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ENVIRONMENT CANADA CONSERVATION AND PROTECTION ENVIRONMENTAL PROTECTION PACIFIC AND YUKON REGION NORTH VANCOUVER, B.C.

BASELINE MONITORING

SNIP PROJECT

- July 30, 1989 -

Data Report DR 91-02

By Benoit Godin and Gerry Mitchell

January 1991

LIBRARY ENVIRONMENT CANADA CONSERVATION AND PROTECTION PACIFIC REGION

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INTRODUCTION

The Snip project is located at the confluence of the Iskut River and Bronson Creek. The mine is situated at an elevation of 180 to 680 metres on the north-west side of the base of Johnny Mountain. The snip property is drained by Monsoon Creek which flow north towards the Iskut River. Dolly Varden char and cutthroat trout are present in Monsoon Lake. Sockeye are known to spawn at the mouth of Bronson Creek and in the side channels in front of the Bronson Creek airstrip. There is no suitable fish habitat upstream of the Cominco property since the creek is characterised by a single channel with fast flows, large boulders and cascading falls. Salmon utilise the lower 1 km of Sky Creek draining the west part of the property to the north west towards the Craig River. Small runs of chinook, pink and sockeye as well as cutthroat trout were identified (Figure 1).

The company is developing an underground mine. The gold and silver extraction will be performed by flotation. The tailings will be discharged in the tailings pond located in the headwaters of Monsoon Creek and Sky Creek.

Site Description

<u>Station</u>	Location	Remarks
1	Sky Creek at the mouth	Tea colour waters
2	Craig River downstream of Sky Creek	Influenced by glaciers
3	Monsoon Creek downstream	Tea colour waters
4	Bronson Creek upstream of Cominco camp	Influenced by glaciers

5	Iskut River upstream of Bronson Creek	Influenced by glaciers
6	Iskut River downstream of Monsoon Creek	Influenced by glaciers
7	Mine adit	Level 180
8	Mine adit	Level 300

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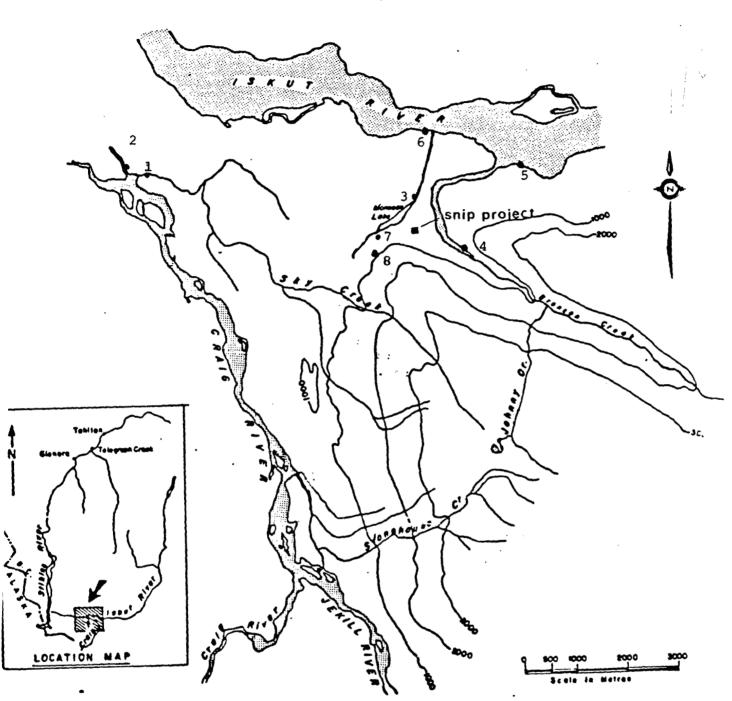




Figure 1 Snip Project - Sampling Sites

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MATERIAL AND METHODS

The site was visited on July 30, 1989. No flow measurements were taken at the sites. Water chemistry and sediment samples were collected at the six receiving water stations but only water at the mine adit. The following chemical parameters were analysed: alkalinity, pH, conductivity, filterable residue, non filterable residue, and sulphate. These samples were kept cool with ice until analysed. Dissolved metals were filtered the same day through a 0.45 micron cellulose nitrate membrane filter. Total and dissolved metals were preserved with nitric acid (0.5 ml/100 ml of sample). All samples were collected with clean polyethylene bottles. The bottles for metal samples were previously acid washed. The hardness was determined from the dissolved metal sample.

Inductively Coupled Argon Plasma (ICAP) was used for the total and dissolved metal analysis and gave a reading of twenty-eight metals. For copper the samples were reanalysed with the graphite furnace when the values were below two times the detection limit on the ICAP procedure. For analytical method details refer to the Environment Canada Pacific Region Laboratory Manual (Anon, 1979).

Sediment samples were collected from the streambed, below the water level, with a clean acrylic corer. Four replicates were taken at each sites, except for stations 7 and 8. The samples were transferred into kraft bags and kept cool until analysed. The samples were air dried, sieved to <150 um, digested with aqua regia, and analysed for heavy metals using ICAP. A portion of the sediments were also ignited at 550° C in a muffle furnace. The loss of weight was reported as volatile residue and the remaining residue was reported as fixed residue. The water metal results can be found in Table 1, while the other water quality results are found in Table 2. The sediment data are reported in Table 3.

Mater Quality - Snip Project July 30, 1989

0.0031 0.0029 0.0007 0.0022 0.0013 0.0008 0.0010 0.0086 0.0035 0.0035 0.0194 0.0061 0.0058 0.0069 0.0063 0.0063 TOTCF CU MG/L ToTICP CU MG/L *.005 *.005 c.002
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c.003
c.003 0.112 500 500 500 500 500 1 0.018 0.028 0.023 0.023 0.005 0.042 0.044 0.043 0.043 0.049 0.044 0.045 0.045 0.066 DISICP CR MG/L +005 +.005 +.005 +.005 500 500 1 1 1 0.00 0.00 0.00 0.00 0.00 50,50,11 <u>8</u> 500 500 500 1 500'' 500'' 0.009 200, 200 200, 200 200, 1 0.008 0.010 0.005 0.005 0.005 0.063 0.067 0.065 0.065 0.065 0.075 0.072 0.070 0.070 0.072 TOTICP CR MG/L DISICP CO MG/L ..005 C.005 C.005 C.005 **200** 0.00 0.00 0.00 0.00 0.00 200°, 200°, 200°, *.005 *.005 500 500 500 500 1 0.020 0.00 500 500 500 500 1 500.3 500.3 0.016 0.025 0.029 0.023 0.023 TOTICP CO NG/L DISICP CD MG/L .005 (.005 (.005 ---200 200 200 200 200 1 2007 2007 2007 500.1 500 500 500 500 1 ¢.005 .005.0050.007 90.00 500.1 500 · · · · **č**.005 500,500,11 500 500 500 1 500 500 500 1 TOTICP CD NG/L 25.2 25.2 25.2 25.2 0.1 57.1 56.2 56.3 0.7 14.2 14.3 14.3 14.3 0.2 17.6 17.1 16.9 17.2 17.2 17.6 17.9 17.7 17.7 17.7 65.2 0.7.7.6 DISICP CA NG/L 24.7 25.8 24.8 25.1 0.6 9.7 10.0 10.0 9.9 54.0 53.2 55.9 54.4 23.8 24.8 24.2 24.2 0.5 16.2 17.1 17.0 15.8 0.5 29.1 27.8 28.2 28.4 28.4 77.2 TOTICP CA NG/L 0.110 0.105 0.105 0.107 0.107 0.034 0.032 0.032 0.033 0.033 0.032 0.035 0.036 0.034 0.002 0.013 0.014 0.013 0.013 0.013 0.028 0.028 0.028 0.028 0.028 0.053 0.062 0.066 0.061 0.063 0.003 0.401 0.423 0.401 0.408 0.408 0.082 0.092 0.092 0.089 0.089 0.118 0.110 0.117 0.115 0.004 0.114 0.138 0.134 0.129 0.013 0.510 0.481 0.502 0.498 0.015 0.137 TOTICP BA MG/L 50.5 20.5 20.5 **5**0,50,11 20.3 20.3 20.1 88811 80.5 80.5 11 **S**. 3 88811 DISICP AS NG/L 50.5 S S S | | 88811 80.7 80.7 10.1 8999 **50.**2 TOTICP AS NG/L 5 5 5 5 5 5 1 1 0.06 0.06 0.08 0.08 S S S | | 0.07 0.07 0.09 80.0 20.0 20.0 20.0 0.08 0.03 0.08 0.08 **8** 8 DISICP AL MG/L 0.06 0.09 0.08 0.02 4.44 5.08 4.96 4.83 6.34 29.60 29.90 29.90 29.90 38.30 36.60 37.40 37.43 0.85 0.14 0.05 0.12 0.05 4.53 6.08 6.02 5.54 0.88 6.22 TOTICP AL MG/L , <u>, , , ,</u> , , , 55511 2.0 DISICP AG MG/L 10.3 0.02 10, 10, 1 | | 10, 10, 1 | | 10.1 10.0 10.2 TOTICP AG NG/L Repl.1 Repl.2 Repl.3 Average S.D. Repl.1 Repl.2 Repl.3 Average S.D. Repl.1 Repl.2 Repl.3 Averege S.D. Repl.1 Repl.2 Repl.3 Average S.D. Repl.1 Repl.2 Repl.3 Averege S.D. Repl.1 Repl.2 Repl.3 Averege Station Number

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Teble 1 (cont.)

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S.D. 0.64 Repl.1 <.005	0.023	; ;	;;	6.6	1.1	0.267	0.051	: :		1.2	0.5	-			
Repl.1 C.005 C.0005 32.90 Repl.2 C.005 C.0005 34.80 Repl.3 C.005 C.0005 33.10 Average 33.60 33.10 Kepl.1 C.005 C.0005 34.80 Repl.1 C.005 C.0005 33.60 Repl.1 C.005 C.0005 34.60 Repl.3 C.005 C.0005 39.60 Repl.3 C.005 C.0005 39.60 Nerrage 1.04 39.73 S.D. 1.005 39.60 Repl.3 C.0005 39.60 39.73 S.D. 1.10 39.73 K.005 C.0005 31.00 31.00 C.005 C.0005 20.20 31.00 C.005 C.0005 31.00 31.00	0.008	ł	;	0.2	0.1	0.013	0.001	;		0.2	0.0	-			;
Repl.1 (.005 (.0005 32.90 Repl.2 (.005 (.0005 34.80 Repl.3 (.005 (.0005 33.10 Average 33.60 33.10 S.D. 1.04 33.60 Repl.1 (.005 (.0005 40.80 Repl.2 (.005 (.0005 39.60 Repl.3 (.005 (.0005 39.60 Nerrage 1.04 39.73 S.D. 39.60 39.60 Repl.3 (.0005 40.80 39.73 Nerrage 1.10 39.73 S.D. 1.10 39.73 S.D. 1.10 39.73 S.D. 1.10 C.005 C.0005 39.00 39.73 S.D. 1.10 S.D. 1.00 S.D. 1.00 Repl.3 1.00 </td <td></td>															
Repl.2 <.005	0.015	нD	0	13.0	2.1	0.767	0.015	10.2	10.3	3.2	0.8	0.06	¢.02	0.6	(.)
Repl.3 (.005 33.10 Average 33.60 S.D. 33.60 S.D. 1.04 S.D. 1.04 Repl.1 (.005 (.0005 40.80 Repl.3 (.005 (.0005 39.60 Repl.3 (.005 (.0005 39.73 Average 1.10 39.73 Average 1.10 39.73 S.D. 1.10 39.73 Average 1.10 39.73 S.D. 1.10 39.73 S.D. 1.10 C.005 (.0005 (.0005 20.20 C.005 C.0005 20.20 0.005 Repl.3 C.0005 C.0005 31.00	0.013	9	ო	13.7	2.0	0.804	0.012	10.2	10.2	Э.4	0.7	Ī			(.1
Average 33.60 S.D. 1.04 S.D. 1.04 Repl.1 (.005 (.0005 40.60 Repl.2 (.005 (.0005 39.60 Repl.3 (.005 (.0005 39.73 Average 1.10 39.73 S.D. 1.10 39.73 K.D. 1.10 39.73 S.D. 1.10 39.73 S.D. 1.10 39.73 S.D. 1.10 (.005 (.0005 20.20 31.00 (.005 (.0005 (.0005 (.005	0.024	9	g	13.1	2.0	0.772	0.014	10.3	10.3	3.2	0.8	Ī			(.1
S.D. 1.04 Repl.1 (.005 (.0005 40.80 Repl.2 (.005 (.0005 39.60 Repl.3 (.005 (.0005 39.73 Average 1.10 S.D. 1.10 (.005 (.0005 20.20 (.005 (.0005 20.20 (.005 (.0005 20.20	0.017	9	m	13.3	2.0	0.781	0.014	;		3.3	0.8	-			;
Repl.1 (.005 (.0005 40.60 80.60 Repl.2 (.005 40.60 38.60 80.60	0.006	-	-	* •0	0.1	0.020	0.002	;	;	0.1	0.1	•			1 1 7
Repl.2 (.005 30.60 Repl.3 (.005 0005 39.60 Average 39.73 S.D. 1.10 C.005 (.005 (.0005 20.20 (.005 (.0005 21.00 (.005 (.0005 21.00 (.005 (.0005 20.20	0.012	đ	0	17.3	2.1	1.080	0.010	6.01	10.3	3.7	6.0		·		۲.,
Repl.3 (.005 39.80 Average 39.73 S.D. 1.10 S.D. 1.10 (.005 (.0005 20.20 (.005 (.0005 20.20 (.005 (.0005 (.005	210.0) u	0	16.4	2.3	1.030	0.010	1012	10.3	3.8	6.0	-	·		
Average 39.73 S.D 1.10 C.005 C.0005 20.20 C.005 C.0005 31.00	0.029	- 10	3	16.8	2.3	1.040	0.009	.01	.01	9°6	6.0	0.06	<.02		
S.D 1.10 1.10 1.10 	0.019	y yo		16.8	2.2	1.050	0.010	5		3.8	0.9	_	•		
<pre><.005 <.0005 20.20 <.005 <.0005 31.00 </pre>	600.0	7) 	0.5	0.1	0.026	0.001	ļ	}	0.1	0.0	-	•		F 1 7
0015 0000-2 2000-2 2005 2005 2005 2005 2005	500-2	σ	٢	14.0	10.2	0.527	0.077	0.02	0.03	A.4	A. 7	¢.02	202	4 -0	1.3
<pre>(.005 (.005 31.00</pre>	~~~	•	•							5					;
<pre>< 005 < 005</pre>	0.015	13	6	17.8	0.6	0.908	0.068	0.04	0.03	7.6	4.9	<.02	¢.02	6.0	1.2
	500-5	2	0	5	1.1	100.3	100.3	10.3	10.2	1.2	1.2	¢.02			1.1
		; () {						12				000		
		y	3	;		1000		10.	10.,	;	1				

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Table 1 (cont.)

Metel Weter Quelity - Snip Project -July 30, 1989

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1 Repl.1 (.05 1 Repl.1 (.05 8epl.1 5.0. 5.0. 5.0. Repl.2 (.05 8epl.1 (.05 6.05 8epl.1 (.05 6.05 8epl.2 (.05 6.05 8epl.2 (.05 6.05 8epl.3 (.05 6.05 8.0 6.05 6.05 8.0 6.05 6.05 8.0 6.05 6.05 8.0 6.05 6.05 8.0 6.05 6.05 8.0 6.05 6.05 8.0	8889 8889 8889 8889 1	<u>8881 8881 8881 8</u>	\$0.3 \$0.3 \$0.3		5												
Repl.2 Repl.3 S.D. S.D. Repl.1 Repl.1 Repl.2 Repl.3 Average S.D. Repl.3 Repl.3 S.D. S.D. S.D.		88911 888911 888911 8	50°,	<.05	17.	3.16	3.26	<	\$0°>	0.110	0.111	600.0	<002	01	٤.01	0.004	¢.002
Kepl.3 S.D. S.D. Repl.1 Repl.3 Repl.1 Repl.3 Repl.3 Repl.3 Repl.3 Repl.3 Repl.3 S.D. S.D. S.D.	6	6 888 888 8	<u></u>	\$. 5	5 . 05	3.35	3.25	\$.05	0.116	0.112	0.013	< ,002		.01	0.006	¢.002
Average S.D. Repl.1 Repl.2 Repl.3 Average S.D. Repl.3 Repl.3 Repl.3 Repl.3 S.D. S.D.				co. >	c0.)	3.14	62.6	6 , 0	60. >	0.108	0.111	0.010	. 002	10.>	10. >	0.008	<.002
S.D. Repl.1 Repl.2 Repl.3 Averege S.D. Repl.1 Repl.1 Repl.3 Repl.3 Repl.3 S.D. S.D. S.D.			-	1	:	3.22	3.25	1		0.111	0.111	0.011	ļ	}	;	0.006	
Repl.1 Repl.2 Repl.3 Average S.D. Repl.3 Average S.D. Repl.3 Repl.3 Repl.3 Repl.3 Repl.3 S.D. S.D.		<u>555511 555511 5</u>		!	!	0.12	0.02	1	1	0.004	0.001	0.002	:	:	;	0.002	:
Repl.2 Repl.3 S.D. Repl.1 Repl.3 Average S.D. Repl.3 Repl.3 Repl.3 Repl.3 S.D. S.D.		<u>888</u>	<5 5.05	\$5	(,05	8.81	0.73	60.3	50°	0.053	0.027	0.331	0.002	¢.01	10.3	0.041	¢.002
Repl.3 Average S.D. Repl.1 Repl.1 Repl.1 Repl.3 S.D. Repl.3 S.D. Repl.3 S.D. S.D.	8888 888 888	<u> </u>											10000				
Repl.1 S.D. S.D. Repl.1 Repl.1 Repl.1 Repl.3 Repl.3 Repl.3 Repl.3 S.D. S.D. S.D.	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8		5	S	5			5.	5	800.0	870.0	118.0	200.0	10.2	10.2	0.032	700.2
Average S.D. Repl.1 Repl.3 Average S.D. Repl.3 Average S.D. Repl.3 Average S.D.		888	6)	co. >	co • >	10.20	0.72	c 0. >	<. 05	0.058	0.027	0.373	002	0.02	10.2	0.010	005
S.D. Repl.1 Repl.2 Repl.3 Average S.D. Repl.3 Average Average S.D.		8881	1	1 1 1	:	9.80	0.73		1	0.056	0.027	0,360	0.002	1		0.028	1
Repl.1 Repl.2 Repl.3 Average S.D. Repl.3 Repl.3 Repl.1 Repl.3 Repl.3 S.D. S.D.	888 888	88811	ļ	ł	ł	0.87	0.01	ļ	;	0.003	0.001	0.025	0.00	;		0.016	
Repl.2 Repl.3 Average S.D. Repl.1 Repl.3 Repl.3 Repl.1 Repl.3 Repl.3 S.D. S.D.	\$\$\$ \$ \$ \$\$	50 50 1	50. >	8,9	\$0 .)	2.34	2.33	¢.05	50. 2	0.486	0.496	600.0	¢.002		10. 3	0.029	¢.002
Repl.3 Average S.D. Repl.1 Repl.3 S.D. Repl.1 Repl.3 Average S.D.	5 5 5 5	8	.05	<.05	:0.,	2.20	2.28	\$0°	50 ,9	0.470	0.475	0.006	¢.002		10.2	0.006	<pre>.002</pre>
Average S.D. Repl.1 Repl.3 Average S.D. Repl.1 Repl.3 Average S.D.			\$0.v	50.2	50.5	2.25	2.26	50.0	50.5	0.504	0.474	0.008	.002		10.2	¢.002	¢.002
S.D. Repl.1 Repl.3 Average S.D. Repl.1 Repl.3 Average S.D.	50°°				;	2.26	2.29			0.487	0.482	0.008			;	0.018	
Repl.1 Repl.3 Repl.3 S.D. Repl.1 Repl.2 Repl.3 Average	\$0. \$0. \$0.	ļ		1	!	0.07	0.04	;		0.017	0.012	0.002	:		;	0.016	ļ
Repl.1 Repl.3 Average S.D. Repl.1 Repl.3 Average S.D.	50.5	2															
Repl.2 Repl.3 Average S.D. Repl.1 Repl.3 Average S.D.	86.1	5.5	<05	\$°.5	5 .3	7.17	0.69	¢.05	¢.05	0.097	0.076	0.302	ć.002	0.02	د.01	0.036	¢.002
Repl.3 Average S.D. Repl.1 Repl.3 Average S.D.	S	5.05	50.2	50° V	. .05	10.10	0.68	¢.05	50. 2	0.109	0.076	0.371	¢.002	0.02	10.3	0.047	<.002
Average S.D. Repl.1 Repl.3 Average S.D.		50.	č.05	<.05	. .05	9.91	0.69	<.05	¢.05	0.110	0.078	0.374	¢.002	0.01	10.2	0.069	¢.002
S.D. Repl.1 Repl.2 Average S.D.	ļ	+	:	!	!	90.6	0.69	:	!	0.105	0.077	0.349	!	0.02	;	0.051	!
Repl.1 Repl.2 Repl.3 Average S.D.		;	ł	;	!	1.64	0.01	;	8	0.007	0.001	0.041	i	0.01	ļ	0.017	!
Repl.2 Repl.3 Average S.D.	0.06	50.3	6.05	50 .0	0.07	42.10	0.93	\$0°\$	0.05	0.159	0-096	0.774	¢.002	0.09	0.01	0.106	6.002
Repl.3 Average S.D.	0.06	\$. 0 <u>5</u>	\$°.5	50. •	50 , 0	43.90	0.89	\$0.5	.05	0.167	0.092	0.801	¢.002	0.09	0.02	0.139	.002
-	8	8	\$.05	¢.05	- 0	41.60	0.89	\$.9	ç. 05	0.160	0.033	0.746	¢.002	0.09	10.2	660°0	<.002
	0.06	:	5	;	;	42.53	0.90	ļ	1	0.162	960.0	0.774	::;	0.09	0.02	0.115	i
	0.0		ļ	ļ	ļ	1.21	0.02			0.004	0.002	0.028	:	0.0	0.01	0.021	
Repl.1 <.05	8.5	¢.05	c. 05	¢.05	50 ,)	51.90	0.91	¢.05	<.05	0.186	0.097	1.240	¢.002	0.12	10.2	0.132	¢.002
Repl.2 0.05	8 . •	. o.	\$0.5	20. 2	50°°	49.50	0.96	5 0. ^	50. 0	0.178	0.107	1.100	د.002	0.11	10.2	0.150	ć. 002
	¢.05	50. 2	\$0.5	<.05	c.05	50,20	0.97	¢.05	¢.05	0.183	0.105	1.100	¢.002	0.11	4.01	0.123	¢.002
-		1	ļ		ļ	50.53	0.95	1	!	0.182	0.103	1.147	:	0.11	;;	0.135	i
S.D	;	:	ł	!	1	1.23	0.03		•	0.004	0.005	0.081	ţ	0.01	;	0.014	!
7 0.07	¢.05	50. >	50. 3	č0. ^	د.05	14.40	4.89	<<	<.05	1.370	1.400	0.579	¢.002	0.03	٤.01	0.233	0.008
	¢.05	<05	ç. 05	¢.05	0.07	31.30	4.39	<5 .05	د.05	1.020	0.804	1.500	<002	0.08	۰.01	0.393	¢.002
blank <.05	50.7	50.2	50.2	50-7	50.7	50.2	50.7	50.5	50.2	, 1001 X	100.2	0.005	C00.3			0.016	. 002
	8	5	8	0.22	50. ,	8	50°, >	0	50°. 7	100.0	.001	0.00	¢.002	.01	10.2	, 002	¢.002

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ALK FH DISTCP NEM NEM NEM Sol Sol <th< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th<>											
NG/L RE/L. NG/L RG/L NG/L RG/L NG/L RG/L NG/L RG/L NG/L RG/L NG/L RG/L NG/L NG/L <t< th=""><th>64 at 100</th><th></th><th>ALK</th><th>Н</th><th>DISICP</th><th>DISICP</th><th>COND</th><th>FR</th><th>NFR</th><th>S04</th><th></th></t<>	64 at 100		ALK	Н	DISICP	DISICP	COND	FR	NFR	S04	
RepL:1 66.2 8.2 73.0 75.0 143 95 65 RepL:3 66.2 8.2 73.3 75.1 143 90 6 S.D. 0.3 0.0 0.2 73.1 75.1 143 90 6 S.D. 0.3 0.0 0.2 0.2 0.2 0.2 3 RepL:1 20.9 7.7 20.6 21:2 45 30 64 RepL:2 20.9 7.7 20.6 21:3 45 30 64 RepL:1 119.0 8.4 160.0 16.1 0.1 <t< th=""><th>Number</th><th></th><th>MG/L</th><th></th><th>MG/L</th><th>ب</th><th>UNHO/C</th><th>1/DM</th><th>NG/L</th><th>NG/L</th><th></th></t<>	Number		MG/L		MG/L	ب	UNHO/C	1/DM	NG/L	NG/L	
Replic 67.7 8.2 73.3 75.3 143 100 45 S.D. 0.3 0.0 0.2 0.2 143 100 6 S.D. 0.3 0.0 0.2 0.2 133 100 6 Replicit 20.9 7.7 20.6 21.2 45 30 91 Replicit 20.9 7.7 20.6 21.2 45 30 64 Replicit 20.9 7.7 20.6 21.2 45 30 64 Replicit 119.0 8.4 166.0 165.1 255 200 75 S.D. 0.0 0.0 0.0 10.1 0.1 0.1 0 16 Replicit 119.0 8.4 156.0 165.1 255 200 75 S.D. 0.0 0.0 0.0 0.0 0.1 0.1 0 16 Replicit 119.0 6.4 160.7<		Repl.1	68.2	1				16			0
Repl.3 68.2 8.2 72.9 75.0 143 100 6 S.D. 0.33 0.03 0.02 0.22 72.1 73.1 73.1 73.1 73.1 73.1 73.1 73.1 73.1 73.1 73.1 73.1 73.1 73.1 73.1 73.1 73 98 Repl.1 20.9 7.7 20.6 21.2 45 30 93 Repl.1 119.0 8.4 160.0 0.1 0.1 0.1 0 16 64 Numerer 20.9 7.7 20.4 21.3 45 30 93 S.D. 0.0 0.0 0.1 0.1 0.1 0.1 0 16 64 Repl.1 119.0 8.4 160.7 165.1 255 200 45 45 30 93 64 44 45 30 45 30 45		Repl.2	67.7	8.2	73.3	75.3		100			~
Average 68.0 8.2 73.1 75.1 143 98 5.D. 0.3 0.0 0.2 0.2 0.2 0 3 Repl1 20.9 7.7 20.6 21.2 45 30 94 Repl1.2 20.9 7.7 20.6 21.13 45 30 93 Numerica 20.9 7.7 20.1 0.1 0.1 0.1 0 16 S.D. 0.0 0.0 0.0 10.1 0.1 0.1 0 16 S.D. 0.0 0.0 0.0 152.0 285 200 45 Repl1.1 119.0 8.4 160.0 165.0 255 200 45 S.D. 0.0 0.0 165.0 152.0 255 200 45 S.D. 0.0 0.0 10.1 21.1 17 30 90 100 Repl1.2 27.4	-	Repl.3	68.2	8.2	72.9	75.0		10		.0	~
S.D. 0.3 0.0 0.2 0.2 0.2 0 3 Repli: 20.9 7.7 20.6 21.3 45 30 91 Repli: 20.9 7.7 20.6 21.3 45 30 93 Repli: 20.9 7.7 20.6 21.3 45 30 93 S.D. 0.0 0.0 0.0 0.1 0.1 0.1 0 16 Repli: 119.0 8.4 160.0 165.0 285 200 45 30 83 S.D. 0.0 0.0 0.0 10.1 0 0 16 0 16 Repli: 119.0 8.4 160.0 162.0 285 200 45 30 83 S.D. 0.0 0.0 2.0 2.1 2.1 1 1 0 1 0 1 0 10 10 10 10 10 10 10 10 10 10 10 10 10 10 <td< td=""><td></td><td>Average</td><td>68.0</td><td>8.2</td><td>73.1</td><td>75.1</td><td>7</td><td>96</td><td>1</td><td></td><td>5</td></td<>		Average	68.0	8.2	73.1	75.1	7	96	1		5
Repl.1 20.9 7.7 20.6 21.2 45 30 91 Repl.3 20.9 7.7 20.6 21.3 45 30 93 Sub. 0.0 0.0 0.0 0.0 0.1 0 0 16 Sub. 0.0 0.0 0.0 0.1 0.1 0 0 16 Sub. 0.0 0.0 0.0 0.1 0.1 0 0 16 Repl.1 119.0 8.4 150.0 151.0 255 200 45 Average 119.0 8.4 156.0 151.0 255 207 45 Average 119.0 8.4 156.0 151.0 255 206 Repl.1 26.9 7.9 40.1 40.7 90 50 109 Repl.3 27.4 7.9 40.4 41.1 89 50 109 Repl.1 26.9 7.9		S.D.	0.3	0.0	0.2	0.2	•	(F)	:		-1
Repl.2 20.9 7.7 20.8 21.3 45 30 64 Newraege 20.9 7.7 20.4 21.3 45 30 93 S.D. 0.0 0.0 0.1 0.1 0.1 0 16 93 S.D. 0.0 0.0 0.1 0.1 0 16 93 Repl.3 119.0 8.4 160.0 165.0 285 200 75 Repl.3 119.0 8.4 160.0 165.0 285 200 75 S.D. 0.0 0.0 0.0 2.1 2.1 17 5 5 Repl.1 190 8.4 160.0 161.0 21.1 17 5 5 5 Repl.1 26.9 7.9 40.1 40.7 55 206 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5		Repl.1	20.9	7.7	20.6	21.2	-	30	•	_	e
Repl.3 20.9 7.7 20.8 21.3 45 30 93 S.D. 0.0 0.0 0.1 0.1 0.1 0.1 0 16 S.D. 0.0 0.0 0.0 0.1 0.1 0.1 0 16 S.D. 0.0 0.0 0.0 0.1 0.1 0 16 Repl.1 119.0 8.4 160.0 162.0 255 200 45 Repl.3 119.0 8.4 160.0 162.0 255 200 45 S.D. 0.0 0.0 0.1 20.1 20 20 55 Repl.1 26.9 7.9 40.1 40.7 26 20 45 Repl.3 27.4 7.9 40.1 41.1 86 50 109 Repl.3 27.4 7.9 40.4 41.1 89 50 109 Repl.3 27.4 7.9 40.4 <td< td=""><td></td><td>Repl.2</td><td>20.9</td><td>7.7</td><td>20.8</td><td>21.3</td><td>-</td><td>е С</td><td></td><td></td><td>ო</td></td<>		Repl.2	20.9	7.7	20.8	21.3	-	е С			ო
Average 20.9 7.7 20.7 21.3 45 30 83 S.D. 0.0 0.0 0.1 0.1 0.1 0.1 0 16 S.D. 0.0 0.0 0.1 0.1 0.1 0.1 0 16 RepL.1 119.0 8.4 163.0 165.0 285 207 45 RepL.2 119.0 8.4 160.0 162.7 255 207 45 S.D. 0.0 0.0 2.1 2.1 2.1 2.1 2.1 RepL.1 26.9 7.9 40.1 40.7 90 50 109 RepL.1 25.7 7.9 40.4 41.1 89 50 109 RepL.1 27.4 7.9 40.4 41.1 89 50 109 RepL.1 42.3 8.1 52.7 53.4 98 50 109 S.D. 0.3 0.0 0.5	2	Repl.3	20.9	7.7	20.8	21.3		ЭС		m	ო
S.D. 0.0 0.0 0.1 0.1 0.1 0 16 Repl.1 119.0 8.4 163.0 165.0 285 200 45 Repl.3 119.0 8.4 160.0 162.0 285 200 45 Repl.3 119.0 8.4 160.0 162.0 285 200 45 Repl.3 119.0 8.4 160.7 162.7 255 210 45 Repl.3 27.4 7.9 40.1 40.7 90 50 109 Repl.3 27.4 7.9 40.1 40.7 90 50 109 Repl.3 27.4 7.9 40.4 41.1 88 50 109 Repl.3 27.4 7.9 40.4 41.1 89 50 109 Repl.3 27.2 7.9 40.4 41.1 89 50 109 Repl.3 41.8 8.1 51.0 51.2 90 50 10 Repl.3 41.8 8.1 51.6		Average	20.9	7.7	20.7	21.3		90		~	e
Repl.1 119.0 8.4 163.0 165.0 285 200 45 Repl.2 119.0 8.4 160.0 162.0 255 207 45 S.D. 0.0 0.0 8.4 160.0 162.0 255 207 45 S.D. 0.0 0.0 2.1 2.1 2.1 17 5 S.D. 0.0 0.0 2.1 2.1 2.1 17 5 S.D. 0.0 0.0 2.1 2.1 17 90 50 109 Repl.2 27.4 7.9 40.1 40.7 90 50 109 Average 27.2 7.9 40.4 41.1 89 50 109 Repl.1 42.3 8.1 52.7 53.4 90 50 10 Repl.2 41.8 8.1 51.4 51.9 90 50 10 Repl.1 44.3		S.D.	0.0	0.0	0.1	0.1	0	0		.0	•
Repl.2 119.0 8.4 160.0 162.0 255 207 45 Awwreage 119.0 8.4 159.0 161.0 255 210 45 S.D. 0.0 0.0 2.1 2.1 2.1 2.1 45 S.D. 0.0 0.0 2.1 2.1 2.1 5 206 Repl.1 26.9 7.9 40.1 40.7 90 50 109 Repl.2 27.4 7.9 40.4 41.1 89 50 109 S.D. 0.3 0.0 0.5 51.2 90 50 109 Repl.1 42.3 8.1 51.0 51.2 99 80 590 Repl.2 44.5 8.1 51.0 51.2 90 730 Repl.3 41.8 8.1 51.0 51.2 99 50 109 S.D. 0.3 0.0 1.2 1.3 1.3		Repl.1	119.0	8.4	163.0	165.0	285	200		5	37
Repl.3 119.0 8.4 159.0 161.0 255 210 <5		Repl.2	119.0		160.0	162.0		207		•	41
Avareage 119.0 8.4 160.7 162.7 265 206 S.D. 0.0 0.0 2.1 2.1 17 5 Repl.1 26.9 7.9 40.1 40.7 90 50 109 Repl.1 27.4 7.9 40.1 40.7 90 50 109 Repl.2 27.4 7.9 40.4 41.1 89 50 109 Avareage 27.2 7.9 40.4 41.1 89 50 109 S.D. 0.3 0.0 0.5 0.6 10 1 0 1 Repl.1 42.0 8.1 51.0 51.2 99 80 500 Avareage 42.0 8.1 51.4 51.9 99 60 500 Avareage 42.0 8.1 51.4 51.9 99 60 720 S.D. 0.3 0.0 1.2 1.3	ო	Repl.3	119.0	8.4	159.0	161.0		210			41
S.D. 0.0 0.0 2.1 2.1 17 5 Repl.1 26.9 7.9 40.1 40.7 90 50 109 Repl.2 27.4 7.9 40.1 40.7 90 50 109 Repl.3 27.4 7.9 40.1 40.7 90 50 109 Average 27.2 7.9 40.4 41.1 89 50 109 Average 27.2 7.9 40.4 41.1 89 50 109 S.D. 0.3 0.0 0.5 0.6 0.6 0.9 10 Repl.1 42.3 8.1 51.0 51.2 98 80 500 Repl.3 41.8 8.1 51.0 51.2 98 80 500 S.D. 0.3 0.0 1.2 1.3 1 0 1 0 10 Repl.1 44.3 8.1 51.0 51.2 98 50 500 S.D. 0.3 1.3 54.6		Average	119.0		160.7	162.7	265	206	ł		ç
Repl.1 26.9 7.9 40.1 40.7 90 50 109 Repl.2 27.4 7.9 40.2 40.6 86 50 109 Repl.3 27.4 7.9 40.2 40.4 41.1 90 50 109 Average 27.2 7.9 40.4 41.1 89 50 109 S.D. 0.3 0.0 0.5 0.6 1 0 1 Repl.1 42.3 8.1 52.7 53.4 98 80 500 Repl.2 41.6 8.1 51.0 51.2 100 80 500 Repl.3 41.6 8.1 51.0 51.2 99 50 730 S.D. 0.3 0.0 1.2 1.3 90 50 730 Repl.3 44.8 8.1 52.6 54.6 103 100 690 720 Repl.3 6.3 6.3 54.6		S.D.	0.0	0.0	2.1	2.1	17		;		2
Repl.2 27.4 7.9 40.2 40.8 88 50 109 Averrege 27.4 7.9 41.0 41.7 90 50 109 S.D. 0.3 0.0 0.5 40.4 41.1 89 50 109 S.D. 0.3 0.0 0.5 0.6 1 0 1 Repl.1 42.3 8.1 52.7 53.4 98 80 590 Repl.2 41.8 8.1 51.0 51.2 100 80 590 Averrege 42.0 8.1 51.4 51.3 99 80 500 S.D. 0.3 0.0 1.2 1.3 1 0 10 Repl.1 44.3 8.1 52.6 53.2 99 730 S.D. 0.3 0.0 0.7 0.7 37 30 713 Repl.2 44.5 8.1 52.6 54.6 103		Repl.1	26.9	7.9		40.7		š		•	15
Repi.3 27.4 7.9 41.0 41.7 90 50 110 Averrege 27.2 7.9 40.4 41.1 89 50 109 S.D. 0.3 0.0 0.5 0.6 1 0 1 0 1 Repl.1 42.3 8.1 52.7 53.4 98 80 590 Repl.2 41.8 8.1 51.0 51.2 100 80 590 Repl.3 41.8 8.1 51.4 51.2 100 80 500 Averrege 42.0 8.1 51.4 51.2 100 80 500 S.D. 0.3 0.0 1.2 1.3 1 0 10 Kepl.1 44.3 8.1 51.4 51.3 103 100 590 720 Repl.3 44.4 8.1 53.7 54.6 103 100 690 720 Repl.3 44.5 8.1 53.4 54.0 103 100 690 720 S.D		Repl.2	27.4	7.9		40.8				m	16
Average 27.2 7.9 40.4 41.1 89 50 109 S.D. 0.3 0.0 0.5 0.6 1 0 1 Repl.1 42.3 8.1 52.7 53.4 98 80 590 Repl.2 41.8 8.1 51.0 51.2 100 80 590 Repl.3 41.8 8.1 55.0 51.2 100 80 590 Average 42.0 8.1 51.4 51.2 100 80 590 Average 42.0 8.1 51.4 51.3 1.3 1 0 10 S.D. 0.3 0.0 1.2 1.3 1 0 10 590 590 Average 44.5 8.1 52.6 53.2 98 90 720 Repl.3 44.4 8.1 53.4 54.0 54.0 733 713 S.D. 0.3 0.0 0.7 0.7 73 6 21 Averacy 44.5 8.1 <td>4</td> <td>Repl.3</td> <td>27.4</td> <td>7.9</td> <td></td> <td>41.7</td> <td></td> <td></td> <td></td> <td>0</td> <td>16</td>	4	Repl.3	27.4	7.9		41.7				0	16
S.D. 0.3 0.0 0.5 0.6 1 0 1 Repl.1 42.3 8.1 52.7 53.4 98 80 590 Repl.2 41.8 8.1 51.0 51.2 100 80 590 Repl.3 41.8 8.1 50.5 51.2 99 80 590 Average 42.0 8.1 51.4 51.2 100 80 590 S.D. 0.3 0.0 1.2 1.3 1 0 10 Kepl.1 44.3 8.1 52.6 53.2 98 90 730 Repl.2 44.5 8.1 53.7 54.6 103 100 690 Repl.3 44.4 8.1 53.7 54.3 103 90 720 Average 44.5 8.1 53.7 54.3 103 90 720 Average 44.5 8.1 53.4 54.0 101 93 713 S.D. 0.3 0.0 0.7 0.7 3		Average	27.2	7.9		41.1		ŝ		"	16
Repl.1 42.3 8.1 52.7 53.4 98 80 590 Repl.2 41.8 8.1 51.0 51.2 100 80 580 Repl.3 41.8 8.1 51.0 51.2 98 80 580 Repl.3 41.8 8.1 51.0 51.2 98 80 580 Average 42.0 8.1 51.4 51.3 99 80 590 S.D. 0.3 0.0 1.2 1.3 1 0 10 Repl.1 44.3 8.1 52.6 53.2 98 90 730 Repl.3 44.4 8.1 53.7 54.6 103 100 690 730 Repl.3 44.4 8.1 53.7 54.0 54.6 101 93 713 S.D. 0.3 0.0 0.7 0.7 0.7 37 313 S.D. 0.3 24.5 54.0		s.D.	0.3	0.0		0.6	1	Ű	-	_	
Repl.2 41.8 8.1 51.0 51.2 100 80 580 Average 42.0 8.1 50.5 51.2 98 80 590 S.D. 0.3 0.0 1.2 1.3 1 0 10 80 590 S.D. 0.3 0.0 1.2 1.3 1 0 10 10 Repl.1 44.3 8.1 52.6 53.2 98 90 730 Repl.2 44.3 8.1 52.6 53.7 54.6 103 90 720 Repl.3 44.5 8.1 53.7 54.0 101 93 713 S.D. 0.3 0.0 0.7 0.7 37 3 21 Average 44.5 8.1 53.7 54.0 101 93 713 S.D. 0.3 0.0 0.7 0.7 37 37 37 S.D. 0.3 0.0 101 93 713 37 S.D. 0.3 2.05 2.0		Repl.1	42.3	8.1	52.7	53.4		8		0	13
Repl.3 41.8 8.1 50.5 51.2 98 80 600 Average 42.0 8.1 51.4 51.9 99 80 590 S.D. 0.3 0.0 1.2 1.3 1 0 10 Repl.1 44.3 8.1 52.6 53.2 98 90 730 Repl.3 44.43 8.1 52.6 53.2 98 90 730 Repl.3 44.5 8.1 53.7 54.6 103 100 690 Repl.3 44.5 8.1 53.7 54.3 103 90 720 Average 44.5 8.1 53.7 54.0 101 93 713 S.D. 0.3 0.0 0.7 0.7 37 5 21 7 134 8.3 205 207 375 250 140 8 135 8.3 169 171 320 240 580 1.5 5.4 4.4 0.5 1 40 <td< td=""><td></td><td>Repl.2</td><td>41.8</td><td>8.1</td><td>51.0</td><td>51.2</td><td></td><td>8C BC</td><td></td><td>0</td><td>13</td></td<>		Repl.2	41.8	8.1	51.0	51.2		8C BC		0	13
Average 42.0 8.1 51.4 51.9 99 80 590 S.D. 0.3 0.0 1.2 1.3 1 0 10 Repl.1 44.3 8.1 52.6 53.2 98 90 730 Repl.2 44.3 8.1 52.6 53.2 98 90 730 Repl.3 44.5 8.1 53.7 54.6 103 100 690 Repl.3 44.5 8.1 53.7 54.3 103 90 720 Average 44.5 8.1 53.7 54.0 101 93 713 S.D. 0.3 0.0 0.7 0.7 375 21 21 7 134 8.3 205 207 375 250 140 8 135 8.3 169 171 320 240 580 1.5 5.4 4.4 0.5 1 75 550 140 1.5 5.4 4.4 0.5 1 56 560 </td <td>ŝ</td> <td>Repl.3</td> <td>41.8</td> <td>8.1</td> <td>50.5</td> <td>51.2</td> <td></td> <td>æ</td> <td></td> <td>0</td> <td>12</td>	ŝ	Repl.3	41.8	8.1	50.5	51.2		æ		0	12
S.D. 0.3 0.0 1.2 1.3 1 0 10 Repl.1 44.3 8.1 52.6 53.2 98 90 730 Repl.3 44.3 8.1 52.6 53.2 98 90 730 Repl.3 44.8 8.1 53.7 54.3 103 100 690 Repl.3 44.5 8.1 53.7 54.3 103 90 720 Average 44.5 8.1 53.7 54.0 101 93 713 S.D. 0.3 0.0 0.7 0.7 37 3 6 21 7 134 8.3 205 207 375 250 140 8 135 8.3 169 171 320 240 580 1.5 5.4 <.4		Average	42.0	8.1	51.4	51.9		æ		0	13
Repl.1 44.3 8.1 52.6 53.2 98 90 730 Repl.2 44.3 8.1 54.0 54.6 103 100 690 Repl.3 44.8 8.1 53.7 54.6 103 100 690 Repl.3 44.6 8.1 53.7 54.0 101 93 713 Average 44.5 8.1 53.4 54.0 101 93 713 S.D. 0.3 0.0 0.7 0.7 375 20 140 7 134 8.3 205 207 375 250 140 8 135 8.3 169 171 320 240 580 1.5 5.4 <.4		s.D.	0.3	0.0	1.2	1.3		U		0	-
Repl.2 44.3 8.1 54.0 54.6 103 100 690 Repl.3 44.6 8.1 53.7 54.3 103 90 720 Averege 44.5 8.1 53.7 54.0 101 93 713 S.D. 0.3 0.0 0.7 0.7 37 5 21 7 134 8.3 205 207 375 250 140 8 135 8.3 169 171 320 240 580 1.5 5.4 <.4		Repl.1	44.3		52.6	53.2		8		0	14
Repl.3 44.6 8.1 53.7 54.3 103 90 720 Average 44.5 8.1 53.4 54.0 101 93 713 S.D. 0.3 0.0 0.7 0.7 31 5 21 7 134 8.3 205 207 375 250 140 8 135 8.3 169 171 320 240 580 1.5 5.8 <.4		Repl.2	44.3		54.0	54.6		ğ		0	14
Average 44.5 8.1 53.4 54.0 101 93 713 S.D. 0.3 0.0 0.7 0.7 3 6 21 7 134 8.3 205 207 375 250 140 8 135 8.3 169 171 320 240 580 1.5 5.4 <.4	9	Repl.3	44.8		53.7	54.3		8		•	14
S.D. 0.3 0.0 0.7 0.7 3 6 21 7 134 8.3 205 207 375 250 140 8 135 8.3 169 171 320 240 580 1.5 5.4 <.4		Average	44.5	8.1		54.0		8		m	4
7 134 8.3 205 207 375 250 140 8 135 8.3 169 171 320 240 580 1.5 5.4 <.4 0.5 1 <5 <5 1.5 5.8 <.4 0.5 1 <5 <5 <5		S.D.	0.3	0.0		0.7	m	U		-	•
8 135 8.3 169 171 320 240 580		7	134	8.3		207	375	250		0	70
1.5 5.4 <.4 0.5 1 <5 <5 1.5 5.8 <.4 <.4 1 <5 <5		6)	135	9 .3		171	320	240		0	58
1.5 5.8 4.4 4.4 1 45 45	Blank	4 1 1 1	1.5	5.4	4.2	0.5		Ų			1
	Blank		1.5	5.8		4.4		Ű		10	5

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Project	
- Snip	1989
iment Quality	July 30.
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NG/G	8520	5410	10800	10200	8733	2416	13100	15900	12700	10400	13025	2256	10500	9779	9840	0006	9778	614	7910	7320	8000	7810	7760	303	10600	10500	9940	9190	10058	647	12300	12400	12500	12800	12500	216	9168	8720	8610	0002	7130	7130	
K 9/90	2900	1000	3100	3100	2525	1021	3000	3400	3000	2600	3000	327	5200	5200	5100	4900	5100	141	6000	5400	6200	5800	5850	342	4400	3500	5800	4500	5050	705	2700	2100	2400	2200	2350	265	4600	4800	4700	003	800	600	
HG / 1	¢.008	0.009	\$008	0.010	0.010	0.001	0.009	.008	¢.008	0.010	0.010	0.001	0.020	0.010	0.018	¢.008	0.016	0.005	600.0	*.008	800.>	, 008		1	0.010	0.010	0.010	600.0	0.010	0.001	0.020	0.026	0.026	0.042	0.029	600'0	0.058	0.068	0.073	0 001	0.816	0.881	
FE UG/G	37100	52100	37300	39600	41525	7141	30800	31200	40200	59600	40450	13484	65200	85900	65500	101000	79400	17356	80700	117000	74800	109000	95375	20752	57000	73100	71500	53300	63725	10037	\$9100	67900	66500	65400	64725	3687	28300	27600	27400	000001	102000	107000	
cu uc/c	25.8	17.7	18.0	19.9	20.4	3.8	9.7	13.0	14.0	15.0	12.9	2.3	161.0	227.0	165.0	330.0	220.8	78.9	229.0	294.0	179.0	291.0	248.3	55.0	131.0	200.0	207.0	126.0	166.0	43.4	62.3	85.9	84.3	79.9	78.1	10.8	10	11	10	120	113	118	
CR UG/G	18.3	21.5	18.9	19.6	19.6	1.4	15.0	15.0	16.9	21.1	17.0	2.9	34.5	35.1	34.4	34.5	34.6	0.3	23.2	21.2	23.7	23.5	22.9	1.2	30.6	33.2	30.5	26.2	30.1	2.9	45.9	48.0	47.6	47.5	47.3	0.9	45.0	44.3	43.6		28500	29500	
CO UG/G	<20	ć 20	ć 20	< 20	1	1	<20	< 20	ć20	¢20		;	<20	< 20	ć2 0	<20	:	!	<20	20	<20	8	50	•	<20	< 20	ć 20	¢20		ł	¢20	¢20	¢20	¢20	:	ł	<20	- <20	< 20	40	4 0	4	***
CD UG/G	د.8	6. 8	6. Υ	6. 8	8	1	د.8	٨.8	٤.۶	٤.۶		í	2.0	2.5	1.8	2.1	2.1	0.3	2.0	1.7	2.4	1.9	2.0	0.3	1.0	1.6	2.3	1.0	1.5	0.6			د.8			·	8	¢.8	٤.۶	9	0.6	9.4	2 1 1 1 1 1 1
0/9n 0/9	10600	7420	15500	14400	11980	3694	19300	21600	18900	15400	18800	2560	0966	12400	9870	13100	11333	1662	22000	19900	22000	19700	20900	1273	13300	14400	14200	15900	14450	1079	13100	13400	13500	13000	13250	238	4290	4180	4130	00200	29800	29900	
BE UG/G	0.3	ć. 2	0.3	0,3	e"0	0.0	0.3	0.3	0.3	0.2	0.3	0.0	0.3	0.3	0.3	0.3	0.3	0.0	0.2	<. 2	0.2	0.2	0.2	0.0	0.3	0.3	0.3	0.3	0.3	0.0	0.4	0.4	0.4	0.4	0.4	0.0	0.8	0.8	0.8	9	0.6	0.6	
BA UG/G	173	100	175	178	156	38	149	162	146	138	149	10	469	645	466	782	591	153	215	179	208	198	200	16	247	272	276	249	261	15	290	3 00	267	308	291	18	41.8	40.2	39.6	50.1	51.6	51.4	
AS UG/G	6 8	8	8	6 8	:	!	68	6 8	6 8	8 >	:	}	49	74	48	86	64	19	58		51	120	92	4	30			29	44	18	23	47		21	35	14	8¥	68	< 8	12	3	11	
NL 16/6 1	12300	8140	13100	12700	11560	2303	12800	14100	12100	10700	12425	1417	18600	17100	17400	16100	17300	1030	15300	14400	16300	15500	15375	780	16600	17000	17000	14800	16350	1050	18500	17700	17700	18100	18000	383	20300	19800	19200	0009	5900	6060	
AG UG/G	\$	\$	\$	Ĝ	1 7	:	\$	\$2	Ċ	ů	!	1	\$	ç	0	ů	1	-	\$	ŝ	Ĉ,	Ç	ł	:	3	ĝ	ĉ	Ç	;	1	3	ŝ	\$	\$;	4 7 1	\$2	\$	5		: 0	\$	1
	Repl.1	Repl.2	Repl.3	Repl.4	Average	s.D.	Repl.1	Repl.2	Repl.3	Repl.4	Average	s.D.	Repl.1	Repl.2	Repl.3	Repl.4	Average	s.D.	Repl.1	Repl.2	Repl.3	Repl.4	Average	S.D.	Repl.1	Repl.2	Repl.3	Repl.4	Average	s.D.	Repl.1	Repl.2	Repl.3	Repl.4	Average	s.D.	25	26	27	80	3 8	30	4 1 1 1 1 1
Station Number			-1						7						e						4						ŝ						Q				v NBS1646	NBS1646	NBS1646	NRSIA45	NBS1645	NBS1645	

Table 3

Table 3 (cont.)

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Sediment Quality - Snip Project -July 30, 1989

		0C/G	06/6	0/90	00/0	ل.	NG/G U	06/G	00/0	06/6	06/6	06/6	0/90	0/90		NG/KG	MG/KG
) 	Repl.1	418			370	: 9	1300	10	581	82	51.5	1380	1	:	. 6.08	000676	20800
	Repl.2	320	0		280	ſσ	1400	8	-	88				130	65.2	986000	14200
٦	Repl.3	436			380	10	1400	10							82.8	976000	23600
	Repl.4	470	0		400	10	1300	10	-	8 × 6		1 1270		-	109.0	974000	26100
	Average	411			358	10	1350	10	-		51.0			66	84.5	978750	21175
	S.D.	64			53		58	0			5.9				18.2	5252	5129
	Repl.1	363			420	10	1500	σ	663	68	36.7	1220	0	78	57.5	985000	15300
	Repl.2	399	9 (2)		470	10	1500	10				-			66.2	983000	16800
2	Repl.3	366	5		460	2	1500	10				-			63.9	984000	15800
	Repl.4	381			380	10	1600	10							64.8	984000	15900
	Average	(1)			433	10	1525	10	658		56.0	0 1220			63.1	984000	15950
	s.D.	17	6		41	0	20	-4	51		3.6				з.9	816	624
	Repl.1	3060	0 10		40	33	1670	71	827	8 (8	89.68		0	ю 6	329.0	956000	43600
	Repl.2	9380			700	47	1700	66	-1				Q		436.0	953000	47200
m	Repl.3	5320			510	34	1650	72	797 3	۲ ۲	0.06			84 3	340.0	965000	34500
	Repl.4			-	560	47	1600	37	-	6 <8					479.0	941000	58800
	Average		-	-	578	40	1655	62			106.0	ĩ	33	ê 68	396.0.	953750	46025
	s.D.	3262		~	84	8	42	1	195	:	19.9		57	4	73.3	9912	10055
	Repl.1	915			40	6 6	1400	60		5 <8			õ	Е <u>6</u> 2	366.0	960000	40400
	Repl.2	874		7 5	560	52	1500	%					<u>S</u>		394.0	935000	64600
4	Repl.3	952			670	86	1400	53					ç		352.0	960000	40000
	Repl.4	954			630	52	1400	150		3 <8			<u>Š</u>		428.0	943000	57100
	Average				625	45	1425	9 6	w	-	86.2	10	ų	62 3	385.0	949500	50525
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Sky Creek site (station 1) is characterised by relatively low aluminum, copper, iron, manganese, lead, and zinc sediment concentrations in comparison with the other sites in this survey. This is a reflection of good water quality with low metal content with good buffering capacity and hardness.

The Craig River site (station 2) downstream of Sky Creek, shows sediment content low in aluminum, copper, iron, mercury, manganese, lead, and zinc. Calcium content is high with 18.8 mg/g. High aluminum and iron content in the water did not reveal significant difference between station 1 and 2 in the sediment content. High variability in total zinc concentration was noticed although the metal could not be detected in the dissolved form. Craig River had a lower alkalinity, hardness, pH and filterable residue, although high non filterable residue was encountered (83 mg/l).

The Monsoon Creek site (station 3) sediment content showed detectable arsenic with an average of 64 ug/g as well as cadmium with an average of 2.1 ug/g. Significantly higher aluminum, copper, iron, lead, manganese, and zinc sediment content than station 1 was found in these two creeks with tea colour water. However the organic content of the station 3 sediments was 4.6% compared to 1.9%. No significant difference could be detected between the two stations with any of the metals. Station 3 showed higher alkalinity (119 mg/l) and hardness (160 mg/l) levels than any other stations in the survey. It could be suggested that the amount of organic content detected in the sediment and the high carbonates as shown in the water hardness, were promoting the precipitation of the metals into the sediments and controlling the amount of metal present in the waters. Sulphate levels were the highest of the receiving water stations surveyed with 40 mg/l.

The Bronson Creek site (station 4) upstream of the Cominco camp is located about 3 km from the mouth of the creek. The area is influenced by the Bronson Glacier, Johnny Creek (receiving Skyline mine discharge) and natural acid rock drainage generated from the canyon walls in the lower part

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of the system. Sediment content showed detectable values for arsenic with an average of 92 ug/g and cadmium with an average value of 2.0 ug/g. High sediment values were found for most contaminants described in Figure 2 except for mercury and manganese, however no significant differences could be detected between the station 3 and 4 except for calcium. The high calcium content at station 4 could be attributed to the effect of liming the mine effluent at Skyline mmine. The loss on ignition represents the highest percentage composition of the station surveyed with an average of 5.1%. Water quality showed high total copper values with 23 ug/l but no detectable dissolved copper with the graphite furnace.

The Iskut River site upstream of the Bronson Creek (station 5) showed detectable levels of arsenic (44 ug/g) and cadmium (1.5 ug/g) in the sediments. Sediment content was low for calcium, mercury, and manganese. Aluminum, copper, concentrations were not significantly different than station 4. However iron, lead and zinc were significantly different than station 4. The water quality at station 5 is dominated by the high suspended solids content which was as an average 590 mg/l. Total metals were generally high for many contaminants such as aluminum, copper, and zinc however the dissolved fraction was close to or below the detection limit.

The Iskut River site downstream of Bronson Creek (station 6) showed generally lower contaminant levels in the sediments except for aluminum, and mercury. In the case of mercury, the average concentration at that site was 29 ng/g which was significantly different than any other site. The mercury concentration is not uncommon, however no explanation could be given for the sudden increase in concentration. The water quality at station 6 is dominated by the high non filteralble residue (713 mg/l). The dissolved metal fraction showed values close to or below the detection limit compared to total metal, especially for aluminum, copper and zinc.

Mine water collected at the level 180 (station 7) and 300 (station 8) showed high total copper levels (0.112 and 0.113 mg/l), and zinc (0.233 and 0.393 mg/l). The dissolved metal content for these two metals was below the detection limit.

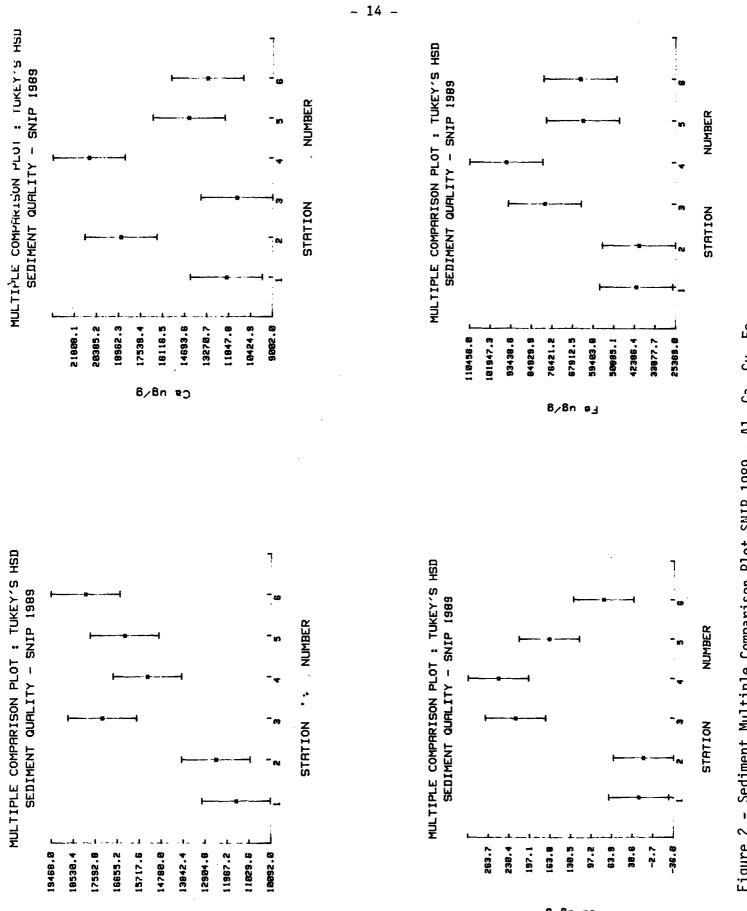


Figure 2 - Sediment Multiple Comparison Plot SNIP 1989 - Al, Ca, Cu, Fe.

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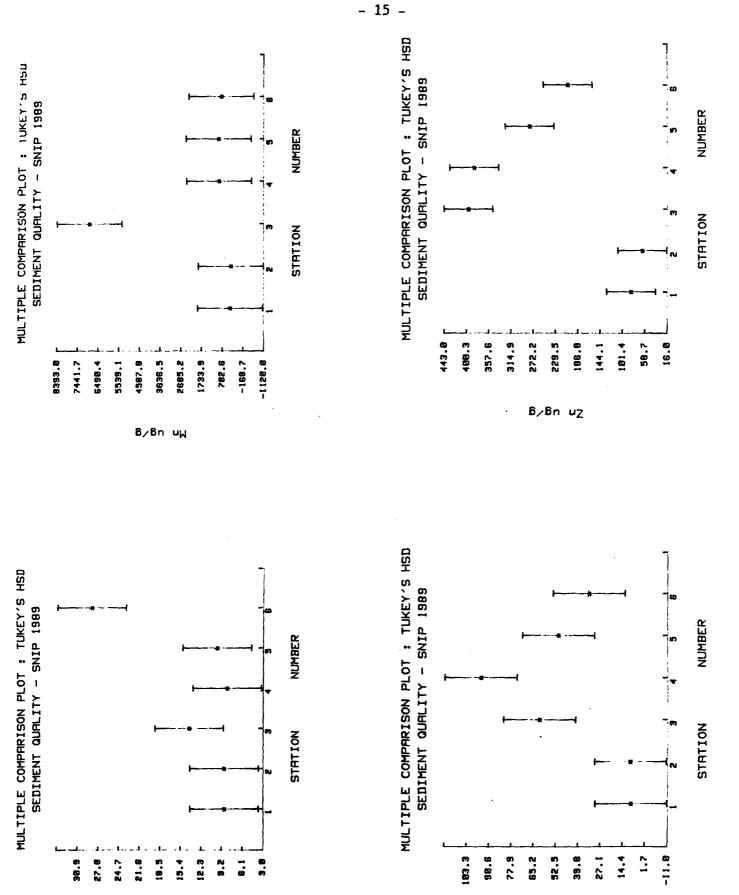


Figure 2 - Sediment Multiple Comparison Plot SNIP 1989 - Hg, Mn, Pb, Zn.

6∕8u 8_H

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REFERENCE

Anonymous. 1979. Laboratory Manual. Department of the Environmental Protection Service. Department of Fisheries and Oceans (Pacific Region).