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M E M O R A N D U M

May 18, 1979

To: Chet Rock and Roger Stanley
From: Bill Yake
Subject: Crown Zellerbach - Port Townsend Class II Inspection

Introduction:

A Class II facility inspection was conducted at the Port Townsend Crown Zellerbach mill on April 10-11, 1979. DOE was represented by Greg Cloud and Bill Yake (Water and Wastewater Monitoring Section) and Chet Rock and Roger Stanley (Industrial Section). Mark McCrary represented Crown Zellerbach.

Two wastewater treatment systems were addressed. The major system treats process waters (10-15 MGD). Approximately 90 percent of this flow is routed through a primary clarifier to a large, aerated stabilization basin (ASB). This basin is curtained to provide plug flow. Floating aerators provide oxygen and mixing in the first portion of the basin. Settling is allowed in the latter portion of the basin. Approximately 10 percent of the flow (sea water and barometric condensor water) enters the system between the primary clarifier and the ASB. The total ASB effluent flow is measured by a two-foot Parshall flume and discharged into Port Townsend Harbor (waterway segment no. 09-17-01).

The second treatment system is a small (10,000-20,000 gpd) extended aeration plant which treats the sanitary waste waters of the plant. Wastewater is pumped from a wet well to an aeration basin. Aerated wastewater is then clarified, chlorinated, and discharged through a V-notch weir to the ASB discharge line.

The receiving water is Port Townsend Harbor (09-17-01), a Class A water, which is identified in the 5-year strategy as a water segment with insufficient data to ascertain its status with respect to the 1983 goals. The data which is presently available from ambient station PTH 005 (Port Townsend Harbor near Walan Point) tentatively indicates that this segment is probably meeting its Class A criteria and thus the 1983 goals.

Findings and Conclusions:

The ASB discharge was easily meeting NPDES permit limitations for BOD₅, suspended solids, and pH. The sanitary effluent has no permit limitations, but appeared to be achieving adequate treatment.

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The ASB discharge apparently had very low total and fecal coliform counts. These counts were well below those noted in other secondary pulp mill effluents, including the Crown Zellerbach ASB system at Camas. It is possible that the recent startup of the Port Townsend ASB with sludge obtained from St. Regis Paper Company's treatment system may in part explain the unusually low counts. This explanation is, however, purely speculative.

The ASB effluent Parshall flume was assessed to determine its accuracy. Although the dimensions of the flume were in close correspondence with specifications (see Figure 1, Parshall Flume), there were problems with approach and discharge design. The approach section allows only a short (about 5 feet) straight approach after a right angle turn. In addition, the joint between the approach channel and the converging section of the flumes is not smooth, leading to a substantial chop and a noisy flow record. The most serious design error, however, is the lack of an adequate discharge run. The channel is truncated by a cement wall with an inset outlet pipe. This backs up flow and appears to initiate submerged conditions at approximately 13-14 MGD. This means that recorded flow is somewhat higher than actual flow when flows exceed 13 MGD. Although actual flow is difficult to determine under these non-ideal conditions, flows recorded on the DMR's are probably within the ± 15 percent error limitations.

A question regarding the NPDES permit requirements for fecal coliform analyses on the sanitary effluent was raised. The permit states "This [fecal coliform] sampling and reporting requirement will be waived if permittee shows levels less than 100 fecal coliform organisms per 100 ml at residual chlorine levels of 1.0 ml/l." First, most permit references to chlorine residuals are written in terms of mg/l rather than ml/l (1 mg/l = 3.17 ml/l at standard temperature and pressure). Additionally, most test kits are calibrated in mg/l; and 1.0 mg/l total chlorine residual is typically sufficient to provide adequate disinfection. Total chlorine residuals of 4.0 and 6+ mg/l were recorded during the inspection. It should be possible to disinfect the waste stream with lower residuals although surging flows (caused by influent wet well pumping) may result in inadequate detention times. Excess chlorine residuals probably have minimal impact on the receiving water because the sanitary flow is low (14,400 gpd) and is discharged along with process flow which should dilute and consume residual chlorine.

Laboratory procedures and agreement of split sample results were excellent. Several suggested modifications of laboratory procedures are addressed in the following section (Review of Laboratory Procedures and Techniques).

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Review of Laboratory Procedures and Techniques:

Laboratory procedures were reviewed with Mark McCrary and other laboratory personnel. Procedures were, in general, very good. Several suggested refinements in techniques are given below.

BOD₅:

1. Samples are held up to four (4) days prior to analysis. This is not an accepted holding time, but is presently necessitated by a five-day work week for laboratory personnel. Modification of this procedure is left to your discretion.
2. DO drop in the dilution water blank is not determined. This should be included as a quality control check. Drops of greater than 0.3 mg/l indicate dilution water contamination. This drop may or may not be included in final calculations at the permittee's discretion.
3. Incubator temperature is regulated by reading the thermometer built into the top of the incubator. Because incubators can develop temperature gradients, it was suggested that a thermometer be placed in a water bath on the same shelf as incubating sample dilutions. This thermometer could then be used to regulate the incubator.

TSS:

Analysis correct, no problems.

BY:cp

Attachments

Class II Field Review and Sample Collection
24-Hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. Primary Influent aliquot - 250 ml/30 min	4/10/79 - 1020	In center of primary clarifier (in-welling)
2. ASB Influent aliquot - 250 ml/30 min	4/10/79 - 0955	Sample hose hooked to Y in C.Z. sampling line, aerated stabilization basin (ASB) influent
3. ASB Effluent aliquot - 250 ml/30 min	4/10/79 - 0930	At Parshall flume, aerated stabiliza- tion basin (ASB) effluent
4. Sanitary Influent aliquot - 250 ml/30 min	4/10/79 - 1110	Influent wet well
5. Sanitary Chlor. Eff. aliquot - 250 ml/30 min	4/10/79 - 1035	Discharge end of chlorine contact chamber

Grab Samples

Date and Time	Analysis	Sample Location
1. 4/11/79 - 0840	Total & Fecal Coliforms	ASB Effluent
2. 4/11/79 - 0955	Total & Fecal Coliforms	ASB Effluent
3. 4/11/79 - 0825	Fecal Coliforms, TRC	Sanitary Effluent
4. 4/11/79 - 0945	Fecal Coliforms, TRC	Sanitary Effluent

Field Data

Parameter	Date and Time	Sample Location	Result
Temp., pH, Spec. Cond.	4/10/79 - 1020	Primary Influent	See Results
Temp., pH, Spec. Cond.	4/10/79 - 0955	ASB Influent	See Results
Temp., pH, Spec. Cond.	4/10/79 - 0930	ASB Effluent	See Results
Temp., pH, Spec. Cond.	4/10/79 - 1035	Sanitary Effluent	See Results
Total Chlorine Residual	4/10/79 - 1035	Sanitary Effluent	>6.0 mg/l
Total Chlorine Residual	4/11/79 - 0825	Sanitary Effluent	4.0 mg/l
Total Chlorine Residual	4/11/79 - 0945	Sanitary Effluent	>6.0 mg/l

Class II Field Review and Sample Collection
24-Hour Composite Sampler Installations
(Continued)

Flow Measuring Device - Sanitary Treatment Facility

1. Type - 30° (actually 32.5°) V-notch weir
2. Dimensions - 12 inches deep, 7 inches across top of V
 - a. Meets standard criteria - NO. Base angle not standard. Weir box cramped, difficult to calibrate.
 - b. Accuracy Check*

	Actual Instan. Flow	Recorder Reading	Recorder Accuracy (% of inst. flow)
1.	4.31 gpm*	5.0 gpm	116%
2.	138 gpm*	84 gpm	60.8%

Is in need of calibration.

Flow Measuring Device - ASB Effluent

1. Type - Parshall Flume
2. Dimension - 2-foot throat
 - a. Meets standard criteria - YES, with reservations. Insufficient straight approach and rough bevels from approach to flume lead to surging in head well. Insufficient discharge distance leads to submergence at flows above 14 MGD and overestimations of higher flows.
 - b. Accuracy check - Based on actual head vs. totalizer. Does not account for submergence and other design imperfections.**

	Actual Instan. Flow	Totalizer Flow	Recorder Accuracy (% of inst. flow)
1.	14.05	13.80	101.8%

Is within 15% error limitations.

* = $Q(\text{cfs}) = 0.729 H^{5/2}$, gpm = cfs (449), based on 32.5° base angle.
 ** = See text.

The following table is a comparison of laboratory results from 24-hour composite(s) together with NPDES permit effluent limitations. Additional results pertinent to this inspection have also been included.

	Pulping Wastewater Treatment System			Crown Zellerbach - Results			NPDES (Daily average)
	DOE - Results						
	Primary Inf.	ASB Influent	ASB Eff.	Prim. Inf.	ASB Eff.	ASB Eff.	
BOD ₅ mg/l	236	184	7		210	6.86	--
lbs/day		22,250	847		25,400	830	2,400
TSS mg/l	278	152	8.6		142	8.9	--
lbs/day		18,380	1,040		17,170	1,076	5,100
Total Plant Flow MGD						14.5	
COD (mg/l)	895	724	457				
PBI (mg/l)	4,186	2,387	1,193				
Total Coli. (#/100 ml)			<100 ¹ <100 ²				
Fecal Coli. (#/100 ml)			<10 ¹ <10 ²				
pH (S.U.)	10.9 11.0* 11.1**	9.5 9.2* 9.6**	7.6 7.4* 7.6**				6-9
Specific Cond. (µmhos/cm)	1,650 2,050* 1,450**	14,600 >10,000* >10,000**	10,540 8,500* 9,500**				
NH ₃ -N (mg/l)	3.1	10.4	5.2				
NO ₂ -N (mg/l)	0.1	<0.1	<0.1				
NO ₃ -N (mg/l)	<0.1	0.2	<0.1				
O-PO ₄ -P (mg/l)	1.2	1.1	0.7				
T-PO ₄ -P (mg/l)	1.3	1.2	0.9				
TS (mg/l)	1,433	8,032	5,774				
TNVS (mg/l)	906	6,998	4,980				
TSS (mg/l)	278	152	8.6				
TNVSS (mg/l)	106	16	1				
Turbidity (NTU's)	60	66	12				
Color (C.U.'s)	4,186	2,387	1,193				
Temperature (°C)	25.5*	23.5*	17.0*				

*Field Analysis - grab "<" is "less than" and ">" is "greater than"

**Field Analysis - composite

¹Grab - 4/11/79 - 0840

²Grab - 4/11/79 - 0955

Table 2 Sanitary Wastewater Treatment System

	DOE - Results	
	Influent	Chlorinated Effluent
BOD (mg/l)	37	<2
lbs/day	4.44 [†]	<0.24 [†]
TSS (mg/l)	46	20
lbs/day	5.52 [†]	2.40 [†]
Total Plant Flow MGD		0.0144 [†]
COD (mg/l)	55	38
Fecal Coli. (#/100 ml)		<10 ¹ <10 ²
Tot. Res. Chlorine (mg/l)		4.0 ¹ 6.0 ²
pH (S.U.'s)	7.9	7.2 8.7*
	7.9**	7.1**
Specific Cond. (μmhos/cm)	262	229 205* 205*
	225**	
NH ₃ -N (mg/l)	>0.1	>0.3
NO ₂ -N (mg/l)	>0.1	>0.1
NO ₃ -N (mg/l)	0.2	0.3
O-PO ₄ -P (mg/l)	1.3	1.0
T-PO ₄ -P (mg/l)	1.5	1.5
TS (mg/l)	134	113
TNVS (mg/l)	70	53
TSS	46	20
TNVSS (mg/l)	6.6	2
Temperature (°C)		12.0
Color (C.U.'s)	29	54
Turbidity (NTU's)	10	7
PBI (mg/l)	41	0

*Field analysis - grab
**Field analysis - composite

¹Grab - 4/11/79 - 0825

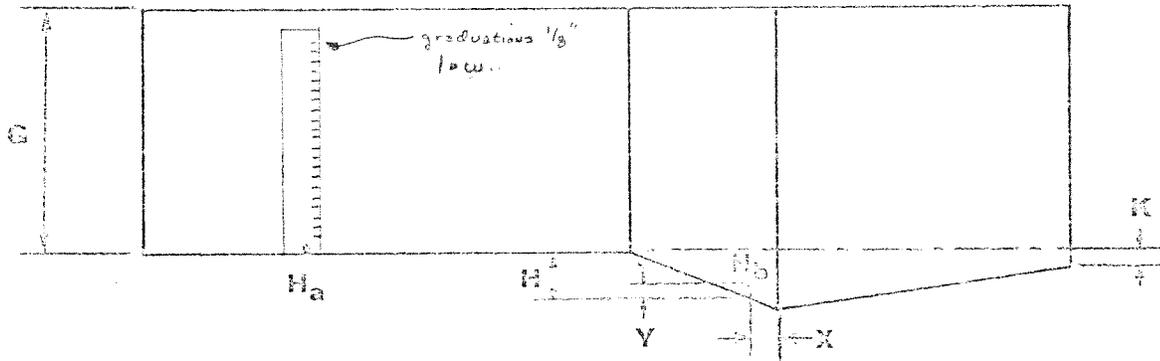
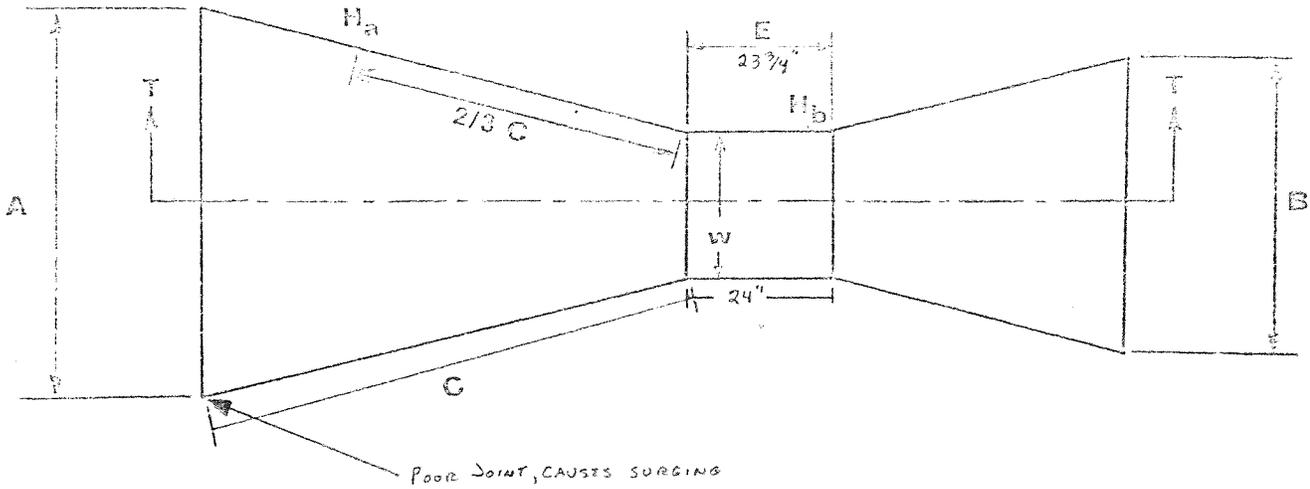
²Grab - 4/11/79 - 0945

[†]Based on effluent totalizer which was inaccurate. Total actual flow and loadings probably 20-30 percent higher.

Figure 1

PARSHALL FLUME: - CROWN ZELLER BACH, PORT TOWNSEND

Dimensions & Flow



Code	Spec's	Measured	Time	H ₁	H ₂	Theoretical Flow	Recorded Flow
A	47 1/2"	47 3/4"	1135	22 7/8"	-	14.1	13.8
B	36"	35 1/2"					
C	60"	60"					
2/3 C	40"	40 1/2"					
E	24"	24"					
G	36"	35 7/8"					
H							
K	3"	2 1/8"					
W	24"	24"					
X							
Y							