82-357-10420 5

ASSESSMENT REPORT
(1981 Exploration Programme)

Based on Costs of Sample
Collection for Metallurgical Research

OWNER/OPERATOR

BORDER RESOURCES LTD.,
#1400 - 1030 West Georgia St.,
Vancouver, B.C., V6E 3C2
Telephone (604) 687-9444

PROPERTY LOCATION

New Westminster M.D.
N.T.S. Grid 92H/6(E)

NORTH GROUP

49°29'00" N. Lat.
121°16'00" W. Long.

(17 Claims)
G 1-2, GWH 2, N 22-27, 28FR, 29FR, TAX 51-56

SOUTH GROUP

49°26'00" N. Lat.
121°14'00" W. Long.

(9 Claims)
EVE 1-2, TOY 3-9

AUTHOR: P. HALL, BA, BEd.

METALLURGIST: H.E.A. von HAHN, P.Eng.

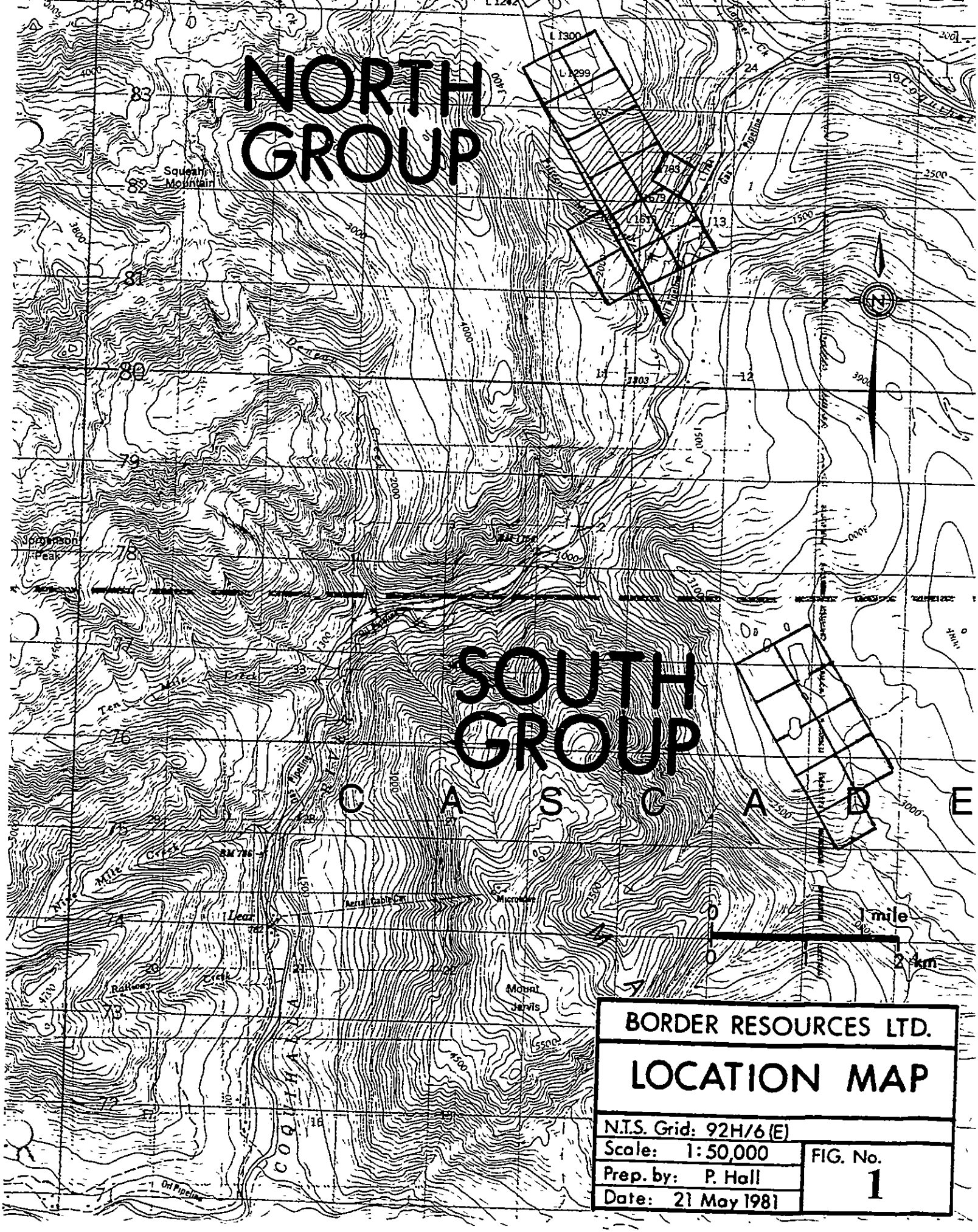
GEOLOGIST: J.A. CHAMBERLAIN, P.Eng., PhD.

DATE: 21 May 1982

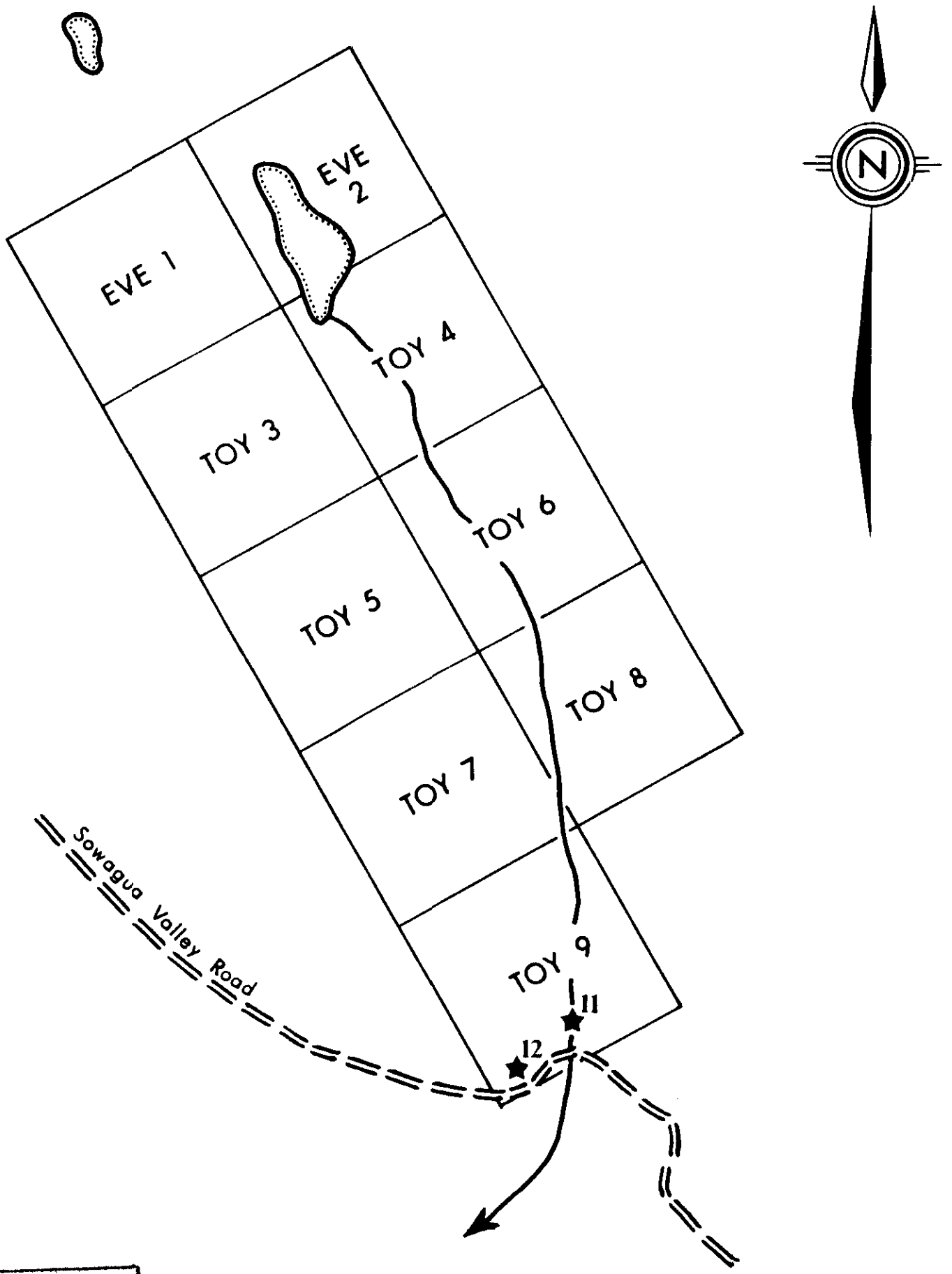
TABLE OF CONTENTS

SECTION

MAPS



BORDER RESOURCES LTD.	
LOCATION MAP	
N.T.S. Grid: 92H/6 (E)	
Scale: 1:50,000	FIG. No. 1
Prep. by: P. Hall	
Date: 21 May 1981	



★ SAMPLE SITE

Map derived from base by
Underhill & Underhill, B.C.L.S.

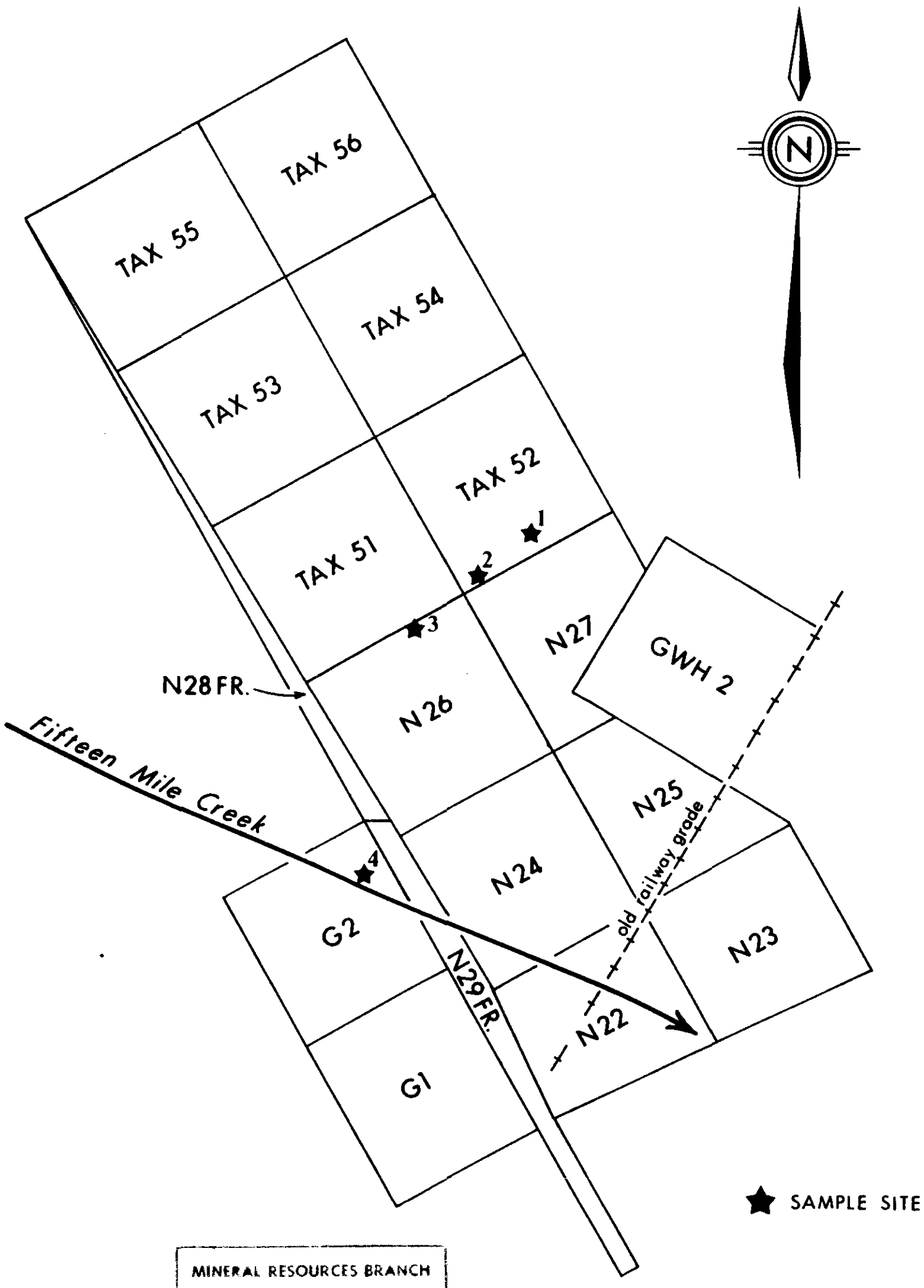
0 1000 2000 3000 feet
0 500 1000 m

BORDER RESOURCES LTD.

SOUTH GROUP

N.T.S. Grid: 92H/6(E)
Scale: 1:12,000
Drawn by: P. Hall
Date: 21 May 1981

FIG. No. 2



0 1000 2000 3000 feet
0 500 1000 m

Map derived from base by
Underhill & Underhill, B.C.L.S.

BORDER RESOURCES LTD.

NORTH GROUP

N.T.S. Grid: 92H/6(E)
Scale: 1:12,000
Drawn by: P. Hall
Date: 21 May 1981

FIG. No. 3

INTRODUCTION AND SYNOPSIS OF 1981 EXPLORATION WORK

This report is the unbroken continuation of the exploration programme commenced in 1980 on the 26 Coquihalla Valley claims held by Border Resources Ltd. During 1981, further metallurgical research was conducted by Dr. von Hahn on the samples from the 1980 sites. Copies of Dr. von Hahn's progress reports, nos. 8 to 11, are reprinted and included as section #2 of this report. Reports 1 to 7 were included in our 1981 Assessment submission.

From Dr. von Hahn's research, it became evident that a large bulk sample of the serpentine mineralization had to be obtained before significant further metallurgical studies could be performed. In accord with this conclusion, Dr. Joseph A. Chamberlain, P.Eng., PhD., was commissioned as a consultant to inspect the North Claims group and select a site from which the prescribed bulk sample was to be obtained. Between October 5-6, 1981, Dr. Chamberlain, in company with the writer climbed and sampled the claims area on the north slopes of the Coquihalla Valley. Dr. Chamberlain's detailed account of the fieldwork is reprinted and included as section #3 of this report. Figure #4 in the back pocket shows the sampling locations.

Based upon Dr. Chamberlain's recommendations to sample sites Nos. 9 and 11 from an 11 site total, the writer and a field assistant returned to the property on October 24, 1981. On that first day the field crew climbed back up to the selected sites to scout out a route by which the bulk sample could be brought down the mountainside.. The preferred site, site No.9, was located on a steep sidehill in an unlogged forested area. Due to the terrain, the idea of building a rough cat road into the area at this stage of the work was ruled completely out. Fortuitously, however, a rock ledge was located approximately 150 ft (45 m) west of #9 site and this ledge, once cleared would be suitable for landing a helicopter on it. The plan was to hire a small Hughes 500 to fly the drill crew in and to fly out the 1000 lbs. (454 kg) of sample.

The following day, the crew returned with a chainsaw and cleared off all the trees and snags that were on the ledge.

The third day was oriented towards obtaining a sample from the more accessible site No.11. Site No. 11 was located in an outcrop just to the north of the abandoned C.P.R. roadbed and within claim "N25". A cable was strung up over a washout in the road bed and by means of an aerial pulley system the rented Pionjar packdrill was conveyed to the site and the bagged samples returned. The site was drilled to depths of 3-4 ft. (1 m) and blasted with 40% Forcite (Mines Blasting Certificate #34231), and the unoxidized samples were immediately sealed in plastic orebags and trucked to Vancouver.

Flight cost quotations from helicopter companies were found to be considerably higher than what the company wanted due to ferrying charges and the policy of some companies to charge up to three hours minimum flight time regardless of actual time flown. In order to circumvent these high charges, it was decided to wait until the use of a helicopter could be shared with another customer working in the same area.

On November 27, 1981, a call was received that a helicopter would be available the following day to fly the drill in, in the morning, and to fly the samples and crew out in the afternoon. Although the helicopter was a Bell 206B and a much larger machine than the anticipated Hughes 500, it was nevertheless decided to try it out.

About noon on November 28, the writer took off from a cleared area beside the Coquihalla road and by circling rose up to Site No.9 on the mountainside almost directly above the takeoff spot. The five-minute flight confirmed the accuracy of the decision to build the helicopter site where it was since no other likely sites could be seen anywhere. Unfortunately, the overhead branches of some of the larger trees surrounding the ledge projected too far into the cleared landing site area. The pilot made a careful effort to land his machine, but upon weighing the risks decided against doing so.

On December 5th, the writer and a field assistant again returned to the property and equipped with two chainsaws successfully cleared the trees that were overhanging the helicopter landing site. A tree falling counterdirection caused a hang-up situation to develop and damaged one of the chainsaws, but by having the other saw there the hung-up trees were able to be brought to ground and the job completed.

The two helicopter companies that were at that time operating out of the Hope airport were once again contacted with the aim of arranging a shared-use hiring of a helicopter. Cancellations of proposed trips due to bad weather kept recurring until approximately December 26th, when a heavy snowfall covered the Coquihalla and ended our hopes to complete the sampling programme in 1981.

Reports from the Coquihalla indicate that the snowload is still heavy in the Fifteen Mile Creek area and accordingly the completion of the sampling programme is now postponed to the summer of 1982.

A-MIN-TECH RESEARCH LTD.

A Minerals Technology Service

Flotation, Hydrometallurgy
Research & Testing

PROJECT BR-1

Progress Report #8

Date: 15 May, 1981

To: Border Resources Ltd.,
412 Granville Square,
200 Granville Street,
Vancouver, B.C.,
V6C 1S4

Attention: G.W. Hornby

Project Title: Treatment of Serpentine Rock for Recovery of Nickel and Other Valuable Minerals.

Report Title: Mineralogical Examinations of Flotation Concentrates.

Summary:

Mineralogical and photomicrographic examinations were made of polished mineral-particle-mounts of two flotation concentrates. The purpose was to identify the sulfides and to examine the size distribution and association of the sulfide particles.

The mineralogical examination showed that more than 98 percent of the sulfides present were pentlandite.

The photomicrographic examination indicated a particle size range from about 40 microns down to 5 microns for the sulfides. Most sulfide particles appear to be free, but there is also evidence indicating the presence of middlings.

cont'd. p.2

A-MIN-TECH RESEARCH LTD.

Project BR-1

Progress Report #8 cont'd.

Mineralogical Examination of Flotation Concentrates

Introduction:

Mineralogical and photomicrographic examinations were made of polished mineral-particle-mounts of the 1st & 2nd concentrates drawn in flotation tests BRF-3, BRF-4 & BRF-5. The purpose of this work was to identify the sulfides recovered during flotation and to examine the size distribution and and association of the sulfide particles.

The mineralogical examinations were kindly performed by Dr. J.A. Chamberlain of Dolmage Campbell & Associates (1975) Ltd. His report is attached as APPENDIX 1 to this report.

Mineralogical Examination:

According to Dr. Chamberlain's report, more than 98 percent of the sulfides present are pentlandite, with some evidence of chalcopyrite and possible millerite.

The flotation concentrates used in the present examinations were derived from Serpentine rock designated Site 4.

The finding that most of the sulfides present in the concentrates are pentlandite is of some significance from a mineral dressing point of view. Many nickel recovery operations involving the flotation of pentlandite have to contend with the problem of separating pyrrhotite from the nickel concentrates. The indicated absence of pyrrhotite in the present concentrates suggests simplifications in flow sheet development.

Photomicrographic Examinations:

Figures 1 and 2, page 3, show photomicrographs of mineral-particle-mounts of BRF-3 Conc.1 and BRF-4 Conc.1. The sulfide particle sizes range from about 40 microns down to about 5 microns. Most of the sulfide particles appear to be free, but there is also some evidence of the presence of middlings, seen mainly in Figure 1. The greyish particles seen are taken as being serpentine gangue.

Signed: _____

H. E. A. von Hahn, P. Eng.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA H. E. A. VON HAHN

cont'd. p.3

Project BR-1

Progress Report #8 cont'd.

Photomicrographs:

Photomicrographs of mineral-particle-mounts of flotation concentrates showing pentlandite particles (white) and serpentine gangue particles (greyish).

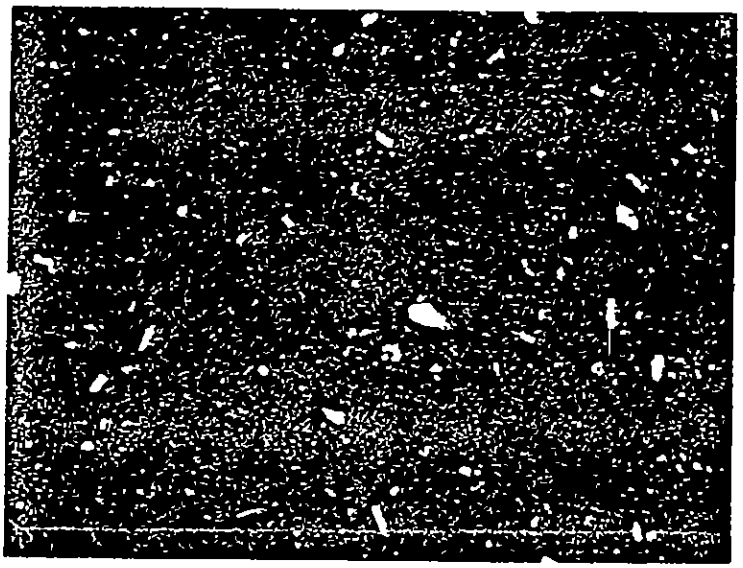


Figure 1: BRF-3, Conc. 1, Mag. 75x

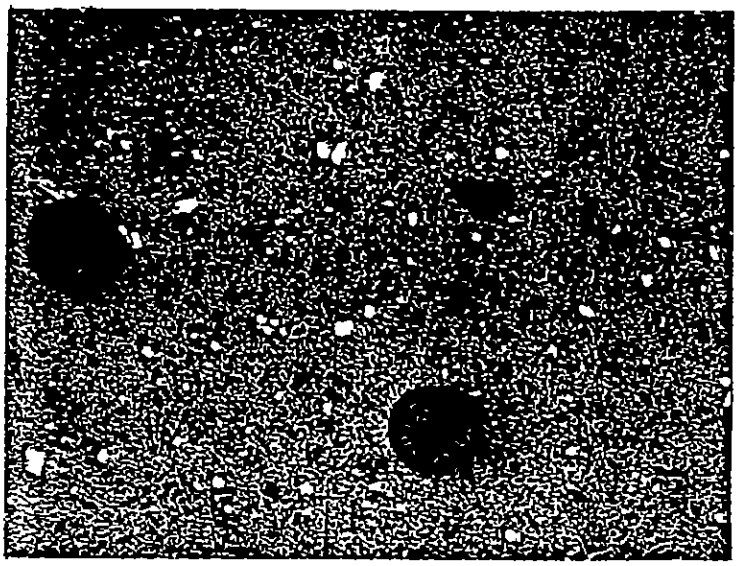


Figure 2: BRF-4, Conc. 1, Mag. 75x

cont'd. p.4

DOLMAGE CAMPBELL & ASSOCIATES (1975) LTD.
CONSULTING ENGINEERS

SUITE 1000-1055 W. HASTINGS STREET
VANCOUVER. CANADA V6E 2E9
TELEPHONE (604) 681-2345

March 27, 1981

A-Min-Tech Research Ltd.,
8464 Adera Street,
Vancouver, B.C.
V6P 5E7

Dear Dr. Von Hahn:

This is to advise you that I have made a brief examination of the polished sections of nickel sulphide concentrate you submitted to me bearing the following designations:

BRF 3	Conc. 1
BRF 3	Conc. 2
BRF 4	Conc. 1
BRF 4	Conc. 2
BRF 5	Conc. 1
BRF 5	Conc. 2

The polished section BRF 3 Concetrate 1 contains the most abundant sulphides, so I spent more time on this than the others. The grain size of the sulphides ranges downward from 0.03 mm to a few microns. They occur as free grains in a matrix of silicate, presumed to be mainly serpentine.

The mineralogy of the sulphides is simple. More than 98% of the grain are pentlandite. A minute amount of chalcopyrite was noted. One or two laths of possible millerite were also noted.

A small quantity (less than 2%) of magnetite is present. One grain of pentlandite associated with magnetite is recorded on the attached photomicrograph.

Sulphides appear to constitute about 10% of the section, but this is merely an educated guess. Pentlandite contains about 30% nickel by weight, so this suggests that the observed sulphides account for about 50% of the nickel in the concentrate if, as you state, the concetrate grade is on the order 6% nickel in BRF 3 Concentrate 1.

/2...

cont'd. p. 5

No other nickel-bearing minerals were noted. No nickel-iron alloy (awaruite) appears to be present. The high cobalt content you mentioned is no doubt contained mainly in the pentlandite.

I think you have achieved a remarkable concentrate considering (a) the grade of the heads of less than 0.3% nickel, and (b) the metallurgical difficulties of working with a serpentine-rich matrix.

Please let me know if I can be of further help. I am extremely busy these days, but I would try to make some time available for this week.

Kind regards.

Yours truly,

DOLMAGE CAMPBELL & ASSOCIATES (1975) LTD.

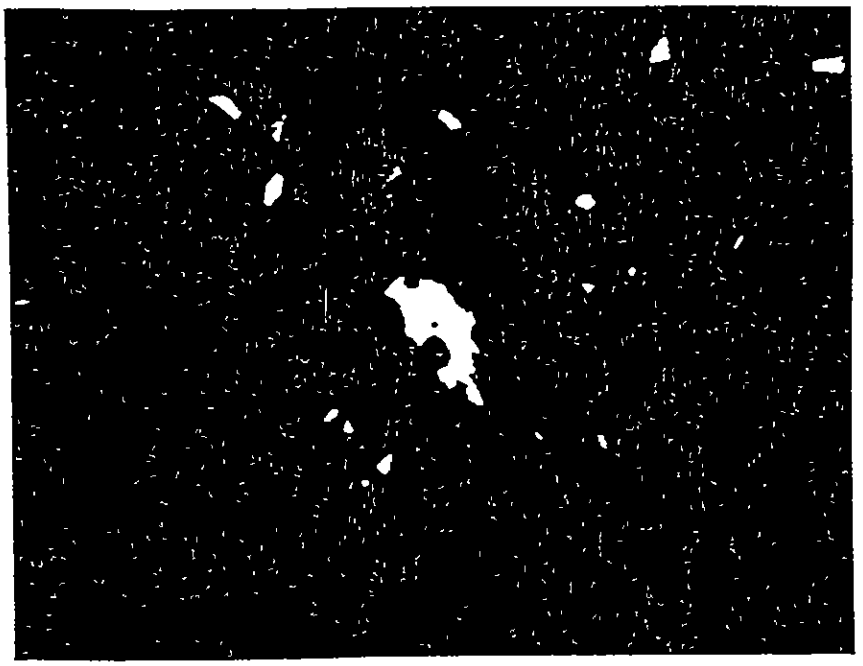
Joseph A. Chamberlain, Ph.D., P.Eng.

JAC:jm

cc: G.W. Hornby

cont'd. p. 6

BRF 3 Concentrate 1



0.1 mm (oil immersion)

Pentlandite (white grain, centre) associated with magnetiute (dark grey)

A-MIN-TECH RESEARCH LTD.

BORDER RESOURCES LTD.

Flotation Tests for Nickel and Cobalt Recovery

Progress Report #9

A-MIN-TECH RESEARCH LTD.

A Minerals Technology Service

Flotation, Hydrometallurgy
Research & Testing

PROJECT BR-1

Progress Report #9

Date: 25 May, 1981

To: Border Resources Ltd.,
412 Granville Square,
200 Granville Street,
Vancouver, B.C.,
V6C 1S4

Attention: G.W. Hornby

Project Title: Treatment of Serpentine Rock for Recovery of Nickel and Other Valuable Minerals.

Report Title: Flotation Tests for Nickel and Cobalt Recovery from Site 1 and Site 4 Serpentine Rock Samples.

Summary:

The purpose of the work reported in this progress report was a continuation of the work described in Progress Report #4, namely to find and develop conditions for optimum nickel and cobalt recovery.

Five flotation tests were done under different conditions of reagent addition, degree of grinding and stages of flotation.

In one test, BRF-8, Site 4 material, overall recoveries of 53.7% Ni and 52.8% Co were achieved, with combined concentrate grades being 2.29% Ni and 0.133% Co.

It is evident from these tests that fine grinding will be an essential feature in obtaining adequate nickel recoveries. Further work in that direction is in progress.

Experimental evidence indicates that pulp aeration and the use of CMC gangue dispersant are of importance for improving recoveries.

The flotation behaviour of Site 1 and Site 4 materials appears to be distinctly different. Recoveries and grades for Site 4 material have been found to be better under similar test conditions.

cont'd. p.2

A-MIN-TECH RESEARCH LTD.

Project BR-1

Progress Report #9 cont'd.

Table of Contents

List of Figures

List of Tables

A-MIN-TECH RESEARCH LTD.

Project BR-1

Progress Report #9 cont'd.

Flotation Tests for Nickel and Cobalt Recovery from Site 1 and Site 4 Serpentine Rock Samples.

Introduction:

Progress Report #4 gave results of flotation tests done on Site 4 material. These showed that nickel recoveries up to 43.1% and cobalt recoveries up to 39.1% had been obtained at combined concentrate grades of 4.2% Ni and 0.21% Co.

The tests described in the present report were done under conditions similar to those in the previous work with the aim to achieve better recoveries and to determine the effects of pulp aeration and finer grinding.

Experimental:

Material: Site 1 and Site 4 samples of serpentine rock in lumps ranging in size from 2" to 8". Approximate assays for both samples were 0.21% Ni and 0.011% Co.

Crushing, Grinding, Flotation: Laboratory equipment and procedures were the same as described in Progress Report #4.

Test Conditions:

Detailed test conditions for each test are listed in Tables 1 to 5.

Grinding: Grinding times were held constant at 37 min. except for tests BRF-6 (20 min.) and test BRF-10 (40 min.). Size distributions of the flotation feed are listed in footnotes (1) Tables 1 to 5.

Pulp Density: For grinding: 50% solids; for flotation: 25% to 22% solids.

Reagents: Collector: Na-isobutyl Xanthate, except for test BRF-6 where a combination of Na-ethyl Xanthate and K-amyl Xanthate was used; gangue dispersant: Carboxymethylcellulose; frother: Dowfroth 250.

Conditioning: Pulp conditioning was done following reagent addition for the lengths of time shown in Tables 1 to 5.

Aeration: Conditioning included aeration of the pulp in tests BRF-8, BRF-9, BRF-10. Aeration times are listed in footnotes (2) Tables 3 to 5.

cont'd. p.4

Project BR-1

Progress Report #9, cont'd.

Pulp pH: 9.5. This is the natural value for this pulp.

Pulp Temperature: 20°C starting. The temperatures rose during flotation to between 25°and 35°C as a result of the impeller stirring action.

Results and Discussion:

Results of the flotation tests are listed in Tables 6 to 10.

A summary of the concentrate grades and recoveries in terms of the cumulative results is shown below:

Test	% Weight	Ni% Grade	Ni% Recovery	Co% Grade	Co% Recovery
BRF-6					
Concentrate 1	0.36	1.75	3.25	0.092	3.09
Concentrate 1&2	0.60	2.11	6.58	0.108	6.10
BRF-7					
Concentrate 1	0.92	3.76	17.18	0.190	15.75
Concentrate 1&2	1.46	3.00	21.70	0.153	20.11
BRF-8					
Concentrate 1	2.39	3.76	43.77	0.218	43.12
Concentrate 1&2	4.04	2.56	50.34	0.148	49.38
Concentrate 1&2&3	4.81	2.29	53.73	0.133	52.83
BRF-9					
Concentrate 1	1.93	2.32	21.73	0.121	18.89
Concentrate 1&2	2.81	1.80	24.59	0.094	21.45
BRF-10					
Concentrate 1	1.01	2.76	13.81	0.128	12.93
Concentrate 1&2	2.69	2.11	28.12	0.102	27.53
Concentrate 1&2&3	3.91	1.62	31.33	0.079	30.71
Concentrate 1&2&3&4	5.85	1.19	34.61	0.058	34.02

Test BRF-8 was done with Site 4 material. All other tests were done with Site 1 material.

The recoveries of cobalt closely resemble those of nickel. This is consistent with results of previous tests (Progress Report #4) and is considered indicative of cobalt being part of the nickel mineralization.

cont'd. p.5

Project BR-1

Progress Report #9, cont'd.

The following discussion of results will be given in term of nickel, since cobalt follows nickel in its recovery behaviour.

The highest recoveries, 53.7%, were obtained in test BRF-8 on Site 4 material. This is consistent with the recoveries in test BRF-3, 43.1%, also on Site 4 material (Progress Report #4).

The highest recoveries on Site 1 material, 34.6%, were obtained in test BRF-10. The other Site 1 tests show recovery figures from 6.6% to 24.6%. No Site 1 tests were done in the earlier series (Progress Report #4).

To provide a convenient means for comparative analysis of the present tests as well as of those reported in Progress Report #4, plots were made of Recovery vs. Concentrate Grade. These plots are shown in Figure 1.

The plots appear essentially linear in the range of grades obtained, and have slopes that are indicative of the fact that grades go down as recoveries increase. The exception of plot BRF-6, where the grade increases with recovery, is thought to be a result of slow initial activation of pentlandite*.

The plots in Figure 1 will now be analyzed in terms of Site 4 and Site 1 material.

Site 4 material: Tests with this material were done first and sofar the best results have been achieved with it. This is with reference to plots BRF-8 and BRF-3. The similar slopes and apparent continuity of the two plots show that the two tests are consistent with respect to each other. Essentially the same conditions of grinding time and reagent addition were used in these tests. The main differences between them were that in BRF-8 more total solids were recovered during flotation, a slightly finer degree of grinding was obtained, and pulp aeration was done in a deliberate manner. In test BRF-3 pulp aeration happened by way of a trial basis.

Plots BRF-4 and BRF-5 are also based on Site 4 material. However recoveries and grades in these tests are much inferior. In both tests a sulfide promoter, Aero 407, was used in addition to the xanthate collector. It is understood from recent discussions(1) that this reagent can also act as a promoter for silicate minerals. Activation of serpentine gangue would certainly offer an explanation for the poor results obtained in these tests.

---

*Pentlandite has been shown to be the principal nickel sulfide mineral recovered in flotation concentrates. Ref: Progress Report #8.

cont'd. p.6

Project BR-1

Progress Report #9 cont'd.

Site 1 material: Plots BRF-10 and BRF-7 show a consistency of results in terms of linearity and slope similar to that obtained for BRF-8 and BRF-3. Recoveries for Site 1 material are however considerably lower. Grades are similar to those for Site 4 material, except for the two highest points on the BRF-10 plot, where they are lower because of more gangue carry over.

Plot BRF-10 exhibits a break as a result of a low initial recovery obtained in the first concentrate. This low recovery is attributed to the fact that the first concentrate was floated without the addition of Carboxymethylcellulose (CMC) gangue dispersant.

The slope of plot BRF-9 is similar to those of BRF-7 and BRF-10. The slope of plot BRF-6 is inverse to those of the other plots for Site 1 tests. As mentioned above this is thought to be related to slow initial activation of pentlandite.

In comparing the overall recoveries of the four Site 1 tests the following conclusions are drawn: The improved recoveries obtained for BRF-10 are attributed to a finer grind. The improved recoveries for test BRF-9 relative to those of BRF-7 are attributed to the use of aeration in BRF-9. The low recoveries obtained in BRF-6 are attributed to the coarse grind, the absence of CMC and lack of aeration. The change of collector in BRF-6 to a combination of Aero 325 and Aero 350 is considered to have had no significant effect on the results in this test. Similarly the different amounts and modes of reagent additions in test BRF-10 relative to tests BRF-7 and BRF-9 are not considered to have had significant effects. The additional and staged use of Dowfroth 250 in BRF-10 was necessary to provide adequate froths.

Conclusions:

Flotation tests on serpentine samples designated Site 4 and Site 1 reported on in this report and in Progress Report #4 have provided the following information: For Site 4 material overall nickel recoveries in the range of 43.1% and 53.7% have been obtained at corresponding concentrate grades of 4.2% and 2.3%. For Site 1 material overall nickel recoveries in the range of 21.7% to 34.6% with corresponding grades of 3.0% and 1.2% were achieved.

The results indicate a distinct difference in the flotation behaviour of Site 4 and Site 1 materials under similar test conditions.

Factors that appear to have significant effects on recovery are fine grinding and aeration during conditioning. Maximum grinding to date has been done to a size distribution of 97% -200 mesh, 79% -325 mesh.

cont'd. p.7

A-MIN-TECH RESEARCH LTD.

Project BR-1

Progress Report #9 cont'd.

Experimental evidence exists that indicates that the use of CMC as a gangue dispersant is of importance for improving recoveries.

References:

(1) Private communication with staff of Sherritt Gordon Mines Ltd.

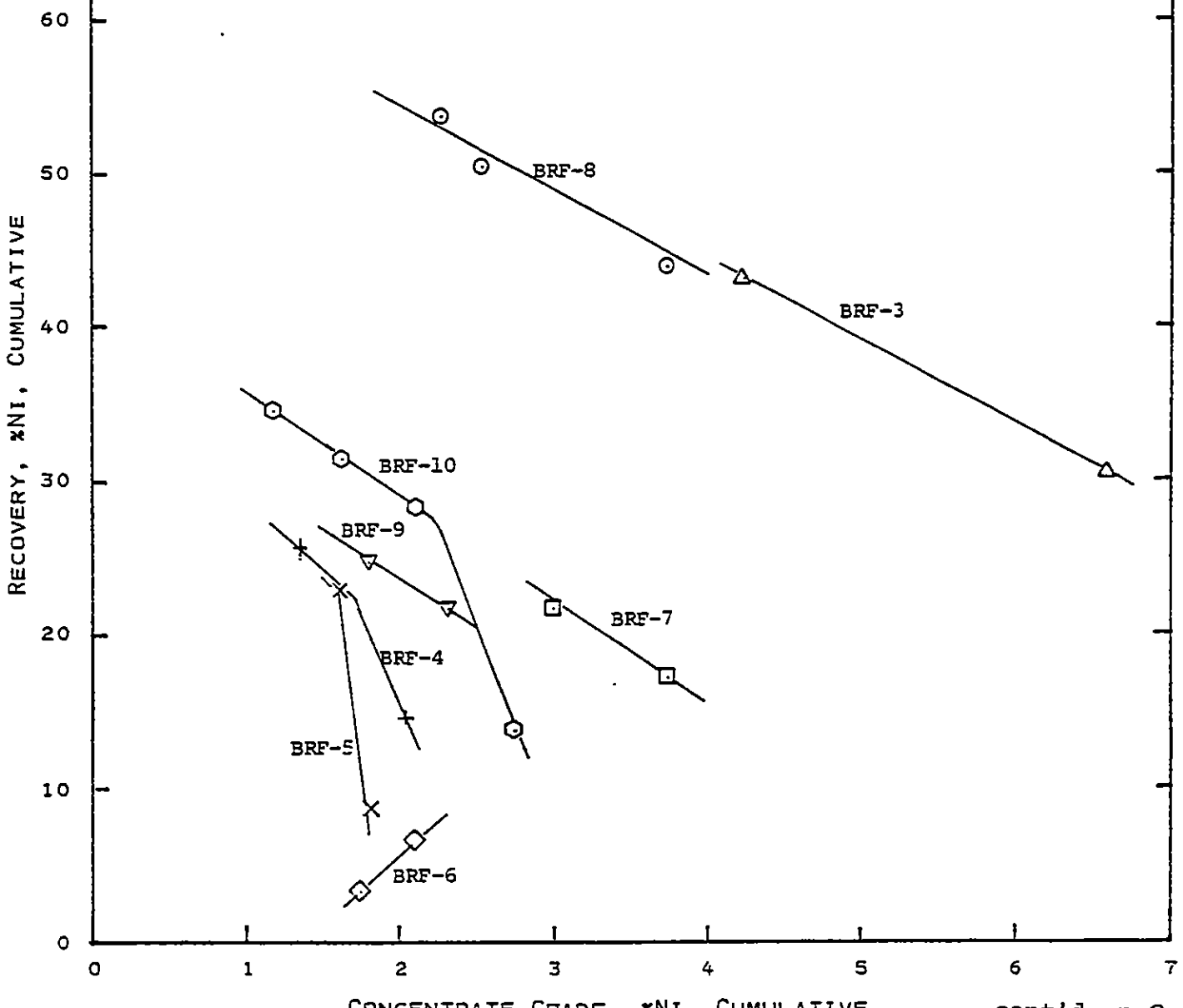
Signed: _____

H.E.A. ~~von Hahn~~, B.Eng.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA H. E. A. VONHAHN

FIGURE 1: PLOTS OF NICKEL RECOVERY VS. CONCENTRATE GRADE.

TEST #	MATERIAL FROM SITE
BRF-3	4
BRF-4	4
BRF-5	4
BRF-6	1
BRF-7	1
BRF-8	4
BRF-9	1
BRF-10	1



cont'd. p.9

Table 1

FLOTATION TEST BRF-6, TEST CONDITIONS

Material: Serpentine Rock, Site 1

STAGE	1 Grinding[1]	2 Conditioning	3 Head Sample	4 1st Flotation	5 Conditioning	6 2nd Flotation	7 Tailing Sample	Total Reagents
Weight of solids in pulp, gm	750	750	703	701	701	699	655	-
Water added, ml (makeup & wash)	750	1600	50	100	100	-	-	-
Pulp volume, ml	1050	2650	2550	2610	2710	2685	-	-
Pulp density, percent solids	50	24	24	23	22	22	-	-
REAGENTS ADDED lb per ton of solids feed								
- Aero 325[2]	-	0.02	-	-	0.03	-	-	0.05
- Aero 350[3]	-	0.03	-	-	0.04	-	-	0.07
- Dowfroth 250	-	0.02	-	0.02[4]	0.01	-	-	0.05
pH, natural	-	-	-	-	-	-	9.5	-
Pulp temperature, °C	-	28	-	32	34	36	-	-
SAMPLES TAKEN								
- Pulp volume, ml	-	-	150	40	-	25	150	-
- Weight of solids, gm	-	-	46.5	2.5	-	1.7	44.5	-
Time of operation, min	20	54	-	4	22	4	-	-
Time elapsed, min	20	88	73	92	118	122	-	-

(1) 65% -200 mesh, 47% -325 mesh
(2) Na-ethyl Xanthate
(3) K -amyl Xanthate
(4) Added in two stages

cont'd. p.10

Table 2

FLOTATION TEST BRF-7, TEST CONDITIONS

Material: Serpentine Rock, Site 1

STAGE	1 Grinding[1]	2 Conditioning	3 Head Sample	4 1st Flotation	5 Conditioning	6 2nd Flotation	7 Tailing Sample	Total Reagents
Weight of solids in pulp, gm	750	750	706	700	700	696	651	-
Water added, ml (makeup & wash)	750	1500[2]	-	150	-	40	-	-
Pulp volume, ml	1050	2550	2400	2490	2490	2490	-	-
Pulp density, percent solids	50	25	25	24	24	24	-	-
REAGENTS ADDED lb per ton of solids feed	-							
- Aero 317[3]	-	0.067	-	-	0.133	-	-	0.200
- CMC[4]	-	2.67	-	-	-	-	-	2.67
- Dowfroth 250	-	0.055	-	-	-	-	-	0.055
pH, natural	-	-	-	-	-	-	9.55	-
Pulp temperature, ^{o}C	19.5	24	-	-	28	-	29	-
SAMPLES TAKEN								
- Pulp volume, ml	-	-	150	60	-	40	150	-
- Weight of solids, gm	-	-	43.5	6.5	-	3.8	45.6	-
Time of operation, min	37	23	-	6	10	5	-	-
Time elapsed, min	37	64	61	70	82	87	-	-

(1) 94% -200 mesh, 72% -325 mesh
(2) Includes 200 ml CMC solution added in stages
(3) Na-isobutyl Xanthate
(4) Carboxymethylcellulose, Domtar Carboxel D435

cont'd. p.11

Table 3

FLOTATION TEST BRF-8, TEST CONDITIONS

Material: Serpentine Rock, Site 4

STAGE	1 Grinding[1]	2 Conditioning[2]	3 Head Sample	4 1st Flotation	5 Conditioning	6 2nd Flotation	7 Conditioning	8 3rd Flotation	9 Tailing Sample	Total Reagents
Weight of solids in pulp, gm	750	750	710	693	693	681	681	676	629	-
Water added, ml (makeup & wash)	750	1500[3]	100	80	-	-	-	-	-	-
Pulp volume, ml	1050	2550	2500	2500	2500	2450	-	2390	-	-
Pulp density, percent solids	50	25	24	23	23	23	23	24	-	-
REAGENTS ADDED lb per ton of solids feed										
- Aero 317[4]	-	0.067	-	-	0.133	-	-	-	-	0.200
- CMC[5]	-	2.7	-		-	-	-	-	-	2.7
- Dowfroth 250	-	0.055	-	-	-	-	0.04	-	-	0.095
pH, natural	-	-	-	-	-	-	-	-	9.5	-
Pulp temperature, °C	-	24	-	-	31	-	-	31	-	-
SAMPLES TAKEN										
- Pulp volume, ml	-	-	150	80	-	50	-	60	150	-
- Weight of solids, gm	-	-	40.1	17.0	-	11.7	-	5.5	46.7	-
Time of operation, min	37	36	-	8	10	5	2	6	-	-
Time elapsed, min	37	85	67	93	105	110	113	119	121	-

(1) 97% -200 mesh, 79% -325 mesh
(2) Conditioning included aeration, stage 2, 8min.
(3) Includes 200 ml CMC solution
(4) Na-isobutyl Xanthate
(5) Carboxymethylcellulose, Domtar Carboxel D435

cont'd. p.12

Table 4

FLOTATION TEST BRF-9, TEST CONDITIONS

Material: Serpentine Rock, Site 1

STAGE	1 Grinding[1]	2 Condi-tioning[2]	3 Head Sample	4 1st Flotation	5 Condi-tioning	6 2nd Flotation	7 Tailing Sample	Total Raegents
Weight of solids in pulp, gm	750	750	704	690	690	684	639	-
Water added, ml (makeup & wash)	750	1500[3]	200	200	-	100	-	-
Pulp volume, ml	1050	2550	2600	2650	2650	2680	-	-
Pulp density, percent solids	50	25	23	23	23	22	-	-
REAGENTS ADDED lb per ton of solids feed								
- Aero 317[4]	-	0.067	-	-	0.133	-	-	0.200
- CMC[5]	-	2.67	-	-	-	-	-	2.67
- Dowfroth 250	-	0.055	-	-	-	-	-	0.055
pH, natural	-	-	-	-	-	-	9.55	-
Pulp temperature, ^{o}C	-	18	-	24	-	-	-	-
SAMPLES TAKEN								
- Pulp volume, ml	-	-	150	150	-	70	-	-
- Weight of solids, gm	-	-	46.0	13.6	-	6.2	45.1	-
Time of operation, min	37	28	-	7	10	6	-	-
Time elapsed, min	37	81	70	88	103	109	111	-

(1) 92% -200 mesh, 70% -325 mesh
(2) Conditioning included aeration, stage 2, 11min.
(3) Includes 200ml CMC solution added in stages
(4) Na-isobutyl Xanthate
(5) Carboxymethylcellulose, Domtar Carboxel 435

cont'd. p. 13

Table 5

FLOTATION TEST BRF-10, TEST CONDITIONS

Material: Serpentine Rock, Site 1

STAGE	1 Grinding[1]	2 Conditioning[2]	3 Head Sample	4 1st Flotation	5 Conditioning[2]	6 2nd Flotation	7 Conditioning[2]	8 3rd Flotation	9 Conditioning	10 4th Flotation	11 Tailing Sample
Weight of solids in pulp, gm	750	750	704	697	697	685	685	676	676	662	620
Water added, ml (makeup & wash)	750	1600	-	50	150[3]	-	50	-	150[3]	-	-
Pulp volume, ml	1050	2650	2500	2490	2640	2540	2590	2470	2620	2470	-
Pulp density, percent solids	50	24	24	24	23	23	23	23	22	22	-
REAGENTS ADDED lb/ton of solids feed											Total Reagents
- Aero 317[4]	-	0.067	-	-	-	-	0.067	-	-	-	0.134
- Dowfroth 250	-	0.055	-	-	0.027	-	0.014	-	0.027	-	0.123
- CMC[5]	-	-	-	-	1.33	-	-	-	1.33	-	2.66
pH, natural	-	-	-	-	-	-	-	-	-	-	9.5
Pulp temperature, °C	20	-	-	23	-	-	-	26	-	31	-
SAMPLES TAKEN											
- Pulp volume, ml	-	-	150	60	-	100	-	120	-	150	150
- Weight of solids, gm	-	-	46.1	7.1	-	11.8	-	8.6	-	13.7	42.6
Time of operation, min	40	22	-	7	9	6	10	6	9	7	-
Time elapsed, min	40	78	71	85	95	101	114	120	131	138	140

(1) 97% -200 mesh, 78% -325 mesh
(2) Conditioning included aeration, stage 2, 8min., stage 5, 5min, stage 7, 3min.
(3) Includes 100 ml CMC solution added in stages
(4) Na-isobutyl Xanthate
(5) Carboxymethylcellulose, Domtar Carboxel 435

A-MIN-TECH RESEARCH LTD.

Table 6

FLOTATION TEST BRF-6, RESULTS

	Product	% Weight	% Nickel Assay	% Nickel Distribution	% Cobalt Assay	% Cobalt Distribution
INDIVIDUAL RESULTS	Head	-	0.20	-	0.011	-
	Concentrate 1	0.36	1.75	3.25	0.092	3.09
	Concentrate 2	0.24	2.64	3.33	0.132	3.01
	Tailings	99.40	0.18	93.42	0.010	93.90
	Head, Calculated	100.00	0.192	100.00	0.011	100.00
CUMULATIVE RESULTS	Concentrate 1	0.36	1.75	3.25	0.092	3.09
	Concentrate 1&2	0.60	2.11	6.58	0.108	6.10

cont'd. p.15

Table 7

FLOTATION TEST BRF-7, RESULTS

	Product	% Weight	% Nickel Assay	% Nickel Distribution	% Cobalt Assay	% Cobalt Distribution
INDIVIDUAL RESULTS	Head	-	0.20	-	0.011	-
	Concentrate 1	0.92	3.76	17.18	0.190	15.75
	Concentrate 2	0.54	1.69	4.52	0.090	4.36
	Tailings	98.54	0.16	78.30	0.009	79.89
	Head, Calculated	100.00	0.201	100.00	0.011	100.00
CUMULATIVE RESULTS	Concentrate 1	0.92	3.76	17.18	0.190	15.75
	Concentrate 1&2	1.46	3.00	21.70	0.153	20.11

cont'd. p.16

A-MIN-TECH RESEARCH LTD.

Table 8

FLOTATION TEST BRF-8, RESULTS

	Product	% Weight	% Nickel Assay	% Nickel Distribution	% Cobalt Assay	% Cobalt Distribution
INDIVIDUAL RESULTS	Head	-	0.21	-	0.012	-
	Concentrate 1	2.39	3.76	43.77	0.218	43.12
	Concentrate 2	1.65	0.82	6.57	0.046	6.26
	Concentrate 3	0.77	0.90	3.39	0.054	3.45
	Tailings	95.19	0.10	46.27	0.006	47.17
	Head, Calculated	100.00	0.206	100.00	0.012	100.00
CUMULATIVE RESULTS	Concentrate 1	2.39	3.76	43.77	0.218	43.12
	Concentrate 1&2	4.04	2.56	50.34	0.148	49.38
	Concentrate 1&2&3	4.81	2.29	53.73	0.133	52.83

cont'd. p.17

Table 9

FLOTATION TEST BRF-9, RESULTS

	Product	% Weight	% Nickel Assay	% Nickel Distribution	% Cobalt Assay	% Cobalt Distribution
INDIVIDUAL RESULTS	Head	-	0.22	-	0.012	-
	Concentrate 1	1.93	2.32	21.73	0.121	18.89
	Concentrate 2	0.88	0.67	2.86	0.036	2.56
	Tailings	97.19	0.16	75.41	0.010	78.55
	Head, Calculated	100.00	0.206	100.00	0.0124	100.00
CUMULATIVE RESULTS	Concentrate 1	1.93	2.32	21.73	0.121	18.89
	Concentrate 1&2	2.81	1.80	24.59	0.094	21.45

cont'd. p.18

Table 10

FLOTATION TEST BRF-10, RESULTS

	Product	% Weight	% Nickel Assay	% Nickel Distribution	% Cobalt Assay	% Cobalt Distribution
INDIVIDUAL RESULTS	Head	-	0.21	-	0.010	-
	Concentrate 1	1.01	2.76	13.81	0.128	12.93
	Concentrate 2	1.68	1.72	14.31	0.087	14.60
	Concentrate 3	1.22	0.53	3.21	0.026	3.18
	Concentrate 4	1.94	0.34	3.28	0.017	3.31
	Tailings	94.15	0.14	65.39	0.007	65.98
	Head, Calculated	100.00	0.202	100.00	0.010	100.00
CUMULATIVE RESULTS	Concentrate 1	1.01	2.76	13.81	0.128	12.93
	Concentrate 1&2	2.69	2.11	28.12	0.102	27.53
	Concentrate 1&2&3	3.91	1.62	31.33	0.079	30.71
	Concentrate 1&2&3&4	5.85	1.19	34.61	0.058	34.02

cont'd. p.19

CHEMEX LABS LTD.

212 BROOKSBANK AVE.
NORTH VANCOUVER. B C
CANADA V7J 2C1
TELEPHONE (604)984-0221
TELEX 043-52597

• ANALYTICAL CHEMISTS • GEOCHEMISTS • REGISTERED ASSAYERS

CERTIFICATE OF ASSAY

TO : A-MIN-TECH RESEARCH LIMITED
8464 ADERA STREET,
VANCOUVER, B.C.,
V6P 5E7

CERT. # : A8110702-001-A
INVOICE # : I8110702
DATE : 16-APR-81
P.O. # : NONE

ATTN: MR. JON HAHN

Sample description	Prep code	Cu percent	Ni percent	Co percent			
BRF-6 HEAD	214	--	0.20	0.011	--	--	--
BRF-6 CONC 1	214	--	1.75	0.092	--	--	--
BRF-6 CONC 2	214	--	2.54	0.132	--	--	--
BRF-6 TAILS	214	--	0.18	0.010	--	--	--
BRF-7 HEAD	214	<0.01	0.20	0.011	--	--	--
BRF-7 CONC 1	214	0.10	3.76	0.190	--	--	--
BRF-7 CONC 2	214	0.06	1.69	0.090	--	--	--
BRF-7 TAILS	214	<0.01	0.16	0.009	--	--	--

CTA MEMBER CANADIAN TESTING ASSOCIATION

Registered Assayer, Province of British Columbia

cont'd. p.20

CHEMEX LABS LTD.

212 BROOKSBANK AVE
NORTH VANCOUVER, B C
CANADA V7J 2C1
TELEPHONE (604)984-0221
TELEX 043-52597

• ANALYTICAL CHEMISTS • GEOCHEMISTS • REGISTERED ASSAYERS

CERTIFICATE OF ANALYSIS

TO : A-MIN-TECH RESEARCH LIMITED
8464 ADERA STREET,
VANCOUVER, B.C.,
V6P 5E7

CERT. # : A8110794-001-A
INVOICE # : I8110794
DATE : 11-MAY-81
P.O. # : NONE

ATTN: MR. VON HAHN

Sample description	Prep code	AU-FA+AA ppb					
BRF-3 HEAD	214	5	--	--	--	--	--
BRF-8 CONC #1	214	--	--	--	--	--	--
BRF-3 CONC #2	214	--	--	--	--	--	--
BRF-8 CONC #3	214	--	--	--	--	--	--
BRF-8 TAILS	214	5	--	--	--	--	--
	214	--	--	--	--	--	--
BRF-6 CONC #1	214	--	--	--	--	--	--

Certified by .....

CTA MEMBER CANADIAN TESTING

contd. p.21

CHEMEX LABS LTD.

212 BROOKSBANK AVE
NORTH VANCOUVER. B.C
CANADA V7J 2C1
TELEPHONE (604)984-0221
TELEX 043-52597

• ANALYTICAL CHEMISTS • GEOCHEMISTS • REGISTERED ASSAYERS

CERTIFICATE OF ASSAY

TO : A-MIN-TECH RESEARCH LIMITED
8464 ADERA STREET,
VANCOUVER, B.C.,
V6P 5E7

CERT. # : A8110881-001-A
INVOICE # :
DATE : 28-MAY-81
P.O. # : NONE

ATTN: MR. VON HAHN

Sample description	Prep code	Cr203 %	Ni percent	Co percent	Fe (%) acid ext		
BRF-9 HEAD	214	--	0.22	0.012	--	--	--
BRF-9 CONC 1	214	--	2.32	0.121	--	--	--
BRF-9 CONC 2	214	--	0.67	0.036	--	--	--
BRF-9 TAILS	214	--	0.16	0.010	--	--	--
BRF-3 MAG	214	1.01	0.13	0.011	DELAYED	--	--
BRF-7 MAG	214	2.78	0.13	0.013	DELAYED	--	--
BRF-3 NON MAG	208	0.34	0.17	0.009	DELAYED	--	--
BRF-7 NON MAG	208	0.20	0.12	0.007	DELAYED	--	--

Registered Assayer, Province of British Columbia

CTA MEMBER CANADIAN TESTING ASSOCIATION

cont'd. p.22

CHEMEX LABS LTD.

212 BROOKSBANK AVE
NORTH VANCOUVER B C
CANADA V7J 2C1
TELEPHONE (604)984-0221
TELEX 043-52597

• ANALYTICAL CHEMISTS • GEOCHEMISTS • REGISTERED ASSAYERS

CERTIFICATE OF ASSAY

TO : A-MIN-TECH RESEARCH LIMITED
8464 ADERA STREET,
VANCOUVER, B.C.,
V6P 5E7

CERT. # : A9110946-001-
INVOICE # : I9110946
DATE : 14-MAY-91
P.O. # : NONE
01-OCT-9.

ATTN: MR. H. VON HAHN

Sample description	Prep code	Ni percent	Co percent				
BRF-10 HEAD	214	0.21	0.010	--	--	--	--
BRF-10 CONC 1	214	1.76	0.126	--	--	--	--
BRF-10 CONC 2	214	1.72	0.087	--	--	--	--
BRF-10 CONC 3	214	0.63	0.026	--	--	--	--
BRF-10 CONC 4	214	0.34	0.017	--	--	--	--
BRF-10 TAILS	214	0.14	0.007	--	--	--	--

Registered Assayer, Province of British Columbia

A-MIN-TECH RESEARCH LTD.
A Minerals Technology Service

Flotation, Hydrometallurgy
Research & Testing

PROJECT BR-1

BORDER RESOURCES LTD.

Progress Report #10

Magnetic Fractionation of Nickel Flotation Tailings for Recovery of Magnetite and Chromite

8464 ADERA ST. VANCOUVER B.C. CANADA V6P 5E7 TEL 604 2630328

A-MIN-TECH RESEARCH LTD.
A Minerals Technology Service

Flotation, Hydrometallurgy
Research & Testing

PROJECT BR-1

Progress Report #10

Date: 31 December, 1981

To: Border Resources Ltd.,
412 Granville Square,
200 Granville Street,
Vancouver, B.C.,
V6C 1S4

Attention: G.W. Hornby, P. Eng.

Project Title: Treatment of Serpentine Sample for Recovery of Nickel and Other Valuable Minerals.

Report Title: Magnetic Fractionation of Nickel-Flotation Tailings for Recovery of Magnetite and Chromite.

Summary:

Single-stage magnetic fractionation tests were done on tailings of Site 4 and Site 1 nickel-flotation tests to recover magnetite and chromite. A Davis tube magnetic separator was used. The magnetic fractions showed the following grades and recoveries in terms of iron and chromic oxide:

Test #	Site	%Fe Assay	%Fe Recovery	$\%Cr_2O_3$ Assay	$\%Cr_2O_3$ Recovery
BRM-1	4	39.5	63.25	2.78	62.91
BRM-2	1	20.0	58.28	1.01	36.16

The stoichiometric iron content of magnetite is 72.4%. Commercial grades of magnetite concentrates are of the order of 69% iron. Further testwork is required to determine the feasibility of obtaining commercially viable grades and recoveries.

The calculated head-assays of the magnetic separator feeds were as follows:

Test #	%Fe	$\%Cr_2O_3$
BRM-1	6.79	0.48
BRM-2	5.49	0.45

These values are consistent with the iron and chromium values of emission spectrographic analyses of serpentine samples as reported in Progress Report #2.

cont'd. p.2

Analyses of the magnetic and non-magnetic fractions for oxide-iron and total-iron showed virtually no difference in values. This suggests that there is essentially no iron present in silicate form in the serpentine samples tested; which is encouraging from the point of view of seeking improvements in magnetite recovery.

No significant recovery of nickel and cobalt into the magnetic fractions took place. This suggests that native nickel-iron alloys (awaruite) are absent from the serpentine samples used.

No upgrading of precious metals took place in the magnetic separation tests, as indicated by comparison of assays of the magnetic fractions for gold, silver, platinum and palladium with corresponding assays of serpentine samples as reported earlier in Progress Report #2.

Semiquantitative emission spectrographic analyses were done on the magnetic fractions to determine the possible recovery of additional elements of importance. Comparison of the results with those obtained in earlier similar analyses of serpentine samples (Progress Report #2) showed essentially no differences except, of course, for iron and chromium. Some upgrading of manganese, vanadium and zinc occured also, but is not considered of significance because of the low initial values of these elements.

Mineralogical examinations of mineral-particle mounts of the magnetic fractions showed the dominant opaque mineral to be magnetite. Chromite particles were seen to be intergrown with magnetite. A single chromite particle was also seen. Pentlandite, haezlewoodite and/or millerite particles were present as mimor constituents as well as some chalcopyrite particles. No evidence was found of nickel-iron alloy particles (awaruite). Particle sizes mostly ranged downward from 25μ diameter. Some larger particles, up to 100μ diameter seen also. Gangue, making up 20-30% of particles present, was not identified but presumed to be antigorite.

Photomicrographs of mineral-particle mounts were prepared for illustrative purposes. Examinations of these indicates the presence of magnetite middlings. For comparison photomicrographs were also prepared of polished sections of Site 4 and 1 serpentine samples. A noteworthy observation was that the size range of the magnetite particles in the polished sections is similar to that in the particle mounts; indicating that no significant comminution of magnetite particles took place during grinding.

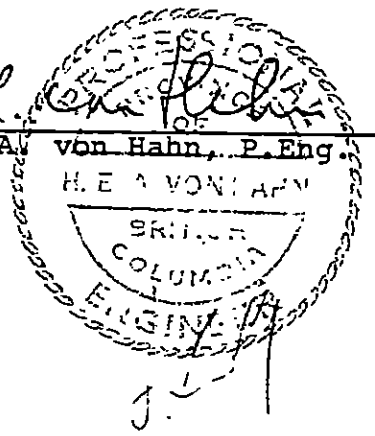
cont'd. p. 3

A-MIN-TECH RESEARCH LTD.

Border Resources Ltd.
Project BR-1
Progress Report #10 cont'd.

The easy recovery of chromite into the magnetic fraction is encouraging from the point of view of preparing bulk concentrates. The mineralogically observed intergrowth of magnetite with chromite indicates, however, possible difficulties in the separation of the two minerals and/or the achieving of satisfactory chromite concentrate grades.

Signed: _____
H.E.A. von Hahn, P.Eng.



cont'd. p.4

A-MIN-TECH RESEARCH LTD.

Contents:

cont'd. p.5

Introduction:

The presence of magnetite and chromite in the Border Resources Ltd. Coquihalla ultramafic complex had been indicated in reports by J.A. Chamberlain[1] and A.J. Sinclair[2].

Emission spectrographic analyses of serpentine samples, reported in Progress Report #2 of the present project, showed iron values of 5-10% and chromium values of 0.3-0.5%.

Visual observations on tailings of nickel-flotation tests indicated the presence of magnetite.

Accordingly it was decided to do single-pass magnetic separation tests on the tailings of two nickel-flotation tests to determine the feasibility of recovering magnetite and chromite.

Experimental:

Magnetic separation (or fractionation) tests were done on the tailings of flotation tests BRF-3 (Site 4 material) and BRF-7 (Site 1 material). The tests were designated BRM-1 and BRM-2 respectively.

The apparatus used was a Davis tube wet magnetic separator.

The work was done by Bacon, Donaldson & Associates Ltd.

The assays were done by Chemex Labs Ltd.; see Appendices I to III.

Results and Discussion:

Magnetite and Chromite Recovery: Results of the magnetic separations are given in Tables 1 and 2 for tests BRM-1 and BRM-2 respectively. The grades and distributions obtained in the magnetic and non-magnetic fractions are shown in terms of percent iron and percent chromic oxide (Cr_2O_3). They are summarized below for the magnetic fractions as follows:

Test #	Site	%Fe Assay	%Fe Recovery	%Cr_2O_3 Assay	%Cr_2O_3 Recovery
BRM-1	4	39.5	63.25	2.78	62.91
BRM-2	1	20.0	58.28	1.01	36.16

cont'd. p.6

A-MIN-TECH RESEARCH LTD.

Head Assays: Iron and chromium head assays for the magnetic separator feeds were calculated and are listed in Tables 1 and 2. They are summarized below:

Test #	%Fe	%Cr_2O_3
BRM-1	6.79	0.48
BRM-2	5.49	0.45

These values are consistent with the iron and chromium values obtained earlier in semiquantitative emission spectrographic analyses of serpentine samples of Sites 1 and 4 as reported in Progress Report #2.

Assessment of Results: It is evident from the data presented that considerable recovery and upgrading of both magnetite and chromite were achieved by single passage of nickel-flotation tailings through the magnetic separator. This is indicated particularly by the results of test BRM-1 with Site 4 material.

The stoichiometric iron content of magnetite is 72.4%. Commercial grades of magnetite concentrates for smelting purposes are of the order of 69% iron. The results obtained in this work in a single stage magnetic separation are not satisfactory in terms of commercial requirements. They are, however, considerd to be sufficiently encouraging to warrant further testwork.

Improvements in recovery will have to be sought by optimization of factors such as degree of grinding, pulp density, rate of throughput, magnetic field intensity. Improvements in grade will require further process steps such as additional passes of magnetic concentrates through the separator and regrinding of middling particles.

Another noteworthy feature of these results is the similarity of recoveries of magnetite and chromite. This is particularly evident in test BRM-1 where the recovery values for the two minerals are virtually identical. This behaviour is useful from the point of view of obtaining bulk concentrates. For the subsequent separation of chromite from magnetite it will be necessary to develop a process that will exploit any differences in the behaviour of the two minerals.

cont'd. p.7

A-MIN-TECH RESEARCH LTD.

Silicate-Iron: The question arose: How much of the iron in the magnetic concentrates is present in silicate form? To answer this, separate analyses were done for oxide-iron (by acid extraction) and total iron (by Na-oxide-peroxide fusion). The results are listed in Appendix I, and are shown below for examination.

Test #	%Fe acid extr.	%Fe total
BRM-1 Mag	39.50	39.50
BRM-2 Mag	19.50	20.00
BRM-1 Non-Mag	2.60	2.73
BRM-2 Non-Mag	2.60	2.80

The figures show that there is no silicate-iron in the magnetic fractions. Also, the amount of silicate-iron in the non-magnetic fractions is small.

The conclusion to be drawn is that virtually all the iron in the serpentine is present in oxide form, i.e., magnetite; not counting the small amounts (relatively speaking) of iron tied up in pentlandite.

No analyses were done for silicate-chromium, but in view of the similar behaviour of chromite and magnetite in the magnetic separations, it is concluded that silicate-chromium is not present in significant amounts.

The absence of any significant amounts of silicate-iron is encouraging from the point of view of seeking improvements in magnetite recovery.

Nickel and Cobalt Recovery: The magnetic and non-magnetic fractions of tests BRM-1 and BRM-2 were assayed for Nickel and Cobalt to determine whether any upgrading of these metals had occured as a result of the magnetic separation.

The results are listed in Appendix I and are shown below for examination. Also shown are the assays of the feed materials.

Test #	Magnetic Fractions %Ni	%Co	Non-Magnetic Fractions %Ni	%Co
BRM-1	0.13	0.013	0.12	0.007
BRM-2	0.13	0.011	0.17	0.009
			Separator Feed Materials	
BRM-1 data from Prog. Rep.#4 test BRF-3			0.12	0.007
BRM-2 data from Prog. Rep.#9 test BRF-7			0.16	0.009

cont'd. p.8

It is evident from these figures that essentially no upgrading of nickel and cobalt were achieved through magnetic separation. The slight increase in the cobalt assays of the magnetic fractions relative to those of the separator feed materials is not considered to be of significance.

These results suggest that no magnetically susceptible nickel- or cobalt- minerals, such as native nickel-iron alloys (awaruite), are present in the separator feed materials. The presence of nickel and cobalt in the magnetic fractions is attributed to the presence of sulfide particles carried over as part of the gangue. This conclusion is consistent with the findings of the mineralogical examinations discussed below.

Precious Metals Recovery: In view of the possible association of precious metals with magnetite, the magnetic fractions were analyzed for gold, silver, platinum and palladium. The values obtained are listed in Appendix II and are shown below together with corresponding earlier analytical values of Site 1 & 4 samples of serpentine (see Progress Report #2).

Test #	Site	Au ppb	Ag oz/ton	Pt ppb	Pd ppb
BRM-1 Mag	4	<100	0.01	<50	<25
BRM-2 Mag	1	<100	0.01	<50	<25
Serpentine samples Progr. Rept. #2					
1-D Cut	1	25	0.09	<50	150
4-A Cut	4	20	<0.01	<50	<50
4-B Cut	4	5	<0.01	<50	<50

These results show that essentially no upgrading of precious metals took place in the magnetic separation tests. The seemingly higher values of gold in the magnetic concentrates only reflect a less sensitive analytical method used on these concentrates as compared to that used on the serpentine samples.

Semiquantitative Emission Spectrographic Analyses: The magnetic fractions of tests BRM-1 and BRM-2 were subjected to 30-element semiquantitative spectrographic analyses to determine the possible recovery of additional elements of importance. The results are listed in Appendix III. On comparing these results with those obtained in earlier spectrographic analyses of Site 1 and 4 serpentine samples (Progress Report #2, Appendix I-3) no

cont'd. p. 9

significant differences are evident except, of course, for chromium and iron. Some upgrading is indicated for manganese, vanadium and zinc. However, the values are not high enough to be considered of importance.

Mineralogical Examinations: Mineralogical examinations were done on mineral-particle mounts of the magnetic fractions of tests BRM-1 and BRM-2. The purpose was to determine the mineral particle compositions of the fractions. The work was kindly done by Dr. J.A. Chamberlain. The observations were communicated orally to H. von Hahn during the examinations and taken down by him as notes.

The results of these examinations are as follows:

Mineral-Particle Mount, Magnetic Fraction, Test BRM-1

Magnetite: Dominant opaque mineral, most grains at 25μ (0.025mm) diameter.

Chromite: A little chromite present; magnetite intergrown with chromite; most chromite seems to be middling; a single chromite particle also seen, dia. 100μ (0.1mm).

Geologically chromite forms first; virtually no chromium should be present as silicate. Later during serpentinization magnetite precipitates out and often forms a rim around the chromite, hence the intergrowth.

Sulfides: A few discreet sulfide grains are present; some to 250μ diameter; most are identified as pentlandite; two grains of haezlewoodite also seen; for haezlewoodite read also millerite; sulfide particles large compared to magnetite particles; small sulfide particles (2-10μ) seen under higher magnification; small chalcopyrite particles also seen.

Nickel-Iron Alloys: No evidence was found of nickel-iron alloy particles (awaruite). This is consistent with finding that the magnetic separation tests yielded no upgrading of nickel.

Gangue: Gangue estimated to make up 20-30% of particles present; not identified but presumed to be antigorite on the basis of earlier identifications.

cont'd. p. 10

Mineral-Particle Mount, Magnetic Fraction, Test BRM-2

The observations made on this mount relative to magnetite, chromite and the sulfides were essentially the same as those made on the previous mount. The main difference was that the particles were generally smaller and the particle concentrations lower. No nickel-iron alloy particles were seen. The proportion of gangue was higher, being about 60%.

Photomicrographs of Mineral-Particle Mounts and Polished Sections: Figures 1 and 2 show photomicrographs depicting typical areas of the mineral-particle mounts of the magnetic fractions of tests BRM-1 and BRM-2. The photomicrographs were prepared to provide a visual means of illustrating the makeup of the magnetite concentrates. Figures 3 and 4 show photomicrographs of polished sections of respectively Site 4 and Site 1 serpentine samples which illustrate, for comparison, the mode of occurrence and particle-size distribution of magnetite and nickel sulfides in the host rock.
Descriptive details, explanatory of the pictures are given in the captions.

Mineral Particle Mounts: The photographic evidence in Figures 1 and 2 is essentially consistent with the mineralogical observations as given above. One additional observation is the indicated presence of magnetite middlings as can be seen by examination of the photographs with a magnifying glass. Middlings would require regrinding of the concentrate to improve the grade by further magnetic separations.

Polished sections: The photomicrographs in Figures 3 and 4 depict typical areas of the magnetite bearing serpentine of Sites 4 and 1 respectively. The Site 4 section exhibits a much greater magnetite particle density as well as the typical stringer-type arrangement of the magnetite particles. Surprisingly, the size range of magnetite particles in the polished sections is similar to that in the mineral particle mounts; suggesting that despite the considerable degree of grinding done to the magnetic separator feed (78% -325mesh) no significant comminution of magnetite particles took place.

Chromite Recovery: The easy recovery of chromite intc the magnetic concentrates, as shown above, is encouraging from the point of view of obtaining a bulk concentrate. The mineralogical examinations, which show magnetite intergrown with chromite, suggest

cont'd. p. 11

A-MIN-TECH RESEARCH LTD.

however, that there will be difficulties in separating the two minerals by magnetic means, as well as in obtaining a satisfactory grade of chromite concentrate if a successful separation method, e.g., flotation, is developed. Research in this direction is required.

Signed: _____

H.E.A. von Hahn, P.Eng.

cont'd. p.12

References:

1. J. A. Chamberlain, Geological Report Coquihalla Property, B.C., May 2, 1971, p. 4.

2. A.J. Sinclair, Mineralogy of a Composite Sample, Hornby-Menzies Ultramafic Complex, July 12, 1976, pp. 7-11.

cont'd. p.13

Table 1

MAGNETIC SEPARATION TEST BRM-1, RESULTS

Product	% Weight	% Fe Assay	% Fe Distribution	% Cr_2O_3 Assay	% Cr_2O_3 Distribution
Magnetic Fraction	10.87	39.5	63.25	2.78	62.91
Non-Magnetic Fraction	89.13	2.80	36.75	0.20	37.09
Head, Calculated	100.00	6.79	100.00	0.48	100.00

Feed Material: Tailings of flotation test BRF-3, Site 4 serpentine

cont'd. p.14

Table 2

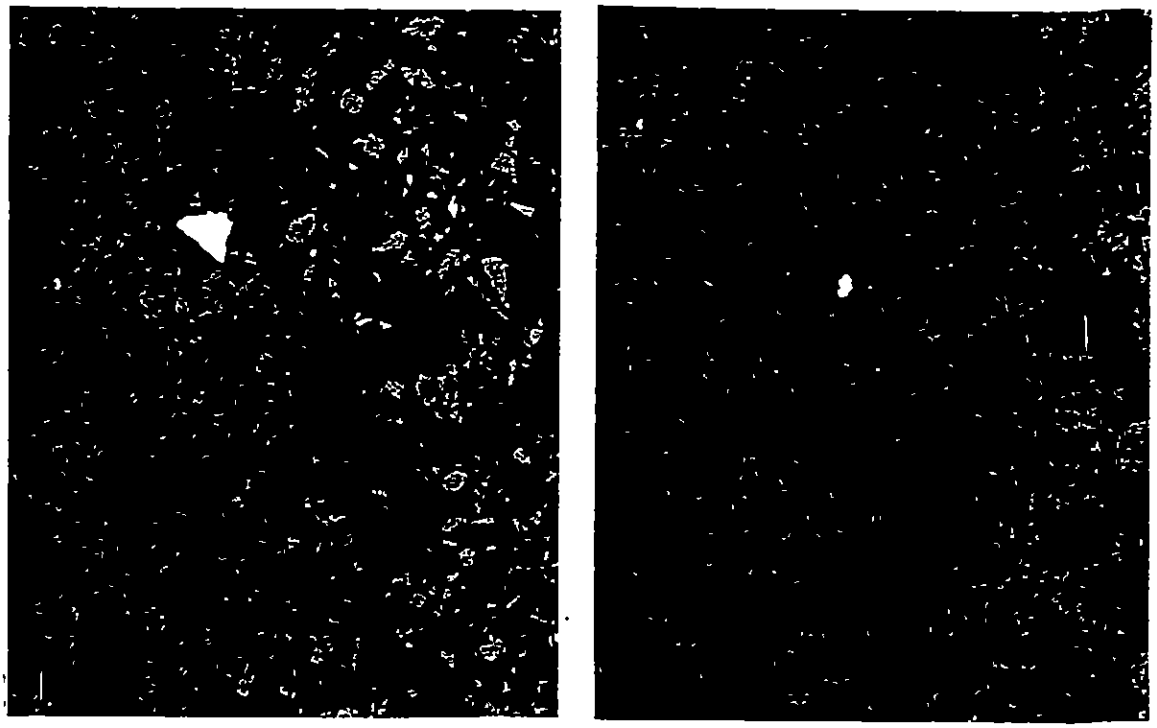
MAGNETIC SEPARATION TEST BRM-2, RESULTS

Product	% Weight	% Fe Assay	% Fe Distribution	% Cr_2O_3 Assay	% Cr_2O_3 Distribution
Magnetic Fraction	16.01	20.0	58.28	1.01	36.16
Non-Magnetic Fraction	83.99	2.73	41.72	0.34	63.84
Head, Calculated	100.00	5.49	100.00	0.45	100.00

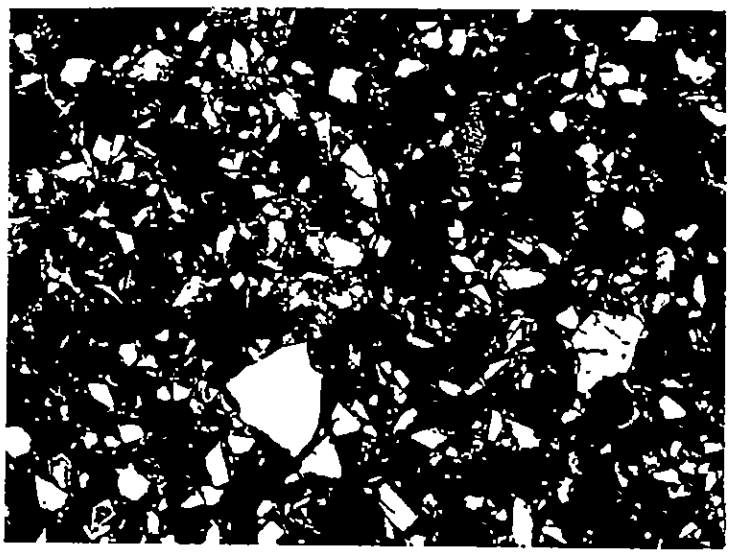
Feed Material: Tailings of flotation test BRF-7, Site 1 serpentine

cont'd. p.15

A-MIN-TECH RESEARCH LTD.



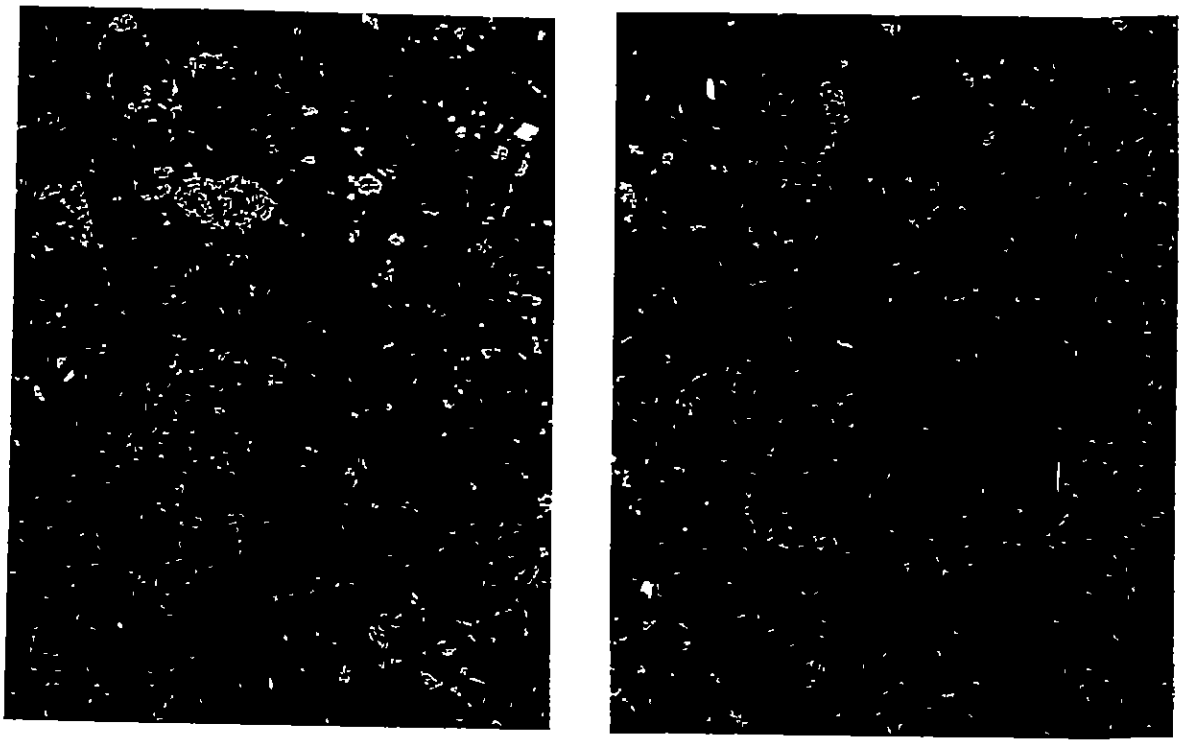
a b



c

Figure 1: Particle mount of magnetite concentrate, test BRM-1. Mag. 100X. Views a, b, c taken of different fields. Grey particles magnetite, size range 10-50μ. White particles nickel sulfides, pentlandite or possibly haezlewoodite/millerite. Serpentine gangue particles evident in plastic matrix. Magnetite middling particles also evident; seen best in view c by means of magnifying glass.

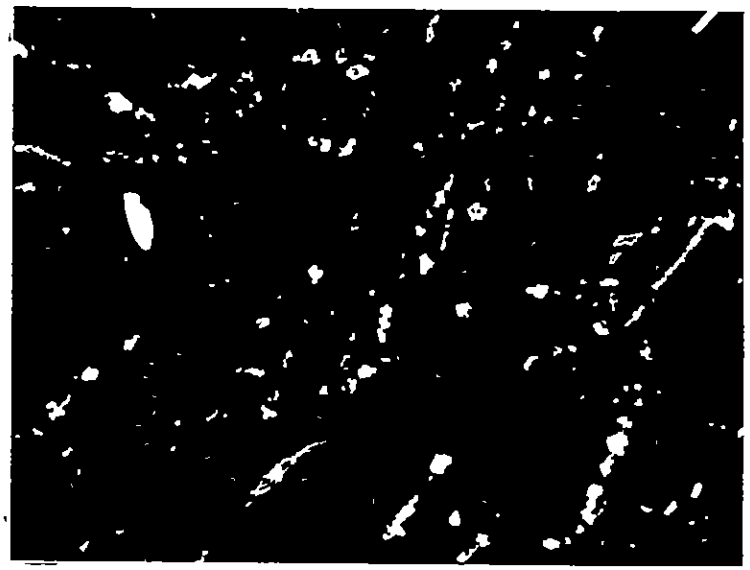
cont'd. p.16



a b

Figure 2: Particle mount of magnetite concentrate, test BRM-2. Mag. 100X. Views a and b taken of different fields. Grey particles are magnetite, size range 3-70µ, mainly 10-20µ. White particles nickel sulfides, pentlandite or possibly haezlewoodite/millerite. Serpentine gangue particles evident in plastic matrix. Magnetite middling particles also evident; seen best by means of magnifying glass.

cont'd. p.17

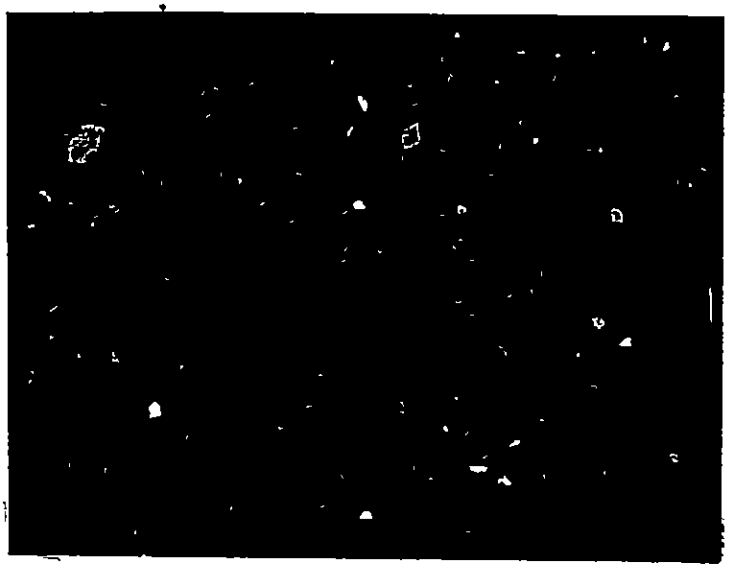


a 4 sec. exposure

b 2 sec. exposure

Figure 3: Polished section of serpentine sample, Site 4 material. Mag. 100X. Grey magnetite particles arranged in typical stringers in serpentine matrix. Size range 10-30μ. White particles are nickel sulfides, e.g., pentlandite; seen more clearly in view b. Pentlandite-magnetite middling evident near left side of view b.

cont'd. p.18



a 4 sec. exposure

b 2 sec. exposure

Figure 4: Polished section of serpentine sample, Site 1 material. Mag. 100X. Grey particles are magnetite. White particles are nickel sulfides, e.g., pentlandite; seen more clearly in view b. Size ranges 5-40μ.

cont'd. p.19

APPENDIX I 55.

CHEMEX LABS LTD.

212 BROOKSBANK AVE
NORTH VANCOUVER B C
CANADA V7J 2C1
TELEPHONE (604)984-0221
TELEX 043-52597

. ANALYTICAL CHEMISTS . GEOCHEMISTS . REGISTERED ASSAYERS

CERTIFICATE OF ASSAY

TO : A-MIN-TECH RESEARCH LIMITED
3+64 ADERA STREET,
VANCOUVER, B.C.,
V6P 5E7

CERT. # : A8110331-001-A
INVOICE # : I8110331
DATE : 03-JUN-81
P.O. # : NONE

ATTN: MR. VON HAHN

Sample description	Prep code	Cr_2O_3 %	Ni percent	Co percent	Fe (%) acid ext	Fe (%) total	
BRF-9 HEAD	214	--	0.22	0.012	--	--	--
BRF-9 CONC 1	214	--	2.32	0.121	--	--	--
BRF-9 CONC 2	214	--	0.67	0.036	--	--	--
BRF-9 TAILS Test #1	214	--	0.16	0.010	--	--	--
BRF-[illegible] MAG	BRM-2214	1.01	0.13	0.011	19.50	20.00	--
BRF-[illegible] MAG	BRM-1214	2.78	0.13	0.013	39.50	39.50	--
BRF-[illegible] NON MAG	BRM-2208	0.34	0.17	0.009	2.60	2.80	--
BRF-[illegible] NON MAG	BRM-1208	0.20	0.12	0.007	2.60	2.73	--

Registered Assayer, Province of British Columbia

CTA MEMBER CANADIAN TESTING

CHEMEX LABS LTD.

212 BROOKSBANK AVE
NORTH VANCOUVER B C
CANADA V7J 2C1
TELEPHONE (604)984-0221
TELEX 043-5259

• ANALYTICAL CHEMISTS • GEOCHEMISTS • REGISTERED ASSAYERS

CERTIFICATE OF ANALYSIS

TO : A-MIN-TECH RESEARCH LIMITED
8464 ADERA STREET
VANCOUVER, B.C.
V6P 5E7

CERT. # : A8114306-001-A
INVOICE # : I8114306
DATE : 13-NOV-81
P.O. # : NONE

Sample description	Test #	Prep code	Pt ppb	Pd ppb				
BRF 3 MAG (BRM-1)		214	<50	<25	--	--	--	--
BRF 7 MAG (BRM-2)		214	<50	<25	--	--	--	--

CTA MEMBER CANADIAN TESTING ASSOCIATION

Certified by .....

cont'd. p.21

CHEMEX LABS LTD.

212 BROOKSBANK AVE
NORTH VANCOUVER B C
CANADA V7J 2C1
TELEPHONE (604)984-0221
TELEX 043-52597

. ANALYTICAL CHEMISTS . GEOCHEMISTS . REGISTERED ASSAYERS

CERTIFICATE OF ASSAY

TO : A-MIN-TECH RESEARCH LIMITED
8464 ACERA STREET
VANCOUVER, B.C.
V6P 5E7

CERT. # : A8114306-001-A
INVCICE # : I8114306
DATE : 13-NOV-81
P.O. # : NONE

Sample description	Test #	Prep code	Au FA g/tonne	S %	Ag FA oz/T			
BRF 3 MAG (BRM-1)		214	<0.1	N.S.S.	0.01	--	--	--
BRF 7 MAG (BRM-2)		214	<0.1	0.09	0.01	--	--	--

Registered Assayer, Province of British Columbia

CTA MEMBER CANADIAN TESTING

cont'd. p.22

212 BROOKSBANK AVE.
NORTH VANCOUVER, B.C.
CANADA V7J 2C1
TELEPHONE: 984-0221
AREA CODE: 604
TELEX: 04-352597

CHEMEX LABS LTD.

ANALYTICAL CHEMISTS · GEOCHEMISTS REGISTERED ASSAYERS

CERTIFICATE OF ANALYSIS

CERTIFICATE NO. SP 1102

TO: A-Min-Tech Research Limited
8464 Adera Street
Vancouver, B. C.
V6P 5E7

INVOICE NO. 42723

RECEIVED Sept. 25/81

ANALYSED Oct. 15/81

ATTN:

SAMPLE NO. :	Lower Concentration Limit (PPM)	Test # → BRM-1 BRF 3 MAG	Test # → BRM-2 BRF 7 MAG
Aluminum	0.02%	0.5%	0.5%
Antimony	100	bcl	bcl
Arsenic	100	bcl	bcl
Barium	2	2	bcl
Beryllium	5	bcl	bcl
Bismuth	10	bcl	bcl
Boron	20	bcl	bcl
Cadmium	50	bcl	bcl
Calcium	0.05%	0.15%	0.3%
Chromium	10	>5000	>5000
Cobalt	20	50	50
Copper	2	30	30
Geramium	10	bcl	bcl
Iron	0.05%	>20%	20%
Lead	10	bcl	bcl
Magnesium	0.02%	5%	7%
Manganese	5	1000	2000
Molybdenum	100	bcl	bcl
Nickel	10	1000	1000
Niobium	200	bcl	bcl
Potassium	0.5%	bcl	bcl
Silicon	0.05%	7%	10%
Silver	1	bcl	bcl
Sodium	0.1%	bcl	bcl
Thorium	200	bcl	bcl
Tin	10	10	10
Titanium	20	100	70
Vanadium	50	100	100
Zinc	20	300	150
Zirconium	20	30	30

SEMI QUANTITIVE SPECTROGRAPHIC ANALYSES

>5000ppm=>5000ppm	50ppm=25-100ppm
5000ppm=2500-10000ppm	20ppm=10-50ppm
2000ppm=1000-4000ppm	10ppm=5-20ppm
1000ppm=500-2000ppm	5ppm=2-10ppm
500ppm=250-1000ppm	2ppm=1-4ppm
200ppm=100-400ppm	1ppm=0.5-2ppm
100ppm=50-200ppm	bcl=below concentration limit

Ranges for Iron, Calcium & Magnesium are reported in %

CTA MEMBER CANADIAN TESTING ASSOCIATION

CERTIFIED BY.

A-MIN-TECH RESEARCH LTD.

A Minerals Technology Service

Flotation, Hydrometallurgy
Research & Testing

PROJECT BR-1

Progress Report # 11 DRAFT

Date: 21 July, 1981

To: Border Resources Ltd.,
412 Granville Square,
200 Grqnville Street,
Vancouver, B.C.,
V6C 1S4

Attention: G.W. Hornby

Project Title: Treatment of Serpentine Rock for Recovery of Nickel and Other Valuable Minerals.

Report Title: Flotation Tests for Nickel and Cobalt Recovery from Site 11 and Site 12 Serpentine Rock Samples.

Summary:

The purpose of the work reported in this progress report was to investigate the nickel and cobalt flotation from Site 11 and Site 12 rock samples under conditions similar to those used in the earlier tests.

Four tests were done with Site 12 material and two tests with Site 11 material.

Flotation of Serpentine gangue was found to be a problem in these tests, particularly with Site 12 material.

For Site 12 material recoveries of up to 25.13% Ni and 24.26% Co were achieved with cumulative concentrate grades being 0.67% Ni and 0.028% Co.

For Site 11 material recoveries were up to 40.67% Ni and 42.01% Co with cumulative concentrate grades being 1.13% Ni and 0.055% Co.

Mineralogical examinations indicate that the low recoveries obtained for Site 12 material can be attributed to a relative deficiency and very small grain size of nickel sulphides.

8464 ADERA ST. VANCOUVER B.C. CANADA V6P 5E7 TEL 604 263 0338

Table

FLOTATION TEST BRF-16, RESULTS

Material: Serpentine Rock, Site 11

	Product	% Weight	% Nickel Assay	% Nickel Distribution	% Cobalt Assay	% Cobalt Distribution
INDIVIDUAL RESULTS	Head	-	0.21	-	0.010	-
	Concentrate 1	2.32	1.81	20.70	0.085	20.59
	Concentrate 2	1.87	1.22	11.20	0.060	11.66
	Concentrate 3	1.76	0.62	5.38	0.032	5.89
	Concentrate 4	1.38	0.50	3.39	0.027	3.87
	Tailings	92.67	0.13	59.33	0.006	57.99
	Head, Calculated	100.00	0.20	100.00	0.010	100.00
CUMULATIVE RESULTS	Concentrate 1	2.32	1.81	20.70	0.085	20.59
	Concentrate 1&2	4.19	1.55	31.90	0.074	32.25
	Concentrate 1&2&3	5.95	1.27	37.28	0.061	38.14
	Concentrate 1&2&3&4	7.33	1.13	40.67	0.055	42.01

Table

FLOTATION TEST BRF-15, RESULTS

Material: Serpentine Rock, Site 11

	Product	% Weight	% Nickel Assay	% Nickel Distribution	% Cobalt Assay	% Cobalt Distribution
INDIVIDUAL RESULTS	Head	-	0.21	-	0.011	-
	Concentrate 1	1.44	2.40	16.93	0.108	14.20
	Concentrate 2	1.45	1.34	9.55	0.064	8.50
	Concentrate 3	0.99	1.04	5.08	0.051	4.64
	Concentrate 4	0.89	0.64	2.82	0.034	2.79
	Tailings	95.23	0.14	65.62	0.008	69.87
	Head, Calculated	100.00	0.20	100.00	0.011	100.00
CUMULATIVE RESULTS	Concentrate 1	1.44	2.40	16.93	0.108	14.20
	Concentrate 1&2	2.89	1.87	26.48	0.086	22.70
	Concentrate 1&2&3	3.88	1.66	31.56	0.077	27.34
	Concentrate 1&2&3&4	4.77	1.46	34.38	0.069	30.13

Table

FLOTATION TEST BRF-14, RESULTS

Material: Serpentine Rock, Site 12

	Product	% Weight	% Nickel Assay	% Nickel Distribution	% Cobalt Assay	% Cobalt Distribution
INDIVIDUAL RESULTS	Head	-	0.20	-	0.009	-
	Concentrate 1	1.64	0.65	4.84	0.026	4.41
	Concentrate 2	2.89	0.79	10.34	0.034	10.13
	Concentrate 3	2.11	0.60	5.74	0.025	5.44
	Concentrate 4	1.65	0.56	4.21	0.025	4.28
	Tailings	91.71	0.18	74.87	0.008	75.74
	Head, Calculated	100.00	0.22	100.00	0.010	100.00
CUMULATIVE RESULTS	Concentrate 1	1.64	0.65	4.84	0.026	4.41
	Concentrate 1&2	4.53	0.74	15.18	0.031	14.54
	Concentrate 1&2&3	6.64	0.70	20.92	0.029	19.98
	Concentrate 1&2&3&4	8.29	0.67	25.13	0.028	24.26

Table

FLOTATION TEST BRF-13, RESULTS

Material: Serpentine Rock, Site 12

	Product	% Weight	% Nickel Assay	% Nickel Distribution	% Cobalt Assay	% Cobalt Distribution
INDIVIDUAL RESULTS	Head	-	0.22	-	0.011	-
	Concentrate 1	2.12	0.92	9.43	0.040	8.89
	Concentrate 2	2.81	0.69	9.40	0.029	8.56
	Concentrate 3	1.41	0.60	4.09	0.027	3.98
	Tailings	93.66	0.17	77.08	0.008	78.57
	Head, Calculated	100.00	0.21	100.00	0.010	100.00
CUMULATIVE RESULTS	Concentrate 1	2.12	0.92	9.43	0.040	8.89
	Concentrate 1&2	4.93	0.79	18.83	0.034	17.45
	Concentrate 1&2&3	6.34	0.75	22.92	0.032	21.43

Table

FLOTATION TEST BRF-12, RESULTS

Material: Serpentine Rock, Site 12

	Product	% Weight	% Nickel Assay	% Nickel Distribution	% Cobalt Assay	% Cobalt Distribution
INDIVIDUAL RESULTS	Head	-	0.22	-	0.009	-
	Concentrate 1	3.81	0.67	11.79	0.030	11.26
	Concentrate 2	3.26	0.44	6.62	0.021	6.74
	Concentrate 3	2.40	0.54	5.99	0.026	6.16
	Concentrate 4	2.24	0.60	6.23	0.028	6.20
	Tailings	88.29	0.17	69.37	0.008	69.64
	Head, Calculated	100.00	0.22	100.00	0.010	100.00
CUMULATIVE RESULTS	Concentrate 1	3.81	0.67	11.79	0.030	11.26
	Concentrate 1&2	7.07	0.56	18.41	0.026	18.00
	Concentrate 1&2&3	9.47	0.56	24.40	0.026	24.16
	Concentrate 1&2&3&4	11.71	0.57	30.63	0.026	30.36

Table

FLOTATION TEST BRF-11, RESULTS

Material: Serpentine Rock, Site 12

	Product	% Weight	% Nickel Assay	% Nickel Distribution	% Cobalt Assay	% Cobalt Distribution
INDIVIDUAL RESULTS	Head	-	0.23	-	0.012	-
	Concentrate 1	2.51	0.35	4.30	0.017	3.87
	Concentrate 2	2.37	0.42	4.86	0.020	4.30
	Concentrate 3	2.39	0.80	9.32	0.036	7.78
	Tailings	92.73	0.18	81.52	0.010	84.05
	Head, Calculated	100.00	0.20	100.00	0.011	100.00
CUMULATIVE RESULTS	Concentrate 1	2.51	0.35	4.30	0.017	3.87
	Concentrate 1&2	4.88	0.38	9.16	0.018	8.17
	Concentrate 1&2&3	7.27	0.52	19.48	0.024	15.95

DOLMAGE CAMPBELL & ASSOCIATES (1975) LTD.
CONSULTING GEOLOGICAL & MINING ENGINEERS
1000-1055 WEST HASTINGS STREET
VANCOUVER, CANADA V6E 2E9

Border Resources Ltd.

SAMPLING FOR NICKEL IN THE COQUIHALLA NORTH GROUP CLAIMS

October 10, 1981

Joseph A. Chamberlain Consultant Vancouver, Canada

TABLE OF CONTENTS

FIGURES

DOLMAGE CAMPBELL & ASSOCIATES (1975) LTD.
CONSULTING GEOLOGICAL & MINING ENGINEERS
1000-1055 WEST HASTINGS STREET
VANCOUVER, CANADA V6E 2E9

SAMPLING FOR NICKEL IN THE COQUIHALLA NORTH GROUP CLAIMS

1.0 Introduction

The writer was requested by Mr. G.W. Hornby of Border Resources Ltd. to conduct a nickel sampling program on a segment of the company's North Group Claims on the Coquihalla River, B.C.. Accordingly, the writer spent October 5 and 6, 1981, on the property, mapping and sampling outcrops in the designated area. In this work, he was ably assisted by Peter Hall.

2.0 Location (121°15'W, 49°29'N)

The subject claims are located ten miles east of Hope, B.C.. They are accessible by a well-maintained gravel road which presently services logging and mining companies operating in the area.

3.0 Geology

The regional and local geology have been described by the writer in the following reports and will not be repeated in the present report:

Nickel Distribution in Coquihalla Ultramafic Belt, August 30, 1969
Geological Report Coquihalla Property, May 2, 1971
Nickel Distribution in the Coquihalla Ultramafic Complex, Progress Report No. 2, August 28, 1971
Geochemical Program, Coquihalla Property, September 2, 1972.

4.0 Sampling Program

Much of the area selected for follow-up sampling occupies a burned area east of Fifteen Mile Creek. The traverse route and sampling locations are shown on Figure 1. Assay results are tabulated in Table 1. These represent assays of chip samples taken from the outcrop areas indicated in Figure 1.

TABLE 1

Sample Site No.	Chemex Sample No.	Elevation Feet (Metres)	Sulphide Nickel %	Total Rock Nickel %	Sulphide Ni as % of Total Ni
81-1	98701 B	2180 (664)	0.05	0.19	26
81-2	98702 B	2220 (676)	0.08	0.22	36
81-3	98703 B	2280 (695)	0.06	0.23	26
81-4	98704 B	2350 (716)	0.04	0.22	18
81-5	98705 B	2340 (713)	0.04	0.23	17
81-6	98706 B	2380 (725)	0.08	0.23	35
81-7	98707 B	2420 (738)	0.07	0.21	33
81-8	98708 B	2440 (744)	0.09	0.21	43
81-9	98709 B	2320 (707)	0.11	0.23	48
81-10	98710 B	1940 (591)	0.07	0.23	30
81-11	98711 B	1500 (457)	0.09	0.21	43
		Averages	0.07	0.22	32

5.0 Discussion

The total rock nickel values obtained in the samples under discussion range from a low of 0.19% to a high of 0.23%. The average total rock nickel content of the samples is 0.22%.

The so-called sulphide nickel content of the samples is obtained by a well-tested method of exposing the samples to a weak acid leach. In this procedure, the sulphides are dissolved while the silicates remain unaffected. The nickel associated with sulphides such as pentlandite and millerite goes into solution and is assayed. The sulphide nickel content of the subject samples ranges from a low of 0.04% to a high of 0.11%. The average sulphide nickel content is 0.07%.

On an average, therefore, the sulphide nickel constitutes 32% of the total rock nickel. In the most favourable case, the sulphide nickel constitutes 48% of the total rock nickel. This refers to sample site 81-9 where the total rock nickel is 0.23% and the sulphide nickel is 0.11%.

6.0 Conclusions and Recommendations

Site 81-9 contains the highest sulphide nickel component of the samples taken in the present program and is therefore a logical site from which to obtain additional samples for metallurgical testing. However, past experience indicates that other factors such as degree of serpentinization of the host rocks and size of the sulphide particles impose additional constraints on recovery of nickel by standard methods.

For the above reasons, one additional site is suggested for follow-up sampling. This is site 81-11 which is located on the old railway grade and is readily accessible. In this site, the total rock nickel is 0.21% and the sulphide nickel is 0.09%, or 43% of the total.

Respectfully submitted,
DOLMAGE CAMPBELL & ASSOC. (1975) LTD.

Joseph A. Chamberlain, P. Eng./Ph.D.

CHEMEX LABS LTD.

212 BROOKSBANK AVE
NORTH VANCOUVER, B C
CANADA V7J 2C1
TELEPHONE (604)984-0221
TELEX 043-52597

• ANALYTICAL CHEMISTS • GEOCHEMISTS • REGISTERED ASSAYERS

CERTIFICATE OF ASSAY

TO : Dolmage Campbell & Associates Ltd.,
Ste. 1000 - 1055 W. Hastings St.,
Vancouver, B.C.
V6E 2E9

CERT. # : A8114472-001-A
INVOICE # : I8114472
DATE : 17-OCT-81
P.O. # : NONE

ATTN: JOESEPH A. CHAMBERLAIN

Sample description	Prep code	Ni %	Ni sulf %				
98701	208	0.19	0.05	--	--	--	--
98702	208	0.22	0.08	--	--	--	--
98703	208	0.23	0.06	--	--	--	--
98704	208	0.22	0.04	--	--	--	--
98705	208	0.23	0.04	--	--	--	--
98706	208	0.23	0.08	--	--	--	--
98707	208	0.21	0.07	--	--	--	--
98708	208	0.21	0.09	--	--	--	--
98709	208	0.23	0.11	--	--	--	--
98710	208	0.23	0.07	--	--	--	--
98711	208	0.21	0.09	--	--	--	--

Registered Assayer, Province of British Columbia

CTA MEMBER
CANADIAN TESTING

SECTION 4

STATEMENT OF COSTS

(1) FIELDWORK:

(a) October 5-6, 1981: (Site Selection)

Meals and accommodation.	$41.63
Sundries	12.02
Transportation (4X4 truck 3/4 ton)	
282.1 miles (454 km @ 22¢/km). . .	99.88
Wages:	
Field Assistant (P. Hall)	
2 days @ $150.00/day	300.00
Expediting & Admin.	
1 day @ $200.00/day.	200.00
Consultant Geologist fees	
(invoice attached)	1,632.24
	$2,285.77

(b) October 24-26, 1981: (Sampling & Access)

Meals and accommodation.	$129.86
Equipment Rental:	
Cobra Packdrill	
($60.00/day X 3 days).	180.00
Chainsaw	
($15.00/day X 3 days).	45.00
Explosives	30.00
Sundries (incl. sample bags) . . .	56.93
Transportation (4X4 truck 3/4 ton)	
293 miles (471 km @ 22¢/km). .	103.62
Wages:	
Driller/blaster (P. Hall)	
3½ days @ $200.00/day.	700.00
Field Assistant (B. Barrow)	
3 days @ $100.00/day	300.00
	$1,545.41

(c) November 28, 1981: (Helicopter)

Meals and accommodation.	$4.05
Equipment Rental:	
Cobra Packdrill	
($60.00/day X 1 day)	60.00
Transportation:	
Helicopter charter	
(Rotortech invoice attached) . . .	75.00
4X4 Truck 3/4 ton	
261 miles (419 km @ 22¢/km). . . .	92.18
Wages:	
Driller/blaster (P. Hall)	
1 day @ $200.00/day.	200.00
	$431.23

STATEMENT OF COSTS (Continued)

(1) FIELDWORK (Cont.)

(d) December 4-5, 1981: (Landing Site)

Meals and accommodation.	$64.18
Equipment:	
2 chainsaws	
(1 day @ $20.00/day)	.40.00
Chainsaw repairs	.92.08
40 X 5-gal shipping barrels. . . .	160.00
Sundries	.35.66
Transportation (4X4 truck 3/4ton)	
263 miles (423 km @ 22¢/km). . . .	.93.06
Wages:	
Supervisor (P. Hall) . .	
1 day @ $200.00/day.	200.00
Field Assistant (G. Neumann)	
1 day @ $150.00/day.	150.00
	$834.98

FIELDWORK TOTAL: = $5,097.39

(2) METALLURGICAL RESEARCH:
(A-MIN-TECH invoices)

17 February 1982.	$1,977.53
17 May 1982 (telephone)	2,266.00
	$4,243.53

METALLURGICAL TOTAL: = $4,243.53

(3) REPORT AND MAP PREPARATION:

(3 days @ $200.00/day).	$600.00
Reprographics and stationery.	25.26
	$625.26

PREPARATION TOTAL: = $625.26

TOTAL THIS REPORT = $9.966.18

Do not
Microfilm

A-MIN-TECH RESEARCH LTD.

A Minerals Technology Service

Flotation, Hydrometallurgy
Research & Testing

INVOICE

PROJECT BR-1

Date: 17 February, 1982

To: Border Resources Ltd.,
412 Granville Square,
200 Granville Street,
Vancouver, B.C.,
V6C 1S4

For:

1.	Professional services re metallurgical work on serpentine samples supplied and as per attached activity record #9	$1400.00
2.	Outlays as per attached invoices and bills:	
	To Guy S. Palmer, photographer	33.75
	To Chemex Labs Ltd. Inv. # 42723	56.00
	To Chemex Labs Ltd. Inv. # I8114306	66.00
	To Dolmage Campbell & Associates Ltd. Inv. # 5438	120.00
	To General Testing Laboratories Inv. # 01074	66.40
	To Chemex Labs Ltd. Inv. # I8110881	206.00
	For xeroxing and supplies (binders) $16.08, $5.35, $7.95	29.38
	Total	$1977.53

Signed: _____
H.E.A. von Hahn, P.Eng.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
H. E. A VONHAHN

DOLMAGE CAMPBELL & ASSOCIATES (1975) LTD.
CONSULTING ENGINEERS

SUITE 1000-1055 W. HASTINGS STREET
VANCOUVER, CANADA V6E 2E9
TELEPHONE (604) 681-2345

BORDER RESOURCES LTD.
4547 West 5th Avenue
Vancouver, B.C.
V6R 1S6
Attention: Mr. G.W. Hornby

Statement
CONSULTING SERVICES

Invoice No.: 5473
Invoice Date: Nov. 9, 1981
Month of: Sept.-Oct., 1981

COQUIHALLA NICKEL PROPERTY

SITE EXAM, MEETINGS AND REPORTS			
Dr. J.A. Chamberlain (Site, Oct. 5-6)	(3-1/2 days @ $400)	$1,400.00	$1,400.00
TYPING	(1-1/2 hrs. @ $10)	$15.00	15.00
EXPENSES			
Oct. 8	J.A. Chamberlain	61.54	
Oct. 17	Chemex Labs Ltd.	153.45	
Oct.	Photocopies	2.25	217.24
	TOTAL THIS INVOICE		$1,632.24
	Less advance of October 5, 1981		1,000.00
	BALANCE OF PAYMENT		$632.24

E. & O. E.

SERVICE CHARGE OF 2 % PER MONTH CHARGED ON OVERDUE ACCOUNTS.

ROTORTECH HELICOPTERS LTD.

#201, 13766 - 72nd Avenue, Surrey, B.C. V3W 2P4
Telephone: (604) 591-7174

HELICOPTER CHARTER

DAILY FLIGHT REPORT

No. 151

Date Nov. 28/82

A/C Reg. No. 122 A/C Type Bell 206B Pilot Fuller

CHARTERER Border Resources

OPERATION	HRS.
	#75 —

Daily Total

By the chartering of the noted services or the signing of this Flight Report the Charterer acknowledges that all conditions associated with this charter shall be as set out in the Tariff filed with the A.T.C., which is available for examination at the office of ROTORTECH HELICOPTERS LTD.

Remarks

Charterer's Signature

Pilot's Signature

FUEL & OIL SUPPLIED BY	COMPANY	CHARTERER	HRS.	HRS.	FLYING	REVENUE	NON REVENUE

CHAIN SAW SALES

207 PEMBERTON AVENUE
NORTH VANCOUVER, B.C.
986-3916

023 AV

QUAN.	PART NO	DESCRIPTION	AMT PARTS	
1		Air Filtre	5	30
~~1~~		~~Bar~~ —	~~47.00~~	
1		Bar	47	00
1		chain	22	30
			74	60

Jon Edmonds

Clean set carb

Paid

Call.

M. Hall PHONE

ADDRESS 669-3616 DATE Dec 3, 81 19

MAKE & MODEL	MILEAGE	SERIAL NO	LICENSE	PROMISED

DESCRIPTION OF WORK	AMOUNT	
1 — Warn 21" Bar + chain		
1 — Check sprocket		
1 — Check Carb set carb	13	00

IN I HEREBY AUTHORIZE THE ABOVE WORK TO BE DONE TOGETHER WITH NECESSARY MATERIALS

SIGNATURE

OUT I HEREBY ACKNOWLEDGE MY INDEBTEDNESS IN THE AMOUNT OF

$ BEING THE TOTAL AMOUNT OWING, OR BALANCE OWING, AS SHOWN HEREON.

DATE SIGN

TOTAL LABOUR	13	00
TOTAL PARTS	74	60
TAX	4	48
TOTAL	92	08

ALL ESTIMATES ARE FOR LABOUR ONLY, MATERIALS ADDITIONAL. THIS COMPANY DOES NOT ASSUME ANY RESPONSIBILITY WHATEVER FOR UNITS LEFT FOR REPAIRS, STORAGE OR OTHER PURPOSES, OR FOR ARTICLES LEFT IN UNITS. UNITS DRIVEN BY OUR EMPLOYEES AT OWNER'S RISK

FORM #119

CUSTOMER INVOICE

REPRODUCTION OFFICES
- ☒ HARBOUR CENTRE, VANCOUVER, B.C.
- ☐ 1112 W. PENDER ST., VANCOUVER, B.C.
- ☐ LOWER MALL, BENTALL III, VANCOUVER, B.C.
- ☐ 1818 CORNWALL ST., VANCOUVER, B.C.
- ☐ 225 W. 1st. ST., NORTH VANCOUVER, B.C.

REPRODUCTION INVOICE

SUPERI REPROL_CTIONS & PRINTING

TELEPHONES:
REPRODUCTION 683-2181
ACCOUNTING 684-7177

REMITTANCE TO 77.
1112 W PENDER ST
VANCOUVER B C V6E 2S1

RECEIVED BY	TIME RECEIVED	PROMISED	REQUESTED	DUE DATE	DELIVER	WILL CALL	WAIT	WAIT DEL	CUSTOMER P.O NO.	REQ/JOB NO
	9.15						X			

P Hall.

DATE 20 DAY | 5 MO. | 82 YR. R 4h846

S	PICKED UP BY	S/C	SHIPPING INSTRUCTION
S	DEL. BY	S/C	( ) MAIL ( ) BUS ( ) AIR MAIL ( ) COLLECT ( ) AIR EXPRESS ( ) PREPAID

ORDERED BY 669. 3616 PLEASE QUOTE INVOICE NUMBER ON PAYMENT

PRINTS TO

ORIGINALS TO

SEQ	DEPT.	DUE DATE	IN	OUT	RUN	TRIM	Q.C.
	WHITE PRINT						
	1860						
	Film						
	XEROX 7000 IBM						
	SUB CONT.						

SPECIAL INSTRUCTIONS

( ) COLLATE ( ) CERLOX ( ) TRIM ( ) BIND

( ) FOLD ( ) STAPLE ( ) PUNCH HOLES

☐ READ ATTACHED ☐ REDUCE TO ☐ ENLARGE TO ☐ SAME SIZE

No. Of Orig.	No Prints of Each	DESCRIPTION				TOTAL SQ. FT	UNIT PRICE	AMOUNT	CODE
1	5	WHITE PRINT	BLUE BLACK BROWN	FRAME	PREFOLD	15			
		WHITE PRINT	CARD	PLAIN PLASTIC	32 LB 56 LB				
		SEPIA	STD. ERASABLE	REV FACE UP					
		MYLAR	002 003 0015	WHITELAR SEPIA BLACK	REV FACE UP				
		1860 2080	BOND	VELLUM					
		SPLICE							
		XEROX 7000/IBM	8½x11 8½x14	BOND TRANS	REDUCED SAME SIZE				
		PROJ. PAPER	KODA BRO KPS	K1594 PHOTO VEL					
		CONTACT PAPER	KC5	CONT-Trans	PROJ THIN STD				
		FILM NEG	TONE COPYLINE CRONAR	ACU-NEG HI-SPEED DUP	COMM CRONA PAQUE				
		AUTO POSITIVE	PAPER FILM	REV. FACE UP	MACHINE FRAME				
		FILM POS. CONTACT PROJ.	FACE UP REV.	Cronaflex Copyline Cronar Clear	RERRO NEG.				
		WASH OFF FILM	AUTO POS	CONTACT	PROJECT				

S.T.P.					SCREEN NEGATIVE	PAN NEGATIVE	
No. Of Orig.	No. Prints of Each	LINE	HALF TONE	SIZE	SIZE	SIZE	
SUB CONTRACT							

QUOTED BY	QUOTED PRICE	TOTAL	3 00
FEDERAL SALES TAX NO.		F.S.T.	27
		SUB TOTAL	
PROVINCIAL SALES TAX NO		PROV TAX	20
LABOUR OR OVERTIME			347
		DELIVERY CHARGES	
		PAY THIS	

INVOICE NUMBER	QUALITY CHECK BY	DATE	BILLED BY	DATE
D				

TERMS NET 30 DAYS

NEVILLE CROSBY INC.
672 RICHARDS STREET, VANCOUVER, B C V6B 3A7

ORDER NO. _____ DATE _____ 19____

SOLD TO _____

ADDRESS _____

SHIP TO _____

ADDRESS _____

WHEN SHIP	HOW SHIP	TERMS	BUYER	SALES REP.	
100	Mail Bag 12x20.			23	95
	Tax			1	44
				25	39

SIGNATURE

010164

D92

01. 30.82
0384 - A

TX 6.37HW
0.38TX
6.75 ST

20.00TCA
13.25 CH

CANADA
SAFEWAY

• A 0.00270 Total

Gr• 0.00030
Gr• 0.00240

0456 -5 Dec 81

Thank You
#123
VANCOUVER 4

12. 04.81
0170 - A

TX 4.05HW
0.24TX
4.29 ST

50.50TCA
46.21 CH

11.25.81
0097 - A

TX 4.99MA
0.30TX
5.29 ST

7.0
17

5.29
.34
6.63 T

B146
PULHAM & BLIGHT
LTD.
VANCOUVER B.C.

Canada Post / Postes Canada **Receipt Reçu**

Office Date Stamp / Timbre à date du bureau

647470
STN. - SUCC. "A"
18 XI 1981
VANCOUVER
B.C.

Received in payment for Postage Supplies / Reçu en paiement d'articles d'affranchissement

$ -3135

Signature

41-16-020 (5-72)

B & B SEYMOUR RENTALS

A DIVISION OF DESTOBEL ENTERPRISES LTD.
154 RIVERSIDE DRIVE • NORTH VANCOUVER, B.C. V7H 1T9
Phone: 929-4080

RENTAL AGREEMENT

RENTED TO P. HALL	DATE
ADDRESS 4728 W. 15TH	TIME OUT NOV 28 AM 7 48
	TIME IN
CAR LICENSE DRIVER'S LIC. PHONE NO. 224-6219	TO BE RETURNED ON

TYPE OF EQUIPMENT AND OTHER RENTALS	RENTAL PERIOD	RATE	AMOUNT
PIONJAR			
1 STARTER BIT			
1 4' BIT.			
E. & O.E.		TAX	
		DELIVERY	
		PICK-UP	
		TOTAL CHARGES	
		DEPOSIT	50 —
		BALANCE DUE ☐ RFD. ☐	

PLEASE TAKE NOTE:

An extra charge will be made if the equipment is not returned clean. Rental will be charged from the time equipment leaves our premises until it is returned to same. Sundays are charged as rental days. In case of failure of the equipment notify us immediately. No adjustment of any kind will be made unless above is complied with.

I/We, the undersigned, do hereby rent and accept the above listed equipment and acknowledge that it is in good working condition and agree to pay a stipulated rental and agree to take care of all the said equipment and to use it in a proper manner and agree that in the event any of the rented equipment is lost or destroyed before it is returned, to promptly pay to the company the full value of such rented property, in cash, and if damaged or injured in any way, to pay an amount equal to the reasonable cost of repairing the same and further do hereby exonerate, indemnify and save harmless the company from all claims or liabilities to all parties for damage or loss to me/us or any person, persons or property in any way arising out of or during the use of said equipment, It is agreed that upon failure to pay rent or if default is made in any of the other terms, hereof, the company may at once take possession of said rented equipment wherever the same may be found and remove the same, and the company or its agents shall in no way be liable for any claims, for damages or injury in the removal of said equipment. The renter declares to have examined the hitch, safety chain and all connections of said rental equipment to motor vehicle and to have received it in a secure condition.

It is understood that the rental commences as of the date hereof and ends only when the rented equipment is returned or delivered at the office or shop of the said company.

Equipment must be returned clean.

CASH PAYMENT ON RETURN OF GOODS UNLESS OTHERWISE ARRANGED

18440

CUSTOMER'S SIGNATURE

STOCKFORMS #1007-4 RENTAL AGREEMENT

CUSTOMER'S COPY

B & B SEYMOUR RENTALS

A DIVISION OF DESTOBEL ENTERPRISES LTD.
154 RIVERSIDE DRIVE • NORTH VANCOUVER, B.C. V7H 1T9
Phone: 929-4080

RENTAL AGREEMENT

RENTED TO Mr Hall	DATE 11/6/81
ADDRESS	TIME OUT
	TIME IN
CAR LICENSE DRIVER'S LIC. PHONE NO.	TO BE RETURNED ON

TYPE OF EQUIPMENT AND OTHER RENTALS	RENTAL PERIOD	RATE	AMO
RE PAIR COBRA			2(
E. & O.E.		TAX	
		DELIVERY	
		PICK-UP	
		TOTAL CHARGES	2(
		DEPOSIT	
		BALANCE DUE ☐ RFD ☐	2(

PLEASE TAKE NOTE:

An extra charge will be made if the equipment is not returned clean. Rental will be charged from the time equipment leaves our premises until it is returned to same. Sundays are charged as rental days. In case of failure of the equipment notify us immediately. No adjustment of any kind will be made unless above is complied with.

I/We, the undersigned, do hereby rent and accept the above listed equipment and acknowledge that it is in good working condition and agree to pay a stipulated rental and agree to take care of all the said equipment and to use it in a proper manner and agree that in the event any of the rented equipment is lost or destroyed before it is returned, to promptly pay to the company the full value of such rented property, in cash, and if damaged or injured in any way, to pay an amount equal to the reasonable cost of repairing the same and further do hereby exonerate, indemnify and save harmless the company from all claims or liabilities to all parties for damage or loss to me/us or any person, persons or property in any way arising out of or during the use of said equipment. It is agreed that upon failure to pay rent or if default is made in any of the other terms, hereof, the company may at once take possession of said rented equipment wherever the same may be found and remove the same, and the company or its agents shall in no way be liable for any claims, for damages or injury in the removal of said equipment. The renter declares to have examined the hitch, safety chain and all connections of said rental equipment to motor vehicle and to have received it in a secure condition.

It is understood that the rental commences as of the date hereof and ends only when the rented equipment is returned or delivered at the office or shop of the said company.

Equipment must be returned clean.

CASH PAYMENT ON RETURN OF GOODS UNLESS OTHERWISE ARRANGED

15230

CUSTOMER'S SIGNATURE

STOCKFORMS #1007-4 RENTAL AGREEMENT

CUSTOMER'S CO

79.

BIBLIOGRAPHY

Chamberlain, J.A. Nickel Distribution in Coquihalla Ultramafic Belt. August 30, 1969.

Geological Report - Coquihalla Property May 2, 1971

Nickel Distribution in the Coquihalla Ultramafic Complex, Progress Report No.2 August 28, 1971.

Geochemical Programme, Coquihalla Property. September 2, 1972.

Hall, P.S. Assessment Report - Based on Costs of Sample Collection for Metallurgical Research. May 22, 1981.

STATEMENT OF QUALIFICATIONS

I am a graduate of the University of British Columbia in Resource Geography.

I have worked in all phases of mineral exploration and as a Mineral Lands Manager with B.C. mining companies since 1969.

I participated in the performance of the fieldwork about which this report is based and can attest that the costs listed herein are both reasonable and correct.

Vancouver, B.C.
21 May 1982

P. Hall, BA

TAX 53

TAX 52

TAX 51

I.P. TAX 51+52
F.P. TAX 49+50

1000 m

900 m

800 m

700 m

600 m

500 m

680m

MPM 7+8 (W.P.)
690 m

604 m

690m

607 m

786 m

81-7
746m

81-8
744m

81-9
707m

81-6
725 m

81-5
713 m

81-4
716m

81-3
695 m

81-2
677m

81-1
664m

CAM (1s)
57841
691m

651m

642m

81-10
591m

OLD BURN
(now imm. Hf)

N28 FR.

N26

N27

GWH 2

flagstone quarry

1981 blazed line Az. 342°

GWH 1
450m

81-11
450m

washout

N25

Az. 12°

1981 Blazed line

N24

game trail

241061
241076

594m

N22,23,24,25
TAX 47,49

L.5+420W (390+360)

Old timbered
explosives magazine

logging debris

washout

N23

N29 FR.

N22

abandoned C.P.R. railway grade

G2

G1

FIFTEEN MILE CREEK

impassible
gorge

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT

[redacted]

0 100 200 300 400 500 m
0 500 1000 1500 feet

Traverse by chain and pace and compass

SAMPLING SITE
LOCATED CLAIM POST
POINT OF NOTE
ROCK BLUFF
SOLITARY FIR VET
HELICOPTER PAD

BORDER RESOURCES LTD.

1981
Coquihalla Valley
EXPLORATION PROGRAMME
North Group Claims

DRAWN BY: P. Hall
N.T.S.: 92 H/6 (W)
M.D.: New Westminster
SCALE: 1:5000

DATE: 7 October 1981

FIG. No. 4