



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

WA-PS-0240

March 6, 1978

To: Ron Devitt

From: Bill Yake

Re: Richmond Beach STP
Class II Inspection

Findings and Conclusions:

A Class II inspection of the Richmond Beach STP was undertaken on February 31 and March 1, 1978. This plant provides primary treatment for a design dry weather flow of 3.2 mgd. Bob Jones is the Senior Plant Operator and Bob Hagen is the lab man.

Analyses of composited samples obtained during the inspection indicate that the Richmond Beach plant is in compliance with NPDES permit limitations.

Because the plant effluent is discharged to Puget Sound through diffuser ports approximately 100 feet below the surface of the sound (see Figure 1), direct sampling for fecal coliforms and chlorine residual is impractical. A graph (Figure 2) is therefore used to determine contact time between chlorination and ultimate discharge. This graph was derived by making the following assumptions 1) Discharge pipe between plant and old chlorination tower flows full for a total of 150 feet 2) Diffuser pipe flows full (1547 feet to first diffuser port) 3) The cross-sectional area of both pipes is 4.909 ft² (ID = 30"). These are reasonable assumptions but do not account for any longitudinal mixing (i.e. non-ideal plug flow). Flow probably approaches plug-flow, but any deviation would result in fecal coliform discharges higher than those determined from samples held for periods of time derived from Figure 2 prior to dechlorination. Plant personnel would prefer to reduce the chlorine addition rate (presently 100#/day). Such a change should be undertaken only after collection and analysis of fecal coliform data obtained using a more conservative contact time. Holding coliform samples for 1/2 the time indicated on Figure 2 is suggested.

The plant's Parshall flume has been calibrated one week prior to inspection by Metro personnel. The approach to the flume is not in accordance with design criteria as the comminuter is located in the approach channel immediately upstream of the Parshall flume. For these reasons, the flow was determined in the approach channel approximately 20 feet upstream of the Parshall flume using a magnetic flow meter and top-setting rod. Flows agreed within the 15% criteria.

BY:ee

cc: Central Files
Dick Cunningham

24 Hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. Influent aliquot - 250 ml/30 minutes	1/31/78 at 1025	Immediately below Parshall flume
2. Unchlorinated effluent aliquot - 250 ml/30 minutes	1/31/78 at 1005	Through grating on exit flow from east clarifier.
3. Chlorinated effluent aliquot - 250 ml/30 minutes	1/31/78 at 1020	Through grating on plunge pool between chlorinator and discharge line.

Grab Samples

	Date and Time	Analysis	Sample Location
1.	1/31 at 1041	Fecal Coliform	Old chlorination tower
2.	2/1 at 1005	Fecal Coliform	Same as chlorinated effluent, dechlorinated after 37.5 min. holding time.
3.	2/1 at 1135	Fecal Coliform	Same as above, dechlorinated after 27.5 min. holding time.
4.			
5.			
6.			

Flow Measuring Device

1. Type Parshall flume
2. Dimensions

a. Meets standard criteria Yes
 No Explain:

b. Accuracy check

	Actual Instan. Flow	Recorder Reading	Recorder Accuracy (% of inst. flow)
1.	2.67 mgd	2.35 mgd	113.6%
2.			
3.			

is within accepted 15% error limitations
 is in need of calibration

Field Data

Parameter	Date and Time	Sample Location	Result
Temperature	2/1/78 at 1100	Influent	12.5°C
Temperature	2/1/78 at 1105	Unchlor. eff.	12.0°C
Temperature	2/1/78 at 1110	Chlor. eff.	12.0°C
pH	2/1/78 at 1100	Influent	7.3
pH	2/1/78 at 1105	Unchlor. eff.	7.3
pH	2/1/78 at 1110	Chlor. eff.	7.1
Conductivity	2/1/78 at 1100	Influent	380
Conductivity	2/1/78 at 1105	Unchlor. eff.	362
Conductivity	2/1/78 at 1110	Chlor. eff.	368

(over for additional field data)

<u>Parameter</u>	<u>Date & Time</u>	<u>Sample Location</u>	<u>Result</u>	<u>After holding period</u>
Chlorine residual	1/31/78 at 1035	Old Chlorination Tower	1.5	
Chlorine residual	1/31/78 at 1040	Chl. eff. site	2.25	
Chlorine residual	1/31/78 at 1005	Chl. eff. site	2.25	1.5
Chlorine residual	1/31/78 at 1135	Chl. eff. site	2.25	1.5

Review of Laboratory Procedures and Techniques

Chlorine residual: 1) The plant presently uses orthotolodine analysis. Neither Standard Methods nor the Department of Ecology accept this procedure. Use of a D.P.D. Kit is recommended.

on samples held for the same period of time as fecal coliform samples (i.e. times determined from Figure 2).

Biochemical Oxygen Demand:

purchase and use of a thermometer submersed in a water bath is recommended.

2) Dilution water blanks are used to determine initial dissolved oxygen concentrations. It is recommended that initial dissolved oxygen concentrations be performed on duplicate dilutions of waste-water prepared in the same manner as the dilutions which are read after 5 days.

3) It is suggested that data be reported only from those dilutions which show a drop of at least 1 mg O_2 /l, and which also have at least 2 mg O_2 /l remaining after the 5 day incubation period.

4) Lab personnel report that blanks occasionally show a drop of greater than 0.2 mg O_2 /l. No obvious reason for this was determined. Personnel should continue every effort to use clean labware in dilution water preparation. In addition dilution water should be prepared daily. As an alternative dilution water may be prepared in advance without phosphate buffer. The phosphate buffer may be then added to aliquots of dilution water on a daily basis.

5) Duplicate dilutions are not run as a matter of course. Processing duplicate dilutions improves the quality of data reported and protects against loss of data.

Total Suspended Solids - Procedures acceptable.

Fecal Coliform - Procedures acceptable.

Agreement between Richmond Beach STP and Department of Ecology data was relatively good. No serious discrepancies were noted.

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			Richmond Beach STP			NPDES (Monthly average)
	Influent	Unchlor. Effluent	Chl. Effluent	Influent	Unchlor Effluent	Chlor. Effluent	
BOD ₅ mg/l	130	117	106	144	126	87	120
lbs/day	1952	1757	1591	2162	1892	1306	3575
TSS mg/l	98	56	32	140	60	--	70
lbs/day	1471	841	480	2102	901	--	2760
Total Plant Flow MGD	--	--	--	1.798	--	--	3.2
FFecal Coliform			450 (1)			150	
			180 (2)				
			130 (3)				
Chlorine Residual*			1.5 (1)				
			2.25 (2a)	1.5 (2b)			
			2.25 (3a)	1.5 (3b)			
			2.25 (4)				
COD (mg/l)	402	209	232				
Total Solids (mg/l)	326	279	285				
Total Non-Volatile Solids (mg/l)	172	171	166				
Total Non-Volatile Suspended Solids (mg/l)	31	14	12				
NH ₃ -N (mg/l)	14.8	16.7	16.8	15.9 ⁽⁵⁾	15.2 ⁽⁵⁾		
NO ₂ -N (mg/l)	0	0	0	--	--		
NO ₃ -N (mg/l)	0.6	0.6	0.6	--	--		
Organic-N (mg/l)	--	--	--	8.8 ⁽⁵⁾	7.8 ⁽⁵⁾		
Total-N (mg/l)	--	--	--	24.7 ⁽⁵⁾	23.0 ⁽⁵⁾		

- (1) At old chlorination tower, dechlorinated immediately.
- (2) Dechlorinated at chlorinated effluent site, dechlorinated after 37.5 minutes (2a) At time of sampling (2b) After 37.5 minutes.
- (3) At chlorinated effluent site, dechlorinated after 27.5 minutes (3a) At time of sampling (3b) After 27.5 minutes.
- (4) At chlorinated effluent site, analyzed immediately.
- (5) Independent analysis of 1/11/78 effluent by Richmond Beach STP.

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

	DOE			Richmond Beach STP			NPDES (Monthly Average)
	Influent	Unchlor. Effluent	Chlor. Effluent	Influent	Unchlor. Effluent	Chlor. Effluent	
O-PO ₄ -P (mg/l)	3.2	3.6	3.6	--	--	--	
T-PO ₄ -P (mg/l)	6.4	6.6	6.6	6.3 ⁽⁵⁾	5.6 ⁽⁵⁾	--	
pH	7.4	7.3	7.3				
pH*	7.2	7.2	7.1				
Spec. Conductivity	405	377	357				
Spec. Conductivity	400	420	393				
Digester Sludge							
Trace Metals (mg/Kg dry wgt.)							
Zinc	2270						
Cadmium	9.3						
Lead	440						
Chromium	40						
Copper	1190						
Trace Metals (mg/l)							
Zinc	360		240				
Cadmium	< 10		< 10				
Lead	< 50		< 50				
Chromium	< 10		< 10				
Copper	220		150				

(5) Independent analyses of 1/11/78 effluent by Richmond Beach STP

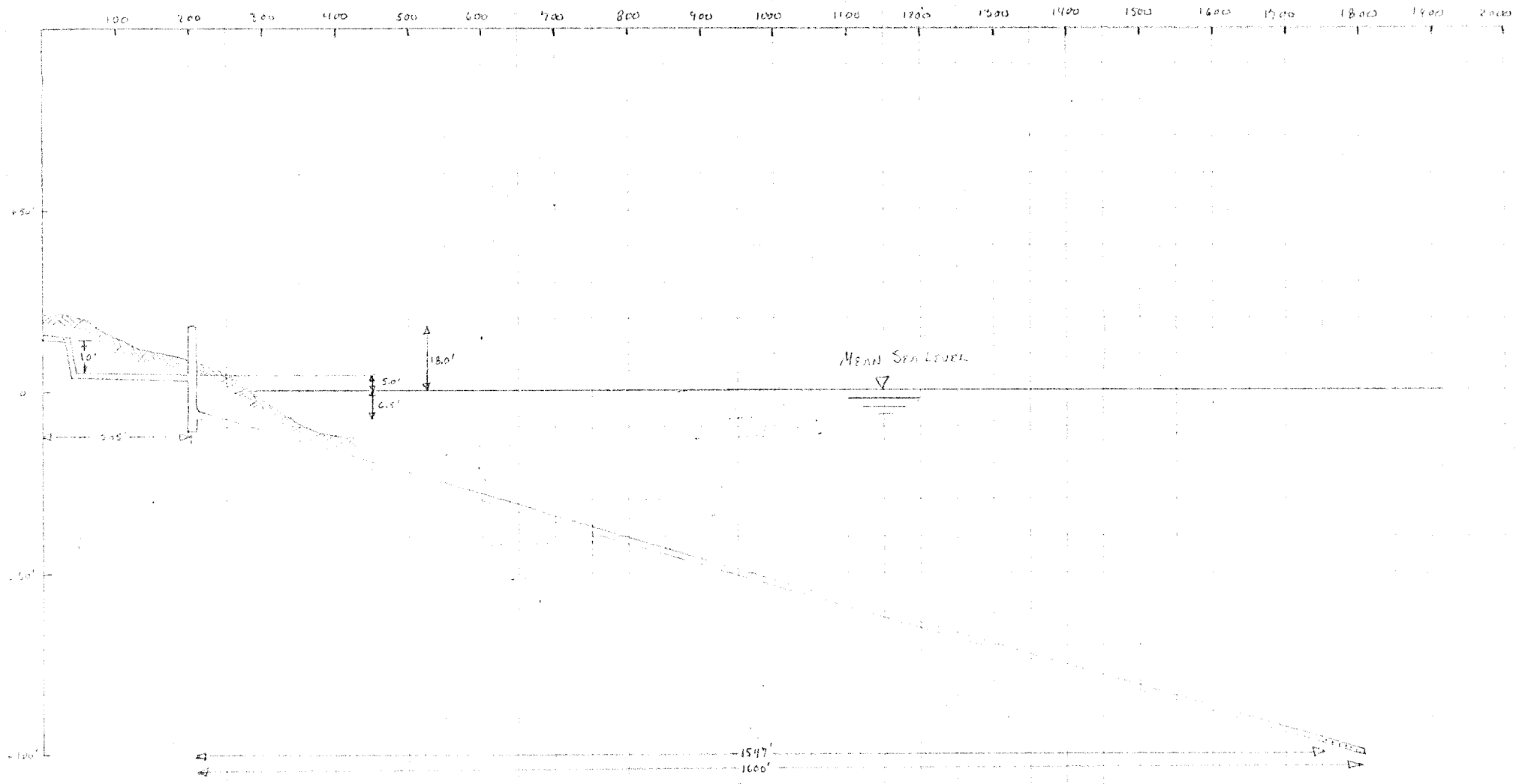
* Field Analysis

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

RICHMOND BEACH STP OUTFALL AND DIFFUSER

FIGURE # 1

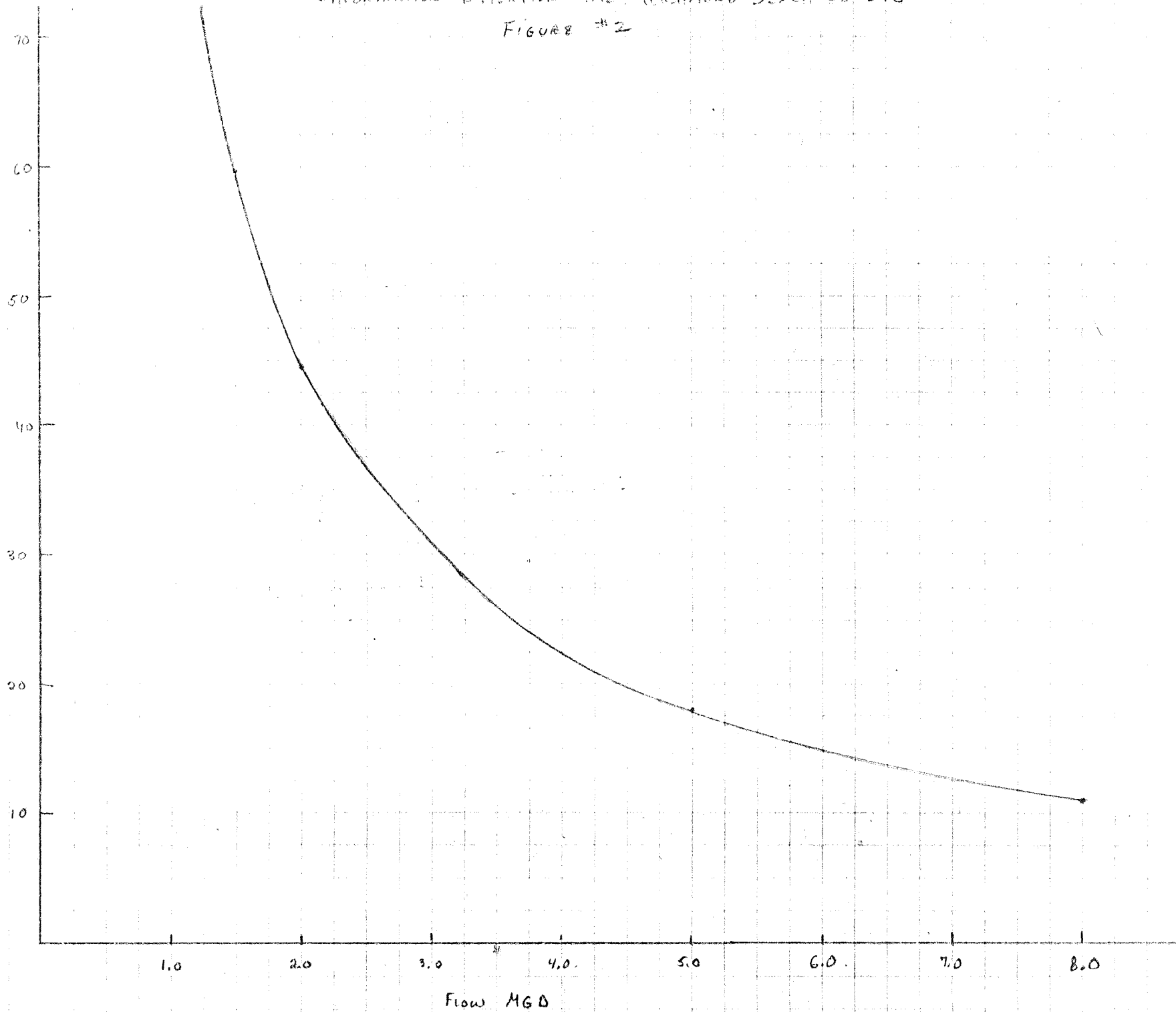
DISTANCE FROM PLANT OUTFALL



CHLORINATION DETENTION TIME - RICHMOND BEACH S.W.T. PLANT

FIGURE #2

RETENTION TIME - MINUTES





DATA SUMMARY

Source Metro's Richmond Beach STP

Collected By Morkous & Yake

Date Collected 1/31-2/1/78

Log Number:

78-361

COMP

62 63

GRAB

64 65 66*

Station:	INF	UNCALIB. EFF	CHLOR. EFF		→	SCUDGE 0900			
pH	7.4	7.3	7.3						
Turbidity (NTU)									
Sp. Conductivity (umhos/cm)	405.	377.	357						
COD	402	209	232						
BOD (5 day)	130.	117.	106.						
Total Coliform (Col./100ml)									
Fecal Coliform (Col./100ml)					180	EST 130			
NO3-N (Filtered)	0.6	0.6	0.6						
NO2-N (Filtered)	<.02								
NH3-N (Unfiltered)	14.8	16.7	16.8						
T. Kjeldahl-N (Unfiltered)									
O-PO4-P (Filtered)	3.2	3.6	3.6						
Total Phos.-P (Unfiltered)	6.4	6.6	6.6						
Total Solids	326	279	285						
Total Non. Vol. Solids	172	171	166						
Total Suspended Solids	98	56	32						
Total Sus. Non Vol. Solids	31	14	12						
ZINC	0.36		0.24			2270.			
Copper	0.22		0.15			1190.			
Chromium	<.01		<.01			40.			
Lead	<.05		<.05			440.			
CADMIUM	<.01		<.01			9.3			

Note: All results are in PPM (mg/L) unless otherwise specified. ND is "None Detected"
 "<" is "Less Than" and ">" is "Greater Than" * mg/kg DRY WEIGHT (6.7% DRY SOLIDS)
 UNABLE TO ANALYZE AT THIS TIME

ECY 040-2-32

Summary By J. RA

Date 3-1-78

WASHINGTON STATE DEPARTMENT OF ECOLOGY

OLYMPIA ENVIRONMENTAL LABORATORY

BOD DATA SHEET AND CALCULATIONS

NAME: RICHMOND BEACH S.T.P.

LOCATION: _____

COLLECTED BY: _____

DATE COLLECTED: _____

TEST RUN: 2/2/78 TIME: 1400

COMPLETED: 2/7/78 TIME: 1400

LOG NUMBERS AND SAMPLE IDENTIFICATION	pH	BOTTLE	SAMPLE VOLUME	0-DAY D.O.	5-DAY D.O.	BLANK D.O. DEPLETION	D.O. DEPLETION	F X SEED CORRECTION	DIL. FACTOR	BOD	BOD AVERAGE
BLANK		1									
		2		9.2	9.0	N/A	.2	x	x	=	
		3		9.2	9.0	N/A	.2	x	x	=	
SEED		4	10								
		5		9.3	7.8	.2	1.3	$\frac{1}{2} \times \frac{1}{4}$	x 100	= 130	$\frac{(130)(2)}{1000} = .3$
		6		9.3	7.8	.2	1.3	$\frac{1}{4} \times \frac{1}{2}$	x 100	= 130	
SEEDED BLANK (2 ml / L)		7									
		8		9.3	8.8	.2	.3	x	x	=	
		9		9.3	8.8	.2	.3	x	x	=	
INF. 780361	7.4	10	40 mL								
		11		9.3	3.5	.2	5.6	$.960 \times .3$	x 25	= 132.5	132 (130)
		12		9.3	3.5	.2	5.6	$.960 \times .3$	x 25	= 132.5	
		13	15 mL								
		14		9.3	6.9	.2	2.2	$.985 \times .3$	x 67	= 127.3	127
		15		9.3	6.9	.2	2.2	$.985 \times .3$	x 67	= 127.3	
780362	7.3	16	50 mL								
UNCHLORINATED		17		9.2	3.1	.2	5.9	$.950 \times .3$	x 20	= 114	114 (117)
EFF.		18		9.2	3.1	.2	5.9	$.950 \times .3$	x 20	= 114	

WASHINGTON STATE DEPARTMENT OF ECOLOGY

OLYMPIA ENVIRONMENTAL LABORATORY

BOD DATA SHEET AND CALCULATIONS

NAME: RICHMOND BEACH STP.

LOCATION: _____

COLLECTED BY: _____

DATE COLLECTED: _____

TEST RUN: 2-2-78 TIME: 1400

COMPLETED: 2-7-78 TIME: 1400

LOG NUMBERS AND SAMPLE IDENTIFICATION	pH	BOTTLE	SAMPLE VOLUME	0-DAY D.O.	5-DAY D.O.	BLANK D.O. DEPLETION	D.O. DEPLETION	f X SEED CORRECTION	DIL. FACTOR	BOD	BOD AVERAGE
		19	20 ML								
		20		9.3	6.4	.2	2.7	.980 x .3	x 50	= 120	120 → (117)
		21		9.3	6.4	.2	2.7	.980 x .3	x 50	= 120	
78-0363	7.3	22	50 ML								
CHLORINATED EFF.		23		9.3	3.5	.2	5.6	.980 x .3	x 20	= 106	106 → (106)
(DECHLORINATED)		24		9.3	3.5	.2	5.6	.980 x .3	x 20	= 106	
		25	20 ML								
		26		9.3	6.7	.2	2.4	.980 x .3	x 50	= 105	105
		27		9.3	6.7	.2	2.4	.980 x .3	x 50	= 105	

Ron:

I think the problems in BOD procedures evidenced at Richmond Beach are possibly symptomatic of some of the smaller treatment plant BOD procedures. With the publication of DOE 77-24 ("Laboratory Test Procedure for Biochemical Oxygen Demand of Water and Wastewater") this would be a good time to deal with this problem. I would suggest that you arrange with Don Kjosness (Turwater Laboratory) for area-wide distribution of this publication. This is usually distributed with a cover letter noting a time approximately 2-3 weeks after distribution when Don will meet with the operators as a group to answer questions from operators. This would allow operators to receive instruction in the theory and practice of BOD determination which should in turn improve the quality of their BOD data.