PITQUAH AREA

GEOLOGY AND MINERALIZATION

Report on Field Work Performed - June 1st to November 29th, 1963

Summary and Conclusions

Within the area copper mineralization is restricted to a group of granulite facies gneisses of dioritic to gabbroic composition named the Pitquah Group. Within the group mineralization occurs mostly within a few basic bands lying within two thousand feet (2,000 feet) of the contact of the Upper Felsic Series and the Amphibolite Series, with the majority of interesting showings being restricted to one basic band - the No. 2 Band. Higher grade shoots within the mineralized bands are thought to occur in the vicinity of the two major north-trending faults and it is recommended that exploration work be concentrated in these areas.

Additional Recommendations for Further Work

In addition to the work recommended immediately above; it is thought that the system of faults paralleling the Thompson River should be mapped as these may be a mineralization control on a sub-regional scale.

To the N.E. of the property, Pitquah Group rocks probably extend to the creek entering the Thompson River at Skhpowtz in a belt approximately one and a half (1-1/2) miles wide paralleling the river. A photographic interpretation of the geology of this area should be made this winter with ground follow-up in the 1964 field season. The known geology of the Pitquah area should be of great assistance in making this interpretation.

THE PITQUAH GROUP

General Structure

Except within two thousand (2,000) feet of the Tom Creek Fault strikes are constant at 315°-325° with dips varying from 15°-40° to the N, and probably averaging about 33°. The Group is cut by numerous northerly-trending faults, mostly of small throw.

There is no evidence of drag-folding in any part of the Group.

There is evidence of flowage at W.3020 N.100 where the lower basic layer of the No. 2 Band cuts the banding of a fine-grained rock of gabbroic composition and also at W.1100 N.1300 where the base of the Upper "Felsic" Series cuts the top of the No. 2 Band.

Metasomatism within the Pitquah Group

The following types occur:

1) Albitization
2) Zoisitization
3) Removal of Mafic Constituents
4) Silicification
5) Metasomatism Associated with the Major N-S Faults (See section on Faulting)

1) Albitization

— was not closely mapped, but appears to be of irregular distribution although in places related to N-S faulting. In places contact between albitized and unalbitized rock is sharp, e.g. W.1100 N.1300. In general it is confined to the Upper and Lower "Felsic" Series.

2) Zoisitization

— is of limited extent and where present accompanies albitization.

3) Removal of Mafic Constituents

— has occurred in many places adjoining northerly trending joints and slips; a basic medium-grained rock (D_m) is made over into a 'felsic' medium-grained rock (F_m), e.g. at W.750 N.1000. The de-

velopment of felsic bands within the base of the Amphibolite Series, starting at approximately W.1200 N.1600, and strengthening steadily eastward along strike, is probably due to this cause.

4) Silicification is of limited extent, being confined to the upper part of the No. 2 Band (where the quartz is often fine-grained, bluish and is associated with pale green chloritization) and to a few basic bands in the upper part of the Upper Felsic Series. An exceptional area is the silicification associated with a dacite dyke at E.500, S.700.

The Amphibolite Series

The "top" is not seen within the map area, at least two thousand (2,000) feet of thickness being present. That part of the formation lying East of the 120° fault through E.2200, N.5000 is more siliceous but otherwise closely resembles the formation to the West.

Composition and texture are rather uniform throughout. Typically the rock is equigranular composed of 50%+ fresh mafics of 2-3 mm grain-size set in grey felspar. The magnetite content probably averages 2% and traces of chalcopyrite are almost always present. There is a strong preferred orientation paralleling that general in the Pitquah Group, i.e. parallel to "bedding".

The "Upper Felsic" Series

This formation has been termed felsic as it is less basic than the adjoining rocks and has a striking white appearance on weathering.

There is great variation in rock type. Two (2) types constitute by far the bulk of the area of outcrop.

1) The felsic medium type (F_m) - up to 40% fresh mafics up to half (1/2) cm size are present in a matrix of grey felspar. This type is gradational into the somewhat less abundant felsic coarse type (F_c).

2) The felsic coarse type (F_c) has mafics up to 4 cm, usually with well developed saiva structure, and again there is a grey felspar matrix.

Both types show a fairly strong preferred orientation of mafics (though not so strong as in the Amphibolite Series). Gneissic banding may be almost entirely absent but is usually quite well developed.

On evidence given above, it is thought that possibly the whole of the Upper "Felsic" Series has developed from more basic material.

The Mineralized Bands

These receive special treatment below.

The Lower "Felsic" Series

This formation is essentially similar to the Upper Felsic Series, but in general is less metasomatized.

The Lower Basic Series

The "base" of this formation is not seen and most of the area of outcrop has not been adequately mapped. 50% fresh mafics, mostly euhedral (0.2-0.8 cm) are set in grey felspar. There is little gneissic banding, preferred orientation parallels that general in the Pitquah Group, but is not so strong as in the Group as a whole.

Chalcopyrite is patchily distributed and is always in trace quantities only, except where the "No. 3 Band" is developed.

The Cache Creek Group

This formation lacks the metamorphism of the Pitquah Group and its deposition must post-date the metamorphism of that group. Dips are at high angles to the East with strikes at 355°. Strong drag folding with 350° striking axes and plunges at 10°S is a notable feature.

The dominant rock type is chert, usually white but green and red weathering types also occur. Some tuffs are also present.

No mineralization of any kind was seen in this formation.

The Spence's Bridge Group

Little of this formation has been examined. The basal parts of the sequence consist of volcanics and coarse sediments in equal proportions while in the upper part of the sequence volcanics appear to predominate.

The Spence's Bridge Group is of Lower Cretaceous age and is believed to post-date the copper mineralization. Certainly, no mineralization of any kind was noted in the Group.

Diorite

Two types are present:

1) Biotite
2) Hornblende

The Biotite Type

-- is characterized by 15% fresh euhedral biotite in grey and white felspar with up to 10% quartz. This type is confined to the Schaaten Creek Diorite stock.

The Hornblende Type

-- typically contains 20-25% fresh euhedral hornblende in white felspar while in the contact facies up to 50% hornblende may be present.

In both types of diorite pink felspar is entirely absent. In the Guichon Batholith of Lower Jurassic age rock types very similar to the two (2) types of diorite noted above may be found. Thus the diorite on the Pitquah property is regarded as being contemporary with the Guichon Batholith. Both types of diorite are almost completely fresh; there being only slight epidote and pyrite alteration at the contacts with a few zones of kaolinization.

Granite

Although a few small areas of igneous material of granitic composition occur in the area immediately East of the West Shuaten Fault, the only stock of granite occurs within the Tom Creek Fault. The typical composition is: 25% orthoclase, 25% quartz with 15-20% hornblende. Some of the orthoclase occurs in veinlike wisps and must be secondary.

"Migmatite" Zones

Within the Upper and Lower "Felsic" Series at irregular intervals, but especially near the Tom Creek Fault, zones of the type described immediately below are developed. A fully exposed "migmatite" zone shows:

1) an outer halo of "metasomatic" type rock (mostly distributed close to the main F-S Faults) with metasomatism becoming progressively more intense towards the centre.

2) an intermediate halo in which the above rock type is present and is intruded by thin dykes of "hybrid" igneous material. This "hybrid" is thought to be a contamination product of the diorite due to the assimilation of wall rock. It has a composition of 50-70% mafics with white felspar (great contrast in hand specimen between mafics and felspar in colour) and varies in texture from pegmatitic to dioritic.

3) The core consists of normal fresh hornblende diorite. It is believed that frequently only the outer halos are exposed.

Dykes

The following types of dyke occur:

1) T_1, a soft easily eroded rock with vugs filled with pink zeolite.

2) T_2, felspar porphyry type - clusters of euhedral white felspars (1 cm) are present in a greenish matrix. Forms rare irregular masses of a few tens of square feet each.

3) T_3, fine-grained dioritic type - shows chills on type T_2 above; fine acicular mafics occur in a matrix of blocky plagioclase. Forms sills and rare dykes.

4) T_4, a reddish aphanitic rock - very rare.

5) T_5, in composition it is a very fine-grained diorite with highly chloritized mafics. Probably the most common dyke type.

There are also rarer types not noted above. Except insofar as the dykes selectively intrude the fault areas, there is no relation between dykes and mineralization.

Faulting

The basic fault pattern of the area is:

1) A very well developed series of N-S (vertical to 80° W. dips) and complementary E-W faults of unknown dip. Some of these faults are major structures.

2) Faulting trending 100°-120° (nearly vertical) which in part pre-dates the Spence's Bridge Group as it contains diorite of Lower Jurassic age, but of considerable post-Lower Cretaceous throw.

The N-S Faults

The Tom Creek Fault: is a major structure passing through E.3600 N.00, which throws the Pitquah Series against Permian rocks. For the following reasons this fault is believed to be a major control of mineralization:

1) Mineralization is developed in three bands in the vicinity of the fault as opposed to mineralization in only one band in most of the rest of the area.

2) The fault zone has suffered considerable intrusion and there has been considerable metasomatism of the adjacent rocks. Thus the zone behaved as an open fracture at the time of intrusion of the diorite which is thought to closelypre-date mineralization.

The Shusten Faults

By correlation of the rocks on either side of Shusten Creek, a fault of approximately one thousand (1,000) foot throw is inferred to exist. Profiles run with an AJ magnetometer in the "Pop" area indicate continuity of "bedding" across the W. Shusten Fault and therefore all this throw must occur on the E. Shusten Fault. The W. Shusten Fault passes through E.1600 N.00 and the E. Shusten Fault passes through E.720 N.5000.

The E. Shusten Fault is intruded by a large diorite stock and there is considerable metasomatism to the West at this fault. The "Pop"-"Main Bluff" mineralization is close to the fault and is thought to be related to it.

The E-W Faults

Lying for the most part outside the map area and therefore not mapped is a series of supposed E-W faults which are thought to control the position of the Thompson River.

The large postulated fault shown across the South of the map trending 077° would separate the lower grade micaceous metamorphics seen at the footbridge from the Pitquah Group. These supposed faults may be important ore controls on a sub-regional scale and should be mapped on, say, 1" = 1,000-foot scale.

The 100°-120° Series

These faults must pre-date mineralization as they contain diorite plugs and thus may be a mineralization control. However, the mineralized bands are never close to any member of this fault system at surface.

Metasomatism Associated with the Two Major N-S Faults

Adjacent to both major N-S faults are areas in which the typical Pitquah Group rocks are not found and their place is taken by a rock type characterized, in the outer metasomatic zone, by subedral blocky felspars which are white or grey in colour showing a strong preferred orientation parallel to that of the Pitquah Group as a whole. Mafics may be subedral and parallel to foliation of the felspars or may form an irregular black ground mass. The much narrower inner zone has the same constituent minerals but the preferred orientation is parallel to the fault. This inner zone is not always present.

N.B.--On the original outcrop map much of this type is recorded as "hornfels". This was an error. On the present map distinction is made in colouring; "true hornfels" being shaded in pencil and the metasomatic type in sky-blue.

Mineralization on the Pitquah Property

There are four mineralized bands on the property, of which only one, the No. 2 Band, is thought to occur in both 'Pop" and Tom Creek areas.

No. 2 Band

This carries most of the interesting showings on the property. The band is continuous from the14 Shusten Creek Fault at E.1600 N.00, to the 000° Fault at W.1650 N.300. The same band is intermittently exposed in the Tom Creek area from W.3320 S.900 to W.4500 to N.1300.

Where unaltered the No. 2 Band consists of a basal ultrabasic zone twenty to forty (20-40) feet thick and an upper zone of up to one hundred and sixty (160) feet, of interbanded basic and felsic material with some disseminated quartz, which is often bluish. The composition of the Lower Ultrabasic Zone is variable, 50% to 80% mafics, mostly black or bronze orthopyroxenes being present with finer-grained ash-grey felspar. The layer lacks the well marked preferred orientation of the rest of the Pitquah Group, including the immediately overlying part of the No. 2 Band. There is, however, a slight preferred orientation parallelling that of the rest of the Group. In the Upper Zone of the No. 2 Band the basic material is finer-grained, while the felsic material, which appears to be replacing the basic, resembles the rocks of the "Felsic" Series. Magnetite is distributed throughout the whole of the No. 2 Band, while the copper values show a marked concentration in the Lower Ultrabasic Zone.

The No. 1 Band

This has been much less closely examined than the No. 2 Band. It occurs only in the Tom Creek area from W.4000 N.1650 to W.4600 N.2550, and is well weathered throughout. There is no rock type similar to the Lower Ultrabasic Zone of the No. 2 Band and the band becomes more felsic at the ends of its known outcrop. In the centre the upper layers show strong silicification and are somewhat similar to the Upper Zone No. 2 Band and there is a concentration of copper values in the basal zone of the Band. In view of the relatively high grade obtained in the one sample taken on this band (in weathered material) further work is recommended.

No. 3 Band

This is a zone of weak mineralization occurring sporadically at the top of the Lower Basic Series. There is no obvious distinc-

tion between the mineralized rocks and those below, either in mineralogy or fabric. No samples were taken but the grade is thought never to reach 0.3% Cu over any significant area. The magnetite content appears to be slightly higher than in the remainder of the Lower Basic Series.

No. 4 Band

Little is known about this band, other than it consists of medium-grained basic rocks with sporadic copper values. In hand specimens the rock type resembles material from the Upper Zone No. 2 Band.

Other Mineralization

In addition to the above, there is significant mineralization at the following localities in the Tom Creek area:

1) At W.4600 N.4800, marked "Nav" on map. Here mineralization probably averaging 0.4% Cu occurs in the top of a zone of metasomatic rocks which parallels the Tom Creek Fault. The area is poorly exposed and to the West is so complicated by faulting that no attempt has been made to interpret the extent of mineralization.

2) At W.6300 N.3800 (marked "Willows" on map), low grade mineralization which possibly should not be included as grading above 0.3% Cu occurs. Only a few tiny outcrops occur making interpretation of extent of mineralization difficult. However, this showing lying within Tom Creek Fault and close to the granite stock is of particular interest. Drift cover is very thin and trenching is recommended in this area.

General

The only primary copper mineral noted on the property is chalcopyrite which mostly occurs as a replacement of mafic constituents but also occurs as a fracture filling. In the "Poy"-"Main Bluff" area, mineralization is, on the whole, rather fine-grained, but in the Tom Creek area blebs and stringers (up to 1/2-inch) occur in places.

Malachite and to a much lesser extent, azurite occur on some joint faces in the No. 2 Band and No. 1 Band and are thought to be a good indication of higher grade material.

Notes on the Map Sheets

1) On the interpretation sheet where the geology is not understood, some areas have been left blank.

2) The granite plug in the Tom Creek area does not show the affect of the post-Lower Cretaceous throw as the walls of the plug and the throw on the fault are assumed vertical.

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December 3, 1963
Lytton, British Columbia

APPLICATION OF "FAULT CONTROL OF MINERALIZATION" HYPOTHESIS TO CURRENT DIAMOND DRILLING PROGRAMME IN "POP" AREA

Consider the area shown on the appended map (Map A) of the "Pop" - "Main Bluff" area.

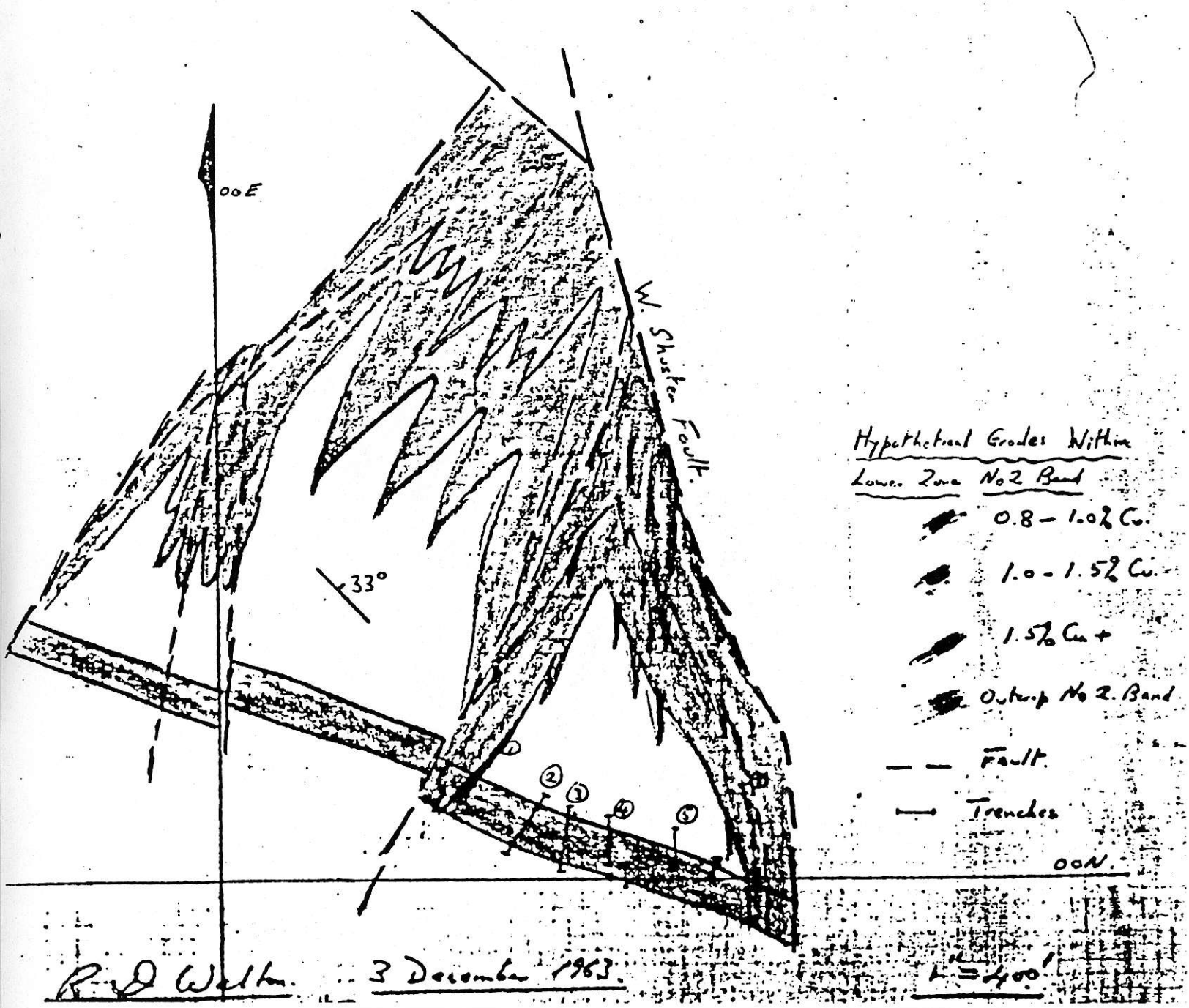
If faults are a major control of mineralization within the No. 2 Band, then higher grades and widths should occur adjacent or near to the fault zones and a mineralization pattern resembling the one shown on the appended map should result.

In the writer's opinion, the current diamond drill programme should test the validity of the above hypothesis. The main ridge separating the "Pop" showing from Thusten Creek would provide a relatively good travelway for diamond drill access to the eastern part of the supposed mineralized area shown on Map "A", page 14.

MAP "A"

Hypothetical Map to Show Possible Mineralization Pattern in "Pop" - "Main Bluff" Area

(Refer to Page 13)



R. D. Walton. 3 December 1963.

1" = 400'

THE GEOLOGY OF THE PITQUAH PROPERTY

Nature of Event	Evidence of Age	
locally	Affects Spence's Bridge Group.	
120° strike. movement on N.S. Faults.	Strong post-Spence's Bridge throw, but initiated in late Triassic as Guichon-type diorite occurs within them in places.	
ics and coarse clastics. ralized.	Overlies Cache Creek Group, and is little affected by N-S faulting. Correlated lithologically with rocks which have been dated, on fossil evidence, as L. Cret	
pyrite mostly after mafics - coarse to very fine - occasionally on ces.	Small quantities of chalcopyrite occur in the breccia dykes. Mineralization post-dates diorite as metamorphic zones on diorite contacts are mineralized.	
chick - sill like - fragments of e, chert, wall-rock, fragments maximum - 1' rounded to angular	Contains fragments of Cache Creek and of Diorite of L. Jurassic age but Spence's Bridge is not represented	
minant types. 1) Zeolitic vuggy type oritized fine-grained dioritic	Cut all rock types, except Spence's Bridge Group. No contact with breccia dykes observed.	
fresh - Diorite of 2 facies - litic 2) Hornblendic. Occurs within major N-S faults.	Petrographically similar to some facies of the Guichon Batholith of Lower-Jurassic age.	
nd complementary 090° strikes. The fault system, to which mineralization loved related.	Intruded by L. Jurassic Diorite and cut 355° striking folding.	
trikes, steep E. dips. Strong drag S plunging S. at low angles.	Folding affects Permian Cache Creek Group, also parallel folding outside map area affects Triassic rocks. L. Jurassic Diorite post-dates N-S faults which post-date folding.	
ntly cherts with some tuffs. Un-lized.	Post-dates Pitquah Group as it entirely lacks the metamorphism of that group. Dated by lithological correlation with rocks outside the area which were dated on fossil evidence as Permian.	
25° strikes, dips 15°-40° N. (High sion?) has removed all evidence of olding.	Post-Pitquah Group as affects that Group.	
nous - 2-3 mm grain size - 50% mafics y feldspar - average 2% magnetite - weathering.		"Deposition" of Pitquah Group
ariable - up to 40% mafics, usually 1/2 cm grey feldspar. Much albitization and ization.		
20'-40' of ultrabasics succeeded by mixed basic and 'felsic' material.		
S, but less albitized.		
variable - 50% mafics in grey felspar. size 0.2-0.8 cms - preferred orientation nounced than in Amphibolite Series.		

Geological Event	Age	Nature of Event
Calcite and Zeolite Veining .	Post-Lower Cretaceous	Intense locally
Faulting	Strong post-Lower Cretaceous Throw	100° - 120° strike. Renewed movement on N.S. Faults.
Deposition at Spence's Bridge Group	Lower Cretaceous	Volcanics and coarse clastics. Unmineralized.
Copper Mineralization	Post-Lower Jurassic and Pre-Lower Cretaceous	Chalcopyrite mostly after mafics - coa (1 cm) to very fine - occasionally on fractures.
Order in time may be reversed (Intrusion Breccia (Dykes	Post-L. Jurassic Pre-L.Cretaceous	6"-3' thick - sill like - fragments of diorite, chert, wall-rock, fragments m size 6" - 1' rounded to angular
(Intrusion of Various (Types of Dyke	Post-L.Jurassic Pre-L.Cretaceous	Two dominant types. 1) Zeolitic vuggy 2) Chloritized fine-grained dioritic
Intrusion of Diorite and Granite	Lower-Jurassic	Almost fresh - Diorite of 2 facies - 1) Biotitic 2) Hornblendic. Occu mostly within major N-S faults.
Faulting	Probably late Triassic	000° and complementary 090° strikes. major fault system, to which mineraliz is believed related.
Orogeny	Probably late Triassic	355° strikes, steep E. dips. Strong d folding plunging S. at low angles.
Deposition of Cache Creek Group	Permian	Dominantly cherts with some tuffs. Un-mineralized.
Orogeny and Metamorphism	Pre-Permian	315°-325° strikes, dips 15°-40° N. (Hig compression?) has removed all evidence drag folding.
Amphibolite Series	Pre-Permian	Homogenous - 2-3 mm grain size - 50% ma in grey feldspar - average 2% magnetite brown weathering.
Upper "Felsic" Series	Possibly Precambrian	Very variable - up to 40% mafics, usual size in grey feldspar. Much albitizati zoisitization.
No. 2 Band		A basal 20'-40' of ultrabasics succeede 150' of mixed basic and "felsic" materi
Lower "Felsic" Series		As "U"F"S, but less albitized.
Lower Basic Series		Rather variable - 50% mafics in grey fel Grain size 0.2-0.8 cms - preferred orie less pronounced than in Amphibolite Seri

Fits with next page →