Segment No. 05-10-05

Publication No. 79-e14

WA-10-1032

STATE OF WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, Olympia, Washington 98504 206/753-2353

MEMORANDUM

October 25, 1979

To: Dave Nunnallee

From: Eric Egbers and Greg Cloud

Subject: Enumclaw Sewage Treatment Plant Class II Inspection

Introduction

A Class II sampling inspection was conducted at the Enumclaw sewage treatment plant (STP) on June 26-27, 1979. Those in attendance were Jim Crossler (Chief Plant Operator), Dave Nunnallee and Mike Dawda (Department of Ecology Northwest Region personnel), and Eric Egbers and Greg Cloud (Department of Ecology, Water and Wastewater Monitoring Section personnel). Curt Larson (Kramer, Chin and Mayo, Inc.) was also present.

The Enumclaw plant is a secondary (trickling filter) treatment facility. Influent flow enters parallel grit chambers, proceeds through an ineffective in-line flow meter, bypasses a comminutor, and enters a circular primary clarifier. The clarified wastewater is pumped to the trickling filter where biological treatment occurs. A portion of the treated wastewater is recycled to the primary clarifier; the remainder leaves the filter, is chlorinated, and proceeds to a circular final clarifier that is used also as a chlorine contact chamber.

The flow leaves the clarifier and enters the White River, surface water segment number 05-10-05, at river mile 23.1. The five-year water quality strategy identifies this segment as presently not meeting the state and federal water quality goals for fecal coliform, pH, and turbidity due primarily to non-point sources of wastewater (animal waste). The treatment facility's contribution is probably minimal to the non attainment of the goal.

This treatment plant is not only receiving wastewater from the town of Enumclaw, but also from one of the town's largest industries, Farman Brothers' Pickle Plant. One of the major concerns of the Northwest Regional Office was to define the impact of wastewater from Farman's on the treatment plant. An effluent composite sampler, continuous pH recorder, and flow totalizer were installed at Farman's. The results and discussion of data obtained from this sampling are attached (Appendix 1) to this memorandum.

The Enumclaw STP is undergoing major reconstruction. Influent entering the plant had been split, with a lesser portion entering the primary clarifier directly, while the major portion flowing through the grit chambers to the clarifier. Since the in-line flow meter is of little value (explained elsewhere in this memo), and since it was impossible to obtain accurate effluent flows, plant flow was not taken. Because there was no way to directly obtain flows, calculation of accurate loadings was not possible. Flows were estimated as explained in the text. Loadings were based on these estimated flows.

Findings and Conclusions

The Enumclaw STP was meeting NPDES monthly average permit limitations for fecal coliform and pH (see Table 1). Biochemical Oxygen Demand, as BOD_5 (mg/l), results exceeded permit limitation by almost 4 times. Total Suspended Solids (TSS) results were slightly in excess of permit limitations. The overall condition of the plant may explain, in part, the non-compliance.

As influent enters the plant, two bar screens trap the large debris. The flow bypasses the comminutor and enters the primary clarifier. The debris that gets past the bar screens ends up in the clarifier and a portion is passed on to the distribution arms of the trickling filter, thus clogging the distribution nozzles. Without even distribution of the clarified wastewater, the efficiency of the filter is impaired. Portions of the media are overloaded while other portions are not being utilized. This also may explain the large populations of filter flies (*Psychoda*), because flies can not survive on surfaces which are kept wet (EPA, 1978). Recirculation, as a means of improving treatment efficiency, is also impaired at the facility. To my knowledge, there is no way to monitor the amount of recirculation entering the headworks. At the time of this survey, the operator indicated the recirculation valve "was wide open". From BOD_5 values, the recirculation rate was calculated to be approximately 0.56:1. If the recirculation rate were higher (i.e., a higher percentage of trickling filter effluent could be recirculated), treatment efficiency could probably be improved.

Since plant flows were impossible to obtain, a "theoretical" flow was calculated using the population of Enumclaw (4,710 - 1977 census), and multiplying by 100 gallons/capita/day (Hammer, M.J., 1975), yielding 471,000 gallons/day. Added to this was the flow leaving Farman Brothers' Pickle Plant, 65,000 gallons/day, yielding a total flow entering the treatment facility of 536,000 gallons/day. Since infiltration and inflow (I and I) historically has been a problem at Enumclaw STP, this total flow is probably conservative. Organic load to the plant is calculated, again, using the population of Enumclaw (4,710), and multiplying by 0.17 lbs BOD_5/capita/day (Hammer, M.M., 1975), yielding an 800 lbs BOD_5 contribution from the town. Farman Brothers' contribution was

1572 lbs BOD_5, yielding a total organic load of approximately 2300 lbs BOD_5/day. (This compares fairly well with an influent BOD_5 load of approximately 1900 lbs/day calculated using the flow above). This organic load is significant in that Farman Brothers' is contributing 66% to 83% of the total BOD_5 load to the plant. In addition, the average design organic load for the new plant, in the year 2000, with a projected population of 10,500 is 2240 lbs/day. The maximum design load is 2490 lbs/BOD_5/day.

At the time of the survey, Farman Brothers' was just starting production of sweet pickles and was operating at about half production. During periods of full production, their flows and organic load to the treatment facility would be expected to be much greater. By the time the new plant is on line, it may already be organically overloaded. The timing of Farman's organic loading to the plant is also significant in that loads probably vary substantially both hourly and seasonally. Shock organic loads will compound operating difficulties at the plant. In conjunction with the monitoring of the wastewater leaving Farman Brothers' Pickle Plant, a continuous recording pH meter was installed at the treatment facility's influent, prior to recirculation. The strip chart clearly shows the pH of the wastewater entering the plant may vary considerably within a very short time (Figure 1). The pH of the influent peaked at 7.9 and dropped to 4.2 within a one-hour period. Fluctuations of this magnitude have the potential of reducing the efficiency of the biological activity in the trickling filter. pH control or equalization of Farman Brothers' effluent may be necessary if the pH often goes outside the 6.5 to 8.5 range.

The inline flow meter, located between the grit chambers and the primary clarifiers, is of little value. It was impossible to calibrate and was near enough to the recirculation flow so that it was measuring the influent and recirculation simultaneously. Therefore, influent flow was not measured. Effluent flow could not be measured because of a lack of accessibility.

In summary, the influence of Farman Brothers' Pickle Plant on the STP is significant. It appears that this influence was not taken into account when the plans for the new plant were reviewed. It may become necessary to pretreat the effluent leaving Farman's, thus switching the responsibility of treatment to the industry and not the city.

Review of Laboratory Procedures and Techniques

Laboratory procedures were reviewed with the operator and were found to be deficient in several areas. The suggestions and recommendations that follow were reviewed with the operator, as per the Laboratory Procedural Survey (Item 1) and should again be reviewed at the follow-up inspection in December by regional personnel. I would appreciate, Dave, a short memo from you regarding your findings of the follow-up inspection.

Sampling Procedures

1. Sample bottles should be cleaned after every use. Presently, ZEP detergent is used for this purpose. If a detergent is used, it should be phosphate free and followed by plenty of water to rinse thoroughly.

2. Sampler lines should also be cleaned after every use. Several cycles of hot water typically works the best.

BOD_5

A poor correlation between DOE laboratory and Enumclaw of effluent BOD_5 results is evident (Table 1). This may be due to not reseeding the samples, not adjusting the pH, and/or not dechlorinating properly.

1. *Standard Methods* and/or DOE BOD_5 procedural manual should be used as reference for the BOD_5 setup and analysis. The operator presently relies primarily on *Water Pollution Control Plant Manual, 1969,* WPCC.

2. All samples, regardless of origin, should be seeded, because of the wide variation of pH values attributable to Farman Brothers' influence. Seed material can be collected from the influent or primary clarifier.

3. If the pH of the sample lies outside the range of 6.5-8.0, the pH must be adjusted and must be reseeded.

4. Store the reagent water in the BOD incubator or at room temperature in a dark-colored carboy. Storage in the dark is necessary to discourage algal growth.

5. At present the operator is making 5 gallons of dilution water at a time. He will use what he needs and store the rest. Dilution water should not be stored. He should make only what he will use for that day's setup.

6. Final effluent samples are collected from the chlorinated effluent. Proper dechlorinating procedures are not employed. Samples should be dechlorinated and reseeded.

7. The BOD incubator control should be checked daily to ensure the temperature of the samples is maintained at 20° ± 1°C. Also, an incubator temperature log should be kept.

8. PAO, used as the titrant in the Winkler-Azide method by Enumclaw, should be standardized on a routine basis. To the operator's knowledge, it had never been standardized.

Previous recommendations (March 14-15, 1978) that were not accomplished:

1. Reseeding the dechlorinated effluent sample.

2. Abolishing the use of the Hach Manometer to analyze samples and reporting the results.

3. Standardization of PAO on a routine basis.

Total Suspended Solids

1. At present, the operator is using an unapproved filter paper for his analysis. He should obtain either the Reeve Angel 934AH or Gelman Type A/E as soon as possible.

2. Filter papers should be routinely prewashed three times with about 20 mls of distilled water each time, dried, and stored in the dessicator. The operator does this only occasionally.

3. The oven temperature used for drying appears to vary considerably. At the time of the inspection, the temperature was 92°C. To compensate for the variability, the operator leaves the filters in the oven overnight. This procedures is poor laboratory technique and should be corrected by having the oven repaired.

Previous recommendations (March 14-15, 1978) that were not accomplished:

1. Purchase and use of an approved filter paper.

In summary, the operator's laboratory techniques for BOD_5 and TSS need refining. In my opinion, a lack of interest is presently preventing the operator from performing required analyses to the best of his ability.

EE&GC:cp

Attachments

Class II Field Review and Sample Collection

24-hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. Influent A (Before Recirculation) sample aliquot: 250 ml/30 min.	6/26 - 1115	Downstream confluence of grit chambers just prior to flow measuring device.
2. Influent B (After Recirculation) sample aliquot: 250 ml/30 min.	6/26 - 1045	Downstream of comminutor just prior to entrance to primary clarifier.
3. Chlorinated Effluent sample aliquot: 250 ml/30 min.	6/26 - 1145	At discharge point of the secondary clarifier/contact chamber combined structure.
4. sample aliquot:		
5. sample aliquot:		

Field Data

Parameter(s)	Date and Time	Sample Location
pH, Sp. Cond., Temp.	6-27 - 1045	Influent (Pre Recirculation)
pH, Sp. Cond., Temp.	6-27 - 1045	Influent (Post Recirculation)
pH, Sp. Cond., Temp.	6-27 - 1200	Influent (Rerouted Alternate)
pH, Sp. Cond., Temp	6-27 - 1100	Chlorinated Effluent
Total Chlorine Residual	6-27 - 1105	Chlorinated Effluent
Total Chlorine Residual	6-27 - 1130	Chlorinated Effluent
Total Chlorine Residual	6-27 - 1210	Discharge pipe prior to entrance to White River

Grab Samples

Lab Analysis	Date and Time	Sample Location
*	6-26 - 1145	Influent C (Rerouted Alternate)
*	6-26 - 1320	Influent C (Rerouted Alternate)
*	6-26 - 1530	Influent C (Rerouted Alternate)
*	6-27 - 1045	Influent C (Rerouted Alternate)
*	6-27 - 1130	Influent C (Rerouted Alternate)
Fecal Coliform	6-27 - 1105	Chlorinated Effluent
Fecal Coliform	6-27 - 1130	Chlorinated Effluent
Fecal Coliform	6-27 - 1210	Discharge pipe at White River
Trace Metals	6-27 - 1230	Digester

*pH, Sp. Cond., Turb., COD, BOD_5, Solids, Nutrients (1000 ml/sample aliquot)

<u>Flow Measuring Device</u>

Type: Unknown. Unique quasi-in-line meter of unknown configuration.

Dimensions: Unknown.

a. Meets standards criteria? <u>No</u> Explain:

Device is not of standard construction, is not calibrated, and is extremely sensitive to error caused by recirculated flows from the trickling filter.

b. Accuracy check:

Actual Instantaneous Flow	Recorder Reading ( )	Recorder Accuracy (% of Instan. Flow)	Percent Error
1.			
2.			
3.			

______ Is within acceptable 15% error limitation.

<u>X</u> Is in need of ~~calibration/~~ replacement.

Table 1

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 Results					Enumclaw STP Results			
	Influent A	Influent B	Influent C	Chlorinated Effluent	% Removal	Influent A	Chlorinated Effluent	% Removal	NPDES (Monthly average)
BOD_5 mg/l	430	330	94	150	65	455	96	79	40
lbs/day	1922 est.			671 est.					670
TSS mg/l	140	170	36	42	70	222	42	81	40
lbs/day	626 est.			188 est.					670
Total Plant Flow	****								
MGD	0.536								2.0
Fecal Coliform ** 1105				70					
(#/100 ml.) ** 1130				80					
*** 1210				50					
Total Resid. Chlor. ** 1105				2.5*					
(mg/l) ** 1130				2.5*					
*** 1210				0.15*					
pH (S.U.)	7.0	6.9	6.9	7.2					6.0-9.0
(1)	7.5*			7.2*					
(2)	6.9*	6.8*	6.2*	7.0*					
Conductivity	1280	1400	410	1400					
(µmhos/cm) (1)	1180*			1350*					
(2)	750*	1400*	390*	1450*					
Temperature (1)	19.0*			19.2*					
(°C) (2)	5.8*	8.0*	12.5*	6.0*					
COD (mg/l)	700	580	170	280					
Turbidity (NTU)	71	66	30	32					
NH_3-N (mg/l)	22	22	7.2	23					
NO_2-N (mg/l)	<0.5	<0.5	<0.1	<0.5					
NO_3-N (mg/l)	<0.5	<0.2	0.5	<0.5					
O-PO_4-P (mg/l)	7.0	7.0	2.4	8.0					
T-Phos-P (mg/l)	8.7	9.0	3.8	7.3					
Total Solids (mg/l)	1100	1100	300	890					
TNV Solids (mg/l)	580	700	180	680					
TNVSS (mg/l)	26	38	9	9					

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

*Field Analysis
**Sample taken 6/27 at Chlorinated effluent at plant
***Sample taken 6/27 at outfall prior to entrance to White River
****Theoretical influent flow as explained elsewhere in memo

(1) From grab sample
(2) From 24-hour composite

Influent Locations

A - Pre-Recirculation
B - Post-Recirculation
C - Rerouted Alternate

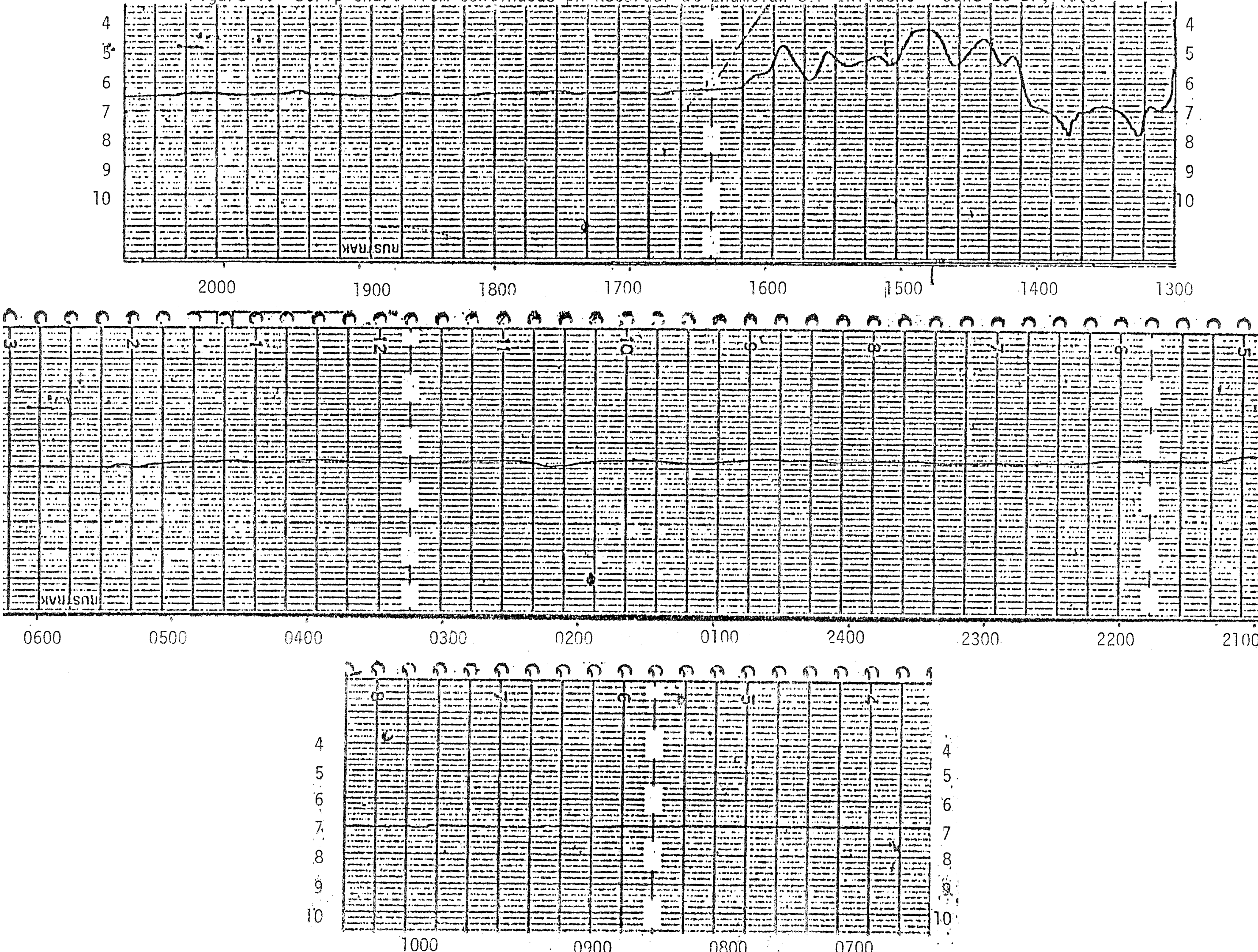
Table 2
Metals Results from Grab Sample of Disgested Sludge

	DOE						NPDES (Monthly Average)
	Digested Sludge						
Copper (µg/gram dry)	713						
Zinc (µg/gram dry)	2200						
Nickel (µg/gram dry)	41						
Chromium (µg/gram dry)	0.4						
Cadmium (µg/gram dry)	0.01						
Lead (µg/gram dry)	411						

* Field Analysis

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

Figure 1. Strip Chart from Continuous pH Recorder at Enumclaw STP Influent June 26-27, 1979



APPENDIX 1

RESULTS OF SAMPLING INSPECTION AT FARMAN'S PICKLE PLANT

On June 26 and 27, 1979, a composite sampler and pH recorder were installed at Farman's Pickles in conjunction with a Class II inspection and survey at the Enumclaw sewage treatment plant (STP). This action was to provide information on the question of BOD and pH as a major influence on the STP. The composite sampler was in place for 24 hours to compile information during active packing periods and shutdown. As the sampler was being installed in the plant (1050 hours), the packing lines were being operated on an intermittent basis. Full operation did not begin until roughly 1200 hours. This level of operation continued until about 2000 hours. After this, the plant was running wash water at a steadily declining rate until 0800 hours on the 27th. When full operation started once more (See Figure A1), the pH record (Figure A2) had a wide range of values - 3.7 - 11.3. The effluent was generally pickle packing brine and wash water. The pickle brine, having both salt and vinegar, made for high conductivities and low pH. The high pH "spikes" can be attributed to the addition of lime as a buffering agent. This lime mixture was apparently being added at irregular intervals directly to the wet well where the composite sampler and pH recorder were located. The composite sampler would only have caught this addition by chance as it samples once every 30 minutes. The pH recorder, with continuous operation, gave a complete record of the lime spikes. This method of treatment has little value in buffering the low pH as the lime is added in large, uncontrolled amounts on an irregular basis.

The BOD load from Farman's Pickles, based on flows from Farman's and through the Enumclaw STP, indicates that approximately 66% to 83% of the BOD load coming into the STP is from Farman's Pickles. This was during a period of partial operation and would be expected to be at least this amount during increased production.

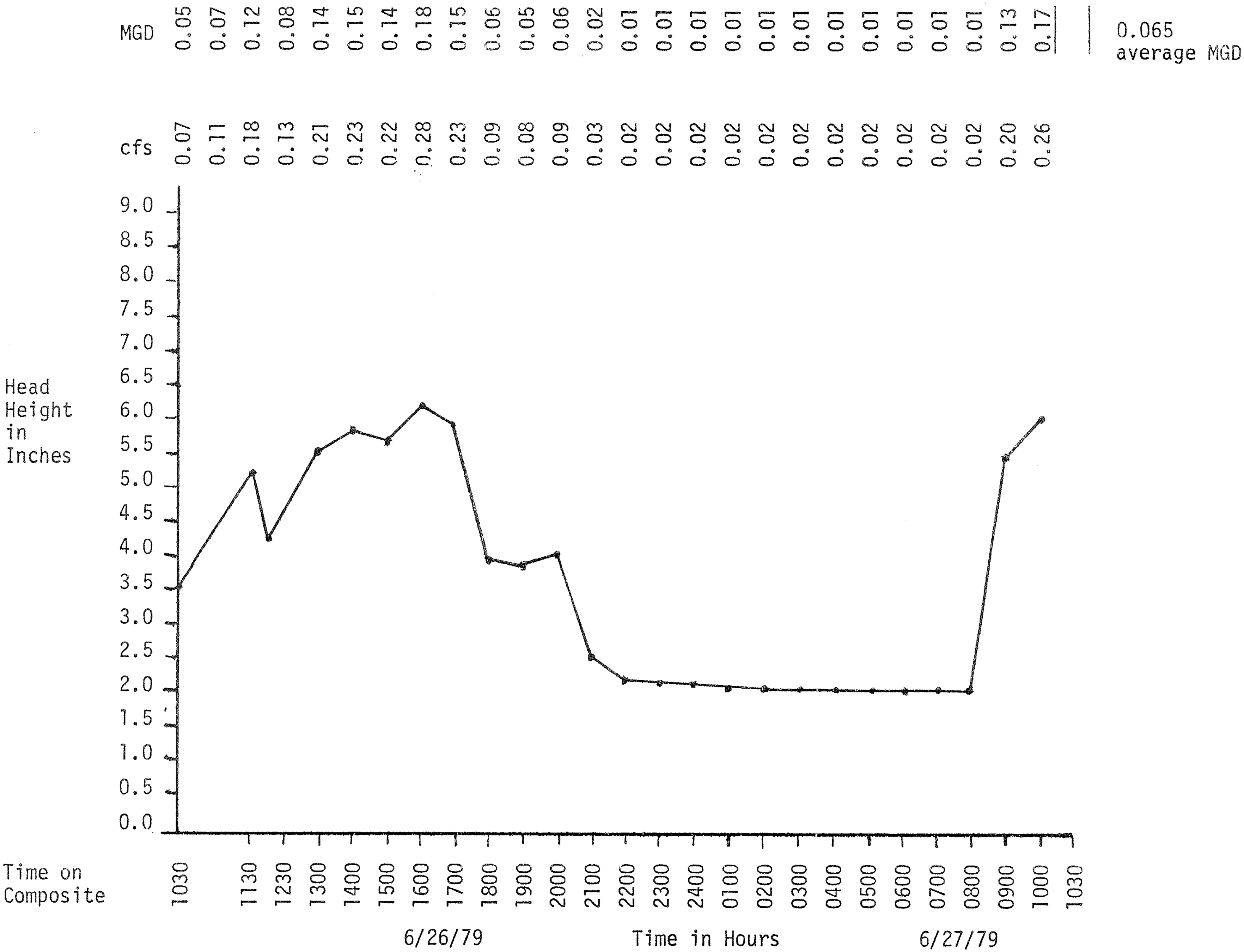
The flow for the 24-hour period was computed from a Stevens Water Level Recorder Type F that Kramer, Chin and Mayo, Inc. had installed in a stilling well inside the wet well at Farman's. The level recorder was calibrated by taking several instantaneous measurements on the 60° 'V' notch weir also installed by K.C.M. Considering the placement of the 'V' notch weir in relation to the standing wave, the accuracy should be good. If more accurate readings are to be made in the future, the placement of the weir should probably be changed to allow for possible turbulence at the weir crest.

Table A1

DOE Analysis - 24-hr. Composite		Field Analysis 6-26-79 1140 hours	Field Analysis 6-26-79 1400 hours	Field Analysis 6-27-79 1000 hours
BOD_5 mg/l lbs/day	2,900 1572			
TSS mg/l lbs/day	110 59.6			
Total Plant Flow MGD	0.065			
pH	4.5	3.9	6.4	3.6
Turbidity	48			
Sp. Conductivity	12,400	19,700	3,600	16,000
COD	5,500			
Total Solids	8,900			
TNVS	6,700			
TNVSS	47			
NO_3-N	2.2			
NO_2-N	<.2			
NH_3-N	20.0			
O-PO_4-P	10			
T-PO_4-P	11			
Temperature °C	10.4	20.1	32.3	20.1
Salinity		13.6	2.3	10.9

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

Figure 1A - Flow Graph for 24-hour period.



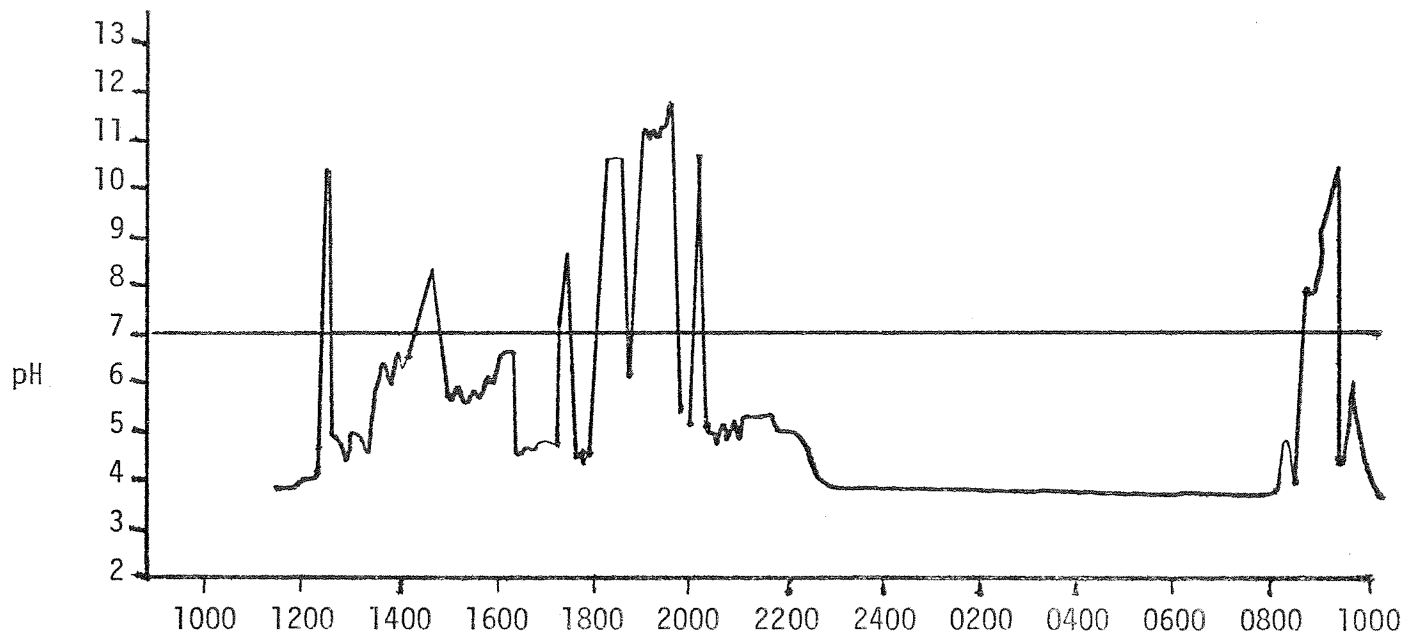


Figure A2. Recording pH Graph, 24-hr. period (Farman's)

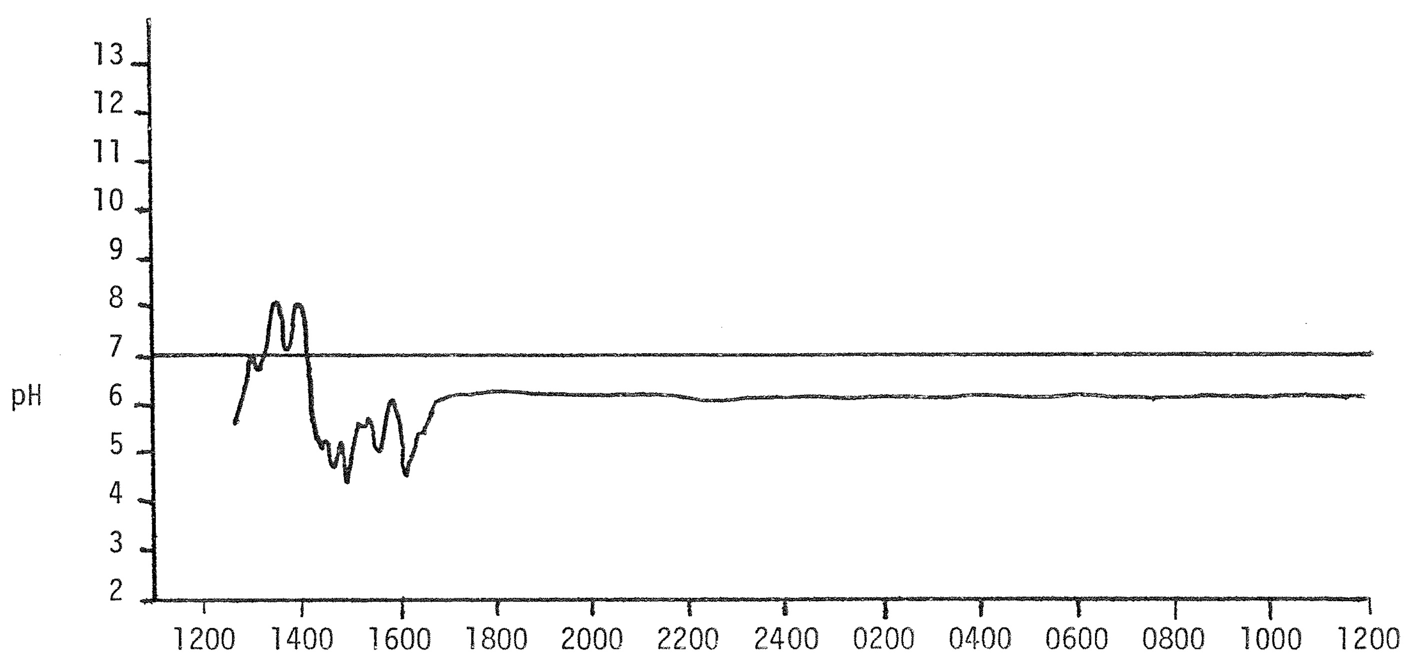


Figure A3. Recording pH Graph, 24-hr. period (Enumclaw STP)

LITERATURE CITED

EPA, 1978. *Field Manual for Performance Evaluation and Troubleshooting at Municipal Wastewater Treatment Facilities*, EPA-430-9-78-001, Culp/Wisner/Culp, Consultants; 90 pp.

Hammer, M. J., 1975. *Water and Wastewater Technology*, John Wiley and Sons, Inc., 298 pp.

LABORATORY PROCEDURAL SURVEY

Discharger: Enumclaw STP

NPDES Permit Number: WA-002057-5 (m)

Date: 6/26/79

Industrial/Municipal Representatives Present: Jim Crossler

Agency Representatives Present: Eric Egbers & Greg Cloud

I. COMPOSITE SAMPLES

A. Collection and Handling

1. Are samples collected via automatic or manual compositing method? Both, Model? Manning 4040

   a. If automatic, are samples portable X or permanently installed ___?

   Comments/problems Automatic composite on Effluent and *Farmans Pickles, Grab composite on Influent.

2. What is the frequency of collecting composite samples? 2/month

3. Are composites collected at a location where homogeneous conditions exist?

   a. Influent? yes, prior to recirculation.

   b. Final Effluent? yes, discharge end of final clarifier/contact chamber.

   c. Other (specify)?

4. What is the time span for compositing period?

Automatic Sample aliquot? 250 mls per 30 minutes
Grab " " ~100 " " 60 "

5. Is composite sample flow or time proportional? Time

* Whenever Kramer, Chin & Mayo wants data.

6. Is final effluent composite collected from a chlorinated or non-chlorinated source? Chlorinated

7. Are composites refrigerated during collection? yes

8. How long are samples held prior to analyses? * 24-26 hours from start of compositing period.

9. Under what condition are samples held prior to analyses?

   a. Refrigeration? X

   b. Frozen? __________

   c. Other (specify)? __________

10. What is the approximate sample temperature at the time of analysis? 18-20°C.

11. Are compositor bottles and sampling lines cleaned periodically?
** Bottles - yes

   a. Frequency? after every use

   b. Method? ZEP detergent & then rinsed.

12. Does compositor have a flushing cycle? yes

   a. Before drawing sample? yes

   b. After drawing sample? yes

13. Is composite sample thoroughly mixed immediately prior to withdrawing sample? yes

Recommendations:

* Should be no longer than 6 hours from end of comp. period.
** Sampler lines should be rinsed with hot water after every use. Detergent contents should be reviewed.

II. BIOCHEMICAL OXYGEN DEMAND CHECKLIST

A. Technique

1. What analysis technique is utilized in determining BOD_5?

a. Standard Methods? ___X___ Edition? 13th

b. EPA? ________

c. A.S.T.M.? ________

d. Other (specify)? "Water Pollution Control Plant Manual" 1969, Water Pollution Control Commission

B. Seed Material

1. Is seed material used in determining BOD? no*

2. Where is seed material obtained? ________

3. How long is a batch of seed kept? ________

and under what conditions? (temperature, dark) ________

4. How is seed material prepared for use in the BOD test? ________

Recommendations:

* Seed material not used because operator is not reseeding. Recommend Seeding not only dechorinated effluent Sample but also influent sample because of largo pH fluctuations from Farmans Pickle Co. influence.

C. Reagent Water

1. Reagent water utilized in preparing diultion water is:

   a. Distilled? X

   b. Deionized? ______

   c. Tap ______, chlorinated ______ non-chlorinated ______

   d. Other (specify)? ______

2. Is reagent water aged prior to use? *yes*

   How long? *Atleast a week*, under what conditions? *at room temperature, in clear 5 gallon carboy**

Recommendations:

*Recommend storing in an incubator or dark colored carboy to prevent algae growth.

D. Dilution Water

1. Are the four (4) nutrient buffers added to the reagent water? *yes*

   ** a. *4.25* mls of each nutrient buffer per *5* ~~mls~~ *gallons* of reagent water

2. When is phosphate buffer added (in relation to setting up BOD test)? *At the same time the other buffers are added.**

3. How often is dilution water prepared? **About every 2 months.*
   Maximum age of dilution water at the time test is set up. *2 months.*

4. Under what conditions is dilution water kept? *Room temperature in a brown glass carboy.*

** At present, the operator is using a 19 ml powder pillow from Hach Chemical Co. that contains enough buffer for 5 gallons of Dilution water. Instead, recommend he purchase either the 3 ml or 6 ml size and make enough dilution water for one days setup.

5. What is temperature of dilution water at time of setup? room temperature.

Recommendations:

* Recommend that the operator determine how much reagent water needed for that days analysis, add enough buffer to that volume (1 ml. of each buffer per 1000 ml. reagent water) and discard excess at the end of set-up.

E. Test Procedure

1. How often are BOD's being set up? 2/month

What is maximum holding time of sample subsequent to end of composite period? 3 hours

2. If sample to be tested has been previously frozen, is it reseeded? N/A How? ______

3. Does sample to be tested contain residual chlorine? yes
If yes, is sample

a. Dechlorinated? yes*

How? Adds thio until no chlorine residual exists

b. Reseeded? no**

How? ______

4. Is pH of sample between 6.5 and 8.5? Generally

If no, is sample pH adjusted and sample reseeded? no***

5. How is pH measured? Corning Model 7

a. Frequency of calibration? every time used

b. Buffers used? 4 & 7

6. Is final effluent sample toxic? no

* Recommend proper dechlorination procedure as described in DOE BOD_5 procedures manual p. 10.

** To insure a viable population of micro-organisms after dechlorination, reseeding is necessary. -OVER-

7. Is the five (5) day DO depletion of the dilution water (blank) determined? yes, normal range? 0 – 0.1 (questionab

8. What is the range of initial (zero day) DO in dilution water blank? 8.9 – 9.0

9. How much seed is used in preparing the seeded dilution water? Not using Seed.

10. Is five (5) day DO depletion of seeded blank determined? no
If yes, is five (5) day DO depletion of seeded blank approximately 0.5 mg/l greater than that of the dilution water blank? ____________

11. Is BOD of seed determined? n/A

12. Does BOD calculation account for five (5) day DO depletion of

a. Seeded dilution water? n/A

How? ____________

b. Dilution water blank? no

How? not necessary if less than 0.2.

13. In calculating the five (5) day DO depletion of the sample dilution, is the initial (zero day) DO obtained from

a. Sample dilution? X

b. Dilution water blank? ____________

14. How is the BOD_5 calculated for a given sample dilution which has resulted in a five (5) day DO depletion of less than 2.0 ppm or has a residual (final) DO of less than 1.0 ppm? ____________

15. Is liter dilution method or bottle dilution method utilized in preparation of

a. Seeded dilution water? n/A

b. Sample dilutions? Liter

16. Are samples and controls incubated for five (5) days at 20°C ± 1°C and in the dark? yes

17. How is incubator temperature regulated? External temperature thermostat.

18. Is the incubator temperature gage checked for accuracy? no

a. ~~If yes, how~~? An internal thermometer is within

b. ~~Frequency?~~ the incubator but at a different elevation than the incubator temperature probe.

19. Is a log of recorded incubator temperatures maintained? no

a. If yes, how often is the incubator temperature monitored/ checked? ______

20. By what method are dissolved oxygen concentrations determined?

Probe ______ Winkler X Other ______

a. If by probe:

1. What method of calibration is in use? ______

2. What is the frequency of calibration? ______

b. If by Winkler:

1. Is sodium thiosulfate or PAO used as titrant? PAO

2. How is standardization of titrant accomplished? PAO has not been Standardized.

3. What is the frequency of standardization? ______

Recommendations:

1) Occasionally check the incubator temperature probe by placing a thermometer at the same level as the incubator probe.

2) The PAO should be Standardized on a routine basis. PAO is traditionally more "Stable" than Sodium thiosulfate and wouldn't necessarily ~~be~~ have to be checked as often as this, (every 2 weeks) but should be standardized routinely.

F. Calculating Final Biochemical Oxygen Demand Values Washington State Department of Ecology

1. Correction Factors

a. Dilution factor:

$$= \frac{\text{total dilution volume (ml)}}{\text{volume of sample diluted (ml)}}$$

b. Seed correction:

$$= \frac{\text{(BOD of Seed)(ml of seed in 1 liter dilution water)}}{1000}$$

c. F factor ~ a minor correction for the amount of seed in the seeded reagent versus the amount of seed in the sample dilution:

$$F = \frac{\text{[total dilution volume (ml)] - [volume of sample diluted ml]}}{\text{Total dilution volume, ml}}$$

2. Final BOD Calculations

a. For seed reagent:

(seed reagent depletion-dilution water blank depletion) x D.F.

b. For seeded sample:

(sample dilution depletion-dilution water blank depletion-scf) x D.F.

c. For unseeded sample:

(sample dilution depletion-dilution water blank depletion) x D.F.

3. Industry/Municipality Final Calculations

$$\text{0 day} - \text{5 day} \quad \times \frac{100}{\text{\% Sample dilution}}$$

Recommendations:

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III. TOTAL SUSPENDED SOLIDS CHECKLIST

A. Technique

1. What analysis technique is utilized in determining total suspended solids?

   a. Standard Methods? X Edition 13th

   b. EPA? ______________

   c. A.S.T.M.? ______________

   d. Other (specify)? "Water Pollution Control Plant Manual" 1969, Water Pollution Control Comm.

B. Test Procedure

1. What type of filter paper is utilized:

   a. Reeve Angel 934 AH? ______________

   b. Gelman A/E? ______________

   c. Other (specify)? Whatman 4

   d. Size? 7 cm

2. What type of filtering apparatus is used? Gooch Crucible

____

3. Are filter papers prewashed prior to analysis? Sometimes

   a. If yes, are filters then dried for a minimum of one hour Overnight at 103°C-105°C temperature Varies *

   b. Are filters allowed to cool in a dessicator prior to weighing? yes

* Temperature was 92° at the time of the inspection.

4. How are filters stored prior to use? Dessicator

5. What is the average and minimum volume filtered? 50 ml.

6. How is sample volume selected?

   a. Ease of filtration? X

   b. Ease of calculation? X

   c. Grams per unit surface area? ____

   d. Other (specify)? ____

7. What is the average filtering time (assume sample is from final effluent)? 1-2 minutes

8. How does analyst proceed with the test when the filter clogs at partial filtration? Has yet to happen, but would start over if it did.

9. If less than 50 milliliters can be filtered at a time, are duplicate or triplicate sampe volumes filtered? no

10. Is sample measuring container; i.e., graduated cylinder, rinsed following sample filtration and the resulting washwater filtered with the sample? yes

11. Is filter funnel washed down following sample filtration? no, Operator weighs gooch & filter together.

12. Following filtration, is filter dryed for one (1) hour, cooled in a desscator, and then reweighed? yes, Sometimes dried for 24 hours.

13. Subsequent to initial reweighing of the filter, is the drying cycle repeated until a constant filter weight is obtained or until weight loss is less than 0.5 mg? no.

14. Is a filter aid such as cellite used? no

a. If yes, explain:

Recommendations:

At 50 mL of sample filtered =

C. Calculating Total Suspended Solids Values Washington State Department of Ecology

19.7390 − 19.7112 = .0278   .0278 ÷ 50 = .000556   .000556 x 10^6 = 556

A. $mg/l\ TSS = \frac{A-B}{C} \times 10^6$

1. Where: A = final weight of filter and residue (grams)

B = initial weight of filter (grams)

C = Milliliters of sample filtered

2. Industry/Municipality Calculations

A − B = X (no decimal)

X (2) = TSS mg/l

Example : A = 19.7390
− B = 19.7112
X = 278
X(2) = 556

Recommendations:

SPLIT SAMPLE RESULTS:

Origin of Sample Chlorinated Effluent

Collection Date 24 hour composite 6/26-27

BOD		TSS		NPDES Permit Limit ~~EPA BOD Standard~~	
DOE	IND./MUN.	DOE	IND./MUN.	BOD ~~DOE~~	TSS ~~IND./MUN~~
150	96	42	42	40	40