CENPP-PE-HR (1110-2-1150) 13 OCTOBER 1992

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

SUBJECT: Chinook Channel Sediment Evaluation

1. Enclosed is the sediment evaluation for the Chinook Channel Federal Project. Chinook Channel sediments are acceptable for unconfined in-water and diked upland disposal according to guidelines in the CWA. The material is sandy silt with concentrations of heavy metals below established concern levels. Organic contaminants detected were below concern levels. No unacceptable adverse environmental impacts are expected from the disposal of this material.

2. If you have questions regarding this study, please contact Jim Britton, CENPP-PE-HR, extension 6471.

Encl
as

STEVEN L. STOCKTON, P.E.
Chief, Planning and Engineering
Division

CF: CENPP-PE-HR (BRITTON)

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5 October 1992

Evaluation of Sediment From Chinook Channel in Baker Bay

Abstract

Sediment from shoals in Chinook Channel is acceptable for both unconfined in-water disposal and diked upland disposal. The material is sandy silt with concentrations of heavy metals below established concern levels. Organic contaminants detected were below concern levels. Only 1 pesticide, 1 phenol and 2 PAHs were detected. No unacceptable adverse environmental impacts are expected from either unconfined in-water or diked upland disposal.

Introduction

1. Chinook Channel is located in Baker Bay near Columbia River mile 5.0. The channel begins near the head of Sand Island and proceeds northeast for about 2 miles to the Chinook boat basin. It is 150 feet wide and 10 feet deep to a turning basin at Chinook. The turning basin, which is maintained by local interests, is 10 feet deep, 590 feet long and 500 feet wide. Chinook Channel is subject to heavy shoaling, especially between channel mile (CM) 0.7 and 1.5 and in that part of the channel extending into the mooring basin at Chinook. Over the past 5 years an average of 177,400 cy have been dredged from the channel by clamshell (1). Sediment from the lower, sandy end of the channel has usually been disposed at Area D, a deep, high energy, dispersive, in-water site located at Columbia River mile 6.5. Disposal of siltier material from the upper end of the channel has been on East Sand Island at two beach nourishment sites and one diked upland site. Since 1987 material from the entire channel has gone to Area D.

2. Several studies of Baker Bay sediment samples taken from federal projects, including sediment from Chinook Channel, have been conducted over the years (2-9). In particular, Chinook Channel sediments were analyzed for grain size distribution and contaminants in 1980, 86 and 87. In the 1980 study, three sediment samples were taken from shoals along the length of the channel. A sediment evaluation report was prepared detailing the results of physical and chemical tests (6). The report suggested disposal options for dredged material according to Clean Water Act guidelines. Physical tests showed that the material progressed from silty sand at the beginning of the channel to sandy silt near the boat basin. The organic content of the samples increased as the silt content increased. Chemical tests for contaminants in the bulk sediment indicated that metals, pesticides and PCBs were below established guidelines. Elutriate tests, which predict the concentrations of contaminants that could enter the water column during disposal, revealed that ammonia, cadmium and manganese release exceeded guidelines. However, it was predicted that precipitation and dilution from a minimal mixing zone factor, during in-water disposal, would bring the levels of these chemicals to below guidelines. Results from the 1986 and 1987 tests followed the same basic pattern as those from 1980 and corroborated them. In these studies, elutriate tests showed that concentrations of cadmium and manganese were not above concern levels as in previous tests. PAHs and phenols were added to the list of contaminants looked for in those later studies. Over the years, more than 80 contaminants have been tested for in Chinook Channel sediment and elutriate samples.

3. As mentioned, Chinook Channel sediment is high in silts and organic material, especially near the mooring basin. The sediment had not been tested for contaminants in 5 years. These factors led to a decision to have both physical and chemical tests run on the sediment to update our knowledge of its condition and suitability for unconfined in-water or upland disposal, according to provisions in the Clean Water Act.

Methods

4. Two samples, CH-BC-1 and CH-BC-2 were taken at CM 1.53 and CM 1.91 from silty shoals close to the mooring basin jetty (Figure 1). The samples were taken by U. S. Army Corps of Engineers (USACE) and National Marine Fisheries Service (NMFS) personnel, using a modified Gray O'Hara box corer, on 19 March 1992. Samples for chemical analyses were placed in EPA approved, Picher brand, glass jars that were acid and hexane rinsed and topped with teflon lined lids. The samples were cold stored til analysis. Additional samples placed in ziplog bags were subjected to physical analyses for grain size distribution and volatile solids content. The chemical samples were subjected to analyses for heavy metals, total organic carbon (TOC), polynuclear aromatic hydrocarbons (PAHs), Pesticides, polychlorobiphenyls (PCBs), acid volatile sulfides (AVS), and phenols. All sampling and analyses were performed according to EPA/USACE approved methods (10). A quality control (QC) and quality assurance (QA) report of the results was prepared by the USACE, Portland District Materials Lab in Troutdale, Oregon (enclosed).

Results/Discussion

5. The results of physical analyses are shown in Table 1. Samples collected were considered to be representative of the material to be dredged. The mean grain size is that of medium to coarse silt. The sediment is greater than 60 % silt, 9.0 % clay and 5.0 % volatile solids (organic content).

6. The concentrations of inorganics are shown in Table 2. The concentrations of metals are below established concern levels (11). Sample CH-BC-1 had about 6 times more acid volatile sulfides (AVS) than the other sample. AVS can help bind heavy metals and reduce their toxicity. Examination of Table 2 reveals a consistent pattern of greater concentrations of metals in CH-BC-1 vs CH-BC-2. Sample CH-BC-1 was located in a sheltered quiescent area and it contanied more fines and organics than the other sample, which could lead to the differences between them.

7. The results of organics analyses are shown in Table 3. All concentrations of organics were below established concern levels. Only trace amounts of 1 pesticide, 2 PAHs and 1 phenol were detected.

8. The results of physical and chemical analyses of the sediment confirm earlier studies and indicate that Chinook Channel sediment has not degaded significantly over the years.This and previous sediment quality evaluations have concluded that no unacceptable, adverse environmental impacts would be expected from its disposal. In the past, sediment from this part of the channel has been diposed upland and at Area D. Physical impacts from disposal would be minimal because of the high energy, dispersive nature of this in-water disposal site. The impact to benthics at the in-water site would be minimal since most of the finer grained material would be rapidly dispersed. It is probable that the populations of benthics at this high energy site are adapted to rapidly changing conditions. A temporary, local increase in turbidity

would be expected at both the in-water and upland sites. If placed upland, returning water from the diked upland site should meet water quality criteria except for perhaps, ammonia. However, ammonia concentrations would be rapidly diluted by receiving waters. This would also be true at the in-water sites.

9. Contract lab quality assurance and quality control for these chemical analyses was acceptable according to the enclosed USACE, materials lab report. All detection limits were acceptable and allowed a good comparison of sediment concentrations to established concern levels.

Recommendations

10. According to provisions of the Clean Water Act (CWA) the sediment from Chinook Channel is acceptable for both unconfined in-water and diked upland disposal. Because of the high silt content use as beach nourishment material is not recommended. Results from this and earlier studies show that no unacceptable adverse environmental impacts would be expected from its disposal.

REFERENCES

1. Navigation Branch, Operations Division, U. S. Army Corps of Engineers, Portland District. September 1991. Federal Navigation Projects: Columbia River Maintenance Disposal Plan. (Prepared by Mandaville Associates, 600 S. W. Tenth #418, Portland, Oregon 92205)

2. U. S. Army Corps of Engineers, Portland District. July-August 1980. Findings of Compliance Dredged Material Disposal Operations Baker Bay Navigation Project.

3. U. S. Army Corps of Engineers, Portland District. June 1981. Factual determinations Columbia River at Baker Bay Proposed Channel Improvement.

4. U. S. Army Corps of Engineers, Portland District. July 1983. (Data taken from Corps sediment quality database showing samples taken in 1983).

5. Turner, R. and Babcock, S. U. S. Army Corps of Engineers, Portland District. December 1988. Results of 1987 Baker Bay at Ilwaco, WA Sediment Quality Testing.

6. U. S. Army Corps of Engineers, Portland District. July-August 1980. Findings of Compliance Dredged Material Disposal Operations Chinook Federal Navigation Project.

7. U. S. Army Corps of Engineers, Portland District. December 1986, July 1987 . (Data taken from Corps sediment quality database showing results of physical and chemical analyses of sediment samples taken in 1986-87 from Chinook Channel).

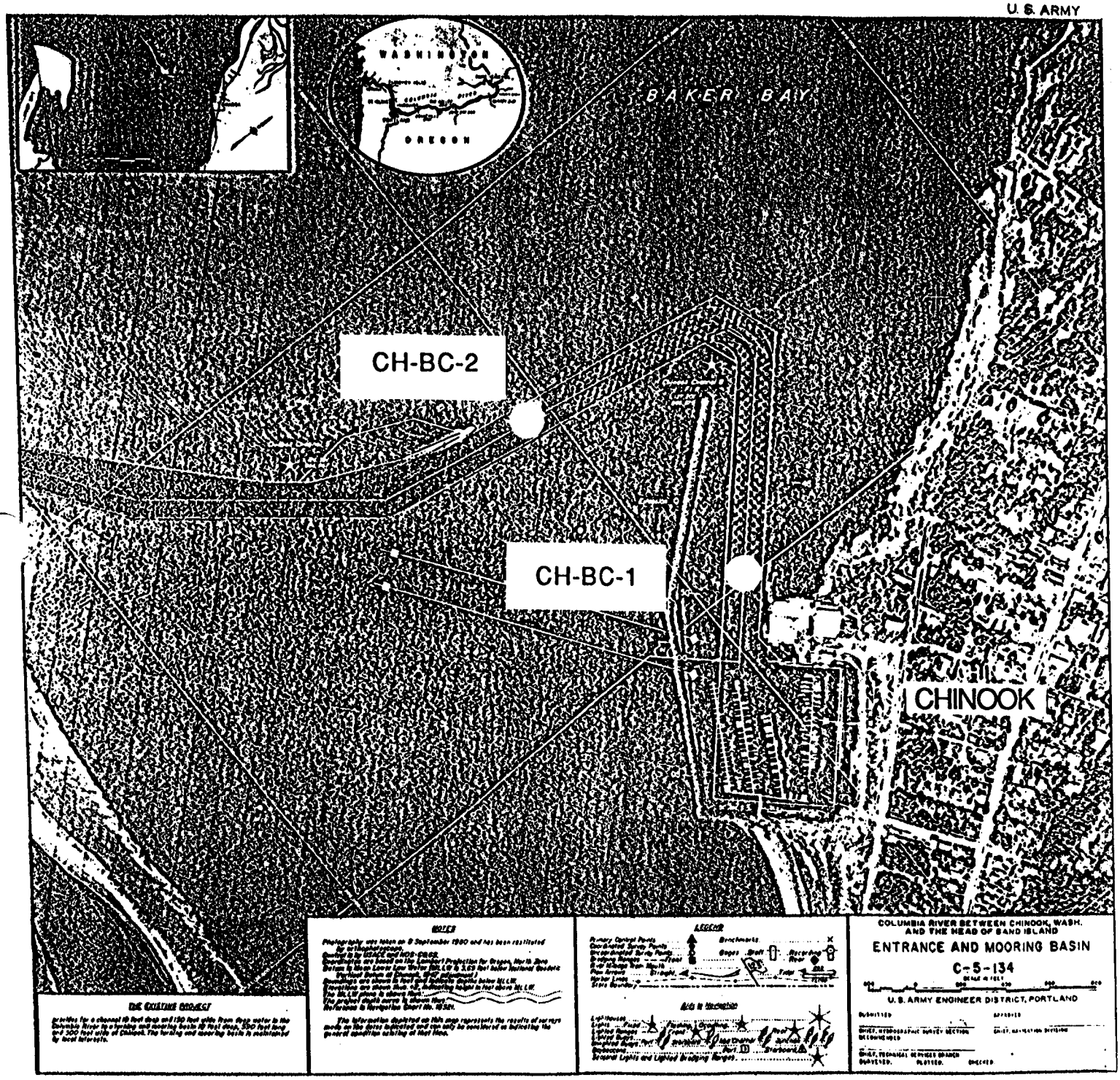
8. Britton J. U. S. Army Corps of Engineers, Portland District. 20 July 1992. Evaluation of Sediment at U. S. Coast Guard Station Ilwaco, Washington.

9. Britton J. U. S. Army Corps of Engineers, Portland District. August 1992. Baker Bay West Channel Sediment Evaluation.

10. U. S. Environmental Protection Agency and U. S. Army Corps of Engineers. February 1991. Evaluation of Dredged Material Proposed for Ocean Disposal (Testing Manual).

11. U. S. Army Corps of Engineers, Portland District. November 1991. Levels of Concern Tier II Analysis. (A list of chemicals and associated concern levels in bulk sediment, established as a temporary guideline useful in evaluating toxicity of sediment. These levels of concern are subject to change as new information warrants.)

FIGURE 1.


U.S. ARMY
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CH-BC-2
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CHINOOK
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COLUMBIA RIVER BETWEEN CHINOOK, WASH. AND THE HEAD OF SAND ISLAND
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Table 1

Results of physical analyses of sediment from Chinook Channel.

sample	mean grain size (mm)	sand (%)	silt (%)	clay (%)	volatile solids (%)
CH-BC-1	0.013	3.2	84.4	12.4	9.8
CH-BC-2	0.048	30.6	60.1	9.3	5.8

Table 2

Concentrations of inorganics and TOC in sediment from Chinook Channel.

	As (ppm)	Cd (ppm)	Cr (ppm)	Cu (ppm)	Pb (ppm)	Hg (ppm)	Ni (ppm)	Zn (ppm)	AVS (µm/g)	TOC %
CH-BC-1	8	1.2	25	48	20	0.12	20	129	46.00	2.72
CH-BC-2	6	0.7	19	27	14	0.08	16	86	7.31	1.62

Table 3.
Results of analyses for organic contaminants* in Chinook Channel sediments.

	PCBs	Pesticides (endosulfan II)	Phenol	PAHs	
				fluoranthene	pyrene
			(ppb)		
CH-BC-1	nd	3	120	150	150
CH-BC-2	nd	2	73	-	-

* PCBs - 7 arochlors
Pesticides - 19 organochlorines
Phenols - 5 phenols
PAHs - 17 polynuclear aromatic hydrocarbons