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STATE OF WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
Olympia, Washington 98504 206/753 2800

M E M O R A N D U M

May 1, 1978

To: Ron Robinson

From: Bill Yake, Mike Morhous

Re: Sumner STP
Class II Inspection

Findings and Conclusions:

A Class II inspection of the Sumner STP was carried out on March 14-15, 1978. There is an activated sludge plant with aerobic sludge digestion. Hal Stahlhut (lab man) was our contact at the plant. This inspection was carried out in conjunctin with a Class II inspection at Standard Brands which provides approximately 30% of the flow to the Sumner plant.

Composite samples were collected from the plant's flow-proportioned influent and effluent samplers. Secondary clarifier effluent was sampled with a portable composite sampler. All samples were split with plant personnel for comparison.

The plant was in compliance with NPDES permit limitations for BOD_5 and pH during the sampling period. Final effluent suspended solids were in excess of monthly average permit limitations (30 mg/l) based on DOE laboratory results (38 mg/l). Secondary clarifier effluent and the plant's analyses of the final effluent composite were, however, within this limitation. Chlorine residual was measured in the field. Grab samples collected on both days were in excess of the permit limitation.

The Sumner plant has experienced difficulties with bulking sludge and high effluent BOD_5 values, particularly during the summer. Plant personnel believe nitrification-denitrification may be responsible for both phenomena. Although some floating sludge was observed during the inspection, the problem was not severe. The plant was in the process of decreasing mean cell residence time (i.e. increasing sludge wasting) to decrease the potential for nitrification. The evidence for the occurrence of nitrification-denitrification at the time of inspection is mixed:

1) Plant personnel report substantial D.O. concentrations in the secondary clarifier making denitrification unlikely unless anaerobic conditions have developed in the sludge near the clarifier bottom.

2) Secondary clarifier effluent showed a BOD_5 of 33 mg/l compared to a final effluent BOD_5 of 13 to 14 mg/l. The plant's chlorinated final effluent sample was reseeded with settled Sumner STP influent and DOE's

final effluent sample was reseeded with Olympia STP's settled effluent. The difference in values may, in part, be due to the presence of nitrifiers and NOD (nitrogenous oxygen demand) which could, theoretically raise the measured oxygen demand by approximately 9.5 mg/l (based on NH_3-N = 2.1 mg/l, NO_2-N = .4 mg/l).

3) The nitrogen consumption within the plant is very close to theoretical requirements for sludge growth, and is in good agreement with phosphorus consumption. This would leave little nitrogen available for ultimate denitrification, mediating against significant denitrification at the time of sampling. The following table presents theoretical nitrogen and phosphorus removals based on assumed sludge yields of .50 and .65 lbs. of sludge wasted/lb. of BOD_5 removed.

Nutrient Consumption

Sludge Yield	BOD_5 Removal	N-Requirements*	P-Requirements**	N-Removal (Actual)	P-Removal (Actual)
0.50	300 mg/l	21	4.5	24.6-26.8	5.8-6.0
0.65	300 mg/l	27	5.9	24.6-26.8	5.8-6.0

* (BOD_5 removed-mg/l)(.14)(sludge yield)

** (BOD_5 removal-mg/l)(.03)(sludge yield)

The ratio of N-Removed:P-Removed is about 4.36. This compares favorably with the theoretical N:P ratio required for sludge cells (4.67). Thus denitrification appears to have been minimal at the time of sampling.

4) A significant drop in alkalinity through the plant may be attributable to nitrification.

The prevalence of nitrification-denitrification in the Sumner STP is open to question. Nitrification may be occurring, but denitrification appeared to be minimal.

A similar sampling carried out during a period of severe sludge bulking might clarify the question. Sampling for the presence of nitrifiers in the aeration tank mixed liquor and denitrifiers in the secondary clarifier would provide additional evidence. It is worth noting that significant pH variations were noted in Standard Brands effluent. Standard Brands has adjusted its discharge scheme. While molasses condensate (thus BOD_5 loading) is now being equalized, sharp variations in pH (caused primarily by caustic tank cleaning solutions) are not equalized. This may be responsible for some of the sludge settling difficulties experienced.

Another distinctly possible reason for occasional poor sludge settleability is the nutrient deficient state of Standard Brands effluent. During the sampling period Standard Brands discharged approximately 1690 lbs. of BOD_5, while the total amount of organic loading to the Sumner STP was approximately 2330 lbs. of BOD_5. Thus, about 73% of the organic load at the Sumner plant was contributed by Standard Brands. Analysis of Standard Brands effluent indicates that it is nutrient deficient especially with respect to phosphorus (see Standard Brands Class II report, March 14-15, 1978.) The following table characterizes the nutrient status of the wastewaters involved.

BOD_5: Nutrient Ratios - Sumner STP and Standard Brands

	BOD_5: Total Nitrogen:Total Phosphorus
Standard Brands effluent	100: 4.5: 0.3
Sumner STP Influent	100: 13: 2.7
Theoretical minimum ratio	100: 5: 1

At the time of sampling the influent nutrient ratio at the Sumner STP was adequate, indicating that other wastewater sources were compensating for the deficiency of nutrients in Standard Brands effluent. However, it is likely that on both an instantaneous basis, as well as for substantial periods of time when Standard Brands is contributing an even greater percentage of total organic loading, nutrient concentrations may fall below minimum requirements.

In general, laboratory procedures were excellent and plant personnel are very competent and conscientious in dealing with the operational problems posed at the plant. The plant's analysis of NH_3-N was, however, questionable. The purchase of a new set of solutions for their test kit may improve this determination.

BY:MM:ee

cc: Central Files
Dick Cunningham

24 Hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. Influent aliquot - Flow proportional	3/14/78 - 1000	Plant sampling line - outfall of preaeratic Grit chamber
2. Unchlorinated effluent aliquot - 250 ml/35 min.	3/14/78 - 0950	Outfall secondary clarifier
3. Chlorinated effluent aliquot - Flow proportional	3/14/78 - 1005	Plant sampling line - right 1/2 of contact chamber.

Grab Samples

	Date and Time	Analysis	Sample Location
1.	3/15/78 - 0945	Fecal coliform	Exit of chlorine contact chamber
2.	3/14/78 - 1710	Fecal coliform	Exit of chlorine contact chamber
3.			
4.			
5.			
6.			

Flow Measuring Device

1. Type - Parshall flume
2. Dimensions - 12" throat

a. Meets standard criteria

[X] Yes

[ ] No Explain:

b. Accuracy check

	Actual Instan. Flow	Recorder Reading	Recorder Accuracy (% of inst. flow)
1.	1.39 mgd	1.29 mgd	92.8%
2.	1.50 mgd	1.50 mgd	100%
3.			

[X] is within accepted 15% error limitations

[ ] is in need of calibration

Field Data

Parameter	Date and Time	Sample Location	Result
pH, Cond., Temp.	3/14/78 - 1350	Influent	See results section
pH, Cond., Temp.	3/14/78 - 1410	Unchlor. Eff.	" " "
pH, Cond., Temp.	3/14/78 - 1420	Chlor. Eff.	" " "

Review of Laboratory Procedures and Techniques

Laboratory results were reviewed with Hal Stalhut. All laboratory procedures and techniques were quite acceptable. However in view of the orthotolidine procedure used for total chlorine residual analysis, it was recommended that an acceptable methodology be incorporated i.e. DPD. Hal indicated that a letter from our department to the STP requesting this change in total chlorine residual procedures would be necessary before the lab could purchase the equipment required for compliance. I assume this letter will originate from your office. If you have any questions feel free to contact Mike Morhous at 753-2006.

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.

	DOE			Sumner STP			NPDES (Monthly average)
	Influent	Sec. Clar. Eff.	Chlor. Eff.	Influent	Sec. Clar Eff.	Chlor. Eff.	
BOD_5 mg/l	309	33	13	335	- -	14	30
lbs/day	2330	249	98	2530		106	500
TSS mg/l	260	21	38	266		24	30
lbs/day	1962	158	287	2010		181	500
Total Plant Flow MGD						0.905 MGD	
COD mg/l	609	99	99				
Alkalinity ppm as $CaCO_3$	173	- -	109				
Turb. (JTU's)	66	8	11				
NH_3-N mg/l	17.0	2.1	3.3			8.0	
NO_2-N mg/l	< .02	.4	.4				
NO_3-N mg/l	.8	6.8	7.8				
Organic N mg/l	22.0	3.7	3.7				
Total N mg/l	39.8	13.0	15.2				
Kjn N mg/l	39.0	5.8	7.0				
O-PO_4-P mg/l	4.2	2.0	2.2				
T-PO_4-P mg/l	8.4	2.6	2.4				
TSS mg/l	260	21	38	266		24	
TNVSS mg/l	36	0	0				
TS mg/l	850	468	479				
TSNVS mg/l	487	363	368				
Sett. Sol. ml/l		Sec.Clar.Inf. 350*					
Fecal Coli. (#/100 ml)			10 est.				200
Chlor. Res. (mg/l)			10 est. 2.25* 1.0*				0.5

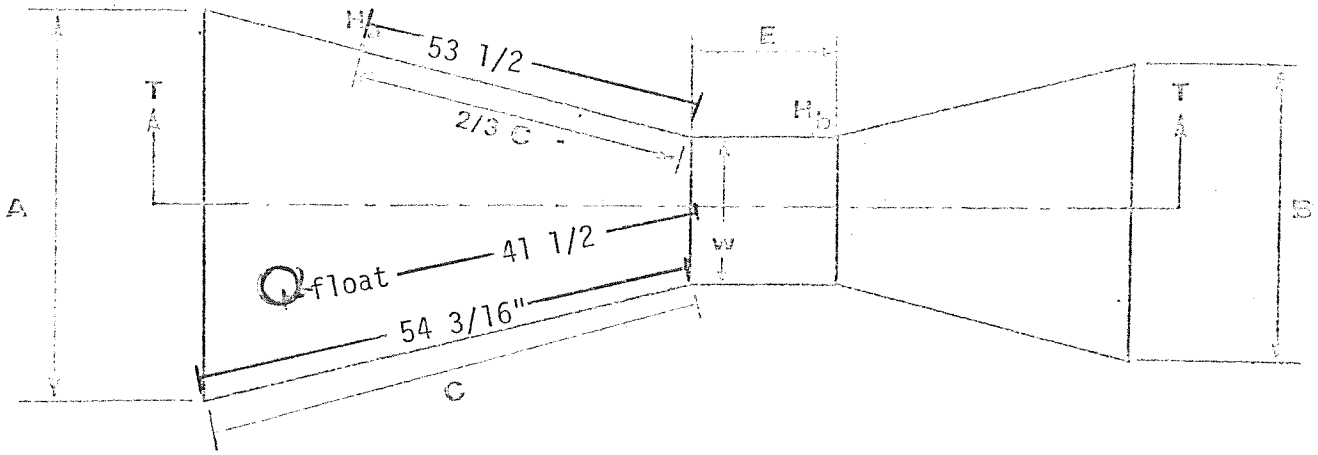
* Field Analysis grab "<" is "less than" and ">" is "greater than"

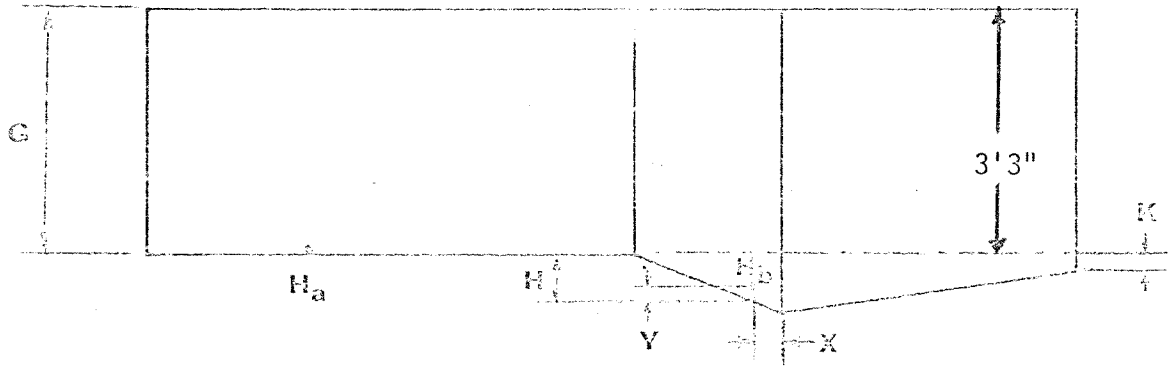
	DOE			NPDES (Monthly Average)
	Influent	Sec. Clar. Eff.	Chlor. Eff	
Temp. °C	16°C*	14°C*	14°C*	
pH	7.1 6.9*	7.4 6.8*	7.4 6.6*	6.5-8.5
Cond. µmhos/cm	942 1400* 1025**	779 780* 700**	741 710* 825**	
	Sludge			
Cu mg/kg (dry wt.)	370			
Cr mg/Kg " "	37			
Cd mg/Kg " "	3			
Zn mg/Kg " "	920			
Pb mg/Kg " "	140			

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

PARSHALL FLUME: Sumner effluent preformed set in place

Dimensions & Flow





Code	Spec's	Measured
A	33 1/4"	33 3/16"
B	24"	23 5/16"
C		
2/3 C	36"	Staff at 35 1/4, float at 41 1/2
E	24"	23 3/4"
G	36"	36 1/4"
H		
K	3"	2 3/4"
W	12"	12" in middle
X		
Y		

Time	Ha	Hb	Theoretical Flow	Recorded Flow
	.505		1.5 mgd	1.5 script chart needle

Remarks: Flume level.