Ministry of Energy, Mines and
Petroleum Resources
Hon. Jack Davis, Minister

MINERAL RESOURCES DIVISION
Geological Survey Branch

GEOLOGY OF THE CENTRAL QUESNEL BELT, BRITISH COLUMBIA

(Parts of NTS 93A, 93B, 93G and 93H)

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INTRODUCTION

The Central Quesnel belt, centred about the town of Likely in south-central British Columbia, comprises that part of Quesnellia Terrane extending from 52° 15′ north to about 53° 10′ north. The area is accessible from the towns of Quesnel and Williams lake via the Quesnel – Barkerville road, the Williams Lake – Likely road and the Williams Lake – Horsefly road.

The geology of the Central Quesnel belt, first examined by Bowman (1887) and later by Cockfield and Walker (1932) and Campbell (1978), was remapped and reinterpreted by geologists of the Ministry of Energy, Mines and Petroleum Resources (Panteleyev, 1987, 1988; Panteleyev and Hancock, 1989; Bailey, 1988a, 1988b, 1989a 1989b; Bloodgood, 1987, 1988, 1989). The accompanying 1:100 000-scale geological map mainly covers the volcanic stratigraphy of the Central Quesnel belt and is compiled from work by Bailey (1976, 1988a, 1988b, 1989a, 1989b), Panteleyev (1987, 1988) and Panteleyev and Hancock (1989). Additional sources are listed in the references.

These notes and the accompanying geological map are preliminary to a more comprehensive publication by Panteleyev (in preparation) which will include a description, not only of the volcanic component of the Central Quesnel belt, but also of the eastern sedimentary facies, incorporating the work of Bloodgood (1987, 1988, 1989).

GEOLOGY

REGIONAL SETTING

The Central Quesnel belt comprises a portion of Quesnellia, a predominantly Mesozoic terrane which, during the Upper Triassic – Lower Jurassic , developed as a volcanic island arc to the west of Mesozoic North America. Subsequent northeasterly movement of Quesnellia, during the Lower Jurassic, ended with the accretion of the volcanic arc and associated sedimentary facies along with underlying oceanic crust (Crooked Amphibolite or Slide Mountain Terrane) on the Omineca Belt to the east. A forearc mélange of oceanic strata is now represented by the Cache Creek Group to the west of Quesnellia. The contact of Quesnellia with the underlying Barkerville Terrane, to the east, is marked by the Eureka thrust (Struik, 1983). Although largely obscured by Miocene basalt and Recent unconsolidated glacial and fluvioglacial sediments, the western contact of Quesnellia with the Cache Creek Group is a high angle fault, named informally the Quesnel fault, which is probably a continuation of the Pinchi fault to the northwest.

STRATIGRAPHY

UNIT 1

This unit is the the lowermost unit stratigraphically in the map area. It consists mainly of fine-grained epiclastic sedimentary rocks but towards the top volcaniclastic rocks become more common. Although this is the basal unit to the dominantly volcanic stratigraphy of the Central Quesnel belt, it is the youngest of a number of sedimentary units mapped to the east by Bloodgood (1988). Unit 1 is equivalent to Bloodgood's (1988) Unit 7. On the basis of conodonts (Bloodgood, 1988) and macrofossils (Bailey, 1988a) the age of the unit ranges from Anisian to Carnian.

The unit consists of dark grey pelite with psammitic interbeds which are exposed both to the east and west of the central volcanic terrane. Towards the top of the unit mafic volcanic material commonly occurs within psammitic strata along with conglomerate beds in which occur basaltic clasts of similar composition to the overlying rocks (Unit 2). These rocks, along with lenses of basaltic breccia intercalated within the sedimentary rocks, indicate the onset of basaltic volcanism probably during the Karnian Stage of the Upper Triassic.

Although limestone has been described by Bloodgood (1988) within Unit 1, it has not been recognized within the map area. Some of the finer grained sediments, however, are highly calcareous.

Orange and light-grey rhyolite dikes and sills occur within Unit 1 in the Swift River area and along the Quesnel River near the western boundary of the map area. The significance of these intrusive rocks with respect to the evolution of the Central Quesnel belt is not yet fully understood.

UNIT 2

Unit 2 represents the oldest entirely volcanic unit within the Central Quesnel belt and is mainly composed of alkali basalt. The lowermost rocks of this unit comprise green and grey olivine and pyroxene-bearing pillow basalt, basaltic breccia, and tuff (2A) deposited under probably relatively deep marine conditions. Overlying these rocks is a basaltic subunit (2B) characterized by its maroon colour and vesicular nature although it is generally of the same composition as the underlying basalt. Tuff and volcaniclastic sandstone interbeds occur within the subunit, especially towards the top. In places this subunit is overlain by a polylithic breccia horizon (2C), dominated by mafic clasts but with scattered clasts of more felsic compositions. Subunit 2D is similar to, and in part coeval with, subunit 2A from which it differs by the presence of hornblende as well as pyroxene phenocrysts. The youngest volcanic rocks of Unit 2 consist of analcite-bearing basaltic breccia (2E) in which analcite is prominent as euhedral phenocrysts up to two centimetres in diameter.

Sedimentary rocks of Unit 2 consist of dark grey mafic sandstone and siltstone, which are often calcareous (2F) and deposited in restricted basins such as adjacent to the QR deposit, massive grey limestone and calcareous sandstone (2G) and graded grey sandstone and siltstone (2H). Not shown on the accompanying map is a thin maroon sandstone unit which occurs locally at the top of Unit 2 and which results from erosion of topographically elevated parts of Unit 2 during the Norian Stage.

The contact of Unit 2 with the underlying Unit 1 is probably gradational, while its contact with the overlying rocks of Unit 3 is probably an angular unconformity.

The age of Unit 2 ranges stratigraphically upwards from Carnian to Norian. The age range is defined by macrofossils in sedimentary interbeds near the base (Bailey, 1978) and by conodonts in limestone of 2G (H.W. Tipper, personal communication, 1987) which, in the northern half of the map area, occurs at the top of Unit 2.

UNIT 3

Unit 3 is composed of a variety of volcanic breccias including polylithologic "slump" breccias (3A), crystal and crystal-lithic tuff and tuff breccia (3B) and, volcanically-derived sandstone and siltstone with intercalated breccia horizons (3C). However, all of these rocks are characterized by felsic volcanic debris, while felsic clasts are absent or rare in breccias of the underlying Unit 2.

Lithologies range from basalt derived from underlying strata, through more intermediate compositions (andesite or latite) to trachyte. While clasts are generally volcanic, clasts of intrusive rocks such as diorite, monzonite and syenite also occur within the breccia pile, especially in proximity to plutons.

These stocks are interpreted, for the most part, as representing the centres of Lower Jurassic volcanoes. Coarse breccias proximal to these centres grade into conglomerate, sandstone and siltstone deposited in small intervolcanic basins distal to the centres.

Unit 3 ranges from Sinemurian to possibly late Lower Jurassic. The early age is defined by the Sinemurian index fossil *Badouxia canadense* while sparse *Weyla* sp. occur throughout the unit. The later age of the unit, however, has not been paleontologically defined but is inferred from stratigraphic relationships and radiometric dating of related plutons (*e.g.* Bailey and Archibald, 1990).

UNIT 4

Maroon analcite and olivine-bearing basalt occurs as outcrop from the south bank of the Quesnel River in the north to near Horsefly in the south. This basalt was erupted subaerially and represents the last volcanic event related to the development of the Triassic Jurassic arc of Quesnellia in the Central Quesnel belt. Unlike analcite-bearing basalt of Unit 2, in which analcite phenocrysts are generally large and white or grey in colour, the analcite phencrysts of Unit 4 are very small and brown, pink or red.

Subaerial flow anatomy is well exposed east of Little Lake where massive flow units grade upwards into well developed vesicular and brecciated flow tops.

Unit 4 is younger than the Canadense zone of the Sinemurian and possibly older than *Arietoceras* bearing strata (Pliensbachian) of Unit 5. However, as contacts with older and younger units have not been recognized in outcrop and as the pattern of outcrop distribution suggests an unconformable relationship with older rocks, the age of Unit 4 may only be speculated at this stage.

UNIT 5

Unit 5 comprises epiclastic sedimentary rocks deposited in a post-volcanic basin which developed along the eastern side of the volcanic arc. These sedimentary rocks are similar to those of Unit 1, consisting of medium to dark grey siltstone and sandstone, but differ from Unit 1 in the common development of syngenetic pyrite, suggesting euxinic depositional conditions. The oldest possible age of Unit 5 has been defined by the occurrence of *Arietoceras* sp., a Pliensbachian ammonite. However, its stratigraphic position is similar to that of Unit 6 (below) which is possibly Bajocian in age.

North of Likely the contact of Unit 5 with older rocks is a fault; elsewhere contacts have not been observed.

UNIT 6

Unit 6 consists of grey and maroon polylithologic conglomerate characterized by clasts of granite and of rock of continental provenance as well as clasts from the underlying strata. This unit unconformably overlies both the Cache Creek Group to the west of the map area, and Quesnellia and, thus, ties the two terranes together. This unit is probably Bajocian in age, by comparison with similar rocks outside the map area considered Bajocian by H.W. Tipper (personal communication, 1987).

Deposition of Unit 6 postdates the amalgamation of Cache Creek Terrane and Quesnellia and thus, probably postdates the cessation of subduction under Quesnellia and, by inference, the collision of Quesnellia with North America, represented to the east of the map area by the Omineca Belt.

Its possible Bajocian age therefore represents the youngest possible age of alkalic volcanism and alkalic-porphyry ore deposition in the Central Quesnel belt (Bailey and Hodgson, 1978; Bailey, 1990).

UNIT 9

Formerly mapped as Lower Jurassic (Bailey, 1988b), this unit is now considered much younger, possibly Upper Jurassic or Cretaceous. The unit comprises polylithologic conglomerate with local fining-upwards sequences of carbonaceous mudstone, sandstone and conglomerate typical of a fluvial or estuarine environment. Clasts range in composition from rocks typical of the Cache Creek Group (greenstone, argillite, limestone) to those possibly derived from the Omineca Belt. Clasts of the underlying Upper Triassic – Lower Jurassic volcanics are also present. Commonly clasts are well sorted and rounded.

It is conjectured that Unit 9 represents a part of an ancestral "Quesnel River" formed after uplift of the Omineca and Cache Creek terranes, subsequent to emplacement of Quesnellia onto North America.

UNIT 10

Unit 10 consists of intermediate to felsic volcanics and sedimentary rocks of Eocene age. The volcanics (10B) in part resemble those of the Lower Jurassic (Unit 3) but they can be distinguished by the presence of primary biotite. Outcrop distribution of Unit 10 strongly suggests an unconformable relationship with older rocks.

Subunit 10A consists of grey, fine-grained sediments in which, within outcrop along the Horsefly River, Eocene fossil fish have been identified (Wilson, 1976, 1977). Pollens extracted from these rocks also indicate a Middle Eocene age (Panteleyev, 1988).

UNIT 11

Unit 11 is widespread across south-central British Columbia and consists of Miocene alkali plateau basalt. In the map area the basalt consists of grey and maroon, subhorizontal subaerial flows and tephra and is distinguished from basalt of units 2 and 4 by its attitudes and the presence, locally, of ultramafic xenoliths. These xenoliths are commonly orthopyroxene-bearing.

INTRUSIVE ROCKS

Two groups of intrusive rocks occur within the map area, those associated with Upper

Triassic Lower Jurassic volcanism (Unit 7) and which are of alkalic compositions and those related to a period of probable Cretaceous calcalkalic magmatism (Unit 8).

Unit 7 consists of three subunits differentiated on the basis of composition and texture. Subunit 7A consists of pyroxene-bearing diorite, monzonite and syenite with minor amounts of clinopyroxenite, peridotite and gabbro. Subunit 7B is dominantly syenitic in composition but is characterized by megacrystic textures and large phenocrysts of orthoclase. Subunit 7C is characterized by the presence of modal nepheline and sanidine as well as sodic amphibole (riebeckite) and pyroxene (aegerine). All three subunits contain normative nepheline and lack modal quartz.

Unit 7 stocks, especially those of 7A, represent subvolcanic intrusions formed in, or near, volcanic centres from which the volcanics of Unit 3 were erupted.

Unit 7 is commonly host to the copper (±gold) deposits such as at Mt. Polley (Cariboo-Bell), Shiko Lake, Kwun Lake and Mouse Mountain.

Unit 7 has been defined radiometrically as Lower Jurassic (Bailey and Archibald, 1990) although some younger K/Ar ages have been reported (*e.g.* Hodgson *et al.*, 1976; Panteleyev, 1987). Bailey and Archibald (1990) consider these younger ages may be the result of modification by later heating, possibly during the Cretaceous period.

Unit 8 consists of granodiorite, quartz monzonite and granite and probably formed during the same period of magmatism which gave rise to the Cretaceous Naver plutonic suite to the north.

METAMORPHISM AND STRUCTURE

Metamorphic grade of the rocks of the Central Quesnel belt is, for the most part, of subgreenschist facies, characterized by the widespread occurrence of zeolite mineral assemblages in mafic volcanic rocks. Sedimentary rocks of Unit 1, however, are metamorphosed to greenschist facies of regional metamorphism in the easternmost part of the map area. The higher grade of metamorphism along the eastern part of the belt compared to most of the Central Quesnel belt can be attributed to processes related to thrusting of Quesnellia over the Omineca Belt and to deformation at the Omineca Quesnellia contact.

The structures of the Central Quesnel belt can be separated into two groups, those formed during accretion of Quesnellia with North America and those which postdate this event. The collision of Quesnellia with North America resulted in folding about northwesterly-striking axes (F_1). These folds are best developed in Unit 1 sediments but are also well developed in sedimentary rocks of Unit 2, especially in Morehead Creek, south of Quesnel River in the centre of the map area. Volcanic rocks, probably because of their more massive character, do not display folds although folding of these rocks is assumed. Bailey (1978) suggested that deformation of the volcanic part of the belt was only by faulting, however, Rees (1987) showed that a folding model was consistent with the stratigraphic pattern and structural history and, in the light of the recognition of folded sediments within the volcanic stratigraphy, this is the model now preferred. F_1 folds in the eastern part of the map area have been refolded about northeasterly-striking axes (F_2). While a penetrative fabric is associated with F_1 folds, F_2 folds have no accompanying penetrative fabric although an S_2 crenulation cleavage has developed.

At least three periods of faulting have occurred in the map area. Earliest faults are those formed in response to accretion of Quesnellia with North America and are generally low-angle thrust faults. The major thrust in the region is the Eureka thrust. The hangingwall consists of rocks of the Crooked Amphibolite overlain by Unit 1 sedimentary rocks, while the footwall consists of rocks of the Barkerville Terrane (Struik, 1983). Within the Central Quesnel belt smaller thrusts have been recognized, all with the same sense of vergence as the Eureka thrust, *i.e.* easterly or northeasterly.

Northeasterly-striking faults, although rarely observed in outcrop, are interpreted from outcrop distribution and aeromagnetic patterns. They are probably high angle extensional faults and probably postdate the development of thrusting. Latest movement was likely no later than Cretaceous as granitic rocks thought to be of this age do not appear to be cut by these faults. Certainly they predate Early Tertiary volcanism in the region.

The third set of faults in the map area are related to the major strike-slip faults of the Cordillera, *e.g.* the Pinchi and Fraser fault systems. The western boundary of the Central Quesnel belt, although poorly exposed, is thought to be a fault which, along the Quesnel River in the northwestern part of the map area, is informally named the Quesnel fault. It separates Cache Creek Group rocks to the west from Upper Triassic Lower Jurassic rocks of Quesnellia to the east and, thus, is considered a southern extension of the Pinchi fault. The Chiaz fault, an arcuate fault extending from the Quesnel fault through the north-central part of the map area, has dextrally displaced Cretaceous granite by at at least four kilometres and, from outcrop distribution of Upper Triassic basalt on either side has undergone at least five kilometres of vertical displacement (west side up). Although seen in outcrop only in the Swift River valley, the trace of the trace fault is well defined on the regional aeromagnetic map and from results of induced polarization surveying.

MINERAL DEPOSITS AND OCCURRENCES

Of the 47 mineral occurrences documented in the map area, and listed on the accompanying map, almost half are related to Upper Triassic – Lower Jurassic plutonism and associated volcanism. Economically the most important deposits and occurrences are within, or adjacent to, alkalic felsic stocks. Consisting of copper with associated gold (or in the case of QR, gold with associated copper), they have been the main targets of exploration within the map area. The largest of these deposits is the Mt. Polley, formerly known as Cariboo-Bell copper-gold deposit, with stated mineable reserves of 51 400 000 tons at 0.38% copper and 0.55 gram per tonne gold (Northern Miner, August 6, 1990). This deposit occurs within the felsic intrusive complex of the Lower Jurassic Mt. Polley stock. The QR deposit located on the north side of the Quesnel River is also associated with a Lower Jurassic alkalic felsic stock but, unlike Mt. Polley and other similar occurrences throughout the map area, it occurs external to the stock within carbonate-altered mafic volcanic rocks. The QR deposits, with a reported mineral inventory of 1 500 000 tonnes at a grade of 5.00 grams per tonne gold, occur within intensely propylitized basaltic rocks at a metasomatic "front" developed during the intrusion of a felsic stock into the previously carbonate-altered volcanics.

Characteristics of copper-gold deposits associated with alkalic stocks are discussed by Barr *et al.*, 1976. Cariboo-Bell is described by Hodgson *et al.*, 1976, and QR by Fox *et al.*, 1986.

Other mineral occurrences within the central volcanic portion of the Central Quesnel belt related to intrusive rocks are occurrences of copper with molybdenum within quartz-bearing calcalkalic stocks such as those at Gavin Lake and near Nyland Lake.

Base and precious metals occur within fine-grained sedimentary rocks of Unit 1. These occurrences, CPW, Tam and Nov comprise metalliferous quartz veins occupying extensional fractures which developed after, or during, the emplacement of Quesnellia on Omineca. Bloodgood (1988) suggests that the mineralizing fluids may have migrated along major detachment surfaces, or thrusts, within the lower sediments. These fluids, unlike the magmatic-meteoric hydrothermal systems of the alkalic copper porphyry deposits of the volcanic part of the belt, are probably of metamorphic origin.

Limestone of subunit 2G commonly hosts copper sulphides and their oxidation products. Near Morehead Lake felsic dikes have intruded the limestone which suggests a relationship between copper deposition and intrusion. However, elsewhere in the map area there is no obvious relationship between copper deposition and felsic intrusion.

Small amounts of native copper occur within basaltic rocks west of Horsefly in the south and near Jacobie Lake in the central part of the map area.

Gold placer deposits in fluvial sediments of the Quesnel River and its tributaries (*e.g.* Cottonwood River, Maud Creek) have been worked intermittently since the 19th Century. The largest deposit of this type was that of the Bullion Pit, near Likely, where gold was recovered from gravels within an early channel of the Quesnel River.

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NOTES

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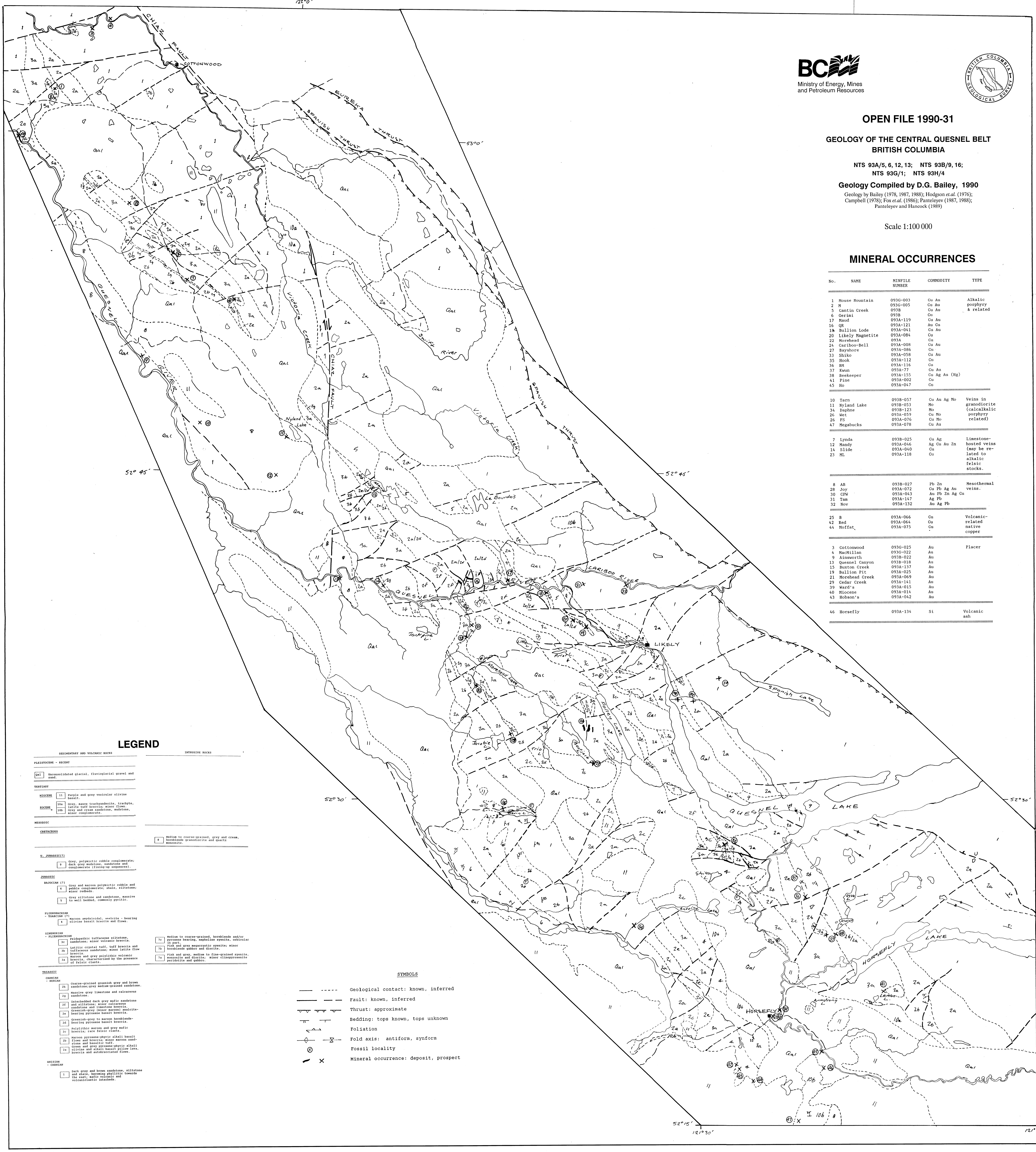

BC Ministry of Energy, Mines and Petroleum Resources

BRITISH COLUMBIA GEOLOGICAL SURVEY

OPEN FILE 1990-31

GEOLOGY OF THE CENTRAL QUESNEL BELT BRITISH COLUMBIA

NTS 93A/5, 6, 12, 13; NTS 93B/9, 16; NTS 93G/1; NTS 93H/4

Geology Compiled by D.G. Bailey, 1990

Geology by Bailey (1978, 1987, 1988); Hodgson *et.al.* (1976); Campbell (1978); Fox *et.al.* (1986); Panteleyev (1987, 1988); Panteleyev and Hancock (1989)

Scale 1:100 000

MINERAL OCCURRENCES

No.	NAME	MINFILE NUMBER	COMMODITY	TYPE
1	Mouse Mountain	093G-003	Cu Au	Alkalic porphyry & related
2	M	093G-005	Cu Au	
5	Cantin Creek	093B	Cu Au	
6	Gerimi	093B	Cu	
17	Maud	093A-119	Cu Au	
16	QR	093A-121	Au Cu	
18	Bullion Lode	093A-041	Cu Au	
20	Likely Magnetite	093A-084	Cu	
22	Morehead	093A	Cu	
24	Cariboo-Bell	093A-008	Cu Au	
27	Bayshore	093A-086	Cu	
33	Shiko	093A-058	Cu Au	
35	Hook	093A-112	Cu	
36	BM	093A-116	Cu	
37	Kwun	093A-77	Cu Au	
38	Beekeeper	093A-155	Cu Ag Au (Hg)	
41	Pine	093A-002	Cu	
45	Ho	093A-047	Cu	
10	Tarn	093B-057	Cu Au Ag Mo	Veins in granodiorite (calcalkalic porphyry related)
11	Nyland Lake	093B-053	Mo	
34	Daphne	093B-123	Mo	
26	Wet	093A-059	Cu Mo	
26	FS	093A-076	Cu Mo	
47	Megabucks	093A-078	Cu Au	
7	Lynda	093B-025	Cu Ag	Limestone-hosted veins (may be related to alkalic felsic stocks.
12	Mandy	093A-046	Ag Cu Au Zn	
14	Slide	093A-040	Cu	
23	ML	093A-118	Cu	
8	AB	093B-027	Pb Zn	Mesothermal veins.
28	Joy	093A-072	Cu Pb Ag Au	
30	CPW	093A-043	Au Pb Zn Ag Cu	
31	Tam	093A-147	Ag Pb	
32	Nov	093A-132	Au Ag Pb	
25	B	093A-066	Cu	Volcanic-related native copper
42	Red	093A-064	Cu	
44	Moffat	093A-075	Cu	
3	Cottonwood	093G-025	Au	Placer
4	MacMillan	093G-022	Au	
9	Ainsworth	093B-022	Au	
13	Quesnel Canyon	093B-018	Au	
15	Buxton Creek	093A-137	Au	
19	Bullion Pit	093A-025	Au	
21	Morehead Creek	093A-069	Au	
29	Cedar Creek	093A-141	Au	
39	Ward's	093A-015	Au	
40	Miocene	093A-014	Au	
43	Hobson's	093A-042	Au	
46	Horsefly	093A-134	Si	Volcanic ash

LEGEND

SEDIMENTARY AND VOLCANIC ROCKS

PLEISTOCENE - RECENT

Qal — Unconsolidated glacial, fluvioglacial gravel and sand.

TERTIARY

MIOCENE

11 — Purple and grey vesicular olivine basalt.

EOCENE

10a — Grey, mauve trachyandesite, trachyte, latite tuff breccia; minor flows.

10b — Grey and cream sandstone, mudstone, minor conglomerate.

MESOZOIC

CRETACEOUS

U. JURASSIC(?)

9 — Grey, polymictic cobble conglomerate; dark grey mudstone, sandstone and conglomerate (fining-up sequences).

JURASSIC

BAJOCIAN (?)

6 — Grey and maroon polymictic cobble and pebble conglomerate; shale, siltstone; minor redbeds.

5 — Grey siltstone and sandstone, massive to well bedded, commonly pyritic.

PLIENSBACHIAN - TOARCIAN (?)

4 — Maroon amydaloidal, analcite - bearing olivine basalt breccia and flows.

SINEMURIAN - PLIENSBACHIAN

3c — Feldspathic tuffaceous siltstone, sandstone; minor volcanic breccia.

3b — Latitic crystal tuff, tuff breccia and tuffaceous sandstone; minor latite flow breccia.

3a — Maroon and grey polylithic volcanic breccia, characterised by the presence of felsic clasts.

TRIASSIC

CARNIAN - NORIAN

2h — Coarse-grained greenish grey and brown sandstone;grey medium-grained sandstone.

2g — Massive grey limestone and calcareous sandstone.

2f — Interbedded dark grey mafic sandstone and siltstone; minor calcareous sandstone and limestone breccia.

2e — Greenish-grey (minor maroon) analcite-bearing pyroxene basalt breccia.

2d — Greenish-grey to maroon hornblende-bearing pyroxene basalt breccia.

2c — Polylithic maroon and grey mafic breccia; rare felsic clasts.

2b — Maroon pyroxene-phyric alkali basalt flows and breccia; minor maroon sandstone and basaltic tuff.

2a — Green and grey pyroxene-phyric alkali olivine and alkali basalt pillow lava, breccia and autobrecciated flows.

ANISIAN - CARNIAN

1 — Dark grey and brown sandstone, siltstone and shale, becoming phyllitic towards the east; mafic volcanic and volcaniclastic interbeds.

INTRUSIVE ROCKS

8 — Medium to coarse-grained, grey and cream, hornblende granodiorite and quartz monzonite.

7c — Medium to coarse-grained, hornblende and/or pyroxene bearing, nepheline syenite, orbicular in part.

7b — Pink and grey megacrystic syenite; minor hornblende gabbro and diorite.

7a — Pink and grey, medium to fine-grained syenite, monzonite and diorite; minor clinopyroxenite peridotite and gabbro.

SYMBOLS

Geological contact: known, inferred

Fault: known, inferred

Thrust: approximate

Bedding: tops known, tops unknown

Foliation

Fold axis: antiform, synform

Fossil locality

Mineral occurrence: deposit, prospect