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GEOLOGICAL
ASSESSMENT REPORT

on the

BROOKLYN CROWN-GRANTED CLAIM

PHOENIX AREA

GREENWOOD MINING DIVISION

NTS: 82E/2E
Latitude: 49°06.2' North
Longitude: 118°36.1' West
Owner: Noranda Exploration Co. Ltd.
Operator: Kettle River Resources Ltd.
Consultant: K.L. Daughtry & Associates Ltd.
Author: W.R. Gilmour
Date: June 29, 1982

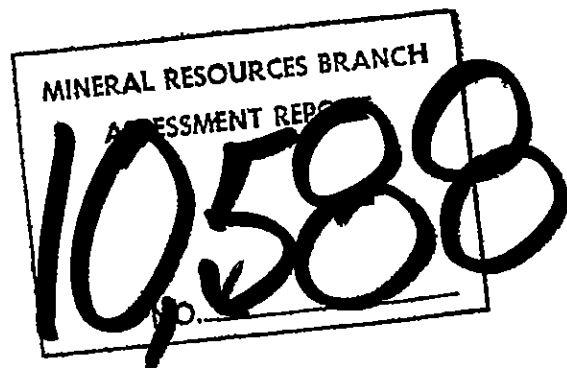


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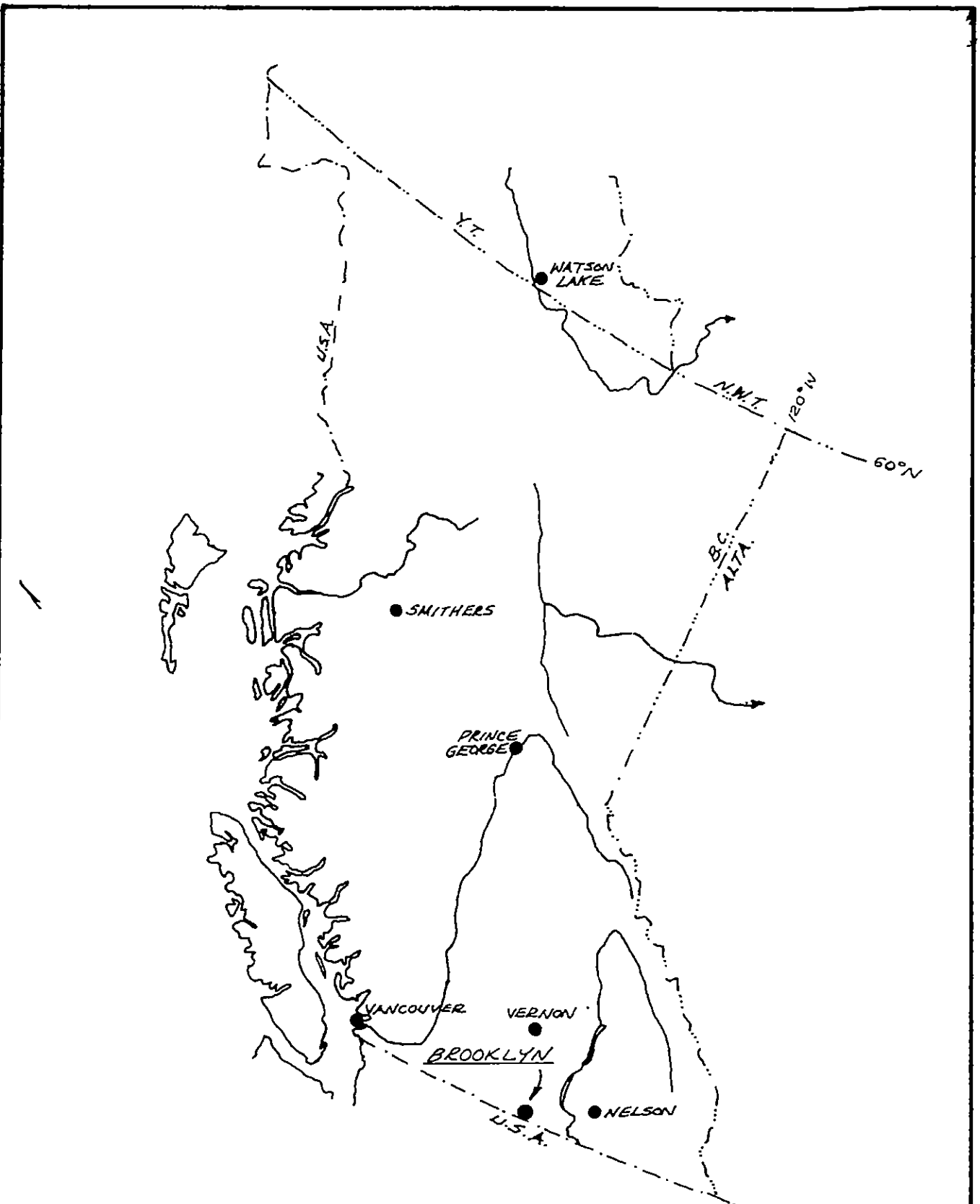
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SUMMARY

This report describes the results of a geological mapping and sampling programme carried out on the BROOKLYN Crown-granted claim during May and June, 1982. Mapping was carried out at a scale of 1:500. A total of 17 rock samples were collected and assayed or geochemically analysed for gold, silver and/or copper.

Significant stratiform and stratabound copper-gold and pyrite-gold mineralization occurs on the BROOKLYN. The property exhibits good exploration potential and a programme of further exploration is recommended.



K.L. DAUGHTRY & ASSOC. LTD

KETTLE RIVER RES. LTD.

LOCATION MAP
BROOKLYN C.G.

JUNE, 1982

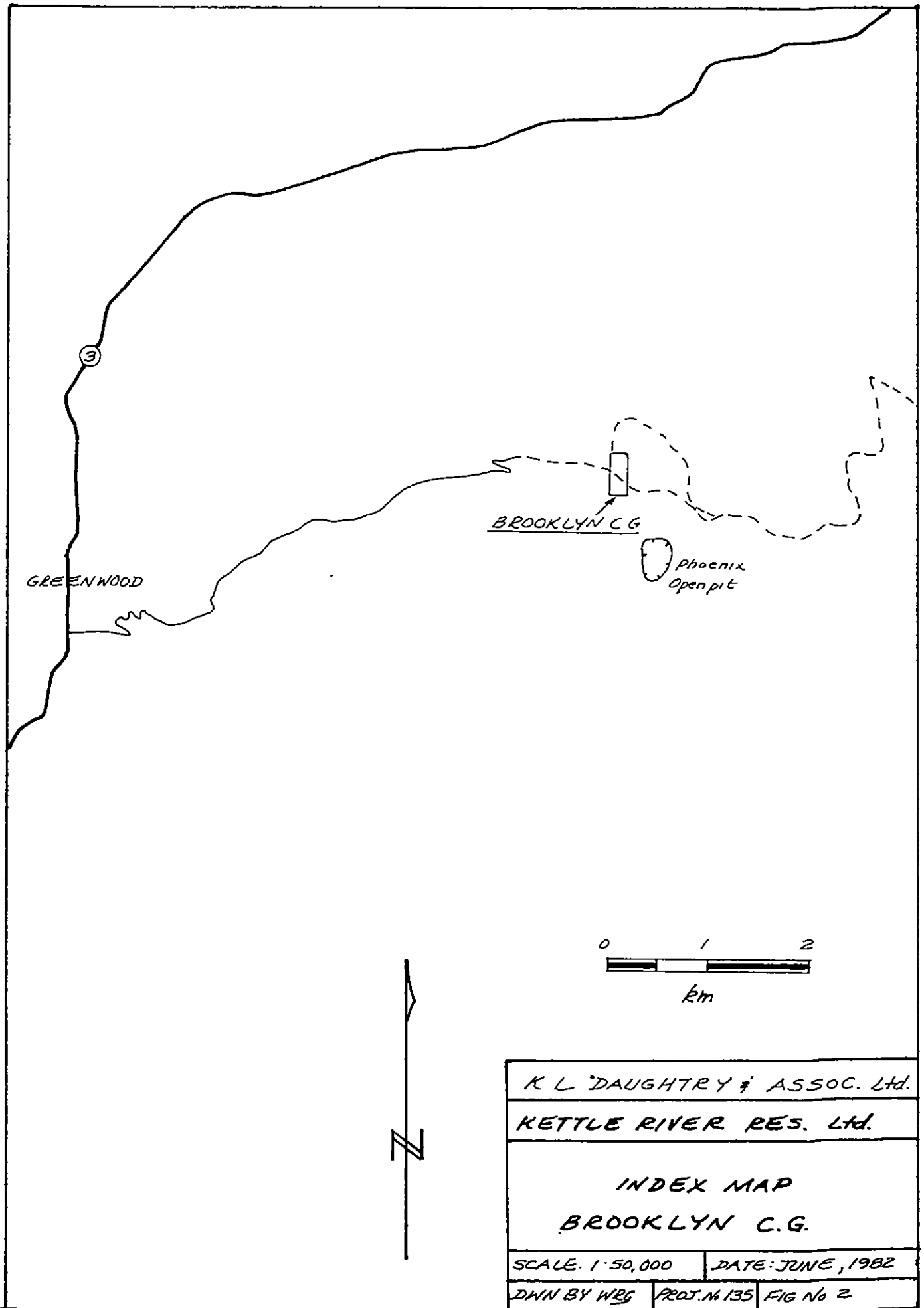
FIG. NO. 1

LOCATION, ACCESS, AND TOPOGRAPHY

The BROOKLYN claim is located 5.5 km east of Greenwood, in the Phoenix Camp of the Boundary District of south-central British Columbia. The BROOKLYN is at $49^{\circ}06.2'$ N. Latitude and $118^{\circ}36.1'$ W. Longitude. The National Topographic System map reference is 82E/2E.

Good access is provided by well maintained gravel roads, adjacent to the area mapped. The distance westerly, via a gravel and then paved road, to Greenwood is about 8 km and easterly is about 12 km to Highway 3.

The elevation of the north glory hole is about 1400 m at sea level and the topography has a moderate slope to the southwest. The southern part of the claim is covered by waste rock and mine tailings from the Phoenix mine. Much of the north glory hole has also been filled with tailings.



K L DAUGHTRY & ASSOC. Ltd.

KETTLE RIVER RES. Ltd.

INDEX MAP
BROOKLYN C.G.

SCALE: 1:50,000

DATE: JUNE, 1982

DWN BY WRG

PROJ. No 135

FIG No 2

PROPERTY

The BROOKLYN Crown-granted claim (Lot 796) was located in 1891 by Joseph Taylor and Stephen Margott. The claim is 20.65 acres (8.36 hectares) in area and is owned by Noranda Exploration Company Limited (no personal liability). The IDAHO (Lot 981) and the NEW YORK (Lot 901) Crown-granted claims adjoin to the south and north respectively. The BROOKLYN is presently grouped in the CYCLOPS 82 group.

Kettle River Resources Ltd. acquired the property on option from Noranda in 1981.

HISTORY

The first recorded production from the BROOKLYN was in 1892 when 120 tons were shipped. The Dominion Copper Company operated the BROOKLYN mine, although not continuously, from 1901-1908. To the end of 1908 the mine was credited with producing 250,293 tons of ore grading 1.2% copper, 0.068 oz/ton gold, and 0.35 oz/ton silver (59). However, LeRoy (45) estimated that only about 135,000 tons came from the BROOKLYN during this period. This discrepancy could account for significant differences in tenor from the above mentioned grades. Minor production occurred in 1918, 1919, 1926, 1928 and 1932. Previous reports (32,58) indicate that the ore body petered out at depth (below 250 foot level?), coinciding with a change to easterly, flatly dipping beds.

The IDAHO mine, the continuation southward of the BROOKLYN zone, was worked between 1906 and 1916, producing 2,570 tons of ore grading and 0.9% copper, 0.033 oz/ton gold, and 0.21 oz/ton silver.

Gold values much above the average for the Phoenix camp have been described in various reports:

"Beyond the orebody proper in the north end of the Brooklyn, pyritic crystalline limestone occurs in a raise from the 150 foot level. A sample was taken across the face and an assay made by H. A. Leverin of the Mines Branch, which gave 0.3 ounce of gold and 0.4 ounce of silver to the ton." (LeRoy, p 101)

"The rocks in which the copper ores were mined in the past were limestone, whereas the recently found gold values are associated with pyrite and calcite in brecciated volcanics lying on the hanging-wall side of the tilted sedimentary beds...a 5-foot chip sample taken across the face of the 80-foot level in the BROOKLYN assayed: Gold, 0.80 oz.; silver, 0.2 oz. per ton; copper, nil. It has been a well known fact for some years that a gold-pyrite zone existed between the STEMWINDER and BROOKLYN mines, and also that some high gold values were associated with the copper ores, but no work has been done as yet to prove the continuity or width of it." (1932 B.C.M.M. Annual Report, p 129)

"Immediately east of the north end of the Brooklyn south glory hole, a promising area was pointed out by W.E. McArthur, a former operator. The following samples were therefrom obtained: Three feet assaying 0.44 oz. gold and 0.5% copper per ton; six feet assaying 0.35 oz. gold and 0.4% copper: and eight feet assaying 0.16 oz./ton gold and 0.3% copper... This showing will be tested by Hole B8 now being drilled." (Northern Miner, Jan. 23, 1947)

No gold values were reported from hole 8 drilled on the BROOKLYN claim (43,54). Diamond drill hole B-16 gave a 8.5 foot section (318.5'-327') averaging 0.30 oz/ton gold, with generally low copper values (50). The true width is not known. This zone was intersected beneath the road about 25 m east of the south end of the north glory hole (43,54). Other drilling (holes 8, B12) encountered significant gold intersections in sharpstone conglomerate(?) about 90 m east of the Brooklyn shaft (43). There are also indications of a narrow pyrite-gold zone adjoining the west side of the main copper zone (43).

Kilburn (44) shows a "hanging wall gold section" (east) and a "foot wall copper section" (west) on the 80 foot level of the mine, east of the north glory hole.

From 1936 to 1940 the mine was operated by lessees, W.E. McArthur being the lessee from 1937 to 1940. Production during this period amounted to 34,250 tons of ore grading 0.86% copper, 0.20 oz/ton gold, and 0.24 oz/ton silver (59). The gold grade is higher and the copper and associated silver grades are lower than in previous production figures.

In 1947, drilling by the Brooklyn-Stemwinder Gold Mines Ltd. (see above) on the BROOKLYN (43,49,50,54) encountered gold mineralization southeast of the north glory hole.

In 1948, diamond drilling was done on the NEW YORK to test a pyrite-gold showing. However, "although considerable pyrite core was obtained, the assays

were not encouraging" (36).

During 1960-1961 and 1963-1964, Phoenix Copper Co. Ltd. a wholly owned subsidiary of Granby Mining Corporation mined at least 140,361 tons of ore from an open pit on the IDAHO claim. To the end of 1964 the BROOKLYN-IDAHO deposits produced at least 275,000 tons of ore.

In 1966 I.P. surveys by Hunttec (40A,50A) showed a strong, north-south anomalous zone ("Zone A") over at least 450 m in length. Associated resistivity lows indicated a conductive anomaly. The zone was tested, north and west of previous mining, by 3 diamond drill holes. The I.P. anomaly appears to correspond to the lower part of the Brooklyn limestone near the clastic contact. Disseminated pyrite with minor chalcopyrite was encountered. There is no indication that the pyritic zone was analyzed for gold.

In 1968 Granby drilled percussion holes in the BROOKLYN-IDAHO area looking for open-pit potential but the cuttings were only assayed for copper (43,52,54). The results were deemed "not encouraging" (52), although some ore grade intersections were drilled. Drilling of vertical percussion holes into steeply dipping mineralization made geological interpretation difficult. In 1968 (or 1970?) Granby obtained gold values from some of the grab samples taken from old trenches east of the BROOKLYN glory hole (53,54). Four of eleven grab samples assayed greater than 0.20 oz per ton gold, the highest being 1.25 oz per ton (53).

Noranda Exploration Company Ltd. acquired the property from Granby in 1978. Kettle River Resources Ltd. acquired an option on the property in 1981 and carried out an exploration programme comprising trenching, geological mapping and rock sampling (42A).

WORK PROGRAMME 1982

Geological mapping and rock sampling were carried out, mostly in the vicinity of the old Brooklyn shaft. Geological mapping was done on a 1:500 scale and 17 rock samples were collected.

REGIONAL GEOLOGY AND MINERALIZATION

Proterozoic(?) gneisses and schists are the oldest rocks in the Greenwood area. Their relationship to the younger rocks is unclear at present.

Pennsylvanian-Permian rocks comprise two distinct rock units (55); 'oceanic' basalt and chert, and 'trench and arc' clastic (chiefly pelitic) and volcanic (andesite to rhyolite) rocks. The Upper Paleozoic rocks have undergone moderate metamorphism and folding.

Tectonically emplaced ultramafic rocks of probable Permian age (55) commonly occur in the area. Minor platinum (SAPPHO), chromium and nickel showings are related or occur in these generally serpentized rocks. Deposits spatially associated with the Ironclad serpentinite (WINNIPEG, ATHELSTAN-JACKPOT, GOLDEN CROWN, KENO, IRONCLAD, and WINNER) produced 16,800 oz. gold and 47,000 oz. silver from 74,000 tons of ore.

Overlying the Upper Paleozoic rocks are middle to upper Triassic rocks of the Rawhide and Brooklyn formations. Shales of the Rawhide Formation are conformable with the overlying Brooklyn Formation (57). The Brooklyn Formation comprises three main rock types: (55)

1. Clastic units of shale, greywacke and/or conglomerate. The clasts in the conglomerates are either chert pebbles ('sharpstone'), volcanic rocks, or limestone ('puddingstone').
2. Carbonate units, grading from pure limestone to limy shale. Iron and copper mineralization occurs in impure limestones and limy shales.
3. Tuffaceous units which in places are difficult to distinguish from

greywackes and vice versa.

All of the above rock types are intercalated and commonly have been metamorphosed to coarse grained marbles and calc-silicate rocks.

In the Greenwood area very significant copper-gold-silver mineralization occurs in the Brooklyn Formation. The ore deposits are restricted to what has been previously classified as 'skarn' (1,38,41,45,56,57,59,60). It was believed that certain stratigraphic horizons, comprising porous limy sediments, were more susceptible to hydrothermal fluids emitting from a mineralizing intrusion, resulting in the formation of calc-silicate skarns and iron and copper mineralization, that is, 'contact metasomatic' deposits. However the author of this report supports a different view, summarized by Peatfield (p 185) as follows:

"...the deposits are stratabound metamorphic, probably originally sedimentary concentrations of copper and iron in limey [sic] shales associated with the landward edges of limestone reefs, or located in 'pools' within reefal accumulations."

These Triassic deposits are generally stratabound and are occasionally stratiform (e.g. EMMA and north end of the BROOKLYN). The deposits have been deformed tectonically, to varying degrees, by faults and folds and cut by intrusive rocks. Pyrite, chalcopyrite, hematite and magnetite are the common 'ore' minerals. Sphalerite occurs in the area of the CYCLOPS showing. Garnet, epidote, actinolite, calcite and quartz are the common 'gangue' minerals, with notable changes in relative amounts according to each particular camp.

Production figures for the main Triassic deposits are as follows:

	Tons <hr/>	Cu %	Au oz/ton	Ag oz/ton
<u>PHOENIX CAMP</u> - Knob Hill, Old Ironsides, Stenwinder, Brooklyn, Idaho, Snowshoe, Rawhide, Gold Drop, Curlew, Monarch	30,278,000	0.85%	0.032	0.20
<u>DEADWOOD CAMP</u> - Motherlode, Sunset, Greyhound, Morrison	4,643,000	0.86%	0.038	0.16
<u>SUMMIT CAMP</u> - BC, Emma, Oro Denorc, Mountain Rose	<u>506,000</u>	<u>1.8%</u>	<u>0.023</u>	<u>0.65</u>
TOTAL	35,427,000	0.86%	0.033	0.20

Andesitic volcanic rocks of probable Jurassic age occur east of the Phoenix area, overlying the Brooklyn Formation. No economic mineral deposits are known to exist in these rocks. The Mesozoic rocks have undergone moderate folding, with a general north-south axial trace of slightly northward plunging open folds.

Intrusive 'Nelson' rocks of Cretaceous age do not seem to be genetically related, except through metamorphism, to the copper-gold-silver Triassic deposits. Porphyritic rocks of Cretaceous(?) age host copper mineralization at the CITY OF PARIS deposit (39), and are responsible for the copper-silver mineralization on the SAPPHO prospect (42).

Mineralized quartz veins of Cretaceous and/or Tertiary(?) age occur in the Greenwood area apparently with random areal distribution. The seven main deposits (DENTONIA, PROVIDENCE, SKYLARK, YANKEE BOY, NUMBER SEVEN, E PLURIBUS UNUM and LAST CHANCE) have produced 54,400 oz. of gold and 2,015,000 oz. of silver from 179,000 tons of ore.

During Tertiary times deposition of clastic sediments and volcanic flows

and the intrusion of acidic to basic igneous rocks accompanied graben-like normal faulting (48).

PROPERTY GEOLOGY & MINERALIZATION

Chalcopyrite± hematite± pyrite± epidote± chlorite mineralization occurs in impure, recrystallized grey Triassic limestone and in greenish argillaceous beds near a regional marble/clastic contact (Figure 3). The underlying (older) white limestone unit is generally massive & recrystallized, with some thin-bedded sections. The overlying (younger) clastic units appears to be mainly sedimentary in origin with some tuffaceous volcanic component. Lithic fragments and rounded to angular chert clasts give the rocks a breccia/conglomerate texture. These Triassic rocks are probably older than those to southeast which host the majority of the Phoenix deposits (55).

Rock samples, totalling 17, were collected and assayed or geochemically analysed, by Bondar-Clegg & Co. Ltd. for Au, Ag and/or Cu by standard methods. The results are shown on Table 1 and the sample locations are plotted on Figure 4.

A generally highly weathered rusty zone east of the Brooklyn shaft was sampled in detail. A copper-gold zone is bordered by narrower pyrite-gold zones. The copper zone average 0.58% Cu, 0.069 oz/ton Au and 0.17 oz/ton Ag across 8.8 metres. The total mineralized zone is exposed for 11.8 metres and assays 0.069 oz/ton Au.

Tertiary bedding plane faults show both vertical and horizontal displacement. How these faults effect the location of mineralization at depth, where the beds are dipping flatly to the east, is not known.

Epidote, chlorite and minor diopside are the main alteration minerals. No hard, massive 'skarn', as commonly exists in the Phoenix mine, has been mapped on

the BROOKLYN.

TABLE 1

<u>SAMPLE NUMBER</u>	<u>SAMPLE TYPE</u>	<u>WIDTH</u> <u>m</u>	<u>Cu</u> <u>%</u> or ppm*	<u>Au</u> <u>oz/ton</u>	<u>Ag</u> <u>oz/ton</u>	<u>COMMENTS **</u>
73026	chip	0.6	1.43	.057	.32	greenish impure marble; hem, py
73027	chip	1.4	65*	<.002	<.02	greenish marble
73028	chip	1.0	.34	.022	.10	greenish marble, fault(?) breccia; minor hem, py
73029	grab	-	-	.021	.02	shear zone
73030	chip	0.3	.23	.018	.02	rusty impure marble; mal
73031	selected grab	-	.56	.040	.13	Brooklyn dump; py, cp
73044	chip	1.7	.16	.071	.07	argillite, marble; highly oxidized; hem
73045	chip	1.9	.70	.052	.24	marble, argillite; highly oxidized; ep, hem, mal
73046	chip	1.7	1.24	.090	.12	marble, argillite; shearing
73047	chip	2.3	.28	.085	.15	impure marble (some highly oxidized)
73048	chip	1.5	.50	.025	.05	impure marble
73049	chip	1.4	.20	.086	.32	impure marble
73050	chip	1.3	.02	.068	.02	blackish marble; py
73201	chip	1.6	.02	.006	.02	impure marble; oxidized
73202	chip	0.4	.03	.012	.03	blackish marble; py
73203	chip	0.5	.01	.010	.05	greyish marble; py, ep
73204	chip	0.5	<.01	.005	.02	chert conglomerate

** pyrite occurs throughout copper-bearing zone

DISCUSSION & CONCLUSIONS

Geological mapping and rock sampling on the BROOKLYN show that significant copper and gold mineralization occurs on surface in the area of former mining activity. The copper-gold mineralization appears to be geologically related to impure limestones and argillites near a limestone/clastic contact. The mineralization is both stratiform and stratabound. The stratabound mineralization reflects facies changes and/or remobilization during metamorphism. Earlier drilling and this year's work have discovered gold zones without copper mineralization. These zones might indicate gold remobilization and deposition related to later thermal metamorphism. The pyrite-gold zones border the copper-gold zone with the zone on the east side being the wider. This confirms previous work (see HISTORY).

A study of previous work indicates that much exploration was carried out without regard to testing gold mineralization. Gold mineralization has been shown to be very significant on the BROOKLYN. The area sampled east of the shaft, being a probable shaft pillar, is possibly predictably of lower grade than mined ore.

Tertiary faulting has possibly resulted in the displacement of significant mineralization to previously unexplored areas.

RECOMMENDATIONS

Before any major exploration is carried out on the BROOKLYN the following program is recommended.

- 1.) The BROOKLYN and IDAHO deposits should be evaluated in terms of the geological study of the Phoenix Camp now being undertaken.
- 2.) Diamond drilling to test the pyrite-gold zones and also to gain stratigraphic and structural data should be done.

Any further work would depend on the results of the above programme.

Respectfully submitted,



W. R. Gilmour

June 29, 1982

Vernon, B.C.

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| 16. | - - - | 1904 | p 211 |
| 17. | - - - | 1905 | p 179 |
| 18. | - - - | 1906 | p 157 |
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| 20. | - - - | 1908 | p 248 |
| 21. | - - - | 1918 | p 209 |
| 22. | - - - | 1926 | p 215 |
| 23. | - - - | 1927 | p 237 |

24.	- - -	1928	p 247
25.	- - -	1929	p 257
26.	- - -	1932	p 129
27.	- - -	1933	p 160
28.	- - -	1934	p D8
29.	- - -	1936	p A34, D55
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31.	- - -	1938	p A39, D38
32.	- - -	1939	p 42, 90
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Statement of Costs

1.	Professional Services W.R. Gilmour, geologist, Field work May 31 June 1,5,7 and report writing	4.5 days @\$200.00/diem		\$900.00
2.	Transportation			
	i) 4 x 4 vehicle June 7			
	1 days @ \$30.00/diem	\$30.00		
	215 km @ \$.30/km	64.50		
	Gas, oil	<u>20.00</u>		
		\$114.50	\$114.50	
	ii) Automobile			
	2 days @ \$20.00/diem	40.00		
	230 km @ \$.20/km	<u>46.00</u>		
		86.00	<u>86.00</u>	
			200.50	200.50
4.	Accommodation, Meals May 31, June 1,5,7			99.60
5.	Analysis			
	Rock Geochem			
	3 copper @\$1.90	5.70		
	Rock Assays			
	15 copper @\$6.50	97.50		
	17 gold, silver @\$12.50	212.50		
	Sample Preparation			
	3 @\$2.75	<u>8.25</u>		
		323.95		323.95
6.	Field supplies, Shipping			50.00
7.	Telephone, Printing, Secretarial			<u>250.00</u>
	Total		\$	1,824.05

STATEMENT OF QUALIFICATIONS

I, W. R. GILMOUR, of 13511 Sumac Lane, Vernon, B.C., V1B 1A1,

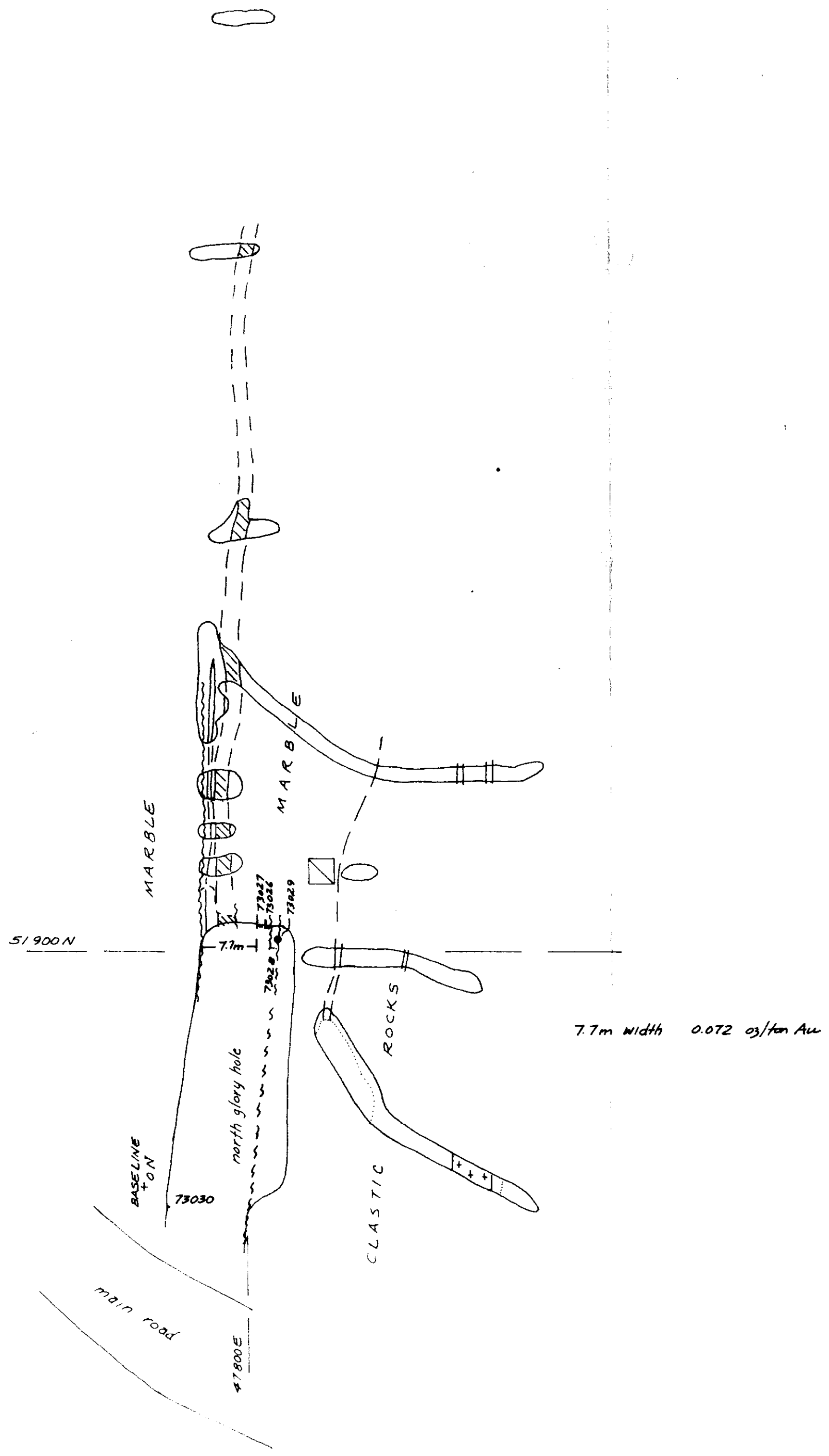
DO HEREBY CERTIFY that:

1. I am a consulting geologist in mineral exploration employed by W.R. Gilmour & Associates Ltd., Vernon.
2. I have been practising my profession in British Columbia, the Yukon Territory, and Nevada for 11 years.
3. I am a graduate of the University of British Columbia with a Bachelor of Science degree in geology.
4. I am a Fellow of the Geological Association of Canada and a member of the Society of Mining Engineers of A.I.M.E.
5. This report is based upon knowledge of the BROOKLYN property gained from exploration work on the property.
6. I am a Director of Kettle River Resources Ltd.



W. R. Gilmour

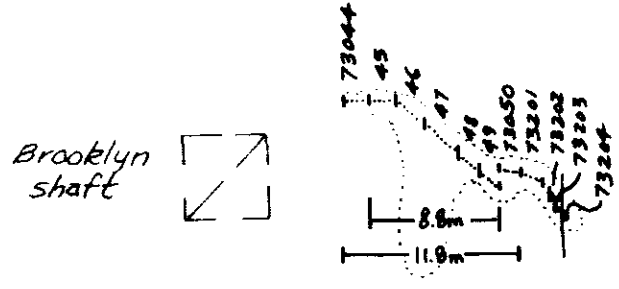
Vernon, B.C.
June 29, 1982



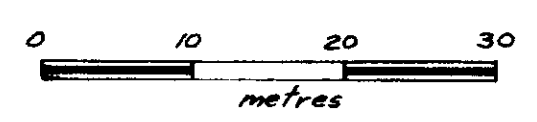
..... rock chip sample
 ● rock grab sample

see Figure 3 for geology
 & Table 1 for results

8.8 m width 0.58% Cu, 0.069 oz/ton Au, 0.17 oz/ton Ag
 11.8 m width 0.069 oz/ton Au



MINERAL RESOURCES BRANCH
 ASSESSMENT REPORT
10,588



KETTLE RIVER RESOURCES LTD.	
K. L. DAUGHTRY & ASSOC. LTD.	
ROCK SAMPLING	
BROOKLYN MINE	
GREENWOOD M.D.	82E/2E
SCALE: 1:500	DATE: JUNE, 1982
DWN. BY: WRG	PROJ. N°: 135
	FIGURE N°: 4

