680056

VAULT PROJECT (Au)

BRITISH COLUMBIA

NTS 82E-5E

Inco Exploration and Technical Services Inc.
February, 1992

INTRODUCTION

Previous exploration at the Vault property had indicated the presence of epithermal gold mineralization in Tertiary volcanic flows and epiclastic sediments located near the eastern, faulted margin of a Tertiary outlier. It was considered that higher grade mineralization could be found along or near structures related to the faulted, eastern margin of the inlier. The property was optioned in 1986 and subsequent diamond drilling found higher gold values in the downfaulted extension of the initial discovery zone. The joint venture was formed on February 1, 1988.

PROPERTY

Location and Access

The property is located in the Osoyoos Mining Division. The centre of the claim block is 2.5 km NW of Okanagan Falls (NTS sheet 82E-5E, Latitude 49°22'N, Longitude 119°37'W). The claims are crossed by paved highways, and power and water are available on the property.

Status

The property consists of eighteen mineral claims totalling 1700 ha. in 79 units (Figure 1). Canadian Nickel Company Limited owns 60% and Seven Mile High Resources Inc. owns 40%. Murray Morrison has a 4.8% NPI in the property up to a maximum of $250,000.

HISTORY

1982: The Vault 1 claim was staked by M. Morrison to cover an area of gossanous silicified breccias that carried anomalous values in gold and silver. Riocanex Inc. optioned the claim, staked the Vault 2-5 claims and carried out a small program of geological mapping and soil geochemistry around the discovery outcrop. Four percussion holes for 295 m and 4 diamond drill holes for 632 m were drilled. Low gold and silver values were encountered.

1983: Dome Exploration (Canada) Limited optioned the claims in late 1983 and carried out a small program of induced polarization geophysics, a magnetometer survey and diamond drilling in the same area (7 holes for 558 m). Again, low values in gold and silver were encountered.

1985: Seven Mile High Resources optioned the property and carried out geological mapping, soil geochemistry, magnetometer and VLF-EM surveys over an area of 4 sq. km. Eight shallow percussion holes for 491 m were drilled in two areas, but the target depth was not reached.

1986: Inco Gold (Canico) optioned the property and remapped the existing SMHR grid, relogged the existing core and after a reinterpretation of the geology, drilled two widely spaced, vertical, diamond boreholes. One of these intersected 9.9 g/t Au over 1.05 m from 373.10 m to 374.15 m.

1987: The Vault 6 and 7 claims were staked. Sixteen diamond drill holes for 4,664 m were drilled. Several highly encouraging intersections were obtained from this drilling including 7.9 g/t Au over 12.9 m in BH 72408.

1988: An additional 49 holes for 18,307 m were drilled. As a result of this work, a large auriferous epithermal system was defined over an area of 1,000 m east-west by 500 m north-south. Within this, a central zone with a strike length of 600 m contains potentially economic gold mineralization.

1989: During this year, 75 holes were drilled for a total of 13,229 m. Most drilling was concentrated on the North Vein. The vein was partially drilled off and a mineral resource was calculated.

1990: Twelve holes were drilled for a total of 2,636 m in the West Zone and the North Vein and two trenches were dug along the strike length of the North Vein. At the east end of the West Zone, drilling discovered a significant mineralized zone within 120 m of surface that gave a best intersection of 5.1 g/t Au over 7.90 m. By the end of the year, all boreholes had been re-logged and standardized and all sections updated and readied for presentation to parties interested in acquiring an interest in the Vault property.

1991: The project was dormant. A complaint under section 35 was not pursued by the plaintiff because of the Eskay Creek ruling.

REGIONAL GEOLOGY

The Vault property is located in the northeastern part of the Penticton Tertiary Outlier (Figure 1). B.N. Church (see BCDMPR Bulletin 61) described a sequence of Eocene volcanics and sediments up to 4,000 m thick. The Outlier is bounded to the east by the major Okanagan Valley normal fault which dips about 30° to the west. The Eocene sequence has been preserved, possibly as a half graben, by down faulting along this structure. The sequence is cut by many northerly-trending step faults and by several westerly-trending radial faults. The beds generally dip easterly.

PROPERTY GEOLOGY AND MINERALIZATION

Three Eocene Formations were mapped on the property. From old to young these are: Marron, Marama and White Lake (Figures 1 and 2). The Marron Formation is made up of flows of porphyritic trachyte. The Marama Formation is divided into 2 parts:

the lower part consists of epiclastic sediments, an olivine trachyte and a felsite unit; the upper part is a thick, very fine grained, dacitic flow. The White Lake Formation is made up of epiclastic sediments interlayered with mafic flows. The Formations are cut by a major north-east trending fault with the down throw on the east side. Drilling results suggest several east-west trending and possibly several northeast trending faults complicating the picture.

Epithermal gold mineralization is present in many narrow east-west trending veins over an area of 1,000 m east-west by 500 m north-south. No major feeder(s) has been found yet. In the down-dropped block, east of the major northeast-striking fault (the Central Zone), ore grade values occur where quartz veins intersect silicified Lower Marama Formation and particularly in a zone between two marker horizons. Marker No. 1 is at the bottom of the Formation and consists of an olivine trachyte flow. Marker No. 2 is a felsite unit and occurs about 30 m above the top of Marker No. 1. The zone has been traced by drilling over a strike length of 600 m and a down-dip extension of 100 m. The picture is complicated by minor faulting and possibly by slumping features. A vertical metal zoning is present as follows (from top to bottom): As-Sb, As(-Mo), Au-Ag(-Mo-Ba).

The North Vein consists of a narrow, discrete, steeply south dipping, quartz-calcite adularia vein cutting Marron Formation trachytes. It is located 350 m N of the Central Zone.

The Western extension of the Central Zone (West Zone or Original Discovery Zone) contains higher grade zones similar to those indicated in the Central Zone but at depths less than 100 m. Drilling in 1990 confirmed this potential.

RESERVES

Not enough pierce points are available to calculate a meaningful reserve in the Central Zone. By interpreting the geology and assay data on cross sections, a resource potential can be estimated. Along a strike length of 267.50 m, from 537+50E to 805E, this potential is 1,342,000 tonnes grading 2 g/t Au. Within this resource, high grade zones occur, but with the lack of sufficient pierce points continuity cannot be substantiated. If continuous, these zones could contain up to 135,000 tonnes grading 7 g/t Au per zone or structure. From 805E to 1100E, drilling is sparse but it appears that gold mineralization becomes more erratic towards the east. The better intersections in this zone are:

Borehole	Section	Width(m)	g/t Au
72436	825E	3.15	1.47
38898	865E	27.55	1.20
	including	1.7	7.37
72441	865E	6.06	2.96
	including	1.57	6.79
		4.28	2.58
	including	0.90	5.48
72414	900E	12.20	1.44
	including	2.40	3.04
72443	920E	7.46	2.66
	including	1.41	5.71
		8.87	2.49
	including	1.07	6.11
72471	1090E	2.93	7.12

The mineralized zone rakes towards the east. The top of the mineralized zone is 170 m below surface at 550E and is 500 m below surface at 1100E.

In 1989, the North Vein was tested over a strike length of 1050 m and a vertical depth varying from 100 to 200 m. Diamond drilling indicated a mineral resource of 150,000 tonnes grading 14 g/t Au using a cut-off grade of 3 g/t Au. The average true width for the intersections included in the tonnage calculation is 0.57 m. Drilling in 1990 tested the east and west ends of the North vein at depths of 400 m and 320 m respectively, but results were not encouraging and are not included in the tonnage calculation. In the trenching program on the North vein, the West Trench averaged 7.2 g/t Au, 50.0 g/t Ag along a strike length of 158 m and average width of 0.38 m and the East Trench averaged 3.4 g/t Au, 22.0 g/t Ag along 256 m with an average width of 0.58 m.

EXPENDITURE SUMMARY (US $)

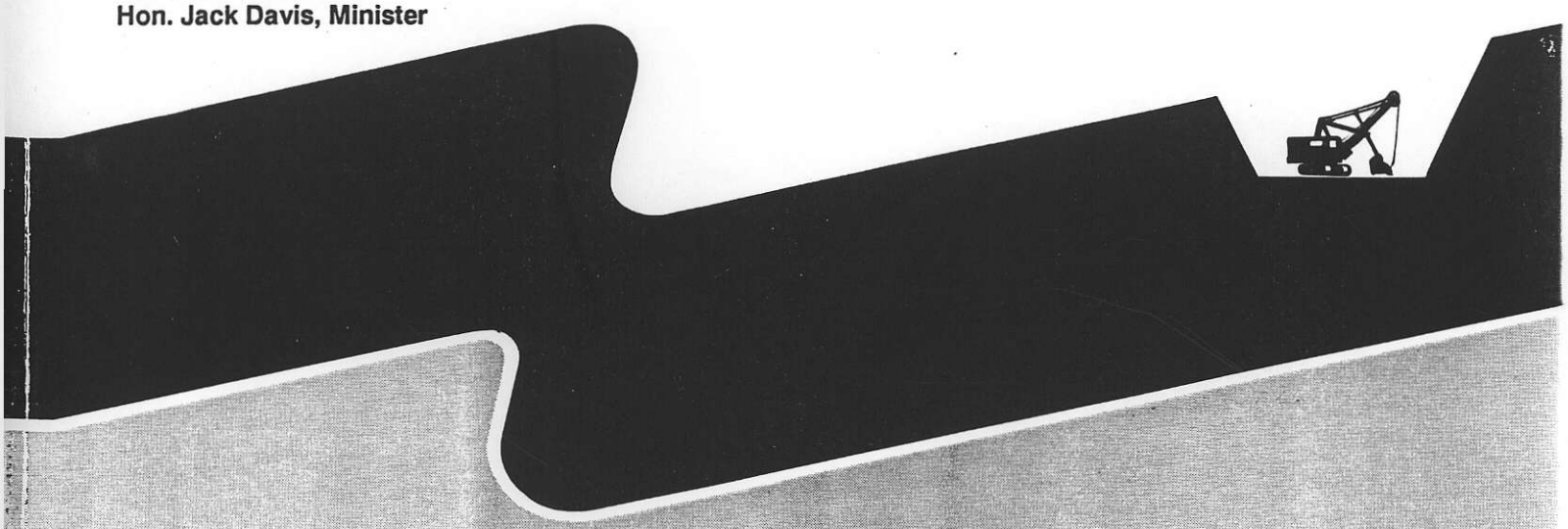
Year	Inco Gold	SMHR	Total
1986	71,383	-	71,383
1987	335,353	-	335,353
1988	1,008,087	593,860	1,601,947
1989	625,000	416,000	1,041,000
1990	152,560	112,541	265,101
1991	-1,627	9,913	8,286
Totals	2,190,756	1,132,314	3,323,070

1992 BUDGET

No program or budget are proposed for 1991. The property will be maintained in good standing pending an increased gold price when it is hoped a purchaser will be found.

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

MINERAL RESOURCES DIVISION
Geological Survey Branch



EXPLORATION IN BRITISH COLUMBIA 1988

Part A - Overview of Exploration Activity

Part B - Geological Descriptions of Properties

Part C - Assessment Report Summaries, Minerals and Coal

VAULT (82ESW173)

By R.E. Meyers

(Fig. B1, No. 02)

LOCATION:	Lat. 49°22′ Long. 119°37′	82E/5E
	OSOYOOS MINING DIVISION. 3 kilometres northwest of Okanagan Falls.	
CLAIMS:	VAULT 1-7.	
ACCESS:	Via White Lake road from Highway 97, approximately 3 kilometres north of Okanagan Falls. Several all-weather logging roads access the central part of the claims.	
OWNERS:	Canadian Nickel Company Limited, Seven Mile High Resources Inc.	
OPERATOR:	INCO GOLD MANAGEMENT INC.	
COMMODITIES:	Gold, silver.	

PRELIMINARY ECONOMIC GEOLOGY OF THE VAULT GOLD DEPOSIT

INTRODUCTION

The relatively recent discovery of gold-silver mineralization on the Vault claims and other properties in the region has helped to re-establish exploration for precious metals in the Tertiary rocks of southern British Columbia. These rocks, once regarded as "cover rock", are now recognized as being part of a Tertiary epithermal province, with excellent potential for hotspring-type gold mineralization.

EXPLORATION HISTORY

Information on mineralization in the Okanagan Falls area was scant prior to the discovery of the Dusty Mac deposit in the late 1960s. Quartz veining and gossanous alteration were noted in the area of the Vault claims by Church (1969) and using this information, Murray Morrison, a geologist from Kelowna, staked the Vault 1 claim in 1982. Riocanex Ltd. optioned the property in the same year and staked the Vault 2-5 claims. The company completed geological and geochemical surveys on the Discovery area and outlined an elongate silicified zone weakly anomalous in gold, arsenic, mercury and antimony. The zone was tested with four percussion-drill holes, totalling 295 metres. In 1983 Riocanex diamond drilled an additional four holes totalling 632 metres, but results were discouraging and the option was dropped.

The following year Dome Exploration Ltd. optioned the property and completed an induced polarization survey in the Discovery area. An anomaly was outlined coincident with the geochemical anomaly and parallel to a fault presumed to represent the contact between the Marron and Lower Marama formations. Dome tested the anomaly with seven diamond-drill holes totalling 559 metres, again with discouraging results and the property was returned to the owner (Oddy, 1984).

Seven Mile High Resources Inc. optioned the claims in 1985 and carried out geological, geochemical, magnetometer and VLF-EM surveys over the Vault 1 and 4 claims and followed up with four percussion-drill holes totalling 491 metres, which did not intersect significant new mineralization (Wilmot 1984). Results generally indicate that anomalous gold values are concentrated in porous lower Marama tuffs, above the inferred Marron fault contact and below upper Marama dacites.

CURRENT WORK

Canadian Nickel Company Limited optioned the Vault claims from Seven Mile High Resources in May 1986 and completed mapping and topographic surveys. This was followed with two deep diamond-drill holes totalling 779 metres, the second of which intersected anomalous gold values over approximately 82 metres from 358 to 440 metres depth. The zone includes intersections of 7.1 grams per tonne gold over 1.7 metres and 6.7 grams per tonne over 1.5 metres.

Since the 1986 discovery the company has continued with major diamond-drilling programs. In 1987, 5411 metres were drilled in 21 holes and in 1988, 49 drill holes were completed for a total of 18 315 metres. The company has drilled 72 holes to date, for a total of 24 505 metres. Another major drilling program is planned for 1989.

REGIONAL GEOLOGY

The Vault claims lie within the eastern part of the White Lake basin, a thick accumulation of Eocene volcanic rocks, interlayered with clastic sedimentary rocks which are largely of volcanic derivation (Church,

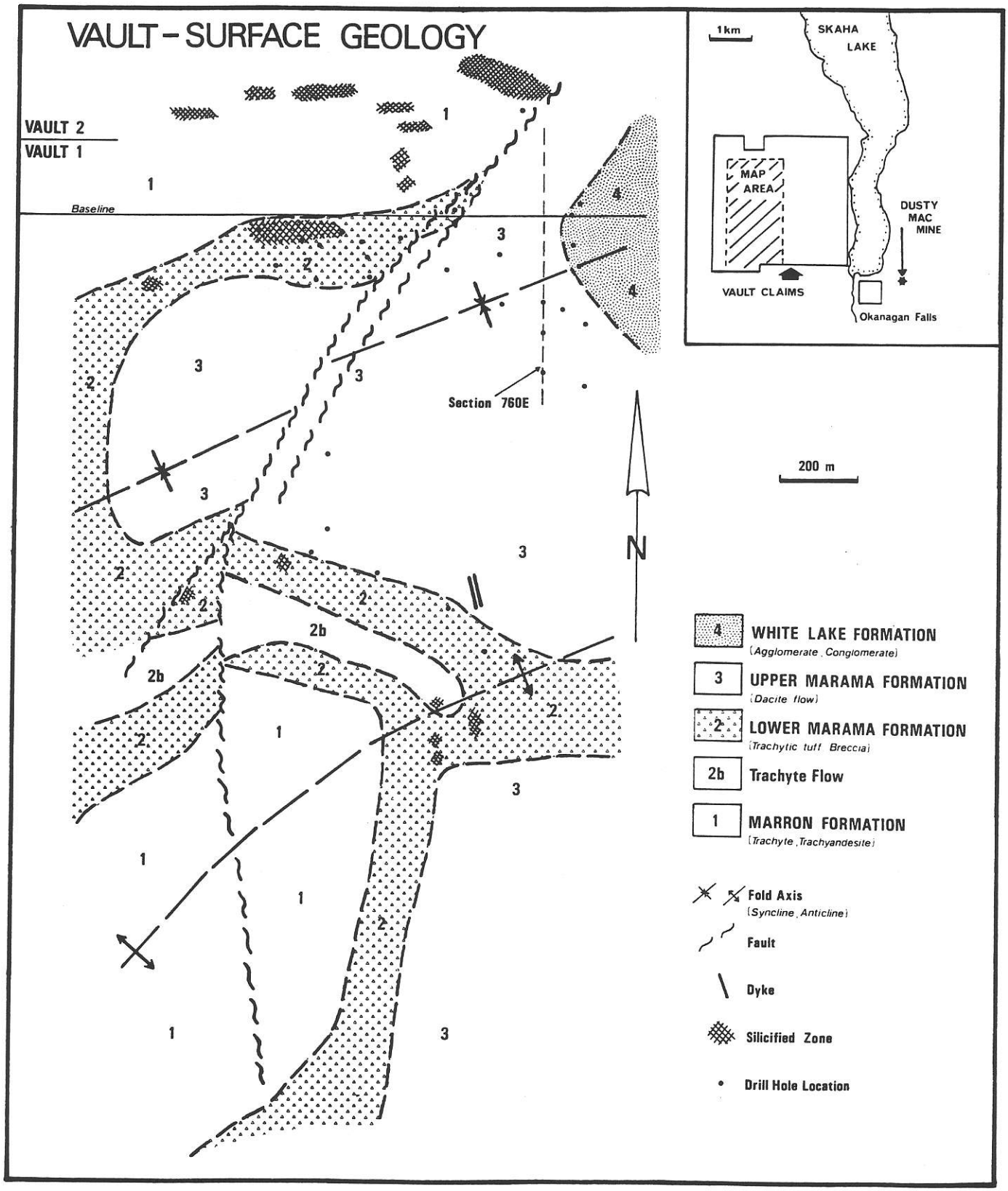


Figure B-2-1 . General geology of the west-central part of the Vault claims (simplified from Groeneweg; 1987, 1988).

1973, 1979). The Eocene rocks rest unconformably on Early to Middle Mesozoic metavolcanic and metasedimentary rocks and Middle to Late Mesozoic granitic rocks. The White Lake sequence comprises an outlier that is correlated with similar Eocene sequences in the region (Church, 1982; Tempelman-Kluit, 1989). They are interpreted to be remnants of an older continuous, southern Okanagan depositional basin (Parrish *et al.*, 1988). Hora and Church (1986) noted a variety of zeolite minerals in Tertiary rocks of the region, suggesting that they originated either from low-grade metamorphism or from late-stage volcanic processes.

PROPERTY GEOLOGY

The stratigraphic sequence on the Vault claims (Figure B-2-1) includes the Marron Formation at the base, overlain by the Marama Formation, with the White Lake Formation at the top. The rocks are gently folded about northeasterly trending synclinal and anticlinal axes and offset by northerly and northeasterly trending faults which form a step-like down-dropped pattern. Precious metal mineralization is related to an east-west oriented fracture system confined largely to the lower Marama Formation and crossing the north-central part of the claim block.

The section of Marron Formation underlying the property, which has been designated the Kitley Lake member (Church 1979), consists of purplish brown to grey, fine-grained plagioclase-porphyritic lavas of trachyte to trachyandesite composition (Plate B-2-1). The upper contact of this unit is strongly weathered and may represent the eroded angular unconformity described by Church (1973).

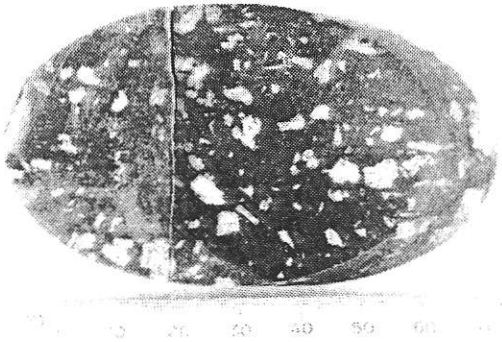


Plate B-2-1. Marron Formation: Trachytic porphyry flow, with glomeroporphyritic alkali feldspar phenocrysts. (Photo: T.G. Schroeter.)

The overlying Marama Formation is the favourable host unit in which gold-silver mineralization occurs, and is subdivided into upper and lower sections. At the base of the lower Marama is a coarse pyroclastic and/or epiclastic unit, which is mapped elsewhere by Church as a conglomerate. The section grades upward into a crudely alternating sequence of coarse and fine-grained tuffaceous and fragmental rocks (Plate B-2-2), believed to reflect repeated explosive events (Groeneweg, 1987, 1988). Much of this section varies from lapilli to ash tuff, with coarse fragments and massive fine-grained trachyte porphyry flows intercalated with thin laminated mudstone and sandstone. The flows display abundant, irregular clay and zeolite(?)-filled amygdules. In some areas the tuff is broken into larger subrounded clasts that are probably the result of epiclastic processes. At other localities the breccia has a random chaotic appearance, characteristic of laharic slumping or debris flow. Church (1979) suggested that some trachytic clasts in the lower Marama Formation are derived from the Marron.

Plate B-2-2. Lower Marama Formation: Agglomeratic breccia with subangular and subrounded porphyritic and amygdaloidal volcanic fragments in a gritty lapilli-ash matrix. Veinlet is filled with black and white silica and has been offset by subsequent brecciation. (Photo: T.G. Schroeter.)

The upper Marama is a massive, aphanitic dacite flow unit that is plagioclase porphyritic, with alkali feldspar, minor hornblende and biotite. Some outcrops

display flow banding and platy brittle fracture. Sheeted dacite feeder dykes, averaging about 1 metre in width, intrude the dacite in the central part of the property.

At the top of the Vault sequence the White Lake Formation consists of coarse agglomeratic and laharic rocks interlayered with andesitic and trachytic flows, conglomerates and carbonaceous mudstones. Church (1973) defined the unit as being derived entirely from underlying Eocene rocks, with no pre-Tertiary components. Groeneweg (1987) suggested that the unit may have formed as infilling debris, following caldera collapse. The angularity of most fragmental material in the unit indicates a relatively close provenance.

ALTERATION

Gossanous silicified zones (Plate B-2-3) were the first precious metals targets identified on the Vault property (McClintock, 1982). The prime area of intense silicification and stockwork veining is an elongate zone parallel to the east-west baseline (Figure B-2-1). It was originally traced on surface for 350 metres in the Discovery area and is coincident with geochemical and geophysical anomalies. Drill information indicates that the zone occurs above the Marron/lower Marama contact and the original zone is on the west side of the area currently being explored. Recent exploration has extended the zone of silicification and veining discontinuously for about 900 metres along strike.

In drill core, the intensity of silicification appears to increase with the frequency of quartz veining. Within the area of mineralization, silicification is pervasive and the replacement of wallrock by chalcedonic quartz is locally evident. Clay alteration is common adjacent to fault zones and is particularly notable as feldspar alteration in trachytic flows and breccias. Minor muscovite and green micaceous minerals are also present in altered sections. Hematite, calcite and chlorite alteration are poorly developed in all units and are usually confined to fractures, vein margins and breccia matrix or fragments. Calcite veinlets usually crosscut silicic alteration and veining.

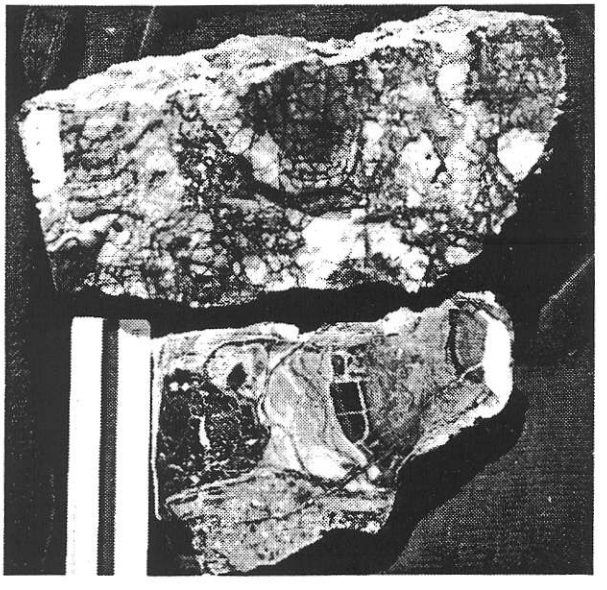


Plate B-2-3. Lower Marama Formation: Surface samples from the Discovery area; Left - brecciated, weakly banded quartz vein material; Right - silicified fragments in volcanic breccia. Note black and grey massive and banded chalcedonic silica replacement of fragments. (Photo: T.G. Schroeter.)

MINERALIZATION

The main area of interest is in the north-central part of the property, on the north limb of a northeast-trending syncline (Figure B-2-1). Gold-silver mineralization is associated with a discontinuous, east-trending, steeply dipping quartz vein system. Veining is concentrated primarily in lower Marama rocks, where the porosity and permeability of the volcanic breccias and tuffs are highest, although a few minor gold-bearing veins have been encountered in the Marron and upper Marama formations. Intense silicification and weak, very fine grained pyritization accompanies much of the mineralization.

Near-surface mineralization, where silicification is less intense, is generally anomalous in precious metals, but below an estimated economic grade of less than 3 grams per tonne gold. With increased depth, silicification becomes more intense and the average grade increases to the 5-10 grams per tonne range, in places over substantial widths (Figures B-2-2, 3). Gold and silver are typically not visible to the naked eye, but are considered likely to occur as native elements, or possibly as electrum. Silver:gold ratios in the mineralized zones are highly variable, but average 9.8:1, based on calculated ratios from 210 reported drill-core intervals. The ratios tend to be lowest with higher gold values.

Veins in the main mineralized zone have typical epithermal textures and mineral assemblages. Finely banded and bladed chalcedonic quartz, ankeritic carbonate and minor alkali feldspar (adularia?) are the main vein components. Veins range in size from fine irregular anastomosing veinlets a few millimetres thick, to larger veins about 10 centimetres wide. Some exceptionally large veins are up to about 30 centimetres in width. They commonly display multistage growth textures (Plate B-2-4), such as scalloped, colloform banding, bladed cockscomb intergrowths and drusy cavities. Where the vein minerals occur as breccia matrix, some breccia fragments are rimmed with finely banded quartz (Plate B-2-5) and occur in a matrix of

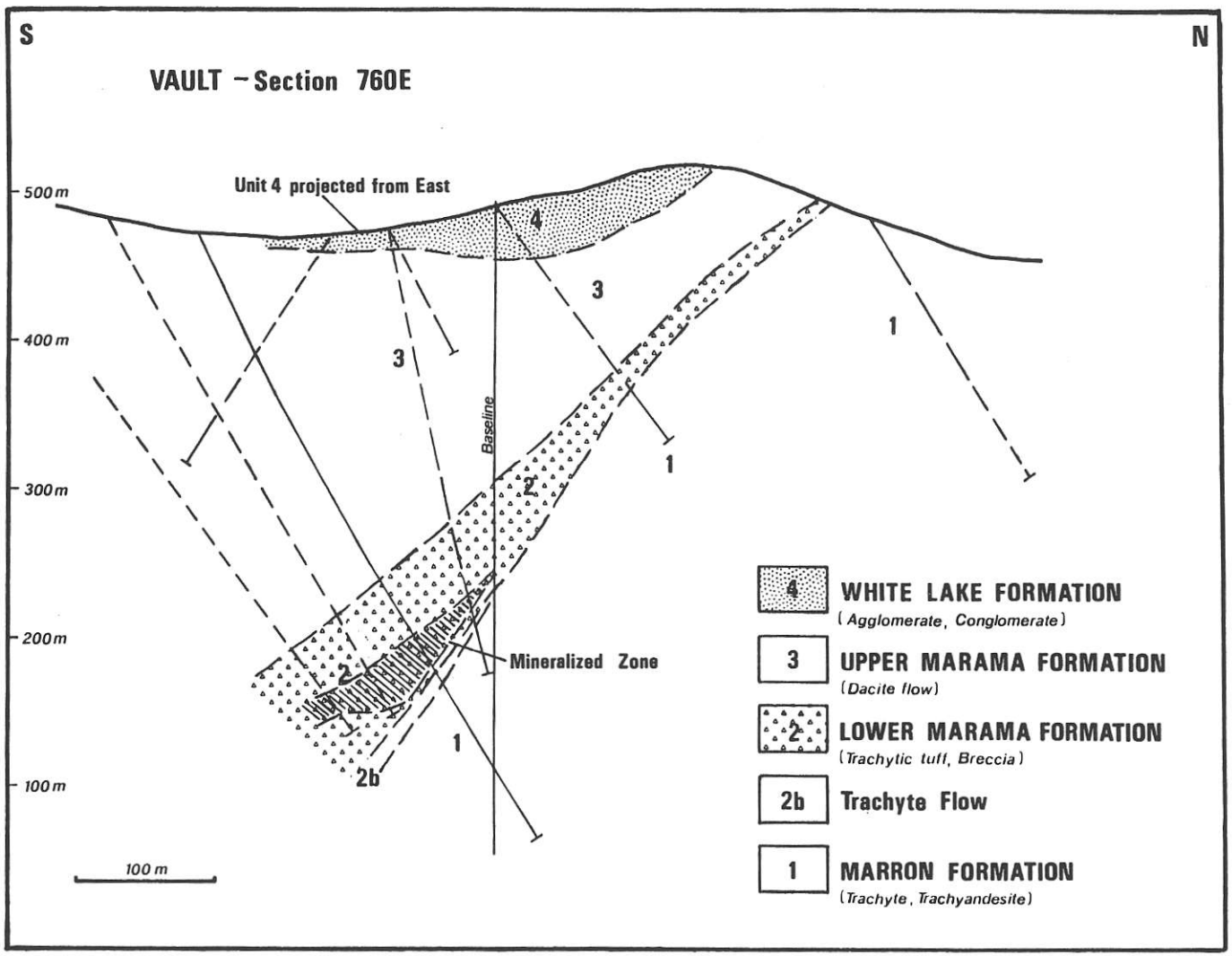


Figure B-2-2. Vault section 760E, looking west, showing stratigraphy and mineralized zone on the north limb of a northeast-trending syncline (simplified from Groeneweg; 1987, 1988).

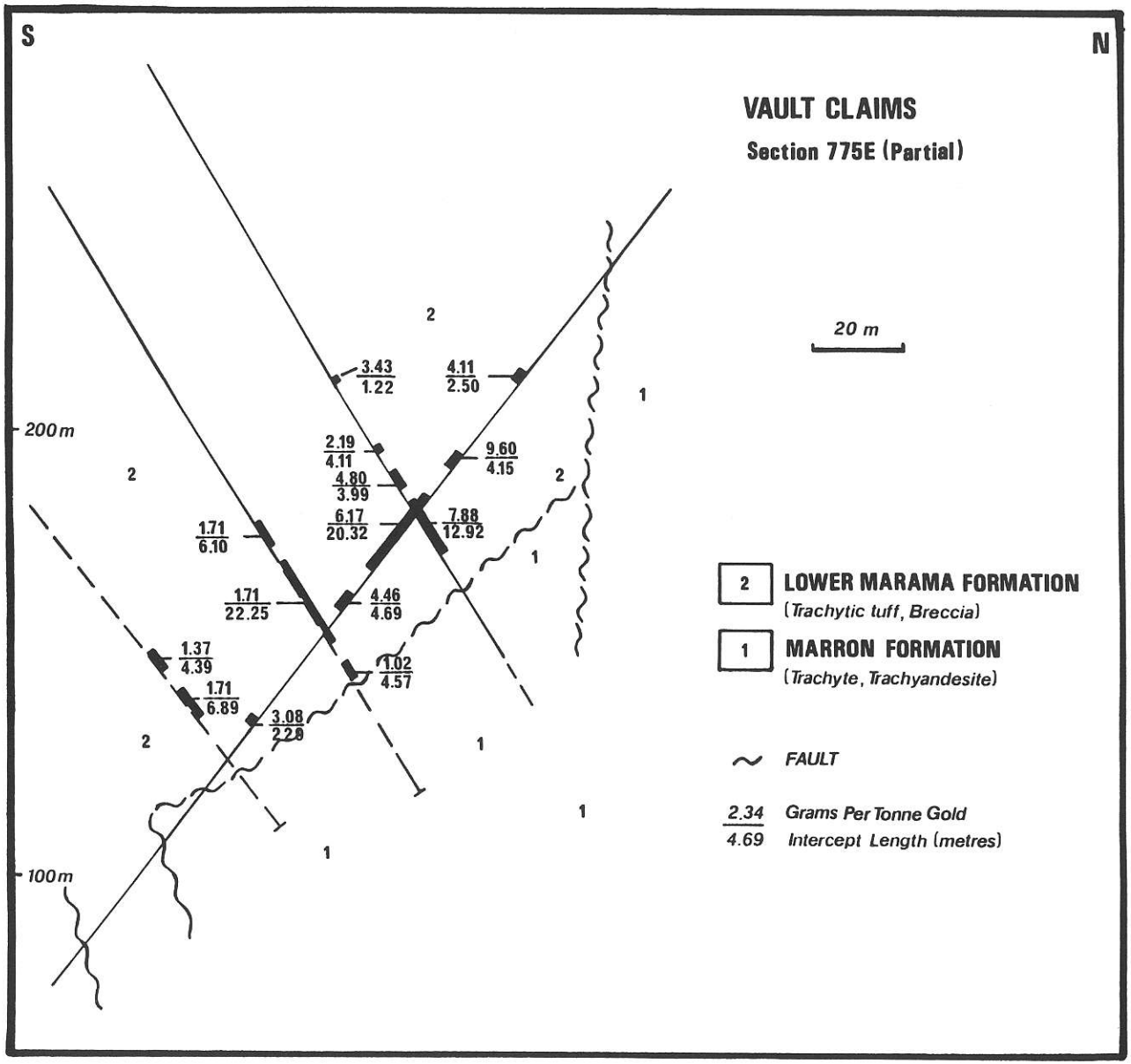


Figure B-2-3. Vault section 775E, looking west, showing detail of diamond-drill intersections.

black, grey and white silica. Some of the most significant gold values are associated with complex multistage veining. In a number of intersections the veins have been brecciated and subsequently rehealed by the addition of banded silica (Plate B-2-6). In other areas, banded quartz clasts are a significant component of the breccia (Plate B-2-7).

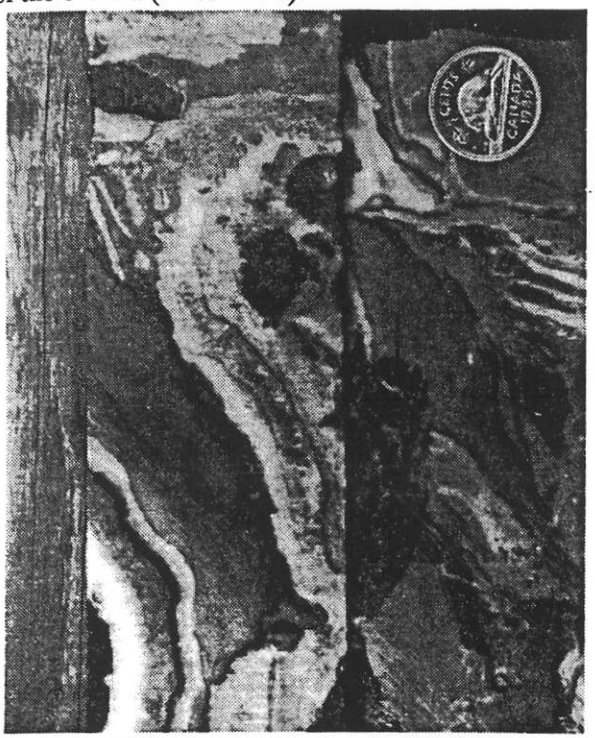


Plate B-2-4. Mineralized zone: Banded and brecciated quartz veins in mudstone, displaying multiple growth layers of white, grey and black chalcedonic quartz. Breccia fragments are strongly silicified and some are cut by later fine silicic veinlets. (Photo: T.G. Schroeter.)

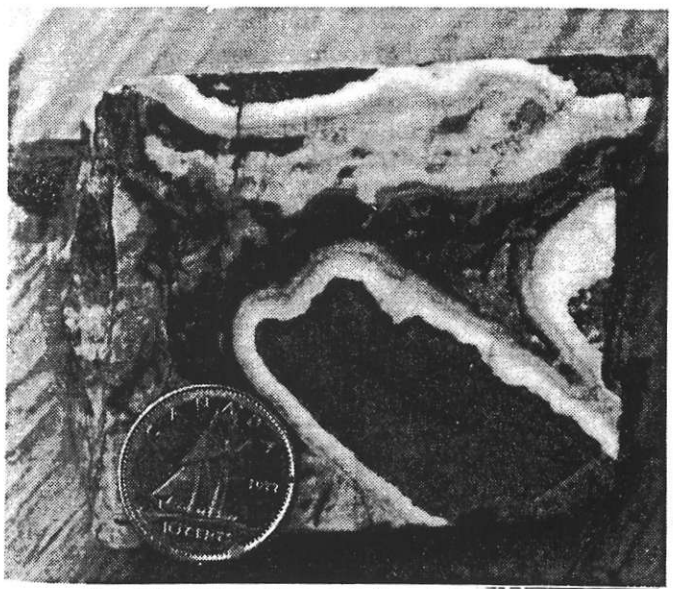


Plate B-2-5. Mineralized zone: Breccia fragments rimmed by banded quartz. Most of the matrix is black and grey silica. (Photo: T.G. Schroeter.)

Plate B-2-6. Mineralized zone: Multistage growth textures in chalcedonic quartz vein and vein breccia. Early formed banded fragments are enclosed in later banded quartz. Fine-bladed quartz-calcite replacement intergrowths occur near the dark rims of individual silica layers. (Photo: T.G. Schroeter.)

Plate B-2-7. Mineralized zone: Banded quartz vein fragments in post-vein breccia (epiclastic ?). (Photo: T.G. Schroeter.)

The sulphide content associated with mineralization is typically low, although some sections are highly oxidized, with 5 to 10 per cent pyrite which is very fine grained and may occur as disseminations, fracture or vein-breccia fillings and thin veinlets. Elevated pyrite content does not generally correlate with significant gold values. Base metal sulphides, such as chalcopyrite, galena and sphalerite, do not appear to be related to precious metal distribution on the Vault property. The geochemical signatures of copper, lead and zinc are typically low, with zinc showing the most variation. Molybdenum is one of the best pathfinder elements in the mineralized zone. It appears to correlate well with some high gold and silver values, however, the relationship is not consistent.

SUMMARY AND DISCUSSION

The geological setting, structure and style of precious metal mineralization on the Vault property show characteristics similar to many epithermal hot-spring-type gold-silver deposits in the western United States and elsewhere (Buchanan, 1981; Henley, 1985). The currently known mineral assemblage tentatively places the deposit in the "adularia-sericite" class, as outlined by Hayba *et al.* (1985).

Mineralization is associated with intense, generally widespread silicification and weak to moderate clay alteration. At surface, precious metals are geochemically anomalous, but sub-economic, whereas, below 300 metres depth, average values are within the economic range for gold.

On a regional scale and vein scale, mineralization is structurally controlled by major northeast and east-trending faults and related parallel fracture systems. It is, in part, lithologically controlled, confined primarily to tuffaceous, agglomeratic and brecciated rocks of the lower Marama Formation. This unit is overlain by dacite flows of the upper Marama Formation and underlain by trachytic rocks of the Marron Formation. Both units are less permeable than the lower Marama Formation.

This apparent stratigraphic control of mineralization may also be due, in part, to the vertical zonation of pressure and temperature and geochemical conditions that existed during the deposition of precious metals. Vertical variations in mineralization are characteristic of epithermal deposits (Buchanan 1981).

ACKNOWLEDGMENTS

I am indebted to Wim Groeneweg of Inco Gold Management Inc. for permission to visit the Vault property and for access to drill core. Fruitful discussions with Inco project geologists and with Murray Morrison, consulting geologist, are also acknowledged. Todd Hubner and William Taylor assisted with data collection and drafting of figures.

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