

CENPP-PL-CH (1105-2-10a)

6 February 1990

MEMORANDUM FOR Chief, Operations Division; ATTN; CENPP-OP-NW

SUBJECT: Preliminary Moorings Sediment Evaluation Report

1. Enclosed are results of physical and chemical analyses of sediments collected at the U. S. Moorings, Willamette River mile 6.1 on 12 October 1989. Three samples were taken along Dock A, berth of Essayons, at depths ranging from 19 to 27 feet about 15 feet from the dock (see enclosure). The chemical data shows that sediment samples exceed USACE Portland District levels of concern. Briefly, some heavy metals and pesticides are at or above levels of concern and Polyaromatic hydrocarbon (PAH) levels are very high--about 50 times concern levels. The data is highlighted by yellow marker on the enclosure.

2. A more detailed report will be prepared after the quality control information is received from Battelle-Northwest.

3. Please contact Jim Britton or Mark Siipola at ext. 6463, if you require further information regarding this subject.

Encl
as

LAUREN J. AIMONETTO
Chief, Planning Division

CF:
CENPP-OP-NW (CARRUBA)

RESULTS OF 1989 U.S. MOORINGS
SEDIMENT QUALITY EVALUATIONAbstract:

1. The results of chemical analyses of U.S. Moorings sediments and a review of previous studies along the lower Willamette River suggests that sediments dredged from the U. S. Moorings should not be placed in unconfined in-water sites. A Tiered Testing approach developed by USACE Portland District was used to analyze the data. Some heavy metals and pesticides exceed USACE Portland District levels of concern. Polyaromatic hydrocarbon (PAH) levels are some of the highest ever measured by the USACE in Willamette River sediments-about 50 times concern levels. Additional sampling and analysis needs to be done to delineate the extent of vertical and horizontal contamination. Elutriate, bioaccumulation and biotoxicity tests may need to be done to determine acceptable disposal methods. However, if a review of the literature indicates that levels of PAHs as high as those in the U.S. Moorings are bio-hazardous, then toxicity and bioaccumulation tests need not be done.

Previous studies

1. The balance of evidence from previous sediment studies of the lower Willamette River suggests that edge-of-channel sediments are relatively more contaminated than mid-channel sediments. These studies have indicated elevated levels of heavy metals, pesticides, PCBs and polyaromatic hydrocarbons (PAHs) in edge-of-channel areas. A 1987 U.S.G.S. report summarized sediment quality data collected in previous years. Heavy metal concentrations were highest in samples taken outside of the main navigation channel (cadmium, lead, zinc). These heavy metal concentrations also exceeded amounts measured in background rock-possibly indicating contamination from unknown sources. Pesticides were measurable in 30% of the samples taken and a value of 2700 ppb for DDT, the highest recorded, was measured at the outlet of Doane Lake (RM 7.1) about 0.9 mile upstream from the U.S. Moorings. Generally, the levels of PCBs and PAHs were higher in terminal berths and slips than in the harbor navigation channel.

2. Two USACE studies of lower Willamette River sediments (1988,1989) and an Ogden Beeman & Associates, Inc. report (1988) confirm the above findings. In 1988 USACE collected 16 samples between RM 2.1 and 11.7. Most of the samples were taken near the edges of the navigation channel in the proximity of outfalls and ship moorings. Many of the sediments showed elevated concentrations of the heavy metals cadmium, copper, mercury, lead

and zinc. There was a high level of DDD and PCB in one sample just upstream from the U.S. Moorings at RM 7.3. Lead and PAH levels were highly elevated above present concern levels in the Broadway Bridge area. Substantially high PCBs were measured at the RM 10.3 shoal and DDTs at RM 7.3. Elutriate tests for metals indicated that all were below freshwater chronic toxicity standards for water quality (EPA "Gold Book", 1986). Bioassays were run on four of these sediment samples, two of which were just upstream from and two downstream from the U.S. Moorings (RM 4.3, 5.1, 7.1, 7.3). These four sediment samples had the highest recorded heavy metal concentrations (except for lead) of the 16 samples collected between RM 2.1 and Rm 11.7. They also contained the highest concentration of most of the organic compounds measured. The sample at RM 7.1, upstream from the U.S. Moorings near Doane Lake outlet, an area that was being investigated under EPA superfund authority, showed significant mortality in the elutriate-phase but not solid phase bioassays. The elutriate-phase test exposes test animals to dissolved substances released from the sediments when they are vigorously mixed with water. The mortality was probably caused by elevated ammonia or depressed oxygen dissolved in the water in the test containers since there was no unusual elevation of either metals or organic contaminants. In 1988, Ogden Beeman & Associates, Inc. studied the sediments near the docksite of Lakeside Industries, Inc. (Rm 8.5). Copper and lead concentrations were at or slightly above USACE Portland District concern levels. Total PAHs were elevated but not to concern levels. Benzoic acid exceeded PSDDA (Puget Sound Dredged Disposal Analysis Report) screening level guidelines.

3. Generally, mid-channel sediments are less contaminated than edge-of-channel areas. Besides the U.S.G.S report cited above, supporting data comes from a 1989 sediment quality evaluation of mid-channel shoal material surrounding the piling/deflection pier of the Burlington Northern Railroad Bridge. Chemical analysis revealed low total organic carbon (TOC), oil and grease and metals. Pesticides, PCBs, PAHs, phthalates and phenols were below the detection limit.

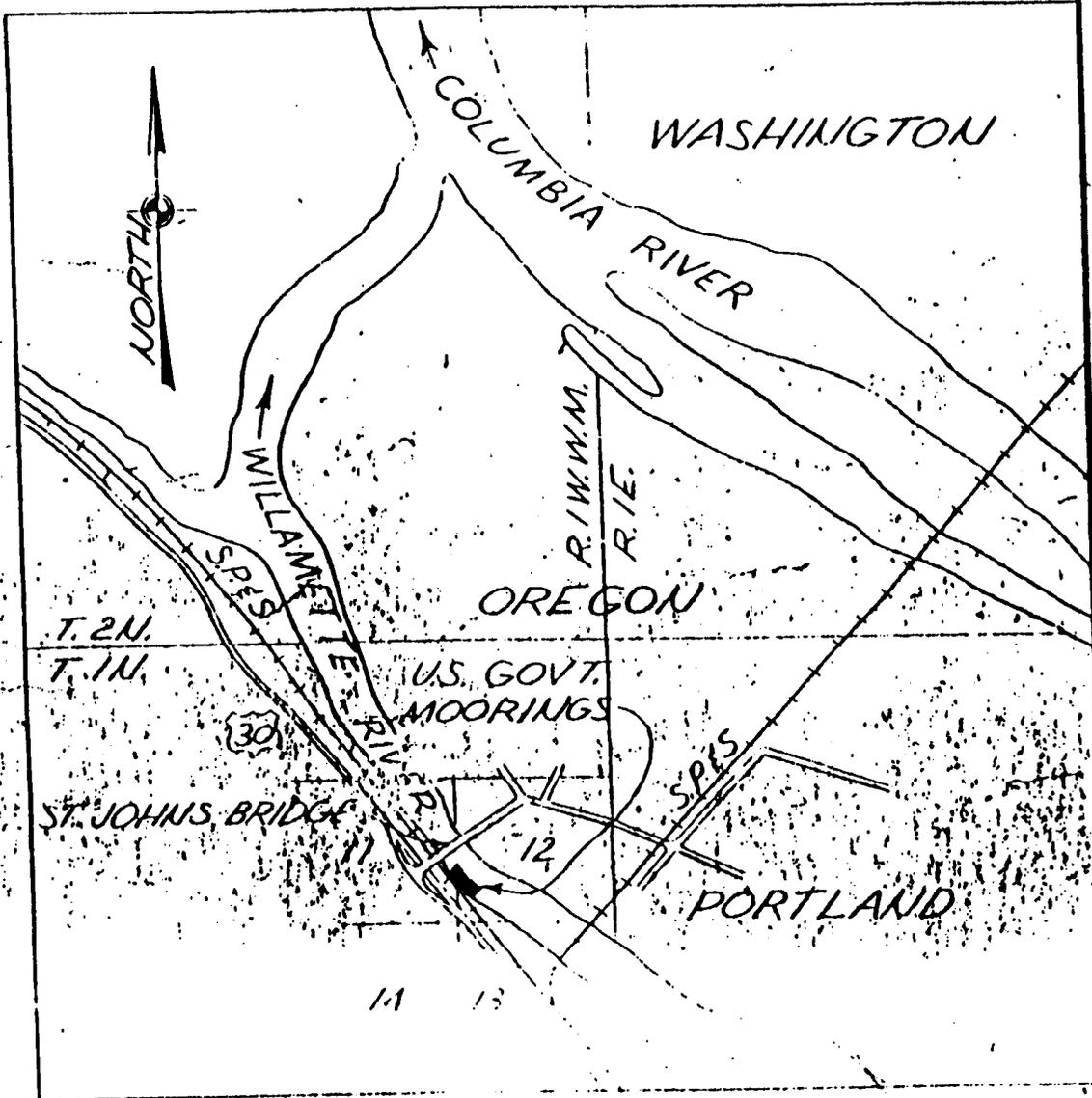
Present study

1. Because of concerns about the depth of the berthing station of the dredge Essayons at the U.S. Moorings, Willamette River mile 6.2, a sediment quality evaluation was undertaken prior to possible dredging, at the request of CENPP-OP. In October 1989 three sediment samples were taken at the U.S. Moorings about 15 feet out from the berthing dock of the dredger Essayons (see enclosed map). The sediment samples were composed of fine grained material (66.6-81.9% fines) with high TOCs (25-31.5%) and volatile solids content (25-31.5%). The sample cores ranged from 4 to 6.5 feet in length. The cores were made up of layers of gray to dark sandy silt mixed in with wood chips, wood fibers and oil droplets. There was a strong "creosote smell" to some of the layers.

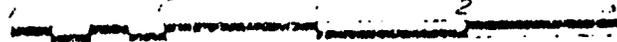
Chemical Results/Discussion:

1. Sediments at the U.S. Moorings exceed concern levels for heavy metals, pesticides and PAHs. The mean lead concentrations (223 ppm) could be characterized as heavy pollution by USACE and EPA criteria. Curiously, data from earlier studies showed much lower levels of lead at upstream and downstream sites in edge-of-channel sediments (20-30ppm Pb). There was also moderate pollution by chromium, copper, mercury and nickel according to EPA guidelines. Duplicate samples of the same area off the dock showed high variability in concentrations of Hg, Pb, and Zn indicating that the sample was not homogeneous and may have been contaminated with metal particles or paint chips. The pesticides DDD, DDT and dieldrin exceeded USACE Portland District levels of concern. One sample had a concentration of 470 ppb DDD, 200 ppb DDT and 29 ppb dieldrin. For DDT alone Portland District concern levels are between 15-20 ppb. Total PAH concentrations averaged 118,000 ppb - well over USACE Portland District concern level (1500-2000 ppb). The mean low molecular weight PAHs averaged 52,697 ppb and high molecular weight PAHs averaged 65,230 ppb. Dr. Eric Crecelius from Battelle-Northwest, the company that conducted the chemical analyses of these sediments, wrote in his report, "The concentration of organic compounds indicate these sediments have been contaminated by both petroleum products and fossil fuel combustion products".

2. The unconfined in-water disposal of dredged material from the U.S. Moorings is not recommended at this time until further studies are completed. The heavy metal, pesticide and PAH concentrations suggest that USACE initiate additional sampling and analysis to delineate the extent of vertical and horizontal contamination at the U.S. Moorings. A review of the literature on PAH toxicity in sediments could help determine the bio-hazard potential of U.S. Moorings sediment and suggest disposal methods. Bioaccumulation and toxicity tests may need to be conducted whether disposal is in-water or upland.



VICINITY MAP
SCALE IN MILES



ROOM
MENT

ST. JOHNS BRIDGE

U.S. GOVT.
MOORINGS

PORTLAND

C

B

1000

Willamette River



M-1

M-2

M-3

TIDE GAGE

DOCK "A"

23

19

DOCK "B"

STAIRWAY

BLOCK HOUSE

MICRO-WAVE TOWER

- 9 DOCK OFFICE
- 8 OFFICE
- 8 LUNCH ROOM
- 8 RIGGING STORAGE ROOM
- 8 ELECTRICAL EQUIPMENT ROOM
- 8 STORAGE ROOM
- 8 PAINT SHOP
- 8 DOCK STORAGE

P

10

13

SHOP

12

12

RIVERINE SEDIMENT QUALITY REPORT
PAGE 1

LOCATION	SAMPLE SITE	DATE TYPE	RIVER MILE	COL RIVER MILE	SED DEPTH (m)	MEAN GRAIN SIZE (mm)	MEDIAN GRAIN SIZE (mm)	FINE SAND (%)	VERY FINE SAND (%)	SILT (%)	OIL/GREASE (ppm)	AMMONIA (ppm)	TOTAL ORGANIC CARBON (mg/g)	VOL% SOLIDS by weight
** MOORINGS														
MOORINGS	M-1	CHL 10/12/89	6.10	0.00	0.00	0.054	0.030	92.40	78.00	66.80	0	0.00	31.50	11.0
MOORINGS	M-2 REP 1	CHL 10/12/89	6.10	0.00	0.00	0.044	0.024	94.40	83.20	71.00	0	0.00	27.10	6.6
MOORINGS	M-2 REP 2	CHL 10/12/89	6.10	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0	0.00	25.00	0.0
MOORINGS	M-3	CHL 12/10/89	6.10	0.00	0.00	0.036	0.021	87.70	84.70	76.80	0	0.00	30.30	8.1

RIVERINE SEDIMENT QUALITY REPORT
PAGE 2

(Metal Values in PPM)

LOCATION	SITE	As	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Zn	Cd (burn)
** MOORINGS												
MOORINGS	M-1	0.00	0.00	29.00	38.00	0.00	333.00	0.00	0.1480	29.00	163.00	0.4400
MOORINGS	M-2 REP 1	0.00	0.00	32.00	52.00	0.00	175.00	0.00	0.2240	37.00	158.00	0.3900
MOORINGS	M-2 REP 2	0.00	0.00	37.00	54.00	0.00	331.00	0.00	0.3120	29.00	94.00	0.4400
MOORINGS	M-3	0.00	0.00	34.00	67.00	0.00	50.00	0.00	0.4290	39.00	77.00	0.4300

RIVERINE SEDIMENT QUALITY REPORT
PAGE 3

(Organic Species in PPB)

Negative values are detection limits/samples below limits

Total

LOCATION	SITE	ALDRIN	CHLOR-DANE	DIEL-DRIN	DDD	DDE	DDT	ENDO-SULFAN	ENDRIN	HEPTA-CHLOR	LINDAN	METHOXY CHLOR	PAHs	PCBs	TOXA-PHENE
** MOORINGS															
MOORINGS	M-1	-3.00	-5.00	11.00	130.00	-8.00	40.00	-8.00	-8.00	-3.00	-3.00	-12.00	134800	-80	-450.0
MOORINGS	M-2 REP 1	-3.00	-5.00	11.00	110.00	-8.00	33.00	-8.00	-8.00	-3.00	-3.00	-12.00	100650	-80	-450.0
MOORINGS	M-2 REP 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0.00
MOORINGS	M-3	-3.00	-5.00	29.00	470.00	-8.00	200.00	-8.00	-8.00	-3.00	-3.00	-12.00	98670	-80	-450.0