JOHN SPELLMAN
Governor

81-e36

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
7272 Cleanwater Lane, LU-11 • Olympia, Washington 98504 • (206) 753-2353

MEMORANDUM
June 23, 1981

To: John Glynn

From: Sharon Chase SC

Subject: Ferndale Sewage Treatment Plant Class II Inspection

Introduction

A Class II inspection was conducted at the Ferndale sewage treatment plant (STP) on April 7 and 8, 1981. Department of Ecology (DOE) personnel involved in the inspection included Sharon Chase and Anne Haines, Water Quality Investigations Section, and John Glynn, Northwest Regional Office. The plant operator, Jerry Leuenberger, also was present during the inspection.

Ferndale STP consists of two aerated lagoons, each with a 7 horsepower and a 10 horsepower aerator, a polishing pond, and a chlorine contact chamber. Flow is measured with a float in the effluent channel above a three-foot, broadcrested weir. The comminutor is located in a pump station approximately 1/2 mile from the plant.

The plant's effluent is discharged to the Nooksack River (waterway segment number 01-01-04). There are two ambient monitoring stations on the Nooksack River; the Nooksack at North Cedarville (01A120) above the Ferndale discharge, and the Nooksack at Brennan (01A050) below the discharge. Table 1 shows the water quality indices for these two stations.

Table 1. Water Quality Indices for the Nooksack River.

Station	Temp.	O_2	pH	Bact.	Trophic	Aest.	TSS	NH_3	Overall WQI
Nooksack at North Cedarville (01A120)	6.8	3.7	13.1	18.1	13.9	19.2	17.2	4.4	15.1
Nooksack at Brennan (01A050)	8.2	7.4	4.7	41.9	11.1	15.9	13.3	0.0	26.3
$\overline{X}$ (mean)	7.6	5.8	8.3	31.8	12.3	17.3	15.0	1.9	21.5

WQI values: 0-20, good; 20-60, marginal; greater than 60, unacceptable.

These data show a decline in the overall water quality between the two stations. How much of this decline is caused by the STP discharge and how much by other sources cannot be quantified with the data presently available. It is reasonable to assume that the discharge makes a small contribution to the decline. A 1979 study of the Nooksack River (Johnson and Prescott) indicated that nonpoint source pollution from dairy and livestock farms was the principal source of nutrient loading and fecal contamination in the river.

The Nooksack is a Class A river. Ambient data for the Nooksack at North Cedarville Water Year 1980 (WY-80) shows one pH violation and one fecal coliform violation. The Nooksack at Brennan had five fecal coliform violations in WY-80. In view of the very low fecal coliform values detected at the STP effluent, these water quality standard violations are most likely attributable to nonpoint sources.

The National Pollutant Discharge Elimination System Permit (NPDES) for the Ferndale plant (Number WA-002-245-4) places limits on effluent biochemical oxygen demand (BOD), suspended solids (TSS), fecal coliforms (FC), pH, and flow. In June 1977 a docket (DE 77-256) was issued to the Town of Ferndale allowing the plant to comply with the interim effluent limitations of their permit (Section S1) until the town was able to upgrade the facility. At the time of this inspection, the plant was in compliance with these interim limits.

The plant is well maintained. The laboratory was uncluttered and clean and the grounds had been mowed.

Procedure

On April 7, 1981 compositors were placed at the effluent, prior to chlorination, and at the influent to the pump station. A Manning dipper flow measuring device was set up at the effluent to check the accuracy of the plant's flow measuring equipment. Grab samples were taken at the influent and effluent for field measurements of pH, temperature, and conductivity. Laboratory procedures were reviewed with the operator. Fecal coliform samples were taken on April 8. Total chlorine residual (TCR) was tested at the same time. The operator takes a grab composite from the influent and effluent. A four-way split of the samples was made. Table 2 summarizes the sample collection schedule.

The plant receives waste from Freeze Hide and Tallow, as well as leachate from Thermal Reduction, Inc., in addition to normal municipal waste. Concern had been expressed regarding the possibility of high metal concentrations in the leachate, so the DOE influent and effluent samples were analyzed for metals in addition to the normal Class II parameters.

Permit Compliance and Discussion of Test Results

The Ferndale STP was in compliance with the interim limits of its permit during the inspection period. The results of the split sample analyses are shown in

Table 2. Summary of Sample Collection Schedule, Locations, and Constituents Analyzed.

Composite Samplers	Aliquot	Date and Time Installed		Location	Field Data Collected
Influent	250 ml/30 min.	4/7/81	0945	Pump station influent below comminutor	pH, Temp., Cond.
Effluent	250 ml/30 min.	4/7/81	0900	Effluent before chlorination	pH, Temp., Cond.
Grab Samples					
Fecal coliforms		4/8/81	1040	Effluent after chlorination	TCR

Table 3. The comparisons between the DOE and STP laboratory results show very close agreement. However, there were some significant differences between the results from the DOE 24-hour composite and the STP's 4-hour grab composite, indicating that despite the operator's good laboratory technique, the results reported on the monthly data sheets are not necessarily accurate representations of plant conditions. The permit requires a 24-hour composite for TSS and BOD (Section S3) and states that "samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge" (S3e). The town should have more accurate data to determine permit compliance and evaluate the need for a plant upgrade.

There also was very good agreement between the plant's script chart and the flow calculated from the Manning dipper set at the effluent. The plant flow was .92 MGD according to their flow measuring device and .925 MGD according to DOE calculations. Both of these measurements are within permit effluent flow limit of 1.2 MGD. However, both flow measurements are higher than the expected flow based on the average expected 100 gal/day/capita. The BOD load was quite close to the expected .2 lbs/day/capita. Table 4 compares the expected values to the measured values. The higher than expected flow probably is due primarily to infiltration and inflow, with small contributions from rainfall and clean dilution water added to the leachage from Thermal Reduction, Inc.

Table 4. Expected flow and BOD versus Measured flow and BOD (based upon a population of 4,400).

	Expected	Measured
BOD lbs/day	880	926
Flow MGD	.44	.92

The fecal coliform count was far below the permit limit of 200 col/100 ml. Although the permit sets no maximum or minimum levels of residual chlorine, the TCR of 2.0 mg/L measured at the plant is higher than it should be. We would prefer to have the plant reduce its chlorine residual and allow the fecal counts to increase. Because chlorine is toxic to aquatic organisms, the lower the chlorine residual the better for the receiving water quality as long as the fecal colonies remain below the permit limit.

Tables 5 and 6 summarize the metals data obtained from the DOE influent and effluent samples and the metals data from an earlier sampling of the leachate from Thermal Reduction, Inc. The leachate is diluted with clean water and pumped intermittently into the sewer system. We do not have any information on the flow or the frequency of pumping. From the data we have, it does not appear as though the metals concentrations at the plant are high enough to interfere with the treatment process.

Table 3. Comparison between Split Samples.

	DOE Laboratory				STP Laboratory					
	DOE Comp. Influent	DOE Comp. Effluent	STP Comp. Influent	STP Comp. Effluent	DOE Comp. Influent	DOE Comp. Effluent	STP Comp. Influent	STP Comp. Effluent	Interim NPDES Limits	Final NPDES Limits
Flow (MGD)	(.925)	.925	(.92)	(.92)	(.925)	(.925)	(.92)	.92	1.2	1.2
BOD (mg/L)	120	31	160*	31*	109	34	148*	34*	60	30
(lbs/day)	930	240	1,200	239	840	270	1,100	270	300	150
TSS (mg/L)	91	17	120	21	80	20	120	20	70	75***
(lbs/day)	702	131	926	162	617	154	926	154	350	--
Fecal Coliforms**		<33						<10	200	200
col/100 mls		<33								

*Samples of 600, 300, and 300 mls taken at 0820, 1050, and 1230 on April 8, 1981.
**Grab sample.
***EPA relaxed standard for TSS.

Table 5. Results of Metals Analysis.

Metal	Influent (mg/L)	Effluent (mg/L)	Threshold concentration[1] of pollutant inhibatory to activated sludge. Carbonaceous Material Removal (mg/L)	Nitrification (mg/L)
Cu	.07	.03	1.0	.005 - .5
Zn	.10	.12	.08 - 10	.08 - .5
Fe	1.7	1.3	1000	
Ni	<0.03	<0.03	1	
Cr	0.07	<0.03	hexivalent 1-10 trivalent 50	.25
Cd	<0.01	<0.01	10-100	
Pb	0.04	0.14	.1	.5
Mn	0.25	0.25		50
Hg	<0.2*	<0.2*	.1-.5*	

Standard deviation plus or minus 10%

[1]Source of threshold values; Manual of Practice (MOP-8), pg. 227.

*This value is shown in ug/L

Table 6. Results of Metals Analysis on Thermal Reduction Leachate (samples taken 3/24/81 by Lew Kittle).

Zn mg/L	.20
Fe mg/L	6.0
Cr mg/L	3.1
Pb mg/L	0.03
Hg ug/L (ppb)	.33

In March of 1978, EPA relaxed the TSS limits for lagoons in Washington to 75 mg/L monthly average. BOD limits remained at 30 mg/L 85 percent removal. Table 7 shows the monthly average BOD and TSS for the Ferndale plant from August of 1980 through May of 1981.

Table 7. Discharge monitoring reports monthly average BOD and TSS values from August 1980 through May 1981.

Month	Flow	BOD (mg/L)	BOD (lbs/day)	TSS (mg/L)	TSS (lbs/day)
August	.361	63*	190	63	190
September	.407	75*	250	55	190
October	.385	61*	200	53	170
November	.746	59	370*	30	190
December	1.102	39	360*	23	210
January	.765	38	240	34	220
February	1.022	36	310*	28	240
March	.698	39	230	30	170
April	.833	34	240	20	140
May	.671	42	240	38	210

*Indicates violation of interim limits.

Our inspection conducted in April showed the plant to be in compliance with the interim limits of its permit. A review of the DMRs, however, showed consistent violations of the interim limits for BOD through December of 1980. Addition of aeration capacity to the lagoons completed in early 1981 may have moderated this problem as the DMRs for January through May of 1981 show only one violation (310 lbs/day in February). A summary of all field and laboratory data is contained in Table 8.

Laboratory Procedural Survey

In general, the operator's laboratory technique was quite good, as the close agreement on the split samples indicates. Recommendations for improvements were as follows:

Sample Collection - The composite time should be longer than 4 to 6 hours and more samples should be taken. Ideally, an automatic composite sampler should be obtained for the influent and effluent.

BOD -

(1) The sample should be allowed to reach room temperature (20°C) before the test is set up.

(2) The pH meter should be calibrated against two buffers (7 and 10 or 4 and 7) daily.

(3) The pH of the BOD sample should be taken before the test is set up. If the sample pH is outside the range of 6.5 to 8.5, the sample must be adjusted and seeded.

(4) The operator reported that the temperature regulation in the BOD incubator was not reliable. We recommend that a log of temperatures in the incubator be kept to document this problem. The incubation temperature is critical to reliable BOD results. The incubator will have to be repaired or replaced if it cannot maintain the correct temperature (20°C plus or minus 1°C).

Fecal Coliforms -

(1) The operator reported using distilled water instead of the working solution containing phosphate buffer and magnesium sulfate. The operator must obtain and use the correct reagents for this test. Distilled water, because it lacks essential ions and is deficient in buffering and chelating capacities, will injure or kill the bacteria being analyzed. (See Handbook for Evaluating Water Bacteriological Laboratories, U.S. EPA EPA 670/9-75-006, August 1975 pages 70 and 71.) The phosphate buffer used for the BOD test must not be used in the fecal test because it contains chemicals which interfere with the growth of the fecal coliform bacteria. The correct procedures for preparing the reagents for the fecal test are not complex. These procedures are as follows:

To Prepare Stock Solutions:

Phosphate Buffer - to make 100 mls, dissolve 3.4 grams potassium dihydrogen phosphate (KH_2PO_4) in 50 mls distilled water. Adjust the pH to 7.2 with 1 N NaOH and dilute to 100 ml with distilled water (for 1 liter of buffer, use 34g of KH_2PO_4).

Magnesium Sulfate - dissolve 5 g $MgSO_4 \cdot 7\ H2O$ in 100 mls of distilled water (for 1 liter, use 50 g $MgSO_4 \cdot 7\ H2O$).

To Prepare the Working Solution - add 1.25 ml of stock phosphate buffer and 5 ml of stock magnesium sulfate to 1 liter of distilled water. Mix thoroughly.

(2) The water bath temperature for the fecal test is critical. The temperature must be maintained at 44.5°C plus or minus .2°C. Therefore, a thermometer with 1° increments is not accurate enough for use in monitoring the water bath temperature. The plant must obtain a thermometer with .1 or .2° increments.

(3) Filters and petri dishes should be sterilized before being discarded because they may contain disease-causing organisms.

Memo to John Glynn
Ferndale STP Class II Inspection
June 23, 1981

Summary of Recommendations

While the STP is operating in compliance with the interim permit limits, continued efforts should be made to bring the BOD of the effluent into compliance with the final effluent limits. To load the plant further without taking steps to increase plant efficiency, through an upgrade or by other means, would be incompatible with the goal of bringing the plant into compliance with the final effluent limits and could easily result in violations of the interim limits. Close attention should be paid to the DMRs in upcoming months to make sure the new aerators are keeping the BOD below the interim limits.

Composite samplers should be installed to allow the plant to obtain a representative 24-hour composite sample as required in the permit.

All of the STP lab equipment should be kept in the STP lab. Some of this equipment is currently kept in the water plant lab and some in the STP lab. There is no logical reason for this arrangement. It is inconvenient for the operator and creates possibilities for confusion and error.

The operator should experiment with reducing the chlorine residual. The TCR should be kept as low as possible as long as the fecal count is within permit limits. The other suggestions in the laboratory procedural section of this report should be followed.

SC:cp

Attachments

Table 8. Summary of Laboratory and Field Data*.

Constituent	DOE Analysis				STP Analysis				Interim NPDES Eff. Limits (Monthly Average)
	DOE Sample		STP Sample		DOE Sample		STP Sample		
	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent	
Flow (MGD)	(.925)	.925	(.92)	(.92)	(.925)	(.925)	(.92)	.92	1.2
BOD$_5$ (mg/l)	120	31	160	31	109	34	148	34	60
(lbs/day)	930	240	1,200	240	840	262	1,140	260	300
COD (mg/l)	340	120	360	130					
Fecal Coliform (col/100 ml)		<33**						<10**	200
Chlorine Residual (mg/l)		2.0**							
Temperature (°C)	12.0**	9.8**							
Conductivity (umhos/cm)	480**	1,750**							
	1,200	1,300							
pH (S.U.)	7.2**	7.2**							6.0 - 9.0
	7.4	7.3							
Total Solids (mg/l)	700	670	1,100	670					
TNVS (mg/l)	530	550	880	560					
TSS (mg/l)	91	17	120	21	80	20	120	20	70
(lbs/day)	702	131	926	162	617	154	926	154	350
TNVSS (mg/l)	12	16	1	4					
Turbidity (NTU)	68	70	22	24					
NO_3-N (mg/l)	.62	<0.10							
NO_2-N (mg/l)	<0.12	<0.10							
NH_3-N (mg/l)	8.8	12							
O-PO_4-P (mg/l)	2.6	2.3							
T-PO_4-P (mg/l)	4.3	4.2							

*Metals data not repeated here. See Tables 5 and 6.
**Grab samples.

REFERENCES

Geldreich, E.E., 1975. Handbook for Evaluating Water Bacteriological Laboratories, U.S. EPA, EPA 670/9-75-006, 195 pp.

Johnson, A. and S. Prescott, 1979. Lower Nooksack River Water Quality Survey, August 27-28, 1979. Memorandum to John Glynn, N.W. Regional Office from Water Quality Investigations Section, DOE, 5 pp.

Singleton, L.R. and J. Joy, 1981. Water Quality Index (WQI) Analysis of State Waterway Segments for the 1981 SEA. Memorandum to John Bernhardt, Water Quality Investigations Section, DOE, 44 pp.

Water Pollution Control Federation, 1977. Wastewater Treatment Plant Design: A Manual of Practice (MOP/8), Lancaster Press, Lancaster PA, 560 pp.

LABORATORY PROCEDURAL SURVEY

Discharger: Ferndale STP

NPDES Permit Number: ______________________

Date: 4/7/81

Industrial/Municipal Representatives Present: Jerry Leuthberger

Agency Representatives Present: John Glynn Sharon Chase Anne Haines

I. COMPOSITE SAMPLES

A. Collection and Handling

1. Are samples collected via automatic or (manual) compositing method? ______________, Model? ______________

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

   Comments/problems 3 samples taken at 830 1030 and 1300

2. What is the frequency of collecting composite samples? weekly

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

   a. Influent? ______________

   b. Final Effluent? end of polishing pond before Cl_2

   c. Other (specify)? ______________

4. What is the time span for compositing period? 5 hrs

   Sample aliquot? 600 for 1st sample / 300 for the other two mls per ______________ minutes

5. Is composite sample flow or (time) proportional? ______________

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

7. Are composites refrigerated during collection? Yes

8. How long are samples held prior to analyses? Set up Right away

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

   a. Refrigeration? ✓

   b. Frozen? __________

   c. Other (specify)? __________

10. What is the approximate sample temperature at the time of analysis? doesn't know - probably colder than Room temp.

11. Are compositor bottles and sampling lines cleaned periodically? __________

    a. Frequency? __________

    b. Method? __________

12. Does compositor have a flushing cycle? N/A

    a. Before drawing sample? N/A

    b. After drawing sample? N/A

13. Is composite sample thoroughly mixed immediately prior to withdrawing sample? Shakes it up.

Recommendations:

- Sample should be allowed to reach Room temp. before set up.
- The composite time should be longer + more samples should be taken. Recomend they get automatic samplers (portable Manning samplers would suit their needs)

II. BIOCHEMICAL OXYGEN DEMAND CHECKLIST

A. Technique

1. What analysis technique is utilized in determining BOD_5?

   a. Standard Methods? ______ Edition? ______

   b. EPA? ______

   c. A.S.T.M.? ______

   d. Other (specify)? Class notebooks

B. Seed Material

1. Is seed material used in determining BOD? NO

2. Where is seed material obtained? N/A

3. How long is a batch of seed kept? N/A

   and under what conditions? (temperature, dark) N/A

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

   N/A.

Recommendations:

Operator has a level II certification. He has a copy of standard methods but he doesn't use it. When he has a problem he consults with one of the operators at a nearby plant.

C. Reagent Water

1. Reagent water utilized in preparing diultion water is:

   a. Distilled? ✓ ______

   b. Deionized? ______

   c. Tap ______, chlorinated ______ non-chlorinated ______

   d. Other (specify)? ______

2. Is reagent water aged prior to use? yes

   How long? ______, under what conditions? ______

Recommendations:

______

D. Dilution Water

1. Are the four (4) nutrient buffers added to the reagent water? Hach pillows

   a. ______ mls of each nutrient buffer per ______ mls of reagent water

2. When is phosphate buffer added (in relation to setting up BOD test)? just before test

3. How often is dilution water prepared? each time
   Maximum age of dilution water at the time test is set up. ______

4. Under what conditions is dilution water kept? doesn't store

5. What is temperature of dilution water at time of setup? ______ doesn't take

Recommendations:

BOD samples should be at Rm temp (20°C) before the test is set up

E. Test Procedure

1. How often are BOD's being set up? weekly

What is maximum holding time of sample subsequent to end of composite period? 0

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

N/A

3. Does sample to be tested contain residual chlorine? NO
If yes, is sample

a. Dechlorinated? N/A

How? ______

b. Reseeded? N/A

How? ______

4. Is pH of sample between 6.5 and 8.5? doesn't take

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

5. How is pH measured? Hach pH meter

a. Frequency of calibration? daily in 7 buffer

b. Buffers used? every 2-3 mos. in 7 and 4

6. Is final effluent sample toxic? NO

7. Is the five (5) day DO depletion of the dilution water (blank) determined? yes, normal range? 0 - .3

8. What is the range of initial (zero day) DO in dilution water blank? 7.8 - 8.9

9. How much seed is used in preparing the seeded dilution water? N/A

10. Is five (5) day DO depletion of seeded blank determined? ________ If yes, is five (5) day DO depletion of seeded blank approximately 0.5 mg/l greater than that of the dilution water blank? N/A

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? ________

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

a. Sample dilution? ✓

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? ________

if value is way off he drops it.

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

a. Seeded dilution water? ________

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? Supposed to be automatic doesn't work well

18. Is the incubator temperature gage checked for accuracy? yes

a. If yes, how? thermometer in water bath

b. Frequency? before test

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 ______ Other ______

a. If by probe:

1. What method of calibration is in use? air

2. What is the frequency of calibration? each use

b. If by Winkler:

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

2. How is standardization of titrant accomplished? ______

3. What is the frequency of standardization? ______

Recommendations:

Recommend operator keeps a log of temps in BOD incubator to document problems experienced w/ the ~~[illegible]~~ temp. regulation.

Recommend the operator calibrate pH meter in 2 buffers daily and that he take the pH of the sample before setting up BOD test.

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

Recommendations:

____

____

____

____

____

____

III. TOTAL SUSPENDED SOLIDS CHECKLIST

A. Technique

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

   a. Standard Methods? __________ Edition __________

   b. EPA? __________

   c. A.S.T.M.? __________

   d. Other (specify)? Class note books & consultation w/ other operators.

B. Test Procedure

1. What type of filter paper is utilized:

   a. Reeve Angel 934 AH? __________

   b. Gelman A/E? __________

   c. Other (specify)? Whatman GF/C 5.5 cm

   d. Size? __________

2. What type of filtering apparatus is used? Gelman

____

3. Are filter papers prewashed prior to analysis? yes

   a. If yes, are filters then dried for a minimum of one hour 1 at 103°C-105°C yes ?

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

4. How are filters stored prior to use? dessicator

5. What is the average and minimum volume filtered?
100 mls

6. How is sample volume selected?

a. Ease of filtration? ______

b. Ease of calculation? ______

c. Grams per unit surface area? ______

d. Other (specify)? visual examination

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

8. How does analyst proceed with the test when the filter clogs at partial filtration?
Starts over

9. If less than 50 milliliters can be filtered at a time, are duplicate or triplicate sampe volumes filtered? yes

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?
yes

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

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? ______

14. Is a filter aid such as cellite used? ______________________

a. If yes, explain: ______________________

____

Recommendations:

____

____

____

____

____

____

____

____

____

____

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

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

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

Recommendations:

SPLIT SAMPLE RESULTS:

Origin of Sample ______________________

Collection Date ______________________

BOD		TSS		EPA BOD Standard	
DOE	IND./MUN.	DOE	IND./MUN.	DOE	IND./MUN