PROJECT SUMMARY FOR COLUMBIA ALUMINUM COMPANY, GOLDENDALE, WASHINGTON CLASS II INSPECTION, MAY 1991

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ABSTRACT

A Class II Inspection was conducted in May 1991, at the Columbia Aluminum primary aluminum smelter in Goldendale. Samples were collected from the three permitted discharges. Nearby surface water sites were also sampled. NPDES permit compliance was good during the inspection. No toxicity was observed in the effluent using Microtox®, rainbow trout, fathead minnow, *Daphnia magna*, and *Ceriodaphnia dubia*. Growth of the algae, *Selenastrum capricornutum* was inhibited at effluent concentrations above 25 percent.

INTRODUCTION

The Washington State Department of Ecology (Ecology) conducted a Class II Inspection at the Columbia Aluminum Company (Columbia) smelting operations near Goldendale, Washington, on May 6-8, 1991. Conducting the inspection were Jeanne Andreasson, Norm Glenn, and Rebecca Inman from the Ecology Compliance Monitoring Section and Wayne Wooster of the Ecology Industrial Section. Perry Brake and Dale van Donsel from Ecology's Quality Assurance Section evaluated the mill's laboratory procedures. Representing Columbia were Fred Rufner, Environmental Manager, and Lester McCoy, Laboratory Manager. The discharge is limited by NPDES Permit No. WA-000054-0. The permit was issued July 2, 1990, and expires July 2, 1995.

The Columbia Aluminum facility is located on the north side of the Columbia River, approximately one mile northeast of the John Day Dam, and nine miles south of Goldendale (Figure 1). Industrial activities include primary aluminum smelting, carbon paste production, and casting operations.

Wastewater sources include wet air pollution control process wastewater, contact and non-contact cooling water, sanitary wastewater, and stormwater runoff (Figure 2). Wastewater treatment units include:

1. A tertiary wastewater treatment plant (WTP) to treat scrubber water blowdown water using a lime and settle system (outfall 001A);

2. A stormwater basin;

3. An activated sludge package plant to treat sanitary wastes (outfall 001B); and

4. A series of four settling ponds (A,B,C, and D). The WTP effluent enters Pond A while stormwater basin and STP flows enter between Ponds B and C. Discharge is from Pond D (outfall 001).

The total flow is measured at a weir at the inlet to Pond C. In May 1991, construction was about to begin on a new flow measuring weir at the Pond D outlet. Discharge is into the Columbia River approximately one mile upstream from the John Day Dam at river mile 216.7.

Underflow from the WTP and the SO_2 scrubbers bleed stream were routed to the west surface impoundment (WSI) for disposal at the time of the inspection. Presently, the SO_2 scrubbers bleed stream is routed to the WTP for treatment and the WTP underflow is dewatered using a filter press. Future plans call for closure of the WSI.

The inspection had six objectives, which were:

1. Assess plant compliance with existing NPDES permit effluent limits at outfall 001, 001A and 001B;

2. Compare pollutant concentrations at the inlet to Pond C and the outlet from Pond D (outfall 001);

3. Evaluate outfall 001 effluent toxicity using a suite of acute and chronic bioassays; and

4. Evaluate the waste streams discharging to the West Surface Impoundment (WSI) for fluoride, cyanide, aluminum, antimony, nickel and polynuclear aromatic hydrocarbons (PAHs), and conduct Hazardous Waste designation bioassays (trout) on these waste streams.

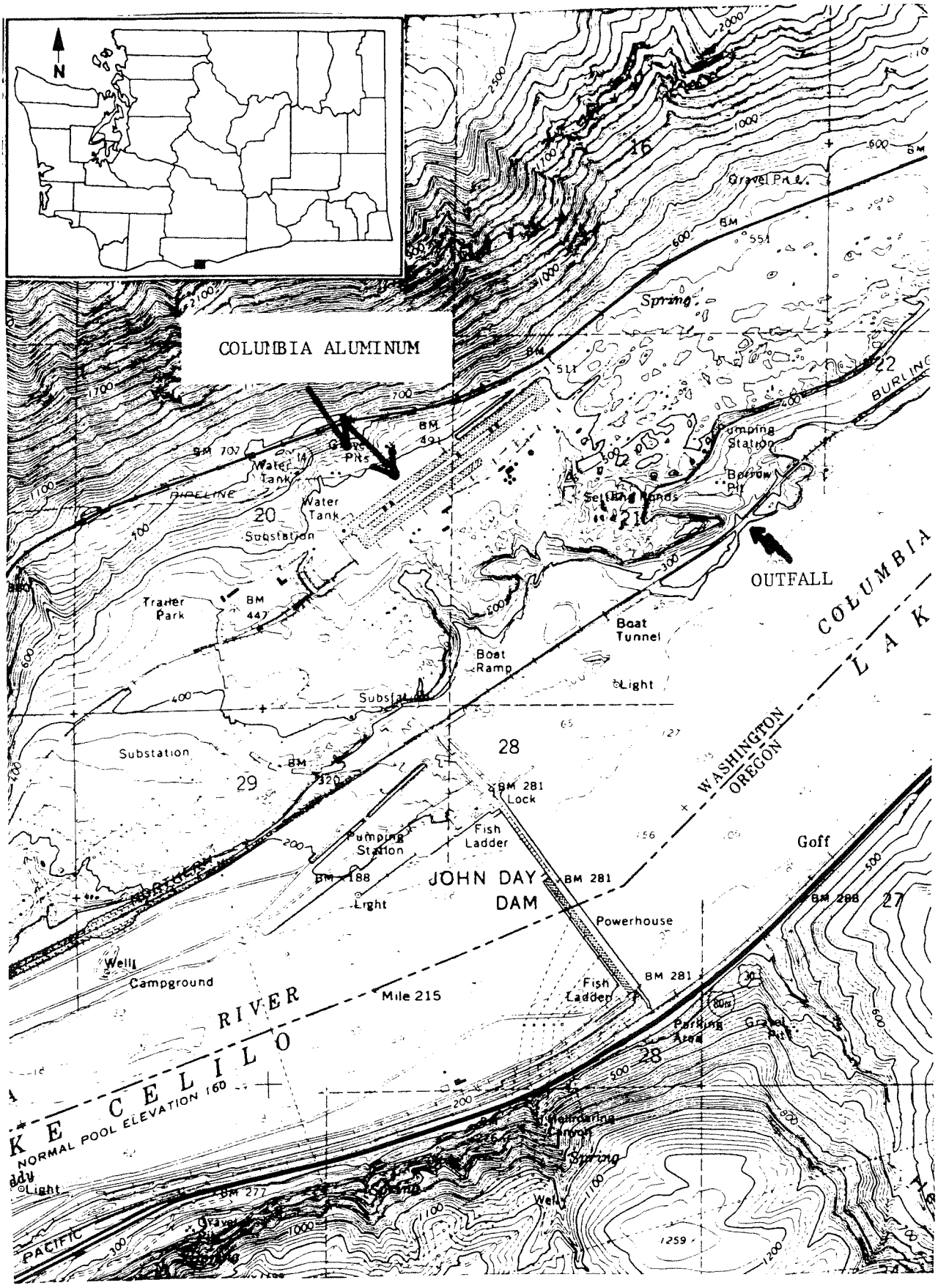

Figure 1. Location Map - Columbia Aluminum, Goldendale - May 1991.

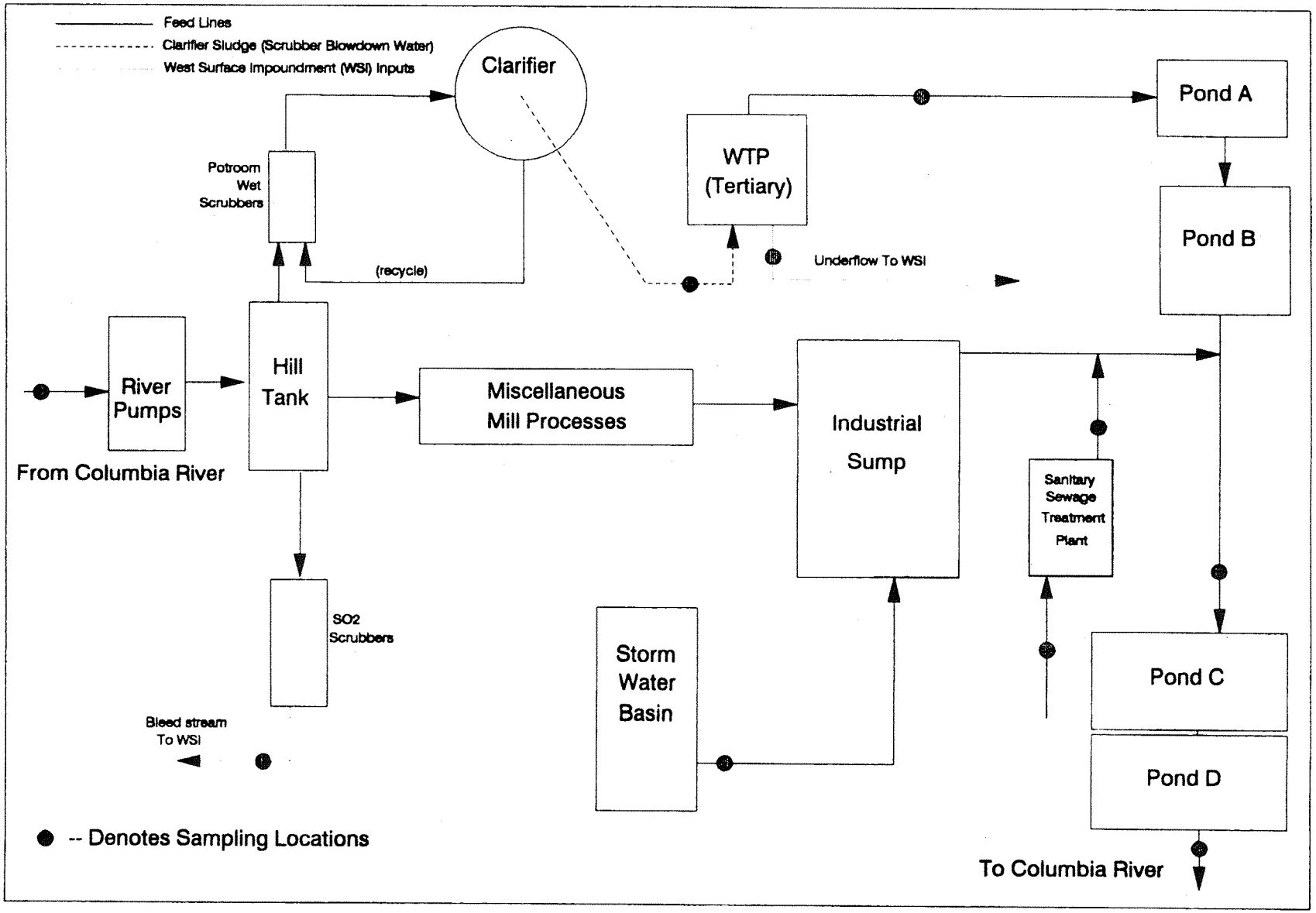

Figure 2 - Sampling Locations - Columbia Aluminum - May 1991.

5. Evaluate samples of surface water (the west rivulet and wildlife management area) and the stormwater basin for fluoride, cyanide, sulfate, aluminum, antimony, nickel and PAH contamination.

6. Review lab procedures at the mill to determine adherence to accepted protocols. Samples for permit parameter analysis were split with the permittee to determine the comparability of Ecology and permittee laboratory results.

METHODS

Ecology collected both composite and grab samples during the inspection. Composite samples of the mill intake, WTP influent, WTP effluent, sanitary influent, sanitary effluent, Pond C inlet, and Pond D effluent (outfall 001) were collected (Figure 2). Ecology Isco® composite samplers were set to collect equal volumes of sample every 30 minutes for 24 hours. Sample collection jugs were iced to cool samples as they were collected. Prior to the inspection the sanitary plant sampling equipment was cleaned using procedures for non-priority pollutant sampling. All other sampling equipment was cleaned using the priority pollutant cleaning procedures (Appendix A).

Ecology grab samples were also collected at most of the composite sampling stations. Additional grab sample sites included the WTP underflow, SO_2 scrubbers bleed stream, the storm water basin, the west rivulet, and the wildlife management area. Also, three grab samples of Pond D effluent were composited for bioassay tests.

Columbia collected typical permit monitoring samples during the inspection.

Sampling times, parameters analyzed, and sample splits are summarized in Appendix B. All samples for Ecology analysis were kept on ice and delivered to the Ecology Manchester Laboratory. A summary of the analytical methods and the laboratory conducting the analysis is provided in Appendix C.

An attempt was made to collect river sediments near the outfall. High winds made navigation difficult and prevented finding the exact location of the discharge. Columbia personnel indicated sediment deposition was minimal near the outfall. Because of the poor weather conditions and the information provided by Columbia, sediment collection as part of the inspection was canceled.

Data Quality Assurance

Sampling

Field transfer results were used to evaluate possible contamination by sampling equipment. Base-neutral-acid extractables (BNAs), pesticide/polychlorinated biphenyls (PCBs), polynuclear

aromatic hydrocarbons (PAHs), total cyanide, weak and dissociable cyanide, fluoride, and metals transfer blanks were prepared by first pumping a 1-liter rinse of deionized organic-free water (obtained from the Ecology Manchester Laboratory prior to the inspection) through a clean compositor. After discarding the rinse, about 10 liters of the water was pumped through the compositor and transferred to appropriate sample containers. Volatile organics (VOA) blanks were prepared by transferring deionized organic free water directly into sample containers.

No BNAs, pesticide/PCBs, PAHS, cyanide, or fluoride were detected in the transfer blank.

Low levels (estimated) of two common organic laboratory solvents, methylene chloride (1 μg/L) and acetone (8 μg/L) were detected in the transfer blank VOA scan.

Total metals analysis indicated the presence of zinc (7.4 μg/L-estimated), iron (25 μg/L), manganese (1.1 μg/L-estimated), and tin (4.9 μg/L-estimated) in the transfer blank (Appendix D-2). Iron and tin were also detected in the laboratory method blank for total metals at 3.3 μg/L-estimated and 4.0 μg/L-estimated, respectively, suggesting that the contamination in the transfer blank may have occurred at the laboratory.

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 Kirchmer (1988), and Huntamer and Smith (1988). Recommended holding times were met for all analyses with the exception of PAHs. With one exception, these samples were extracted one to two days after the pre-analytical holding time. Some of the analyses were performed fifteen to eighteen days after the extraction to analysis holding time (Appendix E).

The PAH holding times are set only as guidelines. Considering that the work was performed reasonably close to the holding time, it is doubtful that exceeding the holding time has had a significant effect upon the results (Magoon, 1991).

Matrix Spike/Matrix Spike Duplicate Analysis

Organics

All VOA, BNA, and pesticide/PCB MS/MSD results were within the EPA Contract Laboratory Program (CLP) established QC limits for percent recovery and relative percent difference (RPD). MS/MSD results for PAHs were reasonable and acceptable. No QC limits have been established for the PAH analytical method.

Metals

Total metals analysis: Spike recoveries were low for cadmium, selenium, and thallium. The RPD for thallium was also poor. No recovery data were reported for tin.

Total recoverable metals analysis: Spike recoveries were low for arsenic and cadmium, and high for selenium.

N qualifiers have been added to the sample results of metals that exceeded QC limits.

Surrogate Standard Recoveries

All VOA, BNA and pesticide/PCB surrogate standard recoveries were within the established CLP QC limits. With a few exceptions, PAH surrogate recoveries for samples, matrix spikes and the method blank are reasonable and acceptable.

Effluent Bioassays

Microtox®, rainbow trout, fathead minnow, *Daphnia magna*, *Ceriodaphnia dubia*, and *Selenastrum capricornutum* bioassay laboratory control and reference toxicant results were acceptable. Control reproduction for *Daphnia magna* and *Ceriodaphnia dubia* on day 7 of the tests were not sufficient for test validation. In order to provide sufficient broods, the tests were extended to day 8.

RESULTS AND DISCUSSION

General Chemistry results for all stations and a complete listing of organic and metal analytes, results, and detection limits is included in Appendix D.

Comparison of Inspection Results to NPDES Permit Requirements

Columbia was operating well within the permit requirements for all permit parameters at outfalls 001, 001A and 001B (Table 1).

Comparison of Pond C and Pond D Pollutant Concentrations

General chemistry parameters were fairly consistent through Ponds C and D (Table 2). PAH concentrations were consistently lower in the Pond D outlet than the Pond C inlet (Table 2) as were the total recoverable metals concentrations (Table 3). None of the pollutants detected in Pond D exceeded the EPA Water Quality Criteria for freshwater (EPA, 1986).

Effluent Bioassays

No acute effluent toxicity was observed in the Microtox®, rainbow trout, fathead minnow and *Daphnia magna* bioassays (Table 4). Chronic bioassays also revealed no effluent toxicity to either *Daphnia magna* or *Ceriodaphnia dubia*, with both organisms showing no observed effect concentrations (NOECs) of 100% for both survival and reproduction.

Table 1. NPDES Permit Limits and Inspection Results - Columbia Aluminum - May 1991.

Outfall 001

Parameter	Monthly Average	Daily Maximum	Inspection results +	
Aluminum (lbs/day)	18.0	40.0	4.8	*
TSS (lbs/day)	250.0	500.0	99.4	U
Fluoride (lbs/day)	160.0	350.0	61.3	*
Oil & Grease (lbs/day)	150.0	350.0	99.4	U
Benzo(a)Pyrene (lbs/day)	0.05	0.10	0.01	J**
Antimony (lbs/day)	5.6	12.6	3.0	U
Nickel (lbs/day)	2.4	3.6	1.0	U
pH	7.0 to 10.0 at all times		8.4; 8.7	
Salmonid bioassay (% survival)	80% (in 100% effluent)		96.7	
Flow (MGD)			11.92	***

Outfall 001A

Parameter	Monthly Average	Daily Maximum	Inspection results +	
TSS (lbs/day)	50.0	100.0	1.0	
Fluoride (lbs/day)	25.0	50.0	9.2	
Benzo(a)Pyrene (lbs/day)	0.03	0.06	0.002	J**
Flow (gallons/day)			62,000	***

Outfall 001B

Parameter	30-Day Average	7-Day Average	Inspection results +	
BOD5 (mg/L)	25.0	45.0	4	
(% Removal)	85		95	
TSS (mg/L)	30.0	45.0	7	
(% Removal)	85		92	
Residual Chlorine (mg/L)	0.1 to 2.5		1.0; 1.3	
Fecal Coliform (organisms/100 mL)	200	400	1	
pH	6.0 to 9.0 at all times		6.7; 6.9	
Flow (gallons/day)			37,300	***

\+ Ecology laboratory analysis of Ecology samples
* Corrected for Mill Intake water.
** Based on PAH scan.
*** From Columbia's Records.
U The analyte was not detected at or above the reported result.
J The analyte was positively identified. The associated numerical result is an estimate.

Table 2. Comparison of General Chemistry and Organics in Settling Ponds – Columbia Aluminum – May 1991.

Station:	Mill Intake	Pond C Inlet	Pond D Effluent	EPA Water Quality Criteria+ Freshwater Acute	Chronic
General Chemistry					
Turbidity (NTU)	2.6	2.1	1.9		
pH	6.2	7.1	7.2		
Conductivity (μmhos/cm)	169	281	270		
Alkalinity (mg/L)	66.6	65.6	66.8		
Hardness (mg/L)	71.8	84.6	79.4		
Cyanide (μg/L)				22	5.2
total	10 U	10 U	10 U		
weak & dissociable	10 U	10 U	10 U		
Fluoride (mg/L)	0.147	0.725	0.764		
TSS (mg/L)	4	2	1 U		
NH3-N (mg/L)	0.010 U	0.030	0.010		
NO2+NO3-N (mg/L)	0.117	0.422	0.301		
Oil & Grease (mg/L)	1 U	1 U	1 U		
Volatile Organics (μg/L)					
Methylene Chloride					
grab 1	5 U	5 U	5 U	11,000 *(a)	
grab2		5 U	1 J	11,000 *(a)	
Acetone					
grab 1	10 U	12	7 J		
grab 2		39	9 J		
PAHs (μg/L)					
Phenanthrene	0.1 U	0.32 J	0.10 J		
Anthracene	0.1 U	0.06 J	0.1 U		
Fluoranthene	0.1 U	0.85 J	0.32 J	3,980 *	
Pyrene	0.1 U	0.63	0.15 J		
Benzo(a)anthracene	0.1 U	0.34 J	0.06 J		
Chrysene	0.1 U	0.48 J	0.10 J		
Benzo(b)Fluoranthene	0.1 U	0.80 J	0.18 J		
Benzo(k)Fluoranthene	0.1 U	0.29 J	0.06 J		
Benzo(a)Pyrene	0.1 U	0.62	0.11 J		
Dibenzo(a,h)Anthracene	0.1 U	0.19 J	0.1 U		
Benzo(ghi)Perylene	0.5 U	0.65 J	0.18 J		
Indeno(1,2,3-cd)Pyrene	0.1 U	0.43 J	0.13 J		

\+ EPA, 1986.
* Insufficient data to develop criteria. Value presented is the LOEL – Lowest observed effects level.
U The analyte was not detected at or above the reported estimated result.
J The analyte was positively identified. The associated numerical result is an estimate.
(a) Total halomethanes criteria

Table 3. Comparison of Metals in Settling Ponds – Columbia Aluminum – May 1991.

Station:	Mill intake	Pond C inlet	Pond D effluent (001)				EPA Water Quality Criteria++	
Type:	E-comp+	E-comp+	E-comp+		C-comp+			
Date:	5/7-8	5/7-8	5/7-8		5/7-8			
Time:	0800–0800	0800–0800	0800–0800		0800–0800			
Sample ID #:	198230	198245	198249		198250			
Analysis:	total	total recoverable	total	total recoverable	total	total recoverable	Freshwater Acute	Chronic
	(µg/L)						(µg/L)	
Antimony	30 U	30 U	30 U	30 U	30 U	30 U	9,000 [1]	1,600 [1]
Arsenic	2.0 U	2.0 U	[2.1] P	[2.1] PN	2.0 U	2.0 U		
Pentavalent							850 [1]	48 [1]
Trivalent							360	190
Beryllium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	130 [1]	5.3 [1]
Cadmium	2.0 UJ	2.0 U	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.7 [2]	0.9 [2]
Chromium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U		
Copper	3.0 U	[7.2] P	[7.0] P	[4.5] P	[7.1] P	[6.5] P	13 [2]	9 [2]
Lead	1.0 U	[1.4] J	1.0 U	1.0 U	1.0 U	1.0 U	54 [2]	2.1 [2]
Mercury	0.04 U	LAC	0.04 U		0.04 U		2.4	0.012
Nickel	10 U	10 U	10 U	10 U	10 U	10 U	1,072 [2]	119 [2]
Selenium	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	260	35
Silver	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	2.3 [2]	0.12
Thallium	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	1,400 [1]	40 [1]
Zinc	4.0 U	[12] PB	4.0 U	4.0 U	4.0 U	[8.6] PB	88 [2]	80 [2]
Aluminum	[46] P	[118]	[94]	[52] P				
Iron	[42]	[62.2]	[46.5]	[37.6]				1000
Manganese	[6.8] JP	[8.1] P	[8.9] P	[6.6] P				
Tin	[4.0] PB*	30 UJ	[4.1] PB*	30 UJ				

\+ E-comp indicates Ecology composite sample, C-comp indicates Columbia composite sample.
++ EPA, 1986.
[1] Insufficient data to develop criteria. Value presented is the LOEL – Lowest Observed Effect Level.
[2] Hardness dependent criteria (71.8 mg/L used).
U The analyte was not detected at or above the reported result.
UJ The analyte was not detected at or above the reported estimated result.
P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
LAC Indicates sample was lost in laboratory accident.
B Analyte was found in the analytical method blank, indicating the sample may have been contaminated.
N Indicates analyte exceeded QC limits for MS/MSD recovery or RPD.
* No MS/MSD recoveries were reported for tin.
[ ] Indicates detected metal.

Table 4. Effluent Bioassay Results - Columbia Aluminum, Goldendale - May 1991.

NOTE: all tests run with Pond D Effluent (Outfall 001): Lab Log No. 198249

Microtox - *(Photobacterium phosphoreum)*

Sample	
100% effluent	Large number of negative gammas - interpreted as a lack of toxicity
DI water blank	Large number of negative gammas - interpreted as a lack of toxicity

Rainbow trout - *(Oncorhyncus mykiss)* - 96 hour acute

Sample	% Survival
100% effluent	96.7
Control	100

Fathead minnow - *(Pimephales promelas)* - 48 hour acute

Sample	% Survival
Effluent	
10%	100
25%	100
100%	100
Control	100
	NOEC = 100%

Water flea - *(Daphnia magna)* - 48 hour acute

Sample	% Survival
Effluent	
6.25%	100
12.5%	100
25%	100
50%	100
100%	100
Control	100
	NOEC = 100%

Water flea - *(Daphnia magna)* - 7 day chronic*

Sample	% Survival	Mean Neonates/Adult
Effluent		
6.25%	90	34.8
12.5%	100	26.3
25%	100	35.5
50%	90	25.7
100.0%	100	34.8
Control	100	22.7
	NOEC = 100%	NOEC = 100%

Water flea - *(Ceriodaphnia dubia)* - 7 day chronic*

Sample	% Survival	Mean Neonates/Adult
Effluent		
6.25%	80	19.8
12.5%	90	19.1
25%	80	20.5
50%	90	20.8
100%	100	23.2
Control	80	15.7
	NOEC = 100%	NOEC = 100%

Algae - *(Selenastrum capricornutum)* - 96 hour chronic

Sample	Mean Cell Density (x10^6)	% Inhibition of Growth
Effluent		
6.25%	2.74	-9.0
12.5%	2.71	-8.0
25%	2.44	2.7
50%	2.14	14.7
100%	1.68	33.1
Control	2.51	--
		LOEC = 50%
		NOEC = 25%
		EC50 = >100%

NOEC No observed effects concentration.
EC50 Concentration at which there is a 50% effect.
LOEC Lowest observed effects concentration
* Test extended to day 8 due to insufficent number of broods for test validation.

After 96 hours, growth of the algae *Selenastrum capricornutum*, was inhibited at effluent concentrations above 25% (NOEC = 25% effluent). The EC_{50} (concentration at which there is a 50% effect) for *Selenastrum* was estimated to be >100% effluent.

Evaluation of Waste Streams Discharging to the West Surface Impoundment (WSI)

Fluoride concentrations were high in the two streams discharging to the WSI (608 mg/L in the WTP underflow and 255 mg/L in the SO_2 scrubbers bleed stream) (Table 5). The WTP underflow had a high concentration of aluminum (450 mg/L). Nickel was also high at almost 6 mg/L. The other permit parameter metal, antimony, was not detected in either the WTP underflow or the SO_2 scrubbers bleed stream. Aluminum and nickel concentrations in the SO_2 scrubbers bleed stream were 6.5 mg/L and 0.028 mg/L, respectively.

PAH levels were generally comparable in the two streams. Total PAH concentrations in the WTP underflow and SO_2 scrubbers bleed stream were 387 μg/L and 514 μg/L, respectively.

Hazardous Waste designation bioassays were conducted on rainbow trout with solutions containing 1000 parts per million (ppm) of the WTP underflow and the SO_2 scrubber bleed stream. Results were 100% survival in the SO_2 bleed stream sample and 96.7% survival in the WTP underflow sample, although the sub-lethal effects were noted in the WTP underflow sample at test termination. The lab data sheet noted fish were "stressed, disoriented, swimming vertically (on tails) and rolling, several lying motionless on bottom of each tank" (Noble, 1991).

Evaluation of Surface Water Sites and the Storm Water Basin

The on-site storm water basin and two nearby surface water sites; a rivulet and the wildlife management area (WMA), were evaluated for general chemistry parameters, permit and priority pollutant metals, and PAHs (Table 6). No cyanide (total or weak and dissociable) was detected in any sample. The storm water basin had the highest concentration of fluoride (6.40 mg/L) followed by the rivulet (3.87 mg/L) and the WMA (0.363 mg/L). For comparison, the fluoride concentration in the Columbia River mill intake water was 0.147 mg/L. The WMA had a high concentration of sulfate (908 mg/L). No fecal coliforms were found in the sample taken at the WMA.

The storm water basin had the highest concentration of aluminum (1200 μg/L) as well as measurable levels of several other metals (Table 6). Aluminum concentrations in the rivulet and WMA were much lower than the storm water basin (85 and 81 μg/L, respectively). Other metals analyses of the two surface water sites were quite similar with low levels of arsenic (2.8 and 4.9 μg/L) and zinc (6.3 μg/L at the WMA) the only other metals detected. While several PAHs were found in the storm water basin, none were detected in either surface water sample.

Table 5. Discharges to West Surface Impoundment - Columbia Aluminum - May 1991.

	WTP Underflow		SO2 Scrubbers Bleed Stream	
General Chemistry				
Hardness (NTU)	8620	IS	59.2	IS
Cyanide (µg/L)				
total	10		100	U*
weak & dissociable	10	U	100	U*
Fluoride (mg/L)	608		255	
Metals - permit parameter (µg/L)				
Aluminum	450,000		6,510	
Antimony	30	U	30	U
Nickel	5,900	E	28	P
Metals - other (µg/L)				
Arsenic	399		58	PJ
Beryllium	27.1		1.0	U
Cadmium	398	J,N	2.0	UJ
Chromium	888	E	12	P
Copper	154		10	P
Lead	232		20	U
Mercury	0.56		0.15	J
Selenium	12	P,N	30	UJ
Zinc	916		4.0	U
PAHs (µg/L)				
Acenaphthene	50	U	110	
Fluorene	4.2	J	5.0	U
Phenanthrene	64		5.8	J
Anthracene	5.0	U	3.4	J
Fluoranthene	97		120	
Pyrene	130		130	
Benzo(a)Anthracene	21	J	31	
Chrysene	38		40	
Benzo(b)Fluoranthene	25		24	
Benzo(k)Fluoranthene	3.1	J	7.7	J
Benzo(a)Pyrene	4.5	J	16	J
Benzo(ghi)Perylene	25	U	19	J
Indeno(1,2,3-cd)Pyrene	5.0	U	7.3	J
TOTAL PAHs	387	+	514	+
Hazardous Waste Designation bioassay				
% survival in 1000 ppm sample	96.7	**	100	

* Matrix interference necessitated analysis by titration.

** Data sheet noted that at test termination fish were; "stressed, dissoriented, swimming vertically (on tails) and rolling, several lying motionless on bottom of each tank" (Noble, 1991).

\+ Compounds with U qualifiers were considered equal to zero; all other qualifiers were disregarded

IS Interferring substance.

U The analyte was not detected at or above the reported result.

UJ The analyte was not detected at or above the reported estimated result.

E The reported result is an estimate because of the presence of interference.

J The analyte was positively identified. The associated numerical result is an estimate.

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

N Indicates analyted exceeded QC limits for MS/MSD recovery and/or RPD.

NR No analytical result reported due to matrix interference.

Table 6. Analysis of Surface Water Sites – Columbia Aluminum – May 1991.

	Storm Water Basin	Rivulet	Wildlife Mgmt Area
General Chemistry			
Hardness (mg/L)	90.0	208	671
Cyanide (µg/L)			
total	10 U	10 U	10 U
weak & dissociable	10 U	10 U	10 U
Fluoride (mg/L)	6.40	3.87	0.363
Sulfate (mg/L)	58.8	54.4	908
Fecal Coliform (organisms/100 mL)			1 U
Metals – permit parameter (µg/L)			
Aluminum	1200	85	81
Antimony	30 U	30 U	30 U
Nickel	16 P	10 U	10 U
Metals – other (µg/L)			
Arsenic	2.0 U	2.8 P	4.9 P
Copper	6.1 P	3.0 U	3.0 U
Lead	2.5 P	1.0 U	1.0 U
Zinc	60.3	4.0 U	6.3 P
PAHs (µg/L)			
Acenaphthene	5.1	1.0 U	1.0 U
Phenanthrene	2.7	0.1 U	0.1 U
Anthracene	0.48 J	0.1 U	0.1 U
Fluoranthene	7.9	0.1 U	0.1 U
Pyrene	5.7	0.1 U	0.1 U
Benzo(a)Anthracene	3.0	0.1 U	0.1 U
Chrysene	4.8	0.1 U	0.1 U
Benzo(b)Fluoranthene	8.2	0.1 U	0.1 U
Benzo(k)Fluoranthene	3.1	0.1 U	0.1 U
Benzo(a)Pyrene	7.1	0.1 U	0.1 U
Dibenzo(a,h)Anthracene	2.1	0.1 U	0.1 U
Benzo(ghi)Perylene	13	0.5 U	0.5 U
Indeno(1,2,3-cd)Pyrene	6.3	0.1 U	0.1 U

U The analyte was not detected at or above the reported result.

J The analyte was positively identified. The associated numerical result is an estimate.

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

Laboratory Review and Split Sample Results

Columbia laboratory procedures were reviewed by Dale van Donsel and Perry Brake of the Ecology Quality Assurance Section and were found to be very good. Their comments and recommendations are included in Appendix E.

Split sample analytical results compared well with the exception of sanitary influent TSS, BOD_5, and NH_3-N and sanitary effluent NH_3-N analyses (Table 7). Ecology had higher TSS and BOD_5 results and lower NH_3-N results than Columbia.

CONCLUSIONS

Discharge concentrations and loadings were within permit limits at all three discharges.

The Pond C inlet had higher levels of PAHs and total recoverable metals than the Pond D outlet (outfall 001) suggesting the ponds provide some treatment.

Little or no toxicity was observed in the Microtox®, rainbow trout, fathead minnow, *Daphnia magna*, or *Ceriodaphnia dubia* bioassays. Growth of the algae, *Selenastrum capricornutum* was inhibited at effluent concentrations above 25% (NOEC = 25% effluent). The EC_{50} was estimated to be >100% effluent.

Both waste streams discharging to the West Surface Impoundment (the WTP underflow and the SO_2 scrubbers bleed stream) had high fluoride, aluminum, and nickel concentrations. Total PAH concentrations in the WTP underflow and SO_2 scrubbers bleed stream were 387 µg/L and 514 µg/L, respectively. Hazardous waste designation bioassays run on 1000 ppm solutions of the two samples indicated no significant toxicity to rainbow trout, although the WTP underflow appeared to have sub-lethal effects.

Fluoride was detected in the west rivulet (3.87 mg/L) and the wildlife management area (0.363 mg/L). The sulfate concentration was high at the WMA (908 mg/L). No fecal coliform contamination was found at this site. Some metals and PAHs were found in the Storm Water Basin sample, but lower metals concentrations and no PAHs were detected in the rivulet or WMA.

Split sample analytical results compared well with the exception of sanitary influent TSS, BOD_5, and NH_3-N and sanitary effluent NH_3-N analyses.

Table 7. Comparison of Ecology and Columbia Analysis of Split Samples – Columbia Aluminum, Goldendale – May 1991.

Station:	Sanitary Influent				Sanitary Effluent (Outfall 001B)						Rivulet		WMA	
Sample Type:	E-comp+		grabs		E-comp+		C-comp+		grabs		grab		grab	
Laboratory:	Ecology	Columbia	Ecology	Columbia	Ecology	Columbia	Ecology	Columbia	Ecology	Columbia	Ecology	Columbia	Ecology	Columbia
Parameter														
BOD5 (mg/L)	74	58.10			4	4.07	4							
TSS (mg/L)	89	21.60	32; 124	36.5	7	7.20	13							
pH									6.7; 6.9	7.1	7.3	7.3	7.1	7.1
NH3-N (mg/L)	18.7	61.0			0.031	0.16			0.03; 0.04	0.12				
CL2 Residual (total-mg/L)									1.0; 1.3	0.9				
Fecal Coliform (#/100 mL)									1	0.5				
Fluoride (mg/L)											3.87	3.94	0.363	0.40

Station:	Mill Intake				WTP Effluent (Outfall 001A)				Pond D Effluent (Outfall 001)					
Sample Type:	E-comp+		grabs		E-comp+		C-comp+		E-comp+		C-comp+		grabs	
Laboratory:	Ecology	Columbia	Ecology	Columbia	Ecology	Columbia	Ecology	Columbia	Ecology	Columbia	Ecology	Columbia	Ecology	Columbia
Parameter														
TSS (mg/L)	4	2.4			2	1.4	2	4.8	1U	4.4	1	1.8		
pH	8.0			8.3									8.4; 8.7	8.3; 8.5
NH3-N (mg/L)									0.010			0.012; 0.016		0.07
Oil & Grease (mg/L)													1U; 1U	0.17; 0.17
Fluoride (mg/L)	0.147			0.13	17.7	18.0	11.9	18.1	0.764	0.78	0.784	0.81		
Benzo(a)Pyrene (µg/L)					3.1J		1.2	0.88	0.11J		0.1U	0.11		
Aluminum (µg/L)									94	72.2		50		
Nickel (µg/L)									10U	2.1	10U	2.1		
Antimony (µg/L)									30U	0.4	30U	ND		

\+ E-comp indicates Ecology composite sampler, C-comp indicates Columbia composite sampler.
U The analyte was not detected at or above the reported result.
J The analyte was positively identified. The associated numerical result is an estimate.
ND None detected.
WMA Wildlife Management Area

REFERENCES

EPA, 1986. Quality Criteria for Water, EPA 440/5-86-001. U.S. Environmental Protection Agecy1986.

Huntamer and Smith, 1988. Ecology Lab Users Manual. Washington State Department of Ecology, Manchester, WA.

Kirchmer, C., 1988. Quality Assurance Manual, Manchester Laboratory. Washington State Department of Ecology, Manchester, WA.

Magoon, S., 1991. Data Review for Columbia Aluminum Class II Inspection Polynuclear Aromatic Hydrocarbon Analysis. Washington State Department of Ecology, Manchester, WA.

Noble, S., 1991. Columbia Aluminum Results of Salmonid Bioassay. Memo to Jeanne Andreasson dated May 24, 1991.

APPENDICES

Appendix A – Equipment Cleaning Procedures – Columbia Aluminum – May 1991.

Non–Priority Pollutant Sampling Equipment

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10% Nitric Acid
4. Rinse three times with distilled/deionized water
5. Allow to dry and seal with aluminum foil

Priority Pollutant Sampling Equipment

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

Appendix B - Sampling Times and Parameters Analyzed - Columbia Aluminum, Goldendale - 5/91.

Station:	WTP Influent	WTP effluent (Outfall 001A)		Sanitary influent			Sanitary effluent (Outfall 001B)					Pond C inlet			Pond D effluent (Outfall 001)				
Type:	E–comp+	E–comp+	C–comp+	grab	grab	E–comp+	grab	grab	grab	E–comp+	C–comp+	grab	grab	E–comp+	grab	grab	grab	E–comp+	C–comp+
Date:	5/7–8	5/7–8	5/7–8	5/7	5/7	5/7–8	5/7	5/7	5/8	5/7–8	5/7–8	5/7	5/7	5/7–8	5/7	5/7	5/8	5/7–8	5/7–8
Time:	1230–1230	0800–0800	0800–0800	12:00	16:00	1000–1000	11:45	15:45	14:45	1000–1000	1000–1000	11:15	15:10	0800–0800	10:15	14:40	15:05	0800–0800	0800–0800
Lab ID#:	198232	198233	198234	198235	198236	198237	198238	198239	198240	198241	198242	198243	198244	198245	198246	198247	198248	198249	198250
GENERAL CHEMISTRY																			
Turbidity						E				E				E				E	E
pH						E				E				E				E	E
Conductivity						E				E				E				E	E
Alkalinity						E				E				E				E	E
Hardness						E				E				E				E	E
Cyanide																			
total	E	E										E	E	E	E	E		E	E
weak & dissociable	E	E										E	E	E	E	E		E	E
Fluoride	E	E/C	E/C									E	E	E	E	E		E/C	E/C
Sulfate																			
SOLIDS																			
TS						E				E	E			E				E	E
TNVS						E				E	E			E				E	E
TSS	E	E/C	E/C	E/C*	E/C*	E/C	E	E		E/C	E/C	E	E	E	E	E		E/C	E/C
TNVSS						E				E	E			E				E	E
BOD5						E/C				E/C	E								
NUTRIENTS																			
NH3-N				E	E	E/C	E/C*	E/C*		E/C		E	E	E	E/C*	E/C*		E	
NO3+NO2-N				E	E	E	E	E		E		E	E	E	E	E		E	
Phosphorus - Total				E	E	E	E	E		E									
Fecal Coliform									E/C								E		
ORGANICS AND METALS																			
Oil and Grease												E	E		E/C	E/C			
Aluminum														E				E/C	C
Fe, Mn, Sn														E				E	
PRIORITY POLLUTANTS																			
BNAs														E				E	E
Pest/PCB														E				E	E
VOA												E	E		E	E			
Metals														E				E/C++	E/C++
PAHs	E	E	E/C+++											E				E	E/C+++
BIOASSAYS																			
Rainbow trout-96 hour acute																		E**	
Microtox-acute																		E**	
Daphnia magna-48 hour acute																		E**	
Fathead minnow-48 hour acute																		E**	
Daphnia magna-7 day chronic																		E**	
Ceriodaphnia dubia-7 day chronic																		E**	
Selenastrum-96 hour chronic																		E**	
FIELD OBSERVATIONS																			
Temp	E	E		E	E		E	E		E		E	E	E	E	E		E	E
pH	E	E		E	E		E/C*	E/C*		E		E	E	E	E/C	E/C		E	E
Conductivity	E	E		E	E		E	E		E		E	E	E	E	E		E	E
Chlorine residual							E/C*	E/C*				E							
Sulfide																			

E Ecology analysis.
C Columbia analysis
* Columbia analyzed one of the two grab samples at this station.
** Samples for bioassays were a three grab composite: 5/7 @ 1015, 5/7 @ 1440, and 5/8 @1020.

\+ E–comp indicates Ecology sampler, C–comp indicates Columbia composite sampler.
++ Columbia analysis for antimony and nickel only.
+++ Columbia analysis for Benzo(a)pyrene only.

Appendix B (cont'd) - Sampling Times and Parameters Analyzed - Columbia Aluminum, Goldendale - 5/91.

Station:	Mill intake		West Surface Impoundment Inputs: WTP underflow	West Surface Impoundment Inputs: SO2 Scrubbers	Storm water basin	Rivulet	Wildlife Management Area		Transfer blank
Type:	grab	E–comp+	grab	grab	grab	grab	grab	grab	—
Date:	5/8	5/7–8	5/7	5/7	5/8	5/7	5/7	5/8	5/8
Time:	15:00	0800–0800	16:20	16:45	09:15	17:35	18:00	15:20	14:30
	196231	196230	196251	196252	196253	196254	196255	196256	196257
GENERAL CHEMISTRY									
Turbidity		E							
pH		E							
Conductivity		E							
Alkalinity		E							
Hardness		E	E	E	E	E	E		
Cyanide									
total		E	E	E	E	E	E		E
weak & dissociable		E	E	E	E	E	E		E
Fluoride	C	E	E	E	E	E/C	E/C		E
Sulfate		E			E	E	E		
SOLIDS									
TS									
TNVS									
TSS		E/C							
TNVSS									
BOD5		E							
NUTRIENTS									
NH3-N		E							
NO3+NO2-N		E							
Phosphorus - Total		E							
Fecal Coliform	E							E	
ORGANICS AND METALS									
Oil and Grease	E								
Aluminum		E	E	E	E	E	E		E
Fe, Mn, Sn		E							E
PRIORITY POLLUTANTS									
BNAs		E							E
Pest/PCB		E							E
VOA	E								E
Metals		E	E	E	E	E	E		E
PAHs		E	E	E	E	E	E		E
BIOASSAYS									
Rainbow trout–96 hour acute			E***	E***					
Microtox–acute									
Daphnia magna–48 hour acute									
Fathead minnow–48 hour acute									
Daphnia magna–7 day chronic									
Ceriodaphnia dubia–7 day chronic									
Selenastrum–96 hour chronic									
FIELD OBSERVATIONS									
Temp			E	E	E	E	E		
pH	C	E	E	E	E	E/C	E/C		
Conductivity		E	E	E	E	E	E		
Chlorine residual				E		E	E		
Sulfide				E		E	E		

E Ecology analysis.
C Columbia analysis

\+ E–comp indicates Ecology sampler, C–comp indicates Columbia composite sampler.
*** Hazardous Waste designation bioassay collected as two part grab. Second grab collected on 5/8 @ 16:00.

Appendix C – Ecology Analytical Methods and Laboratories –
Columbia Aluminum, Goldendale – May 1991.

		EPA 1983	40 CFR	Other Methods	Laboratory
Turbidty		180.1			Manchester
pH		150.1			Manchester
Conductivity		120.1			Manchester
Alkalinity		310.1			Manchester
Hardness		130.2			Manchester
Cyanide					
total		335.3			Analytical Resources
weak & dissociable				SM-17: 4500 CNI.	Analytical Resources
Fluoride		340.3			Manchester
Sulfate		300.0			Manchester
TS		160.3			Manchester
TNVS		160.4			Manchester
TSS		160.2			Manchester
TNVSS		160.4			Manchester
BOD5		405.1			Manchester
NH3-N		350.1			Analytical Resources
N03+NO2-N		353.2			Analytical Resources
Phosphorus-Total		365.2			Analytical Resources
Fecal Coliform				SM-17: 9222D	Manchester
Oil & Grease		413.1			Manchester
Metals		200 series			Manchester
BNAs			625		PNELI
Pesticides/PCBs			608		PNELI
VOAs			624		PNELI
PAHs				EPA 1986a:8310	Analytical Resources
Rainbow trout	96 hour acute			Ecology 1981	Manchester
Microtox	5/15 minute			Beckman	Manchester
Daphnia magna	48 hour acute			EPA 1985	Manchester
Fathead minnow	48 hour aacute			EPA 1985	Manchester
Daphnia magna	7 day chronic			EPA 1989	Manchester
Ceriodaphnia dubia	7 day chronic			EPA 1989	Manchester
Selanastrum	96 hour chronic			EPA 1989	Parametrix Inc

Beckman, Microtox System Operating Manual.

Ecology 1981, Static Acute Fish Toxicity Test, Biological Testing Methods, 1981

EPA 1983, Methods for Chemical Analysis of Water and Wastes.

EPA 1985, Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms.

EPA 1986a, Test Methods for Evaluating Solid Waste.

EPA 1989, Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.

40 CFR, Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater.

SM-17, Standard Methods for the Examination of Water and Wastewater, 17th ed.

Appendix D-1 – Ecology Laboratory General Chemistry Results – Columbia Aluminum, Goldendale – 5/91.

Station:	WTP influent	WTP effluent (Outfall 001A)		Sanitary influent			Sanitary effluent (Outfall 001B)					Pond C inlet			Pond D effluent (Outfall 001)				
Type:	E-comp+	E-comp+	C-comp+	grab	grab	E-comp+	grab	grab	grab	E-comp+	C-comp+	grab	grab	E-comp+	grab	grab	grab	E-comp+	C-comp+
Date:	5/7-8	5/7-8	5/7-8	5/7	5/7	5/7-8	5/7	5/7	5/8	5/7-8	5/7-8	5/7	5/7	5/7-8	5/7	5/7	5/8	5/7-8	5/7-8
Time:	1230-1230	0800-0800	0800-0800	12:00	16:00	1000-1000	11:45	15:45	14:45	1000-1000	1000-1000	11:15	15:10	0800-0800	10:15	14:40	15:05	0800-0800	0800-0800
Lab ID#:	198232	198233	198234	198235	198236	198237	198238	198239	198240	198241	198242	198243	198244	198245	198246	198247	198248	198249	198250
GENERAL CHEMISTRY																			
Turbidity (NTU)						26.0				5.2				2.1				1.9	1.6
pH						6.9				7.0				7.1				7.2	7.2
Conductivity (µmhos/cm)						582				430				281				270	262
Alkalinity (mg/L)						202				62.0				65.5				66.8	65.7
Hardness (mg/L)						154				141				84.6				79.4	81.2
Cyanide (µg/L)																			
total	10U	10U										10U	10U	10U	10U	10U		10U	10U
weak & dissociable	10U	10U										10U	10U	10U	10U	10U		10U	10U
Fluoride (mg/L)	568	17.7	11.9									0.608	0.588	0.725	0.744	0.784		0.764	0.784
Sulfate (mg/L)																			
SOLIDS (mg/L)																			
TS						461				358	343			218				198	208
TNVS						232				178	209			130				138	141
TSS	14300J	2	2	32	124	89	8	3		7	13	3	4	2	2	2		1U	1
TNVSS						12				3	3			1				1U	1
BOD5 (mg/L)						74				4	4								
NUTRIENTS (mg/L)																			
NH3-N				31.4	26.4	18.7	0.030	0.041		0.031		0.027	0.037	0.030	0.012	0.016		0.010	
NO3+NO2-N				0.023	0.093	0.023	15.9	17.6		17.1		0.401	0.307	0.422	0.260	0.266		0.301	
Phosphorus - Total				3.0	3.6	2.5	1.6	1.9		1.9									
Fecal Coliform (organisms/100 mL)									1								2BOF		
ORGANICS																			
Oil & Grease (mg/L)												1U	1U		1U	1U			
FIELD OBSERVATIONS																			
Temp (C)	3.7*	4.5*		19.9	19.9		17.6	17.7		4.1*		17.2	16.9	6.7*	16.8	17.2		5.1*	10.1
pH	8.39	6.31		7.88	7.83		6.70	6.89		7.32		8.10	8.01	7.76	8.37	8.66		7.94	7.92
Conductivity (µmhos/cm)	13200	13300		650	650		392	397		390		235	256	263	88	260		226	227
Chlorine: (mg/L)																			
Free Available							0.6	1.0				<0.1							
Total Residual							1.0	1.3				<0.1							
Sulfide (mg/L)																			

* composite sample was cooled during collection

** Matrix interference necessitated analysis by titration

\+ E-comp indicates Ecology composite sampler, C-comp indicates Columbia composite sampler.

U Analyte not detected at given quantitation limit.

J Estimated amount.

IS Interferring substance.

BOF Fecal coliform sample bottle over-filled.

Appendix D-1 (cont'd) - Ecology Laboratory General Chemistry Results - Columbia Aluminum, Goldendale - 5/91.

Station:	Mill intake		West Surface Impoundment Inputs: WTP underflow	West Surface Impoundment Inputs: SO2 Scrubbers	Storm water basin	Rivulet	Wildlife Management Area		Transfer blank
Type:	grab	E-comp+	grab	grab	grab	grab	grab	grab	—
Date:	5/8	5/7-8	5/7	5/7	5/8	5/7	5/7	5/8	5/6
Time:	15:00	0800-0800	16:20	16:45	09:15	17:35	18:00	15:20	14:30
Lab ID#:	198231	198230	198251	198252	198253	198254	198255	198256	198257
GENERAL CHEMISTRY									
Turbidity (NTU)		2.6							
pH		6.2							
Conductivity (μmhos/cm)		169							
Alkalinity (mg/L)		66.6							
Hardness (mg/L)		71.8	8620 IS	59.2 IS	90.0	208	671		
Cyanide (μg/L)									
total		10U	10	100U**	10U	10U	10U		10U
weak & dissociable		10U	10U	100U**	10U	10U	10U		10U
Fluoride (mg/L)		0.147	608	255	6.40	3.87	0.363		0.02U
Sulfate (mg/L)		11.9			58.8	54.4	908		
SOLIDS (mg/L)									
TS									
TNVS									
TSS		4							
TNVSS									
BOD5 (mg/L)		5							
NUTRIENTS (mg/L)									
NH3-N		0.010U							
NO3+NO2-N		0.117							
Phosphorus - Total		0.027							
Fecal Coliform (organisms/100 mL)	2							1U	
ORGANICS									
Oil & Grease (mg/L)	1U								
FIELD OBSERVATIONS									
Temp (C)			17.7	28.5	12.4	15.3	14.8		
pH		8.03	6.63	6.78	7.21	7.28	7.05		
Conductivity (μmhos/cm)		150	1140	66400	300	488	2010		
Chlorine: (mg/L)									
Free Available									
Total Residual				<0.1		<0.1	<0.1		
Sulfide (mg/L)				<0.1	<0.1	<0.1	<0.1		

* composite sample was cooled during collection

** Matrix interference necessitated analysis by titration

\+ E-comp indicates Ecology composite sampler, C-comp indicates Columbia composite sampler.

U Analyte not detected at given quantitation limit.

J Estimated amount.

IS Interferring substance.

BOF Fecal coliform sample bottle over-filled.

Appendix D-2 – Results of Metals Scans – Columbia Aluminum – May 1991.

Station:	Mill intake	Pond C inlet	Pond D effluent (001)				WTP underflow	SO2 Scrubbers	Storm Water Basin	Rivulet	Wildlife Mgmt Area	Transfer Blank
Type:	E-comp+	E-comp+	E-comp+		C-comp+		grab	grab	grab	grab	grab	--
Date:	5/7-8	5/7-8	5/7-8		5/7-8		5/7	5/7	5/8	5/7	5/7	5/6
Time:	0800-0800	0800-0800	0800-0800		0800-0800		16:20	16:45	09:15	17:35	18:00	14:30
Sample ID #:	198230	198245	198249		198250		198251	198252	198253	198254	198255	198257
Analysis:	total	total recoverable	total	total recoverable	total	total recoverable	total	total	total	total	total	total
	(μg/L)											
Antimony	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U
Arsenic	2.0 U	2.0 U	2.1 P	2.1 P,N	2.0 U	2.0 U	399	58 PJ	2.0 U	2.8 P	4.9 P	2.0 U
Beryllium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	27.1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	2.0 UJ	2.0 U	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	398 J,N	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ
Chromium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	888 E	12 P	5.0 U	5.0 U	5.0 U	5.0 U
Copper	3.0 U	7.2 P	7.0 P	4.5 P	7.1 P	6.5 P	154	10 P	6.1 P	3.0 U	3.0 U	3.0 U
Lead	1.0 U	1.4 J	1.0 U	1.0 U	1.0 U	1.0 U	232	20 U	2.5 P	1.0 U	1.0 U	1.0 U
Mercury	0.04 U	LAC	0.04 U		0.04 U		0.56	0.15 J	0.04 U	0.04 U	0.04 U	0.04 U
Nickel	10 U	10 U	10 U	10 U	10 U	10 U	5900 E	28 P	16 P	10 U	10 U	10 U
Selenium	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	12 P,N	30 UJ	2.0 U	2.0 U	2.0 U	2.0 U
Silver	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Thallium	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Zinc	4.0 U	12 PB	4.0 U	4.0 U	4.0 U	8.6 PB	916	4.0 U	60.3	4.0 U	6.3 P	7.4 P
Aluminum	46 P	118	94	52 P			450000	6510	1200	85	81	20 U
Iron	42	62.2	46.5	37.6								25 B
Manganese	6.8 JP	8.1 P	8.9 P	6.6 P								1.1 P
Tin	4.0 PB*	30 UJ	4.1 PB*	30 UJ								4.9 PB*

\+ E-comp indicates Ecology composite sample, C-comp indicates Columbia composite sampler.
U The analyte was not detected at or above the reported result.
UJ The analyte was not detected at or above the reported estimated result.
J The analyte was positively identified. The associated numerical result is an estimate.
E Reported result is an estimate because of the presence of interference.
P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
LAC Sample was lost in a laboratory accident.
B Analyte was found in the analytical method blank, indicating the sample may have been contaminated.
N Indicates analyte exceeded QC limits for MS/MSD recovery and/or RPD.
* No recoveries for tin were reported.
[ ] Indicates detected analyte.

Appendix D-3 – Results of Volatile Organics Scans – Columbia Aluminum – May 1991.

Station:	Mill Intake	Pond C inlet		Pond D effluent (001)		Transfer Blank
Type:	grab	grab	grab	grab	grab	--
Date:	5/8/91	5/7/91	5/7/91	5/7/91	5/7/91	5/6/91
Time:	15:00	11:15	15:10	10:15	14:40	14:30
Sample ID #:	198231	198243	198244	198246	198247	198257
				(µg/l)		
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	5 U	5 U	5 U	5 U	1 J	1 J
Acetone	10 U	12	39	7 J	9 J	8 J
Carbon Disulfide	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene (total)	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	5 U	5 U	5 U	5 U	5 U	5 U
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U
1,1,1-Trichloroethane	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl Acetate	10 U	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5 U	5 U	5 U	5 U	5 U	5 U
Benzene	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-Pentanone	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	5 U	5 U	5 U	5 U	5 U	5 U
Styrene	5 U	5 U	5 U	5 U	5 U	5 U
Total Xylenes	5 U	5 U	5 U	5 U	5 U	5 U

[ ] Indicates detected analyte.

U The compound was not detected at or above the reported quantitation limit.

J The analyte was positively identified. The associated numerical result is an estimate.

Appendix D-4 - Results of BNA Scans - Columbia Aluminum - May 1991.

Station:	Mill Intake	Pond C Inlet	Pond D Effluent (001)		Transfer Blank
Type:	E-comp+	E-comp+	E-comp+	C-comp+	—
Date:	5/7-8	5/7-8	5/7-8	5/7-8	5/6
Time:	0800-0800	0800-0800	0800-0800	0800-0800	14:30
Sample ID #:	198230	198245	198249	198250	198257
			(µg/l)		
Phenol	10 U	10 U	10 U	10 U	10 U
Bis(2-Chloroethyl)Ether	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
Benzyl Alcohol	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10 U	10 U	10 U	10 U	10 U
Bis(2-chloroisopropyl)ether	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10 U	10 U	10 U	10 U	10 U
N-Nitroso-Di-n-Propylamine	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U	10 U	10 U
2-Nitrophenol	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	10 U
Benzoic Acid	50 U	50 U	50 U	50 U	50 U
Bis(2-Chloroethoxy)Methane	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U
Naphthalene	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-Methylphenol	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	50 U	50 U	50 U	50 U	50 U
2-Chloronaphthalene	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	50 U	50 U	50 U	50 U	50 U
Dimethyl Phthalate	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	50 U	50 U	50 U	50 U	50 U
Acenaphthene	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	50 U	50 U	50 U	50 U	50 U
4-Nitrophenol	50 U	50 U	50 U	50 U	50 U
Dibenzofuran	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U
Diethyl Phthalate	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-Phenylether	10 U	10 U	10 U	10 U	10 U
Fluorene	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	50 U	50 U	50 U	50 U	50 U
4,6-Dinitro-2-Methylphenol	50 U	50 U	50 U	50 U	50 U
N-Nitrosodiphenylamine *	10 U	10 U	10 U	10 U	10 U
4-Bromophenyl-Phenylether	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	50 U	50 U	50 U	50 U	50 U
Phenanthrene	10 U	10 U	10 U	10 U	10 U
Anthracene	10 U	10 U	10 U	10 U	10 U
Di-n-Butyl Phthalate	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10 U	10 U	10 U	10 U	10 U
Pyrene	10 U	10 U	10 U	10 U	10 U
Butylbenzylpthalate	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	20 U	20 U	20 U	20 U	20 U
Benzo(a)Anthracene	10 U	10 U	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U	10 U	10 U
Bis(2-Ethylhexyl)phthalate	10 U	10 U	10 U	10 U	10 U
Di-n-Octyl Phthalate	10 U	10 U	10 U	10 U	10 U
Benzo(b)Fluoranthene	10 U	10 U	10 U	10 U	10 U
Benzo(k)Fluoranthene	10 U	10 U	10 U	10 U	10 U
Benzo(a)Pyrene	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)Pyrene	10 U	10 U	10 U	10 U	10 U
Dibenzo(a,h)Anthracene	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)Perylene	10 U	10 U	10 U	10 U	10 U

\+ E-comp indicates Ecology composite sampler, C-comp indicates Columbia composite sampler.

* Cannot be separated from Diphenylamine

U Indicates analyte not detected at given quantitation limit.

Appendix D-5 – Results of Pesticide/PCB Scans – Columbia Aluminum – May 1991.

Station:	Mill Intake	Pond C Inlet	Pond D Effluent (001)		Transfer Blank
Type:	E-comp+	E-comp+	E-comp+	C-comp+	--
Date:	5/7-8	5/7-8	5/7-8	5/7-8	5/6
Time:	0800-0800	0800-0800	0800-0800	0800-0800	14:30
Sample ID #:	198230	198245	198249	198250	198257
			(µg/l)		
alpha-BHC	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC (Lindane)	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aldrin	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan I	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Dieldrin	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan II	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDD	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Methoxychlor	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Endrin Ketone	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Technical Chlordane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toxaphene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1016	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1221	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1232	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1242	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1248	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1254	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

\+ E-comp indicates Ecology composite sampler, C-comp indicates Columbia composite sampler.

U Indicates analyte not detected at given quantitation limit.

Appendix D-6 – Results of PAH Scans – Columbia Aluminum – May 1991.

Station:	Mill Intake	SO2 Scrubbers	Wastewater Treatment Plant				Pond C Inlet	Pond D Effluent (001)	
			Influent	Underflow	Effluent (001A)				
Type:	E-comp+	grab	E-comp+	grab	E-comp+	C-comp+	E-comp+	E-comp+	C-comp+
Date:	5/7-8	5/7	5/7	5/7	5/7-8	5/7-8	5/7-8	5/7-8	5/7-8
Time:	0800-0800	16:45	1230-1230	16:20	0800-0800	0800-0800	0800-0800	0800-0800	0800-0800
Sample ID #:	198230	198252	198232	198251	198233	198234	198245	198249	198250
					(µg/l)				
Naphthalene	0.5 U	25 U	25 U	25 U	23 J	13 U	0.5 U	0.5 U	0.5 U
Acenaphthylene	0.5 U	25 U	840 U	25 U	25 U	0.5 U	0.5 U	0.5 U	0.5 U
Acenaphthene	1.0 U	50 U	50 U	110	260	1.0 U	1.0 U	1.0 U	1.0 U
Fluorene	0.1 U	4.2 J	7.5 U	5.0 U	5.0 U	0.1 U	0.1 U	0.1 U	0.1 U
Phenanthrene	0.1 U	64	5.0 U	5.8 J	5.4 J	0.25 J	0.32 J	0.10 J	0.06 J
Anthracene	0.1 U	5.0 U	3.3 J	3.4 J	3.2 J	0.29 J	0.06 J	0.1 U	0.1 U
Fluoranthene	0.1 U	97	45	120	25	2.8	0.85 J	0.32 J	0.14 J
Pyrene	0.1 U	130	160	130	8.4 J	0.35 U	0.63	0.15 J	0.06 J
Benzo(a)Anthracene	0.1 U	21 J	5.0 U	31	6.6 J	0.73	0.34 J	0.06 J	0.1 U
Chrysene	0.1 U	38	32	40	4.9 J	0.49 J	0.48 J	0.10 J	0.1 U
Benzo(b)Fluoranthene	0.1 U	25	18 J	24	6.5 J	2.3	0.80 J	0.18 J	0.08 J
Benzo(k)Fluoranthene	0.1 U	3.1 J	5.0 J	7.7 J	5.0 U	0.67 J	0.29 J	0.06 J	0.1 U
Benzo(a)Pyrene	0.1 U	4.5 J	11 J	16 J	3.1 J	1.2	0.62	0.11 J	0.1 U
Dibenzo(a,h)Anthracene	0.1 U	5.0 U	5.0 U	5.0 U	5.0 U	1.4	0.19 J	0.1 U	0.1 U
Benzo(ghi)Perylene	0.5 U	25 U	25 U	19 J	25 U	6.4	0.65 J	0.18 J	0.5 U
Indeno(1,2,3-cd)Pyrene	0.1 U	5.0 U	5.0 U	7.3 J	5.0 U	2.2	0.43 J	0.13 J	0.06 J

\+ E-comp indicates Ecology composite sampler, C-comp indicates Columbia composite sampler.
U Indicates analyte not detected at given quantitation limit.
J Estimated value.
NR No recovery due to matrix interference and/or dilution.
[ ] Indicates detected analyte.

Appendix D-6 (cont'd) - Results of PAH scans - Columbia Aluminum - May 1991.

Station:	Storm Water Basin	Rivulet	Wildlife Mgmt Area	Transfer Blank
Type:	grab	grab	grab	—
Date:	5/8	5/7	5/7	5/6
Time:	09:15	17:35	18:00	14:30
Sample ID #:	198253	198254	198255	198257
		(µg/l)		
Naphthalene	0.5 U	0.5 U	0.5 U	0.5 U
Acenaphthylene	0.5 U	0.5 U	0.5 U	0.5 U
Acenaphthene	5.1	1.0 U	1.0 U	1.0 U
Fluorene	3.0 U	0.1 U	0.1 U	0.1 U
Phenanthrene	2.7	0.1 U	0.1 U	0.1 U
Anthracene	0.48 J	0.1 U	0.1 U	0.1 U
Fluoranthene	7.9	0.1 U	0.1 U	0.1 U
Pyrene	5.7	0.1 U	0.1 U	0.1 U
Benzo(a)Anthracene	3.0	0.1 U	0.1 U	0.1 U
Chrysene	4.8	0.1 U	0.1 U	0.1 U
Benzo(b)Fluoranthene	8.2	0.1 U	0.1 U	0.1 U
Benzo(k)Fluoranthene	3.1	0.1 U	0.1 U	0.1 U
Benzo(a)Pyrene	7.1	0.1 U	0.1 U	0.1 U
Dibenzo(a,h)Anthracene	2.1	0.1 U	0.1 U	0.1 U
Benzo(ghi)Perylene	13	0.5 U	0.5 U	0.5 U
Indeno(1,2,3-cd)Pyrene	6.3	0.1 U	0.1 U	0.1 U

\+ E-comp indicates Ecology composite sampler, C-comp indicates Columbia composite sampler.
U Indicates analyte not detected at given quantitation limit.
J Estimated value.
NR No recovery due to matrix interference and/or dilution.
[ ] Indicates detected analyte.

Appendix E – Holding and Extraction Times for PAHs –
Columbia Aluminum, Goldendale – May 1991.

Sample	Date Collected	Date Extracted	Date Analyzed	# Days Collected to Extracted	# Days Extracted to Analyzed
198230	5/7	5/15	6/6	8 of 7	22 of 40
198232	5/7	5/15	7/9	8 of 7	55 of 40
198233	5/7	5/15	7/9	8 of 7	55 of 40
198234	5/7	5/15	6/6	8 of 7	22 of 40
198245	5/7	5/15	6/6	8 of 7	22 of 40
198249	5/7	5/15	6/6	8 of 7	22 of 40
198250	5/7	5/15	6/6	8 of 7	22 of 40
198251	5/7	5/15	7/9	8 of 7	55 of 40
198252	5/7	5/15	7/9	8 of 7	55 of 40
198253	5/8	5/15	7/12	7 of 7	58 of 40
198254	5/7	5/15	6/6	8 of 7	22 of 40
198255	5/7	5/15	6/6	8 of 7	22 of 40
198257	5/6	5/15	6/6	9 of 7	22 of 40

May 14, 1991

Mr. Lester McCoy
Columbia Aluminum Company
85 John Day Dam Road
Goldendale, WA 98620

Dear Mr. McCoy:

Dale Van Donsel and Perry Brake of the Quality Assurance Section appreciate the assistance you and your staff provided during their visit to your lab on May 7. A copy of their report is enclosed; the original was submitted to Jeanne Andreasson for enclosure in her Class II Inspection report which will be published at a later date. Jeanne agreed to allow us to furnish you the report to assist you in preparing for the laboratory accreditation program.

We see no need for a follow-up visit prior to accreditation at this time but will reserve a final decision in that regard until we have evaluated your QA Manual and forthcoming performance evaluation sample analysis results. Also, we would like you to comment on our findings and recommendations in the attached report.

Also enclosed is a certificate showing traceability of your BOD thermometer to a NIST-certified thermometer. If you need assistance or have any questions on the accreditation program, please do not hesitate to contact us.

Sincerely,

Cliff J. Kirchmer, Section Head
Quality Assurance Section

CJK:PB:pb
Enclosure

cc: Jeanne Andreasson

WASHINGTON STATE DEPARTMENT OF ECOLOGY
ENVIRONMENTAL INVESTIGATIONS AND LABORATORY SERVICES
QUALITY ASSURANCE SECTION

SYSTEM AUDIT REPORT

LABORATORY: Columbia Aluminum Corporation Laboratory

ADDRESS: 85 John Day Dam Road
Goldendale, WA 98620

DATE OF AUDIT: May 7, 1991

PERSONNEL INTERVIEWED: Lester McCoy, Laboratory Manager

Robert Barnett, Chief Chemist and Lab Supervisor

Randall McKinney, Environmental Chemist

AUTHENTICATION:

Dale J. Van Donsel, Team Leader

Perry F. Brake, Team Member

GENERAL FINDINGS AND RECOMMENDATIONS

General

1. A system audit was conducted at the Columbia Aluminum Corporation Laboratory, Goldendale, Washington on May 7, 1991, in conjunction with the Class II inspection of the wastewater treatment plant. The purpose of the audit was to verify laboratory capabilities pertaining to analyses required in the treatment plant discharge permit (WA0000540) and to review analytical and quality control data. General audit findings and recommendations are documented below. Significant recommendations for improvement of laboratory operations are highlighted by use of *italics*.

Personnel

2. The Laboratory Manager (Mr. McCoy) is responsible for overall management of the corporate labs including a carbon process and research lab, the environmental control lab, an industrial hygiene lab, and a process control lab. Additionally, he is responsible for assuring accuracy of all results (i.e., functions as QA coordinator). With a BS in microbiology/chemistry and considerable experience in lab operations, Mr. McCoy is well qualified for the position. He demonstrates in-depth knowledge of plant and lab operations. The Chief Chemist/Lab Supervisor (Mr. Barnett) is responsible for day-to-day activities of all labs and provides technical assistance to plant personnel. The Environmental Chemist (Mr. McKinney) performs and supervises performance of analyses in all labs, implements quality control policies and practices throughout the labs, and conducts technical training as required. At least three other technicians are involved in analysis of environmental samples. All personnel contacted demonstrated adequate knowledge and skills in conducting analyses required by the plant's wastewater discharge permit and for accreditation by the Department of Ecology.

Facility

3. All general chemistry and microbiology activities are carried out in one very large room. Wastewater testing is a very small part of the lab's responsibilities, and the facility is quite adequate for this. Organics analyses are conducted in a separate suite of rooms which are also isolated by relative positive air pressure. No facility deficiencies were discovered that would adversely affect quality of environmental data generated by the lab.

Equipment and Supplies

4. It was not possible to determine the operating temperature of the water bath used for the fecal coliform test, as it was not being used at that time. Temperature control is extremely important for this test; there is only a 0.2°C tolerance allowed, and it is not possible to read the thermometers in this water bath to that precision. They should be replaced with ones that are graduated in 0.1 or 0.2° increments, and these should also be checked against a NIST certified or traceable thermometer. A temperature log should also be maintained for this bath.

5. Because the laboratory is testing for fecal coliforms in chlorinated effluents, a different type of membrane filter was recommended. Although the Gelman filters currently used are permitted, the Millipore type HC filter helps prevent heat damage and dehydration to chlorine-injured organisms during the critical first few hours at the very high temperature of this test. The lab should continue to use Gelman M-FC medium, as this has the best formulation for recovery of these organisms.

Sample Management

6. The laboratory does not have a formal chain-of-custody procedure for its routine sample handling. Wastewater samples are collected by the analyst who has physical possession until he does the actual testing. The only exception to this is sampling for bioassay. These samples are sent out, and a chain-of-custody form is used. *A recommendation was made to include on appropriate bench sheets and data entry forms a place to identify when and by whom samples were taken, analyzed, and discarded.* If initials are used for this purpose (or other official purposes) in the lab, a permanent record should be filed in the lab identifying each set of initials with their originator to avoid problems should any lab records be involved in litigation.

Data Management

7. Analytical records and calculations are usually checked by Mr. Barnett and randomly reviewed by Mr. McCoy. Neither paper nor computer records carried an indication of these. *A system should be instituted that will identify the analyses that were checked and the individuals doing the verifications.*

PE Samples

8. In addition to its NPDES DMR-QA requirements, the laboratory also participates in the WP program. All DMR-QA Study #10 results were acceptable. WP025 results for parameters for which the laboratory is applying were acceptable except for antimony and oil & grease, each of which had one "not acceptable" result.

If accreditation were to be given at this moment (it cannot because the final application has not yet been received) only provisional accreditation could be given for antimony. If acceptable WP026 results are received in the meantime, full accreditation will be given.

Oil & grease results present a different situation; the laboratory has applied for the partition infra-red (*Standard methods* 5520-C) procedure, but according to EPA instruction sheets these samples contain *n*-propanol which makes them unsuitable for this method. It is possible to grant interim accreditation for oil & grease until Ecology finds a source of suitable "blind" samples.

Quality Assurance/Quality Control

9. The environmental laboratory is in the process of applying for accreditation. A draft application for accreditation was received on April 25, and the lab's quality assurance manual was furnished during the audit. A complete review of this manual will be sent to the lab after the final application is received.

10. Stock solutions for all standard solutions (except glucose-glutamic acid for BOD) are purchased rather than being prepared in the lab. The only record of preparation of dilutions from these is the labeling of the working stock solutions. *It is recommended that a log be developed that will show the identity of the original stock (lot, supplier, date, discard date, etc.) date of preparation, dilution, and preparer.* This will assist in identifying and correcting any sources of error originating in the preparation of the calibration standards. The procedure for preparing new standards should include comparing new standards to the previous solutions. Containers for stock standards (as well as other reagents) should be marked with date received and opened to assist in discarding outdated materials on a periodic basis.

11. For verification of fecal coliform test results, future plans are to do periodic sample splitting, submitting samples to a certified drinking water laboratory to do the test by the MPN method. This is the best possible way of verifying that the membrane filter method is achieving proper recovery of fecal coliforms from its chlorinated effluent. The only other suggestion that could be made is that the lab should assure that samples can be tested within the required 6-hour holding time. Given the weekly requirement for the fecal coliform test, quarterly sample splitting should be adequate. Results from the two tests should be interpreted with caution; there will rarely be a close match between them. Instead, the laboratory should be alert for MPN results that are significantly and consistently higher than the MF which would indicate failure to recover some "stressed" organisms.

12. The lab had recently initiated use of control charts to monitor and control precision of selected analyses being conducted in the lab. The concentration value of each gradation on the graph paper used to plot the charts was identified on each chart, and lines were drawn for one, two, and three standard deviations from the central line. The central line was marked "0" rather than the mean value for the specific test which allowed use of preprinted forms for a multitude of different tests. To use the chart to plot results obtained in the lab, the analyst divided the analytical result (in concentration units) by the concentration value of the gradation, and put a mark on the chart at the location of the resultant number of gradations. *A recommendation was made to simplify use of the chart* (although it will disallow use of a single preprint for several different analyses) *by indicating the mean concentration on the central line, and marking the "Y" coordinate with actual concentrations rather than unit-less gradations.* The analyst uses the chart by merely putting a mark at the concentration observed for the test, and determines whether or not it lies within the control limits which have already been marked on the chart. Appendix L of the Procedural Manual for the Environmental Laboratory Accreditation Program describes such construction and use of control charts.

13. For ICP determinations, the lab runs a within-batch calibration and a check standard which is typically near the mid-point of the calibration curve. If time and other resources allow, two standards, one at approximately 0.2 C_u and one at 0.9 C_u where C_u is the upper limit of the calibration curve, should be run with each batch to verify the calibration curve and also to check precision. If precision is acceptable at these two concentrations, it can reasonably be assumed that precision is acceptable at all intermediate concentrations. If time allows only one, it should be the higher (0.9 C_u) standard rather than a mid-level standard since bias due to calibration will be more noticeable at the higher end (random error may mask bias due to calibration toward the lower end). If two standards are analyzed and the results are plotted on control charts, a separate chart should be used for each standard. *A recommendation was made to change the check standard procedure to, as a minimum, run a standard at near the high end of the ICP calibration curve (and other appropriate calibration curves) or, preferably, to run two standards, one each at the high and low ends of the curve.*

14. The thermometer being used for the BOD incubators was neither NBS (NIST) certified nor traceable to NBS certified thermometers. The BOD thermometer was calibrated against an NBS certified thermometer provided by the audit team and a certificate has been provided showing traceability to the certified thermometer. *A recommendation was made to place the tip of the thermometer in a container of water in the incubator to serve as a heat sink. A recommendation was also made to check calibration of the DO meter used in the BOD determination against a Winkler titration on a periodic basis (e.g., semiannually).*

15. Check standards for each general chemistry and ICP procedure used in the lab were being prepared from the same stock standard solution used for preparing calibration standards. One purpose of analyzing a check standard is to check the calibration curve and if the check standard and calibration standards are prepared from the same stock, and that stock is deficient, calibration errors may go undetected. A recommendation was made to prepare check standards separately from calibration standards (i.e., from separate stock solutions or reagents).

Methods

16. Copies of written methods for all reportable parameters and parameters for which the lab is seeking accreditation were present in the lab and being followed by analysts.