

Depot Slough Sediment Evaluation

Abstract

According to 404 (b)(1) guidelines of the Clean Water Act sediment from Depot Slough is acceptable for in-water and upland disposal. Contaminants in bulk sediment and elutriates are below established concern levels. No adverse, unacceptable impacts to the aquatic environment are expected.

Introduction

1. The Yaquina River is located along the Oregon coast about 115 miles south of the Columbia River. The river and its tributaries drain an area of 253 square miles. Its length is 58.6 miles to the source. Elk Creek, a major tributary is 29.7 miles long and drains 136 square miles. About 30 small creeks and sloughs drain into the Yaquina River. One of these creeks is Depot Creek and it forms Depot Slough where it enters the Yaquina River at River Mile (RM) 13.0 near the town of Toledo, Oregon. Tidal influences extend upriver past Depot Slough to RM 26. The diurnal tidal range is 7.9 feet with an extreme of 11.5 feet (1).
2. The towns of Newport (pop. 8,675) and Toledo (pop. 3,245) are the major population centers along the river and are located at RM 1.9 and 13.0 respectively. The principal industries of Lincoln County, where these towns reside, are lumber, fishing, agriculture and tourism (2). Toledo sits astride Depot Slough and is a center for the forest products industry in the mid-coast basin.
3. The Yaquina River Project in Depot Slough is 200 feet wide, 2,000 feet long and 10 feet deep. In the past Depot Slough sediment from maintenance dredging has been placed upland.

Past Studies

4. Sediment from Depot Slough was analyzed for contaminants and subjected to elutriate tests in 1980 as part of a larger study of the Federal Project from the mouth of the Yaquina River to river mile 14.0 (1). At Depot Slough channel mile (CM) 0.25 the sediment was greater than 80% silt but at CM 1.5 it was only 20% silt. The organic carbon content of the sediment was high (volatile solids, 17.48%).
5. Analysis of a bulk sediment sample from Depot Slough CM 0.25 indicated that zinc was exceptionally high (31,000 ppm). Another sample from much further downstream at Yaquina RM 2.4 had a zinc concentration of 7,600 ppm. An elutriate test revealed that only about 1 ppb was released to elutriate water and the resulting concentration of 4.3 ppb was well below either the fresh or marine water quality criteria established by EPA. The official sediment quality report prepared by the USACE in 1980 speculated that elevated zinc in sediment may be a characteristic of the area. This speculation was based on incorrect data provided by the U. S. G. S., which conducted the analyses. A phone conversation with Greg Fuhrer of U. S. G. S. on 20 April 1994 revealed that, because of miscommunication, the data had been reported incorrectly. The correct data is 40 ppm zinc for RM 2.4 and 120 ppm for Depot Slough CM 0.25. Recent measurements of zinc in the same general areas corroborate the corrected U. S. G. S. data. They

show zinc to be in the range of 22-416 ppm (Table 2 and refs. 3 & 4).

6. Other contaminants of concern, such as pesticides, PCBs, phenols and metals in bulk sediment were below established concern levels.

7. The only contaminant of concern in elutriate tests of bulk sediment from Depot Slough that exceeded water quality criteria was ammonia. However, this occurrence is not unusual for fine-grained sediment and is considered manageable using proper disposal methods.

8. Depot Slough sediment was considered acceptable for upland disposal at a site adjacent to the slough.

Current Study

9. A purpose of the current study was to determine if sediment from the Depot Slough Federal Project is acceptable for in-water or upland disposal according to 404 (b) (1) guidelines developed to help implement Section 404 of the Clean Water Act (CWA). Another purpose was to acquire and provide enough information to obtain state 401 water quality certification. At the same time as the Federal Channel was sampled, adjacent Port of Toledo project sediments were collected for the Port of Toledo. The purpose of including the Port project data in this evaluation is to utilize the extra information to help characterize the local area.

Methods

10. Three sediment samples were collected by gravity corer at the project on 8 February 1994 (Figure 1). All sample collection, handling, storage and analyses were performed according to EPA/Corps guidelines (5). Sample locations are shown on the enclosed map. Sediment cores were considered representative of the proposed dredging prism. Core lengths were 4'8", 5'6" and 5'0" for samples T-DS-1, 2 and 3 respectively. The cores were split in half lengthwise and each half was subsampled along its entire length. The core subsamples were taken from material not in contact with the plastic core liner. The integrated subsamples of each core were subjected to chemical and physical analyses. Chemical subsamples were placed in I-Chem glass jars with teflon lined lids. The jars were sealed inside plastic baggies and were cold stored until analysis. The samples were analyzed for metals, acid volatile sulfides (AVS), PAHs, pesticides, PCBs, phenols, tributyltin (TBT) and total organic carbon (TOC). Analyses were performed by Columbia Analytical Associates (CAS), Kelso, Washington. Physical subsamples were placed in plastic baggies and were analyzed for volatile solids (organic content), grain size distribution, resuspended density, void ratio, specific gravity and particle roundness by the USACE, North Pacific Division Materials Testing Laboratory, Troutdale, Oregon. All analyses were performed consistent with the quality assurance program of the testing laboratory - CAS.

Results

Physical

11. Sediment from the Depot Slough Federal Project is sandy, clayey silt with a mean median grain size of 0.012 mm, which is in the range of fine silt (Table 1). The sediment is high in

organic content as measured by volatile solids (12.3 %) and TOC (4.85%) (Tables 1 and 2). For comparison, data from a nearby local project, Port of Toledo Docks, along the eastern edge of the Federal project, are displayed in Tables 1 through 4. The Port of Toledo material is similar in its grain size distribution and organic content (Table 1 and 3). The Port material is closer to local sources of contaminants associated with boatworks operations and urban runoff than is Federal Project sediment.

Metals

12. The concentrations of 9 heavy metals were measured in the sediment samples (Table 2). No Federal Project stations exceeded established concern levels for any of these 9 metals. One Port of Toledo station (TG-GC-2) exceeded the concern levels for zinc and copper, another was close to exceeding screening levels for these two metals (TG-GC-3) (Table 2, Figure 1). These two non Federal Project stations were from the boatworks area of the Port project. The average concentrations of 6 of the 9 metals were lower in Federal Project sediments than the Port sediments.

AVS

13. The AVS concentration (Table 2) in Federal Project sediment was typical of backwater areas. Usually fine-grained, organic rich sediment contains higher levels of sulfur as is the case with Depot Slough. AVS can serve to protect the aquatic environment by serving as a reactive pool for forming insoluble metal sulfides thus reducing the toxicity of metals in sediment and the water column. The downstream station appeared to have considerably less AVS than the two upstream stations (Table 2) though this is based on just one observation.

Organics

14. None of the Federal Project samples exceeded established concern levels for PAHs, pesticides, PCBs, phenols or TBT (Tables 3 and 4). Low concentrations of high molecular weight (HMW) PAHs were the prime organics observed in the Federal Project (Table 4). PAHs were detected at a slightly higher level in the adjacent Port project (Tables 3 and 4). There were more low molecular weight (LMW) PAHs in the Port project sediments especially those located near the boatworks docks (T-GC-2 & 3, Table 4). The upstream Port project sample (T-GC-1) was more similar to the Federal Project samples in distribution of PAHs between LMW and HMW compounds and in PAH concentrations (Tables 3 and 4). Neither Federal Project nor Port Project samples exceeded established screening levels for PAHs. TBT was detected at a concentration (9 ppb) barely above the detection limit (6 ppb) in one Federal Project sample. In Port project samples TBT was detected in 2 samples and exceeded the screening level in one of these samples (Table 3). Although phenols were not detected in Federal Project samples, they were in Port project samples, but at concentrations below established concern levels (footnote, Table 3). The organic content as measured by TOC was similar in Federal Project and Port project samples and averaged 4.79 % (Table 3).

Discussion

15. The purposes of the current study were to obtain State 401 water quality certification and to determine if sediment from the Depot Slough Federal Project is acceptable for in-water or upland disposal according to 404 (b)(1) guidelines (40 CFR 230) developed to help

implement Section 404 of the Clean Water Act (CWA). In the past, a sediment evaluation was conducted using guidance published in Miscellaneous Paper D-76-17, Ecological Evaluation of Proposed Discharge of Dredged or Fill Material into Navigable Waters, that provided interim guidance for implementation of Section 404 (b)(1) guidelines (6). A new guidance manual in draft form titled Evaluation of Dredged Material Proposed for Discharge in Inland and Near Coastal Waters - Testing Manual (Draft) was prepared recently by the EPA and USACE(7). This draft inland testing manual is similar to and consistent with the *Green Book* developed to implement Section 103 of the Marine Protection Research and Sanctuaries Act (MPRSA) regarding disposal into ocean waters (5). Depot Slough sediment was evaluated using guidance in the new, draft inland testing manual.

16. The last evaluation of Depot Slough sediment, conducted in 1980, recommended upland disposal and not in-water disposal. Information gained from the current study regarding contaminants in the sediment indicates that Depot Slough material is acceptable for both in-water and upland disposal. In-water disposal should be conditioned upon specifying an acceptable disposal site with similar grain sizes that is removed from oyster bearing sediments. Upland disposal would have the least impact to the aquatic environment.

17. Disposal alternatives were arrived at using the tiered-testing procedure in the draft Inland Testing Manual (7). The tiered-testing procedure employs 4 tiers of evaluation. The evaluation begins at Tier I with the purpose of determining "whether factual determinations can be made on the basis of existing information" (7). Existing information from the area is adequate. Physical, chemical and elutriate test data collected on bulk sediment from Depot Slough in 1980 and current 1994 bulk sediment data collected at the project and from the adjacent local project are sufficient to make determinations regarding sediment toxicity in Tier I.

18. Sediment chemistry data supports acceptability of in-water disposal for Federal Project sediment from Depot Slough. Bulk sediment chemistry from the above studies reveals that contaminants of concern are below established concern levels (Tables 2-4 and reference 1). Elutriate tests confirm that contaminants do not dissolve into the water column at concentrations that exceed water quality criteria established by the EPA (8). Because of this, mixing zone calculations are not necessary, nor are bioassays, in order to predict the toxicity potential of contaminants in sediment discharged into Yaquina River at an in-water disposal site. Potential impacts of concern for in-water disposal will be burial of disposal site benthic organisms, development of a temporary, aesthetically displeasing turbidity plume, and temporary reduction of dissolved oxygen, light penetration and pH. Disposal should occur at a site sufficiently far upstream to reduce impacts to oysters residing in downriver sediments. Presently there is no specified in-water disposal site nearby in the Yaquina River. Such a site should have physical and chemical characteristics similar to Depot Slough sediment.

19. Sediment chemistry data supports acceptability of upland disposal as well. Upland disposal would have lesser impacts to the aquatic environment of the Yaquina River. The potential adverse environmental impacts of upland disposal due to contaminants in the sediment are minimal. Discharges of water from an upland disposal site into the Yaquina River should not exceed State and Federal water quality criteria for contaminants as bulk chemistry and elutriate data show (Tables 2-4 and ref. 1). Upland disposal may be by clamshell, which would mean no discharge of water back into the Yaquina River. The site should be monitored and managed to insure that turbidity and dissolved solids content of disposal site effluent remains below

guidelines. The sediment is high in clay content and so should help seal the underlying groundwater from leachates. Because the sediment is below established concern levels for contaminants, harmful leachates should not enter groundwater.

Recommendations

20. Sediment from Depot Slough is acceptable for both in-water and upland disposal according to 404 (b)(1) guidelines of the Clean Water Act. A Tier I evaluation suggests that sufficient information exists regarding contaminants in the sediment to arrive at these conclusions. Upland disposal may be preferred to in-water disposal because the potential impacts to the aquatic environment are reduced. In any case, no adverse, unacceptable environmental impacts are expected from such disposal.

REFERENCES

1. Turner, R. 1980 and 1986. Findings of Compliance, Dredged Material Disposal Activities, Yaquina Bay and River Federal Navigation Channel. U.S. Army Corp of Engineers, Portland District.
2. Percy, K.L., Bella, D.A., Sutterlin, C., Klingeman, P.C. 1974. Descriptions and Information Sources for Oregon Estuaries. Sea Grant College Program, Oregon State University.
3. Britton J. U. S. Army Corps of Engineers, Portland District. October 1990. Characterization of Sediments at yaquina Bay & Harbor. Prepared for U. S. Environmental Protection Agency, Region 10.
4. Britton J. U. S. Army Corps of Engineers, Portland District. 17 July 1990. Yaquina Bay Sediment Evaluation April 1990.
5. U. S. Environmental Protection Agency and U. S. Army Corps of Engineers. February 1991. Evaluation of Dredged Material Proposed for Ocean Disposal (Testing Manual).
6. Environmental Effects Laboratory, U. S. Army Waterways Experiment Station, Vicksburg, MS. May 1976. Ecological evaluation of proposed discharge of dredged or fill material into navigable waters. (Interim guidance for implementation of section 404(b)(1) of public law 92-500 Federal Water Pollution Control Act Amendments of 1972).
7. U. S. Environmental Protection Agency and U. S. Army Corps of Engineers. May 1993. Evaluation of Dredged Material proposed for Discharge in Inland and Near Coastal Waters - Testing Manual (Draft) (Inland Testing Manual).
8. U. S. Environmental Protection Agency. May 1986. Quality Criteria for Water ("The Gold Book"). Office of Water Regulations and Standards. Washington, DC.

Figure 1. Locations of gravity core samples of Depot Cloggin sediment.

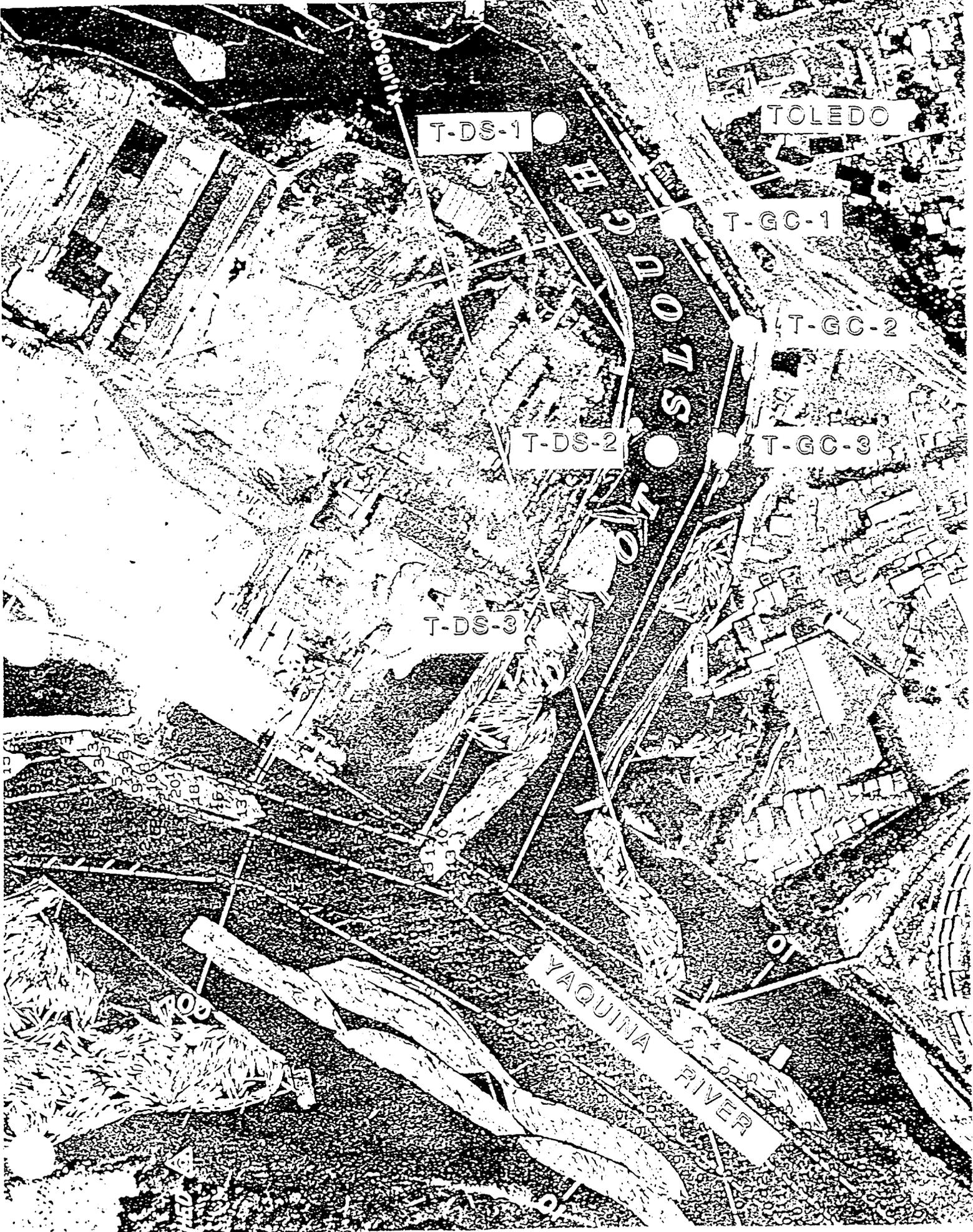


Table 1. Grain size distribution and organic content of Depot Slough sediment.

sample	median gr. size mm	sand	silt	clay	volatile solids
		%			
Federal Project					
T-DS-1	0.011	7.9	65.5	26.6	13.1
T-DS-2	0.012	10.0	69.6	20.4	12.0
T-DS-3	0.014	10.7	65.7	23.6	11.8
mean	0.012	9.5	66.9	23.5	12.3
Port of Toledo Project~					
T-GC-1 TOP^	-	4.2	72.4	23.3	-
T-GC-2 TOP	-	6.8	64.8	28.4	-
T-GC-3 TOP	-	9.5	64.9	25.6	-
T-GC-1,2,3 BOT	-	6.4	64.5	29.1	-
mean		6.7	66.7	26.6	

~ Data from local non Federal Channel Project.

^ TOP is top half of core; BOT is composite of bottom halves of cores 1, 2 and 3.

Table 2. Metals and acid volatile sulfide (AVS) concentrations in Depot Slough sediment.

sample	As	Cd	Cr	Cu	Pb	Hg ppm	Ni	Ag	Zn	AVS
<i>Federal Project</i>										
T-DS-1	12.3	0.34	43	34	21.3	0.10	33.3	0.21	127	4,400
T-DS-2	12.0	0.32	46	34	21.8	0.11	33.2	0.25	130	4,300
T-DS-3	12.5	0.30	48	33	19.7	0.11	36.0	0.22	128	430
mean	12.3	0.32	46	33	20.9	0.11	34.2	0.23	128	3,043
<i>Port of Toledo Project~</i>										
T-GC-1 TOP^	9.0	0.28	43	29	18.5	0.07	26.7	0.31	108	-
T-GC-2 TOP	10.3	0.31	57	161	37.9	0.07	34.0	0.39	416	-
T-GC-3 TOP	9.4	0.30	62	75	28.9	0.08	33.3	0.26	157	-
T-GC-1,2,3 BOT	10.4	0.27	83	97	24.1	0.07	40.7	0.28	156	-
mean	9.8	0.29	61	91	27.4	0.07	33.7	0.31	209	-
SL*	57.0	0.96	180	81	66.0	0.21	140.0	1.20	160	-

~ Data from local non Federal Channel Project.

^ TOP is top half of core; BOT is composite of bottom halves of cores 1, 2 and 3.

* EPA, Region 10 screening level for marine waters.

Table 3. Concentrations of organic contaminants in sediment from Depot Slough Federal project.

Sample	PAHs	PCBs	Pesticides ppb	Phenols	TBT	TOC %
Federal Project						
T-DS-1	373	<10	<2-<10	<20	<7	4.78
T-DS-2	475	<10	<2-<10	<20	9	5.09
T-DS-3	187	<10	<2-<10	<20	<6	4.67
Port of Toledo Project~						
T-GC-1 TOP^	404	<10	<2-<10	<20	<15	5.13
T-GC-2 TOP	1,151	<10	<2-<10	23	24	4.47
T-GC-3 TOP#	1,461	<10	<2-<10	168	120	4.96
T-GC-1,2,3 BOT	1,027	<10	<2-<10	72	<14	4.45
SL*	610-1800	130	6.9-10	10-120	30	-

~ Data from local non Federal Channel Project.

^ TOP is top half of core; BOT is composite of bottom halves of cores 1, 2 and 3.

* EPA, Region 10 Screening Level for marine waters (note: for PAHs, 610 ppb for total low molecular weight (MW) and 1800 for high MW PAHs. No sample exceeded LMW or HMW SLs.

None of the 5 phenols tested for exceeded their individual screening level.

Table 4. Breakdown of PAH concentrations in sediment from Depot Slough Federal Project.

sample	low molecular weight (LMW)						total LMW	high molecular weight (HMW)								total HMW
	naphthalene	2-methylnaphthalene	acenaphthene	fluorene	phenanthrene	anthracene		fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(b+k)fluoranthenes	benzo(a)pyrene	indeno(1,2,3-cd)pyrene	benzo(g,h,i)perylene	
(ppb)																
Federal Project																
T-DS-1	<20	<20	<20	<20	28	<20	28	79	79	29	37	66	22	33	<20	345
T-DS-2	<20	<20	<20	<20	35	<20	35	120	120	30	41	70	22	37	<20	440
T-DS-3	<20	<20	<20	<20	24	<20	24	53	53	<20	36	<40	<20	21	<20	163
Port of Toledo Project~																
T-GC-1 TOP^	<20	<20	<20	<20	20	<20	20	94	78	33	35	100	44	<20	<20	384
T-GC-2 TOP	24	20	35	29	79	25	212	280	220	77	92	140	52	40	38	939
T-GC-3 TOP	30	31	37	31	120	38	287	310	260	98	110	200	82	60	54	1174
T-GC-1,2,3 BOT	41	<20	24	21	80	22	188	210	200	71	81	140	62	37	38	839
SL*	210	67	63	64	320	130	610	630	430	450	670	800	680	69	540	1800

~ Data from local non Federal Channel Project.

* EPA, Region 10 Screening Level for marine waters.