

February 2002

BONNEVILLE DAM BRADFORD ISLAND FISH LADDER

ABSTRACT

This evaluation was conducted following procedures set forth in the Inland Testing Manual, developed jointly by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency to assess dredged material. Guidelines used are those developed to implement the Clean Water Act. These guidelines and associated screening levels are those adopted for use in the Dredge Material Evaluation Framework (DMEF) for the Lower Columbia River Management Area, November 1998.

A total of three (3) sediment samples were collected from the fish discharge at the south end of Bradford Island on December 18, 2001. All samples were submitted for physical analyses including total volatile solids and also analyzed for metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons and organotin.

None of the laboratory data results exceeded their respective screening levels in the DMEF. All sediment is determined to be suitable for unconfined, in-water placement or upland placement with return water without further characterization under guideline of the DMEF. DEQ's cleanup levels in soil for total DDT is 7000 ug/kg (ppb). However, to place the material upland, without return water, all applicable solid waste laws need to be considered.

Although the 1577 CY of material dredged was determined to be suitable for unconfined inwater placement, it was determined, as a management option, to barge the material to RABANCO Regional Disposal Company's facility in Roosevelt Washington.

INTRODUCTION

This report characterizes the sediment analyzed at the outfall of the Bradford Island Fish Ladder for the purposes of dredging and disposal. The sampling and analysis objectives are stated in the Sampling and Analysis Plan (SAP December 2001), and are also listed below. This report will outline the procedures used to accomplish these objectives.

Sampling and Analysis Objectives

- Characterize sediments in accordance with the regional dredge material-testing manual, the Dredge Material Evaluation Framework for the Lower Columbia River Management Area (DMEF).

- Physical and chemical analyses will be conducted on the 3 gravity core (or surface grab samples if gravity core will not penetrate) samples representing the dredging prism.
- Collect, handle and analyze representative sediment of the proposed dredging prism, in accordance with protocols and Quality Assurance/Quality Control (QA/QC) requirements.
- Conduct physical and chemical characterization only for this sediment evaluation.

PREVIOUS STUDIES (SEE FIGURE 1)

In September 1991 three (3) samples were collected in the area below the navigation lock. The material consisted of 24.2% gravel, 49.2% sand and 26.6% fines with, 12.1 mg/g total organic carbon. No chemicals of concern were detected above their corresponding screening levels. All material represented by this sampling event was determined to be suitable for in-water placement without further characterization.

In July 1997 seven (7) sediment samples were collected from Bonneville Second Powerhouse forebay and water supply conduits. Two of the samples were taken from the downstream portion of the south Auxiliary Water Supply (AWS) conduit by divers inspecting the inside of the south AWS. Three additional samples were taken from the surface of the sediment deposits at the north end of the forebay. The final two samples were collected from the sediment and woody debris removed from the north AWS intake trash rack by clamshell and stockpiled on Cascade Island, at the south end of the Elevation 90 Deck crane way extension. Physical analysis, run on four sediments, indicated the material ranges from gavel to very fine sand, with largest fractions in the coarse to medium sand range. Chemical analysis, run on five sediments, included metals, pesticides/polychlorobiphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs) total organic carbon (TOC), acid volatile sulfide (AVS), phenols and dioxin screen (P450). No screening levels were exceeded and the material was determined to be suitable for inwater placement. The portion of the sample submitted to the lab is representative of the material that was dredged, except for the woody debris. Since the wood was waterlogged and would not be a navigation hazard, covered under the Clean Water Act (CWA), it was placed in-water with the sediment as requested by the National Marine Fisheries Service (NMFS).

In May 2001 nine (9) sediment samples were collected near the East End of Bradford Island where a cleanup of a former dumpsite is in progress. A draft report indicates PCBs were detected at levels exceeding the SL of the Dredge Material Evaluation Framework (DMEF), ranging from <0.01 to 1.24 mg/kg.

In August 2001 one (1) surface grab sample and the eight (8) inwater subsurface (borings) were collected from within the proposed plunge pool of the corner collector at Powerhouse #2 at Bonneville Dam. The material consisted of overburden materials and bedrock. In addition to the inwater samples, 41 upland sites (borings and test pits) were also collected

from the proposed upland construction site downstream of the Second Powerhouse and contain similar material. The overburden consists of fill (500 CY of riprap), alluvium, slide debris material and a poorly graded alluvial material referred to as “crystal sands” (poorly graded micaceous silty sand to sand). All the samples recovered from the drillings and surface sample is considered native material derived primarily from historical and prehistorical slides. The bedrock unit consists of the sedimentary Weigle Formation.

The samples collected from the in-water area at the site of the proposed plunge pool dredging indicate the majority of the material to be disposed of consists of 80% gravel, 18% sand with fines representing <2% of total material with an estimate of <1% volatile solids.

CURRENT SAMPLING EVENT/DISCUSSION

A total of three (3) sediment samples were collected from the fish ladder exit on December 18, 2001 (see Figure 1&2 and Table 1).

Table 1. Sample Location Coordinates (NAD 83, Oregon State Plane North)

BONN-P-01	45° 38.462’	BONN-P-03	45° 38.461’
	121° 56.572’		121° 56.561’
BONN-P-02	45° 38.460’		
	121° 56.539’		

The samples were collected using a ponar sampling device (a gravity core sampler was tried, but had only about 12” penetration). All samples were submitted for physical analyses including total volatile solids (TVS) and were analyzed for metals (9 inorganic), total organic carbon (TOC), pesticides and polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons (PAHs) and organotin (TBT).

RESULTS

Physical and Volatile Solids (TVS) (ASTM methods). Three (3) samples were tested and the data are presented in Table 1. All of the samples exceeded 20% fines and one (1) exceeded 5% volatile solids. All samples were classified as “sandy silt”. The mean grain size for all the samples is 0.08 mm, with 0.02% gravel, 51.2% sand and 48.6% fines. Volatile solids for all the samples averaged 4.95%.

Metals (EPA method 6020/7471), Total Organic Carbon (TOC) (EPA method 9060.) Three (3) samples were tested and the data are presented in Table 2. The TOC ranged from 15.3 to 18.8 g/kg in the samples. Low levels of most metals were found but most did not approach the

screening level (SL). The highest level detected was for Mercury (Hg), which was 53.7% of the screening level.

Organotin (pore water method - Krone et al.) Three (3) samples were tested and the data are presented in Table 3. Organotin was not detected in any of the samples at the method detection limit (MDL).

Pesticides/PCBs (EPA method 8081A/8082), Phenols, Phthalates and Miscellaneous Extractables (EPA method 8270C). Three (3) samples were tested and the data are presented in Table 4. No PCBs were found at the MDL in any of the samples. Three (3) phthalate compounds were detected in one or more samples, but all values were below their respective SLs; the highest was for butylbenzylphthalate at 35.7% of the SL. One phenol, 3 & 4 Methylphenol, was detected at 16.4% of the SL. One extractable, benzoic acid was, also, found in all samples, with the highest level detected at 4% of the SL. The pesticide endosulfan I, which has no established SL, was detected at a very low level (0.88 ug/kg). Total DDT and its derivatives (DDD & DDE) were found in all three of the samples at levels less than the SL (6.9 ug/kg, ranging from 6.39 to 6.78 ug/kg (ppb). DEQ cleanup levels in soil for total DDT is 7000 ug/kg (ppb), which would apply if sediment were placed upland.

Polynuclear Aromatic Hydrocarbons (EPA method 8270C). Three (3) samples were tested and the data are presented in Tables 5 and 6. Some of the “low molecular weight” and most of the “high molecular weight” PAHs were found in all three (3) of the samples, with values ranging below 3.5% of their respective SLs.

CONCLUSION

Collection and evaluation of the sediment data was completed using guidelines from the Dredge Material Evaluation Framework for the Lower Columbia River Management Area (DMEF). The DMEF is a regional manual developed jointly with regional EPA, Corps, Oregon Department of Environmental Quality and Washington Departments of Ecology and Natural Resources. This document is a guideline for implementing the Clean Water Act (40 CFR 230) Section 404 (b)(1). The screening levels used are those adopted for use in the DMEF, final November 1998. The DMEF tiered testing approach requires that material in excess of 20% fines and greater than 5% volatile solids, as well as any material with prior history or is suspected (“reason to believe”) of being contaminated, be subjected to chemical as well as physical analyses.

On December 18, 2001 a total of three (3), surface grab, sediment samples were collected from the fish discharge at the south end of Bradford Island. Gravity core samples were attempted, but the sampling device would not penetrate to retrieve required volume of sediment. All samples were submitted for physical analyses including total volatile solids and also were analyzed for metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons and organotin.

None of the laboratory data results exceeded their respective screening levels in the DMEF. Levels of DDT and its derivatives (DDD & DDE) were found in all three of the samples at levels ranging from 6.39 to 6.78 ug/kg (ppb), but did not exceed the 6.9 ug/kg DMEF screening level. All sediment is determined to be suitable for unconfined, in-water placement or upland placement with return water without further characterization under guideline of the DMEF. DEQ's cleanup levels in soil for total DDT is 7000 ug/kg (ppb).

Although the 1577 CY of material dredged was determined to be suitable for unconfined inwater placement, it was determined, as a management option, to barge the material to RABANCO Regional Disposal Company's facility in Roosevelt Washington.

References

1. Briton J. U.S. Army Corps of Engineers, Portland District. September 1991. Bonneville Navigation Lock Sediment Evaluation.
2. U. S. Army Corps of Engineers, Portland District. October 1991. Columbia River Pool Lowering (MOP).
3. Sherman T.J. U.S. Army Corps of Engineers, Portland District. October 1997. Bonneville Second Powerhouse Sediment Evaluation.
4. U.S. Army Corps of Engineers, Portland District and Seattle District; U.S. Environmental Protection Agency, Region 10; Oregon Department of Environmental Quality; Washington State Department of Natural Resources and Department of Ecology. 1998 Final. Dredge Material Evaluation Framework for the Lower Columbia River Management Area.
5. U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. February 1998. Evaluation of Dredged Material Proposed for Discharge in Inland and Near Coastal Waters - Testing Manual (referred to as the "Inland Testing Manual").
6. Clean Water Act, 40 CFR 230 (b)(1).
7. Cornforth Consultants Inc. U.S. Army Corps of Engineers, Portland District. May & November 2001. Bonneville Second Powerhouse Corner Collector Bypass System.
8. URS Consultants Inc., for U.S. Army Corps of Engineers, Portland District. September 2001. Bradford Island Landfill Cascade Locks, Oregon. URS Portland Oregon.
9. U.S. Army Corps of Engineers. 2001. Sediment Sampling and Analysis Plan for Bonneville Dam, Bradford Island Fish Ladder. Portland District.

Physical Analysis & Volatile Solids

Sample I.D.	Grain Size (mm)		Percent			
	Median	Mean	Gravel	Sand	Silt/Clay	Volatile Solids
BONN-P-01	0.06	0.07	0.00	50.61	49.39	4.84
BONN-P-02	0.07	0.11	0.71	51.60	47.70	5.44
BONN-P-03	0.07	0.07	0.00	54.63	45.37	4.69
BONN-P-03 DUP	0.06	0.06	0.00	48.13	51.87	4.45
Mean	0.07	0.08	0.02	51.20	48.57	4.95
Minimum	0.06	0.06	0.00	48.13	45.37	4.45
Maximum	0.07	0.11	0.71	54.63	51.87	5.44

Table 2. Bonneville Dam, Bradford Island Fish Ladder Exit

Sampled December 18, 2001

Inorganic Metals and TOC

Sample I.D.	As	Sb	Cd	Cu	Pb	Hg	Ni	Ag	Zn	TOC
	mg/kg (ppm)									
BONN-P-01	4.79 B2	1.19 J B1	1.55	24.4	15	0.204	15.1	0.258 J	147	16000
BONN-P-02	4.96 B2	1.59 J B1	1.53	26.5	15.8	0.220	14.3	0.146 J	145	15300
BONN-P-03	5.93 B2	1.77 J B1	1.44	24.7	16.3	0.202	15.3	0.182 J	153	18800
Screening level (SL)	57	150	5.1	390	450	0.41	140	6.1	410	

Estimated value (reported values are above the MDL, but below the PQL).

B1 = Low-level contamination was present in the method blank (reported level was < 10 times blank concentration).

B2 = Low-level contamination was present in the method blank (reported level was > 10 times blank concentration).

Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).

Table 3. Bonneville Dam, Bradford Island Fish Ladder Exit

Sampled December 18, 2001

Organotin
Total (pore water) TBT

Sample I.D.	Tetrabutyltin	Tributyltin	Dibutyltin	Monobutyltin	Total TBT
	ug/L				
BONN-P-01	<0.0024	<0.0035	<0.0024	<0.0023	ND
BONN-P-02	<0.0025	<0.0035	<0.0025	<0.0024	ND
BONN-P-03	<0.0027	<0.0038	<0.0027	<0.0026	ND
Screening level (SL)					0.15
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).					

Table 4. Bonneville Dam, Bradford Island Fish Ladder Exit

Sampled December 18, 2001

Pesticides, PCBs, Phenols, Phthalates and Extractables

Sample I.D.	Pesticides					Phthalates			Phenol	Extractables
	ug/kg (ppb)									
	4,4'-DDD	4,4'-DDE	4,4'-DDT	Total DDT	Endo sulfan I	bis(2-Ethylhexyl) phthalate	Di-n-butyl phthalate	Butylbenzyl-phthalate	3- & 4-Methyl phenol	Benzoic Acid
BONN-P-01	1.91 J C2	2.67 J C1	2.20 J C1	6.78	<0.93	42.1 J B1	27.4 J B1	19 J B1	<4.45	12.6 J
BONN-P-02	2.50 J C2	3.38 J C1	0.51 J C1	6.39	<0.72	18.2 J B1	<23.0	346 B2	110	11.4 J
BONN-P-03	2.75 J C2	2.76 J C1	1.01 J C1	6.52	0.879	18.0 J B1	<24.1	<5.26	<4.1	26.0 J
Screen level (SL)	DDD + DDE + DDT = 6.9				*	8300	5100	970	670	650

No PCBs were found in any sample at the MDL (SL = 130 ppb).

* Screening level has not been established.

J = Estimated value (reported values are above the MDL, but below the PQL).

B1 = Low-level contamination was present in the method blank (reported level was < 10 times blank concentration).

B2 = Low-level contamination was present in the method blank (reported level was > 10 times blank concentration).

Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).

Polynuclear Aromatic Hydrocarbons (PAHs)
Low Molecular Weight Analytes
ug/kg (ppb)

Sample I.D.	Acenaphthene	Acenaphthylene	Anthracene	Fluorene	2-Methyl naphthalene	Naphthalene	Phen anthrene	Total Low PAHs
BONN-P-01	<1.49	<1.31	5.72	<1.41	<0.47	3.91	19.6	29.2
BONN-P-02	<1.31	<1.15	<0.67	<1.23	<0.41	<1.24	2.91	2.9
BONN-P-03	<1.37	<1.21	3.88	<1.29	<0.43	<1.30	9.69	13.6
Screen level (SL)	500	560	960	540	670	2100	1500	5200
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit)								

Polynuclear Aromatic Hydrocarbons (PAHs)
High Molecular Weight Analytes
ug/kg (ppb)

Sample I.D.	Benzo(a)-anthracene	Benzo(b)-fluoro-anthene	Benzo(k)-fluoro-anthene	Benzo-(g,h,i)-perylene	Chrysene	Pyrene	Benzo(a)-pyrene	Dibenz(a,h)-anthracene	Indeno-(1,2,3-cd)-pyrene	Fluor-anthene	Total High PAHs
BONN-P-01	20.5	41.8		<0.497	26.2	34.9	16	<0.701	19.9	37.9	197.2
BONN-P-02	5.0	10.0		<0.436	7.14	5.0	4.23	<0.616	<0.616	4.5	35.9
BONN-P-03	13.8	24.9		<0.457	14.4	22.7	9.13	<0.645	8.86	22.1	115.9
Screen level (SL)	1300	b + k = 3200		670	1400	2600	1600	230	600	1700	12000
<p>J = Estimated value (reported values are above the MDL, but below the PQL). Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).</p>											

Figure 1. Bonneville Dam Sediment Sampling Events Map

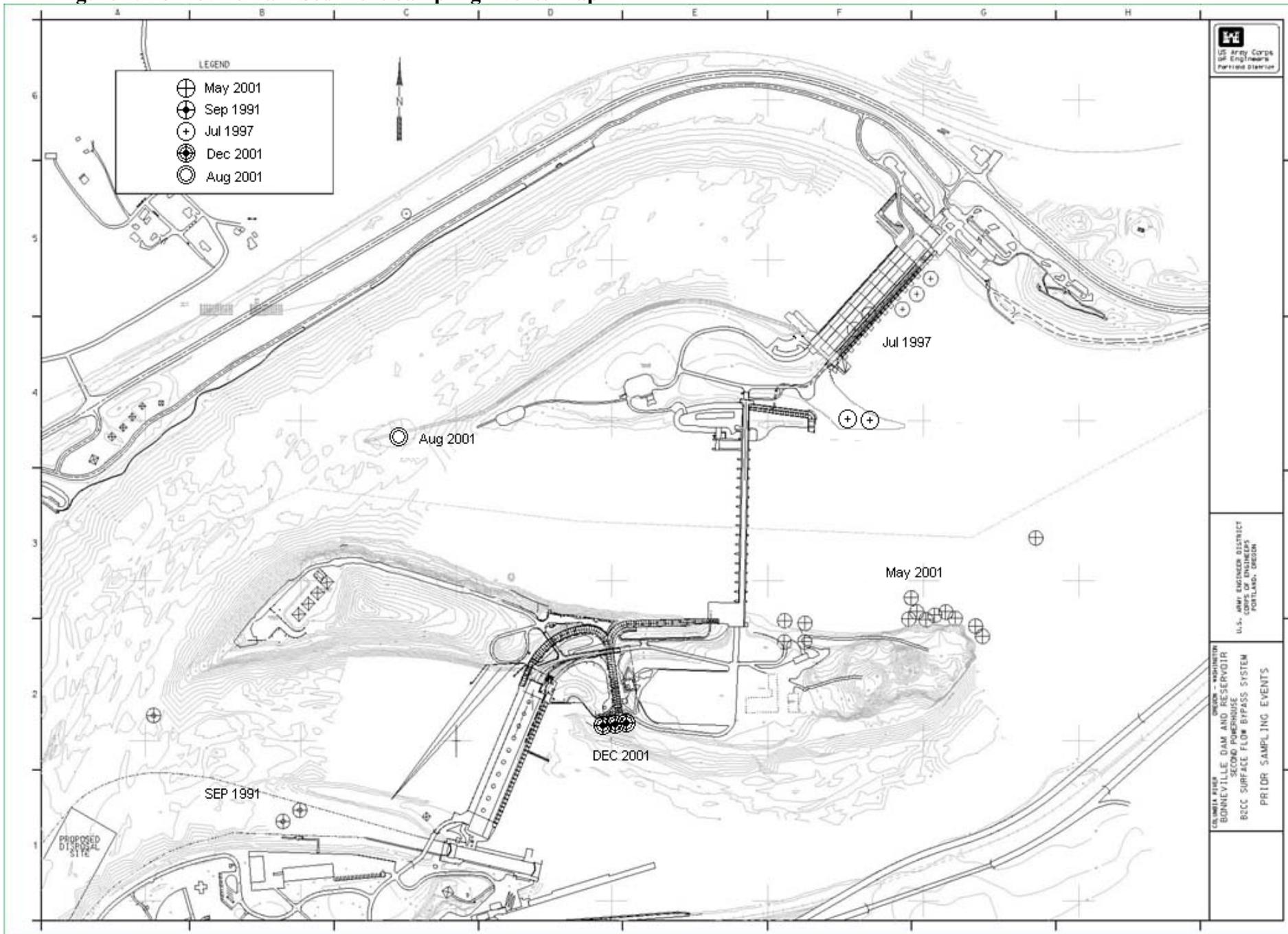


Figure 2. Bonneville Dam, Bradford Island Fish Ladder Exit

