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BASELINE WATER QUALITY MONITORING, BIRCH ISLAND, B.C.



B.C. RESEA



B.C. Research is the technical operation of an independent, industrial research society, the British Columbia Research Council.

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BASELINE WATER QUALITY
MONITORING, BIRCH ISLAND, B.C.
KAMLOOPS MINING DIVISION

N.T.S. 82M/12W
LATITUDE 51° 35'N
LONGITUDE 119° 54'N

Project Report 1-03-302

for

Consolidated Rexspar Minerals
and Chemicals Limited
Mineral Claims

Prepared by

B.C. Research
3650 Wesbrook Mall
Vancouver, B.C.
V6S 2L2

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8066
NO. _____

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File: 1 - 03 - 302

February 29, 1980

PROJECT REPORT No. 1

To: Denison Mines Limited
650 West Georgia Street
P.O. Box 11575
Vancouver, B.C. V6B 4N7

Attention: Mr. B.C. Switzer, Environmental Co-ordinator

Subject: BASELINE WATER QUALITY MONITORING, BIRCH ISLAND, B.C.

INTRODUCTION

Chemical analysis results are reported for the first in a series of water quality surveys to determine seasonal variations in baseline characteristics of drainages in and near the Birch Island property of Consolidated Rexspar Minerals and Chemicals Limited.

SAMPLING AND ANALYSIS PROCEDURES

Sample collection and preservation

Water samples were collected November 27, 1979 from the sites shown in Figure III. Sampling and preservation procedures were in accordance with British Columbia Department of the Environment specifications [1]. Samples for analysis of iron, zinc, lead, copper, cadmium were collected in 250 ml rigid polyethylene bottles that had been pre-soaked for 4 days in 20% nitric acid, 4 days in 10% hydrochloric acid, rinsed and stored containing deionised water. The samples were passed through an acid-washed 0.45 μ Millipore filter in the field and preserved by addition of AR. conc nitric acid. Aliquots for arsenic were collected in 1-litre polyethylene bottles and preserved in the same way. Samples for mercury analysis were collected in glass bottles (1 litre) containing 0.5g potassium dichromate, 10 ml conc. sulphuric acid as preservative. Radionuclide and actinide samples were obtained in 4.5-litre polyethylene containers and were acidified with 10 ml AR conc. nitric acid without filtration. Portions for analysis of other variables were collected in pre-rinsed rigid polyethylene bottles and were not preserved. Samples were returned to the laboratory within 48 h and stored at 2°C until analyses were complete.

Analytical Procedures

General chemical characteristics (solids, hardness, sulphate, etc.) were measured using procedures described in references 1 and 2.

Metals other than mercury, arsenic, radionuclides and actinides were measured by atomic absorption spectrophotometry using a Perkin Elmer Model 306 instrument equipped with deuterium background correction and an HGA-2100 graphite furnace accessory. Mercury was determined by a cold vapour technique using a Pharmacia UV monitor [1]. Arsenic was concentrated by ferric hydroxide flocculation [3] and analysed by the Gutzeit method [2].

Radionuclides and actinides were measured in the Chemistry Division of the Saskatchewan Research Council using colourimetric (thorium), fluorimetric (uranium) and radiochemical procedures described previously [4].

RESULTS

Chemical and radiochemical analysis results are shown in Tables 1-3. Concentrations of dissolved solids in the November 27, 1979 samples from Foghorn and Clay Creeks (Table 1) were higher than in samples collected November 24, 1976 [4]. Foghorn Creek water was alkaline and hard; the dissolved solids content increased by approximately 25% between the upper sampling site on this creek (Site 1), and Site 2, 500 m downstream of Pit BD. No appreciable change in water quality occurred in Foghorn Creek between Site 2 and the downstream station, Site 3. The downstream Thompson River sample (Site 7) was affected by influx of Foghorn Creek water; presumably the two streams were not fully mixed at the point of sampling. Concentrations of dissolved constituents were approximately double the value in the upstream sample from the Thompson (Site 6). Clay Creek was moderately hard, but of very low alkalinity; sulphate was high in this drainage. Sulphate levels were also high in Foghorn Creek. Water in the pond near Pit BD (Site 4) contained very high solids, including 200 mg/l sulphate.

Heavy metal concentrations were low in all samples except the pond near Pit BD adit. Arsenic, lead, mercury and cadmium were less than 1 mg/litre at all sites sampled (Table 2). As in November, 1976, copper and iron concentrations were higher in Clay Creek than in Foghorn Creek. The Thompson River contained dissolved iron levels above the B.C. drinking water standard (0.3 mg/litre), but negligible concentrations of other heavy metals. Iron and zinc concentrations were high in the pond near Pit BD (Site 4).

Radiochemical analyses showed that the sample from lower Foghorn Creek had a similar content of radionuclides and actinides as in November 1976 (Table 3). Polonium-210, lead-210, and uranium concentrations increased between Sites 1 and 2 on Foghorn Creek, but all except uranium were at the same level in the downstream

Foghorn Creek sample (Site 3) as at upstream Site 1. The Thompson River below Foghorn Creek contained 0.7 pCi/l polonium-210 even though Foghorn Creek at the mouth and the upstream Thompson River sample contained none. The pond in front of the adit below Pit BD (Site 4) contained substantially higher levels of radionuclides and actinides than the creeks. However, only polonium-210 was present at higher activity than in November 1976. Other radioactive elements were detected at lower concentrations than in the earlier sample. Clay Creek contained lower radium-226 and higher lead-210 levels than in the 1976 survey.

SUMMARY

The results indicate that no substantial change has occurred since the previous monitoring survey in November 1976. Localised effects on water quality may be occurring in Foghorn Creek due to seepage below Pit BD.

REFERENCES

1. B.C. Department of the Environment. 1976. A Laboratory Manual for the Chemical Analysis of Waters, Wastewaters, Sediments and Biological Material. 2nd edition.
2. APHA, AWWA, WPCF. 1976. Standard Methods for the Examination of Water and Wastewater. 14th edition.
3. Thiel, R. and G. Carpentier. 1971. Dosage photométrique de traces d'arsenic dans les eaux naturelles. Bull. Centre Rech. Pau-SNPA 4:243-246.
4. B.C. Research 1978. Preliminary Environmental Report of Consolidated Rexspar Minerals Birch Island Project (and Addendum).

J. Nuell

for C.C. Walden
Head, Division of Applied Biology

Herbert Jaz
for John M. Leach
Group Leader, Water Quality
Division of Applied Biology

DETAILED COST BREAKDOWN

DETAILED COST BREAKDOWN

SUMMARY OF EXPENDITURES FOR THE PERIOD OF NOVEMBER 1979 - APRIL, 1980

PERSONNEL

R.O. IV	Dr. Leach	8.0 hrs @ \$51.52	\$412.16
R.O. I	L. Lau	21.5 hrs @ 25.78	554.27
R.O. I	E. Lai	7.5 hrs @ 24.00	180.00
T.O. III	L. Hunt	30.5 hrs @ 28.69	875.05
T.O. III	M. Lewis	23.0 hrs @ 29.66	682.18
Draftsman IV	F. Phillips	2.0 hrs @ 26.25	52.50
Stenographer	E. Canton	6.0 hrs @ 12.92	77.52
			\$ 2,833.68

FOOD & ACCOMMODATION

Nov. 26-28	L. Hunt - Birch Island Sample Collection		
	Motel 2 days @ \$21.00		\$ 42.00
	Meals 2 days @ 20.00		
	1 lunch @ 4.75		
	1 dinner @ 9.00		
			53.75
			95.75

TRANSPORTATION

Nov. 26-28 - L. Hunt			
	Truck Rental - Tilden - 3 days		\$117.43
	Truck Fuel - Nov. 27, 28		35.50
	Mileage Nov. 28, 19 mi. @ \$.20		7.60
	Airport Parking		9.00
Nov. 16 - Dr. Leach			
	Mileage, 16 mi. @ \$.20		4.40
Nov. 22 - L. Hunt			
	P. Lawson Travel		88.55
			259.48

FREIGHT, DELIVERY CHARGES

CN Express Division	7.20
Loomis Courier Service	8.15
CP Transport 1	22.25
Loomis Courier Service	16.53
54.13	

ANALYSES

Saskatchewan Research Council - Analytical Services	1,393.00
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OTHER COSTS

B.C. Telephone Company
February, 1980
December, 1979
November, 1979

\$ 5.16
3.22
11.32

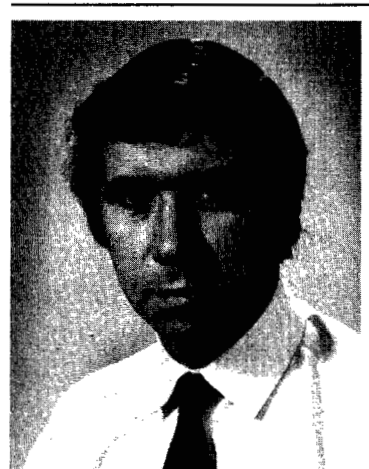
\$ 19.70

\$ 4,655.74

PERSONNEL

JOHN M. LEACH

GROUP LEADER BIOLOGICAL CHEMISTRY
PROGRAM LEADER, ANALYSIS
DIVISION OF APPLIED BIOLOGY



EDUCATION

B.Sc., (Hons.) Chemistry, University of Birmingham, England, 1964.

Ph.D., Organic Chemistry, University of Birmingham, England, 1967.

Post-Doctoral Fellowship, Chemistry, Simon Fraser University, 1967 - 1969.

EXPERIENCE

B.C. RESEARCH. 1971 - Present

Responsible for conception, planning, directing and reporting chemical aspects of studies in the following areas:

- Identification and measurement of toxic constituents in pulp mill and other industrial effluents
- Uptake of metals and persistent organics by fish and shellfish
- Effluent surveys and receiving water monitoring programmes
- Environmental impact assessment
- Analysis of trace elements and major constituents in animal tissue, soil and vegetation.
- Development of chemical analysis procedures

CANADIAN INDUSTRIES LIMITED, QUEBEC. 1969 - 1971.

Pollution abatement techniques for pulp mill effluents

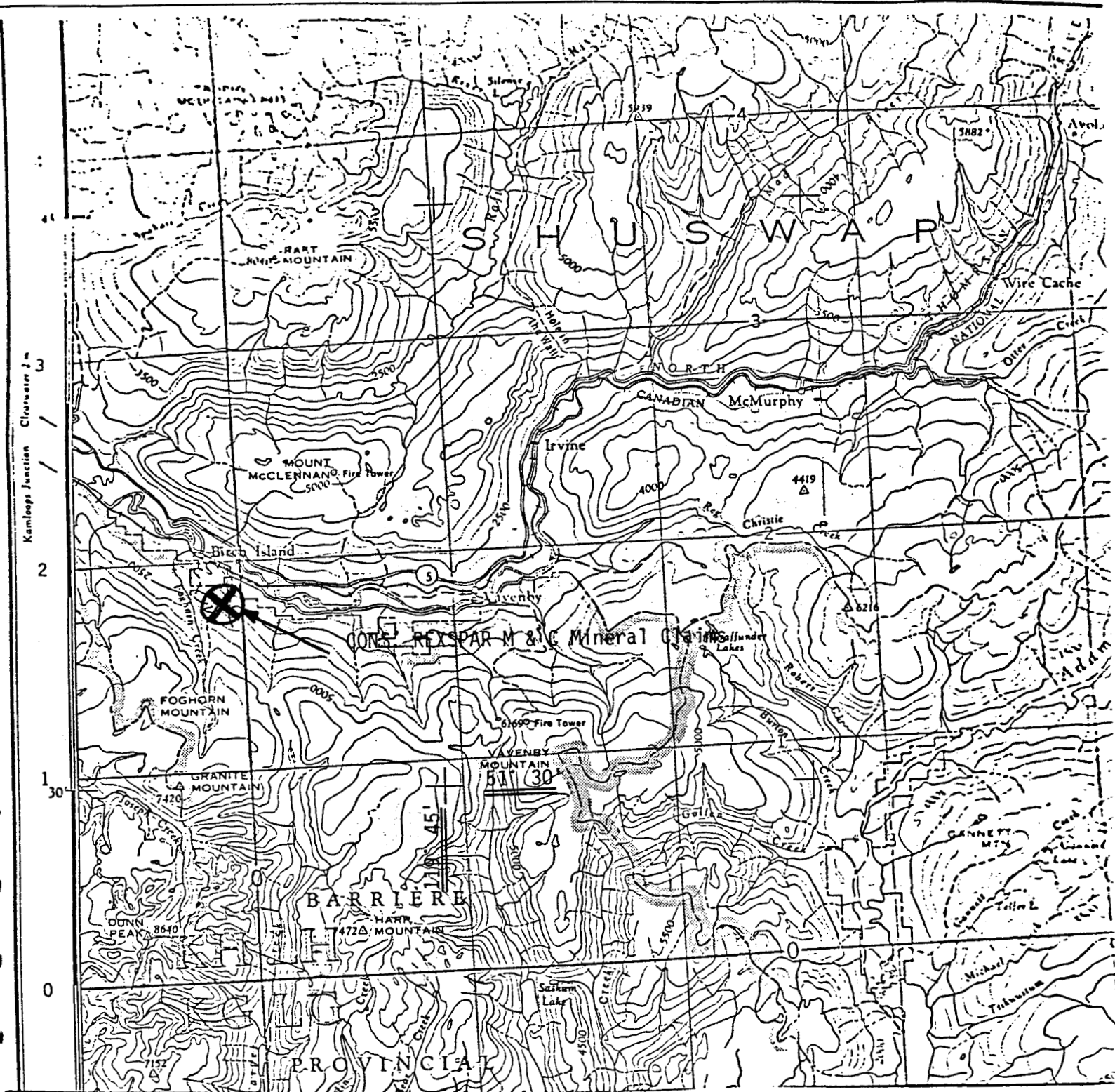
Research into chemical mechanisms of bleaching wood pulp

Evaluation of new methods for bleaching pulp.

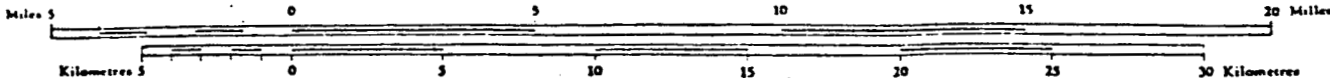
PUBLICATIONS

Twenty-two publications relating to environmental, organic, organometallic and analytical chemistry.

FIGURES



Scale 1:250,000 Échelle



Transverse Mercator Projection
 North American Datum 1927
 Contour Interval 500 feet
 Elevations in feet above Mean Sea Level

Projection Transverse de Mercator
 Niveau de référence nord-américain, 1927
 Équidistance des courbes: 500 pieds
 Élévations en pieds au-dessus du niveau moyen de la mer

FIGURE I
 Regional Location Map
 Birch Island Area
 British Columbia

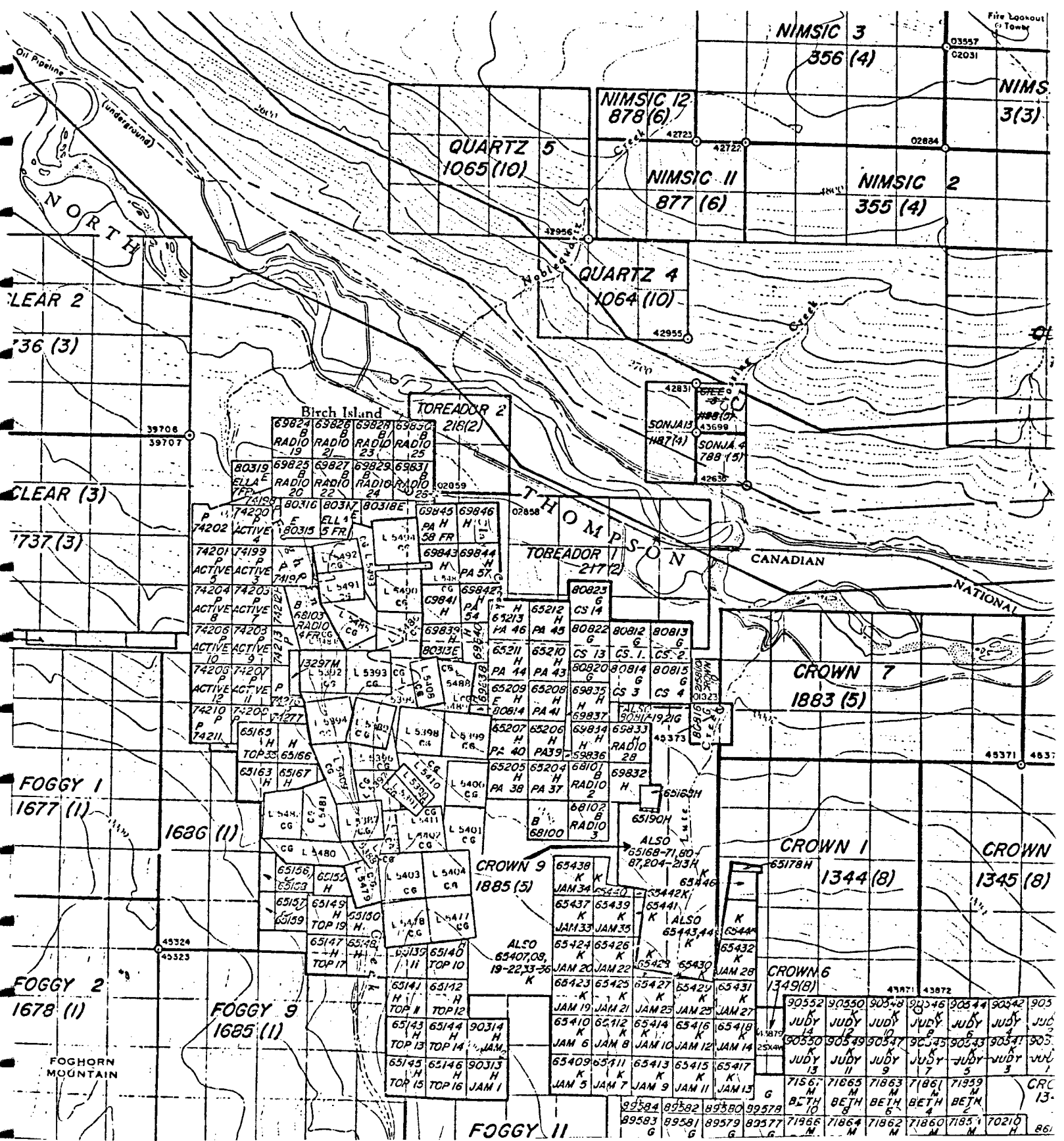
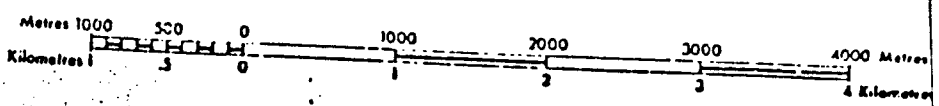


FIGURE II - Property Location Map

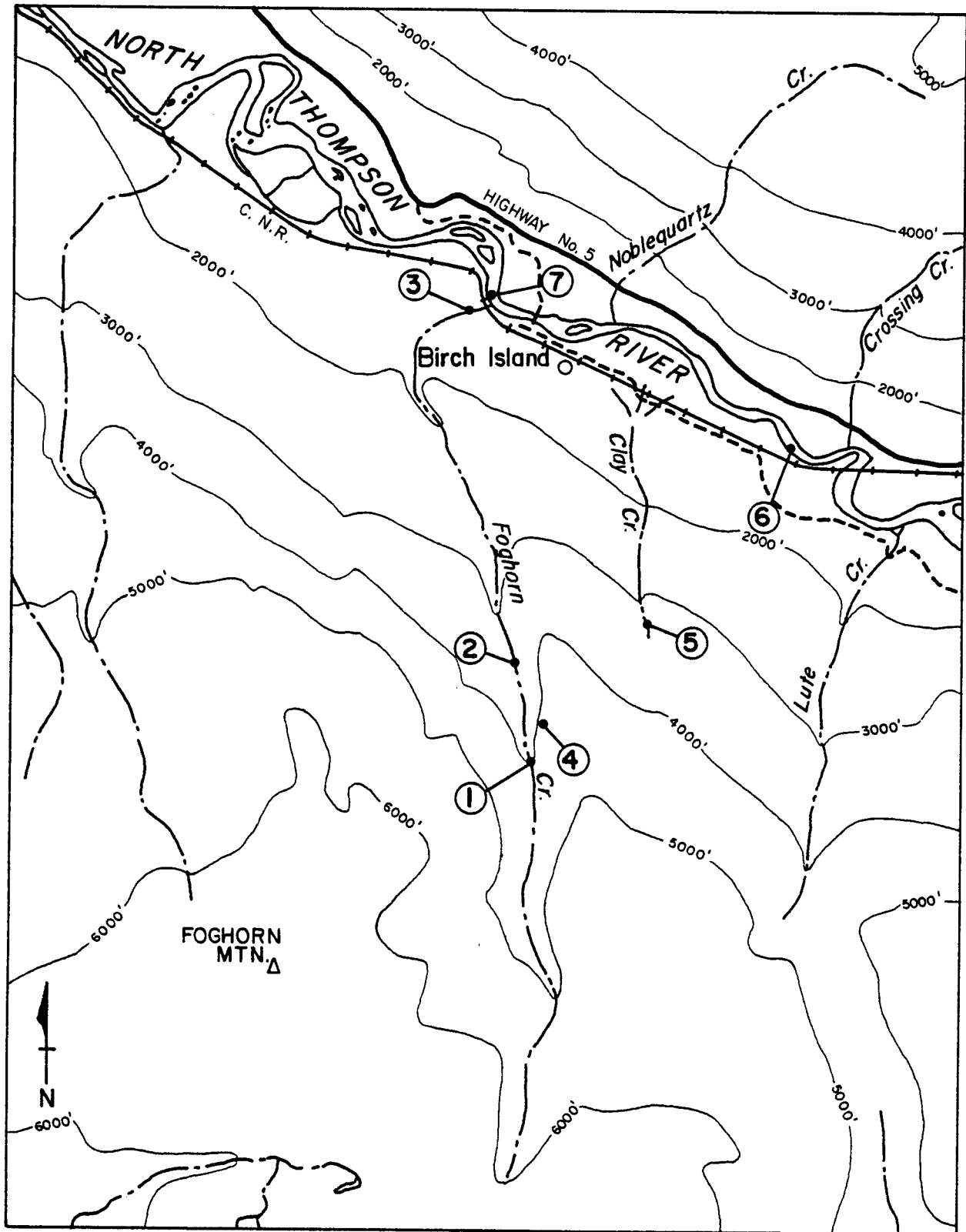
1:50 000



DATE OF MICROFILM: 80-03-20

WEST HALF
 M 82M/12
 CAMLOOPS MINING DIV.

LOCATION OF WATER SAMPLING SITES



Scale : 1:65,000

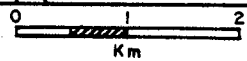


Figure III

TABLES

TABLE 1
GENERAL WATER QUALITY CHARACTERISTICS

Site/Number	Upper Foghorn Creek	Foghorn Creek 500 m downstream of Pit BD	Lower Foghorn Creek	Pond in front of Adit below Pit BD	Clay Creek	Thompson River upstream of Clay Creek	Thompson River below Foghorn Creek
Variable	1	2	3	4	5	6	7
pH	8.1	8.2	8.1	8.1	7.1	7.5	7.8
Dissolved solids (mg/l)	190	240	239	477	186	71	134
Suspended solids (mg/l)	<1	<1	<1	4	<1	<1	4
Specific Conductance (μ mho/cm)	230	295	284	500	193	76	170
Turbidity (N.T.U.)	0.3	0.6	0.7	5.5	0.9	2.0	1.5
Sulphate (mg/l)	51	64	72	200	100	11	30
Ammonia (mg N/l)	<0.005	0.017	<0.005	0.023	0.007	<0.005	0.050
Nitrate (mg N/l)	0.09	0.05	0.04	<0.01	1.1	0.18	0.18
Fluoride (mg/l)	<0.10	0.32	0.27	2.0	0.35	0.27	0.20
Alkalinity (mg CaCO ₃ /l)	106	124	122	143	7	38	72
Calcium (mg/l)	34	42	43	77	31	15	26
Magnesium (mg/l)	17	19	20	25	5.0	1.8	7.4
Calculated Hardness (mg CaCO ₃ /l)	155	183	190	295	98	45	95

TABLE 2

HEAVY METAL CONCENTRATIONS

Site/Number	Upper Foghorn Creek	Foghorn Creek 500 m downstream of Pit BD	Lower Foghorn Creek	Pond in front of Adit below Pit BD	Clay Creek	Thompson River upstream of Clay Creek	Thompson River below Foghorn Creek
Variable	1	2	3	4	5	6	7
Dissolved Iron (mg/l)	0.002	0.002	0.002	1.4	0.026	0.34	0.28
Dissolved Zinc (mg/l)	0.002	0.002	0.006	0.17	0.019	0.001	0.002
Dissolved Lead (mg/l)	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001
Dissolved Copper (mg/l)	0.006	<0.001	<0.001	0.003	0.002	<0.001	<0.001
Dissolved Cadmium (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Arsenic (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Mercury (μ g/l)	0.10	0.03	0.07	0.04	0.03	0.03	0.05

TABLE 3

RADIONUCLIDE AND ACTINIDE CONCENTRATIONS

Site/Number	Upper Foghorn Creek	Foghorn Creek 500 m downstream of Pit BD	Lower Foghorn Creek	Pond in front of Adit below Pit BD	Clay Creek	Thompson River upstream of Clay Creek	Thompson River below Foghorn Creek
Variable	1	2	3	4	5	6	7
Radium-226 (pCi/l)	0.1	0.1	0.1	2.8	0.3	<0.1	0.1
Polonium-210 (pCi/l)	<0.1	0.6	<0.1	28	<0.1	<0.1	0.7
Lead-210 (pCi/l)	<0.5	1.3	<0.5	2.5	1.2	<0.5	<0.5
Thorium (mg/l)	0.4	0.2	0.5	0.3	0.3	1.8	<0.1
Uranium (mg/l)	2.9	6.4	7.3	100	2.0	1.4	1.2

TABLE 4

DETAILED LIST OF NAMES OF CLAIMS, RECORD OR LOT NUMBERS

Name of Claim	No. of Units	Record No. or Lot No.	Name of Claim	No. of Units	Record No. or Lot No.
REX 18		L5399	JANE 9FR		L5481
JANE 3FR		L5410	B D 2		L5387
ELLA 1FR		80313	TOP 33		65163
ELLA 2FR		80314	TOP 35		65165
RADIO 27		69832	TOP 36		65166
RADIO 28		69833	TOP 37		65167
RADIO 29		69834	ACTIVE 1		74197
RADIO 30		69835	ACTIVE 2FR		74198
CS 1		80812	ACTIVE 3		74199
CS 2		80813	ACTIVE 4		74200
CS 3		80814	ACTIVE 5		74201
CS 4		80815	ACTIVE 6		74202
CS 7		80816	ACTIVE 7		74203
CS 8		80817	ACTIVE 8		74204
CS 9		80818	ACTIVE 9		74205
CS 10		80819	ACTIVE 10		74206
CS 11		80820	ACTIVE 11		74207
CS 12		80821	ACTIVE 12		74208
CS 13		80822	ACTIVE 13FR		74209
CS 14		80823	ACTIVE 14FR		74210
PA 37		65204	ACTIVE 15FR		74211
PA 38		65205	ACTIVE 16FR		74212
PA 39		65206	ACTIVE 17FR		74213
PA 40		65207	ACTIVE 80FR		74276
PA 41		65208	ACTIVE 81FR		74277
PA 42		65209	JANE 12FR		13297
PA 43		65210	ELLA 3FR		80315
PA 44		65211	ELLA 4FR		80316
PA 45		65212	ELLA 5FR		80317
PA 46		65213	ELLA 6FR		80318
PA 49FR		69836	ELLA 7FR		80319
PA 50FR		69837	RADIO 19		69824
PA 51FR		69838	RADIO 20		69825
PA 52		69839	RADIO 21		69826
PA 53		69840	RADIO 22		69827
PA 54		69841	RADIO 23		69828
PA 55		69842	RADIO 24		69829
PA 56		69843	RADIO 25		69830
PA 57		69844	RADIO 26		69831
PA 59FR		69846	PA 58FR		69845

May be signed by agent on behalf of owner.