A Department of Ecology Report

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Spokane River Basin Class II Inspection at the Inland Empire Paper Company Wastewater Treatment Plant

Abstract

Announced Basin Class II inspections were conducted at two municipal wastewater treatment plants (WWTPs) and three industrial WWTPs including Inland Empire Paper Company in the Spokane River Basin on March 22-24, 1993. A separate inspection report was written for each discharger in the basin. This report is based on the inspection conducted at the Inland Empire Paper Company's WWTP. The effluent treatment system was operating well at the time of inspection and met permit requirements for five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH. Effluent had very high fecal coliform counts, comprised mostly of Klebsiella. These high bacterial counts suggest possible violations of the state Class A water quality standard, even if a chronic mixing zone is provided. A number of metals, including copper and zinc, were detected in the effluent. The copper concentration exceeded both acute and chronic water quality criteria. A concurrent metals study is progressing in the Spokane River Basin, and it should be consulted for insight concerning potential effluent metals toxicity to the receiving water.

Introduction

Announced Basin Class II inspections were conducted at two municipal and three industrial WWTPs in the Spokane River Basin on March 22-24, 1993. Entities operating the plants are as follows: City of Spokane, Liberty Lake Sewer District, Inland Empire Paper Company (IEP), Kaiser Aluminum, and Spokane Industrial Park. These Basin Class II inspections are done in support of an emerging concept within the Department of Ecology to conduct activities on a coordinated geographic basis. This concept is referred to as the Basin (Watershed) Approach to environmental management. Figure 1 is a map showing locations of the five WWTPs.

Conducting the inspection were Rebecca Inman and Tapas Das of the Environmental Investigations and Laboratory Services Program's Watershed Assessments Section. Patrick Hallinan and Kenneth Merrill of Ecology's Eastern Regional Office (ERO) were present to observe the inspections. The data obtained from these basin inspections will subsequently support the Spokane River total maximum daily load (TMDL) study. A concurrent metals study is also progressing in the Basin (Pelletier, in prep.).

A separate Class II inspection report was written for each discharger. This report is based on the inspection conducted at the Inland Empire Paper Company's WWTP. Rick Fink, technical superintendent, provided assistance during the inspection.

by Tapas Das
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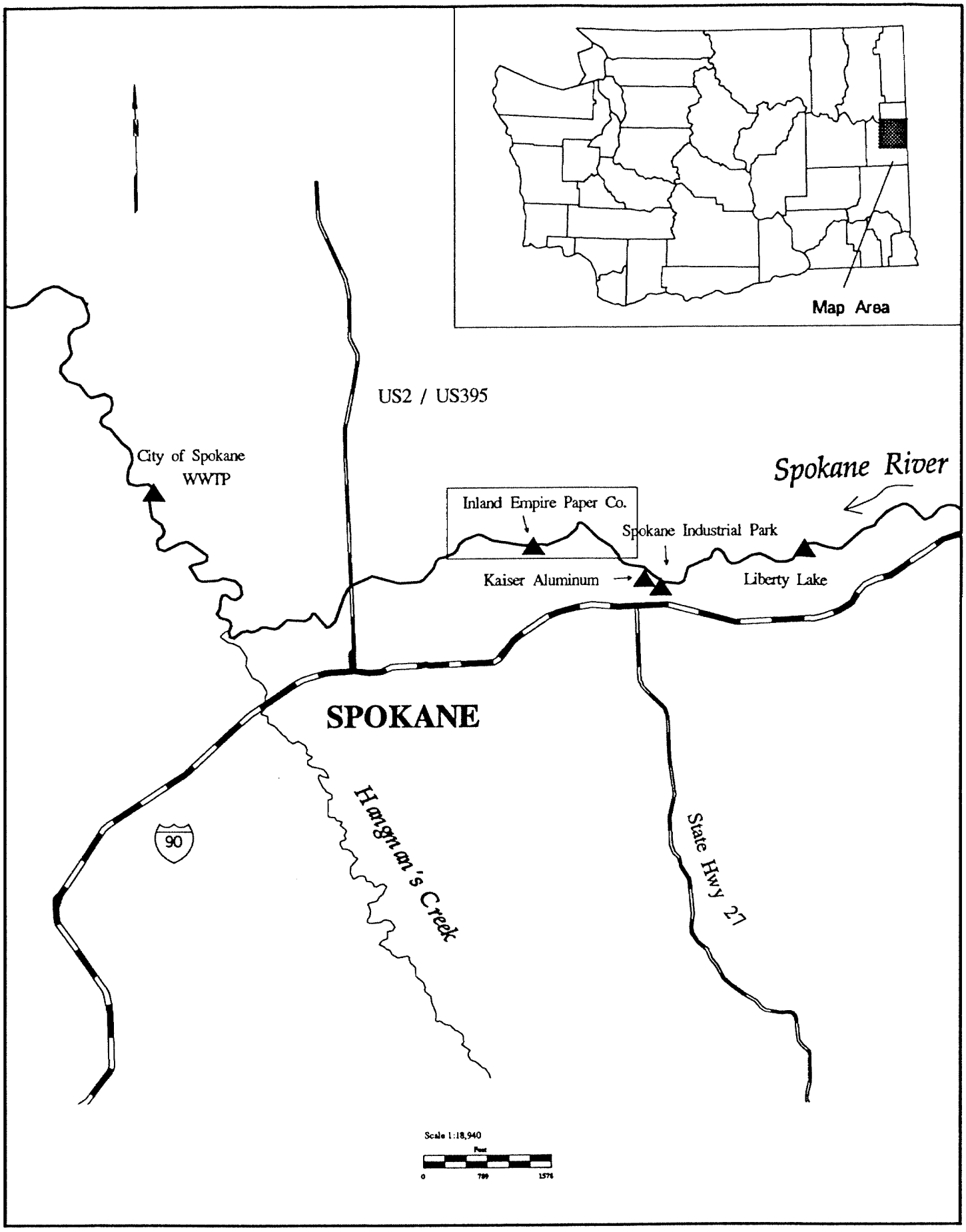

Figure 1. Locations of Five WWTPs - Spokane River Basin Class II Inspection, 3/93

Objectives

1. verify compliance with NPDES permit limits;
2. provide effluent data (including metals) to support the Spokane River TMDL assessment; and
3. evaluate the permittee's sampling and testing procedures by conducting sample splits.

Inland Empire Paper Company operates a groundwood pulp mill and newsprint paper mill in Millwood (northeast of Spokane), Washington. Pulp is produced by the Groundwood CMN (coarse molded news) process, the Groundwood CMP (chemi-mechanical pulp) process, and ONP (old newspapers) Deinking pulp process. IEP's latest addition of the ONP Deinking plant makes use of recycled fiber in the paper making process. The mill's maximum total paper production is 293 tons per day.

The wastewater treatment system at the IEP mill consists of the following: a mechanically cleaned coarse screen bar rack, a wastewater pump station, a primary clarifier, an Envirex Orbal aeration basin, and a secondary clarifier (Figure 2). All process wastewater generated at the mill receives primary treatment at the primary clarifier except Deinking facility wastewater which goes first to a dissolved-air-floatation system (not shown in Figure 2) and then to the Orbal aeration basin. A Parshall flume measures the effluent flow from the secondary clarifier. Primary and secondary sludge(s) are thickened and dewatered separately, and then combined sludge is burned in a fluidized bed boiler. The Inland Empire Paper Company is authorized to discharge treated effluent to the river under NPDES Permit No. WA-000082-5, which will expire on February 5, 1997. The permit has two sets of limitations on conventional parameters during: 1) July 1 through September 30; and 2) October 1 through June 30. The permit also contains an additional limit on total phosphorus which is in effect only during the time period of June 1 through October 31 (Ecology, 1992a).

Procedures

A sampling location is shown in Figure 2. A summary of the analytical methods and laboratories conducting the analyses is given in Table 1. Standard operating procedures (SOPs) which are routinely employed when conducting Basin Class II inspections and when preserving and analyzing the samples are provided in the Ecology document Quality Assurance Project Plan for Basin Class II Inspections (Glenn, in prep.). The following procedures were exceptions to those SOP's (asterisks denotes QAPP changes made at the request of the client):

1) no influent samples were collected during the inspection. The current permit doesn't specify any requirement for routine influent sampling (Ecology, 1992a);
*2) several standard influent and effluent parameters were not analyzed for;
*3) eight selected priority pollutant metals were analyzed by the total recoverable method;
4) rinsate blank was not prepared at this site, but at another WWTP during the Basin Class II inspections;
*5) no duplicates were collected for effluent parameters;
6) ortho-phosphate samples were filtered in the field rather than at the Manchester Lab;
7) instantaneous flow verification was not done during the inspection because of the logistics of moving among the five WWTPs each day; and
8) the composited sample was not maintained at 4°C. For this reason general chemistry results should be used with some caution.

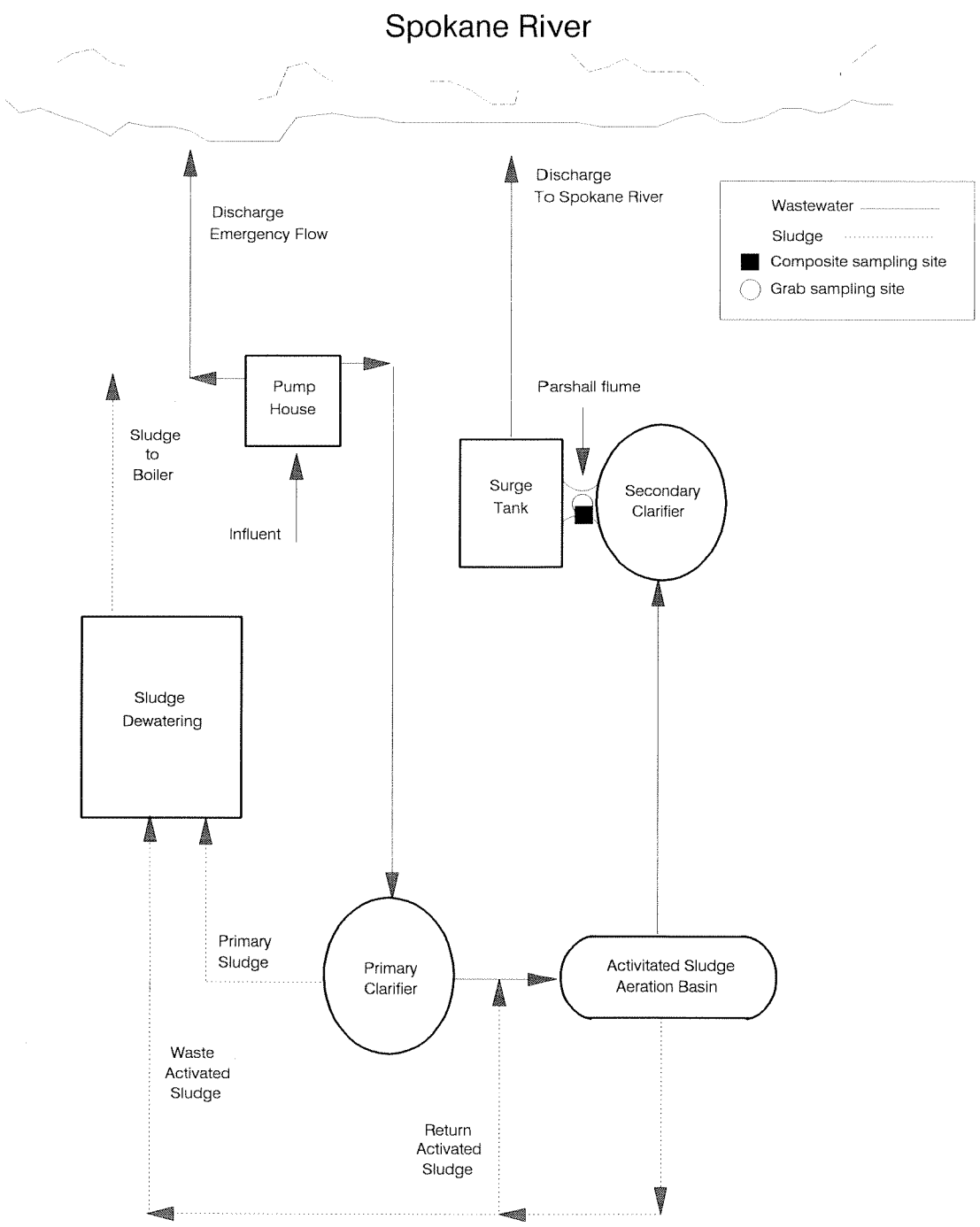

Figure 2. Schematic Diagram of Inland Empire Paper Company WWTP Showing Ecology's Sampling Sites, 3/93

Table 1. Analytical Methods and Laboratories Used, Inland Empire Paper Company WWTP - Spokane River Basin Class II Inspections, 3/93

Parameter	Method	Lab used
Turbidity	EPA, 1983: 180.1	Ecology; Manchester, WA
Conductivity	EPA, 1983: 120.1	Ecology; Manchester, WA
Alkalinity	EPA, 1983: 310.1	Ecology; Manchester, WA
Hardness	EPA, 1983: 130.2	Ecology; Manchester, WA
SOLIDS4		
TS	EPA, 1983: 160.3	Ecology; Manchester, WA
TNVS	EPA, 1983: 106.4	Ecology; Manchester, WA
TSS	EPA, 1983: 160.2	Ecology; Manchester, WA
TNVSS	EPA, 1983: 106.4	Ecology; Manchester, WA
BOD5	EPA, 1983: 405.1	Ecology; Manchester, WA
TOC	EPA, 1983: 415.2	Ecology; Manchester, WA
NUTRIENTS		
NH3-N	EPA, 1983: 350.1	Ecology; Manchester, WA
NO2+NO3-N	EPA, 1983: 353.2	Ecology; Manchester, WA
T-phosphate	EPA, 1983: 365.1	Ecology; Manchester, WA
O-phosphate	EPA, 1983: 365.3	Ecology; Manchester, WA
Total Kjeldahl nitrogen	EPA, 1983: 351.4	Analytical Resources Inc.; Seattle, WA
Fecal coliform (MF)	APHA, 1989:9222D	Ecology; Manchester, WA
% Klebsiella	APHA, 1989:9222F	Ecology; Manchester, WA
Oil and grease	EPA, 1983: 413.1	Ecology; Manchester, WA
METALS		
Cr;Cu;Ni;Zn	EPA, 1983: 200.7	Ecology; Manchester, WA
Hg	EPA, 1983: 245.5	Ecology; Manchester, WA
Ag	EPA, 1983: EP1-272.2	Ecology; Manchester, WA
Cd	EPA, 1983: EP1-213.2	Ecology; Manchester, WA
Pb	EPA, 1983: EP1-239.2	Ecology; Manchester, WA

Results and Discussion

General chemistry results are tabulated in Table 2. Effluent composite results should be interpreted with caution since composite sample temperatures exceeded 4°C. The wastewater treatment plant performed well during the inspection; BOD_5 and TSS results indicated a well-treated effluent. However, two separate grab sample results from the final effluent indicated that the mill was discharging high concentrations of fecal coliform bacteria. Counts were 5,000 and 15,000 #/100 mL, with Klebsiella reported to be 80% and 43% of these totals, respectively. These results suggest possible violations of the state Class A water quality standard, even if a chronic mixing zone is provided. The Class A criterion is a geometric mean of 100 #/100 mL. High fecal coliform counts (due to the presence of Klebsiella) are common in pulp mill effluent. A similar finding was reported in the previous Class II inspection at the IEP pulp mill (Das and Zinner, 1991).

A comparison of effluent results to NPDES permit limits is presented in Table 3. The plant's totalizer readings for a 24-hour time period (March 22-23) indicated a flow of 3.39 MGD; this flow was used to calculate effluent mass loadings for comparison to permit limits. Effluent met all three permit limits (BOD_5, TSS, and pH) at the time of inspection.

Metals results are presented in Table 4. All metals were analyzed by the total recoverable method. The water quality criteria for metals were calculated using a receiving water hardness of 28.5 mg/L as $CaCO_3$ (Pelletier, in prep.). Among eight metals analyzed, copper and zinc were detected in the effluent. The copper concentration (10 μg/L) exceeded both acute and chronic water quality criteria (Ecology, 1992b). Concern over copper toxicities would be minimized by a dilution factor of 2:1 at the edge of the acute and 3:1 at the edge of the chronic mixing zones, respectively. The potential impact of these metals on the receiving water will be evaluated by Pelletier (in prep.).

Table 5 compares results of analyses performed by IEP and Ecology on splits of the same samples. TSS and total phosphorus results showed very good agreement. The difference between BOD_5 results was 35%, but this is not considered significant (Glenn, in prep.). Temperatures of both composited samples were above the recommended 4°C (APHA, 1989).

Conclusions and Recommendations

1. The wastewater treatment plant performed well during the inspection. Conventional parameters indicated a well-treated, high quality effluent; the mill was meeting permit limits for BOD_5, TSS, and pH during the inspection.
2. Fecal coliform counts in the effluent were 5,000 #/100 mL and 15,000 #/100 mL, comprised of 80% and 43% Klebsiella, respectively. These concentrations of fecal coliform bacteria suggest possible violations of the state Class A water quality standard, even if a chronic mixing zone is provided. It is recommended that regular monitoring for fecal coliform/Klebsiella bacteria be initiated, that the next reissuance of the permit contain an effluent limitation for fecal coliform, and that a chronic mixing zone be considered.
3. Copper and zinc were detected in the effluent. The copper concentration exceeded acute and chronic water quality criteria. The Spokane River metals study (Pelletier, in prep.) should be consulted to address potential concern about metal toxicity.
4. Both Ecology's and discharger's effluent composite sample temperatures were higher than the recommended 4°C. The plant's sample cooler should be inspected and adjusted as necessary to provide better sample cooling. Also, Ecology's composite sampler should be more frequently re-iced, especially when high-temperature effluent is encountered.

Table 2. General Chemistry Results, Inland Empire Paper Company WWTP - Spokane River Basin Class Inspection, 9/93
(Effluent Composite Results Should be Interpreted with Caution since Composite Sample Temperatures Exceeded 4°C).

	Station:	Eff-E	Eff-IEP	Eff-1	Eff-2	Blank
	Type:	comp	comp	grab	grab	rinsate
	Date:	3/22-23	3/22-23	3/22	3/23	3/23
	Time:	1030-1030	1030-1030	1100	1130	1830
Parameter	Lab ID#138	-38	-39	-37	-40	-41
Turbidity (NTU)		3.7	3.6			
Conductivity (µmhos/cm)		968	980			
Alkalinity (mg/L)		94.1	92.4			
Hardness (mg/L CaCO3)		121	121			
TS (mg/L)		730				
TNVS (mg/L)		607				
TSS (mg/L)		4	4			
TNVSS (mg/L)		1				
BOD5 (mg/L)		9	---*			
TOC (mg/L)		33.6	32.3			
NH3-N (mg/L)		0.02	0.01			
NO2 + NO3-N (mg/L)		0.04	0.01			
Total Phosphate (mg/L)		0.30	0.28			
Ortho-Phosphate (mg/L)		0.15	0.19			0.06
TKN (mg/L)		0.90	0.97			
Oil & Grease (mg/L)				2	2	
F-Coliform MF (#/100 mL)				5,000	15,000	
% Klebsiella				80	43	
FIELD OBSERVATIONS						
Flow (MGD)		3.39 + +				
Temperature (°C)		8.3 +	12.2 +	29.7	29.9	
pH (S.U.)				6.7	8.0	
Conductivity (µmhos/cm)		985	990	990	955	

Eff - Effluent, E - Ecology sample, IEP - Inland Empire Paper Company sample

---* IEP did not provide enough sample to analyze this parameter.

\+ Iced composite sample.

\+ + Flow was obtained from plant's totalizer for a 24-hour time period (3/22-23).

Table 3. Comparison of Inspection Results to NPDES Permit Limits, Inland Empire Paper Company – Spokane River Basin Class II Inspections, 3/93

Effluent Parameter	NPDES Permit Daily Limit++		Inspection Data	Derived Loadings
	Average*	Maximum**	Composite sample	
BOD5	2,820 lbs	5,370 lbs	9 mg/L	254 lbs
TSS	4,525 lbs	8,450 lbs	4 mg/L	113 lbs
			Grab Sample	
pH		5.0 ≤ pH ≤ 9.0 S.U.	6.7;8.0	--
Flow	---		3.39 MGD+	--

* The daily average is defined as the average of the measured values obtained each day over a calendar month.

** The daily maximum is defined as the greatest allowable value for any calendar day.

\+ Flow obtained from plant's totalizer for a 24-hour time period.

++ October through June limitations.

Table 4. Results of Metals Analyses, Inland Empire Paper Company WWTP - Spokane River Basin Class II Inspections, 3/93

	Station:	Eff-E		
	Type:	comp	Water Quality Criteria (µg/L)	
	Date:	3/22-23	Freshwater	
	Time:	1030-1030		
	Lab ID#:	138238	Acute	Chronic
Metals tot rec (µg/L)				
Cadmium		<0.10 J	1*	0.4*
Chromium		<5	16	11
Copper		10 P	5*	4*
Lead		<1	17*	0.6*
Mercury		<0.05 J	2.4	0.012
Nickel		<10	490*	55*
Silver		<3	0.5*	0.12
Zinc		19 J	40*	37*

Eff - Effluent, E - Ecology sample

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

P - The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.

* Receiving water hardness dependent criteria (based on 28.5 mg/L as CaCO3)(EPA, 1986).

Shaded area denotes metal detected.

Table 5. Comparison of Laboratory Result of Sample Splits, Inland Empire Paper Company WWTP - Spokane River Basin Class II Inspections, 3/93

Station:	Eff-E		Eff-IEP	
Lab ID#:	138238		138239	
Date:	3/22-23		3/22-23	
Sampler:	Ecology		IEP	
Laboratory:	Ecology	WWTP	Ecology	WWTP
BOD5 (mg/L)	9	14	---*	17
TSS (mg/L)	4	4	4	4
T-Phosphorus (mg/L)	0.30	0.31	0.28	---**

Eff - Effluent, E - Ecology sample, IEP - Inland Empire Paper Company sample
---* IEP did not provide enough sample to analyze this parameter.
---** IEP did not analyze this parameter.

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