Chemical Analysis and Toxicity Testing of Spokane River Sediments Collected in October 2000

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Chemical Analysis and Toxicity Testing of Spokane River Sediments Collected in October 2000

by
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July 2001

303(d) listings addressed in this report:
Spokane River WA-57-1010 sediment bioassay failure

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Abstract

Sediment samples from seven sites in the Spokane River drainage and a reference sample from a nearby lake were subjected to chemical analysis and laboratory toxicity tests. The chemicals analyzed included zinc, cadmium, lead, and other metals; semivolatile organic compounds; PCBs; and pesticides (selected samples only). The toxicity tests included bioassays with Microtox® (pore water), the midge *Chironomus tentans*, and the amphipod *Hyalella azteca*. The chemical and biological data concurred in showing toxicity at two sites above Upriver Dam and at a site in lower Long Lake. Although the level of chemical contamination was low in Latah Creek, the sediments were highly toxic to *Hyalella*. The study did not find strong evidence for toxicity in sediments from the Little Spokane River or upper Long Lake.

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Acknowledgements

The advice and assistance given on this project by Brett Betts, John Roland, and Peter Adolphson of the Ecology Toxics Cleanup Program is very much appreciated. The good work of the staff at the Ecology Manchester Environmental Laboratory is gratefully acknowledged. The final report was formatted by Carol Norsen and Joan LeTourneau.

Introduction

Sampling conducted by the Washington State Department of Ecology (Ecology) and the U.S. Geological Survey (USGS) has shown that sediments in the Spokane River are contaminated with zinc, cadmium, lead, and polychlorinated biphenyls (PCBs). Direct evidence of sediment toxicity is, however, limited. Most of the sediment bioassays that have been conducted have been for samples from the Spokane River Arm of Lake Roosevelt, the least contaminated part of the river (Bortleson et al., 1994). With few exceptions, a thorough analysis for chemical contaminants has also not been done.

Therefore, the Ecology Toxics Cleanup Program (TCP) initiated a study in the fall of 2000 to more thoroughly assess sediment chemistry and toxicity at selected sites within the Spokane River drainage. The study was conducted by Ecology's Environmental Assessment Program (EAP).

TCP requested that EAP review existing sediment data on the Spokane River to identify the most contaminated, or potentially most contaminated, locations. Eight sites were selected for testing, in consultation with TCP. Field work was conducted during October 23 – 25, 2000. The chemical analyses included zinc, cadmium, lead, and other metals; semivolatile organic compounds; PCBs; and pesticides (selected samples only). Grain size, total organic carbon (TOC), percent solids, and total volatile solids were also determined. Laboratory bioassays were conducted with Microtox® (100% pore water), the midge *Chironomus tentans*, and the amphipod *Hyalella azteca*. The Microtox test measures changes in light output of a bioluminescent marine bacterium, *Vibrio fischeri*. The *Chironomus* and *Hyalella* bioassays were relatively new long-term tests, 20- and 28-days respectively, with mortality and growth as the endpoints.

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Sampling Site Selection

The following sources of chemical data on Spokane River sediments were reviewed: Bortleson et al. (1994), Johnson et al. (1994), Serdar et al. (1994), EILS (1995), Johnson (1999, 2000), and Grosbois et al. (2001). Figure 1 shows the locations identified through these reports as having the ten highest concentrations of zinc, cadmium, lead, total PCBs, or total polyaromatic hydrocarbons (PAH), and having prominent areas of sediment deposition.

This figure does not include a series of 1998 USGS samples between Myrtle Point (river mile 84.6) and the state line which were taken from small, scattered deposits of material (Horowitz, 1999). The zinc, cadmium, and lead concentrations in some of these samples were in the same range as in the upper river samples plotted in Figure 1 (Grosbois et al., 2001). Also not included were three samples from isolated pockets of bottom sediment material between Upriver Dam (river mile 80.2) and Monroe Street Dam (river mile 74.2) that were somewhat elevated in total PCBs (31 – 390 ug/Kg) (EILS, 1995). These sites are in reaches that are largely non-depositional.

As shown in Figure 1, the most contaminated sediments have been found above Upriver Dam. While metals concentrations continue to be high up to and beyond the state line because of sources in Idaho, PCB concentrations above Trentwood are generally low, major historical sources being located in Trentwood. PAH analysis in the reach between Upriver Dam and the state line has been limited to sediments near the dam, with elevated concentrations being found at two sites.

Further downstream, the reach between Latah Creek and Nine-Mile Dam (river mile 58.1) has not been sampled extensively, but appears to have relatively low levels of contamination. Downstream of Nine-Mile Dam, the middle and lower parts of Long Lake have zinc and cadmium concentrations comparable to sediments in the upper river. Two notable tributaries, Latah Creek and the Little Spokane River, contribute suspended and bedload sediment to the river above Long Lake. Long Lake reservoir is a prominent area of sediment deposition within the river. PCBs and PAH have only been analyzed at two locations in Long Lake (river miles 39.2 and 50.0), and concentrations have been moderate to low. The lowest metals, PCB, and PAH concentrations in the mainstem occur in the Spokane Arm.

Based on this information, the eight sites listed below were selected for testing (see Figures 2 and 3).

Site 1: Above Upriver Dam – river mile 80.7
Site 2: At Upriver Dam – river mile 80.3
Site 3: Latah Creek at mouth – river mile 72.2
Site 4: Little Spokane R. at mouth – river mile 56.4
Site 5: Upper Long Lake – river mile 53.6
Site 6: Middle Long Lake – river mile 46.8
Site 7: Lower Long Lake – river mile 35.2
Site 8: Bead Lake (reference sediment)

River mile	34.3	36	36.5	39	39.2	40	46.3	47.3
Zinc	1400	1300	1200	1200	970	1300	1200	1200
Cadmium	12	11	11	9.9	10	9.8	11	11
Lead	210	230	190	170	98	160	96	94
PCBs	na	na	na	na	34	na	na	na
PAH	na	na	na	na	466	na	na	na

River mile	80.3	80.4	80.5	80.7	80.8	83.4	84.6	92.7	95.8
Zinc	3280	1990	8960	4020	2300	1410	1200	1700	2800
Cadmium	27	13	14	36	23	4.6	13	9	6.8
Lead	564	342	1420	594	360	308.	170	1200	430
PCBs	1273	254	nd	3360	na	118.	na	na	na
PAH	3400	1050	159	2760	na	555.	na	na	na

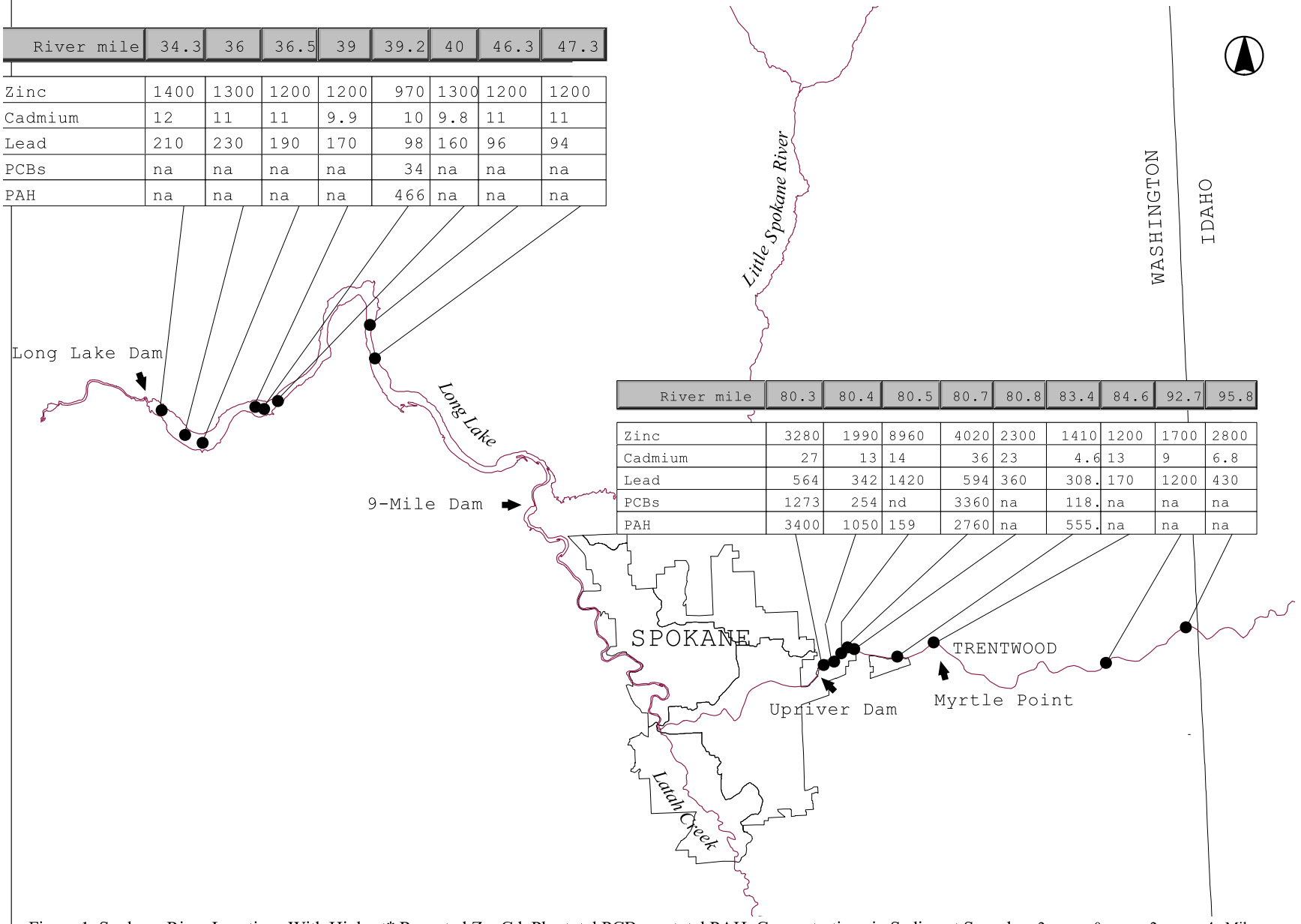


Figure 1. Spokane River Locations With Highest* Reported Zn, Cd, Pb, total PCBs, or total PAH Concentrations in Sediment Samples (metals in mg/Kg; PCBs and PAH in ug/Kg; dry weight basis)
*see text

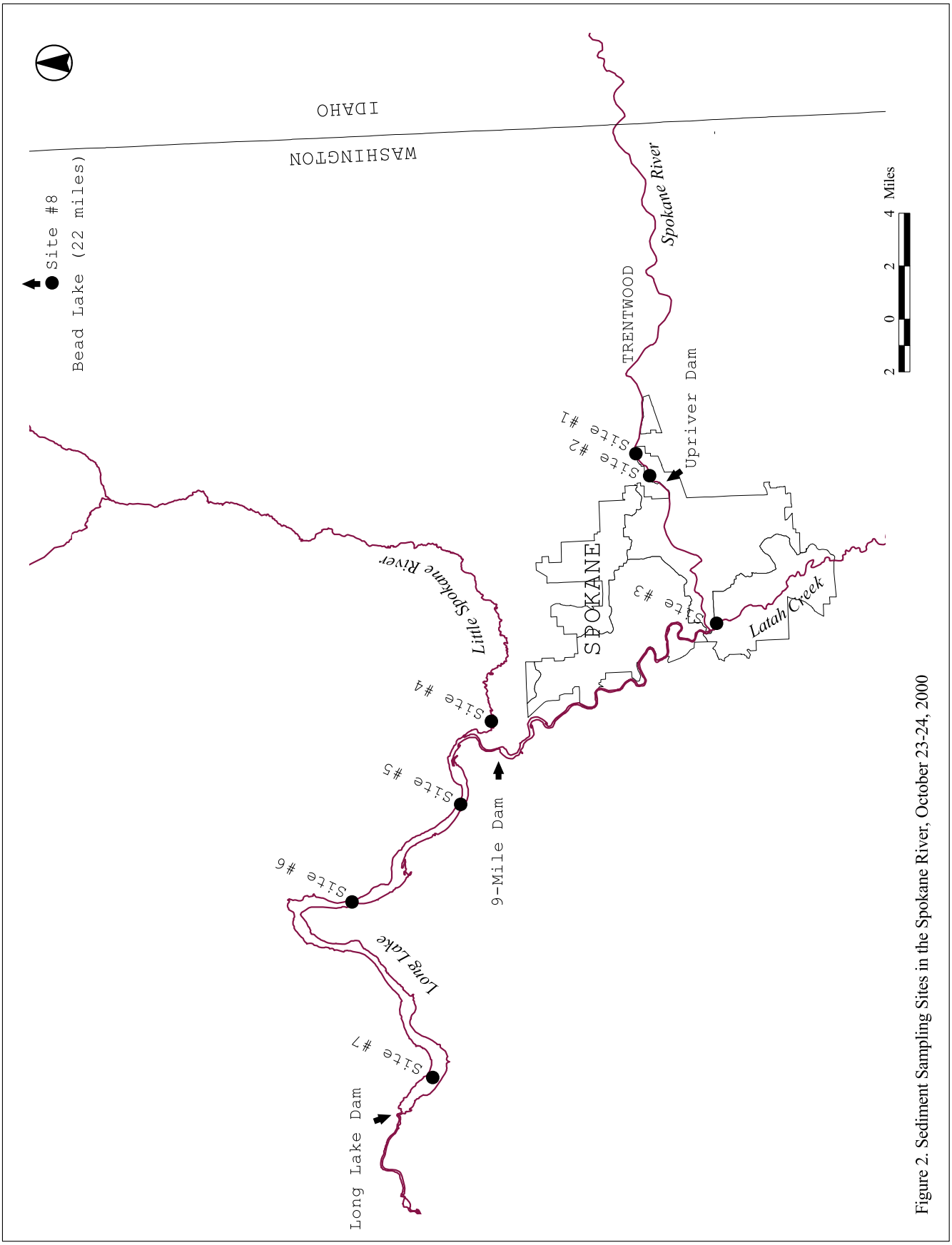
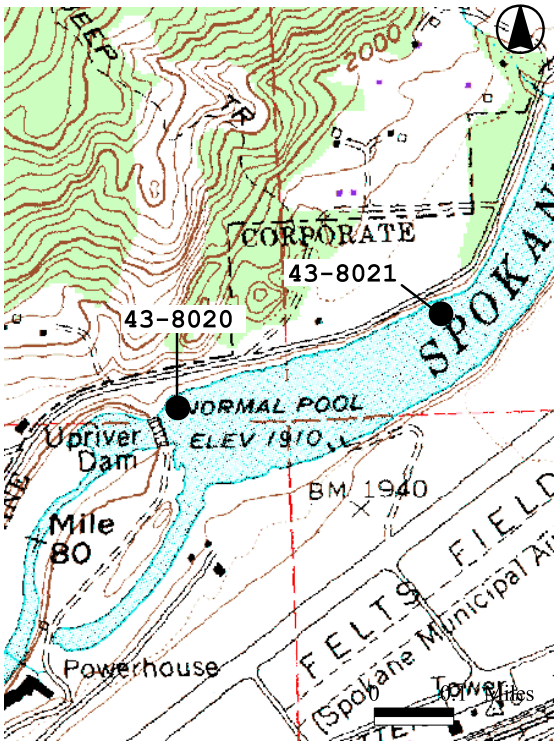
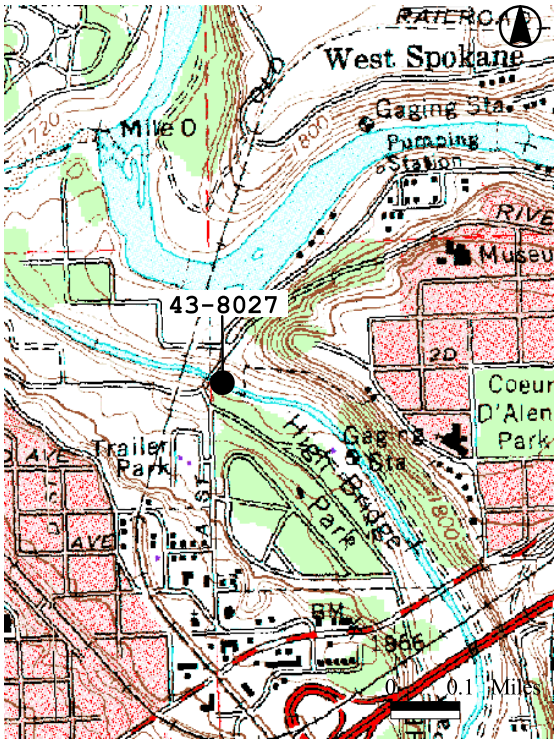


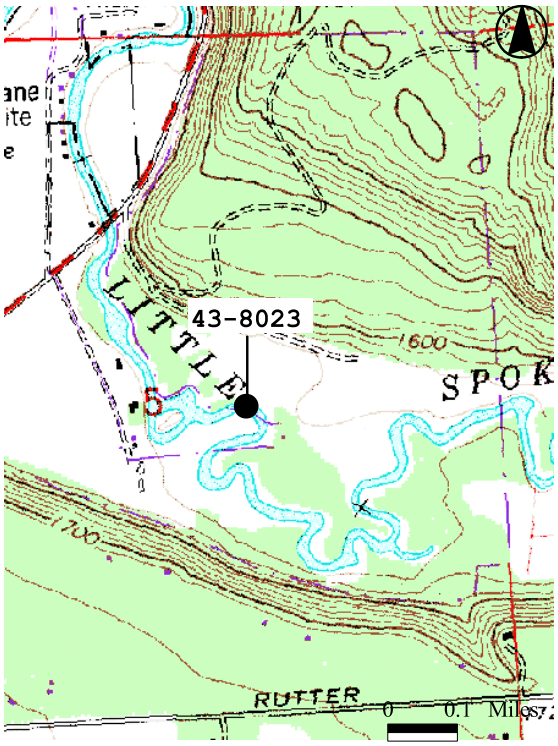
Figure 2. Sediment Sampling Sites in the Spokane River, October 23-24, 2000



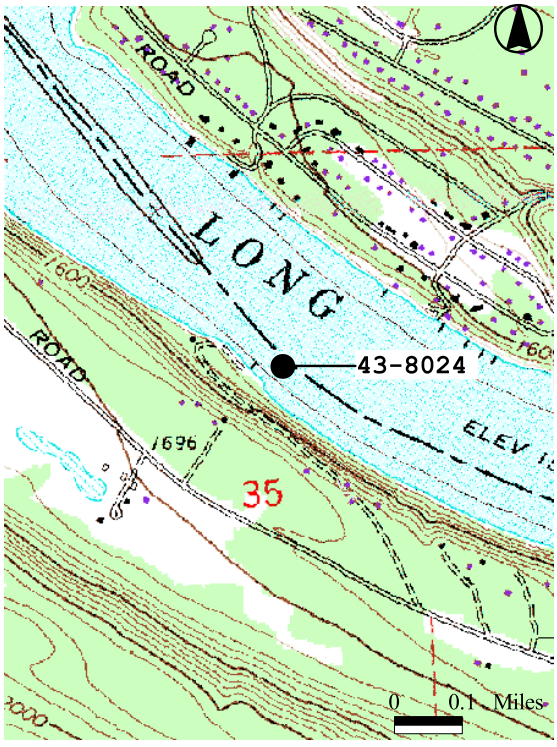
Upriver Dam (sites 1 and 2)



Latah Creek (site 3)

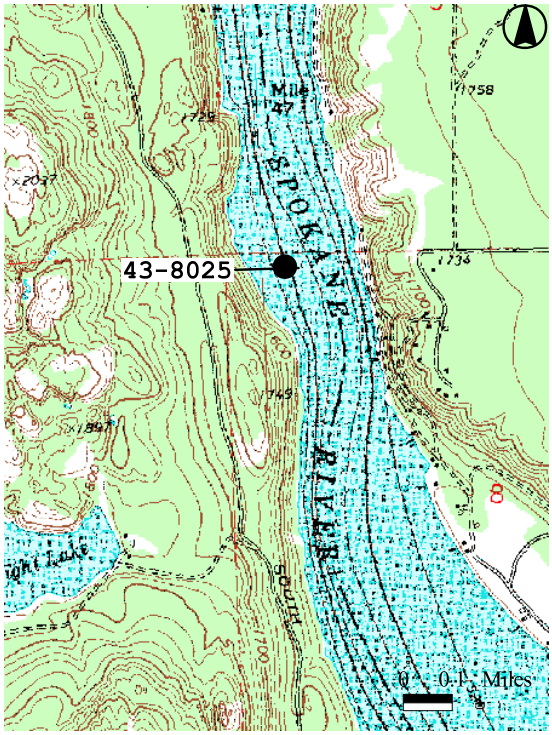


Little Spokane River (site 4)

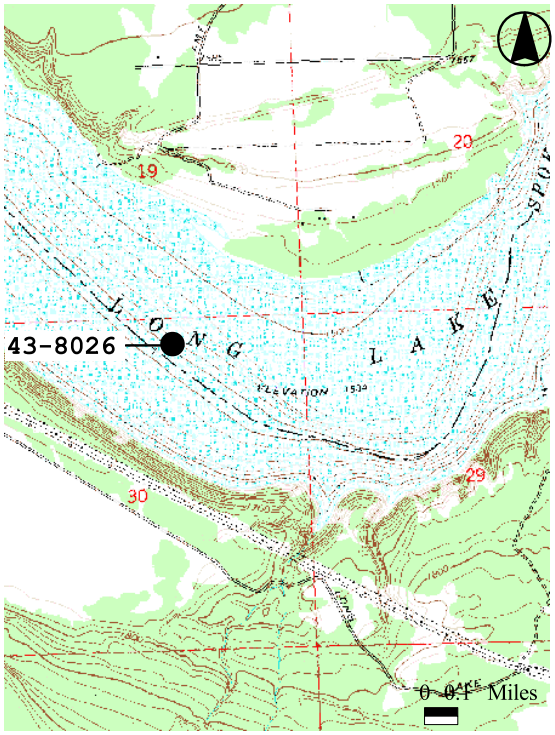


Upper Long Lake (site 5)

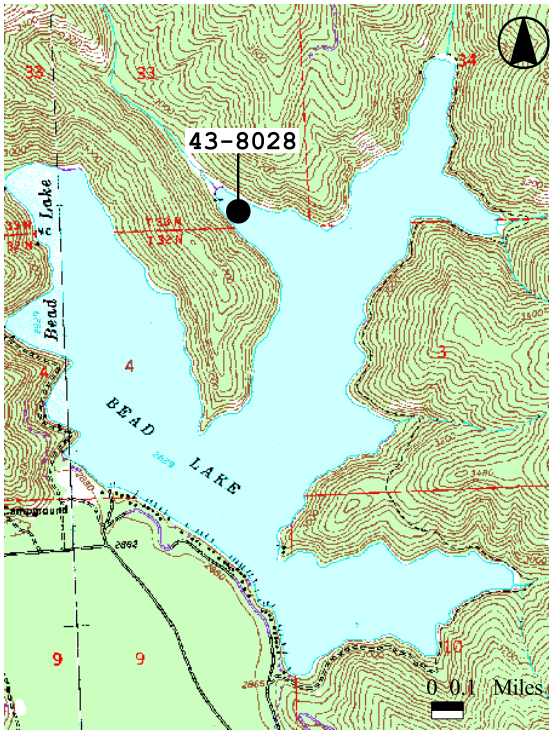
Figure 3. Sampling Site Location Details (sample number shown)



Middle Long Lake (site 6)



Lower Long Lake (site 7)



Bead Lake (site 8)

Figure 3. (continued)

Because of the generally non-depositional character of the river between Trentwood and the state line and the limited presence of fine-grained (sand size or less) subaqueous sediment accumulations, no sampling sites were selected in this reach. During the field work, an effort was made to locate submerged deposits of uniformly fine material at the Star Road/Island Bar complex near the state line (river mile 94.7) – where EPA soil samples have averaged 1,410 ug/Kg lead (EPA, 2000a) – but none could be located.

Sites 1 and 2 above Upriver Dam are among the areas most highly contaminated with metals, PCBs, and PAH. Although relatively close together, two sampling sites were selected because of the physical and chemical heterogeneity of the sediments behind the dam (Johnson, 2000).

TCP requested that samples be analyzed from Latah Creek (site 3), a major source of Palouse-derived sediment to the reach behind Nine-Mile Dam. Ecology and USGS analyzed metals in two sediment samples collected at the mouth of Latah Creek and found low concentrations of zinc (45 - 64 mg/Kg), cadmium (<0.1 - <0.5 mg/Kg), and lead (8 - 33 mg/Kg) (Johnson, 1999; Grosbois et al., 2001). Organic compounds were not analyzed at this location.

TCP also requested that sampling be done at the mouth of the Little Spokane River (site 4). Ecology and USGS have analyzed metals in two sediment samples collected at this location and found low concentrations of zinc (60 - 97 mg/Kg), cadmium (<0.1 - 0.1 mg/Kg), and lead (10 - 24 mg/Kg) (Johnson, 1999; Grosbois et al., 2001). Organic compounds have not been analyzed at this location.

Three sites were selected in Long Lake. Site 7 near Long Lake Dam has the highest zinc, cadmium, and lead concentrations in the lake. Relatively high levels of zinc, cadmium, and lead extend upstream to the middle part of the lake at site 6. TCP requested that a third site (5) also be sampled in the upper lake. The site was selected to be near USGS site SRG-8 which has the highest metals concentrations reported for this part of the river: 800 mg/Kg zinc, 7.9 mg/Kg cadmium, and 68 mg/Kg lead (Grosbois et al., 2001).

Sediment bioassays had been conducted previously at two of the sampling sites selected for the present study. Site 1 above Upriver Dam is on the 1998 303(d) water quality limited list based on a sediment sample bioassayed with Microtox and *Hyalella* (Batts and Johnson, 1994). Bioassays conducted for the same study on a sediment sample collected near site 7 in lower Long Lake indicated little or no toxicity. The metals concentrations in that sample, however, were much lower than those previously analyzed from this area of the lake. Results from a third sediment bioassay on a sample from the Spokane Arm also resulted in a 303(d) listing.

TCP had an interest in identifying a reference sediment with natural physical and chemical characteristics comparable to mainstem Spokane River sediments. TCP proposed Bead Lake (site 8) in Pend Oreille County, approximately 40 miles northeast of Spokane, as a reference for the present study. Bead is a 200-acre lake surrounded by U.S. Forest Service (USFS) land, with a few summer homes/cabins along the southwest shore. USFS has analyzed lead and PAH in the lake sediments. The levels are reported to be very low, but the data are not presently available (Wasson, 2000).

A detailed description of each sampling site can be found in Appendix A.

Sampling Methods

The samples from sites 1, 2, 5, 6, 7, and 8 were collected from an Ecology vessel using a 0.1 m^2 stainless steel van Veen grab. Sampling methods were consistent with PSEP protocols (EPA, 1996) and requirements of the Sediment Management Standards (Ecology, 1995a,b). Site 3 and 4 samples were collected by hand with a stainless steel scoop or stainless steel pipe dredge, respectively. Sampling sites were located and positions recorded using differentially-corrected GPS and landmarks. A grab was considered acceptable if not over-filled with sediment, overlying water was present and not excessively turbid, the sediment surface was relatively flat, and desired depth penetration has been achieved. A field log was maintained during sampling (Appendix B).

All samples were composites of the top 10 cm layer (Ecology, 1995; EPA, 2000b). After siphoning off overlying water, the top10 cm of sediment from each of three-to-five grabs per sampling site (seven or more for the pipe dredge and scoops) were removed with stainless steel scoops, placed in a stainless steel bowl, and homogenized by stirring. Material touching the side walls of the grab was not taken. Samples for the Microtox test were taken with minimum disturbance of the sediment, not homogenized, and the sample containers filled completely (no headspace) to minimize changes in pore water chemistry.

Subsamples of the homogenized sediment were placed in glass jars with Teflon lid liners, cleaned to EPA QA/QC specifications (EPA, 1990). Sample containers, preservation, and holding times are shown in Table 1.

Stainless steel implements used to collect and manipulate the sediments were cleaned by washing with Liquinox detergent, followed by sequential rinses with tap water, dilute nitric acid, deionized water, and pesticide-grade acetone. The equipment was then air-dried and wrapped in aluminum foil. Between-sample cleaning of the van Veen grab consisted of thorough brushing with on-site water.

Sediment samples were placed on ice immediately after collection and transported to the Ecology Manchester Environmental Laboratory within two to three days. Chain-of-custody was maintained (Appendix C).

Table 1. Sample Containers, Preservation, and Holding Times

Analysis	Container	Preservation	Holding Time
Chemistry			
Metals	8-oz. glass; TFE-lined lid	4° C in the dark	6 months
Organics	8-oz. glass; TFE-lined lid	"	7/14 days[b]
TOC	4-oz. glass; TFE-lined lid	"	7/14 days
Grain size	8-oz. glass; TFE-lined lid	"	6 months
Bioassays			
Microtox	1-liter glass; TFE-lined lid	4° C in the dark	14 days
Chironomus	1-liter glass; TFE-lined lid[a]	"	14 days
Hyalella	1-liter glass; TFE-lined lid[a]	"	14 days

[a] a total of three liters was collected for the *Chironomus* and *Hyalella* tests.

[b] extraction/analysis

Analytical Methods and Data Quality

Table 2 shows the analytical methods used and laboratories that did the work.

Manchester Laboratory staff prepared case narratives on the quality of the chemical data for this project. The reviews include an assessment of sample condition on receipt at the laboratory, compliance with holding times, and results for instrument calibration, procedural blanks, laboratory control samples, surrogates, matrix spikes, and matrix spike duplicates.

No significant problems were encountered in the chemical analyses, and the data are usable as qualified. The case narratives and complete chemical data showing reporting limits of undetected organic compounds are in Appendix D.

The precision of the chemical data reported here can be gauged from results of analyzing duplicate aliquots of selected sediment samples, summarized in Table 3. In most instances, the relative percent difference between duplicates was less than 20%. For those contaminants of greatest concern in the study area – zinc, cadmium, lead, and PCB-1248 – the duplicates agreed within 1%. Poor precision was indicated for dibenzofuran (49%) and benzoic acid (86%). A duplicate analysis was not done for pesticides.

Appendix E contains the bioassay laboratories' descriptions of the procedures used, test conditions, and results for reference toxicants and laboratory controls. Peter Adolphson of TCP reviewed the data packages and concluded that the tests were performed adequately. The raw data from the bioassays are on file at Ecology Headquarters.

Table 2. Analytical Methods

Analysis	Method	Laboratory
Chemistry		
Zinc	ICP - SW6010	Manchester
Cadmium	ICP - SW6010	"
Lead	ICP - SW6010	"
Antimony	ICP - SW6010	"
Beryllium	ICP - SW6010	"
Chromium	ICP - SW6010	"
Copper	ICP - SW6010	"
Nickel	ICP - SW6010	"
Silver	ICP - SW6010	"
Iron	ICP - SW6010	"
Aluminum	ICP - SW6010	"
Selenium	GFAA - SW7740	"
Thallium	GFAA - SW7841	"
Arsenic	GFFA - SW7060	"
Mercury	CVAA - EPA 245.5	"
Semivolatiles	GC/MS - SW8270	"
PCBs	GC/ECD - SW8082	"
OP and N pesticides	GC/AED - SW8085	"
OC pesticides	GC/ECD - SW8081	"
Herbicides	GC/AED - SW8085	"
Total Organic Carbon	Combustion/CO^2 - PSEP (1996)	"
Percent Solids	Gravimetric - EPA 160.3	"
Total Volatile Solids	Gravimetric - EPA 160.4	"
Grain Size	Sieve & Pipet - PSEP (1996)	Rosa Environmental
Bioassays		
Microtox pore water	Ecology Protocol (Adolphson, 2000)	Parametrix
Hyalella 28-day	Method 100.4 (EPA, 2000b)	Northwestern Aquatic Sciences
Chironomus 20-day	Method 100.5 (EPA, 2000b)	"

Table 3. Precision of Laboratory Duplicates

[Only detected semivolatiles are shown. Metals concentrations are in mg/Kg; organics are in ug/Kg; dry weight. Metals sample was 438026; organics sample was 438020.]

Analyte	Duplicate #1	Duplicate #2	RPD*
Metals			
Aluminum	31500	27200	15%
Antimony	5.2 J	6.3	19%
Beryllium	0.5 U	0.5 U	0%
Cadmium	20.6	20.4	1%
Chromium	33.6	30.2	11%
Copper	40.1	38.9	3%
Iron	30500	28000	9%
Lead	200	200	0%
Nickel	20.1	18.5	8%
Silver	4.9	4.0	20%
Zinc	1840	1840	0%
Arsenic	16.4	15.2	8%
Selenium	0.42	0.46	9%
Thallium	0.3 U	0.3 U	ND
Mercury	0.300	0.327	9%
Organics			
Total LPAH	1444	1484	3%
Total HPAH	1360	1593	16%
Phenol	214	205	4%
4-Methylphenol	1200	1190	1%
Diethylphthalate	171 UJ	187	>9%
Di-N-butylphthalate	65 UJ	84	>26%
Bis(2-ethylhexyl)phthalate	165 UJ	165	>0%
1,2-Dichlorobenzene	6.4 J	5.3	19%
1,4-Dichlorobenzene	10 J	7.8 J	25%
Retene	4930	5070	3%
Dibenzofuran	45	74	49%
Carbazole	34	31	9%
Benzyl alcohol	83	67	21%
Benzoic acid	578 UJ	231 J	>86%
PCB-1248	1400	1400	0%
PCB-1260	31	27	14%

*relative percent difference (range between duplicates as percent of duplicate mean)
U = not detected at or above the reported result
J = estimated concentration
UJ = not detected at or above the reported estimated result
ND = not detected

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Results and Discussion

Chemical Data

Results from the chemical analyses conducted on Spokane River, tributary, and reference sediments are summarized in Table 4.

The sediments at most of the sampling sites consisted primarily of sand (>76%). Finer material was encountered in middle and lower Long Lake, where the sediments are largely silt and clay (>96%). TOC was low in Latah Creek, the Little Spokane River, and upper Long Lake (0.2 – 0.5%) compared to other sites (2.3 – 6.7%).

The concentrations of zinc, cadmium, and lead in mainstem sediments were consistent with the historical data for these locations (see Figure 1). The highest concentrations occurred in the sample taken just behind Upriver Dam (site 2). Elevated arsenic and mercury concentrations were also measured at this site, as well as in lower Long Lake. For most of the metals analyzed, there appeared to be a trend toward increasing concentrations going from upper to lower Long Lake. Lower Long Lake (site 7) had the highest concentrations of iron, aluminum, chromium, copper, nickel, arsenic, antimony, and silver among the eight sites sampled (Table 5). This trend may be explained by the fact that finer grained sediments typically contain the majority of the metals associated with sediments in aquatic environments (Horowitz, 1985). Metals concentrations in Latah Creek and the Little Spokane River were low and comparable to Bead Lake.

Thirty-one semivolatile compounds were detected in the sediment samples. The largest number of compounds and, in most cases, the highest concentrations occurred in the sample behind Upriver Dam. The most commonly detected semivolatiles (five or more sites) were PAH, retene, 4-methylphenol, phenol, and dibenzofuran (Table 5). The highest concentrations of these compounds were found behind Upriver Dam or in the sample further above the dam (site 1, retene). Petroleum and combustion of fossil fuel are sources of PAH. Retene, 4-methylphenol, and dibenzofuran are often associated with wood waste. Wood fragments were noted in these samples (Appendix B).

PCBs were detected in all mainstem sediment samples, but not in Latah Creek, the Little Spokane River, or in Bead Lake. The highest concentrations again occurred at the two sites above Upriver Dam, where total PCBs were 1,307 – 1,431 ug/Kg. Previous PCB analyses at these sites had shown similar levels (Figure 1). PCB concentrations were much lower in Long Lake (2.0 – 99 ug/Kg total PCBs) and, as with metals, appeared to increase in a downstream direction.

Pesticide analysis was limited to the samples from Latah Creek and upper and lower Long Lake. Of the 114 chemicals analyzed (Appendix D), only DDE, a DDT breakdown product, was detected and only in lower Long Lake. The concentration was 4.1 ug/Kg.

Table 4. Summary of Results from Chemical Analyses of Spokane River Sediment Samples

[Only detected semivolatiles and pesticides are shown. Metals concentrations are in mg/Kg; organics are in ug/Kg; dry weight]

Location:	Above Upriver Dam	At Upriver Dam	Latah Creek	Little Spokane River	Upper Long Lake	Middle Long Lake	Lower Long Lake	Bead Lake
Site Number:	1	2	3	4	5	6	7	8
Date (2000):	23-Oct	23-Oct	25-Oct	24-Oct	24-Oct	24-Oct	25-Oct	24-Oct
Sample No. (43-):	8021	8020	8027	8023	8024	8025	8026	8028
Ancillary Parameters (%)								
Gravel (>2mm)	1.5	2.3	0.8	3.4	0.6	0.6	0.0	1.3
Sand (2mm - 62um)	96.0	76.3	97.3	91.3	80.5	3.1	3.6	80.7
Silt (62um - 4um)	0.5	16.4	1.8	4.6	15.9	81.5	48.9	12.8
Clay (<4um)	2.1	5.0	0.2	0.7	3.0	14.8	47.5	5.2
Total Organic Carbon	2.5	6.7	0.3	0.2	0.5	2.3	2.6	3.8
Total Volatile Solids	4.3	4.6	1.1	0.9	1.3	2.8	2.7	1.7
Solids	44	30	77	75	66	43	31	26
Metals								
Iron	**14700**	**17600**	**17800**	**12100**	**17000**	**24600**	**29200**	**14500**
Aluminum	**10800**	**14600**	**8160**	**8390**	**9050**	**20400**	**29350**	**11000**
Zinc	**1650**	**3010**	**47**	**31**	**391**	**1130**	**1840**	**56**
Lead	**195**	**479**	5 U	5 U	**18**	**84**	**200**	5 U
Chromium	**16**	**25**	**14** J	**10** J	**14**	**23**	**32**	**4.4** J
Copper	**13**	**37**	**7.2**	**3.3**	**8.0**	**23**	**40**	**7.0**
Nickel	**10**	**16**	**8.1**	**5.0**	**9.0**	**14**	**19**	**6.5**
Cadmium	**9.7**	**23**	0.5 U	0.5 U	**2.5**	**11**	**21**	**0.5**
Arsenic	**4.8**	**13**	**4.8**	**7.3**	**5.3**	**8.5**	**16**	**2.1**
Antimony	5 UJ	**5.0** J	5 UJ	5 UJ	5 UJ	**5.1** J	**5.8** J	5 UJ
Silver	2 U	2 U	**2.5**	2 U	2 U	2 U	**4.5**	2 U
Selenium	0.3 U	**0.61**	0.3 U	0.3 U	0.3 U	**0.37**	**0.44**	0.3 U
Thallium	**0.35**	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Beryllium	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Mercury	**0.080**	**0.34**	**0.014**	0.008 U	**0.024**	**0.087**	**0.31**	**0.030**
Low Molecular Weight PAH								
Naphthalene	**208**	**635**	**3.0** J	6.3 U	**6.2** J	108 U	**15** J	**29**
1-Methylnapthalene	**15**	**49**	**1.5** J	6.3 U	**1.5** J	108 U	**2.7** J	**6.2** J
2-Methylnaphthalene	**28**	**67**	**2.2** J	6.3 U	**2.3** J	108 U	**5.6** J	**8.8** J
Acenaphthene	**8.9**	**39**	5.9 U	6.3 U	**1.4** J	108 U	16 U	18 U
Fluorene	**19**	**42**	5.9 U	6.3 U	**8.5**	108 U	**20**	**24**
Acenaphthylene	**35**	**156**	5.9 U	6.3 U	7.6 UJ	108 U	**5.0** J	18 U
Phenanthrene	**121**	**394**	**5.3** J	**2.8** J	**34**	**27** J	**29**	**30**
Anthracene	**21**	**59**	**4.8** J	6.3 U	**16**	**82** J	**21**	18 U
Total LPAH*	**456**	**1438**	**17** J	**2.8** J	**70** J	**109** J	**98** J	**98** J
High Molecular Weight PAH								
Fluoranthene	**115**	**400**	**5.9** J	**4.0** J	**48**	**41** J	**55**	**15** J
Pyrene	**120**	**385**	**11**	**6.2** J	**51**	**78** J	**64**	**14** J
Benzo(a)anthracene	**24**	**92**	**8.6**	**7.1**	**35**	108 U	**35**	18 U
Chrysene	**47**	**151**	**24**	**2.9** J	**40**	108 U	**57**	18 U
Benzo(b)fluoranthene	11 U	**119**	**14**	**9.9**	**35**	108 U	16 U	18 U
Benzo(k)fluoranthene	**52**	**97**	5.9 U	**8.5**	**29**	**135**	16 U	18 U
Benzo(a)pyrene	**33**	**118**	**11**	6.3 U	**35**	108 U	16 U	18 U
Indeno(1,2,3-cd)pyrene	11 U	15 U	5.9 U	**7.0**	**24** J	108 U	**40**	18 U
Benzo(ghi)perylene	11 U	15 U	**15**	**8.7**	**23**	108 U	**41**	18 U
Total HPAH*	**391**	**1360**	**90** J	**54** J	**320** J	**254** J	**292**	**29** J

Table 4. Chemical Data (cont'd)

Location:	Above Upriver Dam	At Upriver Dam	Latah Creek	Little Spokane River	Upper Long Lake	Middle Long Lake	Lower Long Lake	Bead Lake
Site Number:	1	2	3	4	5	6	7	8
Date (2000):	23-Oct	23-Oct	25-Oct	24-Oct	24-Oct	24-Oct	25-Oct	24-Oct
Sample No. (43-):	8021	8020	8027	8023	8024	8025	8026	8028
Phenols								
Phenol	**149**	**210**	35 UJ	**44**	31 UJ	108 U	**58**	**54**
4-Methylphenol	**499**	**1190**	**45**	**26**	**46**	108 U	**36**	18 U
Phthalate Esters								
Diethylphthalate	160 UJ	**187****	20 UJ	16 UJ	25 UJ	**231** J	33 UJ	55 UJ
Di-N-butylphthalate	70 UJ	**84****	56 UJ	28 UJ	49 UJ	**134**	25 UJ	**1710** E
Bis(2-ethylhexyl)phthalate	98 UJ	**165****	101 UJ	45 UJ	92 UJ	**433**	154 UJ	135 UJ
Butylbenzylphthalate	11 U	15 U	**25**	6.3 U	7.6 U	108 U	16 U	18 U
Chlorinated Benzenes								
1,2-Dichlorobenzene	11 U	**5.9** J	5.9 U	6.3 U	7.6 UJ	108 U	16 U	18 U
1,4-Dichlorobenzene	**5.6** J	**8.9** J	5.9 U	6.3 U	7.6 UJ	108 U	**2.8** J	18 U
Miscellaneous Compounds								
Retene	**44200**	**5000**	**13**	**11**	**171**	**243**	**67**	**71**
Dibenzofuran	**20**	**60**	5.9 U	**3.3** J	7.6 UJ	108 U	**5.5** J	**15** J
Carbazole	**13**	**33**	5.9 U	6.3 U	**7.6** J	108 U	16 U	18 U
Benzyl alcohol	11 U	**75**	13 UJ	6.3 U	7.6 UJ	108 U	16 U	**45**
Benzoic acid	318 UJ	**231**** J	131 UJ	134 UJ	134 UJ	2170 U	268 UJ	431 UJ
2,4-Dinitrotoluene	21 U	31 U	12 U	13 U	**17**	108 U	32 U	37 U
Polychlorinated Biphenyls								
PCB-1016	160 UJ	120 UJ	4.7 U	5.1 U	5.8 U	8.4 U	12 U	13 U
PCB-1221	16 UJ	23 UJ	4.7 U	5.1 U	5.8 U	8.4 U	12 U	13 U
PCB-1232	7.9 UJ	35 UJ	4.7 U	5.1 U	5.8 U	8.4 U	12 U	13 U
PCB-1242	79 UJ	12 UJ	4.7 U	5.1 U	5.8 U	8.4 U	12 U	13 U
PCB-1248	**1300**	**1400**	4.7 U	5.1 U	5.8 U	**8.3** NJ	**44**	13 U
PCB-1254	16 UJ	230 UJ	4.7 U	5.1 U	**2.0** NJ	**8.6** NJ	**39**	13 U
PCB-1260	**6.8**	**29**	4.7 U	5.1 U	5.8 U	8.4 U	**16**	13 U
Total PCBs*	**1307**	**1431**	ND	ND	**2.0** NJ	**17** NJ	**99**	ND
Organochlorine pesticides								
4,4'-DDE	NA	NA	ND	NA	ND	NA	**4.1**	NA
Organophosphorus pesticides	NA	NA	ND	NA	ND	NA	ND	NA
N-containing pesticides	NA	NA	ND	NA	ND	NA	ND	NA
Herbicides	NA	NA	ND	NA	ND	NA	ND	NA

Detections highlighted in **BOLD**
U = not detected at or above the reported result
J = estimated concentration
UJ = not detected at or above the reported estimated result
NJ = evidence the analyte is present, numerical result is an estimate
ND = not detected
NA = not analyzed
E = concentration exceeds known calibration range, numerical value is an estimate.
* detected compounds only
** not detected in duplicate sample

Table 5. Detection Frequency for Chemicals Analyzed in Spokane River Sediment Samples

[Metals concentrations are in mg/Kg; organics are in ug/Kg; dry weight]

Analyte	Detection Frequency	Maximum	Minimum	Location of Maximum
Metals				
Iron	8/8	**29200**	**12100**	Lower Long Lake (site 7)
Aluminum	8/8	**29350**	**8160**	Lower Long Lake (site 7)
Zinc	8/8	**3010**	**31**	Upriver Dam (site 2)
Chromium	8/8	**32**	**4.4**	Lower Long Lake (site 7)
Copper	8/8	**40**	**3.3**	Lower Long Lake (site 7)
Nickel	8/8	**19**	**5.0**	Lower Long Lake (site 7)
Arsenic	8/8	**16**	**2.1**	Lower Long Lake (site 7)
Mercury	7/8	**0.34**	0.008 U	Upriver Dam (site 2)
Cadmium	6/8	**23**	0.5 U	Upriver Dam (site 2)
Lead	5/8	**479**	5 U	Upriver Dam (site 2)
Antimony	3/8	**5.8**	5 UJ	Lower Long Lake (site 7)
Selenium	3/8	**0.61**	0.3 U	Upriver Dam (site 2)
Silver	2/8	**4.5**	2 U	Lower Long Lake (site 7)
Thallium	1/8	**0.35**	0.3 U	Upriver Dam (site 1)
Beryllium	0/8	0.5 U	0.5 U	not detected
Organics				
LPAH	8/8	**1438**	**2.8** J	Upriver Dam (site 2)
HPAH	8/8	**1360**	**29** J	Upriver Dam (site 2)
Retene	8/8	**44200**	**11**	Upriver Dam (site 1)
4-Methylphenol	6/8	**1190**	18 U	Upriver Dam (site 2)
Phenol	5/8	**210**	31 UJ	Upriver Dam (site 2)
Dibenzofuran	5/8	**60**	**3.3** J	Upriver Dam (site 2)
PCB-1248	4/8	**1400**	4.7 U	Upriver Dam (site 2)
Di-N-butylphthalate	3/8	**1710**	25 UJ	Bead Lake (site 8)
1,4-Dichlorobenzene	3/8	**8.9** J	**2.8** J	Upriver Dam (site 2)
Carbazole	3/8	**33**	5.9 U	Upriver Dam (site 2)
PCB-1254	3/8	**230**	**2.0** NJ	Lower Long Lake (site 7)
PCB-1260	3/8	**29**	4.7 U	Upriver Dam (site 2)
Diethylphthalate	2/8	**231**	16 UJ	Middle Long Lake (site 6)
Bis(2-ethylhexyl)phthalate	2/8	**433**	45 UJ	Middle Long Lake (site 6)
Benzyl alcohol	2/8	**75**	6.3 U	Upriver Dam (site 2)
Butylbenzylphthalate	1/8	**25**	6.3 U	Latah Creek (site 3)
1,2-Dichlorobenzene	1/8	**5.8** J	5.9 U	Upriver Dam (site 2)
Benzoic acid	1/8	**231**	131 UJ	Upriver Dam (site 2)
2,4-Dinitrotoluene	1/8	**17**	12 U	Upper Long Lake (site 5)
4,4'-DDE	1/3	**4.1**	0.64 U	Lower Long Lake (site 7)

Detections highlighted in **BOLD**
U = not detected at or above the reported result
J = estimated concentration
UJ = not detected at or above the reported estimated result

Sediment Quality Guidelines

There are no Washington State standards or EPA national criteria for chemical contaminants in freshwater sediments. Therefore, as one means of assessing the potential hazard to sediment-dwelling organisms, in addition to the bioassays, the chemical data were compared to sediment quality guidelines from other sources. These are listed below in order of preference.[1]

1. Lowest Apparent Effect Threshold (Cubbage et al., 1997)
2. Consensus-based Threshold Effect Concentrations (MacDonald et al., 2000)
3. Lowest Effect Level (Persaud et al., 1993)
4. Effects Range Medium (Ingersoll et al., 1996)
5. British Columbia Freshwater Sediment Working Guidelines (Nagpal et al., 1995)
6. Ecotox Thresholds (EPA, 1996b)
7. Washington State Marine Sediment Quality Standards (WAC 174-204)
8. Marine Apparent Effects Thresholds (Barrick et al., 1988)

The guidelines used in this assessment are for effects thresholds (i.e., concentrations below which harmful effects on sediment dwelling organisms are not expected to occur). The Cubbage et al. lowest apparent effects thresholds were developed from data on Washington State freshwater sediments. These values were given first preference in comparing to the chemical data. The consensus-based threshold effect concentrations of MacDonald et al. integrate work done by a number of investigators, including Cubbage et al., Persaud et al., and Ingersoll et al., listed above. These values were used wherever a Cubbage et al. value was not available. In an effort to be conservative in assessing the potential for sediment toxicity, the MacDonald et al. values were also used in several instances where they were lower than the Cubbage values. The EPA ecotox thresholds were considered least preferred of the six sets of freshwater guidelines, since these are calculated values based on equilibrium partitioning theory rather than bioassays or benthic invertebrate data as in the other references. Where no freshwater sediment guidelines were available, a Washington State marine standard was used, or, failing that, a marine apparent effects threshold determined by Barrick et al.

Table 6 shows sediment guideline exceedance factors for each of the chemicals detected in the present study. An exceedance factor was calculated as the chemical concentration divided by the selected guideline. A ratio greater than 1 indicates the concentration of that chemical may adversely affect sediment-dwelling organisms. The reporting limit was used in instances where a chemical was not detected at a particular site.

[1] TCP is currently funding work to assemble recommended freshwater sediment quality guidelines. Therefore, the present report's approach and conclusions regarding exceedances of sediment guidelines should be considered preliminary (Betts, 2001).

Table 6. Sediment Quality Guidelines for Adverse Effects Thresholds to Sediment-Dwelling Organisms and Exceedance Factors for Spokane River Sediment Samples [exceedances ≥1 highlighted in **BOLD**]

Chemical	Effects Threshold Concentration	Sample Location: Above Upriver Dam (site 1)	At Upriver Dam (site 2)	Latah Creek (site 3)	Little Spokane River (site 4)	Upper Long Lake (site 5)	Middle Long Lake (site 6)	Lower Long Lake (site 7)	Bead Lake (site 8)
Metals (mg/Kg, dry weight)									
Iron	20,000[a]	0.7	0.9	0.9	0.6	0.9	**1.2**	**1.5**	0.7
Aluminum	58,000[g]	0.2	0.3	0.1	0.1	0.2	0.6	0.5	0.2
Zinc	121[b]	**14**	**25**	0.4	0.3	**3.2**	**9.3**	**15**	0.5
Lead	36[b]	**5.4**	**13**	0.1	0.1	0.5	**2.3**	**5.6**	0.1
Chromium	43[b]	0.4	0.6	0.3	0.2	0.3	0.5	0.7	0.1
Copper	32[b]	0.4	**1.2**	0.2	0.1	0.2	0.7	**1.2**	0.2
Nickel	46[c]	0.2	0.3	0.2	0.1	0.2	0.3	0.4	0.1
Cadmium	0.99[b]	**9.8**	**23**	0.5	0.5	**2.5**	**11**	**21**	0.5
Arsenic	9.8[b]	0.5	**1.3**	0.5	0.7	0.5	0.9	**1.6**	0.2
Antimony	3[c]	<1.7	**1.7**	<1.7	<1.7	<1.7	**1.7**	**1.9**	<1.7
Silver	4.5[c]	<0.4	<0.4	0.6	<0.4	<0.4	<0.4	1.0	<0.4
Selenium	5[f]	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Thallium	na	- -	- -	- -	- -	- -	- -	- -	- -
Beryllium	na	- -	- -	- -	- -	- -	- -	- -	- -
Mercury	0.56[c]	0.1	0.6	<0.1	<0.1	<0.1	0.2	0.6	<0.1
Organics (ug/Kg, dry weight)									
Total PAH	1,610[b]	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenol	48[c]	**3.1**	**4.4**	<0.7	0.9	<0.6	<2.3	**1.2**	**1.1**
4-Methylphenol	670[e]	0.7	**1.8**	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1
Diethylphthalate	1600[d]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1
Total PAH	1,610[b]	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Table 6. Sediment Quality Exceedances (continued)

Chemical	Effects Threshold Concentration	Above Upriver Dam (site 1)	At Upriver Dam (site 2)	Latah Creek (site 3)	Little Spokane River (site 4)	Upper Long Lake (site 5)	Middle Long Lake (site 6)	Lower Long Lake (site 7)	Bead Lake (site 8)
Organics (cont'd) (ug/Kg, dry weight)									
Phenol	48[c]	**3.1**	**4.4**	<0.7	0.9	<0.6	<2.3	**1.2**	**1.1**
4-Methylphenol	670[e]	0.7	**1.8**	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1
Diethylphthalate	1600[d]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1
Di-N-butylphthalate	43[c]	<1.6	**2.0**	<1.3	<0.7	<1.1	**3.1**	<0.6	**40**
Bis(2-ethylhexyl)phthalate	750[c]	<0.1	0.2	<0.1	<0.1	<0.1	0.6	<0.2	<0.2
Butylbenzylphthalate	27000[d]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dichlorobenzene	820[d]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,4-Dichlorobenzene	840[d]	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1
Retene	1,700[h]	**26**	**3.0**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzofuran	32,000[c]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Carbazole	140[c]	<0.1	0.2	<0.1	<0.1	<0.1	<0.7	<0.1	<0.1
Benzyl alcohol	57[e]	<0.2	**1.3**	<0.2	<0.1	<0.1	<1.9	<0.3	0.8
Benzoic acid	650[e]	0.5	0.4	0.2	0.2	0.2	<3.4	0.4	0.7
2,4-Dinitrotoluene	na	- -	- -	- -	- -	- -	- -	- -	- -
Total PCBs	21[c]	**62**	**68**	<0.2	<0.2	<0.1	0.8	**4.7**	<0.6
4,4'-DDE	3.2[b]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**1.3**	<0.1

[a]Lowest Effect Level (Persaud et al., 1993)

[b]Consensus-based Threshold Effect Concentrations (MacDonald et al., 2000)

[c]Lowest Apparent Effect Threshold (Cubbage et al., 1997)

[d]Ecotox Threshold @ 2.4% TOC (EPA, 1996b; exceedances adjusted for TOC content of the sample in question)

[e]Washington State Marine Sediment Standard (174-204 WAC)

[f]British Columbia Freshwater Sediment Quality Working Guidelines (Nagpal et al., 1995)

[g]Effects Range Medium (Ingersoll et al., 1996; effects range low guideline in this reference considered unreliable)

[h]Marine Apparent Effects Threshold (Barrick et al,, 1988)

na = sediment guideline not available

The results of this comparison identify 14 chemicals of potential concern, as summarized below in Table 7. However, seven of these – iron, copper, arsenic, antimony, 4-methylphenol, benzyl alcohol, and DDE – exceeded thresholds by less than a factor of 2. Exceedance factors greater the 2 were limited to zinc, lead, cadmium, phenol, retene, PCBs, and di-N-butylphthalate. The high di-N-butylphthalate concentration in Bead Lake sediments, and resulting large exceedance factor, is unexplained and seems anomalous in light of the lack of anthropogenic sources of this contaminant to the lake.

Table 7. Chemicals of Potential Concern (exceedance factor > 1) Based on Comparison with Sediment Quality Guidelines Effects Thresholds

	Sample Location							
Chemical	Above Upriver Dam (site 1)	At Upriver Dam (site 2)	Latah Creek (site 3)	Little Spokane River (site 4)	Upper Long Lake (site 5)	Middle Long Lake (site 6)	Lower Long Lake (site 7)	Bead Lake (site 8)
Primary Concern								
Zinc	14	25	- -	- -	3.2	9.3	15	- -
Lead	5.4	13	- -	- -	- -	2.3	5.6	- -
Cadmium	9.8	23	- -	- -	2.5	11	21	- -
Phenol	3.1	4.4	- -	- -	- -	- -	1.2	1.1
Di-N-butylphthalate	- -	2.0	- -	- -	- -	3.1	- -	40
Retene	26	3.0	- -	- -	- -	- -	- -	- -
Total PCBs	62	68	- -	- -	- -	- -	4.7	- -
Secondary Concern								
Iron	- -	- -	- -	- -	- -	1.2	1.5	- -
Copper	- -	1.2	- -	- -	- -	- -	1.2	- -
Arsenic	- -	1.3	- -	- -	--	- -	1.6	- -
Antimony	- -	1.7	- -	- -	- -	1.7	1.9	- -
Benzyl alcohol	- -	1.3	- -	- -	- -	- -	- -	- -
4,4'-DDE	- -	- -	- -	- -	- -	- -	1.3	- -

Sediment Bioassays

Results of the Microtox pore water bioassays are summarized in Table 8. In this test, readings of percent change in light emission by *Vibrio* bacteria on exposure to 100% sediment pore water (salinity adjusted) are taken at 5 minutes and 15 minutes. Results were compared to the laboratory control and the Bead Lake reference sediment.

Toxicity was indicated for the two sites above Upriver Dam, which were significantly different for both measurement intervals from both the control and Bead Lake reference sediment. The Latah Creek and Little Spokane samples indicated toxicity at the 15 and 5 minute interval, respectively, when compared to the reference sediment, but not when compared to the control.

Table 8. Summary of Results from Microtox Bioassays

Site Name	Site No.	Sample No.	Significantly different from control at p=0.05?		Significantly different from reference at p=0.05?	
			$T_{5\text{-minute}}$	$T_{15\text{-minute}}$	$T_{5\text{-minute}}$	$T_{15\text{-minute}}$
Above Upriver Dam	1	43-8021	**Yes**	**Yes**	**Yes**	**Yes**
At Upriver Dam	2	43-8020	**Yes**	No	**Yes**	**Yes**
Latah Creek	3	43-8027	No	No	No	**Yes**
Little Spokane River	4	43-8023	No	No	**Yes**	No
Upper Long Lake	5	43-8024	No	No	No	No
Middle Long Lake	6	43-8025	No	No	No	No
Lower Long Lake	7	43-8026	No	No	No	No
Bead Lake (reference)	8	43-8028	No	No	- -	- -

TCP uses results of the Microtox pore water test to make a best professional judgment determination of whether sediment samples exceed Ecology Sediment Quality Standards (SQS) or Cleanup Screening Levels (CSL) (Adolphson, 2000). Currently, equal weight is given to results from the 5 and 15 minute readings, but TCP may consider re-evaluating this position (Adolphson, 2001).

Relative percent differences between reference and test results of $\geq$ 15% indicate a SQS failure. Relative percent differences between reference and test results of $\geq$ 25% indicate a CSL failure. As shown in Table 9, the CSL was exceeded at Upriver Dam sites 1 and 2 (5 minute reading only). The 15 minute reading at site 1 exceeded the SQS but not the CSL.

Table 9. SQS and CSL Exceedance Calculation for Microtox Test

Site Name	Site No.	Sample No.	Exposure Time	Reference Sediment (mean)	Sediment Samples (mean)	RPD (%)
Above Upriver Dam	1	43-8021	$T_{5\text{-minute}}$	105.4	52.0	68**
"			$T_{15\text{-minute}}$	79.6	58.0	31**
At Upriver Dam	2	43-8020	$T_{5\text{-minute}}$	105.4	58.0	58**
"			$T_{15\text{-minute}}$	79.6	67.8	16*
Latah Creek	3	43-8027	$T_{5\text{-minute}}$	87.4	80.4	8
"			$T_{15\text{-minute}}$	78.8	70.4	11
Little Spokane River	4	43-8023	$T_{5\text{-minute}}$	105.4	92.4	13
"			$T_{15\text{-minute}}$	79.6	74.8	6
Upper Long Lake	5	43-8024	$T_{5\text{-minute}}$	105.4	90.8	15
"			$T_{15\text{-minute}}$	79.6	73.4	8
Middle Long Lake	6	43-8025	$T_{5\text{-minute}}$	87.4	85.6	2
"			$T_{15\text{-minute}}$	78.8	74.4	6
Lower Long Lake	7	43-8026	$T_{5\text{-minute}}$	87.4	75.8	14
"			$T_{15\text{-minute}}$	78.8	69.4	13

RPD = relative percent difference = ((reference mean - sample mean) / ((reference mean - sample mean)/2)) x 100
* greater than 15% (SQS) ** greater than 25% (CSL)

Table 10 summarizes results from the *Chironomus* bioassays. *Chironomus* confirmed the toxicity of the sample collected behind Upriver Dam (site 2), with significant mortality (94%) compared to both the control and reference sediment. The growth endpoint could not be evaluated for this sample because there were only two survivors. In contrast to Microtox, no toxicity was evident for the sample collected further upstream of the dam (site 1). *Chironomus* growth in lower Long Lake and in Bead Lake sediments was significantly lower than in laboratory control sediments, but not so for lower Long Lake when compared to the Bead Lake reference.

Table 10. Summary of Results from *Chironomus* Bioassays

		Mortality			Growth		
Site Name (No.)	Sample No.	Percent mortality (mean ± SD)	Significantly > control at p=0.05?	Significantly > reference at p=0.05?	Ave. wt. (mg) per larvae (mean ± SD)	Significantly < control at p=0.05?	Significantly < reference at p=0.05?
Laboratory Control	- -	28.8 ± 20.3	- -	No	1.12 ± 0.25	- -	- -
Above Upriver Dam (1)	43-8021	25.0 ± 14.1	No	No	1.06 ± 0.34	No	No
At Upriver Dam (2)	43-8020	93.8 ± 11.9	**Yes**	**Yes**	0.20 ± 0.20	(a)	(a)
Latah Creek (3)	43-8027	32.5 ± 18.3	No	No	1.16 ± 0.14	No	No
Little Spokane River (4)	43-8023	15.0 ± 13.1	No	No	1.00 ± 0.12	No	No
Upper Long Lake (5)	43-8024	37.5 ± 21.2	No	No	1.18 ± 0.37	No	No
Middle Long Lake (6)	43-8025	46.3 ± 23.3	No	No	1.00 ± 0.22	No	No
Lower Long Lake (7)	43-8026	27.5 ± 21.2	No	No	0.82 ± 0.12	**Yes**	No
Bead Lake (8) (reference sample)	43-8028	26.3 ± 27.2	No	- -	0.47 ± 0.19	**Yes**	- -

(a) unable to analyze due to only two survivors

All samples were toxic (mortality and/or growth) in the *Hyalella* bioassays when compared to the control, but not when compared to the reference sediment (Table 11). There was near total mortality of *Hyalella* in Latah Creek sediments, a marked contrast to results for *Chironomus*.

Nothing could be found in the test procedures or physical nature of the sediments to explain the reason for the high mortality (84%) and poor growth of *Hyalella* in Bead Lake sediments. Whatever the reason for these results, the Bead Lake sediment sample was not a useful reference for *Hyalella*, or *Chironomus*, as indicated by the growth endpoint.

Table 11. Summary of Results from *Hyalella* Bioassays

		Mortality			Growth		
Site Name (No.)	Sample No.	Percent mortality (mean ± SD)	Significantly > control at p=0.05?	Significantly > reference at p=0.05?	Ave. wt. (mg) per amphipod (mean ± SD)	Significantly < control at p=0.05?	Significantly < reference at p=0.05?
Laboratory Control	- -	3.8 ± 7.4	- -	- -	0.26 ± 0.04	- -	- -
Above Upriver Dam (1)	43-8021	16.3 ± 7.4	**Yes**	No	0.23 ± 0.04	No	No
At Upriver Dam (2)	43-8020	48.8 ± 20.3	**Yes**	No	0.20 ± 0.06	**Yes**	- -
Latah Creek (3)	43-8027	98.8 ± 3.5	**Yes**	No	0.05 ± 0.00	(a)	(a)
Little Spokane River (4)	43-8023	33.8 ± 19.2	**Yes**	No	0.16 ± 0.03	**Yes**	No
Upper Long Lake (5)	43-8024	13.8 ± 13.0	**Yes**	No	0.15 ± 0.02	**Yes**	No
Middle Long Lake (6)	43-8025	13.8 ± 16.9	No	No	0.12 ± 0.03	**Yes**	No
Lower Long Lake (7)	43-8026	36.3 ± 16.9	**Yes**	No	0.08 ± 0.02	**Yes**	No
Bead Lake (8) (reference sample)	43-8028	83.8 ± 25.0	**Yes**	- -	0.09 ± 0.02	**Yes**	- -

(a) unable to analyze due to only one survivor

Summary and Conclusions

The results of the sediment guideline comparison and the bioassays are summarized in Table 12.

Table 12. Summary of Indicators for Sediment Toxicity

Toxicity Indicator	Sample Location: Above Upriver Dam (site 1)	At Upriver Dam (site 2)	Latah Creek (site 3)	Little Spokane River (site 4)	Upper Long Lake (site 5)	Middle Long Lake (site 6)	Lower Long Lake (site 7)	Bead Lake (site 8)
Chemicals > 2x Effects Thresholds								
Zinc	**yes**	**yes**	no	no	**yes**	**yes**	**yes**	no
Lead	**yes**	**yes**	no	no	no	**yes**	**yes**	no
Cadmium	**yes**	**yes**	no	no	**yes**	**yes**	**yes**	no
Phenol	**yes**	**yes**	no	no	no	no	no	no
Di-N-butylphthalate	no	no	no	no	no	**yes**	no	**yes**
Retene	**yes**	**yes**	no	no	no	no	no	no
Total PCBs	**yes**	**yes**	no	no	no	no	**yes**	no
Bioassay Response								
Toxic in Microtox test*	**yes**	no	no	no	no	no	no	no**
Toxic to *Chironomus* (mortality)**	no	**yes**	no	no	no	no	no	no
Toxic to *Chironomus* (growth)**	no	**yes**	no	no	no	no	**yes**	**yes**
Toxic to *Hyalella* (mortality)**	**yes**	**yes**	**yes**	**yes**	**yes**	no	**yes**	**yes**
Toxic to *Hyalella* (growth)**	no	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**

*relative to reference sediment
**relative to laboratory control

The sediment guidelines used in the present assessment were substantially exceeded (by at least a factor of 2) above Upriver Dam at sites 1 and 2 and in middle and lower Long Lake at sites 6 and 7, indicating that toxicity would be likely to occur. The zinc and cadmium concentrations at all of these sites exceeded toxicity thresholds by factors of approximately 10 or more. PCBs levels at both Upriver Dam sites exceeded thresholds by factors of 62 - 68. Lead, phenol, di-N-butylphthalate, and retene were also above guidelines at two or more of these sites.

Threshold effect concentrations for zinc and cadmium were slightly exceeded in upper Long Lake (factors of 2 to 3) suggesting a potential for some level of adverse effect. Based on the chemical data, no chemical-induced toxicity would be expected to occur at Latah Creek or Little Spokane River.

Sediment guidelines were exceeded for phenol and di-N-butylphthalate in Bead Lake sediments, but only marginally for phenol. The phthalate result for Bead Lake seems anomalous, as previously mentioned.

Results from two of three sediment bioassays indicate sediment toxicity at Upriver Dam sites 1 and 2, in lower Long Lake, and in Bead Lake. These findings are in agreement with the chemical data. Middle Long Lake had several chemicals at levels of potential concern but, except for reduced growth of *Hyalella*, was nontoxic in the bioassays. The bioassays and chemical results for Upriver Dam site 1 confirm the validity of the current 303(d) listing.

This survey did not find strong multiple lines of evidence for toxicity in sediments from Latah Creek, the Little Spokane River, or in upper Long Lake. However, although the level of chemical contamination appeared to be low in Latah Creek and no toxicity was observed in the Microtox or *Chironomus* tests, the sediments were highly toxic to *Hyalella*.

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Appendices

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Appendix A.

Description of Sediment Sampling Sites

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Appendix A. Description of Sediment Sampling Sites in the Spokane River and Vicinity, October 23-24, 2000

Site Name	Site No.	Sample No.	Description*	Depth (ft.)	Latitude**	Longitude
Above Upriver Dam	1	43-8021	Off right bank, 0.4 mile above dam, river mile 80.6	21	47º 41.272’	117º 19.242’
At Upriver Dam	2	43-8020	Off right bank, just above safety cable approx. 100 yards above dam, river mile 80.2	27	47º 41.186’	117º 19,647’
Latah Creek	3	43-8027	Immediately above Riverside Ave. bridge	1	47º 39.28’	117º 27.22’
Little Spokane River	4	43-8023	Above highway 291, river mile 1.4	3	47º 46.74’	117º 31.29’
Upper Long Lake	5	43-8024	Left side of channel, off brown boat house, river mile 53.6	33	47º 47.863’	117º 35.543’
Middle Long Lake	6	43-8025	Embayment at river mile 47.2, long concrete bulkhead on right bank	66	47º 51.590’	117º 39.903’
Lower Long Lake	7	43-8026	River mile 36.0, 2.1 miles above Long Lake Dam	53	47º 48.778’	117º47.894’
Bead Lake	8	43-8028	Lake is 7 miles NNW of Newport, sample was in north arm, west inlet	30	48º 18.626’	117º 06.801’

*facing downstream
**NAD 83

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Appendix B.

Sediment Sampling Log

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Appendix B. Sediment Sample Log for Spokane River Sediment Bioassay Project

Station (Site No./Sample No.)	Grab No.	Depth (ft.)	Date (2000)	Time	Sediment Penetration (cm)	Sample Description
Above Upriver Dam	1	27	23-Oct	1415	17	Brown sandy-silt with slight H_2S odor
(1 / 43-8021)	2	27	23-Oct	1500	17	Brown sandy-silt with slight H_2S odor
	3	27	23-Oct	1510	15	Brown sandy-silt with slight H_2S odor, wood chips, small sticks
At Upriver Dam	1	21	23-Oct	1530	12	Brown sand with some silt, wood and plant fragments
(2 / 43-8020)	2	21	23-Oct	1545	13	Brown sand with some silt, wood and plant fragments
	3	21	23-Oct	1555	13	Brown sand with some silt, wood and plant fragments
Bead Lake	1	30	24-Oct	1135	17	Brown sandy silt
(8 / 43-8028)	2	29	24-Oct	1140	17	Brown sandy silt, thin wood layer at ~5cm
	3	29	24-Oct	1150	17	Brown sandy silt
Upper Long Lake	1	33	24-Oct	1445	14	Brown silty sand
(5 / 43-8024)	2	33	24-Oct	1455	12	Brown silty sand
	3	31	24-Oct	1500	14	Brown silty sand
Middle Long Lake	1	66	24-Oct	1525	17	Dark green/brown silt, soft
(6 / 43-8025)	2	66	24-Oct	1540	17	Dark green/brown silt, soft
	3	66	24-Oct	1550	17	Dark green/brown silt, soft
Lower Long Lake	1	53	25-Oct	940	17	Brown/gray silt, soft
(7 / 43-8026)	2	53	25-Oct	950	17	Brown/gray silt, soft
	3	53	25-Oct	1000	17	Brown/gray silt, soft
Latah Cr.	*	1	25-Oct	0730	~10	Sand
(3 / 43-8027)						
Little Spokane River	**	3	24-Oct	1730	~5-10	Sand
(4 / 43-8023)						

*multiple grabs with stainless steel scoop
**multiple grabs with stainless steel pipe dredge

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Appendix C.

Chain of Custody

Note to reader:

This chain-of-custody form shows sample number 438020 as *Upriver #1* and 438021 as *Upriver #2*, station identifications assigned in the field. However, in the text, figures, and tables in the main body of this report 438021 is referred to as *Above Upriver Dam, Site No. 1* and 438020 is *At Upriver Dam, Site No. 2.* This was done to maintain a downstream sequence of increasing site numbers, beginning with No. 1.

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Laboratory Analyses Required

Project Name: Spokane Sediment Bioassays
PIC: ______ **Program:** EAP
Send Results to: Art Johnson **Mail Stop:** 11G

☒ Preliminary Investigation ☐ Monitoring ☐ For HW Designation ☐ For NPDES

Date Results needed by: ______
☑ There is a QAPP for this project

General Chemistry: Alkalinity, Conductivity, Hardness, pH, Turbidity, ☐ Chloride ☐ Sulfate, Cyanide ☐ Total ☐ Weak, Total Solids, Total Nonvolatile Solids, Total Suspended Solids, Total Nonvol Suspend, Total Dissolved Solids, ☒ %Solids ☐ %Vol. Solids, TOC, BOD (5 day), Oil & Grease, Ammonia, Nitrate-Nitrite, Total Phos. ☐ low level, Orthophos. ☐ low level, Nitrate, Nitrite, ☐ TPN ☐ TKN, Chlorophyll ☐ filters, Grain size

~~Micro~~ Bioassays: Fecal Coliforms ☐ MF ☐ MPN, Total Coliforms ☐ MF ☐ MPN, E-Coli ☐ MF ☐ MPN, %Klebsiella, Microtox Photobacterium, Hyalella 28-d, Chironomus 20-d

Metals: ICP Scan, ICP/MS scan, PP Metals + Fe, Al, TCLP Metals, Mercury (Hg), GFAA list individually, ☐ Total ☐ Total Rec. ☐ Dissolved

Organic Chemistry: BNA ☐ w/extensive TIC's, PAH's low-level, VOA ☐ w/extensive TIC's, BTEX, Pests/PCB's, PCB's only low-level, OP-Pests, Herbicides, WTPH-HCID, WTPH-G, WTPH-D, WTPH-418.1 Modified, HCID Only

Mo	Da	Hr	Mn	Field Station Identification	Lab Sample Number	Matrix Code	Source Code	No. of Containers	%Solids	TOC	Grain size	Microtox	Hyalella 28-d	Chironomus 20-d	PP Metals + Fe, Al	BNA / PAH's	PCB's only
10	23			Upriver #1	43802020	40	12	7	X		X	X	X	X	X	X	X
↓	23			Upriver #2	21	↓	↓	↓	X	X	X	X	X	X	X	X	X
↓	24			Little Spk	23	↓	↓	↓	X	X	X	X	X	X	X	X	X
↓	24			Up Long Lk	24	↓	↓	↓	X	X	X	X	X	X	X	X	X
↓	24			Mid Long Lk	25	↓	↓	↓	X	X	X	X	X	X	X	X	X
↓	25			Low Long Lk	26	↓	↓	↓	X	X	X	X	X	X	X	X	X
↓	25			Latah Cr	27	↓	↓	↓	X	X	X	X	X	X	X	X	X
↓	24			Bead Lk	28	↓	↓	↓	X	X	X	X	X	X	X	X	X

Project Officer: Art Johnson
Phone number: 407-6766
Samplers: A Johnson, D Norton
Recorder: A Johnson
Date: 25 Oct 00

Chain of Custody Record

Relinquished By:	Received By:	Yr	Mo	Da	Hr	Mn	Seal I.D.	Condition of Seals	Comments
[illegible signature]	11G walkin	00	10	25	14	55	0012638		
							0012897		
CoC WALK-IN	Will White	00	10	26	07	00	0012834	All SEALS	
Will White	[illegible signature]	00	10	26			0012906	INTACT	[illegible]

Comments: (1) Analyze 438026 in duplicate for BNAs and PCBs
(2) Analyze 438026 in duplicate for remaining parameters
(3) Save excess sample

ECY 040-115 Rev. 4/96

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Appendix D.

Case Narratives and Chemical Data

Note to reader:

These laboratory data sheets show sample number 438020 as *Upriver #1* and 438021 as *Upriver #2*, station identifications assigned in the field. However, in the text, figures, and tables in the main body of this report 438021 is referred to as *Above Upriver Dam, Site No. 1* and 438020 is *At Upriver Dam, Site No. 2.* This was done to maintain a downstream sequence of increasing site numbers, beginning with No. 1.

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Washington State Department of Ecology
Manchester Laboratory

December 22, 2000

TO: Art Johnson

FROM: Kamilee Ginder, Chemist

SUBJECT: General Chemistry Quality Assurance Memo for Spokane Sediment Bioassays

SUMMARY

The data generated by the analysis of these samples can be used without qualification. All analyses requested were evaluated by established regulatory quality assurance guidelines.

SAMPLE INFORMATION

Samples for Spokane Sediment Bioassays Week 43 project were collected 10/23/00 - 10/25/00 and received by Manchester Environmental Laboratory on 10/26/00 in good condition with seals intact. Sample containers were shared between % Solids, %Volatile Solids, Total Organic Carbon, Base/Neutral/Acids and Polychlorinated Biphenyls. Total Organic Carbon sample portions were split from the rest on 11/3/00 and frozen until analysis to comply with holdtime limitations as per Puget Sound Sediment Protocol.

HOLDING TIMES

All analyses were performed within established EPA holding times.

ANALYSIS PERFORMANCE

Instrument Calibration

Instrument calibration was checked by initial calibration verification standards and blanks. All initial and continuing calibration verification standards were within control limits. A correlation coefficient of 0.995 or greater was met. Balances are professionally calibrated yearly and calibrated in-house daily. Oven temperature is recorded before and after each analysis batch.

Procedural Blanks

The procedural blanks associated with these samples showed no significant analytical levels of analytes.

Spiked Sample Analysis

Spiked sample analyses were performed where applicable with all spike recoveries within acceptance limits of ±25%. Spiked sample analysis is performed at a frequency of at least 5%.

Precision Data

Spiked sample results and duplicate sample results were used to evaluate precision on this sample set. Relative Percent Differences (RPD) for general chemistry parameters were within acceptance limits of ±20% for duplicate analysis. Laboratory duplication is performed at a frequency of at least 10%. Precision and accuracy specifications are based on sample concentrations greater than four times the reporting limit. For results near the reporting limit, the criteria are not guaranteed to be better than +/- the method detection limit.

Laboratory Control Sample(LCS) Analyses

LCS analyses were within the windows established for each parameter.

Other Quality Assurance Measures and Issues

The "U" qualification indicates that the analyte was not detected at or above the reporting limit.

Please call Jim Ross at (360) 871-8808 or Kamilee Ginder at (360) 871-8826 to further discuss this project.

cc: Project File

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Percent Solids

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Project Officer: Art Johnson **Method:** EPA 160.3
Date Reported: 31-OCT-00 **Matrix:** Sediment/Soil
Analyte: Solids

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
00438020		UPRIVER #1	30.4		%	10/23/00	10/26/00
00438021		UPRIVER #2	43.6		%	10/23/00	10/26/00
00438023		LITTLESPK	75.7		%	10/24/00	10/26/00
00438023	Duplicate		75.0		%	10/24/00	10/26/00
00438024		UPLONGLK	65.7		%	10/24/00	10/26/00
00438025		MIDLONGLK	43.0		%	10/24/00	10/26/00
00438026		LOWLONGLK	31.2		%	10/25/00	10/26/00
00438027		LATAH CR	77.0		%	10/25/00	10/26/00
00438028		BEAD LK	25.9		%	10/24/00	10/26/00

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Total Volatile Solids

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Project Officer: Art Johnson **Method:** EPA 160.4
Date Reported: 31-OCT-00 **Matrix:** Sediment/Soil
Analyte: Total Volatile Solids

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
00438020		UPRIVER #1	4.6		%	10/23/00	10/26/00
00438021		UPRIVER #2	4.3		%	10/23/00	10/26/00
00438023		LITTLESPK	0.9		%	10/24/00	10/26/00
00438023	Duplicate		0.9		%	10/24/00	10/26/00
00438024		UPLONGLK	1.3		%	10/24/00	10/26/00
00438025		MIDLONGLK	2.8		%	10/24/00	10/26/00
00438026		LOWLONGLK	2.7		%	10/25/00	10/26/00
00438027		LATAH CR	1.1		%	10/25/00	10/26/00
00438028		BEAD LK	1.7		%	10/24/00	10/26/00

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Total Organic Carbon (70 C)

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Project Officer: Art Johnson **Method:** PSEP-TOC
Date Reported: 21-DEC-00 **Matrix:** Frozen Sediment/Soil
Analyte: Total Organic Carbon

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
00438020		**UPRIVER #1**	**6.9**		%	10/23/00	12/11/00
00438020	Duplicate		**7.1**		%	10/23/00	12/11/00
00438021		**UPRIVER #2**	**2.5**		%	10/23/00	12/06/00
00438023		**LITTLESPK**	**0.2**		%	10/24/00	12/06/00
00438024		**UPLONGLK**	**0.5**		%	10/24/00	12/06/00
00438024	Matrix	**Spike**	**101%**			10/24/00	12/06/00
00438025		**MIDLONGLK**	**2.2**		%	10/24/00	12/06/00
00438026		**LOWLONGLK**	**2.5**		%	10/25/00	12/06/00
00438026	Duplicate		**2.5**		%	10/25/00	12/06/00
0438026	Replicate		**2.5**		%	10/25/00	12/06/00
00438027		**LATAH CR**	**0.3**		%	10/25/00	12/06/00
00438028		**BEAD LK**	**3.6**		%	10/24/00	12/11/00

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Total Organic Carbon (70C)

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Project Officer: Art Johnson **Method:** PSEP-TOC
Date Reported: 21-DEC-00 **Matrix:** Frozen Sediment/soil
Analyte: Total Organic Carbon

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
00438020		UPRIVER #1	6.6		%	10/23/00	12/11/00
00438020	Duplicate		6.8			10/23/00	12/11/00
00438021		UPRIVER #2	2.5		%	10/23/00	12/06/00
00438023		LITTLESPK	0.2		%	10/24/00	12/06/00
00438024		UPLONGLK	0.5		%	10/24/00	12/06/00
00438024	Matrix	Spike	101			10/24/00	12/06/00
00438025		MIDLONGLK	2.3		%	10/24/00	12/06/00
00438026		LOWLONGLK	2.6		%	10/25/00	12/06/00
00438026	Duplicate		2.6			10/25/00	12/06/00
00438026	Replicate		2.5			10/25/00	12/06/00
00438027		LATAH CR	0.3		%	10/25/00	12/06/00
00438028		BEAD LK	3.8		%	10/24/00	12/11/00

Authorized By:_____ Release Date:_____

State of Washington Department of Ecology
Manchester Environmental Laboratory
7411 Beach Dr. East Port Orchard WA. 98366

December 5, 2000

Project: Spokane Sediments

Samples: 43-8020-21, 8023-28

Laboratory: Rosa Environmental

By: Pam Covey

Case Summary

These samples required eight (8) Grain Size analyses on soil samples using Puget Sound Estuary Protocol (PSEP) method for gravel, sand, silt and clay fractions only. One sample was analyzed in triplicate. The samples were received at the Manchester Environmental Laboratory and transported to the contract lab on October 27, 2000 for Grain Size analyses.

The analyses were reviewed for qualitative and quantitative accuracy, validity and usefulness. See narrative from Rosa for further explanation on sample analysis anomalies.

The results are acceptable for use as reported.

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REG Lab WMBE
Rosa Environmental & Geotechnical Laboratory, LLC

1001 SW Klickitat Way, Suite 107
Seattle, WA 98134
(206) 287-9122

Client: WDOE, Manchester Laboratory	REGL Project No.: 1004-037
Client Project No.: Spokane Sediments	Sample Batch No.: 1004-037-01

Case Narrative

1. Samples were received on October 27, 2000, and were in good condition.
2. The apparent grain size distributions were measured according to PSEP methods.
3. A triplicate was run, and is reported in the attached QA summary.
4. Samples 43-8021 and 43-8027 did not meet the requirement of between 5 and 25 grams of material (passing the #230 sieve) required in the pipette portion of the analysis. For these samples, the maximum of sample was used so they were not reprocessed.
5. There were no other anomalies to the samples or the testing.

Laboratory Lead: _____ Date: 11/22/00

Approved by: _____ Date: 11/27/00
Laboratory Manager

Rosa Environmental and Geotechnical Laboratory, LLC

Wash Dept of Ecology
Spokane Sediments

Major Components of Apparent Grain Size Distribution by PSEP Methodology

Sample Number	Gravel (>2,000)	Sand (2,000< x <62.5)	Silt (62.5< x <4)	Clay (<4)
438026 A	0.0	2.8	50.5	46.6
438026 B	0.0	3.6	48.9	47.5
438026 C	0.1	3.6	47.2	49.1
438024	0.6	80.5	15.9	3.0
438025	0.6	3.1	81.5	14.8
438027	0.8	97.3	1.8	0.2
438028	1.3	80.7	12.8	5.2
438020	2.3	76.3	16.4	5.0
438021	1.5	96.0	0.5	2.1
438023	3.4	91.3	4.6	0.7

1004-037 1.

1. Testing performed according to PSEP "Apparent Grain Size Distribution" protocol, with modifications for determination of only the major components

Rosa Environmental and Geotechnical Laboratory, LLC

Wash Dept of Ecology
Spokane Sediments

QA Summary				
Sample Number	Gravel (>2,000)	Sand (2,000< x <62.5)	Silt (62.5< x <4)	Clay (<4)
438026 A	0.0	2.8	50.5	46.6
438026 B	0.0	3.6	48.9	47.5
438026 C	0.1	3.6	47.2	49.1
Average	0.02	3.35	48.87	47.77
STD,EV	0.02	0.37	1.36	1.04
%RSD	87.08	10.97	2.79	2.18

1004-037

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Washington Department of Ecology
Manchester Environmental Laboratory
7411 Beach Drive Fast
Port Orchard, WA 98366

January 9, 2001

TO: Art Johnson
FROM: Jim Ross, Manchester Lab
SUBJECT: Metals Quality Assurance memo for the Spokane Sediment Bioassays

SUMMARY
Antimony spike recoveries were low (43,46%). Chromium was detected in the prep blank at 2.2 mg/Kg. All antimony data was qualified as estimated. Chromium data below 22 mg/Kg was qualifies as estimated. All other data for this project met all QA and QC criteria and can be used without qualification.

SAMPLE RECEIPT
The samples were received by the Manchester laboratory on 10/26/00 in good condition.

HOLDING TIMES
All analyses were performed within the specified holding time (28 days mercury, 180 days all other metals).

INSTRUIVIENT CALIBRATION
Instrument calibration was performed before each ;analytical run and checked by initial calibration verification standards and blanks. Continuing calibration standards and blanks were analyzed at a frequency of 10 % during the run and again at the end of the analytical run. All initial and continuing calibration verification standards and blanks were within the relevant control limits (90110%).

PROCEDURAL BLANKS
Chromium was present (2.2 mg/Kg) in the procedural blank. Sample results less than ten times the blank level were qualified as estimated. The procedural blanks associated with this sample showed no other analytically significant levels of requested analyte.

SPIKED SAMPLE ANALYSES
Antimony spike recoveries were low (43, 46 %). All antimony results are qualified as estimated values. All other spike and duplicate spike recoveries were all within relevant control limits (75-125%).

PRECISION DATA
Precision estimates based on duplicate spike analysis were all within the acceptance criteria for duplicate analysis (±20 %) for all analytes.

LABORATORY CONTROL SAMPLE (LCS) ANALYSES
The LCS used for this project was in control for all analytes.

Please call Jim Ross at (360) 871-8808 to further discuss this project.

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **M0308SB1** **Method:** SW6010
Field ID: Laboratory Method Bank **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Aluminum	5	U
Antimony	5	U
Beryllium	0.5	U
Cadmium	0.5	U
Chromium	**2.2**	
Copper	1	U
Iron	5	U
Lead	5	U
Nickel	1	U
Silver	2	U
Zinc	1	U

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **M0308SL1** **Method:** SW6010
Field ID: Laboratory Control Sample **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** %

Analyte	Result	Qualifier
Aluminum	**95**	
Antimony	**84**	
Beryllium	**116**	
Cadmium	**106**	
Chromium	**115**	
Copper	**102**	
Iron	**78**	
Lead	**110**	
Nickel	**110**	
Silver	**114**	
Zinc	**103**	

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438020** **Date Collected:** 10/23/00 **Method:** SW6010
Field ID: UPRIVER #1 **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** mg/KG dw

Analyte	Result	Qualifier
Aluminum	**14600**	
Antimony	**5.0**	**J**
Beryllium	0.5	U
Cadmium	**22.6**	
Chromium	**25.0**	
Copper	**37.0**	
Iron	**17600**	
Lead	**479**	
Nickel	**15.9**	
Silver	2	U
Zinc	**3010**	

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438021** **Date Collected:** 10/23/00 **Method:** SW6010
Field ID: UPRIVER #2 **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** mg/KG dw

Analyte	Result	Qualifier
Aluminum	**10800**	
Antimony	5	UJ
Beryllium	0.5	U
Cadmium	**9.64**	
Chromium	**16.4**	**J**
Copper	**12.9**	
Iron	**14700**	
Lead	**195**	
Nickel	**10.5**	
Silver	2	U
Zinc	**1650**	

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438023** **Date Collected:** 10/24/00 **Method:** SW6010
Field ID: LITTLESPK **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** mg/KG dw

Analyte	Result	Qualifier
Aluminum	**8390**	
Antimony	5	UJ
Beryllium	0.5	U
Cadmium	0.5	U
Chromium	**10.5**	**J**
Copper	**3.3**	
Iron	**12100**	
Lead	5	U
Nickel	**5.0**	
Silver	2	U
Zinc	**30.7**	

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438024** **Date Collected:** 10/24/00 **Method:** SW6010
Field ID: UPLONGLK **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** mg/kg dw

Analyte	Result	Qualifier
Aluminum	**9050**	
Antimony	5	UJ
Beryllium	0.5	U
Cadmium	**2.5**	
Chromium	**13.5**	**J**
Copper	**7.95**	
Iron	**17000**	
Lead	**18**	
Nickel	**9.0**	
Silver	2	U
Zinc	**391**	

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438024 (Matrix Spike – LMX1)** **Date Collected:** 10/24/00 **Method:** SW6010
Field ID: UPLONGLK **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** % Recovery

Analyte	Result	Qualifier
Aluminum		NC
Antimony	**43**	
Beryllium	**98**	
Cadmium	**93**	
Chromium	**96**	
Copper	**93**	
Iron		NC
Lead	**96**	
Nickel	**93**	
Silver	**104**	
Zinc	**99**	

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438024 (Matrix Spike – LMX2)** **Date Collected:** 10/24/00 **Method:** SW6010
Field ID: UPLONGLK **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** % Recovery

Analyte	Result	Qualifier
Aluminum		NC
Antimony	**46**	
Beryllium	**100**	
Cadmium	**95**	
Chromium	**97**	
Copper	**93**	
Iron		NC
Lead	**93**	
Nickel	**94**	
Silver	**106**	
Zinc	**94**	

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438025** **Date Collected:** 10/24/00 **Method:** SW6010
Field ID: MIDLONGLK **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** mg/Kg dw

Analyte	Result	Qualifier
Aluminum	**20400**	
Antimony	**5.1**	**J**
Beryllium	0.5	U
Cadmium	**10.8**	
Chromium	**22.6**	
Copper	**23.2**	
Iron	**24600**	
Lead	**84**	
Nickel	**14.3**	
Silver	2	U
Zinc	**1130**	

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438026** **Date Collected:** 10/25/00 **Method:** SW6010
Field ID: LOWLONGLK **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** mg/Kg dw

Analyte	Result	Qualifier
Aluminum	**31500**	
Antimony	**5.2**	**J**
Beryllium	0.5	U
Cadmium	**20.6**	
Chromium	**33.6**	
Copper	**40.1**	
Iron	**30500**	
Lead	**200**	
Nickel	**20.1**	
Silver	**4.9**	
Zinc	**1840**	

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438026 (Duplicate – LDP1) **Date Collected:** 10/25/00 **Method:** SW6010
Field ID: LOWLONGLK **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** mg/Kg dw

Analyte	Result	Qualifier
Aluminum	**27200**	
Antimony	**6.3**	**J**
Beryllium	0.5	U
Cadmium	**20.4**	
Chromium	**30.2**	
Copper	**38.9**	
Iron	**28000**	
Lead	**200**	
Nickel	**18.5**	
Silver	**4.0**	
Zinc	**1840**	

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438027** **Date Collected:** 10/25/00 **Method:** SW6010
Field ID: LATAH CR **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** mg/Kg dw

Analyte	Result	Qualifier
Aluminum	**8160**	
Antimony	5	UJ
Beryllium	0.5	U
Cadmium	0.5	U
Chromium	**13.8**	**J**
Copper	**7.24**	
Iron	**17800**	
Lead	5	
Nickel	**8.1**	
Silver	**2.5**	
Zinc	**46.9**	

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438028** **Date Collected:** 10/24/00 **Method:** SW6010
Field ID: BEAD LK **Date Prepared:** 11/03/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/21/00 **Units:** mg/Kg dw

Analyte	Result	Qualifier
Aluminum	**11000**	
Antimony	5	UJ
Beryllium	0.5	U
Cadmium	**0.51**	
Chromium	**4.4**	**J**
Copper	**7.04**	
Iron	**14500**	
Lead	5	U
Nickel	**6.5**	
Silver	2	U
Zinc	**56.4**	

Authorized By:_____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Arsenic

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Project Officer: Art Johnson **Method:** SW7060
Date Reported: 17-NOV-00 **Matrix:** Sediment/Soil
Analyte: Arsenic

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
00438020		UPRIVER #1	**12.6**		Mg/Kg dw	10/23/00	11/07/00
00438021		UPRIVER #2	**4.80**		Mg/Kg dw	10/23/00	11/07/00
00438023		LITTLESPK	**7.27**		Mg/Kg dw	10/24/00	11/07/00
00438024		UPLONGLK	**5.26**		Mg/Kg dw	10/24/00	11/07/00
00438024	Matrix	Spike	**78 %**			10/24/00	11/07/00
00438024	Matrix	Spike	**91 %**			10/24/00	11/07/00
00438025		MIDLONGLK	**8.53**		Mg/Kg dw	10/24/00	11/07/00
00438026		LOWLONGLK	**16.4**		Mg/Kg dw	10/25/00	11/07/00
00438026	Duplicate		**15.2**		Mg/Kg dw	10/25/00	11/07/00
00438027		LATAH CR	**4.79**		Mg/Kg dw	10/25/00	11/07/00
00438028		BEAD LK	**2.1**		Mg/Kg dw	10/24/00	11/07/00
M0308SB1			0.3	U	Mg/Kg dw		11/07/00
M0308SL1			**117**		%		11/07/00

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Selenium

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Project Officer: Art Johnson **Method:** SW7740
Date Reported: 17-NOV-00 **Matrix:** Sediment/Soil
Analyte: Selenium

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
00438020		UPRIVER #1	**0.61**		Mg/Kg dw	10/23/00	11/07/00
00438021		UPRIVER #2	0.3		Mg/Kg dw	10/23/00	11/07/00
00438023		LITTLESPK	0.3		Mg/Kg dw	10/24/00	11/07/00
00438024		UPLONGLK	0.3		Mg/Kg dw	10/24/00	11/07/00
00438024	Matrix	Spike	**112 %**			10/24/00	11/07/00
00438024	Matrix	Spike	**111 %**			10/24/00	11/07/00
00438025		MIDLONGLK	**0.37**		Mg/Kg dw	10/24/00	11/07/00
00438026		LOWLONGLK	**0.42**		Mg/Kg dw	10/25/00	11/07/00
00438026	Duplicate		**0.46**		Mg/Kg dw	10/25/00	11/07/00
00438027		LATAH CR	0.3		Mg/Kg dw	10/25/00	11/07/00
00438028		BEAD LK	0.3		Mg/Kg dw	10/24/00	11/07/00
M0308SB1			0.3	U	Mg/Kg dw		11/07/00
M0308SL1			**102**		%		11/07/00

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Thallium

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Project Officer: Art Johnson **Method:** SW7841
Date Reported: 05-DEC-00 **Matrix:** Sediment/Soil
Analyte: Thallium

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
00438020		UPRIVER #1	0.3	U	Mg/Kg dw	10/23/00	11/06/00
00438021		UPRIVER #2	**0.35**		Mg/Kg dw	10/23/00	11/06/00
00438023		LITTLESPK	0.3	U	Mg/Kg dw	10/24/00	11/06/00
00438024		UPLONGLK	0.3	U	Mg/Kg dw	10/24/00	11/06/00
00438024	Matrix	Spike	**87 %**			10/24/00	11/06/00
00438024	Matrix	Spike	**80 %**			10/24/00	11/06/00
00438025		MIDLONGLK	0.3	U	Mg/Kg dw	10/24/00	11/06/00
00438026		LOWLONGLK	0.3	U	Mg/Kg dw	10/25/00	11/06/00
00438026	Duplicate			U	Mg/Kg dw	10/25/00	11/06/00
00438027		LATAH CR	0.3	U	Mg/Kg dw	10/25/00	11/06/00
00438028		BEAD LK	0.3	U	Mg/Kg dw	10/24/00	11/06/00
M0308SB1			0.3	U	Mg/Kg dw		11/06/00
M0308SL1			**114**		%		11/06/00

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Mercury

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Project Officer: Art Johnson **Method:** EPA245.5
Date Reported: 04-JAN-01 **Matrix:** Sediment/Soil
Analyte: Mercury

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
00438020		UPRIVER #1	**0.339**		Mg/Kg dw	10/23/00	11/06/00
00438021		UPRIVER #2	**0.080**		Mg/Kg dw	10/23/00	11/06/00
00438023		LITTLESPK	0.008	U	Mg/Kg dw	10/24/00	11/06/00
00438024		UPLONGLK	**0.024**		Mg/Kg dw	10/24/00	11/06/00
00438024	Matrix	Spike	**92 %**			10/24/00	11/06/00
00438024	Matrix	Spike	**91 %**			10/24/00	11/06/00
00438025		MIDLONGLK	**0.087**		Mg/Kg dw	10/24/00	11/06/00
00438026		LOWLONGLK	**0.300**		Mg/Kg dw	10/25/00	11/06/00
00438026	Duplicate		**0.327**		Mg/Kg dw	10/25/00	11/06/00
00438027		LATAH CR	**0.014**		Mg/Kg dw	10/25/00	11/06/00
00438028		BEAD LK	**0.030**		Mg/Kg dw	10/24/00	11/06/00
M0311SG1			**101**		%		11/06/00
M0308SH1			0.006	**U**	Mg/Kg dw		11/06/00

Authorized By: _____ Release Date: _____

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MANCHESTER ENVIRONMENTAL LABORATORY
7411 Beach Drive E., Port Orchard Washington 98366

January 22, 2001

Subject: Spokane Sediment Bioassays
Samples: 00438020 - 021, 023 - 028
Project ID: 435800
Project Officer: Art Johnson
By: Greg Perez

SEMIVOLATILE ORGANICS

ANALYTICAL METHODS:

The samples were extracted following the EPA SW-846 8270 procedure. Extracts were cleaned up using Gel Permeation Chromatography (GPC): Analysis was by capillary gas chromatography with mass spectrometry (GC/MS). Routine QA/QC procedures were performed with the analyses.

HOLDING TIMES:

The samples were stored at 4 degrees C until extraction. They were extracted and analyzed within the recommended holding times.

BLANKS:

Low levels of some analytes were detected in the laboratory blanks. An analyte is considered native to the sample when the on-column concentration is at least five times greater than in the associated method blanks. A phthalate is considered native to the sample when the concentration is at least ten times greater than in the associated method blanks.

SURROGATES:

The standard Manchester Laboratory Base/Neutral/Acid (BNA) surrogates were added to the sample prior to extraction. All surrogate recoveries were within acceptable limits.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

Recoveries for most compounds were acceptable. Those few compounds which were not recovered were qualified. Retene is not in the spiking solution and has been qualified as not calculated (NC).

COMMENTS:

The data is acceptable for use as reported. Sample 438020 was sampled in duplicate. Both duplicates required dilution. These dilutions have been labeled DILI and DIL2. DIL2 is the dilution of the duplicate sample. Sample 438025 was diluted because of aldol condensate interference.

DATA QUALIFIER CODES:

U	-	The analyte was not detected at or above the reported value.
J	-	The analyte was positively identified. The associated numerical value is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
NAF	-	Not analyzed for.
N	-	There is evidence the analyte is present in the sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range. The associated numerical result is an estimate.
bold	-	The analyte was present in the sample. (Visual Aid to locate detected compounds on report sheet.)

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438020** **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21//00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	**214**		2,4-Dinitrotoluene	31	U
Bis(2-Chloroethyl)Ether	15	U	2,6-Dinitrotoluene	15U	U
2-Chlorophenol	15	U	Diethylphthalate	171	UJ
1, 3-Dichlorobenzene	15	U	4-Chlorophenyl-Phenylether	15	U
1,4-Dichlorobenzene	**10**	**J**	**Fluorene**	**43**	
Benzyl Alcohol	**83**		4-Nitroaniline	61	U
1,2-Dichlorobenzene	**6.4**	**J**	4,6-Dinitro-2-Methylphenol	153	U
2-Methylphenol	15	U	N-Nitrosodiphenylamine	15	U
2,2'-Oxybis[1-chloropropane]	15	U	4-Bromophenyl-Phenylether	15	U
4-Methylphenol	**1480**	**E**	Hexachlorobenzene	15	U
N-Nitroso-Di-N-Propylamine	15	U	Pentachlorophenol	15	UJ
Hexachloroethane	15	U	**Phenanthrene**	**431**	
Nitrobenzene	15	U	**Anthracene**	**72**	
Isophorone	15	U	**Carbazole**	**34**	
2-Nitrophenol	15	U	Di-N-Butylphthalate	65	UJ
2,4-Dimethylphenol	15	U	**Fluoranthene**	**464**	
Benzoic Acid	578	UJ	**Pyrene**	**430**	
Bis(2-Chloroethoxy)Methane	15	U	**Retene**	**5650**	**E**
2,4-Dichlorophenol	15	U	Butylbenzylphthalate	15	U
1,2,4-Trichlorobenzene	15	U	3,3'-Dichlorobenzidine	31	U
Naphthalene	**632**		Benzo(a)anthracene	113	
4-Chloroaniline	15	U	Bis(2-Ethylhexyl) Phthalate	165	UJ
Hexachlorobutadiene	15	U	Chrysene	182	
4-Chloro-3-Methylphenol	15	U	Di-N-Octyl Phthalate	15	U
2-Methylnaphthalene	**68**		**Benzo(b)fluoranthene**	**146**	
1-Methylnaphthalene	**55**		**Benzo(k)fluoranthene**	**121**	
Hexachlorocyclopentadiene	15	U	**Benzo(a)pyrene**	**137**	
2,4,6-Trichlorophenol	15	U	Indeno(1,2,3-cd)pyrene	15	U
2,4,5-Trichlorophenol	15	U	Dibenzo(a,h)anthracene	15	U
2-Chloronaphthalene	15	U	Benzo(ghi)perylene	15	U
2-Nitroaniline	15	U			
Dimethylphthalate	18	U U	**Surrogate Recoveries**		
Acenaphthylene	**154**				
3-Nitroaniline	15	U	**D5-Nitrobenzene**	**66**	**%**
Acenaphthene	**40**		**2-Fluorobiphenyl**	**86**	**%**
2,4-Dinitrophenol	306	U	**Terphenyl-D14**	**87**	**%**
4-Nitrophenol	61	U	**Pyrene-D10**	**84**	**%**
Dibenzofuran	**45**		**D5-Phenol**	**89**	**%**

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438020 **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**86**	**%**

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438020 **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21//00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1123097	***2-Cyclohexen-l-one, 3,5-dimethyl***	**626**	**NJ**
1560925	***Hexadecane, 2-methyl***	**13000**	**NJ**
13980126	***cis-9,10-Epoxyoctadecan-l-of***	**2400**	**NJ**
2091294	***9-Hexadecenoic acid***	**10400**	**NJ**
10544500	***Sulfur, mot. (S8)***	**3940**	**NJ**
1599673	***1-Docosene***	**53600**	**NJ**
593497	***Heptacosane***	**5810**	**NJ**
55255577	***Naphthalene, 1-decyl-1, 2, 3, 4-tetrahydro***	**37600**	**NJ**
83476	***.gamma.-Sitosterol***	**53500**	**NJ**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438020 (Duplicate – LDP1) **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	205		2,4-Dinitrotoluene	31	U
Bis(2-Chloroethyl)Ether	15	U	2,6-Dinitrotoluene	15	U
2-Chlorophenol	15	U	**Diethylphthalate**	187	
1, 3-Dichlorobenzene	15	U	4-Chlorophenyl-Phenylether	15	U
1,4-Dichlorobenzene	7.8	J	**Fluorene**	40	
Benzyl Alcohol	67		4-Nitroaniline	61	U
1,2-Dichlorobenzene	5.3	J	4,6-Dinitro-2-Methylphenol	152	U
2-Methylphenol	15	U	N-Nitrosodiphenylamine	15	U
2,2'-Oxybis[1-chloropropane]	15	U	4-Bromophenyl-Phenylether	15	U
4-Methylphenol	1220	E	Hexachlorobenzene	15	U
N-Nitroso-Di-N-Propylamine	15	U	Pentachlorophenol	15	U
Hexachloroethane	15	U	**Phenanthrene**	357	
Nitrobenzene	15	U	**Anthracene**	46	
Isophorone	15	U	**Carbazole**	31	
2-Nitrophenol	15	U	**Di-N-Butylphthalate**	84	
2,4-Dimethylphenol	15	U	**Fluoranthene**	335	
Benzoic Acid	231	J	**Pyrene**	339	
Bis(2-Chloroethoxy)Methane	15	U	**Retene**	5660	E
2,4-Dichlorophenol	15	U	Butylbenzylphthalate	15	U
1,2,4-Trichlorobenzene	15	U	3,3'-Dichlorobenzidine	31	U
Naphthalene	637		**Benzo(a)anthracene**	71	
4-Chloroaniline	15	U	**Bis(2-Ethylhexyl) Phthalate**	165	
Hexachlorobutadiene	15	U	**Chrysene**	119	
4-Chloro-3-Methylphenol	15	U	Di-N-Octyl Phthalate	15	U
2-Methylnaphthalene	65		**Benzo(b)fluoranthene**	91	
1-Methylnaphthalene	42		**Benzo(k)fluoranthene**	73	
Hexachlorocyclopentadiene	15	U	**Benzo(a)pyrene**	98	
2,4,6-Trichlorophenol	15	U	Indeno(1,2,3-cd)pyrene	15	U
2,4,5-Trichlorophenol	15	U	Dibenzo(a,h)anthracene	15	U
2-Chloronaphthalene	15	U	Benzo(ghi)perylene	15	U
2-Nitroaniline	15	U			
Dimethylphthalate	15	U	**Surrogate Recoveries**		
Acenaphthylene	157				
3-Nitroaniline	15	U	D5-Nitrobenzene	60	%
Acenaphthene	37		2-Fluorobiphenyl	75	%
2,4-Dinitrophenol	305	U	Terphenyl-D14	81	%
4-Nitrophenol	61	U	Pyrene-D10	79	%
Dibenzofuran	74		D5-Phenol	75	%

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438020 DUPLICATE – LDP1 **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**73**	**%**

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438020 (Duplicate – LDP1) **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27//00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
483772	*Naphthalene, 1, 2, 3, 4-tetrahydro-1, 6-dimethyl-4-(1-m*	**2980**	**NJ**
1560925	*Hexadecane, 2-methyl*	**1370**	**NJ**
2091294	*9-Hexadecenoic acid*	**2780**	**NJ**
5153924	*1 H-Naphtho(2,1-bJpyran, 4a, 5, 6, 6a, 7, 8, 9,10, IOa, IOb*	**5480**	**NJ**
38754948	*s-Indacen-1(2H)-on e, 3, 5, 6, 7-tetrahydro-.3, 3, 4, 5, 5, 8*	**4870**	**NJ**
1599673	*1-Docosene*	**10400**	**NJ**
7683649	*Squalene*	**2050**	**NJ**
630035	*Nonacosane*	**11000**	**NJ**
629969	*1-Eicosanol*	**10300**	**NJ**
55255577	*Naphthalene, 1-decyl-1, 2, 3, 4-tetrahydro*	**5420**	**NJ**
83476	*. gamma. -Sitosterol*	**9130**	**NJ**
638959	*. alpha. -Amyrin*	**1400**	**NJ**
93287	*Phenol, 2-methoxy-4-(2-propenyt)-, acetate*	**1440**	**NJ**

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438020 (Dilution – DIL1) **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/06/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	**150**	**J**	2,4-Dinitrotoluene	306	U
Bis(2-Chloroethyl)Ether	153	U	2,6-Dinitrotoluene	153	U
2-Chlorophenol	153	U	**Diethylphthalate**	**202**	
1, 3-Dichlorobenzene	153	U	4-Chlorophenyl-Phenylether	153	U
1,4-Dichlorobenzene	**17**	**J**	**Fluorene**	**148**	**J**
Benzyl Alcohol	153	U	4-Nitroaniline	613	U
1,2-Dichlorobenzene	153	U	4,6-Dinitro-2-Methylphenol	1530	UJ
2-Methylphenol	153	U	N-Nitrosodiphenylamine	153	U
2,2'-Oxybis[1-chloropropane]	153	U	4-Bromophenyl-Phenylether	153	U
4-Methylphenol	**1200**		Hexachlorobenzene	153	U
N-Nitroso-Di-N-Propylamine	153	U	Pentachlorophenol	153	UJ
Hexachloroethane	153	U	**Phenanthrene**	**313**	
Nitrobenzene	153	U	**Anthracene**	**142**	**J**
Isophorone	153	U	Carbazole	153	U
2-Nitrophenol	153	U	**Di-N-Butylphthalate**	**172**	
2,4-Dimethylphenol	153	U	**Fluoranthene**	**354**	
Benzoic Acid	3060	U	**Pyrene**	**417**	
Bis(2-Chloroethoxy)Methane	153	U	**Retene**	**4930**	
2,4-Dichlorophenol	153	U	Butylbenzylphthalate	153	U
1,2,4-Trichlorobenzene	153	U	3,3'-Dichlorobenzidine	306	U
Naphthalene	**528**		**Benzo(a)anthracene**	**229**	
4-Chloroaniline	153	U	**Bis(2-Ethylhexyl) Phthalate**	**386**	
Hexachlorobutadiene	153	U	**Chrysene**	**143**	**J**
4-Chloro-3-Methylphenol	153	U	Di-N-Octyl Phthalate	153	U
2-Methylnaphthalene	**55**	J	**Benzo(b)fluoranthene**	**273**	
1-Methylnaphthalene	**46**	J	**Benzo(k)fluoranthene**	**244**	
Hexachlorocyclopentadiene	153	UJ	Benzo(a)pyrene	153	U
2,4,6-Trichlorophenol	153	UJ	Indeno(1,2,3-cd)pyrene	153	U
2,4,5-Trichlorophenol	153	U	Dibenzo(a,h)anthracene	153	U
2-Chloronaphthalene	153	U	Benzo(ghi)perylene	153	U
2-Nitroaniline	153	U			
Dimethylphthalate	153	U	**Surrogate Recoveries**		
Acenaphthylene	**118**	J			
3-Nitroaniline	153	U	**D5-Nitrobenzene**	**64**	**%**
Acenaphthene	**26**	J	**2-Fluorobiphenyl**	**66**	**%**
2,4-Dinitrophenol	3060	UJ	**Terphenyl-D14**	**75**	**%**
4-Nitrophenol	613	U	**Pyrene-D10**	**73**	**%**
Dibenzofuran	**38**	J	**D5-Phenol**	**76**	**%**

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438020 (Dilution – DIL1) **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/06/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**77**	**%**

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438020 (Dilution – DIL2) **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/06/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	128	J	2,4-Dinitrotoluene	305	U
Bis(2-Chloroethyl)Ether	152	U	2,6-Dinitrotoluene	152	U
2-Chlorophenol	152	U	**Diethylphthalate**	**236**	
1, 3-Dichlorobenzene	152	U	4-Chlorophenyl-Phenylether	152	U
1,4-Dichlorobenzene	152	U	**Fluorene**	**145**	**J**
Benzyl Alcohol	152	U	4-Nitroaniline	609	U
1,2-Dichlorobenzene	152	U	4,6-Dinitro-2-Methylphenol	1520	UJ
2-Methylphenol	152	U	N-Nitrosodiphenylamine	152	U
2,2'-Oxybis[1-chloropropane]	152	U	4-Bromophenyl-Phenylether	152	U
4-Methylphenol	**1190**		Hexachlorobenzene	152	U
N-Nitroso-Di-N-Propylamine	152	U	Pentachlorophenol	152	UJ
Hexachloroethane	152	U	**Phenanthrene**	**306**	
Nitrobenzene	152	U	**Anthracene**	**135**	**J**
Isophorone	152	U	Carbazole	152	U
2-Nitrophenol	152	U	**Di-N-Butylphthalate**	**160**	
2,4-Dimethylphenol	152	U	**Fluoranthene**	**307**	
Benzoic Acid	3050	U	**Pyrene**	**332**	
Bis(2-Chloroethoxy)Methane	152	U	**Retene**	**5070**	
2,4-Dichlorophenol	152	U	Butylbenzylphthalate	152	U
1,2,4-Trichlorobenzene	152	U	3,3'-Dichlorobenzidine	305	U
Naphthalene	**589**		**Benzo(a)anthracene**	**205**	
4-Chloroaniline	152	U	**Bis(2-Ethylhexyl) Phthalate**	**379**	
Hexachlorobutadiene	152	U	**Chrysene**	**104**	**J**
4-Chloro-3-Methylphenol	152	U	Di-N-Octyl Phthalate	152	U
2-Methylnaphthalene	**58**	J	**Benzo(b)fluoranthene**	**305**	
1-Methylnaphthalene	**36**	J	Benzo(k)fluoranthene	152	U
Hexachlorocyclopentadiene	152	UJ	**Benzo(a)pyrene**	**284**	
2,4,6-Trichlorophenol	152	U	Indeno(1,2,3-cd)pyrene	152	U
2,4,5-Trichlorophenol	152	U	Dibenzo(a,h)anthracene	152	U
2-Chloronaphthalene	152	U	**Benzo(ghi)perylene**	**219**	
2-Nitroaniline	152	U			
Dimethylphthalate	152	U	**Surrogate Recoveries**		
Acenaphthylene	**132**	J			
3-Nitroaniline	152	U	**D5-Nitrobenzene**	**56**	**%**
Acenaphthene	**32**	J	**2-Fluorobiphenyl**	**66**	**%**
2,4-Dinitrophenol	3050	UJ	**Terphenyl-D14**	**74**	**%**
4-Nitrophenol	609	U	**Pyrene-D10**	**71**	**%**
Dibenzofuran	152	U	**D5-Phenol**	**75**	**%**

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438020 (Dilution – DIL2) **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/06/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**73**	**%**

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438021 **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #2 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	**149**		2,4-Dinitrotoluene	21	U
Bis(2-Chloroethyl)Ether	11	U	2,6-Dinitrotoluene	11	U
2-Chlorophenol	11	U	Diethylphthalate	160	U
1, 3-Dichlorobenzene	11	U	4-Chlorophenyl-Phenylether	11	U
1,4-Dichlorobenzene	**5.6**	**J**	**Fluorene**	**19**	
Benzyl Alcohol	11	U	4-Nitroaniline	43	U
1,2-Dichlorobenzene	11	U	4,6-Dinitro-2-Methylphenol	107	U
2-Methylphenol	11	U	N-Nitrosodiphenylamine	11	U
2,2'-Oxybis[1-chloropropane]	11	U	4-Bromophenyl-Phenylether	11	U
4-Methylphenol	**499**		Hexachlorobenzene	11	U
N-Nitroso-Di-N-Propylamine	11	U	Pentachlorophenol	11	U
Hexachloroethane	11	U	**Phenanthrene**	**121**	
Nitrobenzene	11	U	**Anthracene**	**21**	
Isophorone	11	U	**Carbazole**	**13**	
2-Nitrophenol	11	U	**Di-N-Butylphthalate**	70	U
2,4-Dimethylphenol	11	U	**Fluoranthene**	**115**	
Benzoic Acid	318	UJ	**Pyrene**	**120**	
Bis(2-Chloroethoxy)Methane	11	U	**Retene**	**39800**	
2,4-Dichlorophenol	11	U	Butylbenzylphthalate	11	U
1,2,4-Trichlorobenzene	11	U	3,3'-Dichlorobenzidine	21	U
Naphthalene	**208**		**Benzo(a)anthracene**	**24**	
4-Chloroaniline	11	U	Bis(2-Ethylhexyl) Phthalate	98	U
Hexachlorobutadiene	11	U	**Chrysene**	**47**	
4-Chloro-3-Methylphenol	11	U	Di-N-Octyl Phthalate	11	U
2-Methylnaphthalene	**28**		Benzo(b)fluoranthene	11	U
1-Methylnaphthalene	**15**		**Benzo(k)fluoranthene**	**52**	
Hexachlorocyclopentadiene	11	U	**Benzo(a)pyrene**	**33**	
2,4,6-Trichlorophenol	11	U	Indeno(1,2,3-cd)pyrene	11	U
2,4,5-Trichlorophenol	11	U	Dibenzo(a,h)anthracene	11	U
2-Chloronaphthalene	11	U	**Benzo(ghi)perylene**	11	U
2-Nitroaniline	11	U			
Dimethylphthalate	11	U .	**Surrogate Recoveries**		
Acenaphthylene	**35**				
3-Nitroaniline	11	U	**D5-Nitrobenzene**	**79**	**%**
Acenaphthene	8.9	J	**2-Fluorobiphenyl**	**88**	**%**
2,4-Dinitrophenol	214	U	**Terphenyl-D14**	**91**	**%**
4-Nitrophenol	43	U	**Pyrene-D10**	**89**	**%**
Dibenzofuran	20		**D5-Phenol**	**92**	**%**

Authorized By:_____ Release Date:_____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438021** **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #2 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/06/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**87**	**%**

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438021 **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #2 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27//00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
39029419	*gamma-cadinene*	1810	NJ
30021740	*Naphthalene, 1, 2, 3, 4, 4a, 5, 6, 8a-octahydro7-7-methyl-4*	3700	NJ
483772	*Naphthalene, 1,2,3,4-tetrahydro-1,6-dimethyl-4-(1-m*	6420	NJ
503457	*Cyclohexene, 3, 3, 5-trimethyl-*	472	NJ
941695	*N-Phenylmaleimide*	232	NJ
295170	*Cyclotetradecane*	343	NJ
297030	*Cyclotetracosane*	1180	NJ
77899106	*(Z)14-Tricosenyl formate*	534	NJ
630035	*Nonacosane*	1080	NJ
20834064	*Dodecanoic acid, hexadecyl ester*	1490	NJ
112889	*1-Octadecene*	4180	NJ
83476	*.gamma.-Sitosterol*	4550	NJ

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438021 (Dilution – DIL1) **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #2 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/06/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	1070	U	2,4-Dinitrotoluene	1070	U
Bis(2-Chloroethyl)Ether	1070	U	2,6-Dinitrotoluene	1070	U
2-Chlorophenol	1070	U	**Diethylphthalate**	791	J
1, 3-Dichlorobenzene	1070	U	4-Chlorophenyl-Phenylether	1070	U
1,4-Dichlorobenzene	1070	U	Fluorene	1070	U
Benzyl Alcohol	1070	U	4-Nitroaniline	1070	U
1,2-Dichlorobenzene	1070	U	4,6-Dinitro-2-Methylphenol	4280	UJ
2-Methylphenol	1070	U	N-Nitrosodiphenylamine	1070	U
2,2'-Oxybis[1-chloropropane]	1070	U	4-Bromophenyl-Phenylether	1070	U
4-Methylphenol	**1610**		Hexachlorobenzene	1070	U
N-Nitroso-Di-N-Propylamine	1070	U	Pentachlorophenol	1070	UJ
Hexachloroethane	1070	U	Phenanthrene	1070	U
Nitrobenzene	1070	U	Anthracene	1070	U
Isophorone	1070	U	Carbazole	1070	U
2-Nitrophenol	1070	U	Di-N-Butylphthalate	1070	U
2,4-Dimethylphenol	1070	U	**Fluoranthene**	**108**	**J**
Benzoic Acid	21400	U	**Pyrene**	**483**	**J**
Bis(2-Chloroethoxy)Methane	1070	U	**Retene**	**44200**	
2,4-Dichlorophenol	1070	U	Butylbenzylphthalate	1070	U
1,2,4-Trichlorobenzene	1070	U	3,3'-Dichlorobenzidine	1070	U
Naphthalene	438	J	Benzo(a)anthracene	1070	U
4-Chloroaniline	1070	U	Bis(2-Ethylhexyl) Phthalate	1070	U
Hexachlorobutadiene	1070	U	Chrysene	1070	U
4-Chloro-3-Methylphenol	1070	U	Di-N-Octyl Phthalate	1070	U
2-Methylnaphthalene	1070	U	Benzo(b)fluoranthene	1070	U
1-Methylnaphthalene	1070	U	Benzo(k)fluoranthene	1070	U
Hexachlorocyclopentadiene	1070	UJ	Benzo(a)pyrene	1070	U
2,4,6-Trichlorophenol	1070	U	Indeno(1,2,3-cd)pyrene	1070	U
2,4,5-Trichlorophenol	1070	U	Dibenzo(a,h)anthracene	1070	U
2-Chloronaphthalene	1070	U	Benzo(ghi)perylene	1070	U
2-Nitroaniline	1070	U			
Dimethylphthalate	1070	U	**Surrogate Recoveries**		
Acenaphthylene	1070	U			
3-Nitroaniline	1070	U	**D5-Nitrobenzene**	**76**	**%**
Acenaphthene	1070	U	**2-Fluorobiphenyl**	**36**	**%**
2,4-Dinitrophenol	10700	UJ	**Terphenyl-D14**	**51**	**%**
4-Nitrophenol	1070	U	**Pyrene-D10**	**59**	**%**
Dibenzofuran	1070	U	**D5-Phenol**	**106**	**%**

Authorized By: _____ Release Date: _____

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Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438021 (Dilution – D1L1) **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #2 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/06/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**77**	**%**

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438021 (Dilution – D1L1) **Date Collected:** 10/23/00 **Method:** SW8270
Field ID: UPRIVER #2 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 12/06/00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
74744299	*3-Undecen-5 yne, (E)-*	914	NJ
7715448	*2(1 H)-Phenanthrenone, 3, 4, 4a, 4b, 5, 6, 7, 8,10, 10a-deca*	1400	NJ
629970	*Docosane*	3480	NJ
638664	*Octadecanal*	3270	NJ
1560890	*Heptadecane, 2-methyl-*	3440	NJ
38754948	*s-Indacen-1(2H)-one, 3, 5, 6, 7-tetrahydro-3, 3, 4, 5, 5, 8*	6550	NJ
61141579	*Cyclohexene, 1-ethyl-6-ethylidene-*	4500	NJ
30021740	*Naphthalene, 1, 2, 3, 4, 4a, 5, 6, 8a-octahydro-7-methyl-4*	9660	NJ
483772	*Naphthalene, 1, 2, 3, 4-tetrahydro-1, 6-dimethyl-4-(1-m*	15500	NJ

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Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438023 **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: LITTLESPK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	**44**		2,4-Dinitrotoluene	13	U
Bis(2-Chloroethyl)Ether	6.3	U	2,6-Dinitrotoluene	6.3	U
2-Chlorophenol	6.3	U	Diethylphthalate	16	UJ
1, 3-Dichlorobenzene	6. 3	U	4-Chlorophenyl-Phenylether	6. 3	U
1,4-Dichlorobenzene	6.3	U	Fluorene	6.3	U
Benzyl Alcohol	6.3	U	4-Nitroaniline	25	U
1,2-Dichlorobenzene	6.3	U	4,6-Dinitro-2-Methylphenol	63	U
2-Methylphenol	6.3	U	N-Nitrosodiphenylamine	6.3	U
2,2'-Oxybis[1-chloropropane]	6.3	U	4-Bromophenyl-Phenylether	6.3	U
4-Methylphenol	**26**		Hexachlorobenzene	6.3	U
N-Nitroso-Di-N-Propylamine	6.3	U	Pentachlorophenol	6.3	UJ
Hexachloroethane	6.3	U	**Phenanthrene**	**2.8**	**J**
Nitrobenzene	6.3	U	Anthracene	6.3	U
Isophorone	6.3	U	Carbazole	6:3	U
2-Nitrophenol	6.3	U	Di-N-Butylphthalate	28	UJ
2,4-Dimethylphenol	6.3	U	**Fluoranthene**	**4.0**	**J**
Benzoic Acid	134	UJ	**Pyrene**	**6.2**	**J**
Bis(2-Chloroethoxy)Methane	6.3	U	**Retene**	**11**	
2,4-Dichlorophenol	6.3	U	Butylbenzylphthalate	6.3	U
1,2,4-Trichlorobenzene	6.3	U	3,3'-Dichlorobenzidine	13	U
Naphthalene	6.3	U	**Benzo(a)anthracene**	**7.1**	
4-Chloroaniline	6.3	U	Bis(2-Ethylhexyl) Phthalate	45	UJ
Hexachlorobutadiene	6.3	U	**Chrysene**	**2.9**	**J**
4-Chloro-3-Methylphenol	6.3	U	Di-N-Octyl Phthalate	6.3	U
2-Methylnaphthalene	6.3	U	**Benzo(b)fluoranthene**	**9.9**	
1-Methylnaphthalene	6.3	U	**Benzo(k)fluoranthene**	**8.5**	
Hexachlorocyclopentadiene	6.3	U	Benzo(a)pyrene	6.3	U
2,4,6-Trichlorophenol	6.3	U	**Indeno(1,2,3-cd)pyrene**	**7.0**	
2,4,5-Trichlorophenol	6.3	U	Dibenzo(a,h)anthracene	6.3	U
2-Chloronaphthalene	6.3	U	**Benzo(ghi)perylene**	**8.7**	
2-Nitroaniline	6.3	U			
Dimethylphthalate	6.3	U	**Surrogate Recoveries**		
Acenaphthylene	6.3	U			
3-Nitroaniline	6.3	U	**D5-Nitrobenzene**	**85**	**%**
Acenaphthene	6.3	U	**2-Fluorobiphenyl**	**81**	**%**
2,4-Dinitrophenol	126	U	**Terphenyl-D14**	**89**	**%**
4-Nitrophenol	25	U	**Pyrene-D10**	**84**	**%**
Dibenzofuran	**3.3**	J	**D5-Phenol**	**87**	**%**

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Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438023** **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: LITTLESPK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**81**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438023 **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: LITTLESPK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
926658	*Propane, 2-(ethenyloxy)-*	568	NJ
16015115	*2H-Pyran, 3,4-dihydro-6-methyl-*	624	NJ
627087	*Propane, 1-(1-methylethoxy)-*	2620	NJ
592132	*Hexane, 2, 5-dimethyl-*	160	NJ
13950215	*2H-Pyrrol-2-one, 1,5-dihydro-l-methyl-*	1580	NJ
4436753	*3-Hexene-2, 5-dione*	945	NJ
103822	*Benzeneacetic acid*	158	NJ
150867	*Phytol*	18	NJ
630035	*Nonacosane*	20	NJ
629969	*1-Eicosanol*	154	NJ
254615	*Pyrido(2, 3-dlpyrimidine*	139	NJ
143282	*Oleyl Alcohol*	25	NJ

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438024 **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: UPLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	31	UJ	**2,4-Dinitrotoluene**	**17**	
Bis(2-Chloroethyl)Ether	7.6	U	2,6-Dinitrotoluene	7.6	U
2-Chlorophenol	7.6	U	Diethylphthalate	25	UJ
1, 3-Dichlorobenzene	7. 6	U	4-Chlorophenyl-Phenylether	7.6	U
1,4-Dichlorobenzene	7.6	U	**Fluorene**	**8.5**	
Benzyl Alcohol	7.6	U	4-Nitroaniline		REJ
1,2-Dichlorobenzene	7.6	U	4,6-Dinitro-2-Methylphenol	76	U
2-Methylphenol	7.6	U	N-Nitrosodiphenylamine	7.6	U
2,2'-Oxybis[1-chloropropane]	7.6	U	4-Bromophenyl-Phenylether	7.6	U
4-Methylphenol	**46**		Hexachlorobenzene	7.6	U
N-Nitroso-Di-N-Propylamine	7.6	U	Pentachlorophenol	7.6	UJ
Hexachloroethane	7.6	UJ	**Phenanthrene**	**34**	
Nitrobenzene	7.6	U	**Anthracene**	**16**	
Isophorone	7.6	U	**Carbazole**	**7.6**	**J**
2-Nitrophenol	7.6	U	Di-N-Butylphthalate	49	UJ
2,4-Dimethylphenol	7.6	U	**Fluoranthene**	**48**	
Benzoic Acid	134	UJ	**Pyrene**	**51**	
Bis(2-Chloroethoxy)Methane	7.6	U	**Retene**	**171**	
2,4-Dichlorophenol	7.6	U	Butylbenzylphthalate	7.6	U
1,2,4-Trichlorobenzene	7.6	U	3,3'-Dichlorobenzidine		REJ
Naphthalene	**6.2**	**J**	**Benzo(a)anthracene**	**35**	
4-Chloroaniline		REJ	Bis(2-Ethylhexyl) Phthalate	92	UJ
Hexachlorobutadiene	7.6	U	**Chrysene**	**40**	
4-Chloro-3-Methylphenol	7.6	U	Di-N-Octyl Phthalate	7.6	U
2-Methylnaphthalene	**2.3**	**J**	**Benzo(b)fluoranthene**	**35**	
1-Methylnaphthalene	**1.5**	**J**	**Benzo(k)fluoranthene**	**29**	
Hexachlorocyclopentadiene		REJ	**Benzo(a)pyrene**	**35**	
2,4,6-Trichlorophenol	7.6	U	**Indeno(1,2,3-cd)pyrene**	**24**	**J**
2,4,5-Trichlorophenol	7.6	U	Dibenzo(a,h)anthracene	7.6	U
2-Chloronaphthalene	7.6	U	**Benzo(ghi)perylene**	**23**	
2-Nitroaniline	7.6	U			
Dimethylphthalate	7.6	U	**Surrogate Recoveries**		
Acenaphthylene	7.6	U			
3-Nitroaniline		REJ	**D5-Nitrobenzene**	**75**	**%**
Acenaphthene	**1.4**	**J**	**2-Fluorobiphenyl**	**94**	**%**
2,4-Dinitrophenol		REJ	**Terphenyl-D14**	**103**	**%**
4-Nitrophenol	30	U	**Pyrene-D10**	**97**	**%**
Dibenzofuran	7.6	U	**D5-Phenol**	**99**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438024 **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: UPLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**94**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438024 **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: UPLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
814788	*3-Buten-2-one, 3-methyl-*	2600	NJ
4245765	*N-Methyl-N'-nitroguanidine*	292	NJ
141797	*3-Penten-2-one, 4-methyl-*	2530	NJ
10473140	*3-Buten-2-ol, 3-methyl-*	318	NJ
627087	*Propane, 1-(1-methylethoxy)-*	2830	NJ
17038287	*1,3-Diazabicyclo[3.I.OJhexane*	2450	NJ
4436753	*3-Hexene-2, 5-dione*	731	NJ
1123097	*2-Cyclohexen-l-one, 3,5-dimethyl-*	552	NJ
36794646	*2, 3, 3-Trimethylbutanol*	294	NJ
1599673	*1-Docosene*	236	NJ
77899106	*(Z)14-Tricosenyl formate*	130	NJ
630035	*Nonacosane*	786	NJ
629970	*Docosane*	190	NJ
629969	*1-Eicosanol*	1190	NJ
57885	*Cholesterol*	955	NJ
254615	*Pyrido[2, 3-d1pyrimidine*	4070	NJ
83476	*. gamma. -Sitosterol*	2850	NJ

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Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438024 (Matrix Spike – LMX1) **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: UPLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** % Recovery

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	**77**		**2,6-Dinitrotoluene**	**44**	
Bis(2-Chloroethyl)Ether	**69**		**Diethylphthalate**	**59**	
2-Chlorophenol	**66**		**4-Chlorophenyl-Phenylether**	**59**	
1, 3-Dichlorobenzene	**52**		**Fluorene**	**55**	
1,4-Dichlorobenzene	**52**		**4-Nitroaniline**	**0**	
Benzyl Alcohol	**72**		**4,6-Dinitro-2-Methylphenol**	**30**	
1,2-Dichlorobenzene	**55**		**N-Nitrosodiphenylamine**	**54**	
2-Methylphenol	**64**		**4-Bromophenyl-Phenylether**	**71**	
2,2'-Oxybis[1-chloropropane]	**72**		**Hexachlorobenzene**	**62**	
4-Methylphenol	**60**		**Pentachlorophenol**	**33**	
N-Nitroso-Di-N-Propylamine	**75**		**Phenanthrene**	**71**	
Hexachloroethane	**30**		**Anthracene**	**60**	
Nitrobenzene	**53**		**Carbazole**	**82**	
Isophorone	**71**		**Di-N-Butylphthalate**	**74**	
2-Nitrophenol	**31**		**Fluoranthene**	**68**	
2,4-Dimethylphenol	**73**		**Pyrene**	**64**	
Benzoic Acid	**60**		Retene		NC
Bis(2-Chloroethoxy)Methane	**64**		**Butylbenzylphthalate**	**79**	
2,4-Dichlorophenol	**132**		**Benzo(a)anthracene**	**62**	
1,2,4-Trichlorobenzene	**55**		**Bis(2-Ethylhexyl) Phthalate**	**107**	
Naphthalene	**60**		**Chrysene**	**69**	
4-Chloroaniline	**0**		**Di-N-Octyl Phthalate**	**85**	
Hexachlorobutadiene	**55**		**Benzo(b)fluoranthene**	**70**	
4-Chloro-3-Methylphenol	**71**		**Benzo(k)fluoranthene**	**56**	
2-Methylnaphthalene	**63**		**Benzo(a)pyrene**	**59**	
Hexachlorocyclopentadiene	**0**		**Indeno(1,2,3-cd)pyrene**	**85**	
2,4,6-Trichlorophenol	**68**		**Dibenzo(a,h)anthracene**	**76**	
2,4,5-Trichlorophenol	**63**		**Benzo(ghi)perylene**	**62**	
2-Chloronaphthalene	**65**				
2-Nitroaniline	**63**		**Surrogate Recoveries**		
Dimethylphthalate	**65**				
Acenaphthylene	**68**		**D5-Nitrobenzene**	**80**	**%**
3-Nitroaniline	**0**		**2-Fluorobiphenyl**	**67**	**%**
Acenaphthene	**68**		**Terphenyl-D14**	**70**	**%**
2,4-Dinitrophenol	**0**		**Pyrene-D10**	**67**	**%**
4-Nitrophenol	**83**		**D5-Phenol**	**99**	**%**
Dibenzofuran	**64**		**2-Fluorophenol**	**64**	**%**
2,4-Dinitrotoluene	**30**				

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Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438024 (Matrix Spike – LMX2) **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: UPLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** % Recovery

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	**51**		**2,6-Dinitrotoluene**	**33**	
Bis(2-Chloroethyl)Ether	**72**		**Diethylphthalate**	**53**	
2-Chlorophenol	**61**		**4-Chlorophenyl-Phenylether**	**52**	
1, 3-Dichlorobenzene	**47**		**Fluorene**	**56**	
1,4-Dichlorobenzene	**50**		**4-Nitroaniline**	**15**	
Benzyl Alcohol	**56**		**4,6-Dinitro-2-Methylphenol**	**27**	
1,2-Dichlorobenzene	**56**		**N-Nitrosodiphenylamine**	**61**	
2-Methylphenol	**52**		**4-Bromophenyl-Phenylether**	**71**	
2,2'-Oxybis[1-chloropropane]	**75**		**Hexachlorobenzene**	**71**	
4-Methylphenol	**51**		**Pentachlorophenol**	**35**	
N-Nitroso-Di-N-Propylamine	**74**		**Phenanthrene**	**69**	
Hexachloroethane	**21**		**Anthracene**	**63**	
Nitrobenzene	**51**		**Carbazole**	**85**	
Isophorone	**66**		**Di-N-Butylphthalate**	**64**	
2-Nitrophenol	**25**		**Fluoranthene**	**73**	
2,4-Dimethylphenol	**66**		**Pyrene**	**66**	
Benzoic Acid	**62**		Retene		NC
Bis(2-Chloroethoxy)Methane	**64**		**Butylbenzylphthalate**	**78**	
2,4-Dichlorophenol	**124**		**Benzo(a)anthracene**	**0**	
1,2,4-Trichlorobenzene	**55**		**Bis(2-Ethylhexyl) Phthalate**	**65**	
Naphthalene	**63**		**Chrysene**	**101**	
4-Chloroaniline	**0**		**Di-N-Octyl Phthalate**	**71**	
Hexachlorobutadiene	**51**		**Benzo(b)fluoranthene**	**89**	
4-Chloro-3-Methylphenol	**70**		**Benzo(k)fluoranthene**	**72**	
2-Methylnaphthalene	**62**		**Benzo(a)pyrene**	**65**	
Hexachlorocyclopentadiene	**0**		**Indeno(1,2,3-cd)pyrene**	**66**	
2,4,6-Trichlorophenol	**71**		**Dibenzo(a,h)anthracene**	**77**	
2,4,5-Trichlorophenol	**72**		**Benzo(ghi)perylene**	**81**	
2-Chloronaphthalene	**70**			**68**	
2-Nitroaniline	**64**		**Surrogate Recoveries**		
Dimethylphthalate	**73**				
Acenaphthylene	**74**		**D5-Nitrobenzene**	**52**	**%**
3-Nitroaniline	**0**		**2-Fluorobiphenyl**	**68**	**%**
Acenaphthene	**73**		**Terphenyl-D14**	**71**	**%**
2,4-Dinitrophenol	**0**		**Pyrene-D10**	**67**	**%**
4-Nitrophenol	**85**		**D5-Phenol**	**59**	**%**
Dibenzofuran	**66**		**2-Fluorophenol**	**62**	**%**
2,4-Dinitrotoluene	**0**				

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438025 **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: MIDLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	108	U	2,4-Dinitrotoluene	217	U
Bis(2-Chloroethyl)Ether	108	U	2,6-Dinitrotoluene	108	U
2-Chlorophenol	108	U	**Diethylphthalate**	**231**	**J**
1, 3-Dichlorobenzene	108	U	4-Chlorophenyl-Phenylether	108	U
1,4-Dichlorobenzene	108	U	Fluorene	108	U
Benzyl Alcohol	108	U	4-Nitroaniline	434	U
1,2-Dichlorobenzene	108	U	4,6-Dinitro-2-Methylphenol	1080	U
2-Methylphenol	108	U	N-Nitrosodiphenylamine	108	U
2,2'-Oxybis[1-chloropropane]	108	U	4-Bromophenyl-Phenylether	108	U
4-Methylphenol	108	U	Hexachlorobenzene	108	U
N-Nitroso-Di-N-Propylamine	108	U	Pentachlorophenol	108	UJ
Hexachloroethane	108	U	**Phenanthrene**	**27**	**J**
Nitrobenzene	108	U	**Anthracene**	**82**	**J**
Isophorone	108	U	Carbazole	108	U
2-Nitrophenol	108	U	**Di-N-Butylphthalate**	**134**	
2,4-Dimethylphenol	108	U	**Fluoranthene**	**41**	**J**
Benzoic Acid	2170	U	**Pyrene**	**78**	**J**
Bis(2-Chloroethoxy)Methane	108	U	**Retene**	**243**	
2,4-Dichlorophenol	108	U	Butylbenzylphthalate	108	U
1,2,4-Trichlorobenzene	108	U	3,3'-Dichlorobenzidine	217	U
Naphthalene	108	U	Benzo(a)anthracene	108	U
4-Chloroaniline	108	U	**Bis(2-Ethylhexyl) Phthalate**	**433**	
Hexachlorobutadiene	108	U	Chrysene	108	U
4-Chloro-3-Methylphenol	108	U	Di-N-Octyl Phthalate	108	U
2-Methylnaphthalene	108	U	Benzo(b)fluoranthene	108	U
1-Methylnaphthalene	108	U	**Benzo(k)fluoranthene**	**135**	
Hexachlorocyclopentadiene	108	U	Benzo(a)pyrene	108	U
2,4,6-Trichlorophenol	108	U	Indeno(1,2,3-cd)pyrene	108	U
2,4,5-Trichlorophenol	108	U	Dibenzo(a,h)anthracene	108	U
2-Chloronaphthalene	108	U	Benzo(ghi)perylene	108	U
2-Nitroaniline	108	U			
Dimethylphthalate	108	U	**Surrogate Recoveries**		
Acenaphthylene	108	U			
3-Nitroaniline	108	U	**D5-Nitrobenzene**	**39**	**%**
Acenaphthene	108	U	**2-Fluorobiphenyl**	**60**	**%**
2,4-Dinitrophenol	2170	UJ	**Terphenyl-D14**	**65**	**%**
4-Nitrophenol	434	UJ	**Pyrene-D10**	**63**	**%**
Dibenzofuran	108	U	**D5-Phenol**	**66**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438025 **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: MIDLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**68**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438026 **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: MIDLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
627087	*Propane, 1-(1-methylethoxy)-*	7250	NJ
102608537	*3, 7,11,15-Tetramethyl-2-hexadecen-l-of*	957	NJ
150867	*Phytol*	4170	NJ
638664	*Octadecanal*	989	NJ
593497	*Heptacosane*	6440	NJ
3079285	*Decane, 1-(methylsulfinyl)-*	917	NJ
2765119	*Pentadecanal-*	2660	NJ
630035	*Nonacosane*	1700	NJ
630068	*Hexatriacontane*	1530	NJ
80977	*Cholestanol*	1970	NJ
57885	*Cholesterol*	3760	NJ
55255577	*Naphthalene, 1-decyl-1, 2, 3, 4-tetrahydro-*	11300	NJ

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Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438026 **Date Collected:** 10/25/00 **Method:** SW8270
Field ID: LOWLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	**58**		2,4-Dinitrotoluene	32	U
Bis(2-Chloroethyl)Ether	16	U	2,6-Dinitrotoluene	16	U
2-Chlorophenol	16	U	Diethylphthalate	33	UJ
1, 3-Dichlorobenzene	16	U	4-Chlorophenyl-Phenylether	16	U
1,4-Dichlorobenzene	**2.8**	**J**	**Fluorene**	**20**	
Benzyl Alcohol	16	U	4-Nitroaniline	64	U
1,2-Dichlorobenzene	16	U	4,6-Dinitro-2-Methylphenol	159	U
2-Methylphenol	16	U	N-Nitrosodiphenylamine	16	U
2,2'-Oxybis[1-chloropropane]	16	U	4-Bromophenyl-Phenylether	16	U
4-Methylphenol	**36**		Hexachlorobenzene	16	U
N-Nitroso-Di-N-Propylamine	16	U	Pentachlorophenol	16	UJ
Hexachloroethane	16	U	**Phenanthrene**	**29**	
Nitrobenzene	16	U	**Anthracene**	**21**	
Isophorone	16	U	Carbazole	16	U
2-Nitrophenol	16	U	Di-N-Butylphthalate	25	UJ
2,4-Dimethylphenol	16	U	**Fluoranthene**	**55**	
Benzoic Acid	268	UJ	**Pyrene**	**64**	
Bis(2-Chloroethoxy)Methane	16	U	**Retene**	**67**	
2,4-Dichlorophenol	16	U	Butylbenzylphthalate	16	U
1,2,4-Trichlorobenzene	16	U	3,3'-Dichlorobenzidine	32	U
Naphthalene	**15**	**J**	**Benzo(a)anthracene**	**35**	
4-Chloroaniline	16	U	Bis(2-Ethylhexyl) Phthalate	154	UJ
Hexachlorobutadiene	16	U	**Chrysene**	**57**	
4-Chloro-3-Methylphenol	16	U	Di-N-Octyl Phthalate	16	U
2-Methylnaphthalene	**5.6**	**J**	Benzo(b)fluoranthene	16	U
1-Methylnaphthalene	**2.7**	**J**	Benzo(k)fluoranthene	16	U
Hexachlorocyclopentadiene	16	U	Benzo(a)pyrene	16	U
2,4,6-Trichlorophenol	16	U	**Indeno(1,2,3-cd)pyrene**	**40**	
2,4,5-Trichlorophenol	16	U	Dibenzo(a,h)anthracene	16	U
2-Chloronaphthalene	16	U	**Benzo(ghi)perylene**	**41**	
2-Nitroaniline	16	U			
Dimethylphthalate	16	U	**Surrogate Recoveries**		
Acenaphthylene	**5**	**J**			
3-Nitroaniline	16	U	**D5-Nitrobenzene**	**62**	**%**
Acenaphthene	16	U	**2-Fluorobiphenyl**	**67**	**%**
2,4-Dinitrophenol	318	UJ	**Terphenyl-D14**	**72**	**%**
4-Nitrophenol	64	UJ	**Pyrene-D10**	**69**	**%**
Dibenzofuran	**5.5**	**J**	**D5-Phenol**	**64**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438026** **Date Collected:** 10/25/00 **Method:** SW8270
Field ID: LOWLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**61**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438026 **Date Collected:** 10/25/00 **Method:** SW8270
Field ID: LOWLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
110747	*Formic acid, propyl ester*	1560	NJ
4436753	*3-Hexene-2, 5-dione*	2260	NJ
1123097	*2-Cyclohexen-l-one, 3,5-dimethyl-*	1230	NJ
150867	*Phytol*	68	NJ
1599673	*1-Docosene*	1210	NJ
7683649	*Squalene*	372	NJ
630035	*Nonacosane*	216	NJ
630046	*Hentfacontane*	27	NJ
1892122	*Cyclododecanemethanol*	29	NJ
93989005	*2-Ethoxy-l-methyl-6-oxo-1,2-azaphosphinane 2-oxide*	52	NJ
1678315	*a'-Neogammacer-22(29)-en-3-ol, (3.beta.,21.beta.)-*	34	NJ
515139	*Cyclohexane, 1-ethenyl-l-methyl-2,4-bis(1-methyleth*	262	NJ
473154	*2-Naphthalenemethanol, decahydro-. alpha.*	46	

Authorized By: _____ Release Date: _____

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Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438027 **Date Collected:** 10/25/00 **Method:** SW8270
Field ID: LATAH CR **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	35	UJ	2,4-Dinitrotoluene	12	U
Bis(2-Chloroethyl)Ether	5.9	U	2,6-Dinitrotoluene	5.9	U
2-Chlorophenol	5.9	U	Diethylphthalate	20	UJ
1, 3-Dichlorobenzene	5. 9	U	4-Chlorophenyl-Phenylether	5.9	U
1,4-Dichlorobenzene	5.9	U	Fluorene	5.9	U
Benzyl Alcohol	13	UJ	4-Nitroaniline	2',4	U
1,2-Dichlorobenzene	5.9	U	4,6-Dinitro-2-Methylphenol	59	U
2-Methylphenol	5.9	U	N-Nitrosodiphenylamine	5.9	U
2,2'-Oxybis[1-chloropropane]	5.9	U	4-Bromophenyl-Phenylether	5.9	U
4-Methylphenol	**45**		Hexachlorobenzene	5.9	U
N-Nitroso-Di-N-Propylamine	5.9	U	Pentachlorophenol	5.9	UJ
Hexachloroethane	5.9	U	**Phenanthrene**	**5.3**	**J**
Nitrobenzene	5.9	U	**Anthracene**	**4.8**	**J**
Isophorone	5.9	U	Carbazole	5.9	U
2-Nitrophenol	5.9	U	Di-N-Butylphthalate	56	UJ
2,4-Dimethylphenol	5.9	U	**Fluoranthene**	**5.9**	**J**
Benzoic Acid	131	UJ	**Pyrene**	**11**	
Bis(2-Chloroethoxy)Methane	5.9	U	**Retene**	**13**	
2,4-Dichlorophenol	5.9	U	**Butylbenzylphthalate**	**25**	
1,2,4-Trichlorobenzene	5.9	U	3,3'-Dichlorobenzidine	12	U
Naphthalene	**3.0**	**J**	**Benzo(a)anthracene**	**8.6**	
4-Chloroaniline	5.9	U	Bis(2-Ethylhexyl) Phthalate	101	UJ
Hexachlorobutadiene	5.9	U	Chrysene	24	
4-Chloro-3-Methylphenol	5.9	U	Di-N-Octyl Phthalate	5.9	U
2-Methylnaphthalene	**2.2**	**J**	**Benzo(b)fluoranthene**	**14**	
1-Methylnaphthalene	**1.5**	**J**	Benzo(k)fluoranthene	5.9	U
Hexachlorocyclopentadiene	5.9	U	**Benzo(a)pyrene**	**11**	
2,4,6-Trichlorophenol	5.9	U	Indeno(1,2,3-cd)pyrene	5.9	U
2,4,5-Trichlorophenol	5.9	U	Dibenzo(a,h)anthracene	5.9	U
2-Chloronaphthalene	5.9	U	**Benzo(ghi)perylene**	**15**	
2-Nitroaniline	5.9	U			
Dimethylphthalate	5.9	U	**Surrogate Recoveries**		
Acenaphthylene	5.9	U			
3-Nitroaniline	5.9	U	**D5-Nitrobenzene**	**60**	**%**
Acenaphthene	5.9	U	**2-Fluorobiphenyl**	**62**	**%**
2,4-Dinitrophenol	118	UJ	**Terphenyl-D14**	**68**	**%**
4-Nitrophenol	24	UJ	**Pyrene-D10**	**65**	**%**
Dibenzofuran	5.9	U	**D5-Phenol**	**65**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438027** **Date Collected:** 10/25/00 **Method:** SW8270
Field ID: LATAH CR **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**62**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438027 **Date Collected:** 10/25/00 **Method:** SW8270
Field ID: LATAH CR **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
4436753	*3-Hexene-2,5-dione*	1000	NJ
1123097	*2-Cyclohexen-l-one, 3,5-dimethyl-*	471	NJ
54725734	*1, 8-Nonanediol, 8-methyl-*	161	NJ
7704349	*Sulfur*	449	NJ
150867	*Phytol*	31	NJ
74685339	*3-Eicosene, (E)-*	34	NJ
630035	*Nonacosane*	127	NJ
630046	*Hentfacontane*	77	NJ
629969	*1-Eicosanol*	63	NJ
254615	*Pyrido[2,3-d]pyrimidine*	906	NJ
83476	*. gamma. -Sitosterol*	404	NJ

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Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438028** **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: BEAD LK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	**54**		2,4-Dinitrotoluene	37	U
Bis(2-Chloroethyl)Ether	18	U	2,6-Dinitrotoluene	18	U
2-Chlorophenol	18	U	Diethylphthalate	55	UJ
1, 3-Dichlorobenzene	18	U	4-Chlorophenyl-Phenylether	18	U
1,4-Dichlorobenzene	18	U	**Fluorene**	**24**	
Benzyl Alcohol	**45**		4-Nitroaniline	73	U
1,2-Dichlorobenzene	18	U	4,6-Dinitro-2-Methylphenol	182	U
2-Methylphenol	18	U	N-Nitrosodiphenylamine	18	U
2,2'-Oxybis[1-chloropropane]	18	U	4-Bromophenyl-Phenylether	18	U
4-Methylphenol	18	U	Hexachlorobenzene	18	U
N-Nitroso-Di-N-Propylamine	18	U	Pentachlorophenol	18	UJ
Hexachloroethane	18	U	**Phenanthrene**	**30**	
Nitrobenzene	18	U	Anthracene	18	U
Isophorone	18	U	Carbazole	18	U
2-Nitrophenol	18	U	**Di-N-Butylphthalate**	**1710**	E
2,4-Dimethylphenol	18	U	**Fluoranthene**	**15**	**J**
Benzoic Acid	431	UJ	**Pyrene**	**14**	**J**
Bis(2-Chloroethoxy)Methane	18	U	**Retene**	**71**	
2,4-Dichlorophenol	18	U	Butylbenzylphthalate	18	U
1,2,4-Trichlorobenzene	18	U	3,3'-Dichlorobenzidine	37	U
Naphthalene	**29**		Benzo(a)anthracene	18	U
4-Chloroaniline	18	U	Bis(2-Ethylhexyl) Phthalate	135	UJ
Hexachlorobutadiene	18	U	Chrysene	18	U
4-Chloro-3-Methylphenol	18	U	Di-N-Octyl Phthalate	18	U
2-Methylnaphthalene	**8.8**	**J**	Benzo(b)fluoranthene	18	U
1-Methylnaphthalene	**6.2**	**J**	Benzo(k)fluoranthene	18	U
Hexachlorocyclopentadiene	18	U	Benzo(a)pyrene	18	U
2,4,6-Trichlorophenol	18	U	Indeno(1,2,3-cd)pyrene	18	U
2,4,5-Trichlorophenol	18	U	Dibenzo(a,h)anthracene	18	U
2-Chloronaphthalene	18	U	Benzo(ghi)perylene	18	U
2-Nitroaniline	18	U			
Dimethylphthalate	18	U	**Surrogate Recoveries**		
Acenaphthylene	18	U			
3-Nitroaniline	18	U	**D5-Nitrobenzene**	**71**	**%**
Acenaphthene	18	U	**2-Fluorobiphenyl**	**76**	**%**
2,4-Dinitrophenol	365	U	**Terphenyl-D14**	**79**	**%**
4-Nitrophenol	73	U	**Pyrene-D10**	**75**	**%**
Dibenzofuran	**15**	**J**	**D5-Phenol**	**74**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438028 **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: BEAD LK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**74**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438028 **Date Collected:** 10/24/00 **Method:** SW8270
Field ID: BEAD LK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/27/00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
629732	*1-Hexadecene*	4340	NJ
150867	*Phytol*	620	NJ
593497	*Heptacosane*	653	NJ
6971400	*17-Pentatriacontene*	444	NJ
2136701	*Ethanol, 2-fetradecyloxy)-*	1200	NJ
106252	*2, 6-Octadien-l-ol, 3, 7-dimethyl-, (Z)-*	350	NJ
630035	*Nonacosane*	659	NJ
20834064	*Dodecanoic acid, hexadecyl ester*	1920	NJ
1599673	*1-Docosene*	259	NJ
295658	*Cyclohexadecane*	295	NJ
2917615	*Methanol, (dimethylsilylene)bis-, diacetate*	1990	NJ

Manchester Environmental Laboratory

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Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: OBS0306A1 **Method:** SW8270

Field ID: Laboratory Method Blank **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil

Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	**29**		2,4-Dinitrotoluene	35	U
Bis(2-Chloroethyl)Ether	17	U	2,6-Dinitrotoluene	17	U
2-Chlorophenol	17	U	**Diethylphthalate**	**385**	
1, 3-Dichlorobenzene	17	U	4-Chlorophenyl-Phenylether	17	U
1,4-Dichlorobenzene	17	U	Fluorene	17	U
Benzyl Alcohol	**28**		4-Nitroaniline	69	U
1,2-Dichlorobenzene	17	U	4,6-Dinitro-2-Methylphenol	173	U
2-Methylphenol	17	U	N-Nitrosodiphenylamine	1.7	U
2,2'-Oxybis[1-chloropropane]	17	U	4-Bromophenyl-Phenylether	1.7	U
4-Methylphenol	17	U	Hexachlorobenzene	1.7	U
N-Nitroso-Di-N-Propylamine	17	U	Pentachlorophenol	17	UJ
Hexachloroethane	17	U	**Phenanthrene**	**4.1**	**J**
Nitrobenzene	17	U	Anthracene	17	U
Isophorone	17	U	Carbazole	17	U
2-Nitrophenol	17	U	**Di-N-Butylphthalate**	**90**	
2,4-Dimethylphenol	17	U	Fluoranthene	17	U
Benzoic Acid	**305**	**J**	Pyrene	17	U
Bis(2-Chloroethoxy)Methane	17	U	Retene	17	U
2,4-Dichlorophenol	17	U	Butylbenzylphthalate	17	U
1,2,4-Trichlorobenzene	17	U	3,3'-Dichlorobenzidine	35	U
Naphthalene	17	U	**Benzo(a)anthracene**	**16**	**J**
4-Chloroaniline	17	U	**Bis(2-Ethylhexyl) Phthalate**	**47**	
Hexachlorobutadiene	17	U	Chrysene	17	U
4-Chloro-3-Methylphenol	17	U	Di-N-Octyl Phthalate	17	U
2-Methylnaphthalene	17	U	Benzo(b)fluoranthene	17	U
1-Methylnaphthalene	17	U	Benzo(k)fluoranthene	17	U
Hexachlorocyclopentadiene	17	U	Benzo(a)pyrene	17	U
2,4,6-Trichlorophenol	17	U	Indeno(1,2,3-cd)pyrene	17	U
2,4,5-Trichlorophenol	17	U	Dibenzo(a,h)anthracene	17	U
2-Chloronaphthalene	17	U	Benzo(ghi)perylene	17	U
2-Nitroaniline	17	U			
Dimethylphthalate	**6.9**	**J**	**Surrogate Recoveries**		
Acenaphthylene	17	U			
3-Nitroaniline	17	U	**D5-Nitrobenzene**	**88**	**%**
Acenaphthene	17	U	**2-Fluorobiphenyl**	**84**	**%**
2,4-Dinitrophenol	346	U	**Terphenyl-D14**	**90**	**%**
4-Nitrophenol	69	U	**Pyrene-D10**	**84**	**%**
Dibenzofuran	17	U	**D5-Phenol**	**68**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: OBS0306A1 **Method:** SW8270
Field ID: Laboratory Method Blank **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**56**	**%**

Authorized By: _____ Release Date: _____ Page: 2

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: OBS0306A1 **Method:** SW8270
Field ID: Laboratory Method Blank **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
79094	*Propanoic acid*	307	NJ
7778850	*Propane, 1,2-dimethoxy-*	1960	NJ
141797	*3-Penten-2-one, 4-methyl-*	287	NJ
10473140	*3-Buten-2-ol, 3-methyl-*	1190	NJ
123422	*2-Pentanone, 4-hydroxy-4-methyl-*	26700	NJ
6728263	*2-Hexenal, (E)-*	519	NJ
79345	*1,1, 2, 2-Tetrachloroethane*	489	NJ
110134	*2, 5-Hexanedione*	1290	NJ
13950215	*2H-Pyrrol-2-one, 1,5-dihydro-l-methyl-*	5890	NJ
631572	*Propanenitrile, 2-oxo-*	332	NJ
1638160	*2-Propanol, 1,1'-((1-methyl-1,2-ethanediyl)bis(oxy)*	335	NJ
822866	*Cyclohexane, 1,2-dichloro-, trans-*	408	NJ
3508789	*2,4-Pentanedione, 3-(2 propenyl)-*	256	NJ
2847725	*Decane, 4-methyl-*	337	NJ
18217124	*2-Heptanone, 5-methyl-*	486	NJ
18435455	*1-Nonadecene*	763	NJ
1599673	*1-Docosene*	837	NJ
297245	*Cyclooctacosane*	1170	NJ
1560958	*Tetradecane, 2-methyl-*	199	NJ

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: OBS0306A2 **Method:** SW8270

Field ID: Laboratory Method Blank **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil

Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Phenol	**24**		**2,4-Dinitrotoluene**	**36**	
Bis(2-Chloroethyl)Ether	17	U	2,6-Dinitrotoluene	17	U
2-Chlorophenol	17	U	**Diethylphthalate**	**386**	
1, 3-Dichlorobenzene	17	U	4-Chlorophenyl-Phenylether	17	U
1,4-Dichlorobenzene	17	U	Fluorene	17	U
Benzyl Alcohol	17	U	4-Nitroaniline	69	U
1,2-Dichlorobenzene	17	U	4,6-Dinitro-2-Methylphenol	173	U
2-Methylphenol	17	U	N-Nitrosodiphenylamine	17	U
2,2'-Oxybis[1-chloropropane]	17	U	4-Bromophenyl-Phenylether	1.7	U
4-Methylphenol	17	U	Hexachlorobenzene	1.7	U
N-Nitroso-Di-N-Propylamine	17	U	Pentachlorophenol	1.7	UJ
Hexachloroethane	17	U	**Phenanthrene**	**3.6**	**J**
Nitrobenzene	17	U	Anthracene	17	U
Isophorone	17	U	Carbazole	17	U
2-Nitrophenol	17	U	**Di-N-Butylphthalate**	**76**	
2,4-Dimethylphenol	17	U	**Fluoranthene**	**1.3**	**J**
Benzoic Acid	**267**	**J**	**Pyrene**	**8.6**	**J**
Bis(2-Chloroethoxy)Methane	17	U	Retene	17	U
2,4-Dichlorophenol	17	U	**Butylbenzylphthalate**	**29**	
1,2,4-Trichlorobenzene	17	U	3,3'-Dichlorobenzidine	35	U
Naphthalene	17	U	**Benzo(a)anthracene**	**15**	**J**
4-Chloroaniline	17	U	**Bis(2-Ethylhexyl) Phthalate**	**49**	
Hexachlorobutadiene	17	U	Chrysene	17	U
4-Chloro-3-Methylphenol	17	U	Di-N-Octyl Phthalate	17	U
2-Methylnaphthalene	17	U	Benzo(b)fluoranthene	17	U
1-Methylnaphthalene	17	U	Benzo(k)fluoranthene	17	U
Hexachlorocyclopentadiene	17	U	Benzo(a)pyrene	17	U
2,4,6-Trichlorophenol	17	U	Indeno(1,2,3-cd)pyrene	17	U
2,4,5-Trichlorophenol	17	U	Dibenzo(a,h)anthracene	17	U
2-Chloronaphthalene	17	U	Benzo(ghi)perylene	17	U
2-Nitroaniline	17	U			
Dimethylphthalate	**9**	**J**	**Surrogate Recoveries**		
Acenaphthylene	17	U			
3-Nitroaniline	17	U.	**D5-Nitrobenzene**	**82**	**%**
Acenaphthene	17	U	**2-Fluorobiphenyl**	**80**	**%**
2,4-Dinitrophenol	346	U	**Terphenyl-D14**	**84**	**%**
4-Nitrophenol	69	U	**Pyrene-D10**	**79**	**%**
Dibenzofuran	17	U	**D5-Phenol**	**60**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: OBS0306A2 **Method:** SW8270
Field ID: Laboratory Method Blank **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Surrogate Recoveries (continued)

2-Fluorophenol	**52**	**%**

Authorized By: _____ Release Date: _____ Page: 2

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: OBS0306A2 **Method:** SW8270
Field ID: Laboratory Method Blank **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/21/00 **Units:** ug/Kg dw

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
105317	*1-Hexyn-3-of*	1500	NJ
141797	*3-Penten-2-one, 4-methyl-*	582	NJ
10473140	*3-Buten-2-ol, 3-methyl-*	1250	NJ
123422	*2-Pentanone, 4-hydroxy-4-methyl-*	27700	NJ
79345	*1,1, 2, 2-Tetrachloroethane*	567	NJ
110134	*2, 5-Hexanedione*	1640	NJ
13950215	*2H-Pyrrol-2-one, 1,5-dihydro-1-methyl-*	5590	NJ
6714007	*5-Hepten-2-one*	454	NJ
822866	*Cyclohexane, 1,2-dichloro-, trans-*	378	NJ
70856143	*(E)-3-Isopropyl-6-oxo-2-heptenal*	421	NJ
6975980	*Decane, 2-methyl-*	291	NJ
6064273	*6-Dodecanone*	649	NJ
57103	*Hexadecanoic acid*	535	NJ
119937	*f1,1'-Biphenyl)-4,4'-diamine, 3,3'-dimethyl-*	204	NJ
57114	*Octadecanoic acid*	62	NJ
629969	*1-Eicosanol*	1780	NJ
83487	*Stigmasterol*	1070	NJ

Manchester Environmental Laboratory

7411 Beach DR E, Port Orchard Washington 98366

CASE NARRATI VE

December 7, 2000

Subject: Spokane Sediment Bioassays
Samples: 00438020 - 00438021, 00438023 - 00438028
Case No. 435800
Officer: Art Johnson
By: Myrna Mandjikov,

PCB Aroclor Analysis of the Spokane Sediments

SUMMARY:

Aroclor 1248 is found to be at much higher levels in samples 00438020 and 00438021 than in the rest of the samples analyzed for this project.

Due to high levels of Aroclor 1248 interference, many Aroclor results are reported with estimated reporting limits. The quantitation limit reported is an estimate of the minimum amount of the Aroclor that could be positively identified above the 1248 contamination present in a particular sample.

Results reported below the laboratory reporting limit are qualified with "J".

In a few samples, PCB congeners are found that indicate the presence of Aroclors at or below the laboratory reporting limit. These congeners are not in the proper ratios to produce an identifiable PCB pattern. This phenomenon could result from either degradation of the Aroclor (biological, combustion) or contamination. These results are calculated using the mean value of the indicating Aroclor congeners. Because the percent relative standard deviation between these peaks sometimes exceeds 100%, the results are qualified, "NJ", to note that evidence of the Aroclor is present but the result is an estimate.

The data is useable as qualified.

METHODS:

The samples were extracted into acetone by Soxhlet extraction. Each extract was then eluted through a Florisil® column, with a 94% hexane / 6% preserved diethyl ether solution.

The extracts were solvent exchanged to iso-octane and treated with elemental mercury to remove sulfur and then treated with concentrated sulfuric acid. At this point each extract was analyzed by GC-ECD.

These methods are modifications of EPA SW- 846 methods 3540, 3550, 3620, 3665, and 8082.

BLANKS:

No target analytes were detected in the blanks.

SURROGATES:

All samples and blanks were spiked with decachlorobiphenyl (DCB) prior to extraction. All surrogate recoveries are within the acceptable range of 50 % - 150 % of the reference value.

DUPLICATE SAMPLES:

Sample 00438020 was prepared in duplicate. The relative percent differences (RPD) between the analytes are:

Aroclor	RPD
1248	0.0
1260	3.2

SPIKED SAMPLES AND SPIKED SAMPLE DUPLICATES

Sample 00438024 was prepared in triplicate. Two replicates of the sample were spiked with aroclors 1016 and 1260. All analytes recovered within the method control limits of 50 % - 150 %.

	LMX 1	LMX2	RPD
Aroclor 1016		96	105 9.2
Aroclor 1260		84	90 6.9

HOLDING TIMES:

The sample was extracted and analyzed within the recommended holding times.

DATA QUALIFIERS:

Code	Definition
E	Reported result is an estimate because it exceeds the calibration.
J	The analyte was positively identified. The associated numerical result is an estimate.
N	There is evidence the analyte is present in this sample.
NJ	There is evidence that the analyte is present. The associated numerical result is an estimate.
NAF	Not analyzed for.
NC	Not calculated.
REJ	The data are unusable for all purposes.
U	The analyte was not detected at or above the reported result.
UJ	The analyte was not detected at or above the reported estimated result.
Bold Type	The analyte was present in the sample. Used as a visual aid to locate detected compounds on the report sheet.

Comments on this data package:

Due to catastrophic failure of the instrument computer, some data, calibration, and method files were destroyed before the documentation package for this project was completed.

All the samples and controls had been processed with valid calibrations and all Aroclor calibration verification standards were in control. One closing control for Aroclor 1254 was saved and demonstrates that the system was still in control after the analysis of the sample dilutions.

According to SW-846 method 8082, the Aroclors are expected to behave similarly. It is recommended by this method that 1016 and 1260 be used to demonstrate that all Aroclors are within control, making it unnecessary to analyze all Aroclors on a 10 -20% basis. Since 1254 behaves no differently than 1016 or 1260, the results of this standard should be acceptable to show that the analysis is in control for all the Aroclors.

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438020** **Date Collected:** 10/23/00 **Method:** SW8082
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/09/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	120	UJ
PCB - 1221	23	UJ
PCB - 1232	35	UJ
PCB - 1242	12	UJ
PCB - 1248	**1400**	
PCB - 1254	230	UJ
PCB - 1260	**31**	

Surrogate Recoveries

Decachlorobiphenyl	**66**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438020 (Duplicate – LPD1 **Date Collected:** 10/23/00 **Method:** SW8082
Field ID: UPRIVER #1 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/09/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	110	UJ
PCB - 1221	21	UJ
PCB - 1232	32	UJ
PCB - 1242	11	UJ
PCB - 1248	**1400**	
PCB - 1254	210	UJ
PCB - 1260	**27**	

Surrogate Recoveries

Decachlorobiphenyl	**57**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438021** **Date Collected:** 10/23/00 **Method:** SW8082
Field ID: UPRIVER #2 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/09/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	160	UJ
PCB - 1221	16	UJ
PCB - 1232	7.9	UJ
PCB - 1242	79	UJ
PCB - 1248	**1300**	
PCB - 1254	16	UJ
PCB - 1260	**6l8**	**J**

Surrogate Recoveries

Decachlorobiphenyl	**66**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438023** **Date Collected:** 10/24/00 **Method:** SW8082
Field ID: LITTLESPK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/07/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	5.1	U
PCB - 1221	5.1	U
PCB - 1232	5.1	U
PCB - 1242	5.1	U
PCB - 1248	5.1	U
PCB - 1254	5.1	U
PCB - 1260	5.1	U

Surrogate Recoveries

Decachlorobiphenyl	**70**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438024** **Date Collected:** 10/24/00 **Method:** SW8082
Field ID: UPLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/07/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	5.8	U
PCB - 1221	5.8	U
PCB - 1232	5.8	U
PCB - 1242	5.8	U
PCB - 1248	5.8	U
PCB - 1254	**2.0**	**NJ**
PCB - 1260	5.8	U

Surrogate Recoveries

Decachlorobiphenyl	**74**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438024 (Matrix Spike – LMX1) **Date Collected:** 10/24/00 **Method:** SW8082
Field ID: UPLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/07/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	**96**	
PCB - 1221	**84**	

Surrogate Recoveries

Decachlorobiphenyl	**85**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438024 (Matrix Spike – LMX2)** **Date Collected:** 10/24/00 **Method:** SW8082
Field ID: UPLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/07/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	**105**	
PCB - 1221	**96**	

Surrogate Recoveries

Decachlorobiphenyl	**85**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438025** **Date Collected:** 10/24/00 **Method:** SW8082
Field ID: MIDLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/08/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	8.4	U
PCB - 1221	8.4	U
PCB - 1232	8.4	U
PCB - 1242	8.4	U
PCB - 1248	**8.3**	NJ
PCB - 1254	**8.6**	NJ
PCB - 1260	4.2	UJ

Surrogate Recoveries

Decachlorobiphenyl	**87**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438026** **Date Collected:** 10/25/00 **Method:** SW8082
Field ID: LOWLONGLK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/08/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	12	U
PCB - 1221	12	U
PCB - 1232	12	U
PCB - 1242	25	U
PCB - 1248	44	
PCB - 1254	**39**	
PCB - 1260	**16**	

Surrogate Recoveries

Decachlorobiphenyl	**78**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438027** **Date Collected:** 10/25/00 **Method:** SW8082
Field ID: LATAH CR **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/08/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	4.7	U
PCB - 1221	4.7	U
PCB - 1232	4.7	U
PCB - 1242	4.7	U
PCB - 1248	4.7	U
PCB - 1254	4.7	U
PCB - 1260	4.7	U

Surrogate Recoveries

Decachlorobiphenyl	**80**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **00438028** **Date Collected:** 10/24/00 **Method:** SW8082
Field ID: BEAD LK **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/08/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	13	U
PCB - 1221	13	U
PCB - 1232	13	U
PCB - 1242	13	U
PCB - 1248	13	U
PCB - 1254	13	U
PCB - 1260	13	U

Surrogate Recoveries

Decachlorobiphenyl	**72**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: **OBS0306B1**

Method: SW8082

Field ID: Laboratory Method Blank

Date Prepared: 11/01/00

Matrix: Sediment/Soil

Project Officer: Art Johnson

Date Analyzed: 11/07/00

Units: ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	4.7	U
PCB - 1221	4.7	U
PCB - 1232	4.7	U
PCB - 1242	4.7	U
PCB - 1248	4.7	U
PCB - 1254	4.7	U
PCB - 1260	4.7	U

Surrogate Recoveries

Decachlorobiphenyl	**79**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: **OBS0306B2**

Method: SW8082

Field ID: Laboratory Method Bank

Date Prepared: 11/01/00

Matrix: Sediment/Soil

Project Officer: Art Johnson

Date Analyzed: 11/08/00

Units: ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	4.7	U
PCB - 1221	4.7	U
PCB - 1232	4.7	U
PCB - 1242	4.7	U
PCB - 1248	4.7	U
PCB - 1254	4.7	U
PCB - 1260	4.7	U

Surrogate Recoveries

Decachlorobiphenyl	**78**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: **OCS0306** **Method:** SW8082
Field ID: NIST SRM 1944 **Date Prepared:** 11/01/00 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 11/07/00 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	600	UJ
PCB - 1221	200	UJ
PCB - 1232	600	UJ
PCB - 1242	**440**	**J**
PCB - 1248	**800**	**J**
PCB - 1254	**810**	
PCB - 1260	**380**	

Surrogate Recoveries

Decachlorobiphenyl	**98**	**%**

Authorized By: _____ Release Date: _____

Johnson, Art

From: Mandjikov, Myrna L
Sent: Tuesday, December 12, 2000 10:04 AM
To: Johnson, Art
Subject: RE: Spokane Sediment PCBs 438020-21, 23-28

I'm sorry I should have discussed it. There are no certified values for Aroclors in SRM 1244. It is certified for congeners. However, I am tracking the mean and standard deviation data on this reference material. 1242 is estimated as it is affected by 1248 interference.

In the past we have not been running reference material on small project unless requested. As a result of the audit, we'll be running it more often. I do not have any reference material for aroclors in sediment samples at this time so I used NIST 1244 because it is what we've been using for the majority of work this year.

	Mean	Stdev	%RSD
1242	450 pg/uL J	105	23
1248	780 pg/uL	50	6
1254	680 pg/u L	87	13
1260	335 pg/UL	31	9

----Original Message----
From: Johnson, Art
Sent: Tuesday, December 12, 2000 8:13 AM
To: Mandjikov, Myrna L
Subject: Spokane Sediment PCBs 438020-21, 23-28

Myrna,

I got the above data today and it looks like you did another great job. Results fall in nicely with previous samples at these sites. Thank you.

Could you please provide me with the name and certified values for NIST SRM 1944? Was there a reason for not mentioning the SRM in the case narrative?

Art

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Manchester Environmental Laboratory

7411 Beach Dr E, Port Orchard Washington 98366

CASE NARRATIVE

March 27, 2001

Subject: Spokane River - Sediment Samples
Sample(s): 00438024, 26 & 27

Officer(s): Art Johnson
By: Norman Olson
Organics Analysis Unit

Pesticide Analysis

ANALYTICAL METHOD(S):

The sediment samples for nitrogen-containing, organophosphorous and chlorinated pesticides (Npest, Oppest and Clpest) were extracted following Manchester Laboratory's standard operating procedure for the extraction of pesticides. The samples were extracted with acetone using a Soxhlet apparatus and solvent exchanged to hexane. Following extraction the extracts received Florisil column clean-up collecting a single 100% diethylether (preserved) fraction. The extracts were analyzed for Npest and Oppest by capillary Gas Chromatography with Atomic Emission Detection (GC/AED) following EPA SW-846 Method 8085. The extracts were analyzed for Clpest by capillary Gas Chromatography with Electron Capture Detection (GC/ECD) following EPA SW-846 Method 8081. Confirmation of detected pesticides is performed by Gas Chromatography with Ion-Trap mass spectrometry (GC/ITD), comparisons of elemental ratios of heteroatoms to empirical formulas or dual dissimilar column comparison.

Target analytes have a respective practical quantitation limit (PQL) that is higher than the corresponding method detection limit (MDL). If a target analyte is detected and its identification is unambiguously confirmed at a concentration below its PQL, the reported concentration is qualified as an estimate, ' f qualifier.

BLANKS:
No target compounds were detected in the laboratory blanks. Hence, the blanks demonstrate the system was free from contamination.

HOLDING TIMES:
All samples were extracted and analyzed within the method holding times.

SURROGATE(S): 1,3-Dimethyl-2-nitrobenzene (DMNB), Decachlorobiphenyl (DCB), 4,4'-**Dibromo-octafluorobiphenyl (DBOB),** Tetrachloro-m-xylene (TMX) and triphenylphosphate (TPP) recoveries from the samples and the blank were within the acceptable limits, except for the TMX recovery from sample 00438024 at 44%. Because the other surrogate recoveries were acceptable in this sample no qualifiers were applied.

DMNB recoveries are generally expected to be lower than the other surrogate compounds due to its relative volatility. DMNB is more volatile than the target analytes and thus gives an indication of maximum losses during the concentration steps of the sample preparation procedure.

MATRIX SPIKING:
No matrix spikes were requested

COMMENTS:
Trace levels of tetrabromobiphenylether and pentabromobiphenylethers were detected in sample 00438024 at approximately 4 ug/Kg and 7 ug/Kg, respectively. These numbers should be considered rough estimates.

The reported target list for each parameter contains fewer compounds then the associated parameter lists generally reported for water sample analysis. This difference in the compound list is due to method performance relative to the compounds obtained when the required clean-up steps are included in the soil sample preparation procedure.

The data is useable as qualified.

DATA QUALIFIER CODES

U	-	The analyte was not detected at or above the reported result.
J	-	The analyte was positively identified. The associated numerical result is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
NAF	-	Not analyzed for.
N	-	For organic analytes there is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
NC	-	Not Calculated
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Nitrogen Containing Pesticides

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438024 **Date Collected:** 10/24/00 **Method:** SW8085
Field ID: UPLONGLK **Date Prepared:** 12/14/01 **Matrix:** Frozen Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 03/12/01 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Dichlobenil	18	U
Propachlor (Ramrod)	22	U
Ethalfluralin (Sonalan)	14	U
Treflan (Trifluralin)	14	U
Simazine	9.1	U
Atrazine	9.1	U
Pronamide (Kerb)	36	U
Terbacil	27	U
Metribuzin	9.1	UJ
Alachlor	33	U
Metolachlor	36	U
Diphenamid	27	UJ
Pendimethalin	14	U
Napropamide	27	U
Oxyfluorfen	36	U
Eptam	18	U
Butylate	18	U
Vernolate	18	U
Cycloate	18	U
Benefin	14	U
Propazine	9.1	U
Triallate	27	U
Ametryn	9.1	UJ
Terbutryn (Igran)	9.1	UJ
Pebulate	18	U
Molinate	18	U
Chlorpropham	36	U
Triadimefon	24	U
MGK264	73	U
Butachlor	55	U
Fenarimol	27	U
Diuron	55	UJ
Di-allate (Avadex)	64	U
Profluralin	22	U

Surrogate Recoveries

1,3-Dimethyl-2-nitrobenzene	**28**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Nitrogen Containing Pesticides

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438026 **Date Collected:** 10/25/00 **Method:** SW8085
Field ID: LOWLONGLK **Date Prepared:** 12/14/01 **Matrix:** Frozen Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 03/12/01 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Dichlobenil	39	U
Propachlor (Ramrod)	47	U
Ethalfluralin (Sonalan)	29	U
Treflan (Trifluralin)	29	U
Simazine	19	U
Atrazine	19	U
Pronamide (Kerb)	78	U
Terbacil	58	U
Metribuzin	19	UJ
Alachlor	70	U
Metolachlor	78	U
Diphenamid	58	UJ
Pendimethalin	29	U
Napropamide	58	U
Oxyfluorfen	78	U
Eptam	39	U
Butylate	39	U
Vernolate	39	U
Cycloate	39	U
Benefin	29	U
Propazine	19	U
Triallate	58	U
Ametryn	19	UJ
Terbutryn (Igran)	19	UJ
Pebulate	39	U
Molinate	39	U
Chlorpropham	39	U
Triadimefon	78	U
MGK264	51	U
Butachlor	160	U
Fenarimol	120	U
Diuron	58	UJ
Di-allate (Avadex)	120	U
Profluralin	140	U
Cyanazine	29	UJ

Surrogate Recoveries

1,3-Dimethyl-2-nitrobenzene	**26**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Nitrogen Containing Pesticides

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438027 **Date Collected:** 10/25/00 **Method:** SW8085
Field ID: LATAH CR **Date Prepared:** 02/14/01 **Matrix:** Frozen Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 03/12/01 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Dichlobenil	16	U
Propachlor (Ramrod)	19	U
Ethalfluralin (Sonalan)	12	U
Treflan (Trifluralin)	12	U
Simazine	8.0	U
Atrazine	8.0	U
Pronamide (Kerb)	32	U
Terbacil	24	U
Metribuzin	8.0	UJ
Alachlor	29	U
Metolachlor	32	U
Diphenamid	24	UJ
Pendimethalin	12	U
Napropamide	24	U
Oxyfluorfen	32	U
Eptam	16	U
Butylate	16	U
Vernolate	16	U
Cycloate	16	U
Benefin	12	U
Propazine	8.0	U
Triallate	24	U
Ametryn	8.0	UJ
Terbutryn (Igran)	8.0	UJ
Pebulate	16	U
Molinate	16	U
Chlorpropham	32	U
Triadimefon	21	U
MGK264	64	U
Butachlor	48	U
Fenarimol	24	U
Diuron	48	UJ
Di-allate (Avadex)	56	U
Profluralin	19	U
Cyanazine	12	UJ

Surrogate Recoveries

1,3-Dimethyl-2-nitrobenzene	**40**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Nitrogen Containing Pesticides

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: OBS1045A1 **Method:** SW8085
Field ID: Laboratory Method Bank **Date Prepared:** 02/14/01 **Matrix:** Frozen Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 03/12/01 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Dichlobenil	15	U
Propachlor (Ramrod)	19	U
Ethalfluralin (Sonalan)	12	U
Treflan (Trifluralin)	12	U
Simazine	7.7	U
Atrazine	7.7	U
Pronamide (Kerb)	31	U
Terbacil	23	U
Metribuzin	7.7	UJ
Alachlor	28	U
Metolachlor	31	U
Diphenamid	23	UJ
Pendimethalin	12	U
Napropamide	23	U
Oxyfluorfen	31	U
Eptam	15	U
Butylate	15	U
Vernolate	15	U
Cycloate	15	U
Benefin	12	U
Propazine	7.7	U
Triallate	23	U
Ametryn	7.7	UJ
Terbutryn (Igran)	7.7	UJ
Pebulate	15	U
Molinate	15	U
Chlorpropham	31	U
Triadimefon	20	U
MGK264	62	U
Butachlor	46	U
Fenarimol	23	U
Diuron	46	UJ
Di-allate (Avadex)	54	U
Profluralin	19	U
Cyanazine	12	UJ

Surrogate Recoveries

1,3-Dimethyl-2-nitrobenzene	**28**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Nitrogen Containing Pesticides

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: OBS1045A2 **Method:** SW8085
Field ID: Laboratory Method Blank **Date Prepared:** 02/14/01 **Matrix:** Frozen Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 03/12/01 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Dichlobenil	15	U
Propachlor (Ramrod)	19	U
Ethalfluralin (Sonalan)	12	U
Treflan (Trifluralin)	12	U
Simazine	7.7	U
Atrazine	7.7	U
Pronamide (Kerb)	31	U
Terbacil	23	U
Metribuzin	7.7	UJ
Alachlor	28	U
Metolachlor	31	U
Diphenamid	23	UJ
Pendimethalin	12	U
Napropamide	23	U
Oxyfluorfen	31	U
Eptam	15	U
Butylate	15	U
Vernolate	15	U
Cycloate	15	U
Benefin	12	U
Propazine	7.7	U
Triallate	23	U
Ametryn	7.7	UJ
Terbutryn (Igran)	7.7	UJ
Pebulate	15	U
Molinate	15	U
Chlorpropham	31	U
Triadimefon	20	U
MGK264	62	U
Butachlor	46	U
Fenarimol	23	U
Diuron	46	UJ
Di-allate (Avadex)	54	U
Profluralin	19	U
Cyanazine	12	UJ

Surrogate Recoveries

1,3-Dimethyl-2-nitrobenzene	**51**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Organophosphorous Pesticides (GC/AED)

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438024 **Date Collected:** 10/24/00 **Method:** SW8085
Field ID: UPLONGLK **Date Prepared:** 02/14/01 **Matrix:** Frozen Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 03/12/01 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Sulfotepp	5.5	U
Fonofos	5.5	U
Methyl Chlorpyrifos	7.3	U
Fenitrothion	6.4	U
Malathion	7.3	U
Chlorpyriphos	7.3	U
Merphos (1 & 2)	11	U
Ethion	6.4	U
Carbophenothion	9.1	U
EPN	9.1	U
Azinphos Ethyl	15	U
Ethoprop	7.3	U
Diazinon	7.3	U
Methyl Parathion	6.4	U
Ronnel	6.4	U
Parathion	7.3	U
Imidan	10	U
Azinphos (Guthion)	15	U
Coumaphos	11	U
Dioxathion	15	UJ
Propetamphos	18	UJ
Tribufos (DEF)	13	U
Abate (Temephos)	55	UJ

Surrogate Recoveries

Triphenyl Phosphate	**77**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Organophosphorous Pesticides (GC/AED)

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438026 **Date Collected:** 10/25/00 **Method:** SW8085
Field ID: LOWLONGLK **Date Prepared:** 02/14/01 **Matrix:** Frozen Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 03/12/01 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Sulfotepp	12	U
Fonofos	12	U
Methyl Chlorpyrifos	16	U
Fenitrothion	14	U
Malathion	16	U
Chlorpyriphos	16	U
Merphos (1 & 2)	23	U
Ethion	14	U
Carbophenothion	19	U
EPN	19	U
Azinphos Ethyl	31	U
Ethoprop	16	U
Diazinon	16	U
Methyl Parathion	14	U
Ronnel	14	U
Parathion	16	U
Imidan	21	U
Azinphos (Guthion)	31	U
Coumaphos	23	U
Dioxathion	33	UJ
Propetamphos	39	UJ
Tribufos (DEF)	27	U
Abate (Temephos)	120	UJ

Surrogate Recoveries

Triphenyl Phosphate	**54**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Organophosphorous Pesticides (GC/AED)

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: 00438027 **Date Collected:** 10/25/00 **Method:** SW8085
Field ID: LATAH CR **Date Prepared:** 02/14/01 **Matrix:** Frozen Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 03/12/01 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Sulfotepp	4.8	U
Fonofos	4.8	U
Methyl Chlorpyrifos	6.4	U
Fenitrothion	5.6	U
Malathion	7/4	U
Chlorpyriphos	6.4	U
Merphos (1 & 2)	9.6	U
Ethion	5.6	U
Carbophenothion	8.0	U
EPN	8.0	U
Azinphos Ethyl	13	U
Ethoprop	6.4	U
Diazinon	6.4	U
Methyl Parathion	5.6	U
Ronnel	5.6	U
Parathion	6.4	U
Imidan	8.8	U
Azinphos (Guthion)	13	U
Coumaphos	9.6	U
Dioxathion	14	UJ
Propetamphos	16	UJ
Tribufos (DEF)	11	U
Abate (Temephos)	48	UJ

Surrogate Recoveries

Triphenyl Phosphate	**55**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Organophosphorous Pesticides (GC/AED)

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: OBS1045A1 **Method:** SW8085
Field ID: Laboratory Method Blank **Date Prepared:** 02/14/01 **Matrix:** Frozen Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 03/12/01 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Sulfotepp	4.6	U
Fonofos	4.6	U
Methyl Chlorpyrifos	6.2	U
Fenitrothion	5.4	U
Malathion	6.2	U
Chlorpyriphos	6.2	U
Merphos (1 & 2)	9. 3	U
Ethion	5.4	U
Carbophenothion	7.7	U
EPN	7.7	U
Azinphos Ethyl	12	U
Ethoprop	6.2	U
Diazinon	6.2	U
Methyl Parathion	5.4	U
Ronnel	5.4	U
Parathion	6.2	U
Imidan	8.5	U
Azinphos (Guthion)	12	U
Coumaphos	9.3	U
Dioxathion	13	UJ
Propetamphos	15	UJ
Tribufos (DEF)	11	U
Abate (Temephos)	46	UJ

Surrogate Recoveries

Triphenyl Phosphate	**77**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Organophosphorous Pesticides (GC/AED)

Project Name: Spokane Sediment Bioassays **LIMS Project ID:** 4358-00

Sample: OBS1045A2 **Method:** SW8085
Field ID: Laboratory Method Blank **Date Prepared:** 02/14/01 **Matrix:** Frozen Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 03/12/01 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Sulfotepp	4.6	U
Fonofos	4.6	U
Methyl Chlorpyrifos	6.2	U
Fenitrothion	5.4	U
Malathion	6.2	U
Chlorpyriphos	6.2	U
Merphos (1 & 2)	9. 3	U
Ethion	5.4	U
Carbophenothion	7.7	U
EPN	7.7	U
Azinphos Ethyl	12	U
Ethoprop	6.2	U
Diazinon	6.2	U
Methyl Parathion	5.4	U
Ronnel	5.4	U
Parathion	6.2	U
Imidan	8.5	U
Azinphos (Guthion)	12	U
Coumaphos	9.3	U
Dioxathion	13	UJ
Propetamphos	15	UJ
Tribufos (DEF)	11	U
Abate (Temephos)	46	UJ

Surrogate Recoveries

Triphenyl Phosphate	**77**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Chlorinated Pesticides (GC/AED)

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: 00438024
Field ID: UPLONGLK
Project Officer: Art Johnson

Date Collected: 10/24/00
Date Prepared: 02/14/01
Date Analyzed: 03/12/01

Method: SW8085
Matrix: Frozen Sediment/Soil
Units: ug/Kg dw

Analyte	Result	Qualifier
Alpha-BHC	0.73	U
Beta-BHC	0.73	U
Gamma-BHC (Lindane)	0.73	U
Delta-BHC	0.73	U
Heptachlor	0.73	U
Aldrin	0.73	U
Heptachlor Epoxide	0.73	U
Trans-Chlordane (Gamma)	0.73	U
Cis-Chlordane (Alpha-Chlordane	0.73	U
Endosulfan I	0.73	U
Dieldrin	0.73	U
4,4'-DDE	0.73	U
Endrin	0.73	U
Endosulfan II	0.73	U
4,4'-DDD	0.73	U
Endrin Aldehyde	0.73	U
Endosulfan Sulfate	0.73	U
4,4'-DDT	0.73	U
Endrin Ketone	0.73	U
Methoxychlor	0.73	U
Alpha-Chlordene	0.73	U
Gamma-Chlordene	0.73	U
Oxychlordane	0.73	U
DDMU	0.73	U
Cis-Nonachlor	0.73	U
2,4'-DDE	0.73	U
Trans-Nonachlor	0.73	U
2,4'-DDD	0.73	U
2,4'-DDT	0.73	U
Mirex	0.73	U
Toxaphene	29	U

Surrogate Recoveries

4,4-Dibromooctaflurobiphenyl	**52**	**%**
Tetrachloro-m-xylene	**44**	**%**
Decachlorobiphenyl	**64**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Chlorinated Pesticides (GC/AED)

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: 00438026
Field ID: LOWLONGLK
Project Officer: Art Johnson

Date Collected: 10/25/00
Date Prepared: 02/14/01
Date Analyzed: 03/12/01

Method: SW8085
Matrix: Frozen Sediment/Soil
Units: ug/Kg dw

Analyte	Result	Qualifier
Alpha-BHC	1.6	U
Beta-BHC	1.6	U
Gamma-BHC (Lindane)	1.6	U
Delta-BHC	1.6	U
Heptachlor	1.6	U
Aldrin	1.6	U
Heptachlor Epoxide	1.6	U
Trans-Chlordane (Gamma)	1.6	U
Cis-Chlordane (Alpha-Chlordane	1.6	U
Endosulfan I	1.6	U
Dieldrin	1.6	U
4,4'-DDE	**4.1**	
Endrin	1.6	U
Endosulfan II	1.6	U
4,4'-DDD	1.6	U
Endrin Aldehyde	1.6	U
Endosulfan Sulfate	1.6	U
4,4'-DDT	1.6	U
Endrin Ketone	1.6	U
Methoxychlor	1.6	U
Alpha-Chlordene	1.6	U
Gamma-Chlordene	1.6	U
Oxychlordane	1.6	U
DDMU	1.6	U
Cis-Nonachlor	1.6	U
2,4'-DDE	1.6	U
Trans-Nonachlor	1.6	U
2,4'-DDD	1.6	U
2,4'-DDT	1.6	U
Mirex	1.6	U
Toxaphene	62	U

Surrogate Recoveries

4,4-Dibromooctaflurobiphenyl	**66**	**%**
Tetrachloro-m-xylene	**59**	**%**
Decachlorobiphenyl	**69**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Chlorinated Pesticides (GC/AED)

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: 00438027
Field ID: LATAH CR
Project Officer: Art Johnson

Date Collected: 10/25/00
Date Prepared: 02/14/01
Date Analyzed: 03/12/01

Method: SW8085
Matrix: Frozen Sediment/Soil
Units: ug/Kg dw

Analyte	Result	Qualifier
Alpha-BHC	0.64	U
Beta-BHC	0.64	U
Gamma-BHC (Lindane)	0.64	U
Delta-BHC	0.64	U
Heptachlor	0.64	U
Aldrin	0.64	U
Heptachlor Epoxide	0.64	U
Trans-Chlordane (Gamma)	0.64	U
Cis-Chlordane (Alpha-Chlordane	0.64	U
Endosulfan I	0.64	U
Dieldrin	0.64	U
4,4'-DDE	0.64	u
Endrin	0.64	U
Endosulfan II	0.64	U
4,4'-DDD	0.64	U
Endrin Aldehyde	0.64	U
Endosulfan Sulfate	0.64	U
4,4'-DDT	0.64	U
Endrin Ketone	0.64	U
Methoxychlor	0.64	U
Alpha-Chlordene	0.64	U
Gamma-Chlordene	0.64	U
Oxychlordane	0.64	U
DDMU	0.64	U
Cis-Nonachlor	0.64	U
2,4'-DDE	0.64	U
Trans-Nonachlor	0.64	U
2,4'-DDD	0.64	U
2,4'-DDT	0.64	U
Mirex	0.64	U
Toxaphene	26	U

Surrogate Recoveries

4,4-Dibromooctaflurobiphenyl	**55**	**%**
Tetrachloro-m-xylene	**50**	**%**
Decachlorobiphenyl	**60**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Chlorinated Pesticides (GC/AED)

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: OBS1045A2

Method: SW8085

Field ID: Laboratory Method Blank

Date Prepared: 02/14/01

Matrix: Frozen Sediment/Soil

Project Officer: Art Johnson

Date Analyzed: 03/12/01

Units: ug/Kg dw

Analyte	Result	Qualifier
Alpha-BHC	0.62	U
Beta-BHC	0.62	U
Gamma-BHC (Lindane)	0.62	U
Delta-BHC	0.62	U
Heptachlor	0.62	U
Aldrin	0.62	U
Heptachlor Epoxide	0.62	U
Trans-Chlordane (Gamma)	0.62	U
Cis-Chlordane (Alpha-Chlordane	0.62	U
Endosulfan I	0.62	U
Dieldrin	0.62	U
4,4'-DDE	0.62	u
Endrin	0.62	U
Endosulfan II	0.62	U
4,4'-DDD	0.62	U
Endrin Aldehyde	0.62	U
Endosulfan Sulfate	0.62	U
4,4'-DDT	0.62	U
Endrin Ketone	0.62	U
Methoxychlor	0.62	U
Alpha-Chlordene	0.62	U
Gamma-Chlordene	0.62	U
Oxychlordane	0.62	U
DDMU	0.62	U
Cis-Nonachlor	0.62	U
2,4'-DDE	0.62	U
Trans-Nonachlor	0.62	U
2,4'-DDD	0.62	U
2,4'-DDT	0.62	U
Mirex	0.62	U
Toxaphene	25	U

Surrogate Recoveries

4,4-Dibromooctaflurobiphenyl	**55**	**%**
Tetrachloro-m-xylene	**50**	**%**
Decachlorobiphenyl	**60**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

7411 Beach Dr E, Port Orchard Washington 98366

CASE NARRATIVE

March 21, 2001

Subject: Spokane Sediment Bioassays Project
Sample(s): 00438024, 26 and 27

Officer(s): Art Johnson

By: Bob Carrell
Organics Analysis Unit

ACID HERBICIDE ANALYSIS

ANALYTICAL METHOD(S): (Draft EPA Method 8085)

The sediment samples for acid herbicides were extracted following Manchester Laboratory's standard operating procedure for the extraction of herbicides. The herbicide sample was hydrolyzed at pH > 12, extracted with diethyl ether at pH < 2, solvent exchanged and derivatized along with two method blanks. These extracts were analyzed by capillary Gas Chromatography and Atomic Emission Detection (GC/AED). Confirmation of herbicides is performed by Gas Chromatography and Ion-Trap mass spectrometry (GC/ITD) or comparisons of elemental ratios of hetero-atoms to empirical formulas.

The method utilizes compound independent calibration (CIC) for quantitation of detected compounds. A calibration validation is performed each time CIC is used for target compounds. This is done by comparison of CIC to a single point calibration (SPC) of the target analyte being quantitated.

All analytes have a respective practical quantitation limit (PQL) that is higher than the corresponding method detection limit (MDL). If a target analyte is detected and its identification is unambiguously confirmed at a concentration below its PQL, the reported concentration is qualified as an estimate,' J' qualifier.

HOLDING TIMES:

The sample was extracted and analyzed within the method holding times.

BLANKS:

No target compounds were detected in the laboratory blank at or above the practical quantitation limits (PQL's) thus demonstrating that the system was free from contamination.

SURROGATES:

The surrogate recoveries for the 2,4-dichlorophenylacetic acid and 2,4,6-tribromophenol surrogates were acceptable, ranging from 26% to 47% and 29% to 39% respectively, except for 2,4,dichlorophenylacetic acid on the method blank OBS1045AIH (14%). Since the second surrogate for that blank was at an acceptable level and both surrogates for the second blank were at acceptable levels, no qualifiers were added due to surrogate recoveries.

MATRIX SPIKING:

N/A

COMMENTS:

The target analytes picloram and dinoseb received the `UJ' qualifier because we traditionally experience highly variable recoveries for these compounds.

The data is useable as qualified.

DATA QUALIFIER CODES

U	-	The analyte was not detected at or above the reported result.
J	-	The analyte was positively identified. The associated numerical result is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
NAF	-	Not analyzed for.
N	-	For organic analytes there is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
NC	-	Not Calculated
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Chlorinated Pesticides (GC/AED)

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: OBS1045A1

Method: SW8085

Field ID: Laboratory Method Blank

Date Prepared: 02/14/01

Matrix: Frozen Sediment/Soil

Project Officer: Art Johnson

Date Analyzed: 03/12/01

Units: ug/Kg dw

Analyte	Result	Qualifier
Alpha-BHC	0.62	U
Beta-BHC	0.62	U
Gamma-BHC (Lindane)	0.62	U
Delta-BHC	0.62	U
Heptachlor	0.62	U
Aldrin	0.62	U
Heptachlor Epoxide	0.62	U
Trans-Chlordane (Gamma)	0.62	U
Cis-Chlordane (Alpha-Chlordane	0.62	U
Endosulfan I	0.62	U
Dieldrin	0.62	U
4,4'-DDE	0.62	u
Endrin	0.62	U
Endosulfan II	0.62	U
4,4'-DDD	0.62	U
Endrin Aldehyde	0.62	U
Endosulfan Sulfate	0.62	U
4,4'-DDT	0.62	U
Endrin Ketone	0.62	U
Methoxychlor	0.62	U
Alpha-Chlordene	0.62	U
Gamma-Chlordene	0.62	U
Oxychlordane	0.62	U
DDMU	0.62	U
Cis-Nonachlor	0.62	U
2,4'-DDE	0.62	U
Trans-Nonachlor	0.62	U
2,4'-DDD	0.62	U
2,4'-DDT	0.62	U
Mirex	0.62	U
Toxaphene	25	U

Surrogate Recoveries

4,4-Dibromooctaflurobiphenyl	**72**	**%**
Tetrachloro-m-xylene	**65**	**%**
Decachlorobiphenyl	**82**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Chlorophenoxy Herbicides

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: **OBS1045A1H**

Method: SW8085

Field ID: Laboratory Method Blank

Date Prepared: 02/14/01

Matrix: Frozen Sediment/Soil

Project Officer: Art Johnson

Date Analyzed: 03/12/01

Units: ug/Kg dw

Analyte	Result	Qualifier
2,4,6-Trichlorophenol	41	U
3,5-Dichlorobenzoic Acid	68	U
4-Nitrophenol	120	U
2,4,5-Trichlorophenol	41	U
Dicamba I	68	U
2,3,4,6-Tetrachlorophenol	37	U
MCPP (Mecoprop)	140	U
MCPA	140	U
Dichlorprop	74	U
Bromoxynil	68	U
2,4-D	68	U
2,3,4,5-Tetrachlorophenol	37	U
Trichlopyr	57	U
Pentachlorophenol	34	U
2,4,5-TP (Silvex)	54	U
2,4,5-T	54	U
2,4-DB	81	U
Dinoseb	100	UJ
Bentazon	100	U
Ioxynil	68	U
Picloram	68	UJ
Dacthal (DCPA)	54	U
2,4,5-TB	61	U
Acifluorfen (Blazer)	270	U
Diclofop-Methyl	100	U

Surrogate Recoveries

2,4-Dichlorophelacetic acid	**14**	**%**
2,4,6-Tribromophenol	**29**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Chlorophenoxy Herbicides

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: **OBS1045A2H**

Method: SW8085

Field ID: Laboratory Method Blank

Date Prepared: 02/14/01

Matrix: Frozen Sediment/Soil

Project Officer: Art Johnson

Date Analyzed: 03/12/01

Units: ug/Kg dw

Analyte	Result	Qualifier
2,4,6-Trichlorophenol	41	U
3,5-Dichlorobenzoic Acid	68	U
4-Nitrophenol	120	U
2,4,5-Trichlorophenol	41	U
Dicamba I	68	U
2,3,4,6-Tetrachlorophenol	37	U
MCPP (Mecoprop)	140	U
MCPA	140	U
Dichlorprop	74	U
Bromoxynil	68	U
2,4-D	68	U
2,3,4,5-Tetrachlorophenol	37	U
Trichlopyr	57	U
Pentachlorophenol	34	U
2,4,5-TP (Silvex)	54	U
2,4,5-T	54	U
2,4-DB	81	U
Dinoseb	100	UJ
Bentazon	100	U
Ioxynil	68	U
Picloram	68	UJ
Dacthal (DCPA)	54	U
2,4,5-TB	61	U
Acifluorfen (Blazer)	270	U
Diclofop-Methyl	100	U

Surrogate Recoveries

2,4-Dichlorophelacetic acid	**26**	**%**
2,4,6-Tribromophenol	**39**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Chlorophenoxy Herbicides

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: 00438024
Field ID: UPLONGLK
Project Officer: Art Johnson

Date Collected: 10/24/00
Date Prepared: 02/14/01
Date Analyzed: 03/12/01

Method: SW8085
Matrix: Frozen Sediment/Soil
Units: ug/Kg dw

Analyte	Result	Qualifier
2,4,6-Trichlorophenol	41	U
3,5-Dichlorobenzoic Acid	68	U
4-Nitrophenol	120	U
2,4,5-Trichlorophenol	41	U
Dicamba I	68	U
2,3,4,6-Tetrachlorophenol	37	U
MCPP (Mecoprop)	140	U
MCPA	140	U
Dichlorprop	74	U
Bromoxynil	68	U
2,4-D	68	U
2,3,4,5-Tetrachlorophenol	37	U
Trichlopyr	57	U
Pentachlorophenol	34	U
2,4,5-TP (Silvex)	54	U
2,4,5-T	54	U
2,4-DB	81	U
Dinoseb	100	UJ
Bentazon	100	U
Ioxynil	68	U
Picloram	68	UJ
Dacthal (DCPA)	54	U
2,4,5-TB	61	U
Acifluorfen (Blazer)	270	U
Diclofop-Methyl	100	U

Surrogate Recoveries

2,4-Dichlorophelacetic acid	**47**	**%**
2,4,6-Tribromophenol	**38**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Chlorophenoxy Herbicides

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: 00438026
Field ID: LOWLONGLK
Project Officer: Art Johnson

Date Collected: 10/25/00
Date Prepared: 02/14/01
Date Analyzed: 03/20/01

Method: SW8085
Matrix: Frozen Sediment/Soil
Units: ug/Kg dw

Analyte	Result	Qualifier
2,4,6-Trichlorophenol	93	U
3,5-Dichlorobenzoic Acid	150	U
4-Nitrophenol	270	U
2,4,5-Trichlorophenol	93	U
Dicamba I	150	U
2,3,4,6-Tetrachlorophenol	86	U
MCPP (Mecoprop)	310	U
MCPA	310	U
Dichlorprop	170	U
Bromoxynil	150	U
2,4-D	150	U
2,3,4,5-Tetrachlorophenol	86	U
Trichlopyr	130	U
Pentachlorophenol	78	U
2,4,5-TP (Silvex)	120	U
2,4,5-T	120	U
2,4-DB	190	U
Dinoseb	230	UJ
Bentazon	230	U
Ioxynil	150	U
Picloram	150	UJ
Dacthal (DCPA)	120	U
2,4,5-TB	140	U
Acifluorfen (Blazer)	620	U
Diclofop-Methyl	230	U

Surrogate Recoveries

2,4-Dichloropheylacetic acid	**43**	**%**
2,4,6-Tribromophenol	**35**	**%**

Authorized By: _____ Release Date: _____

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Chlorophenoxy Herbicides

Project Name: Spokane Sediment Bioassays

LIMS Project ID: 4358-00

Sample: 00438027
Field ID: LATAH CR
Project Officer: Art Johnson

Date Collected: 10/25/00
Date Prepared: 02/14/01
Date Analyzed: 03/20/01

Method: SW8085
Matrix: Frozen Sediment/Soil
Units: ug/Kg dw

Analyte	Result	Qualifier
2,4,6-Trichlorophenol	35	U
3,5-Dichlorobenzoic Acid	58	U
4-Nitrophenol	100	U
2,4,5-Trichlorophenol	35	U
Dicamba I	58	U
2,3,4,6-Tetrachlorophenol	32	U
MCPP (Mecoprop)	120	U
MCPA	120	U
Dichlorprop	64	U
Bromoxynil	58	U
2,4-D	58	U
2,3,4,5-Tetrachlorophenol	32	U
Trichlopyr	49	U
Pentachlorophenol	29	U
2,4,5-TP (Silvex)	47	U
2,4,5-T	47	U
2,4-DB	70	U
Dinoseb	88	UJ
Bentazon	88	U
Ioxynil	58	U
Picloram	58	UJ
Dacthal (DCPA)	47	U
2,4,5-TB	53	U
Acifluorfen (Blazer)	230	U
Diclofop-Methyl	88	U

Surrogate Recoveries

2,4-Dichloropheylacetic acid	**47**	**%**
2,4,6-Tribromophenol	**36**	**%**

Authorized By: _____ Release Date: _____

Appendix E.

Test Reports on Bioassays

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Microtox Bioassay

1. INTRODUCTION

Parametrix, Inc. was contracted to perform bioassays on eight freshwater sediment samples provided by the Washington Department of Ecology (WDOE), using the Microtox® Reagent: *Vibrio fischeri*, a bio-luminescent marine bacterium. The sediment samples were collected in October 2000. The 100 percent sediment porewater Microtox® testing was conducted on 1 November 2000. This report summarizes the final bioassay results.

2. METHODS AND MATERIALS

2.1 Test Sediment

Eight sediment samples were delivered to Parametrix's Environmental Toxicology Laboratory on 27 October 2000. Upon arrival, appropriate chain-of-custody procedures were followed, sample labels were checked against the chain-of-custody (COC) form, containers inspected for damage that may have occurred during shipping, and sediment volumes were determined to be adequate. Samples were stored in the dark at 4°C until test initiation.

2.2 Biological Procedures

The Microtox® test was conducted according to the Draft Final 8/15/00 procedure developed by Peter Adolphson of Washington State Department of Ecology.

For the Microtox® 100 percent sediment porewater assessment method, 300 ml of both reference and test sediments were centrifuged at approximately 4500G for 30 minutes resulting in approximately 50 ml of pore water. Approximately 50 mls of porewater was then pipetted into a clean glass container. The remaining porewater was set aside for reducing salinity should the initial salinity adjustment exceed 22 ppt. The samples were then adjusted for salinity using dry salts, dissolved oxygen (DO) by gentle aeration or agitation, and pH by the addition of 0.5N NaOH or HCl. A control test solution was prepared by using deionized water and adjusting salinity, DO and pH as above. The prepared samples were then allowed to equilibrate for 15 minutes at 15°C prior to inoculation of the bacteria.

A vial of freeze-dried bacteria (*V. fisheri*) was rehydrated with 1.0 mL of reconstitution solution, covered with parafilm, stored in a 4°C well on the analyzer, and used within four hours of rehydration for testing.

To each of the test cuvettes, 10 µL of the rehydrated bacterial suspension was added at 30 second intervals and mixed immediately using a 1 ml pipette and allowed to incubate for 5 minutes at 15°C. At the initial (I_0) 5 minute mark, the first control vial is placed into the read chamber to "set" the instrument. At 30-second intervals each cuvette (inclusive of A1) is placed into the read chamber for the initial reading (I_0). Second and third readings are taken at 5 (I_5) and 15 (I_{15}) minutes respectively.

2.3 Negative and Positive Controls

Laboratory controls are necessary to ensure the validity of test results. The Microtox® test is deemed acceptable if the EC50 for the phenol reference toxicant test falls between 12.5 and 30 mg/L. A summary of test conditions is located in Table 1.

2.4 Source of Test Organisms

Microtox® reagent, *V. fischeri*, was obtained from Azur Environmental, Carlsbad, California, and was used within four hours of reconstitution. A reference toxicant, phenol, was used to assess the relative health of the *V. fischeri* and to ensure that their sensitivity fell within an expected concentration range.

2.5 Data Analysis

All test sediments were compared to both the control and reference sediment. The t-test method was used to determine statistical differences between the test samples and the control and reference samples.

Table 1. Summary of test conditions for the Sediment Porewater Microtox® assay.

Job Name: Washington Department of Ecology — Job Number: 555-1583-63 (2000)

Dates: 1 November 2000

Test Protocol:	Microtox® 100 percent sediment porewater assessment, 8/15/00 draft final.
Test Material:	8 sediment samples supplied by the Washington State Department of Ecology
Test Organisms:	*Vibrio fischeri*
Stock Volume/Test Chamber:	10 µl
Volume/Test Chamber:	1,000 µL
Test Concentrations:	Control and 100 %, with a reference sediment
Replicates:	5 pseudo replicates
Reference Toxicant:	Phenol
Test Duration:	15 minutes
Control/Dilution Media:	Azur Microtox® Diluent
Test Chambers:	3.5 ml glass cuvettes
Temperature:	15 ± 1°
Effect Measured:	Percent light change
Test Acceptability:	EC50 of reference toxicant between 12.5 and 30 mg/L

3. RESULTS

A summary of test results is presented in Table 2 below. All original raw data, chain-of-custody form, and project notes are maintained at Parametrix's office in the project file. Copies of the raw data and reference toxicant test data can be found in Appendix A.

Results for the Microtox® 100 percent sediment porewater assay indicated toxicity in sample number 438021 was significantly different relative to both the control and the reference sediment (see Table 2). Sample number 438020 was significantly different when compared to the reference sediment and to the control at the T_5 interval. Sample 438023 was significantly different when compared to the reference sediment at T_5 and sample 438027 was significantly different relative to the reference sediment at T_{15}.

Table 2. Summary of test results.

	Light Measurement Intervals	
Evaluation using Homoscedastic t-Test	**T_5**	**T_{15}**
CONTROL COMPARISONS		
Sample 438020 to Control	**Significant (p<0.05)**	Not significant (p≥0.05)
Sample 438021 to Control	**Significant (p<0.05)**	**Significant (p<0.05)**
Sample 438023 to Control	Not significant (p≥0.05)	Not significant (p≥0.05)
Sample 438024 to Control	Not significant (p≥0.05)	Not significant (p≥0.05)
Sample 438025 to Control	Not significant (p≥0.05)	Not significant (p≥0.05)
Sample 438026 to Control	Not significant (p≥0.05)	Not significant (p≥0.05)
Sample 438027 to Control	Not significant (p≥0.05)	Not significant (p≥0.05)
REFERENCE COMPARISONS		
Sample 438020 to Reference	**Significant (p<0.05)**	**Significant (p<0.05)**
Sample 438021 to Reference	**Significant (p<0.05)**	**Significant (p<0.05)**
Sample 438023 to Reference	**Significant (p<0.05)**	Not significant (p≥0.05)
Sample 438024 to Reference	Not significant (p≥0.05)	Not significant (p≥0.05)
Sample 438025 to Reference	Not significant (p≥0.05)	Not significant (p≥0.05)
Sample 438026 to Reference	Not significant (p≥0.05)	Not significant (p≥0.05)
Sample 438027 to Reference	Not significant (p≥0.05)	**Significant (p<0.05)**
Reference Toxicant	Acceptable	Acceptable

4. REFERENCE

Microtox® Draft Final, 8/15/00; developed by Peter Adolphson of Washington State Department of Ecology.

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Hyalella azteca Bioassay

TEST IDENTIFICATION

Test No.: 627-1

Title: Toxicity of freshwater sediments using a 28-day amphipod, *Hyalella azteca*, sediment bioassay.

Protocol No.: NAS-XXX-HA4c, February 11, 2000, Revision 1 (9-7-00). Based on ASTM 1996 (Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates, E1706-95b), Am. Soc. Test. Mat. Phila., PA, and EPA Method 100.1 (Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates, EPA/600/R-94/024).

STUDY MANAGEMENT

Study Sponsor: Washington Dept. of Ecology, Manchester Lab, 7411 Beach Dr. East, Port Orchard, WA 98366

Sponsor's Study Monitor: Ms. Pam Covey

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365

Test Location: Newport laboratory

Laboratory's Study Personnel G.J. Irissarri, B.S., Proj. Man./Study Dir.; L.K. Nemeth, M.B.A., QA Officer; R.S. Caldwell, PhD, Senior Aq. Toxicologist; G.A. Buhler, B.S., Aq. Toxicologist; M.S. Redmond, M.S., Aq. Toxicologist; G. Hayes, B.S., Tech.

Study Schedule:

Test Beginning: 11-2-00, 1145 hrs.

Test Ending: 11-30-00, 1230 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Test Sediments: Unidentified freshwater test sediments. Details are as follows:

NAS Sample No.	6897F	6898F	6899F	6900F
Description	43-8020	43-8021	43-8023	43-8024
Collection Date	10-23-00	10-23-00	10-24-00	10-24-00
Receipt Date	10-27-00	10-27-00	10-27-00	10-27-00

NAS Sample No.	6901F	6902F	6903F	6904F
Description	43-8025	43-8026	43-8027	43-8028
Collection Date	10-24-00	10-25-00	10-25-00	10-24-00
Receipt Date	10-27-00	10-27-00	10-27-00	10-27-00

Control Sediment: The negative control sediment (NAS#6905F) was collected on 10-27-00 from an area approximately one mile east of the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR. The control sediment was press sieved through a 0.5 mm screen.

Storage: All test, reference and control sediments were stored at 4°C in the dark until used.

TEST WATER

Source: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Dates of Preparation: 11-1-00, 11-6-00, 11-13-00, 11-20-00, 11-27-00
Water Quality: pH 8.0, 8.2, 8.0, 8.0, 8.2; conductivity 310, 320, 320, 300, 300 µmhos/cm; hardness 85, 94, 94, 85, 85 mg/L as $CaCO_3$; alkalinity 70, 70, 70, 70, 70 mg/L as $CaCO_3$.
Pretreatment: Aerated ≥24 hr.

TEST ORGANISMS

Species: *Hyalella azteca,* amphipod.
Age/Size: 10-12 days old
Source: Chesapeake Cultures, Hayes, VA; received 11-1-00
Acclimation: Temperature, 19.9 ± 3.6 °C; dissolved oxygen, 11.6± 4.9 mg/L; pH, 8.1 ± 0.1; conductivity, 355 ± 21 µmhos/cm; hardness, 128± 36 mg/L as $CaCO_3$; and alkalinity, 140 ± 57mg/L as $CaCO_3$.

TEST PROCEDURES AND CONDITIONS

The following is an abbreviated statement of the test procedures and a statement of the test conditions actually employed. See the test protocol (Appendix I) for a more detailed description of the test procedures used in this study.

Test Chambers: 300 ml high-form glass beakers
Test Volumes: 100 ml sediment layer; 175 ml test water.
Replicates/Treatment: 8
Organisms/Treatment: 80
Water Volume Changes: 2 water volumes per day
Aeration: None.
Feeding: Animals are fed 1.5 ml of YCT suspension per beaker daily.
Effects Criteria: Effects Criteria: 1) survival after 28 days, and 2) average individual biomass (based on dry weight) after 28 days. Death is defined as no visible movement or response to tactile stimulation. Missing organisms were considered to be dead.
Water Quality and Other Test Conditions: The temperature, dissolved oxygen, conductivity, pH, hardness, alkalinity, sulfide and ammonia-nitrogen were measured in the overlying water of one replicate test container per treatment on days 0 and 28 of the test. Temperature and dissolved oxygen were measured daily in the overlying water of one replicate test container per treatment. Hardness and alkalinity were measured with titrimetric methods. Sulfide and ammonia-N were measured using Hach test kits based on the methylene blue (EPA Method 376.2) and salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric methods, respectively; samples were not distilled prior to analysis. The photoperiod was 16:8, L:D.

DATA ANALYSIS METHODS

Survival and individual biomass were calculated for each replicate as follows:

percent survival = 100 x (number surviving/initial number tested)
average individual biomass = (final wt. - tare wt.)/number weighed,
where:
final wt. = tare wt. + dry weight of organisms recovered on day 28, in mg

Means and standard deviations for the biological endpoints described above, and for water quality data, were computed using Microsoft Excel 2000. The value for mortality and individual biomass for each test sediment was statistically compared against its appropriate reference and control sediment. An arcsine square root transformation was performed on proportional mortality data before analysis. Following determination of normality and homogeneity of variances, a one-tailed Student T-test, Mann-Whitney or Approximate T test was conducted at the 0.05 level of significance. The statistical software used was BioStat (Beta v.2.0c) bioassay software developed by the U.S. Army Corps of Engineers, Seattle District.

PROTOCOL DEVIATIONS

Although the dissolved oxygen level (3.2 mg/L) in the water quality beaker for sediment 43-8020 dropped below 3.48 mg/L (40% saturation) on day 27 and is therefore a deviation of NAS protocol, EPA /600/R-99/064 allows a dissolved oxygen level as low as 2.5 mg/L before aeration is required.

REFERENCE TOXICANT TEST

The reference toxicant test is a standard multi-concentration toxicity test using cadmium as $CdCl_2 \bullet 2½ H_2O$, to evaluate the performance of the test organisms used in the sediment toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-1218
Reference Toxicant and Source: Cadmium as $CdCl_2 \bullet 2½ H_2O$, Mallinckrodt Lot #TNZ, 1.0 mg/ml stock prepared 12-2-99.
Test Date: 11-2-00.
Dilution Water Used: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Result: 96-hr LC50, 8.84 µg/L. This result is within the laboratory's control chart warning limits (2.72 - 21.9 µg/L).

TEST RESULTS

Observations of water quality in the overlying water throughout the test are summarized in Table 1. A detailed tabulation of the water quality results by sample and test day can be found in Appendix II. The means and standard deviations of percent mortality and growth (weight) of *Hyalella* exposed for 28 days to sediments are summarized in Table 2 and Table 3, respectively. Detailed data organized by sample and replicate, and summary statistics for these observations, are given in Appendix II.

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges, except as noted above. Sulfide and ammonia-N in the overlying water measured at <0.5 mg/L and <0.02 mg/L respectively, for day 0 and day 28 for all samples.

The test met the acceptability criteria specified in the protocol with 96.3% mean control survival (80% required). The reference toxicant (positive control) result was within the laboratory's control chart limits (8.84 µg/L; control chart mean ± 2 S.D. = 12.3 ± 9.59).

All test and reference sediments, except for 43-8025 (NAS#6901F) resulted in mortalities that were statistically significantly greater ($\alpha = 0.05$) than that of the control. No test sediment mean mortality was significantly higher ($\alpha = 0.05$) than that of the reference. The reference sediment produced a mean mortality of 83.8%.

The test sediments, 43-8020 (NAS#6897F), 43-8023 (NAS#6899F), 43-8024 (NAS#6900F), 43-8025 (NAS#6901F), 43-8026 (6902F), and the reference sediment 43-8028 (NAS#6904F) produced individual mean biomasses statistically significantly less ($\alpha = 0.05$) than that of the control. Sediment 43-8027 (NAS#6903F) could not be statistically analyzed against the control or reference for biomass due to having only one replicate with surviving animals. No sediment resulted in a dry weight measurement statistically significantly less ($\alpha = 0.05$) than the reference.

STUDY APPROVAL

_____		_____	
Project Manager/ Study Director	Date	Quality Assurance Unit	Date
_____			
Laboratory Director	Date		

Table 1. Summary of water quality conditions during tests of the amphipod, *Hyalella azteca*, exposed to freshwater sediments.

Water Quality Parameter	Mean ± S.D.	Minimum	Maximum	N
Temperature (°C)	22.7 ± 0.3	22.1	23.4	261
Dissolved oxygen (mg/L)	5.5 ± 0.9	3.2	7.7	261
Conductivity (µmhos/cm)	332 ± 39	300	470	18
pH	7.7 ± 0.1	7.5	7.8	18
Hardness (mg/L as $CaCO_3$)	88 ± 5	85	102	18
Alkalinity (mg/L as $CaCO_3$)	74 ± 8	70	90	18
Sulfides (mg/L)	---	<0.02	<0.02	18
Total ammonia (mg/L)	---	<0.5	<0.5	18

Table 2. Mortality results of *Hyalella azteca* exposed to freshwater sediments for 28-days.

Sample description	Percent mortality (Mean ± SD)	Significantly greater than the control at α = 0.05?	Significantly greater than the reference at α = 0.05?
Control (NAS#6905F)	3.8 ± 7.4	---	Yes
43-8020 (NAS#6897F)	48.8 ± 20.3	Yes	No
43-8021 (NAS#6898F)	16.3 ± 7.4	Yes	No
43-8023 (NAS#6899F)	33.8 ± 19.2	Yes	No
43-8024 (NAS#6900F)	13.8 ± 13.0	Yes	No
43-8025 (NAS#6901F)	13.8 ± 16.9	No	No
43-8026 (NAS#6902F)	36.3 ± 16.9	Yes	No
43-8027 (NAS#6903F)	98.8 ± 3.5	Yes	No
43-8028 (NAS#6904F)*	83.8 ± 25.0	Yes	---

*Reference sediment

Table 3. Growth results of *Hyalella azteca* exposed to freshwater sediments for 28-days.

Sample description	Average wt/amphipod (mg) (Mean ± SD)	Significantly less than the control at α = 0.05?	Significantly less than the reference at α = 0.05?
Control (NAS#6905F)	0.26 ± 0.04	---	Yes
43-8020 (NAS#6897F)	0.20 ± 0.06	Yes	No
43-8021 (NAS#6898F)	0.23 ± 0.04	No	No
43-8023 (NAS#6899F)	0.16 ± 0.03	Yes	No
43-8024 (NAS#6900F)	0.15 ± 0.02	Yes	No
43-8025 (NAS#6901F)	0.12 ± 0.03	Yes	No
43-8026 (NAS#6902F)	0.08 ± 0.02	Yes	No
43-8027 (NAS#6903F)	0.05 ± 0.00	---[1]	---[1]
43-8028 (NAS#6904F)*	0.09 ± 0.02	Yes	---

*Reference sediment

[1]Unable to analyze due to only one survivor

Chironomus tentans Bioassay

TEST IDENTIFICATION

Test No.: 627-2

Title: Toxicity of freshwater sediments using a 20-day midge, *Chironomus tentans*, sediment bioassay.

Protocol No.: NAS-XXX-CT4c, October 18, 2000. Based on ASTM 1996 (Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates, E1706-95b), Am. Soc. Test. Mat. Phila., PA, and EPA Method 100.5 (Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates, EPA/600/R-99/064).

STUDY MANAGEMENT

Study Sponsor: Washington Dept. of Ecology, Manchester Lab, 7411 Beach Dr. East, Port Orchard, WA 98366

Sponsor's Study Monitor: Ms. Pam Covey

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365

Test Location: Newport laboratory

Laboratory's Study Personnel: G.J. Irissarri, B.S., Proj. Man./Study Dir.; L.K. Nemeth, M.B.A., QA Officer; R.S. Caldwell, PhD, Senior Aq. Toxicologist; G.A. Buhler, B.S., Aq. Toxicologist; M.S. Redmond, M.S., Aq. Toxicologist; G. Hayes, B.S., Tech.

Study Schedule:

Test Beginning: 11-2-00, 1330 hrs.

Test Ending: 11-22-00, 1030 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Test Sediments: Unidentified freshwater test sediments. Details are as follows:

NAS Sample No.	6897F	6898F	6899F	6900F
Description	43-8020	43-8021	43-8023	43-8024
Collection Date	10-23-00	10-23-00	10-24-00	10-24-00
Receipt Date	10-27-00	10-27-00	10-27-00	10-27-00

NAS Sample No.	6901F	6902F	6903F	6904F
Description	43-8025	43-8026	43-8027	43-8028
Collection Date	10-24-00	10-25-00	10-25-00	10-24-00
Receipt Date	10-27-00	10-27-00	10-27-00	10-27-00

Control Sediment: The negative control sediment (NAS#6905F) was collected on 10-27-00 from an area approximately one mile east of the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR. The control sediment was press sieved through a 0.5 mm screen.

Storage: All test, reference and control sediments were stored at 4°C in the dark until used.

TEST WATER

Source: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Dates of Preparation: 11-1-00, 11-6-00, 11-13-00, 11-20-00
Water Quality: pH 8.0, 8.2, 8.0, 8.0; conductivity 310, 320, 320, 300 µmhos/cm; hardness 85, 94, 94, 85 mg/L as $CaCO_3$; alkalinity 70, 70, 70, 70 mg/L as $CaCO_3$.
Pretreatment: Aerated ≥24 hr.

TEST ORGANISMS

Species: *Chironomus tentans*, midge.
Age/Size: 1st instar, <24 hrs. old
Source: NAS cultures, originally obtained from EPA, Duluth, MN.
Acclimation: Temperature, 23.0 ± 0.7°C; dissolved oxygen, 6.2 ± 0.5 mg/L; pH, 7.7± 0.2; conductivity, 383 ± 30 µmhos/cm; hardness, 107 ± 6 mg/L as $CaCO_3$; and alkalinity, 85 ± 7 mg/L as $CaCO_3$.

TEST PROCEDURES AND CONDITIONS

The following is an abbreviated statement of the test procedures and a statement of the test conditions actually employed. See the test protocol (Appendix I) for a more detailed description of the test procedures used in this study.

Test Chambers: 300 ml high-form glass beakers
Test Volumes: 100 ml sediment layer; 175 ml test water.
Replicates/Treatment: 8
Organisms/Treatment: 80
Water Volume Changes: 2 water volumes per day
Aeration: None.
Feeding: Animals were fed 1.5 ml of TetraFin suspension (1.5 ml contains 6 mg dry solids) per beaker daily.
Effects Criteria: 1) survival after 20 days, and 2) average individual biomass (based on ash-free dry weight) after 20 days. Death is defined as no visible movement or response to tactile stimulation. Missing organisms were considered to be dead.
Water Quality and Other Test Conditions: The temperature, dissolved oxygen, conductivity, pH, hardness, alkalinity, sulfide and ammonia-nitrogen were measured in the overlying water of one replicate test container per treatment on days 0 and 20 of the test. Temperature and dissolved oxygen were measured daily in the overlying water of one replicate test container per treatment. Hardness and alkalinity were measured with titrimetric methods. Sulfide and ammonia-N were measured using Hach test kits based on the methylene blue (EPA Method 376.2) and salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric methods, respectively; samples were not distilled prior to analysis. The photoperiod was 16:8, L:D.

DATA ANALYSIS METHODS

Survival and individual biomass were calculated for each replicate as follows:

percent survival = 100 x (number surviving/initial number tested)
average individual ash-free biomass = (final wt. – ashed dry wt.)/number weighed,
where:
ash-free dry wt. = dry weight of organisms recovered on day 20 – ashed dry weight, in mg

Means and standard deviations for the biological endpoints described above, and for water quality data, were computed using Microsoft Excel 2000. The value for mortality and individual biomass for each test sediment was statistically compared against its appropriate reference and control sediment. An arcsine square root transformation was performed on proportional mortality data before analysis. Following determination of normality and homogeneity of variances, a one-tailed Student T-test, Mann-Whitney or Approximate T test was conducted at the 0.05 level of significance. The statistical software used was BioStat (Beta v.2.0c) bioassay software developed by the U.S. Army Corps of Engineers, Seattle District.

PROTOCOL DEVIATIONS

None

TEST RESULTS

Observations of water quality in the overlying water throughout the test are summarized in Table 1. A detailed tabulation of the water quality results by sample and test day can be found in Appendix II. The means and standard deviations of percent mortality and growth (weight) of midges exposed for 20 days to sediments are summarized in Table 2 and Table 3, respectively. Detailed data organized by sample and replicate, and summary statistics for these observations, are given in Appendix II.

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Sulfide and ammonia-N in the overlying water measured at <0.5 mg/L and <0.02 mg/L respectively, for day 0 and day 20 for all samples except for sediments 43-8025 (NAS#6900F) and 43-8025 (NAS#6901F) which both measured 0.5 mg/L for ammonia on day 0.

The test met acceptability criteria specified in the protocol with 71.3% mean control survival (70% required) and a 1.12mg average individual ash-free control weight (0.48 mg required).

With a mortality of 93.8%, 43-8020 (NAS#6897F) was the only test sediment that resulted in survival that was statistically significantly different ($\alpha = 0.05$) from that of either the control and/or reference sediments.

Two sediments produced statistically significant ($\alpha = 0.05$) reductions in final biomass relative to the control mean weight: 43-8026 (NAS#6902F) with an individual ash-free weight of 0.82 mg and the reference, 43-8028 (NAS#6904F) with an individual ash-free weight of 0.47 mg. Sediment 43-8020 (NAS#6897F) could not be statistically analyzed against the control or reference for biomass due to having only two replicates with surviving animals. No test sediment resulted in a statistically significant ($\alpha = 0.05$) reduction in ash-free biomass relative to the reference sediment.

STUDY APPROVAL

_____ _____

Project Manager/Study Director Date Quality Assurance Unit Date

_____

Laboratory Director Date

Table 1. Summary of water quality conditions during tests of the midge, *Chironomus tentans*, exposed to freshwater sediments.

Water Quality Parameter	Mean ± S.D.	Minimum	Maximum	N
Temperature (°C)	22.5 ± 0.2	22.1	23.2	189
Dissolved oxygen (mg/L)	4.8 ± 1.2	2.8	7.6	189
Conductivity (µmhos/cm)	345 ± 45	320	520	18
PH	7.6 ± 0.1	7.5	7.7	18
Hardness (mg/L as $CaCO_3$)	89 ± 5	85	94	18
Alkalinity (mg/L as $CaCO_3$)	71 ± 6	60	90	18
Sulfides (mg/L)	---	<0.02	<0.02	18
Total ammonia (mg/L)	---	<0.5	0.5	18

Table 2. Mortality results of *Chironomid tentans* exposed to freshwater sediments for 20-days.

Sample description	Percent mortality (Mean ± SD)	Significantly greater than the control at α = 0.05?	Significantly greater than the reference at α = 0.05?
Control (NAS#6905F)	28.8 ± 20.3	---	No
43-8020 (NAS#6897F)	93.8 ± 11.9	Yes	Yes
43-8021 (NAS#6898F)	25.0 ± 14.1	No	No
43-8023 (NAS#6899F)	15.0 ± 13.1	No	No
43-8024 (NAS#6900F)	37.5 ± 21.2	No	No
43-8025 (NAS#6901F)	46.3 ± 23.3	No	No
43-8026 (NAS#6902F)	27.5 ± 21.2	No	No
43-8027 (NAS#6903F)	32.5 ± 18.3	No	No
43-8028 (NAS#6904F)*	26.3 ± 27.2	No	---

* Reference sediment

Table 3. Growth results of *Chironomus tentans* exposed to freshwater sediments for 20-days.

Sample description	Average Ash-Free Dry wt/Larvae (mg) (Mean ± SD)	Significantly less than the control at α = 0.05?	Significantly less than the reference at α = 0.05?
Control (NAS#6905F)	1.12 ± 0.25	---	Yes
43-8020 (NAS#6897F)	0.20 ± 0.20	---[1]	---[1]
43-8021 (NAS#6898F)	1.06 ± 0.34	No	No
43-8023 (NAS#6899F)	1.00 ± 0.12	No	No
43-8024 (NAS#6900F)	1.18 ± 0.37	No	No
43-8025 (NAS#6901F)	1.00 ± 0.22	No	No
43-8026 (NAS#6902F)	0.82 ± 0.12	Yes	No
43-8027 (NAS#6903F)	1.16 ± 0.14	No	No
43-8028 (NAS#6904F)*	0.47 ± 0.19	Yes	---

* Reference sediment

[1]Unable to analyze due to only 2 replicates with survivors