FACTUAL DETERMINATIONS

DREDGED MATERIAL DISPOSAL OPERATIONS

YOUNGS BAY FEDERAL NAVIGATION CHANNEL

JULY - AUGUST 1980

1. Synopsis. Sediment samples were obtained for elutriate, benthos, and physical analyses from the Youngs Bay navigation channel at channel miles (CM) 1.5 and 2.5 on 22 July 1980, and from inwater sites that have been or will be used for disposal of sediments dredged from the navigation channel. Water from the Columbia River estuary and the ocean was collected and chemically analyzed for comparison with the elutriate data.

BACKGROUND

2. Youngs Bay is located on the south side of the Columbia River estuary opposite approximately Columbia River mile (RM) 12 (figure 1). A navigation channel, 10 feet deep and 150 feet wide, extends from the Columbia River through Youngs Bay and 4 miles into Youngs River, a total length of 7 miles. A side channel is authorized from CM 1.4 of the main channel into the Lewis and Clark River for 4.5 miles. This side channel has never been constructed. The Corps is responsible for maintaining the project depths of the main navigation channel; however, since the original construction of the project in 1939, it has been dredged only once. In 1967, 47,000 cubic yards were removed and discharged at upland sites in the estuary. When sediments are dredged in the future, they will be discharged at either upland or inwater sites. The latter may be either in the ocean or estuary (figure 1).

3. Portland District Corps guidelines specify that proposed dredged sediments must be chemically analyzed if they consist of particles with grain sizes which are more than 20 percent by weight smaller than sand, or if the sediments contain more than 6 percent organic material. The sediments and water at proposed disposal sites must also be analyzed to assess the impact of discharging dredged material on them. Pursuant to these guidelines, samples

for physical and/or chemical analysis were collected on 22 July 1980 from the Youngs Bay navigation channel, on 19 and 20 August from the Area D proposed disposal site, and on 22 and 25 July and 19 August from the Tansy Point proposed disposal site (table 1). Potential ocean disposal site sediments were not sampled since the authority (Section 404 of Public Law 92-500)[1,4] under which the other sampling was done covered freshwater and estuarine areas only. The parameters which were chemically analyzed were those with which the sediments may have been contaminated given the point and nonpoint contaminant sources for the area.

4. High levels of organic material have entered some portions of the Columbia River estuary. The pulp and paper industry is the major point source for the organics. It contributes approximately 75 percent of this waste load. The municipalities contribute about 13 percent, and food processing and miscellaneous industries contribute the remaining 12 percent. In addition, log dumping, rafting, and storage are significant nonpoint sources of organics in the sediments. Research shows that log handling can adversely affect water quality. Youngs Bay has a zone of extensive log dumping, rafting, and storage.[2]

5. Inorganic wastes are also contributed by the sources discussed above. Also, the petrochemical, shipping, aluminum-refining, and forest products industries, woolen mills, grain elevators, agriculture, and dairies contribute to the pollution of the sediments in the Columbia River estuary.

6. There are several sources of contamination in the immediate area of Youngs Bay. The city of Astoria borders on the bay. The town of Warrenton is located upstream in the Skipanon channel which empties into the mouth of the bay, and the town of Hammond is located immediately downstream of the mouth of the bay. Municipal waste treatment, the shipping industry, boat repairing and fish processing operations all occur in these various towns and contribute to the contaminant load in the Youngs Bay area. In addition, log rafting occurs in the Youngs River, Lewis and Clark River, and Skipanon channel, and the latter contains a large sawmill (see table 6 for point source dischargers).

7. Water quality in the Columbia River and its estuary are generally good.

There are no water quality parameters in the Columbia River for which there is substantial, partial or full-time noncompliance.[5] Temperature and radioactivity are the two parameters of most concern in the overall water quality, although degradation to some sections of the waterway from specific point or nonpoint sources may occur. Temperature usually exceeds the desirable levels for salmonids in August but is satisfactory for the remainder of the year. Radioactivity is high primarily as a result of discharges and nuclear waste disposal operations by the Hanford Atomic Works upstream of Richland, Washington, and the Trojan Nuclear Power Plant near Rainier, Oregon.[2] In addition to the above parameters, supersaturated levels of dissolved gases have been produced by spilling of dams upstream. This factor can be critical to salmonids by causing the gas bubble disease in them.

8. The U.S. Geological Survey (USGS) reports that a "turbidity maximum" normally develops in the Columbia River estuary because of a net circulation pattern in which dense saline water flows landward in the bottom layers and less dense freshwater flows seaward in the surface layers. The turbidity maximum is an area within which concentrations of suspended sediment, including some sand, are substantially higher than they are either downstream toward the mouth of the estuary or upstream in the Columbia River.

9. The Columbia River is the largest river in Northwest United States in both flow and drainage area and is second in size only to the Mississippi River in the United States as a whole. The Columbia River drains an area of 258,000 square miles. The flow at its mouth ranges from 150,000 to 600,000 cfs and is highly regulated by dams. This high flow permits a good flushing action in the upper reaches of the river, but it is significantly slowed in the estuary by both the tidal action and larger channel capacity.

10. The tidal effect during low riverflow varies from 7 to 8 feet at the mouth of the Columbia River and 1 to 2 feet at Bonneville Dam (RM 207). Riverflow reversal from the tide has been observed as far upstream as Prescott (RM 72). Ocean water intrusion may extend as far upstream as RM 20. Salinity in Youngs Bay has been shown to range from .6 to 10.1 parts per thousand (ppt) over a single day's tidal cycle.[9] The stilling effects of tidal action may significantly increase the amount of sediment deposited and retained at the

mouth and in the estuary of the Columbia River. Sources of the sediment include both the ocean and the Columbia River and its tributaries.

11. Upstream sources of sediments which are worthy of particular mention are the mudslides and ash fallouts which resulted from the 18 May 1980 eruption of Mount St. Helens. This eruption placed millions of cubic yards of sediments and wood debris into the Columbia River system at RM 67 and released ash which settled in most parts of the watershed. Further eruptions and erosion near the volcano should continue to place sediments, wood debris, and ash into the waterway.

12. To date, chemical analyses of both the ash and sediments which were washed into the Cowlitz and Columbia Rivers has shown that the materials are not highly polluted with contaminants of concern.[3] Of perhaps greater concern than the chemical content of the sediments is the large amount of small grain sized sediments and ash which have entered the watershed and washed down to the estuary. These materials suspend readily and can result in higher turbidity levels than have occurred in the past during dredging and disposal activities. Settling of these materials in the estuary may also have a serious impact on the ecological balance of the benthos in the area.

13. Federal regulations [1,4] require evaluation of dredged material disposal impacts to wildlife sanctuaries and refuges, wetlands, mudflats, vegetated shallows, municipal and private water supplies, recreational and commercial fisheries, water-related recreation, esthetics, parks, national and historic monuments, national seashores, wilderness areas, research sites, threatened or endangered species, and the aquatic food web. Disposal operations which may negatively impact any of these special aquatic sites or human use characteristics cannot be performed unless alternative, economically feasible disposal sites are not available and the operations are fully coordinated with concerned private and governmental agencies. If authorized, such disposal operations are to be managed to limit the effects of the disposal. The special sites and uses in the area of the proposed operation are discussed below.

14. Wetland and mudflat areas are located along the perimeter of Youngs Bay.

Scattered eel-grass beds are located in the bay. None of these were noted in the dredging or disposal areas. Any proposed upland disposal sites will have to be evaluated on a case-by-case basis.

15. The Columbia River estuary and Youngs Bay are well-known, recreational and commercial fishery areas, but the proposed dredged material disposal operations should not significantly impact these uses.

16. The only threatened or endangered specie in the project areas is the bald eagle. Nest sites for this bird have been located in the upstream areas of Youngs Bay. Neither the dredging or disposal operations are expected to impact any bald eagles in the area though maintenance of the channel could have the cumulative impact of encouraging industrialization of the area with a resultant loss of wildlife habitat.

17. Skipanon navigation channel dredged material disposal operations are expected to have insignificant impacts to the aquatic food webs in the Columbia River estuary. The cumulative impact from many such operations could be significant if the sediments discharged significantly contribute to turbidity in the estuary or if upland disposal sites proposed for future use are in ecologically sensitive areas. Youngs Bay sediments are predominantly sand and are not expected to significantly impact turbidity levels or esthetics at any of the proposed inwater disposal sites.

18. There are no known wildlife sanctuaries or refuges, municipal and private water supplies, parks, national and historic monuments, national seashores, wilderness areas, or research sites at the proposed disposal sites.

SAMPLING METHODS

19. The sediment samples collected for physical and chemical analyses were obtained with the Corps' 22-foot trihull, FORT STEVENS. This boat was also used to obtain water and benthos samples from the Columbia River estuary. A 60-foot charter boat was used to collect water from the ocean.

20. When possible, sediments which were sampled for chemical analysis were obtained with a 220-pound, 9-foot-long gravity corer which was equipped to obtain 2-foot cores in detachable, 2-5/8 inch diameter, acid-cleaned core liners. The core liners were made of transparent cellulose butyrate acetate and were sealed with polyethylene caps.

21. An acid-cleaned, stainless steel core catcher was attached to the mouth of each core liner to facilitate retention of the sediment sample during retrieval of the corer. The core catchers were removed before storing the samples in ice for transport to the analytical laboratory. This sampling method provided relatively undisturbed and well-preserved sediment samples. Upon reaching the laboratory, the samples were extruded, composited, and subsampled for elutriate, bulk chemical, and/or physical analyses.

22. A 9 by 9-inch, 45-pound Ponar grab sampler was used to obtain benthic samples. It was also used at those stations where insufficient sediment was obtained in the core samples to allow subsampling them for physical analyses. The benthic samples were sieved through 30 mesh wire. The retained fraction was then preserved with formaldehyde and stored for future analysis. Benthic data are not presented here.

23. Water samples were obtained with an 8-liter, acid-cleaned Van Dorn water sampler.

24. A Hydrolab 8000 water quality testing system was used to measure dissolved oxygen (DO), pH, oxidation reduction potential (ORP), conductivity, and temperature at various sites in Baker Bay, Columbia River, and the ocean (table 3).

ANALYTICAL METHODS

25. Sediment samples collected for chemical analyses underwent both elutriate and bulk sediment chemical analyses. Water samples were used in performing the elutriate tests and were analyzed to provide background data on the water quality at the dredged material disposal sites.

26. The majority of the elutriate and all of the bulk sediment analyses were performed by USGS following the procedures discussed in the USGS publication, "Native Water, Bottom Material, and Elutriate Analyses of Selected Estuaries and Rivers in Western Oregon and Washington".[10] The exceptions to this are cyanide, phenolics, orthophosphate, and phosphate elutriate analyses. These were performed by the Corps' North Pacific Division Materials Laboratory on eluate provided by USGS. The laboratory used methods described in the 14th Edition of Standard Methods for Examination of Water and Wastewater.[11] All chemical methods used have been coordinated with and approved by the Environmental Protection Agency. All sediment physical analyses were also performed by the division laboratory.

SAMPLING LOCATIONS

27. On 18 September 1979, sediments were collected from CM 1.5 and 2.5 in the navigation channel for physical analysis (sampling method is unknown). On 22 July 1980, sediments for the elutriate, benthic, and physical analyses were collected from the same locations (see table 1 and figure 1). On 19 and 20 August 1980, water and 5 sediment samples were obtained from upstream, downstream, and within the Area D disposal site opposite approximately Columbia RM's 7.0, 6.0, and 6.6, respectively. The Tansy Point disposal site was sampled on 22 July and 19 August 1980. Water was collected from the middle of this site on 25 July 1980.

28. Elutriate analyses were performed using freshwater from Columbia RM 18.5 (opposite Tongue Point), Tansy Point, Area D, or the ocean (see table 1). Elutriate testing with both fresh and salt water provides data representative of the extremes in salt content present within Youngs Bay given varying tides and riverflows.

EVALUATION PROCEDURE

29. Elutriate data on the navigation channel sediments are compared to Corps guidelines and to the analytical data on the water and elutriate samples taken

at each disposal site to estimate the water quality impacts of discharging dredged materials at the sites.

30. If a parameter was present in greater amounts in the elutriate analyses than in the guidelines and receiving water, dredged material disposal may negatively impact water quality at the disposal site. To determine the magnitude of the impact, the dilution factor and environmental characteristics of the disposal sites must be considered.

31. The majority of the Corps guidelines were promulgated in the EPA publication, Quality Criteria for Water,[7] and updated in the 28 November 1980 Federal Register,[12] and provide for the protection and propagation of fish and other aquatic life and for recreation in and on the water in accord with the 1983 goals of Public Law 92-500. The criteria were established primarily as a tool for evaluating long-term discharges from industrial point sources, not for assessing intermittent releases from dredged material discharge operations and long-term releases from discharged sediments. However, they provide protective guidelines for use in assessing disposal activities. Parameters without specific criterion were assigned guideline values based on available literature and/or State standards.

32. The elutriate and bulk sediment chemical data on the disposal site sediments are compared to that on the navigation channel sediments to determine if there are significant differences in the levels of potential contaminants. Of particular concern in terms of the bulk sediment analyses are those parameters which are readily bioaccumulated, such as toxic organic substances, mercury, and lead. The bulk sediment analyses can also be used to interpret elutriate data since certain parameters may be released at high or low levels during an elutriate test even though they are not present in a sediment at such levels. It should be remembered, however, that bulk sediment data represent the total amounts of the parameters present in the sediment including those bound mineralogically. They are not necessarily a measurement of the amounts which are readily available for chemical reaction and biological uptake. The elutriate and background data help in predicting these latter potentials.

33. Physical analyses were performed to determine if sediments met the exclusion criteria set up in Section 227.13(b) of the ocean dumping regulations (P.L. 92-532)[15] and Section 230.4-1(b)(1) of the Section 404 regulations.[1] The Portland District, Corps of Engineers, conservatively defines such sediments as consisting of 80 percent by weight of particles larger than silt and containing less than 6 percent organics or volatile solids. The criteria specify that such dredged materials do not have to undergo an evaluation of chemical-biological interactive effects.

34. The grain size of sediments is important in determining physical and chemical impacts of discharge operations. Unconsolidated, fine-grained materials, in comparison to larger grained materials, tend to adsorb more contaminants; suspend more readily thus influencing turbidity levels; form fluid mud layers; and spread further upon discharge. Also, deposits of sediments of grain sizes different from those at a receiving site can result in a greatly altered benthic population which may or may not be more productive than the former.

RESULTS AND DISCUSSION

35. Physical Data. Both of the sediment samples collected on 18 September 1979 from the navigation channel met the physical criteria exempting them from chemical analysis (table 2 and figure 2). However, the samples collected on 22 July 1980 were greater than 20 percent silt and did not meet criteria. The sediment from CM 2.5 on the latter date contained slightly more silt than that from CM 1.5 and was a darker color. The grain size, density, void ratios, volatile solids, and roundness grade of the channel's sediments were intermediate between those of Area D and Tansy Point.

36. Volatile solids levels were below Corps guidelines (6 percent) in all samples obtained. The relatively low levels of volatile solids in the navigation channel sediments indicated that the sediments should have minimal impact on dissolved oxygen levels in the disposal site receiving waters. Also, organic materials tend to adsorb contaminants which can be released upon degradation of the materials. Lack of them is a positive indication of the sediment quality.

37. After Mount St. Helens erupted, large amounts of sediments were deposited in the Columbia River. Some of these fine-grained materials settled in the Columbia River estuary. None of the samples obtained from Youngs Bay appeared to contain a surface layer of sediments such as would have settled as a result of the volcano.

38. Water Quality Data. DO, conductivity, ORP, temperature and pH were measured in the Youngs Bay navigation channel, Area D, Tansy Point disposal site, and the ocean using a Hydrolab 8000 Water Quality Monitoring System (table 3). The DO's (8.56 to 11.57) and temperatures (9.7 to 18.1° C.) measured at all sites were suitable for the survival of adult salmonids. The ORP data (205 to 287) indicated the absence of strongly reducing or oxidizing chemical species. At the pH values found, the moderately high ORP levels indicated that the water in the system will readily oxidize and precipitate iron and manganese if these parameters are released upon dredged material disposal operations.[13] The pH (7.86 to 8.05) at all stations fell within the range which was suitable for the survival of both freshwater and marine aquatic life.[7] Turbidity measurements were made with a YSI turbidometer. The data (7 to 10 NTU) indicated very clear water with minimal suspended solids levels.

39. Since conductivity measurements were not taken during both low and high tides at all stations, the extent of fresh and salt water influence at each site could not be determined; however, the available data indicate that the navigation channel water was fresh during low tide, while Tansy Point was fresh in the surface water and had a high salt content near the bottom. The depth of the halocline at the latter site during low tide on 21 August 1980 was located at approximately 6 meters. Area D was fresh to brackish in the surface water during high tide and had a high salt content near the bottom. The depth of the halocline at Area D during high tide on 20 August 1980 was located at 4 to 7 meters.

40. Sediment Chemical Data. The 10 sediment samples collected for elutriate testing underwent analyses for up to 51 parameters (table 4). In addition, subsamples from 3 of these sediment samples underwent bulk sediment chemical analyses for 40 parameters (table 5). One parameter, ammonia, was present in

the navigation channel sediment's eluate at levels above freshwater guidelines, and only manganese was released at levels exceeding the saltwater guidelines. These parameters are discussed below.

41. Ammonia is a common, highly soluble biproduct of the biological degradation of nitrogenous organic matter. The parameter is biodegraded by aerobic bacteria. In water, ammonia exists in un-ionized and ionized forms which are in equilibrium. A lower pH or higher temperature causes an increase in the highly toxic, un-ionized form. The un-ionized form decreases with increasing salinity. That portion of the ammonia which is in the un-ionized form in freshwater can be roughly estimated,[7] based on the temperature and pH of the water. The actual levels of un-ionized ammonia found during a disposal operation would be lower than those reported in table 4 since the salinity in the estuary is higher. The guideline level of .02 mg/l un-ionized ammonia was established for chronic exposure, not for temporary increases due to dredging operations.

42. Ammonia can be released in potentially significant amounts if sediments are discharged under conditions of little or no turn-over of water. The disposal sites, however, are characterized by fairly high energy regimes. Disposal operations would cause only short-term, elevated ammonia levels at the inwater disposal sites. Water column impacts from ammonia during open water disposal operations should be minimal. On the other hand, releases from an upland disposal area could cause a chronic exposure problem; particularly if the dissolved oxygen or pH levels of the overflow are low and receiving waters are quiescent.

43. Manganese was released at an excessive level (282 ug/l) from the saltwater eluate of the navigation channel sediments. The Corps' saltwater guideline (100 ug/l) was established to prevent chronic exposure problems in marine mollusks. Freshwater guidelines do not exist. The bulk sediment analyses indicated that the metal was not present in excessive levels in the proposed dredged material. Manganese is well-known to be readily released at high levels during elutriate tests. This attribute is the result of reduction of the insoluble, oxidized manganese to a soluble manganese (II) with decreasing pH, ORP, and oxygen such as can occur during elutriate tests. Such

excessive releases are not expected to occur during ocean discharges of sediments since the amounts of dilution water prevent the dissolved oxygen, pH, and ORP from dropping to the same extent. Manganese which is elutriated is expected to rapidly precipitate thus causing only insignificant, short-term water quality impacts. No long-term impacts from release of manganese are expected at the ocean disposal sites or Tansy Point.

44. The bulk sediment data revealed that two parameters, arsenic and copper, were present in the sediments at levels above those found in the disposal site sediments and exceeding the guideline limits (table 5). Neither of these parameters were excessive in the eluate samples and they should not significantly impact receiving water quality. To provide a more detailed assessment of their long-term impact at the discharge site, these parameters are discussed below.

45. Arsenic was present within the proposed dredged material (10 ug/g) at levels only slightly exceeding guidelines (8 ug/g). Since the dredged material level was three times the level in the disposal site sediments (3 ug/g) and greater than the concentrations which have been reported in the earth's crust (5 ug/g),[6] the level found in the dredged sediments may be attributed to anthropogenic contamination.

46. Arsenic can be both directly toxic and can be accumulated by aquatic organisms though it evidently is not progressively concentrated.[7] In one study, the trivalent, inorganic arsenic was determined to be 10 to 15 times more toxic than the pentavalent form. The former was converted to the latter within 30 days and long-term survival of benthic organisms was estimated to be normal in sediments containing as much as 1,920 ug/g arsenic.[7] Since the level found in the navigation channel sediments was only 10 ug/g, significant impacts to the benthos from arsenic are not expected. The toxicity or bioaccumulative capacity should not be significant.

47. Copper was found in the navigation channel sediments at a level (180 ug/g) considerably above the disposal site sediments (4-5 ug/g) and Corps guidelines (25-50 ug/g). Copper is not of particular concern in terms of toxicity to humans or bioaccumulative capacity to aquatic organisms. Its

water quality toxicity is related to pH, alkalinity, and hardness and varies widely among various species.[7] Crustal abundance averages 50 ug/g.[8] Marine sediments, however, may contain more than 400 ug/g.[8]

48. Copper is rapidly precipitated in alkaline and saline environments.[7] This and the fact that low amounts were found during the elutriate tests indicate that no water quality impacts from discharging the sediments are expected. Since the halocline extends into the disposal sites, copper in discharged sediments should remain precipitated. The comparatively high level commonly found in marine sediments indicated that impacts from the discharged sediments should be minimal.

CONCLUSIONS

49. The sediments in the Youngs Bay navigation channel did not meet the Portland District guidelines which exclude them from requiring a chemical-biological evaluation pursuant to 40 CFR 230.[1,4] They were composed of more than 20 percent silt. The sediments did, however, contain less than the Corps guideline level (6 percent) of volatile solids.

50. Additionally, the sediments did not meet the exemption criteria of Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (P.L. 92-532).[15] Pursuant to this, the sediments require bioassay/bioaccumulation testing prior to open water disposal in the ocean. Use of the sediments for beach nourishment may be acceptable since most beach nourishment sites are composed of sand and the navigation channel sediments are substantially the same. However, the small amounts of darker material in the RM 2.5 sediments might make beach disposal unesthetic. For this reason beach nourishment operations should be evaluated on a site-by-site basis.

51. The bulk chemical testing on the navigation channel sediments revealed elevated levels of arsenic and copper. Ammonia was released at excessive levels during freshwater elutriate testing and manganese was released in the saltwater elutriate tests. None of these parameters would be expected to cause significant water quality degradation or long-term impacts to aquatic

life upon open water disposal operations. Upland disposal site overflows could cause some water quality problems in the receiving water from release of ammonia or low DO levels. Monitoring of the overflow combined with appropriate management procedures should be established if dredged materials are discharged upland.

52. Of probable greater importance to the inwater disposal sites ecosystem is the physical impact to benthos which can occur by discharging sediments. There is an immediate, lethal effect on benthos in an area which is receiving sediments, although various organisms have shown considerable ability to vertically migrate through and survive discharges.[14] This ability is often improved if the sediments discharged are similar to those at the receiving site. The extent of impacts to benthos cannot be determined without an extensive, costly benthic sampling program and test dumps. Given the extent of the impacts expected, such sampling is not considered economically justified.

53. Upland and inwater disposal operations may cause negative, esthetic impacts by increasing turbidity levels in the receiving water. At an upland disposal site, turbidity can be prevented by using a flocculant or appropriate management techniques and disposal facility designs to decrease the suspended solids levels. However, given the substantially sandy nature of the sediments, flocculants will probably not be necessary. Impacts from turbidity at the inwater disposal sites are expected to be minimal and short-term.

54. No significant impacts to municipal water supplies, flow patterns, wildlife sanctuaries or refuges, wetlands, mudflats, vegetated shallows or human use characteristics are expected from discharging sediments at the inwater disposal sites. Proposed upland disposal sites must be evaluated for such impacts on a case-by-case basis.

RECOMMENDATIONS

55. A recommendation for a Finding of Compliance with the "Guidelines for Specification of Disposal Sites for Dredged or Fill Material," as discussed in

40 CFR 230[1,4] is made for discharging sediments dredged from the Youngs Bay navigation channel, from RM 0 to the U.S. Highway 101 (alternate) bridge over Youngs River (RM 2.7), at the following inwater disposal sites:

a. Tansy Point - Located just off the south shore of the Columbia River estuary opposite RM 10.

b. Area D - Latitude 46° 14' 27" N; longitude 123° 57' 00" W; 4,000 by 1,000 feet.

56. Sediments near the mouth of the channel up to RM 1.0 may meet the exemption criteria of Section 103 of P.L. 92-532 (Marine Protection, Research and Sanctuaries Act of 1972). Additional sampling and physical analyses would be necessary to determine this. If the sediment meets the exemption criteria, it will be suitable for disposal at EPA approved, interim ocean disposal or beach nourishment sites without further testing.

57. Navigation channel sediments from CM 1.0 to 2.7 cannot be discharged at designated, interim ocean disposal sites without bioassays and/or solid phase bioaccumulation studies being performed. Because of the excessive silt content of the sediments, they should not be used for beach nourishment unless the nourishment site is characterized by similar silt content.

58. Dredged sediment may be discharged at authorized upland sites provided the disposal facility is managed and monitored to assure that the overflow will meet the following water quality requirements:

a. Dissolved oxygen must be a minimum of 5 mg/l within an appropriate mixing zone (estimated at 100 feet downstream of the overflow).

b. Turbidity levels in the overflow should not exceed the upstream ambient by more than 50 JTU.

c. Upstream, downstream, and overflow water samples must be analyzed for DO and turbidity. Ammonia should also be measured if the disposal site is discharging into an area which has poor dilution potential. The levels found should equal background or District guideline levels within an appropriate mixing zone (estimated at 100 feet downstream of the overflow).

59. Use of all disposal sites, and particularly proposed upland areas, must be coordinated with the Washington State Historic Preservation Officer, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Oregon Department of Environmental Quality, and any other private or public agency which has expressed interest in such operations.

60. A Factual Determination and Finding of Compliance must be made for disposal of dredged materials at any sites which are not specifically addressed in this document.

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CORPS OF ENGINEERS

U. S. ARMY

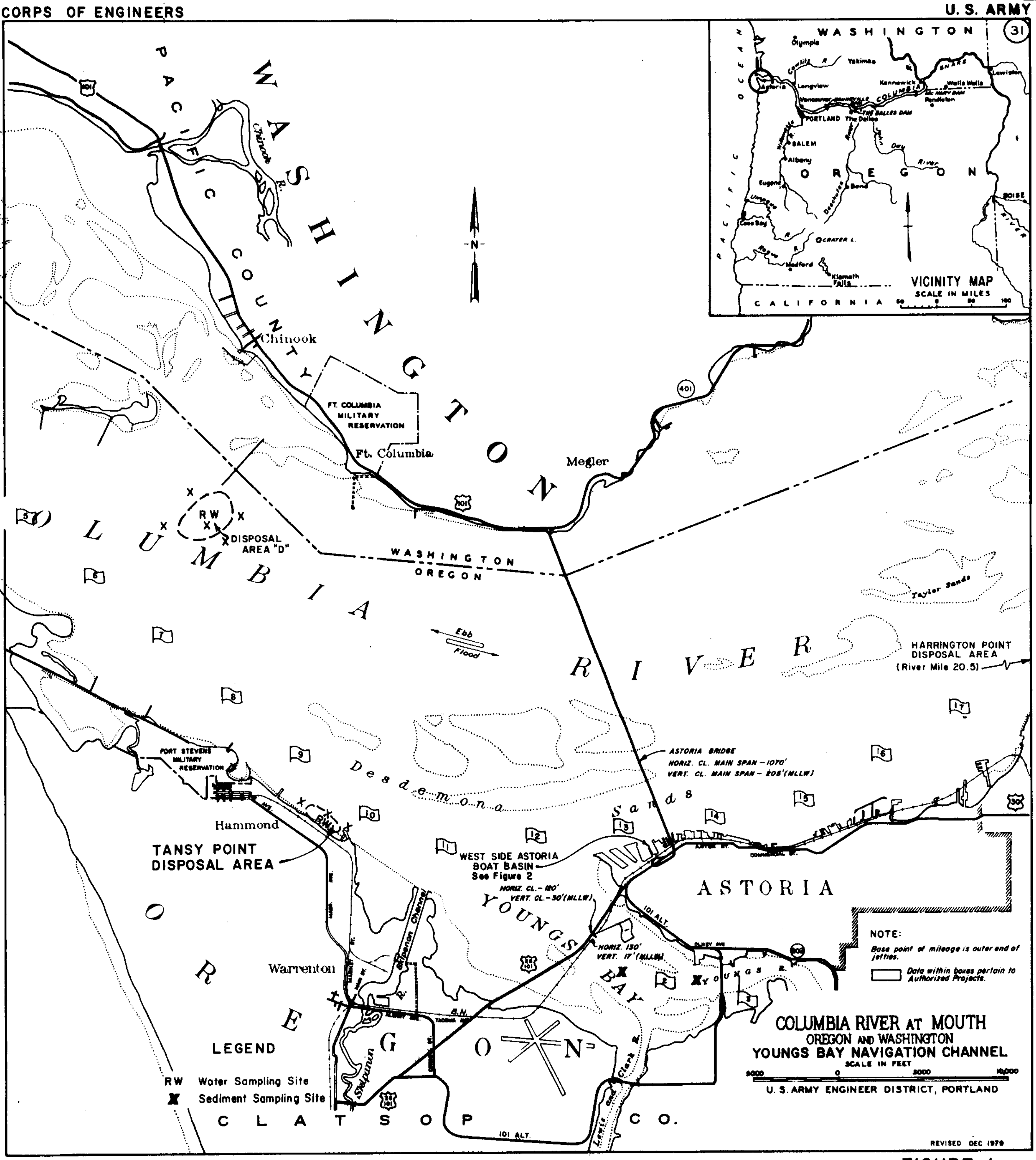
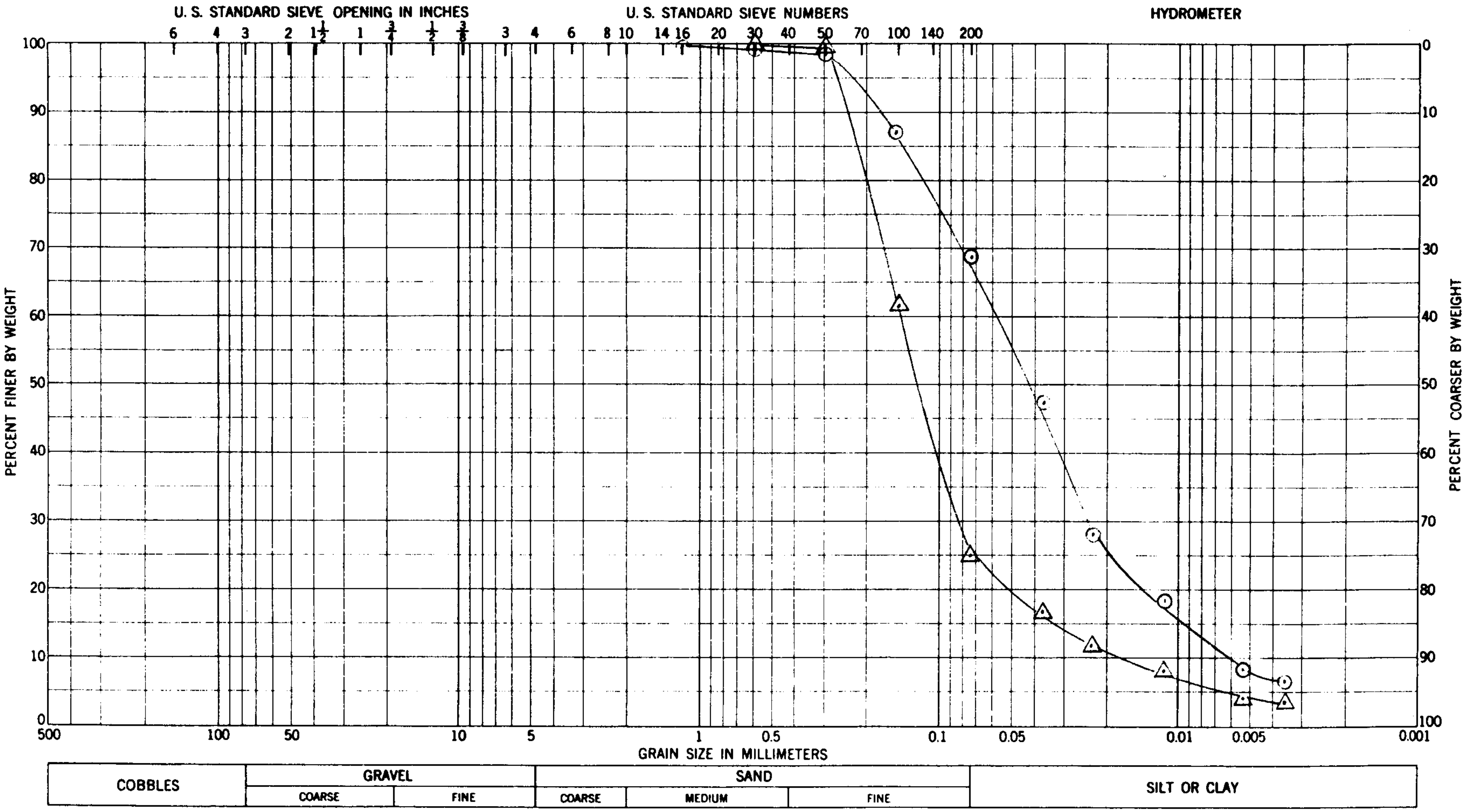


FIGURE I



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
⊙ R.M. 2.5	(1545)	Sandy SILT (ML)				
△ R.M. 1.5	(1500)	Silty SAND (SM)				

Project RIVER/COASTAL SEDIMENT ANALYSIS
Young's Bay, Oregon

Area

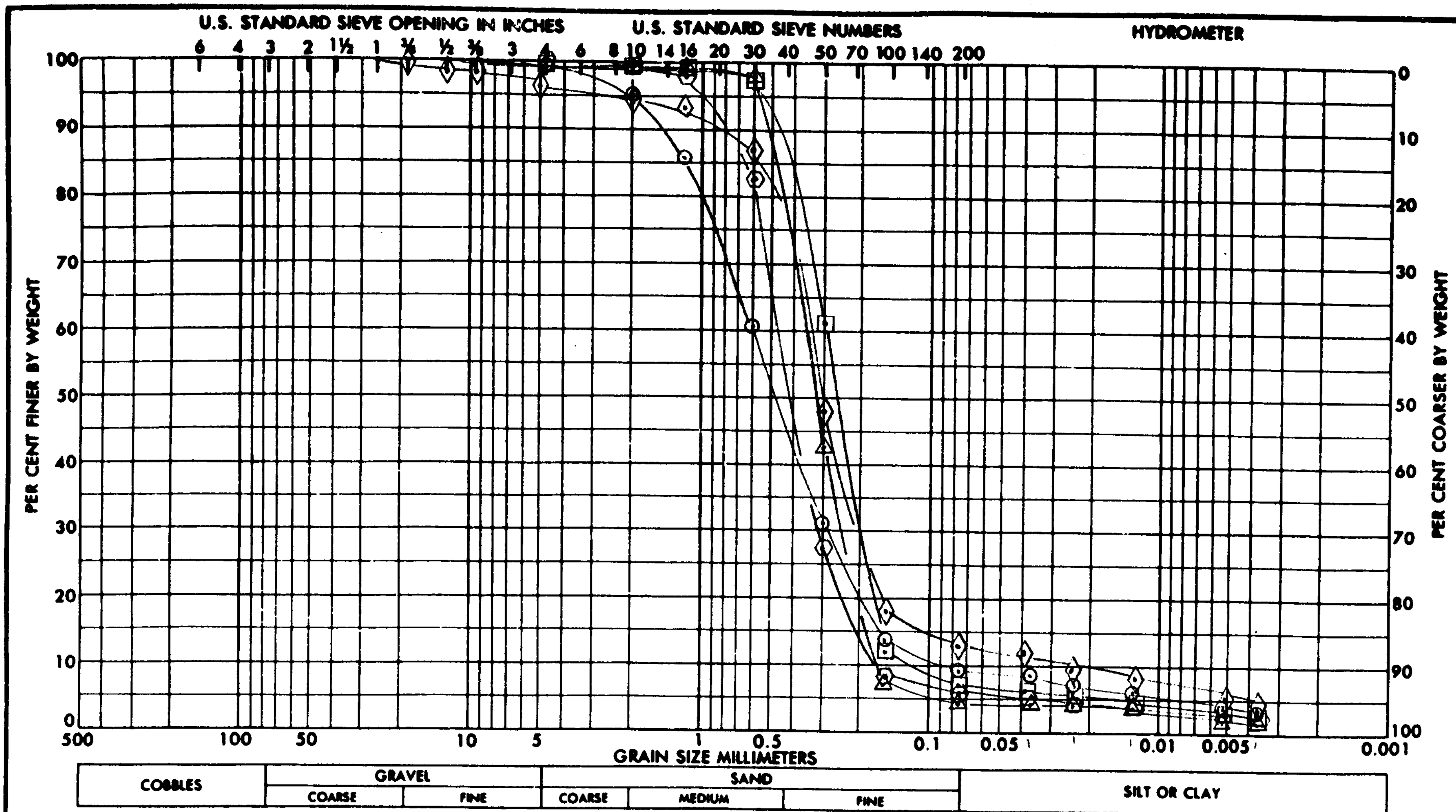
Boring No. Sampled: 22 July 1980

Date 22 OCT 1980 (80-Ch-650)

GRADATION CURVES NPD

ENG FORM 1 MAY 63 2087

Figure 2



	SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI
⊙	20 Aug 80	Area D-NDS @	68' Si. SAND (SP-SM)				
△	20 Aug 80	Area D-SUS @	35' SAND (SP)				
⊡	20 Aug 80	Area D-NUS @	38' Si. SAND (SP-SM)				
◊	20 Aug 80	Area D-SDS @	60' Si, SAND (SM)				
⊙	20 Aug 80	Area D @	68' Si, SAND (SP-SM)				

PROJECT RIVER COASTAL SEDIMENT ANALYSIS

AREA Columbia River

BORING NO.

GRADATION CURVES

NPD

DATE 28 Jan 81 (81-S-816)

ENG FORM 1 MAY 63 2087 REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE 1963 OF—700-136

Figure 3

TABLE 1
Sampling Locations and Methods
Youngs Bay Navigation Channel, Oregon

Sampling location and depth	Sampling Method	Sampling Date	Sampling Time	Type of Sample: Benthos	Sediment (Physical)	Sediment (Channel)	Water
Youngs Bay, CM 2.5, 18' (Dark sand on top with darker material on bottom 6")	Gravity Corer	22 Jul 80	1600		X	C BS BF2	
Youngs Bay, CM 1.5, 5-8' (Sand with shrimp-like organisms)	Gravity Corer	22 Jul 80	1620		X	AF2	
Ocean Receiving Water - One-half mile seaward of the end of the South Jetty; 6'	8-liter Van Dorn	24 Jul 80	0900				B
Columbia River Receiving Water - Just offshore of Tongue Point; RM 18.5; 7'	8-liter Van Dorn	24 Jul 80	1500				B
Tansy Point, Columbia RM 10.17; 200' upstream of DS; 50' (med. size sand with .25 inches of fines on top-possible ash)	Gravity Corer	19 Aug 80	0900			BF1 C	
	Ponar	22 Jul 80	1745	X	X		
Tansy Point, Columbia RM 9.95; in middle of DS, 58' (fine to medium sand with .25 inches of fine material on top) 2 meters	Ponar	22 Jul 80	1730	X	X		
	Gravity Corer	19 Aug 80				AF1	
		25 Jul 80	1500				B
Tansy Point, 200' downstream of DS; 50' (sand with clumps of clay. Some pumice grains and larger 'volcanic' rock)	Ponar	22 Jul 80	1715	X	X		
	Gravity Corer	19 Aug 80	1100			AF1	

TABLE 1 (cont.)
Sampling Locations and Methods
Youngs Bay Navigation Channel, Oregon

Sampling location and depth	Sampling Method	Sampling Date	Sampling Time	Type of Sample			
				Benthos	Sediment (Physical)	Sediment (Channel)	Water
Area D-SUS-Upstream of south corner of disposal site opposite RM 7.0; 38 feet	Corer Ponar	19 Aug 80 20 Aug 80	1500 0915	 X	 X	AF3	
Area D-Mid-middle of Area D; RM 6.6; 68'	Corer Ponar	19 Aug 80 20 Aug 80	1400 0945	 X	 X	AF3	
Area D-NDS-Downstream of north corner of disposal site opposite RM 6.0; 55'	Corer Ponar	19 Aug 80 20 Aug 80	1400 1000	 X	 X	AF3	
Area D-SDS-Downstream of corner of disposal site opposite RM 6.0; 55'	Corer Ponar	19 Aug 80 20 Aug 80	1400 1020	 X	 X	AF3	
Area D-NUS (46°-14'-27" N, 123°-57'-00"W) Upstream of the north corner of disposal site opposite RM 7.0; 38 ft.	Corer Ponar	19 Aug 80 20 Aug 80	1400 0855	 X	 X	BF3 C	
Area D Receiving Water-Middle of Area D (46°-14' 27"-N, 123°-57'-00" W), RM 6.6	Van Dorn	19 Aug 80	1300				B

A - An "A" analysis includes analyses for approximately twelve metals and nutrients but no complex organic compounds.

B - A "B" analysis includes analyses for approximately 20 metals and nutrients and up to 32 complex organic contaminants.

F1 - Denotes an elutriate test which was performed using fresh water from Tansy Point.

F2 - Denotes an elutriate performed with fresh water from Tongue Point.

F3 - Denotes an elutriate test which was performed using fresh water from Area D.

S - Denotes an elutriate performed with salt water from 1/2 mile seaward of the end of the south jetty.

DS - Dredged material disposal site.

CM - Channel mile.

RM - River mile.

C - Bulk sediment chemical analysis.

TABLE 2

SEDIMENT PHYSICAL DATA
Youngs Bay Navigation Channel, Oregon

Sample Identification	Specific Gravity of Water	Density of Matl in place gms/liter	Density of Median Solids gms/liter	Void Ratio	% Volatile Solids	% Wtr Content in place	% Organic Material	Roundness Grade
Youngs Bay CM 1.5 18 Sep 79	1.0094	1921	2740	0.898			1.00	Subrounded to Subangular
Youngs Bay CM 2.5 18 Sep 79	1.0074	1699	2687	1.427			2.46	Angular to Subangular
Youngs Bay CM 1.5 (1500) 22 Jul 80	1.0042	1793	2718	1.17	2.24	43.3		Angular to Subangular
Youngs Bay CM 2.5 (1545) 22 Jul 80	1.0047	1558	2681	2.03	3.21	76.1		Subangular to Subrounded
Tansy Point; Upstream (1735) 22 Jul 80	*1.000	1465	2617	2.48	2.89	94.8		Angular to Subangular
Tansy Point; Middle 58 ft (1730) 22 Jul 80	*1.000	1389	2617	3.16	3.23	120.7		Subangular to Subrounded
Tansy Point, Downstream side (1115) 19 Aug 80	1.0085	1979	2732	0.78	0.78			Subangular to Subrounded

* Distilled water used to saturate sample.

TABLE 2 (cont.)

SEDIMENT PHYSICAL DATA
Area D

Sample Identification	Specific Gravity of Water	Density of Matl in place gms/liter	Density of Median Solids gms/liter	Void Ratio	% Volatile Solids	Roundness Grade
Columbia River S.D.S. Area D 60' 20 Aug 80	1.011	1912	2744	0.92	1.57	Subangular to Subrounded
Columbia River Middle Area D 68' 20 Aug 80	1.011	1938	2725	0.85	0.70	Subangular to Subrounded
Columbia River N.D.S. Area D 68' 20 Aug 80	1.011	1920	2703	0.86	0.61	Subangular to Subrounded
Columbia River S.U.S. Area D 35' 20 Aug 80	1.009	1866	2715	0.99	0.91	Subangular to Subrounded
Columbia River N.U.S. Area D 38' 20 Aug 80	1.009	1934	2722	0.85	0.78	Subangular to Subrounded

TABLE 3

WATER QUALITY DATA
Youngs Bay Navigation Channel, Tansy Point, and Ocean

DATE: 21 Aug 80 SAMPLING PERSONNEL: Pam Moore, Bob Ellard
WEATHER CONDITIONS: ____________________
COMMENTS: (Wildlife, vessel traffic, completion status of training jetty, sampling gear difficulties, sampling vessel, etc.): Low tide was at 1630 (+4/10 feet)

Parameter	Youngs Bay RM 1.5	Youngs Bay RM 2.5	Middle Tansy Point		Ocean*	
Depth, meters	.2	1.4	14.5	.2	9.6	.2
Dissolved Oxygen, mg/l	8.88	8.56	8.85	9.02	10.50	8.71
Conductivity, umho/cm x 10^{-5}	.114	.112	.495	.087	.530	.215
ORP	223	227	224	205	287	261
Temperature, 0° C.	17.9	17.8	10.8	18.1	9.7	15.7
pH	7.96	7.86	8.00	7.98	7.86	8.05
Turbidity, NTU**					7	
Time	1453	1500	1557	1600	0921	0926
Maximum Depth, m	2.0	2.0	15.2		11.8	
Halocline, Depth/Conduct.			6.6/.349		2.1/.421	

* Located at end of North Columbia River Jetty
** Turbidity measurements made on water samples obtained on 22 July 1980

TABLE 3 (cont.)

HYDROLAB WATER QUALITY DATA
Area D Disposal Site
Mouth Columbia River

DATE: 8-20-80

SAMPLING PERSONNEL: Pam Moore, Bob Ellard, Pat Buckles, Phil Livingstone

WEATHER CONDITIONS: Overcast; 60°

COMMENTS: (Wildlife, vessel traffic, completion status of training jetty, sampling gear difficulties, sampling vessel, etc.) Fort Stevens sampling boat and hydrolab water quality testing system

	STATIONS							
Parameter	SDS	SDS	NDS	NDS	Mid-Area D	Mid-Area D	NUS	NUS
Depth, meters	1.0	13.2	2.4	9.8	2.0	14.8	9.3	1.8
Dissolved Oxygen, mg/l	8.74	11.25	8.99	11.60	9.08	10.38	11.57	9.69
Conductivity, umho/cm x 10^{-5}	.158	.505	.164	.492	.163	.507	.470	.122
Salinity, ppt	11		11		11			8
ORP	270	281	254	269	255	270	268	250
Temperature, °C	16.6	10.4	16.5	10.8	16.8	10.4	11.3	17.0
pH	7.90	7.99	7.99	8.02	7.93	8.02	8.00	7.98
Turbidity, NTU**			10		8		10	
Time	1045	1054	1104	1108	1116			
Approximate Halocline, Depth/Cond, meters/umho/cm	4.6/.353			7.2/.477		6.5/.420	5.7/.420	
Maximum Depth, meters	16.9		12.0			19.9	11.8	

** - Turbidity measurements made on water samples obtained on 19 August 1980.

SDS = South and downstream of Area D.
NDS = North and downstream.
NUS = North and upstream.

TABLE 4
Elutriate and Receiving Water Chemical Data
Youngs Bay Navigation Channel and Dredged Material Disposal Sites
July - August 1980

PARAMETERS	FWE RM 1.5	SWE RM 2.5	FWE RM 2.5	OCEAN RCVG WATER	TONGUE PT RCVG WATER	TANSY PT RECVG WATER	FWE TANSY PT UPSTREAM	FWE TANSY PT MIDDLE	FWE TANSY PT DOWNSTREAM	FWE/SWE GUIDELINES
Arsenic, ug/l		2	2	1	1	1	1			440/508
Barium, ug/l			0	100	0	0	100			
Beryllium, ug/l		23	10	10		10	10			130/---
Cadmium, ug/l	0	0	0	0	.04	0	1	1	1	1.5/59
Carbon, Organic, mg/l	13	10.6	19	2.7	3.4	2.7	6.5	2.5	4.9	
Chromium, ug/l	0	0	0	0	0	0	0	0	0	2,200/
Copper, ug/l	2	0	2	49	3	2	1	0	2	52/30
Cyanide, ug/l					5.0	<5.0	1			
Iron, ug/l	10	122	20	200	20	30	60	80	60	1000/---
Lead, ug/l	0	0	0	4	2	1	1	0	1	74/668
Manganese, ug/l	10	282	10	60	10	20	720	210	150	/100
Mercury, ug/l	0.0	0.0	.2	.1	0	.0	0	.1	.2	.0017/.37
Nickel, ug/l		1	0	2	4	0	6			1,100/140
Nitrogen, Ammonia mg/l	9.8	27	9.1	.00	.00	.00	.93	.15	.27	
Un-ionized Ammonia, mg/l*		.77	.26	.00		.00	.03	.005	.009	.02
Nitrogen, Organic mg/l		2	.2	.32	.43	1.6	.48			
Phenolics, ug/l	31		37	9	3	8	20	17	10	10200/5800
Phosphorus, Total ug/l		56	74	58	36	58	62			100/---
Orthophosphate, ug/l	28	23	38	43	37	30	38	53	39	
Zinc, ug/l	20	24	10	50	2.5	20	30	20	30	180/170
Aldrin, ug/l		.00	.00	.00	.00	.00	.00			3.0/1.3
Ametryne, ug/l		.0	.0	.0	.0	.0	.0			
Atratone, ug/l		.0	.0	.0	.0	.0	.0			
Atrazine, ug/l		.0	.0	.0	.0	.0	.0			
Chlordane, ug/l		.0	.0	.0	.0	.0	.0			2.4/.09
Cyanazine, ug/l		.0	.0	.0	.0	.0	.0			
Cyprazine, ug/l		.0	.0	.0	.0	.0	.0			
DDD, ug/l		.00	.00	.00	.00	.00	.00			
DDE, ug/l		.00	.00	.00	.00	.00	.00			1,050/14.0
DDT, ug/l		.00	.00	.00	.00	.00	.00			1.1/.13
Dieldrin, ug/l		.00	.00	.00	.00	.00	.00			2.5/.71
Endosulfan, ug/l		.00	.00	.00	.00	.00	.00			.22/.034
Endrin, ug/l		.00	.00	.00	.00	.00	.00			.18/.037
Hept Epox, ug/l		.00	.00	.00	.00	.00	.00			
Heptachlor, ug/l		.00	.00	.00	.00	.00	.00			.50/.053
Lindane, ug/l		.00	.00	.00	.00	.00	.00			2.0/.004
Methoxychlor, ug/l		.00	.00	.00	.00	.00	.00			.03/.03
Mirex, ug/l		.00	.00	.00	.00	.00	.00			.001/.001
PCB, ug/l		.0	.0	.0	.0	.0	.0			2.0/10.0
PCN, ug/l		.0	.0	.0	.0	.0	.0			
Perthane, ug/l		.00	.00	.00	.00	.00	.00			
Prometone, ug/l		.0	.0	.0	.0	.0	.0			
Prometryne, ug/l		.0	.0	.0	.0	.0	.0			
Propazine, ug/l		.0	.0	.0	.0	.0	.0			
Silvex, ug/l		.00	.00	.00			.00			
Simazine, ug/l		.0	.0	.0	.0	.0	.0			
Simetone, ug/l		.0	.0	.0	.0	.0	.0			
Simetryne, ug/l		.0	.0	.0	.0	.0	.0			
Toxaphene, ug/l		.0	.0	.0	.0	.0	.0			
2, 4-D, ug/l		.00	.00	.00			.00			
2, 4-DP, ug/l		.00	.00	.00			.00			
2, 4, 5-T, ug/l		.00	.00	.00			.00			

ug/l = micrograms per liter

mg/l = milligrams per liter

FWE - Elutriate performed using fresh water

RCVG = Receiving Water

RM - River Mile

SWE - Elutriate performed using salt water from the ocean 1/2 mile seaward of the submerged end of Columbia River South Jetty.

* - Rough estimates extrapolated from tables in EPA's "Quality Criteria for Water."[5]

Table 4 (cont.)
Elutriate and Water Quality Data
Area D Dredged Material Disposal Site
Youngs Bay Navigation Channel, Oregon

PARAMETERS	FWE Area D NUS	FWE Area D SUS	FWE Area D NDS	FWE Area D SDS	FWE Area D Mid	RCVG Water Area D	FWE/SWE Guidelines
Arsenic, ug/l	1					1	440/508
Barium, ug/l	500					0	
Beryllium, ug/l	10					10	130/
Cadmium, ug/l	1	1	1	3	2	1	1.5/59
Carbon, Organic, mg/l	2.3	2.5	3.5	2.8	40	4	
Chromium, ug/l	0	0	0	0	0	1	2,200/
Copper, ug/l	1	1	1	1	1	2	12/
Cyanide, ug/l	1					2	52/30
Iron, ug/l	50	50	80	70	60	80	1,000/
Lead, ug/l	0	0	1	1	1	1	74/668
Manganese, ug/l	30	20	260	1500	170	20	/100
Mercury, ug/l	0	0	.1	.2	.1	.2	.0017/3.7
Nickel, ug/l	11					3	1,100/ 140
Nitrogen, Ammonia mg/l	.18	.09	1.5	2.8	2.1	.12	
Nitrogen, Organic mg/l	.32					.37	
Ammonia, Unionized mg/l*	.04	.18	.03	.06	.04	.002	.02
Phenolics, ug/l	6	7	7	14	42	5	10,200/5,800
Phosphorus, Total ug/l	78					87	100/
Orthophosphate, ug/l	62	53	72	34	35	60	
Zinc, ug/l	20	20	70	30	30	20	180/170
Aldrin, ug/l	.00					.00	3.0/1.3
Ametryne, ug/l	.0					.0	
Atratone, ug/l	.0					.0	
Atrazine, ug/l	.0					.0	
Chlordane, ug/l	.0					.0	2.4/.09
Cyanazine, ug/l	.0					.0	
Cyprazine, ug/l	.0					.0	
DDD, ug/l	.00					.00	
DDE, ug/l	.00					.00	1,050/14.0
DDT, ug/l	.00					.00	1.1/.13
Dieldrin, ug/l	.00					.00	2.5/.71
Endosulfan, ug/l	.00					.00	.22/.034
Endrin, ug/l	.00					.00	.18/.037
Hept Epox, ug/l	.00					.00	
Heptachlor, ug/l	.00					.00	.50/.053
Lindane, ug/l	.00					.00	2.0/.004
Methoxychlor, ug/l	.00					.00	.03/.03
Mirex, ug/l	.00					.00	.001/.001
PCB, ug/l	.0					.0	2.0/10.0
PCN, ug/l	.0					.0	
Perthane, ug/l	.00					.00	
Prometone, ug/l	.0					.0	
Prometryne, ug/l	.0					.0	
Propazine, ug/l	.0					.0	
Silvex, ug/	.00					.00	
Simazine, ug/l	.0					.0	
Simetone, ug/l	.0					.0	
Simetryne, ug/l	.0					.0	
Toxaphene, ug/l	.0					.0	1.6/.07
2,4-D, ug/l	.00					.00	
2,4-DP, ug/l	.00					.00	
2,4,5-T, ug/l	.00					.00	

TABLE 5
Bulk Sediment Chemical Analyses
Youngs Bay Channel and Proposed Dredged Material Disposal Sites

	8-19-80 Tansy Point Upstream of Disposal Site	7-22-80 Youngs Bay CM 2.5	8-19-80 Upstream Area D	Corps Guidelines
Aldrin, ug/kg	0.0	0.0	0.0	10,000
Arsenic, ug/g	3	10	3	3-8
Barium, ug/g	30	40	20	20-60
Beryllium, ug/g	0	0	0	10
Cadmium, ug/g	2	4	2	6
Carbon, Inorganic, g/kg	0.0	.6	3.3	
Carbon, Organic, g/kg	1.1	12	0.0	60
Carbon, Total, g/kg	1.1	13		60
Chlordane, ug/kg	0	0	0	10,000
Chromium, ug/g	6	8	4	25-75
Copper, ug/g	5	180	4	25-50
Cyanide, ug/g	0	0	1	.25
DDD, ug/kg	2.5	0.0	0.1	10,000
DDE, ug/kg	0.7	0.0	0.0	10,000
DDT, ug/kg	1.0	0.0	0.0	10,000
Dieldrin, ug/kg	0.0	0.0	0.0	10,000
Endosulfan, ug/kg	0.0	0.0	0.0	10,000
Endrin, ug/kg	0.0	0.0	0.0	10,000
Hept Epox, ug/kg	0.0	0.0	0.0	10,000
Heptachlor, ug/kg	0.0	0.0	0.0	10,000
Iron, ug/g	4500	11000	4700	17,000-25,000
Lead, ug/g	10	10	10	40-60
Lindane, ug/kg	0.0	0.0	0.0	
Manganese, ug/g	87	140	150	300-500
Mercury, ug/g	0.02	.03	0.01	1
Mirex, ug/kg	0.0	0.0	0.0	10,000
Methoxychlor, ug/kg	0.0	0.0	0.0	10,000
Nickel, ug/g	10	20	10	20-50
Nitrogen, NH_4 mg/kg	6.0	122	2.0	75-200
Nitrogen, NH_4+Org mg/kg	144	760	73	1,000-2,000
PCB, ug/kg	0	0	0	10,000
PCN, ug/kg	0	0	0	10,000
Perthane, ug/kg	0.0	0.0	0.0	10,000
Phosphorus, Tot PO_4 mg/kg	630	480	430	420-650
Silvex, ug/kg	0	0	0	10,000
Toxaphene, ug/kg	0	0	0	10,000
Zinc, ug/g	40	35	22	90-200
2, 4-D, ug/kg	0	0	0	10,000
2, 4-DP, ug/kg	0	0	0	10,000
2, 4, 5-T, ug/kg	0	0	0	10,000

TABLE 6
POINT-SOURCE PERMITS IN THE
VICINITY OF YOUNGS BAY
OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

Permittee Name	Point Source Type	Location
Alaska Packers, Inc.	Fish Processing	Hammond
Astoria Plywood	Lumber Manufacturers	Astoria
Barbey Packing Union	Fish Processing	Astoria
Bioproducts, Inc.	Feed Ingredients	Warrenton
Bumble Bee Seafoods	Fish Processing	Astoria
New England Fish Co.	Fish Processing	Warrenton
Ocean Foods	Fish Processing	Astoria
Pacific Hake Fisheries	Fish Processing	Astoria
Pacific Shrimp, Inc.	Fish Processing	Warrenton
Warrenton Deep Sea	Fish Processing	Warrenton
Astoria, City of	Municipal Wastes	Astoria
Sundown Sanitary District	Municipal Wastes	Astoria
Warrenton, City of	Municipal Wastes	Warrenton

OTHER POTENTIAL POLLUTION SOURCES

Warrenton Lumber Company	Lumber Manufacturer	
Sawmill		Warrenton
Log-rafting		Skipanon River Lewis and Clark Rivers Youngs River
Mobile Welding	Boat Repair	Hammond
Astoria Marine Cosntruction	Boat Repair	Astoria
Bumble Bee Shipyard and Machine Shop	Boat Repair	Astoria
Pacific Machine Shop	Boat Repair	Warrenton
Warrenton Boat Yard	Boat Repair	Warrenton
West Coast Propellor Service	Boat Repair	Astoria