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LONGVIEW FIBRE COMPANY
CLASS II INSPECTION

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Water Body No. WA-CR-1010
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ABSTRACT

Ecology conducted a Class II Inspection at the Longview Fibre Company in Longview, Washington, on May 7-9 and May 15, 1990. The inspection was conducted in order to evaluate compliance with the NPDES permit limits. No violations were noted. The effluent met NPDES permit requirements for BOD_5, TSS, pH, rainbow trout bioassay, and daily discharges. However, a high fecal coliform count and 30 percent Klebsiella were detected in the mill effluent stream. Fecal coliform level in the sanitary plant effluent was marginally higher than the monthly average limit, but lower than the daily maximum. Sanitary effluent had a high residual chlorine level. Sediment samples showed no toxicity to the amphipod *Hyalella azteca* or to Microtox. Total daily discharge of dioxin (2,3,7,8-TCDD) measured in the combined bleach plant effluent (CBPE) was 1.9 mg. Zinc and copper exceeded the freshwater acute and chronic criteria in the outfall 001 effluent.

INTRODUCTION

A Class II Inspection was conducted at Longview Fibre Company (LFC) in Longview, Washington, on May 7-9 and May 15, 1990. The inspection was conducted by Don Reif, Compliance Monitoring Section, Department of Ecology, with assistance from staff members Keith Seiders, Jeanne Andreasson, and Frank Meriwether. David Mendenhall, a water quality engineer at LFC, provided assistance during collection of water and sediment samples and laboratory review. Stewart Lombard of Ecology's Quality Assurance Section conducted an on-site laboratory evaluation on May 11th. The laboratory data was analyzed, interpreted, and the investigative report was written by Tapas Das of the Compliance Monitoring Section of Environmental Investigations and Laboratory Services Program (EILS).

Objectives of the inspection were:

- check for compliance with NPDES permit limits at outfalls 001 (treated process effluent) and 002 (north stormwater sump) and the sanitary treatment plant effluent;

- determine the process wastewater secondary treatment removal efficiency;

- chemically characterize the primary and final (outfall 001) effluent, combined bleach plant effluent, 110 degree hot water, outfall 002 (stormwater), and outfall near-field sediments for priority pollutants and other pollutants of concern;

- evaluate the biological toxicity of Longview Fibre's 001 effluent and outfall sediments with bioassays;

- review sampling methods and laboratory procedures to determine adherence to accepted protocols. Ecology's selected samples were split with LFC to assess laboratory comparability;

- advance Ecology's ongoing development of effluent particulates centrifugation.

LOCATION & DESCRIPTION

Longview Fibre Company is a pulp and paper mill located in Longview, in Southwest Washington (Figure 1). The mill is positioned on the north-eastern bank of the Columbia River, just downstream of the mouth of the Cowlitz River. About 2600 tons of kraft paperboard and paper are produced daily and about 60 million gallons per day (MGD) of wastewater is discharged. A general flow schematic of LFC's process wastewater treatment plant is shown in Figure 2. LFC's process wastewater, including effluent from both sides of the bleach plant, receives primary clarification. A surge basin, which is connected to the primary clarifier, is not commonly used. However, in the event of a spill (black liquor for example), overflows can be retained in the surge basin for about six hours, based on the mill's total wastewater flow.

Following primary clarification, nutrients (ammonia and phosphoric acid) are added to the primary effluent. A high purity oxygen activated sludge secondary treatment, under the trade name UNOX^R, Union Carbide Corporation, is followed by secondary clarification. The overflows from the five secondary clarifiers are collected in a wet well, and the effluent is discharged to the Columbia River through a 310 feet long diffuser section on the submerged outfall pipe. The diffuser section ends 650 feet offshore and just downstream of the Cowlitz Old Mouth Slough. Combined primary and secondary sludges are burned in LFC's hog fuel boilers. Sanitary wastes are treated in a small, separate trickling filter plant. After being treated and chlorinated, sanitary effluent combines with the process wastewater effluent discharge line upstream of LFC's flowmeter and downstream of Ecology's sampling location (Fig 2). LFC discharges are currently regulated by permit Number WA-000007-8, which expires September 30, 1991.

METHODS

Ecology's sampling schedule is listed in Table 1. Sediment sampling locations are shown in Figure 1. Effluent and primary effluent sampling locations are shown in Figure 2. Twenty-four hour composited samples were collected for primary effluent, outfall's 001 (treated process wastewater) and 002 (north stormwater sump), sanitary treatment plant effluent, combined bleach plant effluent and 110 degree hot water. Composited samples generally consisted of 48 samples collected at 30-minute intervals by ISCO battery-powered and ice-cooled field compositors. The composite and grab samplers were cleaned for priority pollutant sampling prior to the inspection. Priority pollutant sampling equipment cleaning protocol as follows:

1. Wash with laboratory detergent;
2. Rinse several times with tap water;
3. Rinse with 10% nitric acid solution;
4. Rinse three times with deionized water;
5. Rinse with high purity methylene chloride;
6. Rinse with high purity acetone; and
7. Allow to dry and seal with aluminum foil.

The primary effluent composites and grabs for VOA and AOX were collected at the head of the UNOX^R basins. Ecology collected secondary effluent composite and grabs from the north side of the wet well pump station, about two feet out from the wall. An additional three-part grab composite was obtained over a 24-hour period for bioassays analyses. The sample for Microtox analysis was split from the regular composited effluent sample. Outfall 002 samples were collected by a compositor installed on the walkway above the retention pond. Don Reif described the flow from this drainage system was almost nonexistent during the inspection. No representative grab sample was collected, therefore, an originally scheduled analysis of oil & grease was canceled.

Ecology sampled sanitary plant effluent from the effluent wet well under the elevated treatment basin, downstream of the chlorine contact chambers. The combined bleach plant effluent samples (CBPE), were composited from three grabs. Each three liter grab consisted of an equal amount of sample from the alkaline and acid lines. Only one of the two sets of bleach plants were operating during the inspection, but both use the same sequencing. Flows were not confirmed, but according to Paul Whiting of LFC, the relative proportion of discharge from the acid and alkaline sides were thought to be roughly equal.

The 110 degree hot water was sampled from a port installed by LFC to accommodate the inspection needs. The sample site was in the line near the northeast corner of the effluent wet well. Water from the valve was allowed to fill a stainless steel beaker from which the composite sample was collected. The sample stream did not run continuously during the inspection. According to David Mendenhall, this is not unexpected as the flow is a function of water uptake and demands within the processing system. Sample collection started at 0930 on the 8th, but the flow was intermittent and was off most of the night. Flow and sampling resumed at 0815 on the 9th and continued until 1400 hours when the sampler was full.

Transfer blanks were run through the process effluent compositor on-site prior to sample collection.

Sediment samples were collected on May 15, 1990. Sediment Sample #1 was collected in 31 feet of water at a point estimated to be 30 feet downstream of the diffuser and 65 feet into the 310 feet long diffuser section. Sediment Sample #2 was estimated to be 300 feet downstream of Sample #1, just outside of the downstream edge of LFC's dilution zone as described in the draft permit. All samples consisted of three to five grabs. The top 2-3 cm of each grab were composited, homogenized, then split into containers for individual analyses.

All individual sample containers were immediately placed on ice and delivered to Ecology's Manchester Laboratory. Appendix 1 lists the chemical and bioassay test methods and the laboratories used.

DATA QUALITY ASSURANCE

Sampling

A determination of wastewater sampling equipment contamination was carried out using field transfer blank samples. About two gallons of deionized organic free water was obtained from the Ecology's Manchester Laboratory prior to the inspection. This water was pumped through a compositor immediately prior to set-up in the field. The water was then subsequently analyzed for priority pollutant organics and metals. Acetone (16 ppb) was detected in the grab transfer blank collected for volatiles.

Analysis (General)

Laboratory quality assurance and quality control (QA/QC) methods, which were followed during the analyses of general chemistry parameters and priority pollutants, are described by Huntamer and Smith (1988), and Kirchmer (1988). Recommended holding times were met for all analyses performed. For the volatile organics analyses, gas chromatograph/mass spectrometer (GC/MS) tuning and mass calibration and initial and continuing calibrations (for all compounds detected) met Contract Laboratory Protocol (CLP) requirements (EPA, 1990). For the Pesticides/PCBs analyses, GC initial and continuing calibrations met CLP requirements.

Matrix spike, spike duplicate recoveries and relative percent difference (RPD), a measure of precision, were acceptable within QC limits for both water and sediment. The targeted accuracy of matrix spikes for priority pollutant metals was $\pm 25\%$ of the true value. All values were within the targeted limits except for Copper (126%), Beryllium (130%) and Hexavalent Chromium (73%). An "N" flag was applied to these data (Table 4A). However, there were no major analytical problems with the analyses of water and sediment samples. The only exception was the BOD_5 analysis which was flagged by the laboratory as failed quality control (FQC). The most probable cause of this problem was contaminated water.

RESULTS AND DISCUSSIONS

Flow

The accuracy of LFC's flowmeter was not assessed during the inspection. No suitable access point was found to install any of EILS's portable flowmeters to field-verify LFC's meter reading. LFC's effluent meter is a venturi meter (differential pressure) installed in-line and located immediately downstream of the effluent wet well pump station (Figure 2). LFC's meter reading of 55.0 MGD for May 8, 1990, is used in this inspection.

Compliance with NPDES Permit Limits

Conventional pollutant data collected during the inspection are summarized in Table 2. A comparison of effluent and sanitary parameters to NPDES permit limits is presented in Table 3. No violations of NPDES permit limits were noted. BOD_5, TSS, pH, and effluent discharge rate levels at outfall 001 were below the daily maximum and daily average permit limits. The effluent passed the 96-hour rainbow trout bioassay. At a 65 percent effluent concentration, 100 percent survival was observed.

Sanitary plant effluent had an unnecessarily high chlorine residual. An optimum total chlorine residual of 0.2-0.3 mg/L could be maintained while still keeping fecal coliform level under control. High chlorine residuals are an unnecessary cost and can be a source of toxic chlorinated organic compounds.

Process Wastewater Secondary Treatment Efficiency

To evaluate the efficiency of secondary treatment, it is necessary to have accurate flowrates for the influent and effluent streams. Due to the lack of suitable access points to install flowmeters, flow measurements were canceled during the inspection. This emphasizes the need for access to a suitable flow measuring site on the effluent stream. A suitable flow measurement point would be desirable for evaluating treatment plant efficiency.

Effluent Chemical Characterization

General chemistry data for water samples collected during the inspection are listed in Table 2. Priority pollutant volatile organics, BNAs, and metals detected in these samples are listed in Tables 4 and 4A, along with non-priority pollutant GCPs and RFAs. Complete results are given in Appendix 2. The effluent fecal coliform count was very high (>4600) and the Klebsiella count was 30 percent. No conventional parameters (TSS and BOD_5) were noted above the permit limit. No priority pollutant organics were detected above the water quality criteria (EPA, 1986). Acetone and chloroform were found in the primary effluent at the levels of 444 ppb and 1,430 ppb, respectively. Chloroform was also detected in the final effluent at 964 ppb level (freshwater acute criteria for chloroform is 28,900 ppb).

Results of effluent and effluent particulates analyses on dioxin are summarized in Appendix 4. 2,3,7,8-TCDD (defined as 2,3,7,8-tetrachlodibenzo-*p*-dioxin) was detected (EPA, 1986a) in the combined bleach plant effluent (CBPE) at 50,000 ppb level (EPA's freshwater quality criteria for 2,3,7,8-TCDD is 0.013 ppq[1]). Total daily discharge of TCDD measured during the inspection was 0.19 mg (based on an assumed CBPE flow of 10 MGD).

A listing of priority pollutant metals detected in the process water stream is presented in Table 4. Among these metals listed, zinc exceeded the freshwater acute criteria level in the outfall 002 stormwater effluent, and chronic criteria level in the CBPE and effluent stream. Copper exceeded both freshwater acute and chronic criteria levels (EPA, 1986).

Effluent Bioassay

In the bioassay method, specific tests are carried out to screen water or sediment toxicity. For this inspection, *Daphnia magna* (EPA, 1987) and *Ceriodaphnia dubia* (EPA, 1989) were used as freshwater column test organisms, while *Hyalella* (burrower) (Nebeker, *et. al.*,) and Microtox (Beckman) were used for both water and direct contact sediment tests. The influence that contaminants have on the organism is determined through the observation of effects such as death, failure to reproduce, deformity, response, growth, etc., as specified in the referenced method for each test.

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[1]*ppq - parts per quadrillion

Effluent bioassay results are given in Table 5. No effluent toxicity was indicated by rainbow trout (Ecology, 1981). A seven-day survival and reproduction test of *Daphnia magna* resulted in 90 percent survival in 100 percent effluent. No Observed Effects Concentration (NOEC) and Lowest Observed Effects Concentration (LOEC) for the test were both 100 percent. In a 48 hour acute screening test, 100 percent survival of *Daphnia magna* in 100 percent effluent was reported.

The laboratory encountered problems in conducting the *Ceriodaphnia dubia* test. Apparently the test dilution water was the source of the problem. It is apparent from a review of the data that survival and reproduction were unaffected by all the higher concentrations except 100 percent. However, the effluent was not acutely toxic even at 100 percent (Stinson, 1990).

A *Hyalella azteca* 96-hour test of survival on the effluent samples showed no significant effects at any of the test concentrations relative to the control. The NOEC for the test was 100 percent.

Effluent sample results indicated low toxicity based on Microtox (photobacterium phosphoreum) saline-extract luminescent test. Effective concentration for 50 percent of the organisms (EC50) for 15 minutes observation were greater than 100 percent.

Sediment Chemical Characterization

General chemistry data for sediment samples collected during the inspection are listed in Table 2. Priority pollutant organics and metals detected in these samples are listed in Table 6; complete organics and metals are summarized in Appendices 2 and 3.

Results of sediment dioxin analyses are summarized in Appendix 4. Dioxin (2,3,7,8-TCDD) (EPA, 1986a) was found in the sediment analysis at 8,800 ppb level.

Sediment Bioassay

Sediment bioassay results are summarized in Table 7. The results of a freshwater amphipod bioassay using *Hyalella azteca* showed no significant differences in survival between three test sediments and control samples. Ninety percent survival was reported. The results of Microtox analysis of three sediment samples indicated lack of toxicity. The effluent concentration affecting 50 percent of the organisms (5 and 15 minutes saline extracts) were greater than 100 percent.

Sediment grain size distributions are presented in Table 8. The majority of the grains collected near the outfall lie in the range of 100 to 250 microns.

Laboratory Review

A comparison of laboratory results is given in Table 9. Ecology's results of TSS and fecal coliform were 72% and 100 times higher, respectively, than LFC's results. The BOD_5 analysis

failed quality control and the most probable cause for this problem was contaminated water (Smith, 1990). An on-site review of Longview Fibre's laboratory procedures did not indicate any serious procedural problems except that the BOD_5 samples collected on Saturday were not analyzed until Wednesday. The LFC laboratory has written procedures for BOD_5 and TSS, and a standard operational procedure (SOP) for maintenance and calibration of the pH meters. The SOPs are complete and should enable a competent technician to perform the procedures properly. The laboratory procedure check sheet is included in Appendix 5.

Effluent Particulates Characterization by Centrifugation

The objective of Ecology's ongoing centrifuge study is to separate colloid and/or settleable particulates from industrial and municipal wastewater effluents and hence to determine the potential sediment contamination level by chemical analyses using the recovered particulate matter. By centrifuging thousands of gallons of effluent over a period of several days, enough particulate material is collected for a detailed chemical analysis. Pollutants, which would not otherwise be measurable in the effluent, may thus be quantified due to the improved detection levels associated with the extremely concentrated particulate materials. A full report on the centrifuge study is being prepared (Andreasson, in progress). Results obtained from the centrifuge study employing LFC's effluent are summarized in Tables 10 and 11. Whole effluent, centrate, and particulate samples were used in each analysis. Volatile organics and BNAs detected in the particulates are listed in Table 10, while the priority pollutant metals detected are shown in Table 11.

RECOMMENDATIONS AND CONCLUSIONS

No suitable access point was found to install any of EILS's portable flowmeters to verify LFC's meter reading. An access point would be desirable around the effluent outfall location, so flow can be monitored independently during an inspection.

The mill was meeting most NPDES permit limits during the inspection at outfall 001: BOD_5, TSS, pH, and effluent discharge rate met daily maximum and monthly average permit limits (Table 3). A high fecal coliform level was detected in the 001 effluent (>4600 MPN/100 ml). Monitoring of fecal coliform levels at different locations, including Columbia River water near the effluent dilution zone may prove useful. Fecal coliform was marginally higher than the monthly average limit in the sanitary effluent, even though residual chlorine levels were relatively high (3-6.5 mg/L). This situation warrants further investigation.

No priority pollutant organics were detected above the freshwater quality criteria. Copper and zinc exceeded acute/chronic freshwater quality criteria in the efflluent prior to discharge. Dioxin (2,3,7,8-TCDD) was found in the combined bleach plant effluent sediment, sludge, and effluent particulates analyses. Total discharge of dioxin was 1.9 mg/day (based on a CBPE flow of 10 MGD).

No effluent or sediment toxicity was indicated by the freshwater organisms used in the bioassays.

Split samples for permit parameters were analyzed by both laboratories. The results obtained from each laboratory were in agreement except for TSS and fecal coliform. An on-site review of Longview Fibre's laboratory procedures showed them to be satisfactory with the exception that the BOD_5 samples collected on Saturday were not analyzed until Wednesday, thus exceeding the maximum holding time stipulated by standard methods. An evaluation should be made to determine whether the extended holding time causes any degradation of the sample.

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FIGURES

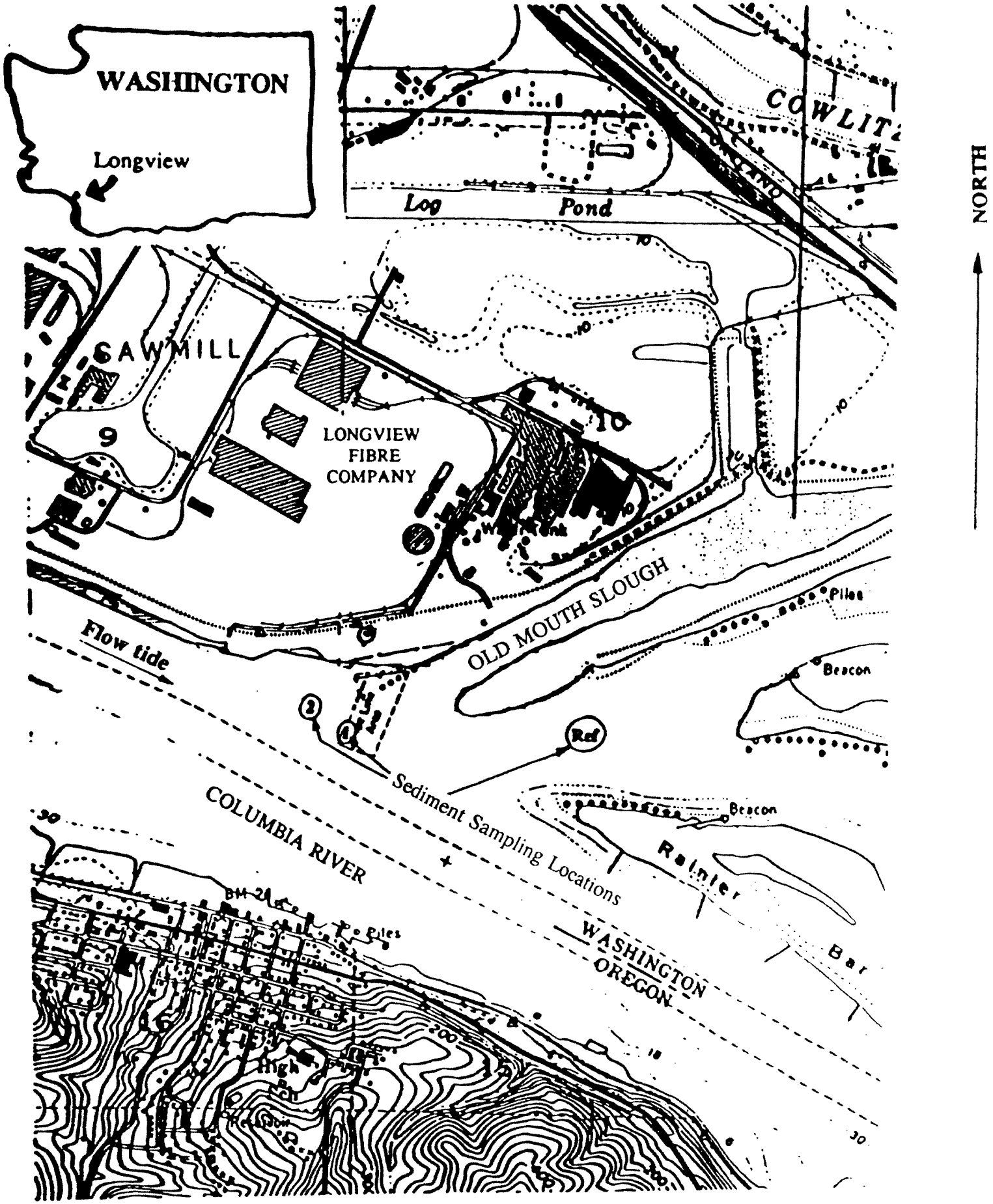

Figure 1 - Site and Sediment Sampling Locations - Longview Fibre, 5/90

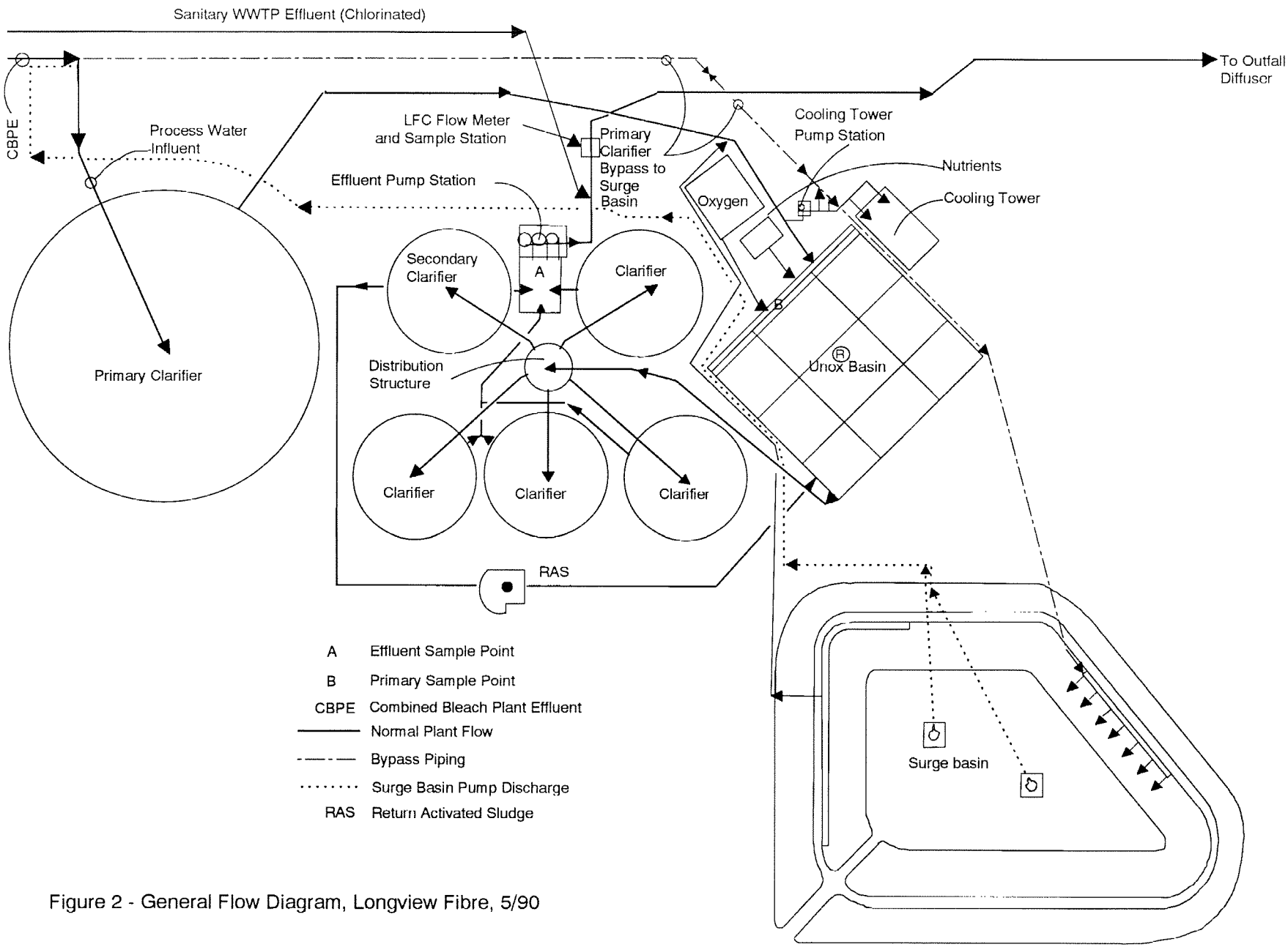

Figure 2 - General Flow Diagram, Longview Fibre, 5/90

TABLES

Table 1. Ecology Sampling Schedule and Parameters Analyzed - Longview Fibre, 5/90

Station:	TransBlank	Primary Effluent			Effluent at Outfall 001				Eff-LF	Combined Bleach Plant Effluent				Outf.#002	Hot H2O
Date:	5/7	5/8	5/8	5/8-9	5/8	5/8	5/9	5/8-9	5-8-9	5/8	5/8	5/9	5/8-9	5/8-9	5/8-9
Time:	pm	am	pm	8am-8am	am	pm	am	8am-8am	8am-8am	am	pm	am	8am-8am	8am-8am	8am-8am
Type:	grab	grab	grab	comp	grab	grab	grab	comp	comp	grab	grab	grab	comp	comp	comp
Lab #: 1982-	05	06	08	12	07	09	22	15	16	13	12	21	17	18	19
Analysis															
Turbidity		E	E	E	E	E		E	E				E	E	E
Conductivity		E	E	E	E	E		E	E				E	E	E
Alkalinity		E	E	E	E	E		E	E				E	E	E
Hardness				E				E					E	E	E
Fluoride								E							
Cyanide (total)	E			E				E					E		E
Cyanide (weak and dissociable)	E			E				E					E		E
Solids(4)				E				E	E						
TSS		E	E		E	E		LF	LF				E	E	E
BOD5				E				E,LF	LF,E						
COD		E	E	E	E	E		E	E				E		E
TOC								E							
NH3-N		E	E	E	E	E		E	E				E		
NO3+NO2-N		E	E	E	E	E		E	E				E		
Total-P		E	E	E	E	E		E	E				E		
Fecal Coliform							E								
% Klebsiella							E								
PP Metals + Cr(VI)	E			E				E						E	E
BNA	E			E				E						E	E
VOA	E		E			E									
Pest/PCBs	E			E				E						E	E
Formaldehyde				E				E							
Phenols	E			E				E							
AOX	E		E			E				E	E	E			
% Solids															
Grain Size															
Resin Acids	E			E				E							
Guaiacols	E			E				E							
Dioxin													E		
Rainbow trout								E							
Microtox								E							
Daphnia magna 7-day								E							
Daphnia magna 48 -hour								E							
Ceriodaphnia dubia								E							
Hyalella (sediment)															
Hyalella (effluent)								E							
Field Parameters:															
pH		E	E	E	E	E		E	E	E	E	E	E	E	E
Temperature		E	E	E	E	E		E	E	E	E	E	E	E	E
Conductivity		E	E	E	E	E		E	E	E	E	E	E	E	E
Chlorine Residual: total															
free															

Table 1 Continued.

Station:	Sanitary			Sed. #1	Sed. #2	Sed. Ref.
Date:	5/8-9	5/8	5/9	5/15	5/15	5/15
Time:	8am-8am	pm	pm	pm	pm	pm
Type:	comp	grab	grab	comp	comp	comp
Lab #: 1982-	20	20	20	208223	208224	208225
Analysis						
Turbidity	E					
Conductivity	E					
Alkalinity	E					
Hardness						
Fluoride						
Cyanide (total)				E	E	E
Cyanide (weak and dissociable)				E	E	E
Solids(4)	E					
TSS	LF					
BOD5	E,LF					
COD	E					
TOC				E	E	E
NH3-N	E					
NO3+NO2-N	E					
Total-P	E					
Fecal Coliform		E	E*			
% Klebsiella						
PP Metals + Cr(VI)				E	E	E
BNA				E	E	E
VOA				E	E	E
Pest/PCBs				E	E	E
Formaldehyde				E	E	E
Phenols				E	E	E
AOX				E	E	E
% Solids				E	E	E
Grain Size				E	E	E
Resin Acids				E	E	E
Guaiacols				E	E	E
Dioxin						
Rainbow trout						
Microtox				E	E	E
Daphnia magna 7-day						
Daphnia magna 48 -hour						
Ceriodaphnia dubia						
Hyalella (sediment)				E	E	E
Hyalella (effluent)						
Field Parameters:						
pH	E	E		E+	E+	E+
Temperature	E	E		E+	E+	E+
Conductivity	E	E		E+	E+	E+
Chlorine Residual: total	E	E	E			
free	E	E	E			

E - Analysis performed by Ecology.
LF - Analysis performed by LFC.
* - Split w/LFC.
+ - Parameters run on surface water at the sediment sampling sites.
++ - Ecology's ongoing studies in effluent particulates centrifugation.

Table 2. Results of Effluent and Sediment General Chemistry Analyses – Longview Fibre, 5/90

Station:	Primary Effluent			Effluent at Outfall 001				Eff-LF	Combined Bleach Plant Effluent			
Date:	5/8	5/8	5/8-9	5/8	5/8	5/9	5/8-9	5/8-9	5/8	5/8	5/9	5/8-9
Time:	1030	1715	8am-8am	1010	1630	1015	8am-8am	8am-8am	1130	1600	0935	8am-8am
Type:	grab	grab	comp	grab	grab	grab	comp	comp	grab	grab	grab	comp
Lab #: 1982 -	06	08	12	07	09	22	15	16	13	12	21	17
Analysis												
General Chemistry:												
Turbidity, NTU	14	14	5.7	12	12		5.9	5.6				7.2
Conductivity, umhos/cm	1040	1090	1080	1040	1070		1060	1070				6770
Alkalinity, mg/L CaCO3	98.6	126	110	122	117		113	112				<1
Hardness, mg/L CaCO3			175				175					357
Fluoride, mg/L							0.113					
Cyanide, total, mg/L			.002				.004					.029
Cyanide, weak & diss., mg/L			<.002				.002					.029
% Solids												
Total Solids, mg/L			953				846	829				
Total NV Solids, mg/L			644				620	620				
TSS, mg/L	43	36	30	31	65		80	57				40
Total NVSS, mg/L			4				17	24				
BOD5, mg/L			172				<50 FQC	<50 FQC				
COD, mg/L	490	488	431	237	281		253	250				776
TOC, mg/L							76.6					
NH3-N, mg/L	.345	.041	.058	.026	.029		.034	.058				.281
NO3+NO2-N, mg/L	.012	.087	.010	<.01	.073		<.010	<.010				.078
Total-P, mg/L	.78	.860	.780	1.62	1.81		1.66	1.64				.700
Fecal Coliform, #/100 mL						4600 X						
% Klebsiella						30						
AOX, mg/L		9.30			6.78				86.8	75.8	95.8	
Formaldehyde, mg/kg												
Phenol, ug/kg												
Chromium VI mg/l							6 N			7 N		
Field Parameters:												
pH, std. unit	6.00	6.27	7.14	5.86	5.78	-	6.56	6.33	1.3	1.26	1.34	2.21
Temperature, deg. C.	32.4	33.7	5.5	32.2	33.2	-	8.0	17.8	42	39.9	37.6	8.8
Conductivity, umhos/cm	1030	1100	1050	1030	1180	-	1030	1010	6400	7600	5800	7160
Chlorine Residual (mg/L): total												
free												

Table 2 Continued.

Station:	TransBlank	Outf.#002	Hot H2O	Sanitary		Sed. #1^	Sed. #2^	Sed. Ref.^
Date:	5/7	5/8-9	5/8-9	5/8-9	5/9	5/15	5/15	5/15
Time:	1700	8am-8am	8am-8am	8am-8am	1320	pm	pm	pm
Type:		comp	comp	comp	grab	comp	comp	comp
Lab #: 1982 -	05	18	19	20	20	208223	208224	208225
Analysis								
General Chemistry								
Turbidity, NTU		9.8	3.0	12				
Conductivity, umhos/cm		243	146	518				
Alkalinity, mg/L CaCO3		64.5	32.1	110				
Hardness, mg/L CaCO3		51	51					
Fluoride, mg/L								
Cyanide, total, mg/L	0.002 U		.004			0.3 J^	0.4 J^	0.3
Cyanide, weak & diss., mg/L	0.002 U		.004			0.6 J^	0.7 J^	0.7
% Solids						71.84	71.85	73.96
Total Solids, mg/L				285				
Total NV Solids, mg/L				189				
TSS, mg/L		25	8	21				
Total NVSS, mg/L				7				
BOD5, mg/L				<50 FQC				
COD, mg/L			19.9	96.3				
TOC, mg/L						470^	280^	220^
NH3-N, mg/L				20.8				
NO3+NO2-N, mg/L				4.63				
Total-P, mg/L				3.60				
Fecal Coliform, #/100 mL					220*			
% Klebsiella								
AOX, mg/L	0.98							
Dioxin, ppt						2.3 U	8.8	2.6 U
Formaldehyde, mg/kg						<1.7	<1.8	<1.8
Phenol, ug/kg						1.1	<0.9	<1.7
Chromium VI mg/L	0.005 U		0.005 N					
Field Parameters:								
pH, std. unit		7.23	7.30	7.57	-			
Temperature, deg. C.		6.1	12.6	4.1	-			
Conductivity, umhos/cm		250	150	600	-			
Chlorine Residual (mg/L): total				3.0	6.5			
free				2.0	3.5			

* - Split sample with Longview Fibre.
x - The "x" flag is an artifact from the computer that occurs when generating a value from a manual integration of the quantitive peak. This flag carries no significance as to the usefulness of the associated value.
U - The material was analyzed for, but was not detected.
J - The associated numerical value is an estimated quantity.
^ - Unit is in mg/kg-dry.
N - Spiked sample recovery not within control limits.
FQC - Failed Quality Control.
ppt - Parts per trillion.

Table 3. Comparison of Class II Inspection Results to NPDES Permit Limits
Longview Fibre, 5/90

Effluent Parameter	NPDES Permit Daily Limit		Inspection Data
	Maximum	Average*	Ecology
Outfall – 001:			
BOD5	36800 lbs	9000 lbs	8581 lbs^
TSS	70200 lbs	35600 lbs	36723 lbs
pH	5.4 – 9.0 all times		5.86–6.56
Flow			55.0 MGD
Rainbow Trout	80% survival in 65% effluent for a 96 hour period		100% Survival
Sanitary: (Prior to junction with outfall – 001)			
BOD5	90 lbs	38 lbs	
TSS	90 lbs	38 lbs	11 lbs
Chlorine Residual	Range 0.1–5.0 (mg/L)		3.0–6.5 (total residual)
Fecal Coliform	400/100 ml	200/100 ml	220/100 ml
pH	6.0–9.0 (all times)		7.57

* – Defined as the average of the measured values obtained over a calendar month's time.
^ – Data obtained from LFC's laboratory.

Table 4. Results of Effluent Organics Analyses – Longview Fibre, 5/90

Station:	TransBlank	Pri.Effl.	Effl.	Hot H20	CBPE	Effl.	Out #002
Lab ID#: 1982 -	05	08	09	19	12	15	18
Parameter (ug/L)							
BNAs							
Diethyl Phthalate							9800
3,3'-Dichlorobenzidine					5000	5000	
Bis(2-Ethylhexyl)phthalate							6300
Dioxin							
2378-TCDD					50000		
Resin/Fatty Acids							
Linoleic acid						4	
Palmitoleic acid						17	
Decanoic acid, hexa-						23	
Oleic acid						16	
Octadecanoic acid						4	
Pimaric acid						7	
Sandaracopimaric acid						2	
Isopimaric acid						11	
Palustric acid						3	
Dehydroabietic acid						43	
Abietic acid						17	
Neoabietic acid						0.3 J	
9,10-Dichlorosteric acid						0.3 J	
12-Chlorodehydroabietic acid						0.3 J	
Dichlorodehydroabietic acid						0.2 J	
Volatile Organics							
Acetone	16	444		16			
Chloroform	1 U	1430	964	35			
1,1,2-Trichloroethane				4.4			
Guaiacols/Phenolics							
Phenol					24		
2-Methylphenol					2 J		
4-Methylphenol					3 J	1 J	
a-Terpeneol					440		
2-Cyclopenten-1-one, 2- methy						1 J	
Guaiacol (2-methoxyphenol)	0.2 J				670	0.4 J	
2,4-Dichlorophenol					2 J	1 J	
4-Chloroguaiacol					13		
2,4,6-Trichlorophenol					4 J	2 J	
4 -Allylguaiacol (engenol)					9		
4'5-Dichloroguaiacol					3 J	0.4 J	
6-Chlorovanillin					4 J	0.3 J	
4,5-Dichlorocatechol					2 J	2 J	
4,5,6-Trichloroguaiacol					4 J	2 J	
9,10-Dichlorosteric acid					6 J	4 J	
5,6-Dichlorovanillin					5 J	0.4 J	
Pentachlorophenol					0.5 J		
3,4,5-Trichlorocatechol					12	5 J	
Tetrachloroguaiacol					6	2 J	
Tetrachlorocatechol					4 J	1 J	

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.

Table 4A. Results of Effluent Metals Analyses – Longview Fibre, 5/90

Station:	TransBlank	CBPE	Effluent	Out #002	Hot H2O	Freshwater Criteria*	
Lab ID#: 1982 –	05	12	15	18	19	Acute	Chronic
Parameter (ug/L)							
Antimony	28	58	38	10	5 U	9000	1600
Arsenic	5 U	52	20	5 U	5 U	360	190
Beryllium	5 N	5 N	5 N	5 N	5 N	130	53
Chromium	20 U	40	40	20 U	20 U	1700	210
Copper	25 N	25 N	25 N	25 N	25 N	18	12
Lead	5 U	8	16	10	6	82	32
Selenium	5 U	32	32	5 U	16 U	2600	35
Zinc	20 U	100	80	340	60 U	320	47
Chromium (VI)	5 U	7 N	6 N		5 N	16	11

* – EPA, 1986.

U – Indicates conpound was analyzed for but not detected at the given detection limit.

N – Spiked sample recovery not within control limit.

J – Indicates an estimated value when result is less than specified detection limit.

Table 5. Effluent Bioassay Results – Longview Fibre, 5/90

Daphnia magna – 7 day survival and reproduction test

(Daphnia magna)

Lab ID# 198215

Concentration (% vol/vol)	Number Tested*	Percent Survival+	Total Reproduction
Control	25	90	160
1.0	25	100	247
3.0	25	100	250
10.0	25	100	294
30.0	25	100	334
100.0	25	90	307

* – Five replicates of five organisms.

+ – These results give a No Observed Effect Concentration (NOEC) and a Lower Observed Effect Concentration (LOEC) for survival of 100% and >100%. The NOEC and LOEC for reproduction are 100% and >100%, respectively.

Daphnia magna – 48 hour acute screening test

(Daphnia magna)

Lab ID# 198215

Concentration (% vol/vol)	Number Tested*	Percent Survival WE
100.0	30	100
Control	30	100

* – Six replicates of five organisms.

WE – Whole effluent at 100%(vol/vol).

Ceriodaphnia dubia – 7 day survival and reproduction test

(Ceriodaphnia dubia)

Lab ID# 198215

Sample (% vol/vol)	Number Tested*	Percent Survival	Total Reproduction
Control	10	10	35
1.5	10	0	144
3.0	10	20	275
6.0	10	40	436
13.0	10	90	670
25.0	10	100	619
50.0	10	100	226
100.0	10	100	18

* – Ten replicates of one organism.

Table 5 Continued.

Rainbow trout – 96 hour survival test

Comparative results from Department of Ecology (DOE) and Longview Fibre (LF)
Lab ID# 198215

Sample	# Tested		Percent Survival	
(% vol)	DOE*	LF	DOE	LF
Control	30^	20^^	100	100
65	30	20	100	100
100	30		100	

* – LC50 for cadmium chloride estimated at 3.0 ug/L.
^ – Three replicates of ten organisms.
^^ – Two replicates of ten organisms.

Survival of Hyalella azteca exposed for 96 hour

(Hyalella azteca)
Sample ID# 198215

Concentration (% vol)	Number Tested*	Percent Survival
100	30	100
60	30	100
36	30	100
22	30	97
13	30	100
8	30	100
5	30	97
Control	30	97

* – Three replicates of ten organisms.
NOEC = 100%.
LC50 > 100%

Microtox

Lab ID#	EC5O for 15 min
198215	>100%

Table 6. Results of Sediment Organic Metals Analyses – Longview Fibre, 5/90

Station:	Sed. #1		Sed. #2		Sed. Ref.	
Lab ID#: 2082–	23		24		25	
Parameter						
BNA (ug/kg)						
Bis(2–Ethyehexyl)phthalate	300	U	400		300	
Dioxin (ppt)						
2378 –TCDD	2.3	U	8.8		2.6	U
Metals (mg/kg)						
Arsenic	0.32	J	0.31	J	0.3	J
Beryllium	0.21	J	0.2	U	0.2	U
Chromium	17.3		32.4		6.3	
Copper	24.7		37.9		13.8	
Lead	20		40.3		6.1	J
Mercury	0.002	U	0.003	J	0.004	J
Nickel	17	J	28.5		7	J
Zinc	57.5		109		21.1	

U – The material was analyzed for, but was not detected.
J – Indicates an estimated value when result is less than specified detection limit.
ppt – Parts per trillion.

Table 7. Sediment Bioassay Results – Longview Fibre, 5/90

Survival of Hyalella azteca - 10 day freshwater sediment toxicity

(Hyalella azteca)

Sample ID#	Repl.	Exposed	Survived	% Survival	Mean* percent survival
Control	1	10	10	100.0	
	2	10	7	70.0	
	3	10	9	90.0	
	4	10	10	100.0	
	5	10	9	90.0	90.0
208223	1	10	8	80.0	
	2	10	7	70.0	
	3	10	9	90.0	
	4	10	8	80.0	
	5	10	10	100.0	84.0
208224	1	10	7	70.0	
	2	10	9	90.0	
	3	10	9	90.0	
	4	10	10	100.0	
	5	10	9	90.0	88.0
208225	1	10	9	90.0	
	2	10	9	90.0	
	3	10	6	60.0	
	4	10	9	90.0	
	5	10	9	90.0	84.0

* An asterisk (*) next to the treatment mean indicates that the latter was significantly ($p<0.05$) different from the control mean.

96 hour Reference Toxictant Test Results Using Hyalella azteca and Cadmium Chloride as Cadmium.
(Hyalella azteca)

NOEC (ug/L)	1
LOEC (ug/L)	3.3
LC50 (ug/L)	0.91

Microtox

Results of Sediment Samples

Lab ID #	EC50 DI Extract	EC50 Saline Extract
208223	a	>100 %
208224	a	>100 %
208225	a	a

EC50 - Effect concentration for 50% of the organisms.
LC50 - Lethal Concentration for 50% of the organisms.
NOEC - No Observable Effects Concentration.
LOEC - Lowest Observable Effects Concentration.
a - Data unsuitable for reduction; indicates lack of toxicity.

Table 8. Sediment Grain Size Distributions in Percentage – Longview Fibre, 5/90

Sample ID#	Sieve size range in microns					
	>4750	4750 – 2000	2000 – 850	850 – 425	425 – 250	250 – 106
208223	0	0	0	1	15	97
208224	0	0	0	0	10	96
208225	2	2	3	14	65	0

Table 9. Comparison of Laboratory Results - Longview Fibre, 5/90

Station	Type	Date	Sampler	Laboratory	BOD5 (mg/L)	TSS (mg/L)	pH SU	Flow MGD	Fecal Coliform MPN	Rainbow trout Bioassay (65% effluent)
Effluent 001	composite	5/8/90	LFC	LFC	12	44	6.5	55	-	100% survival
			LFC	Ecology	20	76		55		
			Ecology	Ecology	<50* (FQC)	80	6.6		-	100% survival
			Ecology	LFC	<50* (FQC)	57				
Sanitary Sewer	grab	5/7/90	LFC	LFC	42	17	7.1	0.07	2 (5/9/90)	-
			Ecology	Ecology	<50* (FQC)	21	7.3	0.06	200 (5/9/90)	-

* - Failed Quality Control (FQC).

Table 10. Priority Pollutant Organics in the Effluent Particulate Analysis
Longview Fibre, Longview, 5/90

Laboratory – Columbia Analytical

	Effluent Concentrations (grams/1,000,000 gallons)		
	Whole	Centrate*	Particulates**
VOLATILES			
Acetone^	190 U	NOT TESTED	110
Chloroform^	3,650		2
2-Butanone	190 U		120
BNAs			
4-Methylphenol	19 U	19 U	6
Diethylphthalate	19 U	32	5 U
Bis(2-ethylhexyl)phthalate	24	19 U	5 U

NO PESTICIDES/PCBs WERE DETECTED IN ANY SAMPLES

Outlined results indicate detected analyte.
* Centrate – The portion of the whole effluent that passes through the centrifuge.
** Particulates – The portion of the whole effluent retained by the centrifuge.
^ The centrifuge field blank had detectable levels of acetone and chloroform.
The effluent transfer blank had detectable levels of acetone.
U Indicates analyte not detected at quantitation limit given.

Table 11. Priority Pollutant Metals in the Effluent Particulate Analysis
Longview Fibre, Longview, 5/90

Laboratory:
(1) Manchester (D.O.E.)
(2) Sound Analytical

	Effluent Concentrations (grams/1,000,000 gallons)		
	Whole	Centrate*	Particulates**
Laboratory:	(2)	(2)	(1)
Antimony, Total^	61	167	2.0
Antimony, Total recoverable	144	144	
Antimony, Dissolved	182	159	
Arsenic, Total^	42	189	1.5
Arsenic, Total recoverable	76	83	
Arsenic, Dissolved	220	227	
Cadmium, Total	19 U	19 U	2.1 J
Cadmium, Total recoverable	19 U	19 U	
Cadmium, Dissolved	19 U	19 U	
Chromium, Total	110	80	70
Chromium, Total recoverable	150	80	
Chromium, Dissolved	110	110	
Copper, Total	95 U	95 U	60
Copper, Total recoverable	95 U	95 U	
Copper, Dissolved	95 U	95 U	
Lead, Total	68	30	31 J
Lead, Total recoverable	61	19 U	
Lead, Dissolved	23	30	
Nickel, Total^	150 U	150 U	9 J
Nickel, Total recoverable	150 U	150 U	
Nickel, Dissolved	150 U	150 U	
Selenium, Total	61	110	0.33 U
Selenium, Total recoverable	121	110	
Selenium, Dissolved	174	190	
Zinc, Total	227	76	210
Zinc, Total recoverable	303	76	
Zinc, Dissolved	79	76	
Hexavalent Chromium, Total	23	23	
Hexavalent Chromium, Dissolved			

Outlined results indicate detected analyte.
* Centrate – The portion of the whole effluent that passes through the centrifuge.
** Particulates – The portion of the whole effluent retained by the centrifuge.
^ The centrifuge field blank had detectable levels of arsenic and nickel.
The effluent field blank had detectable levels of antimony.
U Indicates analyte not detected at quantitation limit given.
J Estimated amount, concentration is below quantitation limit.

APPENDICES

Appendix 1 – Chemical Analytical Methods – Longview Fibre, 5/90

Parameter	Method	Lab Used
General Chemistry		
Turbidity	EPA, 1979: 180.1	Manchester Lab., WA
Conductivity	EPA, 1979: 120.1	Manchester Lab., WA
Alkalinity	EPA, 1979: 310.1	Manchester Lab., WA
Hardness	EPA, 1979: 130.2	Manchester Lab., WA
Fluoride	EPA, 1979: 340.3	Manchester Lab., WA
F-Coliform MPN	APHA, 16: 908C	Manchester Lab., WA
% Klebsiella (KES)	APHA, 17: 9222F	Manchester Lab., WA
Cyanide total	EPA, 1979: 335.2mod	Manchester Lab., WA
Cyanide (wk & dis)	APHA, 17: 4500-CN I	Manchester Lab., WA
Solids		
TS	EPA, 1979: 160.3	Manchester Lab., WA
TNVS	EPA, 1979: 106.4	Manchester Lab., WA
TSS	EPA, 1979: 160.2	Manchester Lab., WA
TNVSS	EPA, 1979: 106.4	Manchester Lab., WA
BOD5	EPA, 1979: 405.1	AmTest, WA
COD	EPA, 1979: 410.1	Manchester Lab., WA
TOC (water)	EPA, 1979: 415.2	Manchester Lab., WA
Nutrients		
NH3-N	EPA, 1979: 350.1	AmTest, WA
NO2+NO3-N	EPA, 1979: 353.2	AmTest, WA
Phosphorous - Total	EPA, 1979: 365.1	AmTest, WA
Organics and Metals		
Pest/PCB (water)	EPA, 1984: 608	Columbia Analytical Services, WA
Dioxin/Furans	EPA, 8290	Triangle Laboratories Inc, NC
PP Metals	EPA, 1979: 200	Sound Analytical Services, WA
Bioassays		
Microtox (acute)	Beckman, 1982	ECOVA, WA
Ceriodaphnia (chronic)	EPA, 600/4-85/014	Manchester Lab., WA
Hyallela	Nebeker, 1984	Northwestern Aquatic Sciences, OR
Daphnia magna (solid acute)	EPA/600/D-87/080	Manchester Lab., WA
Rainbow Trout (acute)	Ecology, 1981	Manchester Lab. and Columbia Analytical Services, WA
Field Analysis		
pH	APHA, 1985:#423	
Temperature	APHA, 1985: #212	
Chlorine Residue	APHA, 1985: #408E (LaMotte Kit)	

Appendix 2. Results of Effluent Pesticides/PCBs and Metals Analyses – Longview Fibre, 5/90

	Field Station:	TransBlank	CBPE	Effluent	Out #002	Hot H2O
	Type:	grab	grab/comp	grab/comp	comp	comp
	Date:	5/7/90	5/8/90	5/8/90	5/8/90	5/8/90
	Time:	pm	pm	pm	24 hr	24 hr
Parameter (ug/l)	Lab sample#: 1982 -	05	12	15	18	19
alpha-BHC		0.04 U	0.5 U	0.3 U	0.04 U	0.04 U
gamma-BHC (Lindane)		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
beta-BHC		0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Heptachlor		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
delta-BHC		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aldrin		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Heptachlor Epoxide		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Endosulfan I		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4,4'-DDE		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Dieldrin		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Endrin		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4,4'-DDD		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Endosulfan II		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4,4'-DDT		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Endrin Aldehyde		0.04 U	0.04 U	<0.3 U	0.04 U	0.04 U
Endosulfan Sulfate		0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Methoxychlor		0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Toxaphene		1 U	1 U	1 U	1 U	1 U
Chlordane		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Aroclor-1016		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor-1221		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor-1232		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor-1242		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor-1248		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor-1254		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor-1260		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

	Field Station:	TransBlank	CBPE	Effluent	Hot H2O	Out # 002
	Type:	grab	comp	grab/comp	comp	comp
	Date:	5/7/90	5/8/90	5/8/90	5/8/90	5/8/90
	Time:	pm	24 hr	24 hr	24 hr	24 hr
	Analysis type:	total	total	total rec.	total	total rec.
Metals (ug/L)	Lab sample#: 1982 -	05	12	15	19	18
Antimony		28	58	38	5 U	10
Arsenic		5 U	52	20	5 U	5 U
Beryllium		5 N	5 N	5 N	5 N	5 N
Cadmium		5 U	5 U	5 U	5 U	5 U
Chromium		20 U	40	40	20 U	20 U
Copper		25 N	25 N	25 N	25 N	25 U
Lead		5 U	8	16	6	10
Mercury		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel		40 U	40 U	40 U	40 U	40 U
Selenium		5 U	32	32	16 U	5 U
Silver		10 U	10 U	10 U	10 U	10 U
Thallium		10 U	10 U	10 U	10 U	10 U
Zinc		20 U	100	80	60 U	340
Chromium(VI)		5 U	7 U		5 U	

U - Indicates compound was analyzed for but not detected at the given detection limit.
N - Spiked sample recovery not within control limits.

Appendix 2. - Cont. - Results of Effluent and Sediment VOA Analyses - Longview Fibre, 5/90

Location:	BLANK	EFFLUENT			SEDIMENT		
Field Station:	TransBlank	Pri-Eff	Effluent	Hot H2O	Sed. #1	Sed. #2	Sed. Ref.
Type:	grab	grab	grab	grab	grab	grab	grab
Date:	5/7/90	5/8/90	5/8/90	5/9/90	5/9/90	5/9/90	5/9/90
Time:	pm	pm	pm	pm	pm	pm	pm
Lab sample#:	198205	198208	198209	198211	208223	208224	208225
Parameter	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/Kg)	(ug/Kg)	(ug/Kg)
Chloromethane	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Vinyl Chloride	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Bromomethane	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Chloroethane	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Trichlorofluoromethane	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Freon 113	10 U	100 U	50 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Acetone	16	444	50 U	16	10 U	10 U	10 U
Carbon Disulfide	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Methylene Chloride	10 U	100 U	50 U	10 U	10 U	10 U	10 U
Trans 1,2-Dichloroethene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Cis 1,2-Dichloroethene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
2-Butanone (MEK)	10 U	100 U	50 U	10 U	10 U	10 U	10 U
Dichloroethane	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Chloroform	1 U	1430	964	35	5 U	5 U	5 U
1,1,1-Trichloroethane	1 U	10 U	5 U	4.4	5 U	5 U	5 U
Carbon Tetrachloride	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Benzene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
1,2-Dichloroethane	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Vinyl Acetate	10 U	100 U	50 U	10 U	10 U	10 U	10 U
Trichloroethene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
1,2-Dichloropropane	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Bromodichloromethane	1 U	10 U	5 U	1 U	5 U	5 U	5 U
2-Chloroethylvinyl ether	10 U	100 U	50 U	10 U	10 U	10 U	10 U
Trans-1,3-Dichloropropene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
2-Hexanone	10 U	100 U	50 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	10 U	100 U	50 U	10 U	10 U	10 U	10 U
Toluene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Tetrachloroethene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Dibromochloromethane	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Chlorobenzene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Ethylbenzene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Styrene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Total Xylenes	1 U	10 U	5 U	1 U	5 U	5 U	5 U
Bromoform	1 U	10 U	5 U	1 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	1 U	10 U	5 U	1 U	5 U	5 U	5 U
3-Dichlorobenzene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
4-Dichlorobenzene	1 U	10 U	5 U	1 U	5 U	5 U	5 U
2-Dichlorobenzene	1 U	10 U	5 U	1 U	5 U	5 U	5 U

U - Indicates compound was analyzed for but not detected at the given detection limit.

Appendix 2. Cont. - Results of Effluent and Sediment BNA Analyses - Longview Fibre, 5/90

Location:	BLANK	EFFLUENT				SEDIMENT		
Field Station:	TransBlank	CBPE	Effluent	Out #002	Hot H2O	Sed #1	Sed #2	Sed. Ref.
Type:	grab	grab/comp	grab/comp	comp	comp	grab	grab	grab
Date:	5/7/90	5/8-9	5/8/90	5/8/90	5/8/90	5/15/90	5/15/90	5/15/90
Time:	pm		pm	24 hr	24 hr	pm	pm	pm
Lab sample#:	198205	198212	198215	198218	198219	208223	208224	208225
Parameter	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/kg)	(ugkg)	(ug/kg)
N-Nitrosodiphenylamine	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Aniline	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Bis(2-Chloroethyl)Ether	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
1,3-Dichlorobenzene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
1,4-Dichlorobenzene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
1,2-Dichlorobenzene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Bis(2-chloroisopropyl)ether	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
N-Nitroso-Di-n-Propylamine	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Hexachloroethane	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Nitrobenzene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Isophorone	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Bis(2-Chloroethoxy)Methane	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
1,2,4-Trichlorobenzene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Naphthalene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
4-Chloroaniline	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Hexachlorobutadiene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2-Methylnaphthalene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Hexachlorocyclopentadiene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2-Chloronaphthalene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2-Nitroaniline	20 U	20 U	20 U	20 U	20 U	2 U	2 U	2 U
Dimethyl Phthalate	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Acenaphthylene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
3-Nitroaniline	20 U	20 U	20 U	20 U	20 U	2 U	2 U	2 U
Acenaphthene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Dibenzofuran	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2,4-Dinitrotoluene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2,6-Dinitrotoluene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Diethyl Phthalate	5 U	5 U	5 U	9.8	5 U	0.3 U	0.3 U	0.3 U
4-Chlorophenyl-Phenylether	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Fluorene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
4-Nitroaniline	20 U	20 U	20 U	20 U	20 U	2 U	2 U	2 U
4-Bromophenyl-Phenylether	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Hexachlorobenzene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Phenanthrene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Anthracene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Dibutylphthalate	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Fluoranthene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Pyrene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Butylbenzylpthalate	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
3,3'-Dichlorobenzidine	5 U	5	5	5 U	5 U	0.3 U	0.3 U	0.3 U
Benzo(a)Anthracene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Bis(2-Ethylhexyl)phthalate	5 U	5 U	6.3	6	5 U	0.3 U	0.4	0.3
Chrysene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Di-n-Octyl Phthalate	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Benzo(b)Fluoranthene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Benzo(k)Fluoranthene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Benzo(a)Pyrene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Indeno(1,2,3-cd)Pyrene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Dibenzo(a,h)Anthracene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Benzo(g,h,i)Perylene	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Phenol	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2-Chlorophenol	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Benzyl Alcohol	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2-Methylphenol	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
4-Methylphenol	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2-Nitrophenol	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2,4-Dimethylphenol	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
Benzoic Acid	50 U	50 U	50 U	50 U	50 U	2 U	2 U	2 U
2,4-Dichlorophenol	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2,4,6-Trichlorophenol	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2,4,5-Trichlorophenol	5 U	5 U	5 U	5 U	5 U	0.3 U	0.3 U	0.3 U
2,4-Dinitrophenol	50 U	50 U	50 U	50 U	50 U	2 U	2 U	2 U
4-Nitrophenol	50 U	50 U	50 U	50 U	50 U	2 U	2 U	2 U
4,6-Dinitro-2-Methylphenol	20 U	20 U	20 U	20 U	20 U	2 U	2 U	2 U
Pentachlorophenol	20 U	20 U	20 U	20 U	20 U	2 U	2 U	2 U

U - Indicates compound was analyzed for but not detected at the given detection limit.

Appendix 2. Cont. - Results of Effluent and Sediment Guaicols Catechols Phenolics Analyses - Longview Fibre, 5/90

Location:	BLANK	EFFLUENT		SEDIMENT		
Field Station:	TransBlank	CBPE	Effluent	Sed. #1	Sed. #2	Sed. Ref.
Type:	grab	grab/comp	grab/comp	grab	grab	grab
Date:	5/7/90	5/8-9	5/8/90	5/15/90	5/15/90	5/15/90
Time:	pm	pm	pm	pm	pm	pm
Lab sample#:	198205	198212	198215	208223	208224	208225
Parameter	(ug/L)	(ug/L)	(ug/L)	(ug/kg)	(ug/kg)	(ug/kg)
Phenol	1 U	24	2 U	140 U	160 U	130 U
Ethanone, 1-phenyl-	0.7 U	0.4 U	2 U	120 U	110 U	120 U
2-Methylphenol	0.4 U	2 J	0.5 U	120 U	110 U	120 U
4-Methylphenol	1 U	3 J	1 J	120 U	110 U	120 U
a-Terpeneol	0.4 U	440	0.5 U	120 U	110 U	120 U
o-Chlorophenol	0.4 U	0.4 U	0.5 U	120 U	110 U	120 U
2,4-Dimethylphenol	0.4 U	0.4 U	0.5 U	120 U	110 U	120 U
2-Cyclopenten-1-one, 2-methy	0.4 U	0.4 U	1 J	120 U	110 U	120 U
2-Cyclopenten-1-one, 3-methy	0.4 U	0.4 U	0.5 U	120 U	110 U	120 U
Guaicol (2-methoxyphenol)	0.2 J	670	0.4 J	120 U	110 U	120 U
4-Chloro-3-methylphenol	0.4 U	0.4 U	0.5 U	120 U	110 U	120 U
2,4-Dichlorophenol	0.4 U	2 J	1 J	120 U	110 U	120 U
2-Nitrophenol	0.4 U	0.4 U	0.5 U	120 U	110 U	120 U
4-Chloroguaiacol	0.4 U	13	0.5 U	120 U	110 U	120 U
2,4,6-Trichlorophenol	0.4 U	4 J	2 J	120 U	110 U	120 U
4-Nitrophenol	0.4 U	0.4 U	0.5 U	120 U	110 U	120 U
2,4,5-Trichlorophenol	0.4 U	0.4 U	0.5 U	120 U	110 U	120 U
4-Allylguaiacol (eugenol)	0.4 U	9	0.5 U	120 U	110 U	120 U
4,5-Dichloroguaiacol	0.4 U	3 J	0.4 J	120 U	110 U	120 U
4-Chlorocatechol	0.4 U	0.4 U	0.5 U	120 U	110 U	120 U
4-Propenylguaiacol	0.4 U	0.4 U	0.5 U	120 U	110 U	120 U
6-Chlorovanillin	0.4 U	4 J	0.3 J	120 U	110 U	120 U
4,5-Dichlorocatechol	0.4 U	2 J	2 J	120 U	110 U	120 U
4,5,6-Trichloroguaicol	0.4 U	4 J	2 J	120 U	110 U	120 U
9,10-Dichlorosteric acid	0.4 U	6 J	4 J	120 U	110 U	120 U
5,6-Dichlorovanillin	0.4 U	5 J	0.4 J	120 U	110 U	120 U
Pentachlorophenol	0.4 U	0.5 J	0.5 U	120 U	110 U	120 U
3,4,5-Trichlorocatechol	0.4 U	12	5 J	120 U	110 U	120 U
Tetrachloroguaicol	0.4 U	6	2 J	120 U	110 U	120 U
Trichlorosyringol	0.4 U	0.4 U	0.5 U	120 U	110 U	120 U
Tetrachlorocatechol	0.4 U	4 J	1 J	120 U	110 U	120 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.

Appendix 2. Cont. - Results of Effluent and Sediment Resin/Fatty Acids Analyses - Longview Fibre, 5/90.

Field Station:	Effluent	Sed. #1	Sed. #2	Sed. Ref.
Type:	grab/comp	grab	grab	grab
Date:	5/8/90	5/15/90	5/15/90	5/15/90
Lab sample#:	198215	208223	208224	208225
Paramater	(ug/L)	(ug/kg)	(ug/kg)	(ug/kg)
Linoleic acid	4	230 U	230 U	240 U
Palmitoleic aced (EE)	17	230 U	230 U	240 U
Decanoic acid, hexa-	23	1200 U	820 U	1300 U
Oleic acid	16	230 U	230 U	240 U
Octadecanoic acid	4	500 U	390 U	540 U
Retene	0.5 U	230 U	230 U	240 U
Pimaric acid	7	230 U	230 U	240 U
Sandaracopimaric acid	2	230 U	230 U	240 U
Isopimaric acid	11	230 U	230 U	240 U
Palustric acid	3	230 U	230 U	240 U
Eicosatrienoic acid (EE)	0.5 U	230 U	230 U	240 U
Dehydroabietic acid	43	25 U	230 U	240 U
Abietic acid	17	16 J	230 U	240 U
Neoabietic acid	0.3 J	230 U	230 U	240 U
9,10-Dichlorosteric acid	0.3 J	230 U	230 U	240 U
14-Chlorodehydroabietic	0.5 U	230 U	230 U	240 U
12-Chlorodehydroabietic	0.3 J	230 U	230 U	240 U
Dichlorodehydroabietic acid	0.2 J	230 U	230 U	240 U

U - Indicates compound was analyzed for, but not detected at the given limit.

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

Appendix 3. Results of Sediment Pesticide/PCBs and Metals Analyses – Longview Fibre, 5/90

Parameter (ug/kg)	Field Station: / Type: / Date: / Lab sample#:	Sed. #1 grab 5/15/90 208223	Sed. #2 grab 5/15/90 208224	Sed. Ref. grab 5/15/90 208225
alpha-BHC		0.01 U	0.01 U	0.01 U
gamma-BHC (Lindane)		0.01 U	0.01 U	0.01 U
beta-BHC		0.03 U	0.03 U	0.03 U
Heptachlor		0.01 U	0.01 U	0.01 U
delta-BHC		0.01 U	0.01 U	0.01 U
Aldrin		0.01 U	0.01 U	0.01 U
Heptachlor Epoxide		0.01 U	0.01 U	0.01 U
Endosulfan I		0.01 U	0.01 U	0.01 U
4,4'-DDE		0.01 U	0.01 U	0.01 U
Dieldrin		0.01 U	0.01 U	0.01 U
Endrin		0.01 U	0.01 U	0.01 U
4,4'-DDD		0.01 U	0.01 U	0.01 U
Endosulfan II		0.01 U	0.01 U	0.01 U
4,4'-DDT		0.01 U	0.01 U	0.01 U
Endrin Aldehyde		0.01 U	0.01 U	0.01 U
Endosulfan Sulfate		0.01 U	0.01 U	0.01 U
Methoxychlor		0.02 U	0.02 U	0.02 U
Toxaphene		0.3 U	0.3 U	0.3 U
Chlordane		0.1 U	0.1 U	0.1 U
Aroclor-1016		0.1 U	0.1 U	0.1 U
Aroclor-1221		0.1 U	0.1 U	0.1 U
Aroclor-1232		0.1 U	0.1 U	0.1 U
Aroclor-1242		0.1 U	0.1 U	0.1 U
Aroclor-1248		0.1 U	0.1 U	0.1 U
Aroclor-1254		0.1 U	0.1 U	0.1 U
Aroclor-1260		0.1 U	0.1 U	0.1 U
Metals (mg/kg)				
Antimony		0.1 U	0.1 U	0.1 U
Arsenic		0.32 J	0.31 J	0.3 J
Beryllium		0.21 J	0.2 U	0.2 U
Cadmium		1 U	1 U	1 U
Chromium		17.3	32.4	6.3
Copper		24.7	37.9	13.8
Lead		20	40.3	6.1 J
Mercury		0.002 U	0.003 J	0.004 J
Nickel		17 J	28.5	7 J
Selenium		0.2 U	0.2 U	0.2 U
Silver				
Thallium		0.25 UJ	0.25 UJ	0.25 UJ
Zinc		57.5	109	21.1

U - Indicates compound was analyzed for but not detected at the givem detection limit.

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

UJ - The material was analyzed for, but not detected. The sample quantitation limit is an estimated quanitity.

Appendix 4. Results of Effluent and Sediment Dioxin Analyses – Longview Fibre, 5/90

Field Station #:	CBPE	Sed. #1	Sed. #2	Sed. Ref.	Particulates++
Type:	grab-comp	grab	grab	grab	centrifuge
Date:	5/8-9	5/15/90	5/15/90	5/15/90	5/9
Lab Sample #:	198217	208223	208224	208225	198525
Dioxin Conc:	ppt	ppt	ppt	ppt	ppb
2378-TCDD	0.05	2.3 U	8.8	2.6 U	0.0898
12378-PeCDD	0.02 +	1.9 U	2.7 U	2.7 U	0.0248
123478-HxCDD	0.01	1.7 U	2.9 U	2.8 U	0.0126
123678-HxCCD	0.01	1.4 U	2.4 U	2.3 U	0.0321
123789-HxCCD	0.04	1.8 U	3.1 U	3 U	0.0316
1234678-HpCDD	0.04	2.8 U	3.6 U	5.3 U	0.185
OCDD	0.2	7.4 U	9.2 U	20 U	2.03
2378-TCDF	0.6	1.5 U	1.8 U	1.8 U	0.779
12378-PeCDF	0.001 U	2 U	2.5 U	2.5 U	0.065
23478-PeCDF	0.004	2.2 U	2.7 U	2.7 U	0.115
123478-HxCDF	0.003 U	1.4 U	2.1 U	2.1 U	0.0429
123678-HxCDF	0.001 U	1.2 U	1.7 U	1.7 U	0.0219
234678-HxCDF	0.01	1.8 U	2.6 U	2.7 U	0.0339
123789-HxCDF	0.003 U	2.5 U	3.6 U	3.7 U	0.0082 U
1234678-HpCDF	0.007	1.5 U	2.2 U	2.4 U	0.0436
1234789-HpCDF	0.005 U	2.7 U	3.9 U	4.4 U	0.0162 U
OCDF	0.01 U	7.2 U	9 U	19.5 U	0.327
TOTAL TCDD	0.21	2.3 U	8.8	2.6 U	0.888
TOTAL PeCDD	0.21	1.9 U	2.7 U	2.7 U	0.265
TOTAL HxCDD	0.15	1.6 U	2.7 U	2.6 U	0.403
TOTAL HpCDD	0.06	2.8 U	3.6 U	5.3 U	0.442
TOTAL TCDF	1.3	1.5 U	1.8 U	1.8 U	2.89
TOTAL PeCDF	0.35	2.1 U	2.6 U	2.6 U	0.617
TOTAL HxCDF	0.03	1.6 U	2.3 U	2.4 U	0.242
TOTAL HpCDF	0.009	1.9 U	2.8 U	3.1 U	0.0561

ppb - Parts per billion.
ppt - Parts per trillion.
U - Not detected at detection limit.
\+ - Estimated maximum probable contamination.
++ - Data obtained from Ecology's ongoing studies on effluent particulates centrifugation (Andreasson).

Appendix 5

BOD CHECKSHEET

(Std Meth 507)

2703CHEK.SHT
10/25/89

Laboratory Longview Fibre Co.

Person Interviewed Dave, Hank + ~~Betty~~ Judy

Date of Audit 5/11/90

Auditor S M. Lombard

	YES	NO	COMMENTS
1. Is approved method followed? Method SM 507	✓		
2. Is incubator adequate (i.e., clean, excludes light)?	✓		Converted Refridgerator w/ T-Stated Light Bulb.
3. Are samples stored in a refrigerator at 4° C?	✓		~~No Certified Thermometer~~
4. Is sample source and type (i.e., grab or composite) recorded?	✓		1 Grab, 7 Composite/Wk.
5. Are samples anayzed within 48 hours?		✓	Analyzed on Wed & Fri.
6. If DO probe is used, is it calibrated--against air?	✓		
--against Winkler titration?		✓	
--against oxygen-saturated water?		✓	
--before each day's use?	✓		
7. If DO probe is used, is it properly maintained so--			
there are no bubbles under the membrane?	✓		Changed Monthly
the membrane is not allowed to dry out?	✓		
there is no growth under the membrane?			
8. Are proper BOD bottles used--250-300 mL (or 125 mL for Hach kit)?	✓		
Sealable?	✓		
9. Is incubator set at 20 ± 1° C?	✓		19.5°C ~~No Certified Thermometer~~
10. Is incubator thermometer certified to ± 1° C?		✓	No Certified Thermometer
11. Is buffer added to dilution water only on day of used?	✓		
12. Is buffer stored in refrigerator?		✓	
13. Is deionized or distilled water used for dilution water?	✓		Barnsted SS Still

Laboratory Longview Fibre Co.

Date 5/11/90

	YES	NO	COMMENT
14. Is dilution water protected from atmospheric contamination?		✓	Not Stored
15. Are dilution water blanks analyzed?	✓		
16. Is the blank depletion less than 0.2 mg/L?	✓		
17. Are BOD bottles and glassware cleaned with non-phosphate detergent and acid rinsed?		✓	Use Acid-Dichromate
18. Are samples neutralized to pH 6.5 - 7.5?	✓		Don't usually need adjustment
19. Is nitrification inhibitor added to dilution water or sample?		✓	
20. Are reagents for dilution water properly prepared-- Ferric chloride (0.25 g/L)?	✓		
Magnesium sulfate (22.5 g/L)?	✓		
Calcium chloride (27.5 g/L)?	✓		
Sodium sulfite (1.575 g/L), prepared daily?			Not Used
21. Are samples brought to 20 ± 1 deg C before dilution?			
22. Is reference solution (150 mg each of glucose & glutamic acid diluted w/distilled water to 1 L) run with each batch of samples?	✓		
23. Are BOD's of the reference solution 200 ± 37 mg/L?	✓		
24. If residual chlorine is present, is chlorine removed with sodium sulfite and are samples properly seeded?		✓	Cl_2 is diluted by WTP effluent.
Source of seed----------final effluent from WWTP	✓		∴ no seed added to effluent samples.
Artificial seed (e.g., Polybac)			
Frozen sewage			
Other			
25. Are proper dilution techniques used?	✓		4 Dilutions/Sample
26. Do dilutions have depletions of at least 2 mg/L?	✓		Range 11-20
27. Are samples incubated for 5 days?	✓		
29. Are calculations completed properly?	✓		

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	YES	NO	COMMENT
30. Are records properly authenticated (i.e., signed/initialled by analyst and one other)?			
31. Are QC samples analyzed regularly?	✓		Sugar Std., 4 Dilutions/ Sample, Dilution H_2O blanks
32. Is precision control chart available and used?		✓	

$$\text{BOD in mg/L} = \frac{D1 - D2}{P}, \text{ or if seeded, } \frac{(D1 - D2) - (B1 - B2)f}{P}$$

where ~~D1 = DO of~~ sample after preparation, mg/L
D2 = DO of sample after incubation
B1 = DO of seed control before incubation
B2 = DO of seed control after incubation

P = decimal volumetric fraction of sample used
f = ratio of seed in sample to seed in control
(i.e., % seed in D/% seed in B)

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HYDROGEN ION (pH) CHECKSHEET

(Std Meth 423)

	YES	NO	COMMENTS
1. Is approved method followed? Method SM 423			N/A
2. Is pH meter adequate (i.e., clean, functioning properly)?	✓		
3. Are electrodes stored according to manufacturers recommendations?	✓		
4. Are electrodes properly filled with electrolyte?	✓		
5. Are at least two buffers used to calibrate the meter?	✓		pH 4 & 7
6. Do buffers bracket the expected sample pH?	✓		effluent is pH 6-7
7. Are fresh buffers used daily?		✓	all pH meters are checked monthly.
8. Are buffer solutions (bulk) replaced at least every four weeks?	✓		Weekly
9. Are polyethylene or TFE beakers used?		✓	use glass
10. Is plastic-coated stirrer used?		✓	No stirrer is used
11. Is temperature of buffer and sample measured and recorded and are they the same?		✓	pH meter has auto. Temp. Compensation ~~[illegible]~~
12. Are buffer solutions replaced periodically (at least every 4 weeks)?	✓		
13. Is temperature compensation used? Manual ____ Automatic ✓	✓		
14. Are samples analyzed as soon as possible after being brought to the lab?			pH for DMRs is measured by the continuous monitor.
15. Are records properly authenticated (i.e., checked and signed/initialled by analyst and one other)?			
16. Are QC samples analyzed regularly?	✓		Continuous Monitor is checked monthly
17. Is precision control chart available and used?		✓	

TSS CHECKSHEET

1703CHEK.SHT
3/20/90

Laboratory Longview Fibre Co.

Person Interviewed Dave, Hank, ~~Betty~~ Judy

Date of Audit 5/11/90

Auditor S. M. Lombard

Ref: SM (16th ed) 209C and (17th ed) 2540D; EPA 160.2	YES	NO	COMMENTS
1. Is approved method followed? Method 209C	✓		
2. Is apparatus adequate (i.e., clean, functioning properly)?			
Balance?	✓		
Funnel?			
Filters?			
Suction device?			
Oven (including thermometer)?	✓		
Dessicator (dessicant dry)?	✓		
3. Is glass fiber filter used?	✓		
4. Is filter properly prewashed?	✓		
5. Following filtration, is filter properly rinsed?	✓		
6. Is residue dried at 103-5° C?	✓		
7. Is residue dried for one hour or at least to constant weight?	✓		should spot check for constant wt.
8. Are samples stored in a refrigerator at 4° C?	✓		
9. Are samples analyzed within seven days?	✓		
10. Are calculations completed properly?	✓		
11. Are records properly authenticated (i.e., checked and signed/ initialled by analyst and one other)?			
12. Are QC samples analyzed regularly?			No dups. or Stds. 3 P.E. samples/yr.
13. Is precision control chart available and used?		✓	

TSS (in mg/L) = [(A - B) x 1000]/sample volume (mL)
where A = weight of filter + residue (mg)
and B = weight of filter (mg)