CREAM SILVER MINES LIMITED

PRELIMINARY ENVIRONMENTAL BASELINE STUDIES

WATER QUALITY, HYDROLOGY AND WILDLIFE INVESTIGATIONS CREAM SILVER PROPERTY 1987

Buttle Lake Area, British Columbia
49° 30', 125° 33'
N.T.S. 92F5E, 12E

CLAIMS STUDIED

CREAM 1-18, 1E-6E, BEAR 2, 6, 8, 21-26, X 1-20, F 1-28, D 1-18
STAN 12-13, 15-16, 18-20

OWNER: Cream Silver Mines Ltd.
OPERATOR: Cream Silver Mines Ltd.

Prepared by

HATFIELD CONSULTANTS LIMITED
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West Vancouver, B.C.
V7V 3R6

September 1987

GEOLOGICAL BRANCH ASSESSMENT REPORT

PRELIMINARY ENVIRONMENTAL BASELINE STUDIES
WATER QUALITY, HYDROLOGY AND WILDLIFE
CREAM SILVER PROPERTY
1987

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Claims	Record Numbers	Anniversaries
BEAR 2	10353	23 SEP
BEAR 6	10357	23 SEP
BEAR 8	10359	23 SEP
BEAR 21-26	10372-77	23 SEP
CREAM 1-2	11497-98	22 JUL
CREAM 3-12	9418-27	22 JUL
CREAM 13-14	10394-95	23 SEP
CREAM 15-18	11574-77	12 OCT
CREAM 1E-2E	11499-500	27 JUL
CREAM 3E-6E	11570-73	12 OCT
D 1-18	16271-88	27 JAN
F 1-16	15882-97	25 NOV
F 17-28	16846-57	22 MAY
STAN 12-13	17057-58	23 SEP
STAN 15-16	17060-61	23 SEP
STAN 18-20	17063-65	23 SEP
X 1-20	15577-96	17 SEP

COST STATEMENT
Preliminary Environmental Baseline Studies
May 14 - June 15, 1987.

Mark Management Ltd,

Salaries and Wages : 2 Pers., 4 mday @ $ 133.33	$ 533.34
Benefits @ 20%	106.66

Hatfield Consultants Ltd.

Analyses, 9 Sites, 5 Tests (43 Units) at each site	2,985.00
Study and Report	6,485.00
General Field Costs Apportioned (4/75 x $ 26,600.63)	1,418.70
TOTAL COST	$11,528.70

PRELIMINARY ENVIRONMENTAL BASELINE STUDIES
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SECTION 1.0 - INTRODUCTION

Cream Silver Mines Limited were granted approval by the Ministry of Environment and Parks in May of 1987 by authorization of a Resource Use Permit (RUP) to undertake preliminary geochemical and geophysical exploration of their Cream Silver claims in Strathcona Provincial Park. The Claims are located in a section of the park designated a Recreational Area which allows specific non-recreational uses.

Hatfield Consultants Limited were subsequently invited by Cream Silver Mines Limited to recommend a baseline environmental monitoring program that would be consistent with the level of exploration activity proposed. A recommended environmental studies program consisting of three components: baseline water quality monitoring, baseline hydrology of adjacent watersheds and wildlife documentation was discussed at a meeting on April 22, 1987. The recommended studies program outline below was accepted by Cream Silver Mines Limited and initiated on May 10, 1987 concurrent with the start of preliminary exploration program. The level of documentation and quality of data collection was to be of a standard necessary to meet government expectations.

1.1 Baseline Water Quality Monitoring Program

An initial collection, filtration and preservation of a complete set of baseline water samples from established stations would be completed during the start of exploration. This initial sampling would include a total of 9 sample sites such that pre-development water quality was well documented. Subsequent water sample collections would be undertaken on a frequency of quarterly and from selected sample sites depending on location and level of activity.

Water quality analyses would included: pH, Suspended Solids, Turbidity, Total Dissolved Solids, Total Hardness, Total Alkalinity, Sulphate, Nitrate, Nitrite, Total Dissolved Phosphorous, Total Cyanide, Total Mercury and Total and Dissolved metals (Aluminum, Antimony, Arsenic, Barium, Cadmium, Copper, Iron, Lead, Molybdenum, Nickel, Selenium, Silver and Zinc).

1.2 Baseline Hydrology Program

Hydrology staff gauges would be installed at appropriate locations on Price and Thelwood Creeks as determined in the field and calibrated using fluorescent dye methodology to develop reliable stage discharge curves. Cream Silver Mines Limited exploration staff would maintain weekly gauge readings during the period of exploration activity. These records would be correlated with long term records on Myra Creek, and adjacent watershed and discharge records from Westmin Resources Limited Thelwood hydroelectric power plant.

1.3 Wildlife Documentation Program

A "Wildlife Observation Log" would be maintained by field staff during the exploration program. Wildlife information would be collected by direct observation and by recording wildlife incidental signs such as dens, licks, trails, scat and pellet groups.

Each of these three environmental components typically require long lead times in order to establish a satisfactory data base for preparation of a Stage I Environmental Impact Assessment suitable for submission to the B.C. Mine Development Steering Committee. Consequently the data collection will serve both immediate and long term purposes.

SECTION 2.0 - SUMMARY

Environmental baseline studies, consisting of hydrology, water quality and wildlife components were initiated on May 10, 1987 concurrent with the preliminary exploration program and continued through to July 30 with geochemical and geophysical investigations.

Water quality data indicate that the Price and Thelwood watersheds were characteristic of pristine, cold mountain streams and generally neutral in pH, clear, low in conductivity and low in dissolved and suspended matter. Both nutrients and metal levels were low or below the level of analytical detection. During early May surface flows were dominated by spring freshet and snow melt, while samples taken in mid summer (July 30) comprised a greater concentration of groundwater flow. The quality of water during 1987 was virtually identical to water quality data reported for 1981 and 1982 for these same streams and all parameters examined met Canadian Water Quality Guidelines for Domestic Drinking Water Supplies and the more stringent guidelines for Protection of Freshwater and Aquatic Life.

One tributary which drains a portion of Flower Ridge and appears to provide recharge to a marsh area on the east side of Thelwood Creek, consistently exhibited a higher pH, conductivity, dissolved solids and hardness and bicarbonate content than adjacent streams in the area. Slightly anomalous levels of zinc found in the marsh area could not be attributed to the inflow source.

Thelwood Creek is estimated to contribute a mean annual surface flow of 4.3 m^3/s or 9.5 percent of the inflow to Buttle Lake, compared to an expected contribution of 12.2 percent based on catchment area. Part of the difference is due to the large groundwater flow through the Thelwood valley alluvium which has

been estimated at 0.66 m^3/s or 15 percent of the total volume.

Mean annual discharges and hydrographs for Price Creek and Thelwood Creek above Price Creek are estimated to average 1.6 m^3/s and 2.9 m^3/s, respectively and have been extrapolated on the basis of catchment and estimates of mean annual discharge for Myra Creek and lower Thelwood Creek. Low flows are expected to occur in March and late August. High flows are expected in June as a result of snowmelt and again in November and December as a result of heavy rainfall. These data are, however, preliminary in nature and are based on a regional analysis and limited site specific data. In order to characterize the hydrology of the watershed in the immediate exploration area, staff gauges have been established on both Price and Thelwood Creeks such that they can be related to Westmin Resources Limited powerhouse discharge and longer term records on Myra Creek. These gauges have been read approximately weekly and calibrated twice during the initial exploration program, but full stage discharge curves have not yet been fully developed.

Records of wildlife observations including both sightings and signs are maintained by Cream Silver Mines Limited exploration staff during the period of activity in order to help identify species presence and abundance and also sensitive habitat areas. Records indicate that black bear (Ursus americanus) and blacktailed deer (Odocoleus hemionus columbianus) are the most commonly observed species.

Blacktailed deer were first noted with young in late May but did not show a strong tendency to migrate to higher elevations as summer progressed, possibly because of the adequate food supply in the lower Thelwood valley. Black bear densities in the lower Thelwood valley are estimated to be relatively high at 1 bear per km^2 and near the upper range for their species. No elk, wolf or rare or endangered species were seen during the period of study.

SECTION 3.0 - BASELINE WATER QUALITY MONITORING

3.1 Sample Locations, Collection and Analyses

A monitoring grid consisting of a total of 9 water quality sample sites covering the major portion of the proposed exploration area were previously selected from topographic maps and are presented in Figure 1.

A complete set of water quality samples were obtained from these locations on May 10, 1987 and prior to any exploration and again on July 30, 1987 following the preliminary exploration program. All samples were field filtered, preserved by the following procedures and returned to the laboratory within 24 hours of collection:

1 litre - cyanide preserved with NaOH to pH of 12 or more.
1 litre - general parameters were kept cold.
250 mls - dissolved metals were filtered (0.45 u cellulose nitrate) and preserved with HNO_3 to pH 2 or less.
250 mls - total metal samples were preserved with HNO_3 to pH 2 or less.

Analysis of water samples were performed by Analytical Services Limited of Vancouver in accordance with "Standard methods for the Examination of Water and Wastewater" published by the American Public Health Association, 1985. All data are presented in Tables 1 (May 10, 1987) and 2 (July 30, 1987).

3.2 Results of Analyses

On May 10, 1987 the annual snowmelt was well advanced and seasonally high waters were encountered at the property. Westmin Resources Limited hydroelectric powerhouse appeared to be

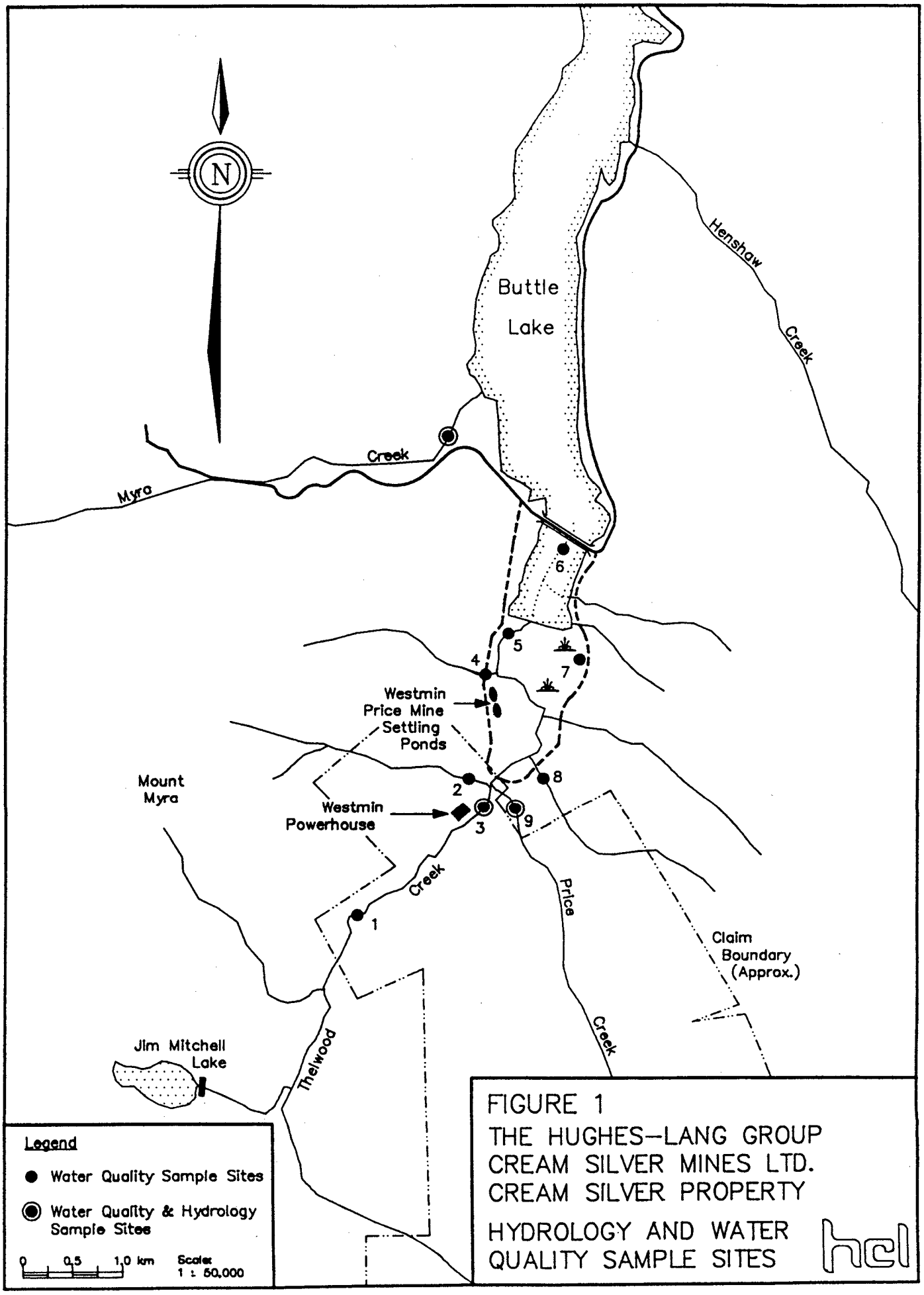

N
Buttle
Lake
Henshaw
Creek
Creek
Myra
6
5
4
7
Westmin
Price Mine
Settling
Ponds
Mount
Myra
2
8
Westmin
Powerhouse
3
9
Creek
Price
1
Claim
Boundary
(Approx.)
Creek
Jim Mitchell
Lake
Thelwood
Legend
Water Quality Sample Sites
Water Quality & Hydrology
Sample Sites
0 0.5 1.0 km
Scale
1 : 50,000
FIGURE 1
THE HUGHES-LANG GROUP
CREAM SILVER MINES LTD.
CREAM SILVER PROPERTY
HYDROLOGY AND WATER
QUALITY SAMPLE SITES
hcl

TABLE 1

BASELINE WATER QUALITY DATA ,CREAM SILVER MINES LIMITED
CREAM SILVER PROPERTY, May 10, 1987.

Parameter		1	2	3	4	5
Physical Tests						
pH		6.16	6.67	6.17	6.73	6.48
Conductivity (µmhos/cm)		10.4	20.8	11.4	31.2	41.6
Turbidity (NTU)		<1.0	<1.0	<1.0	<1.0	<1.0
Suspended Solids (mg/L)		<1.0	<1.0	<1.0	<1.0	<1.0
Dissolved Solids (mg/L)		10.1	17.9	10.2	24.7	32.3
Hardness (mg/L)	CaCO3	5.93	14.8	6.38	19.3	27.7
Dissolved Anions (mg/L)						
Bicarbonate	HCO_3	4.88	10.6	4.88	21.6	19.5
Chloride	Cl	1.50	0.50	2.00	1.00	0.50
Sulfate	SO4	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrate	N	<0.005	<0.005	<0.005	<0.005	0.049
Nitrite	N	<0.001	<0.001	<0.001	<0.001	0.001
Phosphorus	P	0.031	0.005	0.008	0.025	0.014
Other Tests (mg/L)						
Ammonia	N	0.006	<0.005	<0.005	<0.005	<0.005
Total Cyanide	CN	<0.005	<0.005	<0.005	<0.005	<0.005
Total Metals (mg/L)						
Aluminum	Al	0.075	0.015	0.068	0.007	0.007
Arsenic	As	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Barium	Ba	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium	Cd	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	Cu	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	Fe	<0.03	<0.03	<0.03	<0.03	<0.03
Lead	Pb	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury	Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	0.002	<0.001	<0.001	<0.001	<0.001
Selenium	Se	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	<0.005	<0.005	<0.005	<0.005	<0.005
Dissolved Metals (mg/L)						
Calcium	Ca	2.21	5.69	2.36	7.40	10.6
Magnesium	Mg	0.10	0.14	0.12	0.20	0.30
Sodium	Na	0.45	0.44	0.44	0.46	0.61
Potassium	K	0.02	0.03	0.03	0.02	0.04
Aluminum	Al	0.066	0.013	0.068	0.007	<0.005
Arsenic	As	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Barium	Ba	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium	Cd	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	Cu	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	Fe	<0.03	<0.03	<0.03	<0.03	<0.03
Lead	Pb	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	Se	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	<0.005	<0.005	<0.005	<0.005	<0.005

TABLE 1 (Continued)

BASELINE WATER QUALITY DATA ,CREAM SILVER MINES LIMITED
CREAM SILVER PROPERTY, May 10, 1987.

Parameter		6	7	8	9
Physical Tests					
pH		6.44	6.63	7.43	6.65
Conductivity (µmhos/cm)		30.2	88.4	108.	52.0
Turbidity (NTU)		<1.0	<1.0	<1.0	<1.0
Suspended Solids (mg/L)		<1.0	<1.0	<1.0	<1.0
Dissolved Solids (mg/L)		24.6	71.8	101.	48.9
Hardness (mg/L)	CaCO3	16.5	52.2	69.8	34.8
Dissolved Anions (mg/L)					
Bicarbonate	HCO_3	15.2	49.9	75.9	29.3
Chloride	Cl	0.50	1.00	2.00	<0.50
Sulfate	SO4	<1.0	<1.0	<1.0	<1.0
Nitrate	N	0.018	<0.005	0.040	0.043
Nitrite	N	<0.001	<0.001	0.001	<0.001
Phosphorus	P	0.007	0.005	0.009	0.011
Other Tests (mg/L)					
Ammonia	N	<0.005	0.006	<0.005	<0.005
Total Cyanide	CN	<0.005	<0.005	<0.005	<0.005
Total Metals (mg/L)					
Aluminum	Al	0.039	0.024	0.005	0.081
Arsenic	As	<0.0001	<0.0001	<0.0001	0.0005
Barium	Ba	<0.005	0.008	<0.005	<0.005
Cadmium	Cd	<0.001	<0.001	<0.001	<0.001
Copper	Cu	<0.001	<0.001	<0.001	<0.001
Iron	Fe	<0.03	<0.03	<0.03	<0.03
Lead	Pb	<0.001	<0.001	0.004	<0.001
Mercury	Hg	<0.00005	<0.00005	<0.00005	<0.005
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.00005
Nickel	Ni	<0.001	0.003	0.001	0.012
Selenium	Se	0.0002	0.0003	0.0002	0.0003
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	<0.005	<0.005	<0.005	<0.005
Dissolved Metals (mg/L)					
Calcium	Ca	6.13	19.4	26.6	13.1
Magnesium	Mg	0.28	0.92	0.81	0.52
Sodium	Na	0.54	0.71	1.86	1.10
Potassium	K	0.04	0.04	0.07	0.08
Aluminum	Al	0.039	0.019	0.005	0.045
Arsenic	As	<0.0001	<0.0001	<0.0001	0.0028
Barium	Ba	<0.005	0.007	<0.005	<0.005
Cadmium	Cd	<0.001	<0.001	<0.001	<0.001
Copper	Cu	<0.001	<0.001	<0.001	<0.001
Iron	Fe	<0.03	<0.03	<0.03	<0.03
Lead	Pb	<0.001	<0.001	<0.001	<0.001
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	<0.001	<0.001	<0.001
Selenium	Se	<0.0001	0.0001	<0.0001	0.0002
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	<0.005	<0.005	<0.005	<0.005

TABLE 2

BASELINE WATER QUALITY DATA ,CREAM SILVER MINES LIMITED
CREAM SILVER PROPERTY, July 30, 1987.

Parameter		1	2	3	4	5
Physical Tests						
pH		7.35	7.37	6.94		7.31
Conductivity (µmhos/cm)		31.2	31.2	10.4		41.6
Turbidity (NTU)		<1.0	<1.0	1.2		<1.0
Suspended Solids (mg/L)		3.2	0.8	4.0		1.6
Dissolved Solids (mg/L)		23.9	26.6	12.1		36.3
Hardness (mg/L)	CaCO3	12.3	15.6	5.72		21.1
Dissolved Anions (mg/L)						
Bicarbonate	HCO_3	16.7	19.0	9.5		26.2
Chloride	Cl	<0.50	<0.50	<0.50		<0.50
Sulfate	SO4	<1.0	<1.0	<1.0		<1.0
Nitrate	N	0.053	0.031	0.011		0.092
Nitrite	N	<0.001	<0.001	<0.001		<0.001
Phosphorus	P	<0.005	<0.005	<0.005		<0.005
Other Tests (mg/L)						
Ammonia	N	<0.005	<0.005	<0.005		<0.005
Total Cyanide	CN	<0.005	<0.005	<0.005		<0.005
Total Metals (mg/L)						
Aluminum	Al	0.019	0.013	0.093		0.016
Antimony	Sb	<0.0001	<0.0001	<0.0001		<0.0001
Arsenic	As	0.0003	0.0002	0.0002		0.0001
Barium	Ba	<0.005	<0.005	<0.005		0.006
Cadmium	Cd	<0.0005	<0.0005	<0.0005		<0.0005
Copper	Cu	<0.001	<0.001	<0.001		<0.001
Iron	Fe	<0.03	<0.03	<0.03		<0.03
Lead	Pb	<0.001	<0.001	<0.001		0.003
Mercury	Hg	<0.00005	<0.00005	<0.00005		<0.00005
Molybdenum	Mo	<0.005	<0.005	<0.005		<0.005
Nickel	Ni	<0.001	<0.001	<0.001		<0.001
Selenium	Se	<0.0005	<0.0005	<0.0005		<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005		<0.0005
Zinc	Zn	<0.005	<0.005	<0.005		<0.0005
Dissolved Metals (mg/L)						
Calcium	Ca	4.56	5.95	2.11		7.94
Magnesium	Mg	0.21	0.17	0.11		0.30
Sodium	Na	0.45	0.451	0.37		0.76
Potassium	K	0.05	0.05	0.06		0.07
Aluminum	Al	0.009	0.013	0.008		<0.005
Antimony	Sb	<0.0001	<0.0001	<0.0001		<0.0001
Arsenic	As	0.0003	0.0002	0.0001		0.0001
Barium	Ba	<0.005	<0.005	<0.005		0.006
Cadmium	Cd	<0.0005	<0.0005	<0.0005		<0.0005
Copper	Cu	<0.001	<0.001	<0.001		<0.001
Iron	Fe	<0.03	<0.03	<0.03		<0.03
Lead	Pb	<0.001	<0.001	<0.001		<0.003
Molybdenum	Mo	<0.005	<0.005	<0.005		<0.005
Nickel	Ni	<0.001	<0.001	<0.001		<0.001
Selenium	Se	<0.0005	<0.0005	<0.0005		<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005		<0.0005
Zinc	Zn	<0.005	<0.005	<0.005		<0.0005

TABLE 2 (Continued)

BASELINE WATER QUALITY DATA ,CREAM SILVER MINES LIMITED
CREAM SILVER PROPERTY, July 30, 1987.

Parameter		6	7	8	9
Physical Tests					
pH		7.33	7.53	8.02	7.65
Conductivity (µmhos/cm)		39.5	98.8	114.	52.0
Turbidity (NTU)		<1.0	<1.0	<1.0	<1.0
Suspended Solids (mg/L)		0.4	1.2	<0.1	0.4
Dissolved Solids (mg/L)		29.9	87.7	103.	45.7
Hardness (mg/L) CaCO3		17.9	51.4	61.9	27.0
Dissolved Anions (mg/L)					
Bicarbonate	HCO_3	21.4	65.4	76.2	33.8
Chloride	Cl	<0.50	0.51	0.51	<0.50
Sulfate	SO4	<1.0	<1.0	<1.0	<1.0
Nitrate	N	0.065	0.089	0.12	0.043
Nitrite	N	<0.001	<0.001	<0.001	<0.001
Phosphorus	P	<0.005	<0.005	<0.005	<0.005
Other Tests (mg/L)					
Ammonia	N	0.010	0.013	<0.005	<0.005
Total Cyanide	CN	<0.005	<0.005	<0.005	<0.005
Total Metals (mg/L)					
Aluminum	Al	0.081	0.040	<0.005	0.013
Antimony	Sb	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	As	0.0003	0.0001	0.0001	0.0005
Barium	Ba	0.007	0.008	<0.005	<0.005
Cadmium	Cd	<0.0005	<0.0005	<0.0005	<0.0005
Copper	Cu	<0.001	<0.001	<0.001	<0.001
Iron	Fe	<0.03	0.04	<0.03	<0.03
Lead	Pb	0.004	<0.001	<0.001	<0.001
Mercury	Hg	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	<0.001	<0.001	<0.001
Selenium	Se	<0.0005	<0.0005	<0.0005	<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	0.053	0.012	<0.005	<0.005
Dissolved Metals (mg/L)					
Calcium	Ca	6.63	19.1	23.6	10.1
Magnesium	Mg	0.33	0.91	0.74	0.44
Sodium	Na	0.42	0.71	0.58	0.36
Potassium	K	0.08	0.06	0.05	0.04
Aluminum	Al	0.010	<0.005	<0.005	<0.005
Antimony	Sb	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	As	0.0003	0.0001	0.0001	0.0005
Barium	Ba	<0.005	0.007	<0.005	<0.005
Cadmium	Cd	<0.0005	<0.0005	<0.0005	<0.0005
Copper	Cu	<0.001	<0.001	<0.001	<0.001
Iron	Fe	<0.03	<0.03	<0.03	<0.03
Lead	Pb	<0.001	<0.001	<0.001	<0.001
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	<0.001	<0.001	<0.001
Selenium	Se	<0.0005	<0.0005	<0.0005	<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	0.010	0.011	<0.005	<0.005

TABLE 3

WATER QUALITY PROGRAM, 1987
SCHEDULE OF SAMPLE STATIONS AND SAMPLE DATES

	Sample Stations:	Sampling Date 1987 May 10	Jul 30
1)	Thelwood Creek below Jim Mitchell Lake near claim boundary.	*	*
2)	Tributary to Thelwood Creek below Westmin Power House.	*	*
3)	Thelwood Creek at Westmin Power House and above Price Creek.	*	*
4)	Tributary to Thelwood Creek below Westmin's Price Mine Adit.	*	-
5)	Thelwood Creek below Westmin's Price Mine Settling Ponds (Old bridge).	*	*
6)	Thelwood Creek at Buttle Lake.	*	*
7)	Marsh Area east side of Thelwood Creek.	*	*
8)	Tributary to Thelwood Creek below Price Creek.	*	*
9)	Price Creek above Thelwood Creek.	*	*

operating at full capacity (as judged by the level of water in the trail race) and the water level at Jim Mitchell Lake exceeded the spillway elevation. Lower summer flows representing a greater proportion of groundwater recharge were encountered on July 30.

During early May both the Price and Thelwood watersheds, with the exception of Sample Station No. 8, were found to be slightly acidic in pH (6.1 to 6.8), low in Conductivity (10 to 50 umhos/cm), clear (Suspended Solids <1.0 mg/L; Turbidity <1.0 NTU's), low in dissolved constituents (Dissolved Solids <70 mg/L) and relatively soft (Hardness 5 to 50 mg/L $CaCO_3$). Sample Station No. 8, a tributary to Thelwood Creek downstream of Price Creek and drains a portion of Flower Ridge was found to be higher than other sites in pH (7.43), moderately higher in Conductivity (108 umhos/cm), higher in Dissolved Solids (101 mg/L), clear (<1.0 mg/L Suspended Solids; <1 NTU) and slightly higher in Hardness (69.8 mg/L $CaCO_3$) but still within the range of soft water.

These values strongly suggested that the majority of stations were dominated by snowmelt (low pH) and that of No. 8 predominantly groundwater recharge. Higher Carbonate, Chloride, Magnesium, Sodium, Potassium and Calcium content at Station No. 8 also suggested more groundwater content.

During late July water quality at most sites were found to be slightly alkaline in pH (7.31 to 8.02), moderate in Conductivity (40 to 110 umhos/cm), clear (Suspended Solids <5.0 mg/L; Turbidity <1.0 NTU's), generally low in dissolved constituents (Dissolved Solids <70 mg/L) and moderately soft (Hardness 10 to 60 mg/L $CaCO_3$). Sample Station No. 3 was somewhat lower in pH (6.94), Conductivity (10.4 umhos/cm), Dissolved Solids (12.1 mg/L) and Hardness (5.72 mg/L $CaCO_3$).

It is apparent that anomalies detected in May at Sample Station No. 7, the marsh area below Price Creek is the result, of influences from inflow from a tributary (Station No. 8) which drains a portion of Flower Ridge. Sample Station No. 8 was found to be consistently the highest in pH (8.02), Conductivity (114 umhos/cm), Dissolved Solids (103 mg/L), Hardness (61.9 mg/L $CaCO_3$) and Bicarbonate content (76.2 mg/L HCO_3). However, anomalous levels of zinc found at Station No. 7 and further downstream at Station No. 6 during July could not be attributed to this same source.

For the most part nutrient levels (Ammonia, nitrates, nitrites, and phosphates) were relatively low. Nitrate levels generally increased slightly through the summer and phosphate levels decreased. Cyanide was non detectable, throughout the watershed in both sample periods. Mercury was never detected in any sample.

During early May, total metals were found to be low or below the level of detection throughout the watershed. Any natural background levels appeared to have been masked somewhat by the enormous dilution afforded by runoff (freshet) conditions. Selenium, Aluminum, Nickel and on one occasion, arsenic, was detected but in all locations in relatively low concentrations. However, even at lower flows in July, total metals were generally below the level of analytical detection. The noticeable increase were in Aluminum and Arsenic which were detected at all sites but at very low levels.

Levels of Dissolved Metals were, as expected, generally below the level of analytical detection.

No evidence of contamination from Westmin's Price Mine water settling ponds could be detected at Sample Station No. 5, a short distance downstream, in either sampling.

Compared to Canadian Water Quality Guidelines (1987) all parameters examined meet not only the guidelines for Domestic Drinking Water Supplies but also the more stringent guidelines for protection of Freshwater Aquatic Life.

3.3 Previous Water Quality Data

3.3.1 Price Creek And Thelwood Creek Above Their Confluence

Price Creek and Thelwood Creek above Price Creek were monitored by the "Buttle Lake Independent Monitoring Committee" during 1981 and 1982 (B.C. Research, 1981 and 1982). Both Creeks were found to be of similar quality to each other and to Myra Creek at the Tennent Lake Powerhouse. They were found to be neutral to slightly acidic (pH 6.0 to 7.7), soft (<70 mg/L $CaCO_3$ equivalents), clear (Suspended Solids <10 mg/L) and low in total and dissolved metals. Price Creek differed only in that it is slightly harder and more alkaline, and higher specific conductance as a result of it's glacial sediment load. Data from 1981 and 1982 are virtually identical to water quality data generated during the summer of 1987. All Monitoring Committee data are contained in Appendix A.

3.3.2 Lower Thelwood Creek

Lower Thelwood Creek subdivides into three main distributaries over the flood plain before converging again into one main channel prior to entering Buttle Lake. This lower main channel was also monitored by the Independent Monitoring Committee (B.C. Research, 1981 and 1982), but because it became inundated by the rising level of Buttle Lake during summer, it was suspected of being influenced by Buttle Lake water and was

discontinued as a monitoring site. Consequently, each of the three distributary channels were monitored separately (T3a, T3b and T3c). Water quality data for each of the three sites are summarized in Appendix 1.

While all three sites were similar to both Price and Thelwood Creeks above their confluence with regard to pH, Alkalinity, Hardness, Specific Conductance, Filterable Residues, and Non-Filterable Residues (Suspended Solids), they all contained fractionally more total and dissolved Copper and Zinc. This was more evident in the west channel, which is mainly fed by groundwater recharge that is known to pass through metal-enriched colluvium on the west side of lower Thelwood valley. While the observed metal levels are extremely low, the B.C. Aquatic Studies Branch considers these levels environmentally significant under special conditions since the adjacent tributary contains juvenile Dolly Varden char and appears to be suitable trout rearing habitat (Alderdice, D.F., 1982; B.C. Research, 1981 and 1982).

SECTION 4.0 - HYDROLOGY

4.1 Meteorology

Mean annual precipitation in the Buttle Lake catchment ranges between 2500 mm to over 3500 mm. The average annual precipitation at the Cream Silver exploration area is estimated to be approximately 3550 mm based on meteorological data obtained by Westmin Resources Limited and since most of the catchment at this point lies in upland areas above the 250 m.a.s.l. elevation and subject to orographic lifting effects. Monthly total precipitation and average monthly temperatures for the Cream Silver claims area are presented in Table 4.

TABLE 4

MONTHLY TOTAL PRECIPITATION AND AVERAGE MONTHLY MAXIMUM AND MINIMUM TEMPERATURE FOR THE CREAM SILVER CLAIMS AREA (1970 to 1980)

Month	Precipitation (mm) (mm)	Temperature (°C) Average Max.	Average Min.
January	500	2.8	-12.0
February	500	4.2	- 7.4
March	373	8.9	- 8.3
April	173	15.2	- 3.9
May	99	23.5	- 1.5
June	84	27.5	2.5
July	39	31.5	4.2
August	83	30.8	4.9
September	161	24.7	2.6
October	289	16.6	- 2.0
November	574	9.0	- 7.1
December	673	5.1	- 8.7

The average accumulation of snowfall over a ten year period (1971 to 1980) is 4.1 m. Heaviest snows fall from December through February, with little or no accumulations anticipated from May through October. Considerably greater accumulations of

snow occur on ridges and mountain peaks surrounding the Cream Silver claims area (Westmin Resources Limited, 1982).

4.2 Catchment, Precipitation and Runoff Relationships

Buttle lake lies between 210 and 220 m.a.s.l. in the southern part of the Campbell Lake catchment and forms the regionally-low feature in the area. The lake is approximately 30 km long and 1 to 1.5 km wide. Mountain sides are generally steep sloping (up to 60 percent), and rise to over 1500 m.a.s.l. The main tributaries include Wolf River (catchment 27%), Phillips Creek (12.8%), Myra Creek (10.8%), Thelwood Creek (12.2%), Henshaw Creek (6.1%), Shepard Creek (6.0%), and Ralph River (12.6%).

Water Survey of Canada have operated a gauge on Campbell river near the mouth (Station No. 08HD001) since 1910. However, flows have been regulated through the installation of dams since 1949. Prior to regulation mean annual flows were 86.0 m^3/s, with a mean low flow of 37.6 m^3/s (3.6%) in September and mean high flow of 126 m^3/s (12%) in June. Mean annual runoff for Campbell River represents 64% of the mean annual precipitation over the entire catchment. A portion of total precipitation is lost to evaporation and transpiration. A summary of mean annual, mean monthly and unit area discharges for Campbell River and Buttle Lake is presented in Table 5.

On the basis of instantaneous discharges and catchment size, Stevenson International Groundwater Consultants limited (1982) estimated the mean annual flows for the major tributaries to Buttle Lake. Mean annual flows for Thelwood Creek were 4.3 m^3/s, and Myra Creek were 5.6 m^3/s. The mean annual runoff from Myra Creek and Thelwood Creek catchments would be 12.4 and 9.5 percent, respectively of the mean annual runoff into Buttle Lake. Compared to the proportion of their catchments, Myra Creek and

TABLE 5

WATER SURVEY OF CANADA STREAMFLOW SUMMARY
CAMPBELL RIVER (1910 TO 1949)
AND ESTIMATED UNREGULATED DISCHARGE FOR BUTTLE LAKE

Month	Campbell River (Unregulated)*			Buttle Lake (Unregulated)**		
	(m^3/s)	(mm)	(%)	(m^3/s)	(mm)	(%)
January	92.8	177	9.2	48.6	206	9.2
February	79.6	137	7.1	41.7	159	7.1
March	63.6	122	6.3	33.3	142	6.3
April	74.9	139	7.2	39.2	162	7.2
May	114.0	217	11.3	59.7	252	11.3
June	126.0	232	12.0	65.9	270	12.0
July	83.4	159	8.3	43.6	185	8.3
August	41.7	79	4.1	21.8	92	4.1
September	37.6	70	3.6	19.7	81	3.6
October	81.9	156	8.1	42.9	181	8.1
November	115.0	219	11.4	60.2	255	11.4
December	118.0	219	11.4	61.7	255	11.4
Mean	86.0	-	-	45.0	-	-
Total	-	1926	100.0	-	2240	100.0
% of Total Precipitation	-	64%	-	-	64%	-

* Environment Canada, 1984. Water Survey of Canada, Historical Streamflow Summary for British Columbia to 1984.
** Stevenson International Groundwater Consultants Limited, 1982.

Thelwood Creek would be expected to contribute 10.8 and 12.2 percent, respectively. Part of the difference is due to the large groundwater underflow through the Thelwood valley alluvium. Stevenson International Groundwater Consultants Limited (1982) estimated the volume of groundwater flow in the lower Thelwood basin to be 0.66 m^3/s or 15 percent of the total flow.

Thelwood Creek above Price Creek drains the southern part of the catchment, and Price Creek drains the southeastern part of the catchment; much of the Thelwood catchment is at a lower elevation than the Price Creek catchment. The mainstems of both are fed by numerous small tributaries that drain perched upland

lakes, snowmelt and spring water. There are no appreciable permanent snow or ice-fields in the Thelwood headwaters. Mean annual discharges for Price Creek and Thelwood Creek above Price Creek have been extrapolated on the basis of catchment and estimates (Stevenson, 1982) of mean annual discharge for Myra Creek and lower Thelwood Creek and are presented in Table 6.

TABLE 6

ESTIMATES OF MEAN ANNUAL FLOWS FOR PRICE AND THELWOOD CREEKS ABOVE THEIR CONFLUENCE

Tributary	Catchment Area (Km^2)	Catchment as % of Buttle Lake	Estimated Mean Annual Flow (m^3/s)	Runoff as % of Buttle Lake
Buttle Lake	636	100	45	100
Myra Creek at Falls	68.8	10.8	5.6	12.4
Thelwood Cr. at Mouth	77.9	12.2	4.3	9.5
Thelwood Cr. at Mouth *	77.9	12.2	5.0	11.1
Thelwood Cr. Above Price	43.2	6.8	2.4 - 3.5	5.3 - 7.8
Price Creek	22.7	3.6	1.3 - 1.9	2.9 - 4.2

* Adjusted to include an estimated 0.66 m^3/s groundwater flow.

4.3 Local Hydrology Studies, Preliminary Results

The regionalization of hydrology is a comparison of nearby long term records coupled with climatic information and site specific data. This approach provides a basis for extrapolation of on-site data for establishing reliable estimates of average

and extreme annual discharges, estimation of flood recurrence intervals, minimum flow recurrences, and unit discharges.

Since their are no long term records of flow for the adjacent watersheds of Price and Thelwood Creek (particularly since the hydroelectric power development was constructed on Thelwood Creek) the data presented in the foregoing sections are based on a regional analysis and limited site specific measurement. In order to characterize the hydrology of the immediate watersheds to a level necessary to allow extrapolation into long term records for possible future engineering and design purposes and support for Water Licence Applications, a program of regular stream gauging and flow measurement was initiated.

Staff gauges were installed on each of Price and Thelwood Creeks above their confluence on May 10, 1987. The gauge on Thelwood Creek is located downstream of Westmin's Powerhouse discharge such that records of gauge elevations can be related powerhouse records. Staff gauges, including Westmin's staff gauge on Myra Creek at the falls are read on a weekly basis by field staff. A record of the readings are presented in Table 7.

The newly installed gauges were calibrated using florescent dye dilution techniques by injecting a known aliquot of 20% Rhodamine WT dye upstream and sampling the resultant dye plume at 5 second intervals from a point downstream with 50 mls snap top vials. Dye samples are returned to Vancouver for florescence analyses and data reduction.

Both gauges were calibrated on May 10 and July 30, 1987, however, florescence analyses of the later metering were not available for this report. A stage discharge curve for Myra Creek above Myra Falls is presented in Figure 2 (Westmin Resources Limited, 1982) and preliminary stage discharge curves for Thelwood Creek and Price Creek are presented in Figures 3 and

4. It is proposed to meter both gauges on each of five occasions in order to develop reliable rating curves; ie: during heavy rainfall periods (Nov/Dec), spring low flows (Mar/Apr), freshet (May/Jun), low summer flows (Aug/Sep) and fall (Oct). Preliminary hydrographs for Thelwood Creek and Price Creek are presented in Figures 5 and 6.

TABLE 7

HYDROLOGY LOG AND STAFF GAUGE READINGS

Date	Weather	Staff Gauge Station Number			Comments
		1 Price (m)	2 Thelwood (ft)	3 Myra (m)	
May 9	Warm, clear Sunny	0.49	–	–	Water levels rising
May 10	Warm, Slght Overcast	–	4.2	–	Powerhouse Running
May 12	Cloudy, Rain Overcast	–	4.8	–	Powerhouse Running
May 13	Cloudy, Rain Showers	0.49	4.9	0.51	Powerhouse Running
May 14	Sunny and Showers	0.47	4.8	0.6	High Water Power-house Running
May 18	Cloudy/Cool	0.38	3.1	0.5	" "
May 21	Sunny/Warm	0.38	3.1	0.5	" "
May 25	Sunny/Warm	0.42	3.6	0.6	" "
May 28	Heavy Rain	0.46	3.85	0.6	" "
June 1	Sunny/Warm	0.45	3.2	0.59	" "
June 4	Rain/Mild	0.49	4.0	0.74	" "
June 8	Sunny	0.50	3.9	0.76	" "
June 11	Heavy Rain	0.50	4.3	0.77	" "
June 15	Sunny	0.43	3.6	0.6	" "
July 13	Hot/Sunny	0.46	3.0	0.58	
July 17	Hot/Sunny	0.40	2.8	0.49	
July 21	Hot after Showers	0.40	2.8	0.48	
July 24	Showers Hot/Sunny	0.40	2.8	0.49	
July 28	Sunny/Hot Cloudy	0.41	2.9	0.48	
July 30	Sunny with Cloudy Per.	0.38	2.8	—	

FIGURE 2

THE HUGHES–LANG GROUP
CREAM SILVER MINES LTD.

STAGE DISCHARGE CURVE FOR
MYRA CREEK ABOVE MYRA FALLS

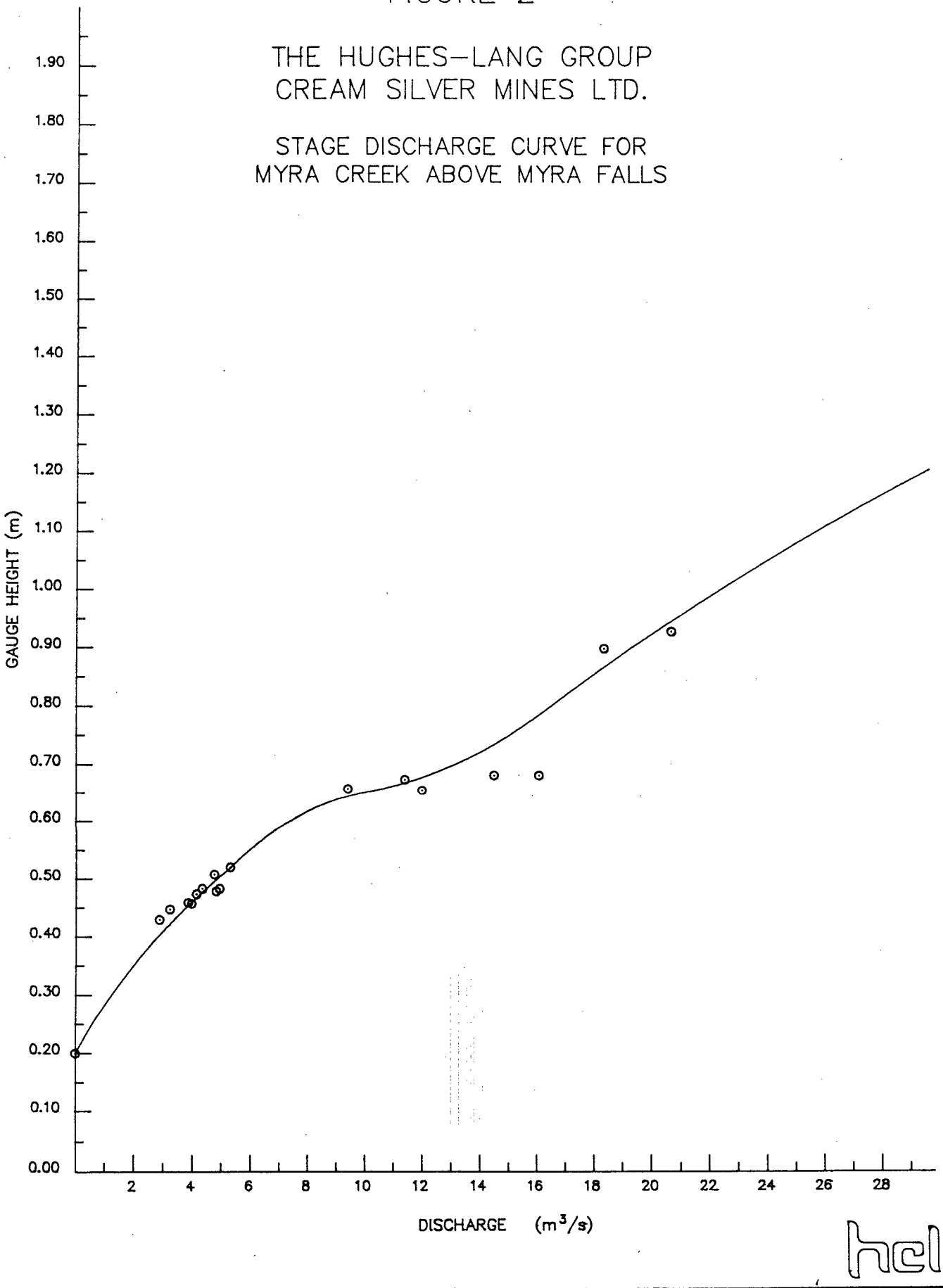


FIGURE 3

THE HUGHES–LANG GROUP
CREAM SILVER MINES LTD.

STAGE DISCHARGE CURVE FOR THELWOOD CREEK ABOVE PRICE CREEK (REGULATED FLOW)

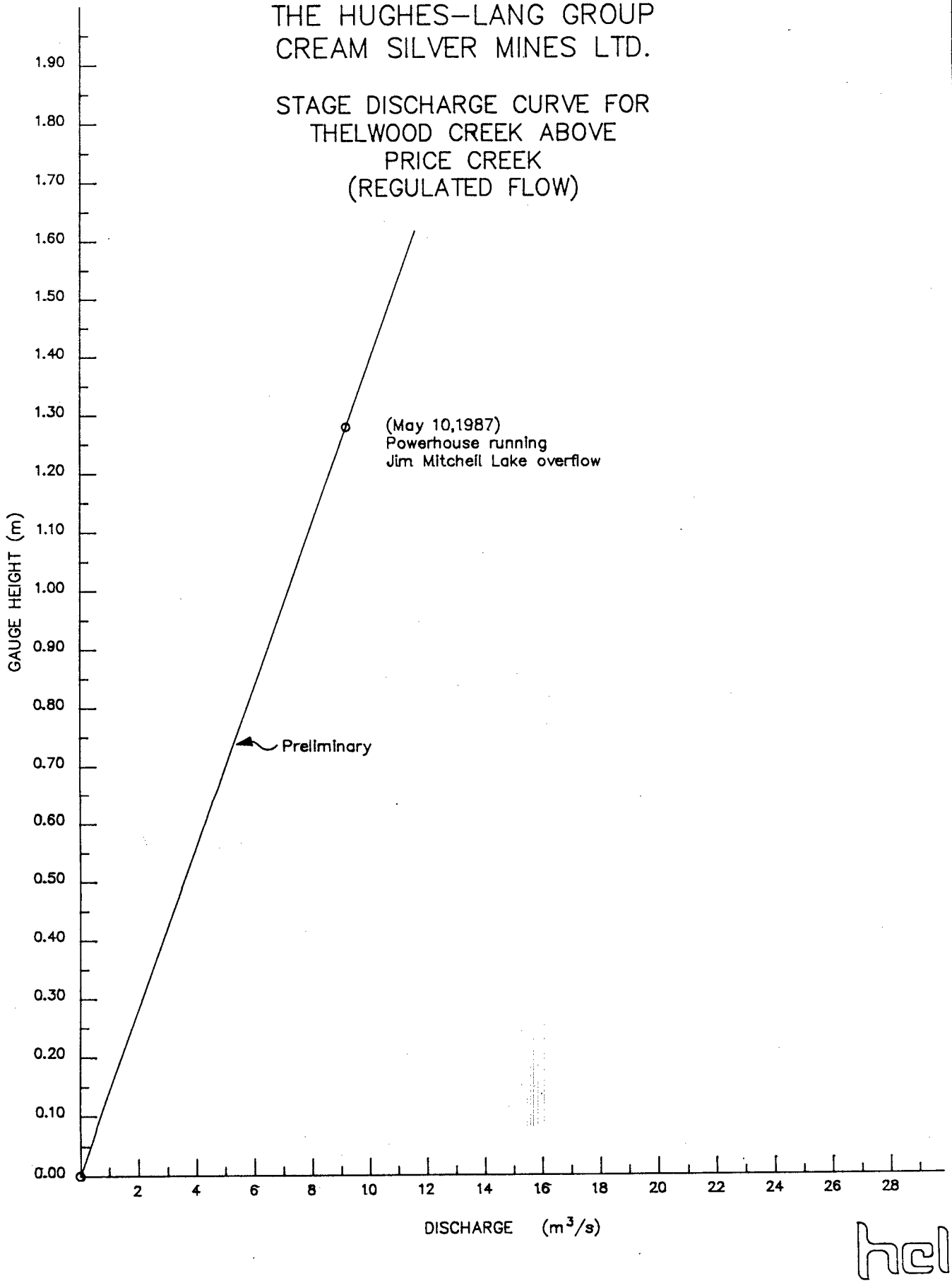


FIGURE 4

THE HUGHES–LANG GROUP
CREAM SILVER MINES LTD.

STAGE DISCHARGE CURVE FOR PRICE CREEK

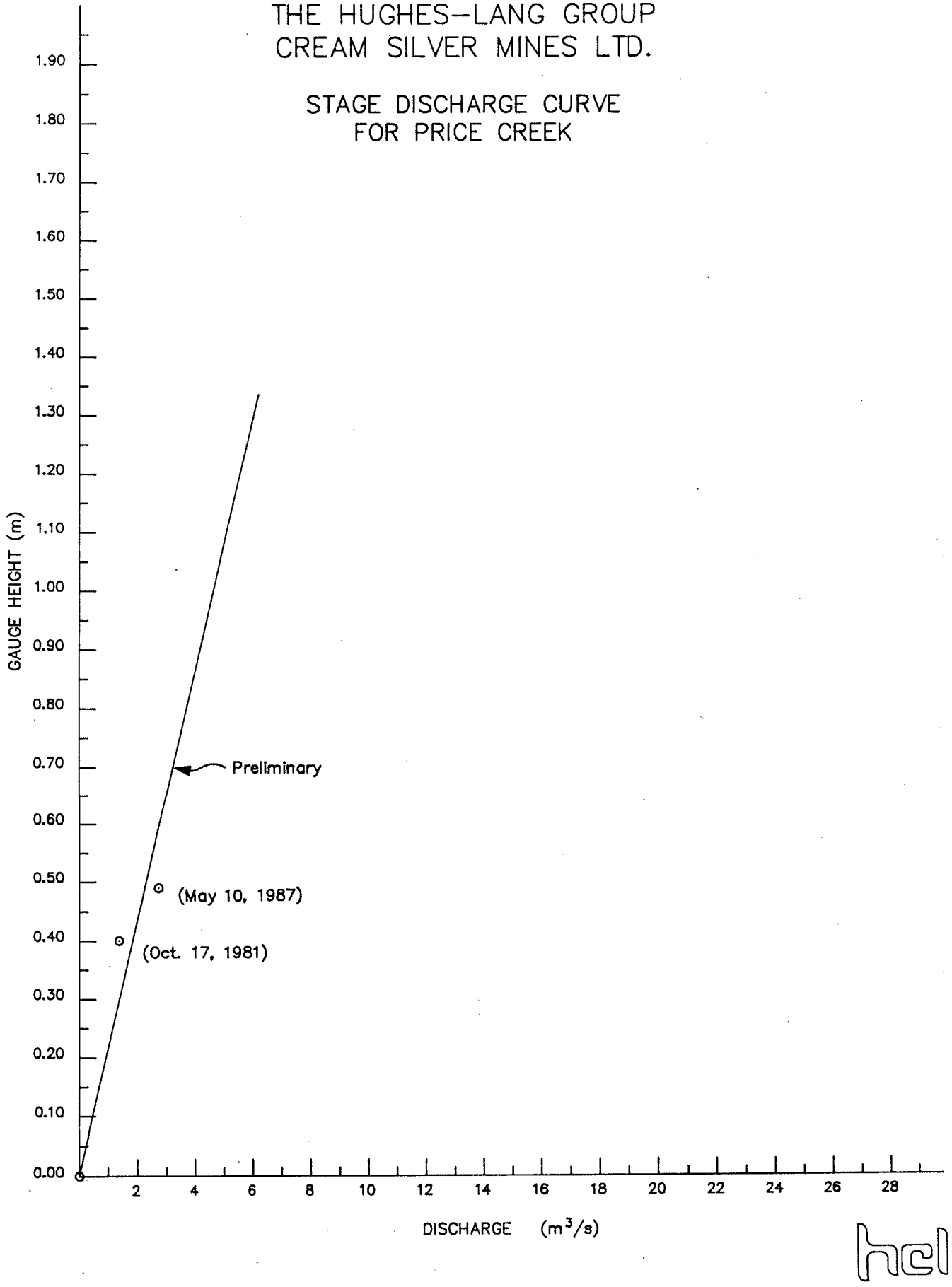


FIGURE 5 PRELIMINARY HYDROGRAPH FOR THELWOOD CREEK ABOVE PRICE CREEK (UNREGULATED)

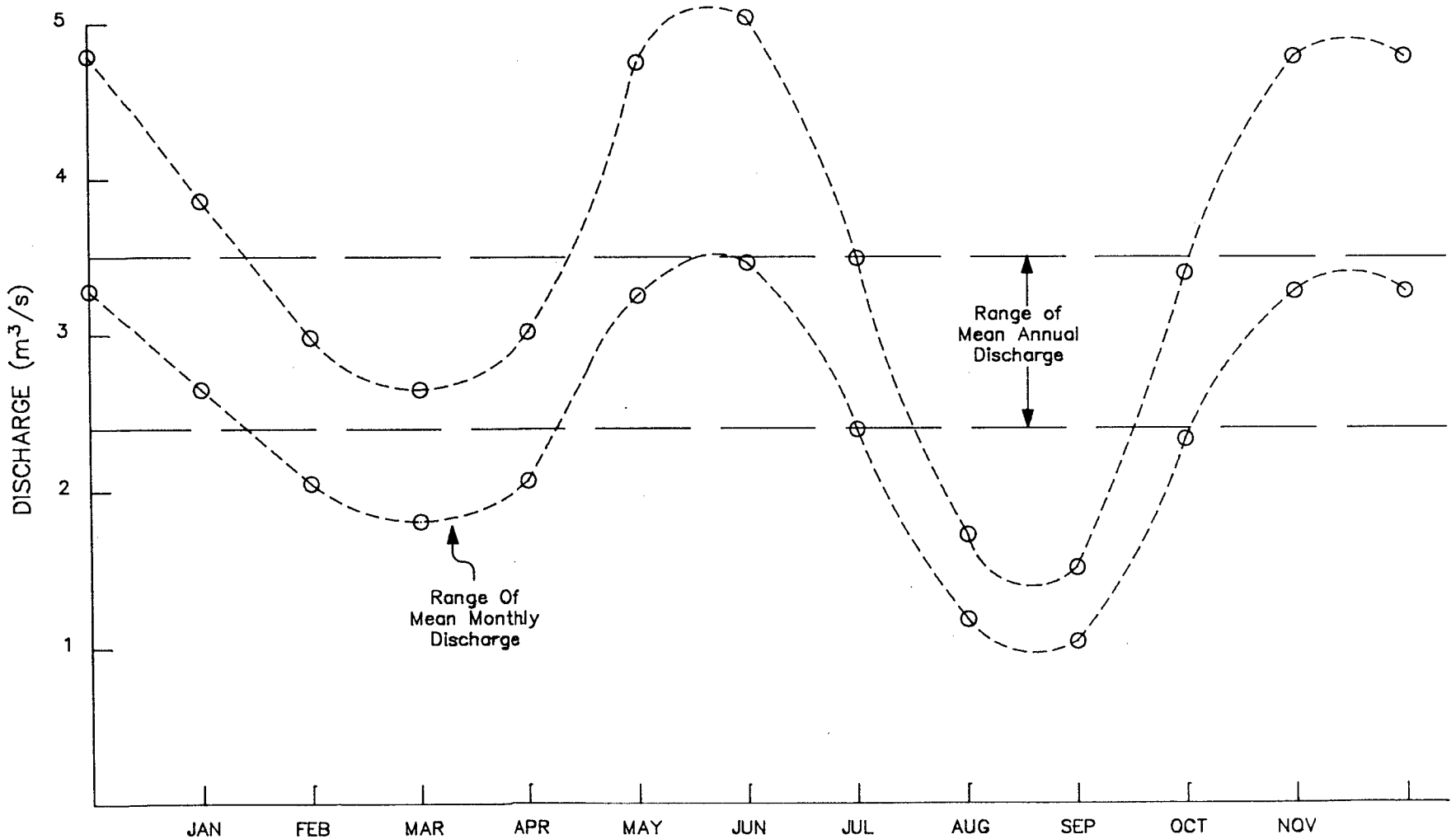
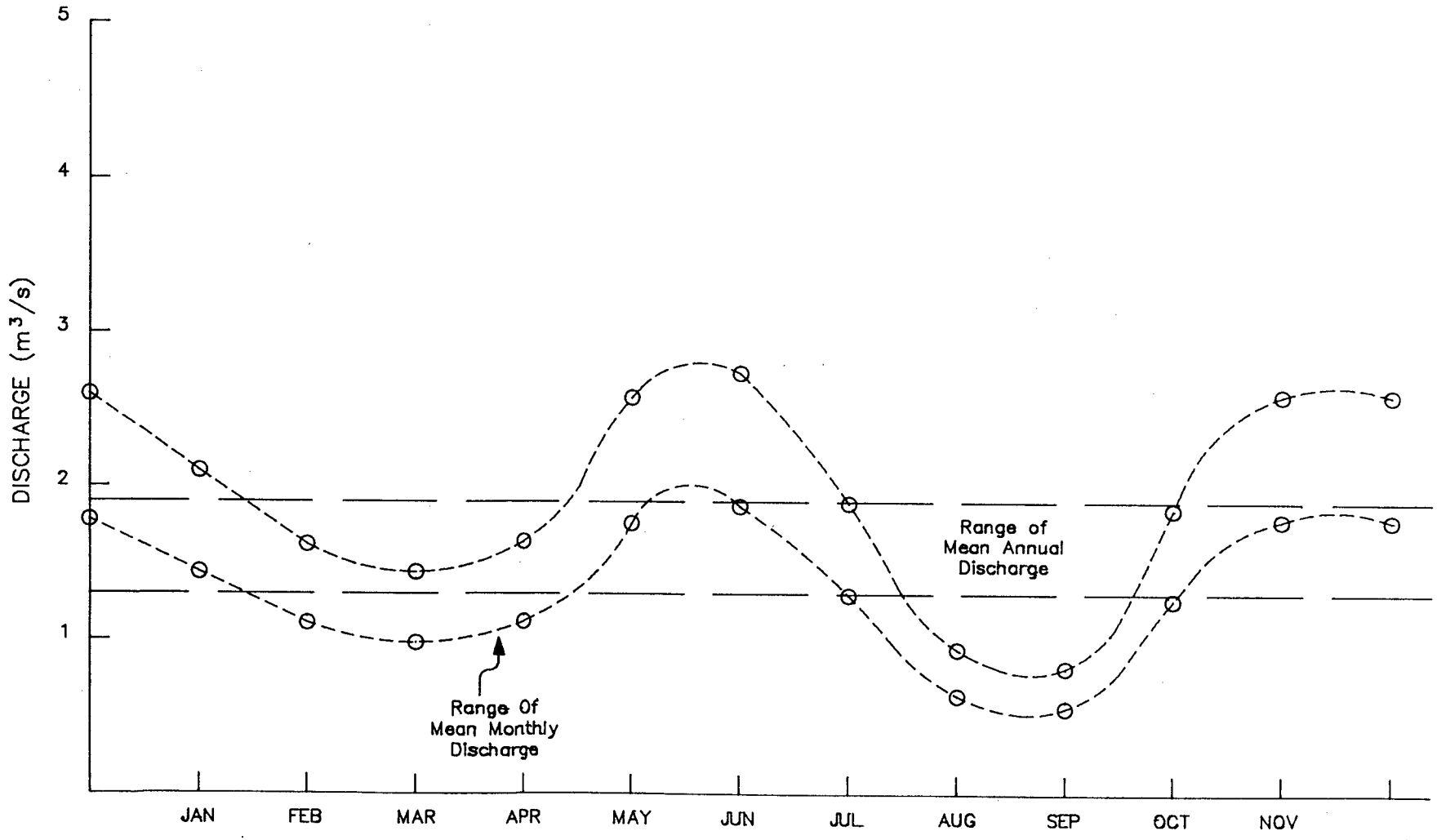


FIGURE 6 PRELIMINARY HYDROGRAPH FOR PRICE CREEK



SECTION 3.0 - WILDLIFE

3.1 Overview

Vancouver Island is reported to support 41 species of mammals, 13 of which are indigenous, 8 have been introduced and 19 are generally widespread throughout British Columbia and 1 is confined to Vancouver Island and the State of Washington. The Island also supports 297 species of bird, 8 species of reptile and 13 species of amphibian.

The Cream Silver claims area falls within the Coastal Western Hemlock biogeoclimatic zone and as such is likely to support a wide variety of animal species. However, the property also falls within Resource management Unit No.1, Sub-unit 1-9-1 for which there are no figures on wildlife resource harvest. This area is located within Strathcona Provincial Park and closed to both hunting and discharge of fire arms.

The Price-Thelwood delta at the south end of Buttle lake is rated by Canada Land Inventory as Class 1W, the highest classification in for ungulate winter range assigned. When it was forested, this area probably represented critical winter range for blacktailed deer (Odocoleus hemionus columbianus) and possibly elk (Cervus elaphus roosvelti); however, the area was clearcut in the 1950's as part of the clearing program for the creation of Buttle - Upper Campbell lakes reservoir system. At present the area probably represents no better than Class 3 or 4 ungulate range and offers only moderate winter range until forest cover is reestablished.

The entire eastern shoreline of Buttle Lake is rated as Class 3W by Canada Land Inventory. The main factor limiting the importance of this area for wintering ungulates is excessive snow

depth. Previous studies indicate that deer use of the mature Douglas fir forest along much of the shore of Buttle lake is limited in comparison to other habitats found further to the north (Westmin Resources Limited, 1982).

The upper portions of Myra, Price and Thelwood Creeks are rated as Class 4 to 7 by Canada Land Inventory i.e.; having moderate to severe limitations to the production of ungulates. Field surveys conducted for Westmin Resources in 1982 indicate that ungulate use of these areas is likely insignificant due to extended periods of snow cover and limited availability of food.

Black bear (Ursus americanus) and cougar (Felis concolor vancouverensis) are the large carnivores most likely to occur in the exploration area. Vancouver Island wolf (Canis lupus crassodon) are thought to be present but uncommon in the area. Bear sign is widespread throughout the area and has been frequently observed during exploration activities. Based on the presence of what appears to be suitable habitat and abundant prey populations, cougar and wolf are expected to be present.

The Vancouver Island wolverine (Gulo luscus vancouverensis) has been reported in the Strathcona Park area and is a protected species; the alpine areas of Mount Myra and other nearby mountains provide good habitat. Martin (Martes americana), mink (Mustela vison evagor), shorttailed weasel (Mustela ermina anguinae) and red squirrel (Tamiascuirus hudsonicus) were observed or signs recorded during studies commissioned by Westmin Resources Limited in 1982. Raccoons (Procyon lotor vancouverensis) are regular inhabitants of the mine site area.

The Vancouver Island marmot (Marmota vancouverensis) has been designated an endangered species; there are estimated to be only 150 individuals on Vancouver Island. These rodents are normally only found living in small colonies in lush alpine

meadows. The closest confirmed population to the Cream Silver property are on Flower Ridge, Marble Meadows, Mount Washington and just east of Forbidden Plateau.

The following is a list of mammals likely to be found in the Thelwood Creek, Price Creek and the southern Buttle Lake area:

Order Artiodactyla

Roosevelt elk	Cervus elaphus roosvelti
blacktailed deer	Odocoleus hemionus columbianus

Order Carnivora

Vancouver island wolf	Canis lupus crassodon
black bear	Ursus americanus vancouveri
raccoon	Procyon lotor vancouverensis
marten	Martes americana
shorttailed weasel	Mustela ermina anguinae
mink	Mustela vison evagor
cougar	Felis concolor
wolverine	Gulo luscus vancouverensis
river otter	Lutra canadensis pacifica

Order Rodentia

red squirrel	Tamiascuirus hudsonicus
beaver	Castor canadensis leucodontus
white-footed mouse	Peromyscus maniculatis
Townsend vole	Microtus townsendi
muskrat	Ondatra zibethica
Norway rat	Rattus norvegicus
house mouse	Mus musculus
Vancouver Island marmot	Marmota vancouverensis

The interior of Vancouver Island offers poor waterfowl breeding and overwintering habitat, primarily because lakes are generally deep and steep sided with limited or no marshy habitat for breeding. Both the Price-Thelwood delta at the south end of Buttle Lake and western extending arm of Upper Campbell lake are rated as Class V marsh with moderately severe limitations to waterfowl production. These areas are regarded the best wetlands

within the interior of Vancouver Island with other areas rated as Class VII; producing virtually no waterfowl. Consequently Buttle Lake does not provide unique habitat for or contain unique concentrations of diving ducks, puddle ducks, geese and swans with the exception of the Trumpeter Swan which is a winter resident of Vancouver Island, particularly of Courtenay, Campbell River and Buttle Lake. While as many as 75 Trumpeter Swans wintered on Buttle Lake for many years, after the flooding by the Strathcona Dam in 1956, these large concentrations of swans split into smaller groups to occupy numerous small lakes and sloughs.

None of the raptorial species (hawks, owls, eagles) can be expected to be truly common in the interior of Vancouver Island or in the Cream Silver exploration area, primarily because of the continuous mature dense forest cover and lack of either terrestrial and aquatic edge habitat. Those species which might be seen include the Cooper's hawk, bald eagle, and osprey. The Buttle lake area also provides appropriate breeding habitat for Perigrine falcon, Merlins and American kestrels.

Of the upland game birds, blue grouse, ruffed grouse and white tailed ptarmigan are expected to be common. The ruffed grouse occupies deciduous and mixed woodland habitats at low elevations in and around the burned over areas near the Price-Thelwood delta. Blue grouse prefer the coniferous forests higher up the Price and Thelwood valleys, and ptarmigan would be most common in the alpine and subalpine areas during summer moving to lower elevations in winter. Pheasants, partridge, doves and quail are not expected to be found in the area.

3.2 Wildlife Observations

A Wildlife Observation Log was maintained by Cream Silver Mines Limited staff during the period of exploration activity

(May 9 to July 29, 1987). It is anticipated that exploration staff through daily observation would be able to help document and form a data base for identifying:

- o Species presence and relative abundance
- o Frequency of encounters
- o Temporal habitat utilization
- o Individual ranges
- o Potentially unique or sensitive habitat

A complete and unedited copy of the field observations are presented in Table 8.

Blacktailed deer (Odocoleus hemionus columbianus) were the most commonly observed species. Elk were not observed during the period of study. From the record the majority of deer sightings occurred in the lower Thelwood and Price Creek drainages, particularly near the junction of the two creeks. This area was previously burned and subsequently logged prior to the raising of lake levels behind Strathcona Dam. Vegetation consists of immature coniferous forest mixed with deciduous species, herbaceous shrubs and some open grass areas. The records also indicate that young are born in late May/early June and develop quickly.

In mountainous areas such as the Strathcona Park deer normally migrate to higher elevations during summer and return to valley bottoms in winter with a home range consisting of 35 to 250 hectares. However, with the lower Thelwood valley bottom offering adequate food resources, migration may be postponed or even abandoned. Nevertheless some deer were observed at higher elevations near upper Drinkwater Creek and Andrew Lake area during mid July.

Black bear (Ursus americanus) and bear sign were seen nearly

TABLE 8

WILDLIFE OBSERVATION LOG

Date	Location	Species	Comments
May 9	East Side of Thelwood Creek	black bear	on Price Creek Rd. young
May 9	East Side of Thelwood Creek	black bear	scat
May 9	East Side of Thelwood Creek	grouse	heard just of Price Creek Road
May 9	Lower Thelwood Creek	Red Shafted Flicker	Thelwood Bridge
May 9	Lower Thelwood Wetlands	Waterfowl (5) mallard	seen from Thelwood Bridge
May 10	Near Powerhouse	several deer	pellets and tracks
May 11	Thelwood Road near West Claim Edge	deer	old, large, grey tipped
May 11	South End of Buttle Lake	black bear	old large with mangy fur
May 12	Grassy Field near South End of B. Lk.	deer	one only
May 12	Thelwood Road near Price adit & Ponds	deer	small young female
May 12	Lower Thelwood Wetlands	Waterfowl (9)	mallards and other species of duck
May 13	South End of Buttle Lake	bald eagle	circling over Buttle Lake
May 14	Near Powerhouse	deer	tracks and pellets
May 18	Near Price Creek Staff Gauge	deer	-
May 24	Thelwood Creek	deer	blacktailed doe
May 26	Near start of Price Creek Trail	black bear	1 or 2 years old
May 26	Thelwood near adit	black bear	good size
June 4	Near start of Price Creek Trail	deer (2)	doe and spotted faun
June 5	Line 6+00 N Approx. 600m E	black bear	not easily moved
June 5	Near adit on Thelwood Road	deer (3)	doe and two fauns
June 8	Near Start of Price Creek Trail	deer (2)	doe and faun growing rapidly
July 9	Price Creek Trail	deer	-
June 11	On Price Creek Trail at 0600 S	black bear	good size

TABLE 8 (Cont')

WILDLIFE OBSERVATION LOG

Date	Location	Species	Comments
June 11	Start of Price Creek Trail	deer (2)	doe and faun becoming familiar
July 12	Price Creek Trail	black bear	-
July 12	Grassy Field at S. end Buttle Lake	black bear	large male
July 14	Knoll between Price and Thelwood Creeks	deer	fresh tracks in snow
July 14	At Price Creek Staff Gauge	(cougar) bobcat	ears observed but vanished quickly
July 14	Knoll between Price and Thelwood Creeks	woodpeckers (2)	Appeared to be fighting
July 15	Lower Thelwood Cr.	black bear	large
July 15	Lower Thelwood Cr.	black bear	average size
July 15	Upper Drinkwater Cr	black bear	frequent sightings of fresh scat
July 15	Upper Drinkwater Cr	deer	fresh tracks
July 16	Grassy Field at S. end Buttle Lake	deer	-
July 17	Upper Price Creek	deer	fresh tracks
July 17	Lower Thelwood Creek Road	black bear	large
July 18	Grassy Field at S. end Buttle Lake	black bear	average size
July 20	West Side of Cream Lake	black bear	scat and tracks
July 21	South Side of Cream Lake	black bear	average size
July 22	Near Andrew Lake	deer	tracks
July 24	At Westmin	deer (3)	2 adult, 1 faun
July 24	At Westmin	black bear	large
July 26	On Highway App. 6 km before Westmin	deer (2)	1 adult, 1 faun
July 28	On lower Price Creek Road	deer	-
July 29	At field before Westmin	black bear	large

as often as blacktailed deer. From the records it would appear that the range of at least two large males and three other younger bears overlap near the south end of Buttle Lake and extend up to the confluence of Price and Thelwood Creeks. It is common for the home range of a male (2.5 to 7.5 km^2) to overlap that of one or more females. Generally population densities range from one bear per 1 to 5 km^2, with densities in the lowerThelwood valley approaching the higher value (one bear per 1 km^2).

Bears and bear sign were also seen in the upper Drinkwater and Cream Lakes area.

A single sighting of a cougar (Felis concolor vancouverensis) was made on July 14 on the basis of a brief observation but spuriously entered as a bobcat. Bobcats, however, do not occur on Vancouver Island and it is assumed to be an incorrect identification.

Between May 9 and July 29, 1987 no species of canids (wolf), mustelids (martin, mink), lagomorpha (rabbits), or rodentia (marmot) were recorded. The exploration staff reported seeing very few squirrels and no raccoons.

Grouse were not recorded but seen or heard daily and broods were large (up to 10) when seen. Waterfowl including mallards were seen making moderate use of wetlands in the lower Thelwood drainage. The only sighting of a raptor was that of a bald eagle on may 13 circling over the south end of Buttle Lake.

SECTION 6.0 - REFERENCE

Alderdice, D.F., 1982. A Review of the Potential Influences of Heavy Metals on Salmonid Fishes in the Campbell River, Vancouver Island, B.C., Department of Fisheries and Oceans Pacific Biological Station, Nanaimo, B.C.

B.C. Research, 1981. Water Quality in the Thelwood and Myra Creek drainages, Phase I. Prepared for the Buttle Lake Study Committee.

B.C. Research, 1982. Water Quality in the Thelwood and Myra Creek Drainages, Progress Report #4, Phase II. Prepared for the Buttle Lake Study Committee.

Clark, M.J.R., 1980. A Preliminary Review of Buttle lake Water Quality. Waste Management Branch, Ministry of Environment.

Clark, M.J.R., 1980. Draft 1981 Buttle Lake Report. Services Unit, Resource Recovery Section, Waste Management Branch, Ministry of Environment.

Environment Canada, 1984. Historical Streamflow Summary, British Columbia to 1984. Inland Waters Directorate, Water Survey of Canada .

Stevenson International Groundwater Consultants Limited, 1982. Hydrogeological Overviews of Buttle Lake Catchment and Zinc Loading Potential of Myra and Thelwood Creeks and Groundwaters. Prepared for Westmin Resources Limited.

Westmin Resources Limited, 1982. Stage I Submission to the B.C. Mine Development Steering Committee. Environmental Impact Assessment Part I - Myra Falls Operations.

APPENDIX A

PRICE CREEK ABOVE CONFLUENCE WITH THELWOOD CREEK (SITE T_1)
MONITORING COMMITTEE - JUNE 1981 TO MAY 1982

Date	Time (h)	Staff Gauge (cm)	T (°C)	pH	Alk (mg/L $CaCO_3$)	Hrd (mg/L $CaCO_3$)	SC (umho/cm)	NFR (mg/L)	FR (mg/L)	Flows (L/sec)	Total Metals (mg/L) Zn	Cu	Cd	Dissolved Metals (mg/L) Zn	Cu	Cd
1981																
27.5	–	–	–	–	–	–	–	–	–	301 440	–	–	–	–	–	–
11.6	16:15	–	8.0	6.9	36	–	58	L1	–	–	0.0014	0.001	L0.0002	0.0011	L0.001	L0.0002
11.6	22:21	–	7.0	7.6	36		60	L1	–	–	0.0016	0.001	L0.0002	0.0010	0.001	L0.0002
12.6	04:37	–	6.5	7.6	40		59	L1	–	–	0.001	0.001	L0.0002	0.001	0.001	L0.0002
12.6	10:30	–	6.5	7.55	37	62	62	L1	–	–	0.001	0.001	L0.0002	L0.001	L0.001	L0.0002
12.6	16:17	–	8.0	7.7	–	–	64	L1	43	–	0.001	0.001	L0.0002	L0.001	L0.001	L0.0002
20.6	04:36	–	6.5	6.82	31		55	L1	40	–	0.0019	0.0011	L0.0002	0.0019	L0.001	L0.0002
20.6	10:40	–	6.5	7.38	–	–	–	–	–	–	0.0016	L0.001	L0.0002	L0.001	L0.001	L0.0002
20.6	16:25	–	9.0	7.63	–	–	–	–	–	–	0.011	L0.001	L0.0002	L0.001	L0.001	L0.0002
20.6	22:19	–	8.0	7.19	–	–	–	–	–	–	L0.001	L0.001	L0.0002	L0.001	L0.001	L0.0002
27.6	–	–	–	–	–	–	–	–	–	142 200	–	–	–	–	–	–
7.7	04:35	–	6.5	6.11	34	–	62	L1	38	–	L0.001	L0.001	L0.0002	L0.001	L0.001	L0.0002
7.7	10:43	–	7.0	6.29	–	–	–	–	–	–	0.002	0.0011	0.0003	0.0021	L0.001	0.0002
7.7	16:11	–	9.0	7.14	–	–	–	–	–	–	0.0019	L0.001	L0.001	0.0019	L0.001	L0.0002
7.7	22:18	–	8.0	6.64	–	–	–	–	–	–	0.0017	L0.001	L0.0002	0.0015	L0.001	L0.0002
21.7	04:39	–	9.0	7.2	25	–	92	L1	35	–	L0.001	L0.001	L0.0002	L0.001	L0.001	L0.0002
21.7	10:06	–	9.5	6.25	–	–	–	–	–	–	0.0214	0.0012	L0.0002	0.0189	L0.001	L0.0002
21.7	16:13	–	12.0	7.00	–	–	–	–	–	–	0.0014	L0.001	0.0005	0.0010	L0.001	0.0002
21.7	22:22	–	10.0	7.77	–	–	–	–	–	–	L0.001	L0.001	L0.0002	L0.001	L0.001	0.0002
4.11	07:50	59.0	–	7.10	35	36	70	6	46	–	0.0020	0.0025	L0.0002	0.0012	0.0008	L0.0002
30.11	13:00	42.0	4	7.52	48	50	100	L1	88	–	0.0006	0.0007	L0.0002	0.0006	0.0006	L0.0002
1982																
7.1	15:35	36.3	–	6.70	52	49	114	1.3	59	–	0.0027	L0.0005	L0.0002	0.0021	L0.0005	L0.0002
2.2	08:45	43.0	3.0	6.85	47	45	79	L1	23	–	0.0015	L0.0005	L0.0002	0.0011	L0.0005	L0.0002
3.3	07:50	47.0	3.0	6.00	41	38	67	L1	43	–	0.0010	0.0011	L0.0002	0.0008	0.0007	L0.0002
30.3	08:30	36.0	2.0	6.00	48	47	77	L1	90	–	L0.0010	0.0009	L0.0002	L0.0010	L0.0005	L0.0002
27.4	13:10	40.0	4.5	6.50	42	42	80	L1	33	–	0.0013	L0.0005	L0.0002	0.0005	L0.0005	L0.0002

L = Less than

Source: B.C. Research. September 1981. Water Quality in the Myra and Thelwood Creek Drainages, Phase I.
B.C. Research. May 1982. Water Quality in the Myra and Thelwood Creek Drainages, Progress Report No. 4, Phase II.

THELWOOD CREEK ABOVE CONFLUENCE WITH PRICE (SITE T_2)
MONITORING COMMITTEE - JUNE 1981 TO MAY 1982

Date	Time (h)	Staff Gauge (m)	T (°C)	pH	Alk (mg/L $CaCO_3$)	Hrd (mg/L $CaCO_3$)	SC (umho/cm)	NFR (mg/L)	FR (mg/L)	Flows (L/min)	Total Metals (mg/L) Zn	Cu	Cd	Dissolved Metals (mg/L) Zn	Cu	Cd
1981																
28.5	—	—	9.0	7.3	—	—	—	—	—	E207060	—	—	—	—	—	—
11.6	16:40	—	9.0	6.6	10.0	—	15.0	L1	—	—	0.0022	0.0014	L0.0002	0.001	0.001	L0.0002
11.6	22:45	—	9.0	6.6	10.0	—	16.0	L1	—	—	0.0021	0.0020	L0.0002	0.001	0.001	L0.0002
12.6	04:58	—	8.0	7.15	12.0		16.0	L1	—	—	0.0018	0.0015	L0.0002	L0.001	L0.001	L0.0002
12.6	10:51	—	9.0	7.3	12.0	—	16.5	L1	—	—	L0.001	L0.001	L0.0002	L0.001	L0.001	L0.0002
12.6	16:29	—	10.0	7.3	—	—	17.5	L1	17	—	L0.001	L0.001	L0.0002	L0.001	L0.001	L0.0002
24.6	04:32	—	8.0	7.3	9.0	—	16.0	L1	14	—	L0.001	L0.001	L0.0002	L0.001	L0.001	L0.0002
24.6	11:15	—	9.0	6.9	—	—	—	—	—	—	0.0022	L0.001	L0.0002	L0.001	L0.001	L0.0002
24.6	16:40	—	10.0	7.2	—	—	—	—	—	—	0.0022	L0.001	L0.0002	L0.001	L0.001	L0.0002
24.6	12:37	—	9.5	7.1	—	—	—	—	—	E187800	0.002	0.0011	L0.0002	0.002	L0.001	L0.0002
7.7	04:52	—	10.0	6.15	12.0	—	22.0	L1	17	—	L0.001	L0.001	L0.0002	L0.001	L0.001	L0.0002
7.7	11:05	—	12.0	6.80	—	—	—	—	—	—	L0.001	L0.001	L0.0002	L0.001	L0.001	L0.0002
7.7	16:29	—	12.5	6.80	—	—	—	—	—	—	L0.001	L0.001	L0.0002	L0.001	L0.001	L0.0002
7.7	21:59	—	11.5	7.00	—	—	—	—	—	—	L0.001	L0.001	L0.0002	L0.001	L0.001	L0.0002
21.7	04:57	—	13.0	7.41	10.0		41.0	L1	15	—	0.11	L0.001	0.0002	0.0079	L0.001	0.0002
21.7	10:19	—	15.0	6.35	—	—	—	—	—	—	0.0020	0.0022	0.0005	0.002	L0.001	0.0003
21.7	16:37	—	16.0	7.28	—	—	—	—	—	—	L0.001	L0.001	L0.0002	L0.001	L0.001	L0.0002
21.7	22:01	—	14.0	7.30	—	—	—	—	—	—	0.0020	L0.001	0.0003	0.002	L0.001	0.0002
4.11	09:15	97.0	—	6.35	6.0	8.0	23.0	L1	18	—	0.0020	0.0007	L0.0002	0.0008	0.0004	L0.0002
30.11	13:40	46.0	4	6.89	10.0	12.0	31.0	L1	68	—	0.0021	0.0009	L0.0002	0.0019	0.0008	L0.0002
1982																
7.1	15:10	31.7	—	6.30	14.0	15.0	36	1.8	22	—	0.0018	L0.0005	L0.0002	0.0018	L0.0005	L0.0002
2.2	08:45	53.5	2.0	7.10	9.5	11.0	26	L1	22	—	0.0013	L0.0005	L0.0002	0.0012	L0.0005	L0.0002
3.3	07:50	66.0	2.0	6.00	9.0	9.5	24	L1	12	—	0.0015	0.0007	L0.0002	0.00012	0.0007	L0.0002
30.3	08:30	40.0	3.0	6.20	11.0	12.0	23	L1	46	—	0.0010	L0.0005	L0.0002	0.0010	L0.0005	L0.0002
27.4	13:35	62.0	3.5	6.75	9.0	10.0	27	L1	1	—	0.0006	L0.0005	L0.0002	0.0005	L0.0005	L0.0002

L - Less than
E - Estimated

Source: B.C. Research. September 1981. Water Quality in the Thelwood and Myra Creek Drainages, Phase I.
B.C. Research. May 1982. Water Quality in the Thelwood and Myra Creek Drainages, Progress Report No. 4, Phase II.

LOWER THELWOOD CREEK - EAST, WEST & MID CHANNELS
MONITORING COMMITTEE - JUNE 1981 TO MAY 1982

Date	Time (h)	T (°C)	pH	Alk (mg/L $CaCo_3$)	Hrd (mg/L $CaCo_3$)	SC (umho/cm)	NFR (mg/L)	FR (mg/L)	Flows (L/min)	Total Metals (mg/L) Zn	Cu	Cd	Dissolved Metals (mg/L) Zn	Cu	Cd
1981 West Channel - Site T_3a															
13.6	09:28	–	7.0	–	–	–	–	–	28 200	0.0044	–	–	0.0032	–	–
3.7	09:50	8.0	6.83	–	–	–	–	–	–	–	–	–	–	–	–
6.7	19:46	8.0	–	–	–	–	–	–	–	–	–	–	–	–	–
8.7	08:37	8.0	–	–	–	–	–	–	–	–	–	–	–	–	–
9.7	10:43	9.0	–	–	–	–	–	–	–	–	–	–	–	–	–
13.7	10:02	9.0	–	–	–	–	–	–	–	0.0031	–	–	0.0029	–	–
4.11	10:20	–	6.30	20	23	52	L1	36	–	0.0025	0.0005	L0.0002	0.0025	0.0005	L0.0002
30.11	14:10	4.0	6.78	23	27	60	L1	64	–	0.0045	0.0015	L0.0002	0.0042	0.0008	L0.0002
1982															
7.1	14:20	–	6.30	26	27	60	2.5	45	–	0.0023	0.0005	L0.0002	0.0023	0.0005	L0.0002
2.2	09:50	5.0	6.80	28	30	57	1	42	–	0.0061	L0.0005	L0.0002	0.0048	L0.0005	L0.0002
3.3	08:30	4.0	6.10	27	27	48	L1	33	–	0.0038	0.0009	L0.0002	0.0036	0.0009	L0.0002
30.3	09:00	4.0	5.70	28	33	60	L1	70	–	0.0049	L0.0005	L0.0002	0.0037	L0.0005	L0.0002
27.4	14:05	5.5	6.60	29	33	67	L1	27	–	0.0040	L0.0005	L0.0002	0.0039	L0.0005	L0.0002
1981 Mid-Channel - Site T_3b															
13.6	09:58	–	7.3	–	–	–	–	–	123 000	L0.001	–	–	L0.001	–	–
3.7	10:06	11.0	6.88	–	–	–	–	–	–	–	–	–	–	–	–
6.7	10:55	12.5	–	–	–	–	–	–	–	–	–	–	–	–	–
8.7	08:36	11.0	–	–	–	–	–	–	–	–	–	–	–	–	–
23.7	10:05	12.0	–	–	–	–	–	–	–	L0.001	–	–	L0.001	–	–
4.11	10:35	–	6.70	17	19	42	2	30	–	0.0012	0.0012	L0.0002	0.0009	0.0006	L0.0002
30.11	14:15	4.0	7.05	28	28	58	L1	58	–	0.0011	0.0007	L0.0002	0.0010	0.0006	L0.0002
1982															
7.1	14:45	–	6.60	28	30	57	2.0	40	–	0.0015	0.0006	L0.0002	0.0013	L0.0005	L0.0002
2.2	10:00	2.5	6.95	24	23	43	1	36	–	0.0013	L0.0005	L0.0002	0.0008	L0.0005	L0.0002
3.3	08:35	2.0	6.00	22	20	36	L1	23	–	0.0018	0.0009	L0.0002	0.0008	0.0008	L0.0002
30.3	09:15	2.5	6.20	22	21	37	L1	52	–	0.0016	0.0007	L0.0002	0.0011	0.0006	L0.0002
27.4	14:05	4.0	6.70	15	16	36	2	8	–	0.0005	L0.0005	L0.0002	0.0005	L0.0005	L0.0002
1981 East Channel - Site T_3c															
13.6	10:30	8.5	7.4	–	–	–	–	–	67 200	0.001	–	–	0.001	–	–
3.7	10:10	11.0	6.86	–	–	–	–	–	–	–	–	–	–	–	–
6.7	19:59	12.5	–	–	–	–	–	–	–	–	–	–	–	–	–
8.7	08:38	11.5	–	–	–	–	–	–	–	–	–	–	–	–	–
23.7	10:09	11.0	–	–	–	–	–	–	–	0.0032	–	–	L0.001	–	–
4.11	10:45	–	6.65	17	19	42	2	33	–	0.0011	0.0013	L0.0002	0.0006	0.0005	L0.0002
30.11	14:20	4.0	7.20	28	28	60	L1	77	–	0.0014	0.0012	L0.0002	0.0011	0.0007	L0.0002
1982															
7.1	14:50	–	6.65	30	28	63	2.5	43	–	0.0013	L0.0005	L0.0002	0.0013	L0.0005	L0.0002
2.2	10:00	2.5	7.00	25	23	43	L1	34	–	0.0023	0.0005	L0.0002	0.0016	L0.0005	L0.0002
3.3	08:40	2.0	6.00	22	20	35	L1	24	–	0.0015	0.0007	L0.0002	0.0013	0.0006	L0.0002
30.3	09:20	3.0	6.20	21	21	36	L1	50	–	L0.0010	L0.0005	L0.0002	L0.0010	L0.0005	L0.0002
27.4	14:20	4.0	6.60	15	16	34	1	10	–	0.0008	L0.0005	L0.0002	0.0006	L0.0005	L0.0002

L = Less than

Source: B.C. Research. September 1981. Water Quality in the Thelwood and Myra Dreek Drainages, Phase I.
B.C. Research. May 1982. Water Quality in the Thelwood and Myra Creek Drainages, Progress Report No. 4, Phase II.