Publication No. 80-e09

WA-23-1020

TO: Files

FROM: Douglas Houck

SUBJECT: Low D.O. Values In The Chehalis River

DATE: January 22, 1980

State of Washington Department of Ecology

On October 8, 1979 the Chehalis River at the Mellon Street bridge was sampled by DOE ambient water quality monitoring personnel and was found to have a dissolved oxygen, D.O., level of 3.0 mg/l. This resulted in a quick investigation to try and determine the causes and culprit for the low D.O. value.

On the 10th, river samples from below the Mellon Street bridge to the State Highway No. 6 bridge were taken. During this time it was discovered that Salzer Creek had a D.O. level of 1.4 mg/l and a BOD_5 of 640 mg/l due to corn waste running off the irrigation fields of National Fruit Canning Company. The reason for the overland flow was, approximately five weeks earlier, National Fruit had broken the irrigation line which allowed them to spray irrigate their corn waste on two of their three fields. This meant that for the last five weeks they could only irrigate the one field. The result was saturation of the soils and direct overland flow. Contact was made with National Fruit and they immediately moved their sprinkles to the far end of the field away from Salzer Creek. The next day they agreed to block off the natural drainage with dirt as there was still a direct discharge from the field. Although there is no way of knowing when the field became saturated severe slime growth in Salzer Creek was present below the point of discharge.

On the 11th, another river sampling run was done along with more sampling of Salzer Creek. All of the data has been compiled, and although there isn't sufficient data for a total explanation, I can draw the following assumptions and conclusions:

1. There has been a historically low D.O. problem in the Chehalis River at the Mellon Street bridge although not to the level experienced in 1979.

2. Salzer Creek on the 10th contributed 8,000 lbs. of BOD_5 and approximately 4,000 lbs. on the 11th.

3. The Chehalis STP contributed 544 lbs. BOD_5 and 622 lbs. nitrogenous oxygen demand (NOD) for a total of 1,166 lbs. total oxygen demanding waste on the 10th.

4. The Chehalis River above the Chehalis STP was flowing at approximately 40 MGD with a D.O. of 10.0 mg/l. The dissolved oxygen levels declined continuously from just below the Chehalis STP to the Centralia STP, with a final D.O. of 0.9 mg/l.

5. No significant D.O. depletion is due to initial dilution of low dissolved oxygen wastes.

6. Assuming an average river width of 100 ft. and a depth between 10 ft. - 12 ft., there was a travel time of 6.4 days between the two STP's.

7. The Chehalis STP, assuming no re-aeration, could have caused a 3.5 mg/l depletion of dissolved oxygen under the conditions as studied.

8. In the stretch between Salzer Creek and the Mellon Street bridge, all of the inorganic nitrogen disappears, there is an increase of organic nitrogen, a significant reduction of ortho-phosphorus, no significant levels of chlorophyll-a or pheophytin-a and a dramatic decrease in the dissolved oxygen levels. I feel that either a large bacteriological bloom and/or sediment oxygen demand was the main cause of the above symptoms.

9. The Chehalis STP is the first major contributor of phosphorus to the Chehalis River, by increasing the total phosphorus level from 0.06 mg/l to 0.15 mg/l.

10. The pH steadily decreased in the Chehalis River below the Chehalis STP; it went from 7.2 to 6.6.

11. The inorganic nitrogen concentrations increased between the Chehalis STP and Salzer Creek. There appears to have been an ammonia source within this stretch, possibly due to organic nitrogen conversion to ammonia.

12. It appears that Salzer Creek was the main reason for the extreme D.O. sag. in the Chehalis River.

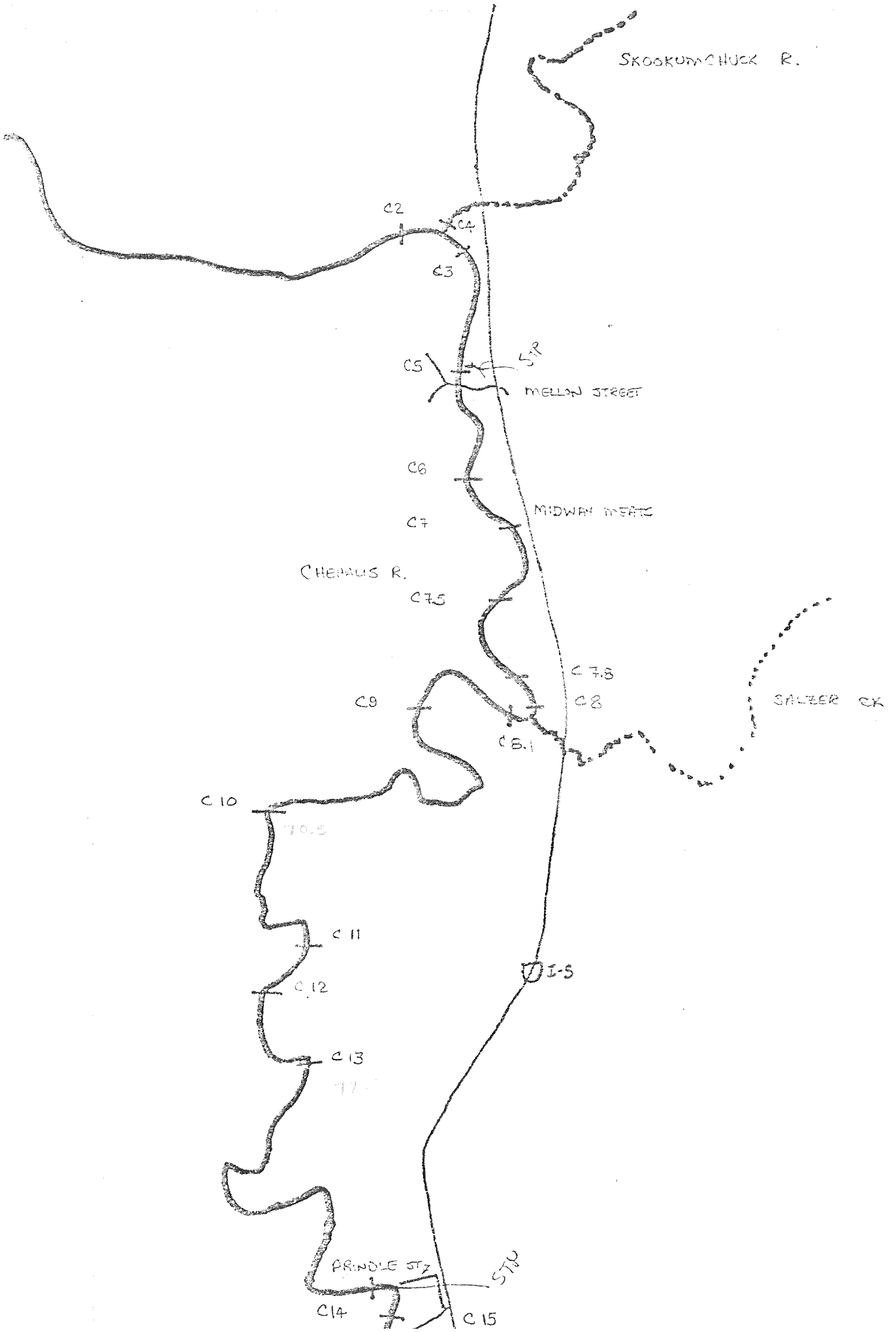
Another survey during the low flow conditions for 1980 needs to be performed to answer the following questions:

1. What impact does the Chehalis STP have on the Chehalis River? What percent of the impact comes from carbonaceous and nitrogenous demand, and the increase in phosphorus concentration?

2. What effect do the sediments have within this stretch of the river?

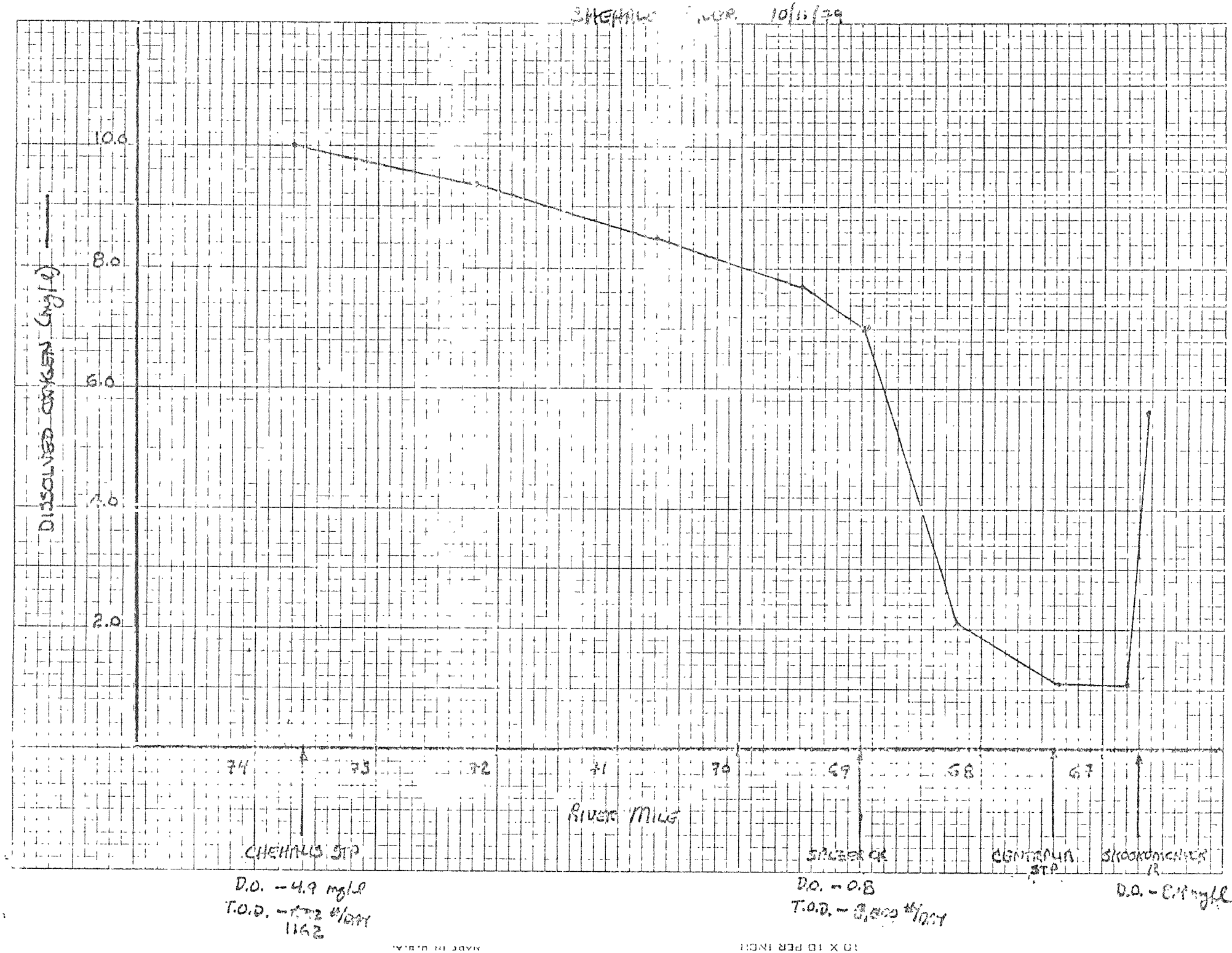
3. Are there any other sources of pollution which could be affecting the river?

By answering these questions I hope to be able to decide what, if any, ammonia and/or phosphorus limitation is needed for the Chehalis STP and if the current Water Quality Standards need to be changed.


SKOOKUMCHUCK R.
C2
C4
C3
C5
S.R
MELLAN STREET
C6
MIDWAY TRAFFIC
C7
CHEHALIS R.
C7.5
C7.8
C9
C8
C8.1
SALTZER CK
C10
C11
C12
I-5
C13
PRINDLE ST
S.R
C14
C15

CHEHALIS RIVER

RM	STATION	D	TEMP	D.O. (% D.O. SAT)	pH	ORG N	NH_3	NO_2 + NO_3	O-PO4	T.P.	COD	T.S.
73.7	C-15	0'	14.0	10.0	7.2	.16	02	<.01	.03	.06		.32
		5'	14.0	10.0								.18
73.10	CHEHALIS STP			4.9	7.2	6	16	10	16	16		
72.2	C 13	0'	14.1	9.5	7.0	.18	.07	.09	.13	.15		.16
		5'		9.4								.34
		15'		9.3								
		0'	15.0	8.6	7.0		.17	.08	.16	.16		.23
70.7	C 10	5'		8.5								
		8'		8.4								
69.5	C-9	0'	15.0	7.7	6.9							
		5'		7.7								
		15'		7.5								
	SALZER CK		15.0	0.8	5.7	1.6	.03	.01	1.3	1.4		
67.0	C-8	0'	15.0	7.3	6.9		.10	.06	.12	.14		.16
BL. SALZER		10'		7.0								
		18'		0.6								
68.2	C-6	0'	15.0	2.1	6.7	.44	ND	ND	.11	.17		.44
67.4	C-5	0'	15.0	1.1	6.6	.58	.03	ND	.08	.15		.03
		10'		1.1								.61
AB CENTRALIA STP												
66.8	C-3	0'	15.0	1.1	6.7		.10	.02	.14	.17		.12
66.35	SKOOKUMCHUCK		13.0	8.4	6.7							
66.7	C _		13.8	5.6	6.8		.06	.08	.08	.12		.14



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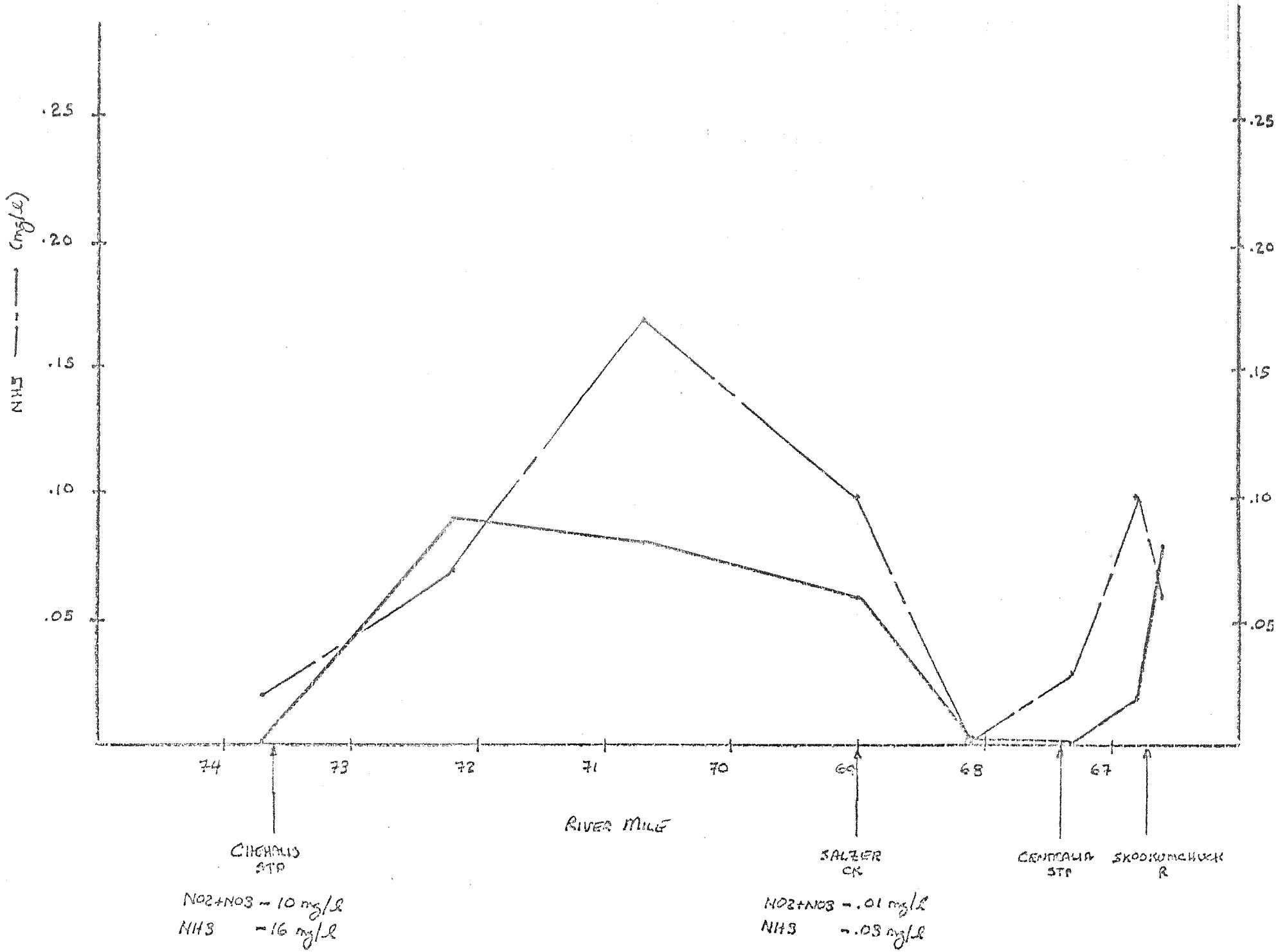
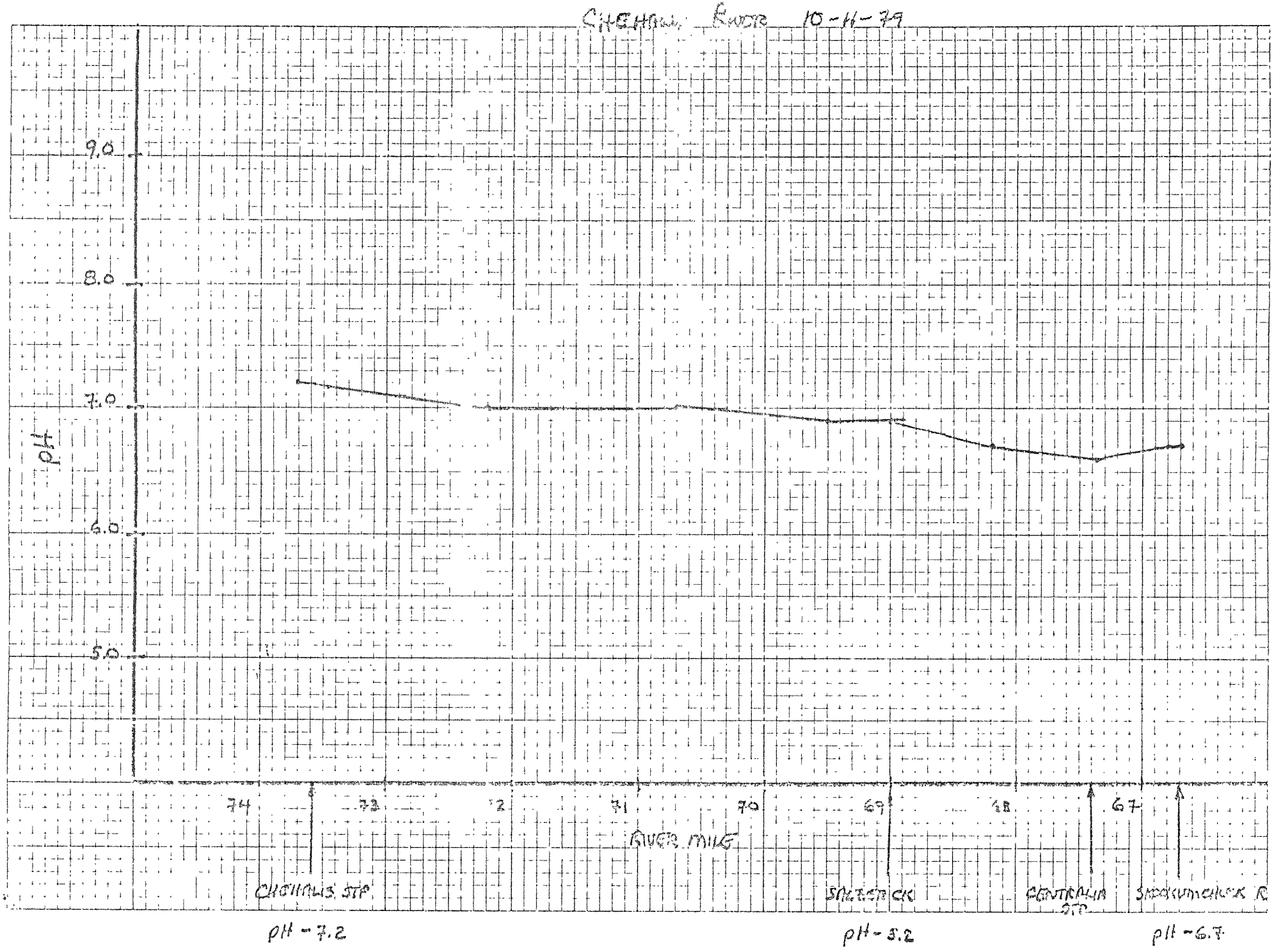
CHEHALIS RIVER 10-11-79





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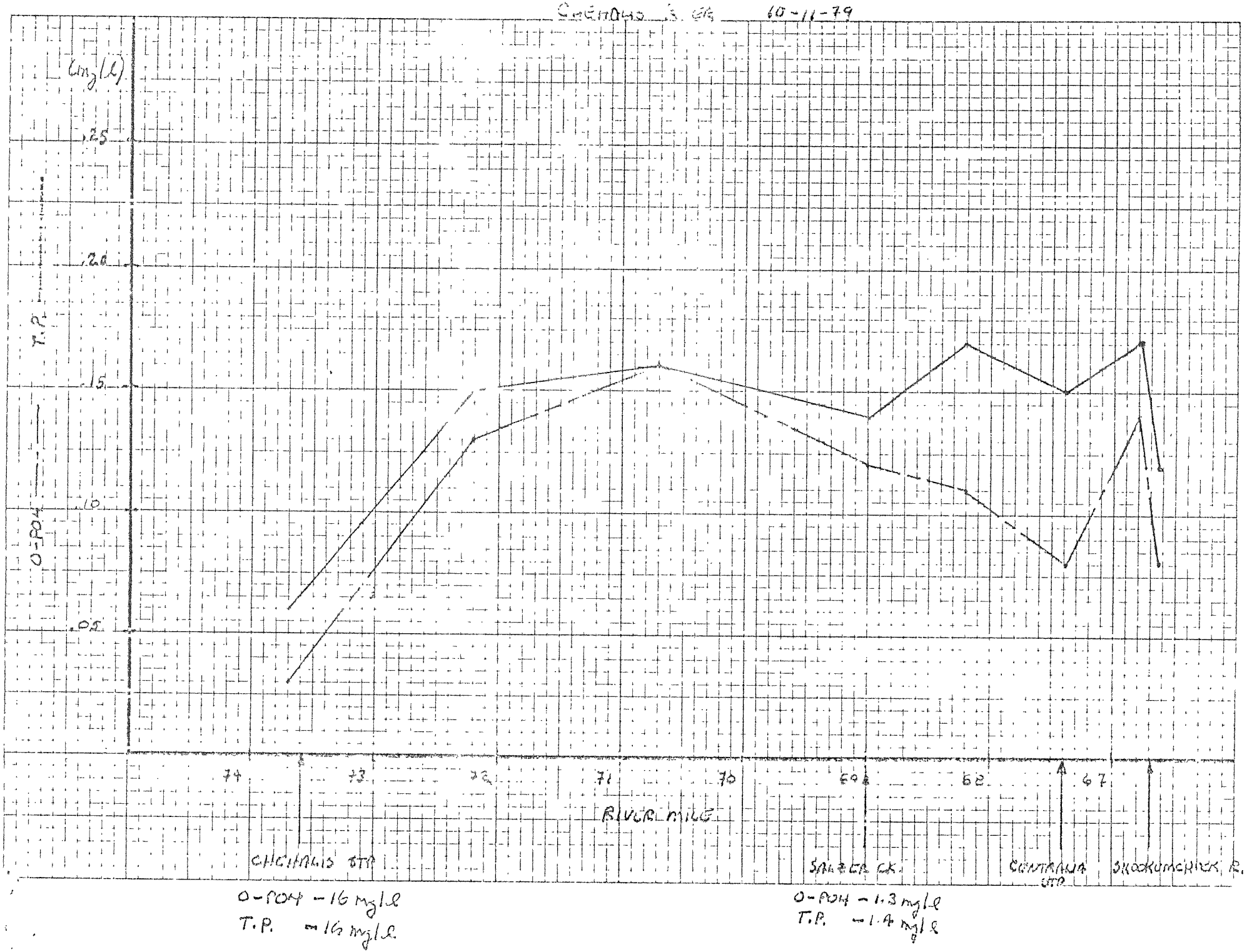

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STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

ORIGINAL TO: D. Houck

COPIES TO:

LAB FILES

OLYMPIA LABORATORY

DATA SUMMARY

Source Chehalis River

Collected By A. Moore

Date Collected 10-10-79

Log Number: 79-3676 77

Station:	Chehalis @ Mellon St. Br.	Salzer Cr @ I-5								
pH		5.0								
Turbidity (NTU)										
Sp. Conductivity (umhos/cm)		326								
COD		420								
BOD (5 day)		640								
Total Coliform (Col./100ml)										
Fecal Coliform (Col./100ml)										
NO3-N (Filtered)	<.01	<.01								
NO2-N (Filtered)	<.01	<.01								
NH3-N (Unfiltered)	.03	.27								
T. Kjeldahl-N (Unfiltered)	.58	1.6								
O-PO4-P (Filtered)	.08									
Total Phos.-P (Unfiltered)	.15	1.2								
Total Solids		620								
Total Non. Vol. Solids		180								
Total Suspended Solids		15								
Total Sus. Non Vol. Solids		6								
Chlorophyll a (mg/M³)	4.1									
Pheophytin a (mg/M³)	0.6									

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

Verified by G. Freeman 11/8/79

ECY 040-2-32

Summary By R. Pall

Date 11/8/79

State of Washington
Department of Ecology

OLYMPIA LABORATORY

DATA SUMMARY

ORIGINAL TO: DH
COPIES TO:
LAB. FILES

Source SALZER CR. & NAT'L. FRUIT

Collected By D. HOUCK

Date Collected 10/11/79

Log Number:	79-3212	18	19	20						
Station:	ROAD AND UPST.	IRRIG RUNOFF@ SALZ CR	SALZER CR DOWNST.	STEARNS CR. @ TWIN OAKS						
pH	6.8	4.4	5.2	7.5						
Turbidity (NTU)	7	60	9	10						
Sp. Conductivity (umhos/cm)	152	1460	279	123						
COD	20	4300	440	20						
BOD (5 day)		1,000								
Total Coliform (Col./100ml)										
Fecal Coliform (Col./100ml)										
NO3-N (Filtered)	<.01	—	D	.12						
NO2-N (Filtered)	<.01	.01	<.01	.01						
NH3-N (Unfiltered)	.08	.18	.02	.05						
T. Kieldahl-N (Unfiltered)	.47	8.8	1.5	—						
O-PO4-P (Filtered)	.12	—	1.4	.11						
Total Phos.-P (Unfiltered)	.13	5.9	1.4	.10						
Total Solids	120	2900	320	120						
Total Non. Vol. Solids	93	900	150	5						
Total Suspended Solids	11	72	33	16						
Total Sus. Non Vol. Solids	10	32	19	15						

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

ECY 040-2-32

Summary By L. Rell Date 10/30/79

State of Washington
Department of Ecology

OLYMPIA LABORATORY

DATA SUMMARY

ORIGINAL TO: DH
COPIES TO:
LAB. FILES

Source Chehalis STP

Collected By D. Houck

Date Collected 10/10/79

Log Number: 79-3206 07

Station: (Composites)	INF	CHLOR-EFF
pH	6.4	7.2
Turbidity (NTU)		
Sp. Conductivity (umhos/cm)	826	772
COD	620	140
BOD (5 day)	330 (164)	44 (110)
Total Coliform (Col./100ml)		
Fecal Coliform (Col./100ml)		
NO3-N (Filtered)	<.2	8.1
NO2-N (Filtered)	<.2	1.4
NH3-N (Unfiltered)	18.	16.
T. Kjeldahl-N (Unfiltered)	30.	22.
O-PO4-P (Filtered)	13.	16.
Total Phos.-P (Unfiltered)	15.	16.
Total Solids	490	760 → Switches
Total Non. Vol. Solids	340 (ed)	380 (236)
Total Suspended Solids	50	230
Total Sus. Non Vol. Solids	6	24

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

ECY 040-2-32

Summary By L. Rolf Date 10/17/79

State of Washington Department of Ecology

ORIGINAL TO: AM
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LAB. FILES

OLYMPIA LABORATORY

DATA SUMMARY

Source Chehalis River

Collected By A. Moore

Date Collected 10-11-79

Log Number:	79-3737	38	39	40	41	42	43	44	45
Station:	DRYDEN PARK	100' [illegible]	C-6	C-8	C-10	C-13	C-15	DILLENBAUGH CR	SALZER CR
pH	6.9	6.9	6.9	7.2	7.1	7.4	7.1	6.7	4.9
Turbidity (NTU)									
Sp. Conductivity (umhos/cm)	100	120	116	111	111	108	106	122	291
COD	12	16	16	12	8	16	8	20	380
BOD (5 day)									
Total Coliform (Col./100ml)									
Fecal Coliform (Col./100ml)									
NO3-N (Filtered)	.08	.02	<.01	.06	.08	.09	<.01	.02	<.01
NO2-N (Filtered)	<.01							>	.01
NH3-N (Unfiltered)	.06	.10	<.01	.10	.17	.07	.02	.06	.03
T. Kjeldahl-N (Unfiltered)			.44			.25	.18		1.9
O-PO4-P (Filtered)	.08	.14	.11	.12	.16	.13	.03	.11	1.3
Total Phos.-P (Unfiltered)	.12	.17	.17	.14	.16	.15	.06	.10	1.4
Total Solids									
Total Non. Vol. Solids									
Total Suspended Solids									
Total Sus. Non Vol. Solids									

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

ECY 040-2-32

Summary By [signature] Date 10/30/79

10-23-13

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

WATER QUALITY LABORATORY

ORIGINAL TO: G. S. Jeanic II

COPIES TO:

LAB FILES

DATA SUMMARY

Source Chehalis R. Collected By G. SJ II

Date Collected 12-2-74 Goal, Pro./Obj.

Log Number: 74- 4725	26	27	28	29	30	31	32	33	34	35	36	STORET
Station: 1	2	2A	3	4	6	8	9	9A	10	China Cr.	Dillenbo Cr	
pH												00403
Turbidity (JTU) 7	6	6	6	5	4	4	4	9	5	5	9	00070
Conductivity (umhos/cm)@25°C												00095
COD												00340
BOD (5 day)												00310
Total Coliform (Col./100ml) 480	1300	1600	250	EST 60	250	1600	1300	470	EST 120	EST 50	230	31504
Fecal Coliform (Col./100ml) EST 6	EST 160	120	EST 4	<2	EST 8	140	64	EST 16	<2	<2	<2	31616
NO3-N (Filtered) .41	.41	.44	.44	.43	.45	.47	.46	.46	.46	.38	.38	00620
NO2-N (Filtered) ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	00615
NH3-N (Unfiltered) .02	.02	.02	.03	.04	.06	.05	.02	.02	.02	.02	.02	00610
T. Kjeldahl-N (Unfiltered)												00625
O-PO4-P (Filtered) .02	.02	.02	.02	.02	ND	ND	ND	ND	ND	ND	.02	00671
Total Phos.-P (Unfiltered) .03	.03	.02	.02	.02	.02	.02	.02	.02	.02	.02	.03	00665
Total Solids												00500
Total Non Vol. Solids												
Total Suspended Solids 8	8	5	7	7	7	5	5	10	4	3	3	00530
Total Sus. Non Vol. Solids 4	5	0	3	3	2	2	3	5	2	0	0	
Chlorides 3	3	3	4	3	3	3	3	3	3	3	6	
Fecal Strep (colonies/100ml) EST 16	EST 34	EST 38	EST 28	EST 12	EST 28	EST 30	EST 10	EST 18	EST 20	78	EST 20	

Note: All results are in PPM unless otherwise specified. ND is "None Detected"
Convert those marked with a * to PPB (PPM X 10^3) prior to entry into STORET

Summary By Stephen D. Robb Date 12-18-74

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

WATER QUALITY LABORATORY

ORIGINAL TO: G.S. Jeane II
COPIES TO:
LAB FILES

DATA SUMMARY

Source Newaukum & Skookum Chuck — Collected By G.S.J II

Date Collected 10-8-74 & 10-9-74 — Goal, Pro./Obj.

Log Number:	74-3995 (10-8)	96 (10-8)	4007 (10-9)	08 (10-9)	STORET
Station:	Chehalis	Skook.	Newauk	Upper Chehalis	
pH	7.2	7.6			00403
Turbidity (JTU)	2.	4.			00070
Conductivity (umhos/cm)@25°C	90.	64.			00095
COD					00340
BOD (5 day)					00310
Total Coliform (Col./100ml)	EST 1600	EST 600	560		31504
Fecal Coliform (Col./100ml)	EST 6	EST 26	EST 16		31616
NO3-N (Filtered)	.02	.06	0.02	0.40	00620
NO2-N (Filtered)	ND	ND	ND	ND	00615
NH3-N (Unfiltered)					00610
T. Kjeldahl-N (Unfiltered)					00625
O-PO4-P (Filtered)	ND	ND	0.05	0.02	00671
Total Phos.-P (Unfiltered)	0.40	0.40	0.20	0.10	00665
Total Solids			96		00500
Total Non Vol. Solids			59		
Total Suspended Solids			3		00530
Total Sus. Non Vol. Solids			ND		
Fecal Strep (colonies/100ml)	EST 3	20	20.		

Note: All results are in PPM unless otherwise specified. ND is "None Detected"
Convert those marked with a * to PPB (PPM X 10^3) prior to entry into STORET

Summary By Stephen P. Bell — Date 10-30-74