

**REYNOLDS METAL COMPANY
CLASS II INSPECTION
FEBRUARY 1990**

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Water Body No. WA-CR-1010
(Segment No. 26-00-04)

June 1991

ABSTRACT

A Class II Inspection was conducted in February 1990 at the Reynolds Metals Company primary aluminum smelter in Longview. Samples were collected from the five permitted discharges. Receiving water sediments near the principal discharge to the Columbia River (002A) and centrifuge samples of the 002A discharge were also collected. NPDES permit compliance was good during the inspection. Some toxicity was observed in 002A effluent using *Daphnia magna*, fathead minnow and Microtox bioassays. Sediment impacts near the 002A discharge were not detected.

INTRODUCTION

A Class II Inspection was conducted on February 26-28, 1990, at the Reynolds Metals Company (Reynolds) primary aluminum smelter in Longview. Receiving water sediment samples were collected on February 23, 1990. The inspection was conducted by Keith Seiders and Marc Heffner of the Ecology Compliance Monitoring Section and Wayne Wooster of the Ecology Industrial Section. Reynolds staff providing assistance were Hal Hays, Stan Casswell, and Tom Dickey.

The smelter has five point discharges regulated by NPDES Permit #WA-000008-6 and Order #89-3 (Figure 1). Outfall 002A into the Columbia River serves as the primary discharge for water used in the plant. Outfall 001 into the Columbia River discharges sanitary wastes generated and treated on-site. Discharge 003 into the Longview Ditch system includes non-contact cooling water and site runoff. Discharges 004 and 005 into the Longview Ditch system are site runoff. At the time of the inspection the cryolite recovery plant, which was scheduled for closure, was in operation.

Objectives of the inspection included:

1. Verify effluent compliance with NPDES permit limits.
2. Characterize priority pollutants in the 002 discharge stream.
3. Characterize priority pollutants in the sediments near outfall 002.
4. Evaluate outfall 002 effluent and sediments for toxicity using a series of bioassays.
5. Review lab procedures at the mill to determine adherence to accepted protocols. Samples were split with the permittee to determine the comparability of Ecology and permittee laboratory results.
6. Advance the state-of-the art of compliance inspections by contributing to ongoing developmental efforts with centrifugation.

PROCEDURES

Ecology sample collection in the 001 and 002 outfall systems included composite and grab samples. Ecology Isco composite samplers were set up to collect 001 effluent, 002-A effluent, 002-B influent, and 002-B effluent samples. Sampler configurations and locations are summarized in Figure 1 and Table 1. Samplers collected equal volumes of sample every 30 minutes for 24 hours. Sampling quality assurance/quality control steps included priority pollutant cleaning samplers prior to the inspection and collecting a field transfer blank sample (Table 2).

Reynolds also collected composite samples of the 002-A effluent and 002-B effluent. Ecology and Reynolds samples were split for analysis by both the Ecology and Reynolds labs. Samples collected, sampling times, and parameters analyzed are summarized in Table 3.

Ecology 003, 004, and 005 discharge grab samples and the 001 Reynolds grab sample collection procedures attempted to assure similar sample was submitted for each analysis. Samples for PAH, oil and grease, and fecal coliform analysis were collected directly into the appropriate containers. For the remaining parameters, grab samples were placed in a large jug until adequate volume was available for all analysis. The sample was shaken then distributed into the appropriate containers. Locations are summarized in Figure 1 and Table 1. Samples collected, sampling times and parameters analyzed are summarized in Table 3.

Receiving water sediments were collected with a 0.1 m² van Veen grab sampler at three stations; one at a background site approximately 500 yards upstream of the outfall (upstrm), one within ten yards downstream of the outfall diffuser (diffuser), and one 300 feet downstream of the diffuser at the edge of the dilution zone (dwnstrm). At each station, the top two centimeters of sample from successive grab samples were collected. A VOA bottle was filled from the first grab while the remainder of the sample was put in a stainless steel bucket. After an adequate volume was collected, the contents of the bucket were homogenized and put in appropriate containers. Sampling quality assurance/quality control steps included collecting only sediment not in direct contact with the sampler and pre-inspection priority pollutant cleaning of equipment that would touch the samples (Table 2). Sampling times and parameters analyzed are included in Table 3.

Samples for Ecology analysis were placed on ice and delivered to the Ecology Manchester Laboratory. Analytical procedures and the laboratories doing the analysis are summarized in Table 4.

RESULTS AND DISCUSSION

Laboratory Evaluation/Split Sample Results

Reynolds laboratory procedures were reviewed by Stew Lombard and Lee Fearon of the Ecology Quality Assurance Section. Their comments and recommendations are included in Appendix A.

Split sample analytical results compared well (Table 5).

001-Sanitary Discharge

The trickling filter plant effluent was within most NPDES permit limits during the inspection (Table 6). The Ecology effluent composite sample TSS concentration (31 mg/L) slightly exceeded the daily average permit limit (30 mg/L) and the two Ecology fecal coliform grab

sample results (590/100mL and 36000-estimated/100mL) exceeded permit limits. Chlorine residual concentrations varied from <0.04 to 0.4 mg/L, perhaps contributing to the high coliform counts.

Trickling filter plant operation was a concern. When collecting the February 27, 1720 effluent grab sample, TSS concentrations appeared high. Further plant inspection revealed approximately 2 inches of water ponded on the trickling filter. A clarifier core sample found a shallow sludge blanket (< 1 foot) but poor settling throughout the water column. Effluent TSS (127 mg/L) and COD (110 mg/L) were elevated while the chlorine residual concentration (<0.04 mg/L) was low (Table 7). Plant personnel reported a blocked line to the treatment plant had been cleared at approximately 1500 on February 27, possibly resulting in the plant disturbance.

When collecting the February 28, 0920 sample, soap suds were observed coming out of the trickling filter intake wetwell. Plant personnel reported that weekly shower cleanup had begun at 0500 resulting in the suds and reducing the amount of cleaner used would be investigated. Ponding was again observed on the trickling filter.

More attention to plant operation appears necessary. Collecting influent composite data to evaluate trickling filter loading and measuring effluent quality with composite samples would be useful. The cause of the ponding should be found and eliminated before further problems develop. Chlorine dosage rates should be set to provide the lowest chlorine residual concentration capable of adequate disinfection. Meeting the requirements in the new permit for the 001 discharge should help correct the plant loading and chlorine residual concerns.

002 - Industrial Discharge

General Chemistry

The discharge was within NPDES Permit general chemistry parameters with the exception of one of the three oil and grease grab samples (grab - 18 mg/L: daily maximum limit - 15 mg/L: Table 6). The other two oil and grease grabs were well below permit limits. The inspection data suggest cyanide sources other than the 002B stream, to which the permit limit applies, may exist. One-third to one-fourth of the cyanide being discharged appeared to come from the 002B stream. Reynolds reported that the cyanide concentrations observed in the 002A sample likely resulted from a pipe in the North plant air pollution control system that broke during the inspection spilling water with elevated cyanide and sulfate concentrations into the 002A system. Cyanide concentrations in the 002A and 002B streams should be resampled during the next inspection.

Laboratory analysis of both the weak & dissociable and total cyanide in the 002A stream found the weak & dissociable concentration to be approximately one-sixth of the total cyanide concentration (Table 7). Continued measurement of total cyanide in the discharge is reasonable because of the varying solubility and reactivity of cyanides and toxicity of hydrogen cyanide (HCN).

Nutrient concentrations were low in the discharge (Table 7). Other general chemistry parameter concentrations appeared acceptable.

Organics

Benzo(a)pyrene, the only organic compound with an NPDES permit limit, was within limits (Table 6). The load in the 002B stream, the permitted stream, represented 10-20 percent of the load measured in the 002A stream. The 002A load fell between the average and maximum loads allowed in the 002B stream.

Organics in the 002A discharge were primarily high molecular weight polynuclear aromatic hydrocarbons (HPAH; Tables 8 and 9). Fluoranthene (22mg/L) was the HPAH found in the highest concentration. The 002B discharge had higher concentrations of HPAHs and several low molecular weight polynuclear aromatic hydrocarbons (LPAH). Organics concentrations detected in the 002A stream were less than available toxicity criteria (EPA, 1986; Table 10). The 002A organic concentrations may also have been influenced by the spill in the North plant discussed in the general chemistry section. A recheck of both the 002A and 002B streams for PAHs is suggested for the next inspection.

Bis(2-Ethylhexyl)phthalate was found in the 002A and 002B samples as well as the transfer blank. Sample or laboratory contamination appear the likely source of the phthalate. Low concentrations of acetone and chloroform were found in the 002A discharge (2 ug/L or less) and higher concentrations of acetone were found in the 002B discharge (17 and 100 ug/L). Five ug/L of acetone, a common laboratory contaminant, was found in the transfer blank.

A complete list of parameters analyzed and analytical results is included in Appendix B.

Tentatively identified compounds are included in Appendix C. Only two compounds were tentatively identified in the 002A sample, both at concentrations of 13 ug/L-estimated or less. In the 002B sample the twenty tentatively identified compounds found in the highest concentration ranged in concentration from 130-910 ug/L-estimated. Most were long-chain carbon compounds.

Metals

Interpretation of permit compliance for metals is difficult due to the poor detection limits attained by the Ecology contract laboratory (Table 11). The Ecology contract laboratory performance evaluation sample results bordered on the unacceptable range for aluminum and nickel (Table 5). The problem was in part caused by improper sample preparation after the sample preparation directions were either not forwarded to the contract lab or lost. Reynolds lab PE sample results for Al and Ni were good. The PE sample provided by the QA section did not contain a known concentration of Sb. Ecology contract laboratory Sb concentrations were all greater than the Reynolds laboratory results. A PE sample for Sb analysis by Reynolds is

suggested for the next inspection. The Reynolds metals results, which are thought to be the most accurate, indicate permit compliance (Table 6).

Detection limits also hampered efforts to compare 002A concentrations to toxicity criteria (Table 10). Several detection limits exceeded the criteria and several of the metals detected were detected at the detection limit, a range of limited analytical accuracy.

Bioassays

The rainbow trout bioassay results were in compliance with the NPDES limit (Table 6). One hundred percent survival occurred in both the 65% effluent concentration specified in the permit and in 100% effluent (Table 12).

Some toxicity was noted in the other organisms tested (Table 12). Acute results showed an LC₅₀ of 26% effluent for *Daphnia magna* and 58.8% effluent for fathead minnow. Chronic results showed a NOEC of 25% effluent for *Daphnia magna* and 12.5% effluent for fathead minnow. The Microtox EC₅₀ was 38% effluent.

The cause of the toxicity is not clear. Comparison of results to toxicity criteria found cyanide to be the only parameter measured in concentrations greater than acute toxicity criteria (EPA, 1986; Table 10). Organics in the effluent were in concentrations less than available toxicity criteria, and comparison of results to metals criteria is inconclusive. Chlorine residual concentrations in 002A effluent samples were <40 ug/L (Table 7). Although the detection limit was slightly greater than the acute (19 ug/L) and chronic (11 ug/L) criteria, chlorine toxicity is not considered likely (EPA, 1986).

Centrifuge

Analysis of centrifuge cake (solids captured in the bowl of the centrifuge) for organics found many of the HPAH and LPAH compounds found in the 002A and 002B samples (Table 8). A similar compound list was found in the 002B treatment plant sludge, although sludge concentrations were generally less than centrifuge cake concentrations. Phenol was only found in the centrifuge solids sample. A volatile organics analysis was not run on the two samples.

Metals results also indicated higher concentrations of metals in the centrifuge cake than in the sludge (Table 11). High effluent metals detection limits prevent informative comparison of centrifuge and effluent data.

A more complete discussion of centrifuge methods and results will be presented in a centrifuge study report (Andreasson, in prep).

003, 004, & 005 - Discharges to the Longview Ditches

The three surface water discharges into the Longview Ditch system were within NPDES Permit limits (Table 6).

The 003 stream general chemistry results closely approximated the Longview Ditch characteristics in the discharge area (Table 7). Chrysene was the only PAH detected at 0.25 ug/L, just above the detection limit of 0.20 ug/L (Table 9). Metals results are not useful.

The 004 stream water quality was somewhat different than ditch quality. Fluoride (29.4 mg/L) and cyanide (total - 370 ug/L: weak and dissociable - 29 ug/L) were both observed in the 004 flow from Reynolds property (Table 7). PAHs were all below detection limits in the discharge (Table 9).

The 005 stream permitted site included flows from both the smelter and cable plant. The upstream station, which included smelter flow only was notably different than downstream (Table 7). The cyanide concentration was higher (total - 53 ug/L: weak and dissociable - 13 ug/L) and eight PAHs, ranging in concentration from 0.3-8.8 ug/L were detected in the upstream station (Table 9).

Rerouting the 004 discharge and further monitoring the 003 and 005 discharges as required in the new permit appears appropriate.

Sediments

Sediments in the area of the 002 outfall showed little impact from the discharge for the parameters measured (Tables 7 and 8). Current velocities appeared adequate to minimize deposition near the outfall. Sediment samples collected varied from 96-98% sand while the centrifuge cake was 95% silt and clay (Table 8). TOC concentrations were very low; 0.15 percent-dry wt basis or lower.

Methylene chloride, acetone, and bis(2-Ethylhexyl)phthalate were found in the three sediment samples collected (Table 8). All three compounds were also found in the transfer blank. Four LPAHs were found in the downstream sample at concentrations up to 76 ug/Kg-dry wt-estimated. Metals concentrations were similar for all three samples (Table 11).

A complete list of parameters analyzed and detection limits is included in Appendix B. Also, five tentatively identified compounds were found in each sample at estimated concentrations up to 890 ug/Kg-dry wt basis (Appendix C).

Bioassays using *Hyallela azteca* and Microtox found no indication of toxicity in the sediments (Table 13).

RECOMMENDATIONS AND CONCLUSIONS

Laboratory Evaluation/Split Sample Results

Sample split results compared well. Laboratory recommendations made by the Ecology Quality Assurance Section are included in Appendix A.

001 - Sanitary Discharge

The sanitary discharge approached BOD₅ and TSS permit limits, and one fecal coliform measurement was quite high, likely due to variable chlorine residual concentrations. More attention to plant operation is recommended; including, measurement of influent loading, correcting the trickling filter ponding as necessary, and maintaining the minimum chlorine residual necessary for good disinfection. Meeting conditions of the new NPDES permit should help satisfy the recommendations.

002 - Industrial Discharge

General Chemistry

Discharge concentrations and loadings were within permit limits. The cyanide loadings observed were greater in the 002A flow than in the 002B flow. The spill in the North plant may account for the observation. A recheck of cyanide in both streams during the next inspection is recommended.

The weak and dissociable cyanide concentrations represented approximately one-sixth of the total cyanide measured. Monitoring both parameters is of value because of the variable stability of many cyanide compounds.

Organics

Organics detected were primarily HPAH compounds. Benzo(A)pyrene loading was within limits in the permitted 002B stream. The load in the 002A stream fell between the monthly average and daily maximum 002B limits. The North plant spill may have contributed to the observation. A recheck of PAHs in both streams during the next inspection is recommended.

Metals

Poor Ecology detection limits limited usefulness of the data. Reynolds results appeared accurate and indicated permit compliance.

Bioassays

The trout bioassay found no toxicity indicating permit compliance. Acute test LC₅₀s ranged from 26-58.8% 002A effluent and chronic test NOECs ranged from 12.5-25% 002A effluent in tests run with other organisms (*Daphnia magna*, fathead minnow, and Microtox). The cause was unclear although cyanide concentrations exceeded toxicity criteria.

Centrifuge

Many of the compounds found in the 002A&B samples and a list very similar to compounds found in the 002B sludge, were found in the centrifuge cake sample. Both metals and organics concentrations were higher in the centrifuge cake than in the sludge.

003, 004, & 005 - Discharges to the Longview Ditches

All three discharges were within permit limits at the time of the inspection. The 003 discharge was similar to the Longview Ditch water near the discharge. The 004 discharge had elevated fluoride (29.4 mg/L) and cyanide (total-370 ug/L) concentrations in comparison to the Longview Ditch. The 005 discharge upstream of the cable plant contributions had cyanide (total-53 ug/L) and eight PAHs (0.3-8.8 ug/L) detected.

Discontinuing the 004 discharge and studies of the 003 and 005 discharges required in the new permit appear appropriate.

Sediments

The sediments were fairly clean with no detected impacts from the Reynolds discharge. There was no indication of toxicity in the bioassays.

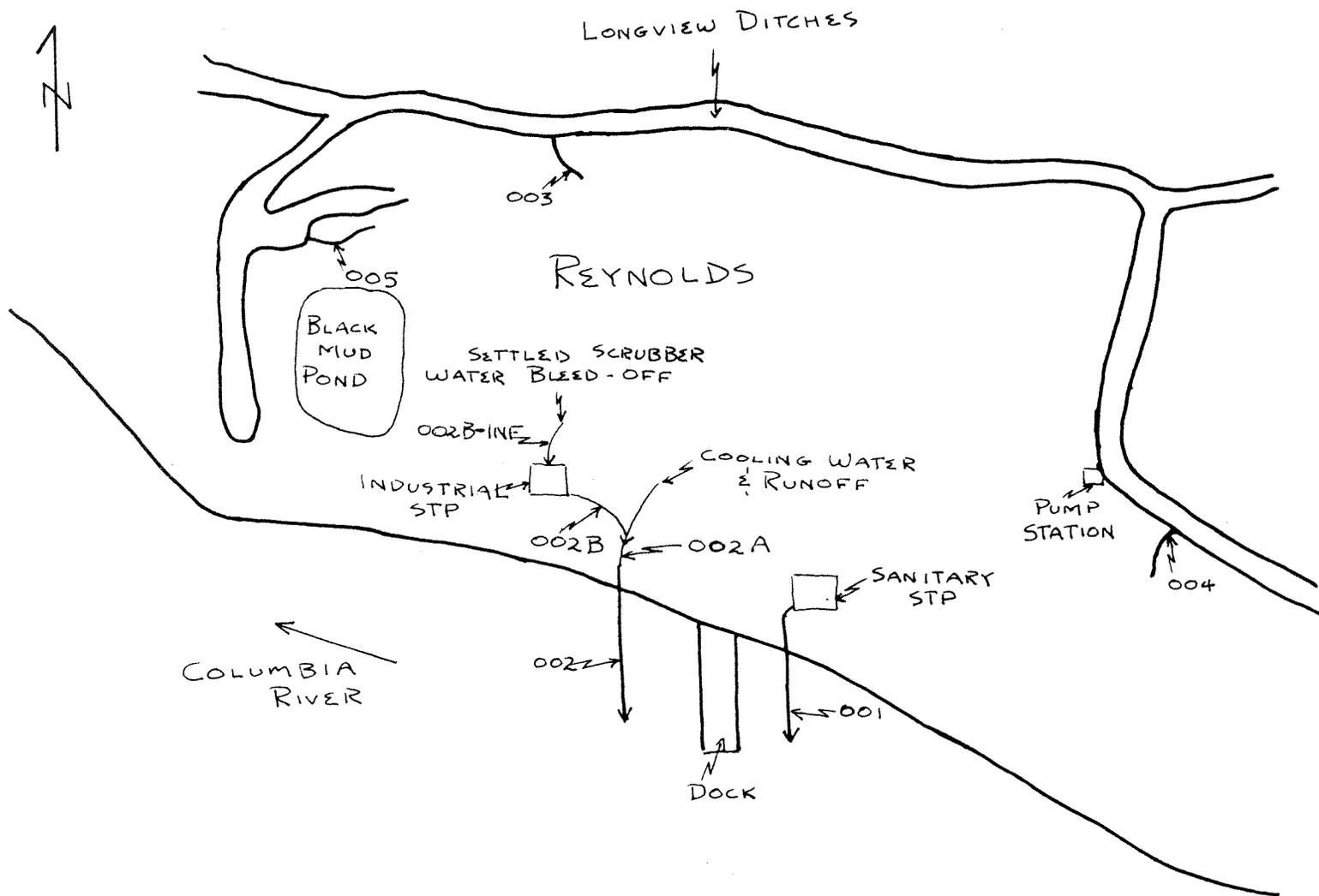
REFERENCES

Andreasson, Jeanne, in preparation. Summary of Ecology Centrifuge Testing.

EPA, Level 1 Biological Testing Assessment and Data Formatting, EPA 600/7-80-079.
April, 1980.

EPA, Quality Criteria for Water, EPA 440/5-86-001, 1986.

FIGURE



11

Figure 1 - Simplified Schematic - Reynolds Metals, February 1990.

TABLES

Table 1 - Sampling Station Descriptions - Reynolds, February 1990.

001

Treated Sanitary Wastewater - Samples collected from the effluent weir box just upstream of the weir.

002-A

Cooling Water, Site Runoff, and Treated Industrial Wastewater - Samples collected from a tap off the effluent pipe gallery above the discharge wet well. Composite and centrifuge samples were collected from a priority pollutant cleaned stainless steel bucket placed under the tap and allowed to overflow at a rate to prevent solids from settling.

002-B-Influent

Industrial Wastewater Treatment Plant Influent - Samples collected from a tap on the pipe into the industrial wastewater treatment plant. Composite sample was collected from a priority pollutant cleaned stainless steel bucket placed under the tap and allowed to overflow at a rate to prevent solids from settling.

002-B

Treated Industrial Wastewater - Samples collected from a tap on the discharge line. Composite samples were collected from a priority pollutant cleaned stainless steel bucket placed above the wet well tank. A teflon line was run from the tap to the bucket and the flow rate set to allow the bucket to overflow at a rate to prevent solids from settling.

003-Upstream

Sample collected approximately 5 feet upstream* of the discharge and 10 feet out into the Longview Drainage District Ditch.

003

Sample collected at corner of Reynolds Cable Plant parking lot just after the 003 ditch passed under the reduction plant/cable plant boundary fence.

003-Downstream

Sample collected in the effluent plume approximately 8 feet into the Longview Drainage District Ditch. The plume was relatively clear water compared to the turbid receiving water.

Table 1 - Cont'd - Reynolds, February 1990.

004-Upstream

Sample collected approximately 10 feet upstream* of the discharge and 8 feet out into the Longview Drainage District Ditch.

004

Sample collected as the 004 discharge fell from the culvert pipe into the Longview Drainage District Ditch.

004-Downstream

Sample collected in the effluent plume approximately 8 feet into the Longview Drainage District Ditch.

005-Upstream

Sample collected from the 005 ditch at the corner of the cable plant spool storage area. Location was upstream of inputs from the cable plant.

005-Permit

Sample collected at the Reynolds sampling bridge just prior to the 005 ditch entering a culvert running into a swampy area.

* Longview Drainage District Ditches were flowing east to west

Table 2 - Priority Pollutant Cleaning and Field Transfer Blank Procedures -
Reynolds, February 1990.

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

FIELD TRANSFER BLANK PROCEDURE

1. Pour organic free water directly into appropriate bottles for parameters to be analyzed from grab samples (VOA).
2. Run approximately 1L of organic free water through a compositor and discard.
3. Run approximately 6L of organic free water through the same compositor and put the water into appropriate bottles for parameters to be analyzed from composite samples (BNA, Pesticide/PCB, metals, cyanide, and PAH).

Table 3 – Sampling Schedule – Reynolds, February 1990.

Sample+:	001	001	001-E	001-R	001	Intake	002A	002A	002A-E	002A-R	002B-Inf	002B-Inf	002B-Inf	002B-Inf	002B	002B	002B	
Date:	2/27	2/27	2/27-28	2/28	2/28	2/28	2/27	2/27	2/28	2/27-28	2/27-28	2/27	2/27	2/28	2/27-28	2/27	2/27	2/28
Time:	0920	1720	0700-0700	0920	1530	1200	0955	1755	1020	0700-0700	0700-0700	1035	1820	1045	0700-0700	1025	1810	1110
Type:	Grab	Grab	Composite	Grab	Grab	Grab	Grab	Grab	Grab	Composite	Composite	Grab	Grab	Grab	Composite	Grab	Grab	Grab
Lab Log #:		098261	098230	098231	098232	098233	098234	098235	098262	098236	098237				098238	098239	098240	

Field Analyses

pH	E	E	ER	ER			E	E	E	ER	ER	E	E	E	E	E	E	E
Conductivity	E	E	E	E			E	E	E	E	E	E	E	E	E	E	E	E
Temperature	E	E	E	E			E	E	E	E	E	E	E	E	E	E	E	E
Chlorine residual	E	E		E			E		E						E		E	
Sulfide									E									

Laboratory Analyses

Conductivity			E	E					E	E					E			
Alkalinity									E									
Hardness			E			E			E	E								
Fluoride (total)			E	ER		E			ER	ER					E			
Fluoride (Soluble)																		
Sulfate									E	E					E			
Cyanide (Total)									ER	ER					E			
Cyanide (Wk & Disoc)									ER	ER					E			
TS			E	E					E						E			
TNVS			E	E					E						E			
TSS		E	ER	ER					ER	ER					E			
TNVSS			E	E					E						E			
BOD5			ER	ER														
Inhib. BOD5			E	E														
COD		E	E	E														
TOC (liquid)									E									
TOC (solids)																		
NH3-N			E	E					E	E								
NO3+NO2-N			E	E					E	E								
Total-P			E	E					E	E								
Oil and Grease							E	E	ER						E	E		
Fecal Coliform				ER	E													
Aluminum (total)			E	E		E			ER	ER					E			
Antimony (total)									ER	ER								
Nickel (total)									ER	ER								
Copper (tot rec)																		
pp metals			E			E			E						E			
pp metals (dissolved)									E									
BNA (water)									E									
VOA (water)							E	E							E	E		
Pest/PCB (water)									E									
PAH (Mthd 610)									E	E					E			
BNA (solids)																		
VOA (solids)																		
Pest/PCB (solids)																		
% Solids																		
Grain Size																		
Trout (65% effluent)									E**									
Trout (100% effluent)									E**									
Microtox									E**									
Fathead Minnow									E**									
Daphnia Magna									E**									
Hyalloella (sediment)									E**									

E Ecology analysis
R Reynolds analysis
* R analysis for Benzo(a)Pyrene only
** bioassay samples are comprised of equal volumes of the three 002A grab samples.
+ station - sampler. Ecology sample when not specified
*+ additional data will be presented in a centrifuge report (Andreasson, in prep)

Table 3 – Cont'd – Reynolds, February 1990.

Sample+:	002B-E	002B-R	003-upstm	003	003-dnstm	004-upstm	004	004-dnstm	005-upstm	005-permit	Trns Blk	PE sample	Upstrm	Diffuser	Dwnstrm	Cent Cake	Sludge
Date:	2/27-28	2/27-28	2/27	2/27	2/27	2/27	2/27	2/27	2/27	2/27	2/26		2/23	2/23	2/23	2/28	2/28
Time:	0700-0700	0700-0700	1220	1255	1150	1515	1530	1500	1620	1640	1430		1515-1545	1245-1340	1355-1415	*+	*+
Type:	Composite	Composite	Grab	Grab		Grab	Grab	Grab	Composite	Grab							
Lab Log #	098241	098242	098243	098244&52	098245	098246	098247&54	098248	098249&56	098250&58	098251	098260	088022	088020	088021	098280	098283
Field Analyses																	
pH	E	E	E	ER	ER	E	ER	ER	ER	ER							
Conductivity	E	E	E	E	E	E	E	E	E	E							
Temperature	E	E	E	E	E	E	E	E	E	E							
Chlorine residual			E	E	E	E	E	E	E	E							
Sulfide			E	E	E	E	E	E	E	E							
Laboratory Analyses																	
Conductivity	E	E	E	E	E	E	E	E	E	E							
Alkalinity	E																
Hardness	E		E	E	E	E	E	E	E	E							
Fluoride (total)	E	E	E	ER	ER	E	ER	ER	ER	ER		ER	E	E	E		
Fluoride (Soluble)													E	E	E		
Sulfate	E	E		E			E		E	E							
Cyanide (Total)	ER	ER	E	E	E	E	E	E	E	E	E	ER	E	E	E		
Cyanide (Wk & Dis)	ER	ER	E	ER	ER	E	ER	ER	ER	ER	E		E	E	E		
TS	E																
TNVS	E																
TSS	E	ER										ER					
TNVSS	E																
BOD5																	
Inhib. BOD5																	
COD																	
TOC (liquid)																	
TOC (solids)													E	E	E	E	E
NH3-N				E			E		E	E							
NO3+NO2-N				E			E		E	E							
Total-P				E			E		E	E							
Oil and Grease				E			E		E	E							
Fecal Coliform																	
Aluminum (total)	E	E	E	E	E	E	E	E	E	E		ER	E	E	E	E	E
Antimony (total)	E	E										ER					
Nickel (total)	E	E										ER					
Copper (tot rec)				R	R			R		R							
pp metals	E		E	E	E	E	E	E	E	E	E		E	E	E	E	E
pp metals (dissolved)																	
BNA (water)	E										E						
VOA (water)											E						
Pest/PCB (water)	E										E						
PAH (Mthd 810)	ER*	ER*		E			E		E	E	E						
BNA (solids)													E	E	E	E	E
VOA (solids)													E	E	E	E	E
Pest/PCB (solids)													E	E	E	E	E
% Solids													E	E	E	E	E
Grain Size													E	E	E	E	E
Trout (65% effluent)																	
Trout (100% effluent)																	
Microtox													E	E	E		
Fathead Minnow																	
Daphnia Magna																	
Hyallolela (sediment)													E	E	E		

Table 4 – Ecology Analytical Methods – Reynolds, February 1990.

	Method Used for Ecology Analysis (Ecology, 1988&89)	Laboratory Performing Analysis
<u>Laboratory Analyses</u>		
Conductivity	EPA #120.1	Ecology
Alkalinity	EPA #310.1	Ecology
Hardness	EPA #130.2	Ecology
Fluoride (total)	EPA #340.3	Ecology
Fluoride (soluble)	EPA #340.3	Ecology
Sulfate	EPA #300.0	Ecology
NH3-N	EPA #350.1	Ecology
NO3+NO2-N	EPA #353.2	Ecology
Total-P	EPA #365.2	Ecology
TS	EPA #160.3	Ecology
TNVS	EPA #160.4	Ecology
TSS	EPA #160.2	Ecology
TNVSS	EPA #160.4	Ecology
COD	EPA #410.1	Ecology
BOD5	EPA #405.1	Ecology
Inhib. BOD5	EPA #405	Ecology
Fecal Coliform (MF)	APHA, 1985: #909C	Ecology
Oil and Grease	EPA #413.1	Amtest
TOC (water)	EPA #415.1	Ecology
TOC (sed/sludge)	Tetra Tech, 1986	Amtest
% Solids	EPA #160.3	Amtest
Grain Size	Tetra Tech, 1986	Laucks
Cyanide (total)	EPA #335.3	Ecology
Cyanide (wk & dis)	APHA, 1985: #412H	Ecology
VOA (water)	EPA #624	Laucks
VOA (sed/sludge)	EPA #8240	Laucks
BNA (water)	EPA #625	Laucks
BNA (sed/sludge)	EPA #8270	Laucks
Pest/PCB (water)	EPA #608	Laucks
Pest/PCB (sed/sludge)	EPA #8080	Laucks
PAH (water)	EPA #610	Ecology
Metals (water)	EPA #200	Sound Analytical Services
Metals (sediments)	EPA #200	Amtest
Metals (cent/sludge)	EPA #200	Ecology
Trout	Ecology, 1981	Weyerhaeuser
Fathead Minnow	EPA, 1989	Northwestern Aquatic Sciences
Daphnia Magna	EPA, 1987	Ecology
Microtox (water)	Beckman, 1982	ECOVA
Microtox (sed/sludge)	Tetra Tech, 1986	ECOVA
Hyallolela	Nebeker, 1984	Northwestern Aquatic Sciences

Table 4 – Cont'd – Reynolds, February 1990.

	Method Used for Ecology Analysis (Ecology, 1988&89)	Laboratory Performing Analysis
<u>Field Analyses</u>		
pH	APHA, 1985: #423	Ecology
Conductivity	APHA, 1985: #205	Ecology
Temperature	APHA, 1985: #212	Ecology
Chlorine Residual	APHA, 1985: #408E	Ecology
Sulfide	EPA #376.2	Ecology

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Table 5 – Split Sample Results Comparison – Reynolds, February 1990.

Sample #:	001-E	001-R	002A	002A-E	002A-R	002B-E	002B-R	003	003-dnstm	004	004-dnstm	005-upstm	005-permit	PE sample	PE sample
Date:	2/27-28	2/28	2/28	2/27-28	2/27-28	2/27-28	2/27-28	2/27	2/27	2/27	2/27	2/27	2/27		
Time:	0700-0700	0920	1020	0700-0700	0700-0700	0700-0700	0700-0700	1255	1150	1530	1500	1620	1640		
Type:	Composite	Grab	Grab	Composite	Composite	Composite	Composite	Grab	Grab	Grab	Grab	Grab	Grab		
Lab Log #:	098230	098231	098262	098236	098237	098241	098242	098244&52	098245	098247&54	098248	098249&56	098250&58	098260	098260
Laboratory															
pH (S.U.)	Ecology	7.1	7.4		7.4	7.4		7.2	7.6	7.3	6.6	7.0	7.3		
	Reynolds	7.8	7.6		7.5	7.5		7.6	7.6	7.4	6.8	7.1	7.6		
Fluoride (total-mg/L)	Ecology		4.7		8.4	8.0		1.4	1.4	29.4	0.75	9.7	0.50	1.7	1.60
	Reynolds		2.4		6.7	7.4		1.2	1.1	22.0	0.65	8.6	0.43	1.6	(1.39-1.78)
Cyanide (total-ug/L)	Ecology				191	649	2630	2950						903	890
	Reynolds				150	171	2250	2890						980	(562-1140)
Cyanide (wk&dis-ug/L)	Ecology				27	19	606	569	2	4	29	4	13	4	
	Reynolds				25	23	890	1040	<5	<5	33	<5	19	<5	
TSS (mg/L)	Ecology	31	19		11	10		285						27	29.7
	Reynolds	32.8	20.8		13.2	11.0		162						29.3	(24.2-33.3)
BOD5 (mg/L)	Ecology	20	19												
	Reynolds	22.4	15.9												
Oil and Grease (mg/L)	Ecology				5.7										
	Reynolds				3.0										
Fecal Coliform (#/100mL)	Ecology		590												
	Reynolds		107												
Benzo(a)pyrene (ug/L)	Ecology						33.0	30.8							
	Reynolds						31	12							
Cu (ug/L)	Ecology								<50	<50		<10		<50	
	Reynolds								<10	<10		<10		<10	
Al (ug/L)	Ecology				690	630								441*	350
	Reynolds				530	500								350	(269-439)
Ni (ug/L)	Ecology				70	50								417*	370
	Reynolds				<20	<20								390	(319-419)
Sb (ug/L)	Ecology				280	70								230*	**
	Reynolds				<50	<50								<50	

+ station – sampler. Ecology sample when not specified.
* proper dilution instructions were not provided to the contract laboratory analyzing the samples.
** true value of Sb not quantified in the PE sample tested.

Table 6 – NPDES Permit Limits/Inspection Results Comparison – Reynolds, February 1990.

Outfall 001

	Effluent Limits		Laboratory	Sample +:	001-E	001-R	001
	Daily Average	Daily Maximum		Date:	2/27-28	2/28	
				Time:	0700-0700	0920	
				Type:	Composite	Grab	Grabs
				Lab Log #:	098230	098231	
pH (S.U.)	6.5-8.5 at all times		Ecology Reynolds			7.4 7.6	7.2; 7.4
TSS (mg/L)	30	45	Ecology Reynolds	31 32.8	19 20.8		
(lbs/D)	38	90	Ecology Reynolds	23.5 24.9	14.4 15.8		
BOD5 (mg/L)	25	45	Ecology Reynolds	20 22.4	19 15.9		
(lbs/D)	31	90	Ecology Reynolds	15.2 17.0	14.4 12.1		
Fecal Coliform (#/100mL)	200	400	Ecology Reynolds			590 107	36000LJ
Chlorine Residual (mg/L)	range 0.1-3.0		Ecology			0.3	0.4; <0.04
Flow (MGD)	0.22	0.32		0.091	0.091		

+ station – sampler. Ecology sample when not specified.
LJ estimated – total plate count greater than 200

Outfalls 003, 004, & 005

	Effluent Limits		Laboratory	Sample:	003	003-dnstm	004	004-dnstm	005-upstm	005-permit
	Daily Average	Daily Maximum		Date:	2/27	2/27	2/27	2/27	2/27	2/27
				Time:	1255	1150	1530	1500	1620	1640
				Type:	Grab	Grab	Grab	Grab	Grab	Grab
				Lab Log #:	098244&52	098245	098247&54	098248	098249&56	098250&58
pH (S.U.)	6.5-9.0 at all times		Ecology Reynolds	7.2+ 7.6+	7.6 7.6	7.3+ 7.4+	6.6 6.8	7.0 7.1	7.3+ 7.6+	
Fluoride (total-mg/L)	**		Ecology Reynolds	1.4 1.2	1.4+ 1.1+	29.4 22.0	0.75+ 0.65+	9.7 8.6	0.50+ 0.43+	
Cyanide (wk&dis-ug/L)	5.2++		Ecology Reynolds	2 <5	4+ <5+	29 33	4+ <5+	13 19	4+ <5+	
Oil and Grease (mg/L)	no visible sheen		Ecology	no sheen+ 1.2	no sheen	no sheen+ 3.3	no sheen	no sheen 3.1	no sheen+ 6.4	
Benzo(a)pyrene (ug/L)	***		Ecology Reynolds	0.20U		0.20U		0.6	0.1U+	
Cu (ug/L)	003	12.7*	Ecology Reynolds		<50+ <10+					
	004	13.0*	Ecology Reynolds				<10+ <10+			
	005	22.0*	Ecology Reynolds						<50+ <10+	

+ location where permit limits are applied
++ chronic toxicity criteria
* chronic toxicity criteria based on hardness
** concentration to be less than chronic toxicity criteria. No criteria available.
*** limit for outfall 005 only. Concentration to be less than chronic toxicity criteria. No criteria available.
U compound analyzed for but not detected at the given detection limit.

Table 6 – Cont'd – Reynolds, February 1990.

	Effluent Limits		Sample +: Date: Time: Type: Lab Log #:	002A	002A-E 2/27-28 0700-0700 Composite 098236	002A-R 2/27-28 0700-0700 Composite 098237	002B-E 2/27-28 0700-0700 Composite 098241	002B-R 2/27-28 0700-0700 Composite 098242	
	Daily Average	Daily Maximum							Laboratory
pH (S.U.)	6.0-9.0		Ecology Reynolds	7.1;7.5;7.1					
Total Fluoride (mg/L) (lbs/D)	608	1315	Ecology Reynolds Ecology Reynolds	8.4 6.7 563 449	8.0 7.4 536 496				
Total Cyanide (ug/L) (lbs/D)	12.0*	18.0*	Ecology Reynolds Ecology Reynolds	191 150 12.8** 10.1**	649 171 43.5** 11.5**	2630 2250 3.2 2.8	2950 2890 3.6 3.5		
TSS (mg/L) (lbs/D)	1850	3700	Ecology Reynolds Ecology Reynolds	11 13.2 738 885	10 11.0 671 738				
Oil and Grease (mg/L)	10	15	Ecology Reynolds	18;2.1;5.7 3.0					
Benzo(a)pyrene (ug/L) (lbs/D)	0.070*	1.000*	Ecology Reynolds Ecology Reynolds	5.7 0.382**	3.0 0.201**	33.0 31 0.041 0.038	30.8 12 0.038 0.015		
Al (ug/L) (lbs/D)	150*	300*	Ecology Reynolds Ecology Reynolds	690 530 46 36	630 500 42 34				
Ni (ug/L) (lbs/D)	3.0	5.1	Ecology Reynolds Ecology Reynolds	70 <20 4.7 <1.3	50 <20 3.4 <1.3				
Sb (ug/L) (lbs/D)	10.1	22.5	Ecology Reynolds Ecology Reynolds	280 <50 18.8 <3.4	70 <50 4.7 <3.4				
Salmonid Bioassay (% Survival)	>80		Ecology	100					
Flow (MGD)				8.04	8.04	0.147	0.147		
Temperature (F)									

* per Order No. 89-3.
 ** limit applies to 002B flow
 + station - sampler. Ecology sample when not specified.

Table 7 – Ecology Laboratory General Chemistry Results – Reynolds, February 1990.

Sample #:	001	001	001-E	001-R	001	Intake	002A	002A	002A	002A-E	002A-R	002B-Inf	002B-Inf	002B-Inf	002B-Inf	002B	002B	002B
Date:	2/27	2/27	2/27-28	2/28	2/28	2/28	2/27	2/27	2/28	2/27-28	2/27-28	2/27	2/27	2/28	2/27-28	2/27	2/27	2/28
Time:	0920	1720	0700-0700	0920	1530	1200	0955	1755	1020	0700-0700	0700-0700	1035	1820	1045	0700-0700	1025	1810	1110
Type:	Grab	Grab	Composite	Grab	Grab	Grab	Grab	Grab	Grab	Composite	Composite	Grab	Grab	Grab	Composite	Grab	Grab	Grab
Lab Log #:		098261	098230	098231	098232	098233	098234	098235	098262	098236	098237				098238	098239	098240	

Field Analyses

pH (S.U.)	7.2	7.4	7.1	7.4			7.1	7.5	7.1	7.4	7.4	9.3	8.9	8.6	9.0	3.0	3.9	3.5
Conductivity (umhos/cm)	480	517	460	454			1055	1268	1120	1132	1210	38600	37300	34500	36700	36700	36000	44200
Temperature (C)	12.0	15.2	1.5	11.6			17.6	16.8	16.7	3.7	18.6	29.7	30.7	27.0	3.1	26.8	28.1	26.5
Chlorine residual (mg/L)																		
Free	0.2	<0.1		<0.1														
Total	0.4	<0.04		0.3			<0.04			<0.04						*	*	
Sulfide (mg/L)																		

Laboratory Analyses

Conductivity (umhos/cm)			517	481					1290	1310					33900			
Alkalinity (mg/L as CaCO3)									125									
Hardness (mg/L as CaCO3)			160			112			132	132								
Fluoride (total-mg/L)			3.3	4.7		0.87			8.4	8.0					1110			
Fluoride (total-mg/Kg dry wt)																		
Fluoride (soluble-mg/L)																		
Sulfate (mg/L)									375	390					17500			
Cyanide (total-ug/L)									191	649					28600			
Cyanide (wk & dis-ug/L)									27	19					865			
Cyanide (total-mg/Kg dry wt)																		
Cyanide (wk & dis-mg/Kg dry wt)																		
TS (mg/L)				372	340				881						38000			
TNVS (mg/L)				257	254				792						32900			
TSS (mg/L)		127		31	19				11	10					309			
SS (mg/L)				14	8				8						211			
5 (mg/L)				20	19													
Inhib. BOD5 (mg/L)				17	16													
COD (mg/L)		110		69	85													
TOC (liquid-mg/L)									11									
TOC (solids-% dry wt)																		
NH3-N (mg/L)				5.6	3.2				0.36	0.28								
NO3+NO2-N (mg/L)				0.61	0.58				0.07	0.19								
Total-P (mg/L)				1.2	0.84				0.46	0.47								
Oil and Grease (mg/L)																		
Fecal Coliform (#/100mL)				590	36000 LJ			18	2.1	5.7					58	25		
% Solids																		

* sample too turbid for accurate test results
+ station - sampler (E - Ecology; R - Reynolds).
Ecology sample when not specified.
J estimated
L total plate count greater than 200
U less than

Table 7 – Cont'd – Reynolds, February 1990.

Sample +:	002B-E	002B-R	003-upstrm	003	003-dnstrm	004-upstrm	004	004-dnstrm	005-upstrm	005-permit	Trns Blk	PE sample	Upstrm	Diffuser	Dwnstrm
Date:	2/27-28	2/27-28	2/27	2/27	2/27	2/27	2/27	2/27	2/27	2/27	2/26		2/23	2/23	2/23
Time:	0700-0700	0700-0700	1220	1255	1150	1515	1530	1500	1620	1640	1430		1515-1545	1245-1340	1355-1415
Type:	Composite	Composite	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab		Grab	Grab	Grab
Lab Log #:	098241	098242	098243	098244&52	098245	098246	098247&54	098248	098249&56	098250&58	098251	098260	088022	088020	088021

Field Analyses

pH (S.U.)	3.9	3.4	7.0	7.2	7.6	6.7	7.3	6.6	7.0	7.3					
Conductivity (umhos/cm)	35100	36500	285	330	280	297	735	302	849	497					
Temperature (C)	5.1	17.9	9.6	14.1	11.7	13.0	7.1	13.5	11.3	13.7					
Chlorine residual (mg/L)															
Free															
Total			<0.04	0.06	<0.04	<0.04	<0.04	<0.04	<0.04	0.08					
Sulfide (mg/L)			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					

Laboratory Analyses

Conductivity (umhos/cm)	34400	34400	297	287	276	280	793	297	910	533					
Alkalinity (mg/L as CaCO3)	1U														
Hardness (mg/L as CaCO3)	303		108	110	109	106	96	112	196	207					
Fluoride (total-mg/L)	190	230	0.80	1.4	1.4	0.20	29.4	0.75	9.7	0.50		1.7			
Fluoride (total-mg/Kg dry wt)													114	34.2	23.5
Fluoride (soluble-mg/L)													3.8U	3.8U	3.1U
Sulfate (mg/L)	18900	20500		3.9			40		64	3.4					
Cyanide (total-ug/L)	2630	2950	8	2U	2	2	370	32	53	4	2U	903			
Cyanide (wk & dis-ug/L)	606	569	6	2	4	6	29	4	13	4	2U				
Cyanide (total-mg/Kg dry wt)													0.091U	0.100U	0.099U
Cyanide (wk & dis-mg/Kg dry wt)													0.094U	0.099U	0.094U
TS (mg/L)	34200														
TNVS (mg/L)	33500														
TSS (mg/L)	308	285										27			
TNVSS (mg/L)	203														
BOD5 (mg/L)															
Inhib. BOD5 (mg/L)															
COD (mg/L)															
TOC (liquid-mg/L)															
TOC (solids-% dry wt)													0.07	0.05	0.15
NH3-N (mg/L)				0.14			0.04		0.65	0.44					
NO3+NO2-N (mg/L)				0.10			0.28		0.16	0.05					
Total-P (mg/L)				0.42			0.12		0.13	0.45					
Oil and Grease (mg/L)				1.2			3.3		3.1	6.4					
Fecal Coliform (#/100mL)															
% Solids													78.2	76.4	76.6

Table 8 – VOA, BNA, and Pest/PCB Compounds Detected – Reynolds, February 1990.

Sample ++:	002A	002A	002B	002B	Trns Blk	Upstrm	Diffuser	Dwnstrm	Cent Cake	Sludge
Date:	2/27	2/27	2/27	2/27	2/26	2/23	2/23	2/23	2/26-28	2/28
Time:	0955	1755	1025	1810	1430	1515-1545	1245-1340	1355-1415		
Type:	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Comp	Grab
Lab Log #:	098234	098235	098239	098240	098251	088022	088020	088021	098280	098283
% Solids						78.2	76.4	76.6	16.1	55.2
% TOC (dry-wt basis)						0.07	0.05	0.15	10.5	3.1
Grain size (%)										
Gravel - +10 mesh						<2	<2	<2	<1	<1
Sand - +230 mesh						96	96	98	5	<1
Silt - 5 - 8 phi						4	3	1	44	69
Clay - 9 - 12 phi						<1	1	1	51	31
VOA Compounds	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/Kg **)	(ug/Kg **)	(ug/Kg **)		
Methylene Chloride	-	-	-	-	1	12 B	14 B	12 B		
Acetone	2 J	-	100	17 J	5	31	24	27		
Chloroform	1	2	-	-	-	-	-	-		
Sample ++:	002A-E		002B-E		Trns Blk	Upstrm	Diffuser	Dwnstrm	Cent Cake	Sludge
Date:	2/27-28		2/27-28		2/26	2/23	2/23	2/23	2/26-28	2/28
Time:	0700-0700		0700-0700		1430	1515-1545	1245-1340	1355-1415		
Type:	Composite		Composite		Grab	Grab	Grab	Grab	Comp	Grab
Lab Log #:	098236		098241		098251	088022	088020	088021	098280	098283
BNA Compounds	(ug/L)		(ug/L)		(ug/L)	(ug/Kg **)				
Phenol	-	-	-	-	-	-	-	-	13000	-
2,4-Dimethylphenol	-	-	2 J	-	-	-	-	-	-	-
2-Methylnaphthalene	-	-	2 J	-	-	-	-	-	-	-
Dibenzofuran	-	-	1 J	-	-	-	-	-	-	-
Bis(2-Ethylhexyl)phthalate	53		55		33	520	210 B	750	-	-
Low Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAH)										
Naphthalene	-	-	3 J	-	-	-	-	-	-	-
Acenaphthylene	-	-	4 J	-	-	-	-	-	-	-
Acenaphthene	-	-	20	-	-	-	-	-	6600 J	9300
Phenanthrene	1 J		16		-	-	-	-	130000	17000
Anthracene	-	-	6	-	-	-	-	-	47000	8500
High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAH)										
Fluoranthene	22		320		-	-	-	39 J	1900000	520000
Pyrene	21		380		-	-	-	37 J	2300000 D	570000
Benzo(a)Anthracene	6		75		-	-	-	-	1100000	240000
Chrysene	10		61		-	-	-	-	1700000	390000
Benzo(b+k)Fluoranthene	11		150		-	-	-	76 J	1800000 D	510000
Benzo(a)Pyrene	3 J		36		-	-	-	42 J	620000	130000
Indeno(1,2,3-cd)Pyrene	1 J		12		-	-	-	-	210000	40000
Dibenzo(a,h)Anthracene	-		4 J		-	-	-	-	88000	17000
Benzo(g,h,i)Perylene	2 J		13		-	-	-	-	230000	44000
Pest/PCB Compounds										
Aldrin	-		0.42		-	-	-	-	-	-

J estimated value - less than the specified detection limit
D result from analysis of a diluted sample
B detected in the method blank also
** dry-wt basis
++ station - sampler. Ecology sample when not specified.

Table 9 – PAH Scan Results – Reynolds, February 1990.

Sample ++:	002A-E	002A-E	002A-R	002A-R	002B-Inf	002B-E	002B-E
Date:	2/27-28	2/27-28	2/27-28	2/27-28	2/27-28	2/27-28	2/27-28
Time:	0700-0700	0700-0700	0700-0700	0700-0700	0700-0700	0700-0700	0700-0700
Type:	Composite						
Lab Log #:	098236	098236	098237	098237	098238	098241	098241
	PAH Scan (ug/L)	BNA Scan (ug/L)	PAH Scan (ug/L)	BNA Scan (ug/L)	PAH Scan (ug/L)	PAH Scan (ug/L)	BNA Scan (ug/L)
Benzo(a)Pyrene	5.7	3 J	3.0	1 J	400	33.0	36
Dibenzo(a,h)Anthracene	1.0 J	4 U	1.1 J	2 U	60 UJ	1.3 UJ	4 J
Benzo(a)Anthracene	9.6	6	4.8	4	720	138	75
Acenaphthene	0.5 U	2 U	0.5 U	2 U	2.5 U	19.0	20
Phenanthrene	1.2	1 J	0.5 U	0.2 J	2.5 U	26.6	16
Fluorene	0.5 U	2 U	0.5 U	2 U	2.5 U	3.0	4 U
Naphthalene	0.5 U	4 U	0.5 U	2 U	2.5 U	1.5	3 J
Anthracene	0.5 UJ	2 U	0.5 U	2 U	2.5 U	10.4	6
Pyrene	20.7	21	6.1	4	2090 J	535	380
Benzo(g,h,i)Perylene	1.2	2 J	1.8	1 J	165	3.0	13
Indeno(1,2,3-cd)Pyrene	1.0 J	1 J	1.1 J	1 J	60 UJ	1.3 UJ	12
Benzo(b)Fluoranthene	14.4	11 X	8.7	5	1000	164 J	150 X
Fluoranthene	27.1	22	7.7	7	2290 J	535	320
Benzo(k)Fluoranthene	7.6	11 X	3.1	4	555	67.0 J	150 X
Acenaphthylene	0.5 U	2 U	0.5 U	2 U	2.5 U	3.5	4 J
Chrysene	17.4	10	9.2	9	1490 J	129	61

Sample ++:	002B-R	003	004	005-upstm	005-permit	Trans Blk	Trans Blk
Date:	2/27-28	2/27	2/27	2/27	2/27	2/26	2/26
Time:	0700-0700	1255	1530	1620	1640	1430	1430
Type:	Composite	Grab	Grab	Grab	Grab	Grab	Grab
Lab Log #:	098242	098244&52	098247&54	098249&56	098250&58	098251	098251
	PAH Scan (ug/L)	BNA Scan (ug/L)					
Benzo(a)Pyrene	30.8	0.20 U	0.20 U	0.6	0.1 U	0.2 U	4 U
Dibenzo(a,h)Anthracene	4.0 J	0.20 U	0.20 U	0.2 UJ	0.1 U	0.2 U	4 U
Benzo(a)Anthracene	70.7	0.20 U	0.20 U	1.7	0.1 U	0.2 U	2 U
Acenaphthene	4.8	0.20 U	0.20 U	0.2 U	0.1 U	0.2 U	2 U
Phenanthrene	11.0	0.20 U	0.20 U	0.2 U	0.1 U	0.2 U	2 U
Fluorene	2.5 U	0.20 U	0.20 U	0.2 U	0.2	0.2 U	2 U
Naphthalene	2.5 U	0.20 U	0.20 U	0.2 U	0.1 U	0.2 U	4 U
Anthracene	4.0	0.20 U	0.20 U	0.2 U	0.1 U	0.2 U	2 U
Pyrene	298	0.20 U	0.20 U	4.9	0.2	0.2 U	2 U
Benzo(g,h,i)Perylene	10.1	0.20 U	0.20 U	0.3	0.1 U	0.2 U	4 U
Indeno(1,2,3-cd)Pyrene	4.0 J	0.20 U	0.20 U	0.2 UJ	0.1 U	0.2 U	4 U
Benzo(b)Fluoranthene	75.4 J	0.20 U	0.20 U	2.2 J	0.1 U	0.2 U	4 U
Fluoranthene	300	NAR	0.20 U	8.4	0.3	0.2 U	2 U
Benzo(k)Fluoranthene	30.7 J	0.20 U	0.20 U	0.8 J	0.1 U	0.2 U	4 U
Acenaphthylene	2.5 U	0.20 U	0.20 U	0.2 U	0.1 U	0.2 U	2 U
Chrysene	77.3	0.25	0.20 U	3.3	0.2	0.2 U	2 U

NAR no analytical result

U compound analyzed for but not detected at the given detection limit

J estimated value less than the specified detection limit

X Benzo(b+k)Fluoranthene

++ station – sampler. Ecology sample when not specified.

Table 10 – Comparison of 002A Data to Toxicity Criteria – Reynolds, February 1990.

VOA Compounds	Sample ++:	002A	002A	Freshwater Toxicity	
	Date:	2/27	2/27	Criteria (EPA, 1986)	
	Time:	0955	1755	Acute	Chronic
	Type:	Grab	Grab		
	Lab Log #:	098234	098235		
	(ug/L)	(ug/L)			
Acetone	2 J	-	-		
Chloroform	1	2		28900 *	1240 *
	Sample ++:	002A-E			
	Date:	2/27-28			
	Time:	0700-0700			
	Type:	Composite			
	Lab Log #:	098236			
	(ug/L)				
Cyanide (total)	191				
Cyanide (wk & dis)	27			22	5.2
<u>BNA Compounds</u>					
Bis(2-Ethylhexyl)phthalate	53			940 **	3 **
<u>LPAHs</u>					
Phenanthrene	1 J				
<u>HPAHs</u>					
Fluoranthene	22			3980 *	
Pyrene	21				
Benzo(a)Anthracene	6				
Chrysene	10				
Benzo(b+k)Fluoranthene	11				
Benzo(a)Pyrene	3 J				
Indeno(1,2,3-cd)Pyrene	1 J				
Benzo(g,h,i)Perylene	2 J				
<u>Metals</u>					
Antimony (TR)	40			9000 *	1600 *
Arsenic (TR)	100 +*				
(Penta)				850 *	48 *
(Tri)				360	190
Beryllium (TR)	10 U+**			130 *	5.3 *
Cadmium (TR)	10 U+**			5.4 +	1.4 +
Chromium (TR)	50 U				
(Hexa)				16	11
(Tri)				2180 +	260 +
Copper (TR)	50 U+**			23 +	15 +
Lead (TR)	100 U+**			116 +	4.5 +
Mercury (TR)	0.2 U			2.4	0.012
Nickel (TR)	50 U			1790 +	199 +
Selenium (TR)	100 +*			260	35
Silver (TR)	100 U+**			6.5 +	0.12
Thallium (TR)	100 U			1400 *	40 *
Zinc (TR)	50 U			148 +	134 +

J estimated value – less than the specified detection limit
 U indicates compound was analyzed for but not detected at the given detection limit
 * insufficient data to develop criteria – Lowest Observed Effect Level (LOEL) presented
 ** LOEL for phthalate esters
 + calculation based on hardness (132 mg/L as CaCO3)
 ++ station – sampler. Ecology sample when not specified.
 +* exceeds chronic toxicity criteria – concentration reported is at detection limit
 +** detection limit exceeds acute and/or chronic toxicity criteria
 LPAHs Low Molecular Weight Polynuclear Aromatic Hydrocarbons
 HPAHs High Molecular Weight Polynuclear Aromatic Hydrocarbons
 TR total recoverable metal

Table 11 – Metals Scan Results – Reynolds, February 1990.

Sample ++:	001-E	001-R	Intake	002A-E	002A-E	002A-R	002B-Inf	002B-E	002B-R	003-upstm	003	003-dnstm
Date:	2/27-28	2/28	2/28	2/27-28	2/27-28	2/27-28	2/27-28	2/27-28	2/27-28	2/27	2/27	2/27
Time:	0700-0700	0920	PM	0700-0700	0700-0700	0700-0700	0700-0700	0700-0700	0700-0700	1220	1255	1150
Type:	Composite	Grab	Grab	Composite	Composite	Composite	Composite	Composite	Composite	Grab	Grab	Grab
Lab Log #:	098230	098231	098233	098236	098236	098237	098238	098241	098242	098243	098244&52	098245

	(ug/L)	(ug/L)	(ug/L)	(ug/L)	dissolved (ug/L)	(ug/L)						
Antimony (TR)	10 U		10 U	40	10 U		10 U	30		20	70	10 U
Arsenic (TR)	100 U		100 U	100	100 U		500	300		100 U	100 U	100 U
Beryllium (TR)	10 U		10 U	10 U	10 U		10 U	10 U		10 U	10 U	10 U
Cadmium (TR)	10 U		10 U	10 U	10 U		10 U	10 U		12	10 U	10 U
Chromium (TR)	50 U		50 U	50 U	50 U		50 U	80		50 U	50 U	50 U
Copper (TR)	50 U		50 U	50 U	60		50 U	50 U		50	50 U	50 U
Lead (TR)	100 U		100 U	100 U	100 U		200	200		100 U	100 U	100 U
Mercury (TR)	0.2 U		0.2 U	0.2 U	0.2 U		0.2 U	0.2 U		0.3	0.2 U	0.2 U
Nickel (TR)	50 U		50 U	50 U	50 U		50 U	470		50 U	50 U	50 U
Selenium (TR)	100 U		100 U	100	100 U		500	100 U		100	100 U	100 U
Silver (TR)	100 U		100 U	100 U	600		100 U	100 U		100	100 U	100 U
Thallium (TR)	100 U		100 U	100 U	100 U		100 U	100 U		100 U	100 U	100 U
Zinc (TR)	50 U		50 U	50 U	60		50 U	50 U		50 U	50 U	50 U
Aluminum (T)	490	340	70	690		630	31800	660	850	370	310	290
Antimony (T)				280		70		90	90			
Nickel (T)				70		50		490	500			

Sample ++:	004-upstm	004	004-dnstm	005-upstm	005-permit	Trns Blk	PE sample	Upstm	Diffuser	Dwnstm	Cent Cake	Sludge
Date:	2/27	2/27	2/27	2/27	2/27	2/26		2/23	2/23	2/23	2/26-28	2/28
Time:	1515	1530	1500	1620	1640	1430		1515-1545	1245-1340	1355-1415		
Type:	Grab	Grab	Grab	Grab	Grab	Grab		Grab	Grab	Grab	Composite	Grab
Lab Log #:	098246	098247&54	098248	098249&56	098250&58	098251	098260	088022	088020	088021	098280	098283

	(ug/L)	(mg/Kg **)										
Antimony (TR)	10 U	2.5 U	2.4 U	2.4 U	1.4 J	0.2 U						
Arsenic (TR)	100 U	0.86	1.1	0.71	325	16						
Beryllium (TR)	10 U	0.98	0.56 U	0.71	3.4	2.0						
Cadmium (TR)	10 U	0.49	0.24 U	0.24 U	11 J	4.2						
Chromium (TR)	50 U	23	13	16	95	1.6 J						
Copper (TR)	10	30	10 U	10 U	50 U	50 U	50 U	24	14	19	176	47
Lead (TR)	100 U	100 U	100 U	100	100	100	100	1.2	5.7	1.1	80 J	38
Mercury (TR)	0.2 U	0.7	0.6	0.9	0.2 U	0.4	0.4	0.031	0.011 U	0.012 U	1.8	0.67
Nickel (TR)	50 U	14	7.4	9.9	495	158						
Selenium (TR)	100 U	0.61 U	0.59 U	0.59 U	36	9.8						
Silver (TR)	100 U	2.5	2.4	2.4	0.3 U	0.09 U						
Thallium (TR)	100 U	1.2	0.71	1.1	1.6 UN	0.45 UN						
Zinc (TR)	50 U	57	28	39	553	15						
Aluminum (T)	580	1530	690	400	240	230	441	5800	6500	6500	70000	15430
Antimony (T)						10 U	230					
Nickel (T)						50 U	417					

U indicates compound was analyzed for but not detected at the given detection limit
 J estimated value less than the specified detection limit
 N spiked sample recovery not within control limits
 ** total metal – dry weight basis
 T total metal for liquid samples
 TR total recoverable metal for liquid samples
 ++ station – sampler. Ecology sample when not specified.

Table 12 – Effluent Bioassay Results – Reynolds, February 1990.

NOTE: all tests were run on 002A effluent – lab log #098236

Daphnia magna – 7 day survival and reproduction test
(*Daphnia magna*)

Sample	# Tested	Percent Survival	Mean # Young per Original Female
Control	10	100	22.1
6.25 % Effluent	10	100	29.1
12.5 % Effluent	10	100	27.5
25 % Effluent	10	100	29.1
50 % Effluent	10	10	23.3
100 % Effluent	10	0	9.9

Acute
LC50 = 26 % effluent
NOEC = 25 % effluent
LOEC = 50 % effluent

Chronic
NOEC = 25 % effluent

Fathead Minnow – 7 day survival and growth test
(*Pimephales promelas*)

Sample	# Tested *	Percent Survival	Mean Weight per Fish (mg)
Control	60	95.0	0.475
6.25 % Effluent	60	91.7	0.471
12.5 % Effluent	60	86.7	0.428
25 % Effluent	60	85.0	0.304
50 % Effluent	60	61.7	--
100 % Effluent	60	21.7	--

Acute
NOEC = 25 % effluent
LOEC = 50 % effluent
LC50 = 58.8 % effluent

Chronic
NOEC = 12.5 % effluent
LOEC = 25 % effluent

* four replicates of 15 organisms

Rainbow Trout – 96 hour survival test
(*Oncorhynchus mykiss*)

Sample	# Tested	Percent Survival
Control	10	100
65% Effluent	30	100
100% Effluent	30	100

Microtox

	EC50 (% effluent)	Ranking *
15 minutes	38	moderate

* priority ranking for further toxicity evaluation based on the EC50 (EPA, 1980)

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

Table 13 – Sediment Bioassay Results – Reynolds, February 1990.

<u>Sample</u>	<u>Lab Log #</u>	<u><i>Hyalella azteca</i></u>		<u>Microtox</u>
		<u># Tested</u>	<u>Percent Survival</u>	<u>EC50</u>
Control		75	96	
Upstrm	088022	75	96	NSR
Diffuser	088020	75	100	NSR
Dwnstrm	088021	75	99	NSR

NSR data not suitable for reduction indicating low toxicity
 EC50 effect concentration for 50% of the organisms

APPENDIX A

WASHINGTON STATE DEPARTMENT OF ECOLOGY
ENVIRONMENTAL INVESTIGATIONS & LABORATORY SERVICES
Quality Assurance Section

April 3, 1990

TO: Marc Hefner
FROM: Stewart Lombard *SLM*
Lee Fearon *LEF*
SUBJECT: Laboratory Evaluation, Reynolds Metals Co., 3/16/1990

Here are our comments and recommendations for the Reynolds lab:

The following Reynolds staff participated in the lab evaluation:

Hal Hayes	Lab Manager
Stan Caswell	Environmental Chemist
Mike Burnside	Chemist
Jack Malone	Chemist (Low Fluorine Lab)
Nick Peyton	Chemist (Cyanide Distillations)
Tom Dickey	Technical Supervisor

BOD

A grab sample for BOD from the sanitary STP (Outfall 01) is collected and analyzed weekly. Duplicate analyses are run at 3 dilutions (aliquots of 60 mL, 120 mL, and 180 mL are diluted to 300 mL in the BOD bottles) along with a blank. Results are in the 5-15 mg/L range. Seed is collected from the settling pond and allowed to age for 24 hours. Samples are incubated in an under-counter cabinet and no temperature check is made. The HVAC system maintains the lab temperature at 72 ± 2 °F (22.2 ± 1.1 °C). This deviation from the required 20 ± 1 °C would produce consistently high BOD results. Dissolved oxygen is determined using the membrane electrode technique. No standards are analyzed with the samples. Quality Control (QC) consists of running the weekly sample in duplicate. Each set consists of two sub sets of three sample aliquot dilutions plus the dilution water/seed blank (Mike Burnside)

It is recommended that the procedure in Standard Methods, 17th edition, Method 5210 B be followed by running a glucose/glutamic acid standard with each set of samples and incubating the samples at 20 °C. The standard sub-set should consist of three dilutions. It is also recommended that the phosphate buffer solution be stored under refrigeration.

TSS

A grab sample from the sanitary STP (Outfall 01) is collected and analyzed weekly. A 24-hour composite sample from Outfall 02A is collected and analyzed daily. QC consists of analyzing all samples in duplicate (Mike Burnside)

It is recommended that a standard control suspension, such as those available from EPA, ERA, or APG, be run on a weekly basis on the same day that both Outfall samples are run.

Total Chlorine Residual

A grab sample from the sanitary STP (Outfall 01) is collected and analyzed daily. QC consists of running this sample in duplicate on a daily basis (Mike Burnside). It is recommended that a freshly prepared chlorine check standard in the range of 1 to 3 mg/L be run along with the normal set in accordance with Method 4500-Cl(G) of Standard Methods, 17th edition.

Fecal Coliform

A grab sample from the sanitary STP (Outfall 01) is collected and analyzed monthly. The 100 mL sample is filtered and the filter is put into a plastic bag and incubated in a water bath inside an oven. A thermometer graduated in 0.1 °C increments is immersed in the water bath and checked each working day. Colonies are counted visually. Typical results are 0-12 ± 3 colonies per filter. No duplicate analyses are performed. (Mike Burnside)

The 0.45 μm membranes used for the fecal coliform test are currently acceptable. However, when new membranes are ordered, it is recommended that the laboratory obtain a type developed for testing chlorinated effluents. The Millipore Corporation type HC (or equivalent) helps prevent heat damage to chlorine-injured organisms during the critical first few hours of the fecal coliform test. Because these filters have a larger pore size, they are also less subject to clogging.

The large deviation in results at the low colony count level of the chlorinated effluent makes it impossible to implement any quality assurance measures.

pH

Grab samples from Outfalls 03, 04 and 05 are collected and analyzed monthly.

Cyanide

A 24-hour composite sample from the industrial WTP (Outfall 02B) is collected and analyzed for total cyanide daily. Grab samples from Outfalls 03, 04 and 05 are collected and analyzed monthly for "free cyanide". Distillation is performed under vacuum. The procedure for maintaining the flow rate of the cyanide is not very precise. (Nick Peyton)

Cyanide is determined by specific ion electrode. The meter is calibrated with two standards. Quantitation is based on the results of a check standard which is distilled along with the samples. Duplicate analyses are performed occasionally. The same material is used to prepare the calibration and check standards. (Mike Burnside)

It is recommended that the daily cyanide sample be run in duplicate along with a check standard (prepared from a source different from the calibration standards) or spiked sample. Both the check standard and the spike should be run together at least once a week.

Fluoride

A 24-hour composite sample from Outfall 02 is collected and analyzed daily. Grab samples from Outfalls 03, 04 and 05 are collected and analyzed monthly. Fluoride is determined by specific ion electrode directly on the sample (no distillation is used). (Jack Malone)

According to Method 4500-F⁻(C), Standard Methods, 17th edition, the distillation step should be performed if there is a possibility of aluminum concentration levels greater than 3 mg/L. It is recommended that the distillation step be performed at the Reynolds lab.

Oil and Grease

A grab sample from Outfall 02 is collected and analyzed daily. The acidified contents (1 liter) of the sample bottle are extracted three times with 30 mL portions of freon in a 2-liter separatory funnel and extracted with freon. The first 30 mL freon portion is used to wash residual oil and grease from the sample bottle before extraction. The freon is passed through a filter paper into a tared beaker and evaporated with warm air. The beaker is weighed on a Mettler electronic balance with a sensitivity of 0.1 mg. No measures are taken to insure that no water is present in the freon.

According to Method 5520 B, Standard Methods, 17th edition, anhydrous sodium sulfate should be used if it is suspected that a stable emulsion may be formed, if there is not a clear separation of water and freon, or if there is an obvious presence of water bubbles in the freon layer. The anhydrous sodium sulfate is poured into the filter paper and the freon is slowly drained from the separatory funnel. It is recommended that anhydrous sodium sulfate be used at the Reynolds lab.

Metals and Benzo (a) pyrene

24-hour composite samples from Outfall 02A and from the industrial WTP (Outfall 02B) are collected and sent to Columbia Analytical Services, Longview, WA weekly for analysis for aluminum, antimony, nickel and benzo(a)pyrene.

We informed Hal and Stan that our proposed WAC 173-220, if adopted as planned later this year, would require the Reynolds laboratory to be accredited by July 1, 1992 but that they could request accreditation at any time. We referred Hal to Perry Brake of our office for further questions and assistance with accreditation.

Marc Hefner

Page 4

We discussed the use of Method 4500-CN(I) from Standard Methods, 17th Edition, for the analysis of "weak and dissociable" cyanide in the effluent from the industrial WTP (Outfall 02B) with Hal and Stan. The treatment process includes the use of ferrous iron to complex the cyanide in the waste stream. The ferrocyanide complex would tie up most of the cyanide. However, the formation of the complex is an equilibrium process, so temperature, pH, concentrations of ferrous iron and cyanide, competing equilibria and retention time in the treatment plant will affect the final concentration of "weak and dissociable" cyanide.

Sample preservation with NaOH to pH 12 would not be suitable for samples of the WTP effluent if the goal of the test is to exclude cyanide complexed as ferrous-cyanide since the complex would be destroyed under these conditions. Unfortunately, Standard Methods, 17th Edition, does not address this situation. We recommend sample storage in a closed dark brown bottle away from sunlight and preservation with a sodium acetate pH 8.5 buffer solution

We have attached a copy of a generic QA Manual for a small WTP lab. We suggest that you forward a copy of the manual to Hal to help him understand the purpose and use of the additional QC data that we have recommended.

If you have any questions please call us.

Attachments

APPENDIX B

Appendix B – VOA, BNA, and Pest/PCB Scan Results – Reynolds, February 1990.

Sample ++:	002A	002A	002B	002B	Trns Bik	Upstrm	Diffuser	Dwnstrm	Cent Cake	Sludge
Date:	2/27	2/27	2/27	2/27	2/26	2/23	2/23	2/23	2/26-28	2/28
Time:	0955	1755	1025	1810	1430	1515-1545	1245-1340	1355-1415		
Type:	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Comp	Grab
Lab Log #:	098234	098235	098239	098240	098251	088022	088020	088021	098280	098283
% Solids						78.2	76.4	76.6	16.1	55.2
% TOC (dry wt basis)						0.07	0.05	0.15	10.5	3.1
Grain size (%)						<2	<2	<2	<1	<1
Gravel - +10 mesh						96	96	98	5	<1
Sand - +230 mesh						4	3	1	44	69
Silt - 5 - 8 phi						<1	1	1	51	31
Clay - 9 - 12 phi										
VOA Compounds	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/Kg **)	(ug/Kg **)	(ug/Kg **)		
2-Chloroethylvinylether										
Chloromethane	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Bromomethane	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Vinyl Chloride	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Chloroethane	3 U	3 U	6 U	15 U	3 U	6 U	6 U	5 U		
Methylene Chloride	1 U	1 U	2 U	5 U	1	12 B	14 B	12 B		
Acetone	2 J	5 U	100	17 J	5	31	24	27		
Carbon Disulfide	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
1,1-Dichloroethene	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
1,1-Dichloroethane	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
1,2-Dichloroethene (total)	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Chloroform	1	2	2 U	5 U	1 U	2 U	2 U	2 U		
1,2-Dichloroethane	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
2-Butanone	3 U	3 U	6 U	15 U	3 U	6 U	6 U	5 U		
1,1,1-Trichloroethane	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Carbon Tetrachloride	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Vinyl Acetate	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Bromodichloromethane	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
1,2-Dichloropropane	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
cis-1,3-Dichloropropene	3 U	3 U	6 U	15 U	3 U	6 U	6 U	5 U		
Trichloroethene	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Dibromochloromethane	3 U	3 U	6 U	15 U	3 U	6 U	6 U	5 U		
1,1,2-Trichloroethane	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Benzene	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
trans-1,3-Dichloropropene	3 U	3 U	6 U	15 U	3 U	6 U	6 U	5 U		
Bromoform	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
4-Methyl-2-Pentanone	3 U	3 U	6 U	15 U	3 U	6 U	6 U	5 U		
2-Hexanone	3 U	3 U	6 U	15 U	3 U	6 U	6 U	5 U		
Tetrachloroethene	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
1,1,2,2-Tetrachloroethane	3 U	3 U	6 U	15 U	3 U	6 U	6 U	5 U		
Toluene	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Chlorobenzene	3 U	3 U	6 U	15 U	3 U	6 U	6 U	5 U		
Ethylbenzene	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Styrene	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		
Total Xylenes	1 U	1 U	2 U	5 U	1 U	2 U	2 U	2 U		

U indicates a compound was analyzed for but not detected at the given detection limit
 J estimated value less than the detection limit
 B detected in the method blank also
 X Benzo(b+k)Fluoranthene

D result from analysis of a diluted sample
 UJ indicates a compound was analyzed for but not detected at the estimated detection limit
 ** dry-wt basis
 ++ station - sampler. Ecology sample when not specified.

Appendix B – Cont'd – Reynolds, February 1990.

Sample ++:	002A-E	002B-E	Trns Blk	Upstrm	Diffuser	Dwnstrm	Cent Cake	Sludge
Date:	2/27-28	2/27-28	2/26	2/23	2/23	2/23	2/26-28	2/28
Time:	0700-0700	0700-0700	1430	1515-1545	1245-1340	1355-1415		
Type:	Composite	Composite	Grab	Grab	Grab	Grab	Comp	Grab
Lab Log #:	098236	098241	098251	088022	088020	088021	098280	098283
BNA Compounds	(ug/L)	(ug/L)	(ug/L)	(ug/Kg **)				
Aniline								
1,2-Diphenylhydrazine								
Phenol	2 U	4 U	2 U	43 U	46 U	43 U	13000 U	3700 U
Bis(2-Chloroethyl)Ether	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
2-Chlorophenol	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
1,3-Dichlorobenzene	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
1,4-Dichlorobenzene	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
Benzyl Alcohol	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
1,2-Dichlorobenzene	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
2-Methylphenol	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
Bis(2-chloroisopropyl)ether	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
4-Methylphenol	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
N-Nitroso-Di-n-Propylamine	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
Hexachloroethane	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
Nitrobenzene	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
Isophorone	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
2-Nitrophenol	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
2,4-Dimethylphenol	2 U	2 J	2 U	43 U	46 U	43 U	12000 U	3700 U
Benzoic Acid	50 U	100 U	50 U	1100 U	1200 U	1100 U	310000 U	93000 U
Bis(2-Chloroethoxy)Methane	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
2,4-Dichlorophenol	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
1,2,4-Trichlorobenzene	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
Naphthalene	4 U	3 J	4 U	86 U	92 U	85 U	25000 U	7400 U
4-Chloroaniline	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
Hexachlorobutadiene	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
4-Chloro-3-Methylphenol	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
2-Methylnaphthalene	2 U	2 J	2 U	43 U	46 U	43 U	12000 U	3700 U
Hexachlorocyclopentadiene	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
2,4,6-Trichlorophenol	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
2,4,5-Trichlorophenol	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
2-Chloronaphthalene	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
2-Nitroaniline	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
Dimethyl Phthalate	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
Acenaphthylene	2 U	4 J	2 U	43 U	46 U	43 U	12000 U	3700 U
2,6-Dinitrotoluene	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
3-Nitroaniline	10 U	20 U	10 U	210 U	230 U	210 U	61000 U	19000 U
Acenaphthene	2 U	20 U	2 U	43 U	46 U	43 U	6600 J	9300 U
2,4-Dinitrophenol	20 U	40 U	20 U	430 U	460 U	430 U	120000 U	37000 U
4-Nitrophenol	20 U	40 U	20 U	430 U	460 U	430 U	120000 U	37000 U
Dibenzofuran	2 U	1 J	2 U	43 U	46 U	43 U	12000 U	3700 U
2,4-Dinitrotoluene	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
Diethyl Phthalate	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
4-Chlorophenyl-Phenylether	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
Fluorene	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
4-Nitroaniline	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
4,6-Dinitro-2-Methylphenol	20 U	40 U	20 U	430 U	460 U	430 U	120000 U	37000 U
N-Nitrosodiphenylamine	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
4-Bromophenyl-Phenylether	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U

Appendix B – Cont'd – Reynolds, February 1990.

Sample ++:	002A-E	002B-E	Trns Blk	Upstrm	Diffuser	Dwnstrm	Cent Cake	Sludge
Date:	2/27-28	2/27-28	2/26	2/23	2/23	2/23	2/26-28	2/28
Time:	0700-0700	0700-0700	1430	1515-1545	1245-1340	1355-1415		
Type:	Composite	Composite	Grab	Grab	Grab	Grab	Comp	Grab
Lab Log #:	098236	098241	098251	088022	088020	088021	098280	098283
	(ug/L)	(ug/L)	(ug/L)	(ug/Kg **)				
BNA Compounds								
Benzidine								
Hexachlorobenzene	4 U	8 U	4 U	86 U	92 U	85 U	25000 U	7400 U
Pentachlorophenol	20 U	40 U	20 U	430 U	460 U	430 U	120000 U	37000 U
Phenanthrene	1 J	16	2 U	43 U	46 U	43 U	130000	17000
Anthracene	2 U	6	2 U	43 U	46 U	43 U	47000	8500
Di-n-Butyl Phthalate	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
Fluoranthene	22	320	2 U	43 U	46 U	39 J	1900000	520000
Pyrene	21	380	2 U	43 U	46 U	37 J	2300000 D	570000
Butylbenzylphthalate	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
3,3'-Dichlorobenzidine	20 U	40 U	20 U	430 U	460 U	430 U	120000 U	37000 U
Benzo(a)Anthracene	6	75	2 U	43 U	46 U	43 U	1100000	240000
Chrysene	10	61	2 U	43 U	46 U	43 U	1700000	390000
Bis(2-Ethylhexyl)phthalate	53	55	33	520	210 B	750	12000 U	3700 U
Di-n-Octyl Phthalate	2 U	4 U	2 U	43 U	46 U	43 U	12000 U	3700 U
Benzo(b)Fluoranthene	11 X	150 X	4 U	86 U	92 U	76 JX	1800000 DX	510000 X
Benzo(k)Fluoranthene	11 X	150 X	4 U	86 U	92 U	76 JX	1800000 DX	510000 X
Benzo(a)Pyrene	3 J	36	4 U	86 U	92 U	42 J	620000	130000
Indeno(1,2,3-cd)Pyrene	1 J	12	4 U	86 U	92 U	85 U	210000	40000
Dibenzo(a,h)Anthracene	4 U	4 J	4 U	86 U	92 U	85 U	88000	17000
Benzo(g,h,i)Perylene	2 J	13	4 U	86 U	92 U	85 U	230000	44000
Pest/PCB Compounds								
alpha-BHC	0.050 U	0.050 U	0.050 U	10 U	11 U	10 U	49 U	15 U
beta-BHC	0.050 U	0.050 U	0.050 U	10 U	11 U	10 U	49 U	15 U
delta-BHC	0.050 U	0.050 U	0.050 U	10 U	11 U	10 U	49 U	15 U
gamma-BHC (Lindane)	0.050 U	0.050 U	0.050 U	10 U	11 U	10 U	49 U	15 U
Heptachlor	0.050 U	0.050 U	0.050 U	10 U	11 U	10 U	490 UD	15 U
Aldrin	0.050 U	0.42	0.050 U	10 U	11 U	10 U	49 U	15 U
Heptachlor Epoxide	0.050 U	0.050 U	0.050 U	10 U	11 U	10 U	49 U	15 U
Endosulfan I	0.050 U	0.050 U	0.050 U	10 U	11 U	10 U	49 U	15 U
Dieldrin	0.10 U	0.10 U	0.10 U	21 U	22 U	20 U	98 U	30 U
4,4'-DDE	0.10 U	0.10 U	0.10 U	21 U	22 U	20 U	98 U	30 U
Endrin	0.10 U	0.10 U	0.10 U	21 U	22 U	20 U	98 U	30 U
Endosulfan II	0.10 U	0.10 U	0.10 U	21 U	22 U	20 U	98 U	30 U
4,4'-DDD	0.10 U	0.10 U	0.10 U	21 U	22 U	20 U	98 U	30 U
Endosulfan Sulfate	0.10 U	0.10 U	0.10 U	21 U	22 U	20 U	98 U	30 U
4,4'-DDT	0.10 U	0.10 U	0.10 U	21 U	22 U	20 U	98 U	30 U
Methoxychlor	0.50 U	0.50 U	0.50 U	100 U	110 U	100 U	490 U	150 U
Endrin Ketone	0.10 U	0.10 U	0.10 U	21 U	22 U	20 U	98 U	30 U
alpha-Chlordane	0.50 U	0.50 U	0.50 U	100 U	110 U	100 U	490 U	150 U
gamma-Chlordane	0.50 U	0.50 U	0.50 U	100 U	110 U	100 U	490 U	150 U
Toxaphene	1.0 U	1.0 U	1.0 U	210 U	220 U	200 U	980 U	300 U
Aroclor-1016	0.50 U	0.50 U	0.50 U	100 U	110 U	100 U	490 U	150 U
Aroclor-1221	0.50 U	0.50 U	0.50 U	100 U	110 U	100 U	490 U	150 U
Aroclor-1232	0.50 U	0.50 U	0.50 U	100 U	110 U	100 U	490 U	150 U
Aroclor-1242	0.50 U	0.50 U	0.50 U	100 U	110 U	100 U	490 U	150 U
Aroclor-1248	0.50 U	0.50 U	0.50 U	100 U	110 U	100 U	490 U	150 U
Aroclor-1254	1.0 U	1.0 U	1.0 U	210 U	220 U	200 U	980 U	300 U
Aroclor-1260	1.0 U	1.0 U	1.0 U	210 U	220 U	200 U	980 U	300 U
Endrin Aldehyde								

APPENDIX C

1F *Sample - 002A-E*
 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
 TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

Lab Name: Laucks Testing Labs Contract: *Lab Log #:* 098236

Lab Code: LAUCKS Case No.: 03051 SAS No.: _____ SDG No.: _____

Matrix: (soil/water)WATER Lab Sample ID: 03051-6

Sample wt/vol: 1000. (g/ml)ML Lab File ID: >LC143::D1

Level: (low/med) LOW Date Received: 03/02/90

% Moisture: not dec. ___ dec. ___ Date Extracted: 03/05/90

Extraction: (SapF/Cont/Sonc) SEPF Date Analyzed: 03/13/90

GFC Cleanup: (Y/N)N pH: 0.0 Dilution Factor: 1.0

CONCENTRATION UNITS:
(ug/L or ug/Kg)UG/L

Number TICs found: 2

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	15.74	9	JN
2. 56803373	PHOSPHORIC ACID, (1,1-DIMETH	36.64	13	JN
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N - good indication identification is correct

IF *Sample - 002 B-2*
 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
 TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

Lab Name: Laucks Testing Labs Contract: *Lab Log#* 098241
 Lab Code: LAUCKS Case No.: 03051 SAS No.: _____ SDG No.: _____
 Matrix: (soil/water) WATER Lab Sample ID: 03051-7
 Sample wt/vol: 1000. (g/ml) ML Lab File ID: >LC148::SS
 Level: (low/med) LOW Date Received: 03/02/90
 % Moisture: not dec. ___ dec. ___ Date Extracted: 03/05/90
 Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/14/90
 GPC Cleanup: (Y/N) N pH: 0.0 Dilution Factor: 2.0

CONCENTRATION UNITS:
 (ug/L or ug/Kg) UG/L

Number TICs found: 20

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.112403	DODECANE	15.92	150	J N
2.629505	TRIDECANE	17.84	280	J
3.74645980	DODECANE, 2,7,10-TRIMETHYL-	19.21	160	J
4.629594	TETRADECANE	19.62	490	J
5.13151741	DECANE 3-CYCLOHEXYL-, 3-CYCL	20.44	140	J
6.629925	NONADECANE	20.69	230	J
7.629505	TRIDECANE	21.32	600	J
8.629969	1-EICOSANOL	22.14	180	J
9.	UNKNOWN	22.35	130	J
10.629970	DODECANE	22.90	640	J
11.75163972	OCTADECANE, 2,6-DIMETHYL-	23.62	330	J
12.4443601	CYCLOHEXANE, (1-HEXYLTETRADE	23.74	200	J
13.629787	HEPTADECANE	24.40	910	J
14.61141728	DODECANE, 4,6-DIEMTHYL-	24.48	440	J
15.630079	PENTATRIACONTANE	25.94	210	J
16.74685306	5-EICOSANE, (E)-	26.90	270	J
17.629925	NONADECANE	27.15	500	J
18.630024	OCTACOSANE	28.44	250	J
19.74685339	3-EICOSENE, (E)-	29.51	540	J
20.	UNKNOWN	35.92	190	J
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N-good indication identification is correct

1F *Sample-Solids Method Blank* SAMPLE NO.
 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
 TENTATIVELY IDENTIFIED COMPOUNDS

SELKL1

Lab Name: Laucks Testing Labs Contract: _____

Lab Code: LAUCKS Case No.: 02340 SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: B0302MSVSLO

Sample wt/vol: 30.0 (g/ml) G Lab File ID: >LC136::D1

Level: (low/med) LOW Date Received: 02/26/90

% Moisture: not dec. 0 dec. __ Date Extracted: 03/02/90

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 03/13/90

GFC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.0

CONCENTRATION UNITS:
 (ug/L or ug/Kg) UG/KG

Number TICs found: 4

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN ALDOL CONDENSATION	7.42	580	JAW
2.	UNKNOWN ALDOL CONDENSATION	8.15	5400	JA
3.	UNKNOWN ALDOL CONDENSATION	9.62	550	JA
4. 646139	OCTADECANOIC ACID, 2-METHYLP	33.01	380	J ✓
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N - good indication identification is correct

IF *Sample - Upstream*
 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
 TENTATIVELY IDENTIFIED COMPOUNDS

DoE
 EPA SAMPLE NO.

Lab Name: Laucks Testing Labs

Contract: *Lab Log #* ;

088022

Lab Code: LAUCKS Case No.: 02340

SAS No.: _____

SDG No.: _____

Matrix: (soil/water)SOIL

Lab Sample ID: 02340-3E

Sample wt/vol: 30.0 (g/ml)G

Lab File ID: >LC139::D1

Level: (low/med) LOW

Date Received: 02/26/90

% Moisture: not dec.22 dec. __

Date Extracted: 03/02/90

Extraction: (SepF/Cont/Sonc) SONC

Date Analyzed: 03/13/90

GPC Cleanup: (Y/N)N

pH: 6.9

Dilution Factor: 1.0

CONCENTRATION UNITS:
 (ug/L or ug/Kg)UG/KG

Number TICs found: 9

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN ALDOL CONDENSATION	17.42	5601JA	N
2.	UNKNOWN ALDOL CONDENSATION	18.13	61001JA	N
3.	UNKNOWN ALDOL CONDENSATION	19.65	5801JA	N
4.	UNKNOWN ALDOL CONDENSATION	10.04	4001JA	
5. 4436753	1,3-HEXENE-2,5-DIONE	10.49	6101JA	
6.	UNKNOWN ALDOL CONDENSATION	11.58	3301JA	
7.	UNKNOWN ALDOL CONDENSATION	12.87	3301JA	
8.	UNKNOWN	13.00	8901J	
9. 646139	OCTADECANOIC ACID, 2-METHYL	13.05	8101J	V
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N - Good indication identification is correct

1F Sample - Diffuser
 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
 TENTATIVELY IDENTIFIED COMPOUNDS

Pg: EPA SAMPLE NO.

Lab Name: Laucks Testing Labs Contract: Lab Log #: 088020

Lab Code: LAUCKS Case No.: 02340 SAS No.: SDG No.:

Matrix: (soil/water)SOIL Lab Sample ID: 02340-1B

Sample wt/vol: 30.0 (g/ml)G Lab File ID: >LC137::D1

Level: (low/med) LOW Date Received: 02/26/90

% Moisture: not dec.28 dec. __ Date Extracted: 03/02/90

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 03/13/90

GPC Cleanup: (Y/N)N pH: 6.9 Dilution Factor: 1.0

CONCENTRATION UNITS:
 (ug/L or ug/Kg)UG/KG

Number TICs found: 9

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN ALDOL CONDENSATION	17.39	710	JA N ✓
2.	UNKNOWN ALDOL CONDENSATION	18.14	7300	JA
3.	UNKNOWN ALDOL CONDENSATION	19.63	980	JA
4.	UNKNOWN ALDOL CONDENSATION	19.99	230	JA
5. 4436753	3-HEXENE-2,5-DIONE	10.44	520	JA
6.	UNKNOWN ALDOL CONDENSATION	11.56	400	JA
7. 116096	2-PROPANONE, 1-HYDROXY-	12.82	310	JA
8.	UNKNOWN	29.95	850	J
9. 646139	DECADECANOIC ACID, 2-METHYL-	33.00	540	J V
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N - good indication identification is correct

IF *Sample - Downstream*
 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
 TENTATIVELY IDENTIFIED COMPOUNDS

Bech
 EPA SAMPLE NO.

Lab Name: Laucks Testing Labs Contract: *Lab Log #* : 088021

Lab Code: LAUCKS Case No.: 02340 SAS No.: _____ SDG No.: _____

Matrix: (soil/water)SDIL Lab Sample ID: 02340-2B

Sample wt/vol: 30.0 (g/ml)G Lab File ID: >LD138::D1

Level: (low/med) LOW Date Received: 02/26/90

% Moisture: not dec.22 dec. __ Date Extracted: 03/02/90

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 03/13/90

GPC Cleanup: (Y/N)N pH: 6.9 Dilution Factor: 1.0

CONCENTRATION UNITS:
 (ug/L or ug/Kg)UG/KG

Number TICs found: 9

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	C
1.	UNKNOWN ALDOL CONDENSATION	17.39	5701JA	<i>sk</i>
2.	UNKNOWN ALDOL CONDENSATION	18.12	6200JA	
3.	UNKNOWN ALDOL CONDENSATION	19.63	7601JA	
4.	UNKNOWN ALDOL CONDENSATION	19.99	4201JA	
5. 4436753	13-HEXENE-2,5-DIONE	10.44	4401JA	
6. 108225	11-PROPEN-2-OL, ACETATE	11.54	3101JA	
7.	UNKNOWN ALDOL CONDENSATION	12.82	2701JA	
8.	UNKNOWN	29.96	8001J	
9. 646139	OCTADECANOIC ACID, 2 METHYL	33.01	5801J	
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N - good indication identification is correct