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DEPARTMENT OF ECOLOGY

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M E M O R A N D U M

September 10, 1986

To: John Glynn
From: Don Reif *DR*
Subject: Coupeville Wastewater Treatment Plant Class II Inspection,
August 19-20, 1985

ABSTRACT

A Class II inspection and abbreviated receiving water survey were conducted at the town of Coupeville's wastewater treatment plant on August 19 and 20, 1985. The oxidation ditch activated sludge plant discharges an average of 80,000 gallons per day into Penn Cove. Treatment efficiency was found to be very good, with effluent quality far exceeding permit requirements. Laboratory procedures also were very good--two minor recommendations were made. Copper concentrations were high in the secondary sludge and may be the limiting factor in a land-disposal application. Penn Cove water quality near the plant outfall appeared to be improved and exceeded bacterial water quality standards.

INTRODUCTION

Coupeville is a community located on the south shore of Penn Cove on Whidbey Island. The Coupeville wastewater treatment plant (WTP) consists of an oxidation ditch for secondary treatment, followed by secondary clarification and discharge of chlorinated effluent to Penn Cove. Sludge is aerobically digested prior to land disposal. The treatment plant is designed for an average flow of 0.25 MGD, and peak flows of 1 MGD. The current average flow is 80,000 gpd.

On August 19 and 20, 1985, a Class II inspection was conducted at the plant site by John Bernhardt, Washington Department of Ecology, Water Quality Investigations Section. The objectives were:

1. Evaluate treatment plant efficiency.
2. Review sampling and laboratory procedures.
3. Perform an abbreviated receiving water survey.
4. Analyze sludge for land-disposal suitability.

METHODS

Composite and grab samples were collected at six stations in the WTP (Figure 2, Table 1). In addition, grab samples of receiving water were collected at three sites. Shellfish specimens also were gathered at each receiving water station and analyzed for fecal coliforms (Figure 1). Sampling sites are noted in Table 7.

Plant flows are measured by a flow meter located between the clarifier and chlorine contact chambers. The meter's accuracy was checked by direct measurement of the two contact chamber effluent weirs using standard techniques for standard suppressed rectangular weirs (Water Measurement Manual, 1967).

Problems developed with both Ecology compositors during the 24-hour sampling period. First, a blockage occurred within the sewer system on the evening of August 19. After the line was cleared by plant personnel, material from the blockage entered the plant headworks and plugged the compositors' influent line. Thus, the influent sample was neither complete nor highly representative.

Second, the Ecology effluent sampler stopped operating during the night. Therefore, any conclusions from the compositor lab results must be made cautiously. Additionally, the digester sludge sample was not analyzed for solids content due to laboratory error. Thus no comparison of metal concentrations on a dry-weight basis is possible for this sample. However, a sample was collected by John Glynn on August 15, 1985. These results are listed in Table 5.

RESULTS AND DISCUSSION

Composite and grab sample analytical results are listed in Tables 2 and 3. Although problems occurred during collection of the composite samples, there is generally good correlation between the composited and grab sample analyses, especially for effluent samples. The composited influent sample had higher values for many parameters, perhaps reflecting high-strength waste concentrations entering the plant just ahead of the loose material that eventually blocked the sampler line.

The plant appeared to perform very well and was very well operated. No significant problems were observed or indicated from lab analysis. Table 4 shows that effluent parameters were far below permit limits. This appears to be the rule rather than an exception. Although not a requirement, nitrification was essentially complete. Some saltwater infiltration to the sewer system may be occurring, based on higher-than-normal conductivity levels observed throughout the plant.

Metals analysis of Coupeville sludge revealed average concentrations of most metals (Table 5). However, copper was much higher than average. In addition, both copper and zinc were slightly higher than average in the influent, while nickel was somewhat high in the effluent stream.

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The accuracy of the plant flow meter was not clearly determined. Water level above the weir was less than the minimum value listed in the flow tables. The estimated flow, however, seemed to be reasonable (Table 6).

A review of laboratory and sampling procedures with plant personnel indicated very good technique and adherence to accepted procedures. Two suggestions are offered. First, seed material should be added to the dilution water rather than directly to the BOD bottles (APHA, 1985; Kjosness, 1982). Second, BOD water should be stored in the dark or a darkened carboy. This will decrease the possibility of growth of autotrophic organisms.

Table 7 compares receiving water data from this survey to historical data. The August 1985 samples showed no detectable fecal coliforms in three water samples near the outfall. Fecal coliform counts in shellfish tissue samples were fairly low and, as with the water samples, indicated good water quality. The fecal coliform levels are well within the limits of no more than 14 organisms per 100 mL for water samples and a maximum of 240 per 100 grams in tissue samples.

CONCLUSIONS AND SUMMARY

1. The Coupeville wastewater treatment plant appeared to be a well-operated and maintained facility. Laboratory and sampling procedures were very good. Two minor recommendations are made.
2. Metals analysis of a sludge sample showed typical levels of all metals except copper, which was fairly high.
3. The receiving water appears to be improved when compared to data from 1982 and 1983. Levels of fecal coliforms in water and shellfish tissue samples were significantly below the limits for growing-water and market standards.

DR:cp

Attachments

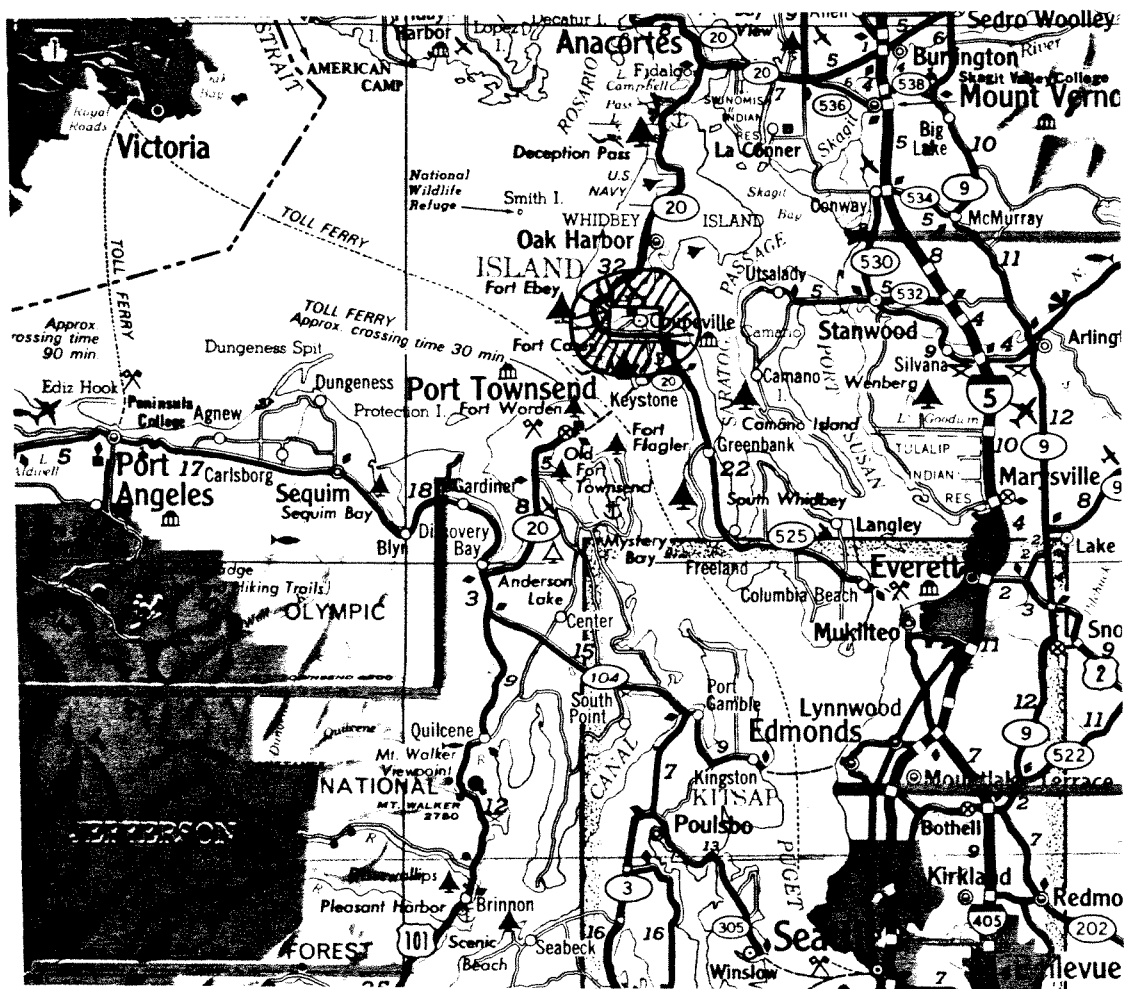
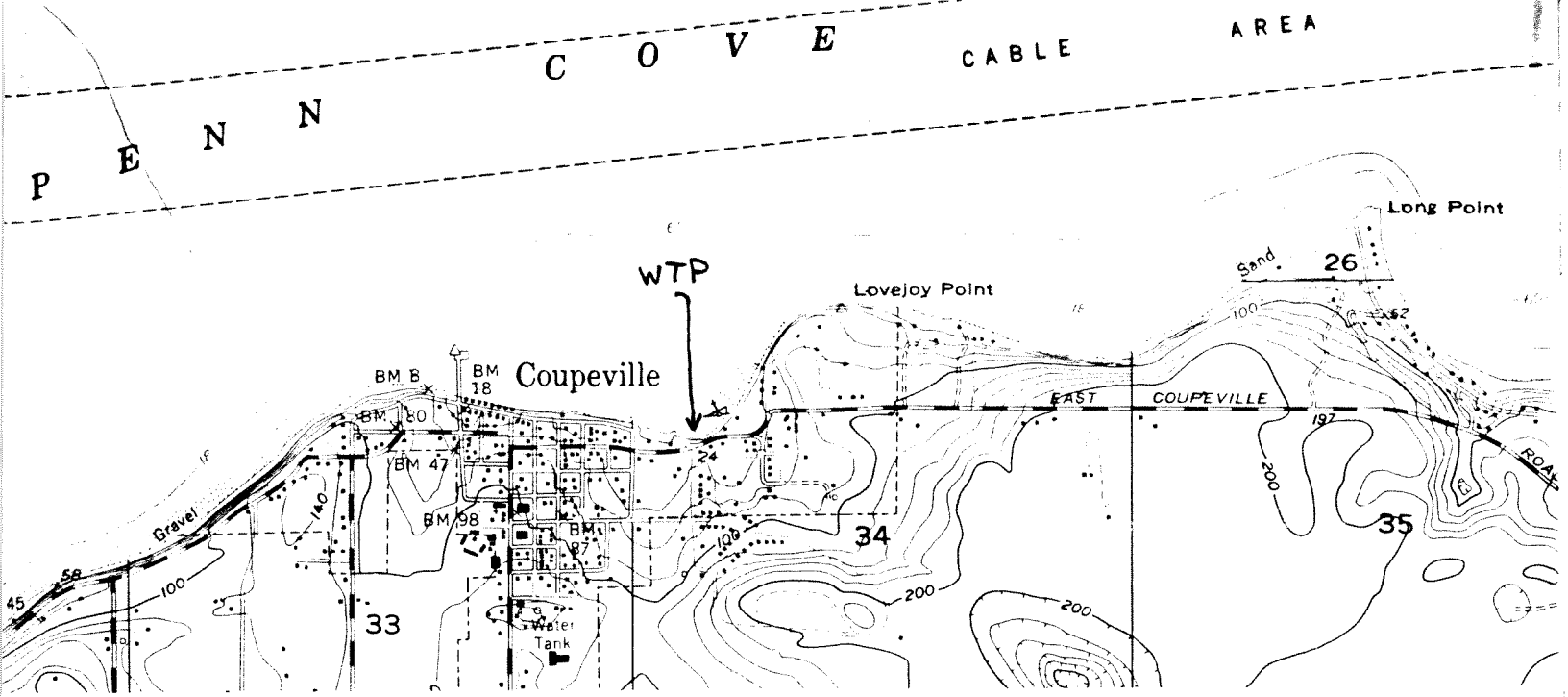


Figure 1. WTP location - Coupeville 1985.

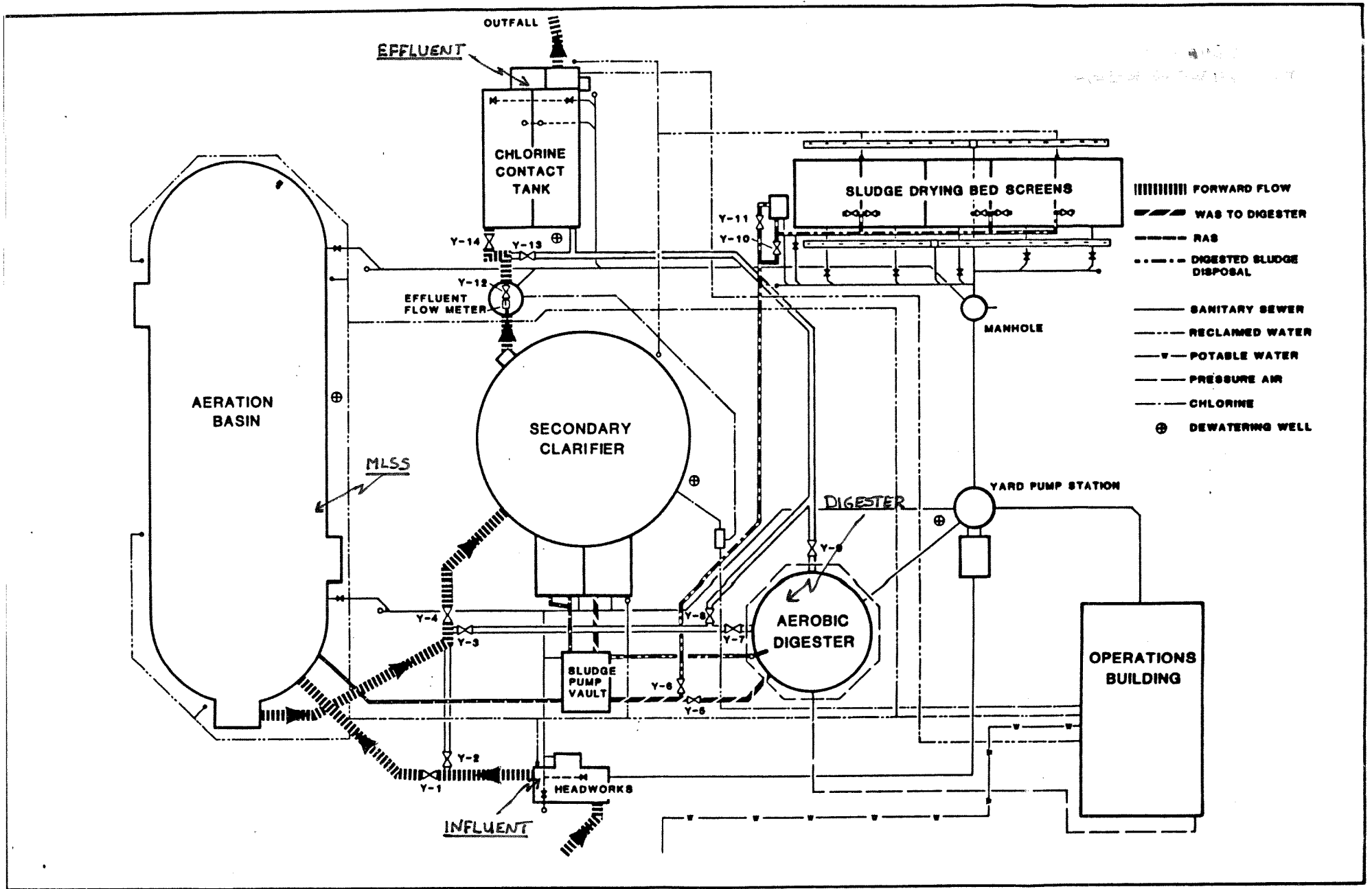


Figure 2. Plant layout and sampling locations - Coupeville 1985.

Table 1 Sampling schedule for Class II facility inspection performed at Cowpeville wastewater treatment plant, August 18-19, 1985.

Sample	Station Number	Date	Time	Field Analysis							Laboratory Analysis															
				pH	Conductivity	Temperature	Diss. Oxygen	Flow	Sudge Depth	Chl. Resid.	pH	Turbidity	Conductivity	COD	BOD	BOD (inhib.)	Solids (4)	Alkalinity	T. Hardness	Fecals	Oil & Grease	Metals	Nutrients (5)	NO ₃ -N, NO ₂ -N	F. Coli. (shellfish)	
				1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	
<u>Grab</u>																										
Influent (headworks)	1	8/19	1337	X	X	X					X	X	X	X	X		X	X			X		X			
		8/20	1130	X		X															X		X			
Oxidation Ditch	2	8/19	1357	X	X	X	X				X		X				X	X								
		8/20	1138	X		X	X																			
Aerobic Digester	3	8/19	1405	X	X	X	X															X		X		
		8/20	1150	X		X	X																			
Clarifier	4	8/19	1413	X		X	X		X																	
		8/20	1200	X		X	X																			
Return Activated Sludge	5	8/19	1421								X		X				X	X								
		8/20	1142	X		X																				
Effluent	6	8/19	1424	X		X				X	X	X	X	X		X	X	X	X	X	X		X			
		8/20	1230	X		X				X																
Receiving Water	7	8/19	1444	X		X	X				X	X	X							X			X		X	
	8	8/19	1450	X		X	X				X	X	X							X			X		X	
	9	8/19	1454	X		X	X				X	X	X							X			X		X	
<u>Composites</u>																										
Influent	1	8/20	1100	X		X					X	X	X	X	X		X	X	X			X	X			
Effluent	6	8/20	1115	X		X					X	X	X	X		X	X	X	X			X	X			

Table 2. Composite sample analytical results. Ecology Class II inspection performed at Coupeville wastewater treatment plant on August 19 and 20, 1985. All values in mg/L unless otherwise stated.

Parameter	Influent	Effluent
Flow (GPD)		77,000
pH (S.U.)	7.0	8.0
Conductivity (umhos/cm)	1,560	1,260
Turbidity (NTU)	52	3
COD	1,700	33
BOD ₅	400	--
BOD ₅ (inhibited)	--	5
Total solids	1,600	1,100
Total non-volatile solids	1,000	900
Total suspended solids	340	11
Total non-volatile suspended solids	130	3
Alkalinity	630	330
Total hardness	440	430
Nitrate-N	0.60	22.5
Nitrite-N	<0.10	<0.25
Ammonia-N	26.0	0.50
Orthophosphate-P	9.06	8.91
Total Phosphate-P	9.88	9.46

Table 3. Grab sample analytical results, Ecology Class II inspection performed at Coupeville wastewater treatment plant on August 19 and 20, 1985. All values in mg/L unless otherwise noted.

Station Name Station Number	Influent (Headworks)		Oxidation Ditch		Aerobic Digester		Clarifier		RAS	Effluent		Receiving Water				
	1	2	3	4	5	6	7	8	9	10	11	12	13			
Date	8/19	8/20	8/19	8/20	8/19	8/20	8/19	8/20	8/20	8/19	8/20	8/19	8/19	8/19		
Time	1337	1130	1357	1138	1405	1150	1413	1200	1142	1424	1230	1444	1450	1454		
<u>Field Parameters</u>																
Flow (GPD)											277,600	77,000				
pH (S.U.)	8.6	8.1	7.8	7.7	7.5	7.5	7.6	7.8	7.8	7.7	7.8	7.7	7.8	8.1		
Conductivity (umhos/cm)	1050	--	>1000	--	>1000	--	--	--	--	--	--	--	--	--		
Temperature (°C)	21.7	20.0	20.2	18.7	20.1	19.6	19.8	18.5	18.0	19.5	18.3	14.2	14.6	14.6		
Dissolved Oxygen	--	--	3.9	3.2	1.6	1.9	2.0	1.9	--	--	--	--	11.0	11.0		
Chlorine Residual (total/free)											1.5/	1.0/				
Sudge Depth (ft)											5	0.7	0.4			
<u>Laboratory Analysis</u>																
pH (S.U.)	7.2		7.2							7.1	7.6	7.7	7.9	7.9		
Conductivity (umhos/cm)	1290		1300							1370	1300	41,900	42,000	41,900		
Turbidity (NTU)	27		--								3	1	1	1		
COD	540										33					
BOD ₅	220										4					
Fecal Coliform (#/100 mL)	--											<1	<1	<1		
Nitrate-N	<0.1				<2.5						22.8	0.02	0.01	0.01		
Nitrite-N	<0.1				<2.5						<0.25	<0.01	<0.01	<0.01		
Ammonia-N	26.0				7.5						0.60	0.02	0.02	0.04		
Orthophosphate-P	6.6										9.01	0.12	0.10	0.09		
Total Phosphate-P	10.0										11.20	0.13	0.10	0.10		
Total Solids	1100		6300							7300	1100					
Total Non-volatile Solids	900		2500							2800	840					
Total Suspended Solids	110		5500							5900	1					
Total Non-volatile Susp. Solids	32		1500							1700	<1					
Total Hardness	--										430					
Alkalinity	470		570							660	360					
Oil & Grease	34										<1					
Fecal Coliform (#/100 gr - shellfish)												<20	20	50		

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Table 4. Comparison of Ecology inspection data to NPDES permit limits, town of Coupeville, August 19-20, 1985.

Parameter	NPDES Permit Limit		Class II Inspection Results	
	Monthly Average	Weekly Average	Final Effluent 24-hr. Comp.	Grab Sample
BOD5	30 mg/L 60 lbs/day	45 mg/L 94 lbs/day	5 mg/L 3.2 lbs/day	4 mg/L 2.6 lbs/day
Suspended Solids	30 mg/L 60 lbs/day	45 mg/L 94 lbs/day	11 mg/L 7 lbs/day	1 mg/L 0.6 lbs/day
Fecal Coliforms	200/100 mL	400/100 mL		3

Table 5. Sludge metals concentration - Coupeville, August 15, 1985.

Metal	Coupeville Sludge** (mg/Kg, dry wt.)	Previous Inspection Data*		Number of Samples
		Geometric Mean (mg/Kg, dry wt.)	Range (mg/Kg, dry wt.)	
Copper	<u>1236</u>	336	75 - 1700	28
Zinc	993	1160	165 - 3370	28
Nickel	42.5	22.4	<0.1 - 62	24
Chromium	58.8	59.8	15 - 300	28
Cadmium	4.9	6.9	<0.1 - 25	28
Lead	79.7	224	34 - 600	28

*Summary of data of digested sludge from activated sludge plants, collected from prior Class II inspections.

**Sludge solids = 1.48 percent.

 = Level is > geometric mean + 1 standard deviation.

Table 6. Flow measurements - Coupeville Class II inspection, August 19-20, 1985.

<u>Date</u>	<u>Time</u>	<u>Totalizer</u>	<u>Weir Measurement Instantaneous Flow, GPD</u>
8/19	1100	82530	
	1305		117,900
	1350	82542	
8/20	1044	82607	

Average flow rate, 1100 - 1350, 8/19 = 101,600 GPD
 Average flow rate during compositing period = 77,000 GPD

Table 7. Receiving water data - Coupeville Class II inspection, August 19-20, 1985.

<u>Date</u>	<u>Location</u>	<u>Fecal Coliforms</u>	
		<u>#/100 mL*</u>	<u>#/100 gm**</u>
9/82***	200' east of outfall	<1 - 18	540
	200' west of outfall	2 - 6	23
	Near outfall		79
8/83****	Near outfall	4.8	
9/83	Dock		2400
9/83	Near outfall	170	
8/85	200' east of outfall	<1	50
	200' west of outfall	<1	<20
	Near outfall	<1	20

*Water samples (water quality standard: geometric mean not to exceed 14 #/100 mL, ten percent not to exceed 43 #/100 mL in Class II waters).

**Shellfish tissue samples (FDA marketability standard: 240 #/100 gr).

***From samples collected by Tim Determan, Ecology.

****From "Penn Cove Water Quality Study," DSHS, Shellfish Sanitation Program, October 1983.