Appendix B

Cougar Reservoir Temperature Control Project
Sediment Quality Evaluation

June 4-5 & August 6-7, 2002
Sampling Events

Prepared by Portland
District Corps of Engineers

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ABSTRACT

In 1996, during the design phase of the project, Geotechnical Resources Inc. submitted twelve (12) surface grab sediment samples for physical and chemical analyses. These samples were collected at the 1400' contour near the intake structure and diversion tunnel and upstream locations, with results published in the Design Memorandum No. 21. No organic contaminates were detected above method detection levels (MDL) and metals were detected only at low levels and were considered at background levels. However, with the greater than anticipated amount of erosion and resulting turbidity during the drawdown process, questions from the public were raised about potential contaminate levels in the turbidity and possible sediment releases. As a result, twelve (12) surface sediment samples, targeting fine-grained sediment and organic material, were collected in June 2002. These samples were collected to target fine-grain and organic material that had been eroded during the drawdown, with one (1) sample to represent lakebed sediments, which were exposed after the drawdown event. All samples were submitted for physical parameters including total volatile solids and five (5) samples were chemically analyzed for heavy metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables and polynuclear aromatic hydrocarbons.

Dichlorodiphenyltrichloroethane (DDT) was detected above levels of concern[1,2] in four (4) of the five (5) samples collected during the June sampling event. As a result of these findings, a follow-up sampling event was conducted on August 6-7, 2002, which analyzed fifteen (15) samples for physical parameters, total organic carbon (TOC) and total DDT (DDT+DDE+DDD or Σ DDT). This event detected no Σ DDT, at MDLs (Method Detection Limits), present in surface sediments taken at two (2) locations in the McKenzie River, downstream of the dam and upstream of the reservoir. Only low levels of Σ DDT (~15% of S.L.) were detected near the inlet to the diversion tunnel, with one (1) of five (5) samples collected from within the current reservoir exceeding screening levels for Σ DDT [1,2] (see Table 9, pages 14-16 for complete results). Samples collected from potential future erosive sites, within the reservoir, contained Σ DDT at levels above the S.L [1,2]. Future sediment monitoring is recommended during winter storm events, to document turbidity and potential sediment migration to evaluate potential transport of Σ DDT.

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[1] Dredge Material Evaluation Framework – Screening level for open water disposal 6.9 ug/kg total DDT.
[2] Oregon Department of Environmental Quality – Level II screening level 7.0 ug/kg total DDT.
[3] See Attachment A & B for complete Sampling and Analysis Plans

INTRODUCTION

This report will evaluate analytical data from both the June and August 2002 sampling events. The goal of the June 2002 sampling event[3] was to target fine-grained sediment and organic material, because most contaminates of concern bind to these substrates. The samples taken in the June event, from cutbanks adjacent to areas of erosion, collected to represent the eroded material, targeted only the

fine-grained and organic lens within the vertical profile and did not represent the entire volume of material that has been eroded. Due to the detection of Σ DDT in these samples, the August 2002 sampling event[3] attempted to satisfy the following questions, with the corresponding action:

1. What levels of Σ DDT are in the background?

   Collect background sediment from above the reservoir on the South Fork of the McKenzie (both in-water and upland).

2. What levels of Σ DDT are represented in the total volume of sediment eroded and those that have a potential for future erosion?

   Collect vertical profile samples from the cut-bank areas where only the fine-grained sediment was targeted in the first sampling event in June were collected.

3. What levels of Σ DDT are exposed in the current reservoir?

   Collect surface sediment, which has recently been eroded and homogenized during the drawdown even, from all the newly formed delta areas in the current reservoir (1400 foot level).

4. What levels of Σ DDT might have migrated beyond the confines of the reservoir?

   Collect recently deposited sediment from just below the dam that would represent sediment that was released during the drawdown.

PREVIOUS STUDIES

In February of 1996 twelve (12) surface grab sediment samples were submitted, by Geotechnical Resources Inc., to the Corp's materials lab (Troutdale, OR) for physical analysis and Sound Analytical Services laboratory for chemical analyses. These samples were collected, from within the reservoir, at the 1400' contour near the intake structure and diversion tunnel and several upstream locations. Physical parameters included soil classification, particle size and dredge test analysis, with analysis varying from 80% gravel to 90% silt. Chemical methods TPH-HCID (petroleum hydrocarbon identification) with quantification for gasoline, TPH-418.1 (Total Recoverable Petroleum Hydrocarbons), 8 RCRA metals, 1311 TCLP (leachability of metals), EPA 200.8 (Trace metals), 7471 (lead), 8080 (chlorinated pesticides and PCBs) and TOC (total organic carbon) were performed on select samples. No organic contaminates were detected above method detection levels (MDL) and metals were detected only at low levels and are considered at background. The laboratory encountered some minor problems with matrix interferences causing recovery levels for several surrogate analyses to be outside the recommended range. These problems are considered minor and do not affect the confidence on the overall data objectives.

CURRENT STUDIES

JUNE 4-5, 2002 SAMPLING EVENT

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During the drawdown process, erosion of the fine-grained sediment delta areas, formed where tributaries enter the reservoir, had occurred. The eroded sediments caused turbidity and sedimentation concerns within and downstream of the reservoir. In addition to the concern of turbidity levels, the question of possible distribution of contamination, contained within the sediments, had arisen. Members of the public expressed concern for the presence of some heavy metals and the use of herbicides and pesticides in areas upstream of the reservoir. Due to the large amounts of sediment being eroded and the concerns expressed, sampling was scheduled.

Twelve (12) physical and five (5) chemical analyses were collected from delta areas. Physical parameters included soil classification, particle size and dredge test analysis, with chemical analyses including: metals (6020/7471), total organic carbon (TOC) method 9060, polynuclear aromatic hydrocarbons (PAHs), phenols, phthalates, chlorinated organic compounds, misc. extractables by 8270 SIM method (low level detection method), pesticides/PCBs by 8081/8082 and chlorinated herbicides by method 8151, conducted by Severn Trent Laboratory in Tacoma. DDT and its breakdown products were the only chemicals detected at levels of concern. [1,2]

The following areas were selected for chemical analyses (with corresponding Σ DDT levels as indicated), two (2) samples were collected from East Fork cut banks (Σ DDT @ 8.5 & 32.6 ppb), one (1) sample below from below the Slide Creek boat ramp, from a delta cut bank (Σ DDT @ 23.9 ppb), one (1) sample from the Annie Creek delta (Σ DDT @ 18.6 ppb), and one (1) sample was collected from lake deposits near the face of the dam on the Rush Creek side (Σ DDT @ 5.3 ppb).

Table 1. June 4 & 5, 2002 Sampling Event, Sampling Station Coordinates (NAD 83, Oregon State Plane South) (Coordinates for samples submitted for physical analysis only, not available).

COUG-G-05 44º 04.846’ 122º 13.670’ Slide Creek – main channel bank.	COUG-G-07 44º 07.145’ 122º 13.726’ North bank of East Fork.	COUG-G-09 44º 07.181’ 122º 13.561’ North bank of East Fork.
COUG-G-11 44º 07.616’ 122º 14.443’ Lake deposit – mid-dam	COUG-G-13 44º 05.949’ 122º 13.778’ Annie Creek – Near main channel.	

AUGUST 6-7, 2002 SAMPLING EVENT

During the August event fifteen (15) samples were collected and analyzed for Σ DDT, total organic carbon (TOC) and physical parameters; this was a follow-up to the Σ DDT detected, above SL, in the June event. Basic objectives are stated in the Introduction section above, as well as, in the SAP attached in Attachment B. The samples were collected as follows: two (2) background samples collected from the South Fork of the McKenzie above the reservoir; three (3) vertical profile samples from the cut-bank areas, where only the fine-grained sediment was targeted in June; five (5) surface composite sediment samples collected from the reservoir, to represent the recently eroded and re-homogenized sediment from the drawdown even. Each of these five (5) samples analyzed were a composite of 2-3 surface grabs from designated areas within the current reservoir. Two (2) additional surface samples were collected, downstream of the dam, on the McKenzie River, from slack water areas where Σ DDT might have been deposited, if it had migrated beyond the confines of the reservoir. One upland station was sampled and two samples submitted for analyses. These samples were collected from forest floor debris, about one-half mile northeast of the bridge crossing the South Fork, upstream of the reservoir. Samples represented the surface - 6”depth and 6”-12” depth of forest floor debris.

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Table 2. August 6 & 7, 2002 Sampling Event, Sampling Station Coordinates (NAD 83, Oregon State Plane South).

COUG-G-14 (No GPS Reading Available) Downstream of Powerhouse – east bank.	COUG-G-15 44º 08.568’ 122º 14.323’ USGS gauging station	COUG-G-16 44º 03.373’ 122º 13.127’ Upstream of reservoir.
COUG-G-17 44º 03.395’ 122º 13.133’ Upstream of reservoir.	COUG-G-18 44º 02.816’ 122º 12.961’ Upland – above reservoir.	COUG-G-19 44º 02.816’ 122º 12.961’ Upland – above reservoir (same location as COUG-G-18.
COUG-G-20 44º 04.732’ 122º 13.671’ (Same location as COUG-G-06) Slide Creek – main channel bank.	COUG-G-21 44º 04.843’ 122º 13.664’ (Same location as COUG-G-05) Slide Creek – main channel bank.	COUG-G-22 44º 07.138’ 122º 13.720’ (Same location as COUG-G-07) North bank of East Fork.
COUG-G-23 44º 07.178’ 122º 13.568’ (Same location as COUG-G-09) North bank of East Fork.	COUG-G-24 44º 07.035’ 122º 14.026’ 44º 07.035’ 122º 14.036’ 44º 07.034’ 122º 14.036’ Composite of 3 samples in delta of East fork – after drawdown.	COUG-G-25 44º 06.433’ 122º 13.918’ 44º 06.431’ 122º 13.924’ 44º 06.447’ 122º 13.965’ Composite of 3 samples in delta of South fork – after drawdown.
COUG-G-26 44º 06.724’ 122º 13.935’ 44º 06.734’ 122º 13.932’ Approximately halfway between East Fork & South fork. Composite of 2 samples from both sides of Reservoir – after drawdown.	COUG-G-27 44º 07.507’ 122º 14.490’ 44º 07.539’ 122º 14.431’ 44º 07.590’ 122º 14.393’ Composite of 3 samples near inlet to diversion tunnel – after drawdown.	COUG-G-28 44º 07.534’ 122º 14.306’ 44º 07.546’ 122º 14.306’ 44º 07.538’ 122º 14.300’ Composite of 3 samples in delta at Northeast end of reservoir – after drawdown.

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RESULTS – JUNE 4-5, 2002 & AUGUST 6-7, 2002

Physical and Total Volatile Solids (TVS) (ASTM methods).

June Event: Twelve (12) samples were submitted for physical and TVS analyses; data are presented in Table 3. Four (4) samples were classified as "silt with sand, five (5) samples were classified as "silt" and three (3) samples were classified as "sandy silt." Mean grain-size for all the samples is 0.04 mm, with 0.06% gravel, 22.0% sand and 78.0% fines. Volatile solids for all the samples ranged from 25600 mg/kg to 82200 mg/kg.

August Event: Fifteen (15) samples were submitted for physical and TVS analyses; data are presented in Table 8. Five (5) samples were classified as "silty sand". Two (2) samples each were classified as "silt with sand", and "sandy silt." One (1) sample each was classified as "poorly graded gravel", "poorly graded sand with gravel," "poorly graded sand," "well graded sand with, gravel," "poorly graded sand with silt and gravel" and "elastic silt." Mean grain-size for all the samples is 1.29 mm, with 14.8% gravel, 51.85% sand and 40.45% fines. Volatile solids for all the samples ranged from 1390 mg/kg to 53700 mg/kg.

Metals (EPA method 6020/7471), Total Organic Carbon (EPA method 9060).

June Event: Five (5) samples were submitted for testing and the data are presented in Table 4. The TOC ranged from 10,800 to 103,000 mg/kg in the samples.

Low levels of most metals were found, but did not approach the screening levels (SL) in the DMEF. Cu & Ni exceeded DEQ Level II screening levels; Cu & Ni levels are consistent in all the samples and consistent with other sample analyses from the Willamette Valley area and are considered background.

August Event: Fifteen (15) samples were submitted for TOC testing, data are presented in Table 9. The TOC ranged from 1180 to 240,000 mg/kg in the samples. No metals were run on these samples, because follow-up to the June sampling event, for metals, was determined not to be necessary.

Pesticides/PCBs (EPA method 8081A/8082), Phenols, Phthalates and Miscellaneous Extractables (EPA method 8270).

June Event: Five (5) samples were tested for pesticides/PCBs and the data are presented in Table 5. No PCBs were found at the MDL in any of the samples. No pesticides (except Σ DDT) were found at the MDL in any of the samples. Two phthalate compounds were detected in one sample each, and the values were well below their respective SLs. No phenols were detected in any samples above MDLs. One miscellaneous extractable (n-nitroso-di-n-propylamine)(DPN) was found in one (1) sample, COUG-G-07. This was not confirmed in the quality assurance (QA) split sample. This chemical is produced primarily as a research chemical and not for commercial purposes (Spectrum). DPN was not considered to be a chemical of further interest.

The following stations were tested for Σ DDT (with corresponding levels as indicated), two (2) samples were collected from East Fork cut banks (Σ DDT @ 8.5 & 32.6 ppb), one (1) sample below from the Slide Creek boat ramp, from a delta cut bank (Σ DDT @ 23.9 ppb), one (1) sample from the Annie Creek delta (Σ DDT @ 18.6 ppb), and one (1) sample was collected from lake deposits near the face of the dam on the Rush Creek side (Σ DDT @ 5.3 ppb).

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August Event: Fifteen (15) samples were submitted for Σ DDT (DDT, DDE & DDE) analyses.

Fifteen (15) samples were collected and analyzed for Σ DDT; two (2) background samples collected from the South Fork of the McKenzie above the reservoir (no Σ DDT detected, <2.6% fines); three (3) vertical profile samples from the cut-bank areas where only the fine-grained sediment was targeted in June (7.27, 7.11 & 17.65 ppb); five (5) surface composite sediment samples collected from the reservoir to represent the recently eroded and homogenized during the drawdown even (ND @ 0.7 ug/kg-ppb), 1.08, 4.77, 6.19 & 25.87 ppb). Each of these five (5) samples analyzed were a composite of 2-3 surface grabs from a designated area of the reservoir; two (2) surface samples from the McKenzie River, downstream of the dam (both ND @ <0.7 ppb) in slack water areas, where Σ DDT contaminated sediments might have been deposited, if it had migrated beyond the confines of the reservoir. One (1) upland station was sampled, upland on a logging road cut bank. Samples represented the surface to 6"depth and 6"-12" depth of forest floor debris (Σ DDT @ 374.6 ppb top 6") and (Σ DDT @ 36.9 ppb 6" – 12" depth).

Polynuclear Aromatic Hydrocarbons (EPA method 8270C).

June Event: Five (5) samples were submitted for testing, data are presented in Table 7 & 8. No "low or high molecular weight" PAHs were detected at the MDL in the samples.

August Event: No samples were submitted for method 8270C.

CONCLUSION

Dichlorodiphenyltrichloroethane (Σ DDT) was detected above levels of concern[1,2] in four (4) of the five (5) samples collected during the June sampling event. As a result of these findings, a follow-up sampling event was conducted on August 6-7, 2002, which analyzed fifteen (15) samples for physical parameters, total organic carbon (TOC) and Σ DDT. This event detected no Σ DDT present in surface sediments taken at two (2) locations in the McKenzie River, downstream of the dam or in two (2) samples from upstream of the reservoir (<2.6% fines). Only low levels of Σ DDT (<16% of S.L.) were detected near the inlet to the diversion tunnel, with one (1) of five (5) samples collected from within the current reservoir exceeding screening levels [1,2], for Σ DDT. Samples collected from potential future erosive sites, within the reservoir, also, contained Σ DDT at levels above the S.L [1,2].

The original source of the pesticide, dichlorodiphenyltrichloroethane, was likely from forest applications to public and private lands, in 1949, in this area to control budworm at a rate of approximately one (1) pound per acre. The one (1) upland station sampled, with two (2) analyses, was collected upland on a logging road cutbank and represented the surface to 6"depth and 6"-12" depth of forest floor debris (Σ DDT @ 374.6 ppb top 6") and (Σ DDT @ 36.9 ppb 6" – 12" depth). This level of Σ DDT is consistent with a one (1) pound per acre application, with a fifteen (15) year half-life of Σ DDT. The earlier material that eroded into the reservoir appears to have contained higher levels of Σ DDT than later sediments entering the reservoir; evidenced by surface sediments collected in the reservoir in the 1996 event and undisturbed surface lakebed sediments not containing detectable levels of Σ DDT, with sediments at lower levels containing higher levels of Σ DDT. The data would indicate that Σ DDT had collected behind the reservoir and then been covered with cleaner non-contaminated

sediment, effectively isolating it from aquatic and benthic organisms. It is likely that this same "capping" effect will take place, covering any Σ DDT exposed during the drawdown events, following construction of the Temperature Control Structure when "normal" operation or the reservoir is resumed.

While Σ DDT was detected in sediments within the reservoir and in upland samples, it was not measurable in sediments below the reservoir and only at low levels in areas near the inlet to the diversion tunnel outlet from the reservoir. It is likely that some floating organic material (fir needles, twigs, etc.), binding DDT, was released during the initial drawdown, but this material was likely distributed over a very large area, and not measurable nor posing any significant risk to the environment, due to dilution by distribution. Because Σ DDT is hydrophobic (little affinity for water) it will tend to remain bound to the organic material and not dissolve into the water column.

The sediment represented by sample COUG-G-26 contained Σ DDT at 25.87 ppb. This sample was a composite of two (2) samples, one (1) from the East near shore bank and one (1) from the West near shore bank, collected along a cross section, about half-way between the confluence of the East Fork and the South Fork from within the post drawdown 1400' pool. Because this material exceeds the SL guidelines, and is currently exposed to the water, it may require management. Best management practices in this case would likely be to allow natural attenuation (natural capping) to take place over time. Earlier testing of the lakebed sediments, prior to the drawdown, in the1996 sampling event were non-detect for Σ DDT. As part of the management strategy for this sediment it will likely include future sampling of this area after the construction period, when all drawdown and further erosion factors are complete, to determine if natural attenuation is effectively isolating the Σ DDT from benthic organisms exposure. Future erosion events will, also, potentially cover this sediment with new deposits that will need to be tested for Σ DDT levels.

The biggest potential for a future release of Σ DDT from Cougar Reservoir comes from the re-suspending and re-distribution of sediments currently exposed during the initial drawdown event. Vertical profile samples indicate sediments in former deposit sites contain Σ DDT above guideline SLs. As stated earlier, future sampling will need to be done to determine if Σ DDT is exposed within the pool from future erosive action.

Alternatives for pool depth (1400' vs. 1532'), drawdown rate (3'/day vs. 6'/day) and target date for reaching the 1400-foot level (March 1 vs. April 1) were discussed. The decision to keep the pool as close to the 1400-foot level as possible, after allowing pool elevation to rise to 1450' for protection of Bull Trout spawning, with a return to 1400' starting on December 1, 2002, was elected as the best management alternative. The differences between the pool level alternatives would likely have little effect on Σ DDT being released downstream. It is difficult to know which alternative might result in the greater re-suspending and re-distribution of sediments, but it is very unlikely that any erosion that occurs will cause greater suspending and distribution of sediments than the original event, which did not result in a measurable release in the sediment tested downstream of the dam.

Turbidity particulate and possibly some bedload sediment monitoring is recommended during the winter and spring seasons. Because Σ DDT binds to the finer-grained sediment particles and organic material, it is recommended that these fine-grained materials be monitored. While a sampling and analysis plan will need to be developed, it would likely include areas above and below the reservoir, upstream and downstream of the confluence of the South Fork and the Mainstem of the McKenzie River, with other possible areas to be determined.

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[1] Dredge Material Evaluation Framework – Screening level for open water disposal 6.9 ug/kg total DDT.

[2] Oregon Department of Environmental Quality – Level II screening level 7.0 ug/kg total DDT.

[3] See Attachment A & B for complete Sampling and Analysis Plans

[4] Oregon Department of Environmental Quality - Upland Soil Cleanup Table (OAR 340-122-045 for Total DDT = 7000 ug/kg – ppb; (DDD = 3000 ppb; DDE = 2000 ppb & DDT = 2000 ppb).

Table 3. Cougar Temperature Control Project **Sampled June 4-5, 2002**

Physical Analysis

Sample I.D.	Grain Size (mm)		Percent			mg/Kg
	Median	Mean	Gravel	Sand	Silt/Clay	Volatile Solids
COUG-G-01	0.040	0.044	0.0	22.3	77.7	67200
COUG-G-02	0.032	0.033	0.0	13.3	86.7	57000
COUG-G-03	0.030	0.032	0.0	10.9	89.1	73000
COUG-G-04	0.040	0.047	0.0	27.1	72.9	69500
COUG-G-05	0.028	0.033	0.0	15.6	84.4	56800
COUG-G-06	0.094	0.093	0.0	73.0	27.0	82200
COUG-G-07	0.007	0.012	0.0	10.7	89.3	51300
COUG-G-08	0.017	0.023	0.1	6.0	93.9	54300
COUG-G-09	0.080	0.093	0.0	61.5	38.5	64500
COUG-G-10	0.008	0.014	0.0	3.2	96.8	72700
COUG-G-11	0.008	0.016	0.0	3.4	96.6	25600
COUG-G-13	0.027	0.034	0.6	16.9	82.5	68200
Mean	0.034	0.040	0.06	22.0	78.0	61858
Minimum	0.007	0.012	0.0	3.2	27.0	25600
Maximum	0.094	0.093	0.6	73.0	96.8	82200

Inorganic Metals and TOC

Sample I.D.	As	Sb	Fe	Cd	Cu	Pb	Hg	Ni	Ag	Zn	TOC
	mg/kg (ppm)										
COUG-G-05	0.81J	0.37J B1	26500	<0.01	49.1B2	4.7B2	<0.022	41.1	0.23JB2	67.5B2	22400
COUG-G-07	2.25	2.4JB2	32900	<0.01	56B2	5.9B2	0.033	37.5	0.22JB2	62.3B2	10800
* COUG-G-07A	1.8	0.3	40900	0.42	53.2	4.9	<0.03	37.3	0.5	60.7	16800
COUG-G-09	1.1J	1.9JB1	13400	<0.02	25.7B2	3.5B2	0.04J	19	0.19JB2	32.5B1	103000
COUG-G-11	3.5	1.12JB1	36300	<0.01	44.3B2	11.5B2	0.05	25.7	0.36JB2	86.9B2	25700
COUG-G-13	2.7	0.68JB1	29500	<0.01	37.6B2	7.3B2	0.04	23	0.32JB2	62.1B2	20700
Screening level (SL) DMEF	57	150	+	5.1	390	450	0.41	140	6.1	410	
Screening level (SL) DEQ Level II	6	+	+	0.6	36	35	0.2	18	4.5	123	

+ No screening level established

* COUG-G-07A is the Quality Assurance lab sample splint for COUG-G-07

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).

Pesticides, PCBs*, Phenols**, Phthalates and Extractables**

Sample I.D.	Pesticides				Phthalates		Herbicides
	ug/kg (ppb)						
	4,4'-DDD	4,4'-DDE	4,4'-DDT	Total DDT	bis(2-Ethylhexyl) phthalate	3 & 4 Methyl phenol	N-nitroso-di-n-propylamine
COUG-G-05	13.3	8.15	2.42 J	23.9	<78.6	<5.4	<2.5
COUG-G-07	3.38	3.7	1.45	8.5	<78.6	<5.4	32.4
* COUG-G-07A	1.10	0.616	<0.487	1.72	<28	<44	<22
COUG-G-09	17.9	6.34	8.39	32.6	<78.6	17.8	<2.5
COUG-G-11	2.75 J	2.57 J	<0.36	5.32	<78.6	<5.4	<2.5
COUG-G-13	9.62	6.06	2.93 J	18.6	110 J	<5.4	<2.5
Screening Level DMEF	DDD + DDE + DDT + = 6.9ppb				8300	670	28
Screening Level DEQ Level II	4 + 1.5 + 4 + = 7.0ppb				750	100	No freshwater value, marine number is 28

***No PCBs** were found in any sample at the MDL (<3.65ppb) (SL = 130 ppb).
****No Phenols or Extractables** were found in any sample at their respective MDLs.
* COUG-G-07A is the Quality Assurance lab sample splint for COUG-G-07
J = Estimated value (reported values are above the MDL, but below the PQL).
No other Pesticides or herbicides were detected at MDL
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).
All Total DDT values underwent second column confirmation.

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
COUG-G-05	<10.6	<9.4	<5.4	<10	<3.4	<10.1	<4.6	ND
COUG-G-07	<10.6	<9.4	<5.4	<10	<3.4	<10.1	<4.6	ND
* COUG-G-07A	<29.0	<19.0	<29.0	<19.0	<31.0	<50.0	<34.0	ND
COUG-G-09	<10.6	<9.4	<5.4	<10	<3.4	<10.1	<4.6	ND
COUG-G-11	<10.6	<9.4	<5.4	<10	<3.4	<10.1	<4.6	ND
COUG-G-13	<10.6	<9.4	<5.4	<10	<3.4	<10.1	<4.6	ND
Screen level (SL) DMEF	500	560	960	540	670	2100	1500	5200
Screen level (SL) DEQ Level II	57	160	57	77	+	176	42	76

* COUG-G-07A is the Quality Assurance lab sample splint for COUG-G-07
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit)

Table 7, Cougar Temperature Control Project **Sampled June 4-5, 2002**

Polynuclear Aromatic Hydrocarbons (PAHs)

High Molecular Weight Analytes

ug/kg (ppb)

Sample I.D.	Benzo(b)-fluro-anthene	Benzo(k)-fluro-anthene	Benzo-(g,h,i)-perylene	Chrysene	Pyrene	Benzo(a)-pyrene	Indeno-(1,2,3-cd)-pyrene	Fluor-anthene	Total High PAHs
COUG-G-05	<9.5	<9.5	<3.6	<12.6	<7.1	<12.6	<5.0	<10.0	ND
COUG-G-07	<9.5	<9.5	<3.6	<12.6	<7.1	<12.6	<5.0	<10.0	ND
* COUG-G-07A	<39.0	<39.0	<32.0	<29.0	<25.0	<41.0	<30.0	<33.0	ND
COUG-G-09	<9.5	<9.5	<3.6	<12.6	<7.1	<12.6	<5.0	<10.0	ND
COUG-G-11	<9.5	<9.5	<3.6	<12.6	<7.1	<12.6	<5.0	<10.0	ND
COUG-G-13	<9.5	<9.5	<3.6	<12.6	<7.1	<12.6	<5.0	<10.0	ND
Screen level (SL) DMEF	b + k = 3200		670	1400	2600	1600	600	1700	12000
Screen level (SL) DEQ Level II	+	27	300	57	53	32	17	111	193

* COUG-G-07A is the Quality Assurance lab sample splint for COUG-G-07
J = Estimated value (reported values are above the MDL, but below the PQL).
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).

Table 8. Cougar Temperature Control Project **Sampled August 6-7, 2002**

Physical Analysis

Sample I.D.	Grain Size (mm)		Percent			mg/kg
	Median	Mean	Gravel	Sand	Silt/Clay	Volatile Solids
COUG-G-14	1.60	4.73	71.83	24.08	4.09	3190
COUG-G-15	1.20	3.74	42.89	49.94	7.17	3120
COUG-G-16	1.30	3.85	42.82	54.56	2.62	1390
COUG-G-17	0.59	0.36	0.00	98.44	1.56	3040
COUG-G-18	0.07	0.09	0.00	55.27	44.73	53700
COUG-G-19	1.20	4.44	46.20	41.97	11.82	7420
COUG-G-20	0.11	0.11	0.00	77.43	22.57	7470
COUG-G-21	0.12	0.11	0.00	72.20	27.80	5890
COUG-G-22	0.07	0.07	0.00	56.90	43.10	10100
COUG-G-23	0.09	0.07	0.00	61.74	38.26	14710
COUG-G-24	0.04	0.04	0.00	20.08	79.92	10630
COUG-G-25	0.03	0.04	0.00	21.55	78.45	8200
COUG-G-26	0.02	0.04	0.00	13.87	86.13	11980
COUG-G-27	0.04	0.31	4.05	35.11	60.84	8420
COUG-G-28	0.05	0.07	0.00	42.75	57.25	9330
Mean	0.47	1.29	14.8	51.85	40.45	11330
Minimum	0.02	0.04	0.00	13.87	1.56	1390
Maximum	1.60	4.73	71.83	98.44	86.13	53700

Table 9. Cougar Temperature Control **Sampled August 6-7, 2002**

Total DDT With Breakdown Products & Total Organic Carbon

ug/kg (ppb)

Location & Date Sampled	Description	Sample ID	DDD	DDE	DDT	Total DDT	TOC
			ug/kg (ppb)				mg/kg
DOWNSTREAM OF DAM Sampled August 6-7, 2002	Downriver by Powerhouse	COUG-G-14	<0.485	<0.574	<0.646	ND	16600
	Downriver by Gauging Station	COUG-G-15	<0.397	<0.469	<0.528	ND	6130
UPSTREAM OF RESERVOIR Sampled August 6-7, 2002	Upriver South Fork (South of bridge)	COUG-G-16	<0.189	<0.223	<0.252	ND	1180
	Upriver South Fork (South of bridge)	COUG-G-17	<0.174	<0.206	<0.232	ND	6780
UPLAND ABOVE RESERVOIR[4] Sampled August 6-7, 2002	Upland above reservoir - top 6" of 12" of forest floor	COUG-G-18	1.76 J	84.6	290	376.4	240000
	Upland above reservoir - bottom 6" of 12" of forest floor	COUG-G-19	<0.28	11.2	25.7	36.9	107000
SLIDE CREEK BANK DEPOSIT Sampled August 6-7, 2002	South Fork - Slide Creek, Vertical profile of COUG-G-06	COUG-G-20	4.76	2.51	<0.319	7.27	29100
	South Fork - Slide Creek, Vertical profile of COUG-G-05	COUG-G-21	3.62	2.63J	0.856J	7.11	20800

Total DDT With Breakdown Products & Total Organic Carbon

ug/kg (ppb)

SLIDE CREEK BANK DEPOSIT Sampled June 4-5, 2002	South Fork - Slide Creek	COUG-G-05	13.3	8.15	2.42J	23.9	22400
EAST FORK BANK DEPOSIT Sampled August 6-7, 2002	East Fork, Vertical profile of COUG-G-07	COUG-G-22	8.57	7.22	1.86J	17.65	30000
EAST FORK BANK DEPOSIT Sampled June 4-5, 2002	East Fork - target fine grain sediment	COUG-G-07	3.38	3.7	1.45	8.5	10800

EAST FORK BANK DEPOSIT Sampled August 6-7, 2002	East fork - Organic layer, Vertical profile of COUG-G-09	COUG-G-23	8.91	5.84	1.41J	16.16	64700
	QC Split of COUG-G-23 - Blind Duplicate	COUG-G-A	9.78	5.37	3.64	18.79	56900
	QA Split of COUG-G-23 -Duplicate to different laboratory	COUG-G-23QA	7.07J	5.59J	<2.24	12.66	54600
EAST FORK BANK DEPOSIT Sampled June 4-5, 2002	East fork - Target organic layer	COUG-G-09	17.9	6.34	8.39	32.6	103000

RESERVOIR POOL COMPOSITE SAMPLE Sampled August 6-7, 2002	East Fork - drawdown pool (Composite of 3 grabs)	COUG-G-24	2.11J	2.66J	<0.617	4.77	25800
	QC Split of COUG-G-24 - Blind Duplicate	COUG-G-B	1.48J	3.23J	<0.573	4.71	26600
	QA Split of COUG-G-24 - Duplicate to different laboratory	COUG-G-24QA	2.11J	3.87J	<2.83	5.98	32100

Table 9. Cougar Temperature Control **Sampled August 6-7, 2002**

Total DDT With Breakdown Products & Total Organic Carbon

ug/kg (ppb)

RESERVOIR POOL COMPOSITE SAMPLE Sampled August 6-7, 2002	South Fork - drawdown pool (Composite of 3 grabs)	COUG-G-25	3.11J	3.08J	<0.497	6.19	18200
RESERVOIR POOL COMPOSITE SAMPLE Sampled August 6-7, 2002	Halfway between S. Fork & E. Fork (Composite of 2 grabs)	COUG-G-26	12	4.62J	9.25	25.87	23300
RESERVOIR POOL COMPOSITE SAMPLE Sampled August 6-7, 2002	Around outlet to diversion tunnel (Composite of 3 grabs)	COUG-G-27	<0.437	1.08J	<0.582	1.08	15600
RESERVOIR POOL COMPOSITE SAMPLE Sampled August 6-7, 2002	East side of Reservoir at dam (Composite of 3 grabs)	COUG-G-28	<0.462	<0.547	<0.615	ND	13600

[4] Oregon Department of Environmental Quality - Upland Soil Cleanup Table (OAR 340-122-045) for Total DDT = 7000 ug/kg – ppb; (DDD = 3000 ppb; DDE = 2000 ppb & DDT = 2000 ppb).

Sample Station Site Map
Collected June 4-5 & August 6-7, 2002

Attachment A

SEDIMENT
SAMPLING & ANALYSIS
PLAN FOR THE
COUGAR TEMPERATURE CONTROL PROJECT

MAY 2002

Prepared by:

CENWP-EC-HR

Portland District Corps of Engineers

Attachment A

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SAMPLING & ANALYSIS PLAN FOR THE COUGAR TEMPERATURE CONTROL PROJECT

1.0 PROJECT DESCRIPTION, SITE HISTORY AND ASSESSMENT

1.1 Project Site Description and Location: The Cougar Project is located on the South Fork of the McKenzie River, 4.4 miles upstream from the confluence with the McKenzie River. The project is 61 river miles (RM) upstream from the mouth of the McKenzie River (Willamette River RM 170.8). Cougar Dam is a rock-fill embankment about 1,600 feet long and 450 feet high from average tailwater to crest of dam. The project controls runoff from a drainage area of 210 square miles of mountainous and timbered land. The purpose of the proposed Willamette Temperature Control project is to modify temperatures for the Cougar and Blue River Projects through a structure addition to the existing intake that will regulate outlet through selective withdrawal to modify the temperature of downstream water released, to replicate a natural cycle of water temperatures, for the benefit of anadromous and native fish species.

Prior to construction of the multilevel withdrawal system, the reservoir level will be lowered to EI. 1400 NGVD (National Geodetic Vertical Datum), which is below minimum power pool El. of 1516 NGVD and full pool El. of 1699 NGVD (original plan called for pool to be lowered to 1375').

1.2 Site History: During the drawdown process, erosion of the [me-grained sediment delta areas formed where tributaries enter the reservoir has occurred. The eroded sediments are causing turbidity concerns within and downstream of the reservoir. In addition to the concerns of turbidity levels, the question of possible distribution of contamination contained within the sediments has arisen. Members of the public expressed concern for the presences of some heavy metals and the use of the herbicide Atrazine in areas upstream of the reservoir. There is no historical evidence that a source of contamination exists or has existed in the past in the areas upstream of the reservoir. However, due to the large amounts of sediment being eroded and the concerns expressed, sampling has been scheduled.

1.3 Previous Sediment Sampling: In February of 1996 twelve (12) sediment samples were submitted by Geotechnical Resources Inc. to the Corp's materials lab and Sound Analytical Services laboratory and for physical and chemical analyses. Physical parameters included soil classification, particle size and dredge test analysis, with analysis varying from 80% gravel to 90% silt. Chemical methods TPH-HCID (petroleum hydrocarbon identification) with quantification for gasoline, TPH-418.1, 8 RCRA metals, 1311 TCLP, EPA 200.8,7471 (lead), 8080 (pest/PCB) and TOC (total organic carbon) were performed on select samples. No organic contaminates were detected above method detection levels (MDL) and metals were detected only at low levels and are considered at background. The laboratory encountered some minor problems with matrix interferences causing recovery levels for several surrogate analyses to be outside the recommended range. These problems are considered minor and do not affect the confidence on the over all data objectives.

2.0 SAMPLING AND ANALYSIS OBJECTIVES

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

- Collect, handle and analyze representative sediments, from the exposed surface adjacent to the sediments eroded during drawdown, in accordance with protocols and Quality Assurance/Quality Control *(QNQC)* requirements.

- Characterize sediments for evaluation of environmental impact due to contamination.

- Conduct physical and chemical characterization only, for this sediment evaluation.

3.0 SAMPLING AND ANALYSIS REQUIREMENTS

3.1 Project Ranking: Ranking does not apply to this sampling plan,

3.2 Sampling and Analysis Requirements: Sampling is being scheduled at the sediment deltas that are being effected the most by the draw down. The areas containing fine-grained sediment will be targeted. A vertical profile sample will be collected from the bank of the eroded area (this will simulate a core sample).

4.0 **SAMPLE COLLECTION AND HANDLING PROCEDURES**

4.1 Sampling Locations and Numbering: Figure 1 shows the project and general sample location areas. Sampling sites are located for the best characterization of the material being eroded as possible. Proper QA/QC procedures as outlined in this section will be followed. Any deviation from these procedures shall be noted in the field log. Sample identification shall follow the following convention:

COUR-X- YY

Where, "COUR" denotes samples collected from the Cougar Reservoir, "X" denotes the type of sampling such as "G" = grab; "YY" denotes the numeric sample sequence number and will consist of two digits for all samples, except composites (i.e. 01,05, 15, etc.). The QC replicates will have a letter designation in place of the numeric designation of the primary sample; e.g. "A" added (CS-GC- A). Duplicate samples will be identified in the field notes.

4.2 Field Sampling Schedule: Sampling is planned for May 2002.

4.3 Field Notes: Field notes will be maintained during sampling and compositing operations. Included in the field notes will be the following:

- Names of the person(s) collecting and logging in the samples.
- Weather conditions.
- Depth of each station sampled as measured from the water surface. This will be accomplished using a leadline or corrected depth recorder.
- Date and time of collection of each sediment sample.
- The sample station number and individual designation numbers assigned for each individual sample.
- Descriptions of sediment or core sections.
- Vertical profile (simulated cores) will be measured and described.
- Any deviation from the approved sampling plan.

4.4 Positioning: Sampling locations will be recorded in the field. Horizontal coordinates will be referenced to the Oregon Coordinate System for proper North or South Zones NAD 83 (North American Datum 1983). Horizontal coordinates will be identified as latitude and longitude to the nearest 0.1 second.

4.5 Decontamination: All sampling devices and utensils will be thoroughly cleaned prior to use according to the following procedure:

- Wash with brush and A1conox soap
- Rinse with distilled water
- Rinse with 10% HC1 solution
- Rinse with distilled water

Utensils used to collect physical samples only will not require the cleaning procedure listed. All utensils used to collect chemical samples will require decontamination prior to each use. All handwork for chemical analyses will be conducted with disposable latex gloves, which will be rinsed with distilled water before and after handling each individual sample, as appropriate, to prevent sample contamination. Gloves will be disposed of between samples or composites to prevent cross contamination between samples.

4.6 Core Log Each discrete core (simulated core) section will be inspected and described. For each core sample, the following data will be recorded on the core log as they apply:
Sample recovery
Physical soil description (includes soil type, density/consistency of soil, color) Odor (e.g., hydrogen sulfide, petroleum products) Visual stratification and lenses Vegetation
Debris
Biological Activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms) Presence of oil sheen
Any other distinguishing characteristics or features

4.7 Field Compositing: No composite samples are planned for this project.

4.8 Field ReD1icates: One project sample will be subjected to a three way split, with two portions submitted to the project lab (one with a blind duplicate ID) and the third portion submitted to a second laboratory as a quality assurance (QA) sample.
4.9 Sample Transport and Chain-of-Custody Procedures: After sample containers have been filled, they will be packed in ice or "blue ice" in coolers. Chain-or-custody procedures will commence in the field and will track delivery of the samples. Sample holding times and storage requirements are presented in Table 1. Specific procedures are as follows:
Samples will be packaged and shipped in accordance with U.S. Department of Transportation regulations as specified in 49 CFR 173.6 and 49 CFR 173.24 or delivered directly to the testing Laboratory.
Individual sample containers will be packed to prevent breakage.
The coolers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the cooler and office name and address) to enable positive identification.
Chain-of -custody forms will be enclosed in a plastic bag and placed inside cooler.

Upon transfer of sample possession to the laboratory, the persons transferring custody of the coolers will sign the chain-of-custody form. Upon receipt of samples at the laboratory, the coolers will be inspected and the receiver will record the condition of the samples.

Table 1, Sample Volume and Storage

Sample Type	Holding Time	Sample Size (a)	Temperature (b)	Container
Particle Size	6 Months	200 g	4ºC	1-1 Quart Plastic Bag
PAHs, Phenols, Phthalates, Misc. Extractables, Chlorinated Organic Compounds	14 Days	125 g	4ºC	1-1 Liter Glass (combined)
Total Organic Carbon	14 Days	125 g	4ºC	
Mercury	28 Days	5g	4ºC	
Metals (except Mercury)	6 Months	50 g	4ºC	
Pesticides and PCBs	14 Days	10 g	4ºC	

a. Required sample sizes for one laboratory analysis. Actual volumes to be collected have been increased to provide a margin of error and allow for retest.
b. During transport to the lab, samples will be stored on ice.

5.0 LABORATORY PHYSICAL AND CHEMICAL SEDIMENT ANALYSIS

5.1 Laboratory Analyses Protocols. Laboratory testing procedures will be conducted in accordance with the DMEF. The samples will be analyzed for all the parameters listed in sections 5.1.3 and 5.1.4 as requested on the chain-of-custody record. Private contract analytical chemical laboratories will conduct all physical and chemical analyses.

5.1.1 Chain-of-Custody: A chain-of-custody record for each set of samples will be maintained throughout all sampling activities and will accompany samples and shipment to the laboratory. Information tracked by the chain-of-custody records in the laboratory include sample identification number, date and time of sample receipt, analytical parameters required, location and conditions of storage, date and time of removal from and return to storage, signature of person removing and returning the sample, reason for removing from storage, and final disposition of the sample.

5.1.2 Limits of Detection: Detection limits of all chemicals of concern must be below screening levels. All reasonable means, including additional cleanup steps and method modifications, will be used to bring all limits-of-detection below the screening levels.

5.1.3 Sediment Chemistry: Private analytical laboratories will conduct all chemical analyses. Chemical analyses will include: metals (6020/7470 or 7471), total organic carbon (TOC) method 9060, polynuclear aromatic hydrocarbons (PAHs), phenols, phthalates, chlorinated organic compounds, misc. extractables with Atrazine by 8270 SIM method or other low level detection method, pesticides/PCBs by 8081/8082 and chlorinated herbicides by method 8151.

5.1.4 Sediment Conventionals: The private analytical laboratories will analyze physical parameters. Particle grain size distribution for each sample will be determined. Sieve analysis will use a geological sieve series, which will include the sieve sizes U.S. NO.5, 10, 18,35,60, 120, and 230. Hydrogen peroxide will not be used in preparations for grain-size analysis. Hydrometer analysis will be used for particle sizes finer than the 230 mesh. Water content will be determined using ASTM D 2216. Sediment classification designation will be made in accordance with U.S. Soil Classification System, ASTM D 2487.

5.1.5 Holding Times: To the maximum extent practicable all chemical results will be provided within 7 -14 days of receipt. All samples for physical and chemical testing will be maintained at the testing laboratory at the temperatures specified in Table 1 and analyzed within the holding times shown in the table.

5.1.6 Quality Assurance/Quality Control: The chemistry QA/QC procedures found in Table 2 will be followed.

5.2 Laboratory Written Resort: The analytical laboratory documenting all the activities associated with sample analyses will prepare a written report. As a minimum, the following will be included in the report:

Results of the laboratory analyses and *QA/QC* results. All protocols used during analyses.
Chain of custody procedures, including explanation of any deviation from those identified herein. Any protocol deviations from the approved sampling plan. Location and availability of data.
As appropriate, this sampling plan may be referenced in describing protocols.

Table 2, Minimum Laboratory

Analytical Type	Method Blank[2]	Duplicate[2]	RM[2,4]	Matrix Spikes[2]	Surrogates[7]
Semivolatiles[1]	X	X[3]	X[5]	X	X
Pesticides/PCBs[1]	X	X[3]	X[5]	X	X
Metals	X	X	X[6]	X	
Total Organic Carbon	X	X	X[6]		
Total Solids		X			
Total Volatile Solids		X			
Particle Size		X			

1. Initial calibration required before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet criteria. Ongoing calibration required at the beginning of each work shift, every 10-12 samples or every 12 hours (whichever is more frequent), and at the end of each shift.
2. Frequency of Analysis = one per batch 3. Matrix spike duplicate will be run 4. Reference Material
5. Canadian standard SRM-l
6. NIST certified reference material 2704
7. Surrogate spikes will be included with every sample, including matrix-spiked samples, blanks and reference materials

6.0 **BIOLOGICAL TESTING**

Bioassays are not planned for this sampling event.

7.0 **REPORTING**

7.1 OA Report: The laboratory QA/QC reports will be incorporated by reference. This report will identify any laboratory activities that deviated from the approved protocols and will make a statement regarding the overall validity of the data collected.

7.2 Sediment Evaluation Report: A written discussion of findings shall be prepared documenting the physical and chemical character of potential material to be dredged. The physical and chemical reports will be included as reference; individual copies will be furnished as requested. As a minimum, the following will be included in the
Previous sampling and analyses.
Locations where the sediment samples were collected.
A plan view of the project showing the actual sampling location. Description of sampling.
Chemical testing data, with comparisons to screening levels guidelines. Biological testing data and evaluation based on the DMEF manual.

SAMPLING & ANALYSIS PLAN FOR THE COUGAR TEMPERATURE CONTROL PROJECT

APPENDIX A

PARAMETERS AND METHODS

1. Recommended Sample Preparation Methods, Cleanup Methods, Analytical Methods and Detection Limits for Sediment Management Standards, Chapter 173-204 WAC, Draft -July 1996.

2. Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound, Puget Sound Estuary Program, March 1986.

3. Recommended Methods for Measuring TOC in Sediments, Kathryn Bragdon-Cook, Clarification Paper, Puget Sound Dredged Disposal Analysis Annual Review, May 1993.

4. Units: ug = microgram, mg = milligram, kg = kilogram, DW = dry weight, oc = organic carbon.

5. Test Methods for Evaluating Solid Waste. Laboratory manual physical & chemical methods. Method 3050, SW-846, 3rd ed., Vol. lA, Chapter 3, Sec 3.2, Rev 1. Office of Solid Waste and Emergency Response, Washington, DC.

6. Graphite Furnace Atomic Absorption (GFAA) Spectrometry -SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

7. Inductively Coupled Plasma (ICP) Emission Spectrometry -SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

8. Test Methods for Evaluating Solid Waste. Laboratory manual physical/chemical methods. Method 7471, SW-846, 3rd ed., Vol. lA, Chapter 3, Sec 3.3. Office of Solid Waste and Emergency Response, Washington, DC.

9. Sonication Extraction of Sample Solids -Method 3550 (Modified), SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986. Method is modified to add matrix spikes before the dehydration step rather than after the dehydration step.

10. GCMS Capillary Column -Method 8270, SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EP A 1986.

11. Purge and Trap Extraction and GCMS Analysis -Method 8260, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

12. Soxh1et Extraction and Method 8081, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EP A 1986.

13. Total PCBs BT value in ffig/kg oc.

QA2 DATA REQUIREMENTS

CHEMICAL VARIABLES

ORGANIC COMPOUNDS

The following documentation is needed for organic compounds:

A cover letter referencing or describing the procedure used and discussing any analytical problems

Reconstructed ion chromatograms for GC/MS analyses for each sample

Mass spectra of detected target compounds (GC/MS) for each sample and associated library spectra

GC/ECD and/or GC/flame ionization detection chromatograms for each sample

Raw data quantification reports for each sample

A calibration data summary reporting calibration range used [and decafluorotriphenylphosphine (DFTPP) and bromofluorobenzene (BFB) spectra and quantification report for GC/MS analyses]

Final dilution volumes, sample size, wet-to-dry ratios, and instrument detection limit

Analyte concentrations with reporting units identified (to two significant figures unless otherwise justified)

Quantification of all analytes in method blanks (ng/sample)

Method blanks associated with each sample

Recovery assessments and a replicate sample summary (laboratories should report all surrogate spike recovery data for each sample; a statement of the range of recoveries should be included in reports using these data)

Data qualification codes and their definitions,

METALS

For metals, the data report package for analyses of each sample should include the following:

Tabulated results in units as specified for each matrix in the analytical protocols, validated and signed in original by the laboratory manager

Any data qualifications and explanation for any variance from the analytical protocols

Results for all of the QA/QC checks initiated by the laboratory

Tabulation of instrument and method detection limits.

All contract laboratories are required to submit metals results that are supported by sufficient backup data and quality assurance results to enable independent QA reviewers to conclusively determine the quality of the data. The laboratories should be able to supply legible photocopies of original data sheets with sufficient information to unequivocally identify:

Calibration results

Calibration and preparation blanks

Samples and dilutions

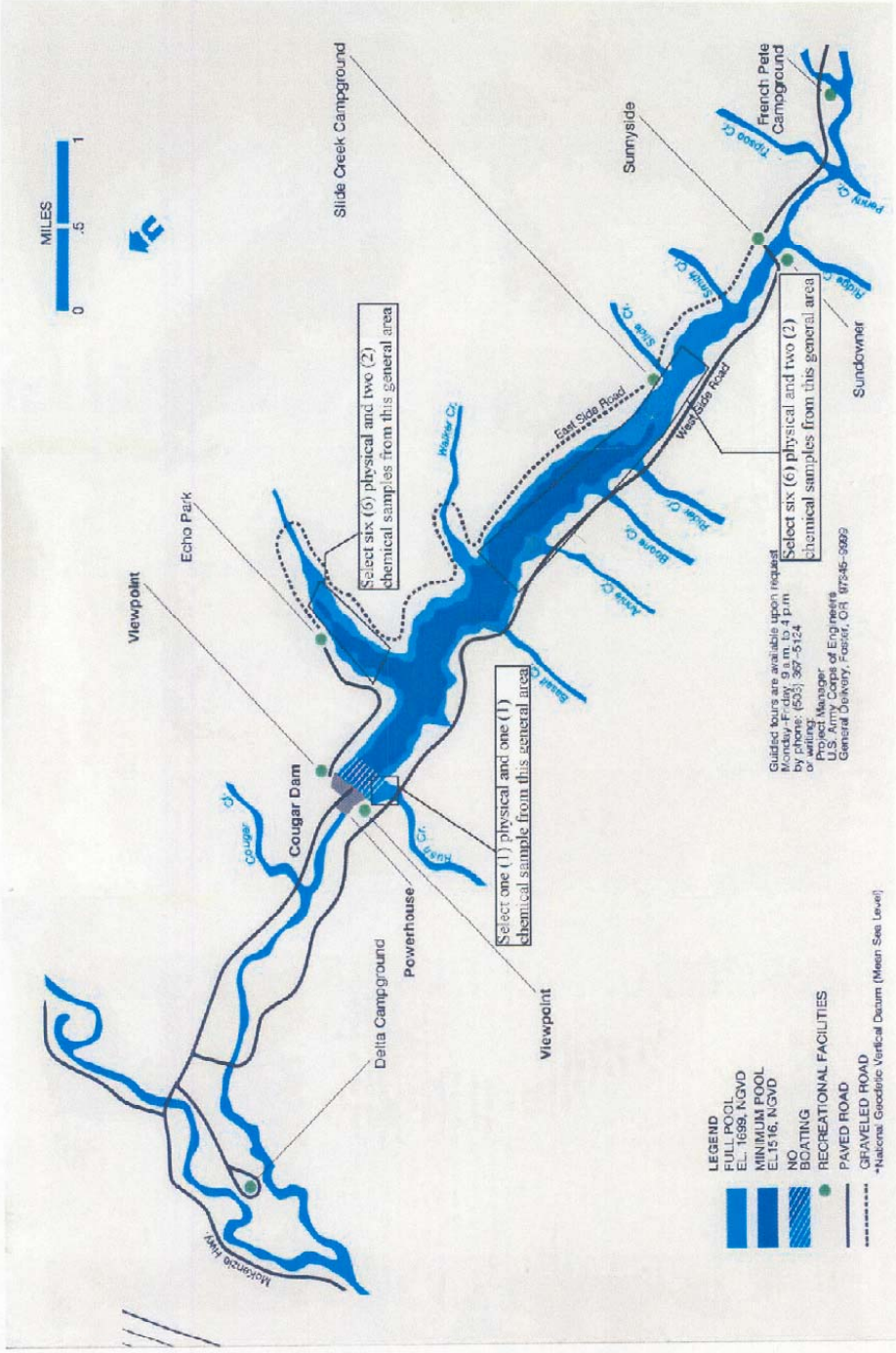
Duplicates and spikes

Any anomalies in instrument performance or unusual instrumental adjustments.

Attachment A
June 2002, Sampling and Analysis Plan

Figure 1, Cougar Temperature Control Structure

Proposed Sediment Sampling Sites



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Attachment B

SEDIMENT
SAMPLING & ANALYSIS PLAN
FOR THE
COUGAR TEMPERATURE CONTROL PROJECT

August 2002

Prepared by:

CENWP-EC-HR

Portland District
Corps of Engineers

Cougar Reservoir Temperature Control Project
Sampling and Analysis Plan

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Cougar Reservoir Temperature Control Project
Sampling and Analysis Plan

1.0 PROJECT DESCRIPTION, SITE HISTORY AND ASSESSMENT

1.1 Project Site Description and Location:

The Cougar Project is located on the South Fork of the McKenzie River, 4.4 miles upstream from the confluence with the McKenzie River. The project is 61 river miles (RM) upstream from the mouth of the McKenzie River (Willamette River RM 170.8). Cougar Dam is a rock-fill embankment about 1,600 feet long and 450 feet high from average tailwater to crest of dam. The project controls runoff from a drainage area of 210 square miles of mountainous and timbered land. The purpose of the proposed Willamette Temperature Control project is to modify temperatures for the Cougar and Blue River Projects through a structure addition to the existing intake that will regulate outlet through selective withdrawal to modify the temperature of downstream water released, to replicate a natural cycle of water temperatures, for the benefit of anadromous and native fish species.

Prior to construction of the multilevel withdrawal system, the reservoir level was lowered to El. 1400 NGVD (National Geodetic Vertical Datum), which is below minimum power pool El. of 1532 NGVD and full pool El. of 1699 NGVD (original plan called for pool to be lowered to 1375').

1.2 Site History:

During the drawdown process, erosion of the fine-grained sediment delta areas, where tributaries enter the reservoir, had occurred. The eroded sediments caused turbidity concerns within and downstream of the reservoir. In addition to the concerns of turbidity levels, the question of possible distribution of contamination contained within the sediments was raised. Of the over 70 contaminates analyzed for, Dichlorodiphenyltrichloroethane (DDT) and its breakdown products, were the only contaminates detected at levels of concern; levels detected are listed in section 1.3, under the heading: June 4-5, 2002 sampling event. N-nitroso-di-n-propylamine (DPN) was detected in one primary lab quality control (QC) sample, but was not detected in the duplicate quality assurance (QA) lab sample or in any of the other samples at low detection levels. DNP is produced primarily for research and usually not for commercial purposes. It is water-soluble and has only a slight tendency to sorb to suspended organic matter, biota and sediments (ref. Spectrum Laboratories: Chemical fact sheet – Cas # 6216647). It is questionable if DNP actually is present in the sample and is not being considered further as a contaminate-of-concern.

1.3 Previous Sediment Sampling:

February 1996

Twelve (12) sediment samples were collected by Geotechnical Resources Inc. and submitted to the Corp's materials lab and Sound Analytical Services laboratory for physical and chemical analyses. Physical parameters included soil classification, particle size and dredge test analysis, with analysis varying from 80% gravel to 90% silt. Chemical methods TPH-HCID (total petroleum hydrocarbon identification) with quantification for gasoline, TPH-418.1, 8 RCRA (Resource Conservation and Recovery Act) metals, 1311 TCLP (toxicity characteristic leaching procedure), EPA 200.8, 7471 (lead), 8080 (pest/PCB) and TOC (total organic carbon) were performed on select samples. No organic contaminates were detected above method detection levels (MDL) and metals were detected only at low levels and are considered at background. The laboratory encountered some minor problems with matrix interferences causing recovery levels for several surrogate analyses to be

outside the recommended range. These problems are considered minor and do not affect the confidence on the over all data objectives.

June 4-5, 2002 Sampling Event

Because most contaminates-of-concern bind to fine-grained sediment and organic material, they were the targeted sediments in the June 4-5 sampling event, which may not be the best representation of all the sediments that eroded. The logic behind the first event was to find the contaminants, if they were present, then determine how much of the entire eroded volume they represented and further determine if the level detected presented a significant environmental risk and what actions, can or should be taken.

Sediment for twelve (12) physical and five (5) chemical analyses were collected from delta areas. The following areas were selected for chemical analyses, two (2) samples were collected from East Fork cut banks (DDT @ 8.5 & 32.6 ppb), one (1) sample below the Slide Creek boat ramp, from a delta cut bank (DDT @ 23.9 ppb), one (1) sample from the Annie Creek delta (DDT @ 18.6 ppb), and one (1) sample was collected from lake deposits near the face of the dam on the Rush Creek side (DDT @ 5.3 ppb). Physical parameters included soil classification; particle size and a suite of dredge testing analyses. Chemical analyses included: (RCRA) heavy metals (6020/7470 or 7471), total organic carbon (TOC) method 9060, polynuclear aromatic hydrocarbons (PAHs), phenols, phthalates, chlorinated organic compounds, misc. extractables by 8270 SIM method (low level detection method), pesticides/PCBs by 8081/8082 and chlorinated herbicides by method 8151. Severn Trent Laboratory in Tacoma analyzed the samples. No contaminants were detected at levels of concern, except total DDT at levels indicated above.

1.4 Proposed Sediment Sampling Event (Follow-up to DDT found June 4-5, 2002)

Though the levels of DDT detected in the June 4-5 sampling event are at a level of concern for the health of benthic organisms, it has not yet been determined if those levels represent the entire volume of material that has been eroded. Due to the detection of DDT in these samples, the next sampling event will attempt to answer the following questions, with the associated sampling action.

Question: What levels of DDT are in the background?

Action: Collect up to two (2) background sediment samples from above the reservoir on the South Fork of the McKenzie to establish a baseline. An additional sample will be collected from the forest floor organic material above the reservoir and analyzed in at least two (2) vertical lifts.

Question: What levels of DDT are represented in the total volume of sediment eroded and sediment that has a potential for future erosion?

Action: Collect up to five (5) vertical profile samples from the cut bank areas where only the fine-grained sediment was targeted in the first sampling event in June. Fresh sediments will be exposed prior to sampling from the cut banks.

Question: What levels of DDT are currently exposed in the reservoir?

Action: Collect up to five (5) surface sediment samples for analyses, from sediment that has recently been eroded and homogenized during the drawdown even, from all the newly formed delta areas in the current reservoir (1400-foot elevation). Each sample submitted for analysis will consist of three (3) composite surface grab samples, using a ponar sampling devise.

Question: What levels of DDT might have migrated beyond the confines of the reservoir?

Action: Collect up to two (2) samples of recently deposited sediment from just below the dam that would represent sediment that was released during the drawdown.

2.0 SAMPLING AND ANALYSIS OBJECTIVES

- To characterize sediments in accordance with the regional dredge material testing manual, the Dredge Material Evaluation Framework for the Lower Columbia River Management Area (DMEF).
- Collect, handle and analyze representative sediments, as outlined above, in accordance with protocols and Quality Assurance/Quality Control (QA/QC) requirements.
- Determine level of risk to environment.
- Conduct physical and chemical characterization only, for this sediment evaluation.

3.0 SAMPLING AND ANALYSIS REQUIREMENT PROCEDURES

3.1 Project DQOs (Data Quality Objectives).

Analyses of the sediment at Cougar from the first round of sampling indicated Total DDT to be at levels ranging from 5.32 ppb to 32.63 ppb. The first round of sampling targeted fine-grain sediment and organic material to determine if contaminates of concern were present. This second round of sampling will attempt to determine, if these levels of DDT represent the total volume of material eroded and what environmental risk the levels of DDT present.

Table 1

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
Target Locations			
What were historical uses of surrounding areas? (Source of DDT.)	NA	Check sources from ODEQ, USFWS, ODFW, USFS, EPA, USGS, EWEB, OSU & previous Corps data for historical data on sediment sample collection and analyses.	NA
What historical sediment data may exist to help determine levels of DDT that existed upstream and downstream of the project prior to drawdown?	Data must have been analyzed using proper quality control with sufficiently low detection levels.	Check sources on the e-web, Forest Service, USGS, Eugene Water Dept. for historical data on sediment sample collection and analyses.	Collect samples above the Cougar pool on the South Fork of the McKenzie River.
Determine the background levels of DDT that exist above and below the project.	Samples must be collected, handled and analyzed for DDT using proper QA/QC with sufficiently low detection levels.	Find areas where fine-grained sediment has collected over time in back eddies.	Collect samples above the Cougar pool on the South Fork of the McKenzie River.
Determine the level of DDT that would represent all of the material	Samples must be collected, handled and analyzed for DDT using proper	1. Sample a vertical profile of previously sampled cut banks that	Determine boat availability for use in the Cougar pool. Locate confluence

Investigation Objectives	Data Requirements	Investigation Strategy	Field Decision Criteria/ Performance Specifications
eroded in the drawdown. (What is the level of DDT in the re-deposited sediment in the pool?)	QA/QC with sufficiently low detection levels.	represent all the material eroded and not just targeted fine-grained and organic material. 2. Surface sediment of each delta will be homogenous and represent the material eroded during drawdown.	areas from all major inlets to reservoir. Collect surface sediment from boat from within the present pool (1400') from the newly formed delta areas formed from eroded sediments.
Determine the potential for migration of DDT from the reservoir.	Samples must be collected, handled and analyzed for DDT using proper QA/QC with sufficiently low detection levels.	DDT Levels measured from recent sediment deposits down	Collect newly deposited sediment in the area immediately downstream of the dam.
If there has been migration, does it represent an added risk to the environment? What is an acceptable level risk?	Samples must be collected, handled and analyzed for DDT using proper QA/QC with sufficiently low detection levels.	The DMEF has adopted 6.9 ug/kg (ppb) as an AET* level for benthic organisms, with 50 ppb as the bioaccumulation trigger* for DDT. For this study, those levels are being considered protective.	Collect newly deposited sediment in the area immediately downstream of the dam.
Is the DDT bioavailable?	Benthic bioassay and bioaccumulation testing best answer bioavailability of DDT. Studies conducted in the PSSDA program have established chemical screening levels (6.9 ppb & 50 ppb) that have been adopted in the DMEF, and are being applied to this data set. If this screening level is exceeded biological testing will be recommended.	DDT, including DDE & DDD, is hydrophobic and binds tightly to the sediment. If absorbed into the water column DDT will quickly reattach to the sediment or volatilize into water and hydrochloric acid.	Benthic bioassay and bioaccumulation testing best answer bioavailability of DDT. Studies conducted in the PSSDA program have established chemical a screening level of 6.9 ppb for bioassay analyses and have been adopted in the DMEF, and are being applied to this data set. If this screening level is exceeded biological testing will be recommended. (It is recommended that 6.9 ppb be considered the trigger for bioaccumulation rather than 50ppb.)
Do the DDT levels reported in the first round of sampling represent the levels in the material eroded?	Analyze (at low detection levels) sediment to be collected in second round for Total DDT, include physical analyses and TOC.	Target entire prism of material that was eroded (or has potential to be eroded).	Re-sample areas where first round samples were collected and collect vertical profile of entire cut banks (not just target fine grain and organic materials).

Apparent Effects Threshold (AET) – were derived using a statistically based method that attempts to relate individual sediment contaminant concentrations with observed biological effects.
** Bioaccumulation Trigger – The level at which bioaccumulation testing for benthic organisms is required to establish suitability for in-water placement of sediment. The level at which statistical evidence of bioaccumulation in benthic organisms is present.
DMEF – Dredge Material Evaluation Framework
PSSDA – Puget Sound Dredged Disposal Analysis

4.0 SAMPLE COLLECTION AND HANDLING PROCEDURES

4.1 Sampling Locations and Numbering: Figure 1 shows the project and general sample location areas. Sampling sites are located for the best characterization of the material being eroded as possible. Proper QA/QC procedures as outlined in this section will be followed. Any deviation from these procedures shall be noted in the field log. Sample identification shall follow the following convention:

COUR-X-YY

Where, "COUR" denotes samples collected from the Cougar Reservoir, "X" denotes the type of sampling such as "G" = grab; "YY" denotes the numeric sample sequence number and will consist of two digits for all samples, except composites (i.e. 01, 05, 15, etc.). The QC replicates will have a letter designation in place of the numeric designation of the primary sample; e.g. "A" added (CS-GC-A). Duplicate samples will be identified in the field notes.

4.2 Field Sampling Schedule: Sampling is planned for August 6-7, 2002.

4.3 Field Notes: Field notes will be maintained during sampling and compositing operations. Included in the field notes will be the following:

- Names of the person(s) collecting and logging in the samples.
- Weather conditions.
- Depth of each station sampled as measured from the water surface. This will be accomplished using a leadline or corrected depth recorder.
- Date and time of collection of each sediment sample.
- The sample station number and individual designation numbers assigned for each individual sample.
- Descriptions of sediment or core sections.
- For simulated cores, the length of the vertical collection site will be measured and described.
- Any deviation from the approved sampling plan.

4.4 Positioning: Sampling locations will be recorded in the field. Horizontal coordinates will be referenced to the Oregon Coordinate System for proper North or South Zones NAD 83 (North American Datum 1983). Horizontal coordinates will be identified as latitude and longitude to the nearest 0.1 second.

4.5 Decontamination: All sampling devices and utensils will be thoroughly cleaned prior to use according to the following procedure:

- Wash with brush and Alconox soap
- Rinse with distilled water
- Rinse with 10% HCl solution
- Rinse with distilled water

Utensils used to collect physical samples only will not require the cleaning procedure listed. All utensils used to collect chemical samples will require decontamination prior to each use. All handwork for chemical analyses will be conducted with disposable latex gloves, which will be rinsed with distilled water before and after handling each individual sample, as appropriate, to prevent sample contamination. Gloves will be disposed of between samples or composites to prevent cross contamination between samples.

4.6 Core Logging: Each discrete core (simulated core) section will be inspected and described. For each core sample, the following data will be recorded on the core log as they apply:

- Sample recovery
- Physical soil description (includes soil type, density/consistency of soil, color)
- Odor (e.g., hydrogen sulfide, petroleum products)
- Visual stratification and lenses
- Vegetation
- Debris
- Biological Activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms)
- Presence of oil sheen

- Any other distinguishing characteristics or features

4.7 Field Compositing: Composite samples will be collected as described in section 1.3 above and restated here.
Action: Collect up to five (5) surface sediment samples for analyses, from sediment that has recently been eroded and homogenized during the drawdown even, from all the newly formed delta areas in the current reservoir (1400-foot elevation). Each sample submitted for analysis will consist of three (3) composite surface grab samples, using a ponar sampling devise.

4.8 Field Replicates: One (1) to two (2) project samples will be subjected to a three way split, with two portions submitted to the project lab (one with a blind duplicate ID) and the third portion submitted to a second laboratory as a quality assurance (QA) sample.

4.9 Sample Transport and Chain-of-Custody Procedures: After sample containers have been filled, they will be packed in ice or "blue ice" in coolers. Chain-of-custody procedures will commence in the field and will track delivery of the samples. Sample holding times and storage requirements are presented in Table 1. Specific procedures are as follows:

- Samples will be packaged and shipped in accordance with U.S. Department of Transportation regulations as specified in 49 CFR 173.6 and 49 CFR 173.24 or delivered directly to the testing laboratory.
- Individual sample containers will be packed to prevent breakage.
- The coolers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the cooler and office name and address) to enable positive identification.
- Chain-of-custody forms will be enclosed in a plastic bag and placed inside cooler.

Upon transfer of sample possession to the laboratory, the persons transferring custody of the coolers will sign the chain-of-custody form. Upon receipt of samples at the laboratory, the coolers will be inspected and the receiver will record the condition of the samples.

Table 2, Sample Volume and Storage

Sample Type	Holding Time	Sample Size (a)	Temperature (b)	Container
Physical analysis	6 Months	200 g		1-1 Quart Plastic Bag
Total DDT	14 Days	125 g	4ºC	1-1 Liter Glass (combined)
Total Organic Carbon	14 Days	125 g	4ºC	

a. Required sample sizes for one laboratory analysis. Actual volumes to be collected have been increased to provide a margin of error and allow for retest.
b. During transport to the lab, samples will be stored on ice.

5.0 LABORATORY PHYSICAL AND CHEMICAL SEDIMENT ANALYSIS

5.1 Laboratory Analyses Protocols. Laboratory testing procedures will be conducted in accordance with the DMEF. The samples will be analyzed for all the parameters listed in sections 5.1.3 and 5.1.4

as requested on the chain-of-custody record. Private contract analytical chemical laboratories will conduct all physical and chemical analyses.

5.1.1 Chain-of-Custody: A chain-of-custody record for each set of samples will be maintained throughout all sampling activities and will accompany samples and shipment to the laboratory. Information tracked by the chain-of-custody records in the laboratory include sample identification number, date and time of sample receipt, analytical parameters required, location and conditions of storage, date and time of removal from and return to storage, signature of person removing and returning the sample, reason for removing from storage, and final disposition of the sample.

5.1.2 Limits of Detection: Detection limits of all chemicals of concern must be below screening levels. All reasonable means, including additional cleanup steps and method modifications, will be used to bring all limits-of-detection below the screening levels.

5.1.3 Sediment Chemistry: Private analytical laboratories will conduct all chemical analyses. Chemical analyses will include: Lead (Pb) by method 6020, Mercury (Hg) by method7470 or 7471), total organic carbon (TOC) by method 9060 and DDT by method 8081.

5.1.4 Sediment Conventionals: The private analytical laboratories will analyze physical parameters. Particle grain size distribution for each sample will be determined. Sieve analysis will use a geological sieve series, which will include the sieve sizes U.S. NO. 5, 10, 18, 35, 60, 120, and 230. Hydrogen peroxide will not be used in preparations for grain-size analysis. Hydrometer analysis will be used for particle sizes finer than the 230 mesh. Water content will be determined using ASTM D 2216. Sediment classification designation will be made in accordance with U.S. Soil Classification System, ASTM D 2487.

5.1.5 Holding Times: To the maximum extent practicable all chemical results will be provided within 7-14 days of receipt. All samples for physical and chemical testing will be maintained at the testing laboratory at the temperatures specified in Table 1 and analyzed within the holding times shown in the table.

5.1.6 Quality Assurance/Quality Control: The chemistry QA/QC procedures found in Table 2 will be followed.

5.2 Laboratory Written Report: The analytical laboratory documenting all the activities associated with sample analyses will prepare a written report. As a minimum, the following will be included in the report:

- Results of the laboratory analyses and QA/QC results.
- All protocols used during analyses.
- Chain of custody procedures, including explanation of any deviation from those identified herein.
- Any protocol deviations from the approved sampling plan.
- Location and availability of data.

As appropriate, this sampling plan may be referenced in describing protocols.

Table 3, Minimum Laboratory QA/QC

Analytical Type	Method Blank[2]	Duplicate[2]	RM[2, 4]	Matrix Spikes[2]	Surrogates[7]
DDT	X	X[3]	X[5]	X	X
Total Organic Carbon	X	X	X[6]		
Total Solids		X			
Total Volatile Solids		X			
Particle Size		X			

1. Initial calibration required before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet criteria. Ongoing calibration required at the beginning of each work shift, every 10-12 samples or every 12 hours (whichever is more frequent), and at the end of each shift.
2. Frequency of Analysis = one per batch
3. Matrix spike duplicate will be run
4. Reference Material
5. Canadian standard SRM-1
6. NIST certified reference material 2704
7. Surrogate spikes will be included with every sample, including matrix-spiked samples, blanks and reference materials.

6.0 BIOLOGICAL TESTING

6.1 Bioassays are not planned for this sampling event. If total DDT levels exceed 6.9 ug/kg, bioassay and bioaccumulation analyses will be recommended.

7.0 REPORTING

7.1 QA Report: The laboratory QA/QC reports will be incorporated by reference. This report will identify any laboratory activities that deviated from the approved protocols and will make a statement regarding the overall validity of the data collected.

7.2 Sediment Evaluation Report: A written discussion of findings shall be prepared documenting the physical and chemical character of potential material to be dredged. The physical and chemical reports will be included as reference; individual copies will be furnished as requested. As a minimum, the following will be included in the

- Previous sampling and analyses.
- Locations where the sediment samples were collected.
- A plan view of the project showing the actual sampling location.
- Description of sampling.
- Chemical testing data, with comparisons to screening level guidelines.
- Biological testing data and evaluation based on the DMEF manual.

8.0 REFERENCES

1. U.S. army Corps of Engineers, Portland District, 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.

2. 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, dated (referred to as the "Inland Testing Manual").

3. The Clean Water Act, 40 CFR 230 (b) (1).

4. U.S. army Corps of Engineers, Portland District. Cougar Lake, Willamette Temperature Control Intake Structure modifications, Design Memorandum No. 21, 31 July 1998.

5. Sittig, Marshall. 1981. Handbook of Toxic and Hazardous Chemicals. Noyes Publication, New Jersey.

6. Merck & Co. 1976. The Merck Index an Encyclopedia of Chemicals and Drugs. Rahway, New Jersey.

7. Spectrum Laboratories: Chemical fact sheet – Cas # 6216647). http://www.speclab.com/compound/c621647.htm

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PARAMETERS AND METHODS

1. Recommended Sample Preparation Methods, Cleanup Methods, Analytical Methods and Detection Limits for Sediment Management Standards, Chapter 173-204 WAC, Draft - July 1996.

2. Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound, Puget Sound Estuary Program, March 1986.

3. Recommended Methods for Measuring TOC in Sediments, Kathryn Bragdon-Cook, Clarification Paper, Puget Sound Dredged Disposal Analysis Annual Review, May 1993.

4. Units: ug = microgram, mg = milligram, kg = kilogram, DW = dry weight, oc = organic carbon.

5. Test Methods for Evaluating Solid Waste. Laboratory manual physical/chemical methods. Method 3050, SW-846, 3rd ed., Vol. 1A, Chapter 3, Sec 3.2, Rev 1. Office of Solid Waste and Emergency Response, Washington, DC.

6. Graphite Furnace Atomic Absorption (GFAA) Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

7. Inductively Coupled Plasma (ICP) Emission Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

8. Test Methods for Evaluating Solid Waste. Laboratory manual physical/chemical methods. Method 7471, SW-846, 3rd ed., Vol. 1A, Chapter 3, Sec 3.3. Office of Solid Waste and Emergency Response, Washington, DC.

9. Sonication Extraction of Sample Solids - Method 3550 (Modified), SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986. Method is modified to add matrix spikes before the dehydration step rather than after the dehydration step.

10. GCMS Capillary Column - Method 8270, SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

11. Purge and Trap Extraction and GCMS Analysis - Method 8260, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

12. Soxhlet Extraction and Method 8081, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

13. Total PCBs BT value in mg/kg oc.

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QA2 DATA REQUIREMENTS

CHEMICAL VARIABLES

ORGANIC COMPOUNDS

The following documentation is needed for organic compounds:

A cover letter referencing or describing the procedure used and discussing any analytical problems.

Reconstructed ion chromatograms for GC/MS analyses for each sample.

Mass spectra of detected target compounds (GC/MS) for each sample and associated library spectra.

GC/ECD and/or GC/flame ionization detection chromatograms for each sample.

Raw data quantification reports for each sample.

A calibration data summary reporting calibration range used [and decafluorotriphenylphosphine (DFTPP) and bromofluorobenzene (BFB) spectra and quantification report for GC/MS analyses].

Final dilution volumes, sample size, wet-to-dry ratios, and instrument detection limit.

Analyte concentrations with reporting units identified (to two significant figures unless otherwise justified).

Quantification of all analytes in method blanks (ng/sample).

Method blanks associated with each sample.

Recovery assessments and a replicate sample summary (laboratories should report all surrogate spike recovery data for each sample; a statement of the range of recoveries should be included in reports using these data).