GEOLOGICAL NOTES ON

COOPER CREEK - GOAT CLAIMS

117^{o} 10' W

50^{o} 09' 30" N

ON BEHALF OF

AQUITAINE COMPANY OF CANADA LTD.

OWNER & OPERATOR OF THE PERTH - PYRITE REVERTED CROWN GRANTS

AND OF THE GOAT 1-3 CLAIMS

BRITISH COLUMBIA

SLOCAN MINING DIVISION, NTS 82K/3E

G.I. GRATT

JUNE 29, 1979

TABLE OF CONTENTS

I INTRODUCTION ..... Page 1

II GEOLOGY - ..... Page 1
(a) Volcanic and Sedimentary Rocks ..... Page 2
(b) Intrusive Rocks ..... Page 4

III STRUCTURE ..... Page 5

IV MINERALIZATION ..... Page 6

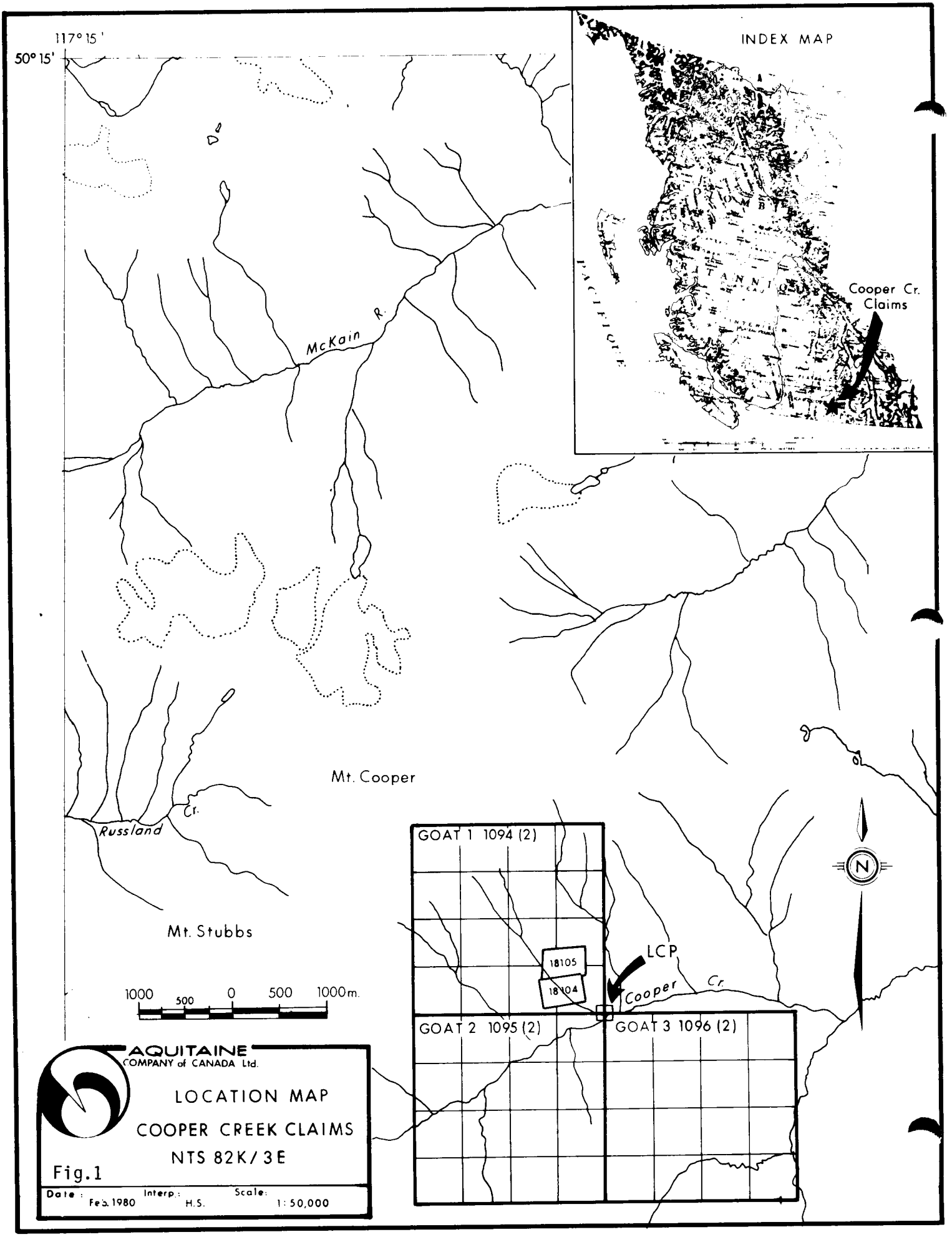
V SUMMARY AND CONCLUSIONS ..... Page 7

STATEMENT OF QUALIFICATION

FIGURES

Figure 1 - Location Map Facing Page 1

Figure 2 - Grid and Sample Location In Pocket


117° 15'
50° 15'
INDEX MAP
Cooper Cr. Claims
McKain R.
Mt. Cooper
Russland Cr.
Mt. Stubbs
1000 500 0 500 1000m.
GOAT 1 1094 (2)
GOAT 2 1095 (2)
GOAT 3 1096 (2)
18105
18104
LCP
Cooper Cr.
N
AQUITAINE
COMPANY of CANADA Ltd.
LOCATION MAP
COOPER CREEK CLAIMS
NTS 82K/3E
Fig.1
Date: Feb. 1980
Interp.: H.S.
Scale: 1:50,000

I INTRODUCTION

Three days were spent traversing the Goat Claims and one day checking gossanous zones in the cirque - at the head of the south fork of Cooper Creek. For ease of description, the creek enclosing the gossan will be called Adit Creek and the creeks on either side will be referred to as East and West Creeks. Traverses were made up all three creeks as well as across the intervening hillsides. Traverse elevations refer to a base elevation of 4400 feet at the helicopter pad. The purpose of these traverses was to define the mode of occurrence of massive sulphide mineralization exposed in the gossan on Adit Creek and to determine the general geology of the surrounding area. Previous reports described the mineral occurrence as a volcanogenic massive sulphide deposit, consisting predominantly of pyrrhotite with lesser amounts of sphalerite and chalcopyrite. The sulphides were said to be hosted by rhyolite and enclosed by andesitic flow rock.

The author found that the mineralization is likely the result of remobilized sulphides which were originally hosted in intermediate volcanics. The close association of the massive sulphide occurrence and leuco-quartz-monzonite dykes (associated with the Cooper Creek stock) was observed. The occurrences and geology of the claim group will be described in more detail below.

II GEOLOGY

The Claim group is underlain by volcanic and sedimentary (?) rocks of the Kaslo Group and intrusive rocks of the herein named Cooper Creek Stock (a satellite pluton associated with the Kuskanax Batholith).

(a) Volcanic and Sedimentary Rocks

The volcanic and sedimentary rocks were seen to occur in a linear fashion along Adit and West Creeks. The rocks generally consist of metamorphosed andesite flows with narrow interflow bands of metamorphosed tuffs and/or sedimentary rocks. Due to the fine grained nature of the bedded rocks, the latter classification is tenuous.

The andesitic rocks vary from fine grained, blocky, dark green meta-andesite (greenstone) to pseudo-hornblende-diorite when proximal to intrusive rocks. A moderately developed foliation is most pronounced in Adit Creek in the greenstone and this foliation varies locally in intensity. Attitudes on foliation as well as bedding almost invariably strike 340^{o} with vertical to near vertical dips. Foliation is well developed in pseudo-hornblende-diorite around the 5500 foot elevation on East Creek where amphibole crystals (probably hornblende) are alligned with their long axis parallel to foliation and are commonly attenuated; often taking an elliptical shape. The rock locally takes on a sub gneissic appearance. The meta-andesite grades locally to amphibolite, as at the 5440 foot elevation on Adit Creek. At the 5660 foot elevation on East Creek a hornblende porphyry intrusive rock was observed. This rock type was also noted to occur on the lower slopes between Adit and East Creeks and is believed to represent a border phase of the stock. The meta-andesites in these areas have been subjectively distinguished from the hornblende intrusives by the occurrence of foliation. Feldspar phenocrysts are rarely visible in the meta-andesite but were observed at several localities.

The bedded rocks are best observed in the lower outcrop zones of Adit Creek. They consist of bands of very fine grained, thin bedded units. These bands are enclosed in meta-andesite and rarely exceed ten feet in thickness. Individual beds are light to dark green, often siliceous and adjacent to dykes or intrusive rocks have been hornfelsed. The hornfels appear as very fine grained, indurate, dark to light brown (buff) rocks. Locally the hornfels consist of a mottled red-brown and green coloration. In the gossan zone of Adit Creek the bedded rocks have been locally altered to a light brown to yellow weathering phyllite along the borders of a leuco-quartz-monzonite dyke. Where the development of phyllite is not as intense the rocks are of a bleached, light brown appearance due to clay alteration, (kaolin). This can be observed at Line 5 + 8E above the cliffs on the eastern edge of Adit Creek. The bedded units are often silicified and 1 to 2 mm glassy quartz veinlets can be observed to roughly parallel bedding. The silicification is best seen in the gossan zone of Adit Creek and near Line 6 + 16W, west of the gossan zone, where sericite accompanies the silicification; and at the 4990 foot elevation of East Creek. The bedded units described above are believed to represent sections of predominantly meta-tuffs. In contrast are rare outcrops of meta-sediments such as black, very fine grained, pyritic shale at the 5280 foot elevation of Adit Creek; an angular float boulder of weakly graphitic grey phyllite (with chalcopyrite on cross fractures) at BLN No. 9 (southwest of gossan); and an outcrop of foliated, very fine grained grey to black rock located at Line 6 + 14-15W. Float boulders of medium to fine grained quartzite were rarely observed in Adit Creek but were not observed in outcrop.

(b) Intrusive Rocks

Intrusive rocks on the property are related to the Jurassic Kuskanax Batholith. The unnamed stock on Cooper Creek, shown on GSC Open File 288 will herein be called the Cooper Creek Stock. This intrusive body appears to extend further east than shown on the Open File Map, although a separate stock, between Adit and East Creeks, might better explain this apparent eastward extension of the Cooper Creek Stock. In the area underlying the claim group, the intrusive appears as a massive, relatively homogenous medium to coarse grained leucoquartz monzonite which weathers white to grey-white and forms large blocky talus in steep areas. Prolific dyke activity associated with the stock occurs in the creek areas, cutting through or following foliation in the volcanic-sedimentary rocks. These dykes are finer grained equivalents of the stock and are characterized by weak to moderate magnetism due to finely disseminated magnetite. Locally the dykes develop a feldspar or quartz-feldspar porphyry texture and locally, especially in the gossan zone of Adit Creek, may show saussuritization. Mafic minerals are uncommon in the dykes but locally, fine 1 - 2 mm chloritic crystals of amphibole (hornblende) may be seen. The intrusive stock on the other hand appears to have a hornblende prophyry peripheral phase as evidenced at the 5660 foot elevation of East Creek and in the vicinity of Line 5 + 9E and Line 4 + 15E between Adit and East Creeks. The hornblende phase carries euhedral to subhedral, 1 - 5 mm long crystals of hornblende. The dykes average about three to four feet wide and range from one to fifteen feet. They show great continuity with sharp, linear contacts. The dykes are oriented in three prominent directions of 310 to 340 degrees (generally parallel to foliation and

bedding); 20 to 40 near vertical dips. The dykes parallel to foliation and bedding could be considered as sills.

The intrusive rocks have variably metamorphosed the volcanic and sedimentary rocks. The meta-andesites coarsen towards intrusive bodies and bedded rocks are either hornfelsed or altered to phyllite ro felsite. Silicification is widespread but is generally restricted to the sedimentary (including tuffs) units.

Quartz veins are most common in East Creek and occur there as thin (5 mm to 5 cm) veinlets paralleling dykes or following fractures and foliation in the greenstone. They are often pyritic with small euhedral cubes of pyrite disseminated throughout. Quartz veins are generally steep to vertically dipping but a few shallow dipping veins were observed at the 5550 foot elevation in Adit Creek. Quartz-epidote veinlets were observed in a strong vein network (2 or 3 veinlets per foot) at the 5150 foot elevation on East Creek. A six inch quartz vein in the gossan zone near the adits, runs parallel to bedding and the adjacent meta-tuffs are obviously silicified. Silicified tuffs commonly host one to three millimeter, glassy quartz veinlets which roughly parallel bedding.

III STRUCTURE

Minor folds were not observed anywhere, but mild warping in the meta-tuff (sedimentary) units in Adit Creek may indicate a broad regional structure. A dyke paralleling the bedding is also warped. This warping has caused minor pinching and swelling in the bedded units resulting in a thickness variation of only a foot or two. The main structural elements in the area reflect the orientation of the dykes. The foliation and major

dykes in lower Adit Creek likely represent a major fault orientation of 340 degrees. At the 5100 foot elevation in East Creek foliation intensifies near joints paralleling foliation (345 degrees). An outcrop of silicified tuffs at the 2990 foot elevation of East Creek has a shattered appearance due to intense fracturing along two strong fracture orientations of 350/vertical and $40^{\circ}/70^{\circ}$W. The location of metavolcanic-metasedimentary rocks in East and Adit Creeks with an intrusive stock occupying the ridge and hillside between indicates further evidence for faults paralleling these creeks.

IV MINERALIZATION

Of primary interest is the massive pyrrhotite (spalerite, chalcopyrite) mineralization exposed in the gossan and adits in Adit Creek at approximately the 4960 foot elevation. At the Upper Adit the massive sulphides were seen to occur adjacent to a leucoquartz monzonite dyke. The dyke carries minor magnetite, pyrite, chalcopyrite and pyrrhotite on fractures and as minor disseminations. Where no massive sulphides occur, the dyke is in contact with the yellow weathering phyllite. Chalcopyrite and pyrrhotite also occurs in the phyllite. The silicic tuffs are commonly pyritic and the meta-andesite/greenstones almost invariably carries fine to coarse grains of pyrrhotite, often as attenuated grains paralleling foliation.

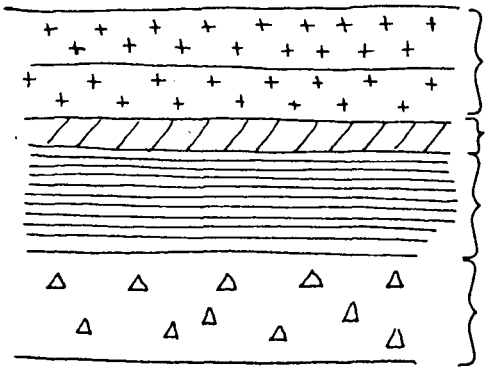
Small patchy gossans are common everywhere on the property and are generally due to minor accumulations of pyrite or pyrrhotite along fractures or quartz veinlets in the volcanics, or along the margins of dykes. Pyrrhotite occurs locally as 1 mm veinlets paralleling fractures

in the greenstones. No massive sulphide occurrences were found outside the gossan zone of Adit Creek, although minor occurrences of chalcopyrite along fractures were observed on rare occasions (float occurrence at BLN No. 9).

The mineralization in the gossan is apparently a remobilization fo sulphides near the tuff andesite contact. The dyke, which here parallels bedding and can be traced for a considerable distance along strike, is considered to be the remobilizing mechanism. Gossan zones exposed in a glacial bowl to the south (2 to 3 miles) of the Cooper Creek occurrence (Adit Creek) indicate that accumulations of disseminated sulphides commonly occur at or near silicic cherty tuff-andesite flow contacts. These zones are very restricted in dimension, usually being a few feet to a few tens of feet in length (along strike) and one to five feet wide. The zones contain patches, a few inches in length, of massive pyrite but are generally low grade, with respect ot economic sulphides. It is evident then, that the massive nature of the sulphides at Adit Creek is due to remobilization of lesser sulphide zones hosted in the volcanics.

V SUMMARY AND CONCLUSIONS

Massive sulphide occurrences at the Cooper Creek prospect are restricted to an altered and metamorphosed sequence of intermediate volcanics of the Triassic (Permian) Kaslo Group. Intrusive dyke activity, paralleling bedding, has remobilized weak sulphide accumulations to produce the massive occurrence. These sulphide zones, consisting predominantly of pyrrhotite (and/or pyrite) with chalcopyrite, are common in relatively unmetamorphosed rocks to the south of the prospect. One of these zones is described by following diagram.



Float boulders of andesite pillows and the extensive outcropping of well bedded silicic tuffs (cherts) indicates subaqueous volcanism. The heterolithologic breccias which show a variety of fragment size indicate an explosive phase of volcanism which could relate to laharic brecciation or proximity to a vent where older rocks have been ripped out of the section and deposited as a flow breccia proximal to the vent. Detailed mapping would be necessary to clarify the environment. The rocks observed in the brief traverse across the glacial bowl showed a dominance of andesite flows.

The environment is one of cyclic volcanism dominated by andesite flows with the cycles ending in siliceous pyroclastic deposition of relatively short duration. The sulphides, predominantly pyrite and/or pyrrhotite, are associated with this active, siliceous, waving phase of the cycle. The relatively thin build-up of acidic pyroclastic material, and the restricted occurrences of sulphides indicates a low potential in the immediate area for locating a sizeable massive sulphide body. It is likely, however, that in the region, a larger vent zone or volcanic centre might be found where conditions for economic sulphide deposition would be positive. Considering the intensity of surface prospecting in

this district, exploration for such a locale would have to be carried out by regional geologic mapping to locate the correct environment and then sub-surface exploration utilizing geophysical techniques and/or drilling to determine economic sulphide potential. Obviously this would involve a large scale program with a high cost attached. Airborne surveys would not be of much use due to the severe limitations imposed by the rugged, high relief of the terrain.

Although the electromagnetic survey on the Cooper Creek prospect was of limited extent, it indicated that the massive sulphides are locally restricted. Considering the mode of occurrence of the sulphides, this is not surprising and should not, therefore, require further exploration.

G.L. Garratt

GLG/hs

GARRATT GEOSERVICES

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March 25, 1980

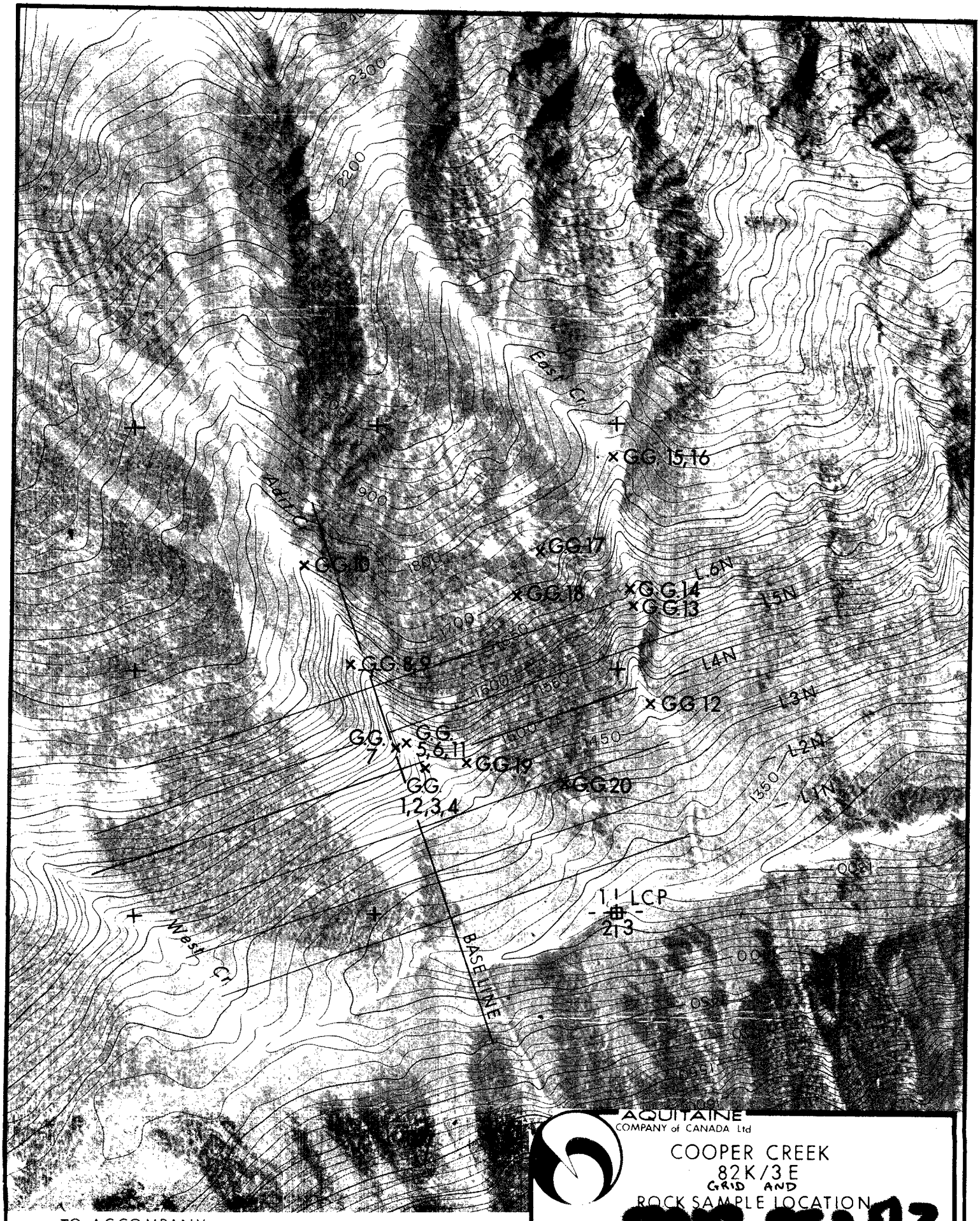
STATEMENT OF QUALIFICATIONS

I, Glen L. Garratt, residing at the above address, completed my Bachelor of Science Degree, majoring in Geology, at the University of British Columbia, in 1973. I have been employed as a geologist in the mineral exploration industry for the past eight years, of which seven were involved in the Canadian Cordillera.

I am a member of the Association of Professional Engineers, Geologists and Geophysicists of Alberta and a Fellow of the Geological Association of Canada.

Signed,

G. L. Garratt, P. Geol.



TO ACCOMPANY:
Geological notes on Cooper Creek-
Goat claims
British Columbia
Slocan Mining Division G.I. Garratt June 29, '79

AQUITAINE
COMPANY of CANADA Ltd

COOPER CREEK
82K/3E
GRID AND
ROCK SAMPLE LOCATION

FIG. 2

DATE May '80

SCALE 1:10,000

ROPY PT 283