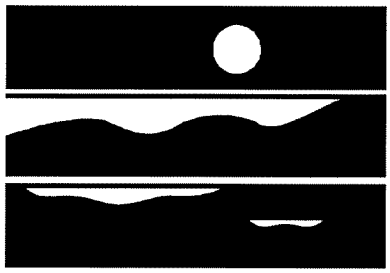

VANALCO ALUMINUM (VANCOUVER)
CLASS II INSPECTION
JANUARY 10-12, 1994

October 1994

Water Body No. WA-CR-1010
Publication No. 94-159
printed on recycled paper

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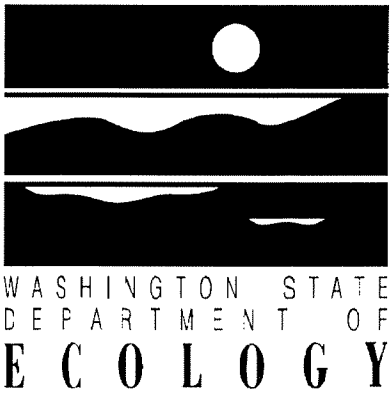

Vanalco Aluminum (Vancouver) Class II Inspection January 10-12, 1994

by
Guy Hoyle-Dodson

Environmental Investigations and Laboratory Services Program
Olympia, Washington 98504-7710

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Abstract

An unannounced Class II Inspection was conducted on January 10-12, 1994, at the Vancouver Aluminum Company (Vanalco) aluminum smelter in Vancouver, Washington. The inspection investigated the Vanalco sanitary sewage trickling filter plant (SSTP) and the facility's industrial wastewater system. SSTP operation was adequate and removal efficiency for most parameters was good. Possible surges of fluoride into the industrial wastewater settling lagoon are noted, and it is recommended that the source be identified. SSTP influent and effluent concentrations were all within NPDES permit limits. Industrial wastewater effluent results were generally less than NPDES permit limits with the possible exception of cyanide. Further cyanide monitoring is recommended. Organic and metal concentrations in SSTP and industrial wastewater effluent were within state and EPA water quality criteria. Bioassays found no toxicity in SSTP samples, but *Ceriodaphnia dubia* and *Selenastrum capricornutum* exhibited toxicity in the industrial wastewater effluent. Identification of the source of *Selenastrum capricornutum* toxicity is recommended. SSTP sludge had a higher than expected concentration of fluoride, possibly from contaminated groundwater. Caution is recommended in the final disposal of this waste.

Summary

Sanitary Sewage Treatment Plant

Flow Measurement

Comparisons of Ecology flow calculations to Vanalco's sanitary sewage treatment plant (SSTP) effluent flowmeter found the meter was operating adequately.

Plant Operation

The sanitary treatment plant was well maintained and managed.

General Chemistry

Influent concentrations were low compared to typical domestic wastewater treatment plants. Treatment efficiency for BOD_5, TOC, COD, and nutrients across the SSTP was good despite the weak influent strength.

Split Samples

Ecology analysis of SSTP split samples showed sampling procedures were comparable. Laboratory analysis results showed general agreement between the two labs with some exceptions. Vanalco sanitary sewage effluent results for all parameters differed significantly from the Ecology results. Several of Vanalco's metal analyses had higher detection limits than the Ecology analyses. For these parameters, comparisons were not possible since the Vanalco results did not reflect the same level of sensitivity as the Ecology results. The Vanalco laboratory is accredited by Ecology for permit parameters.

NPDES Permit Comparisons

Vanalco SSTP influent and effluent results were all within NPDES permit limits.

Detected Organics and Priority Pollutants

Concentrations of VOAs, BNAs, and metals were detected in the SSTP influent and effluent. None exceeded EPA or state freshwater water quality criteria for receiving waters.

Sanitary Sewage Treatment Plant Effluent Bioassays

Significant toxicity was not observed in any SSTP bioassays.

Sanitary Sewage Treatment Plant Sludge

Most constituents were within the typical ranges for anaerobically digested sludge. Fluoride was found in a higher than expected concentration and is possibly the result of infiltration from contaminated groundwater. A number of other priority pollutant contaminates were identified at moderate concentrations.

Industrial Wastewater

Oil Spill

Several days before the inspection, an oil spill into the south lagoon prompted Vanalco to change industrial wastewater discharge to the north lagoon. The spill was contained to the south lagoon and no apparent effect on effluent quality was noted.

Flow Measurement

Verification of effluent flow meter accuracy was not possible due to the inaccessibility of the effluent weir. The weir is located at the bottom of a 25 foot wetwell and safety considerations precluded entry by Ecology personnel.

Settling Basin Operation

The settling basin appeared to be functioning normally, although some leakage from the contaminated south pond may be taking place. Algae was observed growing in the pond and it was reported by Vanalco personnel that algae blooms have caused elevated pH in the lagoon during the summer.

General Chemistry

Industrial wastewater appeared to contain predominately non-organic and non-volatile dissolved solids. The composite effluent fluoride result exceeded the influent result, and may indicate surges of fluoride contaminated industrial wastewater into the lagoon, or the entrainment of fluoride contaminated lagoon sediment into lagoon wastewater.

Split Samples

Settling basin split comparisons found Vanalco sampling and analysis to be similar to Ecology's with the exception of the analysis of influent parameters. Vanalco composite samples holding temperatures were higher than are recommended.

NPDES Permit Comparisons

Effluent results were all within NPDES permit limits with the possible exception of cyanide. The Ecology detection limit for the 24-hour composite cyanide concentration produced a total free cyanide load that exceeded the permit's monthly average limit. Vanalco effluent cyanide results produced loads within the limit.

Detected Organics and Priority Pollutants

Volatile organic, BNA, and metals were detected in the settling basin effluent, but none exceeded the EPA and state water quality criteria for receiving waters. PAHs were also found in low concentrations.

Bioassays

Daphnia magna, fathead minnow, rainbow trout, and microtox bioassays showed no significant toxicity. The *Ceriodaphnia dubia* survival and reproduction test found a slight chronic effect in reproduction with an NOEC of 50% effluent. *Selenastrum capricornutum* demonstrated an intense chronic effect with $LC_{50}=8\%$, LOEC=6.25%, and NOEC<6.25%.

Recommendations

Sanitary Sewage Treatment Plant Wastewater

- Improving access to the effluent weir by the addition of ladders, platforms, lighting, lines, and safety harnesses would allow regular verification of meter accuracy.

- All Vanalco composite sample holding temperatures were higher than recommended and it is suggested that this problem be addressed.

Industrial Wastewater

- The possibility of fluoride surges to the settling lagoon should be evaluated by comprehensive monitoring of cooling wastewater, stormwater runoff, and lagoon sediment entrainment.

- Additional sampling of cyanide by Ecology at lower detection limits is recommended.

- It is recommended that the cause of selenastrum toxicity be identified.

Sanitary Plant Sludge

- Due to the higher than expected concentration of fluoride, caution is recommended in the final disposal of this waste.

Introduction

A Class II Inspection was conducted at Vancouver Aluminum Company's (Vanalco) Vancouver aluminum smelter on January 10-12, 1994. Guy Hoyle-Dodson, environmental engineer for the Washington State Department of Ecology (Ecology) Toxics Investigations Section, conducted the inspection. Don Reif, permit coordinator for Ecology's Industrial Section assisted during the inspection and provided background information. Larry McLellan, Vanalco staff Environmental Superintendent, represented Vanalco Aluminum onsite. Alison Diller, Vanalco Environmental Chemist, assisted onsite and provided information on treatment plant operation.

Wastewater generated at the Vanalco facility is primarily contact and non-contact cooling water, stormwater runoff, and a smaller amount of domestic sanitary sewage. Sanitary sewage from the smelter and a nearby cable mill (ACPC) is treated at Vanalco's trickling filter plant and discharged to the Columbia River. Combined cooling water, process water, and stormwater runoff from Vanalco and ACPC is routed through a settling lagoon and also discharged to the Columbia River, at a separate outfall. The plant discharge and sanitary plant effluent are regulated under NPDES permit No. WA 000029-9 issued January 31, 1990, and modified February 14, 1992. An addendum was introduced in 1991 by Ecology Administrative Order No. DE 92-WQIO33 to include effluent and sediment biomonitoring. The permit's expiration date is July 31, 1994.

The Department of Ecology initiated the inspection to assess permit compliance and to aid in Ecology's ongoing compliance strategy. The inspection was unannounced to ensure a representative compliance evaluation. Specific objectives of the inspection included:

1. assess NPDES permit compliance;

2. assess wastewater toxicity with priority pollutant scans and effluent bioassays;

3. examine sludge characteristics with priority pollutant scans;

4. evaluate treatment plant performance; and

5. evaluate permittee's self-monitoring by conducting split samples.

Setting

The Vanalco aluminum smelter is located west of the City of Vancouver in Clark County, on the Columbia River (Figure 1). The smelter produces aluminum metal by the Hall-Heroult reduction process. The facility contains five pot lines with 650 center worked, pre-baked reduction cells. The company manufactures anodes on-site at a carbon plant and green mill.

The smelter casts the greater portion of refined metal as 30 pound and 90 pound ingots. A significant amount is also formed into logs by a continuous casting process. Production approaches 128,000 tons per year.

The smelter generates wastewater from four main sources: domestic sanitary sewage, contact cooling water, non-contact cooling water, and stormwater runoff. Sanitary flows include wastewater from restrooms, sinks, and showers. Smelter water intake originates from a well field and is largely sprayed as non-contact cooling water on the bottoms of casting molds. Vanalco uses a smaller amount of water in a continuous casting process, which requires direct contact with the cooling water and the addition of castor oil as a lubricant. Smaller quantities are used to cool air compressors. ACPC periodically contributes process water from a dip tank used for cable testing. Stormwater runoff results mainly from precipitation, although some flushing occurs from seasonal spraying of floors, walls, and streets.

The wastewater treatment system consists of a sanitary treatment unit and a settling basin (Figure 2). The sanitary treatment plant discharges treated effluent to the river at a site just upstream of the smelter. Industrial wastewater is piped several thousand feet to a pair of settling basins and then is discharged to the river downstream of the smelter.

Domestic Sanitary Sewage Treatment System

The sanitary sewage treatment plant (SSTP) consists of headworks, primary clarifier, combined trickling filter and secondary clarifier, chlorine contact chamber, dechlorination injector, and anaerobic digester (Figure 3). Influent flows are estimated from pump records and effluent flows are measured at a 90° V-notched weir by ultrasonic flowmeter.

Domestic sewage is gravity fed to a sanitary plant influent wet well. Influent flow is intermittently pumped to the headworks, where it passes through a grit chamber, comminutor, and bar screen. Wastewater is routed through a primary clarifier to the trickling filter. The trickling filter system consists of a tower with a high-specific surface plastic medium. The plant transfers effluent from the trickling filter to a secondary clarifier located directly beneath the tower. Secondary clarifier effluent is injected with Cl_2 and passed through a chlorine contact chamber. Chlorinated effluent is dechlorinated with Na_2SO_3 and discharged to the river. Chlorine and Na_2SO_3 injection are controlled manually.

Clarifier sludge is routed to the anaerobic digester and periodically discharged to drying beds. Dried sludge is hauled to a landfill for disposal.

Industrial Wastewater Treatment System

Cooling water and stormwater runoff are pumped to settling lagoons located west of the smelter. The individual contributions from the two sources are not independently metered.

In addition to precipitation runoff, the stormwater collection system may contain waste from unmonitored sources.

Influent to the settling lagoons is directed by a splitter box. Vanalco also records influent pH at this point. For the past several years Vanalco had used the south lagoon exclusively, but during the inspection contamination of the south lagoon by an oil spill forced a switched to the north lagoon.

Effluent from the lagoon passes through a rectangular weir where pH, temperature, and flow are measured and recorded. Treatment in the lagoon included mainly physical settling and oil skimming, although some biological conversion is possible. The treated waste stream is discharged to the Columbia River via a submerged pipe.

Procedures

Ecology collected both grab and composite samples from Vanalco's sanitary treatment plant and from the settling lagoon. Composite samples were collected from sanitary treatment plant influent, sanitary treatment plant effluent, settling lagoon influent, and settling lagoon effluent (Figure 1, Figure 2, & Appendix A). All effluent composite samples and the influent industrial wastewater sample were collected using Ecology ISCO composite samplers with equal volumes of the sample collected every 30 minutes over a 24-hour period. The sanitary influent sample used a flow proportional collection system that approximated equal volumes of the sample collected every 30 minutes over a 24-hour period.

Pairs of grab samples were collected at the same locations as the composite samples. Additional grabs were taken of the smelter's water intake. Grab-composite samples for whole-effluent toxicity testing were taken from the sanitary plant effluent and the settling lagoon effluent. Sludge from the sanitary plant anaerobic digester was also sampled. Sampling locations are described in more detail in appendix A.

Vanalco personnel collected composite samples from the sanitary sewage influent and effluent, and from the settling lagoon effluent. Vanalco's sampling locations were generally the same as Ecology's sampling locations.

Ecology and Vanalco composite samples were split for analysis by both Ecology and Vanalco laboratories. Parameters analyzed, samples collected, and schedules appear in Appendix B.

Samples designated for Ecology analysis were delivered to personnel from the Ecology's Manchester Laboratory. Chain of custody procedures were observed throughout the inspection. Analytical procedures and laboratories performing the analyses are summarized in Appendix C.

Quality Assurance/Quality Control

Sampling quality assurance included priority pollutant cleaning of sampling equipment (Appendix D). Sampling in the field followed all protocols for holding times, preservation, and chain-of-custody set forth in the Manchester Lab Laboratory Users Manual (Ecology, 1991).

Laboratory QA/QC including applicable holding times, procedural blanks, spike and duplicate spike sample analyses, and control samples were generally within acceptable limits. Qualifiers are included in the data table where appropriate. Specific QA/QC concerns are included in Appendix D.

Results and Discussion

Sanitary Sewage Treatment Plant Wastewater

Flow Measurement

An Ecology instantaneous measurement was made for comparison with effluent flow readings from the SSTP ultrasonic flow meter. The Vanalco metered instantaneous flow rate was 0.060 MGD. Ecology determined the instantaneous rate to be 0.061 MGD. The relative percent difference between the two measurements was less than 2%. The Vanalco flow totalizer recorded a sanitary plant flow of 0.056 MGD, approximately synchronous with the composite sampling period.

Plant Operation

The plant appeared well maintained. The operation of the plant seemed efficient and effective.

General Chemistry

Ecology results are shown in Table 1. BOD_5, TOC, and COD influent concentrations were considerably less than the strength of weak typical domestic sewage influent (Metcalf and Eddy, 1991). Influent TSS and TNVSS concentrations were about half that of the weakest typical range. Dissolved solids and nutrient concentrations were at the low end of typical ranges. Low influent concentrations had only marginal influence on plant removal efficiency, with BOD_5 and TSS reductions across the plant 75% and 80% respectively (Table 2). Nitrification by the SSTP was excellent, with 94% removal of NH_3-N and a concurrent large increase in nitrate-nitrite nitrogen.

Split Samples

Ecology analysis of Vanalco and Ecology SSTP samples produced very similar results, indicating comparable sampling procedures (Table 3). This was despite all Vanalco's composite sample temperatures exceeding both Ecology sample temperatures and the desired 4°C holding temperatures. To enhance representativeness, Vanalco refrigeration units should be checked and adjusted as necessary.

The Vanalco laboratory analytic results were generally similar to the Ecology lab results, with several exceptions (Table 3). Non-parametric statistical analysis (Wilcoxon signed ranks test) of individual analytes across all sample stations indicated that at a 95% confidence interval there was significant variation between labs for alkalinity, hardness, and total phosphorous. Several metal results comparisons were obscured by the different detection limits of Ecology and Vanalco lab results. Significant differences existed between the two lab's analysis for all parameters in both sanitary sewage effluent samples. These findings indicate some variations between labs in laboratory procedures. Presently, Vanalco is accredited by the Ecology Laboratory Accreditation Program for permitted parameters: chloride, fluoride, oil and grease, pH, and TSS.

NPDES Permit Comparisons

Ecology composite sample results found SSTP effluent BOD_5 concentration (13 mg/L) and TSS concentration (11 mg/L) to be well within both the permit 7-day and 30-day average concentration limits (Table 4). The Vanalco composite result produced an effluent BOD_5 concentration that exceeded both limits, but this is believed to be anomalous and probably not representative. Removal efficiencies of BOD_5 (75%) and TSS (80%) were both greater than the 65% 30-day average removal efficient required by the NPDES permit. Effluent fecal coliform, total residual chlorine concentration, and pH were also well within permit limits.

Detected Organics and Priority Pollutants

Table 5 summarizes concentrations of detected priority pollutant organics. Table 6 summarizes detected priority pollutant metals. Appendix E contains results of all targeted organic compounds and metals. Tentatively identified compounds are presented in Appendix F.

Several VOAs, BNAs, and metals were detected in the SSTP effluent (Table 5). Eight VOA and nine BNAs were detected in the sanitary plant effluent, none at concentrations higher than 1.1 μg/L. Pesticides/PCBs were not detected in SSTP effluent. No organic compound concentration exceeded water quality criteria for receiving waters (Ecology, 1992; EPA, 1986). Several metals were detected in the SSTP effluent, but none exceeded EPA and state criteria (Table 6). Copper was found at the highest concentration, reaching 88% of the chronic criterion.

Bioassays

The Daphnia magna bioassay produced an NOEC of 100% for the sanitary sewage plant effluent (Table 8). Rainbow trout and microtox also demonstrated no significant toxicity.

Sanitary Sewage Treatment Plant Sludge

General Chemistry

Total percent solids was about 7% (Table 1); within the typical range of anaerobically digested primary sludge and trickling-filter humus (Metcalf and Eddy, 1991). Sanitary sewage treatment plant sludge contained an estimated 301,000 mg/Kg-dry wt. TOC and 49,000 mg/Kg-dry wt. oil and grease. The latter was approximately 5% of the total solids and is well within the typical range for digested sludge. Fluoride was found at 4,286 mg/Kg-dry wt. It is possible that this constituent entered the sanitary sewage waste stream through infiltration from contaminated groundwater. Groundwater and soil through which the buried sanitary sewage pipe runs is contaminated with fluoride (Hart Crowser, 1987). The contamination is believed to have resulted from the leaching of used pot liner waste. Sludge fluoride concentration does not designate the sludge as a dangerous waste mixture under the dangerous waste regulations (Ecology, 1989). This concentration does pose known health hazards to both human and animals through various exposure pathways (Nature, 1970; IARC, 1982). Caution is recommended in the final disposal of this waste.

Detected Organics and Priority Pollutants

Thirteen BNAs (Table 5) and three PCB (Table 6) were detected in the sludge. The BNA found at the highest concentration was benzo(b)Fluoranthene (9,650 µg/Kg-dry wt.). Aroclor 1,254 (1430 µg/Kg-dry wt.) was the PCB at the highest concentration. Twelve metals were found in the sludge. Copper was detected at the highest concentration (1,440 mg/Kg-dry wt.). Although the criteria is not applied to industrially generated sludge, all concentrations were less than EPA criteria for the land application of domestic sewage sludge (Table 9).

Industrial Wastewater

Oil Spill

During the inspection, Vanalco switched influent discharge from the south lagoon to the alternate north lagoon. The north lagoon had not been used for several years. This was done to contain an oil spill from the boiler house. Approximately 1,500 gallons of 1% water soluble oil was discharged to the south lagoon. It was reported that the spill had been completely contained and that the north lagoon remained unaffected.

Flow Measurements

Vanalco measures sedimentation pond effluent flow with an ultrasonic flowmeter at a square weir. An Ecology verification measurement of instantaneous flow was not possible due to the weir's inaccessibility. The Vanalco effluent totalizer flow varied considerably over the three day inspection, and was recorded by Vanalco as 2.45 MGD on January 11 and 1.38 MGD on January 12. Average flow during the composite sampling period was estimated to be 1.92 MGD.

Settling Basin Operation

The north settling lagoon appeared to be functioning normally, although it had only been in use for the previous few days. The contaminated south lagoon allowed a small amount of seepage into the effluent, but this was not sufficient to noticeably affect effluent quality. Algae was observed growing in the lagoons and it was reported by Vanalco personnel that pH rises dramatically in the summer (above 9.00). During the inspection excessive pH was not observed.

General Chemistry

The settling lagoon influent and effluent composite TSS concentrations were low, although higher than the industrial wastewater intake TSS concentration (Table 1). Concurrent low TOC concentration and the negligible TSS and TOC reduction across the settling lagoon suggest that the industrial wastewater contains predominantly non-organic and non-volatile dissolved solids (Table 2). Fluoride concentration in the settling lagoon influent was almost four times that of the intake water fluoride concentration and increased by more than 300% across the settling lagoon. This suggests surges of fluoride contaminated industrial wastewater to the settling lagoon, possibly from the flushing of air-borne particulate into stormwater runoff. Alternatively, the surges could result from entrainment of lagoon bottom sediment into lagoon wastewater. The extent of these surges should be evaluated by additional monitoring, and if confirmed, the sources fully identified.

Split Samples

Ecology analysis of Ecology and Vanalco settling basin samples found virtually identical results (Tables 1 and 3). Ecology and Vanalco laboratories produced similar results for individual effluent analytes examined; including fluoride, solids, nutrients, cyanide, and metals. Comparisons of lab results for individual sample stations found no significant difference between the lab's effluent sample analyses. The Wilcoxon test identified a significant variation between labs for analytes examined in the lagoon influent sample.

NPDES Permit Comparisons

Settling basin effluent loads were within NPDES permit monthly averages and daily maximums (Table 4). A possible exception was the Ecology 24-hour composite cyanide concentration. Although the result was below the lab's detection limit, a concentration at that detection limit would produce a load (0.16 lbs/day) that exceeds the permit's monthly average load limit. If the actual value of the effluent cyanide concentration approached the detection limit it could conceivably exceed the monthly average limit by up to 7%. The Vanalco lab result was based on a lower detection limit and produced a cyanide load of 0.13 lbs/day, or 87% of the permit's monthly average limit. Further sampling of cyanide at lower detection limits is recommended to clarify this issue.

Detected Organics and Priority Pollutants

Settling basin influent contained 12 detected VOAs and 18 detected BNAs (Table 5). Settling basin effluent contained 9 detected VOAs and 11 detected BNAs, all at concentrations less than 1.0 μg/L. These compounds did not exceed EPA acute or chronic water quality criteria. Pesticide/PCBs were not detected. Metal concentrations results in both the influent and effluent were all within EPA and state water quality criteria (Table 6).

Polynuclear Aromatic Hydrocarbon Scan (low detection)

Twenty-one polynuclear aromatic hydrocarbons (PAH) were detected each in the settling basin influent and settling basin effluent (Table 7). In the effluent fluoranthene (0.19 μg/L) and pyrene (0.12 μg/L) were detected at the highest concentrations. Benzo(a)pyrene, the only PAH cited in the permit, was detected in the effluent at a load of .00086 lbs/day which is below the permit limit of .004 lbs/day.

Bioassays

Two of the six organisms tested demonstrated sensitivity to settling basin effluent (Table 8). Acute tests, including rainbow trout, *Daphnia magna*, and microtox, showed no significant toxicity. Chronic tests included fathead minnow, *Ceriodaphnia dubia* and *Selenastrum capricornutum*. Fathead minnow 7-day survival and growth test found no significant toxicity with a NOEC of 100% effluent. The *Ceriodaphnia dubia* survival and reproduction test found a slight chronic effect in reproduction with an NOEC of 50% effluent. *Selenastrum capricornutum* demonstrated an intense chronic effect with LC_{50}=8%, LOEC=6.25%, and NOEC<6.25%. It is recommended that the cause of selenastrum toxicity be identified.

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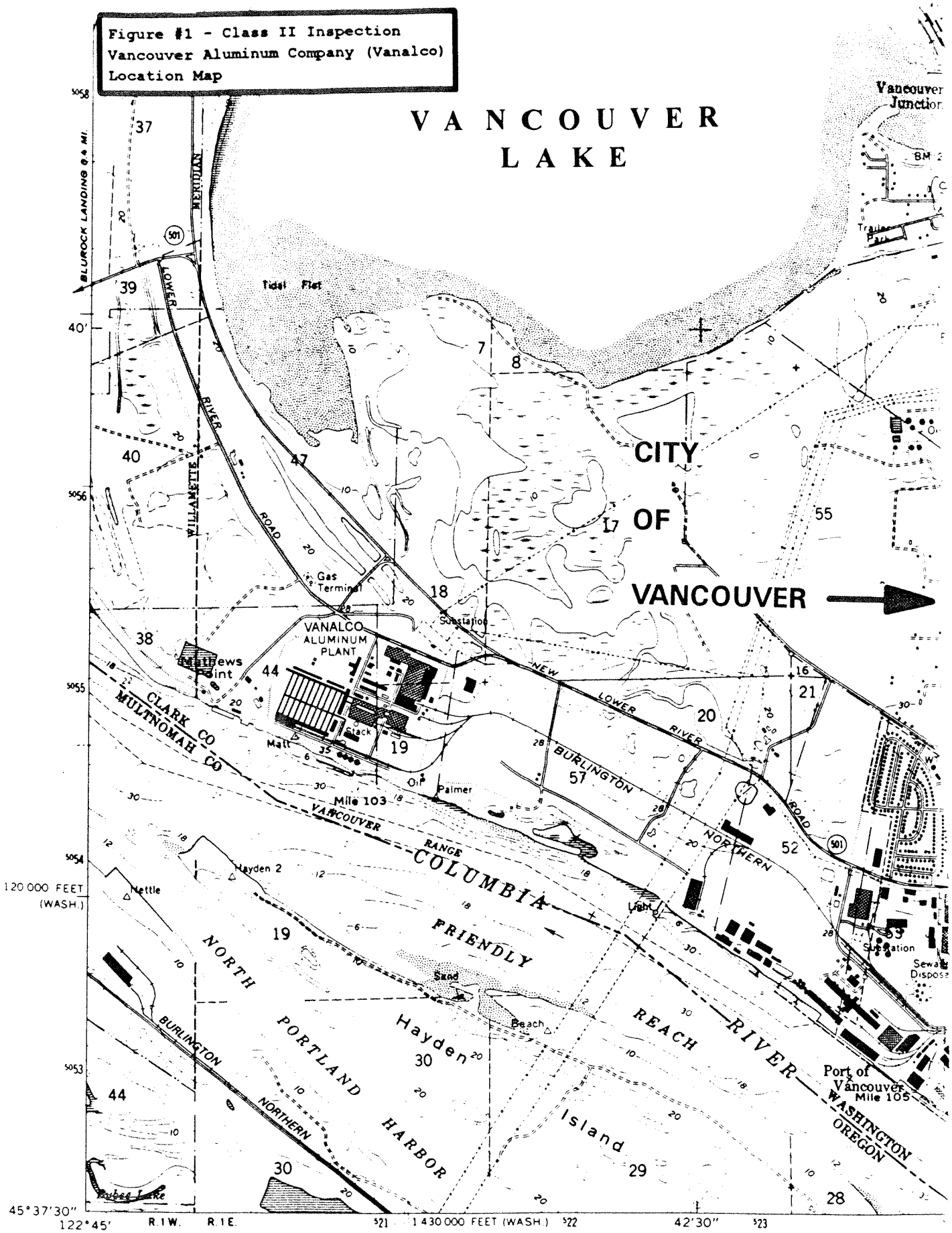
Figure #1 - Class II Inspection
Vancouver Aluminum Company (Vanalco)
Location Map



Mapped edited and published by the Geological Survey

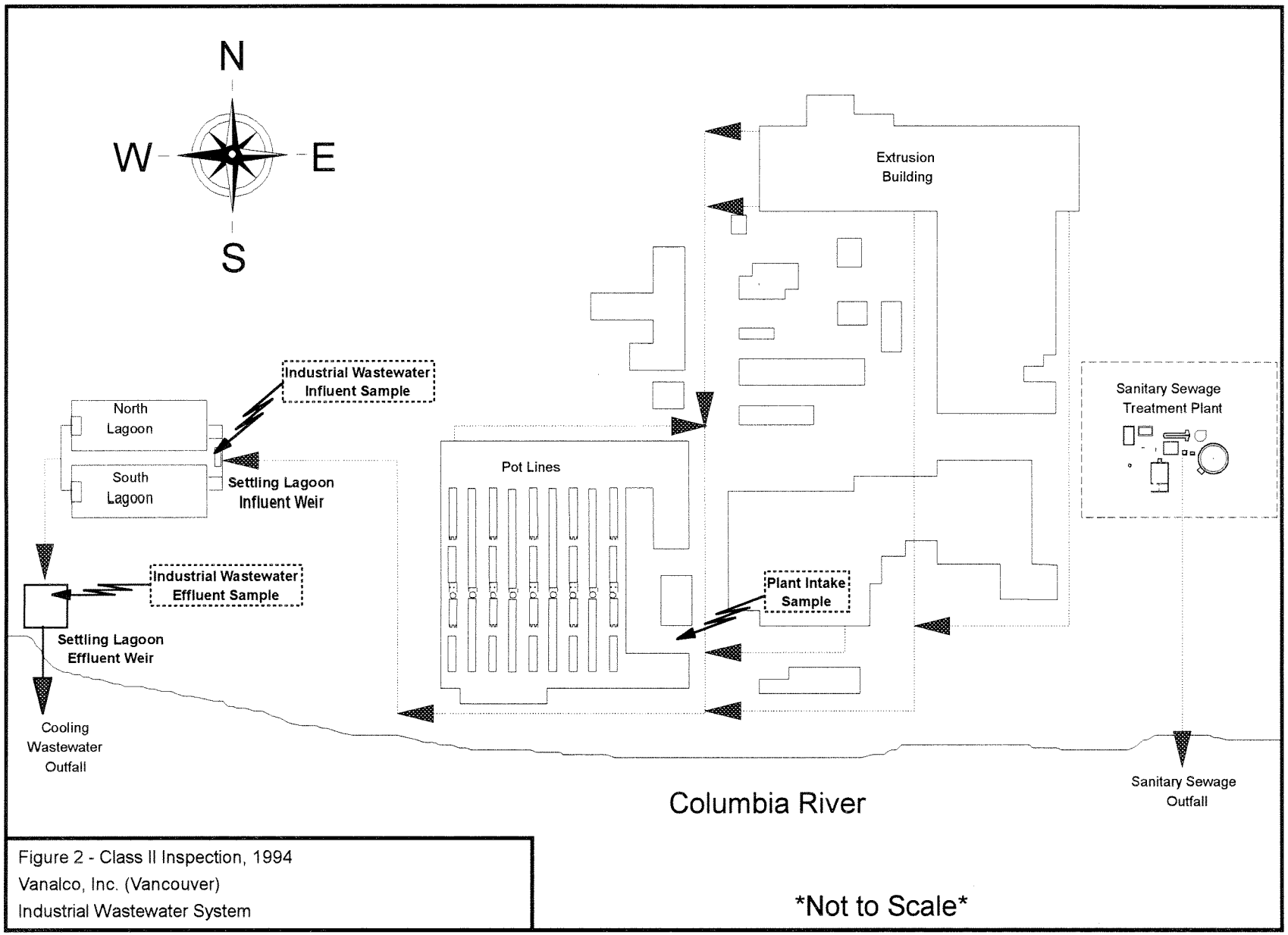


Figure 2 - Class II Inspection, 1994
Vanalco, Inc. (Vancouver)
Industrial Wastewater System

Not to Scale

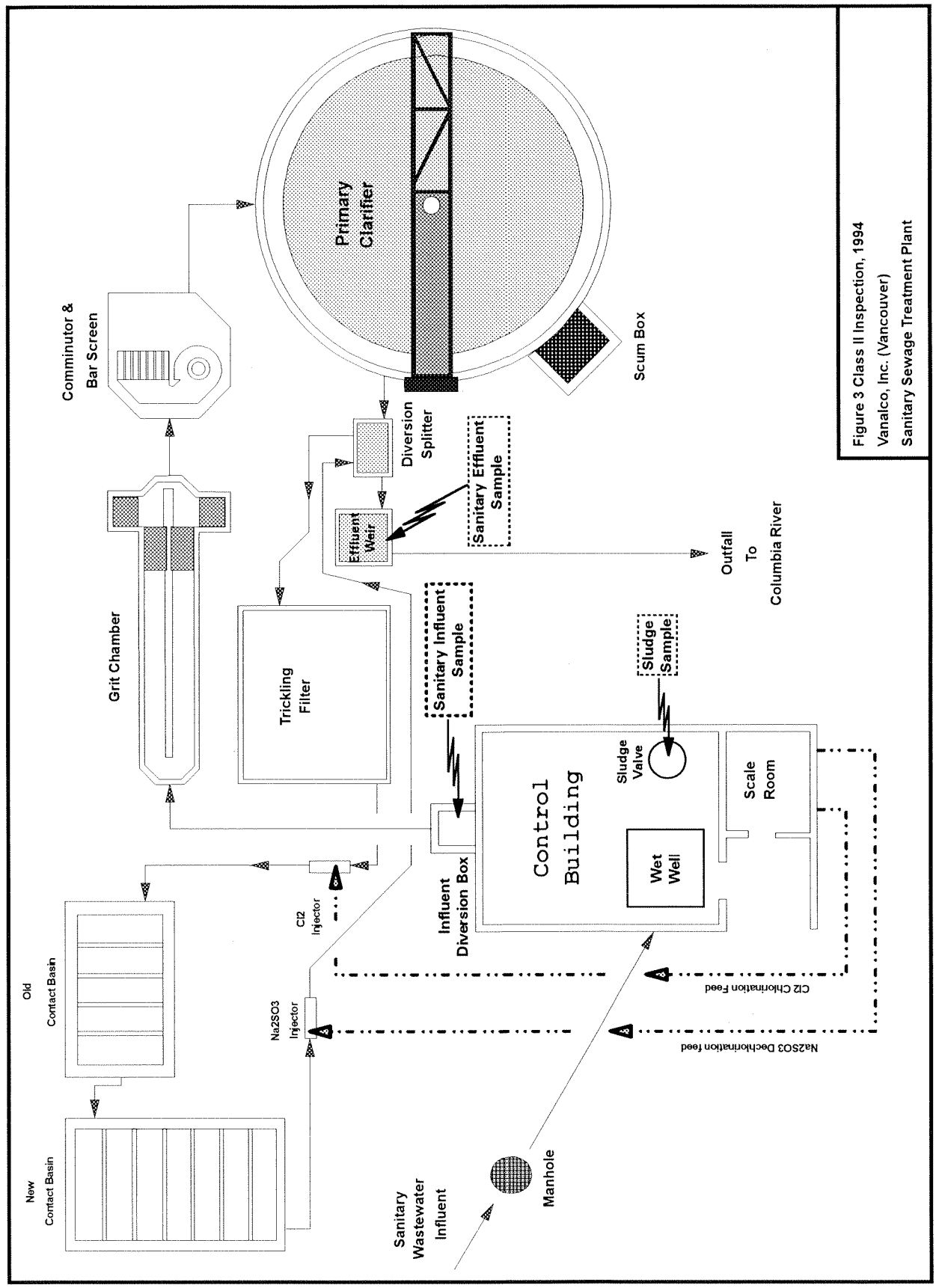

Primary Clarifier
Scum Box
Comminutor & Bar Screen
Diversion Splitter
Sanitary Effluent Sample
Effluent Weir
Grit Chamber
Trickling Filter
Sanitary Influent Sample
Sludge Sample
Outfall To Columbia River
Sludge Valve
Control Building
Wet Well
Scale Room
Influent Diversion Box
Cl2 Injector
Na2SO3 Injector
Old Contact Basin
New Contact Basin
Cl2 Chlorination Feed
Na2SO3 Dechlorination feed
Sanitary Wastewater Influent
Manhole
Figure 3 Class II Inspection, 1994
Vanalco, Inc. (Vancouver)
Sanitary Sewage Treatment Plant

Table 1 - Ecology General Chemistry Results - Vanalco Aluminum (Vancouver), 1994

Parameter	Location:	S-E-Inf-1	S-E-Inf-2	S-E-Inf	S-V-Inf¤	S-E-EF-1	S-E-Ef-2	S-E-Ef	S-V-Ef¤	S-Ef-GC
	Type:	grab	grab	comp	comp	grab	grab	comp	comp	grab/comp
	Date:	01/11	01/11	1/11-12	1/11-12	1/11	1/11	1/11-12	1/11-12	1/11
	Time:	1245	1640	@	@	1250	1635	@	@	1250&1635
	Lab Log #:	028080	028081	028082	028083	028084	028085	028086	028087	028088
GENERAL CHEMISTRY										
Alkalinity (mg/L CaCO3)				217	207			130	130	126
Hardness (mg/L CaCO3)				181	180			173	169	165
Fluoride (total mg/L)				1.4	1.5			1.4	1.3	
Fluoride (soil mg/Kg-dry wt.)										
SOLIDS										
TS (mg/L)				370 J				337		
TNVS (mg/L)				243 J				234		
TSS (mg/L)		45	64	54	79	10	14	11	11	13
TNVSS (mg/L)				10				3		
% Solids										
% Volatile Solids										
OXYGEN DEMAND PARAMETERS										
BOD5 (mg/L)				52	46			13	55	
COD (mg/L)				100	97			27	26	
TOC (water mg/L)		21.5	26.6	24.9	21.8	9.9	7.4	7.3	7.1	
TOC (soil mg/Kg-dry wt.)										
NUTRIENTS										
NH3-N (mg/L)				13	11			0.803	0.909	
NO2+NO3-N (mg/L)				0.728	0.802			9.31	8.91	
Total-P (mg/L)				2.41	2.48			1.55	1.54	
MISCELLANEOUS										
Oil and Grease (mg/L)						1 J	1 J			
Oil and Grease (mg/Kg)										
F Coliform MF (#/100mL)						8 U	8 U			
Cyanide total (mg/L)										
Cyanide total (soil mg/kg dry wt)										
FIELD OBSERVATIONS										
Temperature (°C)		16.5				10.3	13.6			
Temp-cooled (°C)*+				2.1	7.8			5.1	7	
pH		7.6		7.7	7.8	7.4	7.3	7.4	7.4	
Conductivity (umhos/cm)		575		560	532	423	463	474	471	
Chlorine (mg/L)		≤0.1				≤0.1	≤0.1	≤0.1	≤0.1	

E Ecology sample
V Vanalco sample
S Smelter sewage plant
C Smelter cooling water
@ Composite sample period: 08:00-08:00.

comp Composite sample
grab Grab sample
GC Grab-composite sample
Inf Influent sample
Ef Effluent sample

J The analyte was positively identified. The associated numerical result is an estimate.
U The analyte was not detected at or above the reported result.
*+ Refrigerated sample.
¤ Data suggests that results for Vanalco's samples #208083 and #208087 were switched, probably due to misidentifying sample containers during the breakdown of their compositor samples. These data have been transposed.

Table 1 (cont.) - Ecology General Chemistry Results - Vanalco Aluminum (Vancouver), 1994

Parameter II	Location:	Intake	C-E-Inf-1	C-E-Inf-2	C-E-Inf	E-Ef-1	E-Ef-2	E-Ef	V-Ef	Ef-GC	Sludge
	Type:	grab	grab	grab	comp	grab	grab	comp	comp	grab-comp	grab
	Date:	1/11	1/11	1/11	1/11-12	1/11	1/11	1/11-12	1/11-12	1/11	1/11
	Time:	1450	1155	1600	@	@	1545	@	@	1105\1545	1145
	Lab Log #:	028089	028090	028091	028092	028093	028094	028095	028096	028097	028098
GENERAL CHEMISTRY											
Alkalinity (mg/L CaCO3)					169			154	153	153	
Hardness (mg/L CaCO3)					192			157	159	156	
Fluoride (total mg/L)		0.24			0.86			3.5	3.4		
Fluoride (soil mg/Kg-dry wt.)											4286
SOLIDS											
TS (mg/L)								279 J			
TNVS (mg/L)								207 J			
TSS (mg/L)		1 U	7	3	9	8	7	7	6	9	
TNVSS (mg/L)								3			
% Solids											7
% Volatile Solids											54
OXYGEN DEMAND PARAMETERS											
BOD5 (mg/L)											
COD (mg/L)											
TOC (water mg/L)		1.6			3.3			3.3	2.9		
TOC (soil mg/Kg-dry wt.)											301000 J
NUTRIENTS											
NH3-N (mg/L)								0.01	0.01		
NO2+NO3-N (mg/L)								0.023	0.012		
Total-P (mg/L)								0.143	0.132		
MISCELLANEOUS											
Oil and Grease (mg/L)			7 J	2 J		1 UJ	1 UJ				
Oil and Grease (mg/Kg)											49000
F-Coliform MF (#/100mL)						23	15				
Cyanide total (mg/L)		0.01			0.01			0.01	0.01		
Cyanide total (soil mg/kg dry wt)											7 U
FIELD OBSERVATIONS											
Temperature (°C)		11.7	29	18.7		15	14.3				
Temp-cooled (°C)*+					4.7			5.7	7.2		
pH		7.1	7.3	7.6	7.4	7.3	7.4	7.6	7.5		
Conductivity (umhos/cm)		400	397	400	508	439	399	380	388		
Chlorine (mg/L)			≤0.1		≤0.1	≤0.1	≤0.1				

E	Ecology sample	comp	Composite sample	@	Composite sample period: 08:00-08:00.
V	Vanalco sample	grab	Grab sample	J	The analyte was positively identified. The associated numerical result is an estimate.
S	Smelter sewage plant	GC	Grab-composite sample	U	The analyte was not detected at or above the reported result.
C	Smelter cooling water	Inf	Influent sample	UJ	The analyte was not detected at or above the reported estimated result.
Sludge	Sludge sample	Ef	Effluent sample	*+	Refrigerated sample.

Table 2 – Ecology General Chemistry Results Percent Removal– Vanalco Aluminum (Vancouver), 1994

Parameter	Location:	Intake	S-E-Inf	S-E-Ef	Ecology Percent Removal Across Sanitary Sewage Treatment Plant	C-E-Inf	Percent Increase Across Smelter *Intake To Cooling Water*	E-Ef	Ecology Percent Removal Across Settling Basin	S-V-Inf	S-V-Ef	Vanalco Percent Removal Across Sanitary Sewage Treatment Plant	V-Ef	Vanalco Percent Removal Across Settling Basin
	Type:	grab	comp	comp		comp		comp		comp	comp		comp	
	Date:	1/11	1/11-12	1/11-12		1/11-12		1/11-12		1/11-12	1/11-12		1/11-12	
	Time:	1450	@	@		@		@		@	@		@	
	Lab Log #	028089	028082	028086		028092		028095		028083	028087		028096	
GENERAL CHEMISTRY														
Fluoride (total mg/L)		0.24	1.4	1.4	0%	0.86	258%	3.5	-307%	1.5	1.3	13%	3.4	-295%
SOLIDS														
TSS (mg/L)		1 U	54	11	80%	9	800%	7	22%	79	11	86%	6	33%
OXYGEN DEMAND PARAMETERS														
BOD5 (mg/L)			52	13	75%					46	55	-20%		
COD (mg/L)			100	27	73%					97	26	73%		
TOC (water mg/L)		1.6	24.9	7.3	71%	3.3	106%	3.3	0%	21.8	7.1	67%	2.9	12%
NUTRIENTS														
NH3-N (mg/L)			13	0.803	94%			0.01		11	0.909	92%	0.01	
NO2+NO3-N (mg/L)			0.728	9.31	-1179%			0.023		0.802	8.91	-1011%	0.012	
Total-P (mg/L)			2.41	1.55	36%			0.143		2.48	1.54	38%	0.132	
MISCELLANEOUS														
Cyanide total (mg/L)		0.01				0.01	0%	0.01	0%				0.01	0%
FIELD OBSERVATIONS														
pH		7.1	7.7	7.4	4%	7.4		7.6	-3%	7.4	7.8	-5%	7.5	-1%
Conductivity (umhos/cm)		400	560	474	15%	508		380	25%	471	532	-13%	388	24%

E	Ecology sample	comp	Composite sample
V	Vanalco sample	Inf	Influent sample
S	Smelter sewage plant	Ef	Effluent sample
C	Smelter cooling water	Intake	Smelter intake sample
@	Composite sample period: 08:00-08:00.		

Table 3 – Split Sample Result Comparison – Vanalco Aluminum (Vancouver), 1994

Parameter	Location:	S-E-Inf-1	S-E-Inf	S-V-Inf ▵	S-E-EF-1	S-E-Ef	S-V-Ef ▵	Intake	C-E-Inf-1	C-E-Inf	E-Ef-	E-Ef	V-Ef
	Type:	grab	comp	comp	grab	comp	comp	grab	grab	comp	grab	comp	comp
	Date:	01/11	1/11-12	1/11-12	1/11	1/11-12	1/11-12	1/11	1/11	1/11-12	1/11	1/11-12	1/11-12
	Time*:	1245/0830	@	@	1250/0915	@	@	1450/1230	1155/1400	@	@	@	@
	Lab Log #:	028080	028082	028083	028084	028086	028087	028089	028090	028092	02809	028095	028096
General Chemistry	**Laboratory**												
Alkalinity (mg/L CaCO3)	Ecology		217	207		130	130			169		154	153
	Vanalco		220	220		130	130			170		160	160
Hardness (mg/L CaCO3)	Ecology		181	180		179	169			192		157	159
	Vanalco		180	200		180	200			200		180	220
Fluoride (total mg/L)	Ecology		1.4	1.5		1.4	1.3	0.24		0.86		3.5	3.4
	Vanalco		1.3	1.6		1.4	1.4	0.3		0.9		3.8	3.8
TS (mg/L)	Ecology		370 J			337						279	
	Vanalco		350			320						260	
TNVS (mg/L)	Ecology		243 J			234						207	
	Vanalco		220			190						189	
TSS (mg/L)	Ecology	45	54	79	10	11	11	1 U	7	9	8	7	6
	Vanalco	54	90	44	7	7	11	<2	2	10	4	3	4
TNVSS (mg/L)	Ecology		10			3						3	
	Vanalco		18			1						0	
BOD5 (mg/L)	Ecology		52	46		13							
	Vanalco		36	34		10							
COD (mg/L)	Ecology		100	97		27	26						
	Vanalco		100	85		24	28						
TOC (mg/L)	Ecology	21.5	24.9	21.8	9.9	7.3	7.1	1.6		3.3			2.9
	Vanalco	13	10	6.9	4.8	6.1	8.2	1.6		4			2.8
NH3-N (mg/L)	Ecology		13	11		0.803	0.909						0.01
	Vanalco		6.3	4.2		0.89	0.99						<0.02
NO2+NO3-N (mg/L)	Ecology		0.728	0.802		9.31	8.91						0.012
	Vanalco		0.70	0.81		8	11						<0.01
Total-P (mg/L)	Ecology		2.41	2.48		1.55	1.54						0.132
	Vanalco		3.0	2.7		1.9	1.7						0.17
Oil & Grease (mg/L)	Ecology				1 J				7 J		1 UJ		
	Vanalco				1.5				7.3		1.6		
F-Coliform MF (#/100ml)	Ecology				8 U						23		
	Vanalco				1						3		
Cyanide Total (mg/L)	Ecology							0.01 U		0.01 U		0.01 U	0.01
	Vanalco							0.006		0.01		0.008	0.008
Chlorine (mg/L)	Ecology												
	Vanalco												

E Ecology sample
V Vanalco sample
S Sanitary sewage treatment system
C Smelter cooling water
J The analyte was positively identified, but the associated value is an estimate.

S-Inf Sanitary sewage plant influent samples.
S-Ef Sanitary sewage plant effluent samples.
Inf Settling basin influent
Ef Smelter effluent
Comp Ecology composite sample
grab grab sample

Intake Smelter intake water
* Times: Ecology/Vanalco
▵ Data suggests that results for Vanalco's samples #208083 and #208087 were switched, probably due to misidentifying sample containers during the breakdown of their composite samples. These data have been transposed.
@ Composite collection period: 08:00-08:00.

Table 3 (cont.) – Split Sample Result Comparison – Vanalco Aluminum (Vancouver), 1994

Parameter	Location:	S-E-Inf	S-E-Ef	Intake	C-E-Inf	E-Ef
	Type:	comp	comp	grab	comp	comp
	Date:	1/11-12	1/11-12	1/11	1/11-12	1/11-12
	Time*:	@	@	1450/1230	@	@
	Lab Log #:	028082	028086	028089	028092	028095
Metals	Laboratory					
Aluminum (µg/L)	Ecology	665	180 P	20 U	255	489
	Vanalco	890	180	20 U	290	510
Antimony (µg/L)	Ecology	30 U	30 U	30 U	30 U	30 U
	Vanalco	3 U	3 U	3 U	3 U	3 U
Arsenic (µg/L)	Ecology	1.7 P	1.8 P	1.7 P	2.3 P	1.5 U
	Vanalco	5 U	5 U	5 U	5 U	5 U
Berylium (µg/L)	Ecology	1 U	1 U	1 U	1 U	1 U
	Vanalco	1 U	1 U	1 U	1 U	1 U
Cadmium (µg/L)	Ecology	0.34 P	0.13 P	0.10 U	0.10 U	0.10 U
	Vanalco	1 U	1 U	1 U	1 U	1 U
Chromium (µg/L)	Ecology	5 U	5 U	5 U	5 U	5 U
	Vanalco	5	3	3	4	3
Copper (µg/L)	Ecology	49.7	14 P	12 P	5.6 P	4.8 P
	Vanalco	46	13	5	6	5
Lead (µg/L)	Ecology	4.2 P	1.1 P	25	1.5 P	1.0 U
	Vanalco	5 U	5 U	5 U	5 U	5 U
Mercury (µg/L)	Ecology	0.24 P	0.05 U	0.05 U	0.05 U	0.05 U
	Vanalco	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel (µg/L)	Ecology	10 U	10 U	10 U	10 U	21 P
	Vanalco	5 U	2	2 U	2 U	25
Selenium (µg/L)	Ecology	2 U	2.0 U	2.0 U	2.0 U	2.0 U
	Vanalco	5 U	5 U	5 U	5 U	5 U
Silver (µg/L)	Ecology	0.50 UN	0.50 UN	0.50 U	0.05 UN	0.05 UN
	Vanalco	0.1 U	1 U	1 U	1 U	1 U
Thallium (µg/L)	Ecology	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
	Vanalco	2 U	2 U	2 U	2 U	2 U
Zinc (µg/L)	Ecology	66.4	29 P	9.5 P	6.4 P	9.4 P
	Vanalco	54	28	3	8	13

Parameter	Location:	C-E-Inf
	Type:	comp
	Date:	1/11-12
	Time*:	@
	Lab Log #:	028092
Polynuclear Aromatic Hydrocarbons	Laboratory	
Fluorene (µg/L)	Ecology	0.15
	Vanalco	0.21
Phenanthrene (µg/L)	Ecology	0.32
	Vanalco	0.44
Chrysene (µg/L)	Ecology	0.19
	Vanalco	0.17
Benzo(a)pyrene (µg/l)	Ecology	0.2
	Vanalco	0.25

E Ecology sample
S Sanitary sewage treatment system
C Smelter cooling water
S-Inf Sanitary sewage plant influent samples.
S-Ef Sanitary sewage plant effluent samples.

Intake Smelter intake water
N For metals analytes the spike sample recovery was not within control limits
P The analyte was detected above the instrument detection limit, but below the established minimum quantitation limit.
U The analyte was not detected at or above the reported result.

@ Composite collection period: 08:00-08:00.
Inf Settling basin influent
Ef Smelter effluent
Comp Ecology composite sample

Table 4 – Effluent NPDES Limits/Inspection Results – Vanalco Aluminum (Vancouver), 1994

Parameter	NPDES Permit Limits: Sanitary Treatment Plant Discharge 30-Day Average	NPDES Permit Limits: Sanitary Treatment Plant Discharge 7-Day Average	Inspection Data: Sanitary Plant Effluent						NPDES Permit Limits: Industrial Discharge		Inspection Data: Industrial Effluent					
			Ecology Composite		Vanalco Composite		Ecology Grab				Ecology Composite	Vanalco Composite	Ecology Grab			
Location:			S-E-Inf	S-E-Ef	S-V-Inf	S-V-Ef ▲	S-E-EF-1	S-E-Ef-2			E-Ef	V-Ef	E-Ef-1	E-Ef-2	Ef-GC	
Type:			comp	comp	comp	comp	grab	grab			comp	comp	grab	grab	grab-comp	
Date:			1/11-12	1/11-12	1/11-12	1/11-12	1/11	1/11			1/11-12	1/11-12	1/11	1/11	1/11	
Time:			@	@	@	@	1250	1635			@	@	@	1545	1105\1545	
Log #:			028082	028086	028083	028087	028084	028085	Monthly Average	Daily Maximum	028095	028096	028093	028094	028097	
BOD5 (mg/L)	25	45	52	13	46	55										
(lbs/D)																
(% removal)	>= 65			75%		-20% **										
TSS (mg/L)	30	45	54	11	79	11					7	6	8	7	13	
(lbs/D)									400	760	112	96	128	112	208	
(% removal)	>= 65			80%		86%										
Fecal coliform (colonies/100 mL)	200	400					8 U	8 U								
pH (S.U.)	6.0 < pH < 9.0			7.4		7.4			6.0 < pH < 9.0		7.6	7.5	7.3	7.40		
Total Residual Chlorine (mg/L)	0.0 to 1.0			≤ 0.1		≤ 0.1	≤ 0.1	≤ 0.1								
Aluminum (mg/L)											0.489					
(lbs/D)									35.0	80.0	7.8					
Flouride (Total) (mg/L)											3.5	3.4				
(lbs/D)									100.0	200.0	55.9	54.3				
Oil & Grease (mg/L)													1	1 UJ		
(lbs/D)									70.0	150.0			16.0	16.0		
Benzo(a)pyrene B(a) P(a) (mg/L)											0.000054					
(lbs/D)									0.002	0.004	0.00086					
Antimony (mg/L)											0.03 U	0.003 U				
(lbs/D)									2.0	3.0	0.48	0.05				
Nickel (mg/L)											0.021	0.021				
(lbs/D)									2.4	3.4	0.336	0.336				
Free Cyanide (Total) (mg/L)											0.01 U	0.008				
(lbs/D)									0.15	0.4	0.16	0.13				
Chromium (mg/L)											0.005	0.002				
(lbs/D)									0.8	1.5	0.080	0.032				
Zinc (mg/L)											0.0094	0.011				
(lbs/D)									1.8	3.9	0.150	0.176				
Salmonid Bioassay (% Survival-100% Effluent)										80						100

E Ecology sample
V Vanalco sample
S Sewage treatment plant sample
Inf Influent sample
Ef Effluent sample

E-comp Ecology composite
V-comp Vanalco composite
@ Composite sample period: 08:00-08:00
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.

▲ Data suggests that the results for Vanalco samples #208083 and 208087 were switched, probably due to misidentifying containers during the breakdown of their composite samples. These data have been transposed.
GC Ecology Grab composite
** The value of effluent BOD5 as reported by the Vanalco laboratory analysis is anomalous and should be viewed with caution.

Table 5 – Detected VOA and BNA Scan Results – Vanalco Aluminum (Vancouver), 1994.

Parameter	Location:	S-E-EF-1	S-E-Ef-2	C-E-Inf-1	C-E-Inf-2	E-Ef-1	E-Ef-2	EPA Water Quality Criteria Summary	
	Type:	grab	grab	grab	grab	grab	grab		
	Date:	1/11	1/11	1/11	1/11	1/11	1/11	Acute	Chronic
	Time:	1250	1635	1155	1600	1105	1545	Fresh	Fresh
	Lab Log#:	028084	028085	028090	028091	028093	028094		
VOA Compounds		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	(ug/L)	(ug/L)
Acetone					11.5 J				
Chloroform		1.0	0.75 J		0.78 J	0.39 J	0.4 J	28,900 *	1,240 *
Benzene				0.83 J		0.21 J	0.19 J	5,300 *	
1,1,1-Trichloroethane		0.059 J	0.075 J	0.32 J	0.31 J	0.15 J	0.16 J	18,000 *(c)	
Bromodichloromethane		0.27 J	0.2 J		0.67 J	0.29 J	0.31 J	11,000 *(a)	
Trichloroethene		0.43 J	0.46 J	2.3	2.4	1.1	1.2	45,000 *	21,900 *
o-Xylene				0.16 J	1.0				
1,2,4-Trimethylbenzene				0.35 J		0.44 J	0.4 J		
Ethylbenzene				0.13 J				32,000 *	
1,4-Dichlorobenzene		0.64 J						1,120 *(h)	763 *(h)
Toluene		0.16 J	0.12 J	0.46 J		0.19 J		17,500 *	
Dibromochloromethane				0.76 J	0.49 J	0.21 J	0.23 J	11,000 *(a)	
cis-1,2-Dichloroethene		0.24 J	0.28 J	1.8		0.90 J	1.0 J	11,600 *(b)	
1,3-Dichlorobenzene		0.66 J						1,120 *(h)	763 *(h)

Parameter	Location:	S-E-Ef	C-E-Inf	E-Ef	EPA Water Quality Criteria Summary		Sludge
	Type:	comp	comp	comp			grab
	Date:	1/11-12	1/11-12	1/11-12	Acute	Chronic	1/11
	Time:	@	@	@	Fresh	Fresh	1145
	Lab Log#:	028086	028092	028095			028098
BNA Compounds		µg/L	µg/L	µg/L	(ug/L)	(ug/L)	µg/Kg-dry wt.
Benzo(a)Pyrene		0.038 J	0.26 J	0.090 J			
Benzo(a)Anthracene			0.22 J	0.11 J			5200
Isophorone		0.21 J	0.20 J	0.38	117,000 *		482 J
Acenaphthene			0.092 J		1,700 *	520 *	
Diethyl Phthalate		1.1		0.33	940 *(i)	3 *(i)	
Phenanthrene			0.42				3875
Butylbenzyl Phthalate		0.051 J			940 *(i)	3 *(i)	
Fluorene			0.21 J				473 J
1-Methylnaphthalene			0.70				
Naphthalene			0.31		2,300 *	620 *	
2-Methylnaphthalene			0.56				
4-Methylphenol		0.54	0.14 J				
1,4-Dichlorobenzene		0.37			1,120 *(h)	763 *(h)	4300
Phenol		0.20 J			10,200 *	2,560 *	
Pyridine							2860
Anthracene			0.056 J				857 J
Pyrene				0.20 J			6710
Dimethyl Phthalate			0.28		940 *(i)	3 *(i)	
Dibenzofuran				0.076 J			
Benzo(g,h,i)Perylene			0.20 J	0.067 J			
Indeno(1,2,3-cd)Pyrene			0.20 J	0.071 J			4900
Benzo(b)Fluoranthene			0.34	0.14 J			9650
Fluoranthene		0.08 J	0.36	0.28 J	3,980 *		8440
Benzo(k)Fluoranthene			0.13 J	0.061 J			3580
Chrysene		0.072 J	0.28				7110

J	The analyte was positively identified. The associated numerical result is an estimate.	Inf	Influent Sample	comp	Composite sample
S	Sanitary sewage treatment system	Ef	Effluent sample	grab	grab sample
C	Smelter cooling water	E	Ecology sample	a	Total Halomethanes
*	Insufficient data to develop criteria. Value presented is the LOEL - Lowest Observed Effect Level.	@	Composite sample period: 08:00-08:00	b	Total Dichloroethenes
		Sludge	Sanitary sewage system sludge sample	c	Total Trichloroethanes
				h	Total Dichlorobenzenes
				i	Total Phthalate Esters

Table 6 – Detected Pesticide/PCB and Metals Scan Results – Vanalco Aluminum (Vancouver), 1994.

Parameter	Location:	Sludge
	Type:	grab
	Date:	1/11
	Time:	1145
	Lab Log#:	028098
Pesticide/PCB Compounds		µg/Kg–dry wt.
Aroclor–1260		720 NJ
Aroclor–1254		1430 NJ
Aroclor–1248		820 NJ

Parameter	Location:	S–E–Inf	S–E–Ef	Intake	C–E–Inf	E–Ef	EPA and Ecology Water Quality Criteria		Sludge
	Type:	comp	comp	grab	comp	comp			grab
	Date:	1/11–12	1/11–12	1/11	1/11–12	1/11–12	Acute	Chronic	1/11
	Time:	@	@	1450	@	@	Fresh	Fresh	1145
	Lab Log#:	028082	028086	028089	028092	028095			028098
Metals (Total)	Hardness = 170	µg/L	µg/L		µg/L	µg/L	µg/L	µg/L	mg/Kg–dry wt.
Antimony							9,000 *	1,600 *	6.1 J
Arsenic		1.7 P	1.8 P	1.7 P	2.3 P		360.0	190.0	10.9 N
Beryllium							130 *	5.3 *	0.57 P
Cadmium		0.34 P	0.13 P				6.2 +	1.5 +	8.16
Chromium (Total)									42.3
	Hexavalent						16	11	
	Trivalent						2,682 +	320 +	
Copper		49.7	14 P	12 P	5.6 P	4.8 P	25 +	16 +	1440
Lead		4.2 P	1.1 P	25.0	1.5 P		110 +	4.3 +	121
Mercury		0.24 P					2.4	0.012	3.3
Nickel						21 P	2,111 +	235 +	143
Selenium							20.0	5.0	7.22 N
Silver							5.4 +		2.71 J
Zinc		66.4	29 P	9.5 P	6.4 P	9.4 P	163 +	148 +	1410

J	The analyte was positively identified. The associated numerical result is an estimate.
N	For Organic analytes there is evidence the analyte is present in this sample. For metals analytes the spike sample recovery was not within control limits.
NJ	There is evidence that the analyte is present. The associated numerical result is an estimate.
P	The analyte was detected above the instrument detection limit, but below the established minimum quantitation limit.
Inf	Influent Sample
Ef	Effluent sample
E	Ecology sample
@	Composite sample period: 08:00–08:00
S	Sanitary sewage treatment system
C	Smelter cooling water
comp	Composite sample
grab	grab sample
Intake	Smelter intake sample
Sludge	Sanitary sewage system sludge sample
*	Insufficient data to develop criteria. Value presented is the LOEL – Lowest Observed Effect Level.
**	pH dependent criteria (7.8 pH used).
+	Hardness dependent criteria (170 mg/L used).

Table 7 – Polynuclear Aromatic Hydrocarbon Scan – Vanalco Aluminum (Vancouver), 1994

Parameter	Location	C-E-Inf	Ef-E
	Type:	comp	comp
	Date:	1/11-12	1/11-12
	Time:	@	@
	Lab Log	028092	028095
Polynuclear Aromatic Hydrocarbons		µg/L	µg/L
Benzo(a)Pyrene		0.2	0.054
Dibenz(a,h)Anthracene		0.041 J	0.013 J
Benzo(a)Anthracene		0.17	0.059
Acenaphthene		0.061	0.035
Phenanthrene		0.32	0.032
Fluorene		0.15	0.077
1-Methyl-Naphthalene		0.5	0.058
Naphthalene		0.23	0.028 UJ
2-Methylnaphthalene		0.4	0.036 J
2-Chloronaphthalene		0.007 U	0.0071 U
Anthrecene		0.034	0.023
Pyrene		0.23	0.12
Dibenzofuran		0.1	0.065
Benzo(ghi)Perylene		0.14	0.041
Indeno(1,2,3-cd)Pyrene		0.16	0.046
Benzo(b)Fluoranthene		0.26	0.085
Fluoranthene		0.24	0.19
Benzo (k) fluoranthene		0.1	0.027
Acenaphthylene		0.033	0.0071 U
Chrysene		0.19	0.09
Retene		0.007 U	0.0071 U

J	Indicates an estimated value when result is less than specified detection limit
U	Indicates that the compound was analyzed for, but not detected at the given detection limit.
UJ	The analyte was not detected at or above the reported estimated result.
comp	Ecology composite sample
C-Inf-E	Ecology sample of settling basin influent– smelter cooling water.
Ef-E	Ecology sample of smelter Effluent
@	Composite sampling period: 08:00–08:00

Table 8 – Effluent Bioassay Results – Vanalco Aluminum (Vancouver), 1994.

NOTE: tests were run on sanitary sewage treatment effluent (S-Ef-GC Lab Log #028088) and smelter effluent (Ef-GC Lab Log #208097)

Daphnia magna - 48-hour survival test

(Daphnia magna)

Location:	S-Ef-GC	Ef-GC
Type:	grab/comp	grab-comp
Date:	1/11	1/11
Time:	1250&1635	1105\1545
Lab Log #:	208088	028097

Sample	# Tested	Percent Survival	# Tested *	Percent Survival
Control	20	96	20	96
6.25 % Effluent	20	95	20	100
12.5 % Effluent	20	100	20	95
25 % Effluent	20	95	20	100
50 % Effluent	20	100	20	100
100 % Effluent	20	100	20	95
	Survival		Survival	
	LC50 = >100 % effluent		LC50 = >100 % effluent	
	NOEC = 100 % effluent		NOEC = 100 % effluent	

* 4 replicates of 5 organisms

Ceriodaphnia dubia - 7-day survival and reproduction test - Sample: Ef-GC (Lab Log #028097)

(Ceriodaphnia dubia)

Sample	# Tested	Percent Survival	Mean # Young per Original Female
Control	10	100	21.9
6.25 % Effluent	10	100	21.7
12.5 % Effluent	10	100	21.6
25 % Effluent	10	100	21.3
50 % Effluent	10	100	25.3
100 % Effluent	10	90	10.5
		Survival	Reproduction
		LC50 = > 100% effluent	
		NOEC = 100% effluent	NOEC = 50 % effluent
		LOEC = 100% effluent	LOEC = 100% effluent

Fathead Minnow - 7 day survival and growth test - Sample: Ef-GC (Lab Log # 028097)

(Pimephales promelas)

Sample	# Tested *	Percent Survival	Average Dry Weight Fish (mg)
Control	40	92.5	0.46
6.25 % Effluent	40	95.0	0.40
12.5 % Effluent	40	90.0	0.41
25 % Effluent	40	97.5	0.50
50 % Effluent	40	97.5	0.46
100 % Effluent	40	75.0	0.55
		Survival	Growth
		LC50 = >100 % effluent	
		LOEC = >100 % effluent	LOEC = >100 % effluent
		NOEC = 100 % effluent	NOEC = 100 % effluent

* four replicates of 10 organisms

NOEC	No observable effects concentration
LOEC	Lowest observable effects concentration
LC50	Lethal concentration for 50% of the organisms
EC50	Effect concentration for 50% of the organisms
S-Ef	Sanitary sewage system effluent sample
Ef	Smelter effluent sample
GC	Grab composite

Table 8 – Effluent Bioassay Results – Vanalco Aluminum (Vancouver), 1994.

Rainbow Trout - 96 hour survival test

(Oncorhynchus mykiss)

Location:	S-Ef-GC	Ef-GC
Type:	grab/comp	grab/comp
Date:	1/11	1/11
Time:	1250&1635	1105\1545
Lab Log #:	208088	028097

Sample	# Tested	Percent Survival	# Tested	Percent Survival
Control	30	94	30	94
100% Effluent	30	97	30	97

Microtox

Location:	S-Ef-GC	Ef-GC*
Type:	grab/comp	grab/comp
Date:	1/11	1/11
Time:	1250&1635	1105\1545
Lab Log #:	208088	028097

Sample	EC50 (% effluent)	EC50 (% effluent)
5 minutes	>45.5	>45.5
15 minutes	>45.5	>45.5
>15 minutes	>45.5	>45.5

* Negative gamma for all effects

Selenastrum capricornutum - Chronic toxicity test - Sample: Ef-GC (Lab Log # 028097)

(Selenastrum capricornutum)

Sample	Average Cell Density (Cell/mL x1000000)	Growth (% of Control)
Control	0.94	100
6.25 % Effluent	0.55	58.45
12.5 % Effluent	0.33	35.68
25 % Effluent	0.32	34.43
50 % Effluent	0.28	29.63
100 % Effluent	0.2	21.44
		Growth LC50 = 8 % effluent LOEC = 6.25 % effluent NOEC = <6.25 % effluent

NOEC	No observable effects concentration
LOEC	Lowest observable effects concentration
LC50	Lethal concentration for 50% of the organisms
EC50	Effect concentration for 50% of the organisms
S-Ef	Sanitary sewage system effluent sample
Ef	Smelter effluent sample
GC	Grab composite

Table 9 – EPA Metals Concentration Criteria for the Land Application of Municipal Sludge – Vanalco, 1994

Parameter	Location:	Sludge	EPA Standards for Disposal of Sewage Sludge	
	Type:	grab		
	Date:	1/11/1994		
	Time:	1145	Ceiling Concentrations *	Pollutant Concentrations **
	Lab Log #:	028098		
Metals		(mg/Kg-dry wt.)	(mg/Kg-dry wt.)	(mg/Kg-dry wt.)
Arsenic		10.9 N	75	41
Cadmium		8.16	85	39
Chromium		42.3	3000	1200
Copper		1440	4300	1500
Lead		121	840	300
Mercury		3.3	57	17
Nickel		143	420	420
Selenium		7.22 N	100	36
Zinc		1410	7500	2800

Sludge Sanitary sewage plant sludge sample

grab Grab sample

N For metals analyses the spike sample recovery was not within control limits.

* Ceiling concentration limit for bulk sewage sludge or for sewage sludge sold or given away in a bag or other container.

** Pollutant concentration limit of bulk sludge if it is applied to agricultural land, forest land, a public contact site, or a recaimation site.

Appendices

Appendix A - Sample Station Locations

S-E-Inf-#	Ecology AM and PM sanitary sewage Treatment Plant (SSTP) influent grab samples collected from the diversion box that receives influent wastewater from the influent wet well.
S-E-Inf	Ecology SSTP influent composite sample collected from the diversion box that receives influent wastewater from the influent wet well.
S-V-Inf	Vanalco SSTP influent composite sample collected from the pump line leading from the influent wet well to the influent diversion box.
S-E-Ef-#	Ecology AM and PM SSTP effluent grab samples collected from the effluent weir overflow.
S-E-Ef	Ecology SSTP effluent composite sample collected from just above the effluent weir overflow.
S-V-Ef	Vanalco SSTP effluent composite sample collected from just above the effluent weir overflow.
S-Ef-GC	Ecology AM and PM grab SSTP effluent grab-composite sample collected from the effluent weir overflow.
Intake	Smelter well water intake sample collected from a valve at the base of the plant water storage tower.
C-E-Inf-#	Ecology AM and PM smelter cooling water settling lagoon influent grab samples collected from the diversion box into the settling lagoon.
C-E-Inf	Ecology smelter cooling water settling lagoon influent composite sample collected from the diversion box into the settling lagoon.
E-Ef-#	Ecology AM and PM smelter cooling water settling lagoon effluent grab samples collected from the settling lagoon effluent discharge.
E-Ef	Ecology smelter cooling water settling lagoon effluent composite sample collected just above the weir in the effluent discharge well .
V-Ef	Vanalco smelter cooling water settling lagoon effluent composite sample collected just above the weir in the effluent discharge well .
Ef-GC	Ecology AM and PM smelter cooling water settling lagoon effluent grab-composite sample collected from the settling lagoon effluent discharge.
Sludge	Ecology sanitary sewage treatment plant anaerobic sludge sample collected from a valve in the treatment plant pump house

Appendix B – Sampling Schedule – Vanalco Aluminum (Vancouver), 1994

Parameter	Location:	S-E-Inf-1	S-E-Inf-2	S-E-Inf	S-V-Inf	S-E-EF-1	S-E-Ef-2	S-E-Ef	S-V-Ef	S-Ef-GC
	Type:	grab	grab	comp	comp	grab	grab	comp	comp	grab/comp
	Date:	1/11	1/11	1/11-12	1/11-12	1/11	1/11	1/11-12	1/11-12	1/11
	Time:	1245	1640	1110	1110	1250	1635	1200	1215	1250&1635
	Lab Log #:	028080	028081	028082	028083	028084	028085	028086	028087	028088
GENERAL CHEMISTRY										
Alkalinity				EV	EV			EV	EV	E
Hardness				EV	EV			EV	EV	E
Fluoride				EV	EV			EV	EV	
Fluoride (soil)										
SOLIDS										
TS				EV				EV		
TNVS				EV				EV		
TSS		EV	EV	EV	EV	EV	E	EV	EV	E
TNVSS				EV				EV		
% Solids										
% Volatile Solids										
OXYGEN DEMAND PARAMETERS										
BOD5				EV	EV			EV	EV	
COD				EV	EV			EV	EV	
TOC (water)		EV	EV	EV	EV	EV	E	EV	EV	
TOC (soil/sed)										
NUTRIENTS										
NH3-N				EV	EV			EV	EV	
NO2+NO3-N				EV	EV			EV	EV	
Total-P				EV	EV			EV	EV	
MISCELLANEOUS										
Oil and Grease (water)						EV	E			
Oil and Grease (soil/sed)										
F-Coliform MF						EV	E			
Cyanide (total)										
Cyanide (total soil/sed)										
ORGANICS										
VOC (water)						E	E			
BNAs (water)								E		
BNAs (soil/sed)										
Pest/PCB (water)								E		
Pest/PCB (soil/sed)										
PAH (water)										
METALS										
PP Metals (water)				EV				EV		
PP Metals (soil/sed)										
Aluminum-ICP				EV				EV		
BIOASSAYS										
Salmonid (acute 100%)										E
Daphnia magna (acute)										E
Ceriodaphnia (chronic)										
Fathead Minnow (chronic)										
Selernastrum										
FIELD OBSERVATIONS										
Temperature		E	E	E	E	E	E	E	E	
pH		E	E	E	E	E	E	E	E	
Conductivity		E	E	E	E	E	E	E	E	
Chlorine		E				E	E	E	E	

E	Ecology sample and analysis	Inf	Influent	@	Composite sampling period: 08:00-08:00
V	Vanalco sample and analysis	Ef	Effluent		
S	Smelter sewage plant	grab	Grab sample		
C	Smelter cooling water	comp	Composite samples		
		grab/comp	Grab-composite		

Appendix B – Sampling Schedule – Vanalco Aluminum (Vancouver), 1994

Parameter I Locatn:	Intake	C-E-Inf-1	C-E-Inf-2	C-E-Inf	E-Ef-1	E-Ef-2	E-Ef	V-Ef	Ef-GC	Sludge
Type:	grab	grab	grab	comp	grab	grab	comp	comp	grab/comp	grab
Date:	1/11	1/11	1/11	1/11-12	1/11	1/11	1/11-12	1/11-12	1/11	1/11
Time:	1450	1155	1600	@	@	1545	@	@	1105/1545	1145
Lab Log	028089	028090	028091	028092	028093	028094	028095	028096	028097	028098
GENERAL CHEMISTRY										
Alkalinity				EV			EV	EV	E	
Hardness				EV			EV	EV	E	
Fluoride	EV			EV			EV	EV		
Fluoride (soil)										E
SOLIDS										
TS							EV			
TNVS							EV			
TSS	EV	EV	E	EV	EV	E	EV	EV	E	
TNVSS							EV			
% Solids										E
% Volatile Solids										E
OXYGEN DEMAND PARAMETERS										
BOD5										
COD										
TOC (water)	EV			EV			EV	EV		
TOC (soil/sed)										E
NUTRIENTS										
NH3-N							EV	EV		
NO2+NO3-N							EV	EV		
Total-P							EV	EV		
MISCELLANEOUS										
Oil and Grease (water)		EV	E		EV	E				
Oil and Grease (soil/sed)										E
F-Coliform MF					E	E				
Cyanide (total)	EV			E			EV	E		
Cyanide (total soil/sed)										E
ORGANICS										
VOC (water)		E	E		E	E				
BNAs (water)							E			
BNAs (soil/sed)										E
Pest/PCB (water)				E			E			
Pest/PCB (soil/sed)										E
PAH (water)				E			E			
METALS										
PP Metals (water)	EV			EV			EV			
PP Metals (soil/sed)										E
Aluminum-ICP	EV			EV			EV			E
BIOASSAYS										
Salmonid (acute 100%)									E	
Daphnia magna (acute)									E	
Ceriodaphnia (chronic)									E	
Fathead Minnow (chronic)									E	
Selernastrum									E	
FIELD OBSERVATIONS										
Temperature		E	E	E	E	E	E	E		
pH		E	E	E	E	E	E	E		
Conductivity		E	E	E	E	E	E	E		
Chlorine			E		E	E	E	E		

E	Ecology sample	Inf	Inluent	@	Composite sampling period: 08:00-08:00
V	Vanalco sample	Ef	Effluent	Intake	Smelter water intake sample
S	Smelter sewage plant	grab	Grab sample		
C	Smelter cooling water	comp	Composite samples		
Sludge	Sludge sample	grab/comp	Grab-composite		

Appendix C – Ecology Analytical Methods – Vanalco, 1994

Parameter IV	MANCHESTER_METHODS	Lab Used
GENERAL CHEMISTRY		
Alkalinity	EPA, Revised 1983: 310.1	Ecology
Hardness	EPA, Revised 1983: 130.2	Ecology
Fluoride	EPA, Revised 1983: 340.3	Weyerhaeuser Analytical Laboratories
Fluoride (soil)	EPA, Revised 1983: 340.1	Weyerhaeuser Analytical Laboratories
SOLIDS		
TS	EPA, Revised 1983: 160.3	Ecology
TNVS	EPA, Revised 1983: 106.3	Ecology
TSS	EPA, Revised 1983: 160.2	Ecology
TNVSS	EPA, Revised 1983: 106.2	Ecology
% Solids	APHA, 1989: 2540G.	Ecology
% Volatile Solids	EPA, Revised 1983: 160.4	Ecology
OXYGEN DEMAND PARAMETERS		
BOD5	EPA, Revised 1983: 405.1	Ecology
COD	EPA, Revised 1983: 410.1	Weyerhaeuser Analytical Laboratories
TOC (water)	EPA, Revised 1983: 415.1	Weyerhaeuser Analytical Laboratories
TOC (soil/sed)	EPA, Revised 1983: 415.1	Ecology
NUTRIENTS		
NH3–N	EPA, Revised 1983: 350.1	Ecology
NO2+NO3–N	EPA, Revised 1983: 353.2	Ecology
Total–P	EPA, Revised 1983: 365.3	Ecology
MISCELLANEOUS		
Oil and Grease (water)	EPA, Revised 1983: 413.1	Ecology
Oil and Grease (soil/sed)	EPA, Revised 1983: 413.1	Weyerhaeuser Analytical Laboratories
F–Coliform MF	APHA, 1989: 9222D.	Ecology
Cyanide (total)	EPA, Revised 1983: 335.2	Weyerhaeuser Analytical Laboratories
Cyanide (total soil/sed)	EPA, Revised 1983: 335.2	Weyerhaeuser Analytical Laboratories
ORGANICS		
VOC (water)	EPA, 1986: 8260	Ecology
BNAs (water)	EPA, 1986: 8270	Ecology
BNAs (soil/sed)	EPA, 1986: 8270	Ecology
Pest/PCB (water)	EPA, 1986: 8080	Ecology
Pest/PCB (soil/sed)	EPA, 1986: 8080	Ecology
PAH (water)	EPA, 1986: 8310	Ecology
METALS		
PP Metals (water)	EPA, Revised 1983: 200–299	Ecology
PP Metals (soil/sed)	EPA, Revised 1983: 200–299	Ecology
Aluminum–ICP	EPA, Revised 1983: 220.7	Ecology
BIOASSAYS		
Salmonid (acute 100%)	Ecology, 1981.	Parametrix, Inc.
Daphnia magna (acute)	EPA 1985	Ecology
Ceriodaphnia (chronic)	EPA 1989: 1002.0	Parametrix, Inc.
Fathead Minnow (chronic)	EPA 1989 1000.0	Parametrix, Inc.
Selernastrum	EPA 1989	Parametrix, Inc.
Microtox	Beckman	Ecology

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Appendix D - Priority Pollutant Cleaning Procedures and QA/QC Concerns - Vanalco Aluminum (Vancouver), 1994.

PRIORITY POLLUTANT SAMPLING EQUIPMENT CLEANING PROCEDURES

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10% HNO3 solution
4. Rinse three (3) 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

SPECIFIC QA/QC CONCERNS

1. Low levels of the target compound were detected in several laboratory blanks. The EPA 5 times rule was applied. Compounds were considered real and not the result of contamination if the levels in the sample were greater than or equal to 5 times the amount of the compound in the associated method blank.

2. Matrix spike recoveries for semi-volatiles were not within acceptable limits for several compounds. Results for these compounds were qualified with the "J" qualifier.

3. All spike and duplicate spike sample recoveries for metals detected in water samples were within CLP accepted limits except for silver. Silver data was qualified with the "N" qualifier.

4. All spike and duplicate spike sample recoveries for metals detected in sludge samples were within CLP accepted limits except for mercury, arsenic, selenium, and silver. Silver and mercury data was qualified with the "J" qualifier, denoting an estimate. Arsenic and selenium data were qualified with the "N" qualifier.

Appendix E – VOA, BNA, Pesticide/PCB and Metals Scan Results – Vanalco Aluminum (Vancouver), 1994.

Parameter	Location:	S-E-EF-1	S-E-Ef-2	C-E-Inf-1	C-E-Inf-2	E-Ef-1	E-Ef-2
	Type:	grab	grab	grab	grab	grab	grab
	Date:	1/11	1/11	1/11	1/11	1/11	1/11
	Time:	1250	1635	1155	1600	1105	1545
	Lab Log#:	028084	028085	028090	028091	028093	028094
VOA Compounds		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Carbon Tetrachloride		1.0 U	1 U	1.0 UJ	1.0 U	1.0 U	1.0 U
Acetone		12.0 UJ	5.2 UJ	5.4 U	11.5 J	3.2 UJ	6.5 UJ
Chloroform		1.0	0.75 J	1.0 U	0.78 J	0.39 J	0.4 J
Benzene		1.0 U	1.0 U	0.83 J	1.0 U	0.21 J	0.19 J
1,1,1-Trichloroethane		0.059 J	0.075 J	0.32 J	0.31 J	0.15 J	0.16 J
Bromomethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromochloromethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl Chloride		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride		1.0 UJ	1.2 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.2 UJ
Carbon Disulfide		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane		0.27 J	0.2 J	1.0 U	0.67 J	0.29 J	0.31 J
1,1-Dichloroethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane		1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U
2-Butanone (MEK)		5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ
1,1,2-Trichloroethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene		0.43 J	0.46 J	2.3	2.4	1.1	1.2
1,1,2,2-Tetrachloroethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Naphthalene		2.0 U	2.0 U	1.0 UJ	2.0 U	1.0 UJ	1.0 UJ
o-Xylene		1.0 U	1.0 U	0.16 J	1.0	1.0 U	1.0 U
2-Chlorotoluene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene		1.0 U	1.0 U	0.35 J	1.0 U	0.44 J	0.4 J

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.
Inf	Influent Sample
Ef	Effluent sample
E	Ecology sample
S	Sanitary sewage treatment system
C	Smelter cooling water
grab	Grab sample

Appendix E – VOA, BNA. PCB/Pesticided, and Metal Scan (cont.) – Vanalco Aluminum (Vancouver), 1994.

Parameter	Location:	S-E-EF-1	S-E-Ef-2	C-E-Inf-1	C-E-Inf-2	E-Ef-1	E-Ef-2
	Type:	grab	grab	grab	grab	grab	grab
	Date:	1/11	1/11	1/11	1/11	1/11	1/11
	Time:	1250	1635	1155	1600	1105	1545
	Lab Log#:	028084	028085	028090	028091	028093	028094
VOA Compounds		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
1,2-Dibromo-3-Chloropropane (DBCP)		1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2,3-Trichloropropane		2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
tert-Butylbenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropylbenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene		1.0 U	1.0 U	0.13 J	1.0 U	1.0 U	1.0 U
Styrene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Propylbenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Butylbenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Chlorotoluene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene		0.64 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromoethane (EDB)		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
4-Methyl-2-Pentanone (MIBK)		20.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ
m-Xylene		2.0 U	2.0 U	0.25 J	2.0 U	2.0 U	2.0 U
1,3,5-Trimethylbenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene		0.16 J	0.12 J	0.46 J	1.0 U	0.19 J	1.0 U
Chlorobenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
1,2,4-Trichlorobenzene		2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dibromochloromethane		1.0 U	1.0 U	0.76 J	0.49 J	0.21 J	0.23 J
Tetrachloroethene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
sec-Butylbenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichloropropane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene		0.24 J	0.28 J	1.8	1.0 U	0.90 J	1.0 J
trans-1,2-Dichloroethene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene		0.66 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloropropene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone		20.0 UJ	20.0 U	20.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ
2,2-Dichloropropane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1,2-Tetrachloroethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Total Xylenes		3.0 U	3.0 U	0.41 J	3.0 U	3.0 U	3.0 U
cis-1,3-Dichloropropene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

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.
Inf	Influent Sample
Ef	Effluent sample
E	Ecology sample
S	Sanitary sewage treatment system
C	Smelter cooling water
grab	Grab sample

Appendix E – VOA, BNA. PCB/Pesticided, and Metal Scan (cont.) – Vanalco Aluminum (Vancouver), 1994.

Parameter	Location:	S-E-Ef	C-E-Inf	E-Ef	Sludge
	Type:	comp	comp	comp	grab
	Date:	1/11-12	1/11-12	1/11-12	1/11
	Time:	@	@	@	1145
	Lab Log#:	028086	028092	028095	028098
BNA Compounds		µg/L	µg/L	µg/L	µg/Kg-dry wt.
Benzo(a)Pyrene		0.038 J	0.26 J	0.090 J	5930 U
2,4-Dinitrophenol		5.5 U	5.5 U	6.3 U	57200 UJ
Dibenzo(a,h)Anthracene		0.27 U	0.28 U	0.31 U	1430 U
Benzo(a)Anthracene		0.27 U	0.22 J	0.11 J	5200
4-Chloro-3-Methylphenol		0.27 U	0.28 U	0.31 U	1430 UJ
Aniline		0.27 U	0.28 U	0.31 U	1430 U
Dimethyl-Nitrosamine		0.27 U	0.28 U	0.31 U	2860 U
Benzoic Acid		2.7 UJ	2.8 UJ	3.1 UJ	28600 UJ
Hexachloroethane		0.27 U	0.28 U	0.31 U	1430 UJ
Hexachlorocyclopentadiene		1.4 U	1.4 U	1.6 U	14300 UJ
Isophorone		0.21 J	0.20 J	0.38	482 J
Acenaphthene		0.27 U	0.092 J	0.31 U	1430 U
Diethyl Phthalate		1.1	0.28 UJ	0.33	1430 UJ
Di-n-Butyl Phthalate		0.27 U	0.28 UJ	0.31 U	1430 UJ
Phenanthrene		0.27 U	0.42	0.31 U	3875
Butylbenzyl Phthalate		0.051 J	0.28 U	0.31 U	1430 U
N-Nitrosodiphenylamine		0.27 U	0.28 U	0.31 U	1430 U
Fluorene		0.27 U	0.21 J	0.31 U	473 J
Carbazole		0.27 U	0.28 U	0.31 U	581 J
Hexachlorobutadiene		0.27 U	0.28 U	0.31 U	1430 U
Pentachlorophenol		0.68 UJ	0.69 UJ	0.78 UJ	7150 U
2,4,6-Trichlorophenol		0.27 U	0.28 U	0.31 U	1430 U
2-Nitroaniline		1.4 U	1.4 U	1.6 U	7150 U
2-Nitrophenol		0.27 UJ	0.28 U	0.31 UJ	7150 U
1-Methylnaphthalene		0.27 U	0.70	0.31 U	
Naphthalene		0.27 U	0.31	0.31 U	1430 U
2-Methylnaphthalene		0.27 U	0.56	0.31 U	1430 U
2-Chloronaphthalene		0.27 U	0.28 U	0.31 U	1430 U
3,3'-Dichlorobenzidine		0.34 UJ	0.34 UJ	0.39 UJ	2860 U
Benzidine		3.4 UJ	3.4 UJ	3.9 UJ	2860 U
2-Methylphenol		0.27 U	0.28 U	0.31 U	1430 U
1,2-Dichlorobenzene		0.27 U	0.28 U	0.31 U	1430 U
o-Chlorophenol		0.27 U	0.28 U	0.31 U	1430 U
2,4,5-Trichlorophenol		0.27 U	0.28 U	0.31 U	2860 U

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.
Inf	Influent Sample
Ef	Effluent sample
E	Ecology sample
S	Sanitary sewage treatment system
C	Smelter cooling water
grab	Grab sample
comp	Composite sample
@	Composite sample period: 08:00-08:00
Sludge	Sanitary sewage system sludge sample

Parameter	Location:	S-E-Ef	C-E-Inf	E-Ef	Sludge
	Type:	comp	comp	comp	grab
	Date:	1/11-12	1/11-12	1/11-12	1/11
	Time:	@	@	@	1145
	Lab Log#:	028086	028092	028095	028098
BNA Compounds		µg/L	µg/L	µg/L	µg/Kg-dry wt.
Nitrobenzene		0.27 U	0.28 U	0.31 U	1430 U
3-Nitroaniline		0.68 U	0.69 U	0.78 U	1430 UJ
4-Nitroaniline		0.68 U	0.69 U	0.78 U	7150 U
4-Nitrophenol		1.4 U	1.4 U	1.6 U	14300 U
Benzyl Alcohol		0.27 U	0.28 U	0.31 U	1430 U
4-Bromophenyl Phenylether		0.27 U	0.28 U	0.31 U	1430 U
2,4-Dimethylphenol		0.27 U	0.28 U	0.31 U	1430 U
4-Methylphenol		0.54	0.14 J	0.31 U	1430 U
1,4-Dichlorobenzene		0.37	0.28 U	0.31 U	4300
4-Chloroaniline		0.27 U	0.28 U	0.31 U	25200 J
Phenol		0.20 J	0.28 U	0.31 U	1430 U
Pyridine		0.27 U	0.28 U	0.31 U	2860
Bis(2-Chloroethyl)Ether		0.27 U	0.28 U	0.31 U	1430 U
Bis(2-Chloroethoxy)Methane		0.27 U	0.28 U	0.31 U	1430 U
Bis(2-Ethylhexyl)Phthalate		1.1 UJ	0.38 UJ	0.36 UJ	51000 UJ
Di-n-Octyl Phthalate		0.68 U	0.69 U	0.78 U	1430 U
Hexachlorobenzene		0.27 U	0.28 U	0.31 U	1430 U
Anthracene		0.27 U	0.056 J	0.31 U	857 J
1,2,4-Trichlorobenzene		0.27 U	0.28 U	0.31 U	1430 U
2,4-Dichlorophenol		0.27 UJ	0.28 UJ	0.31 UJ	1430 U
2,4-Dinitrotoluene		1.4 U	1.4 U	1.6 U	14300 U
1,2-Diphenylhydrazine		0.27 U	0.28 U	0.31 U	1430 U
Pyrene		0.27 U	0.34 U	0.20 J	6710
Dimethyl Phthalate		0.27 U	0.28	0.31 U	1430 U
Dibenzofuran		0.27 U	0.14 U	0.076 J	1430 U
Benzo(g,h,i)Perylene		0.27 U	0.20 J	0.067 J	1430 U
Indeno(1,2,3-cd)Pyrene		0.27 U	0.20 J	0.071 J	4900
Benzo(b)Fluoranthene		0.27 U	0.34	0.14 J	9650
Fluoranthene		0.08 J	0.36	0.28 J	8440
Benzo(k)Fluoranthene		0.27 U	0.13 J	0.061 J	3580
Acenaphthylene		0.27 U	0.28 U	0.31 U	1430 U
Chrysene		0.072 J	0.28	0.25 U	7110
Retene		0.22 U	0.22 U	3.1 U	
4,6-Dinitro-2-Methylphenol		2.7 U	2.8 U	0.31 U	57200 UJ
1,3-Dichlorobenzene		0.27 U	0.28 U	1.6 U	1430 U
2,6-Dinitrotoluene		1.4 U	1.4 U	0.31 U	14300 U
N-Nitroso-di-n-Propylamine		0.27 U	0.28 U	0.31 U	1430 U
4-Chlorophenyl Phenylether		0.27 U	0.28 U	0.31 U	1430 UJ
Bis(2-Chloroisopropyl)Ether		0.27 U	0.28 U	0.31 U	1430 U

U	The analyte was not detected at or above the reported result.	Inf	Influent Sample	S	Sanitary sewage treatment system
UJ	The analyte was not detected at or above the reported estimated result.	Ef	Effluent sample	C	Smelter cooling water
J	The analyte was positively identified. The associated numerical result is an estimate.	E	Ecology sample	comp	Composite sample
Sludge	Sanitary sewage system sludge sample	@	Composite sample period: 08:00-08:00	grab	grab sample

Appendix E – VOA, BNA. PCB/Pesticided, and Metal Scan (cont.) – Vanalco Aluminum (Vancouver), 1994.

Parameter	Location:	S-E-Ef	C-E-Inf	E-Ef	Sludge
	Type:	comp	comp	comp	grab
	Date:	1/11-12	1/11-12	1/11-12	1/11
	Time:	@	@	@	1145
	Lab Log#:	028086	028092	028095	028098
Pesticide/PCB Compounds		µg/L	µg/L	µg/L	µg/Kg-dry wt.
4,4'-DDT		0.10 U	0.11 U	0.11 U	140 U
Chlordane		0.10 U	0.11 U	0.11 U	140 U
gamma-BHC (Lindane)		0.10 U	0.11 U	0.11 U	140 U
Dieldrin		0.10 U	0.11 U	0.11 U	140 U
Endrin		0.10 U	0.11 U	0.11 U	140 U
Methoxychlor		0.10 U	0.11 U	0.11 U	140 U
4,4'-DDD		0.10 U	0.11 U	0.11 U	140 U
4,4'-DDE		0.10 U	0.11 U	0.11 U	140 U
Heptachlor		0.10 U	0.11 U	0.11 U	140 U
Aldrin		0.10 U	0.11 U	0.11 U	140 U
alpha-BHC		0.10 U	0.11 U	0.11 U	140 U
beta-BHC		0.10 U	0.11 U	0.11 U	140 U
delta-BHC		0.10 U	0.11 U	0.11 U	140 U
Endosulfan I		0.10 U	0.11 U	0.11 U	140 U
Heptachlor Epoxide		0.10 U	0.11 U	0.11 U	140 U
Endosulfan Sulfate		0.10 U	0.11 U	0.11 U	140 U
Endrin Aldehyde		0.10 U	0.11 U	0.11 U	140 U
Toxaphene		2.0 U	2.1 U	2.1 U	140 U
Aroclor-1260		0.82 U	0.88 U	0.89 U	720 NJ
Aroclor-1254		0.82 U	0.88 U	0.89 U	1430 NJ
Aroclor-1221		0.82 U	0.88 U	0.89 U	650 UJ
Aroclor-1232		0.82 U	0.88 U	0.89 U	650 UJ
Aroclor-1248		0.82 U	0.88 U	0.89 U	820 NJ
Aroclor-1016		0.82 U	0.88 U	0.89 U	650 UJ
Endosulfan II		0.10 U	0.11 U	0.11 U	140 U
Aroclor-1242		0.82 U	0.88 U	0.89 U	650 UJ
Endrin Ketone		0.10 U	0.11 U	0.11 U	140 U

U	The analyte was not detected at or above the reported result.
NJ	There is evidence that the analyte is present. The associated numerical value is an estimate.
Inf	Influent Sample
Ef	Effluent sample
E	Ecology sample
@	Composite sample period: 08:00-08:00
S	Sanitary sewage treatment system
C	Smelter cooling water
comp	Composite sample
grab	grab sample
Sludge	Sanitary sewage system sludge sample

Appendix E – VOA, BNA. PCB/Pesticided, and Metal Scan (cont.) – Vanalco Aluminum (Vancouver), 1994.

Location:	S-E-Inf	S-E-Ef	Intake	C-E-Inf	E-Ef	Sludge
Type:	comp	comp	grab	comp	comp	grab
Date:	1/11-12	1/11-12	1/11	1/11-12	1/11-12	1/11
Time:	@	@	1450	@	@	1145
Lab Log#:	028082	028086	028089	028092	028095	028098
Metals (Total) Hardness =	100	µg/L	µg/L	µg/L	µg/L	mg/Kg-dry wt.
Antimony	30 U	30 U	30 U	30 U	30 U	6.1 J
Arsenic	1.7 P	1.8 P	1.7 P	2.3 P	1.5 U	10.9 N
Beryllium	1 U	1 U	1 U	1 U	1 U	0.57 P
Cadmium	0.34 P	0.13 P	0.10 U	0.10 U	0.10 U	8.16
Chromium (Total)	5 U	5 U	5 U	5 U	5 U	42.3
Hexavalent						
Trivalent						
Copper	49.7	14 P	12 P	5.6 P	4.8 P	1440
Lead	4.2 P	1.1 P	25.0	1.5 P	1.0 U	121
Mercury	0.24 P	0.05 U	0.05 U	0.05 U	0.05 U	3.3
Nickel	10 U	10 U	10 U	10 U	21 P	143
Selenium	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	7.22 N
Silver	0.05 UN	0.50 UN	0.50 U	0.050 U	0.050 U	2.71 J
Thallium	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	0.50 U
Zinc	66.4	29 P	9.5 P	6.4 P	9.4 P	1410

J	The analyte was positively identified. The associated numerical result is an estimate.	S	Sanitary sewage treatment system
		C	Smelter cooling water
N	For metals analytes the spike sample recovery was not within control limits.	comp	Composite sample
P	The analyte was detected above the instrument detection limit, but below the established minimum quantitation limit.	grab	grab sample
		Intake	Smelter intake sample
U	The analyte was not detected at or above the reported result.	Sludge	Sanitary sewage system sludge sample
Inf	Influent Sample		
Ef	Effluent sample		
E	Ecology sample		
@	Composite sample period: 08:00-08:00		

Appendix F - Tentatively Identified Compounds - Vanalco (Vancouver), 1994

Sample Location: S-E-Ef
Type: comp
Date: 1/11-12
Time: 08:00-08:00
Sample ID: 028086

Bases/Neutrals/Acids:

Compound Name	Estimated Concentration (µg/L)	Qualifier
1. Hexadecanoic Acid	67.8	NJ
2. Octadecanoic Acid	259	NJ
3. Caffine	12.6	NJ
4. Ethyl Citrate	2.5	NJ
5. 2 - Butoxy - Ethanol	1.6	NJ
6. .Gamma. - Sitosterol	8.8	NJ
7. 3,4 - DDichlorophenyl Iso+	1.3	NJ
8. 2 - (2-Butoxyet+) Ethanol	3.0	NJ
9. Oleic Acid	56.5	NJ
10. 2-(2-Butoxyet+) Ethanol	12.6	NJ
11. 4 - (1,1,3,3 -Tet+) Phenol	2.3	NJ
12. Didecanoic Acid	28.8	NJ
13. Heptadecenoic Acid	3.1	NJ
14. (3.Alp+) Cholestan - 3 - OL	45.8	NJ
15. Tetradecanoic Acid	10.4	NJ
16. Cholest - 4 - EN - 3 - ONE	4.5	NJ
17. Pentadecanoic Acid	3.0	NJ
18. 3- Ethoxy -, + Cholestan	40.8	NJ
19. 9 - Hexadecanoic Acid	7.6	NJ
20. 12+ Tetradecanoic Acid	2.3	NJ
21. (3.+) Cholest - 7 - EN- 3 - ol	29.8	NJ
22. Unknown Compound 1	2.1	NJ
23. Unknown Compound 2	2.3	NJ
24. Unknown Compound 3	1.1	NJ
25. Unknown Compound 4	1.2	NJ
26. Unknown Compound 5	7.2	NJ
27. Unknown Compound 6	12.5	NJ
28. .a+ Benzeneacetic Acid	2.5	NJ

Sample Location: C-E-Inf 1
Type: grab
Date: 5/19
Time: 1155
Sample ID: 028090

Volatile Organics:

Compound Name	Estimated Concentration (µg/L)	Qualifier
1. 2-Octanone	6.2	NJ
2. Heptanal	3.9	NJ

Appendix F (cont.) - Tentatively Identified Compounds - Vanalco (Vancouver), 1994

Sample Location: C-E-Inf
Type: comp
Date: 1/11-12
Time: 08:00-08:00
Sample ID: 028092

Bases/Neutrals/Acids:

Compound Name	Estimated Concentration (μg/L)	Qualifier
1. Octadecanoic Acid	3.8	NJ
2. .Gamma.-Sitosterol	3.4	NJ
3. Heptanoic Acid	6.6	NJ
4. Heptyl es+ Formic Acid	2.0	NJ
5. 2 - (2-Butoxyet+) Ethanol	0.16	NJ
6. 1, 1' -Oxybis [2 - +] Ethane	0.20	NJ
7. (Z +) 9 - Octadecanoic Acid	3.1	NJ
8. Oleic Acid	4.0	NJ
9. 2-Octanol	3.2	NJ
10. 2 - (2-Butoxyet+) Ethanol	112	NJ
11. 1, 8 -Dimet + Naphthalene	1.1	NJ
12. 2, 7 -Dimet + Naphthalene	1.1	NJ
13. 5 - Hexy + 2(3H) - Furanone	33.3	NJ
14. 6 -Methyl - 2 - Heptanone	7.4	NJ
15. Isomaltol	34.9	NJ
16. Unknown Compound 1	2.0	NJ
17. Unknown Compound 2	3.0	NJ
18. Unknown Compound 3	1.6	NJ
19. Unknown Compound 4	7.4	NJ
20. Unknown Compound 5	11.8	NJ
21. Unknown Compound 6	32.0	NJ
22. Unknown Compound 7	6.9	NJ
23. Unknown Compound 8	57.0	NJ
24. Unknown Compound 9	59.5	NJ
25. 1 - (2 - Butoxyet +) Ethanol	20.0	NJ

Appendix F (cont.) - Tentatively Identified Compounds - Vanalco (Vancouver), 1994

Sample Location:	E-Ef
Type:	comp
Date:	1/11-12
Time:	08:00-08:00
Sample ID:	028095

Bases/Neutrals/Acids:

Compound Name	Estimated Concentration (µg/L)	Qualifier
1. Hexadecanoic Acid	4.7	NJ
2. .Gamma. - Sitosterol	4.5	NJ
3. 2 - (2 - Butoxyet+) Ethanol	3.0	NJ
4. Chondrillasterol	2.5	NJ
5. 1, 8 - Dimet+ Namphthalene	0.52	NJ
6. 1, 3 - Dimet+ Namphthalene	0.52	NJ
7. 9 - Hexadecenoic Acid	2.2	NJ
8. 1, 2, 3, 4 - T+ Naphthalene	0.69	NJ
9. Unknown Hydrocarbon 1	1.3	NJ
10. Unknown Hydrocarbon 2	0.56	NJ
11. Unknown Hydrocarbon 3	0.57	NJ
12. Unknown Hydrocarbon 4	1.3	NJ
13. Unknown Hydrocarbon 5	0.47	NJ
14. Unknown Compound 1	1.8	NJ
15. Unknown Compound 2	0.69	NJ
16. Unknown Compound 3	3.6	NJ
17. Unknown Compound 4	0.62	NJ
18. Unknown Compound 5	0.62	NJ
19. 1, 2, 3, 4 - T+ Naphthalene	0.70	NJ
20. 1, 2, 3, 4 - T+ Naphthalene	0.56	NJ

Appendix F (cont.) - Tentatively Identified Compounds - Vanalco (Vancouver), 1994

Sample Location:	Sludge
Type:	grab
Date:	1/11
Time:	1145
Sample ID:	028098

Bases/Neutrals/Acids:

Compound Name	Estimated Concentration (μg/L)	Qualifier
1. Hexadecanoic Acid	491000	NJ
2. Octadecanoic Acid	311000	NJ
3. Cholestanol (VAN)	3240000	NJ
4. .Gamma. - Sitosterol	706000	NJ
5. 4 - Nonylphenol	19000	NJ
6. N, N - di+ 1 - Dodecanamine	40300	NJ
7. MET+ Octadecanoic Acid	38000	NJ
8. N, N - di+ 1 - Tetradecanamine	57700	NJ
9. Oleic Acid	287000	NJ
10. 4 - (1, 1, 3, 3 - TET+) Phenol	32900	NJ
11. Didecanoic Acid	38900	NJ
12. Pentadecane	43900	NJ
13. Unknown Compound - 2	47000	NJ
14. M+ 9 - Hexadecenoic Acid	42800	NJ
15. 3 - Ethoxy ,+ Cholestane	1100000	NJ
16. 9 - Hexadecenoic Acid	133000	NJ
17. 14+ Pentadecanoic Acid	55300	NJ
18. Unknown Compound 1	26600	NJ
19. Unknown Compound 3	48600	NJ
20. Unknown Compound 4	235000	NJ
21. Unknown Compound 5	3680000	NJ
22. 4 - (2, 2, 3, 3 - TET+) Phenol	43300	NJ

NJ There is evidence that the analyte is present. The associated numerical result is an estimate

Appendix G - GLOSSARY

ABN	Acid base-neutral, semivolatile organics, see BNA
AED	Atomic Emission Detector
BNA	Base-neutral acids, semivolatiles, see ABN
BOD	Biological Oxygen Demand
CLP	Contract Laboratory Program
COD	Chemical Oxygen Demand
co-elutants	When two or more compounds have the same chromatographic retention time
CVAA	Cold Vapor Atomic Absorption
d-deuterium	An isotope of hydrogen
DL	Detection Limit
DOC	Dissolved Organic Carbon
DW	Dangerous Waste
ECD	Electron Capture Detector-Sensitive to halogen compounds - use: halogenated hydrocarbons
EHW	Extremely Hazardous Waste
ELD	Electrolytic Detector - Hall
EP TOX	Extraction Procedure Toxicity
Fatty Acid	Monobasic organic acids derived from hydrocarbons; include both saturated and unsaturated acids
FID	Flame Ionization Detector-Sensitive to carbon compounds, used in the determination of hydrocarbons
Flash Point	Minimum temperature that will enable combustion or explosions to take place
FTIR	Fourier Transform Infra-Red
GC	Gas Chromatography
GCMS	Gas Chromatography Mass Spectrometry, also GC/MS
HC	Hydrocarbon
HDPE	High Density Polyethylene
HH	Halogenated Hydrocarbon
HPLC	High Performance Liquid Chromatography
HSD	Halogen-Specific Detector - use: halogenated hydrocarbons
HW	Hazardous Waste
HWPAH	Hazardous Waste Polynuclear Aromatic Hydrocarbon
ICP	Inductively Coupled Plasma
ICP/MS	Inductively Coupled Plasma/Mass Spectrometry
IDL	Instrument Detection Limit
isomer	One of two or more substances which have the same elementary composition but differ in structure and hence in properties
isotope	One of two or more nuclides having the same atomic number, but differing in mass number

Isotopically labelled	The substitution of one or more isotopes for elements in a compound
kg	kilogram (1 X 10^3 grams)
L	Liter (1 X 10^3 milliliters)
LC50	Concentration which is lethal to 50% of the test organisms
LOD	Limit of Detection
LOEC	Lowest Observable Effect Concentration
m^3	Cubic meter (1 X 10^3 liters)
MBAS	Methylene Blue Active substances
metalloids	Elements that exhibit transitional characteristics between metals and non-metals, examples include silver, selenium, antimony
MF	Membrane Filter
mg	milligram (1 X 10^{-3} grams)
mL	Milliliter (1 X 10^{-3} liters)
MPN	Most Probable Number
ng	Nanogram (1 X 10^{-9} grams)
nm	Nanometer (1 X 10^{-9} meters)
NOEC	No Observable Effect Concentration
NPDES	National Pollution Discharge Elimination System
NPOC	Non-Purgeable Organic Carbon
NTU	Nephelometric Turbidity Unit
OSHA	Occupation Safety and Health Administration
OSW	Office of Solid Waste
PCB	Polychlorinated Biphenyl
PE	Polyethylene
pg	Picogram (1 X 10^{-12} grams)
pH	Hydrogen Ion Concentration
PID	Photoionization Detector - use: aromatic hydrocarbons
PLM	Polarized Light Microscopy
POC	Purgeable Organic Carbon
Polyvalent	Capable of having more than one valance state
PP	Priority Pollutant
ppb	Parts per billion (1 X 10^{-9} ug/L or ug/kg)
ppm	Parts per million (1 X 10^{-6} ug/L or ug/kg)
ppt	Parts per thousand (1 X 10^{-3} ug/L or ug/kg)
PQL	Practical Quantitation Limit
PUF	Polyurethane Foam
SDWA	State Drinking Water Act
SOW	Statement of Work
SW	Solid Waste

TC	Target Compounds or Total Carbon
TCD	Thermal Conductivity Detector
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TIC	Total Inorganic Carbon or for GCMS Tentatively Identified Compound
TNVS	Total Non-Volatile Solids
TNVSS	Total Non-Volatile Suspended Solids
TOC	Total Organic Carbon
TP	Total Phosphorous
TPH	Total Petroleum Hydrocarbons
TS	Total Solids
TSS	Total Suspended Solids
TVS	Total Volatile Solids
ug	Microgram (1×10^{-6} grams)
ug/m^3	Microgram per cubic meter
VOA	Volatile Organic Analysis
VOC	Volatile Organic Carbon
ZHE	Zero Headspace Extractor