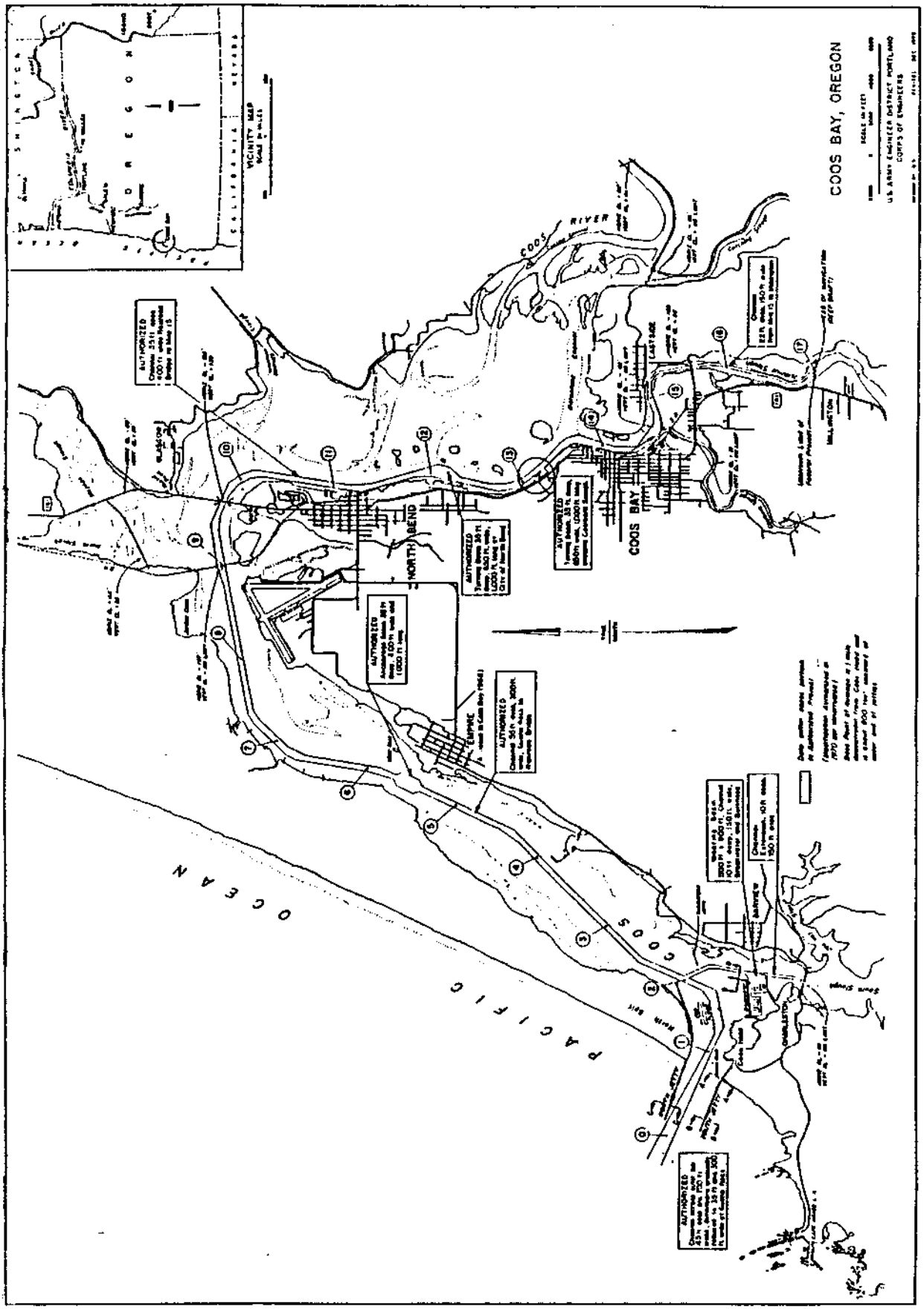


Figure 3.1 Coos Bay area map with existing deep draft navigation project information.

continental glaciers approximately one million years ago. The sea level at that time was about 400 feet lower than present. Estuaries between the Columbia River and Coos Bay lie in an area of weak, erodible marine sediments having structural down-warp or fault related structures (USACE, 1974).

The Coos River/estuary is an aggrading system. Sediment deposition is greater than the natural removal rate. The estuary has been filling with sand, silt and other sediments carried by the flow of the river and ocean tidal currents. The principal streams have survived repeated uplifts of the coastal range and have aided in bringing large quantities of sediment into the bay and out into the ocean. Scour and sediment removal are a local phenomena which generally result in redeposition at other estuarine locations (USACE, 1975).

c. Estuary Dynamics. Water quality, salinity and sedimentation are the primary areas of concern for potential impacts from channel deepening. These factors are, in turn, related to tidal dynamics, riverflow, bathymetry and sediment quality. Coos Bay's tides are of the "mixed, semi-diurnal" type (figure 3.2). This type of tides means that there are two high and two low tides during each "tidal day" (about 24.8 hours). There is a marked variation in height between the two high tides and the two low tides. The mean tidal range to mean high water is 7.0 feet above mean low lower water (m.l.l.w.) at the Coos Bay entrance and 7.3 feet at the city of Coos Bay. The highest predicted tide is 10.5 feet above m.l.l.w. Extreme low water (e.l.w) is predicted to be -3.0 feet below m.l.l.w.

Johnson (1972) calculated the tidal prism for Coos Bay based on a mean surface area between "high water" and "low water" of 10,973 acres and a mean tidal range of 5.2 feet, as 1.86 times 10^9 cubic feet. While other figures could be calculated based on different tidal levels (e.g. between m.l.l.w. and mean high higher water [m.h.h.w.]), it is significant that Coos Bay has the second largest tidal prism (next to Tillamook Bay) of 12 Oregon estuaries excluding the Columbia River. The tidal flow generates substantial tidal currents in the Bay. The average tidal current at City of Coos Bay is 3.4 feet per second (fps) and flood tide currents as high as 5.7 fps have been measured.

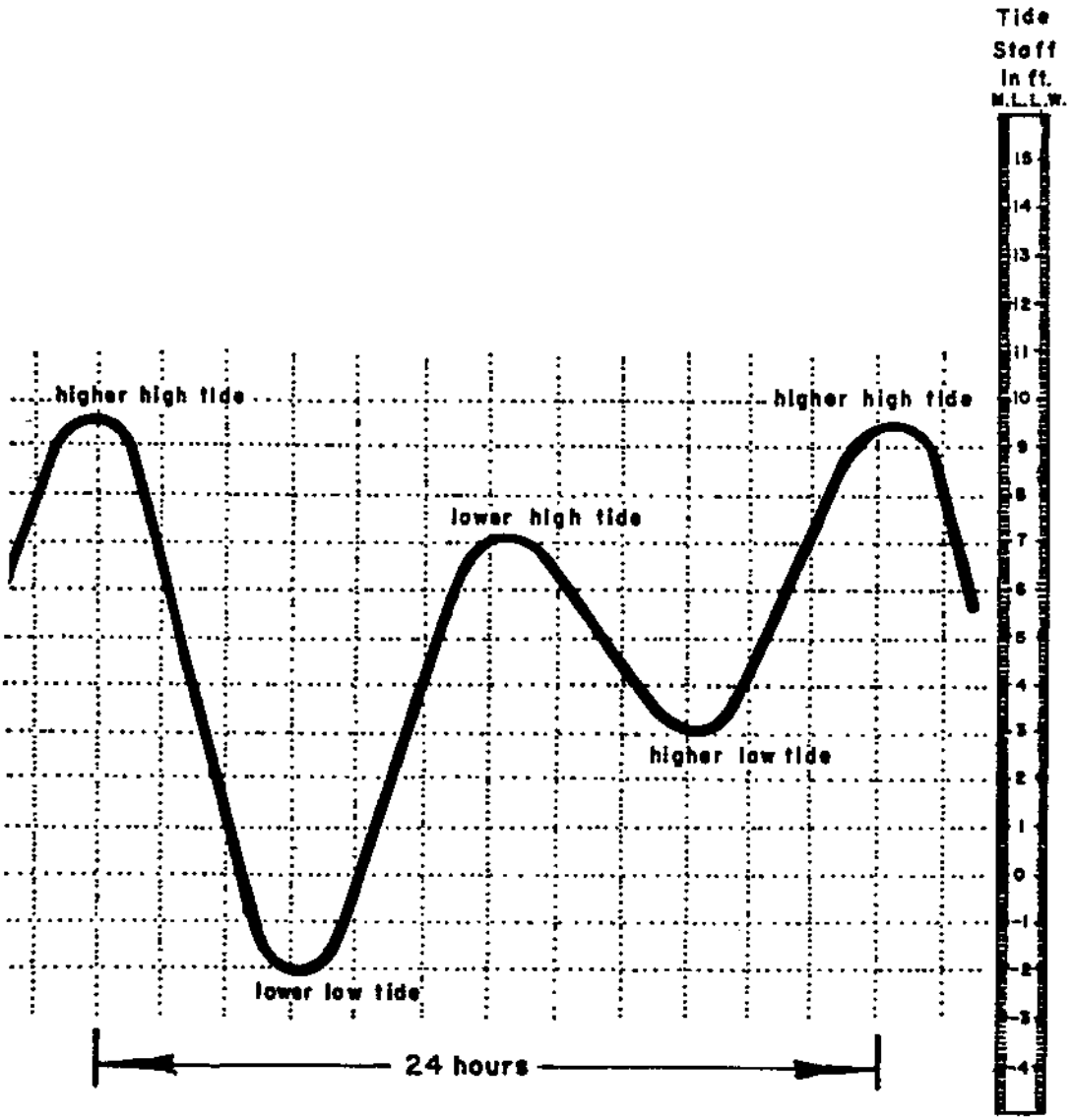


Figure 3.2. Typical Daily Tidal Cycle for Mixed Semi-Diurnal Tide (DSL 1973).

d. Riverflow. Riverflow into Coos Bay is strongly related to regional weather patterns which are characterized by marked wet and dry seasons. The wet season typically begins in October and continues through March. The dry season begins in April and continues through September. For 80 years of record at North Bend, average monthly precipitation is 5 inches with the range from a maximum of 25 inches per month to zero (Baptista, 1989). Because of the effect of the Coast Range, these values may be much higher over the majority of the drainage basin. Figure 3.3 illustrates the relationship between precipitation and riverflow.

e. Bathymetry. The bathymetry of Coos Bay strongly influences circulation with over half of the estuary exposed at low tide on a daily basis can result in strong temperature differentials between the shallow surface waters and the deeper channels. The channels act to confine the denser, saline water brought into the estuary by tidal action. This results in salinity intrusion far up the major tributaries.

f. Sediment Quality. Sediment samples from the Coos Bay Estuary were collected by the USACE, Portland District in May of 1989. The samples were collected with a stainless steel modified 0.096 m^2 Gray O'Hare box-core or a 3.25 inch Benthos gravity core with acid rinsed cellulose butyrate acetate core liners. Samples for chemical analysis were placed in specially cleaned glass containers with teflon lined lids the jars were then placed into ziplock freezer bags. Samples for physical analysis were placed directly into ziplock freezer bags. All samples were placed in an ice chest with ice for transport to the USACE, North Pacific Division Materials Testing Laboratory (NPDMT) in Troutdale. Sample locations, located by three point intersection by sextant, are shown in appendix D, figure D-1.

Physical sediment analyses were completed in June 1989, by NPDMT, for 20 samples from stations in the estuary from RM's 0 to 15. Results showed a mixture of sediment types with coarser sediments located from RM's 0 to 10, and fine sediments within RM's 10 to 15. The sediments have organic content ranging from 0.4 to 14.5 percent volatile solids (appendix D,table D-1). The results of the analysis are similar to the finding in the Coos Bay, Oregon

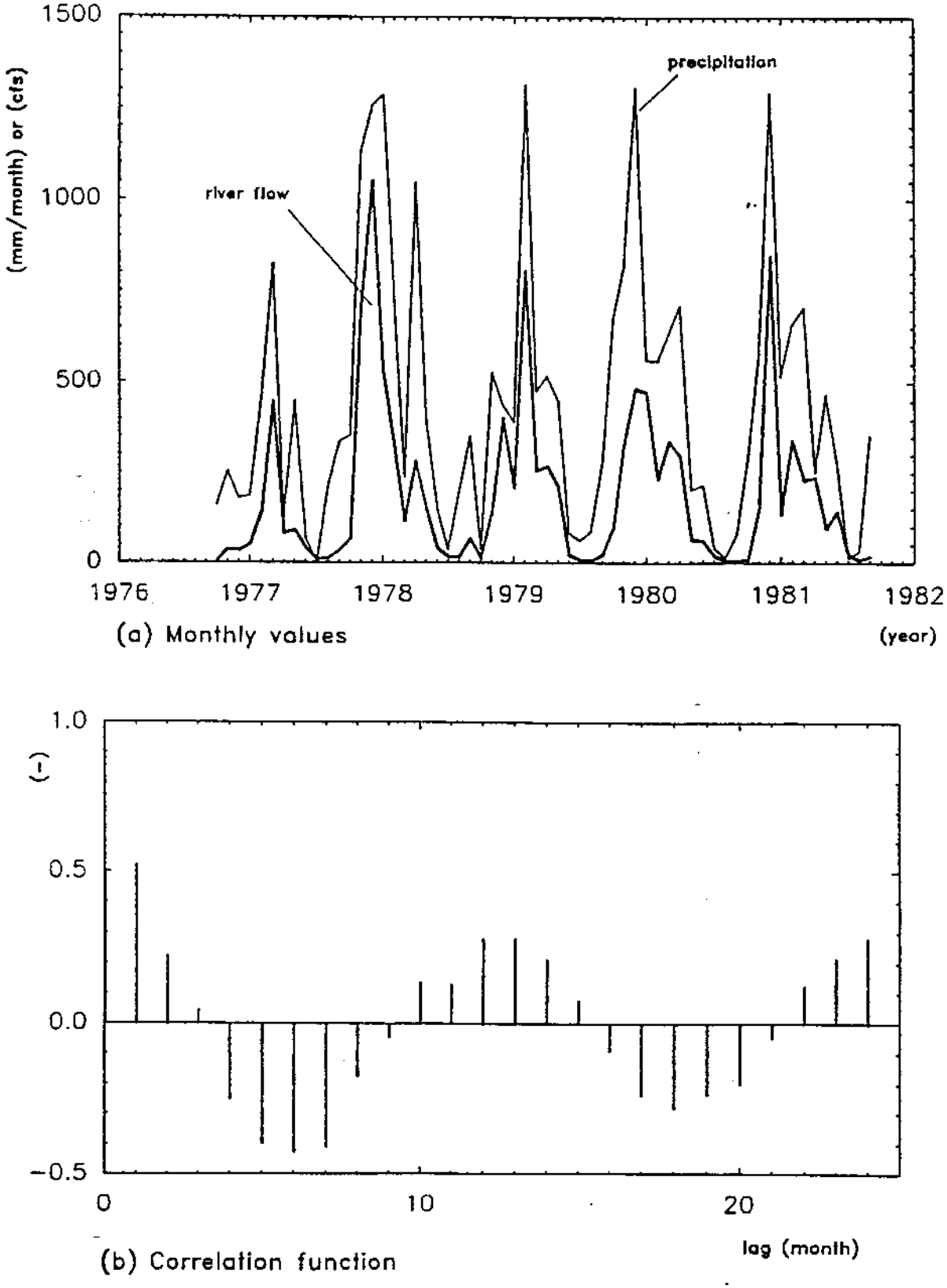


Figure 3.3. Correlation Between Precipitation at North Bend and Flow at West Fork Millicoma River.

Dredged Material Disposal Site Designation, Final Environmental Impact Statement, 1986 (USACE/EPA, 1986).

The physical characteristics for each sample are shown in appendix D, figure D-2. A transition from poorly graded sand to fine grained material occurs above sample station CB-13. This transition corresponds to a major bend in the estuary near the highway bridge. At this location the estuary turns 90 degrees to the south. The gradation curves are presented in appendix D, figures D-4 to D-29.

The fine grained May 1989 gravity core samples (CB-16 through CB-20) were chemically analyzed by Battelle's Pacific NW Marine Sciences Laboratory, Sequim, Washington, for heavy metals (EPA Method 3050) and organic contaminants including pesticides/PCBs (EPA Method 8080), PAHs (EPA Method 8100) and dioxin (EPA method 8290). Results indicates PAH, pesticides/PCBs, metals, ammonia (Standard Method 417), TOC (Standard Method 502) and oil and grease (Standard Method 502) concentrations were undetected or low and typical for uncontaminated coastal and estuarine sediment. Results of dioxin analysis on two Coos Bay sediment samples show levels of 2378 TCDD to be below method detection limits. Only dioxins and furans with six or more chlorines were actually detected. These levels are less toxic than 2378 TCDD and occur naturally in the environment as combustion by-products. The concentrations of dioxins and furans found are considered to be typical of background values and do not represent contamination from an industrial source. The results of the chemical testing are presented in appendix D,tables D-2 and D-3.

Sediment samples were again collected in April 1993 as part of three separate studies; the Coos Bay Channel Deepening Feasibility Study, a routinely scheduled (approximately every 5 years) O&M sediment quality evaluation (USACE, 1993), and a special TBT (tributyltin) study funded by the USACE, EPA, and DEQ (USACE, report in preparation).

Samples were collected at RM 12 as part of the Coos Bay Channel Deepening Feasibility study to assess the sediment quality of material proposed to be removed to widen the RM 12 turning basin. Four box core samples and two

gravity core samples were collected on April 28, 1993. Sediment samples are considered to be representative of the material to be dredged. Physical analyses were conducted on all samples while bulk chemical analyses were conducted on material collected by the gravity cores. The two gravity core samples were sub-sampled along their entire length for the chemical and physical analyses.

Chemical analyses included metals, pesticides/PCB's, TOC's, AVS's, PAH's and butyltins. All chemical analyses are considered acceptable. No element or chemical exceeded USACE, Portland District's established "levels of concern". No USACE, Portland District "levels of concern" have been established for butyltin. All levels except one (DDT) are also below EPA, Region 10's screening levels (SL) for disposal in 404 waters, including the butyltin. Sample CBCD-GC-2 contained 4,4'-DDT at 10 ppb which exceeds EPA's total DDT SL of 6.9 ppb (Portland District's "level of concern" is 15-20 ppb total DDT). Sample CBCD-GC-1 contains <6.0 ppb 4,4'-DDT, the method detection limit for this sample. The material to be dredged to widen the turning basin is considered to be suitable for ocean disposal without further testing.

Three gravity core samples were collected between RM 12.8 and RM 15 at the location discribed in the Coos Bay (Isthmus Slough) Sediment Evaluation report dated 18 November 1993 presented in appendix D (USACE, 1993). These locations were sampled orginally in 1987 then again in 1989 as Stations CB-18, CB-19, and CB-20 as part of the Coos Bay Channel Deepening reconnasance study.

Metal concentrations found in 1993 were very similar to those found in 1989 and 1987. Aldrin, endrin, and DDT were found but at levels below USACE, Portland District concern levels. DDT slightly exceeded the EPA, Region 10 screening level of 6.9 ppb. PCBs were undetected at the method detection limit of 40 ppb. Nine PAHs were quantified but none exceeded established concern or screening levels.

Sediment samples were collected in 1992 and 1993 by the Oregon Department of Environmental Quality (DEQ) and the USACE, Portland District to evaluate the existence and degree of butyltin contamination in Coos Bay (USACE, TBT report

in preparation). Butyltin including tetrabutyltin (TTBT), tributyltin (TBT), dibutyltin (DBT), and monobutyltin (MBT) were not screened for in previous analyses of project sediments. Tributyltin (TBT) is the active ingredient used in antifouling paints and the most toxic of the butyltins. The other butyltins are either manufacturing impurities or degradation by-products. Its presence and ecologic importance was not fully known in 1989. TBT concentrations are presented in the 1993 Sediment Quality Report in appendix D for all of the samples collected. Except for one sample CB-GC-2 (33 ppb TBT) TBT levels for sediments collected from within the project boundaries were below EPA, Region 10's screening level of 30 ppb. Butyltins readily degrade in the environment. In the water-column half-lives are measured in days while in the sediments it is measured in weeks or months. Samples collected outside of the project boundaries by DEQ and analysed by the USACE, Portland District in 1993 showed concentrations as high as 3,270 ppb. High TBT values are associated with boat works and marinas especially where boat repair and painting is conducted.

Sediment quality evaluations from outside of the project area but directly related to the project have been conducted by Port of Coos Bay and various dock owners. See appendix D, figure D-30 for sample locations. Results from the 1989 Port of Coos Bay testing, required under a regulatory permit action for various commercial docks, are located in appendix D, tables D-4 and D-5. The Port of Coos Bay's 1989 test results shows the existence of higher contamination level in sediments located from RM's 12 to 14 outside but adjacent to the Federal Navigation Channel limits.

Continued chemical and biological testing at various docks were conducted in 1990, 1991 and 1993 as part of the ongoing permit process. The bulk of the material for those particular docks tested, was determined to be suitable for ocean disposal without management restrictions.

Three known hazardous and toxic waste (HTW) sites adjacent to the project are being investigated by the Oregon Department of Environmental Quality. Two sites (Chevron USA and Chambers Oil) are bulk fuel storage sites with historical onshore fuel spills. The other site (Hillstrom's) is a former ship

repair facility with onshore and sediment contamination from sandblasting, painting, and other repair activities. The extent of HTW contamination toward the main channel from the Chevron and Hillstrom's sites has been somewhat characterized. HTW analyses at the Chambers Oil site is preliminary.

A Remedial Investigation has been completed at the Chevron site. Historical onshore releases of gasoline and diesel have migrated to nearshore river sediments. The level of PAH sediment contamination drops rapidly within 60 feet offshore which is more than 100 feet from the edge of the main channel. Although contaminant levels are high at the shore, levels in sediments 60 feet offshore are within acceptable limits for unconfined in-water disposal. It is unlikely that contaminants have moved to sediments at the edge of the channel. The channel depth at this site in the October 1993 hydrographic survey is near the proposed depth, so minimal dredging will occur adjacent to this site.

Some historical sediment HTW analyses has been conducted at the Hillstrom's site. Sandblasting and other ship painting and maintenance activities have occurred at the site contributing to metals and TBT contamination of sediments. The extent of site specific contaminants is not completely known. Hydrosurvey information indicates minor dredging will be done in the channel near the site since the channel is close to the proposed project depth. In addition the Hillstrom,s berthing area is only maintained to a depth of 25 feet. Material to be dredged from the berthing area at Hillstrom's was evaluated in 1989 and 1991 in accordance with criteria established under the Ocean Dumping Act. Based upon the 1991 test results, which included physical, chemical, and biological analyses, the Hillstrom's sediment was found to be suitable for unconfined in-water disposal without management restrictions. The berthing area is not a part of this project.

Some limited HTW evaluations have been conducted at the Chambers Oil site. Samples indicate fuel contamination in onshore soils and nearshore sediments but sampling has not been comprehensive. DEQ is anticipating additional sediment sampling early in 1994. Although definitive conclusions regarding this site cannot be drawn, several items indicate that the site contaminants

are unlikely to be disturbed by dredging the proposed project. The channel edge is over 300 feet from the shore and will not be extensively dredged because the channel is near the proposed depth. Sloughing of sediments outside the channel should be negligible. Additional information gathered by DEQ will be used to further assess the potential affects of the dredging in this area.

g. Water Quality. The shallowness and variability in riverflow contribute to water quality problems in Coos Bay. Water quality in Coos Bay is highly variable, by location and by season. The quality of water in Isthmus slough is consistently worse than elsewhere with dissolved oxygen concentrations as low as 3.0 milligrams per liter as well as organic sediment problems. At various sampling locations within Coos Bay, the dissolved oxygen levels are low and the temperatures, coliform, and turbidity levels are high. In general water quality is worse during summer months due to low freshwater flows and warmer temperatures. Increased stream sedimentation, leachates, and organic material carried into the rivers and Bay exert increased biochemical oxygen demand (BOD), thereby creating oxygen deficiencies and lower DO.

h. Salinity. Ocean tides provide the principal source of energy for the mixing of saline and fresh water which gives rise to the patterns of salinity typical of an estuary. The tributaries provide freshwater inflow and the seasonal variations in rates of flow greatly affect mixing patterns and salinity levels. The most important physical principle to bear in mind is that salt water is denser than fresh water. Therefore, there is a natural tendency for salinity to be higher at the bottom than at the surface.

Bruce McAllister (1963) identified a phenomena at Coos Bay where the surface salinity was actually higher (denser) than the salinity at the bottom of the water column. This phenomena was called tidal over mixing. This condition was also described in Arneson, R. J. (1976) data for the Coos Bay estuary.

There are three basic types of mixing patterns in Oregon estuaries, each of which may be exhibited in the same estuary at different times of the year (Burt and McAllister, 1958). These types are as follows:

(1) Stratified or Two Layered System. This type of pattern, has a pronounced layer of undiluted saline water at the base, which moves up and down the estuary with the tide like a "salt wedge". Little mixing occurs between this layer and the practically fresh water upper layer.

(2) Partly Mixed System. This system is a degree of mixing of salt and fresh-water, but there is still a marked difference in salinity between surface and bottom. In this type of system, tides provide enough energy to cause turbulence and mixing within the water column.

(3) Well-mixed or Vertically Homogenous System. This system is where the conditions are the reverse of the 'vertically stratified' estuary. Fresh-water inflow is relatively small compared to the tidal inflow. Tides provide enough energy to cause turbulent mixing throughout the entire water column, together with the effect of density. Salinity levels are within a few parts per thousand at top and bottom.

Burt and McAllister characterize Coos Bay as essentially a "well-mixed" estuary for all months except November, when it was "partly-mixed." They define "well-mixed" on the basis of a vertical salinity change from top to bottom of three parts per thousand (ppt) or less, and partly mixed as 4 to 19 ppt. These measurements were taken at the point where mean salinity was 17 ppt or half fresh and half salt water; however, a longitudinal study showed that in October the estuary was well mixed up to RM 10 and tending to be partly mixed above RM 10, in spite of a low river flow.

A study by the Oregon Graduate Center (OGC) (Appendix E) reviewed three sets of salinity data taken by various researchers in 1930-31, 1973-74 and 1982. OGC concluded that the water downstream of North Bend is typically saline and that freshwater mixing became increasingly important upstream. They concluded that the estuary is vertically well-mixed for low river flows and only becomes stratified during infrequent high river flows.

i. Sedimentation. Sedimentation in Coos Bay channel has averaged about 1,300,000 y^3 annually downstream of RM 12. Entrance sediments comprise some

800,000 y^3 of predominantly marine sand annually. The remaining 500,000 y^3 of sediment becomes increasingly finer upstream. Sedimentation upstream of RM 12 depends upon annual rainfall and runoff impacts on the local drainage basin. Between RM's 12 and 14 some 289,000 y^3 may accumulate in a given year.

Sedimentation above RM 14 is more variable but may be as much as 164,000 y^3 in a given year. Volumes shown in table 3.1 are assumed to be representative of general accumulation rates.

Table 3.1. Sediment Accumulation Within Upper Coos Bay (Cubic Yards).

PERIOD	COOS RIVER RM'S 12 TO 14	ISTHMUS SLOUGH RM'S 14 TO 15
5/80 to 10/80	121,000	149,000
10/80 to 10/81	194,000	21,000
10/81 to 10/82	289,000	164,000

3.3 Physical Resources: Ocean Disposal Sites.

a. Introduction. All of the various dredging scenarios for the proposed Coos Bay channel deepening project assume ocean disposal of dredged material at four existing or potential ocean disposal sites. There have been extensive studies conducted for the offshore area encompassing these sites. Most of the information that follows is from those studies. In addition, three studies were specifically contracted for the proposed deepening project. One was a geologic and geophysical examination of much of the area offshore from water depths of 12 to 46 meters. Another was a detailed study of disposal and sediment dispersal at existing Site F. The third study was biological sampling to update information obtained from the original site designation studies.

b. Geographic Locations. There are four areas evaluated in detail for ocean disposal (figure 3.4). Alternatives eliminated from detailed studies and additional discussion of current alternatives are discussed in Chapter 2. The areas considered in detail are existing Site H for disposal of primarily fine-grained material dredged from above RM 12 and from port berthing areas; a

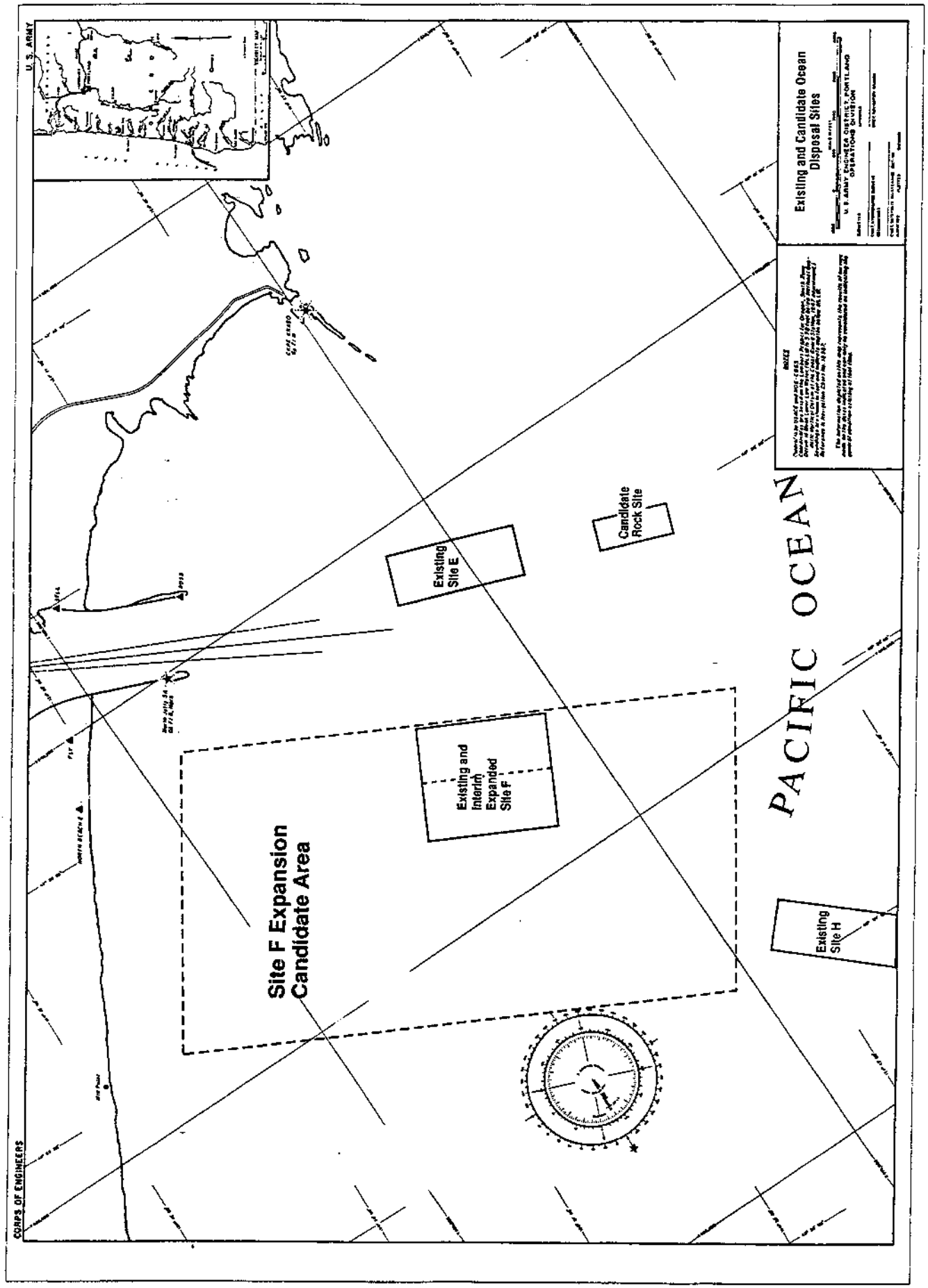


FIGURE 3.4 OCEAN DISPOSAL SITES

site for one time disposal of rock excavated for channel deepening; existing Site E; and a large area which includes existing and expanded Site F for disposal of primarily coarse-grained material removed from the channel below RM 12. Existing Site E is located approximately 1.5 statute miles offshore of the entrance to Coos Bay around the depth of 24 meters. The approximate center of the area investigated for disposal of primarily coarse-grained sediments is located 1.7 miles from the entrance with depths ranging from 8 to 46 meters. Site H is approximately 3.4 miles offshore around the depth of 55 meters. The proposed site for one-time disposal of rock excavated during channel deepening is located approximately 3.4 miles offshore around the depth of 34 meters.

c. Geological Characteristics. In the fall of 1989, a geologic and geophysical survey was performed by Geo Recon Inc (appendix F). The on-shore geology was extrapolated in interpreting the results of the sidescan and seismic surveys. Most of the study area is probably fine sand. There appears to be a broad band of coarser sand/gravel at depths of from 30 to 40 meters. Rock was found to extend in an almost straight line seaward from Lighthouse Point and Yoakam Point. There was a large bottom area several times larger than Area E characterized as partially buried rock/dredged material. The sub-bottom profile through this area shows a sediment thickness of 15 meters through most of the area however. Sediment cover is thinner further offshore approximately where the proposed rock site is located. The exposed rock offshore of Lighthouse Point was also cause for siting a disposal site far enough away for navigation safety.

d. Bathymetry. Regional offshore bathymetric contours generally run northeast-southwest parallel to the coastline. Near-shore contours bulge seaward off the entrance to Coos Bay, reflecting the influence of the tidal delta, the disposal of dredged materials, and the Cape Arago landmass. The top of the foreslope of the tidal delta is at about 24 meters and its base is at about 42 meters. Site F is located on the tidal delta while Site H is not influenced by the tidal delta and is in an area of parallel contours. The Rock Site is located south of the approach channel at a depth of at least 37 meters to avoid on-shore transport.

e. Sediment Characteristics . Hancock et al (1981) and Nelson et al (1983) report that near-shore sediments to approximately 70 meters in depth are clean fine sands of marine origin with median grain diameters of 0.15 to 0.20 millimeters and less than 1.5 percent of volatile solids (figures 3.5 through 3.8). The uniform nature of these highly mobile sands reflects the winnowing action of surface waves and tidal and wind-driven currents. Coarser sediments are found in the tidal delta to depths of about 42 meters. These sediments have median grain diameters in excess of 0.20 millimeters volatile solids concentrations are as low as 0.2 percent and owe their character to the combined influences of their nearness to the source of coarser river materials, strong ebb currents from the estuary, and the disposal of river and entrance materials during dredging operations.

Volatile solids concentrations increase rapidly beyond the tidal delta to between 2 and 3 percent and gradually increase with increasing depth. Between the foreslope of the tidal delta and 70 meters, the sediment is relatively uniform in grain size and volatile solids content. Below 70 meters in depth, grain size decreases and volatile solids concentrations continue to increase due to the decreasing influence of surface waves and ebb currents from the estuary entrance as depth increases.

Figure 3.8 presents averaged median grain sizes and volatile solids percentages for three seasons of resampling at 5 stations in the vicinity of Sites F and H. The error bars indicate the standard deviation. Also included are graphic boundaries that contain all sample medians for each site. The seasonally-averaged median grain sizes for the areas around Sites F and H are 0.26, 0.16, and 0.08 millimeters, respectively, and volatile solids average 0.53, 1.06, and 2.56 percent by weight. Winter sediments are somewhat more poorly sorted than average due to the presence of fines settled from discharged estuarine waters. The average volatile solids content at all sites is at a minimum in summer and at a maximum in winter with the contrast most clearly developed near Site H. Spatial variability in volatile solids content is also highest near Site H with the area near Site F having least-spatial variability. The greater seasonal and spatial changes in volatile solids near

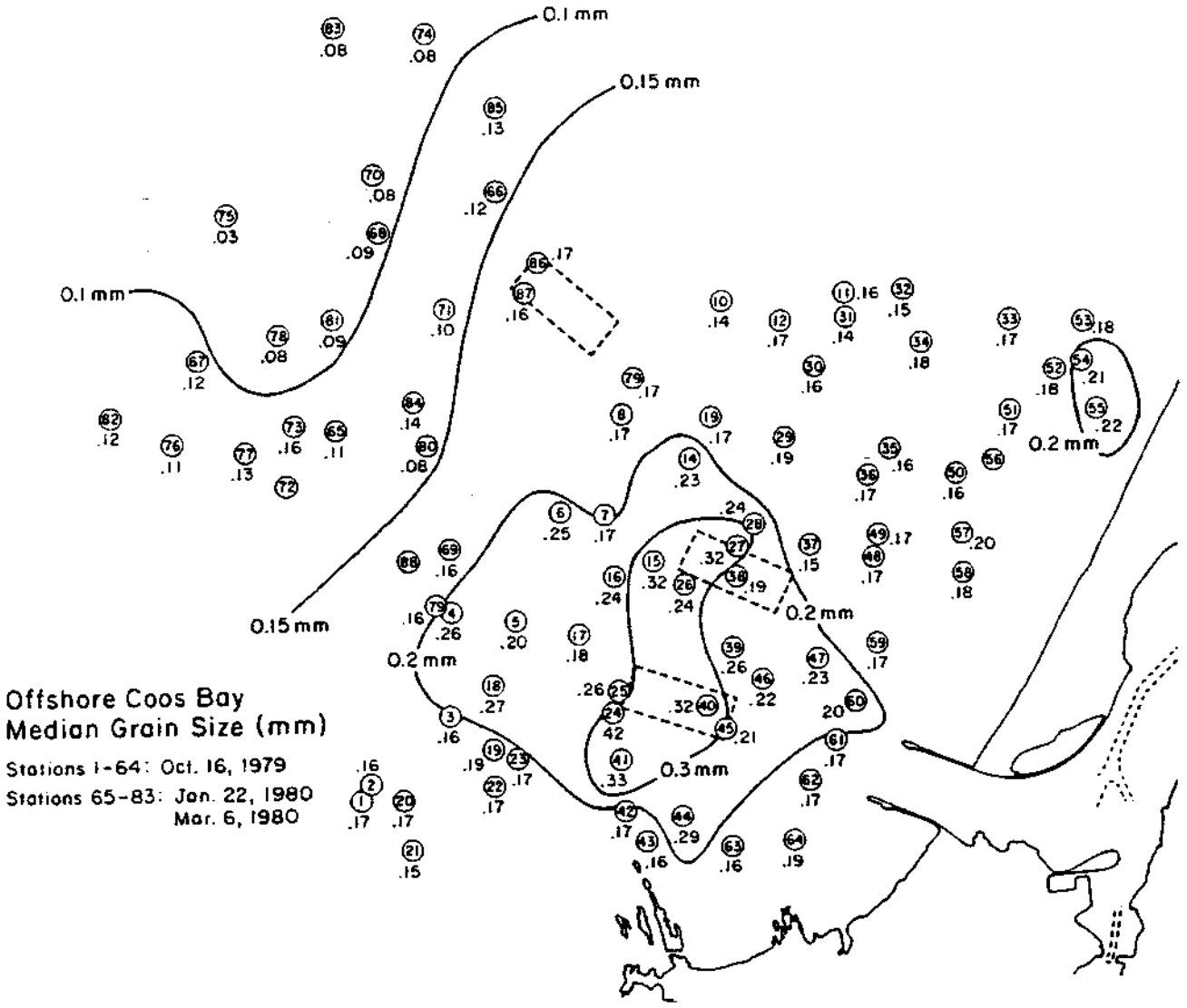


Figure 3.5 Extended offshore area median grain size distribution (Hancock, et al. 1981).

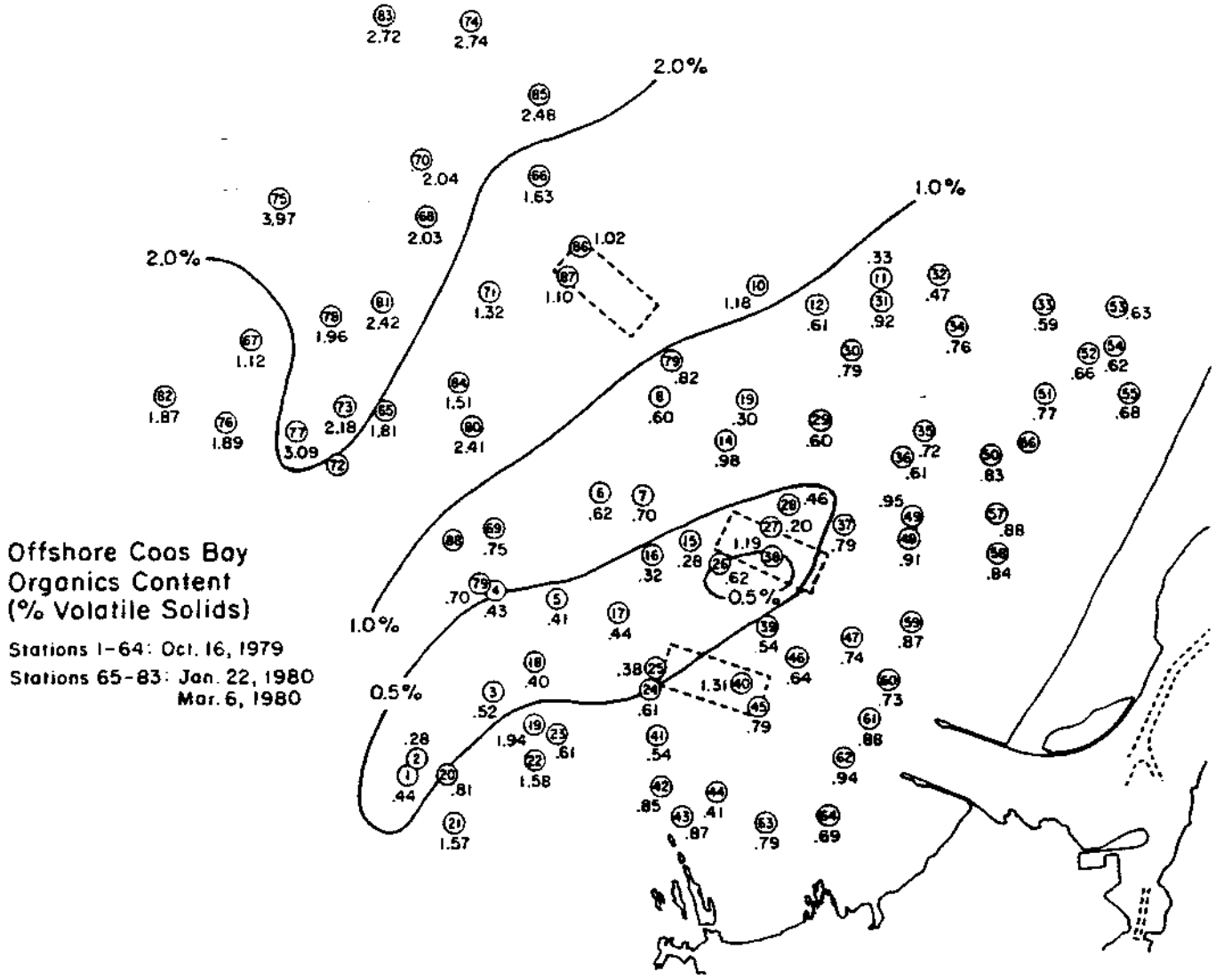


Figure 3.6 - Extended offshore area volatile solids (Hancock, et al. 1981).

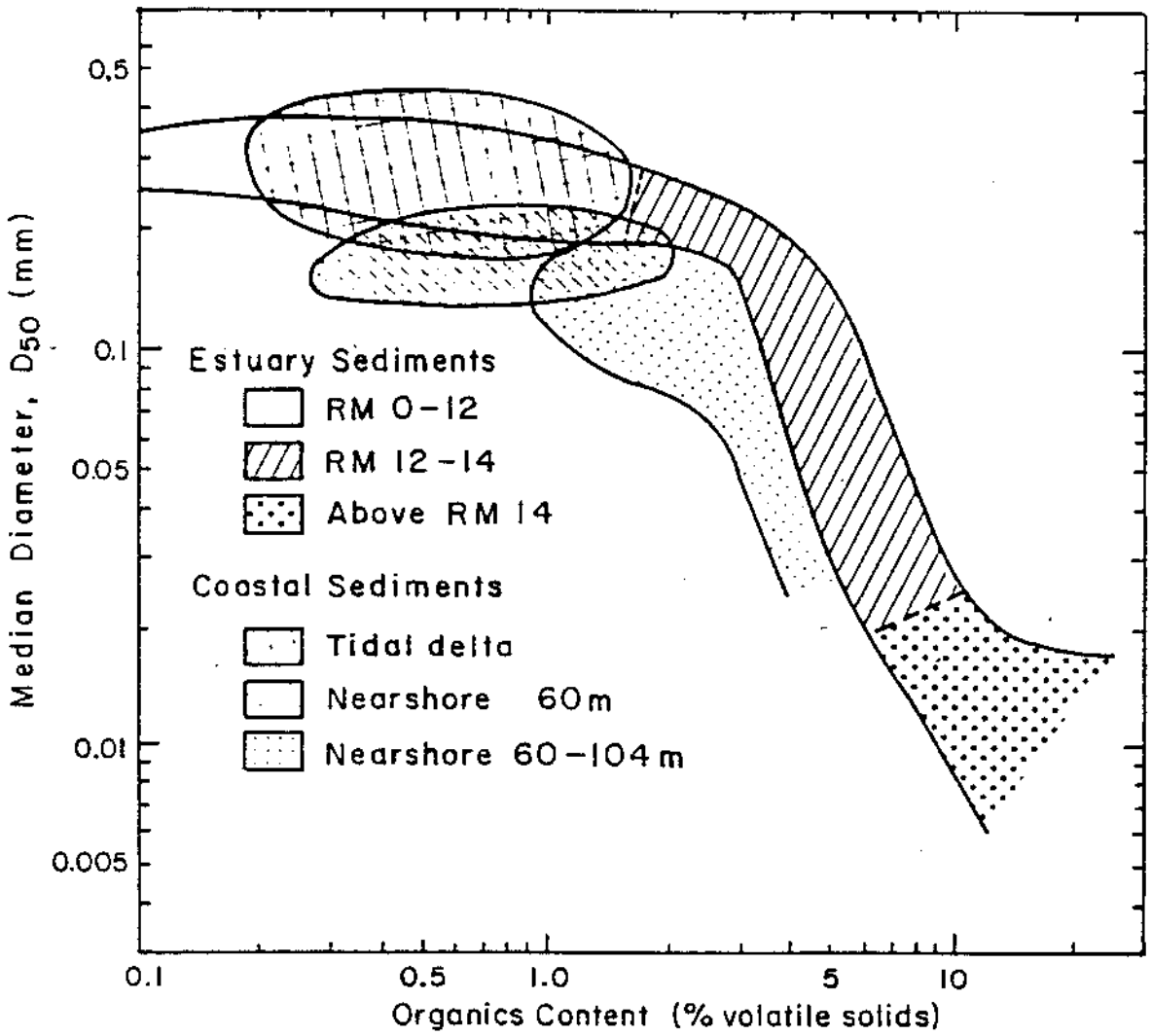


Figure 3.7 Median grain size vs. organics content in estuarine and coastal sediments (Hancock, et al. 1981).

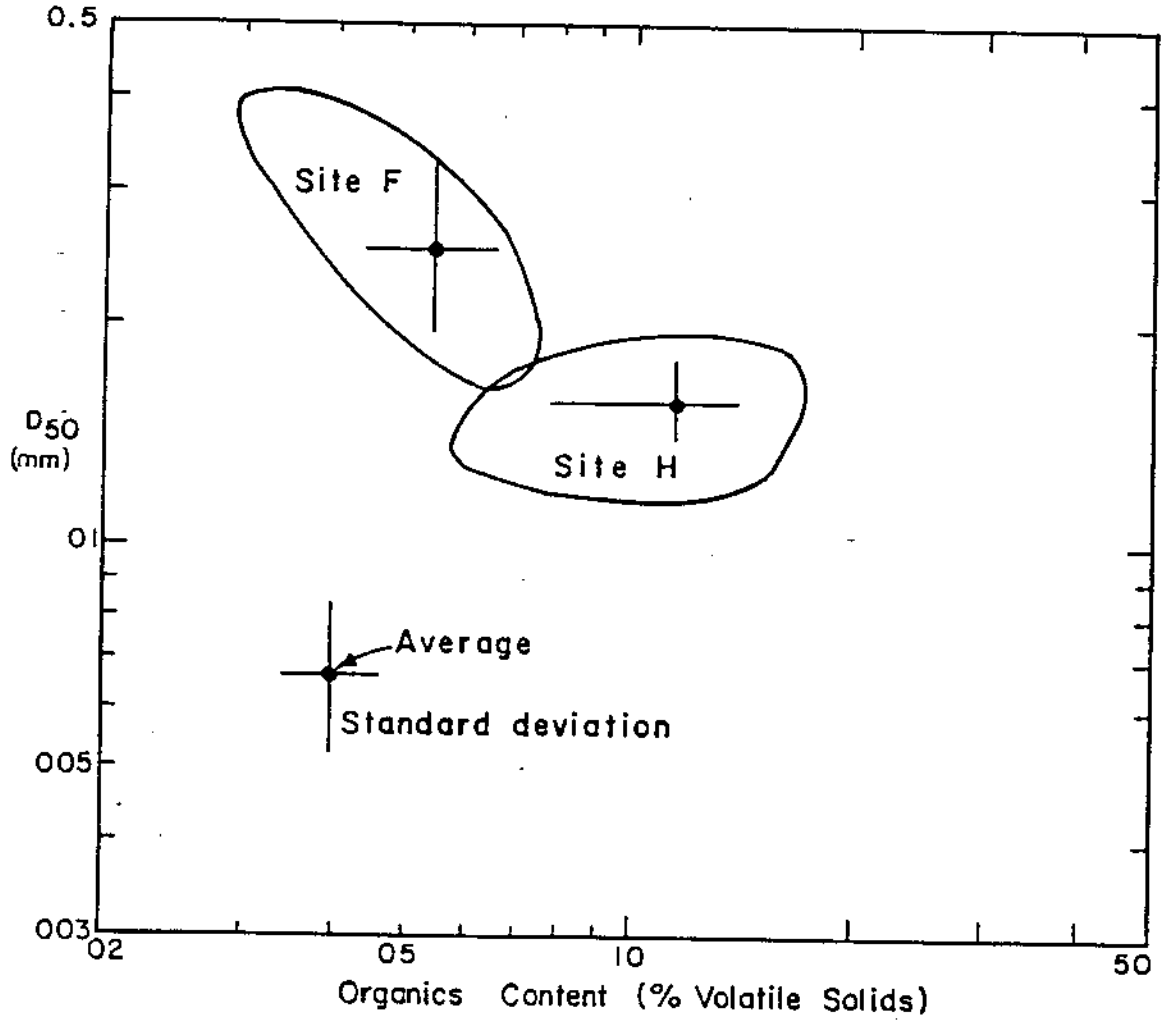


Figure 3.8 Median grain size vs. volatile solids with site average and standard deviation (after Nelson, et. al. 1983).

Site H and various grain size statistics suggest that the area near Site H experiences a greater variability in fine-grained material than the area around Site F. Site F sediments are more poorly sorted than sediments near Site H. The variability near Site F reflects the nature of the river delta sediments and the effects of dredged material disposal. The well sorted nature of material near Site H is consistent with the nature of near-shore fine marine sands.

Hancock et al. (1981) performed detailed bulk sediment chemical analysis on offshore sediments. In general, both water and volatile solids fractions increase with distance from the estuary entrance. This fact correlates with decreasing grain size. Chemical concentrations in these offshore sediments are similar to those of the less contaminated lower estuary sediments and significantly lower than concentrations in upper estuary sediments.

Nelson et al. (1983) present detailed sediment chemical analyses for the study area. Parameter levels are consistent within a site and obvious differences exist between sites. No chemical analysis at any site appeared atypical or indicative of a polluted condition. Site F sediments have higher solids content, lower volatile solids, and generally lower levels of all chemical parameters as compared to the other two sites. Volatile solids levels and most chemical parameter levels increase with depth and decreasing grain size such that Site H has levels intermediate with Sites F. Concentrations of copper, iron, lead, manganese, and zinc showed a strong inverse correlation with mean grain size.

f. Sediment Transport. Continued ocean disposal of dredged material at Coos Bay requires knowledge of the quantities of material to be disposed, as well as the short- and long-term fate of the dredged material. This section describes the sediment transport characteristics at existing ocean disposal sites and within the larger context of the Coos Bay offshore littoral cell.

Bathymetric monitoring of the Coos Bay ocean disposal sites over the past several years has concluded that dispersion rates from Sites E and F has been less than earlier predictions and persistent mounding is occurring at these

sites. As continued mounding may pose a navigational hazard, site modification for the disposal of coarse-grained material will be necessary. The disposal of fine-grained material at Site H will not be modified from present practices as bathymetric records indicate little or no mounding.

Coos Bay lies at the southern boundary of the Winchester littoral cell, which extends for 90 kilometers from Cape Arago north to Heceta Head. This littoral cell is the largest on the Oregon coast. Except for the headlands at both ends of the cell, the entire coastline is made of beach fronting sand dunes. Three major river systems enter the cell. From south to north these are the Coos River, the Umpqua River, which is the largest and provides the major source of sediment to the cell, and the Siuslaw River. Mineral assemblages of the Umpqua River correlate with the littoral sand mineralogies, which indicates that the primary source of sand within the cell is from the Umpqua River. Various sedimentological studies based upon sand mineralogies have suggested an offshore limit of modern sand movement at the 18 meters depth, while others push this limit out to over 30 meters. The Coos River is situated at the southern boundary of the Winchester littoral cell. Material dredged from the lower Coos Bay channel are very similar in their major mineral composition and grain size relative to local the beach sands.

Sediment transport on the Oregon continental shelf 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 offshore. Sediments sand size or coarser may be occasionally suspended by bottom currents or moved directly as bedload. Komar (1972) found evidence of wave induced bottom sand movement as deep as 204 meters (670 feet) off Oregon and concluded that summer wave action reached 50 to 100 meters (164 to 328 feet).

Hallermeier (1981) defined two zones of sand transport, inner and outer, 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. A similar model is described by Komar (1975) and Tunon (1977) for the Oregon coast where winter storms erode and

transport sand offshore and summer swell moves sand onshore. Comparison of aerial photographs along the Oregon coast shows a dramatic increase in width of the surf zone during the winter.

Using Hallermeier (1981) and long-term wave data from Newport (Creech, 1981) the limit for strong long-shore transport varies from -8.5 meters in summer to -15.5 meters in winter on the Oregon coast. Significant onshore-offshore transport occurs to depths of -25 meters in summer and to -82 meters in winter; however, Hancock, et al (1981) calculated the probability for wave-induced current velocities at various depths off Coos Bay. Using the Coos Bay data the probability of wave-induced sand movement is very small beyond a depth of about 46 meters. Sand movement induced by wave action is further influenced by near-bottom currents and downslope gravitational movement.

Coarse-grained sediments, between 0 and 15 meters deep, experience strong onshore and long-shore transport during most of the year. Coarse-grained sediments at depths greater than 46 meters based upon Hancock, et al (1984), are little influenced by waves and currents strong enough to cause significant movement. This is a non-dispersive area. The area between 46 and 15 meters is progressively influenced by waves and current sufficiently strong enough to cause movement with decreasing depth.

For the purpose of comparing static volumes of active sand bodies in the beach, dune and near-shore environments and predicted Coos Bay dredged material volumes, Peterson et al. (1993) identified the area of interest, from the Mouth of the Umpqua River to Coos Bay, as the Coos Bay-Umpqua littoral subcell to the Winchester littoral cell. Peterson found that the total estimated volume of beach sand above the m.l.l.w. datum to be 24 MY (million cubic yards) and the total foredune sand volume to be 7.2 MCY. The total volume of active dune sheet sand is estimated to be 704 MCY. The total volume of active near-shore sand, between 0 meters and 15 meters of water and 1 meters thick, is estimated to be 38 MCY. Active sand volumes at water depths from 15 to 46 meters has not been established do to a lack of information on the thickness of the active sand transport zone. Beyond water depths of 46 meters active sand movement is assumed to be negligible.

Based upon dredging records from 1986 to 1992 an average 983,898 y^3 of dredged material has been placed at Sites E and F annually. Yearly quantities have ranged from a low of 617,649 y^3 in 1989 to a high of 1,247,693 y^3 in 1991. Over a 50 year project life an estimated 49 MCY of sand would be required to be placed at an ocean dredged material disposal site suitable for sandy material.

g. Currents and Tides. Coastal circulation reflects the combined influences of seasonally-reversing regional currents and winds, the tides, and other periodic phenomena. The California and Davidson currents determine seasonal transport along the Oregon coast. The 500-kilometer-wide California current flows southward parallel to bathymetric contours over the entire Oregon continental shelf during the spring and summer with average speeds of 10 centimeters per second (cm/s). Northerly and northwesterly winds reinforce this flow with maximum current strength in the spring. Strong vertical velocity gradients characterized the lower half of the flow (Huyer et. al. 1975).

Under the influence of southeasterly winter winds, this shear layer expands upward and shoreward until northward flow results (Sobey 1977). Ultimately, this northward flow develops into the 150-kilometer-wide Davidson current that lies between the shore and the southerly flowing California current. Circulation over the continental shelf is now northward parallel to isobaths and currents are nearly uniform throughout the water column.

Upwelling from February through July weakens and ultimately destroys the Davidson Current to some 200 meters in depth. Net transport above this depth is thereafter southward as an extension of the California current. The Davidson current persists below that depth on the outer continental shelf with speeds up to 20 cm/s and is probably responsible for the strong velocity gradients that develop in the deeper inner shelf waters in summer.

Detailed current measurements in the study area by Hancock et. al. (1981) and Nelson et. al. (1983) conform to the generalized circulation scheme just

presented. Current strength and directional variability reflect the variability of local surface winds. Mid-water currents (those measured at one-third the depth) and near-bottom currents are generally between 10 and 20 cm/s in the vicinity of Sites F and H. Mid-depth summer median currents near Site F are slightly stronger (20 to 30 cm/s) while median winter and spring currents near Sites F and H may be between 30 and 60 cm/s.

Water transport is generally parallel to bathymetric contours although estuarine circulation and the shoreline configuration tend to produce significant on-shore and offshore flow in the upper water column near Site F and the rock disposal site. Springtime upwelling may also be responsible for shoreward-directed mid-depth mean currents affecting presumably Site H.

Annual and seasonal variations in atmospheric conditions determine the regional circulation just described. Superimposed upon this slowly-varying circulation are periodic currents due to the tides, inertial currents, internal waves, etc. While variations in wind speed and direction for periods longer than 2.5 days are reflected in surface currents, shorter period variations can give rise to inertial currents (Huyer and Patullo, 1972).

Inertial currents have periods of 17.4 hours and speeds up to 10 cm/s (Cutchin and Smith, 1973). Tidal currents with amplitudes of several tens of cm/s occur at periods of 12.4 and 24.8 hours. Other periodic circulation features include shelf or topographic (Rossby) waves that propagate northward with periods of 4.5 days and, possibly, southward with periods of 7.1 days. Internal waves of varying periods and wavelengths can propagate along the permanent and seasonal pycnoclines, causing short-term current oscillations in the order of an hour. When stratification abruptly decreases, as during upwelling events, internal waves become unstable and cause increased vertical mixing in the water column.

h. Surface Waves. The prevailing wave direction off Coos Bay is from the west. Summer waves approach from the west-northwest and littoral transport of beach sediments is to the south. During the remainder of the year, waves approach from the west and southwest driving littoral transport to the north.

Significant wave heights (the average of the highest one-third of all waves) range from a little over 1 meter during the summer to over 3.5 meters in winter with corresponding changes on wave period. Detailed observations have shown that wave-induced currents average between 30 and 60 cm/s year-round in the study area (Hancock et al. 1981). Speeds up to 120 cm/s or more were observed during the winter.

i. Wind Direction and Speed. Prevailing winds are from the south-southeast in January, averaging 5.5 meters per second (m/s), from the north-northeast for June through September at 5.2 m/s, and from the southeast at 4.6 m/s during the remaining months (figure 3.9). Wind speeds and directions are most variable during March, April and September. Significant geomorphic effects of Cape Arago headland and different methods of observation cause local wind statistics to differ significantly in direction and speed from observations at the offshore National Oceanic and Atmospheric Administration (NOAA) data buoy. Since the Coos Head records appear more similar to those of earlier observations (Duxbury et al. , 1966), the Coos Head observations are considered more appropriate for the study of local processes (Hancock et al 1981). The NOAA buoy records are likewise more appropriate to open ocean studies of wind generated waves and currents.

j. Water Quality. Table 3.2 presents the results of water quality analyses for surface and bottom waters on the vicinity of Sites F and H for each of the four seasons (Nelson et al. 1983). Tests for heavy metals and pesticides did not indicate an atypical or polluted condition for any water sample. Salinities characteristic of the surface water mass were observed throughout the water column at all three sites in June 1980, at all but the bottom near Site H in August and December 1980.

3.3 Biological Resources: Coos Bay Estuary.

a. Introduction. Because the interaction of the physical parameters within the system is highly variable, the Coos Bay estuary is best described by division into subsystems (figure 3.10). Much of the descriptiveinformation on these subsystems is contained in the Coos Bay Estuary Inventory Report

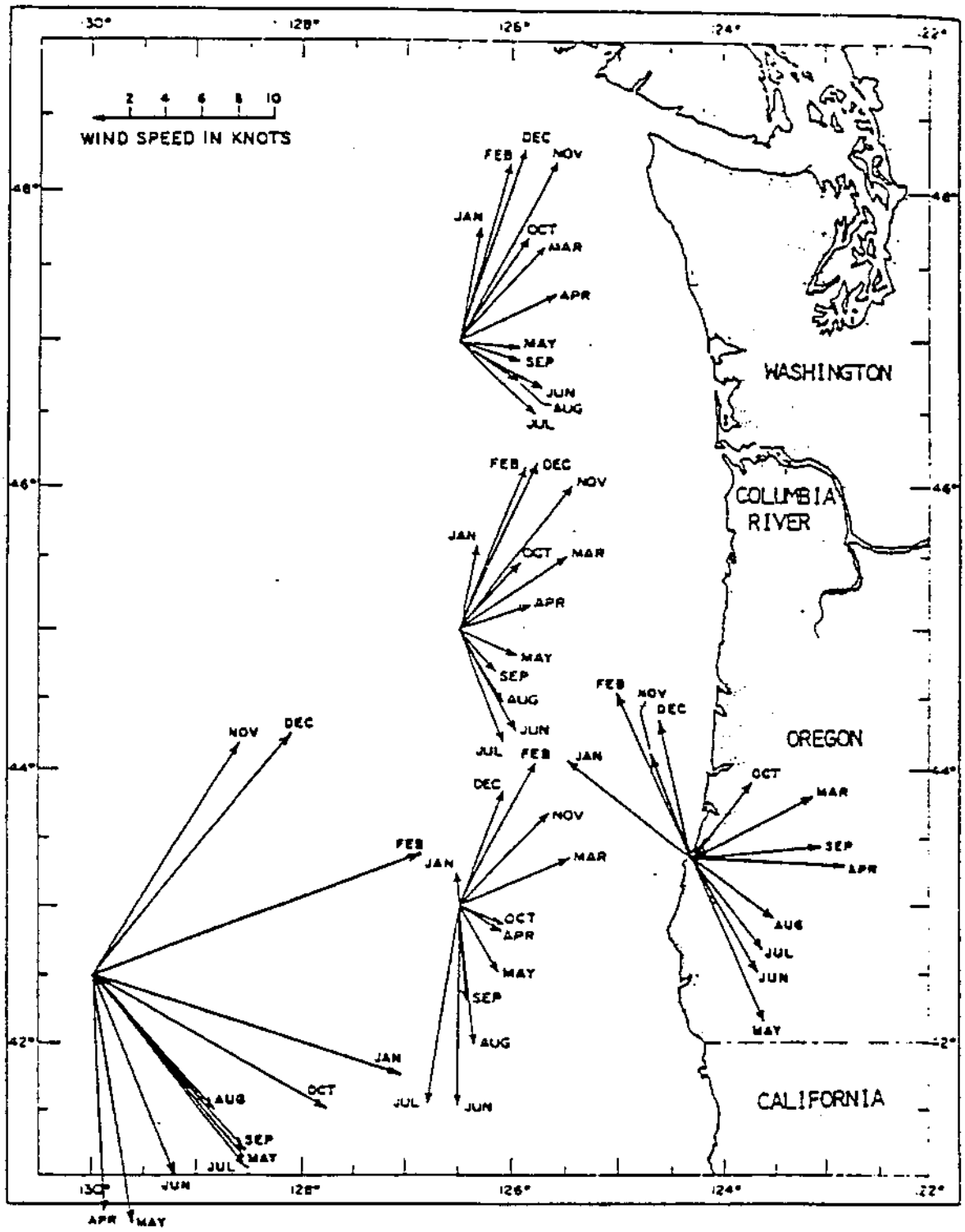


Figure 3.9 Monthly wind vectors observed at North Bend Airport and NOAA offshore data buoys.

TABLE 3.2 Chemical Analysis of Marine Waters at Offshore Sites F, G & H Coos Bay, Oregon (From Nelson, et.al. 1983)

Date	STATION	BOTTOM DEPTH (fathoms)	pH	SALINITY (mg/ml)	NH4-N (ug/ml)	TURBIDITY (NTU)	TSS (ug/ml)	VSS (ug/ml)	As (ug/ml)	Hg (ug/ml)
June 1980	F3B	13	7.85	32	BD	2.9	22	6	BD	ND
	F3T	13	8.00	30	BD	3.7	19	6	ND	BD
	G3B	50	7.70	33	0.10	7.0	52	12	ND	ND
	G3T	50	8.00	31	BD	3.6	26	8	ND	ND
	H3B	33	7.45	33	BD	6.0	27	7	ND	BD
	H3T	33	8.00	31	BD	1.2	26	8	BD	ND
August 1980	F3B	ND	7.70	33	BD	4.2	26	10	ND	BD
	F3T	ND	7.80	33	BD	2.0	23	8	BD	ND
	G3B	ND	7.60	33	BD	1.3	36	9	BD	ND
	G3T	ND	7.90	30	0.03	4.1	20	1	ND	ND
	H3B	ND	7.55	35	BD	2.6	23	8	BD	ND
	H3T	ND	7.70	32	BD	1.2	24	7	ND	BD
December 1980	F3B	13	7.70	33	BD	4.2	26	10	ND	BD
	F3T	13	7.80	33	0.01	2.0	23	8	BD	ND
	G3B	50	7.60	33	BD	1.3	36	9	BD	ND
	G3T	50	7.90	30	0.03	4.1	20	1	ND	ND
	H3B	33	7.55	35	BD	2.6	23	8	BD	ND
	H3T	33	7.70	32	BD	1.2	24	7	ND	BD
April 1981	F3B	13	7.50	35	BD	4.0	ND	ND	BD	ND
	F3T	13	7.50	31	BD	3.8	ND	ND	BD	BD
	G3B	50	7.60	35	BD	2.8	ND	ND	BD	BD
	G3T	50	7.60	32	BD	2.9	ND	ND	BD	ND
	H3B	33	7.50	35	BD	3.2	ND	ND	BD	ND
	H3T	33	ND	ND	BD	ND	ND	ND	BD	BD
LLD					0.03				0.04	0.05

TABLE 3.2 (Continued)

Date	STATION	METAL CONCENTRATION (ng/ml)						PESTICIDE CONCENTRATION (ng/ml)						
		Cd	Cu	Fe	Mn	Pb	Zn	Aldrin	DDE	Dieldrin	DDD	DDT	Arl254	Arl260
June 1980	F3B	ND	ND	ND	ND	ND	ND	0.010	BD	0.005	0.003	0.004	BD	BD
	F3T	1.60	14.00	6	18	3.50	<0.50	0.004	BD	0.005	BD	0.010	BD	BD
	G3B	ND	ND	ND	ND	ND	ND	0.005	0.002	0.005	0.002	0.004	BD	BD
	G3T	ND	ND	ND	ND	ND	ND	0.001	0.002	BD	0.002	0.004	BD	BD
	H3B	1.80	8.60	33	14	3.50	7.00	0.005	BD	0.006	0.010	0.008	BD	BD
	H3T	ND	ND	6	5	ND	ND	BD	0.004	BD	0.003	BD	BD	BD
August 1980	F3B	1.40	11.20	18	16	5.00	2.50	0.001	0.001	BD	0.001	0.004	BD	BD
	F3T	ND	ND	ND	ND	ND	ND	0.002	BD	BD	BD	0.005	BD	BD
	G3B	ND	ND	ND	ND	ND	ND	0.001	BD	BD	0.002	0.001	BD	BD
	G3T	ND	ND	ND	ND	ND	ND	0.002	BD	0.001	0.001	BD	BD	BD
	H3B	ND	ND	69	112	ND	ND	0.001	BD	0.001	BD	0.003	BD	BD
	H3T	3.50	18.20	11	21	5.00	7.00	0.001	BD	BD	BD	0.002	BD	BD
December 1980	F3B	2.80	34.00	18	16	7.00	9.00	0.001	0.001	BD	0.001	0.004	BD	BD
	F3T	ND	ND	ND	ND	ND	ND	0.002	BD	BD	BD	0.005	BD	BD
	G3B	ND	ND	ND	ND	ND	ND	0.001	BD	BD	0.002	0.001	BD	BD
	G3T	2.50	28.80	ND	ND	7.00	7.50	0.002	BD	0.001	0.001	BD	BD	BD
	H3B	1.40	12.60	69	112	3.50	5.00	0.001	BD	0.001	BD	0.003	BD	BD
	H3T	3.10	13.00	11	21	7.00	18.50	0.001	BD	BD	BD	0.002	BD	BD
April 1981	F3B	ND	ND	ND	ND	ND	ND	BD	BD	ND	BD	BD	BD	BD
	F3T	1.30	9.70	14	18	3.50	18.50	BD	BD	ND	BD	0.002	BD	BD
	G3B	1.40	9.50	38	76	3.50	15.00	BD	BD	ND	BD	BD	BD	BD
	G3T	ND	ND	ND	ND	ND	ND	BD	0.001	ND	0.002	0.004	BD	BD
	H3B	2.20	12.50	ND	ND	2.70	79.00	BD	ND	BD	0.002	BD	BD	BD
	H3T	4.40	13.50	11	12	3.50	5.00	BD	ND	BD	BD	BD	BD	BD
	LLD							0.020	0.001		0.001	0.002	0.020	0.020

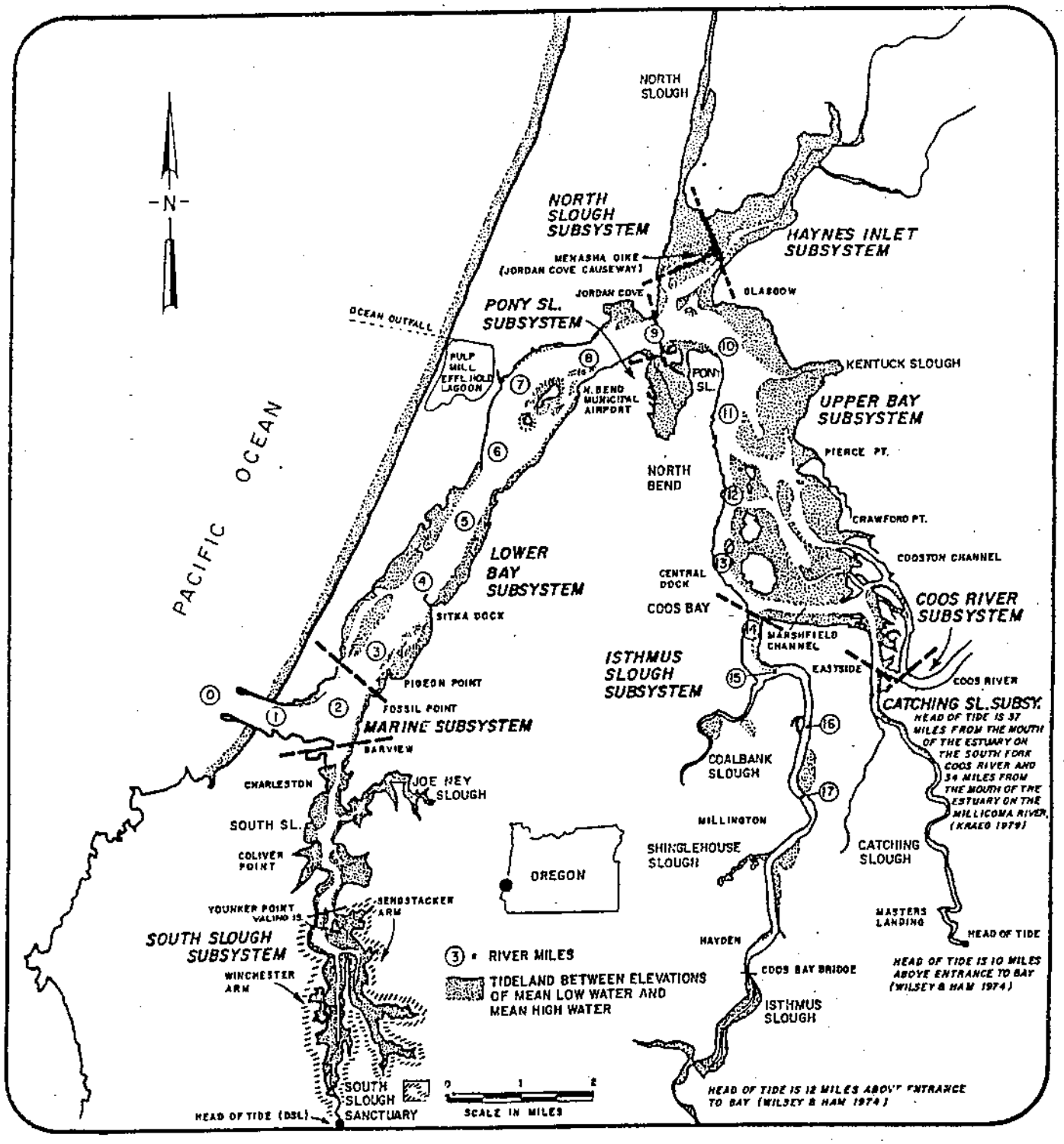


FIGURE 3.10 COOS BAY SUBSYSTEMS

(Roye 1979). Delineations were made between the following subsystems: marine, RM's 0 to 2.5; lower bay, RM's 2.5 to 9; and upper bay, RM's 9 to 17. Riverine and slough subsystem are also characterized individually. These divisions are based on physical and biological characteristics of the individual subsystems which in turn vary with degree of freshwater input, estuarine circulation (wave and current action), salinity gradients, nutrient fluxes, sediment structure and geographical location. Within each subsystem these characteristics vary with time, and in so doing determine the seasonal distribution and standing stock of estuarine biota. Other factors which determine species composition and abundance within the estuary include effects of predation, harvesting, environmental contaminants, human disturbance, and competition between organisms occupying similar niches. The subsystems are as follows:

(1) Marine Subsystems. The marine subsystem (RM's 0 to 2.5) contains a large diversity of habitats (i.e. shorelines, eelgrass, intertidal marsh/mudflat and subtidal channel), with a similarly diverse assemblage of fish and wildlife species. Shorelines are composed of sand, cobble, boulder and bedrock. Intertidal areas, consisting of sand, sandy mudflats, bedrock and unconsolidated material are largely covered with eelgrass and algae beds. Shallow subtidal areas also support eelgrass and algae beds. The bottom of the navigation channel in the marine subsystem is composed mostly of clean sand (> 95 percent [Jefferts 1977]). Small shell hash and small pieces of wood are prevalent between RM's 1 and 2, with increasingly larger amounts of rock up to RM 3 (Moehl and Barton 1989). This subsystem is the most biologically diverse of the entire bay. Of thirteen species collected during sampling of dredged material in the navigation channel, eight were most frequently encountered between RM 1 and 3 (Moehl and Barton 1989). The large species diversity in this subsystem is attributable to the prevailing oceanic influence, as well as to the variety of available habitat.

(2) Lower Bay Subsystem. The Lower Bay subsystem extends along the channel from approximately RM 2.5 to the railroad bridge at RM 9. Although still under considerable oceanic influence, it is not as strongly affected by wave action as is the marine subsystem. The sediments of this reach are

predominantly marine sands, though a relatively high concentration of rocks occur in the navigation channel between RM 2.5 and 4 (Moehl and Barton). Other than rock, shell fragments and wood are common in the channel. The rock concentration diminishes at approximately RM 5, wood debris becomes very prevalent thereafter, particularly between RM's 7 and 9.

(3) Upper Bay Subsystem. The Upper Bay subsystem of Coos Bay has been altered more than any other subsystems. This reach, which extends from RM's 9 through 17, broadens into a system of wide, shallow tideflats through which the navigation channel is maintained along the west side. The broad shallow nature of the upper bay forms a vast intertidal system which supports large eelgrass beds and tidal marshes. These tidal flats are composed largely of mud, with sand occurring near dredge material islands. These flats are an important feeding area for a variety of juvenile and adult fish including striped bass, shad and salmon. It is suspected that these species use this area to adjust to fresh water and wait for proper river conditions to migrate upstream (Cummings and Schwartz 1971). Debris from the local wood products industries is common throughout this system, particularly at the downstream end of the channel, and on the southern tideflats. Higher concentrations of sand occur near the dredge material disposal islands.

(4) Slough And Riverine Subsystems. The sloughs of the Coos Bay estuary are considered as independent subsystems, though they share many similar characteristics. Water quality generally varies with distance from the mouth of the bay and freshwater inflow. The ecological characteristics of the sloughs are largely determined by water quality. With distance from the ocean, tidal forces decrease, therefore, water at the upper reaches is relatively stagnant, particularly during periods of low fresh water runoff.

The riverine subsystems in Coos Bay include the South Fork Coos River and the Millicoma River. These rivers converge to form the Coos River approximately 5.5 miles from the upper bay subsystem. The head of the tide extends approximately 10.5 miles up this system in the Millicoma River and 11 miles up the South Fork of the Coos (Roye 1979). The Coos River is the largest of all tributaries entering Coos Bay. It drains approximately 70 percent of the

entire Coos Bay drainage system (which comprises 1,502 square kilometers). These systems provide important fish habitats, and are critical in the hatching and rearing stages of the life cycle of many commercially and recreationally important species of fish including salmon, striped bass and shad.

b. Flora And Fauna of Coos Bay. There are a number of factors involved in determining distribution and abundance of flora and fauna in Coos Bay. These factors include substrate type, chemical and physical properties of the water (i.e. salinity, dissolved oxygen, and temperature), tidal forces and degree of tidal exposure (wave and current action), habitat stability, predation and harvesting, and competition between organisms.

Distribution of many organisms is seasonally dependant with wide fluctuations in abundance not uncommon. Non-native organisms have been introduced by the local shipping and fishing industries.

(1) Flora.

(a) Algae. Estuarine algae and vascular plants are the major estuarine primary producers in Coos Bay. Ulva and Fucus are two genera of macroalgae which commonly occur in Coos Bay. Ulva occurs on sandstone-clay substrates or floating on mudflats, while Fucus occurs on intertidal rock within the splash zone (USFWS,1987). Bull kelp (Nereocystis leutkeana) occurs in beds off of Pigeon Point in the lower part of the estuary. The great abundance of algae occurs near the mouth of the estuary in locations where moderate wave action allows for attachment to hard substrates. In the quieter waters of the inner bay algae attaches to pilings and outcroppings. Algae diversity and abundance decreases with distance from the mouth, due primarily to decreasing water clarity.

Diatoms are a very common type of algae which are distributed throughout the bay. Diatom distribution is seasonal and correlated with salinity. There are two species assemblages divided by a transition zone which occurs between

RM's 5 and 9 (USACE 1975 from McGowen and Lyons, 1973). The dominant genera of diatoms in the upper bay are Skeletonema and Melosisra, while the principal genera nearer the mouth include Chaetoceros, Skeletonema, and Thalassiosira.

Epiphytic diatoms contribute significantly to estuarine primary production, constituting up to 18 percent of the annual production of carbon in eelgrass primary production system (Phillips 1984). Often forming a felt-like coating on eelgrass leaves, epiphytic algae is preyed upon by a variety of organisms. Epiphytic algae is also found in association with macroalgae and on rocky substrates. Approximately 200 species of epiphytic diatoms have been identified in Yaquina Bay located roughly 150 miles north of Coos Bay. Detailed surveys of this nature have not been conducted in Coos Bay, though a similarly diverse assemblage of species would be expected here. There is a strong correlation between the presence of epiphytic algae and herbivorous epifauna such as amphipods. Amphipods are in turn fed upon by many species of fish and invertebrates including Dungeness crabs and salmon.

(b) Vascular Plants. There are approximately 1,726 acres of tidal marshes in Coos Bay, most of these occur in adjoining sloughs and inlets. These marshes are dominated by a variety of vascular plant species ranging from eelgrass to bulrush and sedge. Marshes act to contain pollutants and sediments, as well as to control buffer the flow of water during flood events.

North-coast birds beak (Cordylanthus maritimus spp. palustris) is a vulnerable plant species which occurs in salt marshes in Oregon and California. It is found locally in a bay-side salt marsh on the North Spit. At this location it is threatened by off-road vehicle traffic.

Eelgrass (Zostera marina L.) is associated with the lower intertidal and shallow subtidal flats in the bay. Coos Bay contains about 1,400 acres of eelgrass tideflats (USFWS 1987). Eelgrass habitat represents one of the richest and most productive of ecosystems. Organic detritus from the decay of eelgrass provides food for a host of benthic invertebrates. Not only are the

primary producing capabilities of this plant tremendous, but it also provides a sheltered habitat for a variety of organisms.

Eelgrass occurs in pure stands in areas of high salinity, and with ditch grass in less saline zones. It achieves optimum growth in salinities ranging from 10 to 30 ppt (Phillips 1984). Eelgrass roots in unconsolidated substrate, creating a relatively structured habitat, or eelgrass bed. Eelgrass is not tolerant of currents greater than 3.5 knots; moderate current speeds (0.0 to 0.8 knots) enhance eelgrass growth (Phillips 1984). If currents are too slow, algae tends to dominate and eelgrass grows poorly. Faster currents tend to tear the leaves from the plant and erode the substrate. Eelgrass does not occur at depths greater than 6.6 meters.

(2) Fauna.

(a) Invertebrates. Eelgrass habitat supports a large diversity of invertebrate species particularly when compared to adjacent unvegetated areas. Studies conducted by Oregon Institute of Marine Biology (OIMB) in summer 1971, compared various habitat types in the Upper Bay subsystem of Coos Bay. This study revealed a strong correlation between dense eelgrass beds and high animal biomass and diversity. Habitats studied included the periphery of the dredge material islands, mud, light eelgrass beds and dense eelgrass beds. Organisms were collected and weighed, and biomass (grams per square meter [g/m2]) calculated for species groups within each habitat type. Mean biomass for each habitat type was reported as: 13.0 g/m2 dredge island perimeter, 16.8 g/m2 mud, 34.7 g/m2 light eelgrass, 59.8 g/m2 dense eelgrass.

Clams, amphipods, and worms were the most commonly encountered organisms. Most commonly encountered clams were Mya arenaria, Macoma balthica, and Tellina salmonea. Amphipods consisted of Corophium spinicorns and Anisogammarus spp. Commonly identified worms were Nereis brandti, Heteromastus filiformis, and Eteone lighti. Miscellaneous organisms which were encountered in relatively high numbers were Calianassa californiensis (ghost shrimp) in the dredge island perimeters. Tectibranchs were common in

the mud, C. Californiensis in the light eelgrass and tectibranchs, Dungeness crabs (Cancer magister) and fish fry in the dense eelgrass.

(b) Zooplankton. Zooplankton in Coos Bay are comprised of such organisms as benthic infauna larvae, fish larvae and a variety of crustaceans including mysids, cumaceans, and cladocerans. Zooplankton play an important role in the food web by their conversion of organic detrital matter and transfer of energy to higher trophic levels. Along with consuming detritus, zooplankton are also herbivorous and/or carnivorous. Zooplankton are capable of exploiting the wide variety of food particles which occur during different tide stages and seasons.

Salinity is the most important factor in determining distribution of plankton, with salinity extremes being more important than average salinity (Simentstad 1984). Zooplankton diversity is greatest at the mouth of Coos Bay with a gradual decline up to RM 10. The low species diversity at RM 10 may be related to the occurrence of a salinity gradient (Chirarochana 1977). Species diversity is suppressed by environmental stresses (Chirarochana 1977, from Carriker 1967), such as salinity gradients. Between RM's 10 and 15, zooplankton diversity gradually increases, and is maintained at a relatively high level up to RM 20 (Chirarochana 1977).

(c) Benthic Invertebrates. Benthic invertebrate sampling conducted in Coos Bay has revealed a notable contrast with regard to species diversity throughout the estuary. In general the upper bay supports a large number of individuals and low species diversity. The lower bay however, supports a large number of individuals and species (Jefferts 1977, NMFS 1990). South Slough faunas were consistently distributed to deeper levels in the sediment, probably due to the lower frequency of disturbance (Jefferts 1977). Benthic infauna of the upper bay was nondiverse, cosmopolitan, and opportunistic; which was attributed to several factors including increased organic content, decreased grain size, and regular physical disturbance by dredging. The effects of dredging on benthic infauna in the upper bay was studied by Parr (1973). Samples were taken both in the channel and at disposal sites, before and after dredging. The study revealed the presence of a stable community

consisting largely of polychaetes (Streblospio benedicti being overwhelmingly dominant) which are largely associated with polluted environments (Parr 1973).

In May of 1989 benthic samples were taken at various locations in Coos Bay (figure 3.11), (Miller et al, April 1990). The species composition appears to have changed in the last 15 years, maximum diversity was observed near RM 5 in May 1975 and in May 1989. High species diversity was also encountered in samples taken in December 1989 near RM 4 (Jones 1990). The apparent change in species composition may be related to the limits of the sampling and identification effort, rather than in actual presence of a species.

Additional samples were taken at 20 locations in and adjacent to the navigation channel. In May 1989, benthic invertebrate density ranged from between 375 per square meter to 13,546 per square meter (table 3.3).

Recreational clam harvest information from Coos Bay provides the majority of current information regarding clam distribution in the estuary. Gaper, cockles, littleneck, and Washington clams are the most commonly harvested clams (Gaumer 1989). Surveys of recreational diggers from 1988 to 1989, revealed general clam distribution to be unaltered from that reported in earlier studies (Roye 1979), although average size and abundance of gaper clams has declined in the past 15 years. An area formed by dredged material known as Clam Island, located between approximately between RM's 3 and 4 on the west side of the channel, is the most productive gaper clam area in the bay. Cockles, littlenecks, and Washington clams are also found here. A similar distribution of clams occurs on tide flats of the North Spit, between approximately RM's 5 and 6. The lower South Slough also supports a population of gaper clams and cockles. The sandbar west of Charleston channel contains a viable population of razor clams. This was thought to be the only population of razor clams in the bay, until this species was discovered in dredged material at RM 7 in Coos Bay (Moehl and Barton 1989). Littleneck and Washington clams are most abundant on the flats near Pigeon Point. Soft shelled clams are found between South Slough and the upper bay subsystem. The broad muddy sand flats between RM's 10 and 16 support large numbers of soft-shelled clams. This species is tolerant of a wide range of salinity (Rudy and Rudy OIMB 1983).

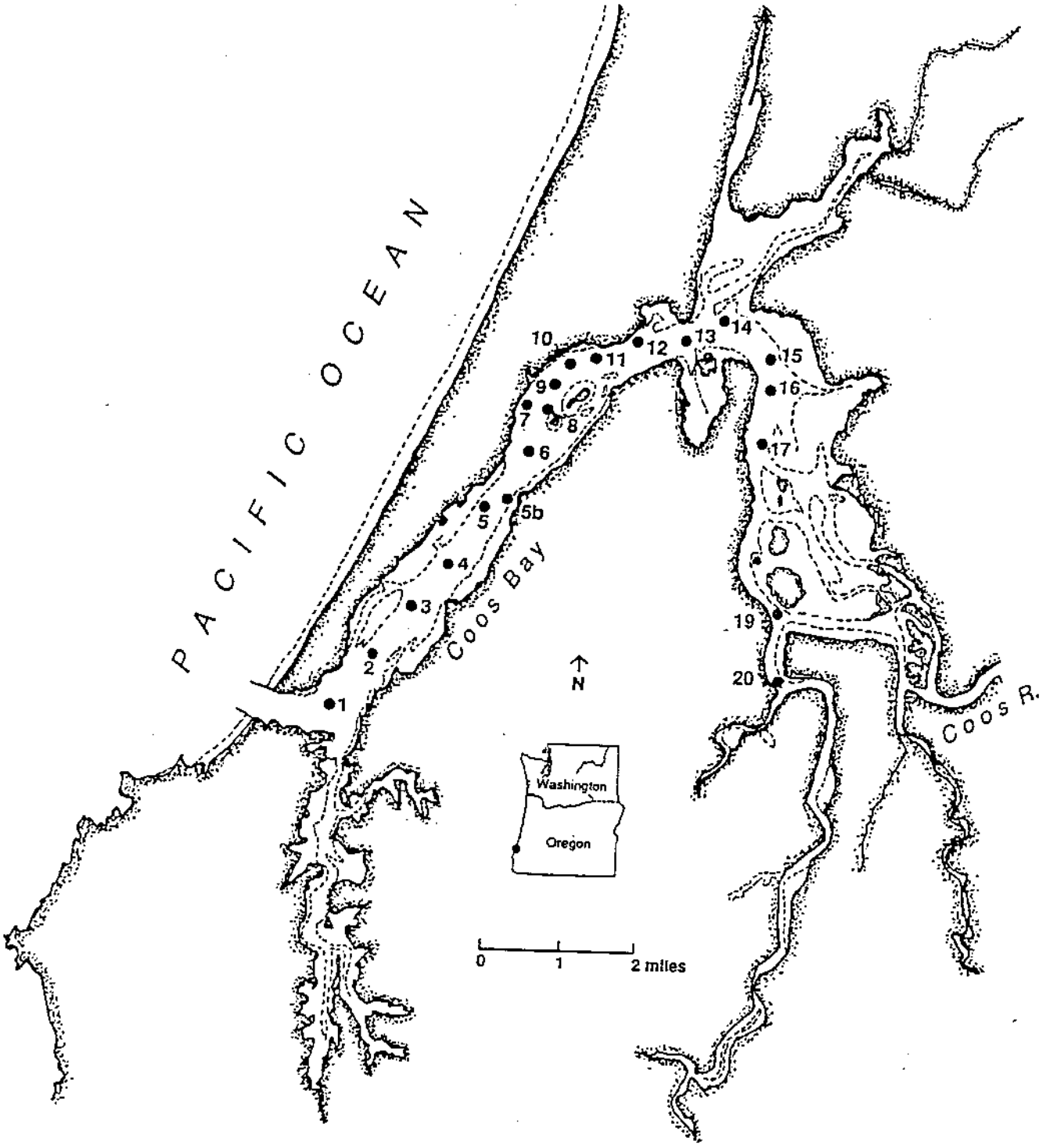


Figure 3.11. Benthic invertebrate sampling stations along the Coos Bay, Oregon navigation channel. 22-23 May 1989.

Table 3.3. Benthic invertebrates at 20 Sampling Stations in and Adjacent to the Coos Bay, Oregon, Navigation Channel, 22-23 May 1989.

STATION	NUMBER OF TAXA	DENSITY OF INVERTEBRATES (NUMBER/M^2)	H'[1]	SDV[2]	SR[3]	J'[4]
1	16	11,764	2.11	0.61	2.13	0.53
2	12	657	2.45	0.73	2.65	0.69
3	10	479	2.45	0.75	2.35	0.74
4	22	13,546	2.02	0.64	2.93	0.45
5	50	5,450	2.54	0.93	7.83	0.80
5b	53	11,004	3.57	0.80	7.47	0.62
6	12	375	2.56	0.74	3.07	0.72
7	7	427	1.77	0.62	1.62	0.63
8	7	1,105	1.59	0.55	1.29	0.57
9	11	667	2.27	0.70	2.40	0.65
10	6	500	1.57	0.59	1.29	0.61
11	16	552	3.03	0.78	3.78	0.76
12	14	1,521	2.06	0.57	2.61	0.54
13	8	469	2.18	0.70	1.84	0.73
14	17	563	3.71	0.90	4.01	0.91
15	20	1,000	3.04	0.77	4.16	0.70
16	17	563	3.45	0.88	4.01	0.84
17	15	490	3.16	0.84	3.64	0.81
19	10	386	2.79	0.82	2.49	0.84
20	11	823	2.25	0.66	2.29	0.65
Means	17	2,617				

[1]Shannon-Weaver Diversity Index
[2]Simpson Diversity Value
[3]Species Richness
[4]Species Evenness

Other species of clams which are not of commercial or recreational value include Macoma balthica, M. nasuta, M. inquinata, and Transennella tantilla (Karen Elardo, OIMB personal comm. 1989). The lower Coos Bay channel is composed of coarse grained sand, rocks, and steep mudstone walls where the navigation channel has been cut. These rocky areas create habitat for such clam species as paddocks and pea pod borers.

(d) Fish. Due to the close proximity of the ocean, fish species diversity is greatest in the Marine and Lower Bay subsystems. Many species which are more commonly associated with the ocean occur here. A total of 66

species of fish have been recorded from throughout the Coos Bay estuary; of these, 91 percent can be found in the lower 5 miles of the estuary at some stage of their life cycle (Cummings and Schwartz 1971).

The Coos Bay estuary provides a nursery for numerous migratory fish species. The broad shallow nature of the upper bay, with large intertidal areas and expansive eelgrass beds provides exceptional fish rearing habitat, and an abundance of prey. Gut content was analyzed in a variety of fish seined from the upper bay by OIMB in 1971. These fish were found to be feeding on diatoms, copepods, amphipods (including Corophium and Anisogammarus), mysids, shrimp, worms, and clams including soft-shelled and Tellina. (McConnaughey 1971).

Pacific herring use the bay as a spawning and nursery ground. Herring eggs can be found between January and March on rocks, pilings, seaweed and eelgrass. Mature and immature herring occur in the bay during spring and summer months. Young herring, with an average length of 6 to 9 centimeters have been found as far up as RM 20, though they are more numerous below RM 15 (Cummings 1971). They prey upon copepods, larval crustaceans, mollusks, and diatoms. Their predators include striped bass, cutthroat trout, salmon, halibut, albacore, dogfish, squid, and seals (OIMB 1971).

After spawning in the open ocean, young and adult northern anchovies enter Coos Bay where they occur in high numbers between April and September in most years. Large numbers of anchovies have been observed between RM's 10 and 14 during April and May (Cummings 1971). Anchovies feed on small crustaceans, fish larvae, copepods and diatoms. Salmon and striped bass are common anchovy predators (McConnaughey 1971).

Silver smelt, longfin smelt, and whitebait top smelt occur in the Coos Bay estuary. Smelt inhabit the plankton-rich upper water level of the bay and are abundant over the tidal flats on the incoming tide (McConnaughey 1971).

American shad adults migrate through the bay during late spring and early summer on their way to spawning areas in the Coos River. Some shad arrive in

early spring and spend several weeks in the estuary feeding on mysids, copepods, Crangon, fish larvae, and Corophium (McConnaughey 1971). The shad population, estimated at 55,000 fish (USFWS 1987), arrives at the spawning area (RM's 23 and 30) by mid-June (Cummings 1971). Yearling shad are present in the river in June occur between RM's 15 and 25 (Cummings 1971). They move downstream in mid-July and arrive at the ocean by the end of August. Young of the year shad occur throughout the upper estuary as far down as RM 9 in August and as far up as RM 31 in September (Cummings and Schwartz 1971).

Chinook, coho, and chum salmon and steelhead and cutthroat trout utilize Coos Bay as a feeding and nursery area, as well as a migration route to spawning areas in the tributary streams. Steelhead, cutthroat trout and salmon can be found in the bay during most of the year. Migration of these species varies and is as follows: chinook, July through November; coho, September through December; chum, October through November; steelhead, November through February; searun cutthroat trout, July through October. (USFWS 1987).

Depending on the species, young enter or pass through the bay when only a few days to two years old. Juveniles, particularly of chinook salmon utilize the bay as a nursery area throughout the year. Emigration of chinook salmon occurs during May through July; coho, April through June; chum, March through May; steelhead and cutthroat, April-June. Emigration of yearling coho salmon, steelhead, and cutthroat trout also occurs during early fall freshets (USFWS 1987).

Chinook from the previous years brood have been seined from throughout the estuary during the following June. Average length of these fish was 10 centimeters (Cummings and Schwartz 1971). By August most of these fish take on the silvery appearance of smolts and leave the upper bay. They appear to remain below RM 8 through September at which time they are approximately 14 to 19 cm in length (Cummings 1971). Coho apparently remain in the river or fresh-water portion of the estuary during the summer. Coho yearlings have been collected from the estuary en route to the ocean between March and May (Cummings and Schwartz 1971). Because of significant declines in coho salmon returns to Pacific coastal streams, it has been petitioned for listing under

the Endangered Species Act. The decision for listing is currently under consideration.

Striped bass are a migratory fish, native to the Atlantic Coast. They were introduced to the Pacific coast via the Sacramento River in 1879. Striped bass were first noted in Oregon waters in 1914; by 1930, a substantial commercial and sport fishery had evolved (Anderson 1985). There is a popular sport fishery at RM 30 on the Coos River during the winter and early spring. Striped bass also occur in Joe Ney and South Slough during the winter. This species feeds over tide flats throughout the bay, and near the mouths of rivers and streams (Cummings and Schwartz 1971).

Spawning begins in May and June when various groups of bass begin to school and move upriver towards the spawning grounds in the Coos River. The spawning grounds occur between the fork and Dellwood, and in the Millicoma River from the fork upstream to Allegheny (USFWS 1987). Spawning extends into mid-July in some years (Cummings and Schwartz 1971). The spawning population is estimated at 3,000 fish (USFWS 1987). Hatchlings rear throughout the bay and in the tidewater section of the Coos River (USFWS 1987). They are thought to migrate to the ocean by the end of their first year (Cummings and Schwartz 1971). Adults feed on shrimp (Crangon), surfperch, shad, chinook salmon, young striped bass, anchovies, herring, and sculpins. Young striped bass feed on mysids, amphipods, isopods, Crangon, annelids, shad, and younger striped bass (McConnaughey 1971).

The striped bass population in the Coos River has experienced a noticeable decline in recent years. This decline has been attributed to poor recruitment in the system within the first two months of life. The reason for poor recruitment is not clear, though eggs, larvae, and juveniles are extremely vulnerable to high river flow conditions and low zooplankton availability (Anderson 1985). Anderson (1985) suggests that the Coos Bay striped bass spawning strategies may be ill-adapted for the existing hydrographic conditions. He also observed an unusually high number of hermaphroditic bass in the Coos Bay population, suggesting a small gene pool may be limiting the adaptive capabilities of this population.

A variety of demersal fish occur in Coos Bay, particularly in the Marine and Lower Bay subsystems. These fish include starry flounder, English sole, sand dab, black rockfish, kelp greenling, Pacific sand lance, gunnels, and sculpins. Starry flounder are found in the bay throughout most of the year, with large numbers moving in from the ocean during the winter. During the summer, young flounder are found scattered throughout the estuary to RM 25. Young English sole, approximately 3 centimeters in length occur in the estuary in July, and are particularly abundant in the lower bay by August; roughly 1,000 juveniles per seine haul were collected in 1970. Smaller numbers occurred in samples up to RM 17 (Cummings 1971). Young sand sole were found up to RM 15 along with English sole, but were only 20 percent as numerous as English sole. A number of perch species are found throughout Coos Bay including striped, white, pile, walleye, redtail, shiner, and surf perches. Shiner perches, however, form the bulk of the perch population in Coos Bay. Both juveniles and adults occur up to RM 25 throughout the summer. The numbers of juvenile often exceeded 1,000 fish per seine haul in the lower bay with peak catches after mid-July from RM's 7 through 9. Other species of perch were scattered throughout the estuary; only shiner perch were found above RM 16 (Cummings and Schwartz 1971).

Green and white sturgeon both occur in Coos Bay. The green sturgeon appears to be the most abundant, and is found in the Coos River up to RM 25. White sturgeon have been found as far up as RM 10 (Cummings and Schwartz 1971). Both of these species prey upon Crangon, Macoma, Corophium, isopods, mysids, crabs, and fish (McConnaughey 1971).

Fish which inhabit the bottom of the navigation channel in Coos Bay are subject to entrainment by dredging activities. A total of four species or species groups of fish were found to be entrained by the hopper dredge YAQUINA in Coos Bay. The sampling took place between RM's 1+25 and 10+10 in the navigation channel. Pacific sand lance comprised 98 percent of all fish entrained by the dredge. Sand lance burrow into sandy substrates in an attempt to escape from predators or for rest, hence, they are very susceptible to entrainment. Other fish which were entrained by the dredge include juvenile

flatfish, staghorn sculpins, saddleback gunnels, and miscellaneous gunnels (Moehl and Barton 1989).

(e) Birds. There are a wide variety of habitats available for use by birds in and around the Coos Bay estuary. In the marine subsystem, the area between the jetties provides storm refuge for a variety of marine birds including auklets, murres, puffins, cormorants, and pigeon guillemots. The cliffs of Coos Head provide nesting habitat for pelagic cormorants, pigeon guillemots, cliff swallows, and belted kingfishers. Waterfowl which occur here include harlequin ducks, oldsquaws, goldeneyes, buffleheads, scaup, scoters, cormorants, loons, grebes, and mergansers. Shorebirds are abundant on the rock bedrock shore near Fossil Point. Common species here include black oystercatchers, wandering tattlers, rock sandpipers, and black turnstones. The largest concentration of spring migratory black brant in the state are found almost exclusively in the tidewater area between fossil point and pigeon point, and across the bay on the North Spit.

The lower bay subsystem is used intensively by a variety of birds. The intertidal and shallow subtidal flats between Pigeon Point and the bend in the bay (RM 8) provide a heavily used wintering area and migratory stopover for Pacific flyway waterfowl, as well as shorebirds. Pigeon Point and the areas across the bay along the North Spit are used heavily by waterfowl. These areas are unique in the lower bay, as they are shallow and not affected by the strong tidal flow typical of the rest of this system. The islands along the North Spit in this subsystem provide nesting habitat for gulls, Caspian terns and double-crested cormorants as well as roosting areas for brown pelicans and various shorebirds. The area to the west of the islands is relatively sheltered, providing a feeding and resting area for a variety of waterfowl, including higher concentrations of puddle ducks than are found in the lower bay. Jordan Cove, located between RM's 8 and 9, is a heavily used wintering area for shorebirds and waterfowl. The high concentrations of waterfowl and shorebirds in these areas reflect a rich local invertebrate and fish community.

The tideflats of upper Coos Bay support relatively large numbers of feeding puddle ducks throughout the year. Substantial numbers of puddle ducks are also found on the tide flats of lower Coos Bay and Pony Slough in the fall and winter. Wintering waterfowl which occur in high numbers, include American wigeon, northern pintails, gadwalls, green-winged teal, mallards, northern shovelers, canvasbacks, and red-heads (Coos County Task Force 1980). Diving and sea ducks are most abundant in the channels of South Slough and lower Coos Bay though they are also common in the Glasgow/Kentuck region of the upper bay. These birds feed over tide flats on epibenthic organisms during high tide. Numerous species of shorebirds occur in the upper bay including; whimbrels, willets, marbled godwits, dunlins, sanderlings, least sandpipers, and western sandpipers (Coos County Task Force 1980). Other common birds in the upper bay subsystem include double-crested cormorants, western grebes, great blue herons, and great egrets.

Gulls and crows are common throughout Coos Bay. These birds are attracted by the output from fish-processing plants in Charleston and Empire and are frequent scavengers over the intertidal and open water areas.

(f) Marine Mammals. Harbor seals are the only resident pinniped, and most common marine mammal in the Coos Bay estuary. Harbor seals frequently haul out in large numbers on the dredge built islands of the lower bay. California and Northern (Steller) sea lions also occur in the estuary. These species are most abundant in the summer near the Charleston boat basin where they feed on fish and fish parts from the local fish processing facility. Important prey items include fish, and to a lesser extent crabs.

California and northern sea lions, elephant seals, and harbor seals frequently haulout on the offshore rocks between Coos Head and Cape Arago. Despite efforts at reestablishment, sea otters have been extirpated from throughout the State of Oregon. In 1970 and 1971 a total of 93 sea otters were released at Port Orford. Following this reintroduction, otters were observed at Cape Arago near Coos Bay; however, as of 1980 no sea otters have been observed in Oregon (Kenyon 1982).

Harbor porpoises are the only resident cetaceans in Coos Bay. Killer whales, which are occasionally observed in the lower bay, are probably attracted by the availability of prey resources including harbor seals and fish. Gray whales do not typically enter the estuary though they do occur in migration offshore. Gray whales and northern sea lions are the only marine mammals found in Coos Bay which are protected under the Endangered Species Act.

3.4 Biological Resources: Ocean Disposal Sites.

a. Introduction. Three studies have been completed over four seasons since 1979 for site designation and placement of material dredged from Coos Bay. The initial studies were conducted by Oregon State University (OSU) with follow up confirmation studies conducted by NMFS (Hinton and Emmett, 1993). The area investigated is shown on figure 3.12. The physical, chemical, and biological characteristics of this area were described in the OSU reports by Hancock et al. (1981), Nelson et al. (1983), and Sollitt et al. (1984). In the first phase of the study, baseline data was established for the entire area off of Coos Bay, from near-shore to offshore (170 meters, approximately 560 feet). The most extensive data was taken to a depth of 46 meters, (150 feet) which includes the area encompassed by the rock site. In the second phase of the study, the benthic invertebrates of three sites (F, G, and H) were examined and compared in detail; five sampling stations were used at each site. In the final phase, Site H was examined in detail with respect to spatial, temporal, and physical changes in species composition, abundance, and variance.

This examination was followed by a benthic sampling begun in 1980 at Site H to monitor changes at the site resulting from disposal activities. Bathymetric, sediment quality, and benthic invertebrate data were collected to characterize the changes at the site following repeated disposal of fine-grained material from the Coos Bay channel maintenance dredging program.

The 1992 benthic and fisheries studies were conducted to further evaluate the effects of utilizing additional area beyond the existing Site F boundaries to accommodate coarse-grained material (new work and maintenance) from the

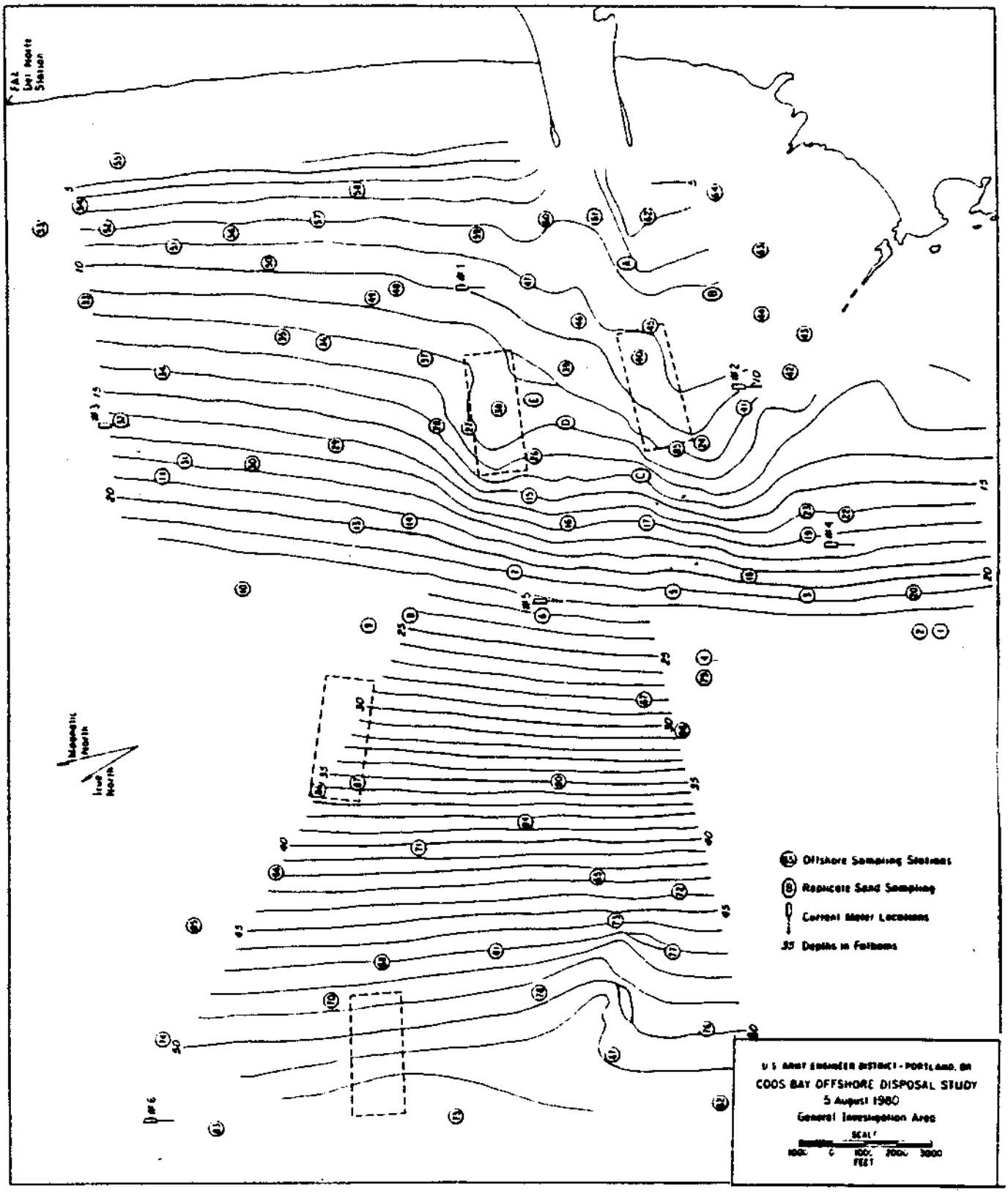


FIGURE 3.12 Coos Bay offshore study area, 1979-1983.

channel deepening. Samples were also taken within the near-shore active transport area (9 to 18 meters depth) to determine the potential effects of disposal at this location. Benthic invertebrate and fish samples were collected in both April and October at the stations shown in figure 3.13. Methodologies are described in Hinton and Emmett (1993).

The area being evaluated for disposal of coarse-grained sediments (figure 3.14) ranges from a depth of 8 meters to 46 meters and contains two benthic invertebrate communities. The inshore, high dispersive area (8 to 15 meters), is characterized by stations 1 through 4 in the 1992 study and partially by the Shallow North Channel Eye grouping of the 1979 study. It generally consists of species tolerant of a high energy wave environment that are adapted to continued disturbance. The 15- to 46-meter depth area is less dispersive and has a benthic invertebrate community typical of that described for Site F and vicinity. It generally has greater species diversity than the inshore area.

b. Benthic Invertebrates.

(1) Site F and Vicinity. The 1978 studies described the area in the vicinity of Site F as the most homogeneous in community structure of the sites investigated during the two studies. The uniformity was attributed to the consistent conditions at the site, the small depth change (22 to 36 meters, and the consistency of the coarse, well-sorted sand at the site (Hancock et al. 1980).

The most abundant polychaete encountered at Site F was Spiophanes bombyx, followed by Glycera tenuis, Ophelia sp., Notomastus lineatus, and Magelona sacculata, respectively (figure 3.15). Table 3.4 lists the most common polychaetes encountered at Site F. Spiophanes bombyx displayed large variations in density throughout the site which were not explicable with the data obtained in the study. A variety of additional polychaetes were also encountered at Site F.

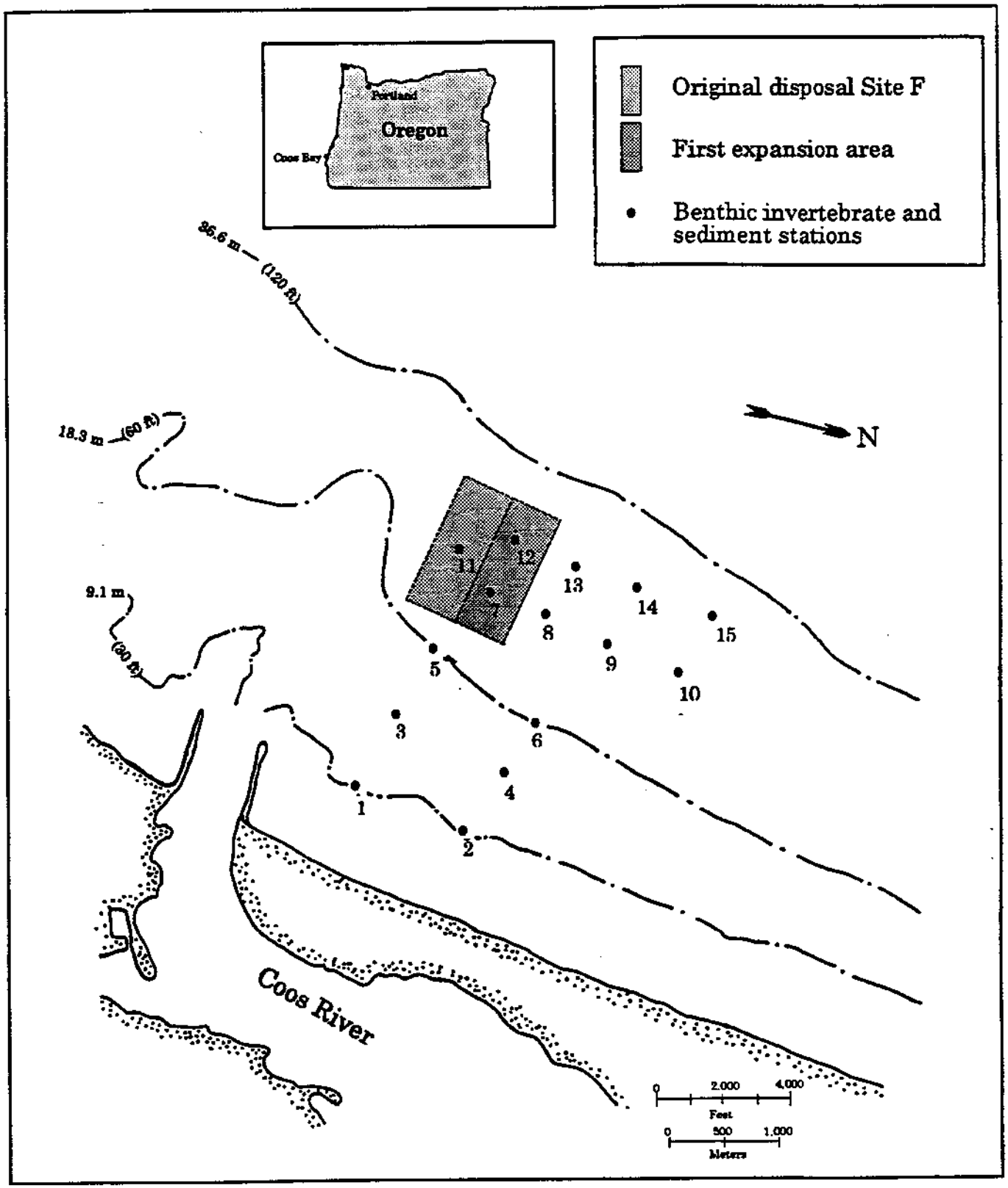


Figure 3.13. Locations of benthic invertebrate and sediment stations at and adjacent to offshore disposal Site F off Coos Bay, Oregon, April 1992.

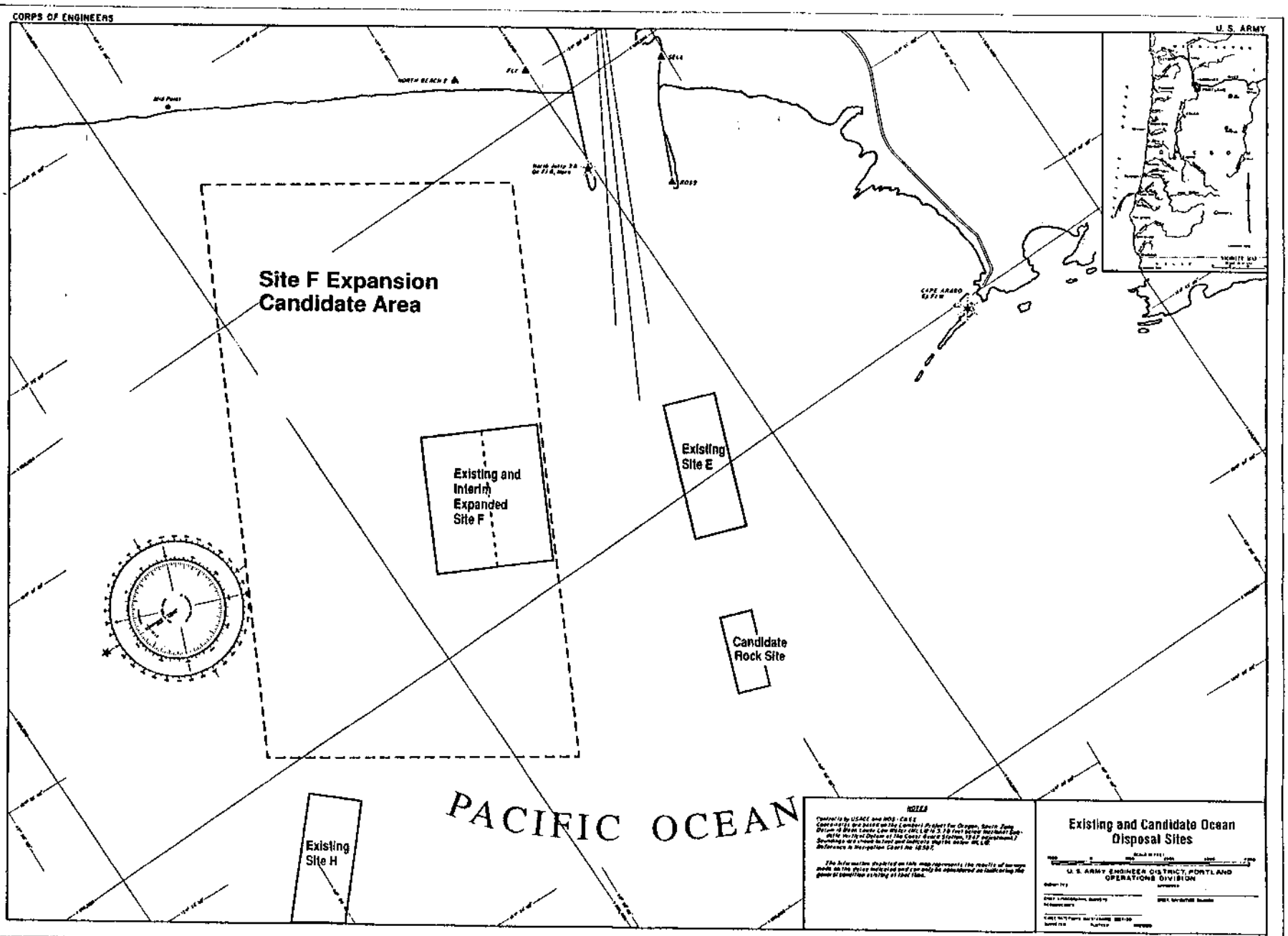

CORPS OF ENGINEERS
U. S. ARMY
Site F Expansion
Candidate Area
Existing and
Interim
Expanded
Site F
Existing
Site E
Candidate
Rock Site
Existing
Site H
PACIFIC OCEAN
CAPE ARAGO
NOTES
Existing and Candidate Ocean
Disposal Sites
U. S. ARMY ENGINEER DISTRICT, PORTLAND
OPERATIONS DIVISION

FIGURE 3.14

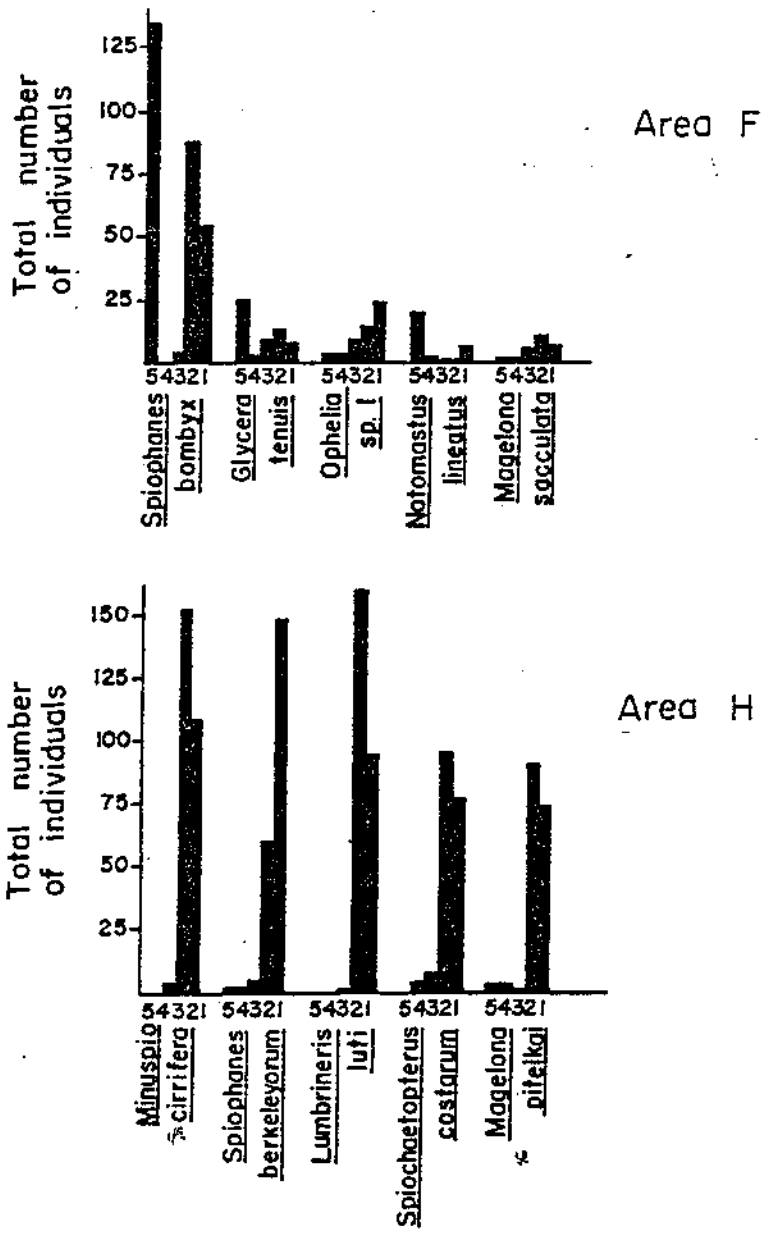


FIGURE 3.15 NUMBERS OF MOST ABUNDANT POLYCHAETES AT STATIONS WITHIN SITE F AND H, APRIL AND OCTOBER, 1979 (HANCOCK et al., 1981).

Table 3-4. Polychaete Species From Site F, Coos Bay, Oregon, 1980-81.

Spiophanes bombyx	Scoloplos armiger
Magelona sacculata	Thalanessa spinosa
Glycera tenuis	Notomastus 19ineatus
Chaetozone setosa	Onuphis iridescens
glycinde armiger	Paraonella platybranchia
Nephtys caecoides	Ophelia sp.
Haploscoloplos elongatus	Eteone sp.
Ceilonereis cyclurus	Nephtys caeca

The most abundant mollusks encountered at Site F included Olivella pycna, Olivella biplicata, and Tellina nuculoides (figure 3.16), which comprised over 95 percent of all mollusks encountered at the Site. None of these species were common at the other sites surveyed. Olivella biplicata was the only species which exhibited varied density within the site, occurring only in the three shallowest depths surveyed and with highest density occurring at the southeast corner of the disposal area. In general, mollusks demonstrated low numbers of species at Site F. This absence was probably due to the sandy, turbulent nature of the site.

The five amphipod species of greatest abundance included Foxiphalus major, Mandibulophoxus unicirostratus, Ampelisca macrocephala, and Hippomedon denticulatus (figure 3.17). Hippomedon denticulatus, Foxiphalus major, and Ampelisca macrocephala were low in numbers and exhibited uneven distribution.

Another benthic crustacean present at Site F was the cumacean Anchicolurus occidentalis. It was suggested by Nelson et al. (1980) that the low abundance and even distribution of some of the crustaceans would cause them to be sensitive to disposal activities at the site. This condition would be expected in that any large disturbance could conceivably wipe out a portion of the population. The uniformly low numbers over the site suggest that the area is not able to support a large population. Disturbances may not only adversely affect the population, but also cause a decrease in resources to support recolonization of the area.

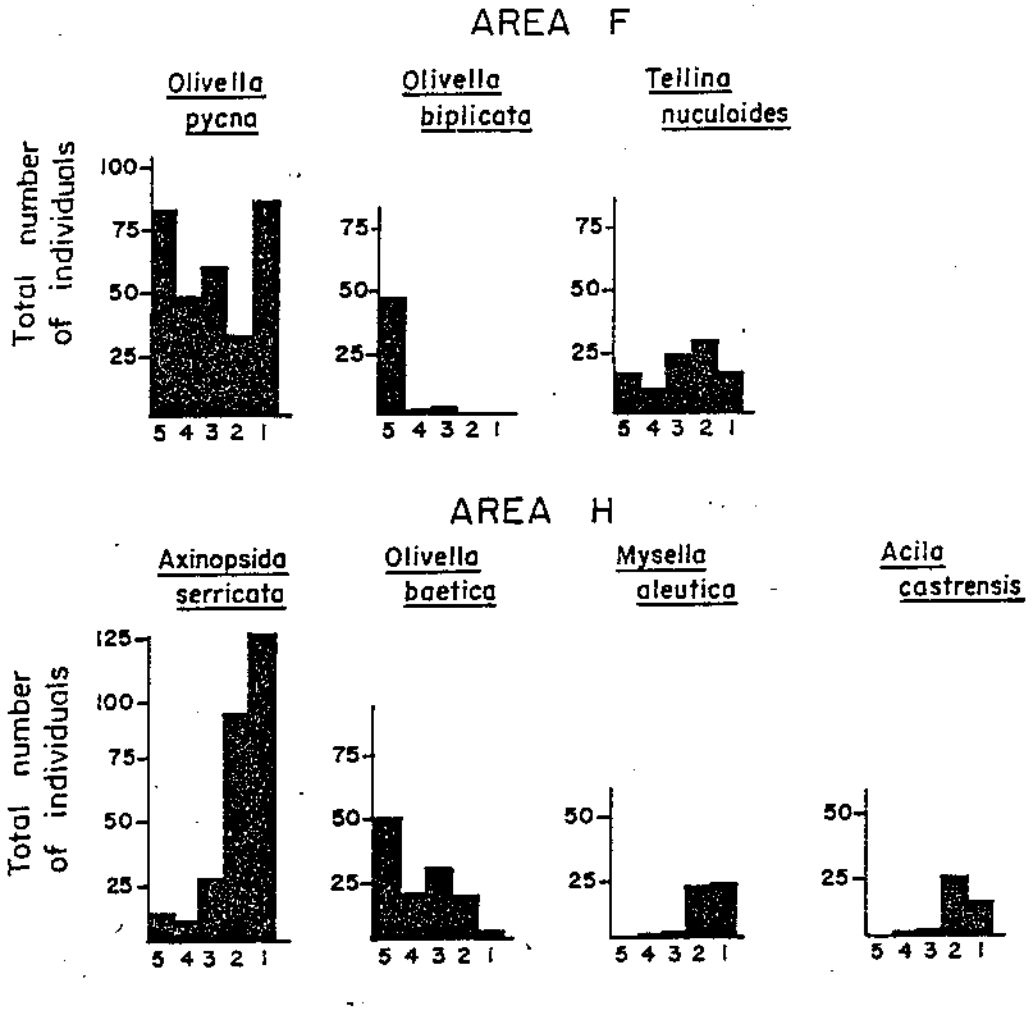


FIGURE 3-16 NUMBERS OF MOST ABUNDANT MOLLUSKS AT STATIONS WITHIN SITE F AND H, APRIL AND OCTOBER, 1979 (HANCOCK et al., 1981).

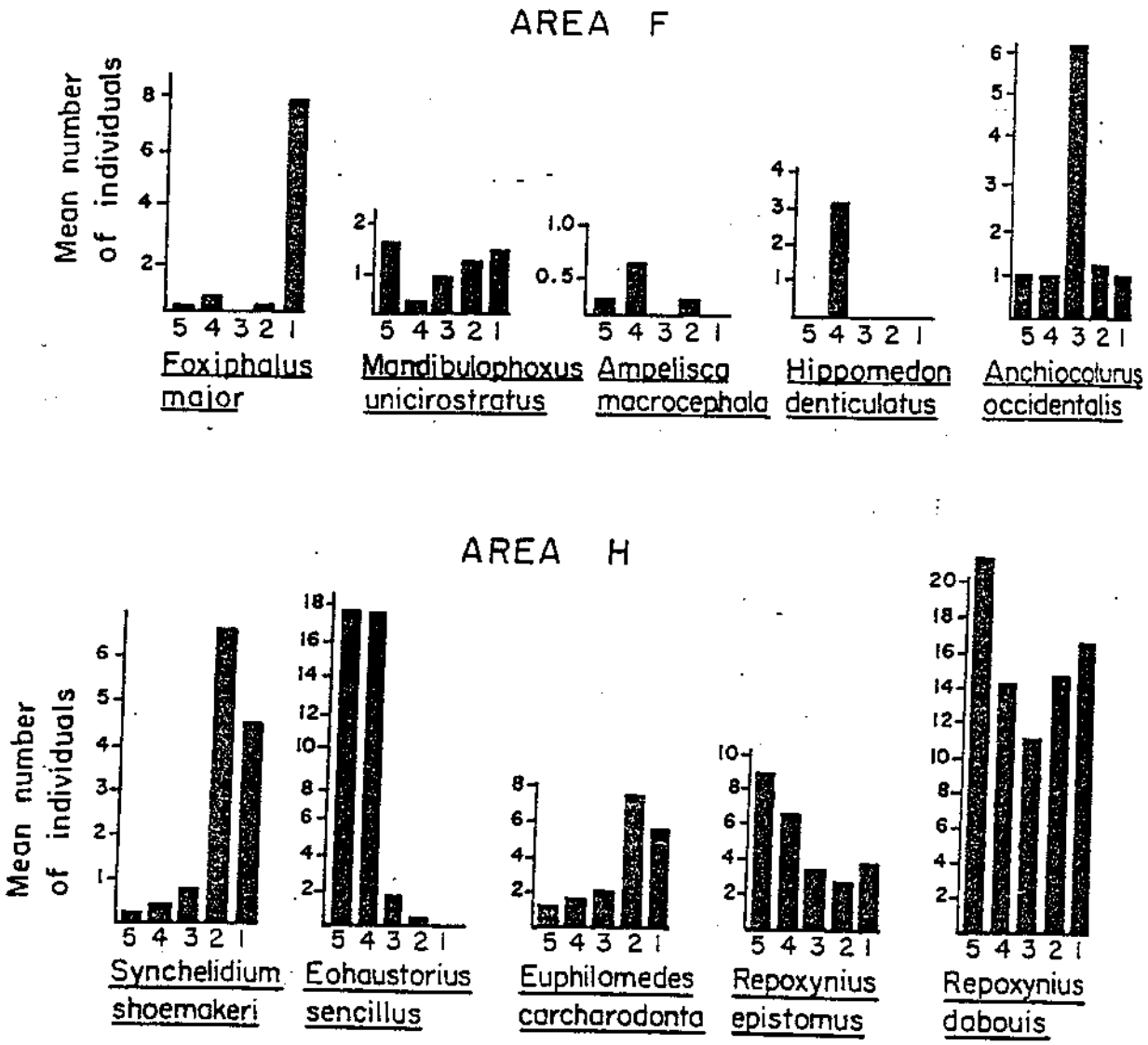


FIGURE 3-17 NUMBERS OF MOST ABUNDANT CRUSTACEANS AT STATIONS WITH SITE F AND H, APRIL AND OCTOBER, 1979 (HANCOCK et al., 1981).

The study concluded that the species richness and abundance was lower at the near-shore Site F than at the two sites surveyed further offshore. The homogeneity of the site was concluded to be due to the uniformity of the sediment in the site, the small variation in depth, and the turbulent environment of the area. It was determined that the effects of disposal would be short term and would be followed by rapid recruitment of benthic species due to: lack of evidence of disposal impacts, highly variable distribution of near-shore species, conformance of dominant benthic species to a high energy environment, and the primary source of recruitment being plankton (USEPA, 1984).

Results of the April 1992 sampling indicate that the area evaluated for proposed expansion of Site F is similar in species composition to that described by the 1979 studies. The data for the October 1992 sampling is expected to be available for the final EIS. The October data is likely to be similar to the 1979 results based on the results from the April sampling. In the 1979 and 1992 studies, *Magelona* spp. was the most abundant polychaete species and *Olivella pycna* was the most abundant mollusca species present in April. Both species are typical of benthic communities found in inshore high energy areas.

The inshore area identified as a high energy active transport zone had a similar benthic invertebrate community as the areas in the vicinity of Site F except for stations 1 and 2 where the species composition was slightly different. *Nephtys* spp. and an unidentified Nemertea were the dominant organisms present. Stations 5 and 6 also had much higher benthic invertebrate abundance than any of the other stations sampled (see figure 3.13). The reason for this is unknown, but the polychaete species *Magelona* spp. and *Spiophanes bombyx* were the species responsible for the large abundance and may represent a recent recruitment of juveniles to the area.

(2) Site H. Disposal Site H is a transition habitat, supporting species from both the high energy near-shore and the deeper offshore environments (USEPA, 1984). The sediments at Site H are intermediate between the finer sediments at offshore Site G and the coarser-grained sediments at

Site F (Sollitt et al., 1984). The greater diversity of habitat types allows for a greater diversity of organisms at Site H. Nelson et al. (1981) and Sollitt et al. (1984), determined that the species occurring at Site H were a combination of near-shore and offshore species found at Sites F and G, respectively. In general, the abundance and species richness were higher at Site H than for the vicinity of Site F, and species were found to vary greatly between time and stations within Site H (Nelson et al. 1981).

There were five numerically dominant polychaete species: Minuspio cirrifera, Spiophanes berkeleyorum, Lumbrinereis luti, Spiochaetopterus costarum, and Magelona pitelkai (see figure 3.15). Unlike Site F, 24 species accounted for significant variations between stations at Site H (Sollitt et al. , 1984). Of the most abundant species, Minuspio cirrifera and Magelona pitelkai varied significantly between stations at all cruises. In the later study (Sollitt et al., 1984), L. luti was also found to vary significantly between stations. These species were all highly mobile detritivores which prefer fine-grained sediments (Sollitt et al. , 1984). Numbers of most abundant crustaceans at stations with Site F and H, April and October, 1979 are shown on figure 3.17 (Hancock et al. , 1981).

Of the mollusks encountered, Olivella pycna and O. baetica were the most abundant (figure 3.16). They are carnivorous gastropods which seem to prefer the more shallow stations and were the only two species which varied significantly between stations (Nelson et al., 1984). Site H also supported a larger number of bivalve species than did Sites F or G, the majority of which were filter or surface feeders. Most of these were found at the deeper stations. The lower energy and more settled sediments would provide a less vulnerable habitat for feeding and respiration (Nelson et al., 1983; Sollitt et al., 1984). The diversity and abundance of mollusk species was much greater at Site H than that for the Site F vicinity. The differences were thought to possibly be due to finer-grained sediments and less wave disturbance..

Crustacean species did not vary greatly between the five sampling stations at Site H (USEPA, 1984), but were in greater abundance at Site H than Site F

(figure 3.17) (Nelson et al. , 1983). The crustaceans also showed a seasonal variation in abundance, reflecting strong seasonal variations normally occurring in the study area and along the Oregon Coast. Euphilomedese carcharodonta and Synchelidium shoemakeri were most abundant at the deeper stations while Eohaustorius sencillus was found at the more shallow stations. Repoxymius epistomus and R. dabouis were also abundant but were evenly distributed between the five stations (Nelson et al. , 1983).

The results of the monitoring study at Site H is described in detail in Jones and Siipola (1992). In general the short term impact of fine grained material disposal at Site H was minimal for some species and large for others. Polychaetes which are highly mobile, can dig out after a disposal event and not be greatly impacted. The molluscan species *Olivella baetica* and *O. pycna* are less able to recover immediately after a disposal event and were more heavily impacted. *O. baetica* is adapted to finer sediments and recovered to pre-disposal abundance, while *O. pycna* is more adapted to coarser sand sediments and did not fully recover to pre-disposal levels. Crustacea species were too high in natural variation to determine if there was an impact from disposal. Many of the species found in this area, however, are highly mobile and were probably not greatly effected.

After disposal events there was also an increase in abundance of estuarine species, presumably transported to the area from the dredge site. Most of these species are not adapted to high energy environments and did not survive at the disposal site.

Disposal activities seem to be one more perturbation that occurs to these organisms and though disposal is a fairly dramatic event most organisms seem adapted to being able to cope with this impact. The organisms most affected are the ones that are not adapted to the altered sediment type and they appear to not survive.

(3) Rock Disposal Site. The site currently being proposed for disposal of rock offshore at a depth of 46 to 60 meters is considered to be within the transition zone between the near-shore and offshore environments. The

transition zone is characterized as being intermediate between the low productivity of the near-shore area and the higher productivity of the offshore area.

An evaluation of the benthic species distribution indicated that the in-shore portion of the transition zone is less productive than the offshore portion of the zone. Benthic abundance is generally low except for a few species that are abundant throughout the zone such as some species of amphipods and shrimp.

c. Macroinvertebrates. Macroinvertebrates and fish were surveyed in October and April 1979 with follow up NMFS studies conducted in April and October 1992. The 1979 studies utilized twelve otter trawls consisting of a 7.3 meters semi-balloon type trawl net lined with 6 mm mesh liner were taken along depth contours in the near-shore area around the disposal sites (figure 3.18). Trawls T-01 through T-06 were taken in April 1979. Trawls T-07 through T-12 were taken in October 1979. The results were combined to characterize the macroinvertebrate and fish species of the area. No Dungeness crab were found in the vicinity of Site F and decapod zoea which would include megalops were in low numbers around the site as well (figure 3.19). Six crabs with an average length of 2 mm were caught by four 15-minute trawls in the vicinity of the proposed rock disposal site in April and October of 1979 (Hancock et al. 1981). Five Dungeness crab (Cancer magister) were found at Site H.

All were females less than 5.75 inches the legal harvest size for male Dungeness crab.

In the same sampling period, 1,008 shrimp of various species were also caught in four 15-minute trawls (described in paragraph 3.5c(1). In an area near the proposed rock site, 1,289 shrimp were caught in three 15-minute trawls (figure 3.20). Only small numbers of shrimp were caught in the offshore sites.

The low numbers of crab, shrimp, and adult fish were attributed to sampling bias due to the small sweep of the beam trawl and avoidance of the net by the more mobile organisms.

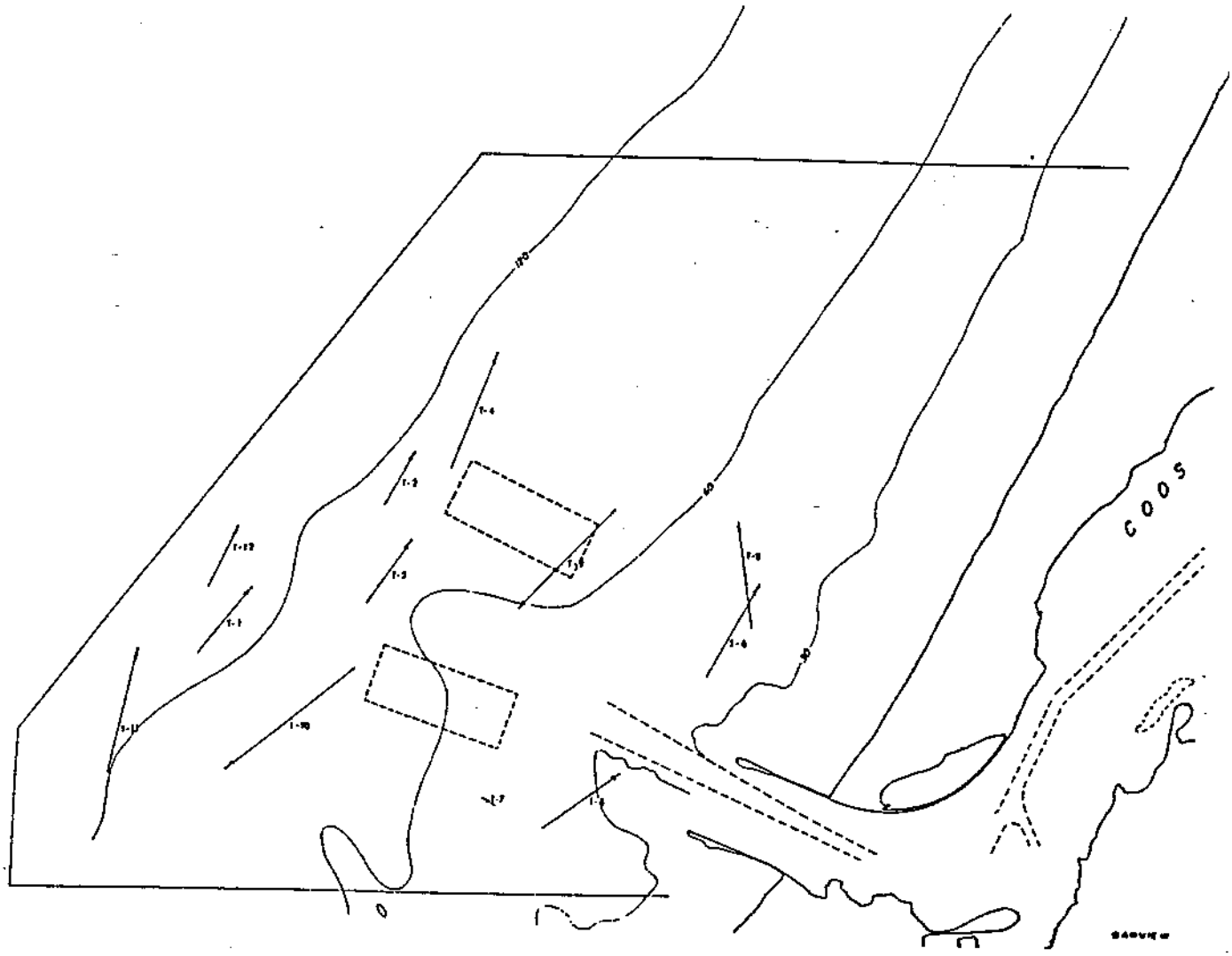


FIGURE 3-18 APRIL AND OCTOBER TRAWL TRANSECTS (HANCOCK et al., 1981).

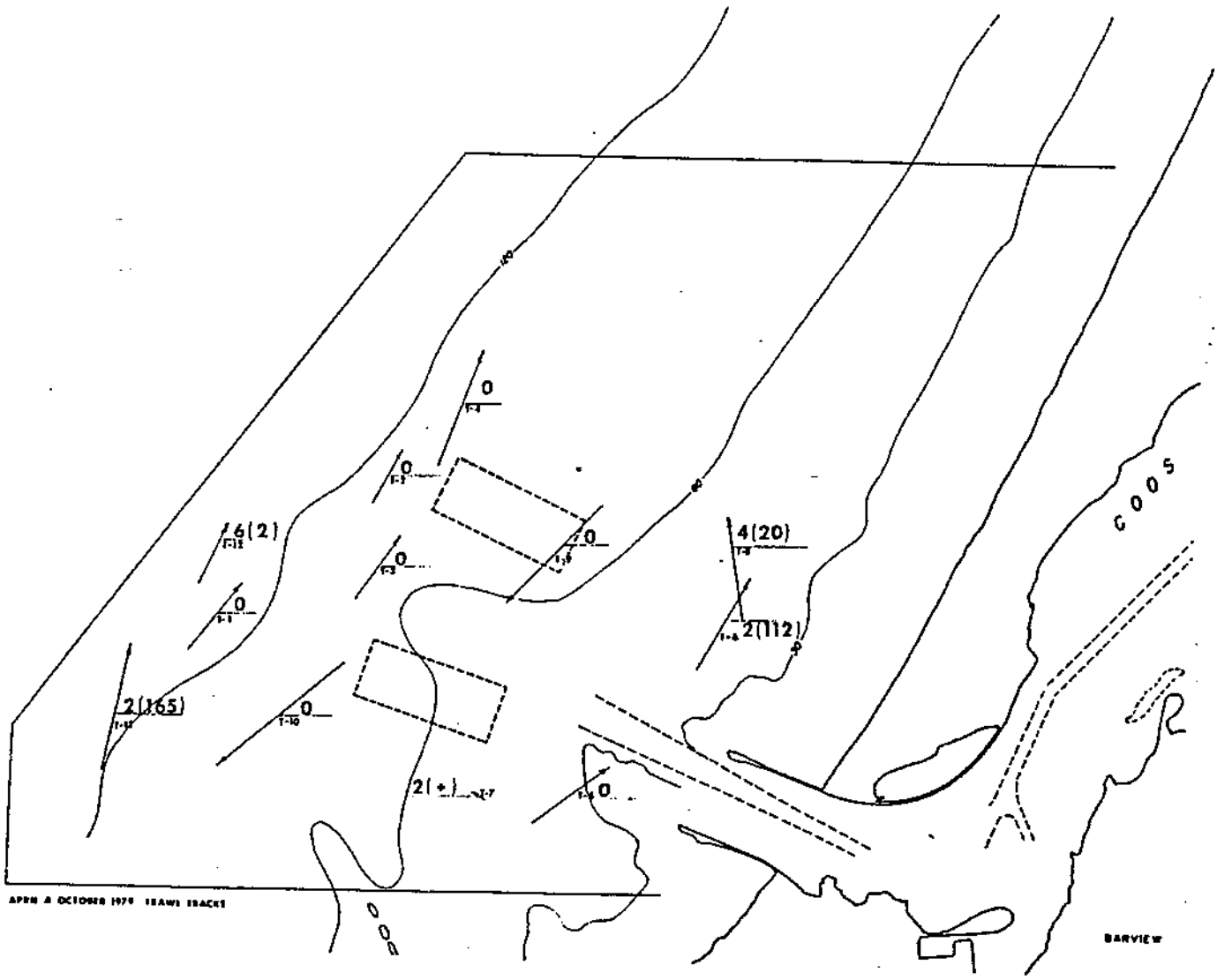


FIGURE 3-19 NUMBERS AND LENGTHS (IN PARENTHESES) OF DUNGENESS CRABS FOR EACH TRAWL TRANSECT, APRIL AND OCTOBER, 1979 (HANCOCK et al., 1981).

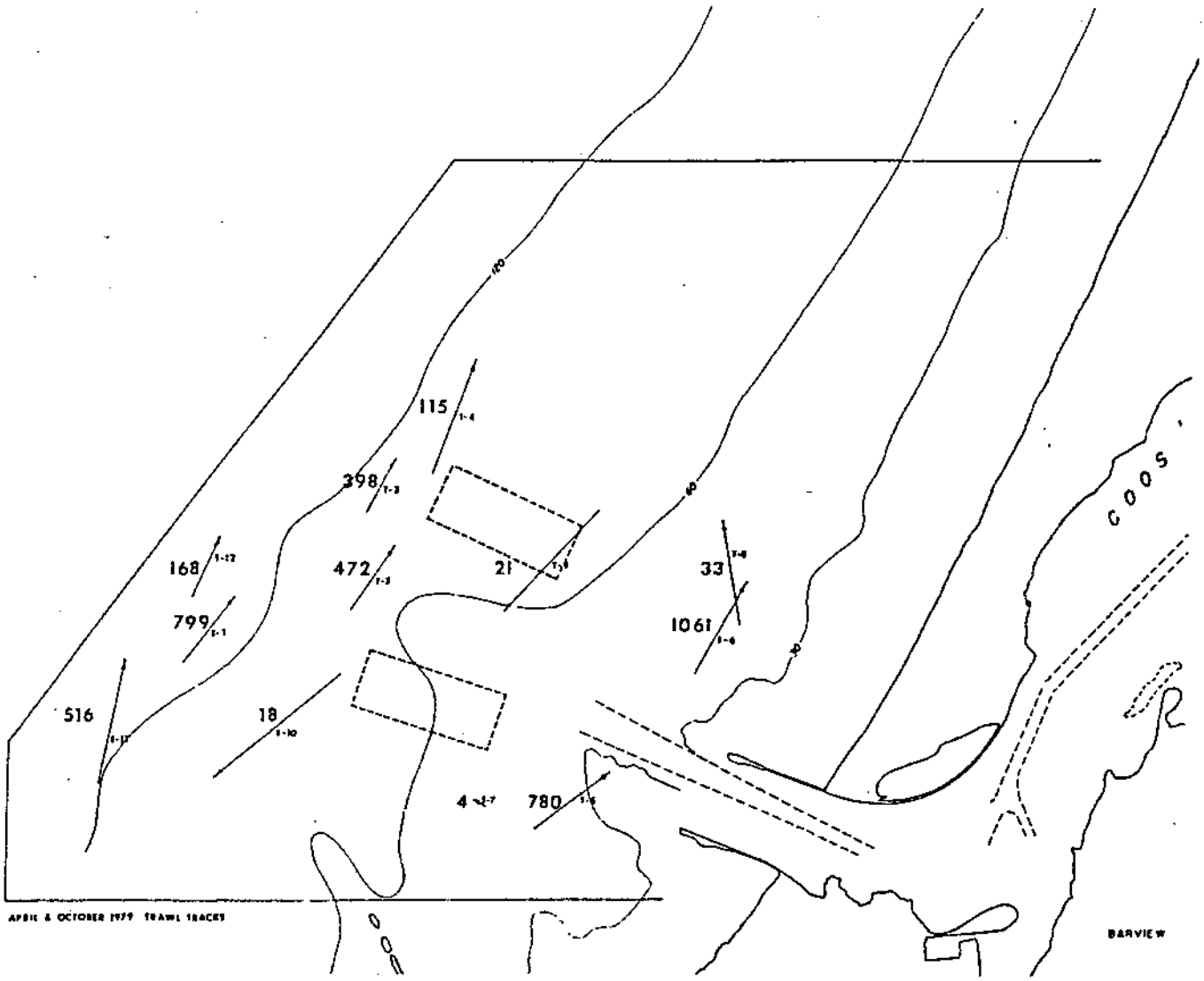


FIGURE 3-20 NUMBERS OF SHRIMP CAUGHT IN FIFTEEN MINUTE TRAWLS AT EACH TRANSECT, APRIL AND OCTOBER, 1979 (HANCOCK et al, 1981).

d. Fish. Trawl samples were taken from 1980-81 (Hancock et al. 1981). Cruise I examined the near-shore area for epibenthic organisms in the vicinity of the disposal sites (figure 3.18). Trawl A combines T-1 and T-2; trawl B combines T-3 and T-4; and trawl E combines T-9 and T-10. Trawls F, G, H, and I represent the offshore sites, comprised of the transects T-14 through T-17. In 1982 and 1983, Site H was resampled to determine long term recovery of the site. Demersal fishes at the disposal areas were not sampled as disposal should have little effect on these species other than temporary avoidance of the sediment plume during disposal operations.

The 1992 studies (April results) concluded that fish species and abundance were similar to the results of the 1979 studies. The dominate species in both studies was juvenile speckled sanddab (*Citharichthys stigmaeus*) and the whitebait smelt (*Allosmerus elongatus*) as well as the northern anchovy (*Engraulis mordax*) in the 1992 study. The area inshore of the 36 meters contour is an important rearing area for juvenile flatfish in the spring and sanddab constituted over 70 percent of the fish collected in the April sampling in 1992. In the October sampling in 1979 speckled sanddab though still one the more dominant species was much reduced in abundance, indicating that the juveniles had moved offshore after rearing. The other dominant species was the night smelt (*Spirinchus starksi*). Based on the similarity of the April samples it is expected that the October samples will also be similar between the two studies.

The most abundant fish species (table 3.5) in the vicinity of existing Site F were juvenile flatfish. A large proportion of the sanddab encountered during sampling were juveniles. Sanddab are of marginal commercial importance. More important commercially, although found in lower numbers around the disposal sites, were sand, butter, and English sole. All of these fish were found in much lower numbers than occurred at the offshore sites.

Abundance of fish species at Site H (table 3.6) was similar to those found near Site F. Speckled (Citharichthys stigmaeus) and Pacific (C. sordidus) sanddab were found during each of the four trawls at Site H but were much lower abundance in the Site F vicinity. Rex sole Glyptoceohalus zachirus)

Table 3.5. Most Abundant Demersal Fishes at Site F.

COMMON NAME	SPECIES
Speckled sanddab	Citharichthys sigmaeus
Pacific sanddab	Citharichthys sordidus
Butter sole	Isopsetta isolepis
Night smelt	Spirinchus starski
English sole	Parophrys vetulus
Pacific tomcod	Microgadus proximus

Table 3.6. Most Numerous Fish Species Caught in Trawls at Disposal Site H, May, August, and December 1980, and May 1981 (Sollitt et al., 1984).

COMMON NAME	SPECIES
Pacific sanddab	Citharichthys sordidus
Speckled sanddab	Citharichthys sigmaeus
Slender sole	Lyopsetta exilis
Slim sculpin	Radulinus asprellus
Rex sole	Glyptocephalus zachirus
English sole	Parophrys vetulus
Sand sole	Psettichthys melanostictus
Pacific tomcod	Microgadus proximus

occurred at Site H but not at Site F. However, English sole Parophrys vetulus) occurred in less than 75 percent of the samples obtained at Site H, but in over 75 percent of the samples in the vicinity of Site F (Sollitt et al. , 1984). The absence or low catches of some species in trawls was probably the result of avoidance of the trawl (Sollitt et al., 1984). Site H appeared to be intermediate in species composition between Site F and the deeper offshore areas, but closer in abundance and catch rate to Site F (Sollitt et al., 1984).

The proposed rock site supports low numbers of fish species, although Pacific and speckled sanddab are present. However they were much less abundant than populations occurring in near-shore areas (Hancock et al. 1981). There were also 43 juvenile rockfish (Scorpaenidae) caught in one 15-minute trawl transect during the April and October 1979 surveys (Hancock et al. 1981). Rockfish are fished commercially and recreationally in the area.

e. Wildlife. Published reports of birds occurring offshore of Coos Bay are lacking. Varoujean and Williams (1987) reported near-shore areas off Coos Bay to be among the areas supporting the highest concentrations of marbled murrelets along the Oregon coast. Although there are few formal reports of bird species present in the vicinity of the disposal sites, casual observations of birds were made by Corps biologists in the summer of 1989 while aboard the dredge Yaquina. The fact that the dredge was actively disposing of dredged material at the time may have influenced some observations as it appeared that some birds were actually attracted by disposal operations. Birds that were observed at the disposal site include cormorants, common murres, and gulls. Also observed further inshore, closer to the jetties, were pigeon guillemots, brown pelicans, and tufted puffins. These species would be expected to occur at Site F as well. Other birds which are expected to occur in the area include scoters, phalaropes, common loons, Western grebes, storm-petrels, auklets, and snowy plovers. An important wintering and breeding area for snowy plovers is located on North Spit, directly inland from Site F.

A number of marine mammals occur off Coos Bay within the vicinity of the disposal site. In early spring and late fall, gray whales migrate off the Oregon coast. Some gray whales also summer along the coast of Oregon, but the numbers which may occur in the Coos Bay area are not documented. California and Northern sea lions, elephant seals, and harbor seals have been sighted in Coos Bay and haul out on the North Spit beaches. California and Northern sea lions and harbor and elephant seals haul out on rocky areas south of the disposal sites, at Cape Arago. Harbor porpoises have been observed swimming in the wake of ships in Coos Bay and probably occur within the disposal areas.

f. Threatened And Endangered Species. Federally listed species, under the administration of the NMFS, which may occur in or near the offshore disposal sites include: gray, fin, humpback, blue, Sei, sperm and right whales, northern (Steller) sea lions, leatherback, loggerhead and green sea turtles, Snake River sockeye salmon, Snake River fall and spring/summer chinook salmon and Sacramento River winter-run chinook salmon. These species, with the exception of northern sea lions, are not expected to occur in the

Coos Bay estuary. They are normally present in offshore waters and occur in limited numbers on a seasonal basis. More detailed information on these listed species can be found in the biological assessments situated in exhibit 7. Biological assessments have been forwarded (December 1990) and letters of concurrence have been received from NMFS (January 1991) for all species except loggerhead and green sea turtles and Snake River sockeye salmon and Snake River fall and spring/summer chinook salmon. Biological assessments for these additional species have been prepared and forwarded to NMFS for concurrence. We are also forwarding the previously submitted biological assessments to NMFS for review and concurrence due to the length of time since they were prepared and their associated concurrence letters received.

Five Federally listed species administered by the U.S. Fish and Wildlife Service (USFWS) occur in the project area. Species present are the brown pelican, peregrine falcon, bald eagle, western snowy plover and the marbled murrelet. Snowy plovers occur on beaches and upland dredged material sites and Coos Bay North Spit. Brown pelicans forage within the bay and near shore waters. This species also uses the bay, headlands, beaches, islands, rocks, and jetties for loafing. They are present from mid to late spring into the fall. Peregrine falcons generally occur in the Coos Bay area during spring and fall migration; a few wintering birds may be present. Bald eagles have established nesting territories in the Coos Bay area, but their occurence in the lower bay is infrequent.

Biological assessments have been forwarded to the USFWS (May and June 1990) and concurrence letters received for all species (July 1991) except for marbled murrelets which were only recently listed. A biological assessment has been prepared for murrelets and forwarded to the USFWS. We are also forwarding the previously submitted biological assessments to NMFS for review and concurrence due to the length of time since they were prepared and their associated concurrence letters received.

3.5 Human Resources.

a. Introduction. Euro-American settlement initially occurred in Coos Bay largely because of its protected natural harbor and strategic location relative to timber stands along the southwest Oregon coast. The first recorded shipment of wood products from Coos Bay was by the Simpson Lumber Company in the early 1860's. Since that time waterborne transport and the wood products industries have been the primary elements contributing to the social and economic conditions of Coos Bay and surrounding region. Today, Coos Bay is one of the largest water-based exporters of forest products in the United States. This position has been achieved through extensive development of industrial processing and handling facilities around the bay, and through publicly and privately financed improvements to the harbor. The wood products industry relies on waterborne transport both for local log movement and for export trade. The progressive deepening of the Coos Bay navigation system over the years has permitted successful use of larger export vessels.

b. Local Economy. Forest products, tourism, and fishing dominate the Coos Bay area economy. Agriculture, ship repair, and light manufacturing also play an important role. Lumber and wood products, although declining in recent years, is by far the largest contributor to the Coos Bay area economy. The industry accounts for nearly two-thirds of the area's employment and payrolls. Commercial and recreational fishing account for the next largest share of the economy with 1988 commercial landings exceeding 30 million pounds. The majority of the commercial and recreational fishing fleet is located at Charleston. In addition to recreational fishing, the tourist industry is sustained by other excellent natural resources of the Coos Bay area including numerous rivers, streams, mountains, forests, and the 10,000-acre Oregon Dunes National Recreation Area. These areas have been enhanced by the addition of camping, picnicking, fishing, hiking, golfing, and boating facilities. These natural resources and facilities have yielded a modest tourist industry which is aided by Coos Bay's location on U.S. Highway 101.

c. Waterborne Transport. The Coos Bay estuary, in conjunction with port developments, harbor facilities, and improvements in inland waterways, has been primarily responsible for the area's ocean-borne transportation and the related land-side trucking and warehousing, a large share of commercial fishing and fish and seafood processing, and some share of tourism. The natural waterway permits efficient movement and storage of economically important locally-handled bulk commodities. A total of 333 deep-draft vessels called on port facilities in 1988. The port and related transportation facilities are in a position to ship large amounts of these commodities (primarily wood products) to world markets. Waterborne exports in 1989 totalled nearly 4.7 million tons. A new import expected to benefit the economy of the region is nickel ore. Projected ore quantities are 1.1 million short tons per year beginning in 1993. U.S. Forest Service analysis of the wood products industry concludes that the market for these products will remain at about current levels for the foreseeable future. Waterborne transport would likewise remain near current levels.

The major docks in Coos Bay are concentrated along the 3- to 4-mile eastern waterfront of Coos Bay/North Bend. In addition, a major wood chip dock is located at RM 7, and smaller docks are located on the north spit and at Empire. The dock facilities are primarily equipped to export wood products and secondarily are outfitted to receive petroleum imports. There are a total of 13 major docks from which ocean-going cargo in deep draft vessels is received and dispatched.

d. Population. The population of Coos County in 1988 was 58,800. The largest city in the county is Coos Bay (population 14,220) with 24.2 percent of the county's population based on 1988 figures, followed by North Bend with a population of 8,850. According to U. S. Census figures, the average growth rate of Coos County for the years 1970 to 1986 was .2 percent. Table 3.7 presents a comparison of population between Coos County and the State of Oregon for the years 1970 to 1988. The Bureau of Economic Analysis, U.S. Department of Commerce, projects that southwest Oregon will have a population growth rate of 1.15 percent from 1985 to 2030.

Table 3.7 Population 1970 to 1988.

YEAR	OREGON	COOS COUNTY
1970	2,091,400	56,515
1980	2,633,200	64,047
1981	2,660,700	63,300
1982	2,665,200	61,750
1983	2,635,000	61,450
1984	2,660,000	61,000
1985	2,675,800	60,150
1986	2,661,500	57,500
1987	2,690,000	57,500
1988	2,741,000	58,800

Source: U.S. Bureau of Census

e. Land Use. Land use patterns of the Coos Bay estuary are a mixture of high-and low density commercial and industrial development, residential development and open space. Most of the high density developments are located along the Coos Bay/North Bend waterfront to about RM 8, which includes the Coos Bay/North Bend airport. Other, less intensively developed commercial and industrial areas are located at Eastside, Jordan Cove, Empire, and Charleston. Land use patterns are not expected to change appreciably for the foreseeable future.

f. State and Local Land Use Plans. Coos Bay is identified in the Oregon estuary classification system as a deep-draft development estuary. As such, and as stipulated in Goal 16, Estuarine Resources, the Oregon Coastal Management Program (OCMP) recognizes that deep-draft port developments, navigation channels, and associated dredging and dredged material disposal are allowed and will continue. In addition, under Goal 19, Ocean Resources, the OCMP recognizes the need to "provide for suitable sites and practices for the open sea discharge of dredged materials 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 natural resources."

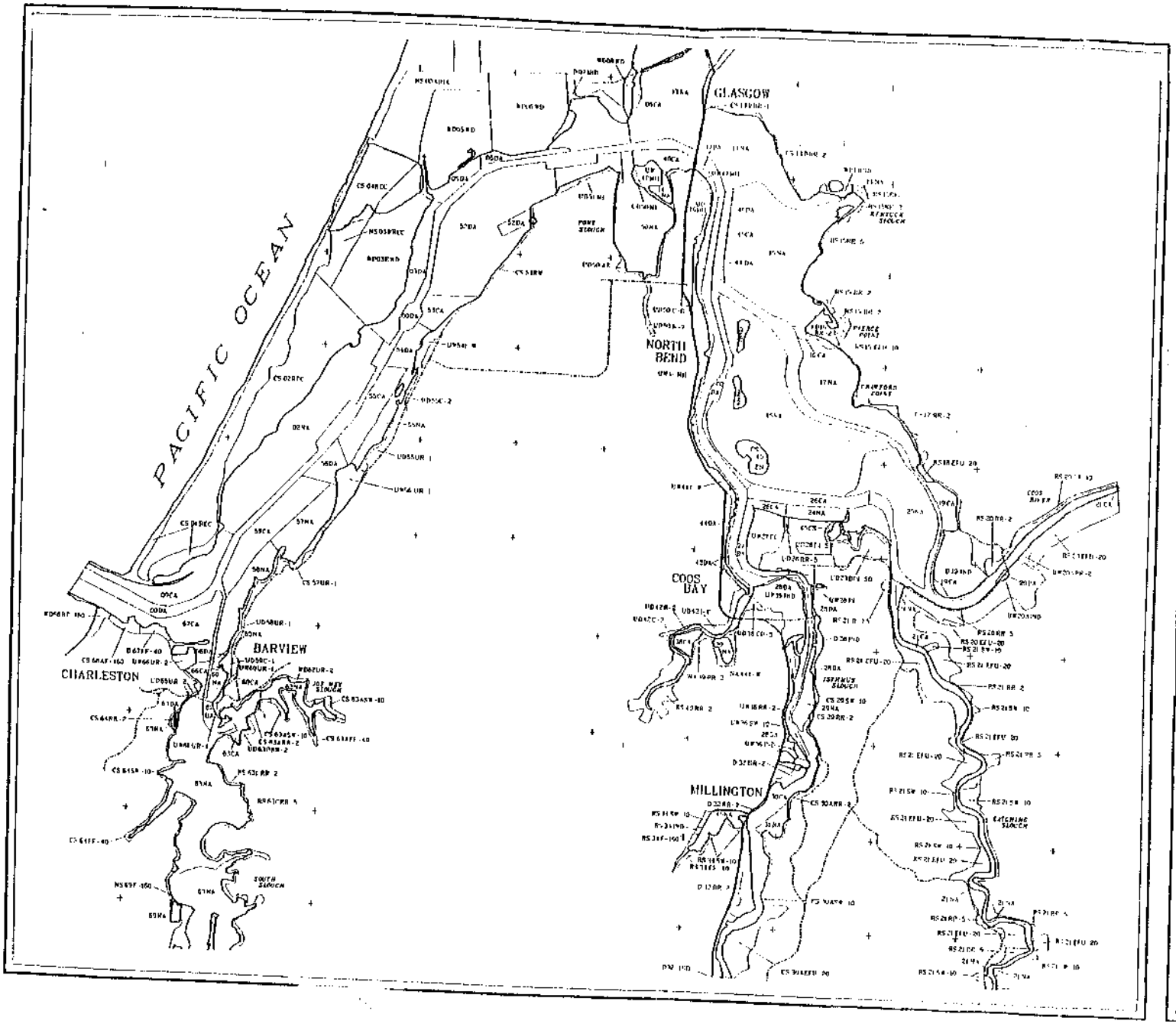
The Coos County Comprehensive Plan contains policies, standards and estuarine management plans which describe the local plan for maintaining deep-draft

navigation in Coos Bay. As mandated by the State of Oregon DLCD Goal No. 16, the Coos Bay Estuary Management Plan has designated management units for the shore-land and aquatic areas of Coos Bay. These management units are delineated in natural, conservation or development segments. The Coos Bay navigation channel, including the segment proposed for turning basin expansion near RM 12, is classified as a "Development Aquatic" segment.

Development Aquatic areas are managed for navigation and other water-dependent uses, consistent with the need to minimize damage to the estuarine system. Development Aquatic areas include areas suitable for deep or shallow draft navigation and in-water dredged material disposal sites. Figure 3.21 delineates all of the management segments for the estuary. Further discussion of local plan elements specific to proposed channel deepening are contained in the attached Coastal Zone Management Consistency Determination.

g. Aesthetics. The aesthetic character of Coos Bay is a mixture of the natural and the human in all aspects of sight, sound, smell, and character. Some areas of the upper bay are dominated by port and industrial development and attendant noise, congestion, diesel and wood product smells, and visual distraction. But this apparently negative aesthetic environment is somewhat relieved by the sights and sounds of seabirds, the natural backdrop of the east bay and the visual "interest" of port and industrial activities. Cargo ships and other vessels at dock or moving in the channel are also an integral part of this scene. Other areas, such as the lower bay, are dominated by natural amenities, particularly by views of the bay and the north spit. This part of the bay also contains the South Slough Sanctuary, a natural preserve where one can be totally absorbed in surroundings of water, forest and wildlife.

h. Cultural Resources. The Coos Bay estuary and region contain extensive evidence of prehistoric occupation. Although only two prehistoric sites have been formally documented, at least nine other sites have been reported along the shoreline of the North spit (from RM's 1 to 9). In addition, prehistoric sites have been identified on some of the low marshy mudflats and islands within the bay.



COOS BAY

ESTUARINE MANAGEMENT UNITS & SHORELAND ZONING

OREGON

SCALE

FIGURE 3.21

During the early settlement period, Coos Bay was a center of pioneer settlement and economic development. The main method of traveling and supplying the settlements and military posts of Coos Bay was by sailing and steam ships. In addition, as the port facilities expanded and the lumber industry grew, Coos Bay developed its own ship building trade along the upper end of Coos Bay. As vessel traffic increased within the bay, a few vessels ran aground and were lost, and, depending on their age, contents and state of preservation may be significant cultural resources.

A shipwreck list for the Coos Bay area resulted in the documentation of 114 shipwrecks. The majority of these wrecks occurred along the beaches and at the entrance to Coos Bay. Thirteen of these vessels wrecked within Coos Bay. Of these, nine vessels sank and were not salvaged and presumably are preserved within the sediments of the bay.

CHAPTER 4

ENVIRONMENTAL EFFECTS OF ALTERNATIVES

4.1 Physical Impacts: Coos Bay Estuary.

a. Predicting Future Changes. Predicting physical impacts on estuarine systems from dredging requires basic knowledge of the system based on historical data. Because of the importance of circulation and salinity changes, the Oregon Graduate Center was contracted to review the available historical data and assess the adequacy of that data to estimate changes in salinity due to channel deepening (appendix E). The expected impacts on the Coos Bay estuary involve decreases in water quality, and slight salinity and sedimentation changes. All of these changes are related to changes in estuarine circulation. Many of these changes were discussed at a workshop in July 1989 at the Oregon Institute of Marine Biology in Charleston, Oregon. The proceedings of this workshop are in appendix H.

The Oregon Graduate Center found seven sets of data from 1932 to present. Of these only four sets were readily available and only three sets were evaluated due to time and funding limitations. Rainfall and related river flow data and tidal data were also evaluated. These data were related to the timing of the data collection for comparability of data. The focus was on data related to salinity, but this focus would also apply to water quality and sedimentation. In 1930-32 water quality and currents were measured at 11 stations every two weeks. Tides, currents and water quality were measured at various stations for selected periods in 1973 and 1974.

Currents and water quality were measured at 11 stations during September and October 1982. Although this data is available, further analysis would require fairly extensive effort. Table 4.1 shows the relationship between some of the available data and past channel changes in Coos Bay.

Table 4.1. Relationship Between Available Data and Past Channel Changes.

DATE	ACTIVITY/REFERENCE
1930-32	Queen and Burt, 1955
1937	Navigation channel dredged to 24 feet deep
1951	Navigation channel dredged to 30 feet
1952	Entrance channel dredged to 40 feet
1956	Charleston channel dredged to 10 feet
1956-58	Burt and McAllister, 1958
1960-63	McAllister and Blanton, 1963
1966	Coos and Millicoma River channels to 5 feet
1970	Charleston channel extended up South Slough
1973-74	Arneson, 1975
1976	Butler, 1978
1979	Navigation channel dredged to 35 feet Entrance channel dredged to 45 feet
1982	NOAA data, unpublished

b. Circulation Changes. The only major circulation factor which will be affected by a deeper channel is tidal propagation. Tidal range predictions are based on data taken over 40 years ago. Arneson (1976) found that measured tidal ranges at the channel entrance were consistently greater than predicted ranges though the error was usually less than 15 percent. This data meant that high tides were higher and low tides, lower. The same results were found further upstream at the city of Coos Bay. Arneson hypothesized that extensive disposal islands and fills which have reduced the surface area of the bay since the original calculations were made, are the cause of the greater tidal ranges. Although the channel has been deepened, which might be expected to offset the effect of the fills, Arneson theorized that this has produced a more hydraulically efficient cross-section, so that there is less drag or dampening exerted on the tidal wave as it sweeps through the bay.

The rate of progress of the tidal wave means that the high and low tides occur progressively later the further from the mouth. Arneson also compared his measurements of timing of high and low tides to those predicted by the National Ocean Survey. At the mouth, actual tides were generally a little earlier than predicted but within 20 minutes of predicted times 80 percent of the time; however, tides were considerably earlier than predicted at the city of Coos Bay, with only 25 percent falling within 20 minutes. The official

predicted time of high tide is 1 1\2 hours later at downtown Coos Bay than at the mouth.

Arneson again suggests that channel deepening may be responsible for this change, as shallow wave theory predicts that tidal waves move more rapidly at increased depth due to decreased frictional drag. One significance of the discrepancy between measured and predicted tidal ranges and timing means that ships, relying on high tide for sufficient clearance, may have to allow a wider margin of error when using the official tidal charts. During the Charleston workshop the effects of a deeper channel on tidal propagation were discussed and were similar to Arneson's predictions. Since Arneson's measurements, the channel has been further dredged to its present 35-foot depth, but the effects of this work on tidal propagation have not been assessed. Other potential physical effects of changes in tidal propagation include changes in tidal fluctuations over intertidal areas, changes in intertidal areas further upstream, increased salinity intrusion, increased sediment flocculation upstream, some increase in upstream bottom currents and concurrent sediment influx from the ocean, and overall increase in tidal prism volume.

c. Salinity. The salinity analysis for the proposed channel deepening is based on a survey of existing information (appendix E), a technical workshop, and results of the one dimensional computer model SALPLOT. This computer model was developed by the U.S. Army Waterways Experiment Station (appendix H) for determining salinity concentration profiles and lengths of intrusion within an estuary. SALPLOT was selected as being able to satisfactorily predict salinity shifts due to the proposed action. This determination was made based on the fact that Coos Bay is a well mixed system with low contributions of freshwater discharge and exhibits high tidal variation. Examining the observed salinity data shows that the salinity at Coos Bay is a high variable dependent upon tidal condition and seasonality. SALPLOT parameters include cross sectional area at the entrance, depth of the navigation channel, fresh water discharge, in addition to tidal velocity, range, and period as well as observed salinity values.

The SALPLOT computer model makes two basic assumptions: (1) the stream velocity and salinity distributions are assumed constant over each cross-section and vary only along the length of the estuary; and (2) the geometric cross section is constant over the length of the estuary. For this study, the computer model for existing conditions is based on salinity measurements (taken at bottom, mid-depth, and surface for both low and high tidal cycles) that were developed by Arneson in 1973 and 1974 prior to the most recent 5-foot channel deepening effort in 1978. The existing conditions model was then adjusted and updated to predict salinity conditions following the 1978 channel deepening. For verification purposes, the updated existing conditions model was then compared to the Oregon Division of State Lands average salinity measurements taken in 1983, and the new existing conditions model generally agreed with those measurements.

Because the SALPLOT computer program has some limitations previously discussed including the assumption of only one cross section at the entrance and one average depth, overestimated salinity values upstream River Mile (RM) 13+40 were reported for the proposed deepening. This overestimated salinity value is a result of model input not considering the shift in channel thalweg geometry for the proposed navigation channel at -34 feet mean low lower water (m.l.l.w.) to the authorized project upstream on the Coos and Millicoma Rivers at -5 feet m.l.l.w.. Figure 4.1 graphically illustrate this major shift in channel thalweg geometry at RM 13+40.

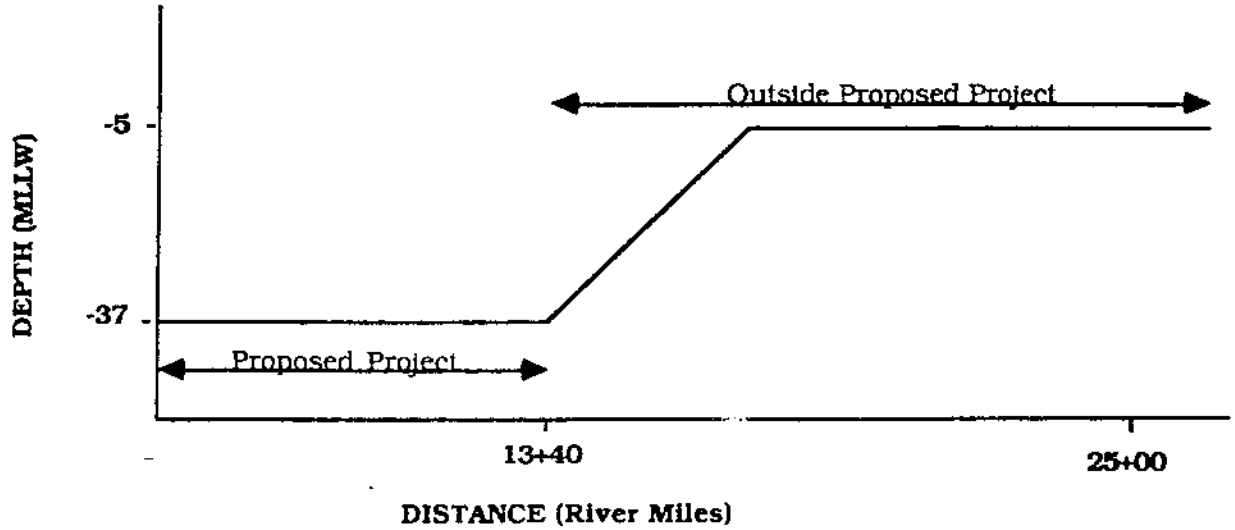


FIGURE 4-1. COOS RIVER PROFILE

To correct for this shift, the existing conditions model was run in a two-step iteration process to obtain salinity values upstream RM 13+40 for both existing and proposed channel conditions. First, the computer model was run for existing high and low flow conditions between the ocean entrance and RM 13+10. The model was then able to estimate the salinity at RM 13+40. This estimated salinity value was used as an input parameter for a second computer model run from RM 13+40 upstream to RM 25+00 on the Coos and Millicoma Rivers using the authorized channel dimensions. The second model for the upstream reach was able to project salinity measurements upstream to RM 25+00 and beyond for both low and high tidal conditions.

Table 4.2 displays the results of the computer run for the stations used by Arneson. The location of the stations as well as the observed salinity values for the low and high tide conditions for September 1973 are also displayed.

Table 4.2. SALPLOT Salinity Modeling Results.

Arneson September 1973 Data

RIVER MILE	LOW TIDE	HIGH TIDE
0.43	33.3	33.5
2.48	32.9	33.5
5.70	32.7	33.5
8.13	32.0	33.5
10.06	31.7	----
11.07	31.5	33.2
13.10	30.8	32.5
15.00	-----	
16.28	25.4	30.5
17.17	21.7	30.4

SALPLOT Prediction

STATION	RM	2-FOOT DEEPENING	5-FOOT DEEPENING	2-FOOT DEEPENING	5-FOOT DEEPENING
Existing Condition (1973)	13+40	30.68	30.78	32.70	32.81
Proposed Condition (1995)	13+40	30.75	30.80	32.75	32.78
Existing Condition (1973)	25+00	0.40	0.41	27.11	29.34
Proposed Condition (1995)	25+00	0.41	0.42	27.13	29.34

The model calculated the salinity value at the confluence of the Coos River (RM 13.76) at high and low tide for the 1973 and 1995 condition. This resulted in a change from 30.68 to 30.75 ppt in the low tide condition and 30.70 to 32.75 ppt for the high tide condition. The salinity prediction 25 miles up the Coos River showed an increase from .40 to .41 for the low tide condition and 27.11 to 27.13 for the high tide condition.

Results of this two-step computer iteration process show only slight increases in salinity conditions (less than 0.1 parts per thousand or PPT) for both the main estuary downstream of RM 13+40, and the riverine portion of the estuary upstream of RM 13+40. Comparison of existing and future conditions model results upstream of RM 25 shows very little if any detectable shift in salinity. Based on the accuracy of the model these two values should be interpreted as no change in salinity.

d. Water Quality. The water quality impacts from dredging are addressed in the Channel Maintenance Dredging EIS (COE, 1975). One of the impacts is a temporary increase in turbidity during dredging operations. Below RM 12 the bottom material is clean sand and produces only slight turbidity effects; however, extremely high turbidity were recorded in the upper bay during dredging operations. Turbidity levels as high as 500 Jackson Turbidity Units (JTU) were recorded.

Such levels are within the range shown to be harmful to benthic species and fish; however, the effects are temporary and return to acceptable values within minutes. Dredging in the upper bay can also bring about a temporary reduction in dissolved oxygen (DO) levels. The causal mechanism is the re-suspension of silty organic material in the channel sediments. This re-suspension may cause DO levels to fall below the minimum necessary to sustain life in some benthic species and fish for short periods.

e. Sedimentation And Sediment Transport. The 1976 EIS recognized that sedimentation was poorly understood in Coos Bay. Accordingly, a recommendation was made to monitor sediment transport and hydraulics as well as develop a numerical hydraulic model for Coos Bay. The 1976 EIS conceptual

model of Coos Bay sedimentation describes accumulation of finer, river-borne sediments upstream of RM 12 and intrusion of marine sands to about RM 2. There is no net input of sediment between RM's 2 and 12; instead, hydraulic forces redistribute available sediment causing recurrent shoals in the navigation channel or changes in the natural channels, which, based upon experience in the Columbia estuary, is likely.

Additional channel deepening could lead to mobilization of sideslopes in areas presently stable and new shoals at those locations. A deeper channel will convey more riverflow and slightly lower current velocities in shallow areas of the estuary, which could lead to increased deposition of fine grained sediments, especially above RM 12.

Deepening of the authorized channel will directly lower that portion of the estuary. There will also be some redistribution or readjustment of channel side slope material outside the channel. These effects have been shown to be important in the Columbia River. The distance of this effect from the channel as related to the angle of the sideslope and the depth of the proposed channel. These effects usually occur during the first few years following dredging. Another effect could be recurring shoals at fixed locations which are continually fed by sideslope material which will contribute to some increase in long-term dredging, but dredging volumes before and after the last channel deepening in 1979 did not show a clear increase. There could be some increase in marine sediment intrusion, but would be less significant because of the magnitude of existing dredging.

f. Sediment Quality. Based on sediment testing throughout the channel in Coos Bay, there should be no sediment quality problem from dredged material during initial construction. The coarser sand sediments below RM 12 should cause minimal turbidity during dredging, quickly settling out and allowing water quality to return to ambient conditions. The finer sediments above RM 12 contain more organic material.

Turbidity impacts during dredging will be more severe above RM 12, but will not differ from those experienced during routine maintenance dredging.

Because of the hydrophobic nature and low concentrations of the contaminants present in the sediments, water quality standards should not be exceeded because of the dredging activities. In addition, dredging, disposal, and subsequent dispersal of the dredged material at the ocean dredged material disposal site would reduce the concentrations still further. Fine-grained material from the Federal Navigation Channel including the present turning basin at RM 12.0 has been deposited at ODMDS H since 1985. Based upon extensive evaluation of the sediment and the benthic community at ODMDS H, no unacceptable adverse environmental impacts are anticipated by the proposed widening of the turning basin due to sediment contamination.

Sediment quality evaluations from outside of the project area, but directly related to the project have been conducted by the Port of Coos Bay and various dock owners. Test results showed the existence of higher contamination levels in sediments located from RM's 12 to 14 outside, but adjacent to the Federal Navigation Channel limits. The bulk of the material for those particular docks tested was determined to be suitable for ocean disposal without management restrictions.

4.2 Physical Impacts: Ocean Disposal Sites.

a. Introduction. There are three ocean disposal sites being considered for the three types of material to be excavated during the proposed channel deepening. Sand size material from the mouth to RM 12 will go to expanded Site F. Finer material upstream of RM 12 will go to existing Site H. Rock material from below RM 5 will go to a new rock disposal site (see figure 3.4). Sites E, F, and H have been previously evaluated and most of the following information is from that work. There are specific and general criteria required to be evaluated for ocean disposal site evaluation. Those pertaining to the physical environment include site geography, size and location, sediment transport, water quality, and monitoring.

b. Location, Size, and Geography. Site H is the furthest offshore and would have the least conflict with navigation or competing uses of the ocean. There would also be no potential for impacts on adjacent recreational beaches.

Site H was selected as the optimum location for an Ocean Dredged Material Disposal Site (ODMDS) for fine sediments, and monitoring studies have been conducted to monitor the effect of ocean disposal of the fine-grained material.

As of July 1988, over 1.2 million y^3 of material has been disposed of at Site H. The first disposal action was carried out as a limited test dump in 1981 in conjunction with the U.S. Army Corps of Engineers-OSU study of Coos Bay offshore disposal sites. Routine disposal began in 1985. The disposal action in November 1987 was the largest to date (658,065 y^3). During September and October 1989, 400,000 y^3 of dredged material were deposited on Site H. Site H is located about 3.08 nautical miles northwest of the entrance to Coos Bay, Oregon. The site is 442 meters wide and 1,097 meters long with the long axis parallel to the slope. The site depth runs from 172.8 feet (54 meters) to 245.4 feet (76.7 meters). The bottom sediments at site H were shown to be uniformly fine sand (about 0.18 millimeters in size). The percentage of fines in the disposal site varies between 0.7 and 66 percent. The volatile solids range from 0.32 to 9.9 percent.

Site F has been expanded (doubled) to reduce potential navigation impacts resulting from mounding at the site. The site expansion has been to the north to reduce potential sediment transport back into the entrance channel. The proposed further expansion of Site F would potentially cover an area 4,450 by 2,450 meters. The center of this expanded site location is about 2.5 nautical miles northwest from the entrance. Site depths range from 8 to 47 meters.

The proposed rock site was located as near to existing rocky bottom as possible and still minimize navigation and biological hazards. It is in a depth of water which will prevent or minimize any impacts on adjacent beaches. The site size will accommodate the proposed disposal volumes with an evenly distributed mound under 1 meter in depth.

c. Sediment Transport. The disposal of fine grained material at Site H need not be modified from present practices as bathymeteric records indicate no persistent mounding. Movement has been to the north and downslope. No

unacceptable adverse environmental impacts have been documented at Site H after extensive biological monitoring. Rock material placed in the "designated rock disposal site" should be immobile under all but the most severe storm conditions. Continued mounding at Site F may pose a navigational hazard, site modification for the long-term disposal of coarse-grained material will be necessary. The following discussion evaluates the likely sediment transport effects for coarse-grained material disposed within the area identified for potential long-term maintenance. See figures 2.3 or 3.14.

Coarse-grained sediments placed in a near-shore site, between 8 and 17 meters deep, will experience strong onshore and longshore transport during most of the year which will tend to disperse the dredged material. Dredged material placed at depths greater than 47 meters based upon Hancock, et al (1981) will be little influenced by waves and currents strong enough to cause significant movement. This would be a non-dispersive area. The area between 47 meters and 15 meters would be progressively influenced by waves and current sufficiently strong enough to cause movement with decreasing depth.

A test nearshore disposal of 836,000 y^3 of sand in 1988, and 585,000 y^3 of sand in 1989 was conducted by the USACE, San Francisco District at a site south of Humboldt Bay, California. The dredged material placed in a 4,500- by 1,100-foot nearshore site (between -15 and -18 meters m.l.l.w.) appeared to migrate shoreward, and in part, disperse. Of the 585,000 y^3 of material placed in 1989, one half had moved towards shore out of the disposal area by June 1990. By March 1991 only one fourth of the original 585,000 y^3 of dredged material remained in the disposal area (Hands 1993). Similar results would be expected for nearshore disposal at Coos Bay though dispersion rates would be greater if material is placed in shallower water.

Scheffner (1991) numerically modeled short-term and long-term fate of both fine-grained and coarse-grained dredged material at a disposal site off the entrance to Humboldt Bay. The disposal site, approximately 3 nautical miles northwest of the bay entrance, is located in 49 to 55 meters of water. Short-term numerical simulations of a single 2,500 y^3 disposal event showed that the coarse-grained material descended rapidly to the ocean floor, leaving no

material in suspension. The maximum thickness of deposition was approximately 0.23 feet, covering an approximate 400- to 500-foot diameter area. This condition is similar to results calculated for Coos Bay sediments using an earlier version of the numeric model (Sollitt 1984). Long-term simulation indicated the coarse-grained material to be non-dispersive with normal wave and tidal/circulation currents. Storm events however initiated some movement. The simulation of a moderate storm event with an 8-day duration showed the centroid of the coarse-grained mound to migrate approximately 3.0 feet. The report concluded that a disposal site at those depths was non-dispersive for coarse-grained material.

The present Site F located between El. -20 and -26 meters m.l.l.w. as a calculated maximum transport rate based upon one directional flow and effective transport width equal to disposal Site F boundaries (1,097 by 427 meters) of approximately 100 to 1,000 cubic yards per day (Beeman 1990). Wave induced bedload movement would only occur at these depths for the months of November, December, January, and February. Further, the calculated transport rates are optimistic maximum values based on shear stress theory and continuous one directional flow. Actual near bed velocities are not sustained nor one directional. Transport rates based upon bathymetric surveys and dredged quantities indicates an average of 165,000 y^3 per year were transported away from the mound over a ten year time period (June 1979 to August 1988). Beeman (1990) gave the average annual disposal rates for this time period at Site F as 600,000 y^3. Based upon dredging records from 1986 to 1992 an average 983,898 y^3 of dredged material has been placed at Sites E and F annually. Yearly quantities have ranged from a low of 617,649 y^3 in 1989 to a high of 1,247,693 y^3 in 1991.

The Beeman (1990) study concluded that 71 percent of the material placed at Site F during the past 10 years remained in the disposal mound. Limited expansion of the site to the north would not increase the dispersive ability of the site until the bed elevation exceeded approximately 15 meters. Limiting mound heights to depths of 15 meters would provide 25 MCY of site capacity. At present disposal rates this would approximate a 25-year site life. It might be assumed that a six fold increase would provide a minimum

50-year project life. Larger (greater than six fold), deeper (non-dispersive) or shallower (dispersive) disposal areas would provide more dredged material disposal options including the ability of avoid navigation hazards caused by excessive mounding.

Transport of fine sediment back into the estuary can occur from Site F, but the percentage of fines in material disposed there is small. On-shore transport from the vicinity of Site H is highly unlikely and dispersion would scatter the sediments to the point that detectable volumes of material would not reach the coastline.

d. Water Quality. Water quality impacts may be divided into physical and chemical aspects. Increased turbidity is the principal physical effect. Disposal of the clean Type 1 sands would produce a very local short term increase in water column turbidity which would quickly be dissipated by local currents at all sites under consideration. Reworking of materials in any bottom mound would produce longer term impacts. Reworking of sediments at Site F is expected to occur during the dredging season while complete reworking at Site H may not be completed until the winter storm period. Consequently, resuspension of any fine material from Site F can be expected to be strong and continuous following disposal, where as deeper sites may have continual but weaker erosion of fines during the summer but rapid winnowing in the winter. Fine material associated with rock disposed at the rock site will also be winnowed rapidly.

Nelson et al. (1983) applied an experimental version of the Koh-Chang (1973) computer model for dredged material plume dispersion of Type 3 sediments. While their results are yet to be verified, the study suggested that the disposal of 3,000 y^3 of sediments under summer conditions could produce maximum vertically-averaged suspended sediment concentrations after 1 hour of 0.04 percent by volume at Site F and 0.004 percent at Site H. These values represent dilutions by factors of 500 and 5,000, respectively. These levels may be compared to summer field measurements by Plank and Pak (1973) off Newport. Averaging surface, mid-depth and bottom concentration for three stations less than 110 meters deep yields volume concentrations between 0.05

and 0.12 percent. The lower figure is approximately equal to the model's highest-projected vertically-averaged concentration after one hour. Consequently, it may be assumed that disposal operations will, under worst case conditions, produce a local turbidity impact comparable to natural events.

Since the majority of chemical contaminants appear to correlate strongly with the finer size fractions, it is reasonable to assume that the dispersal of the chemical contaminants would be proportional to the dispersion of the fine fractions. The final report from preliminary estimates by Nelson et al (1983) suggested that between 50 and 75 percent of the fine sediment would remain in suspension when dumped and would be transported from the disposal sites by mean currents. This material would likely contain much of the chemical contaminants with dilution comparable to those just mentioned. Elutriate analyses (Hancock et al. 1981) indicate that only ammonium-nitrogen, manganese, and cadmium may be released to seawater in sufficient concentration to possibly exceed EPA water quality criteria. Considering the dilutions measured during the 1981 test dump, these concentrations would be well below the levels of concern prior to exceeding the boundaries established by the 4-hour mixing zone. In addition, no significant differences were observed between tests and controls of the bioassay tests conducted. Bioaccumulation in test animals was lower than but in proportion to the concentration of chemicals and metals in the sediments (Nelson et al. 1983). The bioassay and bioaccumulation tests showed that the material is environmentally acceptable for ocean dumping.

4.3 Biological Impacts: Coos Bay Estuary.

a. Primary Impacts. Immediate impacts would be directly associated with the dredging of the channel. Benthic organisms within the channel, as well as along the side slopes of the channel would be destroyed or displaced by the dredging operations. The proposed deepening of the navigation channel between RM's 0 and 15 would entail the complete removal of 2 feet of material from the bottom of the channel, with removal of about 12 feet of relatively shallow material along the sides of the channel. (For every 1 foot of deepening there

is assumed to be a concurrent 6-foot-lateral expansion of the side slope.) Throughout the length of the project, the maximum extent of subtidal habitat which would be directly impacted is estimated at less than 25 acres. Established populations of benthic organisms, as well as habitat for benthic and epibenthic organisms would be removed. Expansion of the turning basin at RM 12 would also result in the loss of benthic invertebrate populations and reduction of shallow water habitat. An estimated 6 acres of total habitat would be impacted.

Impacts to benthic invertebrate populations would probably be greater in the lower estuary (below RM 6). Densities and diversity of benthic invertebrate species were higher in the lower portion of the estuary than in the upper reaches [Jones, 1990 and Miller et.al., 1990]. These species, however, may recolonize rapidly since Jones (1990) found that the species composition at the lower estuary transect had changed distinctly between the December 1989 and April 1990 sampling due a change in sediment type. In December, Mytilidae, which are typical of a coarse bottom of rocks and shell debris were the dominant group while in April the sediment had switched to predominately sand and the dominate species were the sand dwelling polychaetes *Polygordius* sp. and *Saccocirrus eroticus*. The shift in sediment type is probably due to the winter storms bringing sand into the lower bay. This rapid shift in species types indicates that the organisms are adapted to major disturbances and can recolonize rapidly. Consequently, after the initial dredging the benthic community would likely reestablish quickly. In the transect at RM 4 benthic invertebrate densities and diversities were also high and the two side slope stations showed a similar switch in species from December to April, though it was to a more hard bottom type species in April. The mid-channel station consisted of species typical of a sand bottom.

The middle bay transect located at RM 8 had low density and diversity of organisms probably due to the substrate, which consisted of large chunks of shell and very coarse grained sediment. This type of sediment is very unstable and shifts considerable with wave and tide action. Consequently few if any organisms can survive this type of habitat and dredging in this area would probably have little if any impact on the benthic community. It may in

fact improve conditions by removing some of the unsuitable substrate which could create more stable habitat. This area, however, is probably a collection point for this type of material in the estuary and this type of habitat would probably reestablish unless the dredging changes the current conditions.

The upper estuary had a benthic invertebrate community typical of fine grained sand and silts (Jones, 1990). Densities of organisms were generally low except for the station by RM 14 which had large numbers of oligochaetes which is typical of sediments with large percentage of organic material. Other dominant organisms included the spionid polychaetes *Polydora* sp. and *Streblosoma benedicti* and the cumacean *Lamprops quadriplicata*. At RM 9.5 dominant species were the polychaetes *Mediomastus californiensis*, *Spio butleri* and *Scoloplos armiger* in December. In April, the dominant species was *Tharyx multifilis* was has been used to as an indicator of large concentrations of organic material which in this region could be from pollution sources or the currents around the railroad and highway bridge causing the organic material to accumulate. Dredging in this area would probably have minimal impact. Parr (1973) studied the impact of a dredging project at RM 13-14 in Coos Bay and indicated that benthic organisms in the main channel recovered within 28 days of the dredging but did not experience natural population increases as the areas off the main channel possibly because of the condition of the newly exposed sediment. Once sediment conditions had reestablished benthic production would be similar to pre-dredging conditions.

Following the construction of the project, most channel areas would be expected to recolonize rapidly and be back to pre-dredge conditions shortly after dredging was complete. Reestablishment of benthic communities on the channel side slopes would not occur until they reach a natural angle of repose and provide a more stable habitat.

The area proposed for the expansion of the turning basin has a benthic invertebrate community typical of that described for the upper estuary. Species present are typical of those found in fine grain silty sediment. Initial construction would destroy some of the existing population, but

recolonization would occur rapidly following dredging. A small amount of shallow water habitat may be impacted in the side slope area, however this is not considered to be a significant amount and recolonization of the shallower areas on the side slope would occur once they stabilize.

Impacts to the clam population may occur with the proposed deepening project in both the channel and side slopes and the area of the expanded turning basin. No estimate of the clam populations in the these areas are available, consequently the extent of the impact is not known. In-bay disposal of dredged material and/or resuspension of sediments may also affect local clam reproduction. Clam spawning occurs primarily in the spring and summer months. Dredging activities at this time could effect the recruitment of gaper clams which depend on hard objects on the substrate such as shells, and rocks or eelgrass on which they can attach. If these materials are covered with dredged material, recruitment is inhibited. Other clam species do not require similar substrates on which to attach, but they are nevertheless susceptible to smothering at the larval stage.

Maintaining the existing subtidal clam beds and avoidance of in-bay disposal in clam bed areas would minimize impacts to the local clam population. It is important that populations of mature clams are maintained as they are important seed sources for replenishing the clam populations throughout the bay.

Impacts to epibenthic invertebrate populations and fish are expected to be minimal. Some entrainment of epibenthic invertebrates and marine and euryhaline fish would occur during initial construction. The number of these organisms entrained is expected to be small compared to existing populations (Moehl and Barton, 1989). No salmonids are expected to be entrained during construction, since none were caught in the sampling done on the dredge during maintenance dredging in 1989 (Moehl and Barton, 1989). Impacts to salmonid food sources would be temporary and short term.

Most threatened and endangered species would not be present in the estuary (i.e., whales, sea turtles, salmonids) or would be present in off-channel

areas. Northern sea lions and brown pelicans would be present in the navigation channel and off-channel areas. Dredging operations would only preclude these two species from a very limited amount of the overall estuarine habitat used by these species. Bald eagles and peregrine falcons are more associated with intertidal marshes and mudflats, shallow subtidal areas of various inlets and sloughs and adjacent uplands than the navigation channel. No impact to these species or their prey base is anticipated. Western snowy plovers are associated with sandy beach habitat and barren uplands and should not be impacted by construction actions in the navigation channel. We have concluded in the biological assessments developed for threatened and endangered species that the proposed action would have no adverse affect on the listed species.

Work will be conducted during in-water work periods coordinated with the USFWS and ODFW. Rock removal from RM's 0 through 5 will occur from 1 May through 31 January. Common excavation of material from RM's 0 through 12 would occur from 1 May through 31 August; removal of material from RM's 12 through 15 would occur from 1 July through 31 January.

b. Salinity Impacts. Results of the one dimensional salinity model indicated that the salinity change in the estuary would remain unchanged from the previous deepening done in 1978. The model showed, however, that this previous five foot deepening had resulted in an average salinity increase of 2-3 ppt in the upper river (RM 14-25). The effect of this change was not evaluated, consequently it is not known what change in the ecosystem occurred from this increase.

Coos Bay is, however, a predominately euryhaline system with the head of tide extending 11 miles upstream into the South Fork Coos River and the Millicoma River. Salinities from 2 to 14 ppt were recorded in the South Fork Coos River by Anderson (1985) during a low flow period in July. Consequently, organisms in the predominately freshwater part of the estuary which would most likely be impacted by a change in salinity are adapted to periodic episodes of salt water intrusion. An increase in salinity of 2-3 ppt from the original deepening then is not likely to have a significant impact to the ecosystem

unless the duration of salt water intrusion increases. No estimate is available of the pre 1978 deepening or current duration of salt water intrusion in the upriver areas, consequently, no assessment of the change can be made for either the earlier deepening or the proposed deepening. It is unlikely that the change is significant this far upriver since there are already periodic intrusions of salt water into this area during low flows.

Organisms that could be impacted by increases in salinity in the upriver areas are juvenile salmonids, striped bass (*Morone saxatilis*), resident freshwater fish species and invertebrate and phytoplankton populations.

Juvenile salmonids utilize the freshwater saltwater interface areas as a transition area to adapt to saltwater conditions. Fall chinook juveniles may also rear in these areas for extended periods of time while adapting to salt water conditions. Alteration of these areas by changing salinity patterns could reduce the value of a particular area as a rearing/transition zone. No information is available on the extent or value of any of this rearing/transitional habitat so no assessment of the extent of the impact can be made, though it is likely that it is minor since the changes expected in both amount and duration of salinity change is minimal.

Striped bass use the upriver areas for spawning and rearing. Though they spawn in fresh or near fresh water, striped bass eggs can tolerate salinity of up to 10 ppt. Larval striped bass can tolerate salinities up to 15 ppt, but survival can actually be improved if salinity is between 10 and 12 ppt (Anderson, 1985).Consequently, changes in salinity in upriver areas affect striped bass survival.

Resident freshwater fish and invertebrates may be shifted slightly upriver with the estimated extent and duration of the salinity change. Since the impacts predicted for downriver are minor it is expected that impacts will also be minor in the upriver areas.

Increased salinity in the lower estuary may result in the increase in range of marine species and the upriver distribution of eel grass. Increase in eel

grass populations could be a benefit to many species since eel grass beds provide productive habitat for a variety of species. Increased salinity in the lower bay could also spread the incidence of nuisance species such as the boring shipworm clam which will attack pilings further upriver if the salinity is increased to a level they can tolerate. Based on the SALPLOT model results, salinity increases are expected to be minor, consequently, this is not expected to be a problem.

c. Secondary Impacts. The deepening of the channel would slightly affect existing tidal and freshwater currents and the sediment deposition patterns within the system. As indicated by the salinity analysis (paragraph 4.1c.), a 2-foot deepening would not cause a perceptible change in salinity, either vertically or horizontally. Likewise, other water chemistry changes would be minimal. Sedimentation patterns resulting from tidal or freshwater flow, or modified tidal prism would not likely change with a 2-foot deepening. Studies of potential salinity changes conducted for the proposed Columbia River Coal Channel (USACE, October 1987) concluded that tidal fluctuations and velocity changes for up to 5 feet of depth increase could not be accurately measured. The salinity analysis conducted for the 2-foot deepening at Coos Bay tends to confirm this. Additional secondary impacts would be related to the promoting of the status of the International Port of Coos Bay. Continued use of the estuary by foreign ships will increase the incidence of inadvertent introduction of foreign organisms through fouling on the hulls of ships, which could effect native species by increasing competition for habitat and food. Other disturbances to the estuary related to shipping include propeller wash, anchor drag and wave action. Propeller wash and anchor drag create a situation whereby opportunistic or introduced species can gain a competitive advantage. Wave action from moving ships can contribute to shoreline erosion potentially impacting marsh habitat and species. The proposed deepening would not contribute any substantive increase in these disturbances.

4.4 Biological Impacts: Ocean Disposal Sites.

a. Site E. No additional impacts at this site are anticipated as quantities and type of material would not change from current disposal practices.

b. Site F. In comparison to the other sites investigated in previous studies, the area in the vicinity of Site F appeared to be the most suitable for location of new or expanded disposal sites. The near-shore, transition zone supported the lowest average abundance of organisms and was the most homogeneous in species composition of the sites investigated. Dispersal rates of the site are also higher due to the more extensive current and wave action, particularly in the nearshore areas. Expansion of the disposal area for coarse-grained material would impact areas previously undisturbed by dredged material disposal. Distribution of the material over a larger area, however, would reduce long-term impacts to a particular site by allowing a longer time for recolonization between disposal events. Disposal in the nearshore area would likely result in lesser impact than the offshore area since this is a high energy environment and the material would disperse rapidly. This would reduce the burial of organisms and allow them to reestablish more rapidly. Disposal over a larger area, either nearshore or offshore in a thin layer, would produce the least impact. The organisms would not be buried to any depth and the material would disperse more rapidly.

Juvenile flatfish were encountered at Site F as well as most other depths, however they were found in higher quantities at the deeper trawl sites. The area may be an important area for the rearing of juvenile flatfish, but it appears that disposal in the Site F vicinity would have less impacts to the fish than other, deeper sites.

c. Site H. Impacts to organisms, particularly benthic invertebrates, is greater at Site H than at Site F. During 1979 through 1983, the benthics of Site H tended to be surface and filter feeders. Disposal over these species would reduce their keeping capability; however, physical and biological characteristics of the site have resulted in only short-term impacts to species and allowed high recruitment rates.

It was observed by Sollitt et al. (1984) that there appeared to be little significant difference in species abundance or composition before and after the limited test disposal. The site has been monitored and a report prepared which identifies impacts of continued disposal on benthic organisms (Marine

Taxonomic Services, 1990). The monitoring results show little or no impacts to polychaetes and relatively minor impacts to molluscan species. In general, the species found in this area tend to be very motile and able to cope with the dynamics of the area of impact. New work disposal impacts would be similar to those which currently exist under the maintenance dredging program.

d. Rock Site. Although data on this area is less extensive than Site H, it is a preferred site biologically due to the fact that it is located within the transition zone and should exhibit similar characteristics to Site F. This fact is supported by some samples taken in the area (Hancock et al. 1981). It has also been seismically and geologically examined and has been determined to be comprised of gravel and sand; therefore, the proposed site has been determined to be a suitable site for the one time disposal of dredged rock.

Offshore disposal of dredged material and rock excavated from the navigation channel should have no adverse affect to threatened and endangered species. Disposal actions are limited in time and space which lessens potential impact to species present. Occurrence of whales is sporadic and/or seasonal in nature. Gray whales may occasionally be present in the disposal area during the southward migration. Northern sea lion occurrence in the disposal area is expected occasionally. Salmonids are expected to occur in the disposal area but the extent to which listed species would be expected is minimal. Presence of other listed species would be very limited in nature. Given the brief nature and limited spatial extent of disposal actions, the lack of contaminants in the material to be disposed, and the opportunity for either animals to avoid the disposal action or disposal operations to be delayed briefly as gray whales or other species pass through, no affect to listed species is anticipated.

4.5 Human Resource Impacts.

a. Local Economy. It is expected that the major impact of the channel deepening would be to improve the efficiency of waterborne transport. It is not anticipated that the project would result in major changes in the modes or

relative scale of truck, rail, and waterborne shipments such that the Coos Bay timber service area would be changed. The primary service area of Coos Bay's wood products industry would continue to be Coos County ; the secondary area would remain the six-county region of Coos, Curry, Douglas, Lane, Josephine, and Jackson Counties.

The primary direct long-term effects of the proposed action would be related to wood products manufacturing and waterborne shipments. With shipping economics calling for progressively larger ships, shipping costs have increased rapidly at the Port of Coos Bay as a result of delays for favorable tides and "light loading." This condition is tenable only under the most favorable wood products market conditions. Even if the deeper draft channel is constructed, the wood products industry will be subject to short-term market fluctuations, and ultimately limited by timber supply. Employment, productivity, and investment in wood products industries are highly susceptible to national and international market instabilities. The project's positive economic effects would be realized largely during periods of rapid expansion of the market.

No new terminal construction is anticipated along the Coos Bay/North Bend waterfront, although rejuvenation of older facilities can be expected based upon current activity. No expansion is expected in the vicinity of Empire. Expansion is anticipated on the Port's North Spit property. The extent or nature of this expansion is uncertain. This potential development would occur with or without a deeper channel to different degrees and is addressed in the County Comprehensive Land Use and Estuary Plan.

The proposed action would disturb commercial and recreational fishing in the estuary during construction, and during periods of subsequent maintenance dredging. It is anticipated that these impacts would be minimal.

No short term or long term changes in retail or wholesale trade patterns or levels are expected to result directly from the project in Coos County.

b. Waterborne Transportation. Improved channel conditions at the Port of Coos Bay would facilitate the passage of ships through the Port. Larger vessels would be capable of embarking from Coos Bay with more cargo than they presently handle. Fewer large ships would have to delay their departures from the Port in order to take advantage of high tide conditions. As a result, channel improvements would reduce transport costs incurred by the shipping companies serving Coos Bay. The major long range result of improving the Coos Bay channel by the proposed dredging project would be to preserve the Port's position in relation to all other ports on the Oregon coast and the other modes of bulk transport--especially rail and truck. Channel deepening measures would not likely lead to large increases in the export of lumber and wood products, nor to the related import of petroleum products, since harvesting of timber in the Port's resource area is not expected to increase materially and may even decline over an extended period. Primary exports expected to benefit from channel deepening are wood chips, logs, lumber, paper, and plywood. The absence of channel improvements would lead to absolute declines in port traffic in the future.

c. Population and Employment. It is unlikely that the project would affect the total population size or distribution. In the short term, the project would have little impact on age structure or population mobility. In the long term, the project might afford greater economic opportunity or prevent declines in economic productivity which, in turn, might discourage the out-migration of some young people.

The impact of the project on employment depends on how shipping companies respond to improved access to Coos Bay. If wood product shipments increased as a result of the project, employment in the dependent sectors of the economy would rise. However, the major impact of the project would be to reduce the incidence of "light loading" and delays for the existing level of waterborne commerce. Thus, shipping cost savings would be the primary result of the project.

d. Land Use and Land Use Plans. The proposed channel deepening would have little effect on land use in the Coos Bay area. The deepening would

allow for continued maintenance of existing patterns. Economic factors, particularly related to wood products industries would determine future land use changes. As discussed in the attached CZM Consistency Determination, the Coos Bay Estuary Management Plan would not need to be modified to address channel deepening.

e. Cultural Resources. The cultural resource most likely to be directly impacted by the proposed project would be submerged shipwrecks in the estuary and/or in the ocean disposal sites. Potential project impacts may include exposure and destruction of remnants of shipwrecks if present in the locations of areas scheduled for dredging or impacts from disposal at new ocean disposal sites.

The generalized locations of shipwrecks within Coos Bay have been evaluated and determined that dredging activities would not impact known sites within the bay. The new ocean disposal sites required for channel deepening and short-term maintenance requirements (rock disposal site and expanded Site F) have been evaluated and no shipwrecks are known to exist at these locations. The area being investigated for long-term maintenance requirements will require further cultural resource evaluation as part of the final site selection process.

f. Aesthetics. The aesthetic environment of Coos Bay with the exception of short-term turbidity from dredging would not be affected by the proposed channel deepening.

4.6 Unavoidable Adverse Impacts.

a. Dredging Impacts. Deepening the navigation channel and associated berthing areas would slightly modify the bottom topography of Coos Bay. This would modify subtidal habitat and adversely impact benthic species which, in turn, are a food source for a variety of species higher in the food chain. A deepened channel would also result in minor salinity changes which would likewise affect benthic and other aquatic resources. Dredging activity and turbidity would temporarily disturb and displace motile aquatic species. An

undetermined percentage of less motile species such as clams or sand-burrowing species such as sand lance would be removed by the dredges and displaced to the disposal sites. The majority of these impacts would occur during the initial deepening activities. Most populations would re-establish and conditions would revert to near pre-deepening with periodic disturbance from maintenance dredging.

b. Disposal Impacts. Ocean disposal would alter the bathymetry at the described disposal sites, altering habitat and burying some benthic organisms. Disposal activities and resulting turbidity would also temporarily disturb and displace motile aquatic species. Commercial and recreational fishing activities would be temporarily affected by disposal activities.

If material dredged from berthing areas is determined unsuitable for in-water disposal, an upland disposal site would be provided by the Port of Coos Bay. The most likely site to be used for disposal would be the Eastside peninsula area. This site is identified for water dependent development in the Coos Bay Estuary Plan has been previously used for dredged material disposal. Low-lying portions of the site have converted to wetlands but remaining uplands area appears adequate for any foreseeable dredged material quantities.

4.7 Cumulative Impacts. Cumulative impacts are defined by CEQ Guidelines as "...the impact on the environment which results from the incremental impact of the proposed action when added to other past, present and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions." Actions related to the proposed channel deepening are past and present channel deepening and maintenance actions, port and community development actions, and potential future actions related to navigation development. This and earlier referenced EIS documents, fully address past, present and potential future actions directly related to navigation development in Coos Bay. The following discussion addresses reasonably foreseeable future actions related to channel deepening which could indirectly affect physical, biological or human resources.

a. Physical Impacts. Future port developments could result in reduced water and air quality in Coos Bay through introduction of pollutants from increased ship traffic and new industries. This trend could in turn lead to additional population growth and further sources of pollution. Additional port berthing areas may require dredging and disposal of additional sediments. Port developments could alter shorelines and adjacent upland locations.

b. Biological Impacts. Reduction of air and water quality as well as increased development and activity in Coos Bay would impact several aquatic and non-aquatic species. Productivity of the aquatic environment would be reduced with increased ship traffic and pollutants. The severity of impacts from these sources would be relatively higher than from currently existing sources. Additional port and industrial development could impact previously undeveloped shoreline sites. The most likely locations would be on the Coos Bay north spit. These potential developments could remove several acres of valuable habitat for a variety of birds and mammals. Specific impacts from potential future development in this area is included in the North Bay Marine Industrial Park EIS prepared for the Port of Coos Bay in 1982.

c. Human Impacts. The navigation channel is a key component in maintaining the economic viability of the Coos Bay area. Local population growth would likely continue at current rates and ongoing needs for community services would likewise continue. The aesthetic environment of Coos Bay would be slightly modified by additional waterfront development and urban infilling. Auto and commercial truck traffic would likely increase slightly. Air and water quality would be modified. Some archaeologic or historic resources may be impacted by future developments.

4.8 Relationship Between Local Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity. Maintaining a deep draft channel at Coos Bay is a continuation and extension of past and present patterns of estuarine use. Many of the natural components of the estuary have been shaped or used to meet particular human requirements. The economic well-being of the Coos Bay region has been heavily dependant on the waterborne trade generated by the navigation channel. The local economy is also

dependant upon the continued productivity of Coos Bay's fisheries. Although the deep draft channel reduces the overall productivity of the bay, a balance has been maintained to protect areas of clam, crab and fish production as well as habitats and food sources on which they depend. A 2-foot deepening with ocean disposal would not significantly alter this balance between use and productivity.

4.9 Irreversible and Irretrievable Commitments of the Resources. The capital and labor necessary to dredge the channel and dispose of the material would be committed irreversibly and irretrievable. This includes the capital and labor associated with construction activities, administration, personnel, operations, maintenance, and petroleum and other products used. Subtidal lands dredged would be committed throughout the life of the project. Restoration of this substrate and reuse of the discharged dredged material (directly) would not be possible.

CHAPTER 5

REVIEW AND CONSULTATION REQUIREMENTS

5.1 Public Involvement. Public and agency comment was sought throughout the preparation of the Reconnaissance and Feasibility studies. The Feasibility Study/Environmental Impact Statement were initiated with a Notice of Intent published in the Federal Register and a scoping letter outlining the alternatives under consideration and requesting comments on issues to be considered. Agency and public comments were received, expressing concerns on a variety of issues. A summary of these concerns and copies of the letters received are included in appendix I.

The following is a generalized list of federal, state and local agencies and interested public to whom copies of the Draft EIS have been sent:

(1) Federal.

Department of Agriculture
Bureau of Land Management
Coast Guard
Environmental Protection Agency
Fish and Wildlife Service
Department of Interior
Members of Congress
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Department of Transportation

(2) State.

Oregon Dept. of Economic Development
Oregon Dept. of Environmental Quality
Oregon Dept. of Fish and Wildlife
Oregon Dept. of Human Resources

Oregon Dept. of Land Conservation and Development
Oregon Parks and Recreation Division
Oregon Division of State Lands
Oregon State Historic Preservation Office
Oregon Dept. of Transportation
Office of the Governor
State Legistators

(3) Local

Coos County
City of Coos Bay
City of Charleston
City of Eastside
City of North Bend
International Port of Coos Bay
Local Schools and Libraries
Indian Tribes

(4) Interested Public

Businesses and Industries
Commercial and Recreational Fisheries Groups
Environmental Groups
Marine Navigation Association
News Media
Recreational Groups
Interested Individuals

5.2 Compliance with Environmental Laws and Executive Orders.

a. Clean Air Act of 1970, as Amended. The Clean Air Act establishes a comprehensive program for improving and maintaining air quality throughout the United States. The goals of the Act are achieved through permitting of stationary sources, restricting the emission of toxic substances from stationary and mobile sources, and establishing National Ambient Air Quality

Standards. Title IV of the Act includes provisions for complying with noise pollution standards. Alternatives described in the EIS would not likely increase particulate matter in the Coos Bay area or jeopardize its status as an air quality attainment area. Noise created by dredge operations would not exceed current industrial and maintenance dredging noise levels. The proposed channel deepening would be in compliance with the requirements of this Act.

b. Clean Water Act 1977 as amended. No disposal would be considered fill. Ocean disposal has been evaluated under the criteria established by Section 103 of the Marine Protection, Research and Sanctuaries Act. Water Quality Certification will be requested from the State of Oregon for sites within the limits 0-4 the territorial sea based on this evaluation. All requirements of the Clean Water Act will be met.

c. Coastal Zone Management Act of 1972 as Amended. A Federal Determination of Consistency for this project is included with this report (Exhibit 5). The Oregon Department of Land Conservation and Development will be requested to concur with the determination regarding compliance with Oregon's Coastal Zone Management Program and local land use plans.

d. Comprehensive Environmental Response, Compensation and Liability Act. Provisions for evaluation and cleanup of hazardous, toxic and radioactive wastes (HTRW) are included in this Act. In general, dredged material and sediments beneath navigable waters proposed for dredging qualify as HTRW only if they are within the boundaries of a site designated by EPA or the state for a response action or if they are part of a National Priority List site under CERCLA. No HTRW sites have been identified which would impact the navigation channel area. All sediments have been evaluated for suitability for disposal under the guidelines established by Section 404 of the Clean Water Act, and Section 103 of the Marine Protection, Research and Sanctuaries Act. All requirements under this Act have been met.

e. Endangered Species Act of 1973 as Amended. The USFWS and NMFS have been consulted. Biological assessments have been prepared and forwarded to the USFWS and NMFS regarding listed species. Concurrence with our assessment

that listed species will not be adversely affected is anticipated based upon previous consultations and review of project and species information. Bald eagle, peregrine falcon, marbled murrelet, brown pelican, leatherback, green sea and loggerhead sea turtles, northern sea lion, and gray, humpback, blue, right, fin, sei, and sperm whales, Sacramento winter chinook, Snake River sockeye, Snake River fall chinook, and spring/summer chinook salmon are endangered or threatened species identified as potentially affected by the proposed action. Concurrence letters were received for bald eagle, peregrine falcon, brown pelican, and western snowy plover on July 3, 1990; and for gray, humpback, blue, fin, sei, right, and sperm whales; and leatherback sea turtles, northern sea lions, and Sacramento River winter-run chinook salmon on January 22, 1991. Due to changes in the proposed ocean disposal site dimensions, a new Biological Assessment was prepared for the marine and salmonid species and submitted to NMFS on August 16, 1993. Concurrence letters were received on September 21 and 22, 1993. A Biological Assessment for the more recently listed marbled murrelet has been prepared and submitted to USFWS with a determination of no adverse effect. The concurrence letter has not yet been received as of this date. The biological assessments and concurrence letters are included in exhibit 7.

f. Estuary Protection Act. The purpose of the Estuary Protection Act is to establish a program to protect, conserve and restore estuaries. The Act does not affect an Agency's authority for existing programs within an estuary. Coos Bay is designated as a Deep Draft Development Estuary within Oregon's Estuary Management System. This designation seeks to protect the integrity of the estuary's natural resources while recognizing and allowing for deep draft port development. The proposed channel deepening complies with the Act.

g. Fishery Conservation and Management Act of 1976. Law 99-659, Section 104, amended Section 302 of the 1976 Act to require all Federal agencies to respond within 45 days to comments and recommendations made by the Regional Fishery Management Council relative to the impacts a federal activity have on fishery resources under the Council's jurisdiction.

The Pacific Fisheries Management Council will be provided a copy of the Draft Feasibility Report/EIS for review. Their comments on the impacts of the channel deepening on harvest quotas and management plans will be incorporated into the final document. All requirements of the Act will be met.

h. Fish and Wildlife Coordination Act. A Fish and Wildlife Service Coordination Act report was prepared for the proposed action. This report together with Portland District Response Letter is included in Exhibit 6. This report will be coordinated with other Federal and State resource agencies and comply with the Act as required.

i. Marine Mammal Protection Act of 1972. The Marine Mammal Protection Act is the principal U.S. statute for conserving and protecting marine mammals. The alternatives described in the EIS are not likely to adversely impact marine mammals. Dredging and disposal actions are localized in nature and of short duration at any specific location. Thus, marine mammals can avoid these work areas. Impacts to prey resources are expected to be ephemeral. No work is occurring near haulout or pumping areas. Sediments have been evaluated for contaminants; contaminated sediments would be disposed of in a manner consistent with the requirements of the Clean Water Act and the Ocean Dumping Act. Therefore, introduction of contaminants into the marine system is not anticipated nor or contaminant impacts to marine mammals expected.

j. Marine Protection Research and Sanctuaries Act of 1972, as Amended. A Section 103 evaluation for designation of the rock disposal site and disposal at Sites F and H has been prepared in compliance with this Act and is included with this report (Exhibit 4). Expansion of Site F is being evaluated for formal designation by EPA under Section 102 of the Act. All proposed actions would comply with the requirements of this Act.

k. Migratory Bird Conservation Act This authorized a national system of waterfowl refuges. The Migratory Bird Conservation Act provided the Federal government the authority to acquire lands, with the consent the affected states, for migratory bird refuges. The proposed project would have no

bearing on the Migratory Bird Conservation Act of implementation of provisions of the Act.

l. Migratory Bird Treaty Act (1918). The Migratory Bird Treaty Act represents congressional ratification of the 1916 Migratory Bird Treaty with Canada. Similar treaties were later established with Mexico, Japan, and the U.S.S.R. These treaties provide, in part, protection of songbirds, prohibits traffic in all wild migratory birds and establishes management of migratory game birds. The Coos Bay Navigation Channel Deepening Project should not result in the take or loss of migratory birds. Thus, the project would not violate the provisions of the Migratory Bird Treaty Act.

m. Submerged Lands Act of 1953. This Act confirms and establishes titles to the States to lands beneath navigable waters within the State boundaries and to the natural resources within such lands and waters. It also confirms the jurisdiction and control of the United States over the natural resources of the seabed of the Continental Shelf seaward of State boundaries. Development of the deep draft navigation channel at Coos Bay, including ocean disposal of dredged material is considered a suitable activity under the State of Oregon Estuary Management Plan. Further discussion of State jurisdiction is included under the Coastal Zone Management Act requirements.

n. Cultural Resources Acts. Cultural resources investigations and literature search have been conducted and determined that no resources would be affected or can be avoided. The results of the investigation has been coordinated with the State Historic Preservation Office (SHPO). Copies of correspondence with the Oregon SHPO is included in Appendix I. The proposed action has met the requirements of pertinent cultural resources Acts.

o. Analysis of Impacts on Prime and Unique Farmlands, CEQ Memorandum, 1976. No prime or unique farmlands would be affected by the proposed action.

p. Executive Order 11990, Protection of Wetlands, 24 May 1977. No dredging or filling would occur in wetland areas. Salinity increases resulting from a deeper channel could have a minor affect on marshes in upper Coos Bay. Distribution and densities of eelgrass would increase with the

project, which could increase total estuarine productivity slightly. It would also provide additional cover for many species of marine organisms. The amount and species of marine algae would increase in the estuary. Of particular importance would be Enteromorpha sp. Some species of this green algae form dense mats in the late summer and are highly productive. The proposed action conforms to the requirements of this executive order.

q. Executive Order 11988, Floodplain Management, 24 May 1977. Deepening of the Coos Bay channel would take place within the confines of Coos Bay and extend outward into the Pacific Ocean. No dredged material disposal would occur on land with the possible exception of material dredged from port berthing areas as regulatory permit activities. No dredged material would be placed into the estuary. Deepening of the navigation channel would have no adverse impact on the adjacent floodplain nor would it attract any new development into that floodplain.

INDEX

Aesthetics, 3-65, 4-24
Alternatives, 2-2, 2-4, 2-7, 3-10, 5-3

Bathymetry, 3-3, 3-5, 3-12, 4-26
Benthic, ii, 2-5, 2-14, 2-15, 2-18, 2-19, 3-31, 3-33, 3-34, 3-43, 3-45, 3-47, 3-54, 4-8, 4-15, 4-16, 4-17, 4-21, 4-22, 4-26
Biological environment, 2-14
Birds, 3-31, 3-42, 3-42, 3-60, 4-27, 5-6

Candidate Sites, 2-7, 2-16
Chemical Analysis, 3-5, 3-18
Circulation, ii, 2-5, 3-5, 3-21, 3-22, 3-28, 4-1, 4-12
Clams, 3-32, 3-34, 3-37, 4-17, 4-26
Coastal Zone Management, 3-65, 5-3, 5-4, 5-6
Crabs, 3-31, 3-33, 3-41, 3-43, 3-54
Cultural Resources, 3-66, 4-25, 5-6
Currents, 3-1, 3-3, 3-13, 3-19 thru 3-23, 3-32, 4-1, 4-4, 4-11 thru 4-14, 4-16, 4-20

Demersal, 3-40, 3-57, 3-59
Disposal Sites, i, ii, iv, 2-2, 2-4, 2-6, 2-9, 2-12, 2-15, 2-16, 2-19, 3-10, 3-33, 3-43, 3-54, 3-57, 3-59 thru 3-61, 3-65, 4-10, 4-14, 4-21, 4-25, 4-26
Economic Effects, 4-23
Effects, iv, 2-4, 2-5, 2-14, 2-15, 2-19, 3-18, 3-23, 3-28, 3-33, 3-45, 3-50, 4-4, 4-8, 4-9, 4-11, 4-23
Environmental Impact, i, ii, 1-1, 2-5, 2-9, 3-7, 4-11, 5-1
Estuary, 2-2, 2-5, 2-9, 2-19, 3-1, 3-3, 3-5, 3-7 thru 3-9, 3-13, 3-18, 3-23, 3-28 thru 3-34, 3-37 thru 3-43, 3-61, 3-63 thru 3-66, 4-1, 4-4, 4-7 thru 4-9, 4-12, 4-15 thru 4-20, 4-23 thru 4-26, 4-28, 5-4, 5-6, 5-7

Fish, ii, iv, 2-19, 3-28 thru 3-31, 3-33, 3-37 thru 3-43, 3-45, 3-54, 3-57, 3-59 thru 3-63, 4-8, 4-18 thru 4-21, 4-28, 5-1, 5-4, 5-5

Geographic, 3-10
Geologic, 3,1, 3-10, 3-12

Habitat, ii, 2-4, 2-5, 2-16, 2-10, 3-28, 3-30 thru 3-32, 3-37, 3-41, 3-42, 3-51, 3-52, 4-15 thru 4-20, 4-26 thru 4-28
Human Environment, 3-1

Invertebrates, 3-31 thru 3-33, 3-35, 3-43, 3-45, 4-16, 4-18, 4-19

Land Use, 3-65, 3-66, 4-22, 4-23, 5-3
Local Economy, 3-63, 4-25, 4-26

Macroinvertebrates, 3-55
Mammals, 3-42, 3-43, 3-62, 4-25, 5-5
Mitigation, 2-1, 2-21
Monitoring, 2-11, 2-17, 2-19, 2-21, 3-53, 4-9, 4-9, 4-20
Marine Protection, Research, and Sanctuaries Act (MPRSA), i, 2-6, 2-18

Ocean Disposal, i, ii, iv, 1-1, 1-2, 2-4, 2-5, 2-11, 2-12, 2-21, 3-7, 3-10, 3-18, 4-8, 4-19, 4-23, 4-24, 4-26, 5-3, 5-6

Physical Environment, 4-8
Plankton, 3-33, 3-38, 3-51
Population, iv, 3-34, 3-38 thru 3-40, 3-48, 3-61, 3-65, 4-3, 5-14 thru 5-18, 5-22, 5-24, 5-25
Proposed Action, i, ii, 1-2, 4-3, 4-16, 4-21, 4-24, 5-4 thru 5-7
Public Involvement, 5-1

Riverflow, 3-3, 3-5, 3-8, 4-7

Salinity, ii, iv, 2-5, 3-3, 3-5, 5-9, 5-9, 5-28, 5-30, 5-32, 5-33, 5-37, 4-1, 4-2 thru 4-6, 4-16 thru 4-18, 4-23, 5-6
Scoping, iv, 5-1
Sediments, i, iv, 2-1, 2-2, 2-4 thru 2-5, 2-11, 2-14 thru 4-19, 4-20, 3-3, 3-5, 3-7, 3-9, 3-12, 3-13, 3-18 thru 3-20, 3-22, 3-28, 3-31, 3-45, 3-52, 3-53, 3-68, 4-4, 4-6 thru 4-15, 4-25, 5-3, 5-5

Threatened and Endangered Species, 3-6, 4-16, 4-20
Tides, 3-3, 3-8, 3-9, 3-21, 3-22, 4-1, 4-2, 4-21
Turbidity, ii, 3-8, 4-6, 407, 4-11, 4-12, 4-23, 4-24

Water Quality, 3-3, 3-8, 3-23, 3-29, 4-1, 4-6 thru 4-8, 4-11, 4-12, 4-25, 4-1
Waves, 3-13, 3-19, 3-20, 3-22, 3-23, 4-3, 4-9
Whales, 3-43, 3-62, 4-16, 4-20, 5-1
Wind, 3-21 thru 3-23
Wildlife, ii, 2-21, 3-28, 3-61, 3-68, 5-1, 5-3, 5-4

EXHIBIT 1
LIST OF PREPARERS

PRINCIPAL AUTHORS	EXPERIENCE AND BACKGROUND	CONTRIBUTION TO THIS REPORT
Steven J. Stevens BS, Landscape Architecture	Land use planning, EIS preparation (20 years)	EIS coordination and preparation
Dan Winslow BS, Economics MS, Economics	Regional and resource economic analysis for planning studies (14 years)	Economic environment and impacts; cost analysis
Pat McCrae BS, Humanities	Regional economics (17 years)	Economic environment; cost analysis
Brian Shenk BS, Economics	Economist (4 years)	Economic Analysis
Steve Chesser BS, Geology MS, Oceanography	Physical and geological oceanography (15 years) Coastal navigation project planning and maintenance (10 years)	Physical environment description and impacts assessments
Mark Siipola BS, Oceanography MS, Marine Science Physical/chemical Coastal Engineering	Beach restoration dredge operations (14 years)	Water quality, sediment chemistry analysis, sediment analysis
Kim Larson BS, Zoology MS, Fishery Biology	Biological (fisheries) studies; environmental impact assessment (12 years)	Biological environment description and impacts assessment
Michael A. Martin MA, Anthropology	Archeological investigation and cultural resources management (10 years)	Cultural resources
Geoffrey L. Dorsey BS, Wildlife Science MA, Wildlife Science	Wildlife Biology (12 years)	Endangered species assessments
Laura L. Barton BS, Biology	Biological studies (1 1/2 years)	Ocean disposal sites biological resources
Christine E. Moehl BS, Biology	Biological studies (2 years)	Coos Bay Estuary biological resources
John Malek BA, MA	EPA Ocean Dumping Coordinator (19 years)	Ocean disposal issues, procedures

EXHIBIT 2

REFERENCES

Anderson, Duane A. 1985. A Study of the Early Life History of the Stripped Bass, Morone Saxtilis, in the Coos River Estuary, OR. M.S. Thesis, University of Oregon, Eugene, Oregon.

Baptista, A.M. 1989. Salinity in Coos Bay, Oregon: Review of Historical Data (1930-1989). U.S. Army Corps of Engineers, ESE 89-001.

Chirarochana, Nittharatana. 1977. Species Diversities in Zooplankton Communities in Coos Bay Estuary as Related to Salinity. Oregon Institute of Marine Biology. Student Report.

Columbia River Estuary Study Task Force. 1977. Columbia River Estuary Inventory.

Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians. A Map of Cultural Resources along the North Spit of Coos Bay.

Cortright, R., J. Webber, and R. Baily. 1987. The Oregon Estuary Plan Book. Oregon Department of Land Conservation and Development.

Coos Bay County Task Force. 1980.

Cummings, Ed. an de. Schwartz. 1971. Fish in Coos Bay, Oregon, with comments on distribution, temperature, and salinity of the estuary.

Coastal Rivers Invest. Info. Rep. 70-11. Fish Comm. Oregon. 22 pp.

Douthit, Nathan. 1981. The Coos Bay Region 1890-1944, Life on a Coastal Frontier. Coos Bay. River West Books.

Fletcher, W. 1988. Monitoring of Site H, Coos Bay, Oregon, 1985-1987. Progress Report. USACE Portland District. Coastal and Floodplain Management Branch.

Hancock, D.R., P.L. Nelson, C.K. Sollitt, K.J. Williamson. 1981. Coos Bay Offshore Disposal Site Investigation Interim Report Phase I. February 1979-March 1980. Report to U.S. Army Corps of Engineers, Portland District, Portland, Oregon, for Contract No. DACW57-79-C-0040. Oregon State University, Corvallis, Oregon.

Hinton, S.A., R.L. Emmett. 1993. Demersal Fishes, Benthic and Epibenthic Invertebrates and Sediment Characteristics at and Adjacent to Offshore Disposal Site F, Coos Bay, Oregon, April 1992. Report to U.S. Army Corps of Engineers, Portland District by National Marine Fisheries Service, 2725 Montlake Blvd. East, Seattle, WA 98112-2097.

Hoffnagle, et al. 1976. A Comparative Study of Salt Marshes in the Coos Bay Estuary. National Science Foundation Student Oriented Study. 1976.

Jefferts, K. 1977. The vertical distribution of infauna: a comparison of dredged and undredged areas in Coos Bay, Oregon. M.S. thesis. Oregon State University, Corvallis, Oregon. 45 pp.

Jones, H.R. 1987. Benthic Infaunal Analysis of the Coos Bay Ocean Dredge Material Disposal Site H. August 1987. A final report to the U.S. Army Corps of Engineers, Portland District, Portland, Oregon Contract No. DACW-57-87-M-2209.

Jones, H.R. 1990. Coos Bay Channel Invertebrate Assessment Study, July 1990. A final report to the U.S. Army Corps of Engineers, Portland District, Portland, Oregon. Contract No. DACW57-90-C-0013.

Kenyon, Karl. 1986. From: Marine Mammals. Delphine Hadley, ed. Pacific Search Press. Seattle, Washington. pp 255-63.

Miller, David R., R.L. Emmett, and S.A. Hinton. 1990. A Preliminary Survey of Benthic Invertebrates in the Vicinity of the Coos Bay, Oregon, Navigation Channel. Report to the U.S. Army Corps of Engineers, Portland District by National Marine Fisheries Service, 2725 Montlake Blvd. East, Seattle WA 98112-2097

McConnaughey, E.A. editor. 1971. Coos Bay Study: An Interdisciplinary Study of Man and the Estuary. NFS student oriented studies program. University of Oregon, Oregon Institute of Marine Biology, Charleston, Oregon. 205 pp.

Moehl C. and L. Barton. 1989. Dredge material sampling, Coos Bay, Oregon, 1989; fish and invertebrate distribution. CENPP-PL-F. 22 pp. Unpublished.

Nelson, P.O., C.K. Sollitt, K.J. Williamson, D.R. Hancock, 1983. Coos Bay Offshore Disposal Site Investigation Interim Report Phase II, III. April 1980-June 1981. Report submitted to the U.S. Army Corps of Engineers, Portland District, for Contract No. DACW57-79-0040. Oregon State University, Corvallis, Oregon.

Oregon Coastal Conservation and Development Commission. 1973. Historical and Archaeological Site Inventory. Unpublished document of cultural resource locations along the Oregon state coastline.

Parr, R.A. 1974. Harbor dredging and benthic infauna: A case study. M.S. thesis, Oregon State University, Corvallis. 114 pp.

Phillips, Roland C. 1984. The ecology of eelgrass systems in the Pacific Northwest: A community profile. U.S. Fish and Wildlife Service. FWS/OBS-84/23. 85 pp.

Rudy, Paul Jr. and L.H. Rudy. 1983. Oregon Estaurine Invertebrates. U.S. Fish and Wildlife Service Biological Services Program.

Simenstad, Charles A. 1984. Epibenthic Organisms of the Columbia River Estuary Data Development Program.

Simmons, Alexy. 1984. Reports on Cultural Resources in the Proposed Port of Coos Bay Access Road Corridor. (Unpublished document on file at Portland District office.)

Sollitt, C.K., D.R. Hancock, P.O. Nelson. 1984. Coos Bay Offshore Disposal Site Investigation Final Report Phases IV, V. July 1981 - September 1983. U.S. Army Corps of Engineers, Portland District, Portland, Oregon, for Contract No. DACW57-79-C-0040. Oregon State University, Corvallis, Oregon.

Stubbs, Ron D. Report of an Archaeological Field Survey in the Proposed Dredge Spoil Areas, NS-2, NS-3, NS-4, and NS-5. Upper North Spit Area of Coos Bay. (Unpublished document on file at Portland District Office.)

U.S. Army Corps of Engineers, Portland District, 1975. Coos Bay, Oregon, Deep Draft Navigation Project Environmental Impact Statement.

U.S. Army Corps of Engineers, Portland District, 1982. North Bay Marine Industrial Park Environmental Impact Statement.

U.S. Army Corps of Engineers, Portland District, 1987. Columbia River Coal Export Channel Technical Report.

U.S. Army Corps of Engineers, Portland District Shipwreck Data Base for Coos Bay. On file in Portland District Cultural Resource Section.

U.S. Department of the Interior. 1971. Natural Resources, Ecological Aspects, Uses and Guidelines for the Management of Coos Bay, Oregon. A special Report. 128p plus appends.

U.S. Environmental Protection Agency. 1986. Environmental Impact Statement (EIS) Coos Bay, Oregon Dredged Material Disposal Site Designation. USEPA, Washington, D.C.

U.S. Fish and Wildlife Service. 1987. Planning Aid Letter in U.S. Army Corps of Engineers. Coos Bay, Oregon. Reconnaissance Report on Navigation Improvements, 1987.

Varoujean, D.H. 1979. Seabird colony catalog: Washington, Oregon, and California. U.S. Department of the Interior, Fish and Wildlife Service, Region I. Portland, Oregon. 456 pp.

EXHIBIT 3

DEIS COMMENTS AND RESPONSES

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Affairs
500 NE Multnomah Street, Suite 600
Portland, Oregon 97232-2036

RECEIVED
NOV 18 1993
REG & ENV RES BR

November 17, 1993

ER 93/792

Colonel Charles A. W. Hines, District Engineer
U.S. Army Corps of Engineers
Portland District, CENPP-PE-RP
P.O. Box 2946
Portland, Oregon 97208-2946

Dear Colonel Hines;

1 The Department of the Interior (Department) reviewed the Draft Feasibility Report (Report) and the Environmental Impact Statement (DEIS) for the Navigation Improvements, Coos Bay, Coos County, Oregon. The Department does not have any comments to offer.

We appreciated the opportunity to comment.

Sincerely,

Charles S. Polityka
Regional Environmental Officer

1 Comments Noted.

United States Department of the Interior

BUREAU OF MINES
Western Field Operations Center
East 360 3rd Avenue
Spokane, Washington 99202-1413

October 14, 1993

Charles A.W. Hines
District Engineer
ATTN: CENPP-PE-RP
P.O. Box 2946
Portland, OR 97208-2946

Dear Mr. Hines:

SUBJECT: Navigation Improvements, Coos Bay, Coos County, Oregon

The U.S. Bureau of Mines would like the Corps of Engineers to consider an alternative to the ocean disposal of dredged material from the Coos Bay navigation improvement project. Since the decision to perform this work should reflect the national concern for both protection and utilization of important resources, our recommendation is to investigate the economic viability of marketing this coarse-grained sandy material in metropolitan areas along the coast such as nearby Portland, Oregon. The investigation should include a suitability test on the material for industrial use, as well as a market study and an operations cost study. Some of the results from the study could also be applicable to other dredging operations along the Pacific coast. Not only would the sale of this material be a wise use of an important and needed resource, but the potential environmental impacts caused by ocean disposal of this material would no longer be a needed concern.

2

Please consider this comment letter as part of the Department of Interior's response from the Office of Environmental Affairs. We did not receive the document for review until October 12, one day after our required response date. Therefore, to ensure that these comments are timely, we decided to send them directly to you.

Sincerely,

Burton B. Gosling, Supervisor
Environmental and Regulatory Analysis

2

Commercial use of dredged material from Corps' maintenance dredging has been and continues to be an available option, if a demand for the material is expressed. For instance, sands dredged above RM 50 on the Columbia River are commonly used for commercial development. Generally, the material is found to be only suitable for fill and not for other commercial uses, such as concrete aggregate. Studies associated with the Columbia River have shown that a market would have potential in larger population areas with associated development activity. It has also been shown that barge hauling the material over 30 miles is not economical. It would therefore not be feasible to test market Coos Bay material in Portland or other metropolitan areas due to the distance involved and the fact that there would be much closer sources.

Oregon

DEPARTMENT OF FISH AND WILDLIFE

November 24, 1993

Colonel Charles A.W. Hines
District Engineer, Portland District
U.S. Army Corps of Engineers
P.O. Box 2946
Portland, OR 97208-2946

Subject: Feasibility Report on Navigation Improvements with Environmental Impact Statement

Dear Colonel Hines:

Our Department has reviewed the subject report. We appreciate the Corps effort to address concerns that we raised earlier in the review process. We continue to be concerned for the health of the estuary on a larger scale and our needs to continue to work together for better long range management of this estuary.

3 A prime concern is the incremental but continual modification to the estuarine subtidal benthic habitat. As we commented in Tom Gaumer's letter of October 12, 1989, there may be substantial invertebrate, particularly clam, production within these areas. Many of these sites once impacted may not recover to the same level of production or with the same level of biological diversity. There is sufficient speculation in the Environmental Impact Statement (EIS) concerning minimal impacts and reestablishment of the benthic biological communities. Although we concur that recolonization of the benthic substrate would occur, there is sufficient change to the physical conditions that the total modification to the estuary may be substantial. Cumulative effects from the activities of the Corps and others have significantly effect the physical and ecological system of Coos Bay. As previously stated in our letter of October 1989, there is a distinct need to develop distribution and abundance of invertebrates within the estuary. This information is essential to determine true impacts from this project and cumulative impacts over time.

4 Additional concerns involve the effect of salinity on striped bass and other managed species of fish. There has been a substantial decline in the striped bass population and relative recruitment. The EIS speculates that the increased

2501 SW First Avenue
PO Box 59
Portland, OR 97207
(503) 229-5400

3 The cumulative effects of dredging the existing channel, the proposed 2-foot deepening and related port facilities and shipping activities would result in continued and potential future impacts to Coos Bay aquatic resources. The extent of impact is not clear and appropriate mitigation beyond existing methods is difficult to identify. The feasibility of conducting a monitoring program per your recommendation is being reviewed by Portland District. Other proposals suggested to reduce impacts from channel dredging include in-bay disposal of rock or shell material at specific locations to improve habitat, or various means to create additional shallow subtidal habitat. These proposals would most likely be evaluated under other authorities such as Section 1135 of the Water Resources Development Act of 1992, as amended. This authority allows for environmental restoration at existing projects.

4 The statement that striped bass survival and habitat may improve was based on the study by Anderson (1985) of habitat requirements of juvenile striped bass in the upriver areas. The statement was based on his conclusion that striped bass larvae survive better at salinites slightly higher than what currently occurs in the upriver areas. We concur that additional research may be needed on striped bass populations to determine the reasons for their decline, however, since the deepening project is likely to have little or no impact on striped bass populations we would have no reason to fund such studies.

4 salinity may improve habitat and survival for striped bass. We do not necessarily agree. There may be a need to further assess these fish requirements and further assess the reasons for their decline.

5 The feasibility study and the EIS have not adequately evaluated the effects of the extended dredging proposal from an ecosystem perspective. Habitat losses and modification over time have affected the Coos Bay ecosystem. The present proposal implies that the additional deepening and broadening of the channel would have minimal effect. The significance of the additional project requires a broader evaluation of the Coos Bay ecological system over time and space. This evaluation would provide the basis for evaluating the significance of the proposed actions. This evaluation would further lead to developing of mitigation goals and objectives.

6 A strong mitigation plan and monitoring effort are essential. Our Department's Fish and Wildlife Habitat Mitigation Policy, (OAR 635-415-0000, enclosed), requires adequate assessment of the habitat losses and determining its significance within the ecological system. We appreciate that the Corps will take steps to mitigate the immediate and short term impacts. We anticipate that the Corps will work with our Department to dredge within our recommended in water work period of October 1 to January 31. Yet, the long term impacts of habitat loss and impacts to the esturarine ecosystem needs further consideration. Habitat restoration and enhancement are critical elements to a mitigation plan to maintain the estuary as a deep water port and a functioning ecological system.

Thank you for the opportunity to comment. We welcome working cooperatively with the Corps to consider mitigation needs for Coos Bay.

Sincerely,

James C. Turner
Waterways Alteration Coordinator
Habitat Conservation Division

jct
ENC

cc: Patty Snow, John Johnson (marine), Neil Richmond, Jim Muck

5 The EIS included a discussion of the resources of Coos Bay from an ecosystem standpoint (see page 3-27 to 3-30). The impacts of the proposed project were also fully discussed in Section 4 of the EIS. The impacts of previous actions are referenced in the EIS as tiered documents, i.e., Coos Bay, Oregon Deep Draft Navigation Project SEIS, July 1975. The cumulative impact of the proposed 2-foot deepening on the Coos Bay ecosystem represents a relatively minor incremental change.

6 As indicated above, a thorough discussion of the impacts of the proposed project was provided in the EIS. Additional mitigation beyond avoidance of impacts was determined not to be necessary because of the extent of the impacts. In-water work timing has been coordinated previously and the dates listed on page 73 of the main report were agreed to by your agency. Dredging the channel during the winter is not feasible since adverse weather conditions would preclude safe operation of the dredges and ocean disposal.

Oregon

RECEIVED
JAN 5 1994
REG & ENV RES BR
DEPARTMENT OF ENVIRONMENTAL QUALITY

January 3, 1994

Department of the Army
Portland District, Corps of Engineers
PO Box 2946
Portland OR 97208-2946

Re: Coos Bay Feasibility Report/EIS

ATTN: CENPP-PE-RE

As stated in the Department's November 29 letter to General Ernest Harrell, we did not receive the Coos Bay EIS for review during the allotted review period. Please consider this letter our comments.

We have five general areas of concern with the Coos Bay Navigational Improvements Project, all relating to the levels of toxic materials in the Coos Bay: (1) the non-Federal dredging of the berthing sites from RM 10 to RM 15, (2) the transfer of potentially contaminated dredged material to RM 8.4, (3) the channel dredging from RM 8 to RM 12.5, (4) in-lane disposal of sediments at the mouth of the bay, (5) and the proposed upland disposal of contaminated sediments. The information on the levels of the toxics in the bay was taken from the EIS, DEQ's data from 1989 and 1991-1992 sampling, sampling and analysis for TBT by Glenbrook Nickel, and the 1993 "Tributyltin Levels in Coos Bay Sediment" by Jim Britton, USACE. 7

1. Sampling of water and sediment around the berthing areas from RM 10 to RM 15 shows levels of TBT, PCBs, and metals above accepted criteria. Specifically: at Bay Shore Dock, chromium and copper in sediment; at Hilstrom's, chromium, zinc, lead, nickel, PCBs, polynuclear aromatic hydrocarbons (PAHs), and total butyltins in sediment and TBT, copper, nickel, and zinc in the interstitial waters (all metals exceed acute water quality criterion); at Mid Coast Marine, chromium, zinc, lead, nickel, copper, PCBs, and total butyltin in sediment; and at Glenbrook Nickel, TBT in sediment. 8

   DEQ is also currently overseeing the clean-up of hazardous waste at three sites in this area, Hilstrom's, Chambers Oil, and Chevron Oil. (The EIS does not consider the impact of channel slumping on these sites when non-disturbance of sediments has been selected as appropriate at a site or when ongoing cleanup evaluations of contaminant levels are underway.)

811 SW Sixth Avenue
Portland, OR 97201-1390
(503) 229-5696
TDD (503) 229-6993

7 Several comments are related to dredging of berthing areas or disposal of dredged material from berthing areas. As discussed with Oregon DEQ staff, although dredging of the berthing areas are related to the proposed action and are appropriately discussed in the EIS as indirect or cumulative impacts, they are not part of the proposed Federal action. The sediment sampling suggested in the comments would be more appropriately comducted as a requirement under the Section 404 Regulatory Permit authority. Further, except for the Glenbrook Nickel dock, the berthing areas mentioned are not dependent on greater channel depth and are not proposed for dredging beyond current depths.

8 Bay Shore Dock is maintained at 30 feet, Hillstrom is maintained at 25 feet, and Mid Coast Marine (@ RM 15.0) does not require maintenance dredging at this time. Glenbrook Dock (formally Portland Dock) is currently maintained to a depth of 39 feet. Each of these docks except Mid Coast Marine has been evaluated for in-water disposal of dredged material under an 18 member joint USACE permit. Due to concerns regarding sediment contamination, prior to each removal action sediments are collected and evaluated from most of these 18 docks. Material was collected and evaluated in 1989, 1991, and 1993. Evaluations have included physical, chemical and biological testing in a tiered testing approach. Sediment evaluation of the privately owned berthing areas, docks, and property is the responsibility of the individual property owners.

Sediment samples were collected in 1993 from the proposed expanded turning basin at RM 12 by this office. Results of the 1993 sediment evaluation for this area as well as the Federal Channel will be included in Appendix D.

8 DEQ wants to be assured that the dredging at these berthing areas does not resuspend the contaminated sediments. Resuspension would make the contamination more available for bioaccumulation in the aquatic organisms. We recommend additional sampling at three sites: Chevron tank farm (RM 12.5), Hillstroms shipyard (RM 13.75) and the active Mid Coast Marine (RM 15), for chemical and biological parameters on a gradient from the docks to the existing channel to better determine the probable impact of the dredging.

(The EIS also mentions turning basin sites in this stretch that may be expanded. However, the location of these sites is not clear. Dredging at these sites may also resuspend contaminated sediments documented to occur in tidal areas of the bay. We also recommend cross sectional sampling work at the turning basin sites.)

9 2. Sampling in shellfish from RM 8 through RM 10 shows extremely high levels of TBT. The county health department, in conjunction with other agencies, is considering closing identified recreational areas to harvest and initiating the evaluation of TBT levels in commercial shellfish growing areas. This is the area of the proposed transfer site for sediment if weather prohibits going to sea. Again, we are concerned about the resuspension of contaminated sediments. We strongly recommend that sediment transfer not be allowed to this area.

10 3. We are also concerned about the channel dredging from RM 8 to RM 12.5 for the same reasons discussed in item number 2. We recommend additional chemical and biological sampling on a gradient from the shoreline to the channel to determine the extent of the contamination that may be resuspended during dredging.

11 4. The EIS addresses in-lane disposal of the sediments in the area of the jetties when bad weather prohibits the dredge from entering the ocean. We want this material to go out of the bay, outside of the jetties. In-lane disposal has been problematic in the past. Although the disposal is to occur on an outgoing tide, resuspension of the sediments can occur as they are being swept to sea. Also, if the tide does turn with the sediments placed at the jetties, the contaminants re-enter the bay.

9 As stated in USACE, Portland District's Federal Navigation Projects: The Oregon Coast Maintenance Program book (page 82), "Site 8.4 is used for sediment dredged from between RM 6 and RM 12 to reduce transit times and costs. Capacity of the site is limited, and, if time allows, material is often transported to ocean disposal sites E or F." The material placed at this disposal site is similar to and subject to the same environmental conditions as the material existing at the site. The material is sandy, low in organics, and uncontaminated. The fine grained material found above RM 12 is never placed at this site but is transported directly to ocean disposal site H.

10 The USACE evaluates material to be dredged from areas within the boundaries of its Federal projects or regulates material under its various regulatory authorities. The evaluation of material or biological community called for in comment 3 is beyond the scope of the project and authority of the USACE, Portland District.

11 Dredged material placed at the flow lane disposal site has been found to be suitable for unconfined in-water disposal. No contaminated dredged material that would cause an unacceptable adverse environmental impact is allowed to be placed at this or any other unconfined in-water disposal site.

5. The proposed upland disposal site for contaminated sediments is in the area of the Hilstrom's, Glenbrook Nickel, and Mid Coast Marine sites which have contamination as discussed in paragraph 1. Also, bass caught in this area show elevated levels of TBT. We are concerned that possible leaching of contaminants from the sediments in the disposal site would add to the already high level of contamination in the bay in this area. More clarification of the location of this site and proposed controls and monitoring is needed.

12

Any questions or comments may be directed to me at (503)229-6982.

Sincerely,

Barbara L Stifel

Barbara L. Stifel
Toxics Program Specialist

BLS:bls

cc: Ron Marg
Michael Rylko

12 The upland disposal site mentioned in the EIS was identified as a potential disposal site by the Port of Coos Bay. Actual use of the site by the Port or private dock owners would be subject to further evaluation and compliance under the regulatory review requirements.

(503) 731-4015
FAX (503) 731-4077
TDD-Nonvoice (503) 731-4031

Oregon

DEPARTMENT OF
HUMAN
RESOURCES

HEALTH DIVISION

January 14, 1994

Colonel Charles A. W. Hines
District Engineer
US Army Corps of Engineers
PO Box 2946
Portland, Oregon 97208-2946

RE: **Draft Feasibility Report of Navigation Improvements with EIS, September 1993, Coos Bay, Oregon**

Dear Colonel Hines:

Copies of Volumes 1 and 2 of the above draft report and Environmental Impact statement came to our office for review and comment in late September, 1993. Our office does not have regulatory authority or legal standing to impose regulation on this project, but we would like to alert you to a specific and serious concern that we have in Coos Bay. The ongoing dredge work and any future modification to dredging and maintenance operations will have impacts on this problem, and it will be very difficult at this point to predict what these impacts might be. It is a subject which should be addressed in the EIS, we believe.

13 There is a growing realization and concern in Coos Bay among environmental, wildlife and health officials about ongoing tributyltin contamination. Current Oregon and national standards relative to TBT have consisted of setting a legal limitation on the kinds and sizes of craft on which TBT-containing paints may be used. The assumption behind those regulations is that if we limit new contributions of TBT to waterways, environmental degradation of TBT will largely resolve the problem of environmental residuals. In some areas of the country this theory seems to be working. For reasons, largely unknown to us, these spontaneous reductions in TBT residuals (in water and in sediments) have not occurred in most of Coos Bay. Current testing is finding as much TBT as was found at the time the use restrictions were adopted in 1987.

Additional testing and characterization work is underway to better define the problem, identify the key environmental factors, and to characterize the environmental and human health risks that currently exist due to TBT.

Barbara Roberts
Governor

800 NE Oregon Street # 21
Portland, OR 97232-2162
(503) 731-4030 Emergency
(503) 252-7978 TDD
Emergency

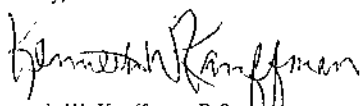
24-26 (Rev. 1-92)

13 See responses to comments from Oregon Department of Environmental Quality.

13 We are troubled by the fact that the draft EIS does not address the issue of tributyltin in any manner. We see it as a contaminant of key concern in the project and one that will be significantly impacted by maintenance dredging, deepening of shipping channels, storage and disposal of spoils, and resultant changes in flow dynamics due to the dredging work.

Please feel free to contact me if you wish to discuss this issue or this letter. Thank you for including our agency in your review process.

Sincerely,



Kenneth W. Kauffman, R.S.
Environmental Health Specialist
Environmental Services & Consultation Section
Center for Environment & Health Systems

KWK:ab

CC: Ron Hall, ESC, Oregon Health Division
Pam Blake, DEQ, Coos Bay Region
Neal Coenen, Oregon Department of Fish & Wildlife, Marine Region

OREGON INTERNATIONAL PORT OF COOS BAY
Front & Market Streets • Coos Bay, Oregon 97420 • Telephone: 503/267-7678 • Fax: 503/269-1475

November 22, 1993

Colonel Charles A. W. Hines
District Engineer
Portland District, U.S. Army Corps of Engineers
PO Box 2946
Portland, OR 97208-2946

Dear Colonel Hines:

The Oregon International Port of Coos Bay has reviewed the revised draft (August 1993) Feasibility Report and Environmental Impact Statement for the Coos Bay channel deepening project, and continues to support Alternative Two as proposed in the study. The Port greatly appreciates the extensive time and effort undertaken by the Corps to provide a clear and thoughtful analysis for public review. We offer the following additional comments for your consideration:

14 1. The Port had understood that the "Ship Simulator Study" would not be required for this project, and I believe that is the current understanding with the Corps. Unfortunately, the Feasibility Study still refers to the "Ship Simulator Study." The final report should clearly explain the fact that the "Ship Simulator Study" is no longer required, and should list the justification for its removal.

15 2. Our understanding of the offshore disposal site usage is that the deepening project will share the cost with operations and maintenance on a 50/50 basis. In turn, the Port, as local sponsor, will share on a 50/50 basis for the deepening project (because of the greater than 45-foot depth), so that the Port's effective share is 25 percent. The local sponsor would also, under the proposal, be required to provide a similar 25 percent cost share for the entrance channel work. Assuming these figures are correct, I believe a small clarification would be appropriate.

3. The entire project is now being very ably managed by Ms. Laura Hicks, and the Port feels very comfortable with the rest of the project team. I have been particularly impressed at the District's commitment to overcoming past mistakes by previous personnel, and the District's laudable success-oriented style. Given past problems from prior years that caused the project to slip significantly, the Port urges you to continue to give this project your highest priority for an expeditious approval. The Port stands ready to assist you in any fashion to enable the project construction to start on schedule and on budget in May, 1995.

STATE OF OREGON REPRESENTATIVE OFFICES

TOKYO, JAPAN
Phone: 81 3 213-3081/4
Fax: 81 3 211 8498

SEOUL, KOREA
Phone: 82 2 753-1349
Fax: 82 2 753-5154

TAIPEI, TAIWAN, R.O.C.
Phone: 886 2 723-2310,11
Fax: 886 2 723-2312

14 See response to letter from Mr. Vogel.

15 Noted, we will revise the text to clarify.

Thank you for the opportunity to comment. We urge your approval of the draft Feasibility Study and EIS so that the project may move forward.

Sincerely,

Allan E. Rumbaugh
General Manager

AER:dcb

cc Laura Hicks, Project Manager
Congressman Peter DeFazio
Senator Mark O. Hatfield
Senator Bob Packwood
Ports Section, Oregon Economic Development Department
Port Commission

OREGON
NATURAL
RESOURCES
COUNCIL

MAIN OFFICE

YEON BUILDING, SUITE 1050
522 SOUTHWEST FIFTH AVENUE
PORTLAND, OREGON 97204
503-223-9001

Protecting Oregon's lands, waters and natural resources

December 10, 1993

Colonel Charles A.W. Hines
District Engineer,
U.S. Army Corps of Engineers
Portland District Office
P.O. Box 2946 (ATTN: Stevens)
Portland, OR 97208-2946

RE: Final Comments, DEIS
Coos Bay Deep Water Dredging

Dear Colonel Hines;

The Oregon Natural Resources Council (ONRC) is a non-profit public interest organization dedicated to the protection of Oregon's lands, waters, and natural resources. We focus on a wide spectrum of natural resource protection issues, including forest health; sensitive, petitioned, threatened and endangered species; fish and wildlife concerns; water issues; wetland and riparian protection; and conservation of related resources. We have also been involved in preliminary discussions for a potential land exchange on the North Spit of Coos Bay involving numerous issues, multi-jurisdictional players and a comprehensive analysis of the ecology of the North Spit and Coos Bay area. We hope that the knowledge we have acquired in this endeavor will contribute to a more comprehensive understanding of the issues involved in this project.

16

We are extremely concerned that the Corps has based the adequacy of its preferred alternative on outdated assumptions and obsolete studies which fail to address major changes and new information since at least 1991. We are concerned that the Corps' rush to complete the FEIS by December 15 of this year to meet alleged fiscal budget constraints may divert the Corps from revisiting basic assumptions critical to the reassessment of project impacts and the possibility of project success. We strongly urge the Corps to reconsider its project purpose and need, as well as the alternatives analysis in terms new information presented in these comments.

A. The Economic Viability Analysis in the DEIS is Critically Outdated

17

At page C-12 of Volume II, the DEIS makes clear that the economic justification for channel deepening is based on favorable commodity projections for timber products (logs, woodchips, and lumber/paper/plywood) and nickel ore. The DEIS assumes that

Printed on 100% recycled paper (50% post-consumer waste) using soy inks

16

Several revisions have been made in the Final Feasibility Report and EIS based on your letter comments and subsequent meeting with members of Portland District staff. Most of these changes are in the form of clarifications of issues with modifications of some report text based on new information. These changes are noted in the following responses.

17

The reference is to page C-12 of Volume II. Concur that the paragraph indicates that economic justification is directly tied to commodity projections for timber products and nickel ore. It is also noted in the same paragraph that commodity projections are necessary inputs to fleet projections, which are directly related to project benefits. However, economic analysis indicates that potential growth in the size of vessels calling at Coos Bay can in and of itself provide economic efficiencies, due to the economies of scale.

sustained or increased exports and imports of these goods will account for "nearly all, if not all, of the shipments projected to be impacted by the channel deepening." The DEIS assumes that this
17 projected increase justifies project benefits. We question this assumption because most, if not all, of these imports and exports are not sustainable at levels reported in the DEIS. Rather, most of these commodities have markedly declined in the past two years and are not expected to increase or even recover in the foreseeable future.

1. The Nickel ore import market has collapsed.

Based on a 1991 feasibility study, the DEIS projected that new nickel ore imports would offset any decline in timber product exports (DEIS § 2.2). However, the nickel ore market collapsed in 1992. No shipments of nickel ore have arrived in Coos Bay this
18 year and the smelter used to process the ore has shut down as well. Market recovery is not expected in the foreseeable future and no new commodity has been identified to replace the loss of that market. Reliance on nickel ore to justify economic benefit now or in the foreseeable future, is no longer valid.

2. Timber product exports are in serious decline. Projections in the DEIS identifying timber products as a stable export base are grounded in predictions from outdated, incomplete or legally inadequate studies.

a. Vol. II at page C-18 of the DEIS relies on a U.S. Forest Service (FS) study from 1988 to predict that Douglas fir subregion harvest in the Pacific Northwest (PNW) will decline from its all time high in 1986-1988 (3.14 bbf/yr) through the year 2000, but will subsequently increase slowly out to the year 2040 as industry land and other private managed stands mature to offset the declining natural forests on our public lands. The FS study projects that the transition from natural stands to managed stands is expected to be completed in the PNW by the year 2010. However,
19 this study predates the listing of the Northern Spotted Owl, the Marbled Murelett and other recently listed or identified sensitive species. The federal mandates to manage for multiple uses and protect threatened and endangered species will continue to impact forest production as emphasis shifts from maximum cuts to habitat restoration and preservation. This new reality, prompted by years of non-sustainable timber harvests culminating in the late 1980's, is expected to drastically limit timber sales and exports throughout the PNW, including the Coos Bay area, for many years to come.

b. Vol. II at page C-21, discusses predictions formulated in May 1990 by a BLM/FS working group. The working group projected that federal timber for sale in Oregon, Washington and California, with owl set-asides as outlined in the Jack Ward Thomas Report, was estimated to decline from 5.0 bbf (average 1980-1988), to 2.6 bbf (projected 1995-2000), a 48% reduction. However, under Option 9 as currently interpreted, available federal timber for sale on

The comment also indicates that it "is assumed that sustained or increased exports and imports of these goods...will justify project benefits." In fact, the projections vary by
17 commodity. Log exports are projected to decline; woodchips, paper, and plywood are projected to be sustained; and lumber exports are projected to show slow growth. These projectons are summarized on page C-31, Table 10, of the Economic Appendix that accompanied the DEIS.

Actually, nickel ore has been imported and delivered to the Glenbrook Nickel site at Coos Bay this year. The Economic Appendix has been revised to discuss the current decline in the nickel market, and to address the expected recovery. In the last 30 years, prior to the current market decline, there have been two nickel market declines. One occured in 1975, the other in 1982. Glenbrook officials indicated that it took them 18 months
18 to two years to recover from the historical declines. They have indicated that they anticipate starting up operations again in 1994. Forecasts by nickel experts indicate that there should be a slight deficit in the nickel supply and demand balance in 1994, with a strong deficit in 1995, to fuel the recovery of the nickel market.

It should also be noted that a sensitivity analysis has been added to the revised document that shows the impact of various levels of nickel ore imports, to provide decision-makers an indication of the sensitivity of the project benefits to assumptions about nickel ore, as well as the other commodities.

The description of timber commodity projections in the subject appendix recognizes the complexity of making projections in a changing environment. Page C-30 of the appendix in the DEIS notes that: "This overview of existing information demonstrates the complexity of the issues surrounding projections of timber product exports at this time. It also demonstrates some variabilitiy in expert opinions about future scenarios." Despite the variability, future projections are a required element in
19 this study. The specific citations in the ONRC comments reference studies that were provided in the economic appendix to help the reader (and decision-makers) understand the issues, and also to see the variability in the conclusions reached by various analysts. It is clear that the timber commodity projections are not made in a static environment. On pages C-31 and C-32, commodity ranges are discussed as a vehicle to account for some of the variability that may occur: "As discussed throughout the section on timber export projections, several potential future conditions may occur....Because of the potential for changes in future commodity tonnage movements, a risk and uncertainty analysis has been developed for these timber-related commodities."

federal lands in Oregon, Washington and California would not be 2.6 bbf, but only 1.0 bbf (plus or minus .2). This represents a reduction of 80% from the historic excess levels of 1980-1988. FS/BLM timber harvest information from May 1990 is no longer adequate for predicting economic feasibility and benefits of future timber product exports. This is especially true because the Ninth Circuit found that both the BML's and FS's 1990 management plans were legally inadequate.

19

Page C-23 of Vol. II goes beyond the above 1990 information by discussing the Forest Services "recently issued" 1992 EIS on the spotted owl. The document states that adopting the Jack Ward Thomas Plan will reduce harvest levels 27 percent to 3.5 billion board feet in 1995 from all national forests in Washington, Oregon and California. As stated above, allowable cuts under Option 9 are only about 1 billion board feet, far lower than the 2.6 bbf quoted by the FS in 1990 and the 3.5 bbf quoted by the FS in 1992. The 1992 FS EIS was also successfully challenged for legal adequacy as the Ninth Circuit found that it violated federal laws.

The DEIS update continues with a discussion of the BLM's 1992 forest plans. The DEIS states:

> The Bureau of Land Management (BLM) has not yet defined its spotted own management plan. It is possible the BLM will obtain an exemption from the requirements of the Endangered Species Act for 44 timber sale units in Southwest Oregon, which account for 30 percent of 1991 BLM sales. For the long run, BLM has proposed a draft "owl preservation plan" that would reduce or eliminate protection for large parts of the owl's habitat and allow logging to go forward in an attempt to reduce economic costs of owl preservation.

20

Id. at C-23. BLM's ESA challenge failed for all but 13 of the 44 sales. As of this writing, none of the 13 sales have gone forward because the BLM has yet to produce a legally adequate owl plan. Its "owl preservation plan" was soundly rejected as bad science in 1992. None of the above FS or BLM projections can therefore be used to justify high, sustainable timber cuts for export from Coos Bay. The Corps must reevaluate its timber export projections based on current information under Option 9, with an additional view to the ever increasing evidence of logging-related damage to fisheries in the PNW.

c. The DEIS states at C-12 that actual wood products export projections selected for use in the analysis are based on information from the U.S. Forest Service which predicts that "lumber exports will show slow growth over the forecasted horizon of 1996-2046." Compare this finding with new information now available under Option 9 which predicts outright decline, not "slow growth." Consider also recent information stating that the Forest Service has routinely suppressed scientific information on

A sensitivity analysis has been added to the revised document that shows the impact of various levels of timber product exports, to provide decision-makers an indication of the sensitivity of the project benefits to assumptions about timber product exports.

20

Additionally, information excerpted from "Forest Ecoysystem Management: An Ecological, Economic, and Social Assessment Report of the Forest Ecosystem Management Assessment Team" (FEMAT report) Appendix A, dated July 1993, has been included in the section on risk and uncertainty. It addresses the most recent estimates of timber harvests, including Option 9 (the preferred alternative in the FEMAT Report).

analyzed in the EIS. Marsh v. Oregon Natural Resources Council, 109 S.C. 1851 (1989). The Corps has the opportunity to supplement the DEIS to update old options which may no longer apply. The Corps should take this time to cure the DEIS before making any final decisions.

20

B. Other Assumptions in the DEIS

1. Inadequate Water Supply

The DEIS states at § 2.2 that the area has an adequate water supply to accommodate uses and development triggered by the deep water dredging. However, our investigations show that the area has few, if any, viable alternatives for increased water supply and that using water from the Oregon Dunes NRA is not one of those alternatives. This likely water shortage also undercuts the assumption that BLM land on the North Spit will soon be exchanged to allow the development of a deep water industrial port. Inadequate water resources to sustain new or expanded marine industrial infrastructure also undercuts the need for the preferred deep water dredging alternative. We have submitted our comments to the Forest Service on the proposed diversion of water from Beale Lake to support this claim.

21

2. Impacts on Fisheries and Aquatic Habitat

The DEIS at § 2.2 correctly states that fishing is one of the primary economic resources for the Coos Bay area. This statement assumes that Coos Bay has an adequate supply of fish to sustain commercial and recreational fisheries into the future. However, new information shows a dramatic decline in fishery resources which now threatens the economic viability of the local fishing industries. The bay population of starry flounder shows a population decline over the past 5 to 8 years. Many salmon species are now in rapid decline and Coho have recently been petitioned under the ESA. Although not yet protected under the ESA, NEPA requires that a federal project not further impact a petitioned species. The benthic community at the dredge site is also doomed. One particular clam species, Tresus, is in danger of local extinction and the dredging would definitely constitute habitat loss over the short and possibly long term. The Corps needs to reassess the project's potential environmental impacts on the Coos Bay fisheries and marine habitat.

22

3. Shoreline and Bay Erosion

The DEIS states at pages 47 and 49 in two cursory sentences that the proposed deep water dredging will have no serious or lasting effect on shore erosion. We respectfully disagree with this non-analysis. Delane Munson, the first Director of the Sough Slough Estuarine Sanctuary, determined that dredging of the channel into South Slough near Charleston has caused a measurable increase in tidal fluctuations in Sough Slough. There, Munson documented that increased dredging has caused the high tides

23

21 The DEIS statement in Section 2.2 is referring to current water supply sources and their adequacy to meet existing and projected port operations as described in the feasibility report. Additional new water sources would not be required.

22 Chapters 3 and 4 of the DEIS discuss anadromous fish (including coho salmon) and their habitats. The primary issue regarding impacts to these species from dredging operations is removal or disturbance of their food sources, principally benthic invertebrates. As stated in the DEIS, some impacts to benthic invertebrates would occur during initial dredging with species recolonizing rapidly following dredging. We have concluded that the proposed 2-foot deepening would not likely have an adverse impact on anadromous fish species, including coho salmon.

became higher and the low tides lower, as compared to historical tidal levels. Such increases can be expected to occur with each incremental increase in channel depth and width. The movement of progressively larger volumes of water into and out of the estuary an impact on salinity, wave action and beach erosion, and inundation of adjacent wetlands and marshes.

Studies of the shorelands on the east side of the estuary near the # 12 buoy, for example, show the presence of offshore stumps of old growth spruce trees, now sitting ten meters from the current line of permanent vegetation. Some of these stumps were WITHIN the zone of permanent terrestrial vegetation as recently as 1978. Requests for permits (including emergency permits) for rip rap in this area have also escalated substantially since 1983, as local residents and/or property owners struggle with the problems of increased shoreline erosion. This increased shoreline erosion has several sources besides channel dredging, including poor land management practices carried out by the land owners themselves. However, all direct and indirect impacts of dredging on shoreline erosion must still be addressed.

23

Further, the introduction of Ammophila arenaria (European beach grass) (EBG) by Oregon Department of Transportation has led to the interruption of the historical sand stream which continually brought wind-borne sediments from Pacific beaches on the west side of the North Spit. The sand historically moved eastward across the spit and into the estuary, where some sediments were carried by water transport onto the beaches on the eastern shore of the estuary. This replenished the shoreline lost to erosion (mainly during winter storms).[1] While the introduction of EBG has been responsible for increased erosion on the east shore of the estuary for some 50 or 60 years, the increased erosion due to the channel dredging is, of course, more recent. Observations of the geomorphology of the eastern shore of the North Spit (including comparisons with older aerial photos), show that the sand stream traveling into the estuary from the Pacific beaches, while substantially reduced due to exotic vegetation, is still a potential factor in offsetting the erosion on the east shore of the estuary. But this potential source of material to counteract the effects of beach erosion is largely trapped by the channel, acting as a "sediment bowl," and now reaches the shoreline in reduced quantities. Deepening and widening the channel will further reduce this sediment stream from the North Spit to the east shore. This will further increase erosion, thus having an additional "social impact" not addressed in the DEIS. This will probably further impact habitat for one or more threatened, endangered, or sensitive plant taxa (discussed below).

[1] In the area east of the # 12 buoy, the region of such unconsolidated sediment, which constitutes essentially the 100 year flood plain, extends over approximately 200 meters to where the bedrock emerges above sea level (under Cape Argo highway). This is the area mentioned above where erosion of up to %5 of the 200 meters of unconsolidated sediment has occurred since the channel deepening of 1978-79.

Shoreline erosion in Coos Bay results from a variety of factors as you have indicated, most of which are unrelated to the navigation channel, such as wind generated waves, cyclical climate changes, shoreline developments and land use changes. We concur that one of the contributing factors is ship-generated waves. We do not conclude, however, that the proposed 2-foot deepening would add to this source of erosion. The deepening would allow the existing fleet to load deeper and navigate the channel more efficiently but would not, in itself, lead to more commodities and more ships. Increases in tidal fluctuation from the proposed deepening and resulting increase in shoreline erosion are also not likely. From a purely physical standpoint, the change in the cross-sectional area of Coos Bay from deepening the channel by 2 feet is so small as to be negligible. The South Slough experience which you have cited represents a much larger change in cross-sectional area as channel depths were increased from an average of 10 feet to 17 feet within a much smaller area. Attempting to calculate any increase (or decrease) in tidal fluctuation based on a 2-foot depth increase is beyond the capability of available physical or numerical models.

23

4. Biological Impacts of Dredging

The DEIS states at page 22 that no federally listed species will be impacted and that all federally listed fish stay out of the estuary. Coho, likely to be listed soon, are commonly found in the estuary. In addition, four federally-listed threatened or endangered birds (brown pelicans, peregrine falcons, bald eagles and Western snowy plovers), and at least one endangered plant are found on the North Spit of Coos Bay. The Spit has been found to support the largest numbers of snowy plovers on the Oregon coast. We trust that the DEIS will incorporate the comments and recommendations of the U.S. Fish and Wildlife Service in their entirety, including the Service's recent Western snowy plover Recovery Plan.

The "Biological Impacts" section of the DEIS did not address the issue of protected plant species potentially affected by this project. Most significant of these is Cordylanthus Maritimus ssp. palustris, Saltmarsh Birdsbeak, a federal candidate species and a state listed species which has significant populations in the estuary below the railroad bridge and one significant population in the North Slough, just north of the bridge. In addition, the federal candidate species Abronia umbellata ssp. breviflora has historical habitation in the estuary and is a candidate for re-introduction to suitable habitat. Limonium californicum (recently added to Oregon Natural Heritage Program's List # 2), also has significant populations at several locations in the estuary below the railroad bridge. All of these species live in portions of the tidelands and/or marsh where they will be strongly effected by even minor changes in 1) salinity, 2) tide level and/or 3) wave action. One or more of these plant species live in areas which are relatively protected by wave action. They appear to need the higher salinities characteristic of the lower estuary, while they are vulnerable to wave action from storms and ship traffic. It seems likely that these and other marsh plants WILL be affected by the proposed project. This issue needs to be addressed.

24

The DEIS acknowledges in Vol. 1, page 48, that there will be effects on salinity, but determines that such effects will be "negligible." This conclusion can not be substantiated without reference to impacts on the above referenced threatened, endangered or sensitive plants which will be affected by changes in salinity, tide levels, wave action, and land use patterns in consequence of this proposed action.

5. Impacts from Induced Land Use Changes

1. The DEIS must address indirect impacts of growth inducing effects related to changes in land use patterns, changes in population density, and indirect adverse effects on air and water as well as the ecosystem. We would like to elaborate on this issue when we sit down together.

25

The DEIS (now FEIS) addresses the effects of the proposed channel deepening on salmonids utilizing the Coos Bay estuary, including coho salmon. The Federally-listed birds are also discussed in the FEIS. Biological Assessments were prepared for these species with a determination of no effect. The USFWS has provided a letter concurring with our determination. Refer to Exhibit 7.

24 Cordylanthus maritimus palustris and Limonium Californicum are not a listed species per Endangered and Threatened Wildlife and Plants, 50 CFR 17.11 & 17.12, August 29, 1992 or on a more recent list from USFWS. Abronia umbellata ssp. breviflora is also not listed and does not occur in Coos Bay to our knowledge. Their status as species of concern is recognized and they are discussed in the EIS. As stated in the EIS, the proposed channel deepening would not adversely affect these species as no perceptible change in ship-induced waves, salinity or tide levels is anticipated. See additional discussion in Section 4.1 of the EIS.

25 Topics related to land use, growth and population are discussed in Sections 3.5, 4.5 and 4.7 of the EIS.

6. Benefits of the No-Action Alternative

In addition, the DEIS should address the possible benefits to the environment under a no-action alternative. This should include a discussion of benefits if channel depth, ship traffic, land uses and dredging activities remain essentially the same unless and until updated studies show renewed economic feasibility and public need for channel deepening and widening in Coos Bay.

26

We have some news clippings for the file which will better explain the comments in this document.

Thank you for your patience and cooperation. We look forward discussing these issues with you soon.

Sincerely Yours,

Lyn Mattei

Lyn Mattei
ONRC Land Use Coordinator

C:
Andy Kerr, Oregon Natural Resources Council
Dr. Ray Noland, Cape Argo Audubon
Dennis Phillips, Biologist
Liz Frenkel, Oregon Chapter Sierra Club
Mike Graybill, South Slough National Estuarine Reserve
Alice Pfand, Kalmioposis Audubon
Wally Johnson, Oregon Shores Conservation Council
Dick Vander Schaff, Nature Conservancy
Ron Garth, U.S. Fish and Wildlife Service

26

The effects of the no-action alternative (also described as the without-project condition) are discussed in Section 3 of the Main Report, Section 2 of the EIS and in the Economics Appendix, Volume II.

Southern Pacific Lines

P. Reilly
ice President and
hief Engineer

Southern Pacific Building • One Market Plaza • San Francisco, California 94105 Room 1007

File No.

November 11,1993

Colonel Charles A.W. Hines
District Engineer
U.S. Army Corp of Engineers
Portland District
P.O.Box 2946
Portland,Oregon 97208-2946

Dear Sir:

On behalf of the Southern Pacific Transportation Company, I am writing to comment on the Feasibility Report/EIS for the proposed navigation improvements at Coos Bay, Oregon.

As you are aware, the Southern Pacific Transportation Company (SPTC) North Bend Drawbridge is within the limits of this project. Deepening the channel near the bridge piers and fender system has the potential to cause deterioration in the bridge support structure. Previous channel dredging caused undermining of the south rest pier. Further channel lowering could have serious consequences for the pivot and north rest piers.

27

Also, despite the statement on page 33, the railroad bridge has been struck at least four times since 1987. The encouragement of larger vessels in this waterway seems to be at odds with the known hazards of traversing the railroad bridge crossing.

Therefore, the SPTC Bridge Department opposes any deepening of the existing channel until it is satisfied that there will be no negative effects on our structure.

If you have any questions regarding these comments, please call either myself (415-541-1504) or Mr. Roger Boraas of my staff (415-541-1493).

Sincerely,

K.L. Wammel

Kenneth L. Wammel
Engineer-Structures

** TOTAL PAGE.001 **

Based on current survey information, modification of the channel as proposed would not require dredging in the vicinity of the bridge piers. The existing channel bottom through the bridge opening is already at or below the deepening level. While it has been an issue, we cannot agree with the conclusion that previous dredging had caused undermining of the south pier. The reference to the number of accidents at the bridge will be revised, but it is noted that there have been no accidents involving deep draft vessels. Deepening the channel by 2-feet, as proposed will allow some deeper draft vessels and/or loading of existing vessels to a deeper draft. A significant increase in the size of vessels above those entering today would not be expected to result. While it is acknowledged that there are risks with the clearance through the bridge, the Coos Bay pilots' established procedures and policies to assure safe navigation through the bridge will continue under the proposed project and there would be little increased risk.

27

November 15, 1993

Colonel Charles A.W. Hines
District Engineer, Portland District
U.S. Army Corps of Engineers
P.O. Box 2946
Portland, Oregon 97206-2946'

TRANSMITTED BY FAX THIS DATE
ORIGINAL BY MAIL SAME DATE

Dear Col. Hines;

This letter is in response to the request for public comment regarding the Draft EIS and Feasibility Report: Coos Bay Oregon. My interest is as the former General Manager of the Oregon International Port of Coos Bay, and my lingering personal and professional desire to see the Coos Bay Project completed.

There is nothing contained in the Draft EIS and Feasibility Report to suggest that the Coos Bay Project has lost any degree of feasibility, national or local interest and benefit. In fact, just the opposite appears to be clear. I wish to comment on three areas of concern.

28 1) As you know, that has not always been the case, and this project has suffered at times due to the changes in the manner by which the Corps performs Local Cost Shared projects. Many of those issues have been resolved and the study is nearly ready for approval by the Board of Rivers and Harbors, prior to submission to Congress for Authorization and Appropriation. I appeal once again, however, for the Corps to give discretionary review of this project in light of the many obstacles and issues which have hampered timely progress and were NOT the fault of the local sponsor.

29 2) Furthermore, I am concerned that the issue of a Ship Simulator study or Model has not been conclusively stricken from the body of the report. There was prior agreement that such would occur. That was reneged, then a Global Positioning Study was performed. It is my understanding that the results of that Corps study confirmed what the local sponsor and local maritime interests have maintained consistently throughout : that the swing span railroad bridge is not a navigation obstruction which needs to be studied or otherwise addressed as an element of this project. I strongly urge the Corps to permanently strike all open-ended reference to the star-crossed Ship Simulator Study notion, and rely instead upon the satellite-based data and charts.

30 3) Also under the heading of "Costly and Unnecessary" seems to be the notion of a supplemental EIS to deal further with offshore disposal. It is suggested that such further study be performed during the PED Phase. It is my view that the existing Draft EIS is complete and comprehensive enough that such further study is unnecessary, costly, and further jeopardizes the timely completion of this Channel Improvement Project. The estimated additional $100,000 will not bear any conclusive new results and could even be addressed as part of on-going O&M research and planning. Please do not continue to jeopardize this project for the wrong reasons. Certainly the capability and authority exist within the Corps of Engineers to designate the off-shore disposal site with approval of this study. I strongly urge you to do so, in the national interest of moving this project forward in a timely and cost-effective manner.

31 Perhaps it is untimely, but please allow me to take this opportunity to once again point out that the southern tip of the North Spit of Coos Bay continues to erode, threatening the

28 Your comment will be included in the final package which goes forward for review. We will do everything we can to assure the project stays on schedule.

29 This past summer Waterways Experiment Station (WES) conducted Differential Global Positioning System (DGPS) Survey on ships navigating in Coos Bay. As a result of the DGPS, WES concluded there was not sufficient indications of significant navigation impact to warrant a simulation study concerning the proposed additional two feet of ship draft. This conclusion was supported by the Portland District. Before the reference can be stricken from the report,however, the District must be granted a waiver by HQUSACE from the ship simulator model. To date we have not received such a waiver.

30 A supplemental EIS (SEIS) is included in the PED schedule and cost estimate in the event it is determined through review that the EIS does not provide sufficient information to designate the off-shore disposal site. After all the comments are received the need for a SEIS will be recvaluated.

integrity of the federal jetty project at the mouth of Coos Bay. The concept of beach nourishment to stabilize the documented erosion process is not included in this project,the
3| construction of which will generate hundreds of thousands of yards of suitable resource material. I raise the issue not as a request for this action to be included in the project EIS or Report, simply to once again go on record as having raised it to the attention of the Corps of Engineers at the District, Division, and D.C. Headquarters levels.

In summary, thank you for the opportunity to comment as an interested member of the public. I strongly urge the Corps of Engineers to approve the Draft EIS, designate the off-shore disposal site within the study approval, and eliminate any future confusion regarding Ship Simulator Studies at the railroad bridge by clearly stating that all previous and contemporary data render it unnecessary.

Sincerely,

Paul W. Vogel
16760 SW 108th Avenue
Tigard, Oregon 97224

cc: Oregon International Port of Coos Bay
U.S. Representative Peter DeFazio
U.S. Senator Mark O. Hatfield
U.S. Senator Bob Packwood
Ports Section, Oregon Economic Development Department

3| As you mentioned, this is a separate Operation and Maintenance (O&M) issue. Our Operations Division is evaluating this situation and will take appropriate action under their O&M authority.

RECEIVED
NOV 15 1993
REG & ENV RES BR

Rudy Gorsch
Rt. 2 Box 2155
Coos Bay, Ore.
97420
1-503-888-5327

To Steve Stevens
U.S.Army Corps of Engineers

Sir;

My concern with the deepening of the Coos Bay channel is environmental and the cost.

32 On the environmental end, will the added salt water bring unwanted changes in the aquatic life of the bay?

33 The crab in the bay may find it easier to feed on the oysters planted at and above the North Bend bridge.

34 The gaper clam will have a better set with the higher salt content. Will the gaper clam overpower the other types in the upper bay?

35 Mud shrimp are found in the higher salt content of the lower tide zone say plus 2 feet down to 30 feet deep at Rocky Point. They do not need any more help.

36 Water in the bay that is loaded with silt may cause a problem with crab larvae that are in the bay in spring and summer. Buy early fall the crab are around the 1 inch size and a little harder for fish to eat.

37 Blasting of any type at buoy 7 to 10 and at buoy 16 is a great fear of mine. Both areas have seed beds of commercial clams (gaper,butter, and littleneck). All are dug tidally buy sport diggers as well. The lose at Charleston Channel buoy #1 (Cribs) was between 3 and 10 million pounds in the blasting that was done in 83-84 to deepen the Charleston Channel. At todays price that is in the millions of dollars lost to the fisherman. The fishing boats had 2 to 4 man crews and a home based sales force. Add to that a state poundage fee of .006 cents per pound and the income tax, you don't get to great an picture.

The cost is the other factor. I have no doubt that the port will find the money to do the job. The port will put use deeper in ddt for a project that will cost use more jobs and add to the cost to maintain. Wood products of any type will have to drop in the next few years to much lower levels than now. The copper ore will be gone in 2 years or so says the export company. What shipping will be need our nice deep channel then? The railroad may close the line down coming to Coos Bay (planed by Southern Pacific as a down sizing measure).

32 As indicated on page 4-17 of the EIS, only minor changes are expected in salinity and then only in the upper portions of the Bay. It is unlikely that these changes will be of sufficient duration or magnitude to effect the aquatic life of the Bay.

33 The proposed 2-foot channel deepening would not effect the distribution or feeding habits of crabs in the Bay.

34 As previously indicated, the only salinity changes predicted to occur are in the upper reaches of the Bay where gaper clams do not occur.

35 See previous response for salinity changes.

36 Dredging the channel will not increase suspended sediment loads in the Bay to any extent.

37 No blasting is currently planned for channel deepening. Rock will be removed by mechanical means.

These are some of my concerns as to why I am asking for a public meeting or hearing that will force the disclosure of information so the people can see the real cost of this project. I ask that it be held in Coos Bay. I ask that information use as bases for this project be sent the me so I can make sure the information is correct.

38

TRULY
Rudy Gorsch

If our responses to your comments do not fully address your issues, please contact Alan Rumbaugh, General Manager of Oregon International Port of Coos Bay, to discuss any further need for a public hearing.

38

RECEIVED
NOV 15 1993
REG & ENV RES BR

Wim de Vriend
573 South 12th
Coos Bay, OR 97420
(503) 267-6177

November 10, 1993

Department of the Army
Portland District, Corps of Engineers
P.O. Box 2946
Portland, OR 97208-2946

Dear Sirs: CENPP-PE-RP - Coos Bay Channel Deepening Project

I have reviewed your draft *"Feasibility Report On Navigation Improvements"* for Coos Bay, Oregon.

I am not an engineer but a local resident who has studied the operations of the Port of Coos Bay for some time. I have no quarrel with the report's recommendation that the Coos Bay channel be deepened by two feet, but I feel some aspects of this project have received insufficient consideration. The first one may be minor: the effect of the channel modifications on downtown Coos Bay. The second one is the need to take a bigger view of the industrial layout of the area and to consider modifying the channel project accordingly.

1. Most of the downtown area of the city of Coos Bay was built on filled mud flats. It is common knowledge that for many years, the ground in this part of town has been sinking around the buildings, with the latter staying in place since they rest on pilings. Repairs of streets and sidewalks have obscured much evidence of sinking ground, but observable examples remain: I would cite the sharply tilted sidewalk along the first block of North Broadway; a large broken conduit on the left front of the old city hall, with a gap of three inches; sunk ground, separated from the building of Dr. Uno on Commercial, and similar phenomena all around Blossom Gulch School.

39

The explanation I have heard for this phenomenon is that subterranean layers of muck are being squeezed out into the deep shipping channel, which runs immediately along the Coos Bay downtown waterfront, and that this is one of the reasons why regular maintenance dredging of the channel is needed. If this is so, one would think the process may get worse if the channel is enlarged as proposed. If further settling occurs it is bound to have costly impacts on public streets and utility lines in Coos Bay, but I don't see any consideration of it in the environmental impact statement

2. If enlarging of the upper bay channel is inevitable, some further settling of downtown Coos Bay may be a fact of life. But I'm not sure of the inevitability of enlarging all of the present channel. The report, while very complete in some aspects, is short on considerations of harbor topography and planning. For instance, on page 2-2 of Volume I, the authors state:

40

In 1987 the Portland District Corps of Engineers contracted the services of Geotechnical Resources, Inc., to addresses this possibility. They produced a report titled "Analysis of Relationship Between Dredging and Subsidence Along the Coos Bay Channel". The conclusions of that report state, "Based on the information developed during the field program, slope stability analyses, and our conversations with private and government entities along Coos Bay waterfront, it is our overall conclusion that dredging within the limits of the navigation channel has not contributed to slope instability or subsidence of the landward slopes west of the navigation channel. It is also our opinion that deepening the channel by about 8 feet, from elevation -35 feet to elevation -43 feet MLLW, will not adversely affect the stability of the landward slopes west of the navigation channel.

39

"Raising the highway bridge and widening the Southern Pacific Railroad bridge proved to be prohibitively expensive and could not be economically justified. Dredging a shorter channel could not be economically justified as, at present, most facilities requiring a deeper channel are concentrated along the upper reaches of the authorized channel, between RM's 12 and 15. Moving existing facilities and attendant infrastructure from the upper channel reaches to the lower bay would likewise be prohibitively expensive. Development of additional deep-draft facilities in the lower bay could not be justified in the foreseeable future."

Nowhere in the report's two volumes do I find information to back up these assertions. Without such data, one is left with the impression that things must stay as they are because they always have been.

To start with the idea of "raising" the McCullough bridge: this implies that the height of the bridge is starting to be a hazard to the superstructure of ocean vessels, as perhaps was demonstrated by the collision of a few years ago. If this is the case, it would argue for a shortening of the channel.

Furthermore, it is well known that the 1917 SP bay bridge only has a couple of years of useful life left. Such statements have been made by the railroad company itself, and I have heard this was the reason why the SP placed a limit of a few years on its service to the Hal-Buck copper ore export facility at Central Dock. I also note the railroad's statement that past channel dredging has already undermined the bridge supports. (Volume II of the report, page I-37).

40

According to a recent estimate by the Port of Coos Bay, it would cost $40 million to replace the SP bay bridge, plus another $1.75 million to replace a smaller SP bridge over Coalbank Slough. The SP is on record as unwilling to pay these expenses, an understandable attitude in view of the low volume of traffic on the line. Chances also seem slim that the taxpayers will buy new bridges for the railroad. (Besides, the bridge at Coos Bay is not the only old structure on the branch line. There are numerous other bridges and trestles, along with nine tunnels.)

If the bridge goes, so does railroad service along the present Coos Bay waterfront. Not assessing the consequences of the coming discontinuance of rail south of the bay may appear like severe myopia to future observers. Granted that not all ship loading facilities require rail service, some do. With the increasing emphasis on container service in large ports, small ones like Coos Bay may see more bulk cargoes (like ore) diverted to them. Such cargoes are most economically shipped by rail. Assuming that the SP branch continues to operate under the present, non-union lessee but its bridge is abandoned, then the future railhead will be on the North Spit, not in Coquille as at present. This will require the construction of a sorting yard on the North Spit, a perfectly feasible move.

41

Farsighted planners should consider tieing in to this with the construction of several ship berths (and dockside rail extensions) on the Port's North Spit property. These berths

In 1987, during earlier reconnaissance studies, these potential measures were considered. The cost of reconstructing the RR bridge was then estimated at $27.8 million and found not to be feasible in terms of benefits to navigation. This information is presented in Section 1, page 4 of the main report. No estimate is currently available for the cost of raising the McCullough bridge nor was an estimate generated at the time. This will be clarified in the text. Raising that bridge would not be feasible in that although the pilots must be diligent in passing under the bridge it does not impose a constraint on deep draft navigation as was considered in the case of the RR bridge. This would be the case even with vessel fleets projected for the future under this study.

40

Detailed studies were not made with regard to moving facilities and shortening the channel. However, while future expansion of port facilities to other areas such as the North Spit may be possible there were no firm plans for such development that the Corps could include in its analysis. Even without detailed analysis it does not appear possible that the cost of relocating the existing facilities from above the bridge to new locations below would be comparable with the cost of this deepening project. The total project cost of the preferred 2-foot deepening plan is just over $13 million. Of the $11 million construction cost, almost $8 million would be expended on the channel up to the bridges, or 70%. Excavating rock in the lower channel is more than 1/2 of that cost. The remaining $3 million could not begin to cover the cost of moving facilities. For instance, the new Glenbrook nickel ore facility alone cost over $30 million to construct at the Pierce dock. This cost was mentioned in the report. In addition, new facilities on North Spit would require the dredging of new access channels with potential for more rock removal, berths, and a turning basin through previously undisturbed areas. There would be additional environmental concerns and potential mitigation involved as well.

41

About one-half of the maintenance dredging at Coos Bay takes place at the entrance. The cost of maintaining the upper channel is about $1 million per year on average. The present value of the maintenance, at 8 1/4% Federal interest rate, would be about $14 million. The cost of relocating the facilities would not be offset by the combined upper channel construction and maintenance.

could be leased to the present operators of dock facilities in the upper bay, thus enabling a shortening of the channel. I would also think the Port of Coos Bay would like to turn its vacant North Spit land into a revenue-producer.

The Corps should bear in mind that Coos Bay's concentration of shipping docks in the upper bay is historically based; that's where most of the (vanished) lumber mills were located. Besides, the long-term trend has been to shorten the dredged channel. In the 1950s, for instance, ocean freighters were able to dock at the McKenna/Coos Head mill up Isthmus Slough.

It would seem that a further shortening of the shipping channel could achieve enormous cost savings for the taxpayers. If the new 37-foot channel stopped near the McCullough bridge, the cost of relocating upper-bay shipping operators to the North Spit could be subsidized out of funds freed by cutting the cost of the proposed deepening project in half. Additional future dredging expenses would be avoided by cutting annual maintenance, which, I believe, costs around $5 million a year.

41

It seems to me that the Corps should explore the costs and benefits of such developments in some detail, particularly the extent to which future savings in dredging could help pay for the changes I outlined. Such calculations should take into account that the properties of present shipping operators in the upper bay would not lose all their value. Some could still be used for industrial projects, while others could be developed for waterfront commercial purposes and use by shallow-draft vessels, commercial as well as recreational.

Coos Bay's potential for recreational development along the waterfront has always been frustrated by the presence of industrial facilities, and particularly by the railroad. Once these barriers are gone, the town would do very well. The same would be true of North Bend. As an illustration, the Sun Plywood plant on the North Bend waterfront has been vacant for several years, and no one has shown an interest in reviving the old mill. Recently, however, there has been a proposal by the Coquille Indians to turn the site into a gambling casino - obviously not a water-dependent industry. But perhaps this is the way the world is moving, and the Corps should take heed.

It disturbs me that the Corps has summarily dismissed all such considerations from its report. All I see are assertions that changes along these lines would be "prohibitively expensive". I don't doubt that they would cost a lot of money, but so would deepening and maintaining the entire 15-mile channel. I sincerely recommend that the costs associated with the relocation of shipping facilities be explored, so the Corps and local officials can make a more informed decision.

Very truly yours,

Wim de Vriend

cc.: Port of Coos Bay

EXHIBIT 4

SECTION 103 EVALUATION

SECTION 103 EVALUATION
OCEAN DISPOSAL SITE USE
COOS BAY CHANNEL DEEPENING

INTRODUCTION

This evaluation addresses ocean disposal and site expansion actions related to the proposed Coos Bay navigation channel deepening and maintenance dredging as provided by EPA regulations (40 CFR 228.4(e) (2)). Specific actions addressed include, disposal of sandy material within an expanded area replacing existing Site F, disposal of fine-grained material at existing Site H and one-time disposal of rock for the channel deepening. Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA) requires that all transportation of dredged material with the intent to dispose the material in ocean waters be evaluated for environmental effects prior to making the disposal. This evaluation assessess the effects of the discharge using the criteria set forth by the Environmental Protection Agency (EPA) under the authority of Section 102 (a) of the act.

The Corps of Engineers and EPA previously prepared an Environmental Impact Statement (EIS) in 1986 which evaluated the designation of three ocean disposal sites off the Coos Bay entrance, Sites E, F and H. The Corps of Engineers also previously prepared a Section 103 Evaluation addressing doubling the size of Site F for disposal of future maintenance dredging quantities.

PROPOSED ACTION

The proposed action is the disposal of sandy material at a new location replacing existing Site F, a rock disposal site (one-time disposal during channel deepening), and the transportation of dredged material for disposal at the new site, existing Site H and the rock disposal site. The dredged material would be obtained from the deepening of the Coos Bay navigation channel (entrance to RM 15) and subsequent maintenance dredging. The dredging involves removal of sedimentary material principally composed of sand and rock by hopper or clamshell dredge and barge.

Expansion of site F would increase the length of the east and west boundaries to approximately 8,000 feet to the north and the north-south boundaries have been extended to 14,500 feet (Figure 1). This is a new disposal area not previously used for disposal of dredged material, although sediments placed within the existing boundaries of Site F move into the expanded area as a result of littoral drift. Site F has been used annually since 1977, and received final site designation on August 21, 1986. The present size of Site F is no longer considered adequate because of persistent mounding which is creating a hazardous

situation. Apparently, waves are formed by the shallower conditions at the mound which create breakers in the vicinity of the entrance channel. Both the U.S. Coast Guard and the Coos Bay pilots have expressed concern over this situation. A management plan would be developed with the expansion of Site F to distribute dredged material over the entire area, thereby reducing the mounding problem.

The area offshore of the Coos Bay entrance has been studied and reported in the above-mentioned site designation EIS. Further discussion regarding the area and resources affected by the proposed channel deepening project is included in the channel deepening EIS.

LOCATION OF THE DISPOSAL SITES

Site E is located approximately 1.5 statute miles offshore of the entrance to Coos Bay. It's northern and southern boundaries are 3600 feet and eastern and western boundaries 1400 feet long. Site F is also located about 1.5 miles offshore with proposed expanded site dimensions of 14,500 feet and east-west and 8,000 feet north-south. Site H is located approximately 3.4 miles offshore with boundaries of approximately 3600 feet by 1400 feet. The rock disposal site is located approximately 2.5 miles offshore with dimensions of 2000 feet by 600 feet. See Figure 1 for the location and configuration of these sites.

DISPOSAL PLAN

Prior to use of the disposal sites, a management plan would be developed to provide for even distribution of dredged material over the entire area. The dredges would be required to deposit material in a dispersive manner. This would minimize mounding at sites E, F and H which would be removed by littoral currents. The rock material is expected to remain essentially in place, and slowly deteriorate with time and disperse in an offshore direction.

EVALUATION OF DISPOSAL SITES

EPA regulations require the evaluation of ocean disposal sites based on 11 specific criteria and 5 general criteria as shown in 40 CFR 228.5 and 228.6. This evaluation, addressing an expanded Site F and the rock disposal site, is based on information published in the site designation EIS, monitoring studies and the Channel Deepening EIS.

Specific Criteria (40 CFR 228.6)

1. Geographic Location. Site E is located approximately 1.5 statute miles offshore of the entrance to Coos Bay at a depth of

20 meters (m). Site F is also located 1.5 miles offshore at a depths of 24 m. Site H is located approximately 3.4 miles offshore at a depth of 55 m, and the rock disposal site is located approximately 2.5 miles offshore at a depth of about 34 m. General locations of these sites are shown on Figure 1 and specific site coordinates are as follows:

Site	Depth (m)	Size (m)	Coordinates
H	55	1097 x 442	43° 23'53"N, 124° 22'48"W 43° 23'42'N, 124° 23'01"W 43° 24'16"N, 124° 23'26"W 43° 24'05"N, 124° 23'38"W
E	17	1097 x 427	43° 21'59"N, 124° 22'45"W 43° 21'48"N, 124° 21'59"W 43° 21'35"N, 124° 22'05"W 43° 21'46"N, 124° 22'51"W
F (existing)	24	1097 x 427	43° 22'44"N, 124° 22'18"W 43° 22'29"N, 124° 21'34"W 43° 22'16"N, 124° 21'42"W 43° 22'31"N, 124° 22'26"W
F (expanded)	24(avg)	4450 x 2450	43° 22'56"N, 124° 19'34"W 43° 21'50'N, 124° 20'29"W 43° 22'51"N, 124° 23'26"W 43° 23'57"N, 124° 22'31"W
ROCK SITE	34	650 x 180	43° 22'08"N, 124° 24'50"W 43° 22'58"N, 124° 24'45"W 43° 22'15"N, 124° 24'28"W 43° 22'08"N, 124° 24'26"W

2. Distance from Important Living Resources. Species diversity and abundance of benthic invertebrates were directly related to water depth and sediment characteristics within the Coos Bay offshore study area. As depth increased and average sediment size decreased, species diversity and abundance of benthic organisms increased. Sites E and F are characterized by benthic species adapted to a high wave energy environment. Seasonal variability of benthic species is large. The benthic fauna in the vicinity of Site H is more diverse and has a greater number of filter feeding bivalves indicative of a less dynamic environment. The rock disposal site exhibits characteristics of both the nearshore and

offshore environments with species numbers increasingly with depth. The nearby rocky reef area off Lighthouse Point is used by commercial and recreational fishermen for rockfish species. Additional discussion of biological resources is contained in the channel deepening EIS.

3. Distance from Beaches. Sites E and F are located within 1.5 miles of the shoreline, Site H is located within 3.4 miles and the rock disposal site is within 2.5 miles. Limited onshore transport of material from Sites E and F would be expected due to the nature of currents and wave transport in that vicinity. Because of the increasing depths, distance from shore,and frequency of offshore currents, onshore transport of sediments from Site H and the rock disposal site is less likely, The majority of disposed rock material would remain essentially in place.

4. Types and Quantities of Material to be Disposed. There are three basic types of material to be dredged for the proposed channel deepening. These are, sandy sediments from the entrance to RM 12, finer sediments from above RM 12 and rock from the entrance to about RM 6. Estimated quantities of sandy material are 735,000 cubic yards (cy) for the channel deepening, with additional annual maintenance dredged material declining from 122,000 to 2,000 cy, and 700,000 cy of current annual maintenance dredged material. Estimated quantities of fine-grained material are 584,000 cy for the channel deepening, with no additional annual maintenance and 300,000 cy of current annual maintenance dredged material. Estimated quantity of rock is 90,000 cy with no maintenance dredging quantities.

Dredged material would be transported by hopper dredge or sea-going tug and barge.

5. Feasibility of Surveillance and Monitoring. Surveillance of the disposal sites can be made from shore facilities or vessels. Approaches to the Coos Bay entrance, including the disposal areas, are surveyed annually by the Corps. Surveillance during heavy weather conditions is expected to be unnecessary since heavy sea conditions curtails ocean disposal operations.

6. Disposal, Horizontal Transport, and Vertical Mixing Characteristics of the Area. Average currents in the region generally flow parallel to bathymetric contours. Local current strength and direction, however, reflect the variability of local winds. Sediments are observed to settle rapidly with no persistent turbidity plumes. Resuspension of sediments would be at maximum during winter storms.

7. Effects of Previous Disposal. Disposal at Site E and F has resulted in mounding at these sites. Continued disposal at current rates and under current sediment transport conditions would result in unacceptable mounding conditions. Site F has already been doubled to meet existing 0 & M needs.The recommended

expansion of Site F would permit distribution over a larger area and reduce or eliminate mounding problems. Disposal at Site E will remain at the present minimal disposal quantity of less than 100,000 cy annually to minimize mounding. Disposal at Site H has resulted in little or no mounding with only minor short-term turbidity effects. Sediments disposed at Site H are gradually transported offshore. No significant biological impacts have been associated with disposal at these sites. Additional discussion of these sites is included in the Channel Deepening EIS. No disposal has occurred at the expanded area of Site F or at the rock disposal site.

8. Interference with Other Uses of the Ocean. The only known commercial and recreational uses occurring in the vicinity of the disposal sites are fishing and marine navigation. No significant impact to these activities is anticipated.

9. Existing Water Qualily and Ecology. Water quality at the proposed disposal sites is discussed in the EIS. In summary, the water quality analysis indicates unpolluted conditions typical for seawater of the Pacific Northwest.

10. Potential for Recruitment of Nuisance Species. The major component of dredged material which might attract nuisance species is the organic material. The only material containing any appreciable amounts of organic material is that dredged between RM 12 and 15. This material has historically been disposed at Site H. No nuisance species have been observed at this site over 10 years of monitoring.

1 1. Existence of Significant Natural or Cultural Features, No known significant natural or cultural features would be affected by the proposed disposal actions.

General Criteria (40 CFR 228.5)

1. Minimal Interference with Other Activities. The location of the ocean disposal sites is based upon reasonable distance from the Coos Bay entrance, depth of water, biological conditions, historical use and estimated amount and type of dredged material. Disposal activities are not expected to result in more than minimal interference with the typical marine activities such as navigation and commercial and recreational fishing.

2. Minimize Changes in Water Quality. The material to be disposed consists of clean sand, rock and fine sand. Based on previous testing, the fine sediments dredged from RM 12-15 is the only material which may contain contaminants. As described in the EIS, sediment test results indicate this material is suitable for ocean disposal. Periodic testing and evaluation of material proposed for disposal would occur as necessary to insure acceptability.

3. Interim Sites Which Do Not Meet Criteria. Site F expansion

(double currently approved site), has been given interim EPA approval to alleviate the mounding problem. This interim site expansion has been evaluated and meets MPRSA criteria.

4. Size of Sites. The size of the existing EPA designated Sites E and F have proven to be inadequate for disposal requirements. Expanding Site F to the proposed size along with current use of site E would more than adequately accommodate disposal of initial channel deepening plus current and additional maintenance dredging of RM 0 to 12. Site H is adequately sized to handle current and anticipated material from RM 12 to 15. The rock disposal site is sized to handle the even distribution of rock excavated by the channel deepening work. With the exception of the rock site, annual bathymetric surveys will be conducted to monitor site capacities.

5. Sites Off the Continental Shelf. Such sites were eliminated during site evaluation for the 1986 site designation EIS. Conditions have not changed to offer any environmental advantage to the use of a site off the continental shelf. Transportation costs, sampling and testing costs, and post-disposal monitoring costs associated with disposal at a continental shelf site would greatly increase over present costs. In addition, there is greater uncertainty over impacts associated with continental shelf disposal, compared to disposal at existing sites which are known low impact areas. Therefore, disposal at a site off the continental shelf is not considered necessary or practical.

DETERMINATION OF ENVIRONMENTAL ACCEPTABILITY OF DREDGED MATERIAL FOR OCEAN DISPOSAL

As described in the channel deepening EIS, the sediments contain no contaminants of concern in excess levels, and sediments below RM 12 have been excluded from the requirements of further biological and chemical testing as provided in 40 CFR 227.13 (b). Additional chemical testing has shown fine-grained sediments from RM 12-15 to be acceptable for ocean disposal. The sediments are also similar to bottom materials at the proposed ocean disposal sites.

NEED FOR OCEAN DISPOSAL

Ocean Disposal is a necessary component of the maintenance of the Coos Bay navigation channel as inbay and upland sites are limited or have restrictive conditions. the quantity of material dredged from Coos Bay on an annual basis, even without channel deepening, can only be accommodated through ocean disposal.

IMPACT OF THE PROPOSED DISPOSAL ON ESTHETIC, RECREATIONAL AND ECONOMIC VALUES

The proposed ocean disposal would not have significant impacts on esthetic, recreational or economic values of the areas. Short-term increases in turbidity would occur; however, because the dredged material is primarily sand and rock, and is relatively free of contaminants, the proposed action is not expected to adversely affect water quality or related recreational or economic values.

IMPACT OF THE PROPOSED DISPOSAL ON OTHER USES OF THE OCEAN

No significant impacts on other known uses of the ocean such as commercial or recreational fishing in open ocean, coastal areas, and estuarine areas; commercial and recreational navigation; actual or anticipated exploitation of living marine resources; actual or anticipated exploitation of non-living resources, including sand and gravel and other mineral deposits, oil and gas explorations, or structural development; and scientific research and study are anticipated.

FINDINGS

The material to be dredged has been evaluated according to the criteria in 40 CFR 227 and determined to be suitable for ocean disposal. The ocean disposal sites have been evaluated using the criteria specified in 40 CFR 228.5 and 228.6 and have been determined to be suitable for the disposal of material dredged from the Coos Bay navigation channel.

On the basis of this evaluation, I find the proposed action acceptable under the provisions of section 103 of the Marine Protection, Research and Sanctuaries Act of 1972.

Date:

CHARLES A. W. HINES
Colonel, Corps of Engineers
District Engineer

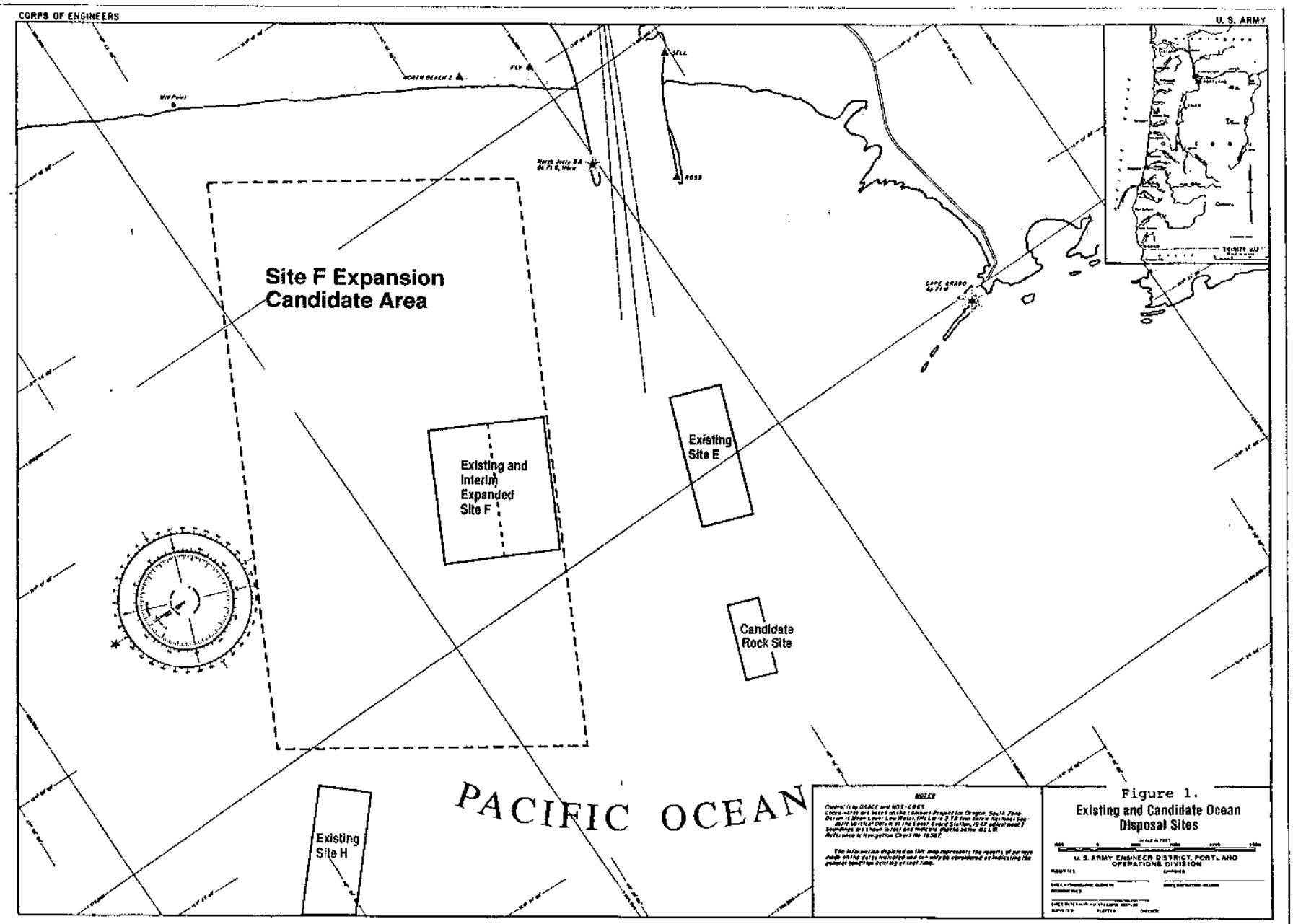


Figure 1.
Existing and Candidate Ocean
Disposal Sites

EXHIBIT 5

CZM CONSISTENCY DETERMINATION

COASTAL ZONE MANAGEMENT ACT
CONSISTENCY DETERMINATION
NAVIGATION CHANNEL DEEPENING
COOS BAY ENTRANCE TO RIVER MILE 15
COOS BAY, OREGON

INTRODUCTION.

The proposed Federal action addressed in this consistency determination is the deepening of the Coos Bay Federal navigation channel by 2 feet with disposal at three ocean disposal sites. This determination of project consistency with Oregon's Coastal Zone Management Plan is based upon applicable sections of the Statewide Planning Goals and Guidelines and the Coos Bay Estuary Management Plan (CBEMP).

STATEWIDE PLANNING GOAL 19 OCEAN RESOURCES COOS BAY ESTUARY MANAGEMENT PLAN

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 continential 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 based on sound information, 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 an 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 shell fisheries, and regions of heavy commercial or recreational navigation". Monitoring is to be conducted at the ocean disposal site. If adverse effects are observed, then 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.

COOS BAY ESTUARY MANAGEMENT PLAN POLICIES
Policy 4: Resource Capability Consistency and Impact Assessment.

a. Action. The proposed work involves the deepening of the Coos Bay Federal navigation channel from the entrance to RM 15. Approximately 1.3 million cubic yards (cy) of sedimentary material, consisting predominantly of clean sand, would be placed in ocean disposal Sites F (expanded), and H, and at a new rock disposal site (see attached map). Material would be removed by hopper or clamshell dredge and barge. Area F will be used for the disposal of material dredged below RM 12. Disposal Site H will be used for material dredged between RM 12 and 15. An estimated 90,000 cubic yards of rock material would be placed at the rock disposal site. Dredging would occur between April 1 and January 15.

b. Resources Affected. Aquatic habitats within the Coos Bay area include algal communities, eelgrass beds, and tidal marshes. The greatest variety of algal species is found near the mouth of the estuary. In quieter waters of the inner bay, algae attach to piling and outcroppings. Eelgrass is associated with lower intertidal and shallow subtidal flats. Both eelgrass and attached algae are used as sites for herring spawning. Tidal marshes vary from low silt to bulrush and sedge dominated marshes.

Coos Bay supports a variety of fish species. Anadromous species present include chinook and coho salmon, steelhead, shad, striped bass, and sea run cutthroat trout. These species are all dependent upon the bay or tributaries for spawning and/or rearing activities. Marine and estuarine species include

sculpin, various species of flat fish, ocean perch, and rockfish. Gaper, cockle, butter, macoma, and littleneck clams are present in the area. The two major crab species harvested are Dungeness and red rock crabs.

Coastal birds and waterfowl present in lower Coos Bay include pelagic cormorant, Canada goose, mallard, grebe, common loon, and American wigeon. These birds feed on marine seaweeds and fish as well as invertebrates found in the tidal flats and eelgrass beds. Migratory waterfowl use the bay as a resting place, feeding area, and wintering ground. Shorebirds present include western sandpiper, common egret, killdeer, and great blue heron. Raptors in the vicinity of the project include the marsh hawk, red-tailed hawk, and bald eagle.

Angler use of the estuary is extensive. A sport fishery exists for coho and chinook salmon. Striped bass fishing is also popular.

c. Expected Extent of Impacts. Some additional short-term turbidity would occur during dredging activities; however, given the clean nature of the material to be dredged, the resulting turbidity is not expected to be significant.

Dredging that would take place within the authorized navigation channel would have no direct impacts to estuarine vegetation. Adult fish species would be

expected to avoid the dredging and disposal area during the work period and , therefore, would not be adversely affected. Most impacts would be to benthic invertebrates within the dredge and disposal areas. Communities which have recolonized the channel area would be removed. Turbidity, although short-term, could interfere with the survival and settling of the larvae of all benthic invertebrates within and adjacent to the dredged and disposal areas during the work period.

Potential impacts to the estuarine resources would be minimized to the extent possible. Disposal of the material at the ocean disposal sites would minimize impacts to anadromous fish and crab populations.

Policy 5: Estuarine Fill and Removal.

a. Deepening the existing Federal navigation channel is proposed expressly for improving navigation conditions. No estuarine disposal is proposed for this action. No additional channel maintenance disposal would occur in the estuary.

b. The navigation channel is an established and significant part of the Coos Bay estuary.

c. The Feasibility Report/EIS for the navigation improvements has discussed the social and economic basis for the proposed deepening. The proposed improvements would increase economic benefit to the region and maintain the Port of Coos Bay's competitive position with other West Coast ports.

d. This section applies to disposal or fill actions. As stated in 5a, no additional estuarine fill would occur for the deepening or subsequent channel maintenance.

e. Adverse impacts to the estuary will be minimized through ocean disposal, timing of dredging activities, and other specific actions to minimize impacts.

f. The proposed action is consistent with the objectives of the Statewide Estuarine Resources Goal 16 and with other requirements of State and Federal law.

COOS BAY ESTUARY MANAGEMENT PLAN
APPLICABLE MANAGEMENT SEGMENTS

The Coos Bay Federal navigation channel, including the segment proposed for turning basin expansion near RM 12, is classified as a "Development Aquatic" segment. The specific management unit is identified as "OODA" in the management plan which includes the deep draft channel and associated turning basins.

This segment is managed for navigation and and other water-dependent uses, consistent with the need to minimize damage to the estuarine system. Activities allowed within this segment include new and maintenance dredging. The proposed channel deepening with ocean disposal complies with the allowable activities in this segment.

STATEMENT OF CONSISTENCY

Based on the above evaluation, we have determined that proposed deepening of the Coos Bay Federal navigation channel (between the entrance and RM 15) complies with the policies and conditions as specified in the appropriate local plans and ordinances. The action is, therefore, consistent with the State of Oregon's Coastal Zone Management Program to the maximum extent practicable.

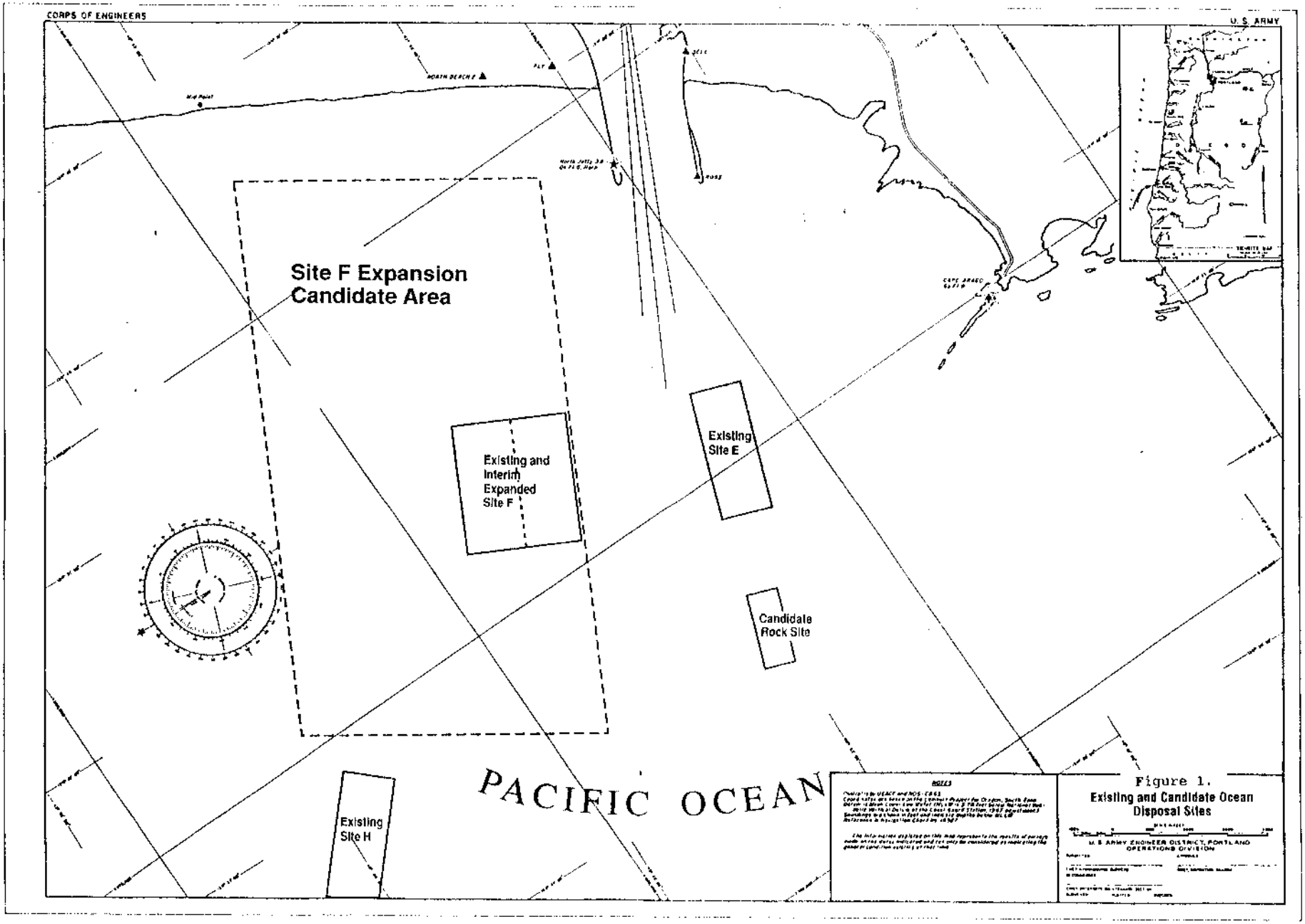


Figure 1.
Existing and Candidate Ocean
Disposal Sites

EXHIBIT 6

FISH AND WILDLIFE COORDINATION ACT REPORT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Portland Field Station
2600 S.E. 98th Avenue, Suite 100
Portland, Oregon 97266

July 27, 1990

Colonel Charles E. Cowan, Jr., District Engineer
Portland District, Corps of Engineers
P. O. Box 2946
Portland, Oregon 97208

Dear Colonel Cowan:

This letter expresses the position of the Fish and Wildlife Service on the impacts to fish and wildlife resources resulting from the proposed channel deepening at Coos Bay, Oregon. This statement and the attached detailed report constitute our Fish and Wildlife Coordination Act Report as required under Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), and is consistent with the intent of the National Environmental Policy Act. This report is intended for inclusion with the Corps of Engineers' feasibility report on this project.

This report has been coordinated with and has the concurrence of the Oregon Department of Fish and Wildlife as indicated in the attached letter from Ms. Patricia Snow dated July 19, 1990. This report was also reviewed by the National Marine Fisheries Service whose comments have been considered in preparation of the report.

The proposed project involves the deepening and widening of the authorized 45-foot entrance channel and 35-foot-deep draft navigation channel in Coos Bay, Oregon between river mile (RM) 0 and 15. Project alternatives include a 1-2-3-4-or 5-foot deepening executed in either single or multiple phases to a maximum depth of 50 and 40 feet, respectively. Up to 559,000 cubic yards of rock would be removed from the channel between river miles (RM) 1 and 5. Rock material would be pre-drilled and blasted to loosen it prior to dredging. Depending on the alternative selected, between 700,000 and 5,000,000 cubic yards of sandy material would be removed from the entire channel over the life of the project. All material removed would be placed offshore in approved ocean disposal sites.

The proposed channel deepening would have varying impacts on fish and wildlife resources, the severity of which directly relates to the amount and location of material removed. Vegetative, planktonic, benthic, epibenthic, shellfish, and fish species would all be impacted to some degree by the channel dredging. Birds, fish and marine mammals would be negatively effected by the proposed blasting. The project could cause changes in salinity, water quality (contaminants), turbidity, marsh and eelgrass vegetation, and the availability of prey species. Of these changes, the extension of the salt wedge has the greatest potential to change the ecological balance of the Bay. Disposal at the approved offshore sites would have some impacts on benthos and shellfish near the disposal site but these effects are expected to be temporary. There is some concern, however, that offshore disposal is, to some degree, increasing the amount of shell debris and other sediment accumulating on the

beaches to the north and south of the Coos Bay jetties. This material may be adversely impacting razor clam beds. On the other hand, there may be an opportunity to enhance snowy plover habitat with the disposal of clean materials on the North Spit beaches.

To minimize adverse impacts of the proposed project, the Fish and Wildlife Service recommends that:

1. The project be conducted in multiple phases, i.e., 1 foot deepening every 5 years until authorized depth is achieved. A monitoring study should be initiated to determine increases in salinity related to channel deepening. If salinity increases significantly with dredging, the benefits of completing the dredging must be re-examined.

2. Due to the potential for serious adverse impacts to species in or near the channel, blasting not be considered unless absolutely necessary. If mechanical removal of rock is not possible, then blasting should occur only during the period from January 1 to March 15. Use of bubble curtains, divers to check for fish kills, micro-second delays between blasts, and acoustic surveys should be incorporated as blasting permit conditions.

3. Additional contaminant studies be conducted at the Port of Coos Bay's docks if the channel is widened in this area.

4. Dredged material (clean sand) be used to enhance snowy plover nesting habitat on the North Spit.

5. Any unavoidable habitat losses be mitigated in-kind within the estuary.

6. No dredging occur near identified contaminant sites.

7. Dredging occur only within specified in-water work periods set by the Oregon Department of Fish and Wildlife.

8. Thorough fish and wildlife studies be conducted on the proposed new disposal sites prior to final selection of a site.

9. All shell and rock debris be disposed of far enough offshore to prevent its return to the ocean beaches. Monitoring of the disposal sites and the beaches would be necessary.

Detailed information regarding fish and wildlife resources, project impacts, and our recommended actions are contained in the attached report. Please notify us of your decision regarding our recommendations, and of any changes in the project plans which may require further evaluation by the Fish and Wildlife Service.

Sincerely,

for Russell D. Peterson
Field Supervisor

NEIL GOLDSCHMIDT
GOVERNOR

Department of Fish and Wildlife

2501 SW FIRST AVENUE, PO BOX 59, PORTLAND, OREGON 97207 PHONE (503) 229-5400

July 19, 1990

Russell D. Peterson
U.S. Fish and Wildlife Service
2600 S.E. 98th Avenue, Suite 100
Portland, Oregon 97266

RE: Draft Coordination Act Report - Coos Bay Channel Deepening

Dear Mr. Peterson:

Thank you for opportunity to comment on the draft Coordination Act Report for the proposed channel deepening project in Coos Bay, Oregon. We concur with the findings in the Coordination Report. We would also like USFWS to include several additional recommendations which are outlined below.

In general the Department opposes the summer time period used by the Corps for its maintenance and construction activities. This is the period when the greatest number of marine species are in the estuary and the greatest negative effects from dredging can occur.

The proposed project would extend, deepen, and widen the existing channel which could result in extension of the salt water wedge further up the estuary. Extension of the salt wedge would change the ecology of the bay affecting all species. In particular, extension of the salt wedge could negatively effect spawning of shad and striped bass.

The Department is very concerned about the extent of inwater blasting that is anticipated for the project. The proposal indicates that blasting could take place every day for four months. This clearly is not the method the Department prefers. If there is no other alternative to blasting, the Department requests that the following conditions be met:

1. Bubble screens be used to prevent fish from moving in to the blast area;

2. Adhere to the Department's timing recommendations (October 1 to January 15);

3. A diver be sent down immediately after each blast to check for damages. If fish are being killed, immediately halt the project.

The Department is concerned that the ocean dump sites are not far enough out in the ocean. Our district biologists have indicated that sediments disposed offshore are visually affecting beach sediments and may be affecting razor clam success.

Thank you for the opportunity to comment on the draft Coordination Report. Please feel free to call me at 229-5400 ext. 442 if you have any questions regarding our comments.

Sincerely,

Patricia Snow
Waterway Alterations Coordinator
Habitat Conservation Division

c John Johnson, ODFW
Jill Zarnowitz, ODFW

IMPACTS ON FISH AND WILDLIFE RESOURCES OF THE PROPOSED CHANNEL DEEPENING PROJECT AT COOS BAY, OREGON

Kathleen A. Larson
July 27, 1990

Prepared for the Portland District
U.S. Army Corps of Engineers
by the
Portland Ecological Services Field Station
U.S. Fish and Wildlife Service

PREFACE

This is the Fish and Wildlife Service's detailed report on fish and wildlife resources affected by the proposed channel deepening project at Coos Bay, Oregon. The project study has been authorized by a resolution from the U.S. Senate Committee on Environment and Public Works passed November 2, 1983. Our analysis of project impacts is based on: 1) project information and engineering data provided as of June 29, 1990; 2) an appraisal of existing resources; and 3) a project life of 50 years.

It should be noted that the proposed project may be subject to permits over which the Fish and Wildlife Service has review responsibilities. Accordingly, our comments do not preclude an additional and separate evaluation by the Service, pursuant to the Fish and Wildlife Coordination Act (16 U.S.C. 661, et seq.), if eventual project development requires a permit from the Corps of Engineers, U.S. Army (Section 10 of the River and Harbor Act of 1899). All such permits are subject to separate review by the Service under existing statutes, executive order, memorandum of agreement, and other authorities. In review of permit applications, the Fish and Wildlife Service may concur, with or without stipulations, or object to the proposed work, depending on specific construction practices which may impact fish and wildlife resources.

TABLE OF CONTENTS

	PAGE
PREFACE	i
TABLE OF CONTENTS	ii
LIST OF TABLES	iii
LIST OF FIGURES	iii
DESCRIPTION OF THE AREA	1
DESCRIPTION OF THE PROJECT	1
BIOLOGICAL RESOURCE EVALUATION	4
FISH	4
Without the Project	4
With the Project	11
WILDLIFE	11
Without the Project	11
With the Project	12
THREATENED AND ENDANGERED SPECIES	13
DISCUSSION	13
RECOMMENDATIONS	14
REFERENCES	REF
SPECIES LIST (CANDIDATE)	ATT

LIST OF TABLES

PAGE

Table 1. Concentration of Metals in Coos Bay Sediment. 8

Table 2. Species Location and Abundance in the Coos Bay Navigation Channel. 9

Table 3. Periods of Use by Adult Salmonids in Coos Bay 10

Table 4. Estimated Number of Adult Salmonids Returning to Coos Bay or Its Tributaries. 10

LIST OF FIGURES

PAGE

Figure 1. General Location Map for Coos Bay, Oregon. 2

Figure 2. Offshore Disposal Sites, Coos Bay, Oregon. 3

Figure 3. Distribution of Eelgrass Beds in Coos Bay. 5

Figure 4. Benthic Invertebrate Sampling Stations Along the Coos Bay Navigation Channel. 6

DESCRIPTION OF THE AREA

Coos Bay is located in southwestern Oregon along the Oregon coast about 170 miles southwest of Portland, Oregon. The Coos, South Fork Coos, and Millicoma Rivers are the major tributaries which empty into the bay, the latter two via the Coos River. The bay and estuary extend inland to about mile 31 of the Coos River and mile 30 of the South Fork Coos River. Tides range from -3.0 feet below mean lower low water to 10.5 feet above sea level.

The Coos Bay Estuary encompasses about 10,500 acres, including that portion of the estuary known as South Slough (Figure 1). Coos Bay, via the Coos and Millicoma Rivers, drains about 820 square miles of mostly forested lands, much of which has been logged at one time or another. Soils overlay slopes that are moderately unstable. Certain timber harvesting practices have led to severe erosion. This material eventually ends up in the navigation channels in the estuary, from which it is dredged annually and shipped either to the ocean or placed on upland.

The climate surrounding Coos Bay consists of warm summers and wet, cool winters. Precipitation averages about 62 inches annually.

DESCRIPTION OF THE PROJECT

The proposed project involves the deepening and widening of the authorized deep draft navigation channel in Coos Bay, Oregon. The existing channel is maintained at a depth of 45 feet between river mile (RM) 0-1, and to 35 feet between RM 1-15. Project alternative a 1-2-3-4- or 5-foot deepening of the entrance and navigation channels to a maximum depth of 50 and 40 feet, respectively. This project would be executed in either a single phase or in multiple phases. Multiple phase construction would involve deepening the channel by 1 foot every 5 years until the desired depth is attained. Total construction time could be 20 years if a 5-foot depth is pursued in multiple phases.

Up to 559,000 cubic yards of rock would be removed from the channel between RM 1 and 5. This material would first be blasted to loosen it for removal by clamshell dredge. Blasting is scheduled to occur daily over a 4-month period (January through April) and would extend through two dredging seasons. Depending on the alternative selected, between 700,000 and 5,000,000 cubic yards of sandy material would be removed from the channel over the life of the project. Most of the material between RM 5 and 12 is medium grained sand, but between RM 12 and 15 it is fine grained silty sand.

All the material removed from the channel would be placed offshore in approved sites. The rock material would require placement at a new disposal site (Figure 2). This disposal area is situated on a sandy bottom adjacent to a natural rocky area in water depths of 150-200 feet deep. Dimensions of this site would be 14,000 by 3,600 feet.

In addition to the need for designating the offshore rock disposal site, the further expansion of existing Site F will also be necessary. This site was expanded under Section 103 authority in 1989. Areas 1 and 2 (Figure 2) are the currently designated F sites, while Area 3 is the proposed expansion site which would extend the existing site 1,400 feet northward. Between 425,000 and 1.5 million cubic yards of dredged material could be placed here. This site is designed to accept only clean materials. Area H (Figure 2) would be the site for disposal of the fine-grained sandy silts from RM 12-15. Chemical analyses of these materials do not show contaminant levels in excess of approved standards.

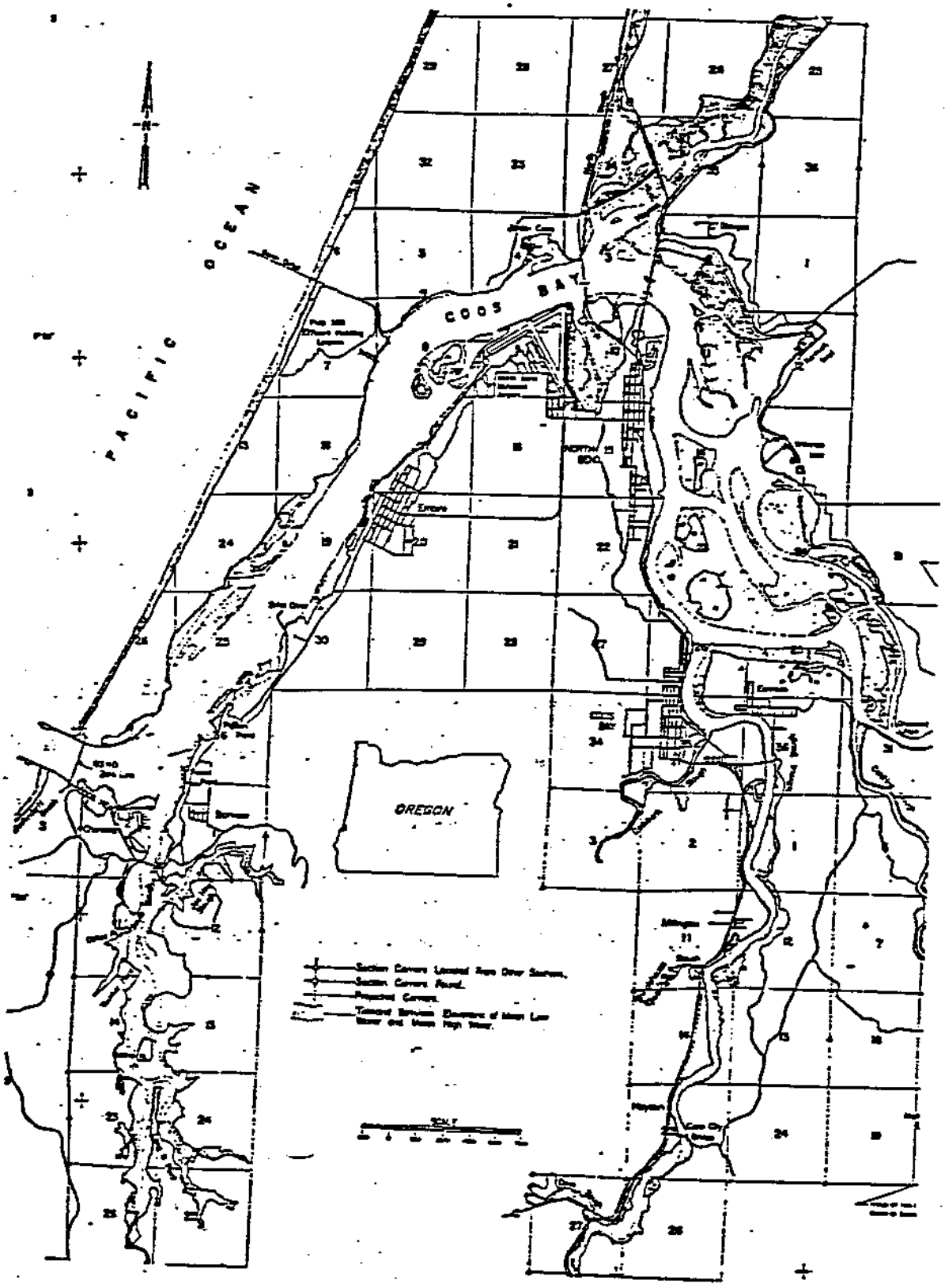


Figure 1. General Location Map for Coos Bay, Oregon

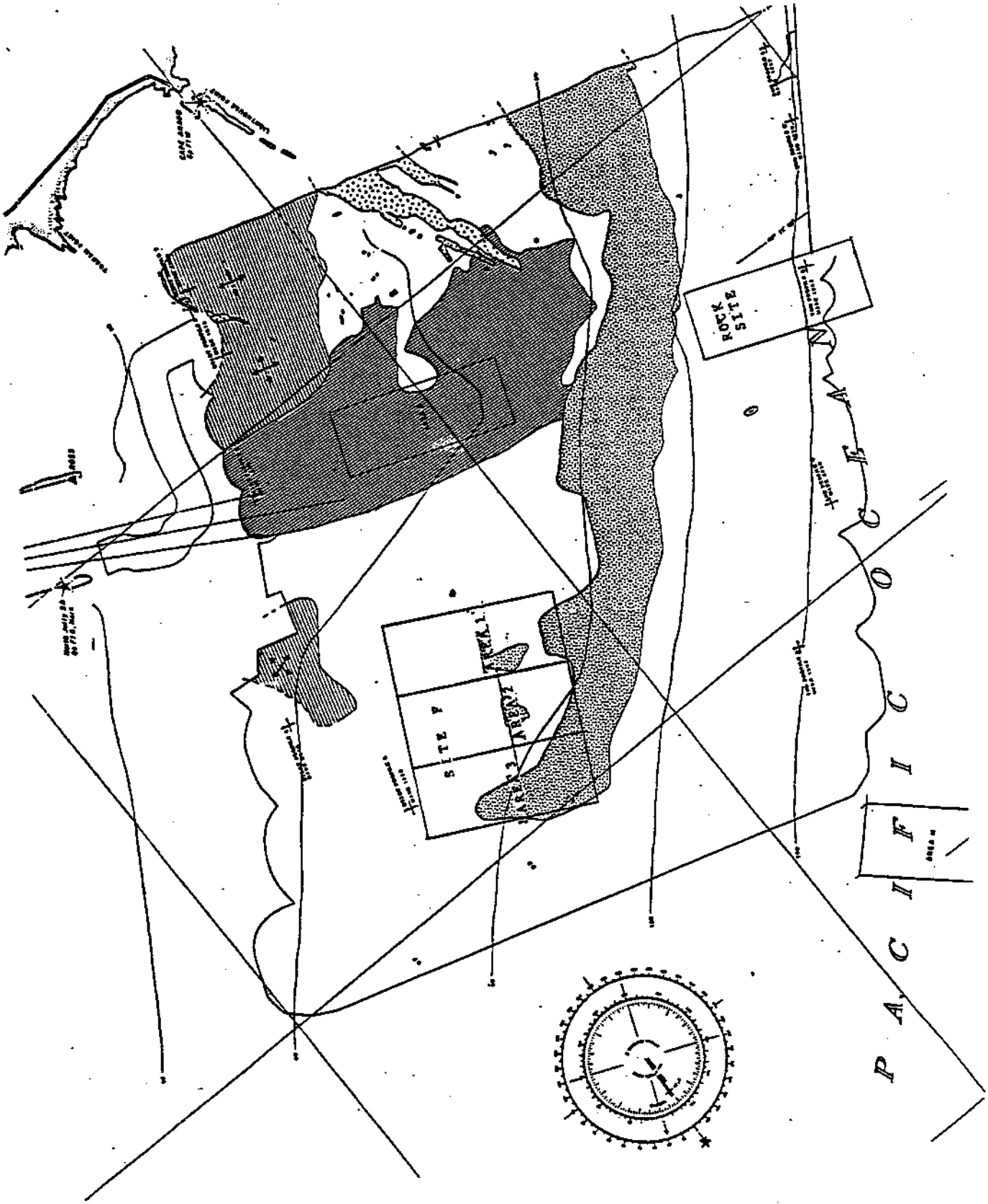


Figure 2. Offshore Disposal Sites, Coos Bay, Oregon

BIOLOGICAL RESOURCES EVALUATION

FISH

Without the Project

Coos Bay Estuary supports a rich diversity of biological resources. The mid-range salinity of the bay's water provides the right proportion of saline and fresh water to sustain an immense array of plankton. In addition to phytoplankton, every major group of animals in the estuary spends a certain portion of its existence either as a larvae or an adult in planktonic form. Collectively, plankton makes up over 90 percent of the biomass found in the estuary.

Plankton forms the base of the food chain in the estuary. Planktonic production is greatest at salinities of 15 to 25 parts per thousand. Thus, plankton production is high in the vicinity of Empire to North Bend but low near Coos Bay and Isthmus Slough.

A plant community of significance in Coos Bay is the eelgrass community. Eelgrass thrives in shallow, clear waters of high salinity free of heavy wave action. Eelgrass is a source of food and/or cover for epifaunal species such as polychaetes, nematodes, copepods, and amphipods. The substrate associated with the eelgrass beds supports polychaetes, amphipods, pelecypods, and clams. Dungeness crab are commonly found in these beds as well. Eelgrass beds are often found in conjunction with algal beds (Figure 3), and in Coos Bay, extend from South Slough upstream to Catching Slough near Coos River.

Benthic sampling conducted by the National Marine Fisheries Service (NMFS) in May, 1989 has provided some recent data on the organisms associated with the substrate near the navigation channel. Sampling stations are shown in Figure 4.

The NMFS study identified a total of 121 invertebrate taxa. The lower estuary (RM 2 to 5) was the area with the highest invertebrate densities. Stations 1, 4, 5, and 5b (Figure 4) had a mean invertebrate density of 10,441/m^2 while the remaining 16 stations had a mean density of only 661/m^2. The dominant species were the polychaetes, Polygordius sp., Mediomastus californiensis, Heteropodarke heteromorpha and Glycera tenuis and the cumacean Eudorellopsis sp. However, there were few numbers of Dungeness crab, oysters, clams, ghost shrimp, or mud shrimp in these samples. This may have been due to the short duration of the sampling (2 days) or to the location and timing (seasonality) of the samples.

Benthic samples were also collected in December, 1989 (Jones, 1990) from the main channel and the side slopes. Those sampling stations between RM 2 and 4 were dominated by juvenile molluscs of the family Mytilidae (most likely the pea pod borer), and polychaete worms (Polygordius sp., Kefersteinia cirrata, and Chone dunneri). At RM 8, the samples consisted of low densities of polychaetes such as Ophelia sp., Heteropodarke heteromorpha, and Glycera tenuis. Densities of invertebrates increased in those samples taken in the upper estuary (upstream of the Highway 101 bridge) with oligochaetes, polychaetes (Polydora sp., Streblosoma benedicti, Mediomastus californiensis, etc.) and cumaceans dominating the samples.

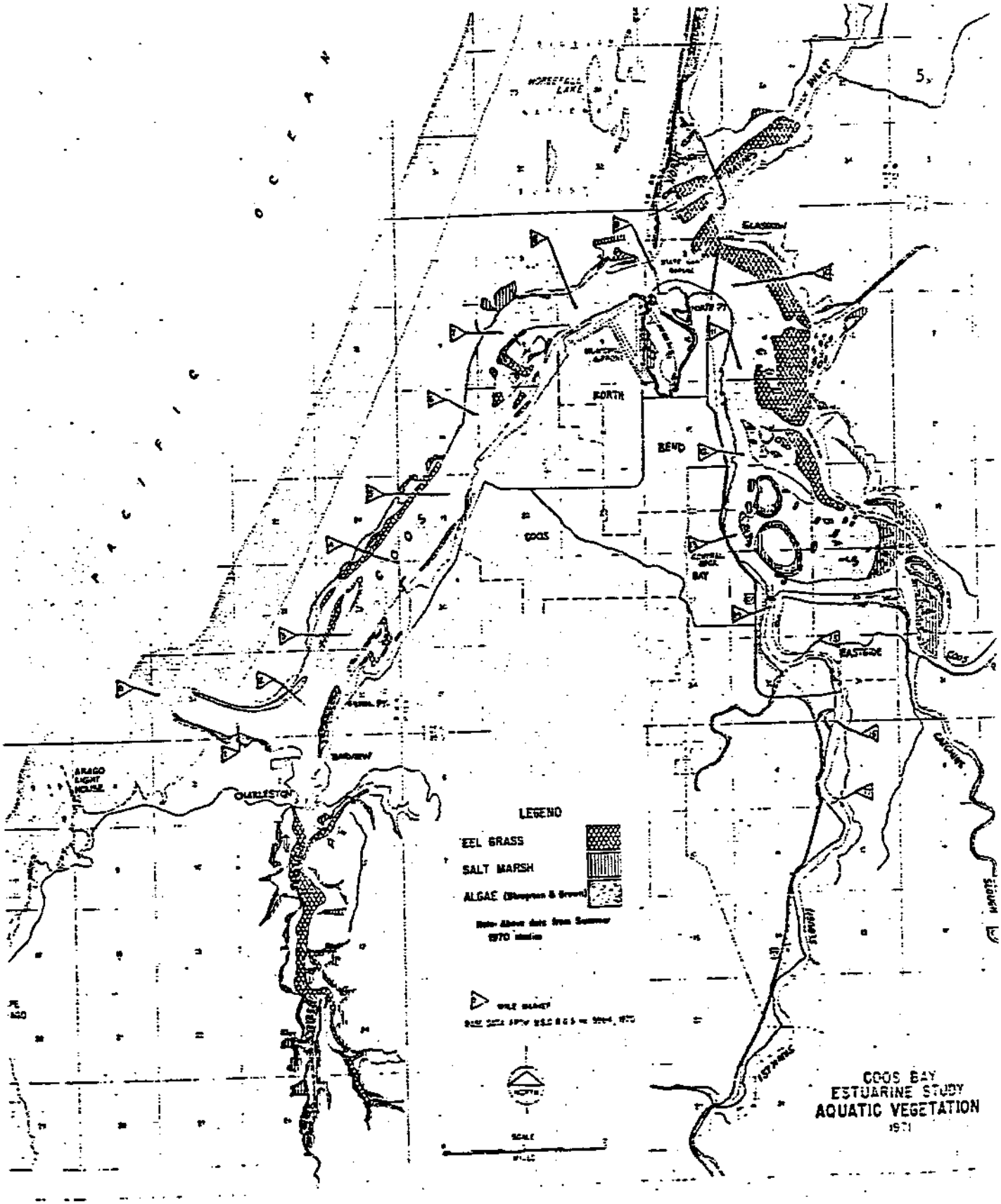


Figure 3. Distribution of Eelgrass Beds in Coos Bay

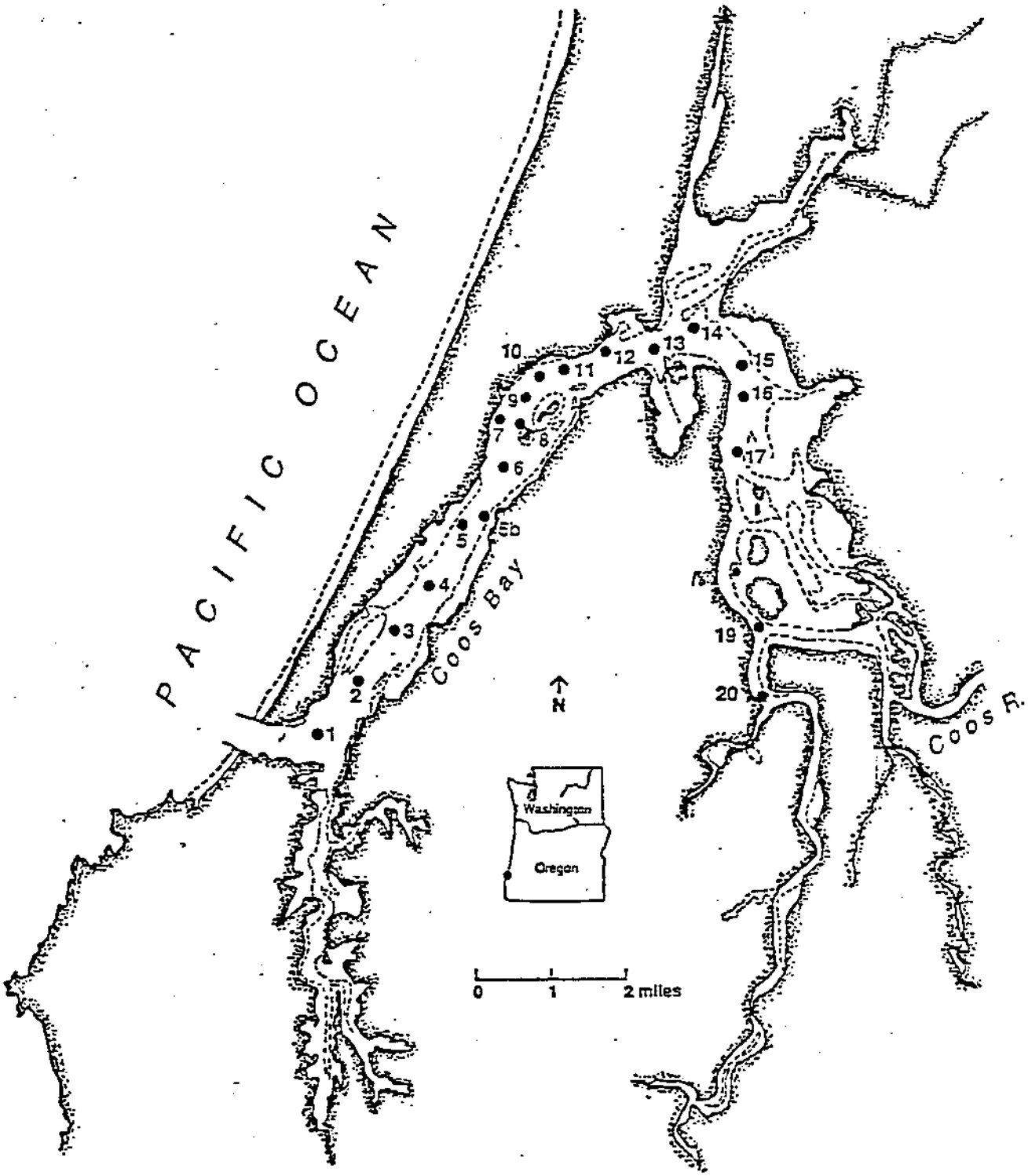


Figure 4. Benthic Invertebrate Sampling Stations Along the Coos Bay, Oregon Navigation Channel (from Miller et al., 1990).

Sediment samples from the navigation channel were collected by the Corps of Engineers in May of 1989 and analyzed for organic contaminants including pesticides, PAHs and PCBs. Test results indicated that organics, metals, ammonia, and oil and grease concentrations were below the method detection limits. The Port of Coos Bay tested the sediments around its commercial docks (RM 12-14) and found evidence of heavy metal contamination in these soils which are adjacent to the navigation channel. Test results are provided in Table 1.

Another study was done by the Corps of Engineers from July 11 to August 14, 1989 (Moehl and Barton, 1989). Sampling of dredged material from the navigation channel between RM 1+25 and 10+10 demonstrated the presence of razor, macoma, gaper, littleneck, cockle, and softshell clams. Crangon shrimp, Olivella spp., sand dollars, anemone, and miscellaneous worms such as Nephtys spp. were also present. Dungeness crab, particularly young of the year, were also found in the samples. Fish species which occurred in the dredge samples included sand lance (most abundant species), saddleback gunnels, juvenile flatfish, and staghorn sculpin. The river mile and bottom composition at which each of these species occurred is presented in Table 2. Young of the year Dungeness crab were generally found in rocky substrate while sub-adult and adult crabs appeared to prefer substrate consisting of wood, small hash, and sand.

In a study done in December 1989 and April 1990 (Jones, 1990), samples were taken in-channel to determine the presence of demersal fish. Results showed the sand lance, sand dab, American shad and staghorn sculpin to be the most abundant of the fish captured.

Trawl samples near the town of North Bend contained few to no fish. The substrate at this trawl site consisted of fine sand with little debris. Most of the other trawls were over substrate consisting of silty material and debris.

Other fish associated with the Coos Bay Estuary include Pacific herring, northern anchovies, smelt, starry flounder, English sole, sturgeon, striped bass, salmon and steelhead trout. Pacific herring use the bay as a spawning and nursery ground. Herring eggs attach to rocks, pilings, and vegetation and can usually be found during January, February, and March. A mixture of mature and immature herring can be found in the estuary during spring and summer. Northern anchovies are plentiful from April through September. Several varieties of smelt (top, longfin, white bait, and silver) inhabit the top-most layers of the water i.e. the plankton. These fish also move in over the mudflats on the incoming tide.

Sand dab, sole, starry flounder, black rockfish, kelp greenling, and a variety of perch species are found in tremendous numbers in Coos Bay during various aspects of their life cycles. The young of these species are found in the shallow water areas and tideflats feeding on the abundant supply of amphipods and isopods in the substrate or in the water column. As they mature, these fish move into the deeper waters of the bay and then into the ocean where they are taken in the commercial and sport fisheries.

Striped bass are present in Coos Bay all year round. They spawn in the Coos River from the forks upstream to Dellwood, and in the Millicoma River from the forks upstream to Alleghany. The nursery area is the entire bay and the tidewater section of the Coos River system. The spawning population is estimated at 3,000 fish.

Table 1. Concentration of Metals in Coos Bay Sediment 1/

(values in parts per million ppm)

Parameter	D-1&2	E-1&2	E-4	F-1&2	H-1	H3&4	I-1&2	J-1&2	K-1&2	K-3&4
As	6.5	5.8	4.1	4.1	3.9	5.7	4.6	8.6	10	8.1
Cd	0.47	<0.31	0.32	0.47	0.53	<0.31	.58	.73	.64	.59
Cr	80.2	75.3	70.1	612*	73.5	72.3	870*	94.6	91.2	91.6
Cu	82.8*	96.9*	49.1	72.1*	58.8*	76.3*	632*	68.3*	69.7*	68.8*
Pb	13	12	9.2	12	9.2	9.5	11	11	2.2	15
Hg	<0.10	<0.12	0.10	0.30	<0.11	<0.12	<0.12	<0.14	<0.14	<0.14
Zn	40.40	36.40	34.0	37.30	40.30	30.11	42.50	41.80	39.20	35.20
TOC	34600	32600	23500	20700	29200	33100	31700	44300	54500	42400

Note: * Indicates compound exceeded USACE Portland District Tier II Bulk Chemical Concern Level

1/ From U.S. Army Corps of Engineers, 1990

Table 2. Species Location and Abundance in the Coos Bay Navigation Channel (from Moehl and Barton, 1989).

	ENTRAINMENT THROUGHOUT COOS BAY CHANNEL			REACH OF CHANNEL WITH HIGHEST SPECIES ABUNDANCE			
SPECIES	average/cy	range	distribution (R.M.)	location (R.M.)	average/cy	average debris composition	debris composition *
SAND LANCE	0.928	0-26/CY	1-9	1-2	5.33	44% SHELL 56% WOOD	90% SHELL 8% ROCK, WOOD &
SADDLEBACK GUNNEL	0.005	0-0.53/CY	2,3,6,8 & 9	2-3	0.10	50% ROCKS 27% WOOD, 23% SHELL	95% ROCK 5% SHELL
JUVERILE FLATFISH	0.005	0-0.13/CY	1-10	2-3	0.03	50% ROCKS 27% WOOD, 23% SHELL	50% WOOD 50% SHELL
STAGHORN SCULPIN	0.004	0-0.24/CY	2-9	2-3	0.03	50% ROCKS 27% WOOD, 23% SHELL	90% SHELL 10% WOOD
RAZOR CLAM	<0.001	0-0.040/CY	3 & 6	6-7	0.002	85% WOOD, 1% ROCK 12% SHELL, 2% MUD	70% WOOD 30% SHELL
COCKLE	0.001	0-0.15/CY	3,4,8,9,& 10	10-10.2	0.07	59% SHELL 34% WOOD, 7% MUD	100% WOOD
MACOMA	0.021	0-1.5/CY	2-6	3-4	0.08	52% SHELL, 29% WOOD 19% ROCK	90% SHELL 8% ROCK, WOOD &
GAPER CLAM	0.001	0-0.096/CY	2-3	2-3	0.03	50% ROCKS 27% WOOD, 23% SHELL	95% ROCK 5% SHELL
[illegible]OCK	0.001	0-0.095/CY	2-3	2-3	0.01	50% ROCKS 27% WOOD, 23% SHELL	95% ROCK 5% SHELL
LITTLENECK CLAM	<0.001	0-0.34/CY	10-10.2	10-10.2	0.02	59% SHELL 34% WOOD, 7% MUD	100% WOOD
SOFTSHELL CLAM	0.005	0-1.3/CY	3,9, & 10	10-10.2	0.47	59% SHELL 34% WOOD, 7% MUD	98% SHELL 2% WOOD
PEA PEA BOARER	0.001	0-0.27/CY	2-3	2-3	0.01	50% ROCKS 27% WOOD, 23% SHELL	70% ROCK 30% SHELL
CRANGON	0.010	0-0.25/CY	1-10	2-3	0.03	50% ROCKS 27% WOOD, 23% SHELL	50% WOOD 50% SHELL
TOT DUNGENESS CRABS	0.17	0-20.8/CY	1-10	4-5	1.33	76% WOOD 28% SHELL, 16% ROCK	100% ROCK
1+ DUNGENESS CRABS	0.01	0-0.73/CY	3-10	10-10.2	0.13	59% SHELL 34% WOOD, 7% MUD	50% WOOD 50% SHELL

* Composition of sample with highest entrainment rate.

Fall and spring chinook, coho, and chum salmon and winter and summer steelhead and searun cutthroat trout are present in Coos Bay during most of the year. These species use the bay as a feeding and nursery area as well as an adult migration route. Time periods when each of the above species is likely to be present are shown in Table 3.

Table 3. Periods of Use by Adult Salmonids in Coos Bay, Oregon

Species	Time Period
Chinook Salmon	July through November
Coho Salmon	July through December
Chum Salmon	October through November
Steelhead Trout	November through February
Searun Cutthroat Trout	July through October

Juvenile salmon, especially chinook salmon, utilize the bay as a nursery throughout the year. Emigration of young salmon occurs over a wide spectrum: chinook salmon - May through July; coho salmon - April through June; chum salmon - March through May; steelhead trout - April through June; and searun cutthroat trout - April through June. Emigration of yearling coho salmon and steelhead and cutthroat also occurs during early fall freshets.

Adult returns to Coos Bay are presented in Table 4.

Table 4. Estimated Number of Adult Salmonids Returning to Coos Bay or Its Tributaries.[1/]

Species	Number Returning			
	Wild	STEP	Private Hatchery	Totals
Chum	100		18	118
Coho	8,900	1,000	270,000	279,900
Spring chinook			25,500	25,000
Fall chinook	4,300	1,000	3,000	8,300
Winter steelhead	6,000	4,600		10,600
Searun cutthroat trout	4,000 2/			4,000

1/ From U.S. Department of the Interior, 1987
2/ 5-year average 1966-70, no estimates since

Green and white sturgeon are also found in Coos Bay. Spawning occurs in the early spring in areas with a fast current and over sandy, coarse sediment. Sturgeon are bottom feeders and are generally associated with the deeper waters of the estuary.

With the Project

Changes in hydrology, temperature, and water circulation patterns, increases in salinity, and possible losses of intertidal habitat caused by the proposed channel deepening would affect bay productivity. These changes would first impact plankton which forms the basis of the food chain. Adverse effects on plankton would, therefore, have negative impacts on fish and wildlife abundance in the bay. Benthic organisms such as worms, amphipods, clams, and crabs would be adversely impacted by changes in salinity, losses of saltmarshes and algal beds, reductions in intertidal habitat, and long-term changes in turbidity and erosion patterns associated with operation and maintenance activities. Any benthic organisms in the deeper portions of the proposed channel alignment would be eliminated either initially or through maintenance dredging. The same would be true for those organisms on the side slopes of the channel.

In some portions of the channel the substrate consists of shell debris and soft rubble-rock. This material's removal would have a detrimental effect on crab and clam use of the area, particularly juveniles. Blasting to break up rock for removal by dredge would cause immediate increased turbidity which could have long-term impacts on intertidal areas, including tideflats and eelgrass beds. Any permanent changes in hydrology or physical or chemical modifications in the bay would negatively impact wetland quality and quantity. Salinity increases would reduce marsh vegetation but would encourage eelgrass production.

Dredging in or around contaminated sites could re-introduce contaminants into the water column. This then offers the opportunity for contaminants to become magnified throughout the food chain.

Hydrological changes could affect fish distribution and fish populations throughout the estuary. Dredging itself would have only a small influence on fish numbers. Reductions or changes in benthic or planktonic prey species would most influence fish use of the estuary. Blasting would cause immediate mortality to those benthic, shellfish, crustacean and fish species within the blast zone. Increased salinity could mean a change in fish distribution as well with more marine species becoming established further upstream in the estuary. Such an "invasion" could mean the displacement of brackish water species. There is already some concern (Johnson, personal communication) that increased salinity in the bay has interfered with shad and striped bass spawning success in the Coos River.

WILDLIFE

Without the Project

About 250 species of birds are resident or regular visitors to the Coos Bay area. Coos Bay is an important resting and feeding area and wintering ground for migratory birds of the Pacific Flyway.

Water-associated birds found in the Coos Bay Estuary include: waterfowl - black brant, American wigeon, pintail, canvasback, mallard, bufflehead, scaup, and white-winged surf, and common scoter; shorebirds - western sandpiper, least sandpiper, black-bellied plover, and sanderling; seabirds - gulls, terns, and murres; and marshbirds - great blue heron, common egret, and American bittern. Some of these birds depend on a variety of habitat types for resting, feeding, or nesting while others are found solely in one habitat

type. Herons, bitterns, and egrets, while common, cannot be considered abundant. On the other hand, ducks, sanderlings, and sandpipers are present seasonally in great numbers.

Marsh birds commonly found in the area include five species of swallows, the song sparrow, long-billed marsh wren, and the sora and Virginia rail. Most of these birds use the marshes primarily for feeding although the marsh wren, rail, and occasionally the song sparrow also nest in them.

Raptors are also present in the bay area. Marsh hawks and red-tailed hawks have been seen using the marshes, although the red-tailed hawk is usually on food forays, flying back and forth between the mudflats and the higher marsh areas. Marsh hawks nest in marshes building nests directly on the ground.

Small mammals using the marshes and tide flats include the vagrant shrew, deer mouse, western red-backed mouse, black rat, and Trowbridge shrew. The vagrant shrew and deer mouse are the most abundant, with the latter found primarily in the high marsh and the former in the more tidally-influenced portions of the marsh.

Aquatic mammals associated with the saltmarshes include raccoon, muskrat, beaver, mink, and river otter. Deer, fox, and coyote have been observed in the South Slough marshes and deer, beaver, muskrat, raccoon, and bobcat have been sighted in Henderson Marsh on the North Spit. By far, however, the raccoon is the most commonly found mammal in all types of marsh habitat. Raccoons are opportunistic, feeding on fruits, fish, invertebrates, bird eggs, and small mammals. Mice feed on fruits, seeds, and insect larvae while shrews eat insects, insect larvae, snails, and worms. For most of the large mammals, the marshes are only part of their home range, but for species such as the vagrant shrew and muskrat, the marshes are their home range.

Marine mammals associated with the estuary include harbor seals, and California and Steller sea lions. The spoil islands in the lower bay are used as hauling grounds by adult and juvenile seals. The sea lions are occasionally seen at the bay entrance; their hauling grounds are located on the rocks and shoals south of the entrance. Killer whales, elephant seals, and harbor porpoises are occasional visitors to the estuary.

With the Project

Changes in hydrology, salinity, water temperature, or turbidity due to dredging would affect changes in planktonic and benthic populations as well as overall habitat viability and function. Increased salinity could have serious negative impacts on saltmarsh vegetation although it would encourage eelgrass production. Turbidity and temperature changes would influence benthic populations, shellfish productivity, and fish distribution, all of which would negatively impact wildlife species that depend on this habitat or these populations for food and cover. The blasting of rock in the lower bay would disturb birds and marine mammals. Greater river traffic and increased maintenance dredging activities would also have adverse impacts on wildlife use of the bay. Increased disposal activity could temporarily affect sea lions and seabirds, but overall offshore disposal impacts would be negligible.

THREATENED AND ENDANGERED SPECIES

In accordance with Section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531, et seq.), the Corps of Engineers is required to assure that its actions have taken into consideration impacts to Federally listed or proposed threatened or endangered species for all Federally funded, constructed, permitted, or licensed projects within its jurisdiction.

We have determined that listed species may be present within the project area (Attachment A). You may consider the attached list as a response pursuant to Section 7(c) and you may begin a biological assessment if you determine this action to be a "construction project" (Attachment B).

The Corp's responsibilities pursuant to Section 7(a) and (c) of the Act are described in Attachment B. We have also included a list of candidate species for your assistance. These species are presently being reviewed for consideration to propose and list as endangered or threatened. Candidate species have no protection under the Endangered Species Act and are included for your consideration as it is possible the candidates could become formal proposals and be listed during the construction period.

DISCUSSION

The proposed project could affect both fish and wildlife resources, depending on the harm done to estuarine habitat and food chain populations. Increasing the depth of the entrance and navigation channels by 1 to 5 feet would disturb and displace benthic populations, both in the channel and on the side slopes. Turbidity levels would increase during construction and would fluctuate during maintenance dredging, although long-term impacts would not be serious. Another concern is the possibility of salinity intrusion beyond that which is now experienced with present dredging activities. Increased salinities would have a detrimental impact on plankton and benthos as well as on the marsh habitat in the lower bay. Increased salinities would benefit eelgrass production, but, at this point, it is not possible to pinpoint the loss of marsh habitat and the increase in eelgrass.

Removal of rock and channel debris could seriously impact the availability of habitat for juvenile and adult crabs which utilize this type of in-channel substrate. Shrimp and clams also depend on the channel area for food and cover. Adult fish use of the estuary would probably not be disturbed to any great degree as a direct result of dredging, except in cases where contaminants might be reintroduced into the water column. However, indirectly the channel deepening could lead to salinity increases and losses of fish, particularly shad and striped bass. Sturgeon eggs would also be susceptible to salinity changes. Juvenile fish use could be impaired if shallow water areas are affected by the dredging or blasting.

Blasting in the lower estuary would affect a variety of species. The most direct impacts in terms of mortalities would be to benthic, crustacean, and fish species in or near the channel. Waterfowl, colonial nesting birds (including brown pelicans), and marine mammals could be affected indirectly by the blasting. In some cases, the blasting may increase the food supply in the immediate area by increasing the numbers of fish at the surface. However, this "benefit" would be offset by the disturbance to marine mammals and birds, including the brown pelican, which could occur during blasting. Because of the potential for great damage to fish and wildlife resources, blasting should

be considered only as a last resort after all other means of rock removal have been eliminated. If blasting is pursued, it must be limited to a time period and duration of least impact to fish and wildlife resources using the area. The Oregon Department of Fish and Wildlife's (ODFW) recommended in-water blasting period is October 1 to January 15. Since this work period could impact anadromous fish, crabs, and brown pelicans, we would prefer to limit the blasting period to the winter months, i.e., January 1 to March 15. The blasting permit should specify use of bubble curtains, micro second delays between blasts, acoustic surveys to check for fish in the area, and divers to check on fish kills. If blasting occurs between May and November, (as recommended by ODFW) it could disturb brown pelicans, making it necessary to initiate formal Section 7 consultation proceedings prior to project construction. A detailed mitigation plan for the brown pelican would also have to be developed.

Disposal at an offshore site would have impacts to benthic and shellfish populations near the disposal site. Clams and crabs would most likely be impacted, since they are not as mobile as fish. Although long-term losses to these species are not expected to occur, thorough fish and wildlife studies of the proposed new disposal sites must be conducted prior to final selection of the new sites. There is some concern that material from the present offshore disposal sites may be washing up on the beaches north and south of the jetties and adversely impacting razor clam beds. Consequently, all shell and rock debris should be placed far enough offshore to prevent its return to the beaches. Of course, timing and location of the disposal is crucial to insuring that the material remains in place. Monitoring studies of the disposal sites and the beaches would also be necessary.

There is an opportunity for enhancing snowy plover habitat with disposal of clean materials on the North Spit beaches. Snowy plovers nest on disposal "mounds." Of course, disposal of contaminated materials must occur only on approved upland sites and every consideration must be given to preventing leakage from these areas.

RECOMMENDATIONS

To assure that fish and wildlife resources are protected, the Fish and Wildlife Service recommends that:

1. The project be conducted in multiple phases, i.e., 1 foot deepening every 5 years until authorized depth is achieved. A monitoring study should be initiated to determine increases in salinity related to channel deepening. If salinity increases significantly with dredging, the benefits of completing the dredging must be re-examined.

2. Due to the potential for serious adverse impacts to species in or near the channel, blasting not be considered unless absolutely necessary. If mechanical removal of rock is not possible, then blasting should occur only during the period from January 1 to March 15. Use of bubble curtains, divers to check for fish kills, micro-second delays between blasts, and acoustic surveys should be incorporated as blasting permit conditions.

3. Additional contaminant studies be conducted at the Port of Coos Bay's docks if the channel is widened in this area.

4. Dredged material (clean sand) be used to enhance snowy plover nesting habitat on the North Spit.

5. Any unavoidable habitat losses be mitigated in-kind within the estuary.

6. No dredging occur near identified contaminant sites.

7. Dredging occur only within specified in-water work periods set by the Oregon Department of Fish and Wildlife.

8. Thorough fish and wildlife studies be conducted on the proposed new disposal sites prior to final selection of a site.

9. All shell and rock debris be disposed of far enough offshore to prevent its return to the ocean beaches. Monitoring of the disposal sites and the beaches would be necessary.

We appreciate the opportunity to provide comments on the project. Please notify us of any changes in the project plans so that appropriate revisions can be made to this report.

REFERENCES

Jefferts, Katherine. 1977. The Vertical Distribution of Infauna: A Comparison of Dredged and Undredged Areas in Coos Bay. Coos Bay, Oregon. 133pp.

Johnson, John. 1990. Personal Communication. Oregon Department of Fish and Wildlife. Charleston, Oregon.

Jones, Howard. 1990. Coos Bay Channel Invertebrate Assessment Study. Draft Report Prepared for the U.S. Army Corps of Engineers. Portland District. Portland, Oregon. 64pp.

Jones, Howard. 1990. Draft Interim Report - Trawl Data from Coos Bay, Oregon Channel Study. Prepared for the U.S. Army Corps of Engineers. Portland District. Portland, Oregon. 42pp.

McCauley, James E., Daniel R. Hancock, and Robert A. Parr. 1976. Maintenance Dredging and Four Polychaete Worms. In Proceedings of the Specialty Conference on Dredging and Its Environmental Effects, P.A. Krenkel, et al, Eds. Mobile, Alabama. pp 673-683.

Miller, D.R., R.L. Emmett, and S.A. Hinton. 1990. A Preliminary Survey of Benthic Invertebrates in the Vicinity of the Coos Bay, Oregon Navigation Channel. Final Report of Research. National Marine Fisheries Service. Seattle, Washington. 32pp.

Moehl, C. and L. Barton. 1989. Dredge Material Sampling, Coos Bay, Oregon - Fish and Invertebrate Distribution. Unpublished Research Report. U.S. Army Corps of Engineers. Portland, Oregon. 23pp.

Parr, Robert A. 1973. Harbor Dredging and Benthic Infauna: A Case Study. Master's Thesis. Oregon State University. Corvallis, Oregon. 113pp.

Rudy, Paul, Jr. and Lynn Hay Rudy. 1983. Oregon Estuarine Invertebrates, An Illustrated Guide to the Common and Important Invertebrate Animals. Oregon Institute of Marine Biology, University of Oregon. Charleston, Oregon. 225pp.

U.S. Army Corps of Engineers. 1989. Sediment Quality - Coos Bay Estuary. Portland District Office. Portland, Oregon. 20pp.

U.S. Department of the Interior. 1987. Planning Aid Letter on the Proposed Channel Improvement Project at Coos Bay, Oregon. U.S. Fish and Wildlife Service. Portland, Oregon. 26pp.

ATTACHMENT A

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CANDIDATE SPECIES THAT MAY OCCUR IN THE AREA OF THE PROPOSED CORPS OF ENGINEERS COOS BAY CHANNEL IMPROVEMENT PROJECT COOS BAY, OREGON*

1-7-90-I-152

LISTED SPECIES 1/

Peregrine Falcon (Migratory)	Falco peregrinus	(E)
Bald Eagle (Resident and Migratory)	Haliaeetus leucocephalus	(T)
Brown Pelican	Pelicanus occidentalis	(E)

PROPOSED SPECIES

None

CANDIDATE 2/

Western Snowy Plover	Charadrius alexandrinus nivosus	(2)

* The Corps of Engineers should consult with the National Marine Fisheries Service regarding threatened and endangered marine mammals.

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

(1) - Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

(2) - Category 2: Taxa for which existing information indicates may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

1/ U. S. Department of Interior, Fish and Wildlife Service, Jan 1989, Endangered and Threatened Wildlife and Plants, 50 CFR 17.11 and 17.12.

2/ Federal Register Vol. 50, No. 181, Sept. 18, 1985 Proposed Rules.

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

Reply to
Attention of:

October 29, 1990

Planning Division

Mr. Russell D. Peterson
U.S. Fish and Wildlife Service
2600 SE. 98th, Suite 100
Portland, Oregon 97266

Dear Mr. Peterson:

We have reviewed your Coordination Act Report for the Coos Bay Channel Deepening Project and have the following responses to your recommendations.

Recommendation 1: The project be constructed in multiple phases, i.e., 1-foot deepening every five years until authorized depth is achieved. A monitoring study should be initiated to determine increases in salinity related to channel deepening. If salinity increases significantly with dredging, the benefits of completing the dredging must be re-examined.

Response: The selected plan is currently for a 2-foot deepening. Phased construction was evaluated for deeper depths but a deeper channel is not economically feasible at this time. Our evaluation of the existing salinity information leads us to believe that there will not be a significant change in salinity by deepening the channel 2 feet.

Recommendation 2: Due to the potential for serious adverse impacts to species in or near the channel, blasting will not be considered unless absolutely necessary. If mechanical removal of rock is not possible, then blasting should occur only during the period from January 1 to March 15. Use of bubble curtains, divers to check for fish kills, micro-second delays between blasts, and acoustic surveys should be incorporated as blasting permit conditions.

Response: Removal of rock in the channel will be accomplished primarily by mechanical means. It is currently estimated that none of the rock will have to be removed by blasting. In the event blasting will have to occur, in-water work periods will be those coordinated with your agency, Oregon Department of Fish and Wildlife and National Marine Fisheries Service; November to January 15 for river mile 2-4 and January to 15 March for 4-6 first then 0-2.

RECEIVED
NOV 01 1990
PORTLAND FIELD STATION

Recommendation 3: Additional contaminant studies be conducted at the Port of Coos Bay's docks if the channel is widened in this area.

Response: Currently there are no plans to widen the channel at the Port docks. Widening will only occur near the railroad bridge at river mile 8.5 to 9.5.

Recommendation 4: Dredged material (clean sand) be used to enhance snowy plover nesting habitat on the North Spit.

Response: The project currently does not include any upland disposal, however; if a plan can be developed that can utilize some of the material for this purpose without increasing project cost, it will be considered and implemented.

Recommendation 5: Any unavoidable habitat losses be mitigated in-kind within the estuary.

Response: Project construction will not result in a loss of habitat.

Recommendation 6: No dredging will occur near identified contaminant sites.

Response: Dredging will be confined to the main navigation channel except between river mile 8.5 and 9.5. Sediment testing has not indicated any contaminated sites in the project area.

Recommendation 7: Dredging occur only within specified in-water work periods set by the Oregon Department of Fish and Wildlife.

Response: Concur

Recommendation 8: Thorough fish and wildlife studies be conducted on the proposed new disposal sites prior to final selection of a site.

Response: Additional studies of expanded Site F and the rock disposal site are planned in the Preconstruction Engineering and Design (PED) phase of the study. Results from these studies will be used to verify that the selected site is adequate. We have no evidence that additional studies will uncover a changed condition from earlier studies performed.

Recommendation 9: All shell and rock debris be disposed of far enough offshore to prevent its return to the ocean beaches. Monitoring of the disposal sites and the beaches would be necessary.

Response: All three proposed disposal sites are located far enough offshore to prevent the material from washing up on shore.

Thank you for your comments on the project. If you have any further questions, please contact Mr. Joe Johnson (326-7119) or Mr. Kim Larson (326-6483) of my staff.

Sincerely,

Lauren J. Aimonetto
Chief, Planning Division

EXHIBIT 7

ENDANGERED SPECIES COORDINATION LETTERS AND BIOLOGICAL ASSESSMENTS

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

APR 16 1990

F/NWR3:1514-04 js

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

Dear Mr. Duncan:

This is to advise you that the northern sea lion, Eumetopias jubatus, was listed as threatened under the Endangered Species Act (ESA) on April 5, 1990 (see enclosed Federal Register notice, 55 FR 12645). In addition, NMFS is conducting a status review of sockeye salmon (Oncorhynchus nerka) populations in the Snake River basin to determine if any populations should be proposed for listing under the ESA. The Snake River sockeye salmon therefore are to be considered as candidate species for ESA Section 7 consultations as described in 50 CFR 402.12(d).

We have revised our list of endangered/threatened species that may occur off Oregon and Washington and a copy is enclosed. Consultations should be initiated (or reinitiated if prior consultations were conducted) on activities that may affect northern sea lions.

You recently submitted two letters dated March 29, 1990 and March 30, 1990 regarding two ESA Section 7 biological assessments: one for a Coos Bay channel deepening and offshore disposal project; and one for a bank protection project at the mouth of the Coquille River. Because northern sea lions do occur in the area of both projects, we will need to receive revised assessments that include this recently listed species. In addition, the biological assessments do not include the most current information available on gray whales. The gray whale assessments for each project should include the applicable information and analyses described in my March 28, 1990 letter to you regarding the Tillamook Bay project.

We will reinitiate our consultation responsibilities under Section 7 of the ESA for these two projects upon receipt of revised biological assessments. If you have any questions concerning this consultation, please contact Joe Scordino at (206) 526-6140.

Sincerely,

for Thomas E. Kruse
Rolland A. Schmitten
Regional Director

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

April 9, 1990

ENDANGERED AND/OR THREATENED SPECIES UNDER THE JURISDICTION OF NATIONAL MARINE FISHERIES SERVICE THAT MAY OCCUR OFF WASHINGTON AND OREGON

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
Northern Sea Lion	Eumetopias jubatus

MARINE TURTLES

Leatherback Sea Turtle	Dermochelys coriacea

FISH

Sacramento River Winter-Run Chinook Salmon	Oncorhynchus tshawytscha

Candidate Species

Salmon River Basin Sockeye Salmon	Oncorhynchus nerka

United States Department of the Interior

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

April 9, 1990

Re: 1-7-90-SP-122

Mr. Richard M. Duncan
Chief, Fish and Wildlife Branch
Portland District, Corps of Engineers
P. O. Box 2946
Portland, Oregon 97208

Dear Mr. Duncan:

This is in response to your letter of March 29, 1990 in which you requested an update of a species list (1-7-87-SP-88) that was provided by this office for the proposed channel deepening and offshore disposal at Coos Bay, Oregon. Since there has not been a change in project or species concerns, the species list provided to you in 1987 remains valid.

Sincerely,

Russell D. Peterson
Field Supervisor

cc:

KL\mm\SE

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

Reply to
Attention of:

March 29, 1990

Planning Division

Mr. Russell D. Peterson
Field Supervisor
U.S. Fish and Wildlife Service
727 NE. 24th Avenue
Portland, Oregon 97232

Dear Mr. Peterson:

We request a list of threatened, endangered and candidate species for the proposed channel deepening and offshore disposal project at Coos Bay, Oregon. A list was included in your April 27, 1987, Planning Aid Letter for this project, though given the lapse of time, we would like to verify the accuracy of this list. The case number for this list is 1-7-87-SP-88.

The proposed project involves the expansion of the existing deep draft navigation channel in Coos Bay, Oregon. The current channel is authorized and maintained to a depth of 45 feet between river mile (RM) 0-1, and 35 feet between RM 1-15. The proposed expansion calls for the deepening of the existing channel by a minimum of 1-foot, or up to a maximum of 5 feet. Construction may be carried out in either a single phase, or in multiple phases. Multiple phase construction would involve deepening the channel by 1-foot every five years, until the desired depth is attained. It is anticipated that as much as 559,000 cy of rock would be removed from the channel between RM 1 and 5. In general, medium grained sand will be removed between RM 5-12, and fine grained silty sand between RM 12-15. Between 32,000 cy and 2,000,000 cy of sandy material would be removed from throughout the channel. The rock material in the lower channel would be drilled and blasted to loosen it for removal by a clam shell dredge. Due to the nature of the work, rock excavation would be carried out during the first year of construction, rather than in phases.

All of the material removed from the channel will be placed offshore. The rock material would require placement at a new disposal site (Figure 1). The proposed location of this site was selected based on biological productivity information which indicates that fewer organisms will be impacted by disposal here. This disposal area is situated on a sandy bottom adjacent to a natural rocky area in waters 150 ft to 200 ft deep. Dimensions of this site would be 14,000 ft X 3,599 ft.

In addition to the need for designating the offshore rock disposal site, the further expansion of existing site F will also be necessary. This site was expanded under section 103 authority in late summer 1989 (We received a concurrence letter from your office dated September 5, 1989, with regard to our biological assessment for that expansion). Area 1 and 2 (Figure 1) comprise the currently designated site F, while area 3 is the proposed expansion site. This expansion would extend the existing site 1,400 ft to the north. The total dimensions of the new site would be 3,600 ft X 4,200 ft. Between 425,000 and 1,500,000 cy of material could be placed at this site with the various alternatives. This material would consist of clean sand with a medium grain size of 0.2mm to 0.3mm. These sediments contain no contaminants of concern in excess levels and are excluded from the requirements for further biological and chemical testing as provided in CFR 227.13(b). The fine grained material which will be encountered above RM 12 will be placed at offshore site E. No further expansion of this site will be necessary. Chemical analysis of these materials does not reveal contaminants of concern in excess levels.

If you have any questions, or need further information concerning this project please contact Chris Moehl or Geoff Dorsey of my staff at 326-6485.

Sincerely,

Richard N. Duncan
Chief, Fish and Wildlife
Branch

Enclosure

USFWS INITIAL ESA LIST

~~Attachment A~~

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CANDIDATE SPECIES THAT MAY OCCUR IN THE AREA OF THE PROPOSED CORPS OF ENGINEERS COOS BAY CHANNEL IMPROVEMENT PROJECT COOS BAY, OREGON

1-7-87-SP-88

LISTED SPECIES[1/]

Bald eagle (Resident and Migratory)	(Haliaeetus leucocephalus	T
Peregrine falcon (Migratory)	(Falco peregrinus)	E
Brown pelican (Migratory)	(Pelicanus occidentalis)	E

PROPOSED

None

CANDIDATE[2/]

Western snowy plover	(Charadrius alexandrinus nivosus)	(2)

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

(1) - Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.
(2) - Category 2: Taxa for which existing information indicates may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

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.
2/ Federal Register Vol. 50, No. 181, Sept. 18, 1985 Proposed Rules

June 22, 1990

Planning Division

Mr. Russell D. Peterson
Field Supervisor
U.S. Fish and Wildlife Service
2600 SE. 98th Avenue, Suite 100
Portland, Oregon 97266

Dear Mr. Peterson:

This letter constitutes an addendum to our biological assessment for the proposed Coos Bay Channel Deepening Project in Coos Bay, Oregon. Our original biological assessment, which was forwarded to you on May 1, 1990, did not address the possible impacts to listed species due to the blasting of rock in the navigation channel.

As recommended by Patty Snow (ODFW), blasting would occur between January 1 and April 30. As much as six months of blasting may be required; if this is the case, the operation would be done over two blasting seasons. A mechanical method of rock removal, which may eliminate the need for blasting either partially or wholly, is currently being explored.

Bald eagles, peregrine falcons and snowy plovers do not utilize the navigation channel directly, therefore, we feel that blasting will have "no effect" on these species. Brown pelicans will not be in the area during the blasting season, hence, this species will also not be effected.

If you need additional information concerning this project, please contact Chris Moehl of my staff at 326-6485.

Sincerely,

Richard N. Duncan
Chief, Fish and Wildlife Branch

CF:
CENPP-EN-GG (Griffiths)
CENPP-EN-GG (Amundson)
CENPP-PL-EF (Johnson)
CENPP-PL-RE (Stevens)

PL-File

DUNCAN
PL-F

DORSEY
PL-F

MOEHL
PL-F
6485/Moehl
22 Jun 90

May 1, 1990

Planning Division

Mr. Russell D. Peterson
Field Supervisor
U.S. Fish and Wildlife Service
727 NE. 24th Avenue
Portland, Oregon 97232

Dear Mr. Peterson:

Pursuant to the requirements of the Endangered Species Act of 1973, we are forwarding a biological assessment for bald eagles, peregrine falcons, brown pelicans and western snowy plovers for the proposed channel deepening and off shore disposal project at Coos Bay, Oregon. This assessment is in response to your 1987 species list (1-7-87-SP-88) and your update letter of April 9, 1990.

We have concluded that this project will have "no effect" on any of the listed species.

Should you require any additional information, please contact Chris Moehl of my staff at 326-6485.

Sincerely,

Richard N. Duncan
Chief, Fish and Wildlife
Branch

Enclosure

CF: PL-F MOEHL

BALD EAGLE, PEREGRINE FALCON, BROWN PELICAN AND WESTERN SNOWY PLOVER BIOLOGICAL ASSESSMENT FOR COOS BAY CHANNEL DEEPENING AND OFFSHORE DISPOSAL PROJECT

PROJECT DESCRIPTION

The proposed project involves the expansion of the deep draft navigation channel in Coos Bay, Oregon, with offshore disposal of all dredged material. The current channel is authorized and maintained to a depth of 45 feet between river mile (RM) 0-1, and 35 feet between RM 1-15. The proposed expansion calls for the deepening of the existing channel by a minimum of 1-foot, or up to a maximum of 5 feet. Construction may be carried out in either a single phase, or in multiple phases. Multiple phase construction would involve deepening the channel by 1-foot every five years, until the desired depth is attained. It is anticipated that as much as 559,000 cy of rock would be removed from the channel between RM 1 and 5. In general, medium grained sand will be removed between RM 0-12, and fine grained silty sand between RM 12-15. Between 32,000 cy and 2,000,000 cy of sandy material would be removed from throughout the channel. The rock material in the lower channel would be drilled and blasted to loosen it for removal by a clam shell dredge. Due to the nature of the work, rock excavation would be carried out during the first year of construction, rather than in phases.

All of the material removed from the channel will be placed offshore. The rock material would require placement at a new disposal site (Figure 1). The proposed location of this site was selected based on biological productivity information which indicates that fewer organisms will be impacted by disposal here. This disposal area is situated on a sandy bottom adjacent to a natural rocky area in waters 150 ft to 200 ft deep. Dimensions of this site would be 14,000 ft X 3,599 ft.

In addition to the need for designating the offshore rock disposal site, the further expansion of existing site F will also be necessary. This site was expanded under section 103 authority in late summer 1989 (We received a concurrence letter from your office dated September 5, 1989, with regard to our biological assessment for that expansion). Area 1 and 2 (Figure 1) comprise the currently designated site F, while area 3 is the proposed expansion site. This expansion would extend the existing site 1,400 ft to the north. The total dimensions of the new site would be 3,600 ft X 4,200 ft. Between 425,000 and 1,500,000 cy of material could be placed at this site with the various

CORPS OF ENGINEERS

U.S. ARMY

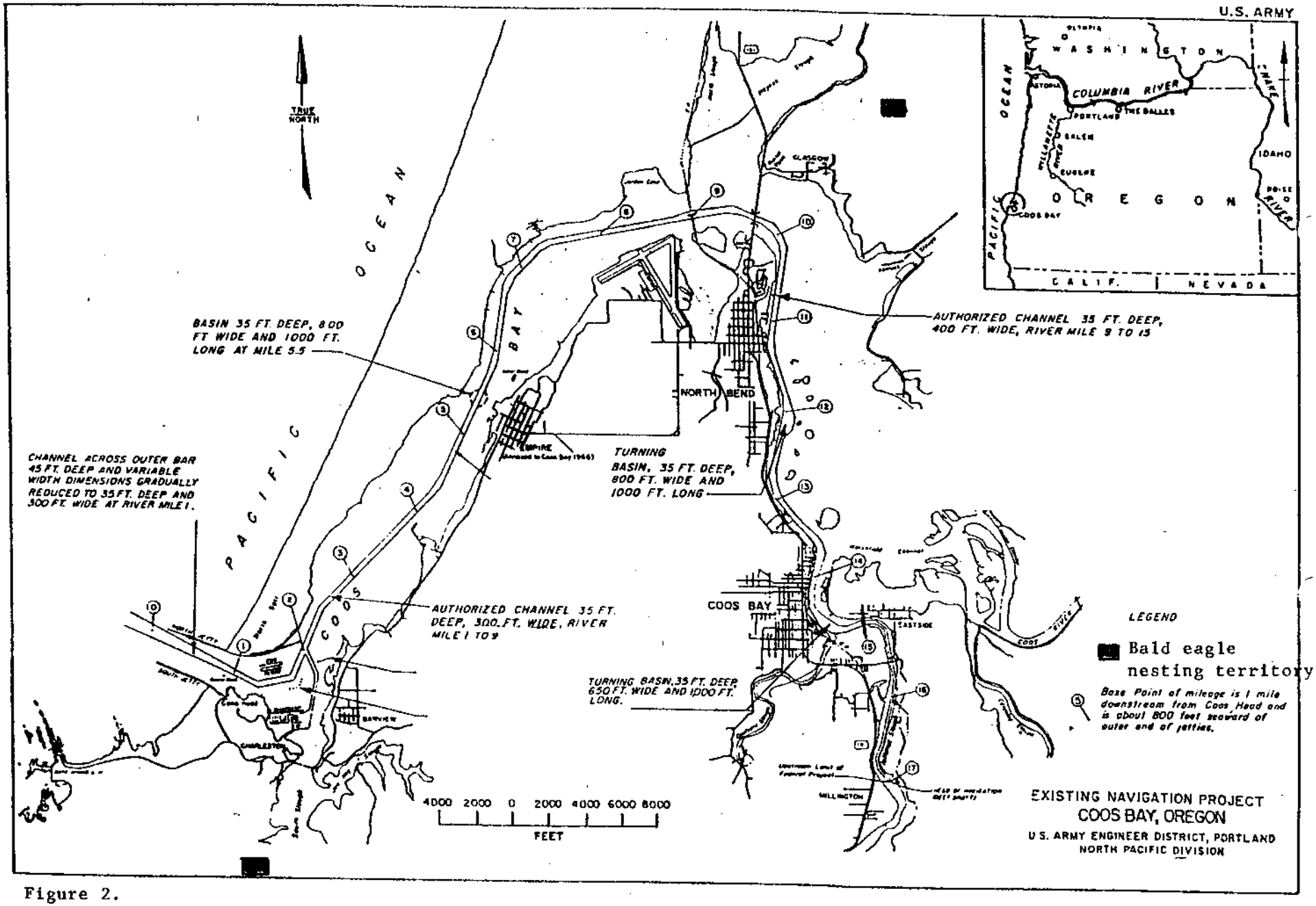


Figure 2.

alternatives. This material would consist of clean sand with a medium grain size of 0.2mm to 0.3mm. These sediments contain no contaminants of concern in excess levels and are excluded from the requirements for further biological and chemical testing as provided in CFR 227.13(b). The fine grained material which will be encountered above RM 12 will be placed at offshore site H. No further expansion of this site will be necessary. Chemical analysis of these materials does not reveal contaminants of concern in excess levels.

BALD EAGLES

There are two pairs of bald eagles nesting in the vicinity of the Coos Bay navigation channel (Figure 2). One pair nests south of Charleston approximately 2 miles from the navigation channel. This pair is known to have been nesting here since 1986 and have successfully produced two young each year through 1989. Bald eagles are frequently observed foraging and perching at various locations in South Slough, in particular, north of Valino Island, at Collver Point, and on the north side of Brown's Cove. They are occasionally observed flying northward over Charleston, and along the bay off Fossil Point. Bald eagles have also been observed perching on a gravel bar at Pigeon Point.

The presence of eagles in the lower part of the Coos Bay estuary suggests that activities such as regular ship and fishing boat traffic, as well as activities associated with the town of Charleston do not preclude the use of this area by bald eagles. A variety of fish and waterfowl species are available for foraging eagles in the lower bay and south slough.

The other local pair of bald eagles nest at Mettman Ridge, northeast of Glasgow, approximately 1.5-2.5 miles from the northern section of the navigation channel. This pair is known to have been nesting here since 1976. History of nesting success is as follows: 1976-1 (1 young fledged), 1977-2, 1978-2, 1979-F (nesting failure), 1980-F, 1981-F, 1982-F, 1983-1, 1984-F, 1985-2 1986-Of (no eggs observed), 1987-F, 1988-F, 1989-F. Likely foraging areas for this pair include Haynes and North Sloughs, as well as the northern section of Coos Bay. Prey items available in these sloughs include a variety of fish and waterfowl species.

During the construction of the last 5-foot channel deepening project in Coos Bay (1976-79), the Mettman Ridge pair did not appear to be adversely effected by the dredging operation, as breeding success for this pair was consistent between 1976-78. The reason(s) for the high rate of breeding failure which has been experienced by this pair since 1979 is unknown. These failures could possibly be attributed to the loss of perching habitat and/or chemical contamination of their food supply. Much

of this pair's territory was logged during the late 1970's and early 1980's; this action may have resulted in a loss of key perch trees. Chemical analysis of sediments from throughout the Coos Bay navigation channel do not indicate that high levels of contaminants occur here. Dredging activities are not expected to have a deleterious effect on local water quality, and ultimately on bald eagles.

Migrant bald eagles also occur at the Coos Bay estuary, particularly in the fall and winter. Concentrations of wintering waterfowl, as well as fish are likely prey items for these eagles. The majority of the dredging in the navigation channel at Coos Bay would occur between April and October, hence migrant bald eagles are not expected to present during construction activities. In the event that dredging should occur while bald eagles are present, it is not expected that these activities would be disruptive to either bald eagles or their prey resources.

We conclude that the construction activities, offshore disposal, and ultimate expansion of the navigation channel at Coos Bay, will have "no effect" on resident or migrant bald eagles.

PEREGRINE FALCONS

Specific information regarding use of the Coos Bay estuary by migrant Peregrine falcons is limited to the vicinity of the North Spit. Personnel from BLM logged 320 hours of observation on 79 trips to North Spit between September 25, 1985 and May 15, 1986. They observed 18 peregrines during their survey for an approximate rate of 18 hours/sighting. CH2M Hill also conducted surveys at the northeast panhandle of the North Spit, where they averaged 31.8 hours/sighting (CH2M Hill Northwest, Inc. 1986). Fall sightings were made primarily on the beach at the northern portion of the spit where shorebird prey were abundant. Winter sightings (Nov. 12, 1985 - Feb. 15, 1986) included two on the southern beach near the North Jetty and four within the forested, stabilized dune habitat of the interior spit. Ten peregrine sightings were recorded by BLM personnel and eight by CH2M Hill personnel in winter. Fewer sightings occurred in spring with BLM recording two peregrines and CH2M Hill personnel one.

The ocean beach, forested, stabilized dune, and effluent lagoon appeared to be the most important peregrine habitat on North Spit. Shorebirds were abundant on the ocean beach habitat and apparently were the primary attraction for peregrines. The forested, stabilized dune habitat provides an excellent vantage point for peregrines of the interior of North Spit. The effluent lagoon provides foraging habitat for peregrines. Sightings of peregrines by Ruediger (1986) and CH2M Hill Northwest, Inc.

(1986) well exceeded that of previous observers (Wilson-Jacobs 1983, 4 sightings.) on North Spit. This appears to be more a function of effort, rather than reflecting a definite increase in peregrine numbers.

Although information with regard to peregrine sightings in other areas of the estuary is not available, it is likely that migrant peregrine falcons occur throughout the Coos Bay estuary, particularly in the fall and winter. Large concentrations of wintering shorebirds and waterfowl occur in the broad intertidal areas of the upper bay and associated sloughs; as such, peregrine falcons should be attracted to these areas.

The dredging of the navigation channel is not expected to effect the distribution of peregrine prey species in the intertidal areas of the bay. Additionally, most of the dredging activities will be conducted between April and October, hence, construction activities should not effect peregrine falcons. Chemical analysis of sediments from the navigation channel do not reveal the presence of pesticides, PCB's or other environmental contaminants at levels which may be deleterious to peregrine falcons.

We conclude this project will have "no effect" on peregrine falcons.

BROWN PELICANS

Brown pelicans are typically found along the southern Oregon coast between June and November; their movement into Oregon waters occurs post breeding and is an annual event. Initial concentrations typically occur at estuaries along the southern Oregon coast, with a gradual movement northward as summer progresses. In recent years they have been observed in Coos Bay during the Christmas bird count, with a high of 54 counted here in 1987. The majority of birds (73-85%) are immatures.

Brown pelicans are known to forage and loaf in the Coos Bay navigation channel and adjacent areas. Foraging by brown pelicans occurs in the bay, between the jetties, and in adjacent nearshore areas. Small fish, such as northern anchovies and Pacific herring, are common prey items for this species. The north jetty at Coos Bay, particularly near the base, is a common loafing area for brown pelicans. Loafing also occurs on sandbars, beaches, offshore rocks, headlands, pilings and channel markers.

During July and August 1989, Corps of Engineers biologists aboard the hopper dredge Yaquina routinely observed brown pelicans foraging and loafing within 50 yards of the dredge. They appeared to be undisturbed by the dredging activities, and

may have been feeding on fish which were displaced by the dredge. Pacific sand lance, which normally occur on the bottom of the channel, are entrained by the dredge and discharged through the overflow ports near the surface. It is possible that dredging may increase the availability of fish, especially Pacific sand lance, which may be preyed upon by pelicans. Pelagic fish species such as the northern anchovy and Pacific herring are rarely entrained by dredges, hence, construction actions are not expected to have an impact on prey species for brown pelicans.

Chemical analysis of sediments from the Coos Bay navigation channel do not reveal the presence of pesticides, PCB's or other environmental contaminants at levels which may be deleterious to brown pelicans.

We conclude that the dredging and offshore disposal of material at Coos Bay will have "no effect" on brown pelicans.

WESTERN SNOWY PLOVERS

The open sand dune habitat of the Coos Bay North Spit supports one of the largest breeding populations of western snowy plovers on the Oregon coast. An initial survey of nesting snowy plovers in coastal Oregon during 1972 indicated that North Spit supported 18% (39/216) of the breeding population (Jacobs 1982). Subsequent breeding surveys have indicated that the North Spit has supported a maximum of 45% of the coastal breeding population (Table 1). During the 1990 wintering survey, 38% (19/50) of the Oregon coastal population was observed at North Spit (Table 2).

The ocean beach, and the dredge disposal areas are the most important snowy plover breeding sites at North Spit. Beach nesting is influenced by the availability of suitable habitat, including the amount of beach above high tide, and by the level of human recreational use. Beach availability varies annually and is influenced by the number, intensity, and duration of winter storm events. The disposal sites on the North Spit are more secure from storm events, but are subject to invasion by European beachgrass and other plants, as well as recreational vehicle use. The south disposal area is more difficult to access than the north disposal area, hence, the south disposal area is generally used more heavily by wintering and breeding snowy plovers. BLM has placed a fence around the north disposal site in an effort to protect nesting plovers from recreational vehicle traffic.

Western snowy plovers have been experiencing low overall productivity along the Oregon Coast. The lack of breeding success has been attributed to high egg predation, particularly by avian predators. In an effort to increase plover productivity, The Nature Conservancy and ODFW will be placing

Table 1. Number of western snowy plovers wintering and breeding on Coos Bay North Spit.

Year	Winter	Breeding	Percent of Coastal Breeding Population
1978	--	3[a]	3[a]
1979	--	45	45
1980	--	26	32
1981	--	47	33
1982	30[b]	37 (20)[c]	45 (24)[c]
1983	12	9	17
1984	0	6	13
1985	9	10	21
1986	18	15	20
1987	10	20	32
1988	0	18	34
1989	2[d]	24	41
1990	19[e]		

--Area not surveyed.
[a] North spit south disposal area not surveyed.
[b] All birds located on North Spit south disposal area.
[c] Parenthetical number is average observed during breeding season (Jacobs 1982).
[d] Dredge spoils not surveyed.
[e] All birds located on disposal areas.

Table 2. ANNUAL SNOWY PLOVER WINTER SEASON COASTAL SURVEYS[a]

Area	Number of Snowy Plovers[b] 1990	1989	1988	1987	1986	1985	1984[d]	1982-1983	Mean
Columbia R.-Necanicum R.	-	0	0	0	0	1	0	0	0.3
Nehalem Spit	-	-	-	0	0	0	-	2	0.5
Bayocean Spit	0	39	18	10	13	11	10	10	13.9
Netarts Spit	-	0	-	0	0	0	0	0	0.0
Sand Lake Spits	-	0	0	0	0	0	0	7	1.0
Nestucca Spit	-	0	0	0	0	0	0	0	0.0
Neskowin Beach	-	0	-		-	-	-	-	0.0
Siletz Spit	0	-	0	0	0	-	-	-	0.0
South Beach, Newport [c1]	0	-	0	0	-	0	0	0	0.0
Alsea Spit	0	0	0	0	0	0	0	0	0.0
Heceta Head-Sutton Spit	2	5	0	17	10	24	5	28	11.4
Sutton Cr.- N. Jetty Siuslaw	0	0	0	0	1	0	-	-	0.2
Suislaw R.- Siltcoos Spit[c2]	13?	3	0	0	0	0	0	0	2.0
Siltcoos Spits	0	4	0	0	0	11	0	0	1.9
Siltcoos Spit- Tahkenitch Spit	1?	0	0	3	13	1	0	0	2.3
Tahkenitch Spits	0	0	0	0	0	0	0	0	0.0
Tahkenitch Spit- Threemile Cr.	0	0	0	0	0	0	0	0	0.0
Threemile Cr.- Umpqua R.[c3]	0	1	0	0	0	0	0	0	0.1
Umpqua River- Tenmile Spit	1	5	9	-	0	0	12	5	4.6
Tenmile Spits	0	0	0	-	0	0	0	4	0.6
Tenmile Spit- Horsfall Beach	0	0	0	-	0	0	3	0	0.4
Horsfall Beach- Coos Bay & Spoils	19e	2[f]	0	10	18	9	0	12	8.8
Whiskey Run-Coquille R.	0	-	0	-	0	0	0	0	0.0
Bandon State Park-New R.	14	20	23	4	17	8	10	13	13.6
New River-Floras Lake	0	1	0	2	0	0	3	0	0.8
Euchre Creek-Greggs Creek	0	1	0	-	0	1	0	2	0.6
Myers Creek-Pistol River	0	0	-	-	-	0	0	0	0.0
TOTAL	50	81	50	46	72	66	43	78	61.4

[a] All surveys in Jan., except 3 Dec. 1982-3 Feb. 1983 and 20 Jan.- 2 Feb. 1984.
[b] If more than one survey conducted, the highest number observed was recorded.
[c] Other beach segments where plovers were found during winter (Nov.-Feb.) outside survey period and/or during winter 1978-1981.
1. South Beach, Newport 1980 (1), 1983 (1).
2. Suislaw R. - Siltcoos Spit 1978 (12), 1979 (6), 1980 (4).
3. Threemile Cr. - Umpqua R. 1979 (10), 1980 (1).
[d] Adverse weather conditions prevailed for most of survey.
[e] Coos Bay dredge spoils recorded all plovers.
[f] Coos Bay dredge spoils not surveyed.
(-) Area not surveyed.

Source: Charlie Bruce, ODFW, 1990.

predator exclosures around individual nests at the south disposal site during the 1990 nesting season.

Snowy plover habitat would be enhanced by upland disposal of dredged material at North Spit, however, upland disposal is not anticipated as it is more economical to use a hopper dredge and dispose of material offshore. Disposal actions offshore would not impact snowy plover habitat.

We conclude that the proposed Coos Bay navigation channel deepening and offshore disposal projects will have "no effect" on western snowy plovers.

LITERATURE CITED

CH2M Hill Northwest, Inc. 1986. An assessment of Peregrine Falcon use of the North Bay Marine Industrial Park Road and Rail Access Corridor. Unpubl. Rept., International Port of Coos Bay, Coos Bay, Oregon. 68p.

Deering, R. 1979. Field report and biological assessment of the North Spit, Coos Bay, Oregon; Final report: 30 June 1978 to 26 January 1979. Unpubl. Report, U.S. Army Corps of Engineers, Portland District.

Jacobs, R.W. 1982. Occurrence and activities of snowy plovers at Coos Bay North Spit, Oregon. Unpubl. report, U.S. Army Corps of Engineers, Portland District. 15p.

Ruediger, R. A. 1986. A survey of peregrine falcon and bald eagle use of the Coos Bay North Spit. Unpubl. report, USDI, Bureau of Land Management, Coos Bay District, Coos Bay, Oregon. 22p.

Ruediger, R.A. 1988. Habitat management plan for Western Snowy Plover (Charadrius alexandrinus nivosus) on Coos Bay North Spit, Oregon. Draft plan, USDI, Bureau of Land Management, Coos Bay District, Coos Bay, Oregon. 14p.

Wilson-Jacobs, R. 1983. Wildlife use of Coos Bay North Spit, Oregon. Unpubl. report, U.S. Army Corps of Engineers, Portland, District. 68p.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Portland Field Station
2600 S.E. 98th Avenue, Suite 100
Portland, Oregon 97266

RECEIVED
JUL 6 1990
REG & RES BR

July 3, 1990

Re: 1-7-90-I-152

Mr. Richard Duncan
Chief, Fish & Wildlife Branch
Portland District, Corps of Engineers
P. O. Box 2946
Portland, Oregon 97208-2946

Dear Mr. Duncan:

This is in response to your letter dated June 22, 1990 that was received by us on June 26, 1990, transmitting an addendum to your biological assessment of May 1, 1990. The addendum and original assessment address the impacts of the proposed channel deepening at Coos Bay, Oregon on bald eagles, peregrine falcons, brown pelicans, and western snowy plovers.

We have reviewed the biological assessment and the addendum and concur with your determination of no effect on bald eagles, brown pelicans, peregrine falcons, and western snowy plovers.

To further conserve western snowy plover, we recommend coordination with the Oregon Department of Fish and Wildlife and the Service in the implementation of measures to enhance breeding habitat.

The requirements established under Section 7(a)(2) and 7(c) of the Endangered Species Act of 1973, as amended, have been met, thereby concluding the consultation process.

We appreciate your concern for listed species.

Sincerely,

Roger E. Torderstrasse
for Russell D. Peterson
Field Supervisor

cc:
R1-FWE, SE
ODFW (Nongame)
ONHP

printed on unbleached, recycled paper

December 4, 1990

Planning Division

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 a biological assessment for threatened and endangered species which could potentially be impacted by dredging and disposal operations associated with the Coos Bay Channel Deepening Project.

We have concluded that this project will have "no effect" on any of the listed species.

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

Sincerely,

Robert E. Willis
Chief, Fish and Wildlife
Branch

Enclosure

CF:
Joe Johnson, PL-C
Steve Stevens, PL-R

PL File

WILLIS
CENPP-PL-F

DORSEY
CENPP-PL-F
6482/Cameron
5 Dec 90

CF: CENPP-PL-F DORSEY

BIOLOGICAL ASSESSMENT

FOR

GRAY, HUMPBACK, BLUE, FIN, SEI, RIGHT, AND SPERM WHALES;

LEATHERBACK SEA TURTLES;

NORTHERN (STELLER) SEA LIONS;

AND

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON

COOS BAY CHANNEL DEEPENING PROJECT

COOS BAY, OREGON

PROJECT DESCRIPTION

The proposed project involves the deepening of the existing deep draft navigation channel at Coos Bay, Oregon. The current channel is authorized and maintained to a depth of 45 feet between river mile (RM) 0-1, and 35 feet between RM 1-15. The proposed project calls for a two foot deepening of the existing with advance maintenance dredging of 5 feet between RM 0-1, 2 feet between RM 1-10, and 3 feet from RM 10-15.

Dredging activities between RM 10-15 would be carried out by clamshell dredge. Excavation of 673,000 cy of material would take an estimated 2 months of effort. Silty clay in this reach of the project is not suitable for hopper dredging.

Excavation of 803,000 cy of material between RM 1-10 will occur by hopper dredge. Again, approximately 2 months of effort will be required to excavate this material. The entrance channel (RM 0-1) would entail removal of 199,000 cy via hopper dredge. Less than two weeks would be required to remove material from the entrance channel.

It is anticipated that approximately 88,000 cy of rock would be removed from the channel. Harder sandstone rock would be removed between RM 1+12 and 3+02 (20,500 cy) with softer rock removed between RM3+06 and 5+30 (67,700 cy). Rock would be removed via a barge-mounted backhoe. Excavation of rock from the Coos Bay Navigation Channel during the previous channel deepening (1977-79) was accomplished in this manner. Blasting could be required should hard points be encountered. It is estimated that this effort would take four months.

The rock material which would be excavated from the channel would require placement at an offshore site (Figure 1). The location of this site was selected based on biological productivity information which indicates that fewer organisms will be impacted by disposal here. This disposal area would be situated on a sandy bottom adjacent to a natural rocky area in

waters 150 ft to 200 ft deep.

In addition to the need for designating the offshore rock disposal site, further expansion of existing site F will also be necessary (Figure 1). This site was expanded under section 103 authority in late summer 1989 (We received a concurrence letter from your office on September 13, 1989 with regard to our biological assessment for that expansion). This expansion would extend the existing site 1,400 ft to the north. The total dimensions of the new site would be 3,600 ft X 4,200 ft. Between 425,000 and 1,500,000 cy of material could be placed at this site with the various alternatives. This material would consist of clean sand with a medium grain size of 0.2mm to 0.3mm. These sediments contain no contaminants of concern in excess levels and are excluded from the requirements for further biological and chemical testing as provided in CFR 227.13(b). The fine grained material which will be encountered above RM 12 will be placed at offshore site H. No further expansion of this Site H will be necessary. Chemical analysis of these materials does not reveal contaminants of concern in excess levels.

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).

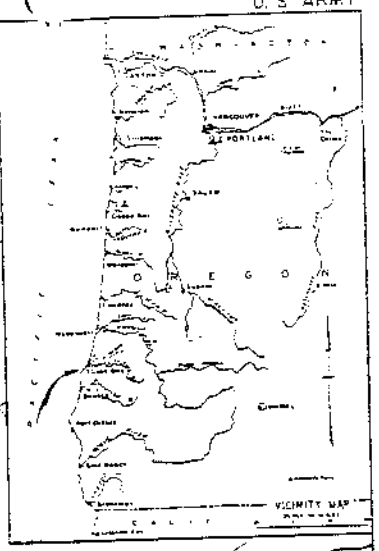
Southward migration occurs off Oregon between early December and mid-February, with pregnant females being the first to pass southward. (Herzing and Mate 1984). Southbound whales typically occur off Oregon in water less than 90 meters deep, with the majority of migrants occurring in water 40-60 m deep, 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

CORPS OF ENGINEERS

U. S. ARMY



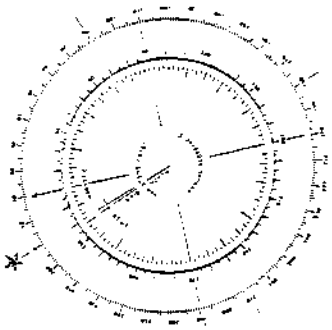
Mid Point

SUNSET BAY

INTERPRETED CLASSIFICATION:

LEGEND:

- ROCK
- COARSE SAND/GRAVEL
- SAND WAVES
- TREND OF SAND WAVE CRESTS
- APPARENT SEDIMENT TRANSPORT
- SAND/SILT
- PARTIALLY BURIED ROCK/DREDGE MATERIAL
- ISOLATED ROCKS/BOULDERS
- TARGETS?
- START/END OF SUBBOTTOM PROFILE
- DEPTH CONTOURS IN FEET



P A C

outh Zone
rational Geo-
djustment.)
ft.

ults of surveys
indicating the

EATTLE, WA

EMBER, 1989

APPROACHES TO COOS BAY

SIDE SCAN SONAR BOTTOM MAP

SCALE IN FEET

1000 0 1000 2000 3000 4000

U. S. ARMY ENGINEER DISTRICT, PORTLAND
OPERATIONS DIVISION

SUBMITTED

APPROVED

CHIEF, HYDROGRAPHIC SURVEYS

CHIEF, NAVIGATION BRANCH

RECOMMENDED

CHIEF, WATERWAYS MAINTENANCE SECTION

SURVEYED PLOTTED CHECKED

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 grey 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 grey 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). Grey 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

The Coos Bay channel deepening and offshore disposal projects are not expected to have an impact on gray whales. The ocean disposal areas are south of the locations where most summering gray whales are observed. Additionally, due to the location offshore, depth of the disposal sites and timing of material placement; migrating gray whales are not expected to be impacted by the offshore disposal. Material to be dredged does not contain contaminants at levels of concern and is suitable for inwater placement, therefore contaminants would not pose a hazard to gray whales. Dredging operations in the estuary are very localized in nature. Should summering gray whales occur in the estuary, avoidance of the immediate dredging area would be expected. Loss of foraging opportunities for gray whales is considered negligible as summering and/or migrant gray whales are infrequent users of the estuary. Rock removal by mechanical

means should have no impact on gray whales except for possible avoidance of the immediate work area, should whales occur during that action. Blasting operations, should they be required, could be more detrimental. However, blasting is unlikely to occur and conservation measures would have to be employed if blasting is used to minimize fish and wildlife resource impacts.

CONCLUSION:

Based upon the aforementioned information and the nature of the project we have concluded that the project will have "no effect" on gray whales. Further coordination with state and federal agencies would be required if blasting is employed, to include endangered species consultations.

LITERATURE CITED

Sumich, J.L. 1984. Grey whales along the Oregon Coast in summer, 1977-1980. The Murrelet. 65:33-40.

HUMPBACK, RIGHT, FIN, BLUE, SEI, AND SPERM WHALES

These species may occur in the project area but information on numbers, distribution, and feeding habits is lacking other than in a general sense. Occurrence of blue whales off the Oregon coast is primarily in May-June and August-October (Rice 1974 in Maser et al. 1981). Blue whales typically occur offshore as individuals or in small groups. Blue whales winter well south of Oregon as do fin whales (Maser et al. 1981). Fin whales do range off the Oregon Coast during summer. Whaling records indicate that fin whales were primarily harvested off Oregon from May-September (Maser et al. 1981). Sei whales also winter south of Oregon. Based upon information from central California, Sei whales probably occur in southward migration off the Oregon coast in late summer - early fall (Maser et al. 1981). Based upon catch records, humpbacks primarily occur off the Oregon coast between April and October with peak numbers occurring during June, July, and August (Maser et al. 1981). Sperm whales occur as migrants and some may summer off the Oregon coast (Maser et al. 1981). Strandings have occurred along the Oregon coast. Right whales may occur off the Oregon coast during winter; summer distribution is in cool waters north of 50 degrees north latitude (Maser et al. 1981).

CONCLUSION

Given the nature of the project, including the channel dredging, low potential for rock blasting, lack of a contaminant problem, offshore disposal, and whale use/occurrence in the project area, we feel this project will have "no effect" on these whale species.

LITERATURE CITED

Maser, C., B.R. Mate, J.F. Franklin, and C.T. Dyrness. 1981. Natural history of Oregon coast mammals. PNW Forest and Range Exper. Stat., USDA, USFS, Gen. Tech. Rep. PNW-133.

Rice, D.W. 1974. Whales and whale research in the eastern North Pacific. In The whale problem: A status report, p. 170-194. W.G. Scheville, ed. Harvard Univ. Press, Cambridge.

NORTHERN (STELLER) SEA LION

Northern sea lions breed along the west coast of north America from San Miguel in California's Channel Islands, 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 Winthrow 1986). The Alaskan population has undergone a 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. The south jetty of the Columbia River and Three Arch Rock appeared to be used primarily during the winter (Brown 1988). 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.

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 Winthrow 1978). The number of sea lions using Orford Reef has declined since 1986. It is not certain, but the decline may be related to disturbance arising from a rapidly growing sea urchin fishery in the area (ODFW 1990).

Northern sea lions forage at river mouths and nearshore 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 Winthrow 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 nearest haulout area to the Coos Bay estuary and offshore disposal sites for northern sea lions is Cape Arago, which is immediately south of the project area. Northern sea lions using Cape Arago appear to frequent the area primarily from April through September (Brown 1988). No pups were recorded during his study at this location. Peak numbers recorded were 110 animals in July 1984.

Foraging by this species would be expected to occur in the project vicinity although the extent of foraging activities at the immediate project site is unknown. Northern sea lions would be expected to avoid dredging operations, but dredging actions affect only limited areas of the channel at any point in time and are not expected to preclude sea lion use of the estuary. It is unlikely that northern sea lions would be impacted by disposal operations which are intermittent in nature and confined to a limited area. We would anticipate some potential for avoidance of the immediate disposal area. As material to be disposed is not contaminated, we anticipate no impacts from contaminants on northern sea lions.

CONCLUSION:

The project may result in some localized avoidance around the immediate dredging and disposal areas 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.

LITERATURE CITED

Brown, R.F., 1988. Assessment of Pinniped Populations in Oregon. Oregon Department of Fish and Wildlife report to National Marine Fisheries Service, Seattle, WA. 44 pp.

NMFS. 1990. Listing of Steller Sea Lions as Threatened and Endangered Species With Protective Regulations. Federal Register 50 CFR Part 227. pp 12645-12661.

Gentry and Winthrow, 1986. "Steller Sea Lion" in Marine Mammals Delphine Haley, ed. Pacific Search Press; Seattle, WA.pp. 186-194.

Roffe, T.J. and B.R. Mate, 1984. Abundances and Feeding Habits of Pinnipeds in the Rogue River, Oregon. J. Wildl. Manage. 48(4):1262-1274.

Oregon Department of Fish and Wildlife (ODFW), 1990. Northern (Steller) Sea Lion Garners Concern. Wild Flyer, vol. 1, no. 2, June 1990.

LEATHERBACK SEA TURTLE

Leatherback sea turtles occurrence off the Oregon Coast is associated with the appearance of albacore. Albacore occurrence, and very likely that of leatherback sea turtles, is strongly associated with the warm waters of the Japanese Current which tends to approach the Oregon Coast in late summer. Typically, warm water associated with the Japanese Current does not closely approach the Oregon Coast (i.e. 1-5 miles), generally occurring 30-60+ miles offshore. During El Nino events, warm water may occur much closer to the Oregon coast than usual.

Leatherback sea turtles generally occur well offshore from the project location with only occasional individuals occurring in nearshore, colder waters. It is expected that leatherback sea turtles would only be casual visitors to the project area.

CONCLUSION

Given the nature of the project, including the channel dredging, low potential for rock blasting, lack of contaminant levels of concern, offshore disposal, and leatherback sea turtle use/occurrence in the project area, we feel this project will have "no effect" on this species.

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 and not winter run chinook salmon, though. It does serve as an indication that Sacramento River winter run chinook salmon may occur off the Oregon coast.

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 Basin 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, 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.

Literature Cited

ECOS INC., 1990. Draft Biological Data Report: Winter Run Chinook Salmon for the Sacramento River Bank Protection Project. U.S. Army Corps of Engineers, Sacramento Dist. 38 pp.

Miller, D. R., J. G. Williams, and C. W. Sims. 1983. Distribution, abundance and growth of juvenile salmonids off the coast of Oregon and Washington. Fisheries Research 2(1983):1-7.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N. E.
BIN C 15700, Building 1
Seattle, Washington 98115

JAN 22 1991

F/NWR3: 1514-04-020 jbn

Robert E. Willis, Chief
Fish & Wildlife Branch
U. S. Army Corps of Engineers
Portland District
P. O. Box 2946
Portland, OR 97208-2946

Dear Mr. Willis:

This is in response to your December 4, 1990 letter and Biological Assessment (EA) regarding endangered/threatened species in the area of the proposed Coos Bay Channel Deepening Project. We have reviewed the assessment and our National Marine Mammal Laboratory had a few comments to offer which we have enclosed for your information. These comments, however, do not affect our response to your request for concurrence.

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 based upon the information provided in your assessment and that, 1) the dredging and disposal are scheduled to occur predominantly during the summer and fall months, a time frame when the presence of migratory gray whales is at a minimum, 2) the potential for blasting is low and further coordination with state and federal agencies including reinitiation of consultation will occur if blasting is required, and 3) that sediments for disposal do not contain environmentally detrimental contaminants. We understand that dredge material disposal may occur as early as May, i.e., the end of the northward migration, and as late as December, i.e., the beginning of the southward migration. Accordingly care should be exercised during disposal to ensure that gray whales are not present in the area of activity. Should this information be incorrect, or change, the Corps should contact this office immediately.

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, 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 Brent Norberg at 526-6140.

Sincerely,

Thomas E. Kruse
for Rolland A. Schmitten
Regional Director

Enclosure

cc: Nancy Foster - F/PR

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

Reply to
Attention of:

March 29, 1990

Planning Division

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 a project description and biological assessment for the proposed Coos Bay, Oregon channel deepening and offshore disposal project. This assessment is in response to your general listing for species in the State of Oregon including: gray, humpback, blue, fin, sei, right, and sperm whales; leatherback sea turtles; and Sacramento River winter-run chinook salmon.

We have concluded that this project will have "no effect" on any of the listed species.

Should you require further information, or an assessment of additional species, please contact Chris Moehl or Geoff Dorsey of my staff at (503) 326-6485.

Sincerely,

Richard N. Duncan
Chief, Fish and Wildlife
Branch

Enclosure

CF: PL-F FILE COPY (MOEHL) NMFCBLET

BIOLOGICAL ASSESSMENT

FOR

GRAY, HUMPBACK, BLUE, FIN, SEI, RIGHT, AND SPERM WHALES;

LEATHERBACK SEA TURTLES;

AND

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON

AT

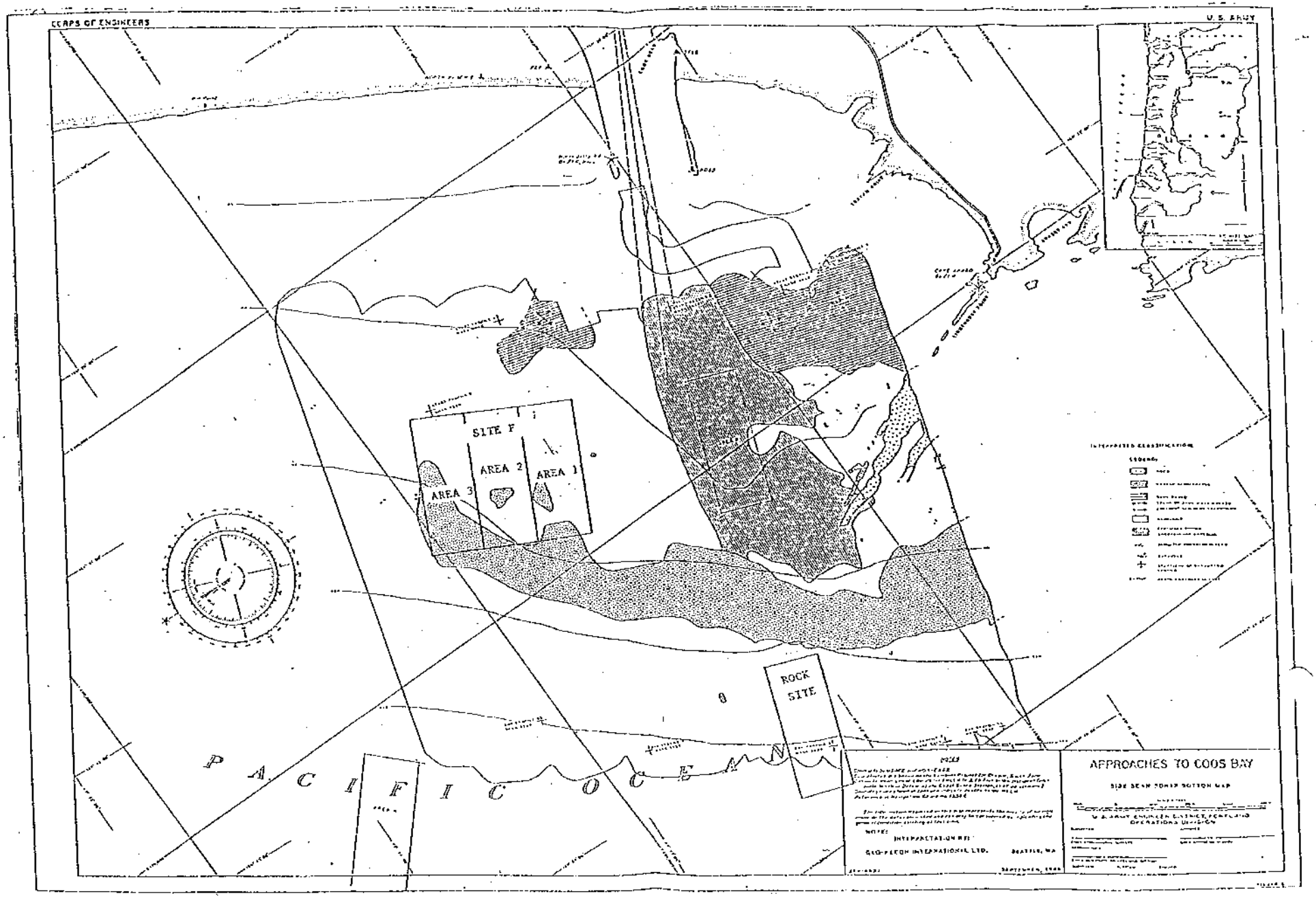
COOS BAY, OREGON

PROJECT DESCRIPTION

The proposed project involves the expansion of the existing deep draft navigation channel in Coos Bay, Oregon. The current channel is authorized and maintained to a depth of 45 feet between river mile (RM) 0-1, and 35 feet between RM 1-15. The proposed expansion calls for the deepening of the existing channel by a minimum of 1 foot, or up to a maximum of 5 feet. Construction may be carried out in either a single phase, or in multiple phases. Multiple phase construction would involve deepening the channel by 1 foot every five years, until the desired depth is attained. It is anticipated that as much as 559,000 cy of rock would be removed from the channel between RM 1 and 5. In general, medium grained sand will be removed between RM 5-12, and fine grained silty sand between RM 12-15. Between 32,000 cy and 2,000,000 cy of sandy material would be removed from throughout the channel. The rock material in the lower channel would be drilled and blasted to loosen it for removal by a clam shell dredge. Due to the nature of the work, rock excavation would be carried out during the first year of construction, rather than in phases.

The rock material which would be excavated from the channel would require placement at an offshore site (Figure 1). The location of this site was selected based on biological productivity information which indicates that fewer organisms will be impacted by disposal here. This disposal area would be situated on a sandy bottom adjacent to a natural rocky area in waters 150 ft to 200 ft deep. Dimensions of this site would be 14,000 ft X 3,599 ft.

In addition to the need for designating the offshore rock disposal site, further expansion of existing site F will also be necessary. This site was expanded under section 103 authority in late summer 1989 (We received a concurrence letter from your office on September 13, 1989 with regard to our biological


CORPS OF ENGINEERS
U.S. ARMY
SITE F
AREA 1
AREA 2
AREA 3
ROCK SITE
PACIFIC OCEAN
APPROACHES TO COOS BAY

assessment for that expansion). Area 1 and 2 (Figure 1) comprise the currently designated site F, while area 3 is the proposed expansion site. This expansion would extend the existing site 1,400 ft to the north. The total dimensions of the new site would be 3,600 ft X 4,200 ft. Between 425,000 and 1,500,000 cy of material could be placed at this site with the various alternatives. This material would consist of clean sand with a medium grain size of 0.2mm to 0.3mm. These sediments contain no contaminants of concern in excess levels and are excluded from the requirements for further biological and chemical testing as provided in CFR 227.13(b). The fine grained material which will be encountered above RM 12 will be placed at offshore site H. No further expansion of this site will be necessary. Chemical analysis of these materials does not reveal contaminants of concern in excess levels.

GRAY WHALES

Coastal waters of Oregon serve as a migrational corridor for gray whales moving to and from their breeding, calving, and assembly areas off mainland Mexico-Baja California and their primary foraging areas in the Arctic (Sumich, 1984). Southward migration occurs in November-December with northbound migrants present from February-April. Recently, it has become apparent that summer occurrence of gray whales off the west coast of North America is more common than previously assumed (Sumich, 1984).

Gray whales summer along the Oregon Coast (Sumich, 1984). Over 1200 gray whale sightings were reported during a 1977-1980 study of gray whale occurrence off coastal Oregon by Sumich (1984). 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 as 60 percent of the 460 observations in 1977 occurred in that portion of the coastline (Sumich, 1984). The author noted that it was not determined if whales were more numerous or just easier to detect along that section of coast than along other portions of the Oregon coast. Sumich (1984) concentrated 1978 study efforts in the 100 km section from Siuslaw River to Government Point because of the higher incidence of sightings. His 1978 data indicated that gray whales were most commonly observed in the northern half of his study area, approximately Alsea River to Government Point, which contrasted with 1977 results. Sumich (1984) reported a maximum observed occurrence of 0.2-0.3 whales/km of coastline for the 100 km study area for the 1977 and 1978 study years.

Most sightings of gray whales occurred within 500 m offshore (Sumich, I984). Gray whales frequented surf or foam lines. Nearshore areas with silty sediments appear to be foraging areas for gray whales; presumably because of high amphipod populations in these sediments (D. Hancock, USACE pers. comm., 1985). Confirmation of foraging areas, prey populations, foraging

substrate, and foraging strategy are necessary. Present tentative conclusions are based on foraging ecology of gray whales in their summer grounds in the Arctic and observed behavior and site use off Oregon. Sightings also occurred at distances 5-80 km offshore in water depths of 50- 2700 m (Sumich, 1984); number of sightings was only 14 comprising 27 whales, however.

Site specific use by gray whales varied both daily and annually (Sumich, 1984); thus, the 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 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 as conservative.

Sumich (1984) states that the primary activity of summer gray whales off the Oregon coast appears to be feeding. It is not known what the prey item(s) are. Benthic infauna, primarily gammarid amphipods, are the principal food items of gray whales in the Arctic. He speculated that the offshore sightings (14 occurrences) may indicate pelagic foraging by the species.

Sumich (1984) also determined size of gray whales whenever possible. His results indicated that calves and yearlings comprised a significantly greater proportion of the Oregon coast population than would be expected from a random sample of the population as a whole. His analysis of length data on gray whales larger than yearlings led to the conclusion that summer gray whales on the Oregon coast are predominantly immature or atypically small mature animals. These animals may be shortening their migration due to insufficient energy reserves.

Advantages to gray whales discontinuing their migration and foraging along the Oregon coast may lie in the energetic savings associated with such behavior (Sumich, 1984). He concluded that the shallow, inshore waters of the Oregon coast should be considered as supplementary summer feeding grounds. As a complete count of gray whales which summer off Oregon is unavailable, the proportion of the population which is present remains an unknown. However, it seems reasonable that only a small proportion of the population does exhibit this tendency to shorten their migration.

CONCLUSION

The Coos Bay channel deepening and offshore disposal projects are not expected to have an impact on gray whales. The ocean disposal areas are south of the locations where summering gray whales are observed and are not expected to have an impact on

these whales. Additionally, due to the location offshore, depth of the disposal sites and timing of material placement; migrating gray whales are not expected to be impacted by the offshore disposal. The in-bay dredging and blasting operations are thought to be sufficiently distant from summering and/or migrating whales that these activities will also not have an impact on this species. Based upon the aforementioned information and the nature of the project we have concluded that the project will have "no effect" on gray whales.

LITERATURE CITED

Sumich, J.L. 1984. Grey whales along the Oregon Coast in summer, 1977-1980. The Murrelet. 65:33-40.

HUMPBACK, RIGHT, FIN, BLUE, SEI, AND SPERM WHALES

These species may occur in the project area but information on numbers, distribution, and feeding habits is lacking other than in a general sense. Occurrence of blue whales off the Oregon coast is primarily in May-June and August-October (Rice 1974 in Maser et al. 1981). Blue whales typically occur offshore as individuals or in small groups. Blue whales winter well south of Oregon as do fin whales (Maser et al. 1981). Fin whales do range off the Oregon Coast during summer. Whaling records indicate that fin whales were primarily harvested off Oregon from May-September (Maser et al. 1981). Sei whales also winter south of Oregon. Based upon information from central California, Sei whales probably occur in southward migration off the Oregon coast in late summer - early fall (Maser et al. 1981). Based upon catch records, humpbacks primarily occur off the Oregon coast between April and October with peak numbers occurring during June, July, and August (Maser et al. 1981). Sperm whales occur as migrants and some may summer off the Oregon coast (Maser et al. 1981). Strandings have occurred along the Oregon coast. Right whales may occur off the Oregon coast during winter; summer distribution is in cool waters north of 50 degrees north latitude (Maser et al. 1981).

CONCLUSION

Given the nature of the project, including the channel dredging, rock blasting and offshore disposal, and the whale use/occurrence in the project area, we feel this project will have "no effect" on these whale species.

LITERATURE CITED

Maser, C., B.R. Mate, J.F. Franklin, and C.T. Dyrness. 1981. Natural history of Oregon coast mammals. PNW Forest and Range Exper. Stat., USDA, USFS, Gen. Tech. Rep. PNW-133.

Rice, D.W. 1974. Whales and whale research in the eastern North Pacific. In The whale problem: A status report, p. 170-194. W.G. Scheville, ed. Harvard Univ. Press, Cambridge.

LEATHERBACK SEA TURTLE

Leatherback sea turtles occurrence off the Oregon Coast is associated with the appearance of albacore. Albacore occurrence, and very likely that of leatherback sea turtles, is strongly associated with the warm waters of the Japanese Current which tends to approach the Oregon Coast in late summer. Typically, warm water associated with the Japanese Current does not closely approach the Oregon Coast (i.e. 1-5 miles), generally occurring 30- 60+ miles offshore. During El Nino events, warm water may occur much closer to the Oregon coast than usual.

Leatherback sea turtles generally occur well offshore from the project location with only occasional individuals occurring in nearshore, colder waters. It is expected that leatherback sea turtles would only be casual visitors to the project area.

Given the nature of the project, including the channel dredging, rock blasting and offshore disposal, and the leatherback sea turtle use/occurrence in the project area, we feel this project will have "no effect" on this species.

SACRAMENTO RIVER WINTER RUN CHINOOK SALMON

The Sacramento River winter-run chinook salmon is not expected to occur in the vicinity of the project. This species is thought to occur offshore in the deep water from Fort Bragg to Montery California (ECOS INC. 1990). Therefore, this project will have "no effect" on this species.

LITERATURE CITED

ECOS INC., 1990. Draft Biological Data Report: Winter Run Chinook Salmon for the Sacramento River Bank Protection Project. U.S. Army Corps of Engineers, Sacramento Dist. 38 pp.

NOAA-NMFS
RECEIVED
JAN 31 1991
NORTHWEST REGIONAL OFFICE
FEB 10 1991

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Alaska Fisheries Science Center
7600 Sand Point Way N.E., Bin C15700
Seattle, Washington 98115-0070

MEMORANDUM FOR: F/NWR - Rolland A. Schmitten

FROM: F/AKC - William Aron

SUBJECT: Comments on Environmental Assessment
-Coos Bay Channel Deepening Project

We have reviewed the information regarding the possible effects of dredging activities in Coos Bay, Oregon, on gray whales and Steller sea lions. We concur with the opinion of no effect on Steller sea lions and that localized disturbance may occur but in our opinion the activity will not jeopardize the species or deleteriously affect critical habitat.

Regarding gray whales, what time of year will dumping occur? The dates of operation are not given. Gray whales migrate through the dumping area from early December and mid-February and again from mid-February through May. The majority of the migrants occur in water 40-60 m deep. The dumping to take place in water 46-62 m deep. Hence we suggest that dumping not be allowed during the southward or northward migrations or when summering animals are present.

The author states that dredging materials do not contain contaminants at levels of concern. Since the report does not give stated levels and since we don't know what levels may impact marine mammals, this statement is not valid (p. 5 under discussion section).

If blasting is deemed necessary, they should review literature on noise effects on marine mammals and fish. This is not adequately addressed in this report. Approval to blast should not be part of the whole package without additional investigations and a knowledge of the timing of these blasting operations and potential effects on wildlife.

Literature cited section is not complete.

We have no additional comments.

NMFS - NORTHWEST REGION
COPY IN
F/NWR
F/NWR1

August 16, 1993

Planning and Engineering Division

Mr. Russell D. Peterson
Field Supervisor
U. S. Fish and Wildlife Service
2600 SE. 98th, Suite 100
Portland, Oregon 97266

Dear Mr. Peterson:

Pursuant to the requirements of the Endangered Species Act of 1973, as amended, we are providing a biological assessment for marbled murrelets for the Coos Bay, Oregon Navigation Improvements (channel deepening) Project. We had previously submitted (June 22, 1990; reference 1-7-90-I-152) a biological assessment for bald eagles, brown pelicans, western snowy plovers and peregrine falcons to your office. Subsequent to that listing, marbled murrelets were listed. A concurrence letter confirming our determination in the biological assessments for those species submitted in our June 22, 1990, correspondence was received on July 3, 1990.

There have been some project-related changes during the interim also. The most significant change has been the substantial enlargement of Site F to accommodate initial and operations and maintenance dredged material from the Coos Bay Navigation Channel. We are also not considering blasting to remove rock from the navigation channel. An updated project description is provided with the biological assessment for marbled murrelets. A draft Feasibility Report and Environmental Impact Statement concerning the project will be published in the near future.

We have determined that the proposed actions will have no effect on the continued existence of marbled murrelets nor will the modifications in the project change our determination that other listed species will incur no effect from the project.

Please contact Mr. Geoff Dorsey (326-6481) of my staff should you have any questions or require clarification regarding this project.

Sincerely,

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

Enclosure

Copies Furnished:
CENPP-PM (Laura Hicks)
CENPP-PE-RPE (Steve Stevens)

CF: CENPP-PE-RPE (Steve Stevens)

BIOLOGICAL ASSESSMENT

FOR

MARBLED MURRELETS

COOS BAY, OREGON NAVIGATION IMPROVEMENT PROJECT

PROJECT DESCRIPTION

The proposed Coos Bay, Oregon Navigation Improvement (channel deepening) Project is located at Coos Bay, Coos County, in southwestern Oregon. The existing project at Coos Bay consists of a north and south jetty, a 45-foot deep by 700-foot wide entrance channel beginning at the entrance bar which transitions to a 35-foot deep by 300-foot wide lower channel from River Mile (RM) 1 to RM 9, and then a 35-foot deep by 400-foot wide upper channel to RM 15 plus one anchorage and two turning basins (Figure 1). The anchorage is located at RM 6. The turning basins are located at RM 12 and RM 14.7.

The proposed action is to deepen the channel two feet from the entrance to RM 15 and widen the turning basin at RM 12 by 100 feet. The alignment for the deepening will be the same as the currently authorized project. Work will be conducted during in-water work periods coordinated with the USFWS and ODFW. Rock removal from RM 0-5 will occur from 1 May - 31 January. Common excavation of material from RM 0-12 would occur from 1 May - 31 August; removal of common material from RM 12-15 would occur from 1 July - 31 January. Rock removal will be by mechanical means; further coordination will occur if conventional blasting is used for rock removal. Construction efforts will be initiated in May 1995.

Disposal of material will occur at approved ocean disposal sites (Figure 2). Current ocean disposal Sites E, F and H were designated by EPA in 1986 and have been used for disposal of sand material dredged from the channel for 10 years (includes interim use period). Dispersion of dredged material at Sites E and F has been less than predicted, hence added disposal capacity at Coos Bay is currently being sought. Investigations concerning expansion of ocean disposal Site F and designation of a rock disposal site were initiated in 1988 by the Corps and the Environmental Protection Agency. Designation of the expanded and rock disposal sites by EPA is anticipated to occur in 1994 under the authority of Section 102 of the Marine Protection, Research, and Sanctuaries Act. Monitoring, according to a plan developed and coordinated with EPA, is conducted at all dredged material disposal sites.

Rock disposal (90,000 cys) at the Section 103 rock disposal site will constitute a one-time use. Fine grain sediments

(584,500 cys) from above RM 12 will be disposed of in Site H; no site expansion for H is required. Sandy sediments will comprise approximately 681,100 cys of the dredged material and will be disposed of at expanded Site F.

Coarser, sandy sediments, characterize channel sediments from RM 0-10. A transition to finer grain sediments occurs at RM 10 corresponding to a major bend in the estuary. Organic content of sediments ranges from 0.4 to 14.5 percent volatile solids with the higher percentage associated with the upstream most, finer grained sediments.

Contaminants exhibit an affinity for fine grain sediments containing organic material. Coarse, sandy sediments with low organic content generally do not contain contaminants. Thus, the most likely sediments to harbor contaminants are located above RM 10 where fine grain materials occur. Five gravity core samples collected in 1989 from the channel above RM 10 analyzed by Battelle's Pacific NW Marine Sciences Laboratory indicated that contaminants were either undetected or else occurred at low levels typical of uncontaminated coastal and estuarine sediments. Concurrent tests (1989) by the International Port of Coos Bay for adjacent dock facilities indicated the existence of higher contamination levels for sediments from RM's 12-14. Subsequent biological testing demonstrated that material associated with dock facilities was suitable for ocean disposal. Sediment samples were also obtained in 1993 from the turning basin extension at RM 12 as the area slated for extension has not been dredged previously.

Four box core samples and two gravity core samples were collected on April 28, 1993 from the area to be dredged to widen the turning basin at Coos Bay River Mile 12.0. These sediment samples are considered to be representative of the material to be dredged. Physical analyses were conducted on all samples while bulk chemical analyses were conducted on material collected by the gravity cores. The two gravity core samples were sub-sampled along their entire length for the chemical and physical analyses.

Chemical analyses included metals, pesticides/PCBs, TOC, AVS, PAHs and butyltin. All chemical analyses are considered acceptable. No element or chemical exceeded USACE, Portland District's established "levels of concern", where established. No USACE, Portland District "levels of concern" have been established for butyltin. All levels except one (DDT) are also below EPA, Region 10's screening levels (SL) for disposal in 404 waters, including the butyltin. Sample CBCD-GC-2 contained 4,4'-DDT at 10 ppb which exceeds EPA's total DDT SL of 6.9 ppb (Portland District's "level of concern" is 15-20 ppb total DDT). Sample CBCD-GC-1 contains <6.0 ppb 4,4'-DDT, the method detection limit for this sample.

The material to be dredged to widen the turning basin is considered to be suitable for ocean disposal without further

testing. Because of the hydrophobic nature and low concentration of the contaminates present in the sediments, water quality standards should not be exceeded because of the dredging activities. In addition, dredging, disposal and subsequent dispersal of the dredged material at the ocean dredged material disposal site would reduce the concentrations still further. Fine grained material from the Federal navigation channel including the present turning basin at RM 12.0 has been deposited at ODMDS H since 1985. Based upon extensive evaluation of the sediment and the benthic community at Site H, from past disposal, no unacceptable adverse environmental impacts are anticipated by the proposed widening of the turning basin due to sediment contamination.

Marbled Murrelet

The marbled murrelet is a near-shore marine bird that is most frequently observed within 1.5 miles of shore (Marshall 1988). Marbled murrelets reportedly forage just beyond the breaker-line and along the sides of river mouths where greater upwelling and less turbulence occurs. Sealy (1975a in Marshall 1988) reported that murrelets foraged within 500 meters of shore. Murrelets forage within the water column; prey items include invertebrates and small fish such as anchovy, herring and Pacific sandlance (Marshall 1988).

Currently, the largest concentrations of marbled murrelets in Oregon are thought to occur off the central coast (Marshall 1988) between Depoe Bay and Coos Bay. Lincoln and Lane Counties, which comprise a large block of the central Oregon coast, were historic centers of abundance for marbled murrelets in Oregon (Fed. Reg. 1991). Initial results from Strong (1992) indicate that abundance of murrelets is relatively higher on the central Oregon coast than the northern Oregon coast. Strong (1992) also reported that murrelet occurrence was patchy and that use of specific concentration locations was not consistent. Briggs et al (1992) reported sightings of marbled murrelets off the central-northern Oregon coast (Cape Arago to Tillamook Head) during June 1989. These sightings occurred in waters less than 10-m in depth and with temperatures of 12.5-13.6° C and were comparable in depth and temperatures to areas where murrelets were observed off the Washington coast. They observed 71 murrelets at 25 locations from the California-Oregon border to Cascade Head, Oregon during their September 1990 survey; again the murrelets were in shallow waters with an average temperature of 11° C. It should be noted that surveys by Briggs et al (1992) were not designed for murrelets and that the nearshore ocean zone frequented by this species was covered rapidly during their surveys. Nevertheless, their information does provide some information on murrelet occurrence.

Marbled murrelets nest in old growth/mature coniferous forests (Fed. Reg. 1991). The low incidence of marbled murrelets

at coastal locations is probably related to the loss of old growth coniferous forest from harvest and/or fire on near-coastal lands (Fed. Reg. 1991). Marbled murrelet populations now typically occur offshore of forested locations which provide suitable nesting habitat. Detection of marbled murrelets was greater in old growth stands (California) greater than 500 acres in size than for stands of 100 acres; few detections were recorded for stands less than 60 acres in size (Paton and Ralph 1988 and Ralph et al. 1990 in Fed. Reg. 1991). Thus, size of remnant stands may also influence presence of marbled murrelets on adjacent coastal waters.

Discussion:

The primary concern with regard to coastal dredging projects is the potential impact to murrelet prey resources. We do not anticipate that dredging or disposal actions will affect murrelet prey resources near the Coos Bay channel entrance. In general, short term, sporadic dredging actions, do not affect fish and invertebrates within the water column. Disposal operations would cause some temporary water column turbidity. However due to the intermittent and confined nature of the operation, and lack of contaminants associated with disposal materials, we do not anticipate these activities will affect foraging by marbled murrelets or their prey resources.

Although DDT has been identified in a portion of the sediments to be disposed of in the ocean, the low concentration of this contaminant in the sediments, the dilution that this material would incur from dredging, disposal, and subsequent dispersal in the ocean and the hydrophobic nature of DDT, combine to minimize the potential for impacts.

Further, the majority of the disposal site acreage is located more than one mile offshore and would appear to be beyond the normal foraging areas for marbled murrelets. Thus, the potential to disrupt foraging activities of marbled murrelets would appear very limited in scope.

Conclusion:

The proposed dredge material disposal operation will not modify known marbled murrelet habitat, nor is it expected to result in any substantial disturbance to this species. Materials which are to be disposed of are not contaminated to a level that is unacceptable for ocean disposal. Therefore, we anticipate no impacts from contaminants due to the disposal operation. We conclude that the proposed Coos Bay, Oregon Navigation Improvements (channel deepening) Project will have no effect on marbled murrelets.

Literature Cited:

Federal Register. 1991. Endangered and threatened wildlife and plants; Proposed threatened status for the marbled murrelet in Washington, Oregon and California. Vol. 56(119):28362-28367.

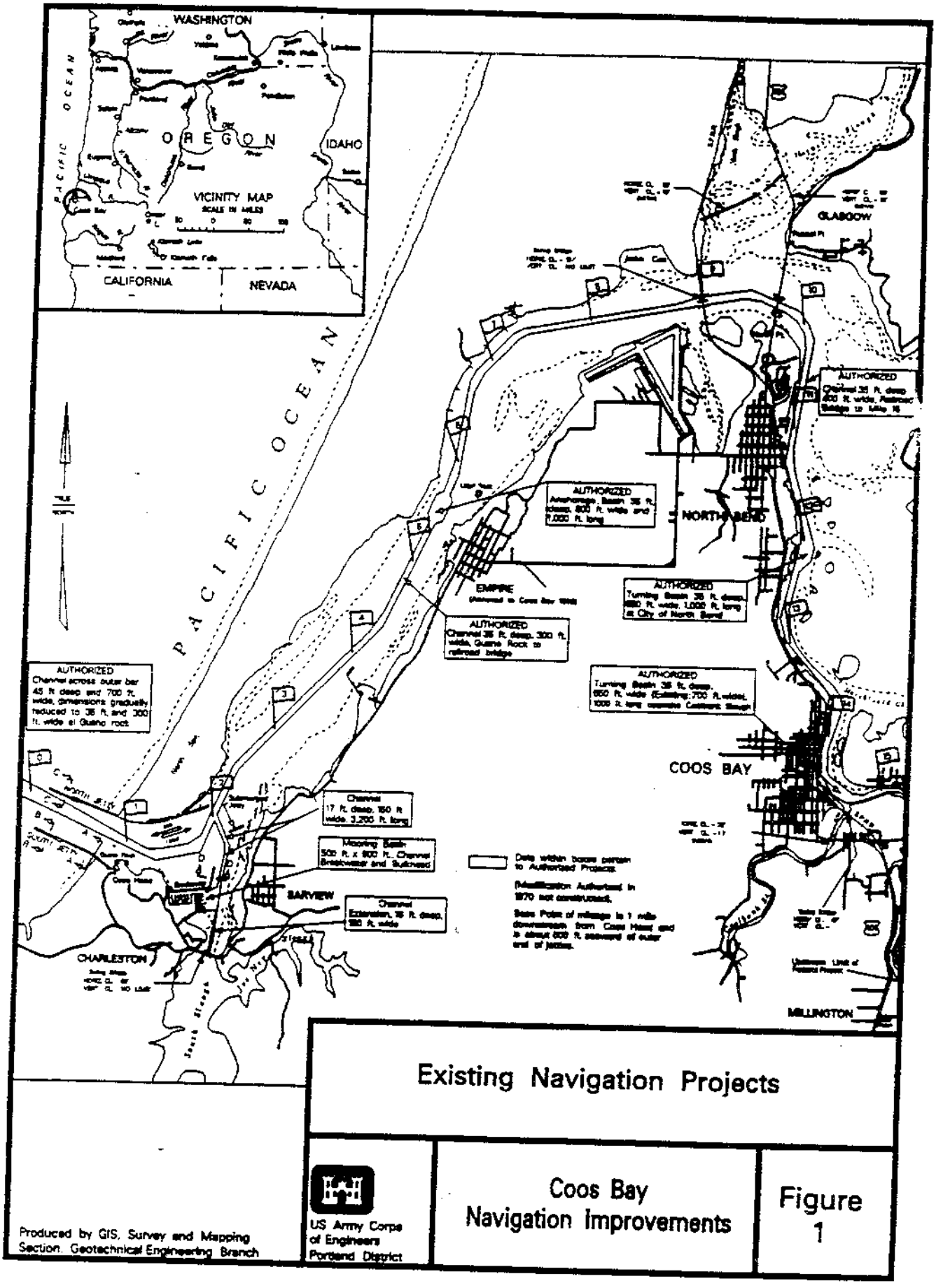
Marshall, David B. 1988. Status of the Marbled Murrelet in North America With Special Emphasis on Populations in Washington, Oregon and California. Audubon Society of Portland 41 pp.

Paton, P. W. and C. J. Ralph. 1988. Geographic distribution of the marbled murrelet in California at inland sites during the 1988 breeding season. Calif. Dept. Fish Game, Sacramento, CA. 35pp.

Ralph, C. J., S. L. Miller, N. L. Naslund, B. O'Donnell, P. W. C. Paton, and J. Seay. 1990. Marbled murrelet research during 1989 in northern and central California - An interim report. Tech. Report 1990-8, Nongame Bird and Mammal Section Report, Calif. Dept. Fish Game, Sacramento. 39pp.

Sealey, S. G. 1975a. Feeding ecology of the ancient and marbled murrelets near Langara Island, British Columbia. Can. J. Zool. 53:418-433.

Taylor, W. P. 1921. The marbled murrelet mystery. Murrelet 2:8.



Existing Navigation Projects

US Army Corps of Engineers
Portland District

Coos Bay Navigation Improvements

Figure 1

Produced by GIS, Survey and Mapping Section, Geotechnical Engineering Branch

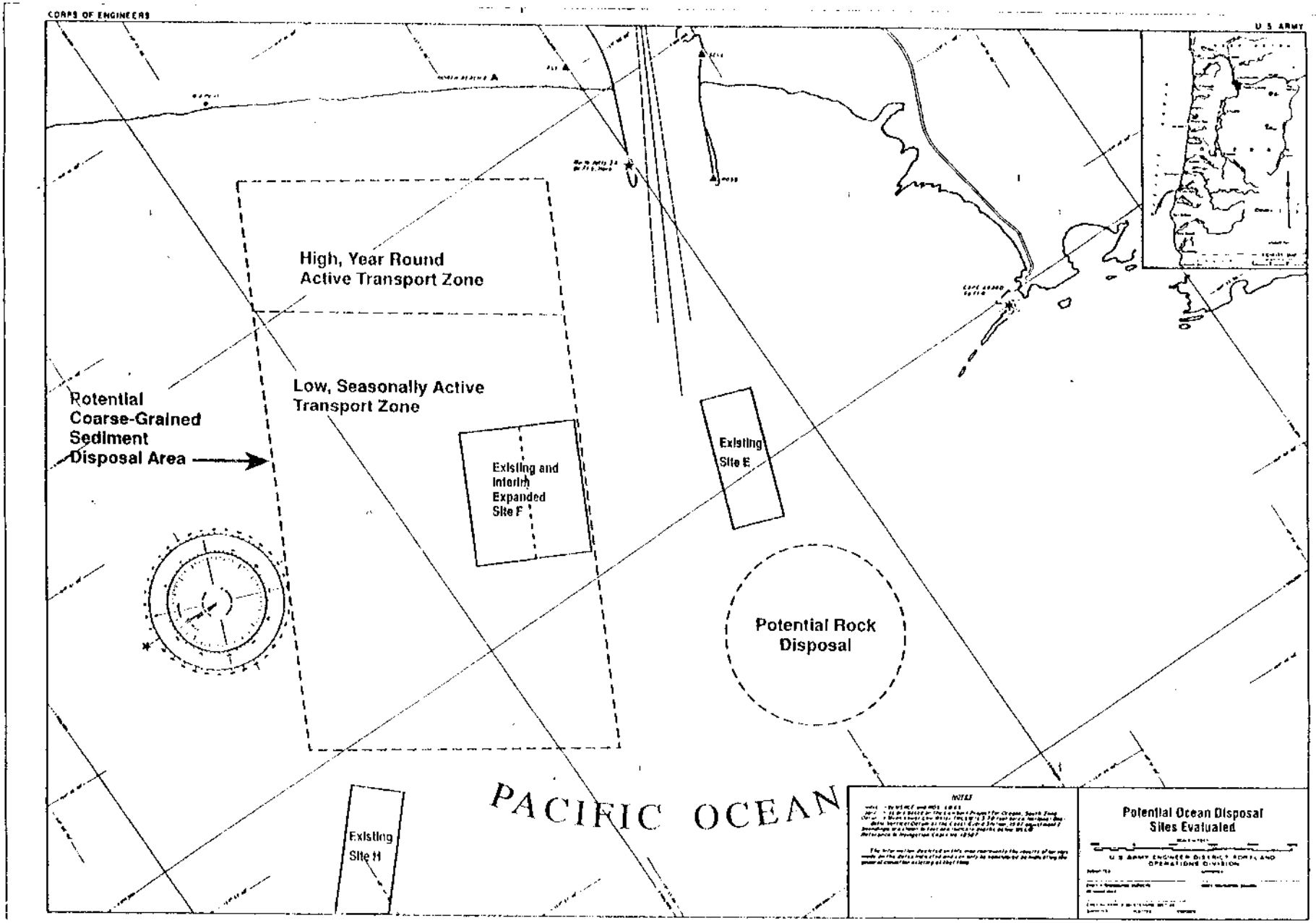

CORPS OF ENGINEERS
U.S. ARMY
High, Year Round
Active Transport Zone
Low, Seasonally Active
Transport Zone
Rotential
Coarse-Grained
Sediment
Disposal Area
Existing and
Interim
Expanded
Site F
Existing
Site E
Potential Rock
Disposal
PACIFIC OCEAN
Existing
Site H
NOTES
Potential Ocean Disposal
Sites Evaluated

FIGURE 2.

August 16, 1993

Planning and Engineering Division

Mr. Merritt Tuttle
National Marine Fisheries Service
911 NE 11th Avenue Room 620
Portland, Oregon 97232

Dear Mr. Tuttle:

Pursuant to the requirements of the Endangered Species Act of 1973, as amended, we are providing a biological assessment addressing Snake River Sockeye and Snake River Spring/Summer and Fall Chinook Salmon for the Coos Bay, Oregon Navigation Improvements (channel deepening) Project.

The biological assessment forwarded to your office only considers Snake River sockeye salmon and Snake River fall and spring/summer run chinook salmon. By an interagency agreement between the U. S. Army Corps of Engineers and the National Marine Fisheries Service (NMFS), biological assessments for threatened and endangered cetaceans, pinnipeds, and sea turtles will be reviewed by your Seattle office. Biological assessments for Sacramento River winter run chinook salmon will be reviewed by your Long Beach, California office.

We have determined that the proposed action should have no effect on the continued existence of the listed species under your jurisdiction.

Should you require any additional information, please contact Mr. Geoff Dorsey of my staff at (503) 326-6481.

Sincerely,

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

Copies Furnished:

CENPP-PM (Laura Hicks)
CENPP-PE-RPE (Steve Stevens)

CF: CENPP-PE-RPE (Steve Stevens)

BIOLOGICAL ASSESSMENT

FOR

SNAKE RIVER BASIN SOCKEYE SALMON

AND

SNAKE RIVER SPRING, SUMMER, AND FALL CHINOOK SALMON

COOS BAY, OREGON NAVIGATION IMPROVEMENTS PROJECT

PROJECT DESCRIPTION

The proposed Coos Bay, Oregon Navigation Improvement (channel deepening) Project is located at Coos Bay, Coos County, in southwestern Oregon. The existing project at Coos Bay consists of a north and south jetty, a 45-foot deep by 700-foot wide entrance channel beginning at the entrance bar which transitions to a 35-foot deep by 300-foot wide lower channel from River Mile (RM) 1 to RM 9, and then a 35-foot deep by 400-foot wide upper channel to RM 15 plus one anchorage and two turning basins (Figure 1). The anchorage is located at RM 6. The turning basins are located at RM 12 and RM 14.7.

The proposed action is to deepen the channel two feet from the entrance to RM 15 and widen the turning basin at RM 12 by 100 feet. The alignment for the deepening will be the same as the currently authorized project. Work will be conducted during in-water work periods coordinated with the USFWS and ODFW. Rock removal from RM 0-5 will occur from 1 May - 31 January. Common excavation of material from RM 0-12 would occur from 1 May - 31 August; removal of common material from RM 12-15 would occur from 1 July - 31 January. Rock removal will be by mechanical means; further coordination will occur if conventional blasting is used for rock removal. Construction efforts will be initiated in May 1995.

Disposal of material will occur at approved ocean disposal sites (Figure 2). Current ocean disposal Sites E, F and H were designated by EPA in 1986 and have been used for disposal of sand material dredged from the channel for 10 years (includes interim use period). Dispersion of dredged material at Sites E and F has been less than predicted, hence added disposal capacity at Coos Bay is currently being sought. Investigations concerning expansion of ocean disposal Site F and designation of a rock disposal site were initiated in 1988 by the Corps and the Environmental Protection Agency. Designation of the expanded and rock disposal sites by EPA is anticipated to occur in 1994 under the authority of Section 102 of the Marine Protection, Research, and Sanctuaries Act. Monitoring, according to a plan developed and coordinated with EPA, is conducted at all dredged material disposal sites.

Rock disposal (90,000 cys) at the Section 103 rock disposal

site will constitute a one-time use. Fine grain sediments (584,500 cys) from above RM 12 will be disposed of in Site H; no site expansion for H is required. Sandy sediments will comprise approximately 681,100 cys of the dredged material and will be disposed of at expanded Site F.

Coarser, sandy sediments, characterize channel sediments from RM 0-10. A transition to finer grain sediments occurs at RM 10 corresponding to a major bend in the estuary. Organic content of sediments ranges from 0.4 to 14.5 percent volatile solids with the higher percentage associated with the upstream most, finer grained sediments.

Contaminants exhibit an affinity for fine grain sediments containing organic material. Coarse, sandy sediments with low organic content generally do not contain contaminants. Thus, the most likely sediments to harbor contaminants are located above RM 10 where fine grain materials occur. Five gravity core samples collected in 1989 from the channel above RM 10 analyzed by Battelle's Pacific NW Marine Sciences Laboratory indicated that contaminants were either undetected or else occurred at low levels typical of uncontaminated coastal and estuarine sediments. Concurrent tests (1989) by the International Port of Coos Bay for adjacent dock facilities indicated the existence of higher contamination levels for sediments from RM's 12-14. Subsequent biological testing demonstrated that material associated with dock facilities was suitable for ocean disposal. Sediment samples were also obtained in 1993 from the turning basin extension at RM 12 as the area slated for extension has not been dredged previously.

Four box core samples and two gravity core samples were collected on April 28, 1993 from the area to be dredged to widen the turning basin at Coos Bay River Mile 12.0. These sediment samples are considered to be representative of the material to be dredged. Physical analyses were conducted on all samples while bulk chemical analyses were conducted on material collected by the gravity cores. The two gravity core samples were sub-sampled along their entire length for the chemical and physical analyses.

Chemical analyses included metals, pesticides/PCBs, TOC, AVS, PAHs and butyltin. All chemical analyses are considered acceptable. No element or chemical exceeded USACE, Portland District's established "levels of concern", where established. No USACE, Portland District "levels of concern" have been established for butyltin. All levels except one (DDT) are also below EPA, Region 10's screening levels (SL) for disposal in 404 waters, including the butyltin. Sample CBCD-GC-2 contained 4,4'-DDT at 10 ppb which exceeds EPA's total DDT SL of 6.9 ppb (Portland District's "level of concern" is 15-20 ppb total DDT). Sample CBCD-GC-1 contains <6.0 ppb 4,4'-DDT, the method detection limit for this sample.

The material to be dredged to widen the turning basin is considered to be suitable for ocean disposal without further

testing. Because of the hydrophobic nature and low concentration of the contaminates present in the sediments, water quality standards should not be exceeded because of the dredging activities. In addition, dredging, disposal and subsequent dispersal of the dredged material at the ocean dredged material disposal site would reduce the concentrations still further. Fine grained material from the Federal navigation channel including the present turning basin at RM 12.0 has been deposited at ODMDS H since 1985. Based upon extensive evaluation of the sediment and the benthic community at Site H, from past disposal, no unacceptable adverse environmental impacts are anticipated by the proposed widening of the turning basin due to sediment contamination.

SALMON RIVER BASIN SOCKEYE AND SPRING, SUMMER AND FALL CHINOOK SALMON

Salmon River Basin sockeye salmon and Snake River fall, summer, and spring chinook salmon could be present in the project area.

Miller et al. (1983) 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.

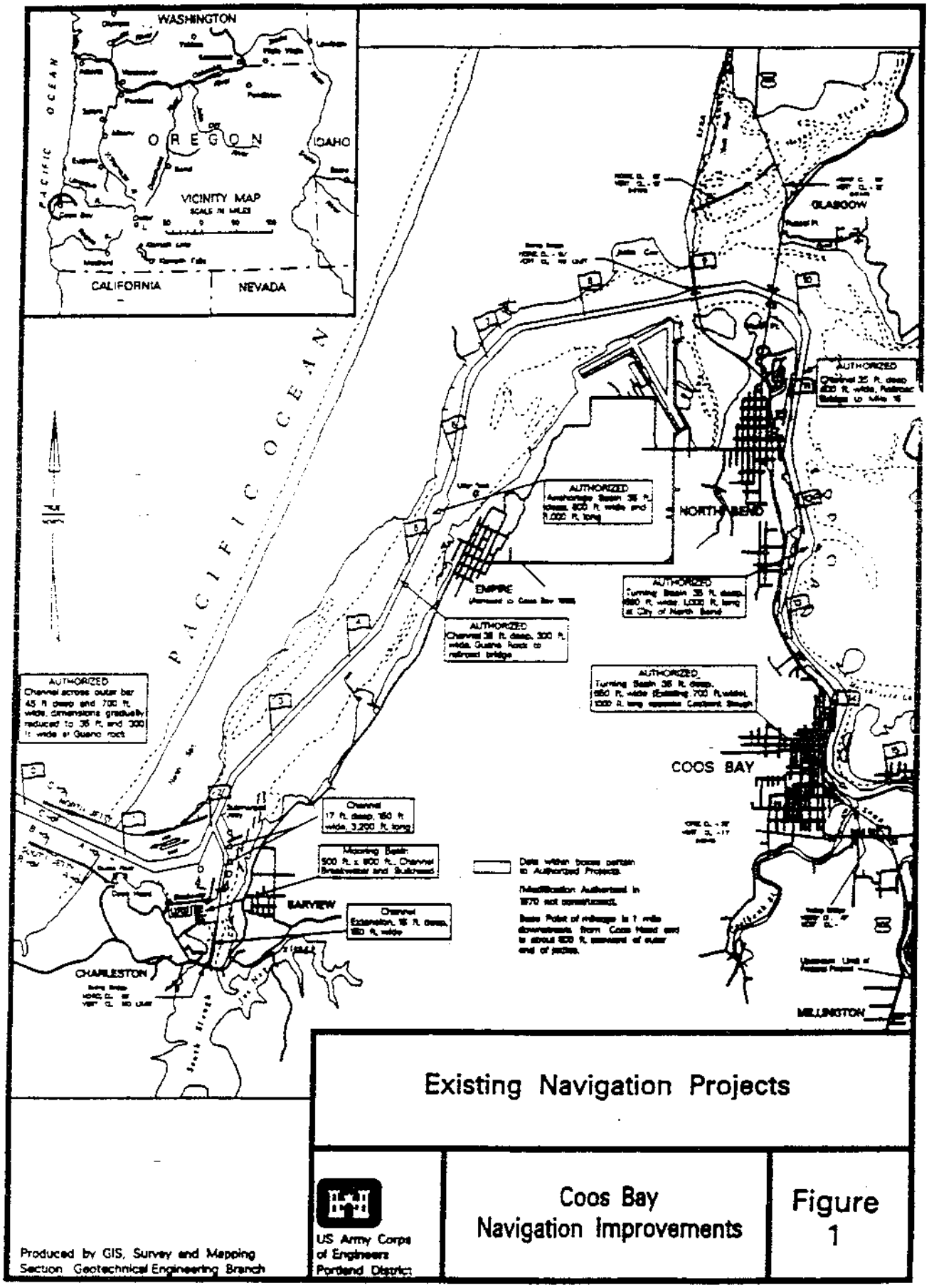
CONCLUSION

Disposal operations should have no effect on these species due to the limited extent of habitat affected by and the intermittent nature of disposal events. Materials which are to be disposed of are not contaminated to a level that is unacceptable for ocean disposal. Therefore, we anticipate no impacts from contaminants due to the disposal operation. These species are not expected to occur within the Coos Bay estuary.

We conclude that the proposed Coos Bay, Oregon Navigation Improvements (channel deepening) Project will have "no affect" on Snake River sockeye or spring/summer and fall chinook salmon.

Literature Cited

Miller, D. R., J. G. Williams, and C. W. Sims. 1983. Distribution, abundance and growth of juvenile salmonids off the coast of Oregon and Washington. Fisheries Research 2(1983):1-7.



Existing Navigation Projects

US Army Corps of Engineers
Portland District

Coos Bay Navigation Improvements

Figure 1

Produced by GIS, Survey and Mapping Section, Geotechnical Engineering Branch

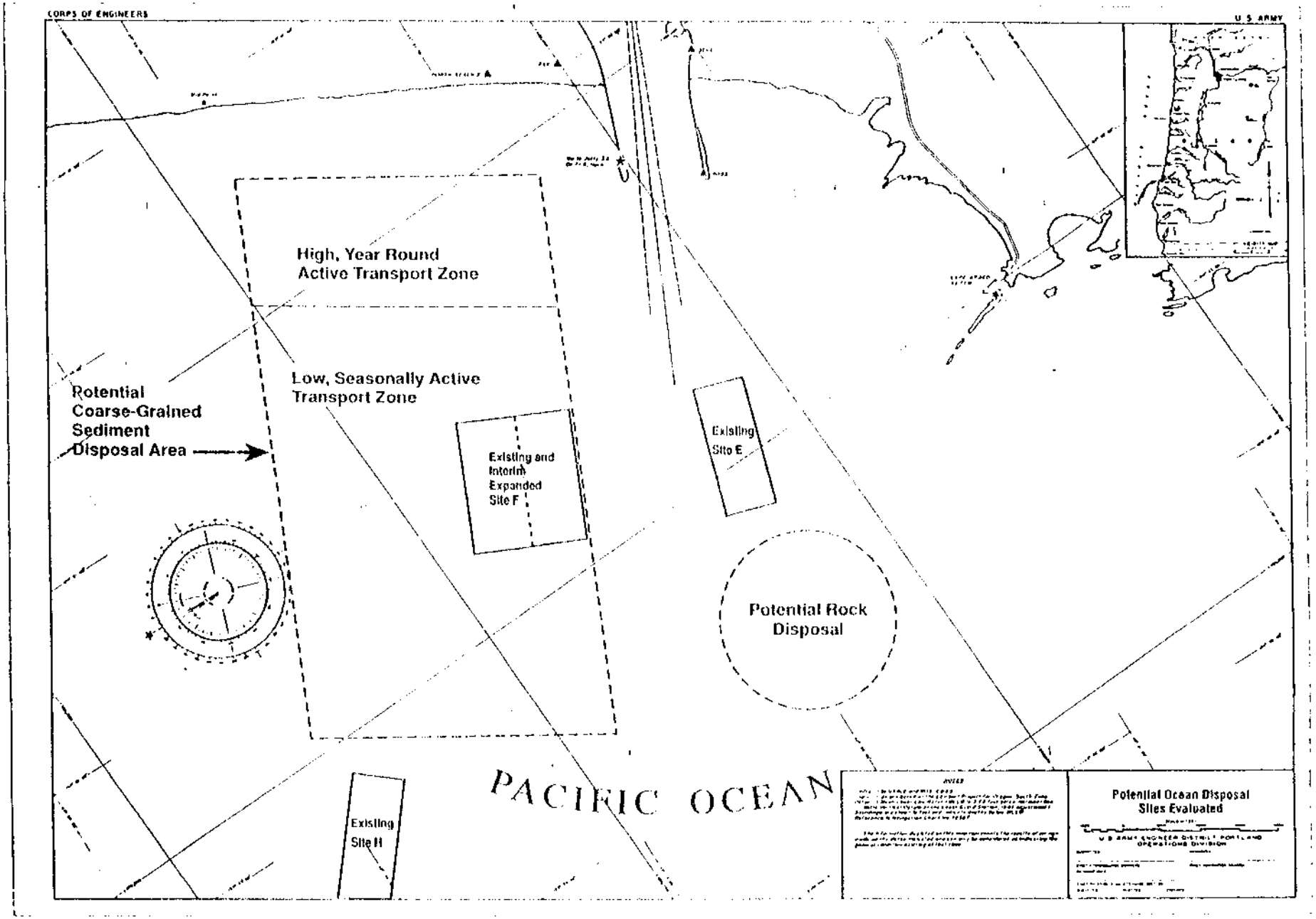

CORPS OF ENGINEERS
U.S. ARMY
High, Year Round
Active Transport Zone
Low, Seasonally Active
Transport Zone
Potential
Coarse-Grained
Sediment
Disposal Area
Existing and
Interim
Expanded
Site F
Existing
Site E
Potential Rock
Disposal
Existing
Site H
PACIFIC OCEAN
Potential Ocean Disposal
Sites Evaluated

FIGURE 2.

August 16, 1993

Planning and Engineering Division

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 a biological assessment addressing species potentially impacted by the Coos Bay, Oregon Navigation Improvements (channel deepening) Project. We have determined that the proposed action would have no effect on threatened and endangered species under your jurisdiction.

Biological assessments for all species except loggerhead and green sea turtles were previously provided (December 4, 1990) to your office. We received a letter from your Seattle office on January 22, 1991, (ref. F/NWR3: 1514-04-020 jbn) concurring with our determination of no effect to listed species. The National Marine Fisheries Service (NMFS) concurrence letter requested renotification should project related actions or information change. There have been changes during the interim in disposal site boundaries. Site F will be substantially enlarged from the proposal set forth in our previous biological assessment. Further, blasting of rock in the channel is not being considered. Our information and findings relative to the listed species have not changed, however. We are resubmitting the biological assessment of December 4, 1990, including the additional species and an updated project description, for your review.

The biological assessment forwarded to your office only considers cetaceans, pinnipeds, and sea turtles. By an interagency agreement between the U. S. Army Corps of Engineers and National Marine Fisheries Service, biological assessments for threatened and endangered fish species will be reviewed by either your Portland or Sacramento office.

Should you require any additional information, please contact Mr. Geoff Dorsey of my staff at (503) 326-6481.

Sincerely,

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

Copies Furinished:

CENPP-PM (Laura Hicks)
CENPP-PE-RPE (Steve Stevens)

CENPP-PE-RPE (Steve Stevens) 2nd

BIOLOGICAL ASSESSMENT

FOR

GRAY, HUMPBACK, BLUE, FIN, SEI, RIGHT, AND SPERM WHALES

LEATHERBACK, LOGGERHEAD AND GREEN SEA TURTLES

AND

NORTHERN SEA LIONS,

AT

COOS BAY, OREGON NAVIGATION IMPROVEMENTS PROJECT

PROJECT DESCRIPTION

The proposed Coos Bay, Oregon Navigation Improvement (channel deepening) Project is located at Coos Bay, Coos County, in southwestern Oregon. The existing project at Coos Bay consists of a north and south jetty, a 45-foot deep by 700-foot wide entrance channel beginning at the entrance bar which transitions to a 35-foot deep by 300-foot wide lower channel from River Mile (RM) 1 to RM 9, and then a 35-foot deep by 400-foot wide upper channel to RM 15 plus one anchorage and two turning basins (Figure 1). The anchorage is located at RM 6. The turning basins are located at RM 12 and RM 14.7.

The proposed action is to deepen the channel two feet from the entrance to RM 15 and widen the turning basin at RM 12 by 100 feet. The alignment for the deepening will be the same as the currently authorized project. Work will be conducted during in-water work periods coordinated with the USFWS and ODFW. Rock removal from RM 0-5 will occur from 1 May - 31 January. Common excavation of material from RM 0-12 would occur from 1 May - 31 August; removal of common material from RM 12-15 would occur from 1 July - 31 January. Rock removal will be by mechanical means; further coordination will occur if conventional blasting is used for rock removal. Construction efforts will be initiated in May 1995.

Disposal of material will occur at approved ocean disposal sites (Figure 2). Current ocean disposal Sites E, F and H were designated by EPA in 1986 and have been used for disposal of sand material dredged from the channel for 10 years (includes interim use period). Dispersion of dredged material at Sites E and F has been less than predicted, hence added disposal capacity at Coos Bay is currently being sought. Investigations concerning expansion of ocean disposal Site F and designation of a rock disposal site were initiated in 1988 by the Corps and the Environmental Protection Agency. Designation of the expanded and

rock disposal sites by EPA is anticipated to occur in 1994 under the authority of Section 102 of the Marine Protection, Research, and Sanctuaries Act. Monitoring, according to a plan developed and coordinated with EPA, is conducted at all dredged material disposal sites.

Rock disposal (90,000 cys) at the Section 103 rock disposal site will constitute a one-time use. Fine grain sediments (584,500 cys) from above RM 12 will be disposed of in Site H; no site expansion for H is required. Sandy sediments will comprise approximately 681,100 cys of the dredged material and will be disposed of at expanded Site F.

Coarser, sandy sediments, characterize channel sediments from RM 0-10. A transition to finer grain sediments occurs at RM 10 corresponding to a major bend in the estuary. Organic content of sediments ranges from 0.4 to 14.5 percent volatile solids with the higher percentage associated with the upstream most, finer grained sediments.

Contaminants exhibit an affinity for fine grain sediments containing organic material. Coarse, sandy sediments with low organic content generally do not contain contaminants. Thus, the most likely sediments to harbor contaminants are located above RM 10 where fine grain materials occur. Five gravity core samples collected in 1989 from the channel above RM 10 analyzed by Battelle's Pacific NW Marine Sciences Laboratory indicated that contaminants were either undetected or else occurred at low levels typical of uncontaminated coastal and estuarine sediments. Concurrent tests (1989) by the International Port of Coos Bay for adjacent dock facilities indicated the existence of higher contamination levels for sediments from RM's 12-14. Subsequent biological testing demonstrated that material associated with dock facilities was suitable for ocean disposal. Sediment samples were also obtained in 1993 from the turning basin extension at RM 12 as the area slated for extension has not been dredged previously.

Four box core samples and two gravity core samples were collected on April 28, 1993 from the area to be dredged to widen the turning basin at Coos Bay River Mile 12.0. These sediment samples are considered to be representative of the material to be dredged. Physical analyses were conducted on all samples while bulk chemical analyses were conducted on material collected by the gravity cores. The two gravity core samples were sub-sampled along their entire length for the chemical and physical analyses.

Chemical analyses included metals, pesticides/PCBs, TOC, AVS, PAHs and butyltin. All chemical analyses are considered acceptable. No element or chemical exceeded USACE, Portland District's established "levels of concern", where established. No USACE, Portland District "levels of concern" have been

established for butyltin. All levels except one (DDT) are also below EPA, Region 10's screening levels (SL) for disposal in 404 waters, including the butyltin. Sample CBCD-GC-2 contained 4,4'-DDT at 10 ppb which exceeds EPA's total DDT SL of 6.9 ppb (Portland District's "level of concern" is 15-20 ppb total DDT). Sample CBCD-GC-1 contains <6.0 ppb 4,4'-DDT, the method detection limit for this sample.

The material to be dredged to widen the turning basin is considered to be suitable for ocean disposal without further testing. Because of the hydrophobic nature and low concentration of the contaminates present in the sediments, water quality standards should not be exceeded because of the dredging activities. In addition, dredging, disposal and subsequent dispersal of the dredged material at the ocean dredged material disposal site would reduce the concentrations still further. Fine grained material from the Federal navigation channel including the present turning basin at RM 12.0 has been deposited at ODMDS H since 1985. Based upon extensive evaluation of the sediment and the benthic community at Site H, from past disposal, no unacceptable adverse environmental impacts are anticipated by the proposed widening of the turning basin due to sediment contamination.

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 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. In contrast to previous observers, Green et. al. (1992) observed that most gray whales occurred further offshore of Oregon. They reported a mean distance of 9.2 km (SD = 4.2 km) for migrant gray whales off the Oregon coastline. They reported that only 16 percent of the whales they observed passed within 5 km of shore off Oregon.

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. comm., 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. Green et. al. (1992) reported that 13 percent of gray whales observed during their surveys of the Oregon and Washington coast occurred during summer. Their observations indicated that summering gray whales typically occurred within 1 km of the coast or in bays. Thirty-one percent of summering whales observed by Green et. al. (1992) were in the vicinity of Yaquina Head near Newport, Oregon.

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.

A 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 associated with this project will occur within the designated offshore disposal sites. Rock disposal operations offshore will occur during the Phase B northward and southward migration for gray whales. Coarser, sandy sediments from RM 0-12 will be placed in offshore Site F from 1 May to 31 August which encompasses the northward Phase B migration period. The fine-grain sediments from RM 12-15 will be placed in Site H from 1 July - 31 January. Fine-grain sediment disposal would encompass most of the southward migration period.

Should disposal operations occur when whales are present, it is unlikely that gray whales would be impacted as disposal operations are intermittent in nature, of a limited quantity per load and are confined to a limited area within the offshore disposal locations.

Although DDT has been identified in a portion of the sediments to be disposed of in the ocean, the low concentration of this contaminant in the sediments, the dilution that this material would incur from dredging, disposal, and subsequent dispersal in the ocean and the hydrophobic nature of DDT, combine to minimize the potential for impacts. We anticipate no impacts from contaminants on migrant or summering gray whales.

CONCLUSION

We conclude that dredging and disposal operations associated with the Coos Bay, Oregon Navigation Improvements Projects will have "no effect" on gray whales.

LITERATURE CITED

Darling, J. D. 1984. Gray whales off Vancouver Island, British Columbia. Pages 267-287 in M. L. Jones, S.L. Swartz, & S. Leatherwood, eds. The gray whale, "Eschrichtius robustus." Academic Press, Inc., Orlando, FL. 600pp.

Green, G. A., J. J. Brueggeman, C. E. Bowlby, R. A. Grotefendt, M. L. Bonnell and K. T. Balcomb, III. 1991. Cetacean distribution and abundance off Oregon and Washington, 1989-1990. Final Report prepared by Ebasco Environmental, Bellevue, WA, and Ecological Consulting, Inc., Portland, OR for the Minerals Management Service, Pacific OCS Region, OCS Study MMS 91-0093. 100pp.

Herzing D. L., & B. R. Mate. 1984. Gray whale migrations along the Oregon Coast, 1978-81. Pages 289-307 in M.L. Jones, S.L. Swartz, & S. Leatherwood, eds. The gray whale, "Eschrichtius robustus." Academic Press, Inc., Orlando, FL. 600pp.

Nerini, M. 1981. A review of gray whale feeding ecology. Pages 423-450 in M. L. Jones, S. L. Swartz, & S. Leatherwood, eds. The gray whale, 'Eschrichtius robustus'. Academic Press, Inc., Orlando, FL 600pp.

Rice, D. W., A. A. Wolman, & H. W. Braham. 1984. The gray whale, 'Eschrichtius robustus'. Mar. Fish Rev. 46(4):7-14.

Sumich, J. L. 1984. Gray whales along the Oregon Coast in summer, 1977-1980. The Murrelet. 65:33-40.

HUMPBACK, RIGHT, FIN, BLUE, SEI, AND SPERM WHALES

These species may occur in the project area but information on numbers, distribution, and feeding habits is lacking other than in a general sense. Occurrence of blue whales off the Oregon coast is primarily in May-June and August-October (Rice 1974 in Maser et al. 1981). Blue whales typically occur offshore as individuals or in small groups. Blue whales winter well south of Oregon as do fin whales (Maser et al. 1981).

Fin whales do range off the Oregon Coast during summer. Whaling records indicate that fin whales were primarily harvested off Oregon from May-September (Maser et al. 1981).

Green et al. (1989), based upon entries (1911-1925) in the logbooks of W. Lagen, U. of Washington Library, noted that fin whales were harvested in Oregon waters in the vicinity of Heceta Head and Yaquina Bay where oceanic banks occur and at the mouth of the Columbia River. Green et al. (1991) reported observing thirteen groups totaling 27 fin whales off the Oregon coast between June and January; all but 5 observations (Nov. 1989-2; January 1990-3) occurred in either June or July of 1989 and 1990. They observed fin whale groups in slope waters 85-90 km west of Newport, Oregon on three separate occasions and considered this an indication of site-specific preference. This area is referred to as the Newport Valley and has high topographical relief. They noted that other authors had observed site fidelity by this species.

Sei whales also winter south of Oregon. Based upon information from central California, Sei whales probably occur in southward migration off the Oregon coast in late summer - early fall (Maser et al. 1981).

Based upon catch records, humpbacks primarily occur off the Oregon coast between April and October with peak numbers occurring during June, July, and August (Maser et al. 1981). Green et al. (1991) observed 36 groups comprising 68 humpback whales off the Oregon and Washington coasts between May and November. They observed this species to be most abundant between May and September. Observations by Green et al. (1991) indicated that humpback whales first occurred off the Oregon coast in May and were off Washington by July. They were only observed in Washington during August shipboard surveys and were more common in Washington during September than Oregon. They noted that by late November, humpbacks were only observed off Oregon. The largest concentration of humpbacks they observed were 35 animals near Heceta Bank in June 1990. They noted that humpback whales were particularly concentrated in Oregon along the southern edge of Heceta Bank. They found this species to primarily occur on the continental shelf and slope.

Sperm whales occur as migrants and some may summer off the Oregon coast (Maser et al. 1981). Strandings have occurred along the Oregon coast. Green et al. (1989), citing Watkins (1977) indicated that sperm whales are pelagic occurring in water greater than 1000 m in depth. Leatherwood and Reeves (1982; more likely Leatherwood et al. 1982) cited in Green et al. (1989) observed a preference for continental shelf margins and sea mounts where upwelling occurs. Mate (1981), cited by Green et al. (1989) reported sperm whales commonly observed off Oregon between March and September.

Right whales may occur off the Oregon coast during winter; summer distribution is in cool waters north of 50 degrees north latitude (Maser et al. 1981). Green et al. (1989), citing

Fiscus and Niggol (1965) reported an observation of right whales off Tillamook Head in April 1959.

DISCUSSION

Discussions with Bruce Mate and other observers have indicated that these species of whales are rather infrequent visitors to the vicinity of coastal jetties, entrance channels and bays. A review of the literature indicates that these species would be more prevalent at offshore locations more distant and of different physical characteristics than the Coos Bay ocean dredged material disposal locations.

CONCLUSION

Given the nature of the project and whale use/occurrence in the project area, we have determined that there will be no effect to these whale species from dredging and disposal actions associated with the Coos Bay, Oregon Navigation Improvements Project.

LITERATURE CITED

Green, G. A., M. L. Bonnell, K. C. Balcomb, D. E. Bowlby, R. A. Grotefendt, and D. G. Chapman. 1989. Synthesis of information on marine mammals of the eastern North Pacific, with emphasis on the Oregon and Washington OCS area. Section 4, pp. 1-116, In: Brueggeman, J. J. (ed.). Oregon and Washington marine mammal and seabird surveys: Information synthesis and hypothesis formulation. Final Report prepared by Envirosphere Co., Bellevue, WA and Ecol. Consulting, Inc., Portland, OR for Minerals Management Service, Pacific OCS Region. OCS Study MMS 89-0030. 374 pp.

Green, G. A., J. J. Brueggeman, C. E. Bowlby, R. A. Grotefendt, M. L. Bonnell and K. T. Balcomb, III. 1991. Cetacean distribution and abundance off Oregon and Washington, 1989-1990. Final Report prepared by Ebasco Environmental, Bellevue, WA, and Ecological Consulting, Inc., Portland, OR for the Minerals Management Service, Pacific OCS Region, OCS Study MMS 91-0093. 100pp.

Fiscus, C. H. and K. Niggol. 1965. Observations of cetaceans off California, Oregon, and Washington. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. No. 498. 27 pp.

Leatherwood, S., R. R. Reeves, W. F. Perrin and W. E. Evans. 1982. Whales, dolphins, and porpoises of the eastern North Pacific and adjacent Arctic waters. A guide to their identification. NOAA Tech. Rep.; NMFS Circ. 444. 245 pp.

Maser, C., B.R. Mate, J.F. Franklin, and C.T. Dyrness. 1981. Natural history of Oregon coast mammals. PNW Forest and Range Exper. Stat., USDA, USFS, Gen. Tech. Rep. PNW-133.

Rice, D.W. 1974. Whales and whale research in the eastern North Pacific. Pages 170-194 **in** W. G. Scheville, ed. The whale problem: A status report. Harvard Univ. Press, Cambridge.

NORTHERN (STELLER) SEA LION

Northern sea lions breed along the west coast of north America from San Miguel in California's Channel Islands, 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. The south jetty of the Columbia River and Three Arch Rock appeared to be used primarily during the winter (Brown 1988).

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. 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 nearshore 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. 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

Foraging by this species would be expected to occur in the Coos Bay estuary although the extent of foraging activities in the immediate project area is unknown. Robin Brown (ODFW, pers. comm. 1993) indicated that presence of northern sea lions in the Coos Bay estuary occurs but is limited in scope. He indicated that the nature of the project was unlikely to impact the species.

It is unlikely that northern sea lions would be impacted by disposal operations as they are intermittent in nature and confined to a limited area. We would anticipate some potential for avoidance of the immediate disposal area.

Although DDT has been identified in a portion of the sediments to be disposed of in the ocean, the low concentration of this contaminant in the sediments, the dilution that this material would incur from dredging, disposal, and subsequent dispersal in the ocean and the hydrophobic nature of DDT, combine to minimize the potential for impacts. We anticipate no impacts from contaminants on northern sea lions.

Dredging actions are also limited spatially. Some avoidance of the immediate area around the dredge by northern sea lions would be expected. The avoidance area associated with a dredge would represent a very minor fraction of the potential habitat available to this species.

CONCLUSION:

The project may result in some localized avoidance around the immediate dredging and disposal areas 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.

LITERATURE CITED

Brown, R.F., 1988. Assessment of Pinniped Populations in Oregon. Oregon Department of Fish and Wildlife report to National Marine Fisheries Service, Seattle, WA. 44 pp.

NMFS. 1990. Listing of Steller Sea Lions as Threatened and Endangered Species With Protective Regulations. Federal Register 50 CFR Part 227. pp 12645-12661.

Gentry, R. L. and D. E. Withrow, 1986. Steller Sea Lion. Pages 186-194 in: Marine Mammals. D. Haley, ed. Pacific Search Press; Seattle, WA.

Roffe, T.J. and B.R. Mate, 1984. Abundances and Feeding Habits of Pinnipeds in the Rogue River, Oregon. J. Wildl. Manage. 48(4):1262-1274.

Oregon Department of Fish and Wildlife (ODFW), 1990. Northern (Steller) Sea Lion Garners Concern. Wild Flyer, vol. 1, no. 2, June 1990.

LEATHERBACK, LOGGERHEAD AND GREEN SEA TURTLES

Very little information has been published in peer-reviewed journals for sea turtles in the eastern North Pacific. Three ESA listed species of sea turtles (*Dermochelys coriacea*, *Caretta caretta* and *Chelonia mydas agassizi*) have been recorded off the Oregon coast (S. Eckert pers. comm. 1992). Of the three, leatherbacks (*D. coriacea*) are the most common visitors to Oregon waters. This species is very thermal tolerant and can maintain a body temperature of 64° F in 41° F water (S. Eckert 1992). Because of their thermal tolerance, leatherbacks may be found off the Oregon coast all times of the year (S. Eckert, pers. comm. 1992). Of the forty sightings reported off Oregon and Washington, 65% were leatherback, 17.5% loggerhead, 7.5% green; 10% were unidentified (S. Eckert[1]).

Leatherbacks are the most pelagic of the sea turtles, exhibiting the most extensive range of any living reptile (Pritchard and Trebbau 1984). Incidental capture in fisheries and sightings indicate that leatherbacks are found as far north as Alaska. Documented encounters continue southward from Alaska through British Columbia, Washington, Oregon, and south to Mexico (K. Eckert 1991). Of the documented sightings off the Oregon coast, none were reported closer than approximately 15 nautical miles from the mouth of the Columbia River (S. Eckert[1]).

Of the documented sightings off Oregon and Washington, loggerhead sea turtles (*Caretta caretta*) were second to

leatherbacks. In the eastern Pacific, loggerheads are reported as far north as Washington, and south to Chile, with most records being of juveniles off California (K. Eckert 1991).

Green sea turtles (*Chelonia mydas agassizi*) were the least abundant of the documented sightings (S. Eckert[1]). As with loggerhead sea turtles, their occurrence off Oregon and Washington is thought to be associated with warmer than normal water temperatures (K. Eckert 1991, S. Eckert, pers. comm. 1992).

DISCUSSION

Leatherback, loggerhead, and green sea turtles are expected to be very infrequent visitors in the area of the Coos Bay, Oregon Navigation Improvements Project. Although all three species have been documented off the Oregon and Washington coasts, none appear to be regular inhabitants. Most sightings occurred off the slope, and the majority of sightings off California are also over the slope. Although there are stranding records for these sea turtles, this near-shore presence can not be considered typical of healthy animals.

CONCLUSION

Due to the very infrequent occurrence of sea turtles in near-shore waters, intermittent nature of disposal operations, and the lack of contaminants associated with disposal materials, indicates that the Coos Bay, Oregon Navigation Improvements Project will have "no effect" on leatherback, loggerhead, and green sea turtles.

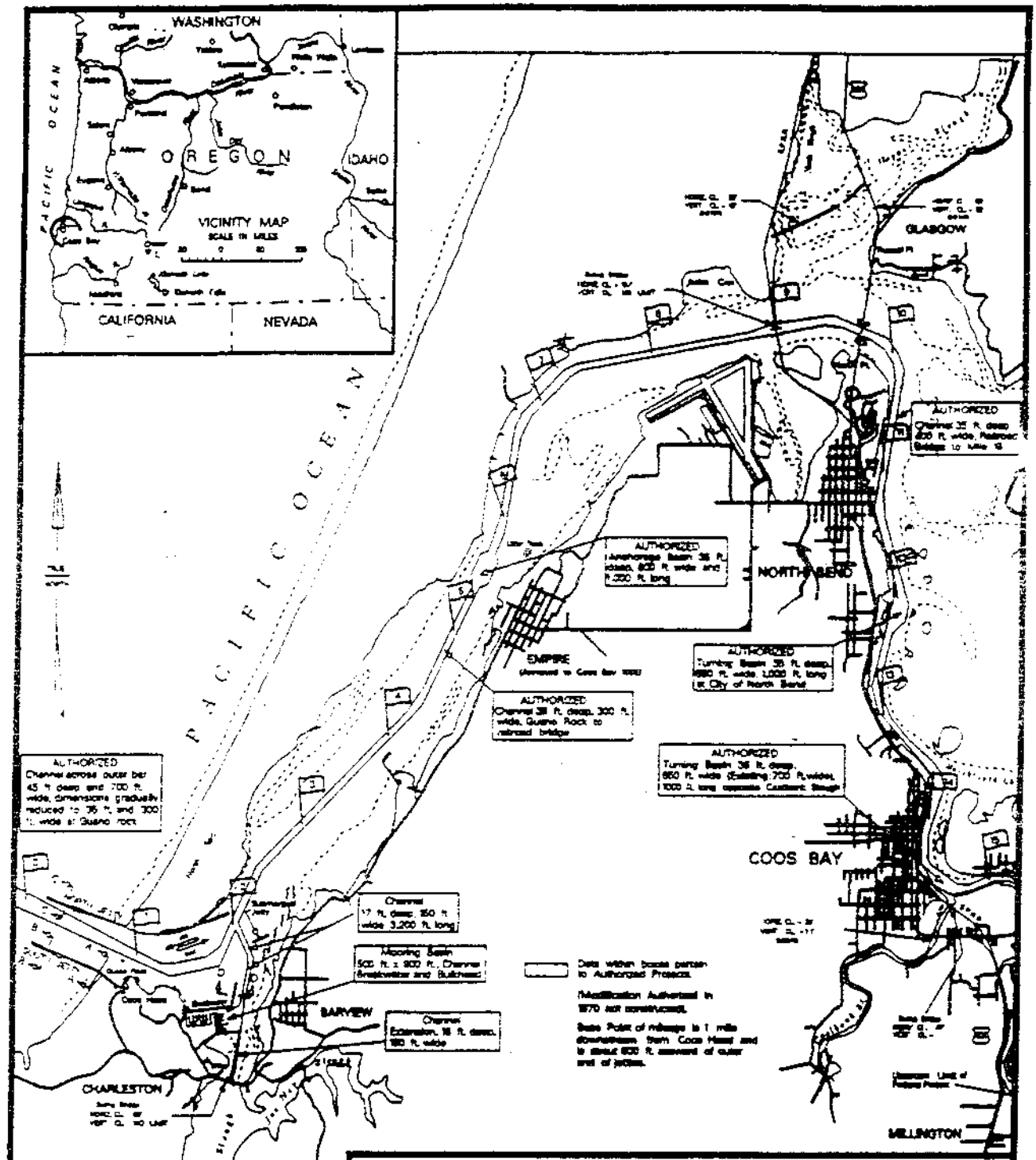
LITERATURE CITED

Eckert, K.L. 1991. The biology and population status of marine turtles in the North Pacific Ocean. Report to National Marine Fisheries Service, contract 40ABNF002067, 119 PP.

Eckert, S.A. 1992. Bound for deep water. Natural History, March 1992, pp. 28-35.

Pritchard, P.C.H., and P Trebbau. 1984. The turtles of Venezuela. Society for the Study of Amphibians and Reptiles, Contrib. Herpetol., No. 2.

1. S. Eckert, unpubl. data. Hubbs-Sea World Research Institute, 1700 South Shore Rd., San Diego, CA. 92109.



Existing Navigation Projects

US Army Corps of Engineers
Portland District

Produced by GIS, Survey and Mapping Section, Geotechnical Engineering Branch

Coos Bay Navigation Improvements

Figure 1

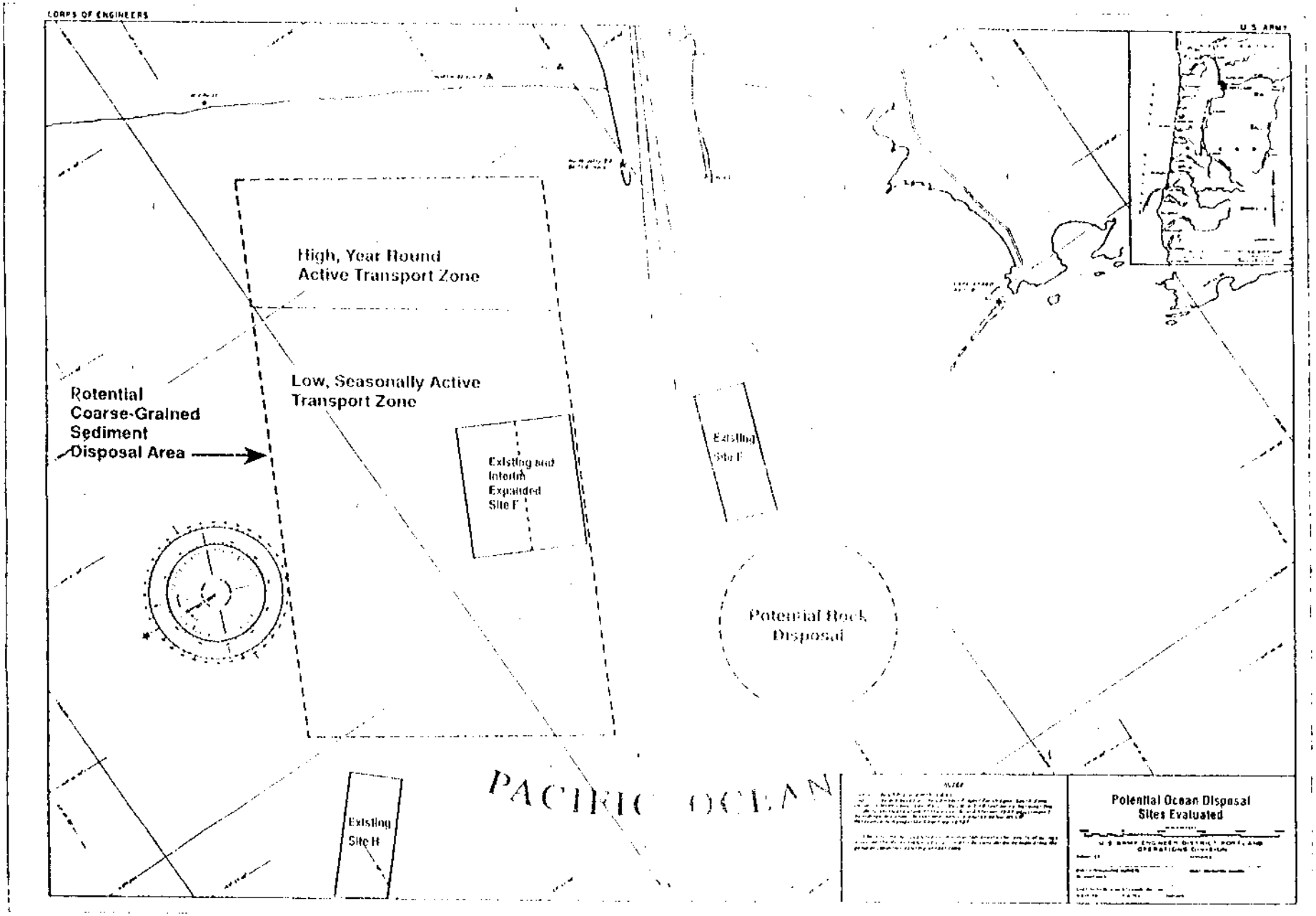

CORPS OF ENGINEERS
U.S. ARMY
High, Year Round
Active Transport Zone
Low, Seasonally Active
Transport Zone
Potential
Coarse-Grained
Sediment
Disposal Area
Existing and Interim Expanded Site F
Existing Site F
Potential Rock Disposal
Existing Site H
PACIFIC OCEAN
Potential Ocean Disposal
Sites Evaluated

FIGURE 2

August 16, 1993

Planning and Engineering Division

Mr. James Lecky
National Marine Fisheries Service
Protected Species Management Branch
501 West Ocean Boulevard Suite 4200
Long Beach, California 90802

Dear Mr. Lecky:

Pursuant to the requirements of the Endangered Species Act of 1973, as amended, we have made a determination that the Coos Bay, Oregon Navigation Improvements (channel deepening) will have no effect on Sacramento River winter run chinook salmon. We previously provided your Seattle office (December 4, 1990), with a biological assessment for this species. We received a letter from your Seattle office on January 22, 1991, (ref. F/NWR3: 1514-04-020 jbn) concurring with our determination of no effect to listed species.

The National Marine Fisheries Service (NMFS) concurrence letter requested renotification should project related actions or information change. There have been changes during the interim in disposal site boundaries. Site F will be substantially enlarged from the proposal set forth in our previous biological assessment. Our information and findings relative to the Sacramento River Winter Run Chinook Salmon have not changed, however. We are resubmitting the biological assessment of December 4, 1990 , plus providing your office a copy of the January 22, 1991 concurrence letter from your Seattle office. To further assist your review, an updated project description follows.

The proposed Coos Bay, Oregon Navigation Improvement (channel deepening) Project is located at Coos Bay, Coos County, in southwestern Oregon. The existing project at Coos Bay consists of a north and south jetty, a 45-foot deep by 700-foot wide entrance channel beginning at the entrance bar which transitions to a 35-foot deep by 300-foot wide lower channel from River Mile (RM) 1 to RM 9, and then a 35-foot deep by 400-foot wide upper channel to RM 15 plus one anchorage and two turning basins (Figure 1). The anchorage is located at RM 6. The turning basins are located at RM 12 and RM 14.7.

The proposed action is to deepen the channel two feet from the entrance to RM 15 and widen the turning basin at RM 12 by 100 feet. The alignment for the deepening will be the same as the currently authorized project. Work will be conducted during in-water work periods coordinated with the U. S. Fish & Wildlife Service and Oregon Department of Fish & Wildlife. Rock removal from RM 0-5 will occur from 1 May - 31 January. Common excavation of material from RM 0-12 would occur from 1 May - 31 August; removal of common material from RM 12-15 would occur from 1 July - 31 January. Rock removal will be by mechanical means; further coordination will occur if conventional blasting is used for rock removal. Construction efforts will be initiated in May 1995.

Disposal of material will occur at approved ocean disposal sites (Figure 2). Current ocean disposal Sites E, F and H were designated by EPA in 1986 and have been used for disposal of sand material dredged from the channel for 10 years (includes interim use period). Dispersion of dredged material at Sites E and F has been less than predicted, hence added disposal capacity at Coos Bay is currently being sought. Investigations concerning expansion of

CF: CENPP-PE-RPE (Steve Stevens)

in 1988 by the U. S. Army Corps of Engineers and the Environmental Protection Agency (EPA). Designation of the expanded and rock disposal sites by the Environmental Protection Agency is anticipated to occur in 1994 under the authority of Section 102 of the Marine Protection, Research, and Sanctuaries Act. Monitoring, according to a plan developed and coordinated with EPA, is conducted at all dredged material disposal sites.

Rock disposal (90,000 cys) at the Section 103 rock disposal site will constitute a one-time use. Fine grain sediments (584,500 cys) from above RM 12 will be disposed of in Site H; no site expansion for H is required. Sandy sediments will comprise approximately 681,100 cys of the dredged material and will be disposed of at expanded Site F.

Coarser, sandy sediments, characterize channel sediments from RM 0-10. A transition to finer grain sediments occurs at RM 10 corresponding to a major bend in the estuary. Organic content of sediments ranges from 0.4 to 14.5 percent volatile solids with the higher percentage associated with the upstream most, finer grained sediments.

Contaminants exhibit an affinity for fine grain sediments containing organic material. Coarse, sandy sediments with low organic content generally do not contain contaminants. Thus, the most likely sediments to harbor contaminants are located above RM 10 where fine grain materials occur. Five gravity core samples collected in 1989 from the channel above RM 10 analyzed by Battelle's Pacific NW Marine Sciences Laboratory indicated that contaminants were either undetected or else occurred at low levels typical of uncontaminated coastal and estuarine sediments. Concurrent tests (1989) by the International Port of Coos Bay for adjacent dock facilities indicated the existence of higher contamination levels for sediments from RM's 12-14. Subsequent biological testing demonstrated that material associated with dock facilities was suitable for ocean disposal. Sediment samples were also obtained in 1993 from the turning basin extension at RM 12 as the area slated for extension has not been dredged previously.

Four box core samples and two gravity core samples were collected on April 28, 1993, from the area to be dredged to widen the turning basin at Coos Bay River Mile 12.0. These sediment samples are considered to be representative of the material to be dredged. Physical analyses were conducted on all samples while bulk chemical analyses were conducted on material collected by the gravity cores. The two gravity core samples were sub-sampled along their entire length for the chemical and physical analyses.

Chemical analyses included metals, pesticides/PCBs, TOC, AVS, PAHs and butyltin. All chemical analyses are considered acceptable. No element or chemical exceeded USACE, Portland District's established "levels of concern", where established. No USACE, Portland District "levels of concern" have been established for butyltin. All levels except one (DDT) are also below EPA, Region 10's screening levels (SL) for disposal in 404 waters, including the butyltin. Sample CBCD-GC-2 contained 4,4'-DDT at 10 ppb which exceeds EPA's total DDT SL of 6.9 ppb (Portland District's "level of concern" is 15-20 ppb total DDT). Sample CBCD-GC-1 contains <6.0 ppb 4,4'-DDT, the method detection limit for this sample.

The material to be dredged to widen the turning basin is considered to be suitable for ocean disposal without further testing. Because of the hydrophobic nature and low concentration of the contaminates present in the sediments, water quality standards should not be exceeded because of the dredging activities. In addition, dredging, disposal and subsequent dispersal of the dredged material at the ocean dredged material disposal site would reduce the concentrations still further. Fine grained material from the Federal navigation channel including the present turning basin at RM 12.0 has been deposited at ODMDS H since 1985. Based upon extensive evaluation of the

sediment and the benthic community at Site H, from past disposal, no unacceptable adverse environmental impacts are anticipated by the proposed widening of the turning basin due to sediment contamination.

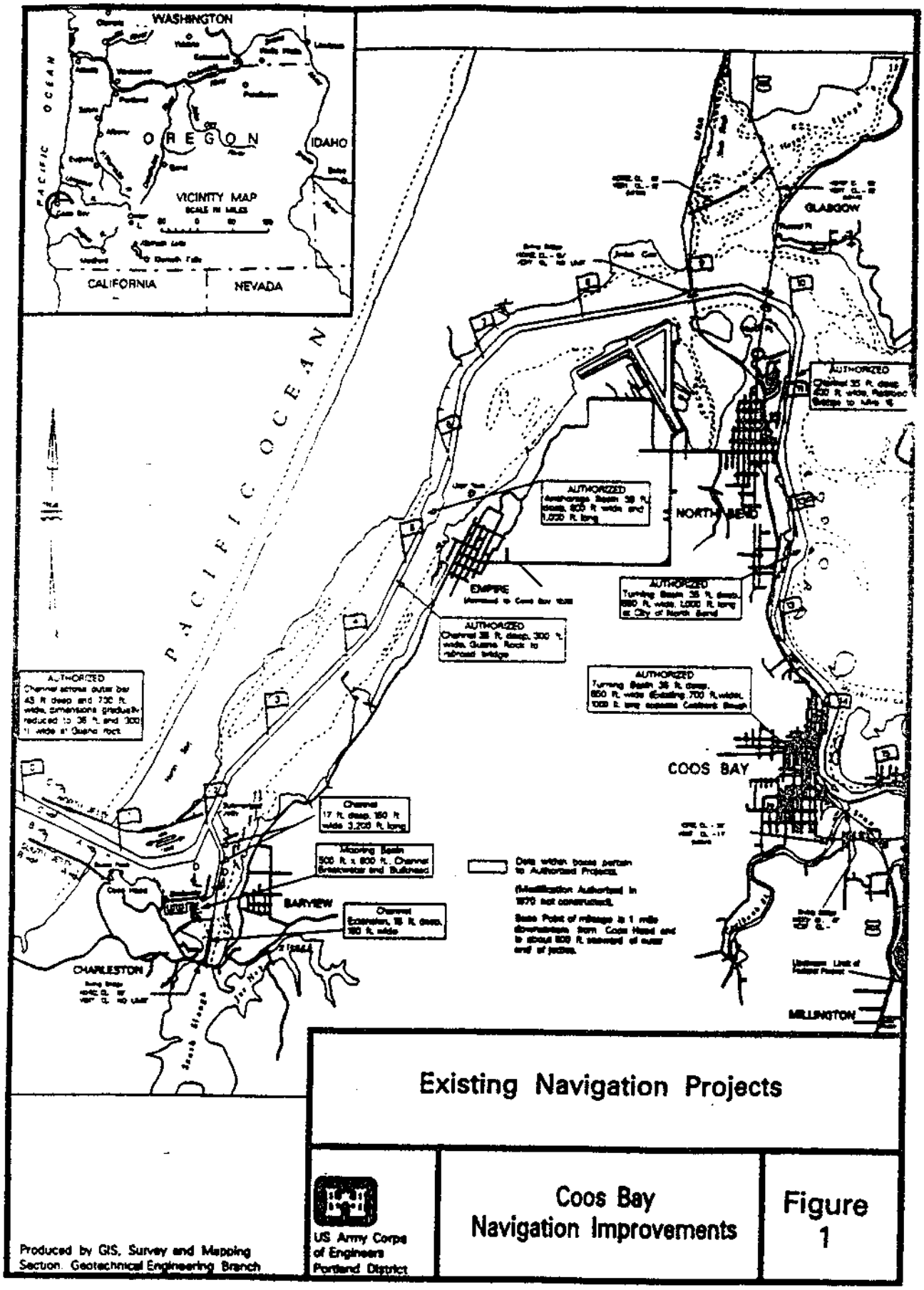
We have determined that the proposed action should have no effect on the continued existence of the Sacramento River Winter Run Chinook Salmon.

Should you require any additional information, please contact Mr. Geoff Dorsey of my staff at (503) 326-6481.

Sincerely,

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

Copies Furnished:
CENPP-PM (Laura Hicks)
CENPP-PE-RPE (Steve Stevens)



Existing Navigation Projects

US Army Corps of Engineers
Portland District

Coos Bay Navigation Improvements

Figure 1

Produced by GIS, Survey and Mapping Section, Geotechnical Engineering Branch

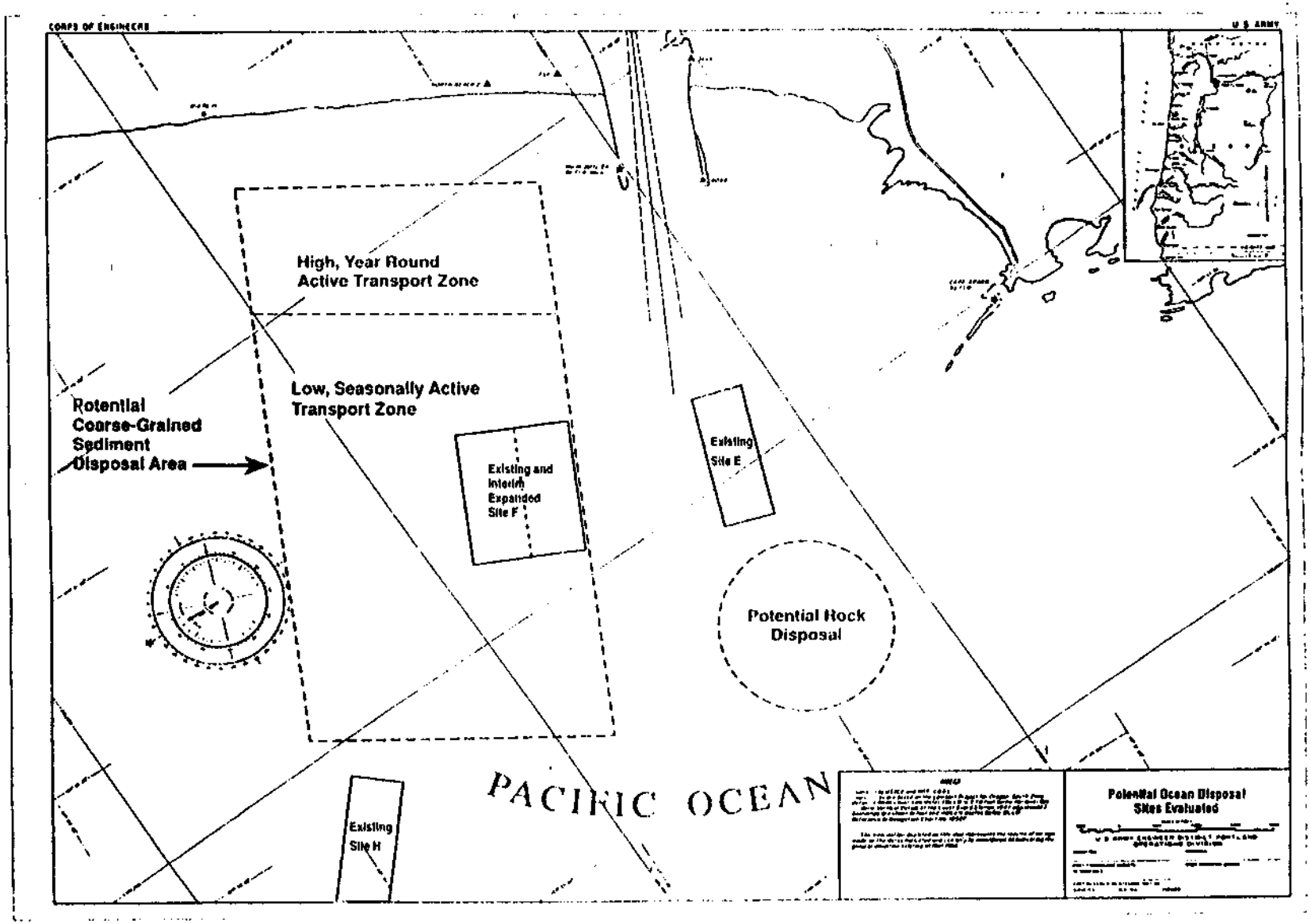

High, Year Round
Active Transport Zone
Low, Seasonally Active
Transport Zone
Potential
Coarse-Grained
Sediment
Disposal Area
Existing and
Interim
Expanded
Site F
Existing
Site E
Potential Rock
Disposal
PACIFIC OCEAN
Existing
Site H
Potential Ocean Disposal
Sites Evaluated

FIGURE 2

December 4, 1990

Planning Division

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 a biological assessment for threatened and endangered species which could potentially be impacted by dredging and disposal operations associated with the Coos Bay Channel Deepening Project.

We have concluded that this project will have "no effect" on any of the listed species.

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

Sincerely,

Robert E. Willis
Chief, Fish and Wildlife Branch

Enclosure

CF:
Joe Johnson, PL-C
Steve Stevens, PL-R

PL File

WILLIS
CENPP-PL-F

DORSEY
CENPP-PL-F
6482/Cameron
5 Dec 90

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 and not winter run chinook salmon, though. It does serve as an indication that Sacramento River winter run chinook salmon may occur off the Oregon coast.

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 Basin 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, 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.

Literature Cited

ECOS INC., 1990. Draft Biological Data Report: Winter Run Chinook Salmon for the Sacramento River Bank Protection Project. U.S. Army Corps of Engineers, Sacramento Dist. 38 pp.

Miller, D. R., J. G. Williams, and C. W. Sims. 1983. Distribution, abundance and growth of juvenile salmonids off the coast of Oregon and Washington. Fisheries Research 2(1983):1-7.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N. E.
BIN C 15700, Building 1
Seattle, Washington 98115

JAN 22 1991

F/NWR3: 1514-04-020 jbn

Robert E. Willis, Chief
Fish & Wildlife Branch
U.S. Army Corps of Engineers
Portland District
P.O. Box 2946
Portland, OR 97208-2946

Dear Mr. Willis:

This is in response to your December 4, 1990 letter and Biological Assessment (BA) regarding endangered/threatened species in the area of the proposed Coos Bay Channel Deepening Project. We have reviewed the assessment and our National Marine Mammal Laboratory had a few comments to offer which we have enclosed for your information. These comments, however, do not affect our response to your request for concurrence.

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 based upon the information provided in your assessment and that, 1) the dredging and disposal are scheduled to occur predominantly during the summer and fall months, a time frame when the presence of migratory gray whales is at a minimum, 2) the potential for blasting is low and further coordination with state and federal agencies including reinitiation of consultation will occur if blasting is required, and 3) that sediments for disposal do not contain environmentally detrimental contaminants. We understand that dredge material disposal may occur as early as May, i.e., the end of the northward migration, and as late as December, i.e., the beginning of the southward migration. Accordingly care should be exercised during disposal to ensure that gray whales are not present in the area of activity. Should this information be incorrect, or change, the Corps should contact this office immediately.

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, 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 Brent Norberg at 526-6140.

Sincerely,

Thomas E. Kruse
for Rolland A. Schmitten
Regional Director

Enclosure

cc: Nancy Foster - F/PR

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
Fisheries Management Division
7600 Sand Point Way N.E.
Seattle, Washington 98115

SEP 21 1993

F/NWO2:1514-04-020

RECEIVED 1993 ENV RES

Robert E. Willis, Chief
Resource Protection and
Fish and Wildlife Section
U.S. Army Corps of Engineers
Portland District
P.O. Box 2946
Portland, OR 97208-2946

Dear Mr. Willis:

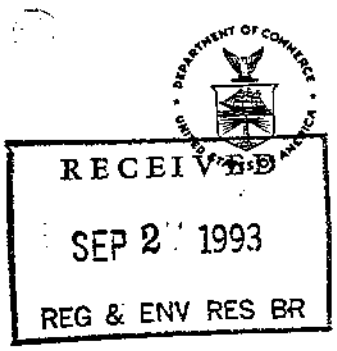
This is in response to your August 16, 1993 letter requesting review of an Endangered Species Act (ESA) Biological Assessment for the proposed Coos Bay, Oregon, channel deepening project. We have reviewed your Biological Assessment which considers cetaceans, northern sea lions and sea turtles. We concur with your determination that populations of threatened/endangered whales, northern sea lions and sea turtles are not likely to be adversely affected by the proposed actions.

This concludes consultation responsibilities under Section 7 of the ESA with regard to listed marine mammals and sea turtles. However, consultation should be reinitiated if new information reveals impacts of the identified activities that may adversely affect listed species, the activity is subsequently modified, or a new species is listed or critical habitat determined that may be affected by the identified activity.

Sincerely,

Rolland A. Schmitten
Regional Director

cc: F/NWO3 - Elizabeth Garr



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213
TEL (310) 980-4000; FAX (310) 980-4018

SEP 22 1993

F/SW031:RCW

Mr. Robert E. Willis
Chief, Resources Protection and
Fish and Wildlife Section
U.S. Army Corps of Engineers
Portland District
P.O. Box 2946
Portland, Oregon 97208-2946

Dear Mr. Willis:

Thank you for your letter requesting concurrence that the Coos Bay, Oregon Navigation Improvements project will not adversely affect the threatened Sacramento River winter-run chinook salmon.

Based on the available information, including your August 16, 1993, letter describing the project and its potential impacts, the proposed project is unlikely to adversely affect the winter-run chinook salmon. This concludes the section 7 consultation process for the Coos Bay, Oregon Navigation Improvements project. If new information becomes available indicating that the winter-run chinook salmon may be adversely impacted by the project, or if the project is further modified, then further consultation will be required.

If you have any questions concerning these comments, please contact Mr. Craig Wingert at (310) 980-4021.

Sincerely,

Gary Matlock, Ph.D.
Acting Regional Director

January 4, 1994

Planning and Engineering Division

Mr. Russell D. Peterson
Field Supervisor
U.S. Fish and Wildlife Service
2600 SE. 98th, Suite 100
Portland, Oregon 97266

Dear Mr. Peterson:

Pursuant to the requirements of the Endangered Species Act of 1973, as amended, we are providing a biological assessment for marbled murrelets relative to the Coos Bay Channel Deepening Project. We have concluded that this project is not likely to adversely effect marbled murrelets.

Please contact Geoff Dorsey (326-6481) of my staff should you have any questions or require clarification regarding this project.

Sincerely,

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

cf: Steve Stevens CENPP-PE-RPE
Laura Hicks CENPP-PM
Eric Braun CENPP-OP-NW
John Kranda CENPP-PE-PF

BIOLOGICAL ASSESSMENT

FOR

MARBLED MURRELETS

COOS BAY, OREGON NAVIGATION IMPROVEMENT PROJECT

PROJECT DESCRIPTION

The proposed Coos Bay, Oregon Navigation Improvement (channel deepening) Project is located at Coos Bay, Coos County, in southwestern Oregon. The existing project at Coos Bay consists of a north and south jetty, a 45-foot deep by 700-foot wide entrance channel beginning at the entrance bar which transitions to a 35-foot deep by 300-foot wide lower channel from River Mile (RM) 1 to RM 9, and then a 35-foot deep by 400-foot wide upper channel to RM 15 plus one anchorage and two turning basins (Figure 1). The anchorage is located at RM 6. The turning basins are located at RM 12 and RM 14.7.

The proposed action is to deepen the channel two feet from the entrance to RM 15 and widen the turning basin at RM 12 by 100 feet. The alignment for the deepening will be the same as the currently authorized project. Work will be conducted during in-water work periods coordinated with the USFWS and ODFW. Rock removal from RM 0-5 will occur from 1 May - 31 January. Common excavation of material from RM 0-12 would occur from 1 May - 31 August; removal of common material from RM 12-15 would occur from 1 July - 31 January. Rock removal will be by mechanical means; further coordination will occur if conventional blasting is used for rock removal. Construction efforts will be initiated in May 1995.

Disposal of material will occur at approved ocean disposal sites (Figure 2). Current ocean disposal Sites E, F and H were designated by EPA in 1986 and have been used for disposal of sand material dredged from the channel for 10 years (includes interim use period). Dispersion of dredged material at Sites E and F has been less than predicted, hence added disposal capacity at Coos Bay is currently being sought. Investigations concerning expansion of ocean disposal Site F and designation of a rock disposal site were initiated in 1988 by the Corps and the Environmental Protection Agency. Designation of the expanded and rock disposal sites by EPA is anticipated to occur in 1994 under the authority of Section 102 of the Marine Protection, Research, and Sanctuaries Act. Monitoring, according to a plan developed and coordinated with EPA, is conducted at all dredged material disposal sites.

Rock disposal (90,000 cys) at the Section 103 rock disposal site will constitute a one-time use. Fine grain sediments (584,500 cys) from above RM 12 will be disposed of in Site H; no site expansion for H is required. Sandy sediments will comprise approximately 834,608 cys of the dredged material (new work and O&M) and will be placed at expanded Site F.

Coarser, sandy sediments, characterize channel sediments from RM 0-10. A transition to finer grain sediments occurs at RM 10 corresponding to a major bend in the estuary. Organic content of sediments ranges from 0.4 to 14.5 percent volatile solids with the higher percentage associated with the upstream most, finer grained sediments.

Contaminants exhibit an affinity for fine grain sediments containing organic material. Coarse, sandy sediments with low organic content generally do not contain contaminants. Thus, the most likely sediments to harbor contaminants are located above RM 10 where fine grain materials occur. Five gravity core samples collected in 1989 from the channel above RM 10 and analyzed by Battelle's Pacific NW Marine Sciences Laboratory indicated that contaminants were either undetected or else occurred at low levels typical of uncontaminated coastal and estuarine sediments. Concurrent tests (1989) by the International Port of Coos Bay for adjacent dock facilities indicated the existence of higher contamination levels for sediments from RM's 12-14. Subsequent biological testing demonstrated that material associated with dock facilities was suitable for ocean disposal. Sediment samples were also obtained in 1993 from the turning basin extension at RM 12 as the area slated for extension has not been dredged previously.

Four box core samples and two gravity core samples were collected on April 28, 1993 from the area to be dredged to widen the turning basin at Coos Bay River Mile 12.0. These sediment samples are considered to be representative of the material to be dredged. Physical analyses were conducted on all samples while bulk chemical analyses were conducted on material collected by the gravity cores. The two gravity core samples were sub-sampled along their entire length for the chemical and physical analyses.

Chemical analyses included metals, pesticides/PCBs, TOC, AVS, PAHs and butyltin. All chemical analyses are considered acceptable. No element or chemical exceeded USACE, Portland District's established "levels of concern", where established. No USACE, Portland District "levels of concern" have been established for butyltin. All levels except one (DDT) are also below EPA, Region 10's screening levels (SL) for disposal in 404 waters, including the butyltin. Sample CBCD-GC-2 contained 4,4'-

DDT at 10 ppb which exceeds EPA's total DDT SL of 6.9 ppb (Portland District's "level of concern" is 15-20 ppb total DDT). Sample CBCD-GC-1 contains <6.0 ppb 4,4'-DDT, the method detection limit for this sample.

The material to be dredged to widen the turning basin is considered to be suitable for ocean disposal without further testing. Because of the hydrophobic nature and low concentration of the contaminates present in the sediments, water quality standards should not be exceeded because of the dredging activities. In addition, dredging, disposal and subsequent dispersal of the dredged material at the ocean dredged material disposal site would reduce the concentrations still further. Fine grained material from the Federal navigation channel including the present turning basin at RM 12.0 has been deposited at ODMDS H since 1985. Based upon extensive evaluation of the sediment and the benthic community at Site H, from past disposal, no unacceptable adverse environmental impacts are anticipated by the proposed widening of the turning basin due to sediment contamination.

Marbled Murrelet

The marbled murrelet is a near-shore marine bird that is most frequently observed within 1.5 miles of shore (Marshall 1988). Marbled murrelets reportedly forage just beyond the breaker-line and along the sides of river mouths where greater upwelling and less turbulence occurs. Sealy (1975a in Marshall 1988) reported that murrelets foraged within 500 meters of shore. Murrelets forage within the water column; prey items include invertebrates and small fish such as anchovy, herring and Pacific sand lance (Marshall 1988).

Currently, the largest concentrations of marbled murrelets in Oregon are thought to occur off the central coast (Marshall 1988) between Depoe Bay and Coos Bay. Lincoln and Lane Counties, which comprise a large block of the central Oregon coast, were historic centers of abundance for marbled murrelets in Oregon (Fed. Reg. 1991). Initial results from Strong (1992) indicate that abundance of murrelets is relatively higher on the central Oregon coast than the northern Oregon coast. Strong (1992) also reported that murrelet occurrence was patchy and that use of specific concentration locations was not consistent. Briggs et al (1992) reported sightings of marbled murrelets off the central-northern Oregon coast (Cape Arago to Tillamook Head) during June 1989. These sightings occurred in waters less than 10-m in depth and with temperatures of 12.5-13.6° C and were comparable in depth and temperatures to areas where murrelets were observed off the Washington coast. They observed 71 murrelets at 25 locations from the California-Oregon border to Cascade Head, Oregon during their September 1990 survey; again

the murrelets were in shallow waters with an average temperature of 11° C. It should be noted that surveys by Briggs et al (1992) were not designed for murrelets and that the nearshore ocean zone frequented by this species was covered rapidly during their surveys. Nevertheless, their information does provide some information on murrelet occurrence.

Marbled murrelets nest in old growth/mature coniferous forests (Fed. Reg. 1991). The low incidence of marbled murrelets at coastal locations is probably related to the loss of old growth coniferous forest from harvest and/or fire on near-coastal lands (Fed. Reg. 1991). Marbled murrelet populations now typically occur offshore of forested locations which provide suitable nesting habitat. Detection of marbled murrelets was greater in old growth stands (California) greater than 500 acres in size than for stands of 100 acres; few detections were recorded for stands less than 60 acres in size (Paton and Ralph 1988 and Ralph et al. 1990 in Fed. Reg. 1991). Thus, size of remnant stands may also influence presence of marbled murrelets on adjacent coastal waters.

Discussion:

The primary concern with regard to coastal dredging projects is the potential impact to murrelet prey resources. Sand lance, a prey species of marbled murrelets occur in Coos Bay. The Pacific sand lance is common to abundant in the marine portions of Oregon estuaries from the Columbia River to Coôs Bay (Emmett et al. 1991). The species is considered abundant in Tillamook Bay by Emmett et al. (1991). Sand lance are neritic (nearshore) species generally occurring in waters <100 m in depth (Trumble 1973 in Emmett et al. 1991). Clean, unconsolidated sand is required by adults and juveniles for escape and resting habitat; this species burrows into the substrate (Emmett et al. 1991). Escape and resting habitat must also contain sufficient oxygen, thus these areas typically occur in areas with high bottom current velocities (Emmett et al. 1991). Areas with high bottom current velocities, high substrate oxygen levels and clean, unconsolidated sand typically occur in the mouths of estuaries (Emmett et al. 1991).

This species, which uses a resting and predator avoidance strategy of burrowing in unconsolidated sandy substrates, is quite susceptible to entrainment by hopper dredges during dredging operations. The entrainment rate reported by Moehl and Barton (1989) for Coos Bay was 930 sand lance/1000 cy of dredged material.

We have analyzed potential entrainment numbers for sand lance associated with new work and O&M dredging that will occur with project construction. We have also estimated habitat availability for sand lance in the Coos Bay estuary below RM 9.0

in comparison to habitat acreage potentially impacted by project dredging. This analysis is based upon yardage removed, an estimate of acres of bottom substrate impacted and potential habitat acreage available to this species in Coos Bay below river mile 9.0. Moehl and Barton (1989) did not record sand lance upstream of RM 9.0.

We estimated acreage of channel area for the four reaches below RM 9.0 where dredging associated with the channel deepening project would occur (Table 1). Reaches 1, 2 and 4 below RM 9.0 would be dredged; dredging actions included both new work and O&M materials. The first reach extends from RM 0-50+00 to 0+00+30 and encompasses 81 acres (700 feet x 5,030 feet). Total dredging volume associated with project construction in reach one is 155,602 cys; O&M = 60,988 cys and new work = 94,614 cys. Reach two encompasses 50 acres and extends from RM 0+00+30 to 0+40+00. Total project-related dredging volume for reach two is 201,917 cys. No dredging was required in reach three (RM 0+40+00 to 1+00+00 which encompasses 10 acres. Reach four extends from RM 1+00+00 to 9+00+00 and encompasses 320 acres. An estimated 477,089 cy of material will be removed from this reach. There are 461 acres within the channel configuration in these four reaches.

Only common material (i.e. sand) yardage is used in estimating acres impacted by the project; rock removal was not considered as it did not represent suitable substrate for sand lance and the method of removal (backhoe) was not considered a problem.

We have based our estimate of sand lance habitat impacted by dredging associated with the Project on:

1) a review of the typical shoaling areas for these reaches in The Oregon Coast Maintenance Program (USACE 1991);
2) the footprint (acres) of the navigation channel by reach; and
3) the amount of dredged material (new work and O&M) forecast for each reach below RM 9.0.

We selected a range of acreage impacted for each reach we considered most representative of project impacts (Table 1). Shoaling patterns are not uniform across the channel, instead they are scattered along the channel configuration. Channel deepening will not require a uniform depth reduction along the length of the navigation channel. Deepening actions should occur primarily where the present shoals are located with some expansion to account for the increased depth.

Table 1. Acreage by reach and estimated acres of impacted by Coos Bay Channel Deepening Project.

Reach (acres)	Minimum Acres	Percent of Channel	Maximum Acres	Percent of Channel
1 (81)	24	30	32	40
2 (50)	31	63	42	84
3 (10)	0	0	0	0
4 (320)	74	23	99	31
Total (461)	129	28	173	38

We estimate that dredging actions will impact 129-173 acres of habitat potentially suitable for sand lance within the Navigation Channel (Table 1). There are approximately 461 acres within the Navigation Channel below RM 9.0. Thus, dredging actions associated with channel deepening, including removal of typical O&M material, will impact 28-38 percent of the channel area.

The total yardage (sand) to be removed from the entrance to RM 9.0 is 834,608 cy. The average hopper dredge entrainment rate for Coos Bay reported by Moehl and Barton (1989) of 930 sand lance/1000 cy of dredged material would yield an estimated entrainment level of 776,185 sand lance for the Coos Bay Channel Deepening Project. This number has to be put into some perspective in order to assess potential impacts to marbled murrelets.

To attain some perspective on potential impacts, we have compared the estimated acreage impacted (of potentially suitable habitat for sand lance) within the channnel with the acreage estimate for the lower Coos Bay estuary (i.e. entrance channel to RM 9.0 excluding Charleston Channel, South Slough, islands and intertidal habitat) as represented on the 1970 USGS quads for the area. Total estuarine acreage in the lower estuary was 2,918 acres. The impacted acreage within the channel represents 4-6 percent of this estuarine acreage. If only 50 percent of this estuarine acreage was suitable for sand lance, only 9-12 percent of the habitat base would potentially be impacted. Habitat for sand lance also occurs in the nearshore ocean waters off Coos Bay. The extent of habitat availability and population levels for sand lance in the nearshore environment are unknown.

Thus, we can identify a potential for a minor reduction in the sand lance population based upon entrainment levels and habitat impacts. It seems unlikely that a potential reduction of this magnitude will have an impact on marbled murrelets.

The literature review indicates the species occurs in the nearshore environment more so than in bays. None of the information reviewed to date indicates that concentrations of murrelets occur within Coos Bay proper. Varoujean and Williams (1987) reported marbled murrelets to the immediate north and south of Coos Bay entrance in surveys conducted from April-June 1986 and May-June 1987. The peak number of marbled murrelets recorded by Varoujean and Williams within three km of Coos Bay entrance was 15 in 1986 and 19 in 1987.

Their surveys from Coos Bay entrance to points greater than three km from the entrance recorded highs of 37 (1986) and 60 (1987) marbled murrelets. Their launch location for survey and capture efforts off Coos Bay was Charleston; they did not mention in their report any observations within Coos Bay. One murrelet was captured by Varoujean and Williams (1987) 1.0 km west of the Coos Head lighthouse; this would place the bird in the entrance.

They observed large numbers of murrelets offshore near tidal plumes. They stated that these observations may be biased because their sampling intensity was highest near mouths of estuaries. Varoujean and Williams also observed murrelets near boundaries of rip currents offshore of sandy beaches.

Neither Jim Collins or Dan Van Dyke, Oregon Department of Fish and Wildlife (pers. comm. 1993), were aware of marbled murrelets concentrating within the project area. Christmas Bird Count information provided by Dan Van Dyke, ODFW for the period 1972 and 1974-1992 indicated that marbled murrelets had been observed during seven years of that period; the maximum number being observed was 16 murrelets in 1991. The count area includes Coos Bay, Coos Bay North Spit and south of the entrance to Cape Arago. These observations are indications that Coos Bay proper is not a major foraging area for the species.

The 1991 Federal Register, Volume 56, No. 119, page 28363, stated that: "Concentrations of murrelets offshore were almost always adjacent to old-growth forests on-shore." We interpret the information from the Federal Register to mean that marbled murrelets are currently limited by nesting habitat, not by foraging resources. Our analysis of the listing proposal indicates that it is the U.S. Fish and Wildlife Service's opinion that forested habitat for nesting is limiting (reference Summary of Factors Affecting the Species). Forage resources are not documented as limiting in the Federal Register - Summary of Factors Affecting the Species.

Disposal operations would cause some temporary water column turbidity. However due to the intermittent and confined nature of the operation, and lack of contaminants associated with disposal materials, we do not anticipate these activities will affect foraging by marbled murrelets or their prey resources.

Although DDT has been identified in a portion of the sediments to be disposed of in the ocean, the low concentration of this contaminant in the sediments, the dilution that this material would incur from dredging, disposal, and subsequent dispersal in the ocean and the hydrophobic nature of DDT, combine to minimize the potential for impacts.

Further, the majority of the disposal site acreage is located more than one mile offshore and would appear to be beyond the normal foraging areas for marbled murrelets. Thus, the potential to disrupt foraging activities of marbled murrelets would appear very limited in scope.

Conclusion:

Channel deepening actions will impact sand lance, via physical disruption of 4-12 percent of the available habitat in the lower estuary and entrainment of an estimated 776,185 individuals. Thus, the action may constitute a minor impact to a potential prey population for marbled murrelets. No known foraging concentrations of this species occurs within Coos Bay; typically this species forages in nearshore ocean waters.

The proposed dredge material disposal operation will not modify known marbled murrelet habitat, nor is it expected to result in any substantial disturbance to this species. Materials which are to be disposed of are not contaminated to a level that is unacceptable for ocean disposal. Therefore, we anticipate no impacts from contaminants due to the disposal operation.

We conclude that the proposed Coos Bay, Oregon Navigation Improvements (channel deepening) Project is not likely to adversely effect marbled murrelets.

Literature Cited:

Emmett, R. L., S. L. Stone, S. A. Hinton, and M. E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries, Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Federal Register. 1991. Endangered and threatened wildlife and plants; Proposed threatened status for the marbled murrelet in Washington, Oregon and California. Vol. 56(119):28362-28367.

Marshall, David B. 1988. Status of the Marbled Murrelet in North America With Special Emphasis on Populations in Washington, Oregon and California. Audubon Society of Portland 41 pp.

Moehl, C. and L. Barton. 1989. Dredge material sampling. Coos Bay, Oregon 1989 fish and invertebrate distribution. USACE, Portland District, Unpub. Report. 22 pp.

Paton, P. W. and C. J. Ralph. 1988. Geographic distribution of the marbled murrelet in California at inland sites during the 1988 breeding season. Calif. Dept. Fish Game, Sacramento, CA. 35pp.

Ralph, C. J., S. L. Miller, N. L. Naslund, B. O'Donnell, P. W. C. Paton, and J. Seay. 1990. Marbled murrelet research during 1989 in northern and central California - An interim report. Tech. Report 1990-8, Nongame Bird and Mammal Section Report, Calif. Dept. Fish Game, Sacramento. 39pp.

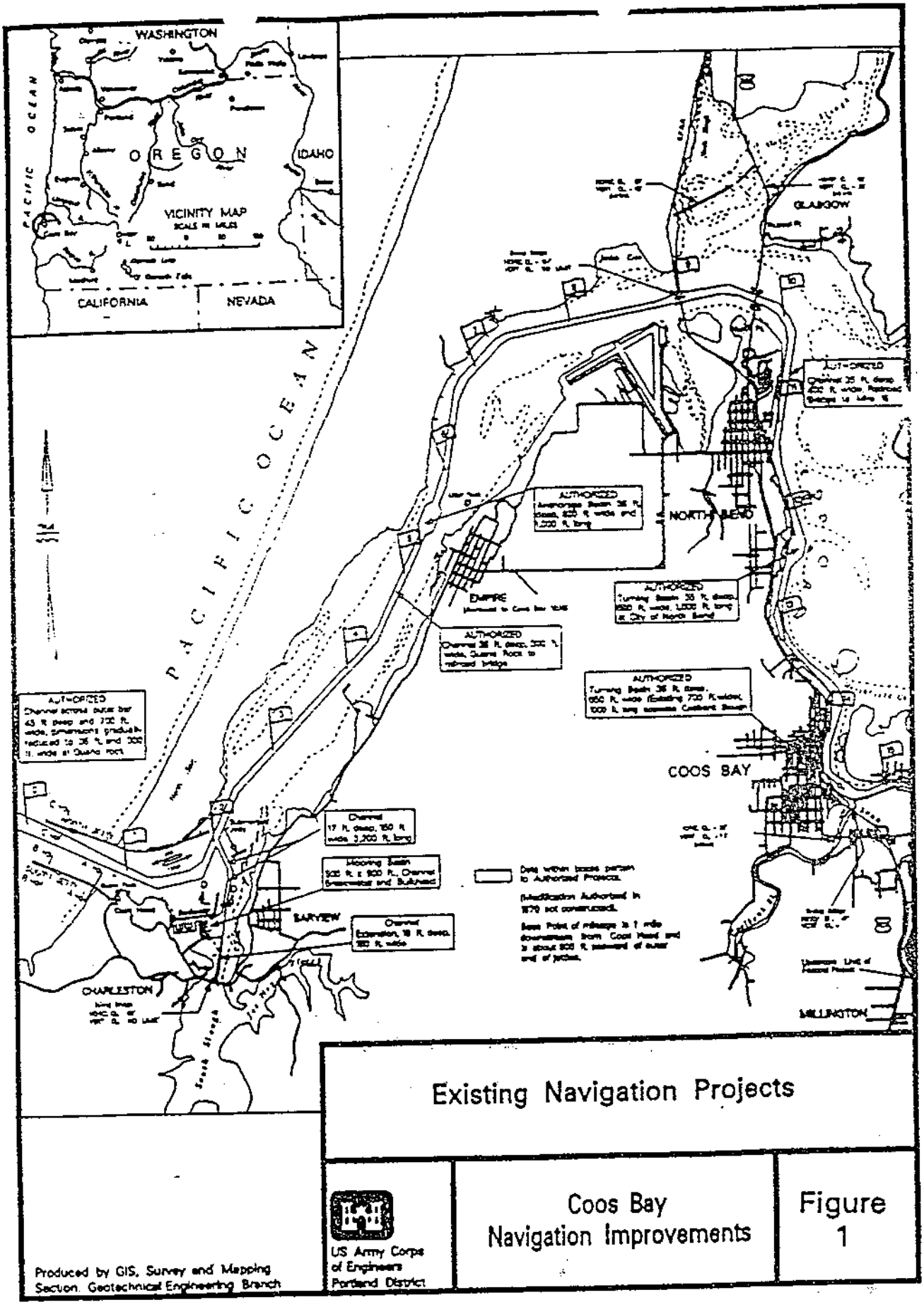
Sealey, S. G. 1975a. Feeding ecology of the ancient and marbled murrelets near Langara Island, British Columbia. Can. J. Zool. 53:418-433.

Taylor, W. P. 1921. The marbled murrelet mystery. Murrelet 2:8.

Trumble, R. J. 1973. Distribution, relative abundance, and general biology of selected underutilized fishery resources of the eastern north Pacific Ocean. M.S. Thesis, Univ. Wash., Seattle, WA. 178pp.

U.S. Army Corps of Engineers. 1991. Federal Navigation Projects: The Oregon Coast Maintenance Program. Nav. Br., Oper. Div., Portland, District. 145 pp.

Varoujean, D. H. and W. A. Williams. 1987. Nest locations and nesting habitat of the marbled murrelet (Brachyramphus marmoratus) in coastal Oregon. ODFW Nongame Wildl. Prog. Tech Rep. No. 87-01.


WASHINGTON
OREGON
IDAHO
CALIFORNIA
NEVADA
PACIFIC OCEAN
VICINITY MAP
NORTH BEND
COOS BAY
EMPIRE
BARVIEW
CHARLESTON
GLASGOW
MILLINGTON
AUTHORIZED
Channel
Mooring Basin
Existing Navigation Projects
US Army Corps of Engineers
Portland District
Coos Bay
Navigation Improvements
Figure
1
Produced by GIS, Survey and Mapping
Section, Geotechnical Engineering Branch

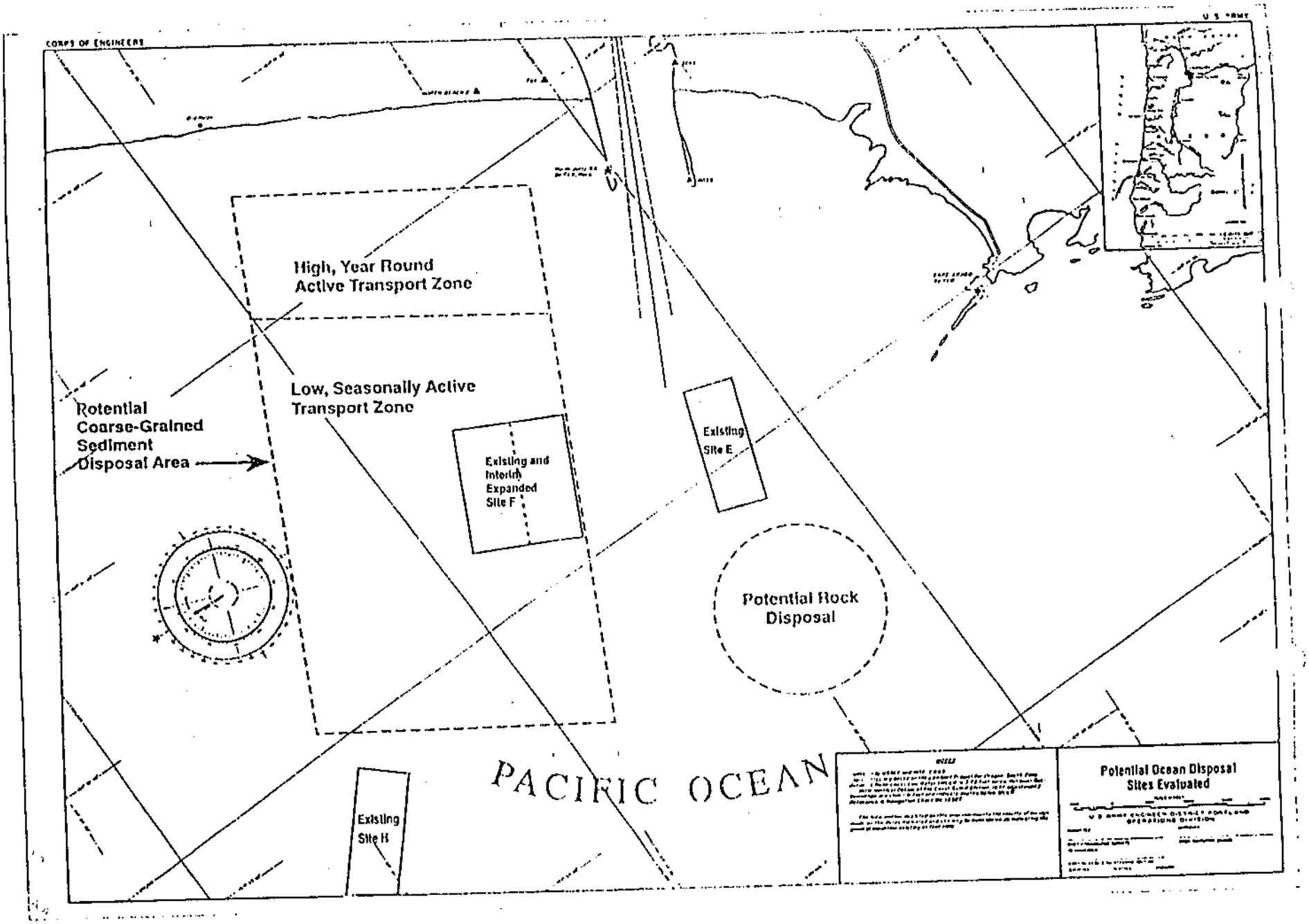

CORPS OF ENGINEERS
U S ARMY
High, Year Round
Active Transport Zone
Low, Seasonally Active
Transport Zone
Rotential
Coarse-Grained
Sediment
Disposal Area
Existing and
Interim
Expanded
Site F
Existing
Site E
Potential Rock
Disposal
PACIFIC OCEAN
Existing
Site H
NOTES
Potential Ocean Disposal
Sites Evaluated

FIGURE 2