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Water Body No. WA-CR-1060
(Segment No. 26-00-04)

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December 5, 1990

TO: Ken Merrill

FROM: Don Reif Jorm Glenn for

SUBJECT: Washington Water Power Generating Station, Kettle Falls, Class II Inspection on July 11 - 12, 1989.

INTRODUCTION

A Class II inspection was conducted at the Washington Water Power Generating Station at Kettle Falls on July 11-12, 1989. The inspection was requested by Roger Ray of Ecology's Eastern Regional Office (ERO). Don Reif of Ecology's Environmental Investigations and Laboratory Services Program, Compliance Monitoring Section, and Ken Merrill of ERO conducted the inspection. Johnny Pitman, chemist with KFGS, assisted.

Objectives of the inspection were as follows:

- Verify effluent compliance with NPDES permit limits by measuring flows and evaluating samples.
- Review laboratory procedures and split sample results to determine analytical accuracy and adherence to protocols.
- Assess effluent toxicity by analyzing bioassay and chemical results.

LOCATION AND DESCRIPTION

Kettle Falls Generating Station (KFGS) is located three miles northwest of Kettle Falls in northeastern Washington, on the east bank of Franklin D. Roosevelt Lake on the Columbia River.

The station consists of a wood-fired boiler generating steam that turns a steam turbine capable of producing 46 megawatts of electricity. The process is fueled by waste wood from the region's wood products industries, such as sawdust, bark, and chips. Wastewater sources generated by the process include boiler and cooling tower blowdown, boiler feedwater demineralizer waste, furnace bottom ash handling overflow, and machine shop floor drain runoff (Figure 1). Final effluent discharges to the Columbia River via a submerged outfall diffuser, and is regulated by NPDES permit #WA-004521-7. Sanitary wastes are treated in an on-site septic system.

METHODS

Table 1 lists Ecology's sampling schedule. Composite samples were collected from KFGS's effluent line in ISCO portable samplers set for 330 mL every 30 minutes for 24 hours. Also, three sets of grab samples were taken. All samples were placed on ice and delivered to Ecology's Manchester Laboratory within 48 hours of collection. Analytical methods used and their appropriate references are listed in Appendix 1. Metal results were analyzed as total recoverable with the exception of mercury, which was analyzed as 'total' mercury. A Polysonics doppler-type portable flowmeter was set up on the discharge piping in the pumphouse to check KFGS's flowrate. KFGS uses a Krohne-America Altoflex MT900F magnetic inductive flowmeter located in the six-inch line preceding the clarifier.

RESULTS

Flow

Ecology's flowmeter did not agree closely with the KFGS flowmeter. As shown in Table 2, Ecology's meter indicated a flowrate 26 percent higher than KFGS's. However, in an April 29, 1990, retention basin drawdown test, KFGS personnel found the flowrate to be near their typical meter reading of approximately 105 gpm. In this test, the actual volume removed from the retention basin was recorded and compared to KFGS's flowmeter reading. These flowmeter readings, however, did not show the apparent decreased flowrate as the basin level dropped. Since the question of flowmeter accuracy is unresolved, KFGS should address this. Flowrates should be rechecked at the next inspection.

NPDES Permit Compliance

KFGS did not exceed any daily maximum effluent limitations during the inspection (Table 4). Effluent suspended solids were very low. Chlorine residuals were near or below detection limits but provided adequate protection for fecal coliform control (Table 3). One oil and grease sample equalled the allowable daily maximum, but the other two samples were below detection limits. Effluent temperature was slightly above the daily average limit but well below the daily maximum. The flowrate was somewhat controversial, with the KFGS meter

reading just under the daily average limit, while Ecology's reading was considerably above the daily average but less than the daily maximum (see previous section). If Ecology's flow reading was accurate, KFGS could technically be in violation of their flow limit.

Effluent Bioassays

Three bioassays indicated no measurable toxicity to KFGS effluent (Table 5). No chronic toxicity was apparent in the fathead minnow and *Ceriodaphnia dubia* tests, nor acute effects in any of the three.

Effluent Chemistry

Only five priority pollutants were detected in KFGS's effluent--one VOA, one BNA, and three metals. Of these, four were found near the detection limit and/or were also found as contaminants in the lab blanks. These included chloroform (0.4 μg/L), bis(2-ethylhexyl)phthalate (0.5 μg/L), lead (3.9 μg/L), and zinc (13 μg/L). Mercury was elevated: the concentration was ten times EPA's freshwater chronic criterion for protection of receiving waters (0.12 μg/L versus criterion of 0.012 μg/L). EPA recommends the total recoverable analytical method to compare with the water quality criteria. Since mercury was analyzed as 'total', this result probably overestimates the 'total recoverable' amount. Even so, only a ten-fold dilution would be required within the mixing zone to prevent an exceedance of the chronic water quality criterion for mercury. Potential sources of mercury at KFGS are not known.

Laboratory Evaluation/Comparison of Sample Splits

KFGS's procedures for sample collection and permit-required lab analyses were evaluated. Procedures for pH and TSS followed accepted protocols and no alterations were deemed necessary. However, KFGS did not refrigerate or otherwise cool their composite sample during collection and storage. This procedure definitely needs to be corrected.

Splits of TSS samples between the Ecology and KFGS labs compared very well. Comparison of the oil and grease split was difficult due to the poor accuracy of the test at low concentrations.

CONCLUSIONS AND RECOMMENDATIONS

KFGS's effluent was very 'clean' as only five priority pollutants were detected. Of these, only mercury was substantially elevated. No exceedances of daily maximum permitted limits were found. Effluent suspended solids and chlorine residuals were quite low. Temperature of the effluent was above the daily average limit but less than the daily maximum. No significant effluent toxicity was found by three bioassays. Sample splits between Ecology and KFGS labs compared very well, although KFGS's composite sample was not refrigerated

during the collection period. Ecology's portable flowmeter indicated that KFGS's flowmeter might be somewhat out of calibration.

Recommendations are as follows:

- KFGS needs to have their flowmeter checked and calibrated at a variety of flowrates to assure proper operation under all flow conditions. Ecology should verify proper calibration during the next Class II inspection or sooner.

- If not already corrected, KFGS must provide proper refrigeration of composited effluent samples.

- Mercury should be included as a pollutant of concern in KFGS's permit.

NG:krc
Attachments

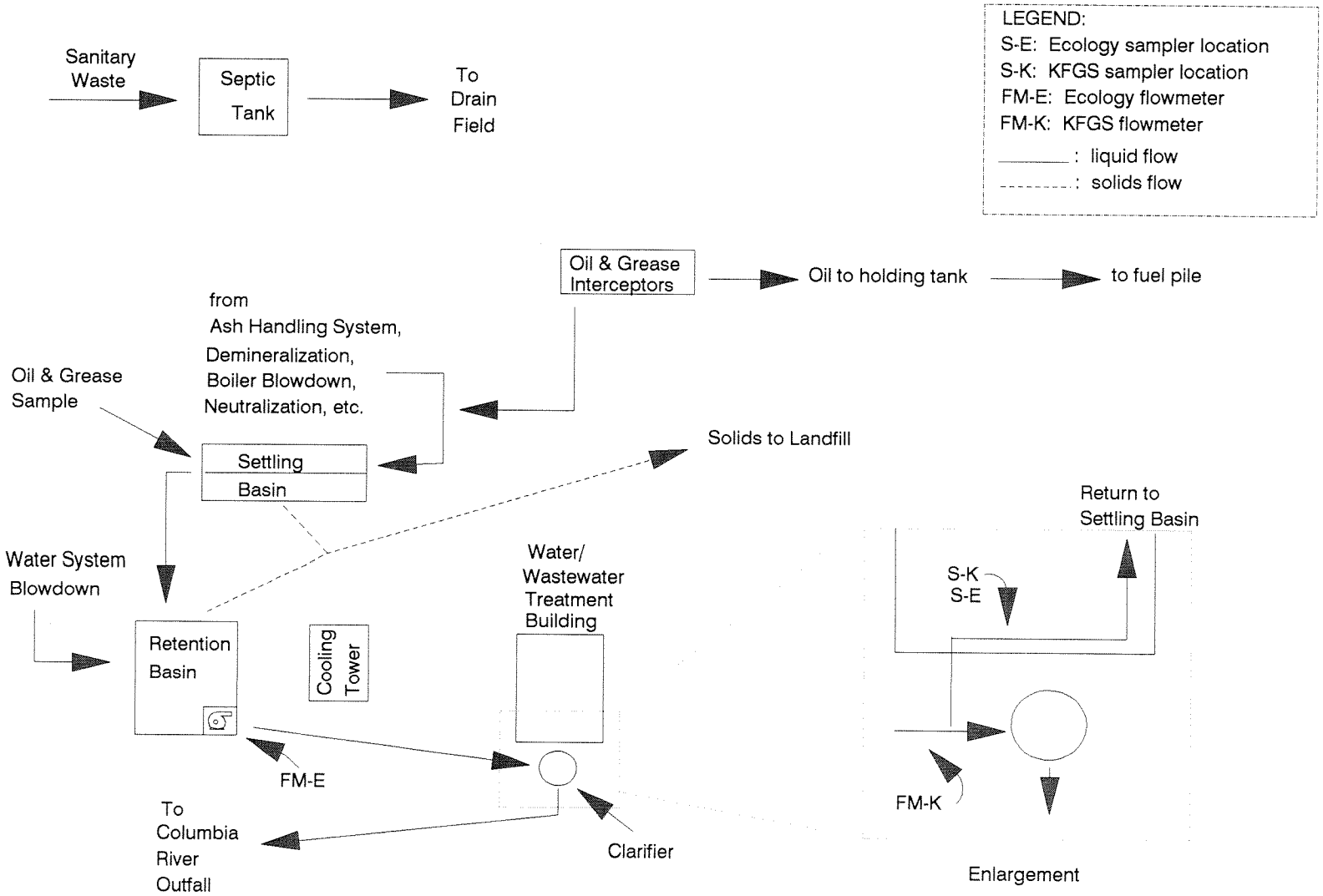

Figure 1. Wastewater system schematic- KFGS Class II inspection: July 11-12, 1989.

Table 1. Sampling Schedule: Washington Water Power Class II Inspection - July 11-12, 1989.

	Water Samples				
Sample:	Effluent	Effluent	Effluent	Eff-Eco	Eff-WWP
Log #:	288000	288001	288002	288003	288004
Date:	7/11/89	7/11/89	7/12/89	7/12/89	7/11-12/89
Time:	am	pm	am	8am-8am	8am-8am
Type:	grab	grab	grab	composite	composite
Field Analyses:					
Temperature	E	E	E	E	WW
pH	E	E	E	E	WW
Conductivity	E	E	E	E	WW
Chlorine Residual	E	E	E		
Laboratory Analyses:					
General Chemistry					
Turbidity	E	E	E	E	WW
Conductivity	E	E	E	E	WW
Alkalinity	E	E	E	E	WW
Hardness				E	
Solids(4)				E	WW
TSS	E	E	E		
BOD_5				E	WW
COD	E	E	E	E	WW
NH_3	E	E	E	E	WW
NO_3+NO_2	E	E	E	E	WW
T-Phosphate	E	E	E	E	WW
Fecal Coliform			E		
Oil & Grease	E	E	E		
Organics + Metals					
pp metals				E	
ABN (water)				E	
VOA (water)			E		
Pest/PCB (water)				E	
Phenols				E	
Bioassays					
Trout				E	
Ceriodaphnia				E	
Fathead minnow				E	

E - Denotes analysis is conducted on Ecology's sample.
WW - Denotes analysis is conducted on Washington Water Power sample.

Table 2. Flow measurement results and comparison - Washington Water Power Class II Inspection: July 11-12, 1989.

Date	Time	Ecology Results*	WWP Results+
7/11	1610	190,080 GPD (+26%)	151,000 GPD
7/11-7/12	0840 0840	190,300 GPD (+26%)	150,780 GPD

* - from Ecology's portable ultrasonic flowmeter
+ - from WWP's magnetic flowmeter

Table 3. Ecology analytical results: Washington Water Power Class II Inspection- July 11-12, 1989.

		Water Samples				
	Sample:	Effluent	Effluent	Effluent	Eff-Eco	Eff-WWP
	Log #:	288000	288001	288002	288003	288004
	Date:	7/11/89	7/11/89	7/12/89	7/12/89	7/11-12/89
	Time:	1015	1545	0800	0835-0805	0805-0735
	Type:	grab	grab	grab	composite	composite
Field Analyses:						
Temperature	(deg C.)	22.6	23.6	22.2	8.1	7.5
pH	(std. units)	7.89	8.14	8.41	8.12	8.14
Conductivity	(umhos/cm)	2400	2600	2210	2320	2180
Chlorine Residual	(mg/L)					
total:		<0.05	0.1	0.1		
free:		<0.05	<0.05	<0.05		
Laboratory Analyses:						
General Chemistry						
Turbidity	NTU	4.4	2.9	3.4	2.4	2.6
Conductivity	umhos/cm	2290	2280	2240	2320	2280
Alkalinity	mg/L $CaCO_3$	190	200	210	200	200
Hardness	mg/L				1330	
Total solids	mg/L				2250	2260
Tot.NVsolids	mg/L				1910	1920
TSS	mg/L	18	10	13	9	10
Tot.NVSS	mg/L				3	4
BOD_5	mg/L				8	7
COD	mg/L	46	44	41	28	41
NH_3	mg/L-N	.044	.036	.090	.070	.058
NO_3+NO_2	mg/L-N	20.400 J	3.050 J	2.650 J	4.250 J	2.750 J
T-Phosphate	mg/L-P	1.370 J	1.870 J	1.490 J	1.750 J	1.580 J
Fecal Coliform	#/100 mL			6		
Oil & Grease	mg/L	15	<1	<1		

J - indicates an estimated value when result is less than specified detection limit

Table 4. Comparison of inspection results to NPDES permit limits: Washington Water Power Class II inspection - July 11-12, 1989

Parameter	Daily Average	Daily Maximum	Inspection Results
Flow, MGD	0.158	0.233	0.190*
Temperature, F.	70	90	73, 74, 72
pH, std. units	from 6.0 to 9.0		7.89, 8.14, 8.41
TSS, mg/L	30	100	9
Oil & Grease, mg/L	10	15	15, <1, <1
Chlorine residual: free available, mg/L	0.2	0.5	<0.05

* - flow reading from Ecology meter: Washington Water Power reading was 0.151 MGD

Table 5. Effluent bioassay results - Washington Water Power Class II inspection: July 11-12, 1989.

96-hour Rainbow trout (*Oncorhyncus mykiss*)

Percent Effluent	# of live test org's: Initial	Final	Percent Survival
Control(0%)	20	20	100
6.25%	20	20	100
12.5%	20	20	100
25.0%	20	20	100
50.0%	20	19	95
100.0%	20	20	100

Results Summary:

	% effluent
LC_{50}	>100%

10-day *Ceriodaphnia dubia*

Percent Effluent	Total # Exposed	Adult Survival	Mean # of Young/ Female
Control(0%)	10	90%	22.8
6.25%	10	100%	29.1
12.5%	10	100%	31.3
25.0%	10	100%	35.3
50.0%	10	90%	36.4
100.0%	10	90%	29.7

Results Summary:

	% effluent
NOEC	>100%
LOEC	N/A
48 hr LC_{50}	>100%

Fathead Minnow

Percent Effluent	Total # Exposed	Percent Survival	Mean Weight per Fish (mg)
Control(0%)	10	97	0.31
6.25%	10	97	0.34
12.5%	10	90	0.33
25.0%	10	97	0.40
50.0%	10	97	0.35
100.0%	10	93	0.42

Results Summary:

	% effluent
NOEC	>100%
LOEC	N/A
96 hr LC50	>100%

NOEC - No Observed Effect Concentration: the highest concentration of effluent that did not cause an observable adverse effect.
LOEC - Lowest Observed Effect Concentration: the lowest concentration of effluent that caused an observable adverse effect.
LC_{50} - Concentration lethal to 50 percent of the organisms.

Table 6. Summary of VOAs, BNAs, and metals detected in effluent - Washington Water Power Class II inspection: July 11-12, 1989.

(all units are ug/L)	
VOA Compounds	
Chloroform	0.4 J
BNA Compounds	
bis(2-Ethylhexyl)Phthalate	0.5 BJ
Metals	
Lead	3.9 B
Mercury	0.12
Zinc	13.0 B

J indicates an estimated value when result is less than specified detection limit

B This flag is used when the analyte is found in the blank as well as the sample. Indicates possible/probable blank contamination

Table 7. Comparison of laboratory results- Washington Water Power Class II inspection: July 11-12, 1989.

Sample	Sampler	Laboratory	TSS (mg/L)	Oil & Grease (mg/L)
Effluent	Ecology	Ecology	9	<1
	Ecology	KFGS	9.5	-
	KFGS	Ecology	10	-
	KFGS	KFGS	10.0	3.3

APPENDICES

Appendix 1. Analytical methods - Washington Water Power Class II inspection: July 11-12, 1989.

Laboratory Analyses	Method Used for Ecology Analyses	Laboratory Performing Analysis
Turbidity	APHA, 1989: 213OB	Ecology; Manchester, WA
Conductivity	APHA, 1989: 251OB	Ecology; Manchester, WA
Alkalinity	APHA, 1989: 232OB	Ecology; Manchester, WA
Hardness	APHA, 1989: 234OC	Ecology; Manchester, WA
Total Solids	APHA, 1989: 254OB	Ecology; Manchester, WA
TNVS	APHA, 1989: 254OE	Ecology; Manchester, WA
TSS	APHA, 1989: 2540D	Ecology; Manchester, WA
TNVSS	APHA, 1989: 254OE	Ecology; Manchester, WA
BOD_5	APHA, 1989: 521OB	Ecology; Manchester, WA
COD	APHA, 1989: 522OB	Ecology; Manchester, WA
NH_3-N	EPA, 1983: 350.1	Aquatic Research, Seattle, WA
NO_3+NO_2-N	EPA, 1983: 353.2	Aquatic Research, Seattle, WA
T-Phosphate	EPA, 1983: 365.1	Aquatic Research, Seattle, WA
Fecal Coliform	APHA, 1989: 9221C	Ecology; Manchester, WA
Oil & Grease	EPA, 1983: 413.1	Ecology; Manchester, WA
VOA (water)	EPA, 1984: 624	Ecology; Manchester, WA
BNA (water)	EPA, 1984: 625	Ecology; Manchester, WA
Pest/PCB (water)	EPA, 1984: 608	Ecology; Manchester, WA
PP Metals (water)	Tetra Tech, 1986	Ecology; Manchester, WA
Total phenolics	EPA, 1983: 420.2	Ecology; Manchester, WA
Trout 96-hour	Ecology, 1981	ERCE Bioassay Lab; San Diego, CA
Ceriodaphnia dubia	EPA, 1985	ERCE Bioassay Lab; San Diego, CA
Fathead minnow	EPA, 1985	ERCE Bioassay Lab; San Diego, CA

APHA-AWWA-WPCF, 1989. Standard Methods for the Examination of Water and Wastewater, 17th ed.

Ecology, 1981. Static Acute Fish Toxicity Test. July 1981 revision. DOE 80-12.

EPA, 1983. Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, revised March 1983.

EPA, 1984. 40 CFR Part 136, October 26, 1984.

EPA, 1985. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. EPA/600/4-85/014

Tetra Tech, 1986. Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound, Final Report #TC-3991-04. March 1986.

Appendix 2. Results of VOA, BNA, Pest/PCB and metal priority pollutant scans-
Washington Water Power Class II inspection: July 11-12, 1989.

Sample:	Eff-Eco			Eff-Eco	
Lab Log #:	288003			288003	
Type:	Composite			Composite	
Date:	7/11-12/89			7/11-12/89	
VOA Compounds	ug/L			ug/L	
Chloromethane	10	U	Tetrachloroethene	5	U
Dichlorodifluoromethane	10	U	1,1,2,2-Tetrachloroethane	5	U
Bromomethane	10	U	Toluene	5	U
Vinyl Chloride	10	U	Chlorobenzene	5	U
Chloroethane	10	U	Ethylbenzene	5	U
Trichlorofluoromethane	5	U	Ethenylbenzene	5	U
Methylene Chloride	5	U	Bromobenzene	5	U
Acetone	10	U	1,2,3-Trichloropropane	5	U
Carbon Disulfide	5	U	2-Chlorotoluene	5	U
1,1-Dichloroethene	5	U	4-Chlorotoluene	5	U
1,1-Dichloroethane	5	U	Total Xylenes	5	U
trans-1,2-Dichloroethene	5	U	1,2,4-Trimethylbenzene	5	U
Cis-1,2-Dichloroethene	5	U	Tert-Butylbenzene	5	U
2,2-Dichloropropane	5	U	1,3,5-Trimethylbenzene	5	U
Bromochloromethane	5	U	Sec-Butylbenzene	5	U
Chloroform	0.4J		p-Isopropyltoluene	5	U
1,2-Dichloroethane	5	U	Butylbenzene	5	U
2-Butanone	10	U	CBCP	5	U
1,1,1-Trichloroethane	5	U	1,2,3-Trichlorobenzene	5	U
Carbon Tetrachloride	5	U	Isopropylbenzene (Cumene)	5	U
1,1-Dichloropropane	5	U	Propylbenzene	5	U
Vinyl Acetate	10	U	1,3-Dichlorobenzene	5	U
Bromodichloromethane	5	U	1,4-Dichlorobenzene	5	U
1,2-Dichloropropane	5	U	1,2-Dichlorobenzene	5	U
Dibromomethane	5	U	1,2,4-Trichlorobenzene	5	U
trans-1,3-Dichloropropene	5	U	Naphthalene	1	UJ
Trichloroethene	5	U	Hexachlorobutadiene	5	U
Dibromochloromethane	5	U			
1,2-Dibromomethane (EDB)	10	U	Phenols, Total	2	U
1,1,2-Trichloroethane	5	U			
Benzene	5	U			
cis-1,3-Dichloropropene	5	U			
Bromoform	5	U			
2-Hexanone	10	U			
4-Methyl-2-Pentanone	10	U			

Appendix 2. (Continued)

Sample:	Eff-Eco			Eff-Eco	
Lab Log #:	288003			288003	
Type:	Composite			Composite	
Date:	7/11-12/89			7/11-12/89	
BNA Compounds	ug/L			ug/L	
Benzo(a)Pyrene	1	U	2,4-Dimethylphenol	1	U
2,4-Dinitrophenol	6	UJ	4-Methylphenol	1	U
Dibenz(a,h)anthracene	1	UJ	1,4-Dichlorobenzene	1	U
Benzo(a)anthracene	1	U	4-Chloroaniline	1	UJ
4-Chloro-3-Methylphenol	1	UJ	Phenol	1	U
Benzoic acid	6	UJ	bis(2-Chloroethyl)Ether	1	U
Hexachloroethane	1	U	bis(2-Chloroethoxy)Methane	1	U
Hexachlorocyclopentadiene	3	U	bis(2-Ethylhexyl)Phthalate	0.5BJ	
Isophorone	1	U	Di-n-Octyl Phthalate	1	U
Acenaphthene	1	U	Hexachlorobenzene	1	U
Diethylphthalate	1	U	Anthracene	1	U
Di-n-Butylphthalate	1	U	1,2,4-Trichlorobenzene	1	U
Phenanthrene	1	U	2,4-Dichlorophenol	1	U
Butylbenzylphthalate	1	U	2,4-Dinitrotoluene	1	U
N-Nitrosodiphenylamine	1	U	Pyrene	1	U
Fluorene	1	U	Dimethylphthalate	1	U
Carbazole	1	UJ	Dibenzofuran	1	U
Hexachlorobutadiene	1	U	Benzo(ghi)Perylene	1	U
Pentachlorophenol	6	U	Indeno(1,2,3-cd)pyrene	1	U
2,4,6-Trichlorophenol	1	U	Benzo (b)fluoranthene	1	U
2-Nitroaniline	6	U	Fluoranthene	1	U
2-Nitrophenol	1	U	Benzo (k)fluoranthene	1	U
Naphthalene, 1-Methyl-	1	U	Acenaphthylene	1	U
Naphthalene	1	U	Chrysene	1	U
2-Methylnaphthalene	1	U	Retene	1	U
2-Chloronaphthalene	1	U	4,6-Dinitro-2-methylphenol	6	U
3,3'-Dichlorobenzidine	1	UJ	1,3-Dichlorobenzene	1	U
2-Methylphenol	1	U	2,6-Dinitrotoluene	1	U
1,2-Dichlorobenzene	1	U	N-Nitroso-di-n-Propylamine	1	U
o-Chlorophenol	1	U	4-Chlorophenyl-phenylether	1	U
2,4,5-Trichlorophenol	6	U	bis(2-chloroisopropyl)ether	1	U
Nitrobenzene	1	U			
4-Nitroaniline	6	UJ			
4-Nitrophenol	6	UJ			
Benzyl Alcohol	1	U			
4-Bromophenyl-phenylether	1	U			

Appendix 2. (Continued)

Sample:	Eco-Inf		Eco-Inf
Lab Log #:	338090		338090
Type:	Composite		Composite
Date:	8/10/88		8/10/88
Pest/PCB Compounds	ug/L	**Priority pollutant metals**	ug/L
		Antimony	2.0UR
alpha-BHC	0.01U	Arsenic	1.0 U
beta-BHC	0.01U	Beryllium	2.0 U
delta-BHC	0.01U	Cadmium	5.0 U
gamma-BHC (Lindane)	0.01U	Chromium	5.0 U
Heptachlor	0.01U	Copper	4.0 U
Aldrin	0.01U	Lead	3.9 B
Heptachlor epoxide	0.01U	Mercury	0.12
alpha-Endosulfan	0.01U	Nickel	20 U
Dieldrin	0.01U	Selenium	2.0UJ
4,4'-DDE	0.01U	Silver	0.50U
Endrin	0.01U	Thallium	1.0 U
beta-Endosulfan	0.01U	Zinc	13 B
4,4'-DDD	0.01U		
Endosulfan Sulfate	0.01U		
4,4'-DDT	0.01U		
Methoxychlor	0.02U		
Endrin aldehyde	0.01U		
Chlordane	0.04U		
Toxaphene	0.4 U		
Aroclor-1016	0.1 U		
Aroclor-1221	0.1 U		
Aroclor-1232	0.1 U		
Aroclor-1242	0.1 U		
Aroclor-1248	0.1 U		
Aroclor-1254	0.1 U		
Aroclor-1260	0.1 U		

U indicates compound was analyzed for but not detected at the given detection limit
J indicates an estimated value when result is less than specified detection limit
B This flag is used when the analyte is found in the blank as well as the sample. indicates possible/probable blank contamination
R The data are unusable. Resampling is necessary for verification.