

INTERIM REPORT

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HANAFORD CREEK SAMPLING PROGRAM

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Interim report Hanaford Creek Sampling program through April 1971.
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INTRODUCTION

During the year 1971 the Steam-Electric project near Centralia, Washington will begin operation. This project has a potentially large capacity to cause water quality problems from several sources. Due to the lack of water quality information on the streams adjacent to the project (Hanaford Creek and its tributaries) it was apparent that some kind of surveillance program was necessary.

In May of 1970, the Washington State Department of Ecology established stations and began sampling the Hanaford Creek, and some of its tributaries in the vicinity of the Centralia Steam-Electric Project. Stations were also located on the Skookumchuck River above and below its junction with Hanaford Creek.

It is the purpose of this paper to report the results of the first year of sampling (May 1970 through April 1971). This data, along with some collected by the Washington State Department of Fisheries, will be used as background Water Quality to evaluate the effects of the coal mining, coal preparation, coal storage, and the power plant operation on the Hanaford-Skookumchuck River System.

SAMPLING PROGRAM

<u>Station No.</u>	<u>Storet No.</u>	<u>Description</u>	<u>River Mile</u>
1	541206	Hanaford Cr nr Tono, Wash.	69.7-3.7-6.6
2	541207	Packwood Cr nr mouth nr Tono Wash.	69.7-3.7-5.7-0.3
3	541208	Overburden Cr nr mouth nr Tono, Wash.	69.7-3.7-5.2-0.2
4	541209	Hanaford Cr bl Power Plant	69.7-3.7-3.8
5	541210	Hanaford Cr 0.2 mi ab S Hanaford Cr.	69.7-3.7-2.5
6	541211	S. Hanaford Cr 0.1 mi ab mouth	69.7-3.7-2.3-0.1
7	541212	N. Hanaford Cr at Tono, Wash.	69.7-3.7-2.0-4.7
8	541213	Skookumchuck R nr Centralia, Wash.	69.7-4.5
9	541214	Skookumchuck R at Centralia, Wash.	69.7-2.4

Samples were collected at the above stations (Fig. 1) twice each month, and returned to the Department of Ecology laboratory for analysis.

At each sampling staff height measurements were taken at stations 5 and 8, which are the United States Department of the Interior Geological Survey (U.S.G.S.) flow gaging station numbers 12-0265.5, and 12-0264.00 respectively. Flow measurements were then read from the current U.S.G.S. rating tables for these stations.

The Washington State Department of Fisheries had been collecting data on stations 1, 2, 3, 5, 7, 8 and 9. These stations were collected from June 1968 until December 1969. There was no set frequency, although there were 28 samplings during this 18 month period.

Several special stations are also shown in figure I. They were located as follows:

<u>Station No.</u>	<u>Description</u>
2A	Located on Packwood Creek approximately 1/4 mile from mouth of Packwood Creek and above the discharge from the Packwood Lagoon.
2B	Located in the discharge of Packwood Lagoon about 50 feet before it enters Packwood Creek.
10	Sampled from the test coal pile drainage. This was a floating station taken from the standing water around the coal pile.
11	Taken from standing water on the coal in the mining area just north of Overburden Creek and just east of Hanaford Valley Road.

METHODS

Commencing May 7, 1970, bi-monthly water samples were returned to the Department of Ecology laboratory for dissolved oxygen, conductivity, pH, turbidity, alkalinity and iron analysis. Dissolved oxygen was determined by the Azide modification of the Winkler Method. The dissolved

oxygen samples were taken to the manganic basic oxide state in the field, then returned to the laboratory, acidified and titrated with .025 N Sodium Thiosulfate reagent. The conductivity was run on a Leeds and Northrup conductivity bridge, and referenced to 25°C. Turbidity was conducted on a Hach model 2100A Turbidimeter, and pH on a Fisher pH meter. Total Alkalinity was titrated to a pH of 4.8 with sulfuric acid. Iron analysis was conducted on an Atomic Absorption Spectrophotometer, and is reported as total iron.

Total alkalinity, conductivity, pH and iron were recommended by Dr. Harold Lovell (State College Pennsylvania) as indicators of the effects of the mining and Power Plant Operation on water quality. Total acidity was also considered, but not included as one of the routine parameters because of difficulties in interpreting the results, although occasional samples were taken in the mine area and from the test coal pile drainage.

RESULTS

The results of the Department of Ecology sampling from May, 1970 to April, 1971 are shown in the tables I through XI. A statistical summary of the information for this period of stations 1 through 9 is shown in table XII. Table XIII is a statistical summary of all data collected by the Department of Fisheries and the Department of Ecology from June, 1968 through April, 1971 (the Fisheries data is not included in this report).

On Station number 2 and 3, there were several dates when high turbidity, iron and conductivity values were obtained. These high values were caused by construction activities in the mining area. The dates of these occurrences were 9-8-70, 9-22-70 and 1-27-71. Although this data should not be included as background information, it does

indicate what could happen if adequate settling is not maintained on the surface drainage from the mining area. On 1-27-71, the company was painting some mining equipment with what appeared to be a primer containing iron compounds. This is the probable cause of the 16 ppm iron at station 3.

On 4-7-71 and 4-21-71, samples were collected at station 11 and a total acidity (boiling sample titrated to a phenolphthalein end point) was determined. On 4-7 the total acidity was 40 ppm and on 4-21 none could be measured. Samples collected by the Fisheries Department at station 10 had total acidity values as high as 66 ppm, (data not included on this report).

Two samples of washed coal, collected from the storage pile had mercury concentrations of 90 ppb and 93 ppb. Samples were also collected from the surface waters on April 2, 1971 for mercury analysis. The results of this sampling are reported in table XIV.

COMMENTS

1. There is some increase in iron, turbidity and conductivity values between station 1 (Hanaford Creek above the power plant) and station 4 (Hanaford Creek just below the site).
2. There is little change in water quality between stations 4 and 5.
3. Stations 2 and 3 show considerable variance in turbidity, total alkalinity and conductivity, but with the exceptions noted in the results, this appears to be natural.

4. The only parameter that was collected in the Skookumchuck River by Hanaford Creek is turbidity.
5. High total acidity values have been obtained from standing water on the coal in the mine and from the test pile, apparently related to amount of contact time the runoff water had with coal.

RECOMMENDATIONS

The sampling should continue at the same frequency through the start up and first year of the power plant operations. Sampling at stations 4, 6, 7, 8 and 9 can be discontinued. The parameters presently being collected appear to be adequate. The data should be evaluated after the power plant has been in full operation for at least one year.

FIGURE I

HANAFORD WATERSHED
SHOWING DEPT. OF ECOLOGY SAMPLING STATIONS

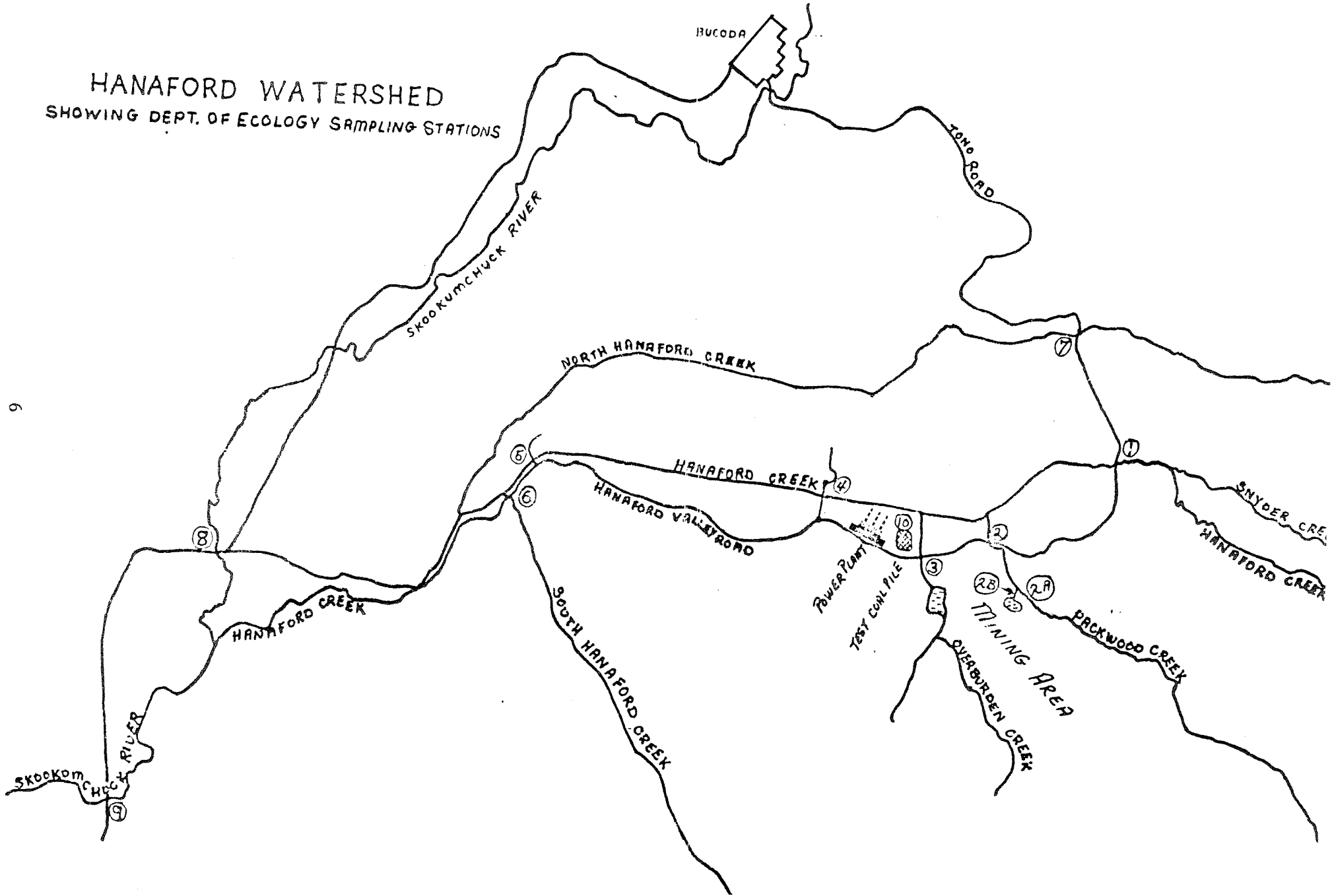


TABLE I

The data collected by Department of Ecology at Station No. 1, Storet No. 541206, called Hanaford Creek nr Tono, Wash. River mile 69.7-3.7-6.6

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00070 TURB JKSN JU	00400 PH SU	00410 T ALK CAC03 MG/L	01045 IRON TOTAL MG/L	00095 CNDUCTVY AT 25C MICROMHO	00060 STREAM FLOW CUFT/SEC
70/05/07	11	10	10.1	10.9	7	7.00	23	1	53	
70/05/21	09	05	10.7	10.0	8	7.20	28	1	53	
70/06/09	10	45	13.0	9.6	8	7.20	47	1	66	
70/06/26	08	40	16.1	8.6	9	7.20	36	1	78	
70/07/09	08	20	16.1	9.0	10	7.30	33	1	87	
70/07/23	08	10	13.5	9.5	13	7.40	41	1	107	
70/08/07	08	50	15.6	8.9	4	7.20	32	1	95	
70/08/20	08	50	14.9	8.6	5	7.10	32	1	92	
70/09/08	08	50	12.1	9.2	9	7.00	60	1	80	
70/09/22	10	28	12.0	9.7	15	7.40	29	2	90	
70/10/09	08	35	9.8	10.0	3	7.30	33	1	101	
70/10/23	08	40	8.6	10.3	24	7.10	25	2	60	
70/11/13	10	45	6.4	11.1	20	6.70	16	2	60	
70/11/27	09	25	5.7	11.0	100	6.90	14	7	50	
70/12/11	09	20	5.9	11.2	55	6.90	18	2	39	
70/12/22	10	35	3.1	12.5	10	6.80	16	1	42	
71/01/06	10	00	2.2	13.3	10	6.70		1	49	
71/01/27	09	55	6.5	11.2	40	6.10		2	30	
71/02/09	09	50	7.0	11.4	30	6.80	11	2	39	
71/02/25	11	45	5.5	11.8	20	6.60	17	2	40	
71/03/10	10	05	5.8	11.4	20	6.80	12	2	40	
71/03/24	10	15	7.1	11.3	20	6.90	14	2	37	
71/04/07	10	15	7.1	11.3	10	7.20	15	.1	42	
71/04/21	10	30	8.1	12.7	6	6.80		1	45	

TABLE II

The data collected by Department of Ecology at Station No. 2, Storet No. 541207, called Packwood Cr nr mouth nr Tono, Wash. River mile 69.7-3.7-5.7-0.3

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00070 TURB JKSN JU	00400 PH SU	00410 T ALK CACO3 MG/L	01045 IRON TOTAL MG/L	00095 CNDUCTVY AT 25C MICROMHO	00060 STREAM FLOW CUFT/SEC
70/05/07	11	30	11.1	11.5	11	7.00	23	1	74	
70/05/21	10	00	11.2	10.5	9	7.10	30	2	75	
70/06/09	11	00	14.5	8.9	70	7.10	56	4	108	
70/06/26	08	55	17.3	6.0	57	7.30	63	4	139	
70/07/09	08	35	16.5	6.4	55	7.50	125	4	260	
70/07/23	08	25	13.8	7.2	85	7.60	166	5	347	
70/08/07	09	00	16.2	5.8	25	7.60	170	7	349	
70/08/20	09	00	14.6	7.0	27	7.70	166	6	320	
70/09/08	09	00	13.3	9.5	142	7.40	154	13	336	
70/09/22	10	35	12.4	7.0	220	7.50	102	9	320	
70/10/09	08	40	10.2	7.8	26	7.50	121	6	294	
70/10/23	08	50	8.4	8.9	160	6.90	87	8	113	
70/11/13	10	55	6.9	10.1	45	6.40	14	4	99	
70/11/27	09	35	5.3	10.2	60	6.30	11	5	75	
70/12/11	09	30	5.6	10.3	60	6.60	8	5	57	
70/12/22	10	45	2.9	11.9	70	6.60	11	8	62	
71/01/06	10	05	2.0	12.8	20	6.50		1	64	
71/01/27	10	15	6.6	10.4	30	6.10		2	48	
71/02/09	10	00	5.9	11.3	35	6.60	12	2	62	
71/02/25	11	50	5.5	11.3	45	6.50	17	3	57	
71/03/10	10	30	5.8	10.8	40	6.60	11	2	52	
71/03/24	10	25	7.8	10.9	30	6.70	14	1	61	
71/04/07	10	30	8.5	11.0	30	7.00	17	3	63	
71/04/21	11	05	8.7	12.0	9	6.70	18	1	68	

TABLE III

The data collected by Department of Ecology at Station No. 3, Storet No.
541208, called Overburden Cr nr mouth nr Tono, Wash. River mile 69.7-3.7-5.2-0.2

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00070 TURB JKSN JU	00400 PH SU	00410 T ALK CACO3 MG/L	01045 IRON TOTAL NG/L	00095 CNDUCTVY AT 25C MICROMHO	00060 STREAM FLOW CUFT/SE
70/05/07	11	40	11.8	11.4	13	7.00	28	3	86	
70/05/21	10	15	13.9	10.3	15	7.30	37	3	89	
70/06/09	11	10	14.8	7.6	24	7.10	59	5	135	
70/06/26	09	00	16.4	2.9	13	7.00	82	4	179	
70/07/09	08	50	15.7	4.4	13	7.30	91	2	197	
70/07/23	08	35	13.2	4.9	75	7.50	110	4	235	
70/08/07	09	20								
70/08/20	09	05								
70/09/08	09	15								
70/09/22	10	45	12.7	9.3	1500	6.50	8	30	342	
70/10/09	08	50								
70/10/23	09	00								
70/11/13	11	05	8.0	9.3	120	6.50	12	10	261	
70/11/27	09	45	4.4	11.1	45	6.60	14	5	262	
70/12/11	09	40	5.3	11.2	110	6.40	10	8	135	
70/12/22	10	55	2.5	12.1	20	6.60	14	2	134	
71/01/06	10	10	2.9	12.3	65	6.40	13	5	97	
71/01/27	10	30	7.2	11.3	220	5.80		16	64	
71/02/09	10	45	7.3	11.3	60	6.80	18	2	125	
71/02/25	12	10	5.3	12.0	10	6.60	15	1	160	
71/03/10	10	40	5.9	11.6	25	6.80	10	2	426	
71/03/24	10	55	9.4	10.7	20	6.80	13	2	150	
71/04/07	11	15	10.4	10.5	10	6.80	15	2	200	
71/04/21	11	30	12.0	10.2	30	6.50	19	2	110	

TABLE IV

The data collected by Department of Ecology at Station No. 4, Storet No. 541209, called Hanaford Cr bl Power Plant. River mile 69.7-3.7-3.8

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00070 TURB JKSN JU	00400 PH SU	00410 T ALK CACO3 MG/L	01045 IRON TOTAL MG/L	00095 CONDUCTVY AT 25C MICROMHO	00060 STREAM FLOW CUFT/SEC
70/05/07	12	00	11.4	10.4	12	6.80	22	1	67	
70/05/21	11	55	12.4	10.2	13	7.20	33	2	72	
70/06/09	11	55	14.4	9.0	24	7.00	43	2	86	
70/06/26	09	50	18.6	6.9	28	7.00	39	2	96	
70/07/09	09	40	18.8	7.2	33	7.10	37	2	105	
70/07/23	09	25	15.0	6.6	90	7.10	51	3	128	
70/08/07	09	45	17.3	6.6	24	7.10	42	3	112	
70/08/20	09	45	15.1	6.1	17	7.10	37	2	120	
70/09/08	09	45	13.7	7.4	29	6.80	65	2	99	
70/09/22	11	30	13.0	4.9	20	7.10	31	2	99	
70/10/09	09	35	10.2	7.8	13	6.80	34	2	128	
70/10/23	09	20	8.8	8.9	40	6.80	27	3	190	
70/11/13	11	35	7.4	9.9	25	6.50	16	2	94	
70/11/27	10	05	5.3	10.3	140	6.60	12	3	103	
70/12/11	10	00	5.4	9.6	35	6.50	10	3	58	
70/12/22	11	10	2.6	11.8	45	6.60	17	5	61	
71/01/06	10	25	2.2	12.3	20	6.40	13	2	59	
71/02/09	11	10	7.8	11.3	40	6.60	12	2	59	
71/02/25	12	20	5.0	11.7	30	6.60	13	2	55	
71/03/10	10	50	5.9	10.5	20	6.50	11	2	73	
71/03/24	11	20	7.6	10.8	25	6.80	16	2	56	
71/04/07	11	30	7.8	10.7	15	6.70	15	2	59	
71/04/21	11	50	8.5	11.2	10	6.40	17	1	61	

TABLE V

The data collected by Department of Ecology at Station No. 5, Storet No. 541210, called Hanaford Cr 0.2 mi ab S. Hanaford Cr. River mile 69.7-3.7-2.5

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00070 TURB JKSN JU	00400 PH SU	00410 T ALK CACO3 MG/L	01045 IRON TOTAL MG/L	00095 CNDUCTVY AT 25C MICROMHO	00060 STREAM FLOW CUFT/SEC
70/05/07	12	20	11.6	10.2	10	6.40	24	2	69	32
70/05/21	11	10	12.3	10.1	15	7.10	32	2	73	27
70/06/09	12	15	14.7	8.6	28	7.00	53	3	89	14
70/06/26	10	10	18.7	6.8	34	7.10	40	2	103	9
70/07/09	09	55	19.1	6.6	90	7.10	41	2	110	8
70/07/23	09	40	17.4	5.6	70	7.20	73	4	175	
70/08/07	10	10	17.6	6.7	14	7.10	42	2	118	6
70/08/20	10	05	16.7	6.0	21	7.00	41	2	128	4
70/09/08	10	05	14.0	7.7	14	6.90	52	1	100	30
70/09/22	11	40	13.0	7.5	13	7.10	32	2	98	19
70/10/09	09	45	10.4	7.5	33	6.80	34	4	145	13
70/10/23	09	35	8.8	9.1	30	6.70	23	2	250	38
70/11/13	11	50	7.5	9.6	20	6.40	16	2	95	72
70/11/27	10	25	5.3	10.2	35	6.60	13	3	80	130
70/12/11	10	15	5.4	9.3	35	6.40	8	3	56	279
70/12/22	11	25	2.8	11.5	45	6.50	11	4	60	114
71/01/06	10	40	2.0	12.2	15	6.40	12	1	59	70
71/01/27	10	45	7.3	9.1	70	6.00		5	41	858
71/02/09	11	25	6.6	10.9	35	6.50	12	2	61	88
71/02/25	12	30	4.9	11.3	30	6.50	13	2	56	158
71/03/10	11	10	5.8	10.6	25	6.60	11	2	72	198
71/03/24	11	30	7.6	10.6	25	6.70	13	2	55	126
71/04/07	12	15	8.1	10.6	15	6.70	16	2	58	74
71/04/21	12	05	8.5	10.9	8	6.40	18	1	62	52

TABLE VI

The data collected by Department of Ecology at Station No. 6, Storet No. 541211, called S. Hanaford Cr 0.1 mi ab mouth. River mile 69.7-3.7-2.3-0.1

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00070 TURB JKSN JU	00400 PH SU	00410 T ALK CACO3 MG/L	01045 IRON TOTAL MG/L	00095 CNDUCTVY AT 25C MICROMHO	00060 STREAM FLOW CUFT/SEC
70/05/07	12	40	12.4	11.1	5	6.80	26	2	109	
70/05/21	11	20	13.4	10.0	3	7.10	35	2	116	
70/06/09	12	25	15.9	4.0	6	6.80	55	3	185	
70/06/26	10	20	17.7	1.9	7	6.90	68	4	235	
70/07/09	10	10	17.2	2.2	13	7.00	81	3	261	
70/07/23	09	55	16.4	2.5	20	7.10	106	1	307	
70/08/07	10	20	16.1	2.2	4	7.00	117	2	359	
70/08/20	10	15	13.9	3.4	5	7.00	118	2	388	
70/09/08	10	15	13.6	3.1	3	7.00	91	1	318	
70/09/22	11	50	13.0	7.0	3	7.20	65	1	305	
70/10/09	09	55	10.3	4.9	3	6.90	45	2	272	
70/10/23	09	45	8.4	7.3	3	7.10	39	1K	295	
70/11/13	12	00	7.8	11.1	10	6.30	16	1	157	
70/11/27	10	35	5.1	9.2	110	6.50	15	1	116	
70/12/11	10	25	5.2	8.3	15	6.30	13	1	79	
70/12/22	11	30	2.9	10.6	7	6.40	16	1	81	
71/01/06	10	50	1.8	11.3	8	6.20	13	1	89	
71/01/27	10	55	7.4	8.8	20	6.10		2	55	
71/02/09	11	35	6.4	10.0	15	6.50	20	1	83	
71/02/25	12	40	5.0	10.8	10	6.50	14	1	67	
71/03/10	11	20	6.0	9.7	10	6.70	15	1	63	
71/03/24	11	40	7.9	9.8	10	6.50	16	1	71	
71/04/07	12	25	8.8	10.6	6	6.50	17	1	80	
71/04/21	12	20	9.1	11.2	6	6.30	19	1	87	

TABLE VII

The data collected by Department of Ecology at Station No. 7, Storet No. 541212, called N. Hanaford Cr at Tono, Wash. River mile 69.7-3.7-2.0-4.7

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00070 TURB JKSN JU	00400 PH SU	00410 T ALK CACO3 MG/L	01045 IRON TOTAL MG/L	00095 CNDUCTVY AT 25C MICROMHO	00060 STREAM FLOW CUFT/SEC
70/05/07	10	50	11.0	9.6	7	6.90	95	1	318	
70/05/21	09	00	12.4	8.6	4	7.10	135	1	439	
70/06/09	10	30	15.5	8.4	3	7.10	191	1K	594	
70/06/26	08	25	18.6	7.4	8	7.40	202	1K	645	
70/07/09	08	05	18.1	7.6	10	7.60	212	1K	662	
70/07/23	07	55	16.1	8.1	27	7.70	220	1K	694	
70/08/07	08	40	17.5	7.9	6	7.60	213	1K	661	
70/08/20	08	40	17.0	8.1	9	7.70	207	1K	677	
70/09/08	08	40	14.2	8.2	8	7.60	211	1K	634	
70/09/22	10	20	13.7	8.0	20	7.90	207	1	651	
70/10/09	08	30	10.6	8.8	7	7.40	207	1K	683	
70/10/23	08	30	9.2	8.9	6	7.70	199	1K	619	
70/11/13	10	35	7.1	9.8	15	7.00	99	1	365	
70/11/27	09	10	6.2	9.2	115	7.10	70	2	275	
70/12/11	09	10	6.4	9.3	15	6.80	47	1	156	
70/12/22	10	30	5.7	9.6	10	6.80	54	1	197	
71/01/06	09	45	4.8	8.3	15	6.70	52	1	271	
71/01/27	09	40	7.2	8.4	20	6.50		2	201	
71/02/09	09	40	7.4	7.6	15	6.70	95	1	373	
71/02/25	11	30	7.4	9.3	10	6.60	56	1	223	
71/03/10	09	45	6.5	9.8	9	7.00	43	1	164	
71/03/24	09	45	8.0	8.6	10	6.70	8	1	266	
71/04/07	09	45	8.3	8.9	7	6.80	79	1	274	
71/04/21	10	15	9.0	9.7	7	6.50	75	1	275	

TABLE VIII

The data collected by Department of Ecology at Station No. 8, Storet No. 541213, called Skookumchuck R nr Centralia, Wash. River mile 69.7-4.5

DATE FROM TO	TIME OF DAY	DEPTH FEET	0001C WATER TEMP CENT	00300 DO MG/L	00070 TURB JKSN JU	00400 PH SU	00410 T ALK CACO3 MG/L	01045 IRON TOTAL MG/L	00095 CNDUCTVY AT 25C MICROMHO	00060 STREAM FLOW CUFT/SEC
70/05/07	13	05	11.1	11.3	4	7.00	28	1K	63	
70/05/21	11	30	12.1	11.1	2	7.50	32	1K	68	
70/06/09	12	40	15.4	10.3	4	7.50	58	1K	80	68
70/06/26	10	40	19.7	7.7	4	7.40	36	1K	86	54
70/07/09	10	30	19.9	8.1	3	7.40	35	1K	89	31
70/07/23	10	05	16.5	8.7	5	7.50	44	1K	93	25
70/08/07	10	35	17.8	8.2	2	7.60	33	1K	92	24
70/08/20	10	30	17.2	8.0	3	7.20	34	1K	96	21
70/09/08	10	30	14.4	9.4	4	7.30	47	1K	110	77
70/09/22	12	10	13.0	9.3	4	7.60	32	1K	84	
70/10/09	10	05	10.6	9.9	2	7.40	31	1	114	26
70/10/23	09	55	8.6	10.4	20	7.30	25	2	99	313
70/11/13	12	10	7.5	10.9	15	7.00	23	1	76	158
70/11/27	10	45	5.7	11.3	15	7.30	20	1	69	287
70/12/11	10	35	6.0	11.4	30	6.90	17	2	55	710
70/12/22	11	40	4.0	12.2	20	7.00	17	2	52	464
71/01/06	10	00	3.6							
	11	00		12.6	15	6.90	12	1	56	390
71/02/09	11	45	7.3	11.4	20	6.90	17	1	50	375
71/02/25	12	50	5.3	11.9	20	6.80	17	1	46	693
71/03/10	11	30	5.6	11.7	15	6.50	20	1	46	710
71/03/24	11	50	6.6	11.7	20	7.00	16	2	42	940
71/04/07	12	40	7.3	11.5	8	7.00	18	1	48	465
71/04/21	13	35	8.0	11.7	6	6.70	20	1K	52	300

TABLE IX

The data collected by Department of Ecology at Station No. 9, Storet No. 541214, called Skookumchuck R at Centralia, Wash. River mile 69.7-2.4

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00070 TURB JKSN JU	00400 PH SU	00410 T ALK CACO3 MG/L	01045 IRON TOTAL MG/L	00095 CNDUCTVY AT 25C MICROMHO	00060 STREAM FLOW CUFT/SEC
70/05/07	13	20	11.8	11.1	4	7.10	25	1K	69	
70/05/21	11	45	13.1	11.1	4	7.50	33	1	74	
70/06/09	12	55	16.2	8.8	100	7.30	59	4	85	
70/06/26	10	50	21.2	7.5	130	7.30	40	4	92	
70/07/09	10	45	21.0	8.8	5	7.50	38	1K	96	
70/07/23	10	20	17.8	10.0	11	7.60	43	1K	96	
70/08/07	10	50	18.5	9.3	2	7.50	35	1K	100	
70/08/20	10	50	17.9	8.9	14	7.20	34	1K	101	
70/09/08	10	40	14.4	9.3	9	7.40	45	1	97	
70/09/22	12	25	13.6	9.6	5	7.50	31	1K	90	
70/10/09	10	15	10.5	10.4	3	7.40	31	1K	101	
70/10/23	10	05	11.0	10.3	25	6.80	16	2	74	
70/11/13	12	20	7.7	10.5		6.90		1	90	
70/11/27	11	00	5.5	10.9	115	6.90	20	3	78	
70/12/11	10	50	5.8	10.4	30	6.80	16	2	60	
70/12/22	11	50	3.7	11.9	20	6.80	16	2	61	
71/01/06	11	10	3.3	12.5	15	6.80	13	1	65	
71/01/27	11	10	6.4	11.2	40	6.50		2	44	
71/02/09	11	55	7.2	11.3	20	6.80	16	1	62	
71/02/25	13	00	5.3	11.7	20	6.80	16	2	52	
71/03/10	11	40	5.7	11.2	15	6.90	16	1	57	
71/03/24	12	00	7.1	11.5	20	6.90	16	2	47	
71/04/07	12	50	7.8	11.2	8	6.90	18	1	54	
71/04/21	13	15	8.7	11.2	7	6.70	21	1	59	

TABLE X

The data collected at Station 10, (fig. 1) by the Department of Ecology.

Date	Time	Temp °C	DO ppm	Cond Micromho	pH	Iron ppm	Turb JU	Alk ppm CaCO ₃
70-05-21	1030	20.2	5.7	61	6.8	4.9	14	145
70-06-09	1120	17.7	7.3	367	7.1	4.1	21	77
70-06-26	0910	20.3	4.9	421	7.1	4.6	70	111
70-07-09	0900	21.4	5.2	500	7.1	0.7	15	116
70-07-23	0845	17.5	4.9	564	7.3	0.6	16	140
70-08-07	0910	18.8	3.6	534	7.2	0.4	4	160
70-08-20	0910	17.4	3.4	599	7.2	1.1	8	174
70-09-08	0910	15.6	8.5	595	6.9	0.4	10	62
70-09-22	1055	14.5	9.0	676	4.5	1.3	60	0
70-10-09	0845	11.7	10.5	760	7.0	0.3	3	25
70-10-23	0910	11.0	9.9	410	6.8	18.9	360	15
70-11-13	1015	8.3	11.4	410	6.8	58.0	235	55

TABLE XI

The data collected at Stations No. 2A and 2B, (fig. 1) by the Department of Ecology.

2A

Date	Time	Temp	DO	Cond	pH	Iron	Turb	Alk
71-02-09	1020	6.8	8.3	36	6.1	0.6	15	10
71-02-25	1200	4.6	11.0	36	6.1	0.5	7	16
71-03-24	1040	7.5	12.2	35	6.3	2.2	7	12
71-04-07	1040	7.5	10.5	40	6.5	0.6	6	14

2B

71-02-09	1010	6.4	11.6	62	6.6	3.8	60	15
71-02-25	1155	5.9	11.7	62	6.6	6.1	85	17
71-03-24	1035	9.2	10.8	63	6.9	3.3	45	16
71-04-07	1050	10.4	10.3	61	7.0	2.2	20	15

TABLE XII

STATISTICAL SUMMARY OF THE INFORMATION COLLECTED ON STATIONS 1 THROUGH 9
BY THE DEPARTMENT OF ECOLOGY

	00010	00300	00070	00400	00410	01045	00095	00060
	Water	DO	Turb	PH	T Alk	Iron	Conductivity	Stream
	Temp	MG/L	JKSN	SU	CAC03	Total	at 25°C	Flow
	(0°)		JU		MG/L	MG/L	Micromho	(cu ft/sec)

Station 1.

No.	24	24	24	24	21	24	24	
Max	16.1	13.3	100	7.4	60	7.0	107	
Min	2.2	8.6	3	6.1	11	.9	30	
Mean	9.2	10.6	19	7.0	26	1.6	61	
Var	16	1.7	445	.1	165	1.5	555	
Std Dev	4.0	1.3	21	.3	13	1.2	23	

Station 2.

No	24	24	24	24	22	24	24	
Max	17.3	12.8	220	7.7	170	13.0	349	
Min	2.0	5.8	9	6.1	8	1.0	48	
Mean	9.6	9.6	56	7.0	63	4.4	146	
Var	19	4.3	2598	.2	3702	9.1	13415	
Std Dev	4.4	2.1	50	.5	60	3	116	

Station 3.

No	19	19	19	19	18	19	19	
Max	16.4	12.3	1500	7.5	110	30.0	426	
Min	2.5	2.9	10	5.8	8	1.0	64	
Mean	9.4	9.7	126	6.8	32	5.7	178	
Var	19.4	7.7	113560	.2	1004	47.9	8698	
Std Dev	4.4	2.8	337	.4	32	6.9	93	

Station 4.

No.	23	23	23	23	23	23	23	
Max	18.8	12.3	140	7.2	65	5.0	190	
Min	2.2	4.9	10	6.4	10	1.0	55	
Mean	10.2	9.2	33	6.8	27	2.2	89	
Var	24.1	4.5	824	.1	225	.7	1089	
Std Dev	4.9	2.1	29	.3	15	.8	33	

Station 5.

No	24	24	24	24	23	24	24	23
Max	19.1	12.2	90	7.2	73	5	250	858
Min	2.0	5.6	8	6.0	8	1.0	41	4
Mean	10.3	9.1	30	6.7	27	2.3	92	105
Var	26.5	3.6	422	.1	297	1.1	2188	31843
Std Dev	5.6	1.9	21	.3	17	1	47	178

TABLE XII (Continued)

	00010	00300	00070	00400	00410	01045	00095	00060
	Water	DO	Turb	PH	T Alk	Iron	Conductivity	Stream
	Temp	MG/L	JKSN	SU	CAC03	Total	at 25°C	Flow
	(0°)		JU		MG/L	MG/L	Micromho	(cu ft/sec)
Station 6.								
No	24	24	24	24	23	24	24	
Max	17.7	11.3	110	7.2	118	4.0	388	
Min	1.8	1.9	3	6.1	13	1.0	55	
Mean	10.1	7.5	13	6.7	44	1.5	174	
Var	22.5	12.2	457	.1	1299	.7	12201	
Std Dev	4.7	3.5	21	.3	36	.8	110	
Station 7.								
No	24	24	24	24	23	24	24	
Max	18.6	9.8	115	7.9	220	2.0	694	
Min	4.8	7.4	3	6.5	8	.6	156	
Mean	10.7	8.7	15	7.1	129	1.1	430	
Var	20	.5	485	.2	5413	.1	40925	
Std Dev	4.5	.7	22	.4	74	.3	202	
Station 8.								
No	23	23	23	23	23	23	23	20
Max	19.9	12.6	30	7.6	58	2.0	114	940
Min	3.6	7.7	2	6.5	12	1.0	42	21
Mean	10.6	10.5	10	7.2	27	1.2	72	307
Var	27	2.2	69	.1	133	.2	492	80468
Std Dev	5.2	1.5	8	.3	12	.4	22	284
Station 9.								
No	24	24	23	24	22	24	24	
Max	21.2	12.5	130	7.6	59	4.0	101	
Min	3.3	7.5	2	6.5	13	.8	44	
Mean	10.9	10.4	27	7.1	27	1.6	75	
Var	31	1.4	1322	.1	156	.9	357	
Std Dev	5.6	1.2	36	.3	12	.9	19	

TABLE XIII

STATISTICAL SUMMARY OF THE INFORMATION COLLECTED ON STATIONS 1,2,3,5,7,8 AND 9
BY THE DEPARTMENT OF ECOLOGY AND THE WASHINGTON STATE DEPARTMENT OF FISHERIES

Data includes Department of Fisheries data collected from June 1968 to December 1969.

	00010	00300	00070	00400	00410	01045	00095
	Water	DO	Turb	PH	T Alk	Iron	Conductivity
	Temp	MG/L	JKSN	SU	CAC03	Total	at 25°C
	(0°)		JU		MG/L	MG/L	Micromho
Station 1.							
No.	52	52	51	52	34	24	24
Maximum	17.4	13.3	100	7.9	85	7.0	107
Minimum	2.2	8.6	1	6.1	4	.9	30
Mean	10.0	10.7	13	7.1	24	1.6	61
Var	18.8	1.6	277	.1	269	1.6	556
Std Dev	4.3	1.3	17	.3	16	1.2	24
Station 2.							
No.	54	53	53	54	36	24	24
Maximum	19.0	12.9	220	7.7	170	13.0	349
Minimum	2.0	5.0	5	6.1	1	1.0	48
Mean	10.5	9.3	36	6.9	40	4.4	146
Var	24.6	4.8	1863	.2	3124	9.1	13415
Std Dev	5	2.2	43	.4	56	3.0	116
Station 3.							
No.	48	48	47	48	18	19	19
Maximum	20.6	12.9	1500	7.8	110	30.0	426
Minimum	2.0	2.9	3	5.8	8	1.0	64
Mean	11	9.4	88	6.9	32	5.7	178
Var	27.7	5.7	73800	.2	1004	47.9	8698
Std Dev	5.3	2.4	272	.4	32	7	93
Station 5.							
No.	53	53	52	53	36	24	24
Maximum	19.1	13.0	90	7.6	73	5.0	250
Minimum	2.0	5.6	1	5.9	3	1.0	41
Mean	10.8	9.7	20	6.9	24	2.3	92
Var	24.6	2.8	331	.2	235	1.1	2188
Std Dev	5.0	1.7	18	.4	15	1.0	47
Station 7.							
No.	53	53	52	53	36	24	24
Maximum	21.7	11.3	115	7.9	220	2.0	694
Minimum	4.8	7.2	1	6.4	8	.6	156
Mean	12.1	8.8	11	7.1	114	1.1	430
Var	26.5	.8	252	.2	4683	.1	40925
Std Dev	5.1	.9	16	.4	68	.3	202

TABLE XIII (Continued)

	00010	00300	00070	00400	00410	01045	00095
	Water	DO	Turb	PH	T Alk	Iron	Conductivity
	Temp	MG/L	JKSN	SU	CAC03	Total	at 25°C
	(0°)		JU		MG/L	MG/L	Micromho
Station 8.							
No.	51	51	50	51	35	23	23
Maximum	19.9	12.6	37	7.6	58	2.0	114
Minimum	3.1	7.7	1	6.5	8	1.0	42
Mean	11.3	10.2	9	7.2	24	1.2	72
Var	27.9	2.1	91	.1	129	.2	492
Std Dev	5.3	1.5	10	.3	11	.4	22
Station 9.							
No.	53	53	51	52	35	24	24
Maximum	23.0	12.6	130	7.6	59	4.0	101
Minimum	3.0	7.5	1	6.3	8	.8	44
Mean	11.5	10.2	17	7.1	23	1.6	75
Var	32.2	1.7	737	.1	138	.9	357
Std Dev	5.7	1.3	27	.3	12	.9	19

TABLE XIV

The Results of Samples Collected on April 2, 1971.

Station Number	Mercury Concentration ug/l
1	0.3
2	1.0
2B	0.6
3	2.0
4	0.8
5	0.8
6	0.1
7	0.4
- Hanaford Creek - 1.5 Miles from Mouth	0.5