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ALDERWOOD WASTEWATER TREATMENT PLANT
OCTOBER 26-27, 1992

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by
Paul Stasch

Washington State Department of Ecology
Environmental Investigations and Laboratory Services Program
Toxics, Compliance and Ground Water Investigations Section
Olympia, WA 98504-7710

Waterbody No. WA-PS-0240

July 1993

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ACKNOWLEDGEMENTS

I would like to thank Marc Heffner and Bernie Strong for their assistance on the aborted sediment collection voyage. I would like to thank Casey Clishe and Bernie Strong for their assistance on the successful expedition. I would also like to thank Dave Wright for providing much appreciated regional assistance.

ABSTRACT

A Class II Inspection was conducted at the Alderwood Water District's wastewater treatment plant on October 26 and 27, 1992. Level of treatment and wastewater flow rates were acceptable during the inspection. The plant's discharge was well within the NPDES permit effluent limits. However, influent BOD_5 loading exceeded the plant's design capacity and influent TSS was at the design capacity. Planned hookups within the Alderwood Water District service area to the Metro North Creek trunk line, will reduce influent loadings to the treatment plant. Bioassays indicated only limited toxicity of the chlorinated effluent to some test organisms. Sediment bioassays demonstrated no toxic effects. The Alderwood Laboratory received accreditation as a result of the system audit conducted in conjunction with this inspection.

INTRODUCTION

A Class II Inspection was conducted at the Alderwood Water District's wastewater treatment plant on October 26 and 27, 1992. The inspection was conducted by Marc Heffner and Paul Stasch of the Toxics, Compliance and Ground Water Investigations Section of the Environmental Investigations and Laboratory Services Program (EILS) of the Washington State Department of Ecology (Ecology). Leroy Wheaton, the treatment plant operator, represented the Alderwood Water District and provided assistance onsite. Dave Wright of the Ecology Northwest Regional Office requested the inspection and was present during portions of the inspection. Dale Van Donsel and Perry Brake of the EILS Quality Assurance Section conducted a system audit of the Alderwood laboratory on October 27, 1992.

The Alderwood Water District operates two contact stabilization package plants in parallel. One of the units has a two million gallons per day capacity (2MGD) and the other has a one million gallons per day capacity (1MGD). The plant discharges chlorinated effluent directly into Puget Sound off of Picnic Point in Snohomish County (Figure 1). The flow schematic is depicted on Figure 2. Ecology issued an NPDES permit (# WA-002082-6) on June 21, 1988. The current permit expires June 30, 1993. Residential growth in the service area has raised questions about existing plant capacity and treatment capabilities.

Specific objectives of the inspection include:

1. Verification of compliance with existing effluent limitations;

2. Analysis of the treatment plant's loadings and efficiency;

3. Characterize influent and effluent for chemical constituents;

4. Assess toxicity of whole effluent and sediments near outfall; and

5. Evaluate the permittee's self-monitoring programs.

PROCEDURES

Ecology collected grab and composite samples from several locations within the plant. Composite samples were collected from the influent at the plant headworks (downstream from the sludge press filtrate return), from the clarifier overflow trough of both the 1MGD and 2MGD units, and at the overflow weir of the chlorine contact chamber. The Ecology Isco composite samplers were used to collect equal volumes of sample every 30 minutes for 24 hours.

Grab samples were collected at the composite sampling locations, of sludge and filtrate from the sludge press. A grab-composite sample of the effluent was collected for bioassay analyses.

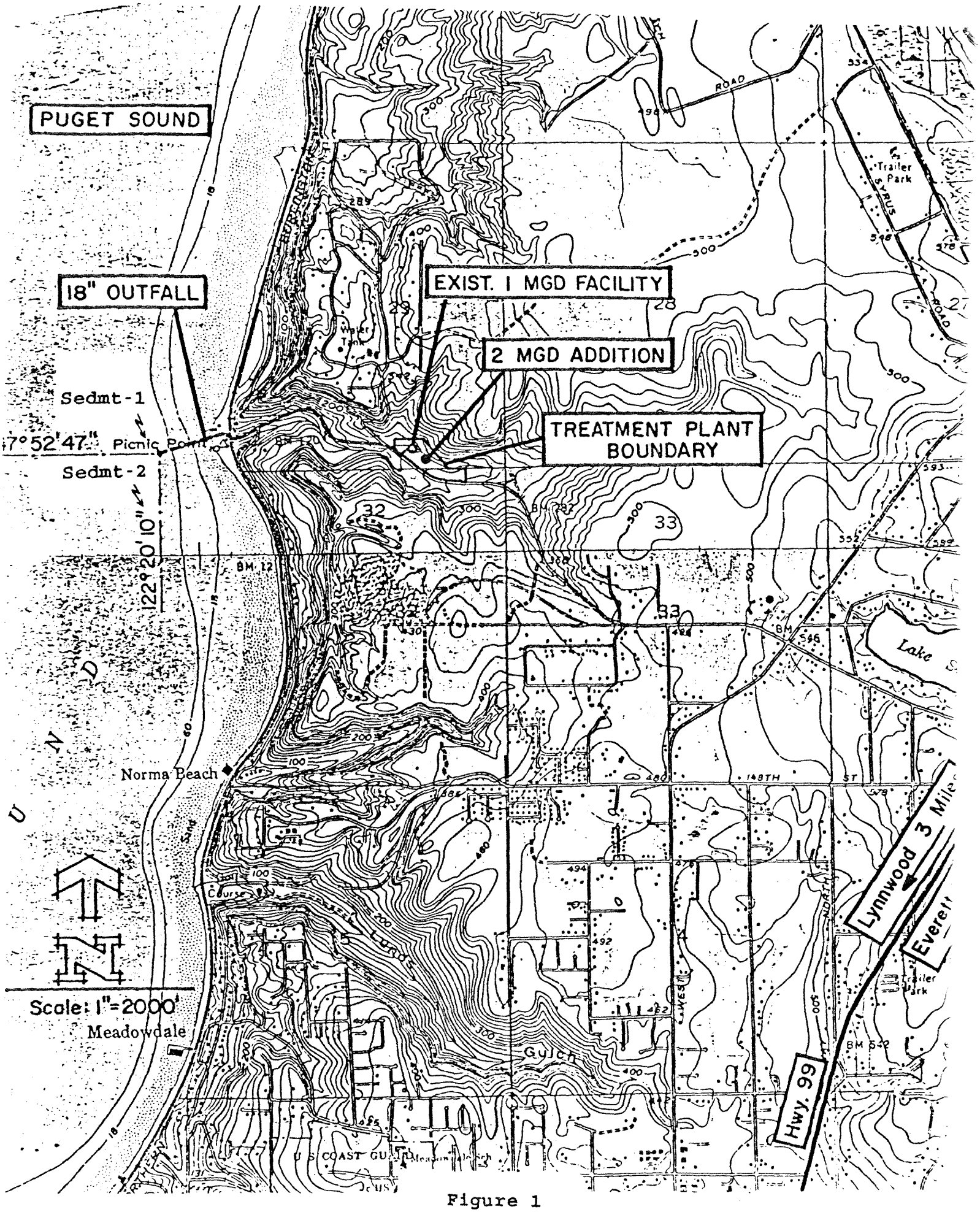

PUGET SOUND
18" OUTFALL
EXIST. 1 MGD FACILITY
2 MGD ADDITION
TREATMENT PLANT BOUNDARY
Sedmt-1
47°52'47"
Picnic Point
Sedmt-2
122°20'10"
Norma Beach
Meadowdale
Scale: 1"=2000'
Lake
Lynnwood 3 Miles
Hwy. 99
148TH ST
GULCH
ROAD
Trailer Park
BM 12
BM 546
BM 542
U S COAST GUARD

Figure 1

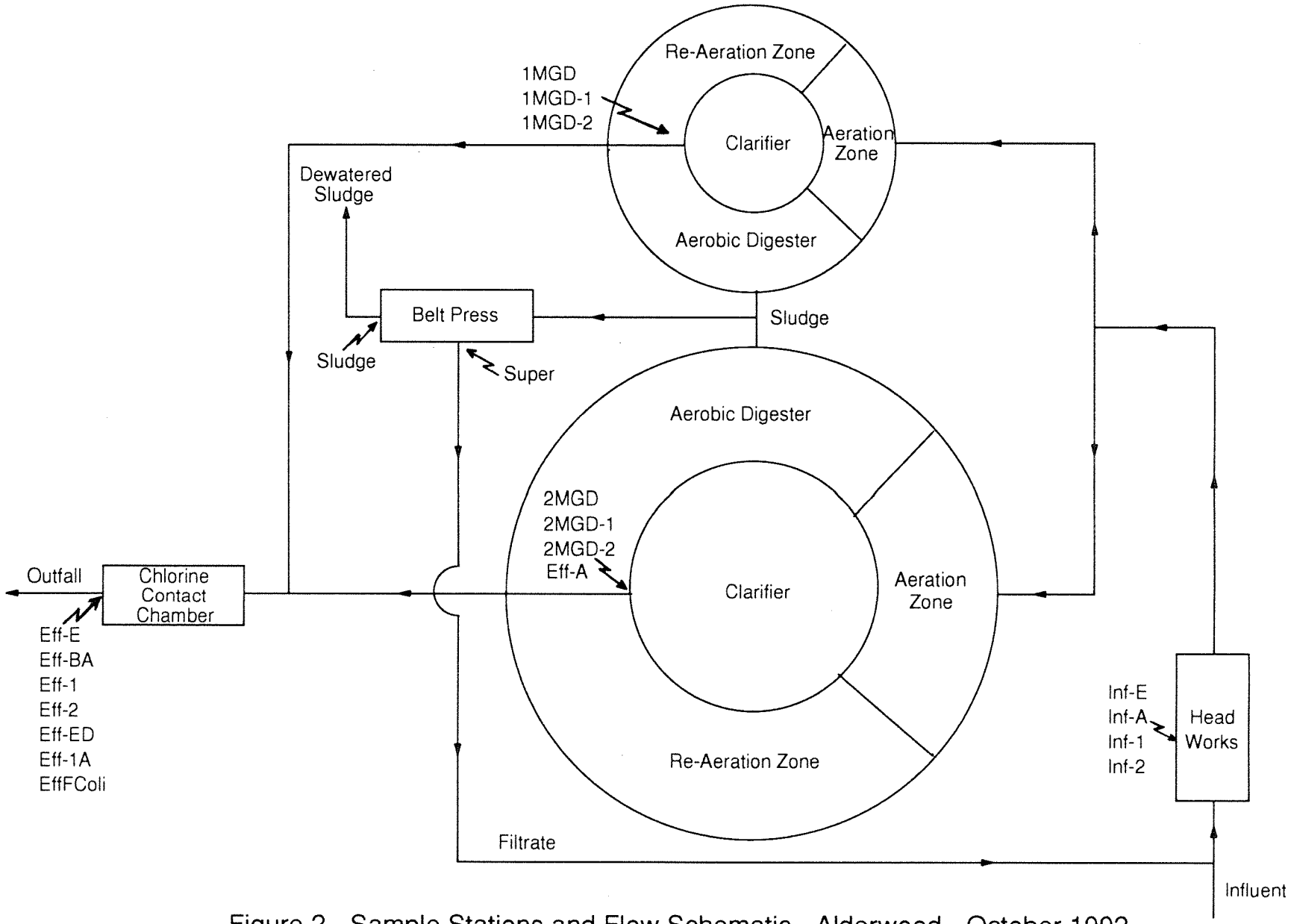


Figure 2 - Sample Stations and Flow Schematic - Alderwood - October 1992

Samples of sediment were collected in approximately 80 feet of water off Picnic Point on November 12, 1992. The samples were collected with a Van Veen grab sampler and composited aboard the sampling vessel. A sediment sample near the outfall and a background sediment sample were collected. The gravelly composition of the sediments near the outfall made collection of the outfall sample difficult, exhausting our available sampling time to such an extent that a second background sample could not be collected.

The location of samples collected are identified on Figures 1 and 2 and described on Table 1. The sampling dates, type of sample and parameters analyzed for are provided in Appendix A. Laboratories conducting the analyses are identified in Appendix A-1.

Alderwood operators also collected influent and effluent composite samples. The Alderwood samplers were programmed to collect an equal volume of sample every 30 minutes for 24 hours. However, the Alderwood effluent sampler malfunctioned and an insufficient volume of sample was collected. The sample identified as Eff-A was taken from the Alderwood compositor sampling the effluent from the 2MGD unit.

Sampling quality assurance/quality control (QA/QC) steps included using cleaning procedures appropriate for collecting priority pollutant samples (Appendix B) for composite samplers and sediment sampling equipment prior to the inspection (Appendix B). Samples were properly iced and delivered to our Manchester Laboratory. Chain-of-custody tracking of all sampling was maintained.

Ecology and Alderwood samples were split for analysis by both the Ecology and Alderwood laboratories to evaluate Alderwood's sampling and analytical procedures. Ecology's Quality Assurance Section conducted a system audit for laboratory accreditation in conjunction with this Class II Inspection. The system audit was conducted on October 27, 1992.

RESULTS AND DISCUSSION

Flow Measurements

The Alderwood influent Parshall flume was inspected and the flume configuration was verified to be acceptable. No instantaneous check of plant influent meter was made. Flow in the six-inch flume to the 1MGD unit and the nine-inch flume to the 2MGD unit were measured. The flow to each unit was measured twice for comparison with Alderwood's flow meter measurements. The Ecology and plant flow meter measurements agreed on all four occasions. Thus, Alderwood's flow meters appear to be recording accurate readings. The 1MGD unit was operated between 0.6-0.8 MGD. The 2MGD unit was operated between 1.2-1.4 MGD. Effluent flows were not measured.

Table 1 - Sample Station Descriptions - Alderwood Water District - October, 1992.

Inf-E

Ecology composite sample collected at the headworks of the plant, immediately downstream from the influent flume and the sludge filtrate return flow .

Inf-1,2

Grab samples collected at the headworks of the plant, immediately downstream of the influent flume and the sludge filtrate return flow.

Inf-A

Alderwood composite sample collected at the headworks of the plant, immediately downstream of the influent flume and the sludge filtrate return flow.

2MGD

Ecology composite sample collected from the clarifier overflow of the 2MGD package plant.

1MGD

Ecology composite sample collected from the clarifier overflow of the 1MGD package plant.

2MGD-1,2

Grab samples taken from the clarifier overflow of the 2MGD package plant.

1MGD-1,2

Grab samples taken from the clarifier overflow of the 1MGD package plant.

Eff-E

Ecology composite sample collected at the overflow weir of the chlorine contact chamber.

Eff-BA

Grab-composite sample collected at the overflow weir of the chlorine contact chamber.

Eff-1A,2

Grab samples collected at the overflow weir of the chlorine contact chamber.

Eff-A

Alderwood composite sample collected out of the 2MGD package plant overflow.

Eff-ED

Duplicate sample split from the Eff-E sample.

Table 1 - Sample Station Descriptions (cont.) - Alderwood Water District - October, 1992.

Sludge

Grab sample of sludge collected at the filter press.

Super

Grab sample of filtrate collected from the filter press.

Sedmt-1

Grab-composite sample collected within dilution zone off Picnic Point; Latitude 47°52'47", Longitude 122°20'10".

Sedmt-2

Grab-composite sample collected approximately south of the Sedmt-1 sample station for background comparison; Latitude 47°52'40", Longitude 122°20'10".

Quality Assurance/Quality Control

Sampling quality assurance/quality control (QA/QC) steps included priority pollutant cleaning of composite samplers and sediment sampling equipment prior to the inspection (Appendix B) and the submittal of a blind duplicate for laboratory analyses. The composite sample containers were iced to properly cool the samples as they were collected. All samples were iced and delivered to our Manchester Laboratory. Chain-of-custody tracking of all sampling was performed.

All samples submitted to the Manchester Laboratory were received in good condition, with chain-of-custody maintained. All samples were analyzed within the USEPA method holding times specified for each analyses. The results of the blind duplicate submitted for analyses were acceptable. The procedural blanks associated with the samples showed no significant levels of analytes. Laboratory control sample analyses were within the windows established for each parameter. The data provided on the tables is considered reliable and can be used noting the data qualifications included on the tables.

The EILS Quality Assurance Section conducted a System Audit for Laboratory Accreditation of the Alderwood Laboratory immediately following the Class II Inspection. The Alderwood Laboratory is now accredited as a result of this audit. The Alderwood System Audit Report, Certification, and Scope of Accreditation are provided as Appendix C.

General Chemistry

The influent to the Alderwood plant is typical of medium strength domestic wastewater (Table 2). The plant provided good treatment for the oxygen demand substances and suspended solids. Nutrient removal was moderate and some nitrification was occurring. Some oil and grease data were qualified with a J (estimated) because the samples were not acidified within the specified 24-hour period. Total residual chlorine concentrations in the effluent grab samples ranged from 0.5-1.5 mg/L. The maximum free chlorine concentration measured was 0.8 mg/L. Fecal coliform bacteria were controlled by these chlorine levels.

The purpose of collecting composite samples from the 1MGD and 2MGD units was to compare the treatment performance of each unit. The 1 MGD unit appeared to perform slightly better than the 2MGD unit. TSS and BOD_5/COD/TOC concentrations were also slightly lower in the 1MGD unit's effluent. Also, it appears the 1MGD unit is partially nitrifying the wastewater while the 2MGD unit is not. One explanation is that the 2MGD unit has inadequate aeration, resulting in lower DO concentrations in the aeration basin. The operator indicated the district's consulting engineer is investigating the lower DO concentrations he has observed in the 2MGD unit.

NPDES Permit Compliance

Compliance with the effluent limitations of the permit was good (Table 3). Ecology compositor results for BOD_5 and TSS were both lower than the weekly and monthly average concentration

Table 2 - General Chemistry Results - Alderwood Water District - October 1992.

Parameter	Location:	Inf-E	Inf-1	Inf-2	Inf-A	2MGD	Eff-A*	2MGD-1	2MGD-2
	Type:	E-comp	grab	grab	A-comp	E-comp	A-comp	grab	grab
	Date:	10/26-27	10/26	10/27	10/26-27	10/26-27	10/26-27	10/26	10/26
	Lab Log #:	448280	448281	448282	448283	448284	448291	448286	448294
GENERAL CHEMISTRY									
Conductivity (umhos/cm)		545			576	486	488		
Alkalinity (mg/L, CaCO3)		175			178	156	155		
Hardness (mg/L, CaCO3)		43.6			47.4	38.8	37.9		
Total Solids (mg/L)		598			608	251	260		
Total NonVol Solids (mg/L)		211			239	162	170		
Total Suspended Solids (mg/L		282	156	225	310	13	16	7	17
NV-Suspended Solids (mg/L)		1 U			1 U	1	1 U		
% Solids									
% Volatile Solids									
OXYGEN DEMAND									
BOD5 (mg/L)		316			297	30	26		
BOD INH (mg/L)		210			210	19	15		
COD (mg/L)		470			480	78	81		
TOC (water)(mg/L)		102	133	79.1	125	37.2	24.7	30.4	25.5
TOC (% dry weight)									
NUTRIENTS									
NH3-N (mg/L)		22.8			21	17.4	17.2		
NO2+NO3-N (mg/L)		1.35			0.02	0.11	0.02		
Total-P (mg/L)		8.24			9.74	3.41	3.03		
MISCELLANEOUS									
Oil and Grease (water)(mg/L)			206 J	21 J					
F-Coliform MF (#/100 ml)									
Grain Size (%)									
	gravel (+10 mesh)								
	sand (20-230 mesh)								
	silt (4-8 phi)								
	clay (9-10 phi)								
FIELD OBSERVATIONS									
Temperature (C)			18.2	18.2				18.4	18.0
Temp-cooled (C)+		3.3			17.7	2.9	9.9		
pH (SU)		7.7	7.8	7.7	7.7	7.6	7.8	7.6	7.3
Conductivity (umhos/cm)		490	465	345	490	480	420	480	365
Chlorine (mg/L)									
	Free								
	Total								

E-comp Ecology composite sample.
A-comp Alderwood Water District sample.
* Alderwood effluent sampler failed. Sample was collected from Alderwood's 2MGD unit compositor.
\+ Temperature of the sample collected with an iced or refrigerated composite sampler.
U The analyte was not detected at or above the reported result.
J The analyte was positively identified. The associated numerical result is an estimate.

Table 2 - General Chemistry Results (cont.) - Alderwood Water District - October 1992.

Parameter II	Location:	1MGD	1MGD-1	1MGD-2	Eff-E	Eff-ED	Eff-BA	Eff-1	Eff-2
	Type:	E-comp	grab	grab	E-comp	E-comp	g-comp	grab	grab
	Date:	10/26-27	10/26	10/26	10/26-27	10/27	10/26	10/26	10/27
	Lab Log #:	448285	448287	448295	448288	448292	448296	448289	448290
GENERAL CHEMISTRY									
Conductivity (umhos/cm)		412			473				
Alkalinity (mg/L, CaCO3)		97.6			135				
Hardness (mg/L, CaCO3)		40.2			38.1		40.5		
Total Solids (mg/L)		246			322	283		286	
Total NonVol Solids (mg/L)		167			179	157		172	
Total Suspended Solids (mg/L		7	7	4	12	9		27	8
NV-Suspended Solids (mg/L)		1 U			1	1 U		1 U	
% Solids									
% Volatile Solids									
OXYGEN DEMAND									
BOD5 (mg/L)		23			20				
BOD INH (mg/L)		10			15				
COD (mg/L)		47			75				
TOC (water)(mg/L)		17.8	27.4	17.2	23	21.7			22.8
TOC (% dry weight)									
NUTRIENTS									
NH3-N (mg/L)		6.89			14.5	14.4			
NO2+NO3-N (mg/L)		5.47			2.06	2.05			
Total-P (mg/L)		3.94			3.61	3.86			
MISCELLANEOUS									
Oil and Grease (water)(mg/L)								1 J	1 U
F-Coliform MF (#/100 ml)								9	
Grain Size									
	gravel (+10 mesh)								
	sand (20-230 mesh)								
	silt (4-8 phi)								
	clay (9-10 phi)								
FIELD OBSERVATIONS									
Temperature (C)			19.3	19.0				18.1	18.5
Temp-cooled (C)+		3.3			3.0	3.0			
pH (SU)		7.4	7.4	7.1	7.5	7.5		7.3	7.3
Conductivity (umhos/cm)		415	435	385	450	450			435
Chlorine (mg/L)									
	Free							<0.1	0.8
	Total							1.5	0.8

E-comp Ecology composite sample.
g-comp Ecology grab composite of two equal volumes.
+ Temperature of the sample collected with an iced or refrigerated composite sampler.
U The analyte was not detected at or above the reported result.
J The analyte was positively identified. The associated numerical result is an estimate.

Table 2 - General Chemistry Results (cont.) - Alderwood Water District - October 1992.

Parameter III	Location:	Sludge	Eff-1A	Super	EffFColi	Sedmt-1	Sedmt-2
	Type:	grab	grab	grab	grab	grab	grab
	Date:	10/26	10/26	10/26	10/27	11/12	11/12
	Lab Log #:	448293	448300	448301	448302	448297	448298
GENERAL CHEMISTRY							
Conductivity (umhos/cm)							
Alkalinity (mg/L, CaCO3)							
Hardness (mg/L, CaCO3)							
Total Solids (mg/L)							
Total NonVol Solids (mg/L)							
Total Suspended Solids (mg/L)			13	940			
NV-Suspended Solids (mg/L)							
% Solids		12				82.2	79.5
% Volatile Solids		80.9				2.45	1.05
OXYGEN DEMAND							
BOD5 (mg/L)				527			
BOD INH (mg/L)							
COD (mg/L)							
TOC (water)(mg/L)			22.2	360			
TOC (% dry weight)		39.8				0.2	0.13
NUTRIENTS							
NH3-N (mg/L)							
NO2+NO3-N (mg/L)							
Total-P (mg/L)							
MISCELLANEOUS							
Oil and Grease (water)(mg/L)			1 J				
F-Coliform MF (#/100 ml)					18		
Grain Size							
gravel (+10 mesh)						24	0
sand (20-230 mesh)						72	97
silt (4-8 phi)						2	1
clay (9-10 phi)						2	2
FIELD OBSERVATIONS							
Temperature (C)			19.0		17.8		
Temp-cooled (C)+							
pH (SU)			7.5		7.4		
Conductivity (umhos/cm)			460				
Chlorine (mg/L)							
Free			<0.1		0.5		
Total			1.25		0.5		

\+ Temperature of the sample collected with an iced or refrigerated composite sampler.
U The analyte was not detected at or above the reported result.
J The analyte was positively identified. The associated numerical result is an estimate.

Table 3 - NPDES Effluent Limitation/Ecology Inspection Data Comparison - Alderwood Water District - October 1992.

	NPDES Permit Limitations		Location:	Inf-E	Eff-E	Eff-ED	Eff-1	Eff-2	Eff-1A	EffFColi
	Monthly Average	Weekly Average	Type:	E-comp	E-comp	E-comp	grab	grab	grab	grab
			Date:	10/26-27	10/26-27	10/26-27	9/27	9/27	9/26	9/27
			Lab Log #:	448280	448288	448292	448289	448290	448300	448302
5 Day Biological Oxygen Demand	30 mg/L 750 lbs/day 85% removal	45 mg/L 1125 lbs/day		316 mg/L 5,401 lbs/day	20 mg/L 342 lbs/day 93.7% removal					
Suspended Solids	30 mg/L 750 lbs/day 85% removal	45 mg/L 1125 lbs/day		282 mg/L 4,820 lbs/day	12 mg/L 205 lbs/day 95.7% removal	9 mg/L	27 mg/L	8 mg/L	13 mg/L	
Fecal Coliform Bacteria	200/100mL	400/100mL						9/100mL		18/100mL
pH	Shall not be outside the range of 6.0 - 9.0						7.3	7.3	7.5	7.4

limits specified in the permit. Based on the Alderwood influent flow totalizer reading of 2.05 MGD (Wheaton, personal communication), the loading to Puget Sound was 342 pounds of BOD_5 and 205 pounds of TSS per day. Both of these loading rates were less than the weekly and monthly averages specified in the permit.

The influent BOD_5 loading of 5400 lbs/day exceeded the design criteria of 5000 lbs/day specified in the permit. The influent TSS loading of 4820 lbs/day was just under the design criteria of 5000 lbs/day. The treatment plant was exceeding the minimum 85% removal efficiency for BOD_5 and TSS as specified in the permit. However, it should be noted that the filtrate from the sludge belt press is reintroduced to the influent upstream of both the Alderwood and Ecology influent sampling locations. This artificially elevates the influent BOD_5 loading and removal efficiency calculations.

The fecal coliform bacteria counts from the two Ecology grab samples were 9 and 18/100 mL. These are substantially less than the 200/100 mL and 400/100 mL monthly and weekly averages respectively specified in the permit. The total residual chlorine was fairly high (0.5-1.5 mg/L). The operator should see if acceptable coliform concentrations can be achieved with lower total residual chlorine concentrations.

The pH of the discharge was within the permit limitation of within 6.0 - 9.0.

The flow into the plant at the time of the inspection was approximately 2.05 MGD. This is less than the Design Annual Average Daily Flow Rate of 3.0 MGD specified in their permit.

Split Sample Analyses

The comparison of Alderwood and Ecology samples analyzed by the Manchester Laboratory was good. This indicates that the sampling was representative. Note: Alderwood composite samples were not adequately cooled during collection.

A comparison of samples analyzed by the Alderwood and the Manchester Laboratories indicates that the Alderwood BOD_5 and TSS results are consistently reported high relative to the Ecology results. However, it should be noted that the variability seen is within an acceptable range for those parameters. The fecal coliform results varied. Ecology's result was 18/100ml while Alderwood did not detect any colonies.

Table 4 presents the results of the Alderwood and Ecology split samples in tabular form.

Priority Pollutant Organics - VOA, BNA and Pesticide/PCB Scans

There were 14 VOA and BNA target analytes detected in the Alderwood wastewater (Table 5). Only six were detected in the effluent. However, all six compounds were less than the USEPA acute and chronic water quality toxicity criteria for saltwater (USEPA, 1986).

Table 4 - Split Sample Results Comparison - Alderwood Water District, October 1992.

		Location:	Inf-E	Inf-A	2MGD	Eff-A*	1MGD	Eff-E	Eff-ED	EffFColi
		Type:	E-comp	A-comp	E-comp	A-comp	E-comp	E-comp	E-comp	grab
		Date:	10/26-27	10/26-27	10/26-27	10/26-27	10/26-27	10/26-27	10/26-27	10/27
		Lab Log #:	448280	448283	448284	448291	448285	448288	448292	448302
		Sampler:	Ecology	Alderwood	Ecology	Alderwood	Ecology	Ecology	Ecology	Ecology
PARAMETER	Analyzed by:									
TSS (mg/L)	Ecology		282	310	13	16	7	12	9	
	Alderwood		330	310	30	27	20	17	20	
BOD5 (mg/L)	Ecology		316	297	30	26	23	20		
	Alderwood		350	340	34	21	31	30	29	
pH (S.U.)	Ecology									7.4
	Alderwood									7.1
F-Coliform MF (#/100 mL)	Ecology									18
	Alderwood									<1

* Alderwood effluent sampler failed. Sample was collected from Alderwood's 2MGD unit compositor.

Table 5 - VOA, BNA, Pesticide/PCB and Metals Scan Results - Alderwood Water District - October, 1992.

Location:	Inf-E		Inf-1		Inf-2		Eff-E		Eff-2		Eff-1A		Sludge		EPA Water Quality Criteria Summary			
Type:	comp		grab		grab		comp		grab		grab		grab		Saltwater		Saltwater	
Date:	10/27		10/26		10/27		10/27		10/27		10/26		10/26		Acute		Chronic	
Lab Log#:	448280		448281		448282		448288		448290		448300		448293					
VOA Compounds	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/kg		ug/L		ug/L	
Acetone			46		28				7	J		U		U				
Chloroform			6	J	4	J			2	J	1	J		U	12,000	*(a)	6,400	*(a)
Tetrachloroethene			1	J		U				U		U		U	10,200	*	450	*
Toluene			2	J		U				U		U		U	6,300	*	5,000	*
Total Xylenes			7	J	3	J				U		U		U				
1,2-Dichlorobenzene				U		U				U	1	J	320		1,970	*(h)		
1,4-Dichlorobenzene			2	J	1	J			4	J	44		51	J	1,970	*(h)		
BNA Compounds															(ug/L)		(ug/L)	
2-Methylphenol		U						U					4300	J				
4-Methylphenol	32							U						U				
2,4-Dinitrophenol	6	J						U						U	4,850	*(l)		
Di-n-Butyl Phthalate	1	J						U						U	2.944	*(i)	3.4	*(i)
Pyrene		U						U						U	300	*(n)		
Butylbenzyl Phthalate	29							U						U	2.944	*(i)	3.4	*(i)
Bis(2-Ethylhexyl)Phthalate	16							U					15000		2.944	*(i)	3.4	*(i)
1,2-Dichlorobenzene		U					10							U	1,970	*(h)		
Pesticide/PCB Compounnds																		
Gamma-BHC (Lindane)	0.078	NJ					0.067	NJ						U	0.16			
Heptachlor	0.065	NJ						U						U	0.053		0.0036	
Metals**													mg/Kg-dr					
Arsenic		U						U					3.28					
Beryllium		U						U						U				
Cadmium	4.5	P						U					7.97		43		9.3	
Chromium		U						U					16.8					
Copper	33.6	N					14	N					398		2.9			
Lead	10.9						5.4	J					266		140		5.6	
Mercury	0.29	P						U					1.03	J	2.1		0.025	
Nickel		U						U					37.4		75		8.3	
Selenium		U						U					3.77		410		54	
Silver	38.4						2.3						103	N	2.3			
Zinc	86.3						45.6						442		95		86	

Table 5 - VOA, BNA, Pesticide/PCB and Metals Scan Results (cont.) - Alderwood Water District - October, 1992.

	Location:	Sedmt-1		Sedmt-2		Ecology Sediment Management Standards Marine Sediment Quality Standards Chemical Criteria
	Type:	grab		grab		
	Date:	11/12		11/12		
	Lab Log#:	448297		448298		
BNA Compounds		mg/Kg-TOC		mg/Kg-TOC		mg/Kg TOC
Pyrene		200	J		U	1000
Metals**		mg/Kg-dry		mg/Kg-dry		mg/Kg-dry
Arsenic		2.77		2.11		57
Beryllium		0.13	P	0.12	P	
Cadmium		0.36	P		U	5.1
Chromium		24.2		16		260
Copper		5.39		3.13	B	390
Lead		8.97		4.7	P	450
Mercury		0.013	PJ	0.011	PJ	0.41
Nickel		27.9		14.3		
Selenium			U		U	
Silver		0.31	PN		U	6.1
Zinc		35		20.5		410

NOTE: SOME INDIVIDUAL COMPOUND CRITERIA OR LOELS MAY NOT AGREE WITH GROUP CRITERIA OR LOELS. REFER TO APPROPRIATE EPA DOCUMENT ON AMBIENT WATER QUALITY CRITERIA FOR FULL DISSCUSSION.

P The analyte was detected above the instrument detection limit but below the established minimum quantification limit.
U The analyte was not detected at or above the reported result.
N For organic analytes there is evidence the analyte is present in this sam For metals analytes the spike sample recovery is not within control limits.
B The analyte was detected in the analytical method blank, indicating the sample may have been contaminated.
J The analyte was positively identified. The associated numerical result is an estimate.
* Insufficient data to develop criteria. Value presented is the LOEL - Lowest Observed Effect Level.
** Results are reported as total metals for Hg in the water samples, and for sludge and sediment samples. Results are reported as total recoverable metals for the remaining metal in the water samples.
+ Hardness dependent criteria (100 mg/L used).
a Total Halomethanes
h Total Dichlorobenzenes
i Total Phthalate Esters
l Total Nitrophenols
n Total Polynuclear Aromatic Hydrocarbons

Four VOA and BNA compounds were detected in the sludge sample (Table 5). Bis(2-ethylhexyl)phthalate was detected in the highest concentration, yet lower than the USEPA National Sewage Sludge Survey (USEPA, 1990).

A complete list of priority pollutant compounds and their respective detection limits is provided in Appendix D. Tentatively identified compounds detected are provided in Appendix E.

Priority Pollutant Inorganics - Metals Scans

A number of priority pollutant metals were present in the influent. Four were detected in the effluent (Table 5). Of these, the copper concentration slightly exceeded the USEPA acute water quality toxicity criteria for saltwater. Silver and lead concentrations approximated acute and chronic criterias, respectively. The general trend was a decrease in concentration across the treatment works.

All priority pollutant metals except beryllium were detected in the sludge. The metals were present in concentrations less than the geometric mean plus one standard deviation identified in the USEPA National Sewage Sludge Survey (Table 6) (USEPA, 1990).

Bioassays

The bioassay results demonstrated slight effluent toxicity (Table 7). The sample collected for bioassay testing was dechlorinated at the laboratory.

The rainbow trout (*Oncorhynchus mykiss*) static acute toxicity test, *Daphnia pulex* 48 hour survival test, and *Ceriodaphnia dubia* chronic renewal toxicity test yielded LC_{50}s and NOECs greater than or equal to 100% effluent.

The fathead minnow (*Pimephales promelas*) chronic renewal toxicity test also yielded an LC_{50} greater than 100% effluent. However, the NOEC for growth and survival were 50% and 6.25% effluent, respectively.

Sediments

The grain size distribution for the two sediment samples was different. The outfall sample was 24% gravel while the background sample was nearly pure sand. Percent solids, percent volatile solids and TOC were similar (Table 2).

Only one organic priority pollutant compound was detected in the sediments analyzed. The compound was the polynuclear aromatic hydrocarbon pyrene detected at an estimated concentration of 400 ug/Kg dry-weight (200 mg/kg TOC) in the outfall sample. The compound was not detected in the influent, effluent or sludge samples. All priority pollutant metals detected were found at slightly higher concentrations in the outfall sample than the background

Table 6 - Comparison of Compounds in Sludge with the National Sewer Sludge Survey - Alderwood Water District - October 1992.

		Data from EPA Sludge Survey (USEPA, 1990)				
Parameter	Location: Sludge Type: grab Date: 10/26 Lab Log # 448293 mg/Kg-dry	Geometric Mean **	Geometric Mean + 1 S.D.	Coefficient of Variation	Number of Samples	Percent Detected
		mg/Kg-dry	mg/Kg-dry			%
BNA COMPOUNDS						
Bis(2-ethylhexyl) Phthalate	125	74.7	673	8.01	200	62
METALS						
Arsenic	3.28	9.93	28.7	1.9	199	80
Cadmium	7.97	6.9	18.7	1.7	198	69
Chromium	16.8	118.6	458	2.9	199	91
Copper	398.0	741.0	1703	1.3	199	100
Lead	266.0	134.0	332	1.5	199	80
Mercury	1.03 J	5.22	20.8	2.98	199	63
Nickel	37.4	42.7	137.5	2.2	199	66
Selenium	3.77	5.16	12.5	1.42	199	65
Zinc	442.0	1202	2756	1.3	199	100

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

** In general, concentrations are a weighted combination of flow rate group estimates.

Table 7 - Effluent Bioassay Results - Alderwood Water District - October 1992.

NOTE: All tests were run on the effluent (Eff-BA sample) - lab log # 448296

Ceriodaphnia dubia - Chronic Renewal Toxicity Test

Sample	# Tested *	Percent Survival	Mean # Young per Original Female
Control	10	90	17.9
6.25 % Effluent	10	70	11.6
12.5 % Effluent	10	80	14.3
25 % Effluent	10	90	22.6
50 % Effluent	10	90	19.7
100 % Effluent	10	80	13.1

* 10 replicates of 1 organism

LC50 = > 100% Effluent
NOEC for survival = 100 % Effluent
NOEC for reproduction = 100 % Effluent

Fathead Minnow (Pimephales promelas) - Chronic Renewal Toxicity Test

Sample	# Tested *	Percent Survival	Mean dry weight of organisms (mg)
Control	30	97.1	0.7
6.25 % Effluent	30	97.1	0.63
12.5 % Effluent	30	97.1	0.6
25 % Effluent	30	100	0.58
50 % Effluent	30	94.3	0.46
100 % Effluent	30	71.4	0.27

* 3 replicates of 10 organisms

LC50 = >100 % Effluent
NOEC for survival = 50 % Effluent
NOEC for growth = 6.25% Effluent

Table 7 (cont.) - Effluent Bioassay Results - Alderwood Water District - October 1992.

Rainbow Trout (Oncorhynchus mykiss) - Static Acute Toxicity Test

Sample	# Tested *	Percent Survival
Control	30	90
100% Effluent	30	93

* 3 replicates of 10 organisms

LC50 = >100 % Effluent

Daphnia pulex - 48 Hour Survival Test

Sample	# Tested *	Percent Survival
Control	20	80
6.25 % Effluent	20	95
12.5 % Effluent	20	100
25 % Effluent	20	100
50 % Effluent	20	95
100% Effluent	20	100

* 4 replicates of 5 organisms

LC50 = >100 % Effluent
NOEC = 100 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

sample (Table 5). The concentrations of inorganics were one to two orders of magnitude less than the Washington State Department of Ecology Marine Sediment Quality Standards, Chemical Criteria (Ecology, 1991). The concentration of pyrene was one-fifth the sediment standard.

The sediment bioassay results document that the sediments tested were not toxic to either the *Rhepoxynius abronius* or Microtox test organisms (Table 8).

RECOMMENDATIONS AND CONCLUSIONS

Flow Measurements

Influent flows were measured at the flumes to the 1MGD and 2MGD units. Flows were verified as acceptable when compared to Alderwood's flow meters.

Quality Assurance/Quality Control

All samples were received by the Manchester Laboratory with chain-of-custody maintained. All samples were extracted and/or analyzed within the USEPA method holding times specified for each parameter. Manchester Laboratory QA/QC were deemed acceptable by the Manchester quality assurance personnel.

The Ecology Quality Assurance Section conducted a system audit of the Alderwood Laboratory capabilities in conjunction with this Class II Inspection. As a result of this system audit, the Alderwood Laboratory has received Laboratory Accreditation.

General Chemistry

The Alderwood treatment plant provided good treatment for the solids and oxygen demand parameters. The 1MGD unit appeared to provide slightly better treatment than the 2MGD unit. The 1MGD unit was partially nitrifying while the 2MGD unit was not nitrifying. The operator indicated the 2MGD unit aeration system was less efficient; a likely explanation for the observed differences. Methods to improve aeration should be investigated.

NPDES Permit Compliance

Compliance with the effluent limitations of the permit was good. BOD_5 and TSS were treated below both the weekly and monthly averages specified in the permit and exceeded the minimum 85% removal efficiency required in the permit. The discharge was within the acceptable pH range.

The influent BOD_5 loading exceeded the design capacity and TSS loading approximated the design capacity. The degree to which the sludge press filtrate return flow contributes to the

Table 8 - Sediment Bioassay Results - Alderwood Water District - October 1992.

Amphipod (Rhepoxynius abronius) - 10 Day Survival Test

Sample	# Tested *	Percent Survival	Mortality per Replicate +	Total Emergence Events per Replicate +	Failure to Rebury
Control	100	98	0.4 (+/- 0.5)	1.0(+/- 1.4)	0.4 (+/- 0.5)
Sedmt-1 (Sample #448297) Outfall	100	96	0.8 (+/- 0.8)	5.2(+/- 6.3)	1.6 (+/- 1.1)
Sedmt-2 (Sample #448298) Background	100	99	0.2 (+/- 0.4)	0.8(+/- 1.1)	0.2 (+/- 0.4)

* five replicates of 20 organisms
\+ mean (standard deviation)

Microtox - Toxicity Test *

EC50 = >100% Sediment

* 2 replicates each, conducted on samples #448297 and #448298

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

influent loadings is not known. However, the new Metro North Creek trunk line should reduce the influent loadings when completed. The feasibility of relocating the influent sample station upstream of the filtrate return should be investigated.

The influent flow was approximately 66% of the annual average daily flow rate specified in the permit.

The discharge was adequately disinfected. However, the total residual chlorine concentrations should be reduced to the lowest level capable of controlling fecal coliform bacteria.

Split Sample Analyses

The split sample results indicated that Alderwood was collecting representative samples. Alderwood analyses of BOD_5 and TSS were generally higher than the corresponding Ecology analyses but within an acceptable range for those parameters. The causes for these discrepancies should be explored. Additionally, provisions should be made to ensure that influent sample, collected by Alderwood, are cooled to 4° C.

Priority Pollutants

A number of priority pollutants were detected in the wastewater. Only the effluent copper concentration exceeded the USEPA Acute Water Quality Toxicity Criteria for saltwater.

The sludge also contained a number of priority pollutants. All were at concentrations less than the average concentrations reported in the USEPA sewer sludge survey.

Bioassays

The bioassay results demonstrated slight effluent toxicity. The fathead minnow (*Pimephales promelas*) showed a limited toxic response to the effluent. The chronic renewal toxicity test yielded an NOEC for survival and growth at 50% and 6.25% effluent respectively.

Sediments

Few target analytes were detected in the sediment priority pollutant scans. All were less than Washington State's Sediment Management Standards.

The sediments demonstrated no significant toxicity to bioassay test organisms.

REFERENCES

Ecology, 1991. Sediment Management Standards. Chapter 173-204 WAC.

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

USEPA, 1990. Federal Register, National Sewage Sludge Survey, Vol. 55, N0. 218, 40 CFR Part 503. U.S. Environmental Protection Agency.

Wheaton, L., 1993. Personal communication. Alderwood Water District.

APPENDIX

Appendix A - Ecology Sampling Schedule and Parameters Analyzed - Alderwood Water District - October 1992.

Parameter	Location:	Inf-E	Inf-1	Inf-2	Inf-A	1MGD-1	1MGD-2	1MGD	2MGD-1	2MGD-2
	Type:	E-comp	grab	grab	A-comp	grab	grab	E-comp	grab	grab
	Date:	10/26-27	10/26	10/26	10/26-27	10/26	10/26	10/27	10/26	10/26
	Lab Log #:	448280	448281	448282	448283	448287	448295	448285	448286	448294
GENERAL CHEMISTRY										
Conductivity		1			1			1		
Alkalinity		1			1			1		
Hardness		1			1			1		
Grain Size										
SOLIDS 4		1			1			1		
TSS			1	1		1	1		1	1
% Solids										
% Volatile Solids										
OXYGEN DEMAND										
BOD5		1			1			1		
BOD INH		1			1			1		
COD		1			1			1		
TOC (water)		1	1	1	1	1	1	1	1	1
TOC (soil/sed)										
NUTRIENTS										
NH3-N		1			1			1		
NO2+NO3-N		1			1			1		
Total-P		1			1			1		
MISCELLANEOUS										
Oil and Grease (water)			1	1						
F-Coliform MF										
ORGANICS										
VOC (water)			1	1						
VOC (soil/sed)										
BNAs (water)		1								
BNAs (soil/sed)										
Pest/PCB (water)		1								
Pest/PCB (soil/sed)										
Herbicides (water)										
METALS										
PP Metals (water)		1								
PP Metals (soil/sed)										
BIOASSAYS										
Salmonid (acute 100%)										
Microtox (acute)										
Ceriodaphnia (chronic)										
Fathead Minnow (chronic)										
Rhepoxinius (solid acute)										
Microtox (solid acute)										
FIELD OBSERVATIONS*										

E-comp Ecology com[posite sample.
A-comp Alderwood composite sample.
* Temperature, pH and conductivity were measured on all water samples collected except the grab-composite # 448296.
Free and total chlorine were measured on all effluent grab samples.

Appendix A - Ecology Sampling Schedule and Parameters Analyzed (cont.) - Alderwood Water District - October 1992.

Parameter II	Location:	2MGD	Eff-1	Eff-1A	Eff-2	EffFColi	Eff-BA	Eff-E	Eff-ED	Eff-A#
	Type:	E-comp	grab	grab	grab	grab	g-comp	E-comp	E-comp	A-comp
	Date:	10/26-27	10/27	10/26	10/27	10/27	10/26	10/26-27	10/26-27	10/26-27
	Lab Log #:	448284	448289	448300	448290	448302	448296	448288	448292	448291
GENERAL CHEMISTRY										
Conductivity		1						1		1
Alkalinity		1						1		1
Hardness		1						1		1
Grain Size										
SOLIDS 4		1						1	1	1
TSS				1						
% Solids										
% Volatile Solids										
OXYGEN DEMAND										
BOD5		1						1		1
BOD INH		1						1		1
COD		1						1		1
TOC (water)		1		1				1	1	1
TOC (soil/sed)										
NUTRIENTS										
NH3-N		1						1	1	1
NO2+NO3-N		1						1	1	1
Total-P		1						1	1	1
MISCELLANEOUS										
Oil and Grease (water)			1	1	1					
F-Coliform MF					1	1				
ORGANICS										
VOC (water)			1	1	1					
VOC (soil/sed)										
BNAs (water)								1		
BNAs (soil/sed)										
Pest/PCB (water)								1		
Pest/PCB (soil/sed)										
Herbicides (water)								1		
METALS										
PP Metals (water)								1		
PP Metals (soil/sed)										
BIOASSAYS										
Salmonid (acute 100%)							1			
Microtox (acute)							1			
Ceriodaphnia (chronic)							1			
Fathead Minnow (chronic)							1			
Rhepoxinius (solid acute)										
Microtox (solid acute)										
FIELD OBSERVATIONS										

E-comp Ecology composite sample.
A-comp Alderwood composite sample.
g-comp Ecology grab-composite sample.
Alderwood effluent sampler failed. Sample was collected from Alderwood's 2MGD unit compositor.
* Temperature, pH and conductivity were measured on all water samples collected except the grab-composite # 448296.
Free and total chlorine were measured on all effluent grab samples.

Appendix A - Ecology Sampling Schedule and Parameters Analyzed (cont.) - Alderwood Water District - October 1992.

Parameter III	Location:	Sludge	Super	Sedmt-1	Sedmt-2
	Type:	grab	grab	grab	grab
	Date:	10/26	10/26	10/29	10/29
	Lab Log #:	448293	4482301	448297	448298
GENERAL CHEMISTRY					
Conductivity					
Alkalinity					
Hardness					
Grain Size				1	1
SOLIDS 4					
TSS			1		
% Solids		1		1	1
% Volatile Solids		1		1	1
OXYGEN DEMAND					
BOD5			1		
BOD INH					
COD					
TOC (water)			1		
TOC (soil/sed)		1		1	1
NUTRIENTS					
NH3-N					
NO2+NO3-N					
Total-P					
MISCELLANEOUS					
Oil and Grease (water)					
F-Coliform MF		1			
ORGANICS					
VOC (water)					
VOC (soil/sed)		1		1	1
BNAs (water)					
BNAs (soil/sed)		1		1	1
Pest/PCB (water)					
Pest/PCB (soil/sed)		1		1	1
Herbicides (water)					
METALS					
PP Metals (water)					
PP Metals (soil/sed)		1			
BIOASSAYS					
Salmonid (acute 100%)					
Microtox (acute)					
Ceriodaphnia (chronic)					
Fathead Minnow (chronic)					
Rhepoxinius (solid acute)				1	1
Microtox (solid acute)				1	1
FIELD OBSERVATIONS					

* Temperature, pH and conductivity were measured on all water samples collected except the grab-composite # 448296. Free and total chlorine were measured on all effluent grab samples.

Appendix A-1 - Ecology Analytical Methods and Laboratories Used - Alderwood Water District - October 1992.

Parameter	Method	Laboratory
Conductivity	EPA Method 120.1	Manchester Laboratory
Alkalinity	EPA Method 310.1	Manchester Laboratory
Hardness	EPA-130.2	Manchester Laboratory
Grain Size	Puget Sound Protocol	Soil Technology
TS	EPA Method 160.3	Manchester Laboratory
TNVS	SM 2540E	Manchester Laboratory
TSS	EPA Method 160.2	Manchester Laboratory
TNVSS	SM 2540E	Manchester Laboratory
TVS	EPA Method 160.4	Manchester Laboratory
% Solids	SM 2540G	Weyerhauser Analytical Testing Service
% Volatile Solids	SM 2540G	Weyerhauser Analytical Testing Service
BOD5	EPA Method 405.1	Weyerhauser Analytical Testing Service
BOD5 INH	SM-17 5210	Weyerhauser Analytical Testing Service
COD	EPA Method 410.1	Weyerhauser Analytical Testing Service
TOC (water)	EPA Method 415.2	Manchester Laboratory
TOC (soil)	Puget Sound Protocol	Weyerhauser Analytical Testing Service
NH3-N	EPA Method 350.1	Manchester Laboratory
NO2+NO3-N	EPA Method 353.2	Manchester Laboratory
Phosphorus-Total	EPA Method 365.1	Manchester Laboratory
Oil and Grease	EPA Method 413.1	Manchester Laboratory
F-Coliform MF	SM 9222D	Manchester Laboratory
VOA (water)	EPA Method 8260	Weyerhauser Analytical Testing Service
VOA (soil)	EPA Method 8240	Pacific Environmental Laboratory
BNA (water)	EPA Method 8270	Weyerhauser Analytical Testing Service
BNA (soil)	EPA Method 8270	Pacific Environmental Laboratory
Pest/PCB (water)	EPA Method 8080	Weyerhauser Analytical Testing Service
Pest/PCB (soil)	EPA Method 8080	Pacific Environmental Laboratory
PP Metals (water)	EPA Method 200	Manchester Laboratory
PP Metals (soil)	EPA Method 200	Manchester Laboratory
Salmonid (acute 100%)	Ecology, 1990	Manchester Laboratory
Microtox (acute)	Beckman, 1982	Manchester Laboratory
Ceriodaphnia (chronic)	EPA Method 1002	Manchester Laboratory
Fathead Minnow (chronic)	EPA, 1989	Manchester Laboratory
Rhepoxinius (solid acute)	NAS-XXX-NA4	Northwestern Aquatic Sciences
Microtox (solid acute)	Beckman, 1982	Manchester Laboratory

Appendix B

Priority Pollutant Cleaning Methodology

1. Wash with laboratory grade detergent (Liqui-Nox).
2. Rinse several times with tap water.
3. Rinse with 10% nitric acid solution.
4. Rinse three (3) times with distilled/deionized water.
5. Rinse with reagent-grade methylene chloride.
6. Rinse with reagent-grade acetone.
7. Allow to air dry and seal with aluminum foil.

Note: The priority pollutant cleaning methodology was altered for the cleaning of the sediment collection equipment used for sediment samples #448297 and #448298. The use of the methylene chloride rinse was replaced with a methanol rinse.

Appendix C

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

Post Office Box 488 • Manchester, Washington 98353-0488 • (206) 895-4649

October 29, 1992

Mr. Roger C. Gorham
Alderwood Wastewater Treatment Plant
6315 Picnic Point Rd
Edmonds, WA 98026

Dear Mr. Gorham:

I am pleased to inform you that the Alderwood Wastewater Treatment Plant Laboratory has met all requirements for accreditation under the provisions of Chapter 173-50, Washington Administrative Code. A report of the system audit conducted on October 27, 1992 is enclosed. Also enclosed is the lab's Certificate and Scope of Accreditation.

As noted in the system audit report, a number of recommendations were made for improving laboratory operations. Please keep us informed of any changes made to your quality assurance program including those made to implement any of recommendations in the audit report.

To maintain accreditation status, the lab must: report significant equipment and personnel changes as they occur; submit any updates of the lab's QA manual; submit results of performance evaluation sample analyses semiannually (e.g., one DMR-QA Study, one WP Study); and submit a new application and appropriate fees annually.

Thank you for joining our Environmental Laboratory Accreditation Program in such a timely manner. My staff is available to assist in matters concerning the lab's quality assurance program. Please contact us if you think we can help.

Sincerely,

Stewart M. Lombard for CJK

Cliff J. Kirchmer, Manager
Quality Assurance Section

CJK:DJ:dj
Encls:
1. Certificate
2. Scope of Accreditation
3. On-site Audit Report

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

SYSTEM AUDIT REPORT

LABORATORY: Alderwood Wastewater Treatment Plant Laboratory

ADDRESS: 6315 Picnic Point Road
Edmonds, WA 98026

DATE OF AUDIT: October 27, 1992

AUDITORS:	Dale Van Donsel	Team Leader, Microbiology
	Perry Brake	Admin, General Chemistry
PERSONNEL INTERVIEWED:	Roger Gorham	Lab Technician, Operator II
	LeRoy Wheaton	Senior Operator

AUTHENTICATION:

Dale Van Donsel, Team Leader

Perry Brake, Team Member

GENERAL FINDINGS AND RECOMMENDATIONS

A system audit was conducted at the Alderwood Wastewater Treatment Plant Laboratory on October 27, 1992 pursuant to Chapter 173-50-080, Washington Administrative Code. The purpose of the audit was to verify laboratory capabilities as stated in the application for accreditation and quality assurance manual (previously submitted by the laboratory in partial fulfillment of accreditation requirements), and to review analytical and quality control data. General audit findings and recommendations are documented below. Significant recommendations for improvement of laboratory operations are highlighted by use of *italics*.

1. Personnel

a. Mr. Gorham is responsible for operation of the treatment plant lab and is the primary architect of the lab's quality assurance (QA) program and author of the QA manual. Mr. Wheaton usually does analyses in the morning and Mr. Gorham in the afternoon. One other individual assigned to the plant, and a fourth individual assigned to the Alderwood Water District who occasionally fills in at the WTP, also conduct analyses in the lab as required.

b. Mr. Gorham meets minimum recommended requirements for training in lab operations for the parameters done in the lab. He was also very familiar with operation of the instruments used in the lab and demonstrated ability to follow applicable analytical methods. He and Mr. Wheaton both appeared eager to improve lab efficiency and effectiveness.

2. Facility

a. The lab facility consists of one spacious room located in the treatment plant control building. Most administrative functions supporting lab operations (e.g., paperwork) are also done in the same room with an adjoining room used for some filing. There is sufficient space in the current lab to support limited expansion of analytical capabilities.

b. Lab utilities (e.g., electricity, reagent grade water, safety shower), were evaluated and found satisfactory for current operations. There was no record to indicate a fume hood in which a muffle furnace, drying oven, and steam bath were located, had ever been checked for adequacy of air flow. A check was made by the visiting team and the flow found to be 120 linear feet per minute with the sash fully open which meets the ASTM-recommended flow of 75-125 FPM. *A recommendation was made to have the hood checked for flow periodically (e.g., every year).*

3. Equipment and Supplies

a. The lab is currently using a Corning "pH Meter 5" analog meter for pH determinations. The meter is not listed in current lab supply catalogs

(e.g., VWR) and apparently is no longer in production. The meter is slow to respond and difficult to read accurately which complicates calibration and sample analysis. The analog dial can be read only to tenths of pH units, and then only with some uncertainty. To give the lab a capability to measure pH with greater precision and certainty and do so quicker (estimated time savings per day is 30 minutes), *a recommendation was made to replace the marginally functional Corning instrument with a digital meter having automatic temperature compensation, and a probe with integral thermometer.*

b. A Wallace and Tiernan amperometric titrator was being used for residual chlorine determinations by the back titration method. While the amperometric titration methods give greater sensitivity than other methods (e.g., colorimetric), use of the amperometric titrator requires greater operator skill and a concerted preventative maintenance program to obtain reliably good results. Loss of chlorine can occur due to rapid stirring, and electrodes must be conditioned and cleaned frequently for sharp (and thus easily recognized) end points. To give the lab a capability to accurately analyze residual chlorine using a method which requires considerably less operator interpretation, is significantly quicker, and minimizes use of expensive and potentially hazardous reagents (e.g., PAO), *a recommendation was made to purchase a colorimeter and use the much simpler DPD method of analysis.* Relatively inexpensive colorimeters and prepackaged reagents are available which greatly simplify residual chlorine testing with little sacrifice in sensitivity (e.g., the Hach DR-100, $235, or the Hach Pocket Colorimeter, approximately the same price).

c. The thermometers being used for the BOD and fecal coliform incubators were neither NIST-certified nor traceable to an NIST-certified thermometer. The thermometers were calibrated against a NIST-certified thermometer provided by the audit team. Certificates are enclosed showing traceability to the certified thermometer. Although the fecal coliform thermometer is acceptable, it is very long and in a location where it is subject to breakage. A shorter one, such as the ERTCO coliform incubator thermometer (available from most suppliers) would be safer. Before another thermometer is put into use, it should be calibrated against the present one.

d. An improper formulation was being used for preparation of the buffered dilution/rinse water for the fecal coliform test. *Addition of magnesium chloride is necessary (see enclosed method).* The stock phosphate component should be prepared in a clear container and refrigerated and discarded when turbidity develops. The distilled water used for preparation of the buffered water comes from a glass still that should produce an excellent quality water, but it was recommended that for buffered water preparation, water should be drawn directly from the still, avoiding the storage carboys. Even though these are cleaned regularly, bacterial growth can occur. Common organisms such as *Pseudomonas* are notorious for growing in stored water and producing toxic compounds that can interfere with microbiological test results. A more convenient alternative to preparation of the buffered water is to purchase it. This is available from most laboratory supply houses at very reasonable cost.

e. Although Mr. Gorham is presently able to adequately monitor performance in the lab with presently available supplies and equipment, to do so is time consuming and laborious. Ready access to a personal computer with printer would save considerable time not only for monitoring performance (e.g., by automating the control charting process) but also for data and information recording related to all plant activities. Time saved could be spent on other priority tasks in the lab and plant.

4. Sample Management. Because of the nature of the treatment plant and lab, sample management appeared to present no significant problems. Samples are analyzed immediately after being taken. Chain-of-custody procedures, both administrative and physical, were reviewed during the audit and found satisfactory.

5. Data Management and Records Keeping. No significant deficiencies were noted with regard to data management or records keeping. *A recommendation was made to add a space on the pH bench sheet for recording results of standard solution (i.e., a buffer solution other than the calibration buffers) analysis.* This should be done when forms are next revised and, in the meantime, results should just be written somewhere on the present form.

6. Performance Evaluation (PE) Samples. The plant is not a major discharger, so it does not receive DMR-QA samples. Raw data for the most recent PE sample analyses (samples provided by the QA Section and from Analytical Products Group) were reviewed during the audit and found to be in order. Samples for pH, TSS, BOD, and residual chlorine were analyzed successfully. The lab had signed up for WP029 and was in the process of analyzing the samples.

7. Quality Assurance/Quality Control

a. Prior to preparing for the laboratory accreditation program, the lab had relied upon infrequent analysis of PE samples as the only check on accuracy (with no check on precision). In addition to continuing the analysis of PE samples, the current QA program calls for analysis of pH, BOD, TSS, and residual chlorine check standards as a check on accuracy, and frequent analysis of both TSS and BOD duplicates as an additional check on precision. Sufficient data were available to evaluate the outcome of TSS duplicate and both BOD tests; each was "in-control" and meeting laboratory data quality objectives. Material for preparing the TSS standard had just been received and only one test had been run.

(1) The lab should continue to analyze BOD standards (glucose/glutamic acid) and duplicates to provide maximum information on accuracy and precision. The BOD test is the most likely to experience problems and the more information that is available, the easier it will be to find and eliminate the source of the problems.

(2) Once the TSS standard (cellulose suspension) is being analyzed successfully on a regular basis and precision is found to be good (as indicated by a small standard deviation), the lab should consider discontinuing analyzing duplicate TSS samples. Precision can be adequately monitored from the results of analyzing the standard suspension.

(3) Precision of the residual chlorine test should be monitored by analyzing duplicate samples frequently and control charting the results. Accuracy can be monitored less frequently (perhaps quarterly) by analysis of a standard. The standard can be purchased (e.g., from Hach) or prepared in the lab.

(4) Analysis of the third buffer frequently (e.g., weekly), and control charting the results, is sufficient to monitor accuracy and precision for the pH test.

b. Environmental samples were not being stirred with a magnetic stirring bar during the pH determination. *A recommendation was made to stir all environmental samples as required by the method.* The importance of stirring can be easily demonstrated with a turbid sample by monitoring the pH of a stirred and unstirred sample. The unstirred sample pH will stabilize very slowly as the pH changes during settling of solids and will differ considerably from the pH of the stirred sample

c. The laboratory is taking all the possible steps to optimize fecal coliform recovery with the membrane filter (M-FC) test. However, the test itself has some serious deficiencies when it is applied to chlorinated effluents. It is important that the lab establish its own credibility with this method. *EPA Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act, 40 CFR Part 136,* Table 1A, dated July 1, 1990 states, "Since the membrane filter technique usually yields low and variable recovery from chlorinated wastewaters, the MPN method will be required to resolve any controversies". The simplest approach for this lab is to do periodic sample splitting with another lab capable of doing the MPN method. This may be a laboratory accredited for this procedure by the Department of Ecology or certified by the Department of Health. Mr. Gorham is able to have this test done at the Lynnwood treatment plant lab which is accredited for it. Monthly comparisons would be acceptable, and if numbers compare well, sample splitting can be reduced to quarterly. The object of these comparisons is not to seek an exact comparison of numbers between the two methods, but to watch for MPN results significantly and consistently higher than the MF that would indicate failure to recover some organisms.

d. Fecal coliform cultures are not decontaminated before being discarded. This is a source of potential criticism or liability for the laboratory. Fecal coliform colonies on the membranes are made up of very high numbers of living organisms (mostly *Escherichia coli* and *Klebsiella pneumoniae*) some types of which can cause human infection. Some of the "background" colonies on membranes may also be potential human pathogens. *Autoclaving for a minimum of 30 minutes is normally required and a record should be maintained of decontamination runs.* This will provide documentation that discarded cultures were decontaminated properly.

8. Methods

a. Current copies of the methods employed in the lab are present and readily available to analysts at bench level.

b. The lab had requested accreditation for residual chlorine using Standard Method 4500-Cl G, a colorimetric DPD method used for process control determinations at the plant (using a color comparator). The method actually used in the lab for NPDES reporting is amperometric titration, SM 4500-Cl D, the method for which accreditation should be granted.

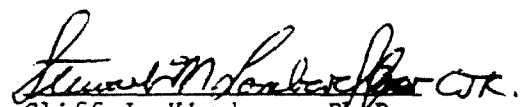
c. At the time of the audit, the lab was judged capable of accurately analyzing for all parameters for which accreditation has been requested.

Encl: Thermometer Certificates
Fecal Coliform Procedure

SCOPE OF ACCREDITATION

The Alderwood Wastewater Treatment Plant Laboratory, Edmonds, Washington, is accredited by the State of Washington Department of Ecology to perform analyses for the parameters listed below using the indicated analytical methods as cited in *Standard Methods for the Examination of Water and Wastewater*, 17th edition. Accreditation for all parameters is final. This accreditation applies to water and water-related analyses only.

PARAMETER	METHOD
pH	SM 4500 H^+
Biochemical Oxygen Demand (BOD)	SM 5210 B
Total Suspended Solids	SM 2540 D
Residual Chlorine	SM 4500-Cl D
Fecal Coliforms	SM 9222 D

AUTHENTICATION: 

Cliff J. Kirchmer, Ph.D.
Quality Assurance Officer

October 28, 1993
Expiration date

Parameters Denied accreditation

Parameter	Method
None	

The State of Washington

Department of Ecology

This is to certify,

That Alderwood Wastewater Treatment Plant Laboratory,

located at Edmonds, Washington,

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an ACCREDITED LABORATORY for the analytical parameters listed on the accompanying Scope of Accreditation.

This certificate is effective on the 29th day of October 1992 and shall expire on the 28th day of October 1993.

Witnessed under my hand this 29th day of October 1992.

LAB ACCREDITATION NUMBER
M052

Cliff J. Kirchmer Dep SMR

Cliff J. Kirchmer, Ph.D.
Quality Assurance Officer

Appendix D - VOA, BNA, Pesticide/PCB and Metals Scan Results - Alderwood Water District - October 1992.

Location:	Inf-E	Inf-1	Inf-2	Eff-E	Eff-2	Eff-1A	Sludge	Sedmt-1	Sedmt-2
Type:	comp	grab	grab	comp	grab	grab	grab	grab	grab
Date:	10/27/92	10/26/92	10/26/92	10/27/92	10/27/92	10/27/92	10/26/92	11/12/92	11/12/92
Lab Log#:	448280	448281	448282	448288	448290	448300	448293	448297	448298
VOA Compounds	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/kg-dr	ug/kg-dr	ug/kg-dr
1									
Chloromethane		10 U	10 U		10 U	10 U	170 U	20 UJ	20 UJ
Bromomethane		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Vinyl Chloride		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Chloroethane		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Methylene Chloride		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Acetone		46	28		7 J	10 U	170 U	50 U	50 U
Carbon Disulfide		10 U	10 U		10 U	10 U	170 U	20 U	20 U
1,1-Dichloroethene		10 U	10 U		10 U	10 U	170 U	20 U	20 U
1,1-Dichloroethane		10 U	10 U		10 U	10 U	170 U	20 U	20 U
1,2-Dichloroethene (total)		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Chloroform		6 J	4 J		2 J	1 J	170 U	20 U	20 U
1,2-Dichloroethane		10 U	10 U		10 U	10 U	170 U	20 U	20 U
2-Butanone (MEK)		10 U	10 U		10 U	10 U	170 U	20 U	20 U
1,1,1-Trichloroethane		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Carbon Tetrachloride		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Bromodichloromethane		10 U	10 U		10 U	10 U	170 U	20 U	20 U
1,2-Dichloropropane		10 U	10 U		10 U	10 U	170 U	20 U	20 U
cis-1,3-Dichloropropene		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Trichloroethene		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Dibromochloromethane		10 U	10 U		10 U	10 U	170 U	20 U	20 U
1,1,2-Trichloroethane		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Benzene		10 U	10 U		10 U	10 U	170 U	20 U	20 U
trans-1,3-Dichloropropene		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Bromoform		10 U	10 U		10 U	10 U	170 U	20 U	20 U
4-Methyl-2-Pentanone (MIBK)		10 U	10 U		10 U	10 U	170 U	20 U	20 U
2-Hexanone		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Tetrachloroethene		1 J	10 U		10 U	10 U	170 U	20 U	20 U
1,1,2,2-Tetrachloroethane		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Toluene		2 J	10 U		10 U	10 U	170 U	20 U	20 U
Chlorobenzene		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Ethylbenzene		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Styrene		10 U	10 U		10 U	10 U	170 U	20 U	20 U
Total Xylenes		7 J	3 J		10 U	10 U	170 U	20 U	20 U
1,2-Dichlorobenzene		10 U	10 U		10 U	1 J	320	20 U	20 U
1,4-Dichlorobenzene		2 J	1 J		4 J	44	51 J	20 U	20 U
1,3-Dichlorobenzene		10 U	10 U		10 U	10 U	170 U	20 U	20 U

Appendix D (cont.) - VOA, BNA, Pesticide/PCB and Metals Scan Results - Alderwood Water District - October 1992.

Location:	Inf-E	Inf-1	Inf-2	Eff-E	Eff-2	Eff-1A	Sludge	Sedmt-1	Sedmt-2
Type:	comp	grab	grab	comp	grab	grab	grab	grab	grab
Date:	10/27/92	10/26/92	10/26/92	10/27/92	10/27/92	10/27/92	10/26/92	11/12/92	11/12/92
Lab Log#:	448280	448281	448282	448288	448290	448300	448293	448297	448298
BNA Compounds	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/kg	ug/kg-dr	ug/kg-dr
1									
Phenol	10 U			10 U			14000 U	810 U	872 U
Bis(2-Chloroethyl)Ether	10 U			10 U			14000 U	810 U	872 U
2-Chlorophenol	10 U			10 U			14000 U	810 U	872 U
1,3-Dichlorobenzene	10 U			10 U			14000 U	810 U	872 U
1,4-Dichlorobenzene	10 U			10 U			14000 U	810 U	872 U
Benzyl Alcohol	10 U			10 U			14000 U	810 U	872 U
1,2-Dichlorobenzene	10 U			10			14000 U	810 U	872 U
2-Methylphenol	10 U			10 U			4300 J	810 U	872 U
Bis(2-Chloroisopropyl)Ether	10 U			10 U			14000 U	810 U	872 U
4-Methylphenol	32			10 U			14000 U	810 U	872 U
N-Nitroso-di-n-Propylamine	10 U			10 U			14000 U	810 U	872 U
Hexachloroethane	10 U			10 U			14000 U	810 U	872 U
Nitrobenzene	10 U			10 U			14000 U	810 U	872 U
Isophorone	10 U			10 U			14000 U	810 U	872 U
2-Nitrophenol	10 UJ			10 UJ			14000 UJ	810 U	872 U
2,4-Dimethylphenol	10 U			10 U			14000 U	810 U	872 U
Benzoic Acid	10 U			10 U			14000 U	2000 U	2181 U
Bis(2-Chloroethoxy)Methane	10 U			10 U			14000 U	810 U	872 U
2,4-Dichlorophenol	10 U			10 U			14000 U	810 U	872 U
1,2,4-Trichlorobenzene	10 U			10 U			14000 U	810 U	872 U
Naphthalene	10 UJ			10 UJ			14000 UJ	810 U	872 U
4-Chloroaniline	10 U			10 U			14000 U	810 U	872 U
Hexachlorobutadiene	10 U			10 U			14000 U	810 U	872 U
4-Chloro-3-Methylphenol	10 U			10 U			14000 U	810 U	872 U
2-Methylnaphthalene	10 U			10 U			14000 U	810 U	872 U
Hexachlorocyclopentadiene	10 UJ			10 UJ			14000 UJ	810 U	872 U
2,4,6-Trichlorophenol	10 U			10 U			14000 U	810 U	872 U
2,4,5-Trichlorophenol	25 U			25 U			33000 U	810 U	872 U
2-Chloronaphthalene	10 U			10 U			14000 U	810 U	872 U
2-Nitroaniline	25 U			25 U			33000 U	810 U	872 U
Dimethyl Phthalate	10 U			10 U			14000 U	810 U	872 U
Acenaphthylene	10 U			10 U			14000 U	810 U	872 U
2,6-Dinitrotoluene	10 U			10 U			14000 U	810 U	872 U
3-Nitroaniline	25 UJ			25 UJ			33000 UJ	810 U	872 U
Acenaphthene	10 U			10 U			14000 U	810 U	872 U
2,4-Dinitrophenol	6 J			10 U			33000 UJ	2000 U	2181 U
4-Nitrophenol	25 U			25 U			33000 U	810 U	872 U
Dibenzofuran	10 U			10 U			14000 U	810 U	872 U
2,4-Dinitrotoluene	10 U			10 U			14000 U	810 U	872 U
Diethyl Phthalate	10 U			10 U			14000 U	810 U	872 U
4-Chlorophenyl Phenylether	10 U			10 U			14000 U	810 U	872 U
Fluorene	10 U			10 U			14000 U	810 U	872 U
4-Nitroaniline	25 UJ			25 UJ			33000 UJ	810 U	872 U
4,6-Dinitro-2-Methylphenol	25 UJ			25 UJ			33000 UJ	2000 U	2181 U
N-Nitrosodiphenylamine	10 U			10 U			14000 U	810 U	872 U
4-Bromophenyl Phenylether	10 U			10 U			14000 U	810 U	872 U
Hexachlorobenzene	10 U			10 U			14000 U	810 U	872 U
Pentachlorophenol	25 U			25 U			33000 U	810 U	872 U
Phenanthrene	10 U			10 U			14000 U	810 U	872 U
Anthracene	10 U			10 U			14000 U	810 U	872 U
Di-n-Butyl Phthalate	1 J			10 U			14000 U	810 U	872 U
Fluoranthene	10 U			10 U			14000 U	810 U	872 U
Pyrene	10 U			10 U			14000 U	400 J	872 U
Butylbenzyl Phthalate	29			10 U			14000 U	810 U	872 U
3,3'-Dichlorobenzidine	10 U			10 U			14000 UJ	810 U	872 U

Appendix D (cont.) - VOA, BNA, Pesticide/PCB and Metals Scan Results - Alderwood Water District - October 1992.

Location:	Inf-E		Inf-1	Inf-2	Eff-E		Eff-2	Eff-1A	Sludge		Sedmt-1		Sedmt-2	
Type:	comp		grab	grab	comp		grab	grab	grab		grab		grab	
Date:	10/27/92		10/26/92	10/26/92	10/27/92		10/27/92	10/27/92	10/26/92		11/12/92		11/12/92	
Lab Log#:	448280		448281	448282	448288		448290	448300	448293		448297		448298	
BNA Compounds	ug/L		ug/L	ug/L	ug/L		ug/L	ug/L	ug/kg		ug/kg-dr		ug/kg-dr	
Benzo(a)Anthracene	10	U			10	U			14000	U	810	U	872	U
Chrysene	10	U			10	U			14000	U	810	U	872	U
Bis(2-Ethylhexyl)Phthalate	16				10	U			15000		810	U	872	U
Di-n-Octyl Phthalate	10	U			10	U			14000	U	810	U	872	U
Benzo(b)Fluoranthene	10	U			10	U			14000	U	810	U	872	U
Benzo(k)Fluoranthene	10	U			10	U			14000	U	810	U	872	U
Benzo(a)Pyrene	10	U			10	U			14000	U	810	U	872	U
Indeno(1,2,3-cd)Pyrene	10	U			10	U			14000	U	810	U	872	U
Dibenzo(a,h)Anthracene	10	U			10	U			14000	U	810	U	872	U
Benzo(g,h,i)Perylene	10	U			10	U			14000	U	810	U	872	U
Pesticide/PCB Compounds														
alpha-BHC	0.05	UJ			0.05	UJ			140	U	1.5	U	1.7	U
beta-BHC	0.05	UJ			0.05	UJ			140	U	1.5	U	1.7	U
delta-BHC	0.05	UJ			0.05	UJ			140	U	1.5	U	1.7	U
gamma-BHC (Lindane)	0.078	NJ			0.067	NJ			140	U	1.5	U	1.7	U
Heptachlor	0.065	NJ			0.05	UJ			140	U	56	U	1.7	U
Aldrin	0.05	UJ			0.05	UJ			140	U	1.5	U	1.7	U
Heptachlor Epoxide	0.05	UJ			0.05	UJ			140	U	1.5	U	1.7	U
Endosulfan I	0.05	UJ			0.05	UJ			140	U	1.5	U	1.7	U
Dieldrin	0.1	UJ			0.1	UJ			140	U	1.5	U	1.7	U
4,4'-DDE	0.1	UJ			0.1	UJ			280	U	3.5	U	1.7	U
Endrin	0.1	UJ			0.1	UJ			280	U	1.5	U	1.7	U
Endosulfan II	0.1	UJ			0.1	UJ			280	U	1.5	U	1.7	U
4,4'-DDD	0.1	UJ			0.1	UJ			280	U	1.5	U	1.7	U
Endosulfan Sulfate	0.1	UJ			0.1	UJ			280	U	1.5	U	1.7	U
4,4'-DDT	0.1	UJ			0.1	UJ			280	U	1.5	U	1.7	U
Methoxychlor	0.5	UJ			0.5	UJ			1400	U	1.5	U	1.7	U
Endrin Ketone	0.1	UJ			0.1	UJ			280	U	1.5	U	1.7	U
alpha-Chlordane	0.1	UJ			0.1	UJ			140	U	1.5	U	1.7	U
gamma-Chlordane	0.1	UJ			0.1	UJ			140	U	1.5	U	1.7	U
Toxaphene	5	UJ			5	UJ			14000	U	600	U	652	U
Aroclor-1016	1	UJ			1	UJ			2700	U	120	U	131	U
Aroclor-1221	2	UJ			2	UJ			5600	U	120	U	131	U
Aroclor-1232	1	UJ			1	UJ			2700	U	120	U	131	U
Aroclor-1242	1	UJ			1	UJ			2700	U	120	U	131	U
Aroclor-1248	1	UJ			1	UJ			2700	U	120	U	131	U
Aroclor-1254	1	UJ			1	UJ			2700	U	120	U	131	U
Aroclor-1260	1	UJ			1	UJ			2700	U	120	U	131	U
Endrin Aldehyde	1	UJ			1	UJ			280	U	1.5	U	1.7	U

Appendix D (cont.) - VOA, BNA, Pesticide/PCB and Metals Scan Results - Alderwood Water District - October 1992.

Location:	Inf-E	Inf-1	Inf-2	Eff-E	Eff-2	Eff-1A	Sludge	Sedmt-1	Sedmt-2
Type:	comp	grab	grab	comp	grab	grab	grab	grab	grab
Date:	10/27/92	10/26/92	10/26/92	10/27/92	10/27/92	10/27/92	10/26/92	11/12/92	11/12/92
Lab Log#:	448280	448281	448282	448288	448290	448300	448293	448297	448298
Metals*	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/Kg-dr	mg/Kg-dr	mg/Kg-dr
Antimony	30 U			30 U			3 UN	3 UN	3 UN
Arsenic	1.5 UN			1.5 UN			3.28	2.77	2.11
Beryllium	1 U			1 U			0.1 U	0.13 P	0.12 P
Cadmium	4.5 P			2 U			7.97	0.36 P	0.2 U
Chromium	5 U			5 U			16.8	24.2	16
Copper	33.6 N			14 N			398	5.39	3.13 B
Lead	10.9 J			5.4 J			266	8.97	4.7 P
Mercury	0.29 P			0.05 U			1.03 J	0.013 PJ	0.011 PJ
Nickel	10 U			10 U			37.4	27.9	14.3
Selenium	2 U			2 U			3.77	0.4 U	0.4 U
Silver	38.4			2.3			103 N	0.31 PN	0.3 UN
Thallium	2.5 U			2.5 U			0.25 U	0.25 U	0.25 U
Zinc	86.3			45.6			442	35	20.5

* Results are reported as total metals for Hg in the water samples, and for the sludge and sediment samples. Results are reported as total recoverable metals for the remaining metals in the water samples.
B Analyte was also found in the analytical method blank indicating the sample may have been contaminated.
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 the sample. For metals analytes the spike sample recovery is not with in control limits.
P The analyte was detected above the instrument detection limit but below the established minimum quantification limit.

Appendix E

Tentatively Identified Compounds - Alderwood Water District - October 1992.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

448280

Lab Name: WEYERHAEUSER Contract: 8270

Lab Code: WEYER Case No.: 10102 SAS No.: SDG No.: 448280

Matrix: (soil/water) WATER Lab Sample ID: 98768

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 2BN21111F

Level: (low/med) LOW Date Received: 10/28/92

% Moisture: decanted: (Y/N) Date Extracted: 10/30/92

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 11/11/92

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:

Number TICs found: 20

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	5.38	82	J
2.	54446-78-5	ETHANOL, 1-(2-BUTOXYETHOXY)-	10.94	19	JN
3.	10482-56-1	3-CYCLOHEXENE-1-METHANOL, .A	11.07	35	JN
4.	143-07-7	DODECANOIC ACID	17.64	37	JN
5.	629-76-5	1-PENTADECANOL	20.47	63	JN
6.	544-63-8	TETRADECANOIC ACID	20.60	28	JN
7.	58-08-2	1H-PURINE-2,6-DIONE, 3,7-DIH	21.55	27	JN
8.	36653-82-4	1-HEXADECANOL	21.85	50	JN
9.	57-10-3	HEXADECANOIC ACID	23.70	830	JN
10.		UNKNOWN	24.12	12	J
11.		UNKNOWN	24.44	51	J
12.		UNKNOWN	25.86	1000	J
13.	57-11-4	OCTADECANOIC ACID	26.16	480	JN
14.		UNKNOWN	26.47	17	J
15.		UNKNOWN	27.54	13	J
16.		UNKNOWN	27.79	34	J
17.		UNKNOWN	27.82	18	J
18.		UNKNOWN	32.14	110	J
19.		UNKNOWN	34.69	62	J
20.	57-88-5	CHOLEST-5-EN-3-OL (3.BETA.)-	35.04	66	JN

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

448281

Lab Name: WEYERHAEUSER Contract: 046-5751

Lab Code: WEYER Case No.: 10102 SAS No.: SDG No.: 448280

Matrix: (soil/water) WATER Lab Sample ID: 98769

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: B9036

Level: (low/med) LOW Date Received: 10/28/92

% Moisture: not dec. Date Analyzed: 10/30/92

GC Column: CAP ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 11 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	115106	Methane, oxybis-	6.61	17	JN
2.	541059	Cyclotrisiloxane, hexamethyl	20.62	250	JN
3.	103651	Benzene, propyl-	27.28	11	JN
4.	0	Benzene, ethyl-methyl- isome	27.52	61	JN
5.	556672	Cyclotetrasiloxane, octameth	27.70	330	JN
6.	0	Benzene, ethyl-methyl- isome	28.20	22	JN
7.	526738	Benzene, 1,2,3-trimethyl-	28.68	96	JN
8.	138863	Limonene	29.49	23	JN
9.	620144	Benzene, 1-ethyl-3-methyl-	29.91	18	JN
10.	496117	1H-Indene, 2,3-dihydro-	30.44	10	JN
11.	99876	Benzene, 1-methyl-4-(1-methy	31.07	11	JN

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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

448288

Lab Name: WEYERHAEUSER Contract: 8270

Lab Code: WEYER Case No.: 10102 SAS No.: SDG No.: 448280

Matrix: (soil/water) WATER Lab Sample ID: 98774

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 2BN21111G

Level: (low/med) LOW Date Received: 10/28/92

% Moisture: decanted: (Y/N) Date Extracted: 10/30/92

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 11/11/92

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:

Number TICs found: 20 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	20324-32-7	2-PROPANOL, 1-(2-METHOXY-1-M	7.07	5	JN
2.		UNKNOWN	7.13	4	J
3.		UNKNOWN	7.35	8	J
4.	112-34-5	ETHANOL, 2-(2-BUTOXYETHOXY)-	10.79	7	JN
5.	124-17-4	ETHANOL, 2-(2-BUTOXYETHOXY)-	13.97	36	JN
6.		UNKNOWN	14.17	2	J
7.		UNKNOWN	14.79	4	J
8.	143-07-7	DODECANOIC ACID	17.34	5	JN
9.	544-63-8	TETRADECANOIC ACID	20.22	6	JN
10.		UNKNOWN	20.57	6	J
11.	5746-58-7	TETRADECANOIC ACID, 12-METHY	21.20	2	JN
12.	58-08-2	1H-PURINE-2,6-DIONE, 3,7-DIH	21.37	17	JN
13.	2091-29-4	9-HEXADECENOIC ACID	22.65	16	JN
14.	57-10-3	HEXADECANOIC ACID	22.97	40	JN
15.		UNKNOWN	25.09	48	J
16.	57-11-4	OCTADECANOIC ACID	25.39	32	JN
17.		UNKNOWN	25.87	3	J
18.		UNKNOWN	32.06	8	J
19.		UNKNOWN	34.62	10	J
20.	57-88-5	CHOLEST-5-EN-3-OL (3.BETA.)-	34.96	11	JN

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

448290

Lab Name: WEYERHAEUSER Contract: 046-5751

Lab Code: WEYER Case No.: 10102 SAS No.: SDG No.: 448280

Matrix: (soil/water) WATER Lab Sample ID: 98775

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: B9041

Level: (low/med) LOW Date Received: 10/28/92

% Moisture: not dec. Date Analyzed: 10/30/92

GC Column: CAP ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 2 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	541059	HEXAMETHYLCYCLOTRISILOXANE	20.61	14	JN
2.	556672	Cyclotetrasiloxane, octameth	27.70	6	JN

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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

448293

Lab Name: WEYERHAEUSER Contract: 8270

Lab Code: WEYER Case No.: 10102 SAS No.: SDG No.: 448280

Matrix: (soil/water) SOIL Lab Sample ID: 98777

Sample wt/vol: 30.2 (g/mL) G Lab File ID: 2BN21111E

Level: (low/med) LOW Date Received: 10/28/92

% Moisture: 88 decanted: (Y/N) N Date Extracted: 11/02/92

Concentrated Extract Volume: 500.0 (uL) Date Analyzed: 11/11/92

Injection Volume: 2.0(uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) Y pH: 6.8

Number TICs found: 20

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	26730-14-3	TRIDECANE, 7-METHYL-	12.37	39000	JN
2.	74645-98-0	DODECANE, 2,7,10-TRIMETHYL-	16.27	44000	JN
3.	544-63-8	TETRADECANOIC ACID	20.54	28000	JN
4.		UNKNOWN	21.40	120000	J
5.	5746-58-7	TETRADECANOIC ACID, 12-METHY	21.50	34000	JN
6.		UNKNOWN	21.84	66000	J
7.	2091-29-4	9-HEXADECENOIC ACID	23.15	930000	JN
8.	57-10-3	HEXADECANOIC ACID	23.65	920000	JN
9.	506-12-7	HEPTADECANOIC ACID	24.00	21000	JN
10.		UNKNOWN	24.19	39000	J
11.		UNKNOWN	24.40	28000	J
12.		UNKNOWN	25.89	2500000	J
13.	57-11-4	OCTADECANOIC ACID	26.06	440000	JN
14.		UNKNOWN	26.12	41000	J
15.		UNKNOWN	26.41	22000	J
16.		UNKNOWN	27.76	50000	J
17.		UNKNOWN	28.92	57000	J
18.		UNKNOWN	32.16	170000	J
19.		UNKNOWN	34.72	110000	J
20.	57-88-5	CHOLEST-5-EN-3-OL (3.BETA.)-	35.11	150000	JN

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

448300

Lab Name: WEYERHAEUSER Contract: 046-5751

Lab Code: WEYER Case No.: 10102 SAS No.: SDG No.: 448280

Matrix: (soil/water) WATER Lab Sample ID: 98778

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: B9042

Level: (low/med) LOW Date Received: 10/28/92

% Moisture: not dec. Date Analyzed: 10/30/92

GC Column: CAP ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 1 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 541059	Cyclotrisiloxane, hexamethyl	20.58	9	JN

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

448293

Lab Name: WEYERHAEUSER Contract: 046-5751

Lab Code: WEYER Case No.: 10102 SAS No.: SDG No.: 448280

Matrix: (soil/water) SOIL Lab Sample ID: 98777

Sample wt/vol: 2.5 (g/mL) G Lab File ID: A2937

Level: (low/med) LOW Date Received: 10/28/92

% Moisture: not dec. 88 Date Analyzed: 10/29/92

GC Column: CAP ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 6

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	75183	Methane, thiobis-	5.49	680	JN
2.	624920	Disulfide, dimethyl	16.41	2700	JN
3.	3658808	Trisulfide, dimethyl	27.90	770	JN
4.	138863	Limonene	28.41	630	JN
5.	1120214	Undecane	29.98	100	JN
6.	2958761	Naphthalene, decahydro-2-met	31.76	170	JN