APPENDIX 1

FINDINGS OF COMPIANCE

# PHYSICAL AND CHEMICAL ANALYSES OF SEDIMENT COLLECTED AT THE ASTORIA WEST-SIDE BOAT BASIN

December 1980

1.01 Synopsis. Sediment samples were obtained for elutriate, physical, and benthic analyses from six locations at the Astoria West-Side Boat Basin. Water was collected at two locations (near area "B", the proposed ocean disposal site; and area "D", the proposed inwater disposal site) and chemically analyzed for comparison with boat basin eluates.

## BACKGROUND

1.02 The Astoria Boat Basin is located at Columbia River mile (CRM), 13.5 immediately west of the Astoria-Megler Bridge of U.S. Highway 101. The present boat basin is protected by rock-filled wood-cribbing which is in poor condition. The Port of Astoria, in conjunction with the Corps of Engineers, is planning to replace the breakwater and expand the existing facilities. This will require dredging for an entrance channel and interior access channel. Current plans call for the Corps to remove 30,000 cubic yards of sediment along the east side of the basin. The Port of Astoria will remove an additional 20,000 cubic yards of material from other areas of the basin. It is proposed that the dredged material be placed in one of three designated dump sites. The primary dump site is area "B", located directly west of the Columbia River north jetty in the Pacific Ocean. Secondary disposal sites are area "D", located in the Columbia River estuary north of CRM 8, and Harrington Point disposal area at CRM 20.5.

1.03 This study was undertaken to determine the physical and chemical characteristics of the dredged material and to assess the impacts it might have during disposal operations.

## METHODS

1.04 Sediment samples for elutriate tests were collected on 2 December 1980 at six locations within the Astoria Boat Basin (figure 2). Sediments were collected using a 220-pound, 9-foot-long, gravity corer which was equipped to obtain 2-foot cores in detachable, 2-5/8 inch diameter core liners. The core liners were made of transparent cellulose butyrate acetate and were sealed with polyethylene caps. The full core liners were stored with ice and transported to the analytical laboratory, thus providing relatively undisturbed sediment samples.

1.05 A Hydrolab 8000 water quality testing instrument was used to measure dissolved oxygen, pH, oxidation-reduction potential (ORP), conductivity, and temperature at each sampling station. A water sample was also collected and transported to the laboratory for turbidity determinations.

1.06 Elutriate analyses were conducted using water from area "D". This water was brackish with a salinity profile which ranged between 12.3 and 31.7 parts per thousand (ppt). Water was collected at mid-depth (15 feet) using a Scott-modified, Van Dorn water sampler. The water was transferred into acid-cleaned, collapsible, polyethylene containers and stored with ice for transport to the laboratory. Additionally, two sediment samples (stations 3 and 4) were analyzed with water collected in the Pacific Ocean near the south jetty. These analyses were included to insure that the elutriate tests accurately reflected water conditions during ocean disposal (field notes are presented in table 6).

1.07 Sediments to undergo physical and benthic analyses were sampled with the Ponar sampler. The benthos samples were sieved through 30-mesh wire. The retained fraction was preserved with formaldehyde and stored for future analysis if such is desired. The sediments collected for physical analysis were sent to the Division Materials Laboratory for analysis.

1.08 The elutriate analyses were performed by the U.S. Geological Survey (USGS) using methods detailed in their publication, "Native Water, Bottom Material and Elutriate Analyses of Selected Estuaries and Rivers in Western Oregon and Washington."[1] These methods were coordinated with and approved by the U.S. Environmental Protection Agency (EPA).

RESULTS

1.09 Physical Characteristics. The physical characteristics of sediments collected in the Astoria Boat Basin are presented in table 1 and figures 3 and 4. The void ratio ranged between 1 and 2 in all samples indicating that sediments were porous. The percent volatile solids is a measure of combustible organic material and boat basin samples contained moderate amounts (2 to 7 percent) of these organics. The density of the sediments ranged between 2,601 and 2,697 grams per liter (g/l) which is a median range and shows that light weight material (such as Mount St. Helens ash) was not present in significant quantities. The roundness grade estimates the angularity of material. Generally, angular material resists displacement more than rounded material and Astoria Boat Basin sediments were angular to subangular.

1.10 Grain size distribution curves for Astoria Boat Basin samples show that the sediments were composed predominantly of silt and clay (figures 3 and 4). The central and west side of the basin contained more silt and clay (83 to 95 percent) than the east side of the mooring area (47 to 62 percent). Comparatively, sediment collected outside the boat basin in the area of the proposed entrance channel was uniform, fine sand with only about 12 percent silt and clay.

1.11 Chemical Characteristics.

a. Water Quality. Data collected on water quality in the Astoria Boat Basin and proposed disposal sites are presented in table 2. The temperature, dissolved oxygen (DO) concentration, pH, and ORP measurements were within normal ranges and similar at all locations (boat basin, area "D", and ocean). The conductivity was much lower within the boat basin (.073 to .110 mmho/cm)

than at either disposal site (.206 to .500 mmho/cm). Turbidity measurements were higher in the boat basin (17 to 35 NTU) than in area "D" (6.5 to 10 NTU) on the ocean disposal area (0.9 to 1.3 NTU). The lower conductivity in the Astoria Boat Basin is expected and characteristic of a protected area where water currents are reduced and fine-grained material can settle out of the water column.

b. Water quality data were not collected at Harrington Point disposal area. Salinity studies[5] show that this area is the upstream edge of salinity intrusion into the Columbia River where the maximum salinity is only 0.3 ppt near the bottom. Unlike area "D" which is brackish water, Harrington Point is freshwater.

c. Chemical Analyses. Chemical analyses for elutriate and water samples collected in Astoria Boat Basin and the two, downstream disposal areas are presented in tables 3 and 4. Results from bulk sediment analyses are presented in table 5. The water and elutriate data are compared to EPA guidelines[2,3] which provide for the protection and propagation of fish and other aquatic life and for recreation in accordance with the 1983 goals of Public Law 92-500. EPA guidelines are not established for all the substances measured. In these cases, the results are compared to guidelines established by Portland District, Corps of Engineers.[4] It should be remembered that the District's guidelines are not rigid standards and are used only for purposes of comparison. Substances which exceeded the various guidelines (contaminants of concern) are barium, iron, manganese, nitrogen (ammonia), mercury, and phenols.

(1) Barium. The concentration of barium at station 3 was 1,500 micrograms per liter (ug/l), and bulk sediment analyses indicated that this sediment was "moderately polluted" with this element. Barium is commonly used in lubricants which are applied to boat motors and propellers. It precipitates out of the water column and is generally considered non-toxic by the EPA.

(2) Iron. The amount of iron in eluates from stations 3 and 4 was excessive, ranging between 2,400 and 2,700 ug/l. Area "D" receiving water

contained only 140 ug/l iron. Large amounts of dissolved iron are present in the water column only during anaerobic conditions. When oxygen is present iron rapidly oxidizes from hydrous ferric oxides which precipitate. This should occur at the disposal sites. Precipitating iron forms flocs which can coat the surface of fish gills and cover benthic invertebrates. Another effect of iron is that it is one of the few heavy metals readily taken into the tissue of marine organisms from surrounding sediments.

(3) Manganese. Manganese was present in high concentrations (1,500 to 10,000 ug/l) in eluates from all sampling stations within the Astoria Boat Basin (station 1 was the only location sampled outside the basin). Both brackish and seawater eluates from area "D" and the ocean disposal site, respectively, contained 30 to 40 ug/l manganese. This element is a micronutrient, which rapidly precipitates out of the water column, and is relatively nontoxic.

(4) Nitrogen (ammonia). The concentration of ammonia in the brackish and saltwater eluates was high (21 to 57 ug/l) compared to the ammonia concentration at the disposal sites (0.04 to 0.06 ug/l). The bulk sediment analyses also indicated that sediments were "moderately polluted" with ammonia. Ammonia dissolved in water to an un-ionized ($NH_3$) and an ionized ($NH_4^+$) species.[2] The un-ionized form is toxic in freshwater and its relative concentration is dependent on pH and temperature. Conditions at the disposal site indicate that the initial concentrations of un-ionized ammonia at area "D" would range between 0.18 and 1.82 ug/l. A similar initial concentration would be released upon disposal of Astoria Boat Basin sediments at the ocean disposal site (0.67 to 1.83 ug/l).

(5) The initial ammonia concentration at Barrington Point is expected to be slightly lower than at area "D". STORET[6] data shows that the pH decreases slightly at upstream sampling locations and is 7.49 at CRM 38.6. Using this datum, the minimum estimated un-ionized ammonia concentration would range between 0.03 and 0.31 ug/l. These values exceed freshwater guidelines of 0.02 ug/l.

(6) Mercury. The concentration of mercury ranged between 0.1 and 0.2 ug/l at sampling stations 3 and 4. This exceeds the freshwater guideline of 0.0017 ug/l, but not the marine guideline of 3.7 ug/l. Additionally, receiving water from area "D" indicated that the ambient concentration of mercury was 0.1 ug/l.

(7) Phenols. The concentration of phenols ranged between 84 and 159 ug/l in boat basin eluates compared with 6 to 9 ug/l in receiving water samples. The concentration of phenols in the eluate sample exceeds the 1976 EPA guidelines for phenolic compounds (1 ug/l). However, newer values have been published which delineate between a variety of phenolic compounds with guidelines ranging between 30 and 500,000 ug/l. The most toxic of these are anthropogenic, chlorinated phenols. High background levels of 100 to 200 ug/l for phenols in eluate samples are characteristic of the Pacific Northwest and are associated with the logging industry.

DISCUSSION

1.12 Dredged material extracted from within the Astoria Boat Basin and on the east and west sides of it are predominantly composed of silt and clay. The disposal of this material either by sidecasting or at one of the three porposed disposal sites is expected to resuspend the fine-grained materials into the water column resulting in high turbidity, transport of material out of the disposal area, reduction in light penetration, covering of benthic organisms at the disposal site, and creation of unesthetic conditions. These impacts would be minimized at the designated ocean disposal site where the large volume of water could dilute and disperse the sediments as they settle out of the water column.

1.13 Dredged material extracted immediately north of the Astoria Boat Basin (station 1) in the proposed entrance channel is predominantly fine sand containing very little organic material. If this material is extracted and deposited at one of the disposal areas, it will rapidly settle to the bottom and physical impacts will be minimal.

1.14 The water quality within the boat basin is good and similar to the conditions present at the disposal sites. Conductivity within the boat basin was only about 20 percent of the levels measured at areas "B" and "D", but greater than levels at Harrington Point. This is not expected to cause negative impacts because the volume of water discharged is insignificant compared to the volume of the receiving water. Additionally, areas "B" and "D" are subject to large variations in conductivity as a result of tidal influences.

1.15 Chemical anlayses indicate that ammonia, barium, iron, manganese, and phenols will initially be released in concentrations which exceed ambient levels during disposal of dredged material from stations 2 to 6. Disposal areas "B" and "D" are primarily marine and ammonia, barium, iron, and manganese precipitate so rapidly out of seawater that they are considered nontoxic and no marine guidelines are published for the substances. The Barrington Point disposal area is freshwater and initial levels of ammonia, barium, iron, manganese, and phenols would exceed freshwater guidelines. This would cause a short-term impact to water quality but precipitation and dilution would reduce concentrations to values below guideline levels and no long-term impacts would result.

1.16 Mercury was present at a level that exceeded freshwater guidelines; however, as stated above the disposal areas "B" and "D" are marine and not freshwater. More importantly, the background mercury concentration (0.1 ug/1) was equal to the eluate concentration showing that disposal of dredged sediment at any of the three dump sites would not increase mercury above extant levels.

1.17 The initial concentration of phenols will be much greater than background levels upon the disposal of Astoria Boat Basin sediments. Naturally occurring phenols are subject to rapid biological degradation in addition to dilution during disposal activities. The initial concentration will quickly diminish to levels below guideline values and no adverse impacts from phenols are expected to occur outside the disposal areas.

CONCLUSIONS

1.18 The disposal of Astoria Boat Basin sediments are expected to cause suspension of fine-grained material and an initial concentration of ammonia, barium, iron, manganese, and phenols which greatly exceeds ambient levels. Increased turbidity will be the most significant impact and it is likely that this material will be transported and dispersed over a large area. The chemical substances are all relatively nontoxic and will rapidly be diluted and precipitated from the water column.

1.19 Dredged material from the proposed entrance channel is predominantly sand and is not expected to cause significant adverse impacts during disposal operations.

RECOMMENDATIONS

1.20 A finding of compliance with the requirements of the "Guidelines for Specification of Disposal Sites for Dredged or Fill Material," as discussed in 40 CFR 230 (Volume 45, No. 249, 24 December 1980), is made for the Astoria West-Side Boat Basin under the conditions discussed below.

1.21 Dredged material in the proposed entrance channel of the Astoria West-Side Boat Basin, directly north of the existing breakwater (station 1) is predominantly sand with less than 1.5 percent volatile solids. This material complies with Section 404 of Public Law 92-500 and Section 103 of Public Law 92-532 and can be discharged at either a designated, interim ocean disposal site (area "B"), beach nourishment site, or inwater disposal site (area "D").

1.22 Dredged sediment from within the existing boat basin and from its east and west sides is predominantly silt and clay, and therefore, is not in compliance with exclusion criteria set forth in Section 103, Marine Protection, Research, and Sanctuaries Act of 1972. Prior to ocean disposal of this material, bioassays would have to be performed to determined whether significant impacts would occur. Chemical and physical analyses suggest that ocean disposal would result in fewer physical and chemical impacts than would

disposal at area "D" or Harrington Point. If bioassays can be economically justified, it is strongly recommended that they be performed.

1.23 Disposal area "D" is estuarine and initial concentrations of measured soluble chemicals would not exceed marine guidelines but would exceed some freshwater guidelines. Since there are no estuarine criteria, it is difficult to assess chemical impacts. The sediment would have no significant physical impacts on wildlife sanctuaries and refuges, wetlands, mudflats, vegetated shallows, muncipal and private water supplies, national seashores, parks and historic monuments, wilderness areas, research sites, and threatened or endangered species. Disposal of this material could have minor short-term impacts to esthetics and plankton as a result of higher turbidities causing reduced light penetration. Additionally, the U.S. Fish and Wildlife Service is concerned that disposal activities at area "D" may result in widespread dispersal of fine-grained material resulting in siltation of salmonid nursery areas in Baker Bay. Therefore, it is recommended that area "D" not be used for the disposal of Astoria West-side Boat Basin sediments.

1.24 It is recommended that Astoria Boat Basin dredged sediments be dumped at the Harrington Point disposal site. The initial concentration of several, relatively non-toxic substances, would exceed ambient levels. However, it is highly unlikely that these substances would exceed guideline values upon the application of even the most conservative dilution factor as permited by 40 CFR 230. Physical impacts would be similar to those discussed for area "D".

1.25 EPA guidelines (40 CFR 230) state that the least environmentally harmful disposal option should be utilized. Water column, physical and benthic impacts at area "D" and Harrington Point are expected to be similar. It is recommended that the Harrington Point disposal site be used because of fish and wildlife concerns with the use of area "D" as a disposal site.

1.26 Upland disposal of Astoria West-side Boat Basin dredged sediments was not proposed and no upland sites have been designated for this project. If an upland site were available, it would be an appropriate alternative for disposal of dredged sediments because it would minimize the physical impacts caused by the fine-grained sediments in the boat basin. This alternative

would require additional evaluation in accordance with Section 404 regulations and consequent coordination with other Federal and State agencies.

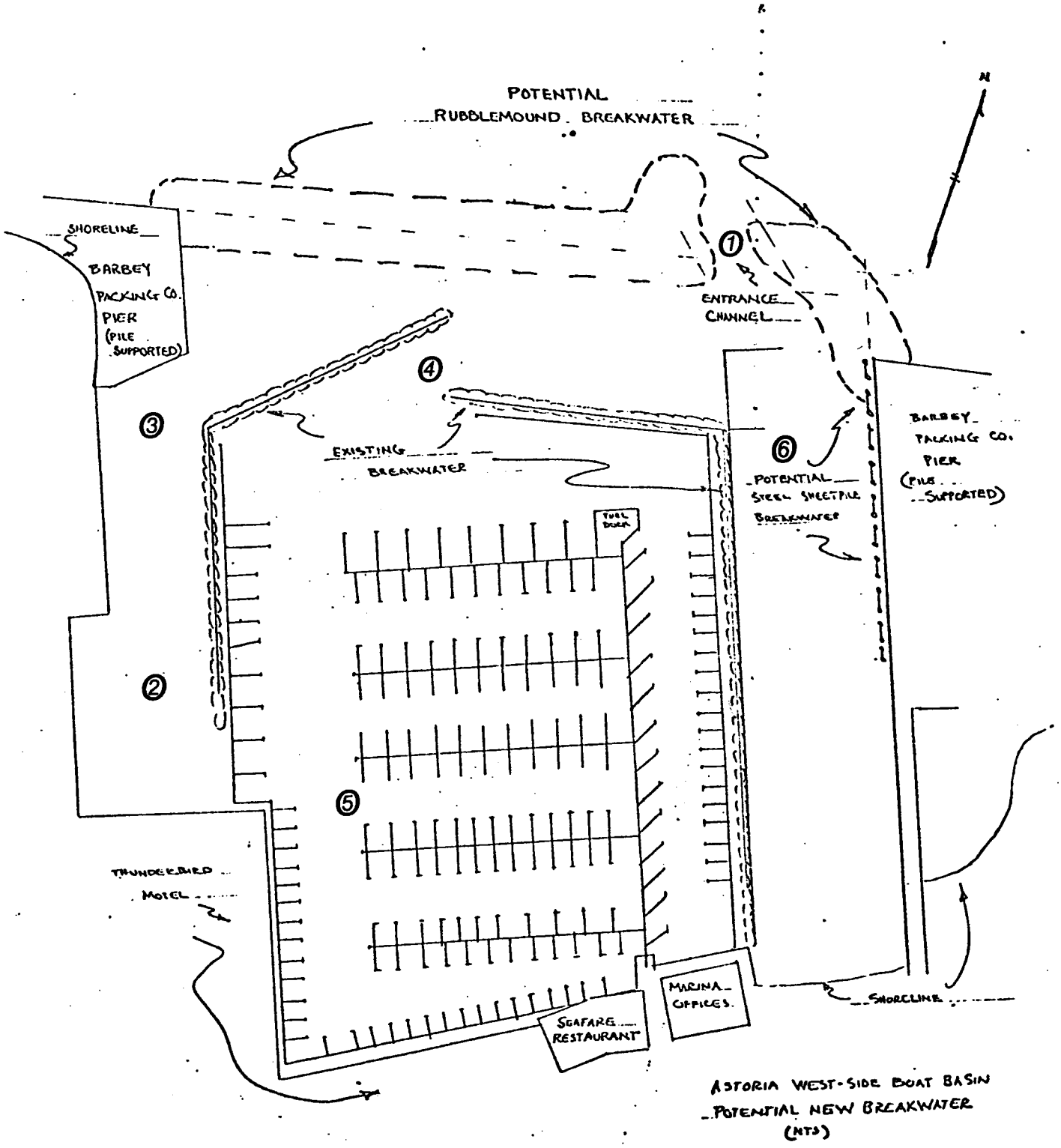
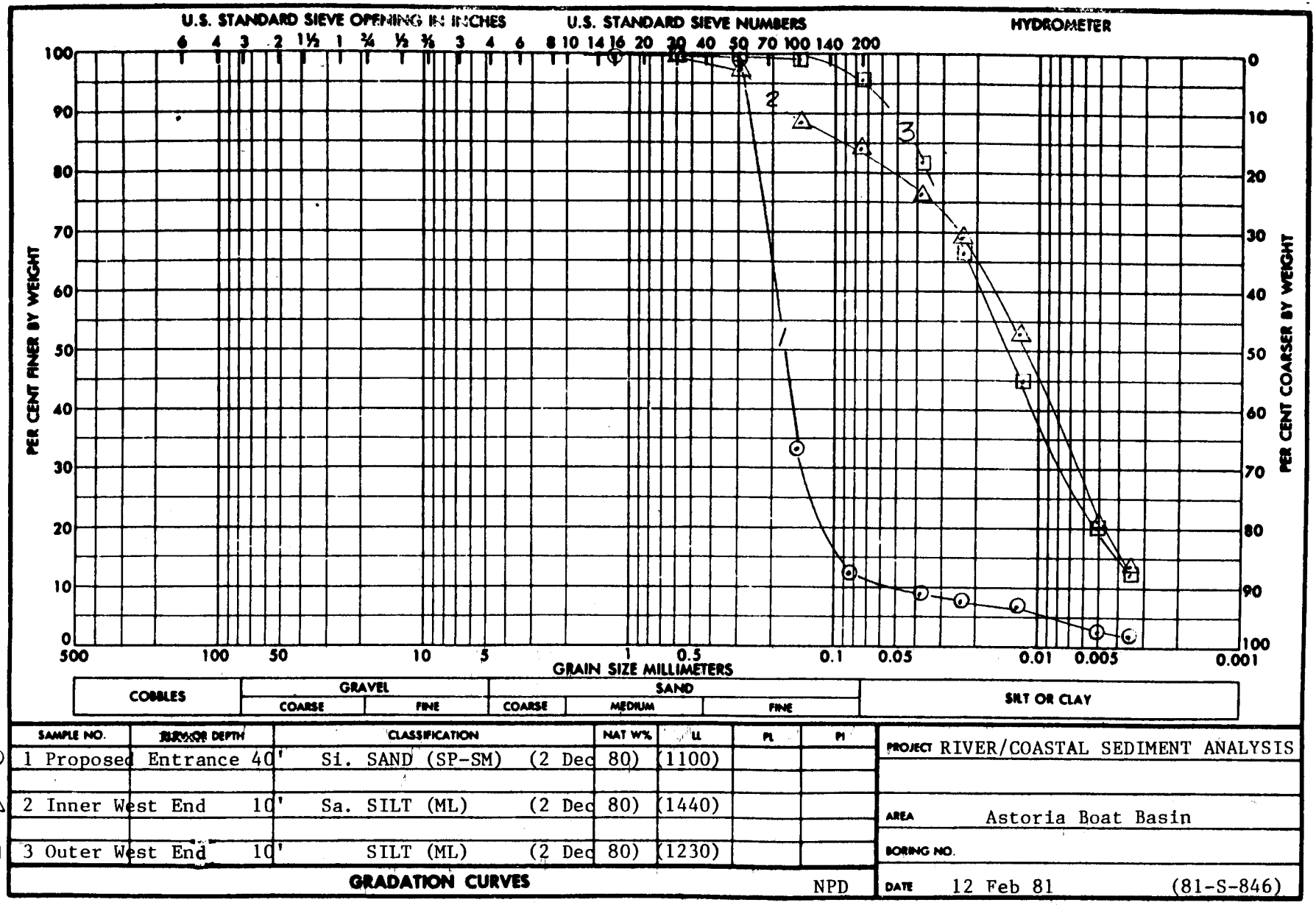



Figure 2. West-side Astoria boat basin sampling stations.




| SAMPLE NO. | BORING OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| ⊙ 1 Proposed | Entrance 40' | Si. SAND (SP-SM) (2 Dec | 80) | (1100) | | |
| △ 2 Inner West End | 10' | Sa. SILT (ML) (2 Dec | 80) | (1440) | | |
| ⊡ 3 Outer West End | 10' | SILT (ML) (2 Dec | 80) | (1230) | | |

GRADATION CURVES NPD

PROJECT RIVER/COASTAL SEDIMENT ANALYSIS

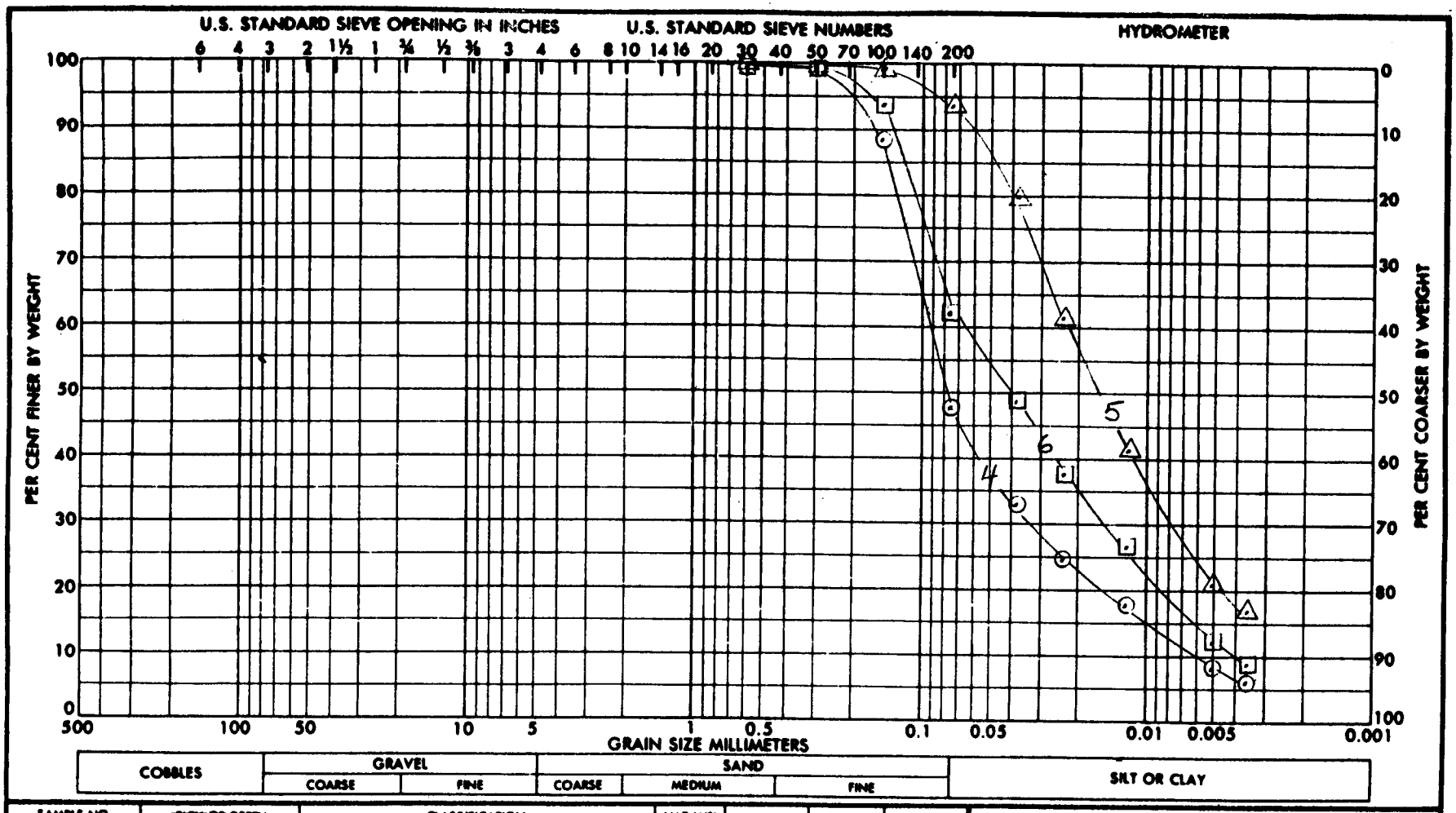
AREA Astoria Boat Basin

BORING NO.

DATE 12 Feb 81 (81-S-846)

U.S. GOVERNMENT PRINTING OFFICE . 1963 O—709-126

Figure 3. Grain size distribution curves for sediments collected from the west-side Astoria boat basin.




| | SAMPLE NO. | RIVER OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|---|
| ⊙ | 4 Existing | Entrance 16' | Si. SAND (SM) (2 Dec 80) | (1500) | | | |
| △ | 5 Inside | Boat Basin 12' | SILT (ML) (2 Dec 80) | (1315) | | | |
| ⊡ | 6 Outer | East End 8' | Sa. SILT (ML) (2 Dec 80) | (1528) | | | |

GRADATION CURVES NPD

PROJECT RIVER/COASTAL RIVER ANALYSIS

AREA Astoria Boat Basin

BORING NO.

DATE 12 Feb 81 (81-S-846)

U.S. GOVERNMENT PRINTING OFFICE : 1963 O—700-130

Figure 4. Grain size distribution curves for sediments collected from the west-side Astoria boat basin.

TABLE 1

PHYSICAL CHARACTERISTICS OF SEDIMENTS COLLECTED FROM
ASTORIA WEST-SIDE BOAT BASIN

| 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 |
|---|---|---|---|---|---|---|
| (1) Proposed Entrance 40' 2 Dec 80 (1100) | 1.0041 | 1837 | 2697 | 1.033 | 1.35 | Angular to Subangular |
| (2) Inner West End 10' 2 Dec 80 (1440) | * 1.000 | 1548 | 2605 | 1.928 | 3.21 | Subangular to Subrounded |
| (3) Outer West End 10' 2 Dec 80 (1230) | * 1.000 | 1548 | 2624 | 1.966 | 3.10 | Angular to Subangular |
| (4) Existing Entrance 16' 2 Dec 80 (1500) | *1.000 | 1750 | 2681 | 1.240 | 2.09 | Angular to Subangular |
| (5) Inside Boat Basin 12' 2 Dec 80 (1315) | * 1.000 | 1553 | 2601 | 1.893 | 7.18 | Angular to Subangular |
| (6) Outer East End 8' 2 Dec 80 (1528) | * 1.000 | 1711 | 2642 | 1.310 | 2.66 | Angular |

* Distilled water used to saturate sample.

TABLE 2
WATER QUALITY DATA
ASTORIA WEST-SIDE BOAT BASIN

3 December 1980

Sampling Personnel: U'Ren and Livingston

Weather Conditions: Overcast-showers

Comments: High tide 1029 (8.3 mllw)

| Stations | Proposed Entrance 1 | | West End 2-3 | | Existing Entrance 4 | | Inside Basin 5 | | Outer East Basin 6 | | Receiving Water Area "D" | | Receiving Water* South Jetty (12/4/80) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameters: | | | | | | | | | | | | | | |
| Depth | 3' | 37' | 3' | 13' | 3' | 26' | 3' | 16' | 3' | 12' | 3' | 43' | 3' | 58' |
| DO | 11.04 | 11.02 | 10.90 | 11.24 | 11.10 | 10.85 | 11.07 | 11.07 | 10.88 | 10.86 | 11.22 | 10.8 | 11.10 | 11.10 |
| Conductivity | .097 | .357 | .072 | .096 | .075 | 103 | .073 | .099 | .096 | .110 | .206 | .486 | .485 | .500 |
| Salinity | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ORP | 233 | 238 | 246 | 245 | 219 | 221 | 219 | 221 | 222 | 221 | 235 | 239 | 277 | 270 |
| Temp. (°C) | 8.6 | 10.3 | 8.5 | 8.7 | 8.3 | 8.7 | 8.3 | 8.6 | 8.6 | 8.7 | 9.1 | 11.1 | 10.6 | 11.5 |
| pH | 8.14 | 8.27 | 8.02 | 8.03 | 8.07 | 8.15 | 8.06 | 8.11 | 8.09 | 8.18 | 8.23 | 8.20 | 8.15 | 8.18 |
| Turbidity | 17.0 | 17.5 | 19.0 | 19.5 | 18.0 | 19.5 | 18.0 | 35.0 | 13.0 | 22.0 | 10.0 | 6.5 | 0.9 | 1.3 |
| Time | 0943 | 0946 | 0937 | 0945 | 1000 | 1002 | 1005 | 1007 | 0953 | 0956 | 1044 | 1046 | 0930 | 0940 |

* - Water collected at 15 feet where conductivity was .500.

Table 3. Results of freshwater elutriate tests from sediments collected in the Astoria Boat Basin.

| PARAMETERS | RECEIVING WATER (DISPOSAL AREA "D") | STATION 1 | STATION 2 | STATION 3 | STATION 4 | STATION 5 | STATION 6 | FRESH-WATER GUIDE-LINES |
|---|---|---|---|---|---|---|---|---|
| ARSENIC, UG/L | 1 | | | 2 | | | | 440 |
| BARIUM, UG/L | 0 | | | 1500 | | | | 1000 |
| BERYLLIUM, UG/L | 0 | | | 20 | | | | 130 |
| CADMIUM, UG/L | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.5 |
| CARBON, ORGANIC MG/L | 3.2 | 5 | 5.6 | 13 | 6 | 12 | 4.4 | |
| CHROMIUM, UG/L | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 2200 |
| COPPER, UG/L | 0 | 0 | 2 | 7 | 8 | 0 | 0 | 12 |
| CYANIDE, UG/L | 1 | | | 3 | | | | 52 |
| IRON, UG/L | 140 | 160 | 2700 | 2400 | 210 | 560 | 480 | 1000 |
| LEAD, UG/L | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 74 |
| MANGANESE, UG/L | 30 | 920 | 5700 | 9300 | 1500 | 3800 | 5600 | |
| MERCURY, UG/L | .1 | 0 | .1 | 0 | .1 | 0 | 0 | .0017 |
| NICKEL, UG/L | 3 | | | 4 | | | | 1100 |
| NITROGEN, AMMONIA MG/L | .04 | 6.1 | 43 | 43 | 37 | 59 | 30 | .02 |
| NITROGEN, ORGANIC MG/L | .85 | | | | | | | |
| PHENOLS, UG/L | 6 | 124 | 84 | 115 | 30 | 159 | 28 | |
| PHOSPHORUS, TOTAL UG/L | 60 | | | 68 | | | | |
| ORTHOPHOSPHATE,UG/L | 53 | 32 | 35 | 38 | 27 | 32 | 19 | |
| ZINC, UG/L | 30 | 30 | 40 | 50 | 30 | 50 | 50 | 180 |
| ALDRIN, UG/L | 0 | | | 0 | | | | 3 |
| AMETRYNE, UG/L | 0 | | | 0 | | | | |
| ATRATONE, UG/L | 0 | | | 0 | | | | |
| ATRAZINE, UG/L | 0 | | | 0 | | | | |
| CHLORDANE, UG/L | 0 | | | 0 | | | | 2.4 |
| CYANAZINE, UG/L | 0 | | | 0 | | | | |
| CYPRAZINE, UG/L | 0 | | | 0 | | | | |
| DDD, UG/L | 0 | | | 0 | | | | |
| DDE, UG/L | 0 | | | 0 | | | | 1050 |
| DDT, UG/L | 0 | | | 0 | | | | 1.1 |
| DIELDRIN, UG/L | 0 | | | 0 | | | | 2.5 |
| ENDOSULFAN, UG/L | 0 | | | 0 | | | | .22 |
| ENDRIN, UG/L | 0 | | | 0 | | | | .18 |
| HEPT EPOX, UG/L | 0 | | | 0 | | | | |
| HEPTACHLOR, UG/L | 0 | | | 0 | | | | .5 |
| LINDANE, UG/L | 0 | | | 0 | | | | 2 |
| METHOXYCHLOR, UG/L | 0 | | | 0 | | | | .03 |
| MIREX, UG/L | 0 | | | 0 | | | | .001 |
| PCB, UG/L | 0 | | | 0 | | | | 2 |
| PCN, UG/L | 0 | | | 0 | | | | |
| PERTHANE, UG/L | 0 | | | 0 | | | | |
| PROMETONE, UG/L | 0 | | | 0 | | | | |
| PROMETRYNE, UG/L | 0 | | | 0 | | | | |
| PROPAZINE, UG/L | 0 | | | 0 | | | | |
| SIMAZINE,UG/L | 0 | | | 0 | | | | |
| SIMETONE, UG/L | 0 | | | 0 | | | | |
| SIMETRYNE, UG/L | 0 | | | 0 | | | | |
| SILVEX, UG/L | 0 | | | 0 | | | | 10 |
| TOXAPHENE, UG/L | 0 | | | 0 | | | | 1.6 |
| 2,4-D, UG/L | 0 | | | 0 | | | | 100 |
| 2,4-DP, UG/L | 0 | | | 0 | | | | |
| 2,4,5-T, UG/L | 0 | | | 0 | | | | |

Table 4. Results of saltwater elutriate tests from sediments collected in the Astoria Boat Basin.

| PARAMETERS | RECEIVING WATER (PACIFIC OCEAN) | STATION 3 | STATION 4 | MARINE GUIDE-LINES |
|---|---|---|---|---|
| ARSENIC, UG/L | 1 | 2 | | 508 |
| BARIUM, UG/L | 100 | 1100 | | |
| BERYLLIUM, UG/L | 0 | 20 | | |
| CADMIUM, UG/L | 3 | 0 | 0 | 59 |
| CARBON, ORGANIC MG/L | 2.7 | 9.5 | 5.5 | |
| CHROMIUM, UG/L | 0 | 0 | 0 | 44 |
| COPPER, UG/L | 6 | 1 | 0 | |
| CYANIDE, UG/L | 1 | 3 | | 30 |
| IRON, UG/L | 160 | 4300 | 200 | |
| LEAD, UG/L | 4 | 0 | 0 | 668 |
| MANGANESE, UG/L | 40 | 10000 | 6200 | |
| MERCURY, UG/L | 0 | .1 | .2 | 3.7 |
| NICKEL, UG/L | 3 | 4 | | 140 |
| NITROGEN, AMMONIA MG/L | .06 | 57 | 21 | |
| NITROGEN, ORGANIC MG/L | .84 | | | |
| PHENOLS, UG/L | 9 | 136 | 98 | |
| PHOSPHORUS, TOTAL UG/L | 60 | 113 | | |
| ORTHOPHOSPHATE,UG/L | 48 | 60 | 32 | |
| ZINC, UG/L | 50 | 50 | 50 | 170 |
| ALDRIN, UG/L | 0 | 0 | | 1.3 |
| AMETRYNE, UG/L | 0 | 0 | | |
| ATRATONE, UG/L | 0 | 0 | | |
| ATRAZINE, UG/L | 0 | 0 | | |
| CHLORDANE, UG/L | 0 | 0 | | .09 |
| CYANAZINE, UG/L | 0 | 0 | | |
| CYPRAZINE, UG/L | 0 | 0 | | |
| DDD, UG/L | 0 | 0 | | |
| DDE, UG/L | 0 | 0 | | 14 |
| DDT, UG/L | 0 | 0 | | .13 |
| DIELDRIN, UG/L | 0 | 0 | | .71 |
| ENDOSULFAN, UG/L | 0 | 0 | | .034 |
| ENDRIN, UG/L | 0 | 0 | | .037 |
| HEPT EPOX, UG/L | 0 | 0 | | |
| HEPTACHLOR, UG/L | 0 | 0 | | .053 |
| LINDANE, UG/L | 0 | 0 | | .004 |
| METHOXYCHLOR, UG/L | 0 | 0 | | .03 |
| MIREX, UG/L | 0 | 0 | | .001 |
| PCB, UG/L | 0 | 0 | | 10 |
| PCN, UG/L | 0 | 0 | | |
| PERTHANE, UG/L | 0 | 0 | | |
| PROMETONE, UG/L | 0 | 0 | | |
| PROMETRYNE, UG/L | 0 | 0 | | |
| PROPAZINE, UG/L | 0 | 0 | | |
| SIMAZINE,UG/L | 0 | 0 | | |
| SIMETONE, UG/L | 0 | 0 | | |
| SIMETRYNE, UG/L | 0 | 0 | | |
| SILVEX, UG/L | 0 | 0 | | 10 |
| TOXAPHENE, UG/L | 0 | 0 | | .07 |
| 2,4-D, UG/L | 0 | 0 | | 100 |
| 2,4-DP, UG/L | 0 | 0 | | |
| 2,4,5-T, UG/L | 0 | 0 | | |

TABLE 5

Results of Bulk Sediment Analyses from Samples Collected at the Columbia River inside the Astoria Boat Basin (Station 3)

| PARAMETERS | LOCATION Station 3 | EPA Region V Guidelines |
|---|---|---|
| Aldrin (ug/kg) | 0 | -- |
| Arsenic (mg/kg) | 7 | 8 HP* |
| Barium (mg/kg) | 40 | 60 HP |
| Beryllium (mg/kg) | 1 | -- |
| Cadmium (mg/kg) | 5 | 6 HP |
| Carbon Inorg. (g/kg) | 0.3 | -- |
| Carbon Org. (g/kg) | 16 | -- |
| Carbon Tot. (g/kg) | 16 | -- |
| Chlordane (mg/kg) | 0 | -- |
| Chromium (mg/kg) | 14 | 75 HP |
| Copper (mg/kg) | 31 | 50 HP |
| Cyanide (mg/kg) | 0 | .25 HP |
| DDD (ug/kg) | 0.0 | -- |
| DDE (ug/kg) | 2.9 | -- |
| DDT (ug/kg) | 0.0 | -- |
| Dieldrin (ug/kg) | 0.1 | -- |
| Endosulfan (ug/kg) | 0.0 | -- |
| Endrin (ug/kg) | 0.0 | -- |
| Hept Epox (ug/kg) | 0.0 | -- |
| Heptachlor (ug/kg) | 0.0 | -- |
| Iron (mg/kg) | 11,000 | 25,000 HP |
| Lead (mg/kg) | 10 | 60 HP |
| Lindane (ug/kg) | 0.0 | -- |
| Manganese (mg/kg) | 190 | 500 HP |
| Mercury (mg/kg) | 0.0 | 1 HP |
| Mirex (ug/kg) | 0.0 | -- |
| Mthxyclr. (ug/kg) | 0.0 | -- |
| Nickel (ug/kg) | 20 | 50 HP |
| Nitr - $NH_4$ (mg/kg) | 150 | 200 HP |
| N. $NH_4$ + Org. (mg/ | 1,300 | -- |
| PCB (ug/kg) | 11 | 10,000 HP |
| PCN (ug/kg) | - | -- |
| Perthane (ug/kg) | 0.0 | -- |
| Phosph. Tot-P (mg/kg) | 800 | 650 HP |
| Silvex (ug/kg) | 0 | -- |
| Toxaphene (ug/kg) | 0 | -- |
| Zinc (mg/kg) | 110 | 200 HP |
| 2,4-D (ug/kg) | 0 | -- |
| 2,4-DP (ug/kg) | 0 | -- |
| 2,4,5-T (ug/kg) | - | -- |

* HP - Sediments with concentrations exceeding this value are considered "heavily polluted."

Table 6 FIELD REPORT

Astoria West - Side Boat Basin



Purpose of Sampling 107 Sampling of boat basin

Date 2 Dec 80 Wind 10-20 MPH

Water Conditions (Wave heights & Direction, Tides, Currents) High Tide 0947
Choppy, squalls,

Weather Rotten, Miserable Sampling Vessel Fort Stevens

Sampling Personnel U'Ren, Livington, Faust Sampling Gear Ponar, Benthos, Corer

Analytical Laboratory USGS

Comments (Wildlife, Sampling Difficulties, etc.) Wind and hard rain hampered sampling

| Station | Depth | Sampling Time | Sampling Methodology | Sampling Description |
|---|---|---|---|---|
| 1 - Proposed | 40' | 1046 | Corer - A analysis | sand and silt, definite anaerobic zone |
| Entrance | | | | |
| 1 | " | 1100 | Ponar - benethic | hard bottom, shell fragments and wood chips |
| | | | | |
| 1 | " | 1115 | Ponar - size | sand - silt |
| | | | | |
| 2 -Inner | " | 1145 | Corer - A analysis | sand - silt, anaerabic zone below |
| West End | 10' | | | 1st few inches |
| | | | | |
| 3 - Outer | 10' | 1215 | corer - B analysis | silt - anaerobic sample |
| West End | | | 2 cores | |
| | | | | |
| 4-Existing | 16' | 1300 | corer - A analysis | silt - sand |
| Entrance | | | | |
| | | | | |

Conclusions (Is sampling completed? Was sampling method adequate? Considerations for future sampling at the project)

FIELD REPORT

Astoria Boat Basin



Purpose of Sampling

Date 2 December 1980 Wind

Water Conditions (Wave heights & Direction, Tides, Currents)

Weather Sampling Vessel

Sampling Personnel U'Ren, Livingston, Faust Sampling Gear

Analytical Laboratory

Comments (Wildlife, Sampling Difficulties, etc.)

| Station | Depth | Sampling Time | Sampling Methodology | Sampling Description |
|---|---|---|---|---|
| 5 -Inside | | | | |
| boat basin | 1315 | 12' | Corer - A analysis | silt - clay - anaerobic |
| | | | | |
| 6 -Outer | | | | |
| East End | 8' | 1400 | Corer - A analysis | Fine sand, silt - black (anaerobic) |
| | | | | below 1st few inches, lost two cores to submerged |
| | | | | logs |
| 3 | 10' | 1230 | Corer - size | silt-clay |
| | | | | |
| 5 | 12' | 1320 | Corer - size | silt-clay |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Conclusions (Is sampling completed? Was sampling method adequate? Considerations for future sampling at the project)

FIELD REPORT

Astoria Boat Basin 

Purpose of Sampling

Date 2 December 1980 Wind

Water Conditions (Wave heights & Direction, Tides, Currents)

Weather Sampling Vessel

Sampling Personnel Sampling Gear

Analytical Laboratory

Comments (Wildlife, Sampling Difficulties, etc.)

| Station | Depth | Sampling Time | Sampling Methodology | Sampling Description |
|---|---|---|---|---|
| 2 | 10' | 1440 | Ponar - size analysis | silt |
| 4 | 16' | 1500 | Ponar - size analysis | silt |
| 6 | 8' | 1528 | Ponar - size analysis | silt |
| | | | | |
| 2 | 10' | 1430 | Ponar - benthic sample | wood fibre - some shell |
| 3 | 10' | 1445 | " " | long fibres, wood, live bivalves, little mat- |
| 4 | 16' | 1510 | " " | erial wood pieces |
| 5 | 12' | 1515 | " " | little material, some wood |
| | | | | |
| 6 | 8' | 1545 | " " | Fine wood fiber |
| 12/3/81 | | | | |
| Area "D" | 45' | 1100 | receiving water-Scott bottle | changing tide hi to lo, sampled at 15' |
| 4 | 16' | 1230 | Corer - A analy. Salt $H_2O$ | black, anaerobic sample |
| 3 | 10' | 1245 | Corer - A analy. Salt $H_2O$ | black, anaerobic sample |
| | | | | |

Conclusions (Is sampling completed? Was sampling method adequate? Considerations for future sampling at the project)

## REFERENCES


1. Rinella, F.A. and G. Fuhrer, "Native Waters, Bottom Material and Elutriate Analyses of Selected Estuaries and Rivers in Western Oregon and Washington." U.S. Geological Survey, Open File Report 81-___ (in review).

2. U.S. Environmental Protection Agency. "Quality Criteria for Water." USEPA 440/9-76-023, Washington, D.C., 1976.

3. U.S. Environmental Protection Agency. "Water Quality Criteria Documents; Availability." Federal Register 45(231):79318-79355. Washington, D.C., 1980.

4. Portland District, Corps of Engineers. "Supplemental, Interim Procedures for Evaluating and Testing Discharges of Dredged Material." Portland, Oregon, 1980.

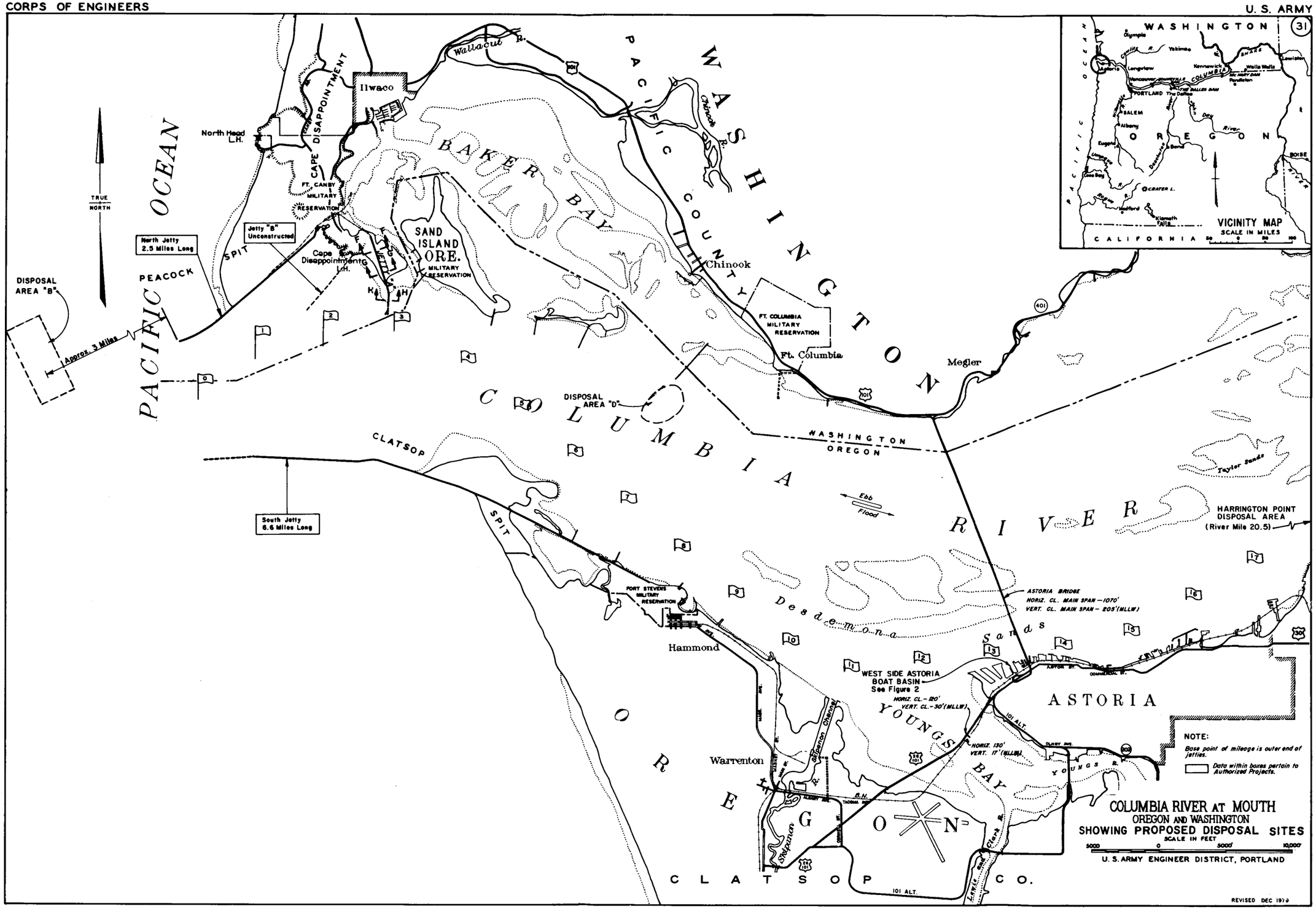
5. Waterways Experiment Station, Corps of Engineers. "Columbia River Estuary Physical Model for the South Jetty, North Jetty, and Jetty B Studies." Vicksburg, Mississippi, 1981 (report in preparation).

6. U.S. Environmental Protection Agency. A STORET Printout of Water Quality Data. USEPA, Region X, Seattle, Washington, 1981.

7. Portland District, Corps of Engineers. "Columbia and Lower Willamette River Environmental Statement." Portland, Oregon, 1975.

CORPS OF ENGINEERS

U. S. ARMY




## COLUMBIA RIVER AT MOUTH
## OREGON AND WASHINGTON
## SHOWING PROPOSED DISPOSAL SITES

SCALE IN FEET

5000 0 5000 10,000

U. S. ARMY ENGINEER DISTRICT, PORTLAND

REVISED DEC 1979

FIGURE 1