GEOLOGY OF THE CANTIN CREEK AREA
QUESNEL RIVER
(93B/16)

By J. Lu; Visiting Scholar,
Ministry of Metallurgical Industry, Hefei
Peoples' Republic of China

KEYWORDS: Regional geology, Quesnel belt, Cantin Creek, stratigraphy, lithogeochemistry, alteration, gold.

INTRODUCTION

The Cantin Creek map area lies in the south-central part of the Quesnel belt, about 33 kilometres south of Quesnel and 55 kilometres northwest of Likely (Figure 1-20-1). It covers an area of approximately 100 square kilometres between latitudes 52°53′ and 53°00′ north and longitudes 122°22′ to 122°08′ west. The area was studied as part of a 4-year mapping project, the goal of which is to interpret the geological setting and evaluate the gold and copper resource potential along the central volcanic-intrusive axis of the Quesnel belt, (Bloodgood, 1987, 1988; Bailey, 1988; Panteleyev, 1988).

The Quesnel belt, previously known as the Quesnel trough, consists of Upper Triassic and Lower Jurassic basic to intermediate volcanic and volcaniclastic rocks, as well as coeval alkalic intrusions. The belt is bounded to the east by the Precambrian to Lower Paleozoic Snowshoe Group and to the west by the Permo-Carboniferous Cache Creek Group (Figure 1-20-2).

PREVIOUS WORK

The first geological investigation of the Quesnel belt dates back to 1887 when G.M. Dawson recognized Triassic volcanic rocks near Kamloops. Extensive regional mapping and local, detailed research were carried out only after the 1940s. In the 1970s, Fox (1975), Lefebure, Morton, Barr *et al.*, Hodgson *et al.*, (all 1976), Bailey (1978) and Preto (1979) described the alkaline nature of the plutonic and volcanic rocks of the region.

Early mining activity in the area was limited to placer gold operations. From the late 1960s, exploration for porphyry copper and copper-gold deposits and, more recently, mesothermal and epithermal gold-bearing systems has occurred. The discovery of several deposits, including the QR gold deposit (Fox *et al.*, 1986), is a direct result of these efforts.

LITHOLOGY

Due to the general sparseness of outcrop, fault offsets, and the limited size of the map area, correlation of map units is difficult. Fortunately there are two seemingly continuous horizons of volcanic wackes and one horizon of maroon basalt flows that may be used as markers. The sequence established here (Figure 1-20-3) is compatible with those of previous workers in the Quesnel belt. In this study Unit 1 is equivalent to Unit 1 of Bailey (1988) and Panteleyev (1988). Similarly Units 2 to 5 correspond to Bailey's Units 2A to 2H, and Unit 6 is part of his Unit 3. The instrusive Units 7, 8 and 9 are similar to those described by Bailey and Panteleyev, except that Unit 7 in the Cantin Creek area contains alkalic, mafic cumulate material as well as diorite and monzonite.

Unit 1 – Argillite: Dark grey to black, thinly bedded, locally with thin layers of fine-grained, pink to pale grey feldspathic wacke. The unit is exposed in the northwest part of the map area and as xenoliths within an intrusion of megacrystic quartzose syenite porphyry (Unit 9). The stratigraphic thickness is unknown due to the intrusion of the porphyry.

Unit 2 – Basalt Flows: Dark green, porphyritic with phenocrysts 2 millimetres in average diameter consisting of 3 per cent feldspar, 8 per cent pyroxene and minor olivine. The matrix is altered and contains carbonate and chlorite. The base of the unit is not exposed and the thickness is not known.

Unit 3 – Pyroxene-bearing Wacke: Maroon, coarse-grained; subrounded grains; locally well bedded otherwise massive, consisting of 15 per cent feldspar, 15 per cent

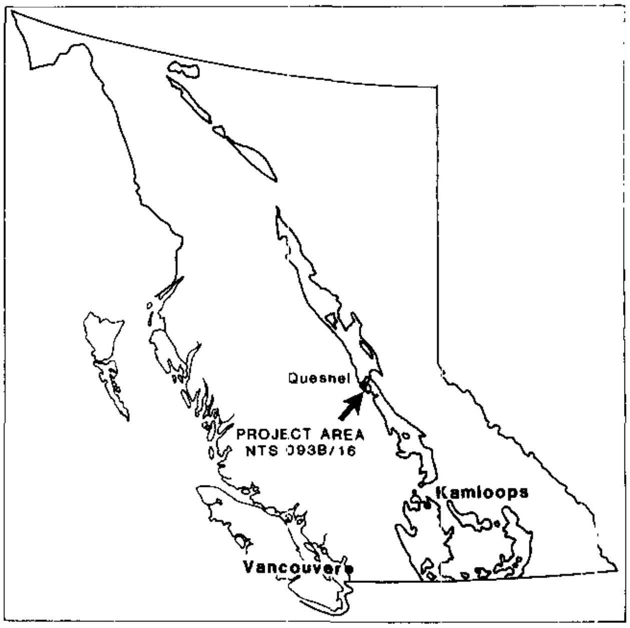


Figure 1-20-1. Location of Cantin Creek map-area in Quesnel terrane.

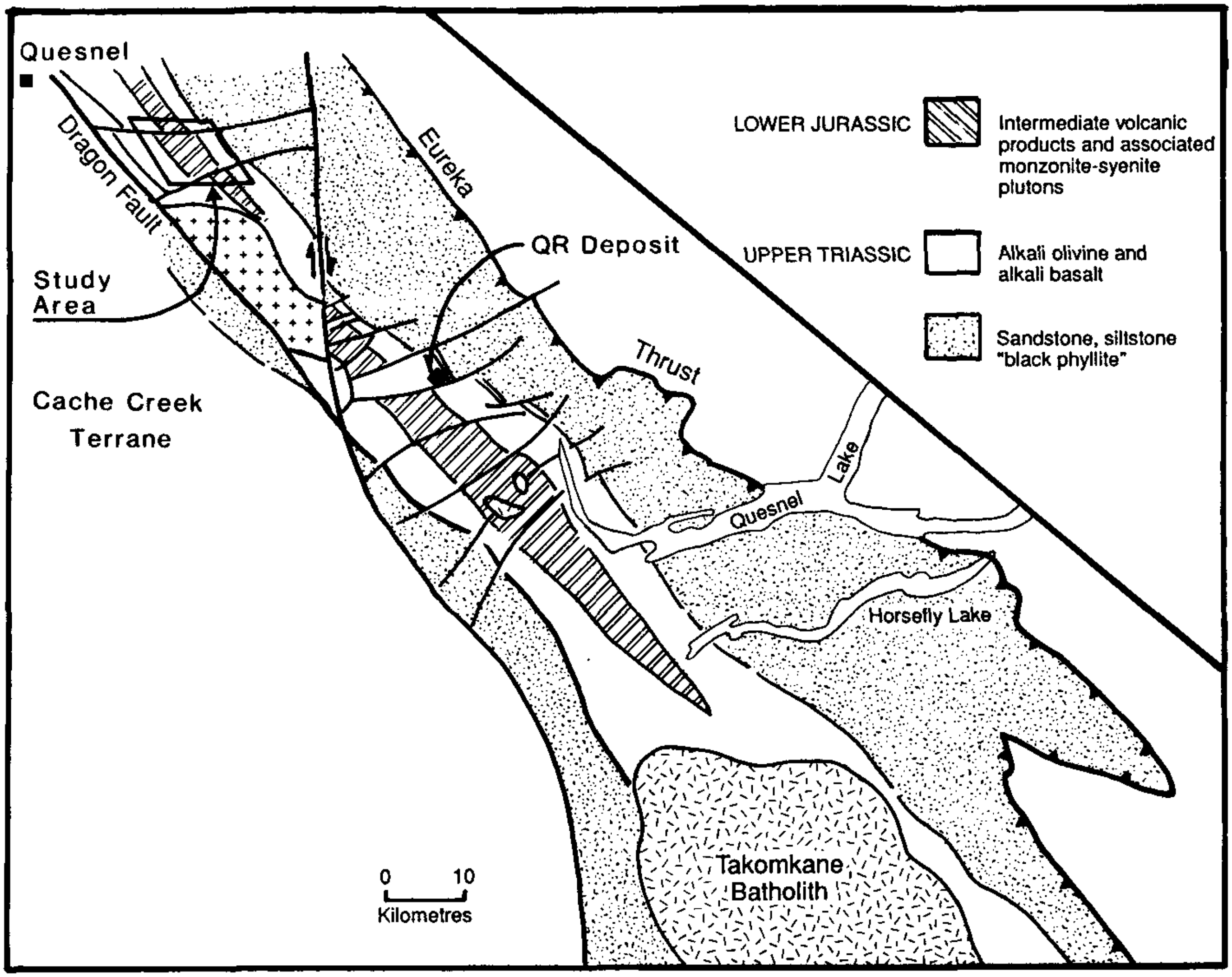


Figure 1-20-2. Regional setting of Cantin Creek map-area in Quesnel belt, (93A, B) (after Bailey, 1988).

pyroxene, 3 per cent iron oxides and minor amounts of lithic fragments. Towards the top of the unit the grain size decreases significantly and crossbedding features are more evident, the feldspar proportion increases and the unit assumes a pale greenish tinge. The thickness of the unit ranges from 80 to 270 metres.

Unit 4 – Maroon Basalt: Porphyritic with 45 per cent pyroxene, 12 per cent feldspar and 3 per cent olivine phenocrysts. At the base of the unit, sphene phenocrysts and ovoid amygdules of analcite and calcite are well developed. The unit is relatively continuous and varies in thickness from 770 metres in the southeast to 400 metres in the middle of the map area.

Unit 5 – Feldspathic Wacke: Maroon, consisting of subrounded to angular fine-grained fragments of feldspar, minor lithic fragments and iron oxides. The unit is capped by a thin layer of limestone. It is thickest in the southeast at 480 metres and thins towards the northwest.

Unit 6 – Polylithic Breccia and Feldspathic Tuffs: Breccias with feldspathic and heterolithic clasts from underlying tuffaceous rocks are dark green to maroon, consisting of 70 to 80 per cent feldspar, 10 to 20 per cent pyroxene, minor olivine and other minerals. In the southeast of the map area, breccias are most common. The thickness of the unit is not well defined. The section is 700 to 1300 metres thick but probably has some structural thickening.

Unit 7 – Pyroxenite, Gabbro, Diorite, Monzonite and Minor Syenite: This unit intrudes Unit 6. The mafic rocks are green due to extensive chloritization. Where sampled they contain 50 per cent phenocrysts consisting of 35 per cent pyroxene, 10 per cent feldspar, and 5 per cent olivine. The matrix composition is optically indeterminable due to alteration. The map unit is poorly exposed and is mainly defined by diamond drilling.

Unit 8 – Syenite to Quartz-Syenite Porphyry: Pink to greyish white when weathered, with 30 to 60 per cent potassium feldspar phenocrysts and megacrysts that are 20 by 2 millimetres on average and occassionally reach 12 by 2 centimetres in size. The matrix is fine grained and consists of feldspar, amphibole and quartz. Within the stock are xenoliths of diorite consisting of 70 per cent feldspar, 15 to 20 per cent amphibole and minor amounts of other minerals.

TABLE 1-20-1

MAJOR OXIDE AND MINOR ELEMENT ANALYSIS, CANTIN CREEK; SAMPLES PLOTTED ON FIGURES 1-00-4 AND 1-00-5 SHOWN WITH AN ASTERISK

Rec. No.	Field Label	Unit	Description	Rb	Sr	Y	Zr	Nb	Mo	U	Th	Cr	Ni	Ba	Ti	V	Au	Ag	Cu	Pb	Zn	Hg	As	Sb	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	LOI	$NSiO_2$
1	C1-9	8	Syenite Porphyry	86	1091	10	100	2	1	3	0	18	11	1936	1247	67	20	0.0	3	15	38	0	4.3	0.0	65.54	0.21	17.33	2.07	0.08	0.62	2.02	5.91	5.66	0.07	0.33	69.89
2	C2-3	8	Syenite Porphyry	90	995	21	121	4	4	9	1	36	14	1271	3733	217	30	0.0	69	12	0	33	1.1	0.0	57.08	0.60	16.27	6.81	0.14	2.66	5.69	4.06	5.25	0.31	1.24	61.17
3	C3-3	6	Altered Basalt (Vein?)	40	1885	22	173	2	2	9	23	305	162	7289	8135	219	20	0.0	58	20	90	560	1.7	2.8	47.79	1.31	14.34	9.25	0.14	6.52	6.34	2.72	2.92	1.02	6.22	54.05
4	C3-4	7	Basaltic Porphyry?	41	839	12	42	0	0	0	10	203	42	458	4272	297	20	0.0	85	6	82	15	29.7	0.6	47.05	0.66	12.24	11.37	0.21	7.97	13.21	2.45	1.67	0.46	2.20	49.44
5	C3-10	6	Basaltic Tuff	55	325	23	106	3	4	0	11	6	1	1762	3955	117	0	0.0	4	25	19	0	3.3	0.5	54.73	0.66	16.88	7.60	0.12	2.92	3.44	5.35	3.94	0.31	3.91	59.68
6	C4-2C	6	Basaltic Breccia	75	435	19	66	0	0	0	5	9	6	1714	4905	228	0	0.0	7	6	46	0	29.7	0.6	47.55	0.80	17.01	9.54	0.14	3.06	6.68	4.53	3.25	0.23	6.70	53.24
7	C4-10	5	Basalt (Vein?)	64	994	15	65	0	0	7	4	207	49	864	4316	285	0	0.0	8	14	105	10	10.5	1.8	46.64	0.68	11.59	10.64	0.18	8.59	9.16	2.07	3.83	0.76	4.92	52.08
8	C4-12B	5	Basalt (Vein?)	31	1147	15	62	1	1	7	0	74	24	655	4844	297	30	0.0	13	8	105	0	14.1	0.6	47.14	0.78	13.72	11.36	0.20	6.23	9.25	4.65	1.29	0.70	3.34	50.01
9	C5-2	6	Altered Basalt	45	1280	30	329	86	5	0	8	186	165	480	19482	212	20	0.0	51	5	153	0	12.1	0.0	42.42	3.06	11.28	14.53	0.21	8.73	9.83	3.72	2.09	1.11	1.70	45.23
10	C6-2C	4	Maroon Basalt	77	536	16	60	6	2	4	0	228	55	987	4307	221	20	0.0	90	9	89	0	1.1	0.0	47.20	0.68	12.03	10.80	0.20	8.13	9.24	2.97	3.26	0.75	4.05	51.73
11	C6-3A	4	Maroon Basalt	58	574	18	63	3	0	2	3	590	102	619	3716	172	20	0.0	19	14	80	0	12.1	0.8	43.32	0.58	12.97	8.71	0.16	5.24	8.32	2.48	4.08	0.45	13.11	52.97
12	C7-3	4	Maroon Basalt	75	1482	14	57	0	1	11	0	110	25	1042	4057	243	0	0.0	168	10	97	48	28.4	0.0	47.36	0.62	13.45	10.56	0.21	5.71	10.05	2.41	3.96	0.53	3.73	52.41
13	C8-3	9	Granite	30	621	10	147	0	8	3	7	10	5	2358	1241	26	0	0.0	4	16	18	0	13.4	0.0	68.11	0.21	16.00	1.42	0.03	0.44	1.15	6.61	3.34	0.07	1.27	72.48
14	C8-6	9	Granite	95	1017	11	130	0	0	9	6	38	18	1614	1827	44	0	0.0	2	27	30	0	0.0	0.0	67.01	0.31	15.71	2.28	0.05	1.01	2.09	5.21	3.42	0.10	1.66	71.54
15	C8-7C	3	Volcanic Pyroxene-bearing Wacke	25	543	20	70	2	0	1	0	14	13	86	5515	312	0	0.0	110	8	93	0	0.0	3.4	47.95	0.89	15.04	10.70	0.20	4.42	7.83	3.96	1.55	0.37	6.16	52.70
16	C8-7K	9	Granite Porphyry	26	575	15	122	0	8	3	7	47	14	1956	2541	69	0	0.0	11	16	63	10	14.4	1.1	63.87	0.44	15.67	3.60	0.06	2.11	3.18	5.35	1.19	0.17	4.07	67.75
17	C10-1C	3	Volcanic Pyroxene-bearing Wacke	23	367	19	60	4	2	0	4	140	21	2027	5025	1122	0	0.0	246	4	87	0	0.0	0.0	49.25	0.84	15.15	9.32	0.18	5.07	6.06	4.96	2.00	0.30	6.15	54.22
18	C10-3A	4	Maroon Basalt	35	1985	20	127	1	2	13	0	376	221	5952	7153	182	40	0.0	62	16	24	60	12.5	5.3	45.68	1.16	12.96	7.88	0.13	7.50	6.99	2.84	1.52	0.58	10.98	53.65
19	C10-3B	8	Syenite Porphyry	26	581	3	77	0	11	0	0	12	8	1657	831	14	20	0.0	15	15	83	76	8.2	6.0	68.42	0.15	16.99	0.99	0.02	0.50	1.48	6.30	1.52	0.03	2.65	72.13
20	C10-3D	3	Volcanic Pyroxene-bearing Wacke	46	592	16	51	0	1	0	0	23	14	754	5476	299	30	0.0	89	4	60	11	3.0	3.0	47.50	0.86	18.23	9.68	0.17	4.52	11.00	1.95	2.17	0.26	3.18	50.58
21	C11-9	4	Maroon Basalt	70	483	16	56	2	1	4	0	213	82	2286	4182	276	40	0.0	123	9	95	12	5.0	0.0	46.52	0.64	13.36	10.72	0.17	7.24	10.73	0.99	4.28	0.44	3.37	51.48
22	C11-11	4	Maroon Basalt	77	336	13	38	0	0	0	0	346	82	1374	4182	258	0	0.0	510	8	75	17	11.8	0.0	46.49	0.76	11.59	12.59	0.21	8.35	10.69	1.51	3.59	0.26	3.36	50.43
23	C11-19	6	Basaltic Tuff	45	609	25	97	3	0	3	0	9	6	1951	4925	188	0	0.0	22	8	77	0	13.1	0.9	51.58	0.80	17.86	9.25	0.16	3.26	6.12	4.58	2.47	0.27	2.78	55.10
24	C12-6	8	Syenite Porphyry	58	731	22	82	2	2	4	0	15	10	1779	3186	130	0	0.0	38	28	94	19	22.2	1.2	58.99	0.53	17.12	6.95	0.19	2.71	3.49	4.54	2.49	0.24	2.71	62.41
25	C13-7	2	Basalt	47	968	20	73	0	3	4	0	52	16	932	6006	315	0	0.0	54	6	133	0	6.0	2.5	47.73	0.97	15.27	11.25	0.20	5.09	8.56	3.68	2.28	0.32	3.38	51.46
26	G3-3	8	Syenite(?)	67	280	12	63	4	3	0	10	60	26	1571	2028	150	50	0.0	30	15	47	82	11.5	1.1	57.82	0.33	14.65	6.56	0.11	4.21	4.65	4.33	5.48	0.19	1.46	62.40
27	G3-4	7	Pyroxenite	11	71	6	19	4	0	0	0	2112	877	25	1872	119	20	0.0	13	0	78	38	0.0	0.0	42.01	0.31	2.36	12.42	0.22	25.80	10.28	0.00	0.02	0.01	6.55	44.98
28	G5-2	6	Basaltic Breccia	78	428	16	79	2	3	0	7	37	25	1792	3316	241	30	0.0	66	12	23	26	20.6	1.9	52.15	0.54	16.11	8.63	0.11	3.47	4.48	4.88	4.84	0.30	3.09	57.71
29	G7-3	7	Pyroxenite	11	174	7	22	5	0	0	0	1041	343	27	2546	174	30	0.0	11	0	55	28	1.7	0.0	46.21	0.37	3.36	9.97	0.19	17.44	17.74	0.22	0.01	0.02	2.05	48.39
30	G8-1	7	Basaltic Porphyry	65	530	16	47	0	2	6	0	195	63	2338	3926	254	20	0.0	221	5	76	16	13.8	0.0	49.74	0.61	12.99	10.30	0.16	6.35	9.84	2.04	3.78	0.30	2.59	54.05
31	G8-3	6	Basaltic Tuff(?)	29	645	20	80	2	2	3	11	12	8	611	3772	164	0	0.0	15	7	46	20	22.9	1.7	53.52	0.63	17.99	7.82	0.15	3.39	5.30	5.77	1.69	0.16	2.58	56.59
32	G8-4	7	Basaltic Porphyry	48	294	16	48	0	2	0	7	174	52	1279	4502	299	20	0.0	295	8	98	2000	19.3	0.8	47.09	0.76	12.10	11.70	0.20	6.76	9.41	3.36	2.56	0.48	2.82	51.53

Note: Values below the analytical detection limit are listed as zero.

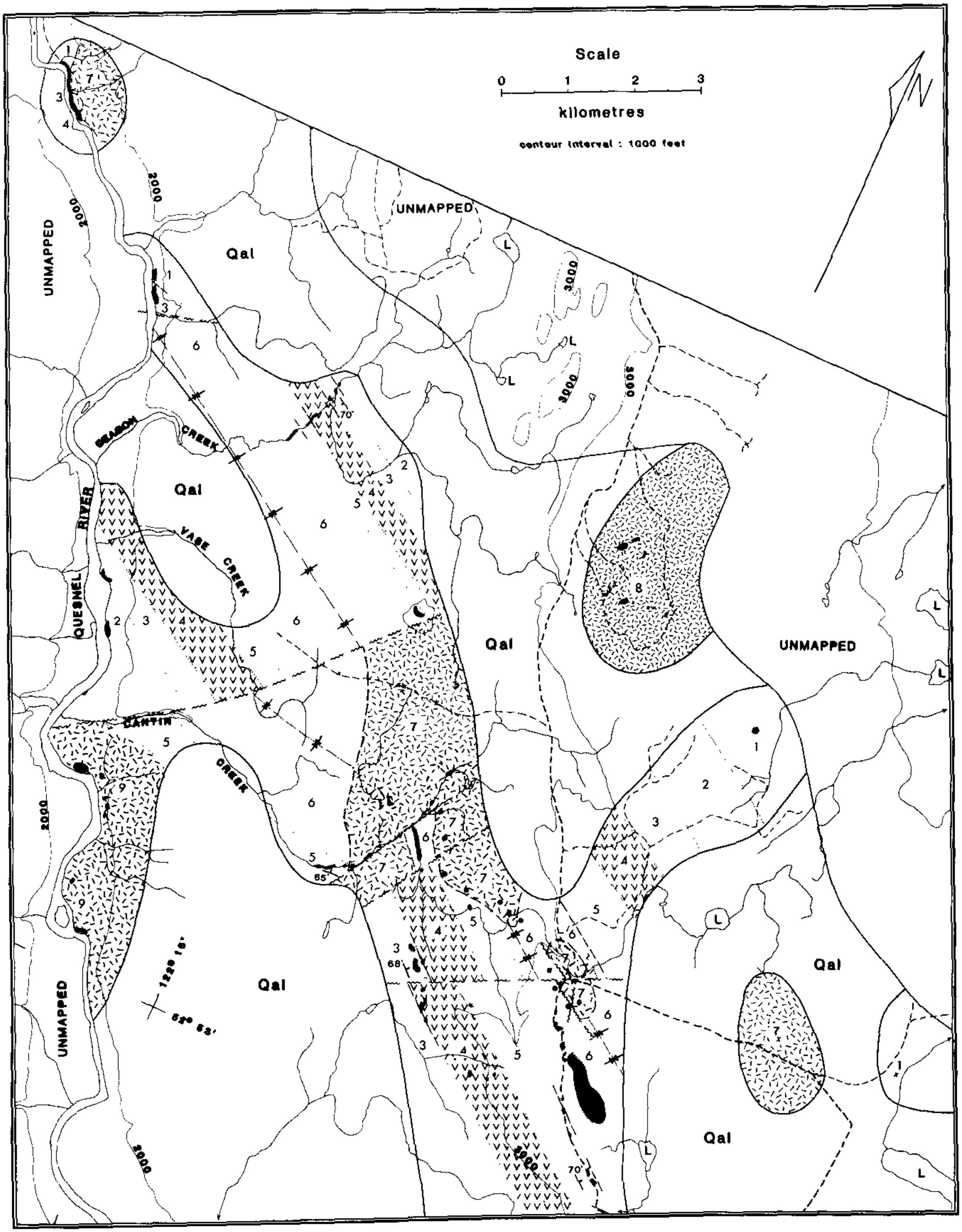
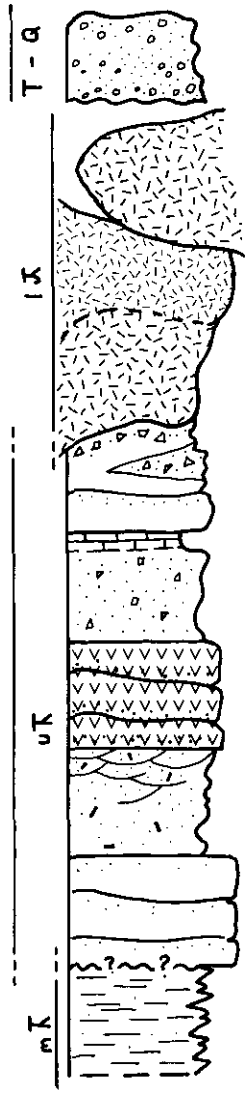


Figure 1-20-3a. Cantin Creek Study Area.



UNIT #	NAME	DESCRIPTION
Qal	Alluvium	Unconsolidated till and overburden, sand to cobble size, poorly sorted
9	Granodiorite	Grey, medium-grained, biotite-bearing, locally carbonate-altered
8	Quartz Syenite, Syenite Porphyry	Pink to pale grey and chalk-white, medium to coarse-grained, locally megacrystic
7	Gabbro, Pyroxenite, Diorite, Monzonite, Syenite	Differentiated diorite to monzonite stock; mafic cumulate and syenite, in part
6	Polylithic breccias, feldspathic tuffs	Breccia with heterolithic clasts; feldspathic clasts and tuffs common, contains basaltic detrius
5	Feldspathic wacke	Maroon feldspathic wacke, overlain by a thin limestone member
4	Maroon Basalt flows	Maroon flows, massive, containing pyroxene and feldspar phenocrysts
3	Pyroxene - bearing Wacke	Maroon crystal - lithic wacke, abundant pyroxene and feldspar grains
2	Basalt flows	Dark green flows, massive, fine-grained, containing small feldspar and pyroxene phenocrysts
1	Argillite and Siltstone	Dark grey to black, thinly bedded, locally thin beds of feldspathic wacke

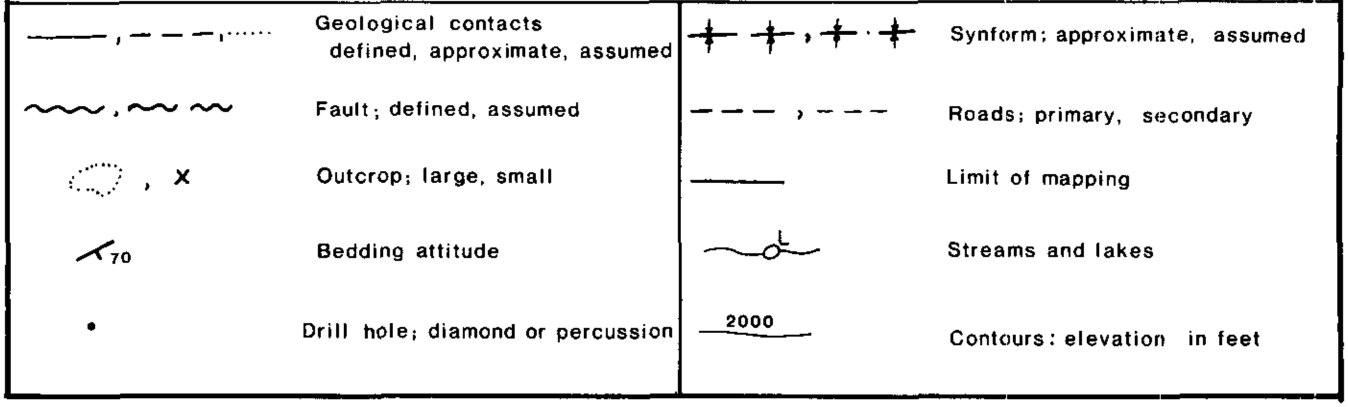


Figure 1-20-3b. Legend for Figure 1-20-3a.

TABLE 1-20-2

MINOR ELEMENT ANALYSIS – RANGE AND MEAN VALUE ACCORDING TO MAP UNITS.

					(Minor elements in ppm; Au and Hg in ppb)						
Map Unit	**No of Samples**	**Au**	**Ag**	**Cu**	**Pb**	**Zn**	**Hg**	**Sb**	**As**	**Ni**	**Mo**
2	1 mean	0	0	54	6	133	0	2.5	6	16	3
3	3 range	0-30	0	89-246	4-8	60-93	0-11	3-3.4	0-3	13.21	0-2
	mean	10	0	148	5	80	4	2.1	1	16	1
4	6 range	0-40	0	19-510	8-16	24-97	0-60	0-5.3	1-28	25-221	0-2
	mean	20	0	162	11	77	23	1	12	95	1
5	2 range	0-30	0	8-13	8-14	105	0-10	0.6-1.8	11-14	24-49	0-1
		15	0	11	11	105	5	1.2	13	37	1
6	7 range	0-30	0	4-66	5-25	19-153	0-560	0-2.8	2-30	1-165	0-5
	mean	10	0	32	12	65	87	1.2	15	53	2
7	5 range	20-30	0	11-295	0-8	55-98	15-2000	0-0.8	0-30	42-827	0-2
	mean	22	0	125	4	78	419	0.3	13	275	1
8	5 range	0-50	0	3-69	12-28	0-94	0-82	0-6	1-22	8-26	1-11
	mean	24	0	31	17	52	42	2	10	14	4
9	3 range	0	0	2-11	16-27	18-63	0-10	0-1.1	0-14	5-18	0-8
	mean	0	0	6	20	37	3	0.4	9	12	5
All Units	32 mean	15	0	79	11	71	96	1.2	11	80	2

Note: Values below the analytical detection limit are shown as zero.

Late-stage syenite dykes, consisting of 80 per cent potassium feldspar, 10 per cent amphibole and 5 per cent quartz cut the stock. Veins of granular white quartz are found throughout the stock and crosscut all phases of the unit.

Unit 9 – Granite Stock: White to greyish white with a porphyritic texture. It is composed of 60 to 70 per cent potassium feldspar, 15 to 20 per cent quartz, 5 to 7 per cent biotite, and 5 to 10 per cent sodium feldspar. Locally the rock has been intensely carbonatized.

STRATIGRAPHY

The age of the map units has been determined by lithologic correlation as no fossil control has been established in the map area.

The age of Unit 1, which is equivalent to Bailey's (1988) Unit 1, has been determined elsewhere (Struik, 1986) to range from Middle Triassic to Late Triassic, mainly on the basis of conodont dating. Units 2 through 5 are stratigraphic equivalents to Bailey's Unit 2 and are thus Late Triassic, probably Norian in age. According to intrusive relationships, Units 6 and 7 are probably Early Jurrasic; Unit 8 appears to be similar to other dated alkalic stocks of Early Jurassic age. However, radiometric data of Panteleyev (1987) and the presence of much hydrothermal alteration suggest a longer period of intrusive activity, possibly well into the Middle Jurassic. Unit 9 is equivalent to Bailey's Unit 9 and so is most probably Cretaceous in age.

STRUCTURAL GEOLOGY

Due to the variability of bedding attitudes and sparse outcrop distribution, it is difficult to interpret details of the regional structure. Based on the established stratigraphic column, the map area is probably underlain by a tight syncline. The southwest limb is relatively well preserved in the southeast and central parts of the map area and trends approximately 130° with dips of 60° to 70° northeast. In the central area, the strata are offset by a fault and are tightly folded and locally overturned. The northeast limb trends approximately 120° and dips 70° southwest. In the northwest, the intrusion of the granite porphyry (Unit 9) has locally steepened or overturned the strata. The strata are crosscut and offset by northeast to northerly trending normal faults.

PETROCHEMISTRY

Thirty-two rock samples were analyzed for major oxides and minor elements (*see* Table 1-20-1). X-ray flourescence was used for all major oxides and minor elements, Rb, Sr, Y, Zr, Nb, U, Th, Cr, Ba, Ti, and V. Atomic absorption was used to determine Ag, Cu, Zn, Mo, Ni, As and Sn. Gold was analyzed by fire assay and atomic absorption finish. The data were plotted on a series of discrimination plots to determine the geochemical character of the rocks. To meet the prerequisites of certain diagrams, a number of altered samples with elevated loss on ignition (LOI), H_2O and CO_2 were screened out. Fourteen of the least-altered samples were chosen to be representative of the rock suite. Even this select sample group, when tested by discriminant major-element plots described by Beswick and Soucie (1978) and de Rosen-Spence and Sinclair (1987), reveal that only $A1_2O_3$, SiO_2, TiO_2, P_2O_5 and possibly Na_2O remain relatively consistent. The other major oxides – K_2O, CaO, Fe_2O_3, MgO and MnO are changed by various degrees. Based on these observations, especially the low TiO_2 content of the rocks, a generalization can be made, as shown on Figure 1-20-4, that the sample suite represents island arc calalkaline basaltic flows deposited in a convergent plate setting. Alkali enrichment noted elsewhere in the Quesnel belt is not as evident in the Cantin Creek rock suite. This is possibly because the more alkalic rocks were not selected for analysis or the analyses were rejected because the alkalic rocks are the most highly altered.

Minor element discriminant plots based on immobile elements are considered to be less affected by alteration. Various plots, some of which are shown on Figure 1-20-5, indicate a volcanic-arc environment of basaltic character. However, the minor element plots are not capable of further resolving whether the magma suites are alkaline or sub-

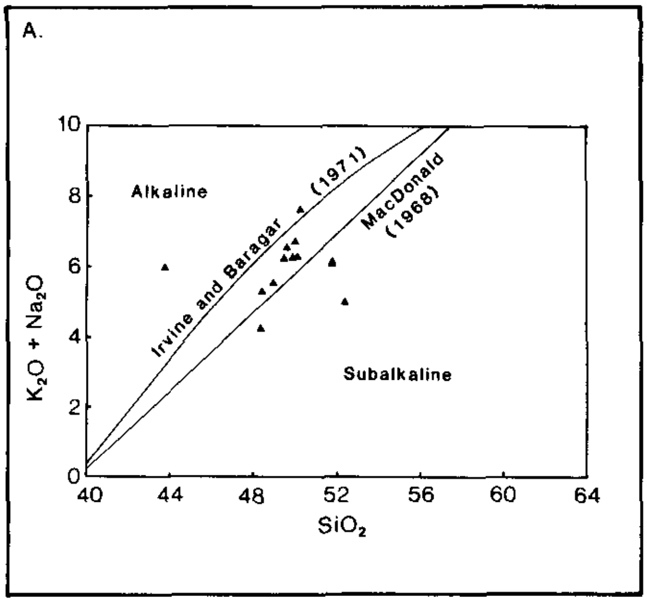


Figure 1-20-4a. Alkalinic-subalkalic divisions according to Irvine and Baragar (1971) and MacDonald (1968).

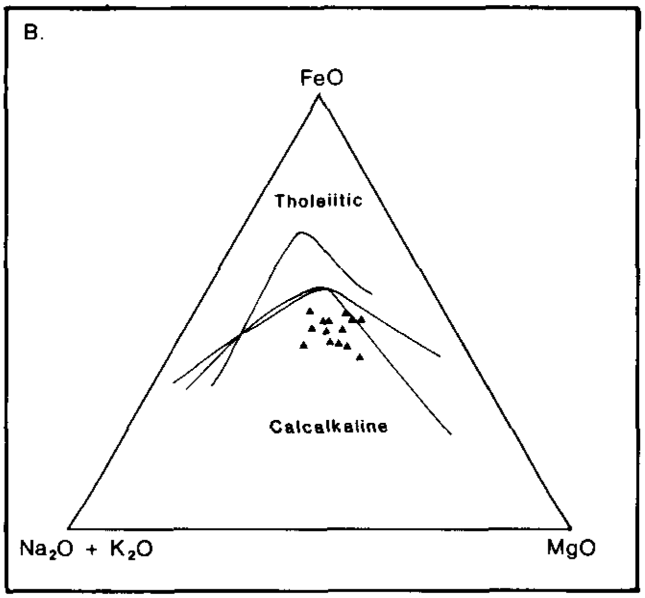


Figure 1-20-4b. AFM diagram after Irvine and Baragar (1971) and MacDonald and Katsura (1964) showing calcalkaline nature of Cantin Creek rocks.

alkaline (tholeiitic) in affinity. These indeterminable minor element data are consistent with other analyses from pyroxene-bearing basalts that were deposited during early Quesnel arc volcanism (Bloodgood, 1987; Morton, 1976; Bailey, 1978).

ALTERATION AND MINERALIZATION

At least five related types of relatively low-temperature hydrothermal alteration or burial metamorphism have been

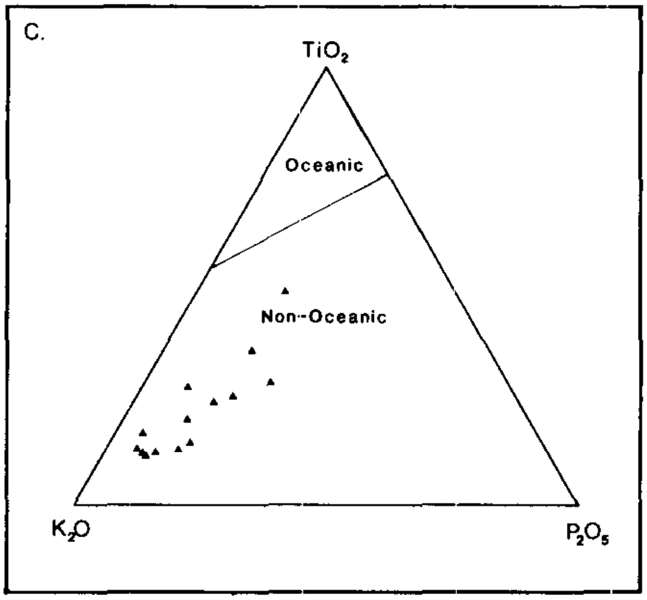


Figure 1-20-4c. TiO_2-K_2O-P_2O_5 plot after Pearce *et al.* (1975) showing the low TiO_2 and potassic nature of the non-oceanic rocks.

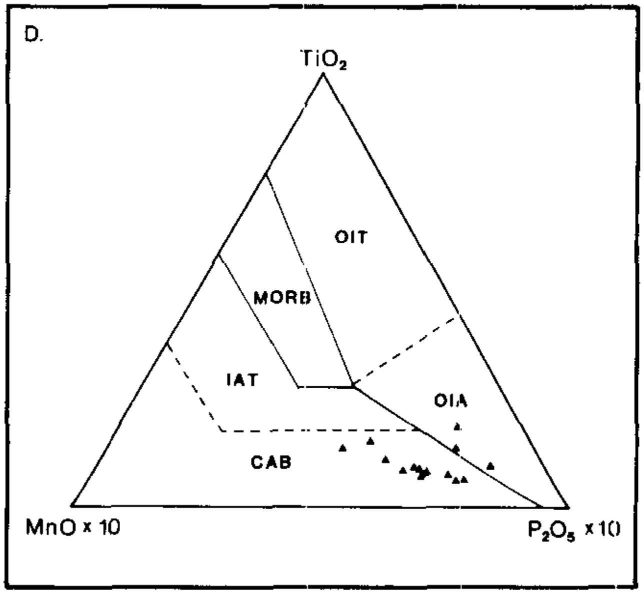


Figure 1-20-4d. Tectonic setting discrimination according to Mullen, (1983) showing calkalkaline (CAB) to ocean island (alkaline) basalt (OIA) character. IAT = island arc (low K) tholeiite, OIT = ocean island tholeiite; MORB = mid-ocean ridge basalt.

identified at Cantin Creek: carbonatization, chloritization, epidotization, pyritization and zeolitization. All types are found as pervasive alteration and in some veins. Carbonatization is most common throughout the map area and is not confined to any specific map unit. Chloritization is also common, but is best developed in Units 5 and 6. Epidote alteration is confined to Unit 6 and pyritization to Unit 5. Zeolite alteration is essentially restricted to the vesicles of flow rocks. Units 5 and 6 are the most pervasively altered, seemingly because of their high porosity.

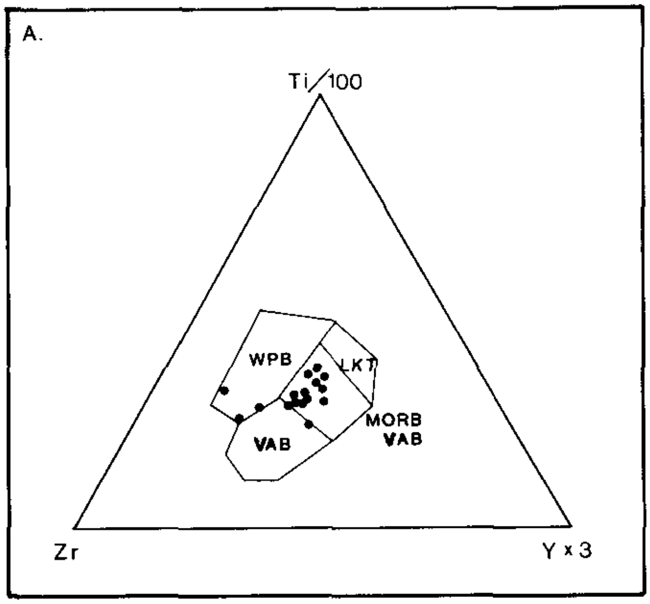


Figure 1-20-5a. Discriminant minor element tectonic setting plot after Pearce and Cann (1973). VAB = volcanic arc basalt; WPB = within plate basalt.

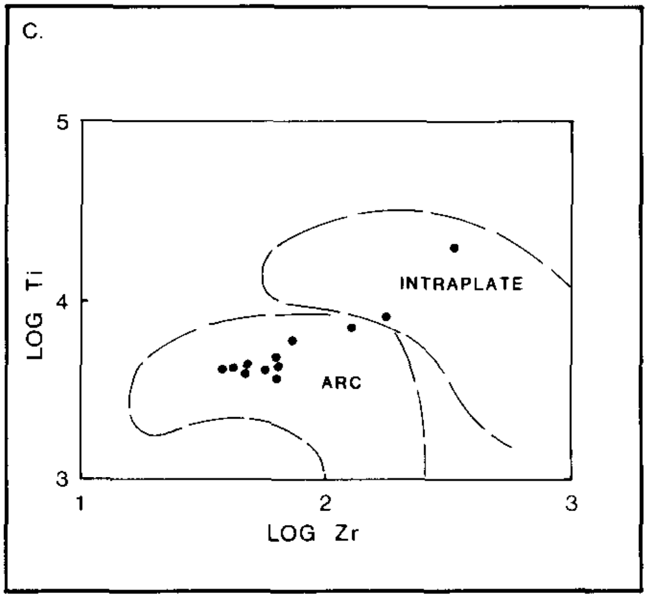


Figure 1-20-5c. Minor element discriminant plots after Pearce (1982).

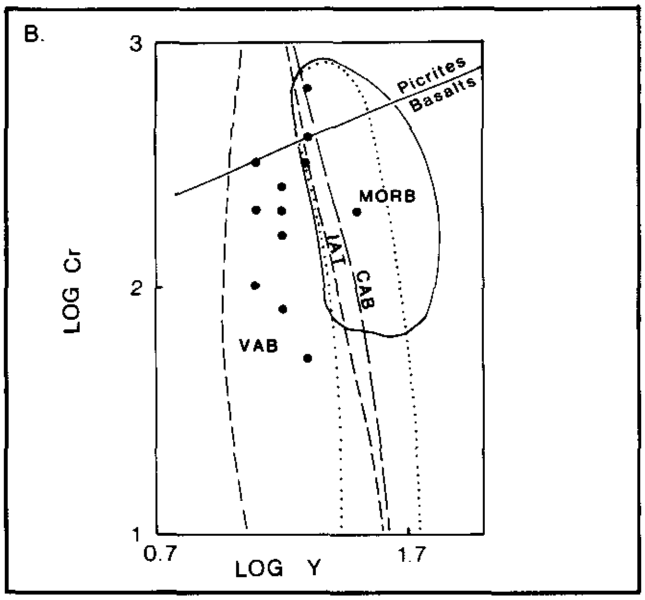


Figure 1-20-5b. Minor element discriminant plots after Pearce (1982).

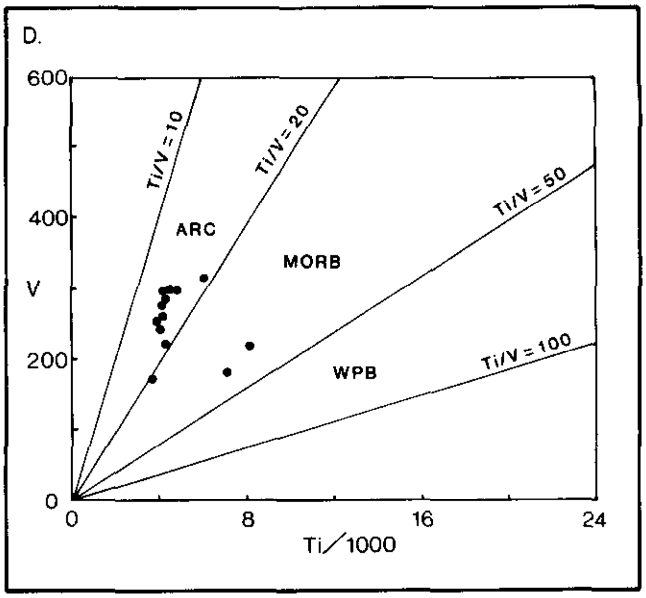


Figure 1-20-5d. Ti-V discriminant plot after Shervais (1982) distinguishing tectonic settings.

A series of 21 rock samples were analyzed for gold and related elements (Au, Ag, Cu, Pb, Zn, Hg, Sn, Mo, Ni; *see* Table 1-20-2) in order to study the relationship between alteraton and mineralization. Statistical analysis shows there is no clear association between any specific rock unit and gold enrichment. Furthermore, there is no apparent correlation between alteration type and gold. However, comparing Cantin Creek to the Horsefly area (Morton, 1976) and the Nicola Group (Preto, 1979), the data are significantly different. In the Horsefly area, the maximum nickel, copper and zinc values are 128; 198; and 125 ppm; in the Cantin Creek area these values are much higher at 877; 510; and 187 ppm respectively. In Nicola rocks, the mean values of nickel for flow rocks, tuffs and intrusive rocks are approximately 17; 10; and 6 ppm; for copper, 77; 56; and 45 ppm; for zinc, 93; 89; and 76 ppm; and for lead, 12; 10; and 6 ppm. In contrast, the mean values for the same rocks in the Cantin Creek area are: nickel, 95; 53; and 114 ppm; copper, 162; 32; and 61 ppm; zinc, 77; 65; and 59 ppm; and lead, 11; 12; and 13 ppm. These values clearly indicate that the copper and nickel content in Cantin Creek rocks is greater than that of Nicola Group rocks in general. These data demonstrate the basic nature of the basal Quesnel volcanic units and their pyroxene-rich erosional products compared to the more differentiated Nicola sucessions. Gold, silver and related-element data from the map area cannot be compared with other areas in the

Quesnel belt due to the limited data available. However, with mercury values up to 2 ppm, mean gold values of 15 ppb and up to 50 ppb, the potential for significant gold concentrations in the area is indicated.

ACKNOWLEDGMENTS

I would like to acknowledge Dr. Andre Panteleyev and Kirk Hancock for advice and assistance in preparing this report. Mike Fournier is thanked for his able assistance in the field. I am also grateful to Joanne Nelson and Don MacIntyre who assisted me with the microscope and microcomputer work. Special thanks are due to Dr. Peter Fox of Fox Geological Consultants Ltd., who provided property information and permitted sampling of drill core from the Cantin Creek site. Dr. D.G. Bailey's critical review of earlier mauscripts has greatly improved the clarity of this report.

REFERENCES

Bailey, D.G. (1978): Geology of the Morehead Lake Area, South-central British Columbia, Unpublished Ph.D. Thesis, *Queens University*, 198 pages.

——— (1988): Geology of the Central Quesnel Belt, Hydraulic, South-central British Columbia, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Geological Fieldwork, 1987, Paper 1988-1, pages 147-153.

Barr, D.A., Fox, P.E., Northcote, K.E. and Preto, V.A., (1976): The Alkaline Suite Porphyry Deposits: a Summary *in* Porphyry Deposits of the Canadian Cordillera, A. Sutherland Brown, Editor, *Canadian Institute Mining and Metallurgy*, Special Volume 15, pages 359-367.

Beswick, A.E. and Soucie, G. (1978): A Correction Procedure for Metasomatism in an Archean Greenstone Belt, *Precambrian Research*, Volume 6, pages 235-248.

Bloodgood, M.A. (1987): Geology of the Triassic Black Phyllite in the Eureka Peak Area, South-central British Columbia, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Geological Fieldwork, 1986, Paper 1987-1, pages 135-142.

——— (1988): Geology of the Quesnel Terrane in the Spanish Lake Area, Central British Columbia, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Geological Fieldwork, 1987, Paper 1988-1, pages 139-145.

de Rosen-Spence, A. and Sinclair, A.J. (1987): Classification of the Cretaceous Volcanic Sequences of British Columbia and Yukon, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Geological Fieldwork, 1986, Paper 1987-1 pages 419-427.

Fox, P.E. (1975): Alkaline Rocks and Related Mineral Deposits of the Quesnel Trough, B.C. *Geological Association of Canada*, Cordilleran Section, Program and Abstracts, February 1975, page 12.

Fox, P.E., Cameron, R.S. and Hoffman, S.J. (1986): Geology and Soil Geochemistry of the Quesnel River Gold Deposit, British Columbia, *in* GEOEXPO 86, Proceedings, *Association of Exploration Geochemists*, Vancouver, May 1986, pages 61-71.

Hodgson, C.J., Bailes, R.J. and Verzosa, R.S. (1976): Cariboo-Bell, *in* Porphyry Deposits in the Canadian Cordillera, A. Sutherland Brown, Editor, *Canadian Institute of Mining and Metallurgy*, Special Volume 15, pages 388-396.

Irvine, T.N. and Baragar, W.R.A. (1971): A Guide to the Chemical Classification of the Common Volcanic Rocks, *Canadian Journal of Earth Sciences*, Volume 8, pages 523-547.

Lefebure, D.V. (1976): Geology of the Nicola Group in the Fairweather Hills, British Columbia, Unpublished M.Sc. Thesis, *Queen's University*, 178 pages.

MacDonald, G.A. (1968): Composition and Origin of Hawaiian Lavas, *Geological Society of America*, Memoir 116, pages 477-522.

MacDonald, G.A. and Katsura, T. (1964): Chemical Composition of Hawaiian Lavas, *Journal of Petrology*, Volume 5, pages 82-133.

Morton, R.L. (1976): Alkalic Volcanism and Copper Deposits of the Horsefly Area, Central British Columbia, Unpublished Ph.D. Thesis, *Carleton University*, 196 pages.

Mullen E.D., (1983): $MnO_2/TiO_2/P_2O_5$: A Minor Element Discriminant for Basaltic Rocks of Oceanic Environments and its Implications for Petrogenesis; *Earth and Planetary Science Letters*, Volume 62, pages 53-62.

Panteleyev, A. (1987): Quesnel Gold Belt – Alkalic Volcanic Terrane Between Quesnel and Horsefly Lakes, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Geological Fieldwork, 1986, Paper 1987-1, pages 125-133.

——— (1988): Quesnel Mineral Belt – The Central Volcanic Axis Between Horsefly and Quesnel Lakes, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Geological Fieldwork, 1987, Paper 1988-1, pages 131-137.

Pearce, J.A. (1982): Trace Element Characteristics of Lavas From Destructive Plate Boundaries. *in* Andesites, Thorpe, R.S., Editor, *John Wiley & Sons*, New York, pages 525-548.

Pearce T.H., Gorman B.E. and Birkett T.C., (1975): The TiO_2-K_2O-P_2O_5 Diagram: a Method of Discriminating Between Oceanic and Non-oceanic Basalts; *Earth and Planetary Science Letters*, Volume 24, pages 419-426.

Preto, V.A. (1979): Geology of the Nicola Group between Meritt and Princeton, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Bulletin 69, 90 pages.

Shervais J.W., (1982): Ti-V Plots and the Petrogenesis of Modern and Ophiolitic Lavas, *Earth and Planetary Science Letters*, Volume 59, pages 101-118.

Struik, L.C. (1986): Imbricated Terranes of the Cariboo Gold Belt with Correlations and Implications for Tectonics in Southeastern British Columbia, *Canadian Journal of Earth Sciences*, Volume 23, Number 8, pages 1047-1061.

NOTES