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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

October 30, 1978

To: John Glynn

From: Mike Morhous

Re: Mt. Vernon STP
Class II Inspection

INTRODUCTION

On July 11-12, 1978 a Class II inspection was conducted by Mike Morhous and Greg Cloud of the Water and Wastewater Monitoring Section of the Department of Ecology. The Mt. Vernon STP is a secondary (Activated Biological Filter - ABF Tower) wastewater treatment facility. The final effluent is discharged to the Skagit River.

Those persons present during the inspection were John Glynn - DOE Northwest Region, Chuck Saunders - Plant Superintendent and Bill Fuller - Plant Operator I. Ken Mosbaugh representing the Environmental Protection Agency, Region X was present on the second day of the inspection, July 12, to audit DOE Class II procedures.

Prior to our arrival at the STP, we installed automatic composite samplers at three manhole stations in the City of Mt. Vernon. The purpose of this sampling was to detect possible toxic wastes, specifically trace metals, being discharged to the STP. The following list describes the sampling stations and respective commercial dischargers. Station location is provided in the "24 Hour Composite Sampler Installation" section of this memo.

Station	Commercial Dischargers
#1 manhole	Washington Cheese Co., Draper Poultry, a dairy and a newspaper printer
#2 manhole	Blade Chevrolet, Evergreen International Inc., and Farrell's Wrecking Yard
#3 manhole	Coca Cola distributor and a metal plating shop

At the #2 manhole station, it was not feasible to install the composite sampler. Therefore, a manual composite was collected.

Findings and Conclusions

The Mt. Vernon STP has been experiencing digester and ABF tower failures and difficulty in meeting secondary limitations. At the time of this inspection, the STP was not meeting the NPDES BOD_5 concentration limitation. The remaining NPDES limitations were being met although the total suspended solids concentration was marginal.

During the inspection, sampling was conducted for a possible toxicity problem with regard to metals concentrations. Higher than normal concentrations of lead and copper were found in the STP's influent and sludges. This may indicate a metals toxicity problem. However the samplers installed in town failed to provide an indication as to the source or sources of these metals. Table 1 shows Mt. Vernon's trace metal concentrations in comparison with the means of trace metal concentration data collected during Washington State Class II inspections. All data used in this comparison were collected from municipal secondary treatment plants within the last two years. The results from three plants were utilized for the influent concentrations mean. The results from 24 plants were utilized for the sludge concentration mean. Toxic thresholds are also included.

Table I. Trace Metal Concentrations and Toxic Limits

	Influent (mg/l)			Sludge (dry wgt. mg/Kg)		
Parameter	Mean* Concen.	Mt. Vernon	Threshold 1/ Concen.	Mean* Concen.	Mt. Vernon Aerobic	Mt. Vernon Anaerobic
Cu	.08	.27	.005 to 0.5 2/	545.0	1400	1230
Cd	<.01	<.01		11.7	8.8	9.1
Cr	<.03	<.01		150.0	50	51
Pb	<.05	.15	0.1 3/	535.0	1200	2200
Zn	.30	.34	.08 to .5 2/	1845.0	1850	1660

* See text

1/ MOP/8 1977 Water Pollution Control Federation Table 14-III

2/ Threshold concentration inhibitary to the activated sludge nitrification process

3/ Threshold concentration inhibitary to activated sludge Carbonaceous BOD Removal

The nutrient data obtained from the STP influent/effluent composites showed that little or no nitrification was occurring at the time of the inspection (Table II). Table I indicates that the nitrification process

was probably being inhibited by the concentrations of copper and zinc found in the influent at the time of this inspection. The concentration of lead in the influent was possibly high enough to inhibit the plant's efficiency in reducing the carbonaceous biochemical oxygen demand.

In summary, it appears a portion of the total efficiency problem experienced by the STP may be attributed to metals toxicity, specifically: copper, lead and zinc.

Laboratory procedures were reviewed and appeared quite satisfactory with respect to comparison of split sample results.

The STP's flow measuring device, a Sparling propeller, was checked for accuracy by comparing the recorded flow with the calculated flow over a suppressed rectangular weir at the outfall end of the chlorine contact chamber. This was accomplished using an engineer's level and rod to determine the crest and head elevations. It was noticed, while checking the propeller meter, that the needle in the instantaneous flow dial was broken. Repair of this dial needle would increase the precision of the accuracy check. In view of the methodology implemented during this check, I would suggest a subsequent accuracy check after the dial has been repaired.

MM:ee

Attachments

cc: Dick Cunningham
Bill Yake
Central Files through Skip Harlan

Review of Laboratory Procedures and Techniques

Laboratory procedures were reviewed with Bill Fuller. Procedures appeared quite adequate and the DOE and STP results (Table II) were in close agreement.

Total Residual Chlorine

The lab uses the amperometric titration method for determining total residual chlorine.

BOD_5

The lab uses the Winkler Azide Modification procedure for determining dissolved oxygen in conjunction with the BOD test. Two discrepancies were noted with regard to the chlorinated effluent BOD_5. First, the lab was not checking the composite sample for a chlorine residual. Second, the lab was not reseeding the sample when setting up the BOD test. Dechlorination and reseeding procedures were reviewed with Bill and a copy of DOE's "Laboratory Test Procedure for Biochemical Oxygen Demand, 1977" was given to him for reference.

The comparison of chlorinated effluent BOD_5 results showed an insignificant difference between DOE's value using the reseeding technique and the STP's value with no reseeding technique used. In view of the circumstances, it was suggested that the STP conduct a comparison of reseeded versus non-reseeded BOD_5 tests. If the STP wishes to implement the non-reseeding technique for the chlorinated effluent BOD_5 test, a copy of the comparison test results must be sent to the DOE Northwest Regional Office for review. In accordance with the NPDES permit (S2,f) written approval by the Department of Ecology is required prior to implementing a procedure which deviates from Standard Methods. In the event the non-reseeding technique is approved, it is requested that the STP continue to conduct a comparison of these two techniques each month. This would provide a quality check on the accuracy of the chlorinated effluent BOD_5 results on a continuing basis. The results of all BOD_5 technique comparisons should be documented together with raw lab data sheets and kept on file at the plant.

Recommendations

1) Check the chlorine residual of the chlorinated effluent composite samples and dechlorinate as needed.

2) Incorporate reseeding procedures when running BODs on the chlorinated effluent.

3) Obtain written approval from the Department of Ecology prior to implementing a technique which deviates from the reseeding procedures presently required.

Fecal Coliform

The lab uses the membrane filter procedure for fecal coliform analysis together with commercially prepared M-FC medium. The lab runs a blank at the beginning of the test. It was suggested that a blank also be run occasionally at the end of the test as a check on the thoroughness of the final rinses. Procedures appeared to be well in order.

TSS

The lab uses the coliform filtering apparatus for TSS and Reeve Angel 934 AH glass fiber filter papers. Bill indicated that 30-40 mls and 100 mls was normally filtered for the influent and final effluent respectively. The filtering times were both approximately 15 seconds.

As a check for the optimum volume of sample to be filtered during this analysis, the following guideline should be used. The sample volume should be sufficient to reduce the initial filtration rate by approximately 50-60 per cent at the end of the sample filtering period. Sample volumes should be adjusted accordingly. This may necessitate filtering a portion of the sample, prior to the analysis, to determine the sample volume required. In no case should the total sample volume filtered be less than 50 mls. Duplicate or triplicate filtrations become necessary when the filterable sample volume is less than 50 mls.

Recommendations;

1) Utilize the sample filtration rate as a guide to the optimum volume of sample to be filtered during the test.

2) Filter a minimum of 50 mls of sample, utilizing duplicate or triplicate samples if necessary.

24 Hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. #1 manhole [1/] aliquot - 250 ml/30 min.	7/11 @ 0845	East side of Riverside Dr. @ Mt. Vernon Trailer Supplies
2. #2 manhole [2/] aliquot - 6 - 500 ml samples collected 7/11-12/78		West side of Freeway Dr. between College Way and Evergreen International, Inc.
3. #3 manhole aliquot - 250 ml/30 min.	7/11 @ 0930	Intersection of Cleveland and Blackburn

NOTE: Flow proportional composite samplers were used to collect the STP influent and chlorinated effluent composites and Wn. Cheese waste discharge composite.

Grab Samples

	Date and Time	Analysis	Sample Location
1.	7/11 @ 0930	Heavy Metals	Anaerobic digester sludge
2.	7/11 @ 1100	Heavy Metals	Aerobic digester sludge
3.	7/11 @ 1510	Total Oils	#2 manhole
4.	7/12 @ 0930	Fecal Coliform	Chlorine contact chamber outfall
5.			
6.			

Flow Measuring Device

1. Type : Sparling propeller meter
2. Dimensions

a. Meets standard criteria

☐ Yes

☐ No Explain:

b. Accuracy check

	Actual Instan. Flow	Recorder Reading	Recorder Accuracy (% of inst. flow)
1.	1.7 mgd	2.0 mgd	118% (18% error)
2.			
3.			

☐ is within accepted 15% error limitations

☐ is in need of calibration

See Findings and Conclusions

Field Data

Parameter	Date and Time	Sample Location	Result
Cl_2 Residual, pH, Cond.	7/11 @ 1030	Chl. Eff.	0.5 ppm, 7.0, 375 µmhos/cm
pH, Cond.	7/11 @ 1135	#2 manhole	7.9, 325 µmhos/cm
Cl_2 Residual	7/12 @ 0930	Chl. Eff.	0.25 ppm

1/ Incomplete 24 hr. composite, dead battery

2/ Manual grab composite

TABLE II

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.

	STP Inf.	DOE STP Chl. Eff.	Cheese Processor Eff.	STP Inf.	STP Chl. Eff.	Cheese Processor Eff.	NPDES (Monthly average)
BOD_5 mg/l	377	53	1750	380	55	1800	30
lbs/day (% removal)	4686	659 (86)	584	4723	684	600	1000
TSS mg/l	216	30		214	33		30
lbs/day (% removal)	2685	373 (86)		2660	410		1000
Total Plant Flow MGD					1.49	.04	not to exceed 4.0
Fecal Coliform Colonies/100 mls @ 0930 - 7/12		est. 25					200
* Chlorine Residual ppm @ 0930 - 7/12		.25					
COD mg/l	670	140		813	152	2352	
pH	6.9	7.2	7.8				6.5 to 8.5
Sp. Cond. µmhos/cm	541	490	927				
NO_3-N (filt.) mg/l	<.02	<.02	<.02				
NO_2-N (filt.) mg/l	<.02	<.02	<.02				
NH_3-N (unfilt.) mg/l	17.6	15.0	2.6				
T. Kjeldahl-N (unfilt.) mg/l	24.	28	75				
O-PO_4-P (filtered) mg/l	4.2	6.5	26				
Total Phos.-P (unfilt.) mg/l	8.3	6.8	35				
Total Solids mg/l	551	264	1700				
Total Non Vol. Solids mg/l	227	180	532				
Total Susp. Non Vol. Solids mg/l	48	7	16				

* Field Analysis
DPD Chl. Kit

"<" is "less than" and ">" is "greater than"

Additional DOE Results

	DOE						
	Manhole #1	Manhole #2	Manhole #3	STP Inf. 1/	STP Chl. Eff 1/	Anaerobic Dig. Sludge (STP) 1/	Aerobic Dig.Sluc (STP) 1/
pH	6.9	7.4	7.3				
Sp. Cond. µmhos/cm	572	914	475				
COD mg/l		930	330				
BOD_5 mg/l	420						
Total Oils 1/ mg/l		43					
NO_3-N (filt.) mg/l	<.02						
NO_2-N (filt.) mg/l	<.02						
NH_3-N (unfilt) mg/l	15.6						
T. Kjeldahl-N (unfilt.) mg/l	36						
O-PO_4-P (filt) mg/l	10.5						
T. Phos-P (unfilt) mg/l	14						
Total Solids mg/l	550	522	352				
T. Non Vol. Solids mg/l	245	262	170				
T. Susp. Solids mg/l	140	124	128				
T. Susp. Non Vol. Solids mg/l	20	32	28				
Percent Solids						4.5	2.4
Copper	.23	.26	.24	0.27	.08	1230*	1400*
Chromium	<.01	<.01	<.01	<.01	<.01	50*	51*
Lead	<.05	.10	<.05	.15	<.05	2200*	1200*
Zinc	.22	.28	.21	.34	.07	1660*	1850*
Cadmium	<.01	<.01	<.01	<.01	<.01	9.1*	8.8*

"<" is "less than" and ">" is "greater than"

1/ Grab Sample * Results in mg/Kg dry wt., all other metals results are mg/l