

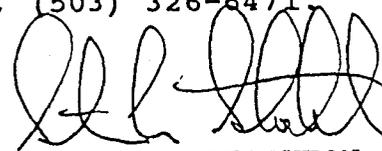
18 November 1993

MEMORANDUM FOR Chief, CENPP-OP, CENPP-OP-NW (ATTN: Carrubba)

SUBJECT: Coos Bay (Isthmus Slough) Sediment Evaluation

1. Enclosed is the sediment evaluation for the Coos Bay, Isthmus Slough portion of the Federal Project. In the past, the sediment has been found to be acceptable for unconfined in-water disposal. Data from the current study indicates that the material has not changed significantly. Material from Isthmus Slough is sandy, clayey silt high in organic content. Metals in the sediment are below concern levels. Most pesticides were not detected except DDT which was found in low concentrations (7-10 ppb) that are below the Portland District established concern level. PAHs were detected in small amounts (21-130 ppb) that were below established concern levels. TBT was detected in the samples at concentrations of 18-33 ppb. The EPA, Region 10 screening level is 30 ppb for marine sediment. Monitoring of ODMDS disposal site H, shows that the environmental impact of disposal is minimal and acceptable according to MPRSA constraints.

2. If you have any questions regarding this study, please contact Jim Britton, CENPP-PE-HR, (503) 326-6471.



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Coos Bay (Isthmus Slough) Sediment Evaluation

Abstract

Material from Isthmus Slough is sandy, clayey silt high in organic content. Metals in the sediment are below concern levels. Most pesticides were not detected except DDT which was found in low concentrations (7-10 ppb) that are below the Portland District established concern level. PAHs were detected in small amounts (21-130 ppb) that were below established concern levels. TBT was detected in the samples at concentrations of 18-33 ppb. The EPA, Region 10 screening level is 30 ppb for marine sediment. In the past the material has been found to be acceptable for unconfined in-water disposal. Data from the current study indicates that the material has not changed significantly. Monitoring of ODMDS disposal site H, shows that the environmental impact of disposal is minimal and acceptable according to MPRSA constraints.

Introduction

1. Coos Bay is located about 200 miles south of the mouth of the Columbia River. It is the largest estuary, excepting the Columbia River estuary, in the state of Oregon. The bay is upside down U shaped (see map) with many sidearms and extensions. There are at least 30 tributaries but the major one is the Coos River which discharges to the bay at a point 12 miles from the estuary mouth.
2. Timber, fish and agricultural resources are important in the area. Coos Bay is one of the ports along the Oregon coast that receives the most commercial fish landings (1). There is also an important shellfishery in the bay including clams and oysters. The majority of the work force in the area is tied to the lumber industry. Dairy and small animal farms comprise most of the agricultural activities.
3. There are several sloughs in the bay. One of these, Isthmus Slough, is the subject of this sediment evaluation. The slough begins about RM 13.8 and proceeds southward for several miles. The mouth of the slough lies between the cities of Coos Bay and Eastside. The Federal Navigation Project extends into Isthmus Slough to RM 17.0. The Federal Navigation Project in Isthmus Slough is 35 feet deep and 400 feet wide to RM 15, from there it is 22 feet deep and 150 feet wide to RM 17.0. Opposite Coalbank Slough at RM 14.0 is a turning basin 35 feet deep, 700 feet wide and 1,000 feet long. Sediment from the slough is dredged by clamshell and barge and disposed offshore at designated ocean dredged material disposal site (ODMDS) H (2).

Previous Studies

4. Previous studies of the Isthmus Slough portion of the Federal Navigation Project, conducted in 1987 and 89, determined that the sediment was acceptable for unconfined in-water disposal at the offshore disposal site H. The results were summarized in the Draft Coos Bay Channel Deepening Feasibility Study and a report monitoring the environmental effects of disposal on the offshore ODMDS disposal site H (3, 4). In the 1987 and 89 studies 3 cores were taken along the length of the Federal Project between RMs 12.8 and 15.0. Results showed that the material was sandy, clayey silt with a median grain size of medium silt (0.019mm). The sand content varied from 5 to 35 percent. Silt ranged from 47 to 72 percent and clay from 14

to 28 percent. The sediment contained 10 to 15 percent organic matter (volatile solids) and 2.5 to 4 percent total organic carbon (TOC). Contaminants in the sediment were either not detected or were found at mean concentrations below established concern levels. No pesticides, PCBs, PAHs or phenols were detected. Metals were well below concern levels. The mean oil & grease found in 6 samples was 616 ppm (range 124-1,460 ppm). Samples in the upper end of the project near RM 15.0 tended to have more oil & grease. Ammonia was measured in the 1989 sediment samples at concentrations ranging from 153 to 356 ppm which in some concern level classifications would be considered moderately polluting, though Portland District and EPA, Region 10 have no established concern level for this compound (5). Despite these in situ bulk sediment ammonia concerns, ammonia release to the water column during disposal is at safe levels. Studies conducted from 1981 to 1983 concluded that ammonia released from the sediment to the water column, during disposal at the offshore site, was 10 times lower than the toxicity limit (6,7). All studies of disposal site H sediment, conducted after disposal, have shown that contaminants are either not detected or are at concentrations below established concern levels (3, 4). In summary, these bulk sediment and elutriate studies have consistently shown the sediment from Isthmus Slough to be acceptable for in-water ocean disposal.

Current Study

5. Portland District conducts sediment evaluations on a 5 year rotation at projects that are dredged regularly, or on an as needed basis. Though Coos Bay operations & maintenance (O&M) sampling was scheduled for fiscal year 1994, it was decided that O & M sampling would be conducted in 1993. By 'piggy backing' onto 1993 sampling efforts of two other studies in the bay an economy of effort was achieved.

6. The purpose of the present study at Isthmus Slough was to determine acceptability of ocean disposal of dredged sediment according to requirements of the Marine Protection Research and Sanctuaries Act (MPRSA) and guidelines in the Evaluation of Dredged Material Proposed for Ocean Disposal Testing Manual prepared by the EPA and U. S. Army Corps of Engineers (8).

Methods

7. Three samples were taken on 28 April 1993 from Isthmus Slough at the locations shown in Figure 1. The samples were taken between RM 12.8 and RM 15.0. Sample CB-GC-1 was from the upstream end of the turning basin in Isthmus Slough. CB-GC-2 was taken mid channel at the junction of Isthmus Slough and the Marshfield Channel of the Coos River at RM 13.7. CB-GC-3 was taken left of mid channel at RM 12.8. The sampling device used was a Benthos Gravity Corer with acid washed plastic core liners. Cores varied from 34 to 47 inches in length. The length of each core was subsampled, in the field soon after recovery, for both physical and chemical analyses. Samples for physical analyses were stored in plastic baggies. Dredge tests, including volatile solids content, grain size distribution, resuspended density, void ratio, and specific gravity were performed on these samples. The last four tests are useful to dredging operations and contractors and are not used in this sediment evaluation. Chemical samples were put into EPA approved glass jars and cold stored in coolers. They were delivered to the NPD Materials Testing Laboratory in Troutdale, Oregon. From there they were shipped to Columbia Analytical Associates, Kelso, Washington for analysis. Chemical samples were tested for metals, pesticides, polychlorobiphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), acid volatile sulfides (AVS), total organic carbon (TOC) and tributyltin (TBT). All sample taking, handling and storage was performed according to EPA/Corps approved techniques

(8). In addition to O & M samples, Coos Bay Channel Deepening, EPA-TBT and DEQ-TBT samples were also taken from other areas in the bay. TBT and Channel Deepening results from these samples are pertinent to this sediment evaluation and will be included in results/discussion.

Results/Discussion

Physical

8. Sediment in O & M samples was sandy, clayey silt with a median grain size (0.031mm) that is in the range of medium to coarse silt (Table 1). Volatile solids, a rough measure of organic content, averaged 10.5 percent. The total organic carbon (TOC) content, a more precise measure of organic material varied between 2.8 and 4.8 percent (Table 3).

Chemical

Metals

9. None of the nine metals measured exceeded established levels of concern (Table 2). O & M sample CB-GC-1 appeared to contain slightly higher concentrations of metals than the other two samples (not enough samples were taken to make statistical comparisons between samples). This was probably because that sample also contained more fine grained material that acts as sink for metals. Examination of Portland District database reveals that the levels of metals found on this sampling trip are very similar to that found in samples taken in 1987 and 1989 from the same area. This supports the view that degradation in sediment quality from a metals standpoint is not occurring in the Federal Channel.

AVS

10. There was plenty of AVS (110 to 400 ppm, or 3.2 to 11.7 $\mu\text{M/g}$) available as a reactive pool to form insoluble metal sulfides. This function of AVS helps to reduce the potential toxicity of metals to aquatic organisms. It is an advantage to have sufficient excess sulfide (AVS) to react with metals especially when metals concentrations are high, which is not the case with these samples.

Pesticides/PCBs

11. Aldrin, endrin and DDT were found in O & M and Channel Deepening samples (Table 3). Only DDT (6 to 10 ppb) exceeded the established screening level of EPA, Region 10 (6.9 ppb). However, it did not exceed the Portland District concern level of 15 to 20 ppb. DDT is known to be persistent in the environment even though it has been banned since 1972. This is largely due to its hydrophobic unreactive nature. DDT has not been found in past studies of Isthmus Slough sediment conducted in 1987 and 89. It is often found in fine grained sediments and has been detected in sediment from Columbia, Rogue and Umpqua rivers. It is probable that DDT, carried by fine grained particles, is washed down into Coos Bay from the watershed. PCBs were undetected in the samples with the detection limit at <40 ppb, which is well below concern levels.

PAHs

12. Nine PAHs were detected in the samples (Table 4). These ranged in concentration from 20 to 130 ppb. Neither individual nor total PAH concentrations exceeded established concern levels as shown in Table 4.

TBT

13. TBT is an ingredient, used in antifouling paints, that is toxic to aquatic organisms. The TBT concentrations in the O & M and Channel Deepening samples ranged from 14 to 33 ppb with a mean TBT concentration of 20.8 ppb (n=5). The screening level for EPA, Region 10 is 30 ppb, Portland District has not yet established a concern level for this compound. Sample CB-GC-2 (33 ppb) was the only sample that exceeded this screening level. This sample was collected from the Federal Channel near the Junction of Coos River and Isthmus Slough. This area is near docks that have shown elevated levels of TBT in the past (9).

14. Last summer (1993), U. S. Army Corps of Engineers, in cooperation with the EPA conducted a study of Federal Channel sediments to determine the extent of TBT contamination. Fourteen samples were taken between RM 1.0 and 15.0 in the Federal Channel. Ten of the seventeen samples were below detection limits for TBT (<0.22 ppb). Most of these non detects were between RM 1.0 and 13.2 (see figure 1 for locations). TBT was detected in four samples between RM 12.2 and 15.0, roughly the area of Isthmus Slough. If the results from the above O & M and Channel Deepening samples are included in the EPA detects, then the average concentration of TBT in nine Federal Channel sediment samples, in and near Isthmus Slough, is 18.3 ppb with a range of 9.5 to 33 ppb. The mean level of TBT in Isthmus Slough sediment is below the EPA, Region 10 screening level and is acceptable for in-water disposal.

15. According to studies conducted by DEQ, TBT contamination is widespread in Coos Bay especially near boat works, marinas and backwater areas (10). Some DEQ samples showed concentrations as high as 3,270 ppb TBT. In contrast results from EPA, Channel Deepening and O & M studies show that Federal Channel material is relatively free of TBT contamination (see Table 5). The upper end of the Federal Channel does show hits for TBT and should be monitored on a regular basis for TBT contamination whenever the regular 5 year rotation for sediment sampling occurs. In time, the need for monitoring should lessen because TBT use has been restricted by Congress and the State of Oregon.

Conclusions

16. Material from Isthmus Slough is sandy, clayey silt high in organic content. Metals in the sediment are below concern levels. Most pesticides were not detected except DDT which was found in low concentrations (7-10 ppb) that are below the Portland District established concern level. PAHs were detected in small amounts (21-130 ppb) that were also below established concern levels. These current results are similar to those obtained from studies of Isthmus Slough conducted in 1987 and 89. TBT, not sampled for in earlier studies, was detected in the current samples at concentrations between 9.5-33 ppb with a mean of 24.6 (n=3) that is below the concern level. As mentioned above, the mean of all EPA, Channel Deepening and O&M samples, taken in the Isthmus Slough area, is 18.3 ppb (n=7), a figure well below the EPA screening level.

17. In the past the material from Coos Bay, Isthmus Slough was considered acceptable for unconfined in-water disposal. Evidence from the current study supports this conclusion. The dispersive nature of disposal site H will further decrease any contaminant levels at the disposal site. Monitoring of the disposal site H, shows that the environmental impact of disposal is minimal and acceptable (3).

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Table 1. Results of physical analyses of Isthmus Slough sediment.

sample	median grain size mm	%			volatile solids
		sand	silt	clay	
O & M					
CB-GC-1	0.018	21.8	60.4	17.8	12.1
CB-GC-2	0.055	39.4	45.9	14.7	10.4
CB-GC-3	0.026	21.4	63.4	15.2	9.0
mean	0.031	27.5	56.6	15.9	10.5
ChI Deepening					
CBCD-BC-1	0.061	49.2	40.7	10.1	10.6
CBCD-BC-2	0.072	56.2	35.7	8.1	5.8
CBCD-BC-3	0.046	43.1	48.5	8.4	8.1
CBCD-BC-4	0.050	43.6	46.4	10.4	8.0
CBCD-GC-1	0.039	32.7	56.5	10.8	7.7
CBCD-GC-2	0.069	55.3	36.6	8.1	7.4

BC=box core

GC=gravity core

Table 2. Concentrations of metals in Isthmus Slough sediment.

sample	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn	AVS
ppm										
O & M										
CB-GC-2	5.4	0.18	48	23	10.0	0.06	32	0.10	82	180
CB-GC-3	6.6	0.18	45	20	12.5	0.05	29	0.10	77	110
Chl Deepening										
CBCD-GC-1	6.7	0.21	47	19	9.8	0.05	33	0.09	72	180
CBCD-GC-2	6.5	0.02	40	14	8.1	0.04	28	0.09	61	210
SL*	57	0.96	180	81	66	0.21	140	1.2	160	-
LOC^	40	1.00	20-300	50	40	0.15	-	1.0	250	-

* SL=screening level, EPA Region 10

^ LOC=Portland District levels of concern

Table 3. Concentrations of pesticides, PCBs, TBT and TOC in bulk Isthmus Slough sediment.

sample	aldrin	endrin	DDT ppb	PCBs	TBT	TOC %
O & M						
CB-GC-1	2	2	10	<40	18	4.80
CB-GC-2	2	2	7	<40	33	4.36
CB-GC-3	<2	<2	<2	<40	23	2.80
Chl Deepening						
CBCD-GC-1	<2	<2	6	<40	14	2.58
CBCD-GC-2	2	2	10	<40	16	2.66

Table 4. Concentrations of PAHs in bulk Isthmus Slough sediment.

sample	phenanthrene	fluoranthene	pyrene	benzo(a) anthracene	chrysene	benzo(b+k) fluoranthene	benzo (a) pyrene	indeno (1,2,3 -cd) pyrene	benzo(g,h,i) perylene	total
ppb										
O & M										
CB-GC-1	23	26	56	26	32	60	<20	23	<20	246
CB-GC-2	<40	130	100	74	73	91	40	<40	<40	508
CB-GC-3	25	21	54	45	63	54	36	<20	21	319
Chl Deepening										
CBCD-GC-1	<20	26	36	23	26	54	<20	<20	<20	165
CBCD-GC-2	21	26	53	25	26	45	<20	20	<20	216
SL*	320	630	430	450	670	800	680	69	540	2,410

SL=EPA, Region 10 screening level

Table 5. Grain size distribution, organic content and tributyltin concentrations in sediment samples from Coos Bay, Oregon.

	median grain size mm	sand	silt %	clay	volatile solids	TBT (ppb)	TOC (%)
EPA							
CB-EPA-BC-1	0.027	22.5	64.3	13.2	12.0	15.70	3.37
CB-EPA-BC-2	0.270	99.2	0.8	-	1.4	<0.22	0.08
CB-EPA-BC-3-1	0.150	77.2	18.6	4.2	3.7	-	-
CB-EPA-BC-3-2	0.052	25.8	63.2	11.0	-	-	-
CB-EPA-BC-3-3	0.020	99.8	0.2	-	-	-	-
CB-EPA-BC-3/CR1*	-	-	-	-	-	8.30	1.70
CB-EPA-BC-3/CR2*	-	-	-	-	-	10.70	1.87
CB-EPA-BC-4	0.076	59.7	33.8	6.5	12.0	15.80	2.08
CB-EPA-BC-5	0.140	73.8	20.4	5.8	10.7	20.40	2.44
CB-EPA-BC-6	0.180	98.4	1.6	-	1.9	<0.22	0.14
CB-EPA-BC-8	0.210	99.8	0.2	-	0.7	<0.22	0.26
CB-EPA-BC-9	0.280	99.4	0.6	-	0.4	<0.22	0.36
CB-EPA-BC-10	0.300	99.8	0.2	-	0.5	<0.22	0.03
CB-EPA-BC-10A	0.450	99.1	0.9	-	1.7	<0.22	0.10
CB-EPA-BC-11	0.340	99.7	0.3	-	0.8	<0.22	0.09
CB-EPA-BC-12	0.380	99.9	0.1	-	0.5	<0.22	0.03
CB-EPA-BC-13	0.320	99.8	0.2	-	0.1	<0.22	0.03
CB-EPA-BC-14	0.200	99.9	0.1	-	0.7	<0.22	0.07
O&M							
CB-GC-1	0.018	21.8	60.4	17.8	12.1	18.00	4.80
CB-GC-2	0.055	39.4	45.9	14.7	10.4	33.00	4.36
CB-GC-3	0.026	21.4	63.4	15.2	9.0	23.00	2.80
CHANNEL DEEPENING							
CBCD-BC-1	0.060	49.2	40.7	10.1	10.6	-	-
CBCD-BC-2	0.072	56.2	35.7	8.1	5.8	-	-
CBCD-BC-3	0.046	43.1	48.5	8.4	8.1	-	-
CBCD-BC-4	0.050	43.6	46.0	10.4	8.0	-	-
CBCD-GC-1	0.039	32.7	56.5	10.8	7.7	14.00	2.58
CBCD-GC-2	0.069	55.3	36.6	8.1	7.4	16.00	2.66
DEQ SAMPLES							
(COE-1) DEQ-2492	0.073	57.8	37.3	4.9	-	2.80	1.05
(COE-2) DEQ-1346	0.078	63.0	32.8	4.2	-	2.05	1.24
(COE-3) DEQ-1343	0.056	43.0	53.0	4.0	-	3.98	1.30
(COE-4) DEQ-1348	0.066	52.6	44.9	2.5	-	1.89	1.33
(COE-5) DEQ-1342	0.080	57.3	37.8	4.9	-	10.50	1.85
(COE-6) DEQ-1338	0.030	31.2	59.7	9.1	-	<0.22	5.67
(COE-7) DEQ-1344	0.026	25.7	62.4	11.9	-	2.37	-
(COE-8) DEQ-1354	0.260	97.2	2.8	-	-	3270.00	0.24
(COE-9) DEQ-1356	0.250	98.7	1.3	-	-	2620.00	0.23
(COE-10) DEQ-3512	0.170	83.9	13.7	2.4	-	439.00	0.70
(COE-11) DEQ-3508	0.130	71.7	25.0	3.3	-	473.00	1.53
(COE-12) DEQ-3477	0.042	40.1	52.3	7.6	-	14.00	5.93
(COE-13) DEQ-2486	0.033	28.5	63.2	8.3	-	<0.22	3.48
(COE-14) DEQ-1520	0.033	27.5	65.9	6.6	-	<0.22	3.12
(COE-15) DEQ-3478	0.390	95.3	4.7	-	-	217.00	0.08
(COE-16) DEQ-3479	0.440	94.2	5.8	-	-	79.00	0.06
(COE-17) DEQ-1345	0.065	50.8	42.3	6.9	-	20.50	1.63
(COE-18) DEQ-3499	0.056	42.6	54.0	3.4	-	9.00	1.61

*Composite of CB-BC-3-1, 2, 3

