

MEMORANDUM

March 26, 1976

To: Tom Coleman

From: Doug Houck

Subject: Richland STP Class II Inspection

On November 6 Tom Coleman, DOE, and I met with the head operator of the Richland sewage treatment plant, Don Dean. Composite samplers were set up to take 24 hour composites of both the influent and effluent. The influent sampler location was at the beginning of the head works just before the grit chamber. The effluent sampler location was in the discharge channel after the chlorine contact chamber. A 250 ml sample was taken every 30 minutes from both samplers. No bacteriological samples were taken as they could not be brought back to DOE's lab in time. The chlorine residual and pH were determined and their flow measuring device checked.

The plant measures the flow with a Sparling turbine type in-line flow meter located just before the chlorine contact chamber. The flow measuring device was checked by comparison of the flow over the suppressed sharp-crested rectangular weir at the end of the contact chamber to the Sparling. The difference between the Sparling and the weir was 5.7 percent. The pH and chlorine residual met the permit requirements although the chlorine residual was very high at 5 ppm. The reason for the high chlorine residual was the reporting of high fecal coliform counts which was a result of incorrect laboratory techniques. The lab was using outdated MF broth ampules, not using dilution water and reading the fecal coliforms under a 20 power microscope. After correcting the laboratory procedure the concentration of fecal coliforms was below 200 colonies per 100 ml which has resulted in a large decrease of the chlorine residual.

The plant was also reporting a high five-day BOD concentration in the effluent. This does not appear to be a result of poor laboratory techniques.

The problem apparently results from the filter having too many snails and too low of a recirculation ratio. The snail problem seems to have started when the city used Yakima River water to augment the small flow within the sewer lines when the first plant was just starting. This snail problem has increased since the city shut down the first plant and started using the second plant exclusively.

The composite samples were split and analyzed by both Richland and DOE. The following table shows the results.

	<u>DOE</u>		<u>Richland</u>		<u>NPDES Permit</u>
	<u>Influent</u>	<u>Effluent</u>	<u>Influent</u>	<u>Effluent</u>	<u>Weekly Average</u>
BOD (mg/l)	124	22	216	75	45
T.S.S. (mg/l)	126	28	---	---	45

Richland did not analyze for total suspended solids because of insufficient sample. The effluent sample was only a six-hour composite due to equipment malfunction.

As seen from the table there is a large discrepancy in the five day BOD results. The results obtained by the DOE lab should be questioned due to large D.O. drops in the dilution water. The dissolved oxygen dropped 2.5 mg/l in the influent control sample and 1.3 mg/l in the effluent control sample. The city of Richland experienced a D.O. drop of only 0.1 mg/l in both of their control samples. It is recommended that another Class II inspection be done to qualify the city of Richland's laboratory data.

DH:ee

STP Survey Report Form

Efficiency Study

City Richland Plant Type Secondary Pop. Served \_\_\_\_\_ Design Capacity \_\_\_\_\_  
 Receiving Water Yakima River Perennial  Intermittent \_\_\_\_\_  
 Date 11/6-7/75 Survey Period 6 hrs - 24 hrs. Survey Personnel Doug Houck  
 Comp. Sampling Frequency 30 min. Sampling Alequot 250 ml  
 Weather Conditions (24 hr) clear Are facilities provided for complete by-pass of raw sewage?  Yes \_\_\_\_\_ No/Frequency of bypass \_\_\_\_\_  
 Reason for bypass \_\_\_\_\_ Is bypass chlorinated?  Yes \_\_\_\_\_ No  
 Was DOE Notified? \_\_\_\_\_ Discharge - Intermittent \_\_\_\_\_ Continuous \_\_\_\_\_

Plant Operation

Total flow \_\_\_\_\_ How measured Sparling flow meter  
 Maximum flow \_\_\_\_\_ Time of Max. \_\_\_\_\_  
 Minimum flow \_\_\_\_\_ Time of Min. \_\_\_\_\_  
 Pre Cl<sub>2</sub> \_\_\_\_\_ #/day Post Cl<sub>2</sub> \_\_\_\_\_ #/day

Field Results

Influent

Effluent

Determinations	Max.	Min.	Mean	Median	Max.	Min.	Mean	Median
Temp °C								
pH (Units)				7.6				7.3
Conductivity (µmhos/cm <sup>2</sup> )								
Settleable Solids (mis/l)								

Laboratory Results on Composites

	Influent	Effluent	% Reduction
Laboratory No.	<u>75-5138</u>	<u>75-5139</u>	
5-Day BOD ppm	<u>124</u>	<u>22</u>	<u>82% *</u>
COD ppm	_____	_____	_____
T.S. ppm	_____	_____	_____
T.N.V.S. ppm	_____	_____	_____
T.S.S. ppm	<u>126</u>	<u>28</u>	<u>78%</u>
N.V.S.S. ppm	_____	_____	_____
pH (Units)	_____	_____	_____
Conductivity (µmhos/cm <sup>2</sup> )	_____	_____	_____
Turbidity (JTU's)	_____	_____	_____

\* Questionable Data

Laboratory Bacteriological Results

Lab No.	Sampling Time	Colonies/100 ml (MF)			Cl <sub>2</sub> Residual
		Total Coliform	Fecal Coliform	Fecal Strep	
	11-6				≈ 5.0
	11-7				DOE 2.6 Richland 1.3

Additional Laboratory Results

NO <sub>3</sub> -N ppm	-
NO <sub>2</sub> -N ppm	-
NH <sub>3</sub> -N ppm	-
T. Kjeldahl-N ppm	-
O-PO <sub>4</sub> -P ppm	-
T-PO <sub>4</sub> -P ppm	-

Operator's Name Don Dean Phone No. 509-943-9161 Ext. 225

Furnish a flow diagram with sequence and relative size and points of chlorination.

Type of Collection System

Combined  Separate  Both

Estimate flow contributed by surface or ground water (infiltration)

\_\_\_\_\_ MGD

Plant Loading Information

Annual average daily flow rate (mgd)

Peak flow rate (mgd)

Dry \_\_\_\_\_

Dry \_\_\_\_\_

Wet \_\_\_\_\_

Wet \_\_\_\_\_

COMMENTS: \_\_\_\_\_

10

M E M O R A N D U M

July 8, 1976

To: Jim Milton

From: Douglas Houck

Subject: Richland STP Class II Inspection

On March 2, 1976, Mike Morhous and I arrived at the Richland sewage treatment plant to conduct a second inspection. The primary reason for the inspection was the laboratory discrepancies noted during the last inspection. From the last inspection our data showed an effluent BOD<sub>5</sub> of 22 ppm while their analysis showed 75 ppm. For this inspection a composite sampler was placed after the comminutor, at the overflow from the secondary clarifier and at the end of the chlorine contact chamber. A 250 ml aliquot was taken every 30 minutes from each sampler.

Laboratory analytical techniques were reviewed again and found satisfactory. Pete Riler was still experiencing small blue dots on the membrane filter paper when examined under magnification. He therefore wanted to try a double enrichment procedure which Millipore has come out with. He was also told that after counting the number of colonies after 24 hours of incubation to note any differences after an additional 24 hours of incubation. Both techniques are to overcome what are called "stunted colonies" due to sub-lethal injury caused by chlorination. I don't feel though that this is his problem. He was reporting the fecal count correctly.

The plant's flow recorder was checked and was found to be reading approximately 8 percent on the high side. This is acceptable. They had a chlorine residual as determined by the DPD method of 1.3 ppm at 0855 on the third.

The plant was still experiencing a snail problem in their trickling filter. They were going to try and kill the snails, species Physa, with chlorine at a future date. It was noticed that a large number of dead fly larvae were floating in the chlorine contact chamber. The larvae was identified of the family simuliidae.

On the third we returned to pick up the samples and split the composites. All three composites were split with the city and analyzed for BOD<sub>5</sub> and TSS. It should be noted that the city of Richland did not seed the chlorinated BOD<sub>5</sub> sample.

The following table presents their analyses along with DOE's results and their NPDES monthly average permit limitations.

	<u>DOE</u>			<u>Richland</u>			<u>NPDES Permit</u>
	<u>Inf</u>	<u>2nd</u>	<u>Eff</u>	<u>Inf</u>	<u>2nd</u>	<u>Eff</u>	<u>Monthly Average</u>
BOD <sub>5</sub> (mg/l)	140	30	23	216	30	42	30
TSS (mg/l)	144	24	19	158	37	51	30
Fecal Coliforms (colonies/100 ml)			<10				1,000

As can be seen from the above table there are still some discrepancies for both BOD and TSS. Using DOE's figures the treatment plant is meeting their permit conditions. Using Richland's figures they are not. I have few ideas for why there are still discrepancies in the laboratory results. Using COD and other solids results it appears that DOE's results are correct except for possibly the effluent BOD<sub>5</sub>. Assuming a constant relationship between COD and BOD<sub>5</sub> and that DOE's influent and secondary clarifier results are correct the effluent BOD<sub>5</sub> would be 35 ppm instead of 23 ppm.

It is felt that a possible reason for Richland's previously high reported BOD<sub>5</sub>'s is due to sampling technique. It is strongly felt that the city should purchase an automatic composite sampler instead of manually taking an eight hour composite. Their eight hour composite normally consists of only 4 samples. It is also felt that their fecal coliform permit condition should be lowered to a monthly geometric mean of only 200 colonies per 100 mls.

DH:ee  
 Attachment



DATA SUMMARY

ORIGINAL TO: DL  
COPIES TO:  
.....  
.....  
.....  
LAB FILES.....

Source Richland STP

Collected By Houck + Mordous

Date Collected 3-23-76

Log Number:

76-640 641 642 643 644 645 646

Station:	INF	UNCHLOR. EFF	CHLOR. EFF	→ +H <sub>2</sub> SO <sub>4</sub>	2% CHLOR. UNCHLOR. EFF	GRAB 0845	GRAB 0905				
pH	7.3	7.3	7.3								
Turbidity (NTU)											
Sp. Conductivity (umhos/cm)											
COD	270	75	83								
BOD (5 day)	<sup>216</sup> 140	<sup>30</sup> 30	<sup>42</sup> 23	<sup>42</sup>							
Total Coliform (Col./100ml)											
Fecal Coliform (Col./100ml)						<10	<10				
NO <sub>3</sub> -N (Filtered)		0.97	1.1	1.1	0.97						
NO <sub>2</sub> -N (Filtered)		0.18	0.09	0.02	0.14						
NH <sub>3</sub> -N (Unfiltered)		17.	18.	18.	18.						
T. Kjeldahl-N (Unfiltered)											
O <sup>-</sup> PO <sub>4</sub> -P (Filtered)		5.8	6.2	4.9	6.2						
Total Phos.-P (Unfiltered)		7.7	8.0	7.8	8.2						
Total Solids	544	406	402								
Total Non. Vol. Solids	310	304	295								
Total Suspended Solids	<sup>154</sup> 144	<sup>37</sup> 24	<sup>51</sup> 19								
Total Sus. Non Vol. Solids	26	4	4								

Note: All results are in PPM (mg/L) unless otherwise specified. ND is "None Detected"  
" < " is "Less Than" and " > " is "Greater Than"

Efficiency Study

City Richland Plant Type Secondary Pop. Served \_\_\_\_\_ Design 38,000 pe  
 Receiving Water Yakima River Perennial  Intermittent \_\_\_\_\_  
 Capacity \_\_\_\_\_  
 Date 3/2-3/76 Survey Period 24 hours Survey Personnel Houck, Morhous  
 Comp. Sampling Frequency 30 min. Sampling Alequot 250 ml  
 Weather Conditions (24 hr) dry Are facilities provided for complete by-  
 pass of raw sewage?  Yes \_\_\_\_\_ No/Frequency of bypass \_\_\_\_\_  
 Reason for bypass \_\_\_\_\_ Is bypass chlorinated?  Yes \_\_\_\_\_ No  
 Was DOE Notified? \_\_\_\_\_ Discharge - Intermittent \_\_\_\_\_ Continuous \_\_\_\_\_

Plant Operation

Total flow \_\_\_\_\_ How measured Sparling flow meter  
 Maximum flow \_\_\_\_\_ Time of Max. \_\_\_\_\_  
 Minimum flow \_\_\_\_\_ Time of Min. \_\_\_\_\_  
 Pre Cl<sub>2</sub> \_\_\_\_\_ #/day Post Cl<sub>2</sub> \_\_\_\_\_ #/day

Field Results

Influent

Effluent

Determinations	Influent				Effluent			
	Max.	Min.	Mean	Median	Max.	Min.	Mean	Median
Temp °C				14.3				12.8
pH (Units)								
Conductivity (µmhos/cm <sup>2</sup> )								
Settleable Solids (mls/l)								

Laboratory Results on Composites

	Influent	Effluent	% Reduction	lbs/day
Laboratory No.	<u>76-640</u>	<u>-642</u>		
5-Day BOD ppa	<u>140</u>	<u>23</u>	<u>83.6%</u>	
COD ppa	<u>270</u>	<u>83</u>		
T.S. ppa	<u>544</u>	<u>402</u>		
T.N.V.S. ppm	<u>310</u>	<u>295</u>		
T.S.S. ppa	<u>144</u>	<u>19</u>	<u>93.8%</u>	
N.V.S.S. ppa	<u>26</u>	<u>4</u>		
pH (Units)	<u>7.3</u>	<u>7.3</u>		
Conductivity (µmhos/cm <sup>2</sup> )				
Turbidity (JTU's)				

Lab No.	Sampling Time	Colonies/100 ml (MF)			Cl <sub>2</sub> Residual
		Total Coliform	Fecal Coliform	Fecal Strep	
76-645			<10		1.0 @ 3/2/76
-646			<10		1.3 @ 3/3/76

Additional Laboratory Results

NO <sub>3</sub> -N ppm -	1.1
NO <sub>2</sub> -N ppm -	0.02
NH <sub>3</sub> -N ppm -	18.0
T. Kjeldahl-N ppm -	
O-PO <sub>4</sub> -P ppm -	4.9
T-PO <sub>4</sub> -P ppm -	7.8

\* Operator's Name Don Dean Phone No. 943-9161 Est. 225

Furnish a flow diagram with sequence and relative size and points of chlorination.

Type of Collection System

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Estimate flow contributed by surface or ground water (infiltration)

\_\_\_\_\_ MGD

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Annual average daily flow rate (mgd)

Peak flow rate (mgd)

Dry \_\_\_\_\_

Dry \_\_\_\_\_

Wet \_\_\_\_\_

Wet \_\_\_\_\_

COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_