GEOLOGIC REPORT
for
ASSESSMENT WORK
COMMERCE CLAIMS, S.E. BRITISH COLUMBIA

49° 11' N. 114° 22' W. 82 G/1W

KINTLA EXPLORATIONS LIMITED
1979

'80-#263-# 8301

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Location

The Commerce claims are staked on a number of lines, none of which are recognizable at present owing to the depredations of second growth, bears and the weather. The claim outline on the map (to which the reader is referred) is approximated from details of the claims locations taken from R.D. Morton (1971) and from details given by F. Goble. The claims were staked to cover two zones of immediate economic importance: firstly, the Grinnell Formation between Commerce and Sage Creeks, for it's potential of stratabound copper mineralization, and secondly, a zone of intrusion of sills and dykes in the eastern claims, for it's potential of copper-gold mineralization.

Introduction

The Commerce claims were examined and mapped by the author during the period 15th July to 10th August, 1979. The author was assisted by K. Goble.

The area was mapped onto an enlarged portion of the topographic sheet (SAGE CREEK, B.C.) at 417' tO 1". Since the topographic maps are drawn at 1:50,000 from air photographs, they sacrifice much detail. Consequently, the enlargement of the topographic map is singularly lacking in details required when mapping at this scale. The problem of accurate location on this map was great, and errors of ± 100' are to be expected. The area was mapped with the philosophy of understanding the geology, understanding the nature and controls of known areas of mineralization, evaluating such areas, and determining their limits. Mineral occurrences were noted and evaluated where found during traverses. In an area that has been so extensively prospected, it was expected that most of the mineral showings would be know.

The map consequently locates those mineral showings that were intersected during traverses, but no attempt was made to traverse every foot of the property. The map usefully can be used as a base on which to locate all prospector-discovered showings. It is the opinion of the author, however, that all the 'Gossan Zone" mineralization and a large proportion of the stratabound copper mineralization were located, evaluated, and understood.

General Geology of the Claim Group Area

The area is underlain by rocks of the Purcell Period, and sections of all formations from the Altyn to the Phillips were traversed. For details of the regional stratigraphy the reader is referred to Price (1961), and to the enclosed Table of Formations, adapted by the author from Price's for use in the Commerce area only.

The rocks are Proterozoic in age and are cut by diabasic to dioritic dykes and sills. The rocks are folded on an easterly trending axis into large tight anticlines and open synclines (F_1) which are severely discontinuous. The associated meso-drag folds are present in all formations. Those folds were refolded by large, open, and northerly [redacted] trending folds (F_2), so that they have a double plunge. These F_2 folds are related to the Akamina syncline. F_2 drag folds were found only to be common near the crests of the F_2 anticline.

Apart from the immediate contacts with the sills and dykes, the rocks are unmetamorphosed. Faulting, in contradiction to Morton (1971, p. 10) is not intense, but is extremely minor: most of the recognised faults are joint planes along which minor adjustments have occurred.

Altyn Formation:

About 1000' of dark fissile shales with dolomitic horizons outcrop to the south and west of the claims and are assigned to the Altyn Formation. Many of the bedding planes in the shales are covered in a thin plating of pyrite, but no other minerals were observed.

Appekunny Formation:

The base of this formation is taken at the lower of two 50'-thick distinct white sandstone bands which outcrop, 100' apart, to the south and west of the claims. They are overlain by about 2000' of grey and green fissile shales with occassional dolomitic horizons and towards the top there are an increasing number of intercalated thin white sandstone beds. Pyrite was observed as thin smears on joint and bedding planes in the shales and pyrite and hematite blebs were seen in some of the upper sandstones. No copper minerals were seen.

Two easterly plunging F_1 folds bring the outcrop of this formation onto the western Commerce claims, and in the axial regions of both F_1 and F_2 folds good non-penetrative F_1 and F_2 cleavages are developed. The axial planes of F_1 drag folds have broken occassionally, allowing small 'faults' to develop.

The Grinnell Formation:

The base of this ~2000' thick formation is marked by the incoming of the first red bed, which conformably overlies the Appekunny. The lower part of the Grinnell consists of red silts and marls with buff and green horizons and very rare sandstone beds. The buff and green horizons are not true beds, but are developed round thin beds and lenses of coarser silt and sandstone, presumably during post-depositional ground water percolation.

The sandstone beds increase in number and in thickness up the Grinnell until they make up some 50% of the outcrop in the upper 500'.

The silts contain ripple marks, suncracks and mud-flake conglomerate horizons. The sandstones are often cross-bedded, have rippled and scoured bases, and contain shale clasts. The rocks are interpreted as being the deposits of a deltaic floodplain, with the sandstones representing periodic channel spills. The rocks were deposited in part in very shallow water and in part subaerially.

The sandstones are not homogenous along strike but vary from pure to 'dirty', from massive, to laminated to cross-bedded, and from empty to shale clast bearing. In the lower and middle Grinnell (no actual boundaries are defined or defineable) the shale clasts are usually green, but green and red ones become mixed in the upper Grinnell. This greenness indicates that the beds were permeable to ground water solutions of low EH, and that Fe^{3+} was reduced to Fe^{2+} in them. That the beds were not completely permeable along strike is indicated by the change from green to red clasts along some beds, the corresponding decrease in green alteration of the surrounding red silts, and by the heterogeneity of the beds.

Secondary hematite is common in many of the sandstone beds, and can usually be seen to be crystallised from primary detrital iron oxides, the lag concentrates on cross-bed foresets. Pyrite was seen less frequently in the sandstone beds, usually as small blebs disseminated amongst the quartz-grains, and as partial replacements of green shale clasts.

Copper minerals - bornite, chalcocite, chalcopyrite, and occasionally covellite, with secondary malachite and, rarely, azurite - are found in some of the sandstone beds, over parts of their length. These minerals occur as disseminated blebs, or as partial or complete replacements of green shale clasts. No copper mineral was seen replacing a red shale clast, and only very rarely were copper minerals seen in sandstone beds containing red clasts.

In no case was the copper mineralisation extant over the complete outcrop of a bed, but was found only in the 'dirty' and clast-bearing portions. No copper was found in the surrounding shales.

Each showing of copper mineralisation is detailed below, but it can be generalised that:

1. The copper is of local origin.

2. The copper was leached into or deposited in the sandstone beds, and was precipitated or reprecipitated as sulphides where the EH was such that Fe^{2+} was stable.

3. An epigenetic source is impossible because of the restriction of mineralisation to certain parts of certain beds.

4. Copper is an inherent part of the Grinnell sandstones, and was crystallised to its present form in most beds prior to folding, etc.

However, it is apparent that this primary, and probably uneconomic, copper mineralisation may be concentrated later - see the description of copper zones H and F.

Description of the Individual Copper Zones in the Grinnell Formation

Zones A, B, and C are described separately in the SAGE claims report.

Zone D:

Owing to the nature of the topography here, the lateral continuity of some beds could not be ascertained. On this razorback ridge the upper Grinnell rocks dip steeply to the SE and contain frequent sandstones up to 5' thick. Five thin sandstone beds were seen to contain blebs of chalcopyrite and bornite in lenses and pods and a thick sandstone (3'-5') with shaley lenses contains 2-3% copper sulphides over its 200' of accessible outcrop. The SW end is hidden beneath snow and scree, and the NE end runs down a vertical cliff. This bed may be continuous with the uppermost one at Zone C, but if so the copper mineralisation is not continuous for the horizon was traversed between Zones C and D. Above this bed occasional specks of copper minerals were seen in three beds up to the Siyeh contact.

Zone E:

A complete section of all the Grinnell rocks exposed between 8108 Mountain and Commerce Peak, revealed only this small lens of copper minerals (chalcopyrite, mainly) over 3' in two adjoining 6" thick beds.

The copper in Zones C, D, and E may be slightly concentrated in the core of the F_1 syncline, but is probably at its original concentration. Only the one bed in Zone D shows any promise of lateral continuity - the rest are proven discontinuous.

Zone F:

No copper was observed in the lower Grinnell on Commerce Ridge here, but in the middle Grinnell two sandstone beds were observed to carry chalcopyrite and malachite. The first is 6" thick and < 1% Cp was seen over 3'. The second is 3' ± thick and is exposed for 150^X-200^X on a dip-slope. Small vertical, quartz-filled joints, parallel to F_1 cut the rock, and both these and the bedding planes are covered in chalcopyrite and malachite. Disseminated blebs of chalcopyrite and ?chalcocite were seen in the bed. The jointing has stepped the bed giving an illusion of greater thickness. The bed is mineralised over its whole outcrop here, in the core of an F_1 syncline. No other copper mineralisation was observed on the ridge between here and 7900 Mountain, although there is only 10-20' of Grinnell exposed here above the cupriferous bed.

Zone G:

A detailed traverse from the ridge top down 600' of middle Grinnell rocks revealed two mineralised sandstone beds. The fourth sandstone from the top is exposed for 70^X between a snow-filled gully in the south and a scree in the north. It is 1' thick with green and red shale clasts and contains blebs and smears of chalcocite at between 3 and 5% over its whole outcrop. The thirteenth sandstone from the top is 6" thick and contains ~ 1% chalcocite over 3'. One end is not exposed, the other is barren.

Traverses about 1000' to the north failed to locate mineralisation in a stratigraphically similar position.

Zones F and G appear to be slightly concentrated zones of copper mineralisation associated with the trough of a major F_1 syncline.

Zone H and Associated Veins:

The Grinnell Formation is folded here into two tight anticlines (see sketch below), and the crests of these anticlines have cracked and allowed dilation and very minor faulting. Quartz has been remobilised from the sandstone beds and deposited as veins in parts of these cracks. Where bedding is parallel to the veins, the sandstone beds are recrystallised to quartzite, and the vein, as such, is a bed. The veins are podiform, being wider at slight kinks. Often there are small offshoots and nearby tension fracture pods.

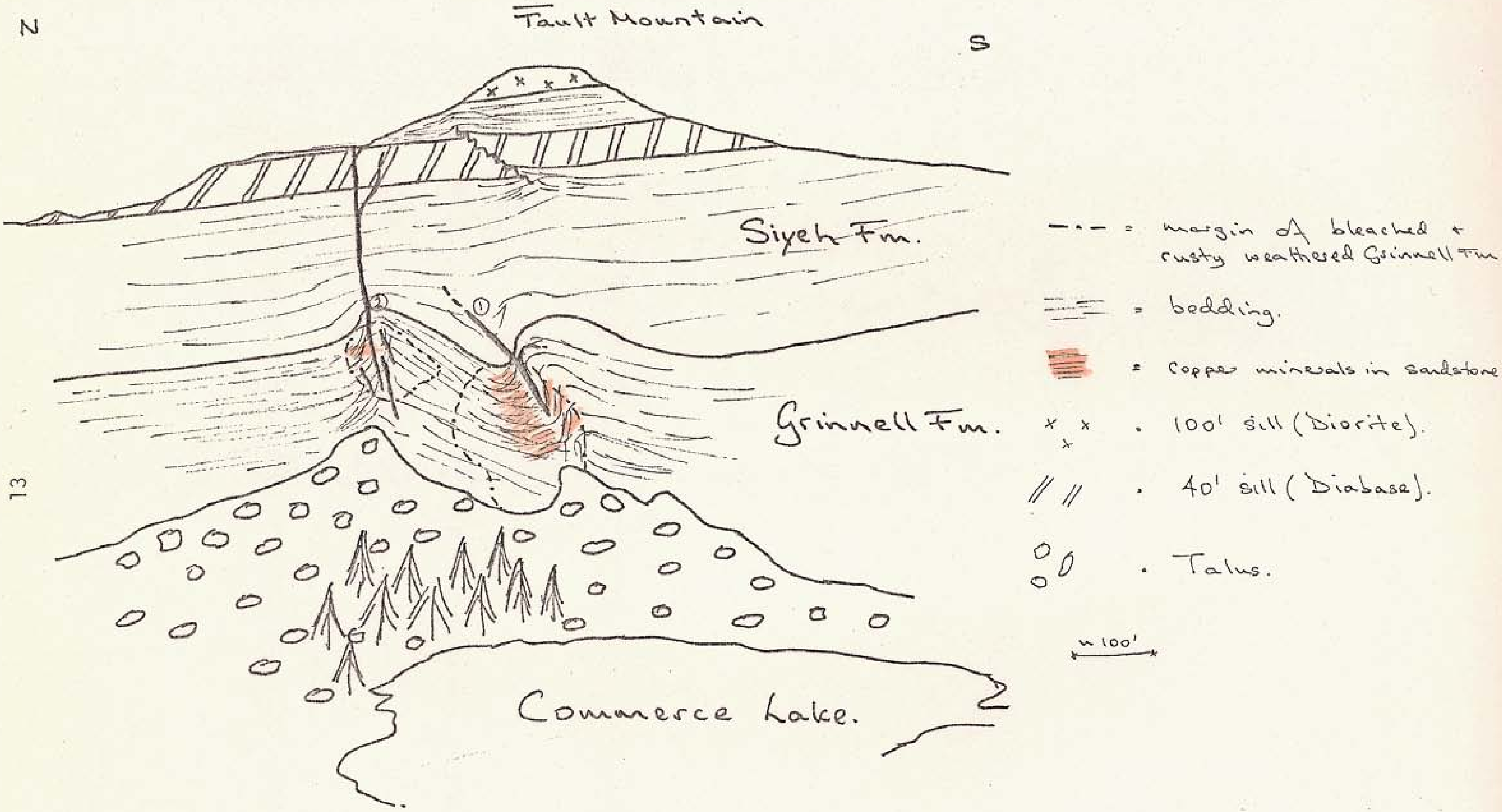
Vein 1 is generally barren where it transects the Grinnell, although blebs of chalcopyrite were seen, in places up to 5%. The vein was covered in snow and inaccessible where it presumably transects the Siyeh Formation. This vein does not transect the Siyeh and the sills higher up on Fault Mountain.

Vein 2 is very poorly exposed at its lower end, and was not seen to be mineralised. The top is likewise barren. Owing to the time and the snow, the middle portion was not examined, but concentrations of tetrahedrite and chalcopyrite are reported from it (Morton, 1971).

The Grinnell rocks are severely bleached to the north of Vein 1, for 100-150', and the first 50' north of the vein are weathered rusty. These bleached beds (pale green and brown) can be traced laterally into the normal red succession. There is a small amount of bleaching around Vein 2.

Traverses were made up both sides of Vein 1 and down the north side of Vein 2. On the south side of Vein 1 three copper-bearing sandstones were found and were persistent up to 50' from the vein. These contained disseminated blebs of chalcocite and chalcopyrite up to 3% in concentration. 50' to the north, in the rusty zone, 18 beds or sets of beds contain copper minerals. The lower nine have between ½% and 5% of chalcocite blebs, a black soft mineral, smeared round quartz grains (? tetrahedrite) and some chalcopyrite specks. In the upper nine beds the proportion of chalcopyrite increases sharply at the expense of the other minerals, keeping a concentration of 1-5% sulphides. Malachite and azurite are well developed. These mineralised beds do not persist laterally, but fade out by the end of the bleached zone - mineralisation is restricted to the Grinnell Formation and does not continue into the Siyeh above. On the north side of Vein 2 500' of Upper Grinnell were traversed and one sandstone bed containing ½% chalcopyrite was noted.

It seems clear that the primary concentrations of copper in the Grinnell have been selectively emplaced in fold cores here,


Fault Mountain
N
S
Siyeh Fm.
Grinnell Fm.
Commerce Lake.
= margin of bleached + rusty weathered Grinnell Fm.
= bedding.
= copper minerals in sandstone.
. 100' sill (Diorite).
. 40' sill (Diabase).
. Talus.
~100'

presumably as the deposits of a syn-tectonic fluid migration. The mineralisation is not of an 'epigenetic hydrothermal' variety - both copper sulphides and the vein material are of local derivation.

The veins were not located on the east side of Fault Mountain, nor is the Grinnell exposed there. However, the folds, while being vertically discontinuous, may persist laterally and allow a substantial amount of mineralisation beneath Fault Mountain. It is recommended that the immediate area of the veins be mapped on 100':1" on a baseline and grid and that mineralised blocks be sampled statistically to obtain rough tonnage and grade figures.

Rough calculations taking a block of 500' x 100' with a depth beneath the mountain of 100', and containing 1-5% copper sulphides in 10% of the rock by volume, indicate ~ 50,000 tons of good mineralisation.

In Conclusion:

1. The Grinnell Formation contains small patches of primary copper sulphide mineralisation in some sandstone beds.

2. Such mineralisation has been concentrated by fluid migration into fold cones during or after F_1 folding.

3. No other concentrators, such as the faults and dykes observed on other of the Company's properties, were observed in the Grinnell on the Commerce or Sage claims.

The Siyeh Formation

The basal 1000-1500' of this formation consist of well-bedded, buff weathering grey and black shales and dolomites with sparse sandstone beds. The latter contain grains of pyrite, and, near the base, one bed has about 5% micronodules of marcasite. These are overlain by ~ 400' of interbedded dolomites and sandstones. The dolomites are often algal (hemispheroid to parallel, continuous linkage, indicating just sub-tidal) and often contain inclusions of grey limestone with 'molar tooth' (Daly, 1912) and heiroglyph structures. These are interpreted partly as brecciated fragments of algal mat and partly as soft sediment brecciation during compaction and cementation (Adshead, 1963). Towards the centre of the middle Siyeh a 50' thick algal dolomite is a distinctive marker and towards the top there is another such, 30' thick. The depositional environment is interpreted as having been shallow lagoonal.

The upper Siyeh consists of 200-250' of well-bedded fissile argillites and arenites, with green and grey shale being the dominant lithology.

The Purcell Lavas

Between 200' and 400' of pillowed, massive and vesicular green to purple flows overlie the Siyeh with complete conformity. These flows were identified in the field as 'andesite', but the work of Hunt (1961) and the lack of tuffaceous activity would indicate them to be basaltic andesites and trachybasalts. The vesicles may be round, ellipsoid, amoeboid or tubular and branching. They are filled with chlorite, quartz and carbonate, containing rare specks of pyrite and chalcopyrite. Larger vug cavities are lined with quartz and, occasionally, pyrite. No primary mineralisation was seen in the matrix of the rocks, which are interpreted as being extruded both into shallow water and subaerially.

The Sheppard Formation

The apparent thinning of the Purcell lavas, and the presence of volcanic fragments in quartz grit beds in the base of this formation testify to unconformity here, shown as a disconformity in this area, and representing small tectonic adjustments to the volcanic event.

The basal Sheppard contains three distinct quartz grit beds, in 70' of shales and calcargillites. A 30' thick flow and set of flows, indistinguishable from Purcell Lava in the field, overlies these, and is in turn overlain by 250' of stromatolitic dolomites (just subtidal) and calcargillites, representing a return to lagoonal conditions. The top of the lava flow is ropy and scoriaceous.

The Gateway Formation

300' of red siltstones with shale and sandstone horizons overlie the Sheppard conformably and represent the return of deltaic conditions. The unit is typified by ripple marks, suncracks, mud-flake conglomerates and salt casts.

The sandstones in this unit should be prospected for indications of primary copper mineralisation. 50' of buff shales overlie the Gateway Formation on Hopper Mountain and are tentatively ascribed to the Phillips Formation.

The Gossan Mountain Mineralisation

The top of the middle Siyeh, the upper Siyeh, the Purcell lavas, and the lower Sheppard are intruded by numerous dykes and sills of diabasic to dioritic composition. For complete chemical descriptions of these rocks the reader is referred to Hunt (1961).

Most of the sills are plagioclase-hornblende porphyritic diorites. They contain abundant amphibolitised xenoliths, chilled margins, baked host rocks at the contacts, and late magmatic segregation pods, veins and dykes. The texture is generally diabasic, but patches of pegmatitic plagioclase are common. K-feldspar and quartz-bearing pods occur frequently and the late magmatic dykes and veins are occasionally K-feldspar--hornblende-biotite porphyritic, but are more generally pink and aplitic. Nodules containing olivine, plagioclase, and pyroxene have been reported (Hoffman, pers. comm.) from one of these sills outside the area reported on herein. Local segregation pods of biotite were observed in the thicker sills, and late dykes of fine quartz-feldspar with large blebs of golden mica (phlogopite ?) were seen.

The sills are frequently both fed by and cut by dykes of identical texture and composition. The sills are not strictly stratabound but jump on joint planes, have apophyses and offshoot dykes and sills, and may bifurcate and rejoin. All the dioritic rocks contain primary sulphides, mainly pyrite and pyrrhotite, with rarer chalcopyrite.

One sill of more diabasic nature was found in the middle Siyeh, and no intrusions were observed below this. The basal nature of this last sill, the postulated relationship of the Purcell lava and these sills (Daly, 1912) (Hunt, 1961), the presence of basic nodules, and the presence of more basic intrusions at similar horizons elsewhere, leads to the conclusion that the diorites are the differentiates of a more basic liquid and their texture and mineralogy suggests that they were intruded at fairly low temperatures, at shallow depths and under hydrous conditions.

Where the sills intrude the middle Siyeh rocks sulphide mineralisation is absent. The sandstones and limestones are bleached and recrystallised and the growth of epidote, andradite, idiocrase (?), grossularite, tremolite, and diopside was observed in the siliceous algal bands in the dolomites. Where the sills are isolated, bleaching and metamorphism was not apparent beyond 20' from the contacts, but in zones of multiple intrusion the metamorphism is more widespread. Where the sills intrude upper

Siyeh rocks both they and the shales are often well-mineralised. The Purcell lavas are commonly extensively replaced by sulphides along contacts with sills. Mineralisation was not evident in Sheppard rocks.

The dykes are more commonly mineralised throughout their length, but some are, nevertheless, barren.

The zone of major intrusion stretches from North Ridge, through Gossan Mountain, to Andradite Mountain. The majority of sills and dykes are in the top 400' of the Siyeh Formation, and the mineralisation in both igneous and sedimentary rocks is almost entirely confined to the Upper Siyeh shales.

A number of possibilities present themselves:

1. The Siyeh shales represented a permissive zone at the depth of intrusion of mineralised sills.

2. The Siyeh shales were sulphide rich and the permissive intrusion mobilised the concentrated the sulphides.

3. The chemical nature of the Siyeh shales allowed replacement by sulphide from the dykes and sills.

The sulphides are present in the sediments as metablasts and as platings on bedding and joint planes. Those in the igneous rocks occur as disseminated primary blebs, and as coating on joint planes. It must be concluded that the sulphides are of magmatic origin, and that the physical (and chemical ?) nature of the Siyeh shales permitted intrusion of the sills and mineralisation at this horizon.

There is no sign of skarn (s.s.) on contacts between intrusives and limestones, and only two very small patches of malachite were seen on such contacts. The sills and dykes are described individually, and are numbered, or lettered, on the map. Sketch sections of their outcrop are attached.

SILLS

1. 15' thick unmineralised medium-grained diorite.

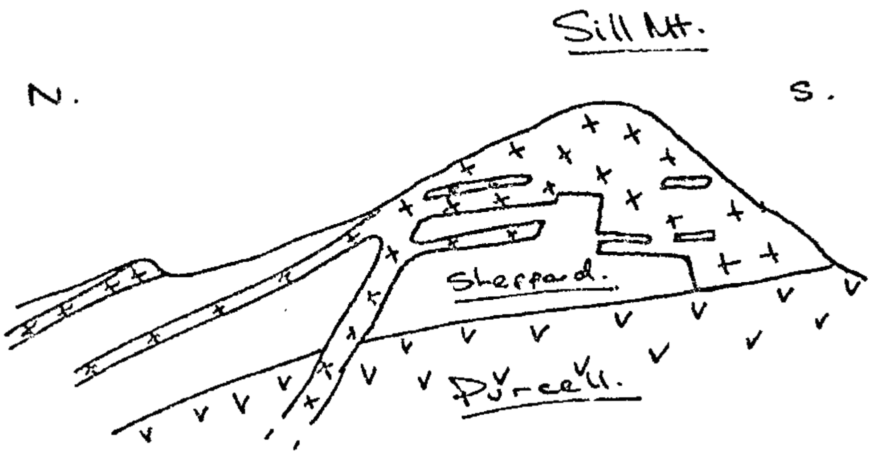
2. 'Sill Mountain sill'. At least 100' thick. The base steps near the Purcell lava - Sheppard contact, and contains many large blocks of Sheppard sediment. It is fed by a vertical, 20' thick dyke (α) of medium-grained diorite. The sill is mostly grey, unmineralised diorite, but contains pegmatitic, quartz-rich and k-feldspar-rich patches and late dykelets.

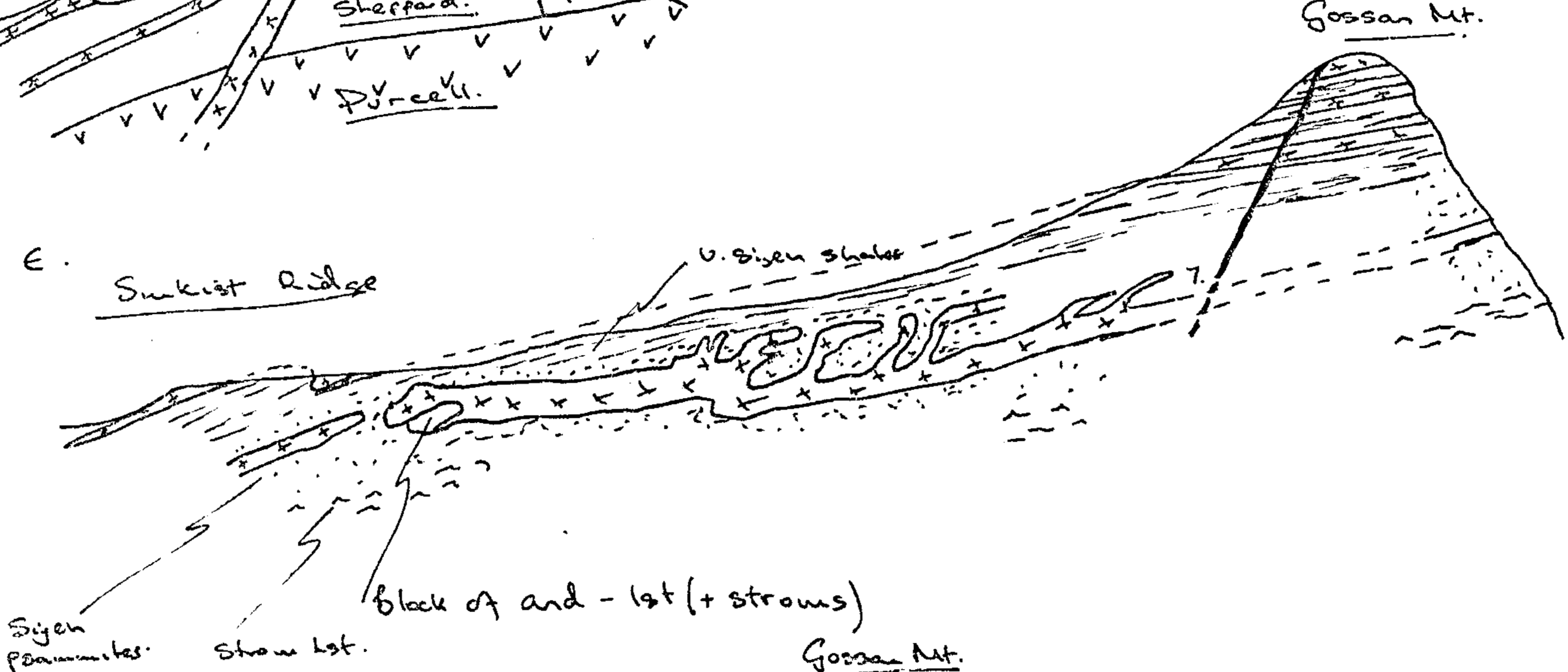
One patch, with late vuggy quartz, contains good sulphide mineralisation, from which gold assays have been attained. The zone was badly weathered and half covered by snow, so a further understanding of this zone was impossible. The southern contact with the Purcell lava is well exposed and the lava is impregnated with 15-20% of pyrite > pyrrhotite > chalcopyrite. This zone must be trenched and investigated immediately.

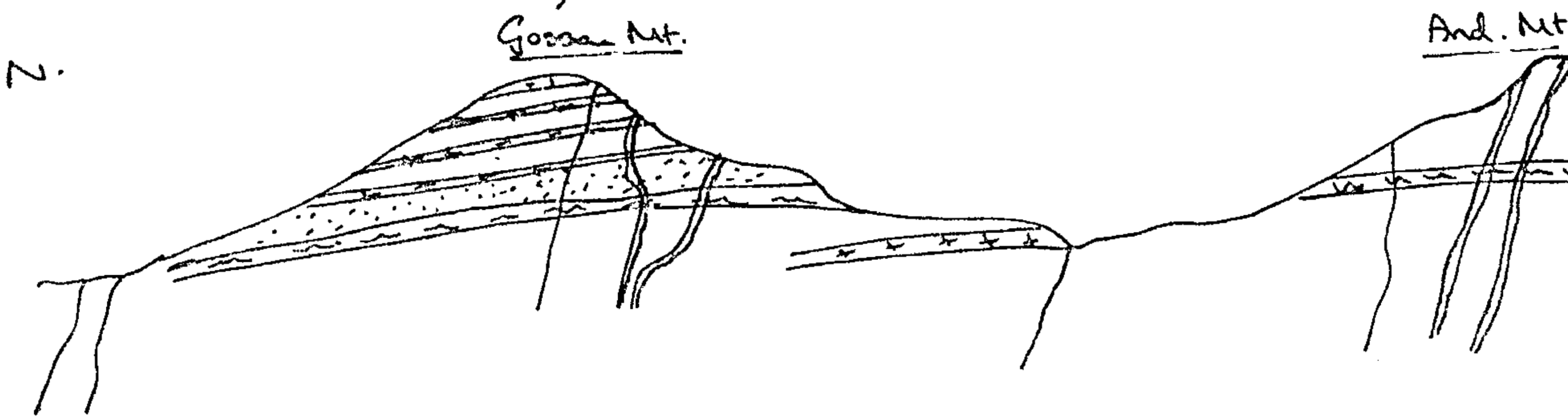
Small patches of rusty weathering occur in the Purcell lava and the sill near the western contact, but little fresh sulphide was seen.

3. 10' thick, exposed for 50^{x} at base of Sill Mountain. Fed

Sketch Sections for notebook.

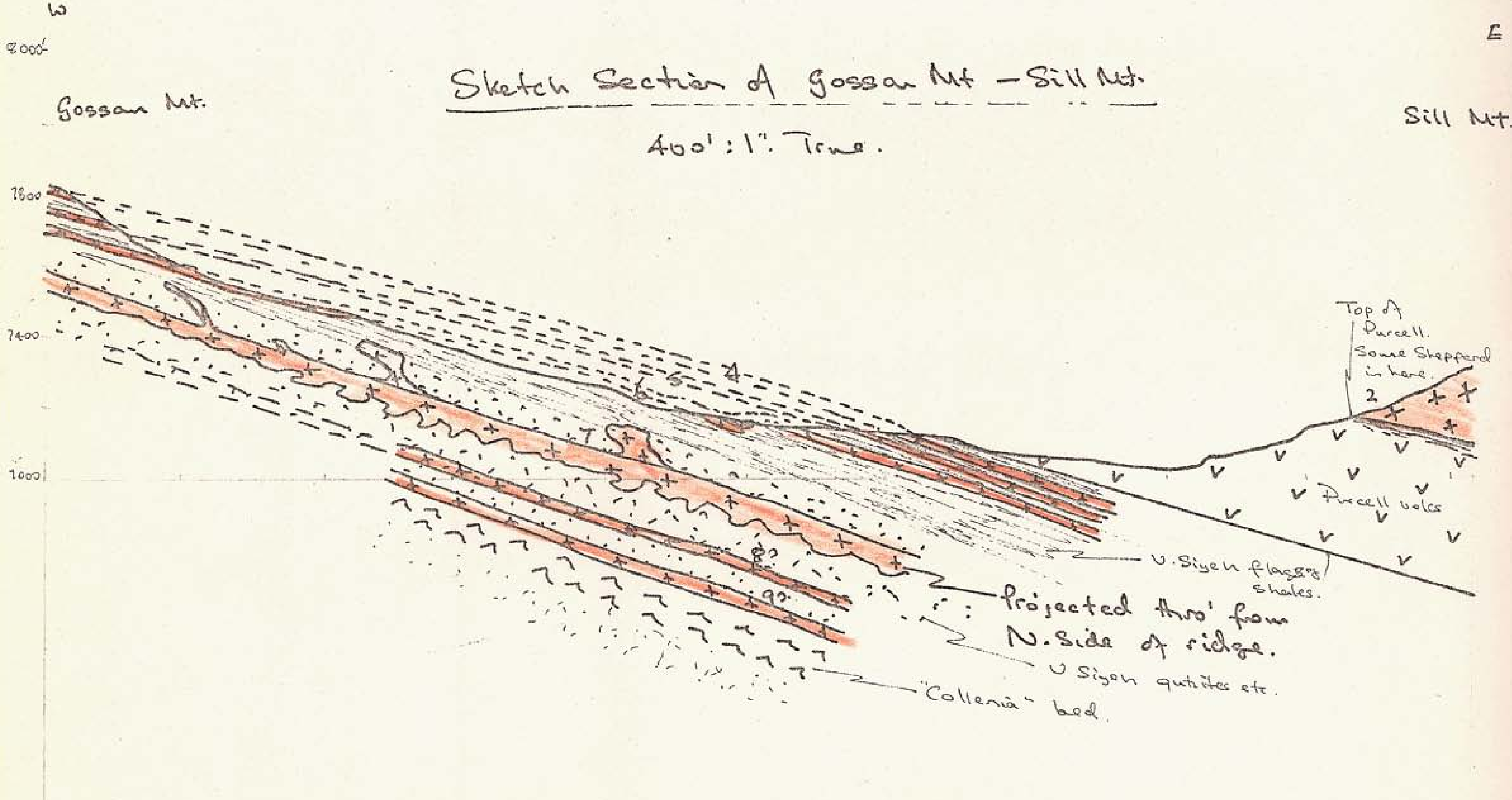






Sketch Section of Gossan Mt – Sill Mt.

400' : 1". True.



by dyke α. Unmineralised diorite.

4. 10' thick uniform diorite sill. Unmineralised in its eastern outcrop, but in its outcrop on Gossan Mountain it contains up to 5% Py > Po, and the sediments around it are impregnated with pyrite.

5. Similar to (4).

6. 10' thick diorite. Outcrops all the way up the eastern slope of Gossan Mountain and both it and the surrounding shales are well mineralised. On Gossan Mountain the sulphides concentrate up to 5% in the margins of the sill, and drop to ½% in the central portions. Py > Po.

7. 15-20' thick, very irregular diorite. Mineralised with 5-10% Py > Po throughout its outcrop. It intrudes the Middle to Upper Siyeh contact and has sparse blocks of stromatolitic dolomite caught up in its base. The shales above it are well mineralised with pyrite. Below it, no sulphides were observed.

8. 5-10' diorite. Very small patches of sulphide concentration up to 1% in its southern outcrop.

9 and 10. Similar to (8). 10 is mineralised with 1% pyrite on Andradite Mountain. The surrounding rocks are not mineralised. 10a and 10b appear to be barren continuations of 10.

11. The 100' sill. Mostly grey diorite but with varying texture and grain size. It is severely sheared in places and the shear planes are heavily epidotised. Beneath North Ridge, this sill is at least 300' thick and is polyphase consisting of mixed diorite

and syenite. It is full of epidotised shears here. Many dykes and veins extend upward from this sill, and all the rocks above it are bleached. Below it the rocks are unaffected 5' from the contact. Apart from a few grains of pyrite, the sill is unmineralised.

12. Small, well-mineralised diorite sill on top of Andradite Mountain, both fed by and cut by vertical, mineralised dykes.

13. Unmineralised diorite sill that appears to bifurcate in Sheppard limestones.

14. 100' below (11), this is a 40' thick diabase. The Siyeh sediments are bleached for 20' on each side, but neither they, nor the sill, are mineralised.

DYKES

α) Unmineralised diorite feeder dyke to sills 2 and 3.

β) Pinkish, trachytic, syenite dyke. 3' wide; unmineralised.

γ) Δ) Two 2-5' wide quartz-feldspar dykes with blebs of golden mica and sparse pyrite.

ε) 4' wide diorite with 1% pyrite.

η) π) κ) Three 5-10' wide diorite dykes with 1-3% pyrite and pyrrhotite. Most of their outcrop is inaccessible.

σ) Unmineralised 3' diorite.

τ) ω) φ) ζ) ρ) ο) λ) ϖ) Complex of 2-5' vertical dykes of well mineralised diorite. Mineralisation from ½-3%. Pyrite and pyrrhotite varies laterally and is generally lower in the central portions.

s) 2' wide dyke as α) and Δ).

x) 1' wide barren fine-grained diorite.

g) 5' wide discontinuous semitrachytic syenite as β).

Unmineralised.

In addition the section from Gossan Mountain to North Ridge, above the 100' sill, is laced by a complex network of thin, unmineralised dykes, sills and veins in the dolomites and sandstones.

Conclusions

1. The sills 11 and 14 are the base of a horizon of extensive intrusion.

2. Many of the feeder dykes appear to originate in sill 11.

3. The dykes and sills are coeval.

4. Mineralisation is common in the feeder dykes, and is consequently of magmatic origin.

5. Mineralisation in the sills is restricted to those that intrude Upper Siyeh shales and Purcell lavas, and is concentrated in the margins of these sills.

6. The shales and lavas marginal to mineralised sills are also mineralised. No other horizons are mineralised.

7. The thickening of sill 11 beneath North Ridge, and the concommittant increase in the number of smaller intrusions and the degree of metamorphism above sill 11 here indicate that the 'root zone' would seem to be beneath North Ridge. The root zone is unlikely to be a stock because of the lack of alteration beneath sills 11 and 14, but is probably a vertical pipe.

8. The sills and dykes attain their maximum development beneath Gossan Mountain and decrease in size and intensity to the east.

Recommendations

Because of the extensive pyrite and pyrrhotite mineralisation in the sills and dykes in the Gossan Mountain area, and because of the good possibility of associated gold mineralisation, the 'Gossan Zone' from Andradite Mountain and North Ridge, to Camp Lake, should be mapped and sampled in detail.

This investigation should follow the course of outlining blocks of rock with constant visual percentages of sulphides, followed by the statistical sampling of these blocks, in order to be able to make a tonnage-grade estimate.

Since there is good three-dimensional exposure of most of the mineralised zones, the above procedure will prove both cheaper and more accurate (not to mention more practical) than diamond drilling.

It is imperative that, to assist the above programme, areas where gossan outcrops, but exposure is poor, be trenched immediately. The depth of weathering is not great, but it is necessary for the geologist carrying out this programme to see fresh rock. Random grab samples of mineralised zones indicate mineralisation but do not prove or even indicate either a grade or a tonnage.

Summary of Conclusions and Recommendations

1. The Grinnell Formation contains primary copper mineralisation in sandstones. This is not economically important.

2. The above copper mineralisation may be slightly concentrated into fold cores. Again this is not economically important.

3. Where such fold cores have broken owing to their tightness the copper mineralisation may concentrate to levels to be of economic interest.

4. Such a zone (Zone H) on the Commerce claims should be mapped and sampled in order to make tonnage and grade estimates.

5. Diorite sills are mineralised where they intrude Upper Siyeh shales and Purcell lava. The host rocks may also be mineralised.

6. The above mineralisation consists of pyrite, pyrrhotite, and some chalcopyrite, from which assemblage gold assays have been returned.

7. The outcrop of the above mineralisation is restricted to the 'Gossan Zone', which must be mapped and sampled to estimate reliable tonnages and grades.

8. To help this programme some fairly large mineralised areas must be stripped of overburden and weathered surface rocks.

Nick Badham

REFERENCES

Adshead, J.D., 1963. Petrology of the Carbonate Rocks of the Siyeh Formation, SW Alberta. M.Sc. Thesis, U. of A.

Daly, R.A., 1912. Geology of the North American Cordillera at the 49th Parallel. Geol. Surv. Can., Memoir 38.

Hunt, G.H., 1961. The Purcell Eruptive Rocks. M.Sc. Thesis, U. of A.

Morton, R.D., 1971. Report on the Geology and Economic Potential of the Properties of Kintla Exploration Limited within SE British Columbia and SW Alberta.

Price, R.A., 1961. Fernie Map area, east half. Geol. Surv. Can., Paper 61-24.

8. SUMMARY OF COSTS

8. Crew

J.P.N. Badham, Geologist

K.R. Goble, Assistant

8.2 Wages

Badham, 26 days @ $2,400.00 per month	$2,400.00	
Goble, 26 days @ $1,500.00 per month	1,500.00	$3,900.00

8.3 Costs

Transportation	238.00	
Food	392.80	
Supplies	46.00	$ 677.20

TOTAL COSTS	$4,577.20
OFFICE, 10 %	457.72
	$5,034.92

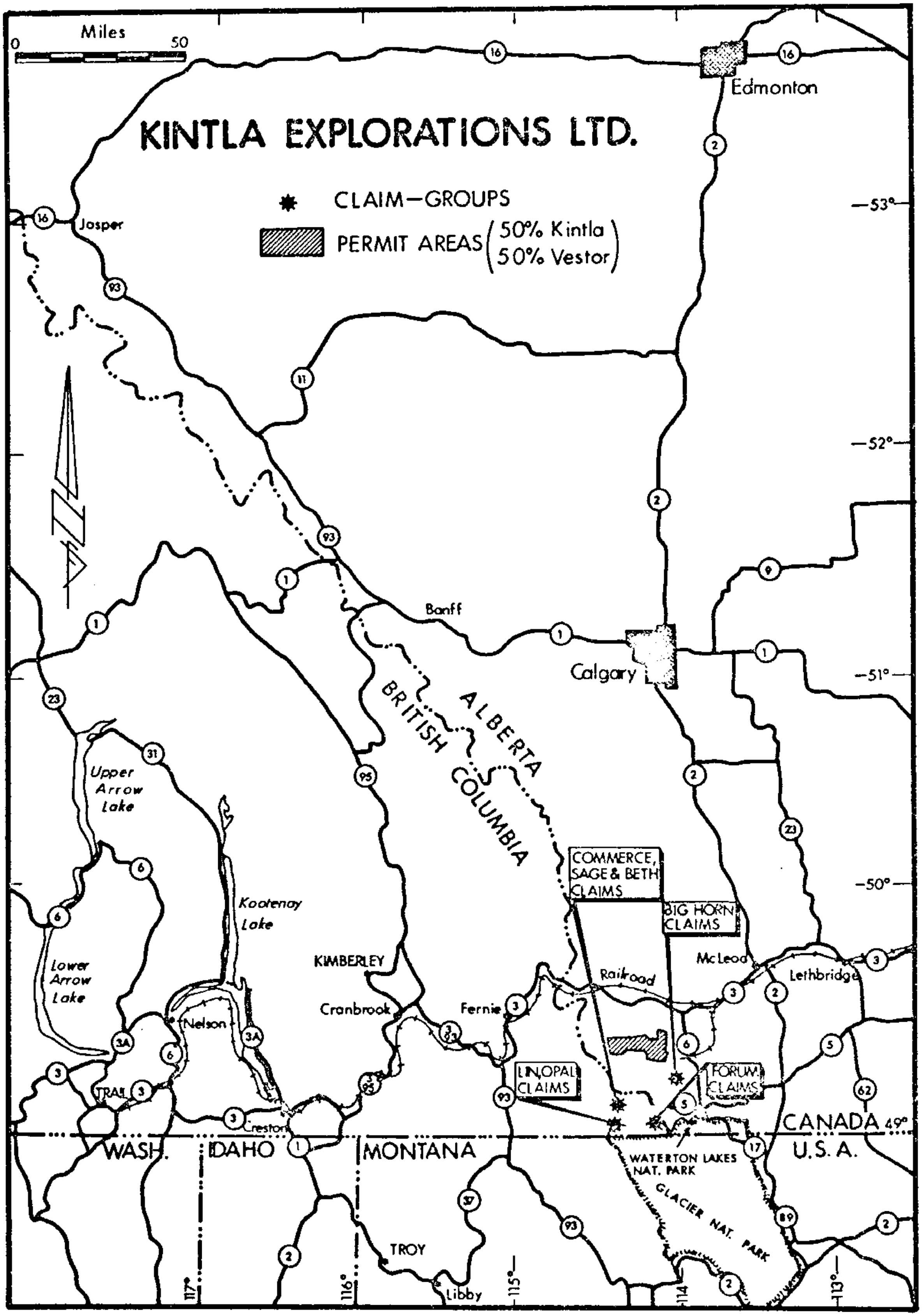
CERTIFIED A TRUE STATEMENT OF COSTS,
KINTLA EXPLORATIONS LIMITED, JUNE 16, 1980.

PER: Linnea Goble

Linnea E. Goble,
Director

Frank Goble

Frank M. Goble,
Managing Director



LOCATION MAP
MAP 1.

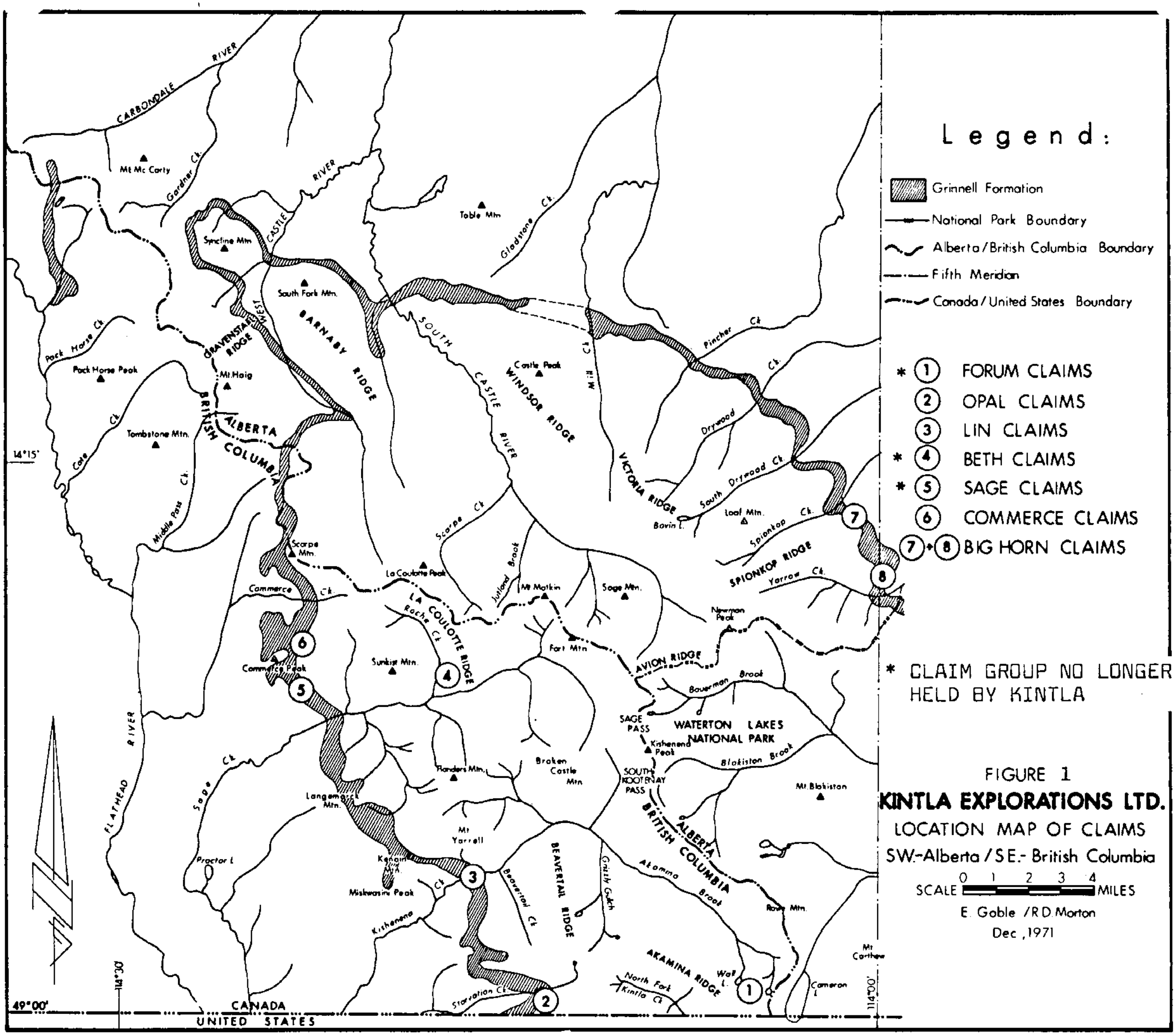
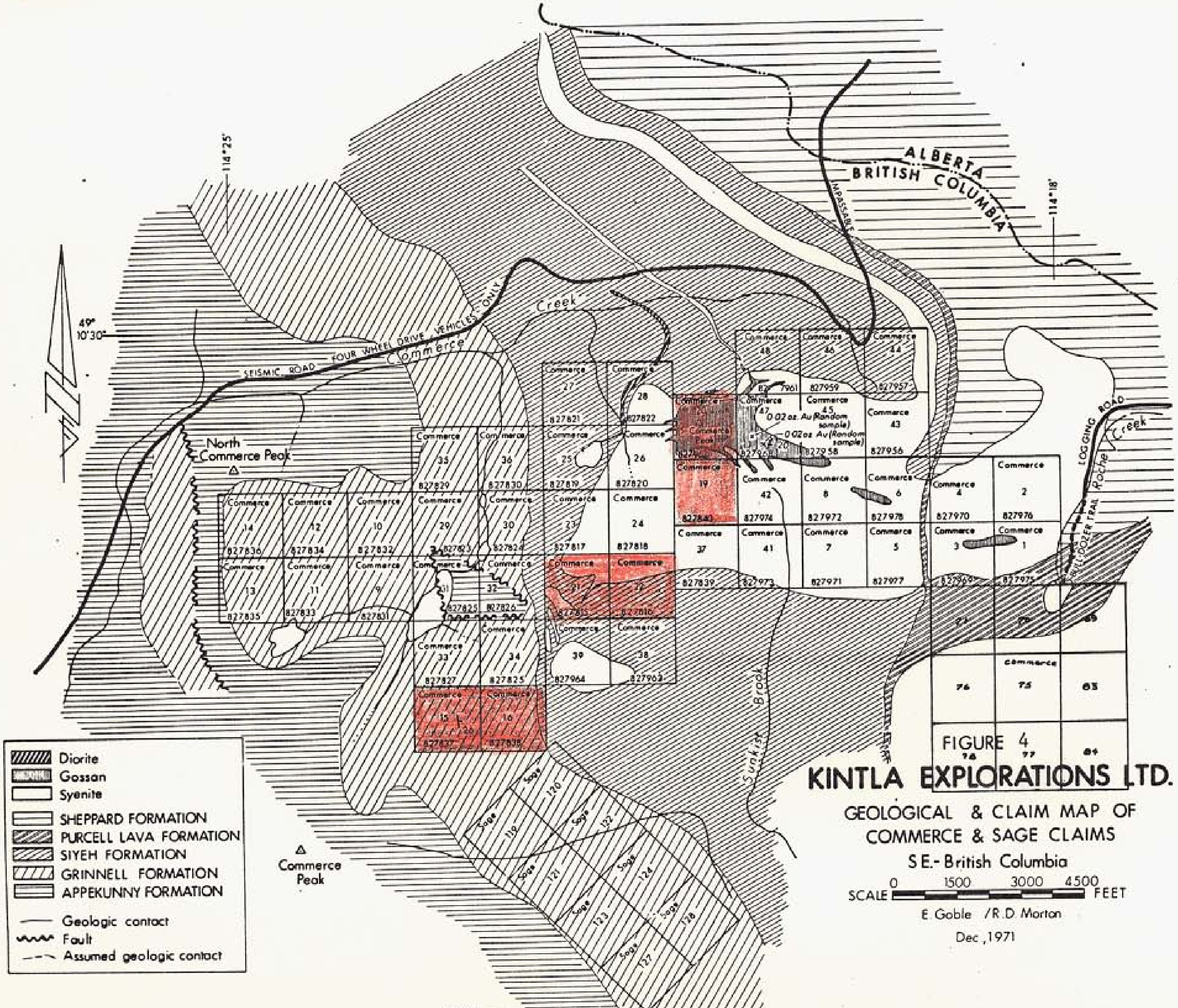


FIGURE 1
KINTLA EXPLORATIONS LTD.
LOCATION MAP OF CLAIMS
SW.-Alberta / S.E.- British Columbia

LOCATION MAP

CLAIMS [illegible]/16, 19/20, 21/22



CERTIFICATE:

I HEREBY CERTIFY THAT:

1. I am a graduate of the University of Alberta (1969) with the degree of Bachelor of Science in Geology.

2. I am a member in good standing in the Association of Professional Engineers, Geologists, and Geophysicists of Alberta.

3. The appended statement of costs is a true and accurate statement of expenditures undertaken in the described program.

4. I personally supervised the program described in the Report.

5. I have an interest in the property.

Certified in the City of
Lethbridge in the Province
of Alberta this 15th day of
October, 1979.

EOGoble

E. O. Goble, B.Sc.,
Geologist & Prof. Eng.

PROFESSIONAL ENGINEER ALBERTA
E. O. GOBLE

KINTLA EXPLORATIONS LTD.

GEOLOGIC MAP OF COMMERCE CLAIMS

Southeast British Columbia

J. P.N. BADHAM Nov. 1979