

Bonneville Navigation Lock Sediment Evaluation

Abstract

According to requirements in section 404 (b) (1) of the Clean Water Act, sediments downstream from the Bonneville Navigation Lock were evaluated and found to be acceptable for unconfined in-water or upland disposal with no unacceptable adverse environmental impacts expected. The sediment ranged from sandy gravel to gravelly, silty sand. Concentrations of metals were below screening levels. Pesticides, PCBs and PAHs were below method detection limits.

Introduction

1. The Bonneville Navigation Lock is located at River Mile (RM) 145.38 on the south side of the Columbia River. The authorized Federal navigation channel in this reach of the river is 300 feet wide and 27 feet deep, although currently the depth is maintained at 17 feet. The project width narrows from 300 feet at RM 145.15 to approximately 100 feet just downstream from the navigation lock at RM 145.38.
2. The area just below the navigation lock is dredged infrequently, with 2,050 cubic yards removed in 1986. Prior to 1986 the last dredging occurred in the late 1970s. There are no previous sediment quality reports covering this small downstream area below the navigation lock. This area is in a very high energy regime especially when water is released from the lock to lower an upstream vessel to the downstream level.
3. The purposes of the present study were to measure the physical nature of the sediment and to take some measurements of chemicals of concern to round out our knowledge of contaminants, if any, in the area.

Methods

4. Sediment samples were taken from three locations below the navigation lock (Figure 1). One sample, B-3, served as a reference site for possible downstream in-water disposal. Because of the rocky nature of the material below the lock, several attempts were made with a ponar grab sampler before acceptable samples were obtained. The material consisted of fist-sized, very angular rocks which were probably fill material used in constructing the north levee bordering the channel and for lining the south bank of the channel (see Figure 1). Samples for physical analysis were stored in zip-lock bags and delivered to U. S. Army Corps of Engineers Materials Lab, Troutdale, Oregon where grain size distribution and volatile solids were measured. Sub-samples of B-1 and B-2 were taken for chemical analyses using standard methods of handling and storage. These were composited into one sample, B-1/2, which was sent to Columbia Analytical Associates, Kelso, Washington where chemical tests were conducted to measure metals, pesticides, PCBs, PAHs, TOC and acid volatile sulfides (AVS).

Results

Physical

5. The material in the channel directly below the navigation lock is gravelly with some sand and fines. Several attempts were made to obtain samples by criss-crossing along the entire length and width of the shoal area in the channel, an area about 1,000 by 200 feet. The ponar sample attempts often came up empty or with a few fist-sized, angular rocks in the sampler. Sample B-1 contained enough material to keep for physical and chemical analysis. This material was a silty sand with gravel having a mean grain size in the range of pebbles (12.33 mm, Table 1). Sample B-2, near the edge of the channel from an area where wood chip barges are sometimes moored (Figure 1), was a silty sand with some clay. Based on the attempts to obtain samples from throughout the project area, the B-2 material is characteristic of only a small part of the project sediments. The reference sample B-3, taken downstream from the project in a very high energy area of the Columbia River, was a well graded gravel with sand. This sample served to characterize potential in-water disposal site sediment. The organic content of all three samples, as measured by volatile solids, was between 2.2 and 3.8 percent.

Chemical

6. The project sediments were below EPA, Region 10 and USACE, Portland District screening levels for metals (1,2). There were no detectable concentrations of pesticides, PCBs and PAHs. Acid volatile sulfides (AVS) were 0.14 μ -moles/g. Total Organic Carbon (TOC) was 12.1 mg/g (1.21 %).

7. Quality control for all the chemical analyses was acceptable (see attached CAS QC report). Laboratory blanks for all methods were free of targeted analytes. Surrogate recoveries and relative percent differences of laboratory duplicates of pesticides, PCBs and PAHs were within QC limits. Matrix spike recoveries of metals, AVS and PAHs were also acceptable. Detection limits were marginally acceptable according to District guidelines for pesticides, PCBs and PAHs but were below established screening levels. Since none of the organics were detected they are below screening levels.

Discussion/Recommendations

8. The Bonneville Navigation Lock sediments are acceptable for unconfined in-water disposal as well as upland disposal (2). The material is composed predominantly of sand and gravel and is similar to placement sediments as shown by reference sample B-3. This general area of the river is a high energy environment and dispersive in nature. No chemical contaminants were found in the project sediment at concentrations above established concern levels and there are no point sources of contaminants in the area. These factors indicate that no unacceptable adverse environmental impacts are expected from in-water or upland disposal.

Table 1.

Results of physical analyses of Bonneville Navigation Lock sediments.

sample	mean gr. size	gravel	sand	finer	volatile solids	TOC*
	mm			%		mg/g
B - 1	12.33	24.2	49.2	26.6	3.8	12.1
B - 2	0.12	0.1	78.9	21.0	3.0	
B - 3	7.16	81.3	18.7	0.0	2.2	

* from composited sample of B-1 and B-2

Table 2.

Concentrations of contaminants in Bonneville Navigation Lock sediments.

sample	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn	AVS	Organics*
				ppm					µm/g	ppb
B-1/2†	3.0	0.8	16.0	22.0	nd	18.0	14.0	124	0.14	nd

* organics/detection limits

pesticides 10-30 ppb

PCBs 100

PAHs 100

† composite of sample B-1 and B-2

REFERENCES

1. U. S. Environmental Protection Agency. Screening Levels on file with Ocean Dumping Coordinator, Region 10, Seattle.
2. U. S. Army Corps of Engineers, Portland District. Concern Levels on file in Planning and Engineering Division, Hydraulics and Hydrology Branch, Reservoir Regulation and Water Quality Section.
3. U. S. Environmental Protection Agency. Guidelines For Specification of Disposal Sites for Dredged or Fill Material. Code of Federal Regulations, 40 CFR 190.01, 1985.

