GOLDEN BEAR PROJECT*
(104K/1)

By T. G. Schroeter

INTRODUCTION

The Golden Bear gold deposit (Mineral Inventory 104K-079) previously called the Muddy Lake gold deposit (Schroeter, 1985, 1986) is located 137 kilometres west of Dease Lake. In the spring of 1986 North American Metals Corp. negotiated a joint venture agreement to acquire a 50-per-cent interest in the Chevron Minerals Ltd. Golden Bear property. Diluted geological reserves on the 12 140-hectare property were calculated by Chevron at 1.18 million tonnes with an average grade of 11.5 grams of gold per tonne; equivalent to approximately 13.6 tonnes of gold. These drill-indicated reserves are contained in two zones:

(1) **Bear Main:** 765 000 tonnes of diluted geological reserves grading 13.3 grams of gold per tonne with a cut-off grade of 6.86 grams per tonne — in part open pittable;

(2) **Fleece Bowl:** 415 400 tonnes of diluted geological reserves grading 8.15 grams of gold per tonne — underground (Wober and Shannon, 1985).

The Totem Silica zone is geologically favourable and the potential for increasing reserves is considered very good.

Chevron has invested $12.3 million on development of the Golden Bear property and completed some 18 300 metres of surface diamond drilling. North American Metals has taken over as operator of the project and can earn a 50-per-cent interest by spending $9 million on further development. The 1987 development program is expected to cost $3.3 million with a feasibility study planned for spring 1987 and mine production in late 1988.

A brief visit to the property was made on November 4 and 5, 1986; this report presents some new age data and chemical analyses, and provides comment on ore genesis. Locations of the samples reported are shown in Figure 2-13-1.

BEAR MAIN ZONE

Development during 1986 was concentrated on the Bear Main zone (Plate 2-13-1). Surface and underground diamond drilling and crosscuts have intersected the zone over a strike length in excess of 325 metres and further testing is planned (Figure 2-13-2). Recent assay results both from drill core and underground sampling indicate higher grades than expected. For example, surface drill hole 86-127 returned 37.03 grams of gold per tonne over 16.76 metres and a panel sample from underground on the 3809E crosscut (Figure 2-13-2) assayed 43.54 grams of gold per tonne over a width of 9.14 metres (North American Metals Corp., October 28, 1986, Press Release). Substantial widths of lower grade mineralization are present above and below some intersections.

The Bear Main zone consists of oxide mineralization, estimated to contain 208 600 tonnes grading 14.4 grams of gold per tonne and an underlying refractory zone containing 556 900 tonnes grading 12.9 grams of gold per tonne. A significant part of these reserves is available for open-pit mining with a stripping ratio of approximately 6:1 (J. Franzen, personal communication, 1986). Exploration for additional reserves is currently in progress in the 1400-metre level adit. An updated reserve estimate will be available on completion of the program.

TABLE 2-13-1.
AGE DATING FROM GOLDEN BEAR AND AREA

Field No.	Lab No.	Location Longitude	Location Latitude	Zone	Rock Type	Minerals	%K (mean n = 5)	Ar^{40} $\times 10^{-10}$ mol/g	% Ar	Apparent Age (Ma)	Comments
ML — 81	31643M	58°13′	132°17′	Bear Main	Talc-sericite tuff	Sericite	8.35 ± 0.12	31.300	96.8	204 ± 7	Drill core @ 162.9 to 163.3 m
ML — 92	31644M	58°14′	132°17′	Totem Silica	Sericitic tuff	Sericite	7.26 ± 0.10	26.226	93.4	197 ± 7	Drill core @ 59 m
ML — 93	31645M	58°13.5′	132°17′	Fleece Bowl	Sericitic tuff	Whole rock (sericite concentrate)	4.34 ± 0.06	14.160	87.0	179 ± 6	Drill core @ 37.2 m
ML — 95	31646M	58°14′	132°17′	Totem Silica	Sericitic tuff	Sericite	7.40 ± 0.05	27.928	98.3	205 ± 7	Drill core @ 94.2 to 94.4 m
NIE-85-1	31647M	58°21′	132°18′	NIE (2 oz. Notch)	Hornblende feldspar porphyry dyke	Hornblende	1.45 ± 0.02	4.105	94.4	156 ± 5	Hand specimen
WH — 70	—	58°16′21″	132°24′30″	Ram/Tut	Albitite	Whole rock	0.474 ± 0.01	1.473	79.2	171 ± 6	Hewgill thesis (1985)
		58°12′50″	132°17′	Bear Main	Sericitic tuff	Whole rock (sericite concentrate)	6.94 ± 0.08	22.437	96.7	177 ± 6	Chevron (1984)

* Radiogenic Ar
Constants: $\lambda^{40} K_\epsilon = 0.581 \times 10^{-1}$ yr^{-1}; $\lambda^{40} K_\beta = 4.96 \times 10^{-10}$ yr^{-1} ; $K/K = 1.67 \times 10^{-4}$
%K determined by the Analytical Laboratory, British Columbia Ministry of Energy, Mines and Petroleum Resources, Victoria.
Ar determination and age calculation by J.E. Harakal, The University of British Columbia.

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British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork, 1986, Paper 1987-1.

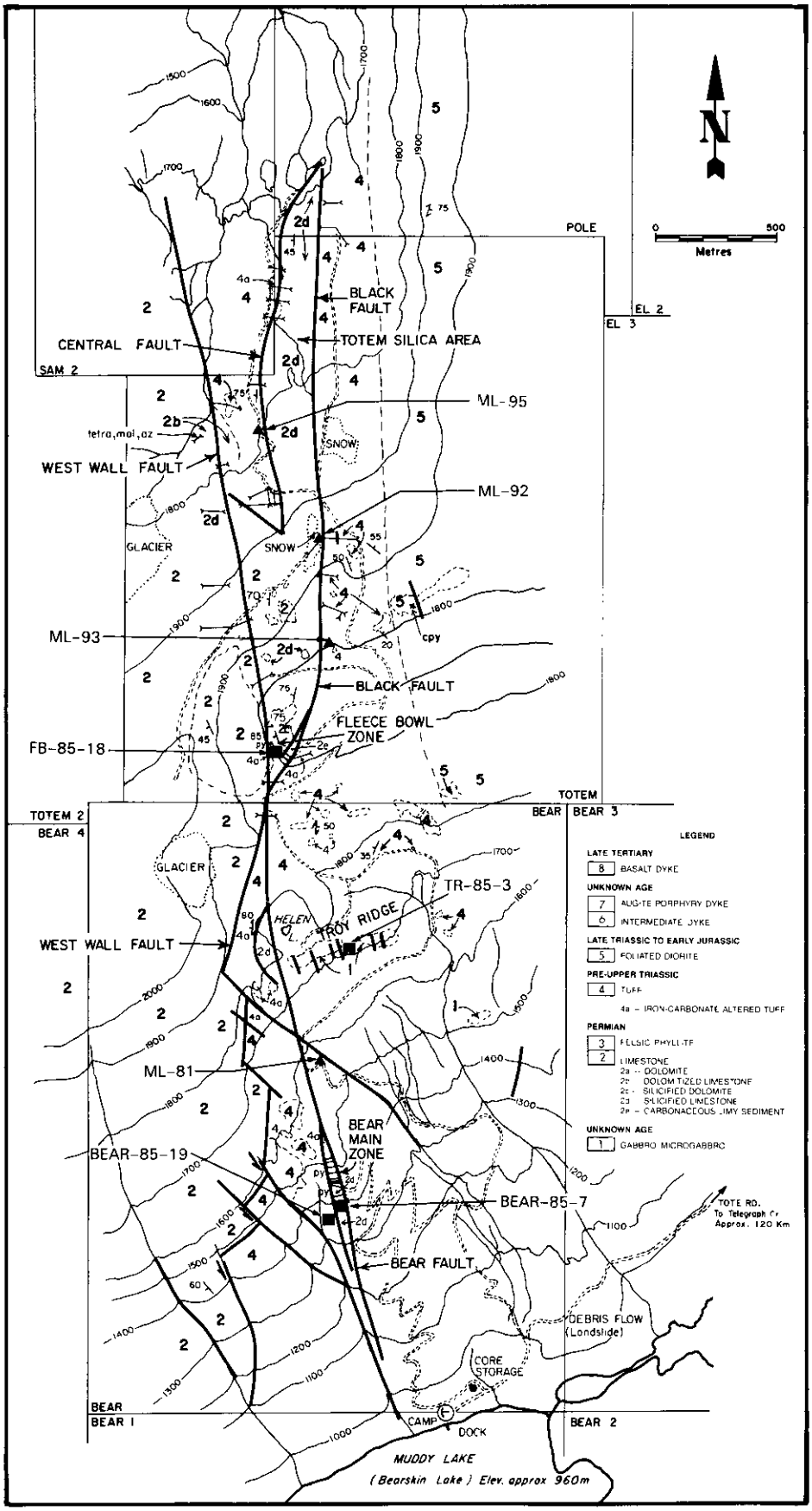

Figure 2-13-1. Location map showing age dates (▲) and chemical analyses (■), Golden Bear property.

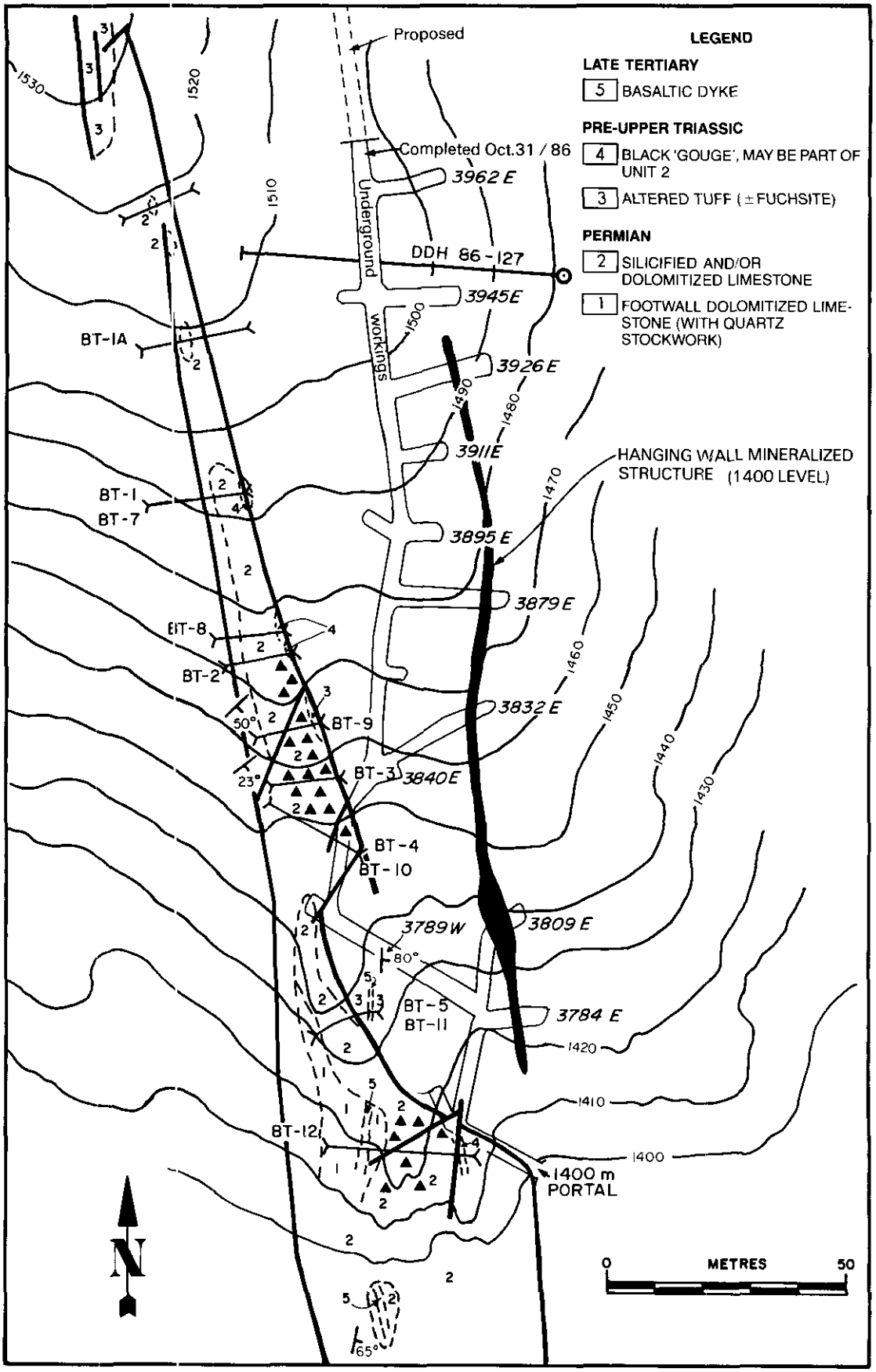

Figure 2-13-2. Geological plan of Bear Main zone, Golden Bear deposit.

It appears that up to 55 per cent of the gold may occur in the hangingwall foliated tuffs and 45 per cent in the hangingwall breccia, with a small amount in silicified limestones and dolomites of the zone (J. Franzen, personal communication, 1986).

AGE DATING

Five samples collected during the 1985 field season for age dating were run in October 1986 (*see* Figure 2-13-1 for sample locations). The results are shown in Table 2-13-1 together with two previously reported dates from the area.

Four samples of drill core were selected from the three zones of interest, Bear, Fleece Bowl and Totem Silica. Sericite was analysed, and is assumed to represent the age of alteration and perhaps mineralization. An additional sample was taken from a relatively fresh hornblende porphyry dyke, which lies along the fault zone trace at the "2 oz. Notch" showing, approximately 10 kilometres northwest of the Bear Main zone. Elsewhere this dyke is mineralized.

The results are shown in Table 2-13-1. They indicate a period of hydrothermal alteration (± mineralization?) extending over a period of at least 30 million years (ages of 174 to 204 million years) with a possible additional 20 million years as suggested by the young, late-stage mineralized dyke from the "2 oz. Notch" showing. The main period of alteration (mineralization?) is suspected to have occurred at 200 ± 7 million years (Early Jurassic).

The age of mineralization appears to be significant with respect to the timing of mineralization elsewhere in British Columbia, particularly in the northwestern part of the province in the Toodoggone and Stewart gold districts. A strong positive correlation exists between the ages of volcanic and intrusive events, alteration, and mineralization.

CHEMICAL ANALYSES

Four grab samples were collected in 1985 for complete major oxide analyses. The results are shown in Table 2-13-2. The mafic units, gabbro and "greenstone", are alkali basalts and basalts respectively. The locations of the samples are indicated in Figure 2-13-1. A description of rock types on the property is included in *Geological Fieldwork, 1985* (Schroeter, 1986).

TABLE 2-13-2.
MAJOR OXIDE ANALYSES,
GOLDEN BEAR DEPOSIT

	1	2	3	4
SiO_2	47.29	45.07	47.44	67.44
TiO_2	1.16	2.16	0.58	<0.02
Al_2O_3	14.30	13.86	13.10	0.07
Fe_2O_3	15.39	12.88	12.33	0.13
MnO	0.228	0.15	0.209	0.11
MgO	6.12	7.54	8.93	0.15
CaO	9.66	9.83	12.81	18.02
Na_2O	2.87	2.87	1.84	<0.01
K_2O	1.07	0.69	0.60	0.02
P_2O_5	0.27	0.36	0.15	0.08
LOI	1.77	5.13	3.05	18.97
Total	**100.10**	**100.50**	**101.00**	**104.57**

Key to Analyses:

Lab No.	Field No.	Field Description	Area (Zone)	Classification
1-30915	TR-85-3	Gabbro	Troy Ridge	Alkali basalt
2-30916	BEAR-85-7	Basalt dyke	Bear Main	Basalt-alkali basalt
3-30917	BEAR-85-19	"Typical greenstone"	Bear Main	Basalt
4-30918	FB-85-18	Silicified carbonate	Fleece Bowl	Silicified limestone

ORE DEPOSITIONAL MODEL

As suggested earlier (Schroeter, 1985, 1986), the Golden Bear deposit and other precious metal-bearing deposits in the region are postulated to be vein-type with epithermal characteristics. Evidence to date suggests that as the mineralizing solutions ascended the fault zone between carbonate rocks and volcanic tuffs they reached a point, termed a "roll" by J. Franzen (personal communication, 1986), where extensive tectonic brecciation, silicification and carbonatization took place in the host limestones, dolomites and tuffs above this flexure (Figure 2-13-3). In the footwall, carbonate rocks (dolomites?) show a diffuse pattern of alteration over distances of 1 to 2 metres, producting a texture referred to locally as "rind" rock (J. Franzen, personal communication, 1986). Clast-supported breccia fragments with beige to orange limonitic reaction rims in a dark grey sulphide-rich matrix, and/or carbonate-filled fractures are typical textures seen in this rock.

In the hangingwall a silicic mineralized breccia developed (Plate 2-13-2) with a higher grade zone of mineralized volcanic tuff lying above it. Locally the tufts are altered to a listwanitic quartz-iron carbonate-pyrite-fuchsite assemblage (Schroeter, 1986, page 181).

Regionally some stratigraphic units, particularly limestones, have been preferentially brecciated and silicified, especially adjacent to fault zones. The apparent selective replacement of these horizons has produced stratabound mineralized zones. The permeability and/or porosity of these rock units may have been important factors in determining depositional sites for the ascending mineralizing solutions. Locally, within the Bear Main zone, much more detailed sampling will be required to test this hypothesis.

A possible genetic association with an early Jurassic event is suggested by recent age dates (this report). In addition, a mineralized intrusive feldspar porphyry dyke (F1 dyke) in the Fleece Bowl zone was intersected by diamond drilling; unfortunately an attempt to date it was unsuccessful. Intrusive activity, alteration and mineralization along the major regional fault (Ophir lineament) is postulated to have occurred over a 50-million-year time span (that is, 156 to 206 million years).

PROJECT WORK

Work in 1986 consisted of:

(1) 850 metres of underground development; including 325 metres of drifting, 375 metres of crosscutting and a 150-metre raise;
(2) 1457 metres of surface diamond drilling;
(3) 1000 metres of underground drilling;
(4) Examination of two possible all-weather access routes to connect the property with the Telegraph Creek road (Highway 114) either at Telegraph Creek, a distance of approximately 120 kilometres, or at the Tahltan River crossing, a distance of approximately 140 kilometres;
(5) Minesite and road environmental studies;
(6) Minesite and waste management geotechnical studies;
(7) Metallurgical bulk sampling and pilot scale testing;
(8) Initiation of a final feasibility study.

ACKNOWLEDGMENTS

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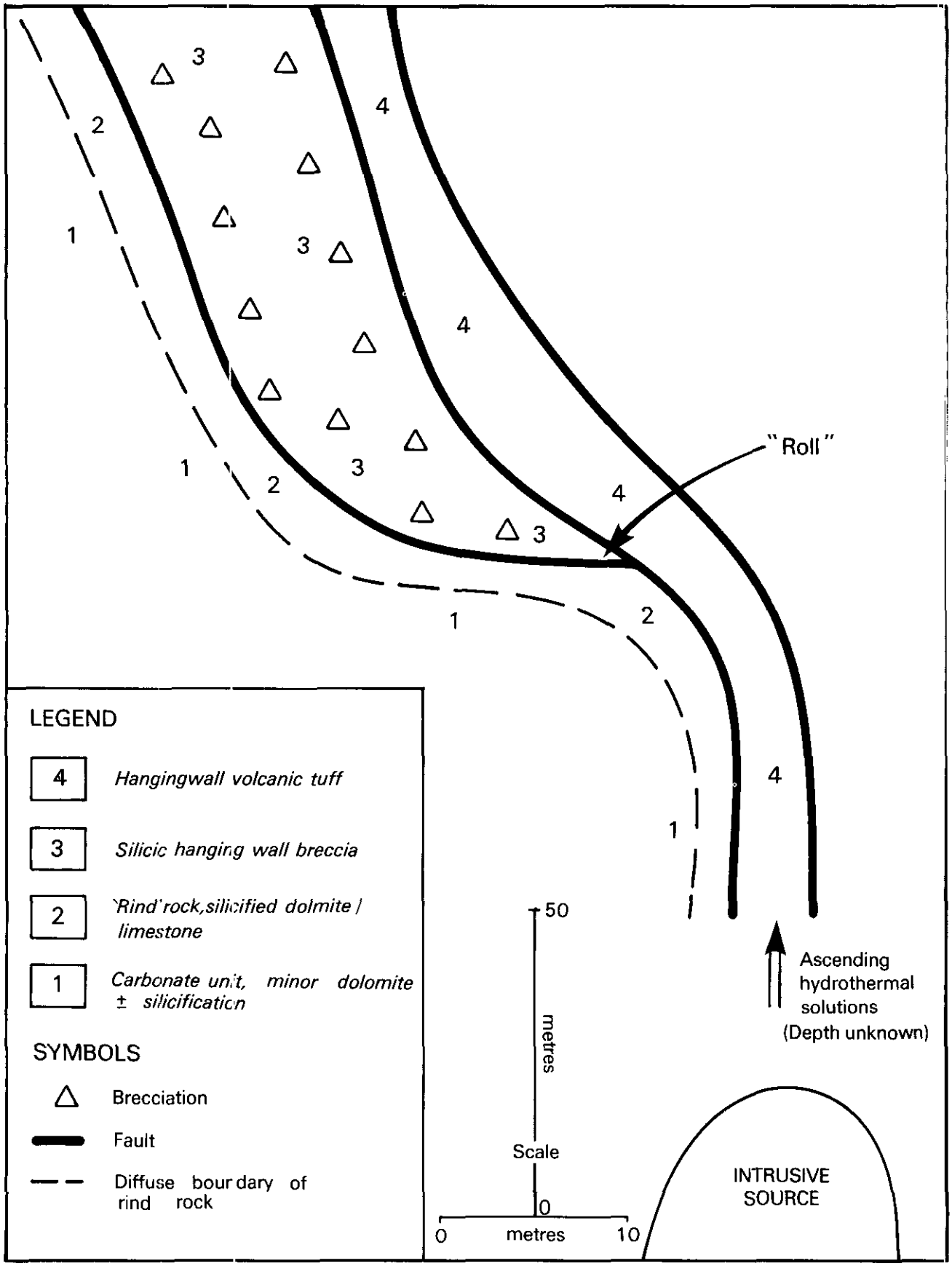

Figure 2-13-3. Schematic representation of ore genesis and emplacement, Bear Main zone, Golden Bear deposit.

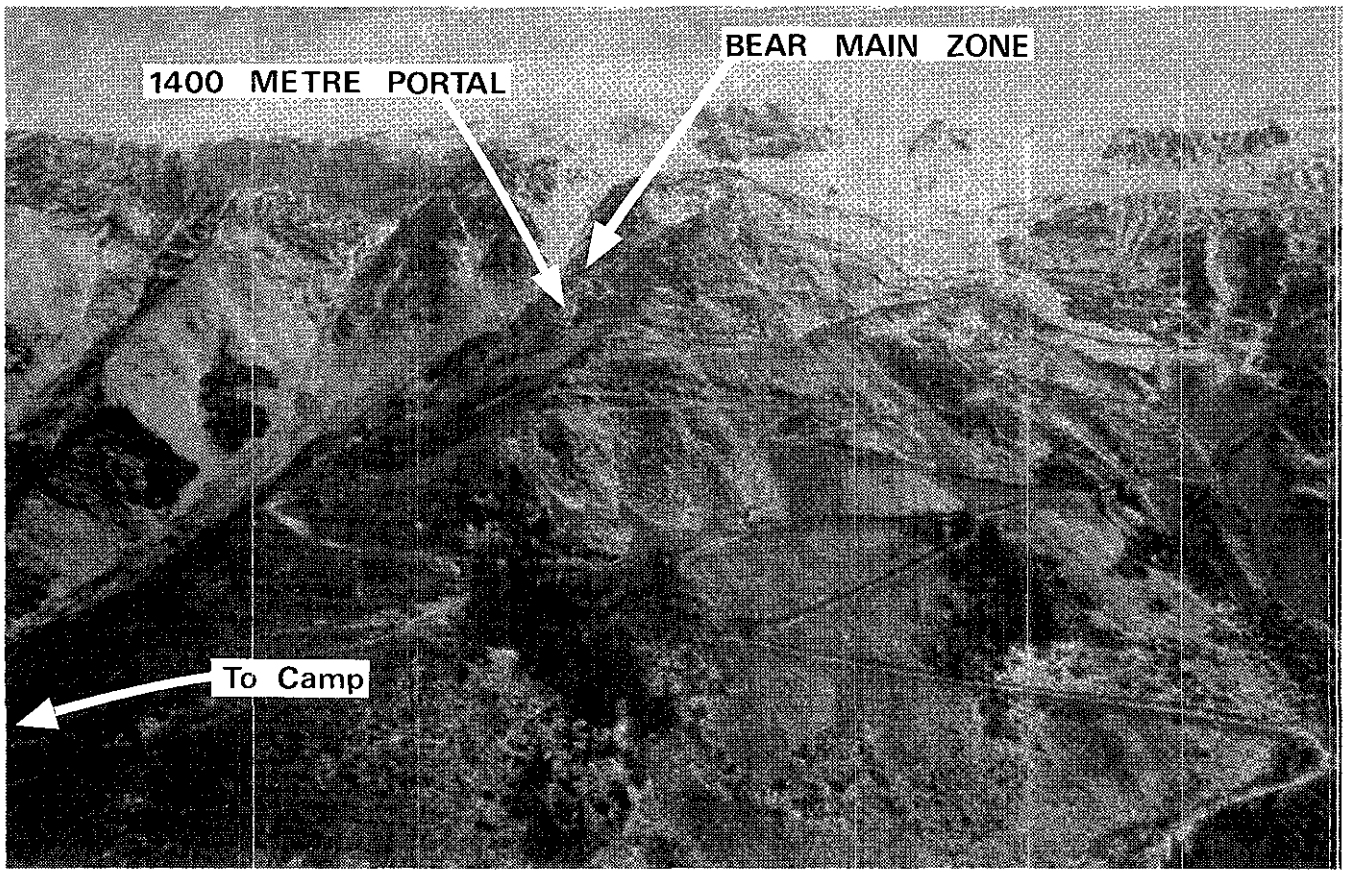

Plate 2-13-1. Looking northwesterly over Bear Main zone, Golden Bear deposit.

Plate 2-13-2. Hangingwall mineralized silicic breccia, Bear Main zone, Golden Bear deposit. Fragments are mainly silicified limestone; matrix is mainly fine-grained pyrite and a minor mixture of very fine-grained rock fragments.

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