

PROPERTY FILE

104B/10

STU CLAIMS

018984

(TAKEN FROM CLIFTON STAR RESOURCES  
PROSPECTUS RPT: JUNE 1, 1990.)

**SUMMARY REPORT 1989**

**STU PROPERTY**

**LIARD MINING DIVISION**

**BRITISH COLUMBIA**

**NTS 104 B / 10**

**LATITUDE 36° 38' N / LONGITUDE 130° 55' W**

**prepared for**

**KESTREL RESOURCES LTD.  
Vancouver, British Columbia**

**by**

**JOHN BUCHHOLZ  
Geologist**

**December, 1989**

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## **SUMMARY**

The work performed by Kestrel Resources Ltd. since acquiring the Stu Prospect in November 1986 is listed in chronological order.

**1987** Reconnaissance prospecting, rock chip sampling, geological mapping, geochemical soil sampling. During this program, preliminary work was done on the Billy Goat Bowl zone, Zappa Glacier zone, Magnetite zone and Central Stu zone.

**1988** Airborne magnetic - electromagnetic surveying, additional limited reconnaissance prospecting and sampling.

**1989** Reconnaissance prospecting and sampling, detailed geological mapping, ground magnetic - electromagnetic surveying, hand trenching and chip and channel sampling.

During the 1989 field season, emphasis was placed on investigating the Ridge zone, Billy Goat Bowl zone and the Actinolite Skarn zone (Bear zone).

Results of the work have identified a number of mineralized zones, two of which are sufficiently anomalous to warrant additional investigation. These two zones are the Ridge zone, a large intensely altered fault structure, and the newly discovered Actinolite Skarn zone containing erratic but high (2%+) values in copper mineralization. Both have potential for precious metal deposits.

## INTRODUCTION

Enclosed is a compilation of work completed on the Stu 1-2 property presently under exploration by Kestrel Resources Ltd. Work during the past three years consisted of prospecting, geological mapping, geophysical mapping, lithochemical sampling, hand trenching and chip sampling. Results of this work, discussed briefly, are sufficiently encouraging to warrant additional expenditures as outlined in the recommendations and proposed cost estimate attached.

## LOCATION, ACCESS AND TOPOGRAPHY

The property is located within the Liard Mining Division, 10 km southeast of Bronson Air Strip, situated at the junction of Bronson Creek with the Iskut River. Latitude 56° 38' N and Longitude 130° 55' W pass through the centre of the property. Bronson is located 110 km northwest of Stewart, British Columbia. Access is via helicopter from Bronson then via foot traverse within the claims. A large part of the property is not readily accessible due to cliffs, ice and glaciated terrain. Elevations range from 910 metres to 2,010 metres A.S.L. The claims are generally devoid of vegetation except for shrubs and grasses and exhibit abundant outcrop. Precipitation exceeds 4,000 mm (160 inches) annually while temperatures range from -40° to 25° C.

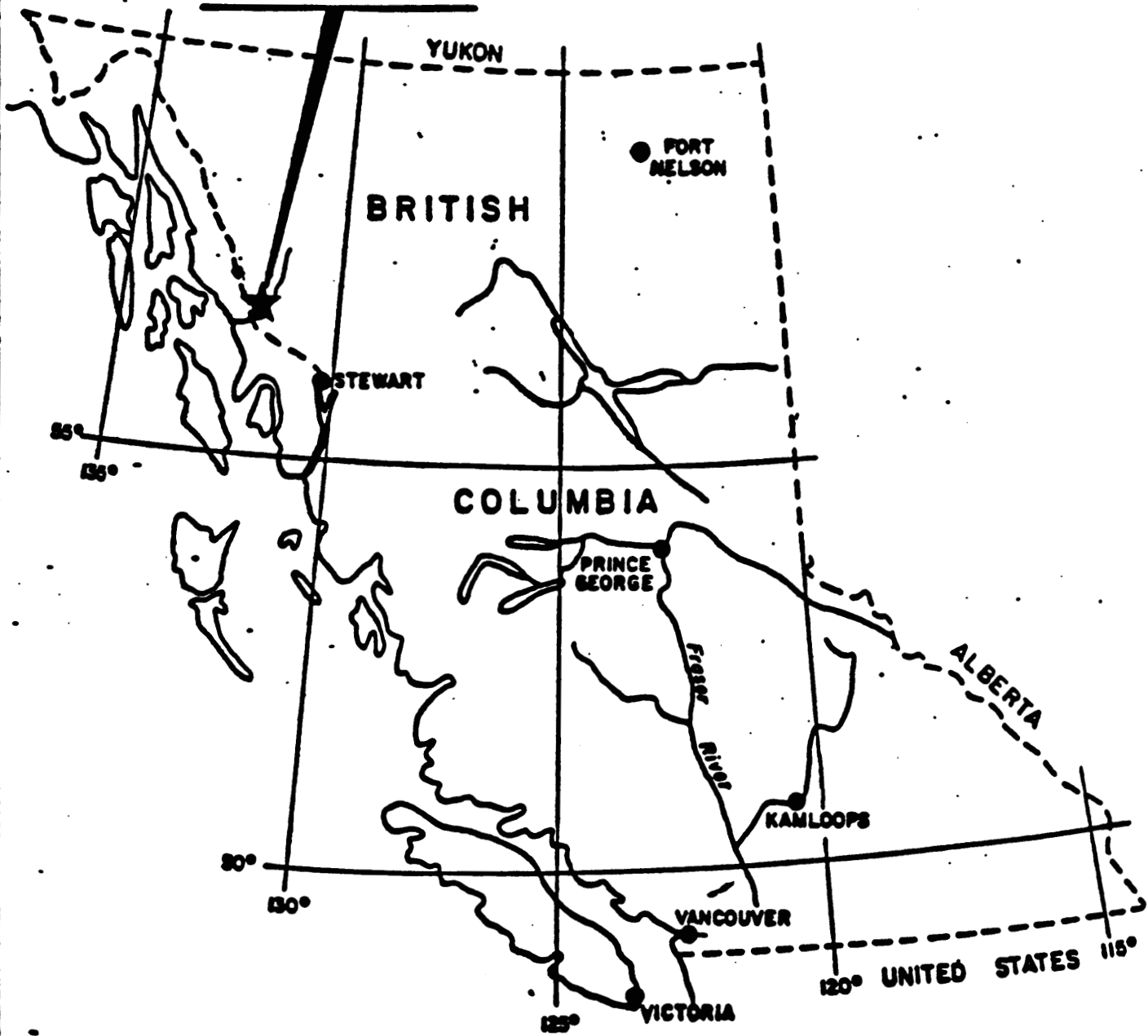
## PROPERTY AND LIST OF CLAIMS

The Stu prospect consists of two modified grid claims optioned to Kestrel Resources Ltd. by I. Hagemoen who is a director of the company.

Pertinent information concerning the claims is tabulated below:

<u>Claim Name</u>	<u>Record No.</u>	<u>No. of Units</u>	<u>Record Date</u>	<u>Expiry Date</u>
Stu 1	3716	18	Dec 5/87	Dec 5/97
Stu 2	3717	18	Dec 5/87	Dec 5/97

# STU MINERAL CLAIMS



KESTREL RESOURCES LTD.

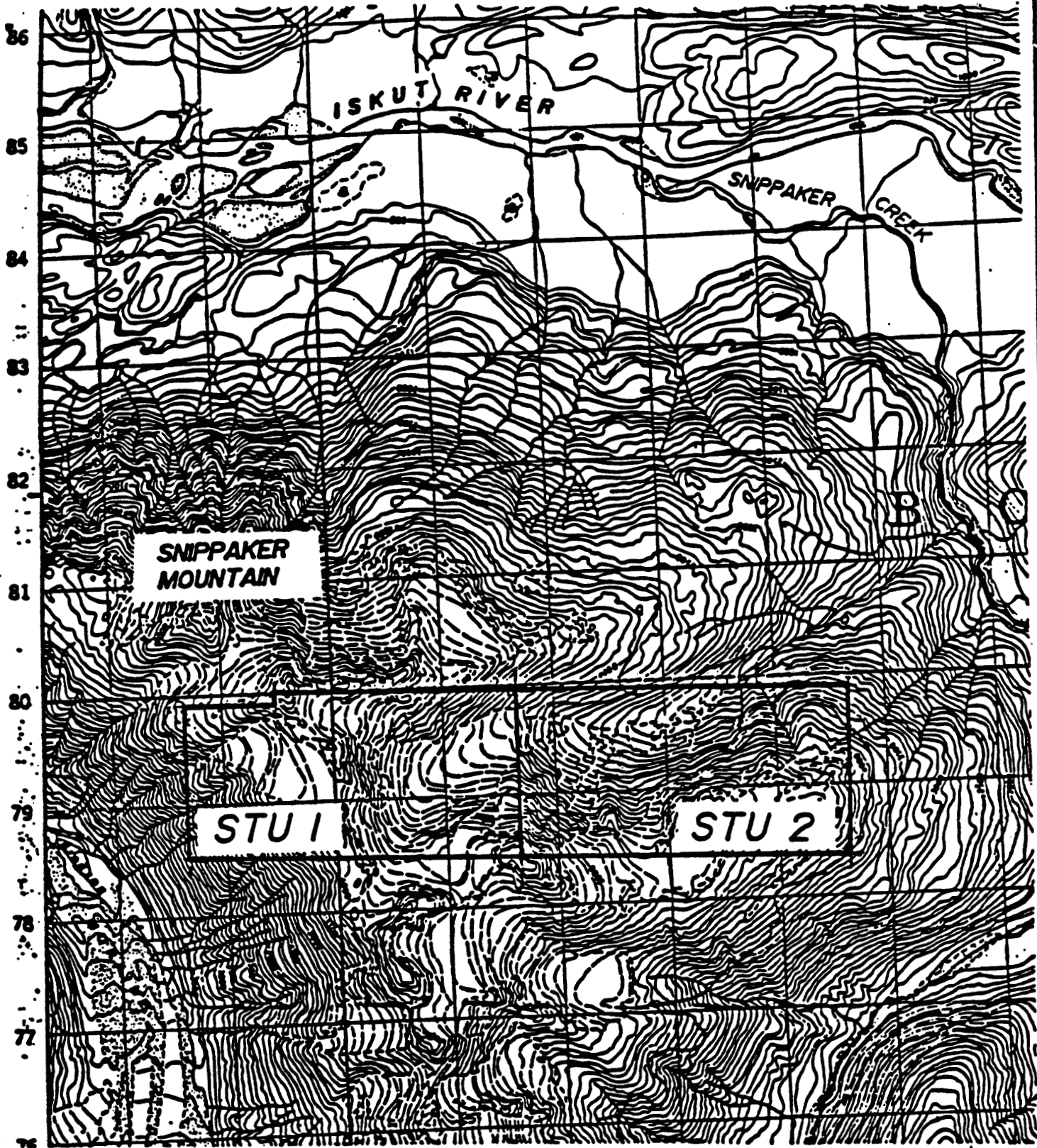
## STU PROPERTY. INDEX MAP

LIARD MINING DIVISION, B.C.

RANGEX SERVICES

Drawn By: Meridian Map

FIG.



**SNIPPAKER  
MOUNTAIN**

**STU 1**

**STU 2**

**ISKUT RIVER**

**SNIPPAKER  
CREEK**



**KESTREL RESOURCES LTD.**

**STU PROPERTY  
CLAIM MAP**

**DRAWN BDS | NTS 104B/10**

The following sections describing history and regional geology are taken from a report prepared for Kestrel Resources Ltd. by Minorex Consultants of Delta, British Columbia, to fulfill assessment requirements for the Stu prospect.

## **HISTORY**

The Iskut River area has received sporadic exploration attention since the turn of the century; although, most of the early activity in this region concentrated in and around the Stewart mining camp. As the placer and lode miners explored northward placer gold operations were intermittently active along both the Iskut and Unuk Rivers.

The first recorded work in the Iskut River area was in 1907 when a prospecting party from Wrangell, Alaska recorded nine mineral claims north of Johnny Mountain.

Hudson Bay Mining and Smelting Limited discovered high grade gold-silver-lead-zinc mineralization in float on the upper slopes of Johnny Mountain in 1954. This occurrence, called the "Pickaxe" showing, was evaluated but the covering claims were eventually allowed to lapse.

In the 1960's several major mining companies, including Newmont Mining Corporation of Canada and Kennco Explorations (Canada) Limited, conducted reconnaissance exploration programs in the Iskut River area for porphyry copper mineralization similar to the Liard Copper and Galore Creek copper deposits to the north. It was during this period that Cominco Ltd. first became interested in the pyritization near the confluence of Bronson Creek with the Iskut River.

Skyline Explorations Ltd. discovered massive polymetallic sulphide mineralization in float on the Bronson Creek glacier in 1969, and staked the source area as the INEL property. After the company restaked the REG property on Johnny Mountain in 1980 they explored both the high grade gold-bearing veins there and the sulphide mineralization on the INEL property until 1987.

In January, 1988 Skyline Explorations Ltd. reported geological reserves at their Stonehouse deposit of 1,087,875 tons grading 0.704 o.p.t. gold, including significant silver and copper values, over mineable widths with good lateral and vertical continuity. They proceeded directly from underground exploration to production with the establishment of a fixed-wing supported mining operation in 1988. Production difficulties and corporate problems affected the operation until recently. After renovating the milling process and increasing recovery and exploration funding, they have reduced mining costs and discovered a number of very interesting precious metal showings. The latest combined geological reserves (April 30) for all categories are 876,000 tons grading 0.55 o.p.t. gold at a cut-off grade of 0.3 o.p.t. gold (Northern Miner, Aug. 21/89).

In 1986, Delaware Resources Ltd. (now Prime Resources Corporation) and Cominco Ltd. commenced detailed exploration of the SNIP property, located immediately north of Reg property on the northern slopes of Johnny Mountain. Their surface and



underground exploration efforts over the last three years have been successful in defining a geological reserve of 1,032,000 tons grading 0.875 o.p.t. gold using a cut-off grade of 0.35 o.p.t. gold and a dilution factor of 20 percent at zero grade (G.C.N.L. No. 214, Nov. 7/89). The joint venture partners are presently completing a feasibility study on the deposit.

Aside from the Johnny Mountain mining operation and the SNIP gold deposit, there are a number of other advanced projects in the Iskut River area, including: the INEL property belonging to Inel Resources Ltd. that has eight zones of high grade gold, silver, copper and zinc mineralization; and the McLYMONT property of Gulf International Minerals Ltd. with two zones of high grade gold, silver and copper mineralization.

There is no reported exploration in the vicinity of the STU 1 and 2 mineral claims prior to 1980. In May, 1980, Du Pont of Canada Exploration Ltd. collected several heavy mineral separate samples from the Snippaker Creek drainage. These samples returned anomalous gold values, and Du Pont subsequently staked the Zappa claim (now the GIM claim) in July to cover the drainage (Strain, 1981). Later follow-up heavy mineral separate sampling in 1980 and soil sampling in 1981 pinpointed the probable source of the anomalous geochemical values to the headwaters of a drainage now covered by the STU 2 mineral claim (Korenic, 1982). Du Pont did not discover the mineralized source and allowed their claim to lapse.

In 1983, Bluegrass Petroleum Inc. acquired an option on the then HEMLO WEST 5 and 6 mineral claims. The STU 1 mineral claim now overlies most of the old HEMLO WEST 5 mineral claim. Bluegrass Petroleum carried out a limited soil geochemical sampling and geological mapping program. Their work located three mineralized quartz vein occurrences and the soil sampling discovered three zones of anomalous gold-in-soil values (Ricker, 1983). Despite their encouraging results, no further work was undertaken and their claims were allowed to lapse.

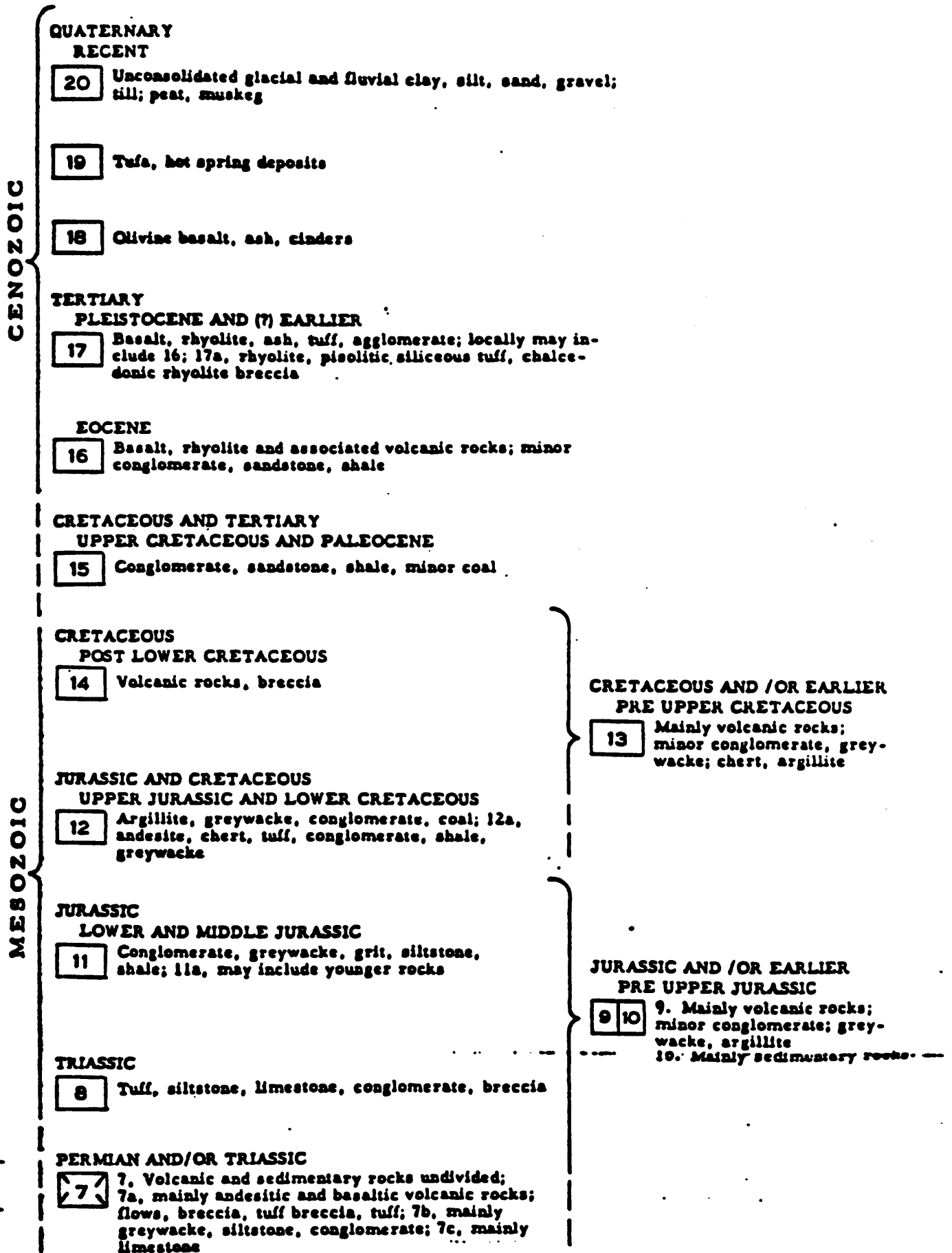
Placer Development Limited conducted a Dighem III airborne survey over the Johnny Mountain and Snippaker Mountain area in July, 1983 (Dvorak, 1983). Even though the survey did not include the area of the subject claims, it did locate a number of electromagnetic conductors northwest of the STU 1 claim.

During the 1987 and 1988 field season, the property was explored by Pamicon Developments Ltd. on behalf of its owner. In 1987, Pamicon Developments prospected most of the accessible areas and collected 256 rock and 47 soil geochemical samples. The results of their work identified four main zones of precious metal-bearing sulphide mineralization including: the Billy Goat Bowl, tongue of the Zappa Glacier, central STU 2, and Magnetite Zones (Todoruk and Ikona, 1988).

In 1988, an airborne magnetic and electromagnetic survey was conducted over the property. Later, a limited prospecting and litho-geochemical sampling program was carried out in August and September. The results of this work identified several mineralized structures on the STU 1 mineral claim (Todoruk and Ikona, 1989). Pamicon Developments recommended that the company should undertake detailed geological and geochemical surveying of the known mineralization during the 1989 field season.

- 5 -  
LEGEND

SEDIMENTARY AND VOLCANIC ROCKS



PALAEOZOIC

**PERMIAN AND (?) EARLIER**

- 6** Limestone, greenstone, chert, argillite, phyllitic quartzite, greywacke; meta-andesite and meta-diorite locally abundant near ultramafic bodies. May include younger greenstone; 6a, Carboniferous or Permian, mainly andesitic flows, breccia, tuff; minor sedimentary rocks

**DEVONIAN AND MISSISSIPPIAN**

**UPPER DEVONIAN AND MISSISSIPPIAN**

- 5** Chert, argillaceous quartzite, argillite, greywacke, greenstone, conglomerate, limestone

**DEVONIAN**

**MIDDLE DEVONIAN**

- 4** Limestone, dolomite, quartzite

**ORDOVICIAN AND SILURIAN**

**UPPER ORDOVICIAN AND LOWER SILURIAN**

- 3** Limestone, cherty limestone, quartzite, red and green chert, shale

**CAMBRIAN AND ORDOVICIAN**

**MIDDLE AND (?) UPPER CAMBRIAN, LOWER AND MIDDLE ORDOVICIAN**

- 2** Shale, phyllite, slate, calcareous slate, limestone

**CAMBRIAN**

**LOWER CAMBRIAN**

- 1** Limestone, dolomite, quartzite, slate, phyllite

**INTRUSIVE ROCKS**

- A** Felsite, felsite porphyry
- B** Mainly quartz monzonite, granodiorite, granite
- C** Mainly diorite; minor gabbro
- D** Granite porphyry, granophyre, syenite and related rocks
- E** Serpentinite, peridotite; locally includes meta-andesite and meta-diorite

METAMORPHIC ROCKS

TRIASSIC OR EARLIER

**F** Phyllite, sericite schist, hornfels, granulite, fine-grained biotite-hornblende gneiss; Fa, may include or be equivalent to 9

PERMIAN AND/OR EARLIER  
PRE MIDDLE PERMIAN

**G** Ga, Gneiss; Gb, phyllite, quartzite, minor crystalline limestone, highly altered and sheared greywacke and volcanic rock

MAINLY CARBONIFEROUS AND PERMIAN

**H** Biotite-quartz-feldspar gneiss, biotite-muscovite schist, crystalline limestone, greenstone, quartzite, phyllite

MISSISSIPPIAN AND EARLIER

**J** Gneiss, schist, crystalline limestone, crystalline dolomite, quartzite

Geological boundary (defined, approximate, assumed) . . . . .	— — — — —
Limit of geological mapping . . . . .	.....
Bedding (horizontal, inclined, vertical, overturned) (dip, g, gentle; m, medium; s, steep) . . . . .	+ / X /
Bedding, inclined (direction of tops unknown, over- turning suspected) . . . . .	↗ ↘ ↙ ↚
Schistosity, gneissosity (inclined, vertical, dip unknown) . . . . .	↗ ↘ ↙ ↚
Fault (defined, approximate, assumed) . . . . .	~~~~~
Anticline (defined, approximate) . . . . .	↑
Syncline (defined, approximate) . . . . .	↓
Anticline, syncline (overturned) . . . . .	∩ ∪
Trend of complexly folded beds (direction of plunge known, unknown) . . . . .	↗ ↘
Belt of quartz diorite and quartz porphyry dykes . . . . .	
Glacial striae (direction of movement known, unknown) . . . . .	↗ ↘
Placer mine . . . . .	X
Mine or prospect . . . . .	X
Cinder cone or recent volcanic crater . . . . .	⊙

## **GEOLOGICAL SETTING**

### **Regional Geology**

Despite its recent high level of exploration attention, there is a paucity of available geological publications regarding the Iskut River area and, specifically, for the subject property itself. The latest geological publication, G.S.C. Open File 2094 (1989), does not cover the property although it does provide information for the region eastward and northward along the Forrest-Kerr River drainage. Both G.S.C. Maps 9-1957 (1:250,000) and 1418A (Iskut River, 1979, 1:1,000,000) are too regional to be of much use at a property scale. Thus, the following geological discussion is based largely upon a recent report by R.G. Anderson (1989) and the writer's extrapolations of geological data from recent geological studies adjacent to the property.

The Iskut River area is situated regionally along the margin between the Coast Plutonic Complex and Intermontane tectonic belts of the west-central Cordillera. It is a geologically complex area of stratigraphic, plutonic, structural and metamorphic transitions between four tectonostratigraphic elements: Paleozoic Stikine assemblage, Triassic and Jurassic Stikinian strata and plutons, Middle and Upper Jurassic Bowser Lake Group overlap assemblage, and Tertiary Coast Plutonic Complex (Anderson, 1989). Of these elements, precious metal vein deposits seem to be most commonly associated with the Lower Jurassic volcanics, their associated alkaline granitic rocks and related dykes of the Stikinian assemblage.

According to R.G. Anderson (1989), the geological setting of the Iskut River map area is:

Early Devonian to Early Permian coralline limestone reef and mafic to felsic volcanic rocks make up the Stikine assemblage and include some of the most intensely deformed rocks in the region. Distinctive porphyritic dykes link Upper Triassic and Lower Jurassic volcanics with their plutonic equivalents. Lower and Middle Jurassic basinal limestone, radiolarian-bearing siliceous shale and tuff mark the end of the Triassic-Jurassic volcanic arc-building event. Middle and Upper Jurassic fine- and medium-grained siliciclastics are part of an overlap assemblage which, to the north, demonstrably links Stikinia and Cache Creek terranes. Post-tectonic, fresh, felsic plutons of mainly Tertiary age characterize the Coast Plutonic Complex along the southwest margin of the map area. Younging of strata from west to east attests to intrusion and uplift of the Coast Plutonic Complex. The eastern margin of the complex is defined by: the extent of the Tertiary plutons and local zones of high strain in the southeast; intrusive contacts in the central part of the map area; and an abrupt increase in metamorphic grade and change in plutonic style across the Stikine River in the west.

Unconformities seem to bound the major stratigraphic assemblages. Stratigraphic relationships among members of the Stikine assemblage are poorly known. The regionally extensive Permo-Triassic event is marked by local polymictic conglomerate, a regional decrease in

conodont colour alteration index with age and, possibly, an angular unconformity between recumbent isoclinally folded Lower Permian limestone and overlying Upper Triassic (?) mafic volcanics (?). A regionally important sub-Toarcian unconformity and a local but metallogenetically important Pliensbachian unconformity characterize the Lower Jurassic strata in the area.

The Lower Jurassic Hazelton Group and alkaline members of the cogenetic Early Jurassic Texas Creek plutonic suite have proved the most productive and prospective for precious metal lodes. Fossiliferous Upper Triassic Stuhini Group and Lower to Middle Jurassic Spatsizi Group strata provide recognizable biostratigraphically restricted, bounding markers which define the economically important but mainly unfossiliferous and heterogeneous Lower Jurassic volcanic strata of the Hazelton Group metalotect.'







The subject property is dominantly underlain by intercalated Upper Triassic volcanic and sedimentary strata that have been intruded by a number of stocks and dykes of alkaline composition. It is situated immediately east of the structural contact between the recumbent isoclinally folded Lower Permian Cache Creek strata, belonging to the Stikinia assemblage, and the overlying Upper Triassic and Lower to Middle Jurassic strata of the Stikine terrane.

Due to the paucity of local geological information, none of the observed structural deformation within the claims can be correlated to any major regional features; however, it is obvious from the results of the writer's geological surveying that all of the volcanic, sedimentary and plutonic rocks have undergone varying degrees of uplift and deformation. The survey results also show that the Upper Triassic strata have been regionally metamorphosed to lower greenschist facies and, locally, they have been propylitically- to potassically- altered, and pyritized near the intrusive bodies."

### Property Geology

Geological mapping completed by both Pamicon and Minorex has identified intercalated volcanic-sedimentary rocks of Upper Triassic age (Stuhini Equivalent) which are intruded here and there by alkaline stocks and dykes of probable Jurassic age. Regional deformation of the strata has resulted in a northerly as well as easterly fracture pattern and subsequent emplacement of sulphide mineralization within quartz filled tensional fractures as well as the development of a metasomatic contact skarn zone. Gold mineralization is found within the tensional fracture system associated with pyrite, chalcopyrite, minor galena and sphalerite. Copper, lead, zinc and silver

**LEGEND**

-  Trench
-  Geological Contact
-  Fault
-  Outcrop
-  Panel Sample (1 sq. M.)
-  Channel Sample (1 M.)

Geological Contact of  
Limestone and Quartz-  
Actinolite Skarn.



8326 550, 15.3, nd  
8327 1463, 38.0, nd

83208 \* 0.08, 0.08, <0.005

83208 \* 0.85, 0.11, 0.01

83311 \* 0.52, 0.10, <0.005

8325 4703, 1.7, nd

83910 \* 0.35, 0.04, <0.005

8382 \* 0.95, 0.15, <0.005

83433 5411, 2.6, nd  
83434 120000, 43.7, 20  
83435 6002, 3.7, nd  
83436 589, 0.1, 20  
83437 2026, 1.2, nd  
83438 3629, 3.6, nd  
83439 13052, 12.9, nd  
83440 4280, 5.5, nd

8324 \* 0.12, 0.12, <0.005

Sulphide mineralization

8323 \* 0.08, 0.09, <0.005

Limestone

83441 3608, 9.7, nd

83442 3568, 7.6, nd

83443 4283, 8.6, nd

83444 326, 0.5, nd

83445 2836, 2.6, nd

83446 2861, 1.8, nd

83447 655, 0.4, nd

Edge of snowfield



\* Denotes Assays-% Cu, o.p.f. Ag,  
o.p.f. Au

83433 Denotes Geochem Analysis  
Cu-ppm Ag-ppm Au-ppb

**KESTREL RESOURCES LTD.**

**STU PROPERTY**

**TRENCH SAMPLES  
ACTINOLITE SKARN ZONE**

**LIARD MINING DIVISION, B.C.**

Drawn BDS

Scale: 1:500

Date: Dec 1989

Figure: 4

mineralization occur within the quartz-actinolite-epidote skarn zone in the form of pyrrhotite, chalcopyrite, galena and sphalerite.

The following geological description is quoted from the assessment report prepared by Minorex as noted previously:

## **Geological Survey**

### **1) Lithology**

According to Geological Survey of Canada Map 1418A (1979), the property is dominantly sedimentary strata that have been intruded by a number of stocks and dykes. The volcanic and sedimentary strata were apparently deposited during or shortly after the deposition of the Upper Triassic Stuhini Group of volcanic and sedimentary rocks which have been mapped to the north. Furthermore, the property is regionally situated east of the structural contact between the recumbent isoclinally folded Lower Permian Cache Creek strata, belonging to the Stikinia assemblage, and the overlying Upper Triassic and Lower to Middle Jurassic strata of the Stikine terrane.

The lithologic units have been tentatively correlated stratigraphically, in order of decreasing age, as follows:

#### **1) Andesite Flow and Flow Breccia (Unit 1)**

These volcanic rocks underlie most of the property, and based upon bedding attitudes, assuming tops up, they are probably the basement rocks. The stratigraphic contacts between the volcanic members of this unit are both indistinct and discontinuous; exemplifying relatively rapid accumulations of volcanic rocks, in probably a subaqueous setting, prior to any period of quiescence and sedimentation.

The volcanic rocks are usually light to dark grey/green in colour, and they are quite massive to very poorly banded. The subangular to subrounded clasts of the monomictic flow breccia may range up to 40 centimetres or more in size.

Based upon macroscopic studies, the flow and flow breccia rocks are of andesitic composition. Plagioclase feldspar and, to a lesser degree, hornblende occur locally as porphyritic phenocrysts, up to 1 centimetre, within a grey to green, aphanitic groundmass. The flow members are usually quite aphanitic while the flow breccia members are easily distinguished in weathered outcrops by their more porphyritic clasts within an aphanitic matrix. Hornblende phenocrysts are often partially or completely replaced by epidote, chlorite, quartz and magnetite, and biotite occurs locally, usually as a secondary alteration product. Magnetite and pyrite in minor amounts are common constituents of the rocks as very fine-grained disseminations or micro-fracture infillings.



## **II) Lithic Tuff and Chert (Unit 2)**

This unit appears to be both intravolcanic and conformably overlies the basal volcanic flows and flow breccias at both the Billy Goat Bowl and Ridge Zones. The lithic tuff and chert are interbedded but quite massive; like exhalative pyroclastic rocks that have accumulated rapidly during and after volcanism from dense subaqueous plumes.

This unit is commonly light to medium grey to brown in colour, quite siliceous and well indurated. Both of the lithologic members are quite aphanitic and similarly coloured.

The lithic tuff member is distinguishable by its granular texture, and it often contains angular and subangular andesitic tuffaceous fragments that range up to 1 centimetre in length. The groundmass of the tuffaceous member is a crystal tuff containing euhedral to anhedral plagioclase and quartz phenocrysts. Fine-grained secondary epidote, chlorite, quartz, calcite, biotite and sericite occur as alteration products of saussuritization, or locally as a result of metasomatism near intrusive bodies. Very fine-grained to fine-grained pyrite and magnetite are common accessory minerals, especially near intrusions.

The chert member also contains angular and subangular tuffaceous fragments, but it is distinguishable by its cryptocrystalline texture.

## **III) Limestone (Unit 3)**

Light to medium grey, massive limestone crops out near the theoretical M.G.S. claim coordinate 1 North by 5 East of the STU 2 mineral claim. It is bounded on the north by a major east-northeasterly trending fault with prominent hematite and ankerite alteration. On the south, it appears to be interbedded with the lithic tuff and chert unit (Unit 2). Along its south-southeastern margin it has been metasomatized to a quartz-actinolite-epidote skarn. The stratigraphic contact between the limestone and the pyroclastic rock is quite sharp and distinct, but the margins of the skarn zone are typically vague with large, angular clasts of unaltered limestone surrounded by resistant skarn material.

The limestone unit initially appears in outcrop to be intravolcanic, but it is more likely to occur stratigraphically at the transition from dominantly volcanic to sedimentary facies. It is the writer's opinion that this unit may have been downfaulted to its present position by juxtaposed transcurrent fault movement, both north and south of the exposure.

Recrystallization and fracture healing by secondary calcite is common in outcrop, but there is no primary sulphide mineralization. The disseminated mineralization near the contacts of the limestone with the skarn zone appears to have been emplaced during the metasomatic event.

**iv) Argillite, Siltstone and Minor Lithic Tuff (Unit 4)**

Near M.G.S. claim coordinate 0 North by 4 East of the STU 2 mineral claim, finely-laminated argillaceous sediments occur interbedded within the fine-grained sediments of Unit 5. This unit is distinct from Unit 5 because of its dominantly argillaceous component. In outcrop, these sediments are medium brown to black in colour, fissile and quite carbonaceous.

Within shear zones, gypsum was found to occur infilling fracture voids as pale yellow, waxy, prismatic crystals, locally up to 15 centimetres long. Minor magnetite is ubiquitous throughout this unit and diagenetic pyrite was found to occur within the argillaceous members. Local silicification with associated pyritization, oxidized to hematite and/or limonite, is restricted to shear zones and the margins of feldspar porphyry dykes.

**v) Siltstone, Sandstone, Chert, Lithic Tuff and Argillite (Unit 5)**

Near the southern boundaries of the STU 2 mineral claim, predominantly fine-grained, finely-laminated sedimentary rocks with a strong pyroclastic component overlie the older volcanic and pyroclastic units. These rocks appear to have been deposited within submarine basins following volcanism and pyroclastic deposition. Bedding attitudes show that the sedimentary rocks have been tilted up to  $-15^{\circ}$  southward.

The stratigraphic contact between Unit 5 and the underlying pyroclastic unit is not exposed, nor is the apparent structural contact between Unit 5 and the andesitic volcanics (Unit 1) that occurs westward. It is the writer's opinion that the fine-grained sediments have been downfaulted with respect to the older volcanic rocks, and that the faulting occurred along a number of northeasterly trending, transcurrent faults that cut the stratigraphy.

Within local shear zones and near the margins of feldspar porphyry dykes, the fine-grained sediments are silicified and pyritized over short distances. Fine-grained magnetite is ubiquitous throughout the sedimentary sequence but in very minor amounts.

**vi) Feldspar Porphyry Dyke (Unit 6)**

This unit occurs throughout the property, but it is especially prolific within the Billy Goat Zone. It is light to medium grey in colour, medium-grained, barren, massive and poorly fractured. Plagioclase feldspar often form euhedral porphyritic phenocrysts, up to 2 centimetres, within an aphanitic quartz and plagioclase feldspar groundmass. Variations of this unit include a non-porphyritic variety and a hornblende-rich variety with poikilitic grains. These varieties commonly coexist within the same dyke structure.

Near the northwestern margin of the diorite stock, at M.G.S. claim coordinates 1 North by 5 East, the diorite stock gradually changes texturally to resemble the feldspar porphyry unit at its intrusive contact. Along the southern margin of the same intrusion, a feldspar porphyry dyke cuts the diorite-pyroclastic contact. Based upon these observations, it is apparent that the feldspar porphyry unit is probably dioritic in composition, and coeval and cogenetic with the dioritic intrusion (Unit 8).

This unit is dominantly controlled by northerly to northeasterly trending shear and fault structures. Within the Billy Goat Bowl Zone the feldspar porphyry dykes are relatively wide, up to 40 metres, and very continuous. At the Ridge Zone the dykes are noticeably narrower, usually less than 3 metres, and generally quite discontinuous.

#### vii) Diorite Dyke (Unit 7)

This unit is medium grey in colour, aphanitic, barren, massive and very poorly fractured. It commonly occurs as narrow structures, less than 1 metres wide, that occupy northerly to northeasterly trending fault structures with sharp, non-chilled margins. No cross-cutting features were observed between units 6 and 7 to establish their age relationship.

It is the writer's opinion that the diorite dykes are comagmatic with the feldspar porphyry dykes (Unit 6) and the dioritic intrusion (Unit 8), and they may be feeder structures for now-eroded, overlying volcanic strata. Their distribution within similarly oriented, but much more restricted, structures as Unit 6 suggests that the diorite dykes may be slightly younger in age.

#### viii) Diorite, Monzonite (Unit 8)

Two stocks of diorite to monzonite composition occur within the mapped portion of the Ridge Zone, at M.G.S. claim coordinates 3 East and 1 North by 5 East. Near M.G.S. claim coordinate 3 East, along the southern boundary of the STU 2 mineral claim, a small diorite stock has intruded andesitic flows. The immediate margins of this stock are propylitically-altered and locally pyritized but the alteration and mineralization does not extent more than 20 metres from its intrusive contact.

At M.G.S. claim coordinates 1 North by 5 East there is an east-west elongated stock of diorite which grades inward to a monzonitic core. This is the stock that has a northwestern margin similar in composition and texture to Unit 6. The andesitic flow, lithic tuff and chert surrounding the intrusion are propylitically-altered and pyritized for a distance of 20 to 30 metres. An orthoclase feldspar vein cuts the western intrusive contact, infilling a northeasterly trending shear structure, while the eastern core of the stock is orthoclase feldspar-rich.

The dioritic member is medium green to grey in colour while the monzonitic members tends to be slightly pinkish to orange. Both intrusive varieties are medium-grained and poorly foliated. Porphyritic plagioclase and hornblende often occur as euhedral phenocrysts within a finer-grained feldspar-rich

groundmass. Very fine-grained magnetite is ubiquitous, and pyrite commonly occurs as disseminations and fracture filling with epidote, chlorite and calcite.

#### **ix) Quartz-Actinolite-Epidote Skarn**

Along the southern margins of the limestone unit (Unit 7), there is a quartz-actinolite-epidote skarn zone that has been mapped westward for more than 350 metres and traced eastward by prospecting to the eastern boundary of the STU 2 mineral claim. This zone trends 060° to 070° and appears to dip steeply southward. It grades northward into unaltered limestone, its southern contact is buried beneath a snowpack, and westward it is truncated by a northeasterly trending fault structure. This skarn hosts disseminated pyrrhotite, chalcopyrite and lesser amounts of galena and sphalerite along its entire length. Lensoid, semi-massive and massive pyrrhotite and chalcopyrite mineralization occurs along a 75-metre section of the skarn, in the northeastern corner of the Ridge Zone. This occurrence has been called the "Bear" Zone.

The writer recognizes that this unit is not a distinct lithologic entity but rather a product of metasomatic alteration; however, its occurrence, dimensions and possible economic importance require that it be described fully. A weathered outcrop of skarn is medium to dark greenish brown in colour while fresh exposures are medium to dark green in colour. It is quite massive and very brittle. Euhedral actinolite crystals, up to 8 centimetre long, often occur within a medium-grained quartz, actinolite and epidote groundmass. Quartz, calcite, epidote and chlorite with sulphide minerals infill fractures. Near its margins it has large angular clasts of unaltered limestone surrounded by a skarn matrix giving it a brecciated appearance in weathered outcrops.

This unit is a calcic skarn of the copper-iron variety. Since there is no exposed intrusions in the immediate vicinity and this type of skarn is often associated with epizonal granodiorite and quartz monzonite stocks in continental crust, it is the writer's opinion that the skarn was formed after ascending hydrothermal fluids from a buried calc-alkaline pluton contacted the limestone unit. Such a pluton has been mapped by government geologist southeast of the property (G.S.C. Map 1418A), and it probably extends northward under the STU 2 claim. Furthermore, there is strong structural evidence that there is an east-northeasterly trending fault structure along the southern margins of the skarn, and this fault was probably the conduit for the iron- and copper-bearing hydrothermal fluids. If this is the case, then there is the potential for similar mineralization along strike and downdip of the Bear Zone.

## 2) Structure

The volcanic and sedimentary strata have undergone uplift and structural deformation. Numerous faults, shears and fractures cut and displace the strata to a greater degree than the intrusives; suggesting that the deformation of the country rocks predated the tectonic events leading to the emplacement of the alkaline and, possibly, the calc-alkaline plutons.

Based upon the structural data collected during the survey, major normal and transcurrent faulting has occurred primarily in a north-northeasterly to east-northeasterly direction ( $030^{\circ}$  to  $070^{\circ}$ ). Dip directions and angles vary but many of the structures dip steeply ( $-50^{\circ}$  to  $-80^{\circ}$ ) southeastward.

There is a second fracture pattern within the strata that strikes easterly ( $090^{\circ}$  to  $110^{\circ}$ ) and dips moderately southward ( $-30^{\circ}$  to  $-45^{\circ}$ ). This fracture set is predominantly of the open tensional variety.

It is the writer's opinion that the Upper Triassic strata were displaced initially by northeasterly to east-northeasterly transcurrent faulting. An easterly trending set of open tensional fractures were created during this deformation, and it was along these fracture voids that the majority of the narrow, precious metal-bearing vein structures were emplaced. The hydrothermal fluids probably emanated from a differentiating buried pluton. Following the precipitation and sealing of the easterly trending fractures, the strata was again deformed by northeasterly trending normal faulting along regional zones of structural weakness. This tectonic event downfaulted the stratigraphy and provided conduits for the emplacement of the feldspar porphyry and diorite dykes. This tectonic event occurred prior to and during the emplacement of the alkaline plutons. Subsequent north-northeasterly transcurrent faulting has displaced all of the lithologies.

There is no definitive evidence within the volcanic or sedimentary rocks of any regional or small-scale folding within the property. The bedding attitudes simply steepen from the fine-grained sedimentary rocks along the southern boundary of the STU 2 mineral claim (i.e.  $-13^{\circ}$  southward) to the volcanic strata at Billy Goat Bowl (i.e.  $-45^{\circ}$  southward).

## 3) Metamorphism and Alteration

All of the volcanic and sedimentary rocks have undergone regional metamorphism of the lower greenschist facies grade. The andesitic volcanics best display this metamorphism with the alteration of their mafic constituents to epidote, chlorite, calcite, quartz and magnetite. The more leucocratic sedimentary rocks have been epidotized and chloritized to a lesser degree.

The intrusive rocks have also undergone some degree of regional metamorphism; although, it is difficult to distinguish local assimilation features, saussuritization and regional metamorphic alteration products.

Near the diorite stock on the southern boundary of the STU 2 mineral claim, the volcanic rocks have been thermally metamorphosed, propylitically-altered and pyritized. Its contact metasomatic aureole is often quite restricted, less than 20 metres. Near the diorite stock with the monzonitic core, the surrounding pyroclastic rocks have been propylitically- and potassically-altered, and pyritized. Along dyke contacts the country rocks are locally propylitized and pyritized but this alteration rarely extends more than 1 metre beyond their contact.

The most prominent alteration feature occurs along a northeasterly trending fault structure that transects the Ridge Zone. Along this structure the volcanic, pyroclastic and sedimentary rocks have been intensely fractured and altered to a bright orange to red colour. Within the fault zone the rock types are often indistinguishable except as an aphanitic quartz, plagioclase, hematite and ankerite groundmass.

## **MINERALIZATION**

Economic mineralization on the Stu prospect consists of three distinct, recognizable types:

- 1) **Shear or fracture-filled precious metal bearing sulphide vein structures.** These veins vary in size to 30 cm by 5 to 15 metres but are commonly a few cm wide and less than 5 metres long. Sulphide mineralization consists usually of pyrite and chalcopyrite when significant gold or silver values are present. The exact proportion of chalcopyrite to gold content has not been determined but it is recognized that chalcopyrite is necessary in order to yield precious metal values. Gangue minerals consist of quartz-calcite-epidote and sometimes chlorite. Sulphide minerals consist of pyrite, chalcopyrite and minor amounts of galena and sphalerite. The veins are of two ages - an older easterly tensional fracture set and a younger northeasterly trending set which cut and often displace the older easterly veins. Both sets are in turn truncated by intrusive feldspar porphyry and diorite dykes. This is the most common type of economic mineralization on the property.

- 2) **Metamorphic Alteration Sulphides** - the most common mineral of this type is pyrite. Pyrite occurs as fine grained disseminations and fracture fillings within regionally metamorphosed volcanic sedimentary rocks (mapped as lower greenschist facies by Minorex), as propylitic alteration haloes near intrusive contacts or as narrow (1 metre or less) wall rock alteration envelopes next to vein structures. Finally, pyrite occurs within a large alteration zone associated with, or superimposed upon, a steeply dipping northeasterly trending major fault structure. This zone has received very limited rock sampling, to date, and remains virtually unexplored. According to S.J. Geophysics "the rocks between anomaly U3 and U4 appear to be much more conductive than the surrounding rocks and could very well be mineralized along part of the strike length, as indicated by the mineralization on the Bear Zone. The best conductivities in this zone appear to be between lines 2000 E and 2400 E along the southern contacts (U3)".
  
- 3) **Metasomatic Mineralization** - chalcopyrite and pyrrhotite mineralization occur as disseminations, fracture fillings and lens-like bodies in massive to semi-massive form over a strike length of 700 metres within the quartz-actinolite-epidote skarn zone at the northeast end of Stu 2 mineral claim.

The following general remarks concerning skarn mineralization have been extracted more or less verbatim from a British Columbia Department of Mines publication prepared by Ettliger and Ray (1989) and released in December of 1989.

Skarn deposits in British Columbia have produced 95 tonnes of gold and 340 tonnes of silver, since mining began in the province. Precious metal enrichment occurs mostly in calcic skarns which are nearly always associated with late Triassic to upper Jurassic island arc volcanic-sedimentary rocks represented by Nicola, Rossland, Stuhini, Takla, Vancouver and Sicker groups. Gold enrichment is most common in deposits having copper or iron skarn affinities. The most promising regions for gold enriched skarns lie within any of the following terranes: Quesnell, Wrangell, Alexander and Stikine, especially where late Triassic limy rocks occur near margins of Jurassic to Cretaceous calc-alkaline intrusives. As may be seen

from a brief review of the geology, the quartz-actinolite-epidote skarn on the Stu property possesses nearly every single criterion itemized above.

## **DISCUSSION OF RESULTS**

The work completed prior to 1989 consisted mostly of prospect sampling although a generalized geological compilation was completed by Pamicon during its 1987 field program. Results of the airborne magnetic and electromagnetic survey carried out in 1988 were inconclusive and did not add significantly to the data base of the property. The 1989 program contributed detailed geological mapping, additional reconnaissance rock chip sampling, ground electromagnetometer and magnetometer surveys, hand trenching and sampling. All of the geological and sampling information obtained to date is presented in the accompanying maps (Figures 4-6B). The geophysical data are supplied separately under Appendix I. The geological mapping was completed by Minorex Consulting Ltd., while the geophysical work was carried out by S.J. Geophysics Ltd. Rangex Services supplied support personnel and supervised the work under direction of Kestrel Resources Ltd. A total of 62 prospect rock chip samples (select grab) were collected as a consequence of the prospecting work during 1989. A further 7 samples were collected during the mapping program and an additional 25 samples were collected from the hand trenches excavated later in the season. All of the 94 lithochemical samples collected were shipped to Van-Geochem Laboratories in Vancouver and analyzed for gold using standard F.A. and A.A. techniques. As well, a 25 element ICAP analysis was obtained for each sample collected.

Sample results of the 1987 and 1988 programs completed by Pamicon were obtained using similar methods.

All of these results showing values obtained for gold as well as copper, lead, zinc, silver where applicable, are presented in Figures 5B and 6B. A total of 500 rock chip samples were collected by Pamicon crews during the 1987 and 1988 seasons. All of the 1987 results and 18 selected results of the 1988 work are located on Figures 5B and 6B.



A total of 12.4 kilometres of grid line were established by S.J. Geophysics over two separate areas in order to provide control for the geophysical surveys completed as part of the 1989 field program. The grid locations and results of the surveys are identified on Figure 6A and discussed by S.J. Visser in his report provided in Appendix I.

Six hand trenches, excavated as "follow-up" to the prospecting yielded 25 channel samples taken at 1 metre intervals across the strike of the actinolite skarn zone. The trenching totalled 40 metres over a strike length of 60 metres. Location of the trenched area is indicated on the geological compilation (Figure 6A). Results of the sampling are shown on Figure 4. As may be seen, sulphide mineralization is present in significant amounts in a number of samples, the highest of which returned values listed below:

<u>Sample No.</u>	<u>Cu ppm</u>	<u>Pb ppm</u>	<u>Zn ppm</u>	<u>Ag ppm</u>
83434	20,001	N/A	N/A	43.7
83917	14,621	1,280	11,655	39.0

Gold values are absent in amounts greater than 1 ppb.

An examination of the geophysical data (Ridge Zone) reveals the following:

- 1) Moderately good correlation between magnetic high values and underlying diorite intrusives at the eastern portion of grid (Lines 2400E - 2700E). Magnetics indicate a sizeable intrusive stock (300 metres by 600 metres), only a small portion of which is exposed and which trends easterly south of and parallel to the actinolite skarn zone. This diorite body is undoubtedly the source of the skarn mineralization. It is open at the eastern limit of surveying and gives good indications of continuation toward the eastern claim boundary.

The actinolite skarn zone between lines 2800E and 2850E gives a partial positive magnetic response which again is incompletely defined due to the limit of geophysical surveying. Additional ground geophysical surveying

extending the grid easterly as far as possible is required to outline the intrusive diorite and possible extension of the skarn zone.

- 2) The central portion of the grid yields flat to slightly negative magnetics. The negative anomalies, which when joined, parallel the fault structure mapped on surface. The magnetics are offset 100 metres to the south suggesting a southerly, steep dip.
- 3) The extreme western portion of the grid is thought to reflect underlying andesitic volcanic rocks.
- 4) The Utem survey reveals a contact anomaly axis which closely parallels geological mapping of the alteration zone (Ridge fault zone).

## CONCLUSIONS

The exploration work completed by Kestrel Resources Ltd. to date has outlined two areas of mineralization that require further evaluation. These are the sulphide bearing quartz-actinolite-epidote skarn found at the contact between the limestone and pyroclastic rocks on STU 2 mineral claim, and the northeasterly-trending fault structure truncating the Ridge zone.

Prospect rock chip samples taken by Pamicon crews during the 1987 field season within the "Ridge" fault structure obtained values to 12.1 gms/tonne (0.354 opt) Au. The structure, delineated by the 1989 work program, has received very sparse sampling and requires further investigation as it offers a good exploration target containing in excess of 100,000,000 tonnes of possibly mineralized rock (assuming uniformity and down-dip dimension of 500 metres). Extent of the mineralization remains to be defined.

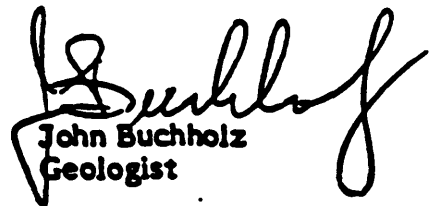
Similarly, the actinolite skarn zone has received incomplete investigation having been discovered late in the 1989 program. A distance of 500 metres to the eastern claim boundary remains to be explored especially since the zone has been traced this far by prospecting. Westerly, the zone merges with

the Ridge Fault structure at its south boundary (north end of fault) over a distance of 350 metres. It is not certain that this metasomatic alteration feature is terminated at the Ridge Fault junction - in fact, the opposite is suggested by the coeval relationship of the two. A number of select grab samples collected from the skarn returned values ranging to 42 ppm silver, 19,900 ppm copper and 10,300 ppm zinc. Gold has not been discovered in the skarn zone in amounts greater than 1.0 ppb to date.

### **RECOMMENDATION**

The 1989 work program for Stu 1 and 2 mineral claims comprised a limited geophysical, mapping and trenching program totalling an expenditure of \$82,000. Additional work is warranted as outlined, in order to continue the assessment of the potential of the property.

Work should consist of additional trenching and surface work totalling \$140,000 and contingent on the results obtained, should lead directly to a drill program of 1,500 metres (5,000 feet) to be completed early in the 1990 field season.

  
John Buchholz  
Geologist

**PROPOSED EXPENDITURE**

**Phase I - Surface Exploration**

Limited prospecting and mapping	40 man days	\$ 16,000
Trenching	80 man days (4 men/20 days)	24,000
Room and board	6 men	16,000
Helicopter	2 hrs/day @ \$800/hour	24,000
Transportation and supplies	Mob-demob, plugger, etc.	10,000
Assaying	500 samples @ \$20 each	10,000
Compilation	Reports and maps	<u>10,000</u>
		110,000
Management fee		<u>12,000</u>
		122,000
Contingency 15%		<u>18,000</u>
<b>Total Phase I</b>		<b>\$ 140,000</b>

**Phase II - Diamond Core Drilling**

BQ or larger at \$60/ft - 5,000 ft.	\$ 300,000
Freight, assaying, supervision, etc.	<u>60,000</u>
<b>Total Phase II</b>	<b>\$ 360,000</b>

**TOTAL PHASE I AND II** \$ 500,000

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**ENGINEER'S CERTIFICATE**

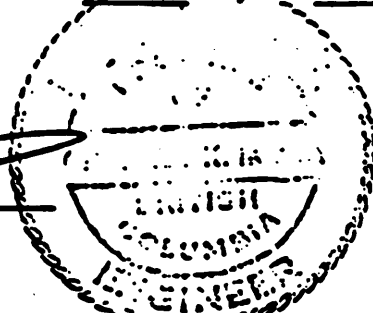
**I, CHARLES K. IKONA, of 5 Cowley Court, Port Moody, in the Province of British Columbia, DO HEREBY CERTIFY:**

- 1. THAT I am a Consulting Mining Engineer with offices at Suite 711, 675 West Hastings Street, Vancouver, British Columbia.**
- 2. THAT I am a graduate of the University of British Columbia with a degree in Mining Engineering.**
- 3. THAT I am a member in good standing of the Association of Professional Engineers of the Province of British Columbia.**
- 4. THAT I have reviewed the report on the Stu property by John Buchholz dated December 1989 and agree with the proposed program and budget contained therein.**
- 5. THAT work on the property was conducted by our company in 1987 and 1988 and that I examined the property during both these programs.**
- 6. THAT I have no interest in the property described herein nor do I expect to acquire any such interest.**
- 7. THAT I consent to the use by Kestrel Resources Ltd. or any company associated with Kestrel of this letter in a Prospectus or Statement of Material Facts or any other such document as may be required by the Vancouver Stock Exchange or the Office of the Superintendent of Brokers.**

DATED at Vancouver, B.C., this 22 day of Feb, 1990.



Charles K. Ikona, P.Eng.



**Strain, D.A., 1981: Geological and Geochemical Report on the Zappa Claims, Liard Mining Division, British Columbia; British Columbia Ministry of Energy, Mines and Petroleum Resources, Assessment Report 9189.**

**Todoruk, S. and Ikona, C.K., 1989: Geological Report on the STU 1 & 2 Mineral Claims, Liard Mining Division, British Columbia; Addendum to report prepared for Kestrel Resources Ltd. dated April 26, 1989.**

GEOLOGIST'S CERTIFICATE

I, JOHN BUCHHOLZ, of the 10370 Monte Bella Road, Winfield, British Columbia, hereby certify that:

1. I am a graduate of the University of British Columbia having obtained a degree in Geology (B.A.) in 1962.
2. I have practiced my profession during the period 1962-1974 and 1987 to the present on various exploration projects ranging from grass roots to underground programs.
3. I have no interest in the property described herein, nor any securities of any company associated with the property, nor do I expect to receive any such interest.
4. This summary report is based on a personal examination of the property and private reports prepared for Kestrel Resources Ltd., and accurately reflects the complete report prepared for the property.
5. I consent to the use by Clifton Star Resources Inc. of this report in a prospectus or statement of material facts or any other similar document as may be required by the Vancouver Stock Exchange or the British Columbia Securities Commission.

Dated at Vancouver, B.C. this 20th day of February, 1990.

  
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John Buchholz, Geologist

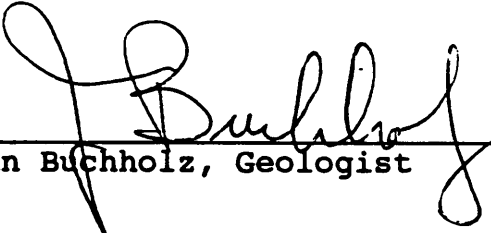


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2. I have practiced my profession during the period 1962-1974 and 1987 to the present on various exploration projects ranging from grass roots to underground programs.
3. I have no interest in the properties described in the Rights Offering Memorandum and Statement of Material Facts ("SMF") of Clifton Star Resources Inc., nor any securities of any company associated with the properties, nor do I expect to receive any such interest.
4. The summary reports included in the SMF are based on a personal examination of the properties and private reports prepared for Kestrel Resources Ltd., and accurately reflect the complete reports prepared for the properties.
5. I consent to the use by Clifton Star Resources Inc. of the reports in the SMF or any other similar document as may be required by the Vancouver Stock Exchange or the British Columbia Securities Commission.

Dated at Vancouver, B.C. this 30th day of May, 1990.

  
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John Buchholz, Geologist