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CASE HISTORIES OF MINERAL DISCOVERIES

Volume I

DISCOVERIES OF EPITHERMAL PRECIOUS METAL DEPOSITS

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Chapter 13

QUEEN CHARLOTTE, CANADA

Discovery of the Queen Charlotte Gold Deposit

V. F. HOLLISTER

The Queen Charlotte gold deposit (also known as the Specogna, Babe, or Cinola) was discovered in late 1970 by Efrem Specogna and Johnny Trico. They were prospecting along the trace of the Sandspit fault, and they sampled jarositic material that included veins from the fault zone. Their assays included some good gold values. They located the Babe Claims in 1971 and optioned them to Kennco Explorations Ltd. Kennco conducted stream sediment and soil geochem studies, geological mapping and drilling of 55.2 m (181 ft) in two drill holes. Kennco withdrew from the property, and by 1977, Cominco, Placer Development, Silver Standard, and Quintana Minerals had each successively worked on the deposit. Consolidated Cinola Mines bought the claims in 1977 and completed exploration of the deposit ultimately in a joint venture arrangement with Energy Reserves. Energy Reserves entered in late 1979, and by 1983, a total of 200 surface and 12 underground drill holes had been completed, totaling 28 600 m (93,832 ft). In addition, a 461.9 m (1515 ft) adit was driven in the ore body. Reserves published by Cinola aggregate 34 Mt (37 million st) of 1.7 g (0.060 oz) Au per tonne.

All industry geologists working in the area agree that the Queen Charlotte gold is an epithermal gold deposit in porous volcaniclastic and clastic rocks that is genetically related to a Miocene-Pliocene rhyolite plug. The geologic description here follows the oral presentation made by G. G. Richards, J. S. Christie, and M. R. Wolfhard at a 1976 CIM meeting. Additional comments by the late C. S. Ney of Kennco Explorations are included with the Richards, Christie, and Wolfhard data to complete the geologic setting. The attached reprint by Champigny and Sinclair (1980) provides additional data on the deposit.

The Queen Charlotte (Babe, Specogna, or Cinola) gold deposit is located on Graham Island in the northern Charlotte Islands, at the fault boundary of the Skidegate plateau and the Charlotte lowlands. The Sandspit fault marks the physiographic boundary, and it is intruded by rhyolite porphyry at the deposit. Because displaced geochem anomalies, drainage patterns, and topography suggest dextral and east side down movement for the fault, exposed east block rocks are younger than rocks west of the fault. The east block, which included the ore deposit, is a lowland largely masked by unconsolidated Pleistocene and Recent clastic rocks. Rocks west of the rhyolite plug, on the Skidegate plateau, are Cretaceous carbonaceous and calcareous shale unconformably overlain by a thin veneer of rhyolite tuff. The deposit is about 100 m (328 ft) above sea level.

GEOLOGIC SETTING

At the ore deposit, the Sandspit fault is a complex structure. However, lithologies on either side of the fault-controlled rhyolite porphyry plug are distinct. West of the rhyolite, the upper member of the Cretaceous Haida formation shale is the most common rock type. The member is composed of dark grey to black, poorly consolidated, and thinly bedded carbonaceous and calcareous shale. The sequence is silicified to an argillite or a hornfels near the rhyolite. West of the rhyolite porphyry plug, but not importantly involved in the mineralization, is a thin masking cover of rhyolite tuff. The tuff unconformably succeeds the cretaceous shale, but it is largely eroded in the mine area.

East of the fault-controlled rhyolite porphyry plug is a thick section of conglomerate and sandstone of the Miocene-Pliocene Skonun formation. The ore body occurs within the coarse clastics, the rhyolite intrusive as the western boundary. Ore is entirely contained within the clastics. Original permeability of the clastic rocks was a major control for ore deposition and alteration, and for that reason, the Skonun formation is described in greater detail.

The Skonun formation clastics unconformably overlie Haida shale. The Skonun is at least 300 m (984 ft) thick in the mine area, where it trends northerly and dips easterly 15° to 25°. The sequence is about 62 percent conglomerate, 31 percent coarse arkosic sandstone, and 7 percent interbedded siltstone and sandstone. Contacts between adjacent beds are generally sharp. Stratigraphic correlations between drill holes are based on projections of sandstone, siltstone, or conglomerate units rich in mafic volcanic pebbles. The correlations show that some beds are preferred hosts for mineralization, and porosity seems to have been the most important control.

The principal rock type in the ore zone is a medium grey to pale brown polymictic conglomerate with subangular to rounded pebbles and cobbles. The coarse fraction, with an average clast diameter of 3 cm (1.2 in.), comprises 70 percent of the conglomerate. Graded bedding of poorly sorted particles and load cast structures are abundant. Clast lithologies are 60 percent felsic volcanic rock, 20 percent mafic volcanic rock, 10 percent siltstone. The favorable host is therefore composed mostly of felsic volcaniclastic and clastic sediments. Wood fragments, to 3 percent of the rock, are intermixed with both the coarse and fine fraction of the conglomerate. However, as much as 15 percent of the sandstone is wood fragments. Leaves, peat, and shells (pelecypods) accompany the wood.

Rhyolite porphyry occurs in the discovery outcrop and in numerous exploration drill holes. The rhyolite seems to be controlled by a strand or branch of the Sandspit fault, although separate dikes are exposed outside of the main plug. The dikes contain up to 20 percent fragments of silicified black shale. The contact zone of the plug and the intruded rock includes a mixture of rhyolite breccia, with Skonun conglomerate and sandstone fragments, developed as the rhyolite penetrated the Haida and Skonun formations. In outcrop the rhyolite is variably brecciated. Unweathered rhyolite is pale grey and contains about 3 percent quartz eyes and 10 percent feldspar phenocrysts. The ground mass is too altered for its protolith to be determined.

The Sandspit fault, at the mine, is called the Footwall fault. This fault, although occupied by the rhyolite porphyry, may not be the main strand of the fault, but it is part of that system. It is clear from the field relationships that fault movements occurred during alteration and mineralization.

ALTERATION AND MINERALIZATION

The Skonun coarse clastics are pervasively altered by silicification, sericitization, and illite and kaolin argillization. Clay and sericite alteration are most extensive. Supergene kaolin also occurs near the surface. Near the rhyolite porphyry, alteration tends to be stronger in some strata, and it weakens from the rhyolite contact to the east. Both clay and sericite occur in the matrix as well as in the clasts of the conglomerate. Pyrite and marcasite also occur pervasively in the conglomerate and as a replacement of wood fragments. These sulfides constitute about 2 percent of the altered Skonun rocks. Chlorite occurs within 20 m (66 ft) of the rhyolite porphyry as disseminations and stringers. The rhyolite is altered to clay, with lesser sericite and silicification also occurring. The Haida shale is altered near the rhyolite porphyry, mostly to clay. Clearly the silica cap has been removed by erosion and the bonanza zone is exposed in the Queen Charlotte deposit.

Mineralization is controlled by the bedding and by stringers and stockworks related to fault movement. Hypogene mineralization includes very fine grained quartz, chalcedony, pyrite, marcasite, hematite, native gold, and cinnabar. Chalcopyrite and sphalerite occur as rare microscopic traces. Barite is suggested by some analyses, and carbon is present as a black, very fine grained dust in the siliceous veins. Calcite and adularia are not obvious in the veins. Pyrite and marcasite are the most usual vein sulfides, but some pyrite and marcasite concentrations are barren of gold. The gold is normally very fine grained.

Petrographic studies suggest that gold mineralization occurs in two stages. The earliest is extremely fine grained gold, with an Au:Ag ratio of about 1:3. The average grade of this stage ore is on the order of 1 g (0.035 oz) Au. No copper, lead, or zinc sulfides occur at this stage, and mineralization probably is selectively controlled by porosity of the strata. Mineralization seems to decrease away from the fault and its rhyolite intrusion in this stage.

The second stage is associated with steeply dipping veins and veinlets that cut the clastics. The gold grain size is generally somewhat larger, and the Au:Ag ratio is 1. The average grade of the quartz veins is on the order of 8.5 g (0.3 oz) Au, and copper, zinc, and lead sulfide occur in this stage. Mineralization is controlled by veins and veinlets that are mostly steep to vertical.

Oxidation occurs within 20 m (66 ft) of the surface.

CONCLUSIONS

Clearly, the Queen Charlotte deposit is typical of epithermal mineralization in volcanic and volcaniclastic rocks. Mineralization occurs in a wide range of porosites and chemical properties within conglomerate beds. However, specific beds with higher porosities are preferred hosts. Mineralization altered the conglomerate, and deposited silica and sulfides in the interstices of the clasts. Younger quartz-chalcedony veins cut the bedding and carry better grade gold values. The sulfide mineralogy and the illite-kaolin-sericite alteration are typical of mineralization found below the silica cap, in the bonanza zone.

Progress Report on the Geology of the Specogna (Babe)Gold Deposit*

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INTRODUCTION

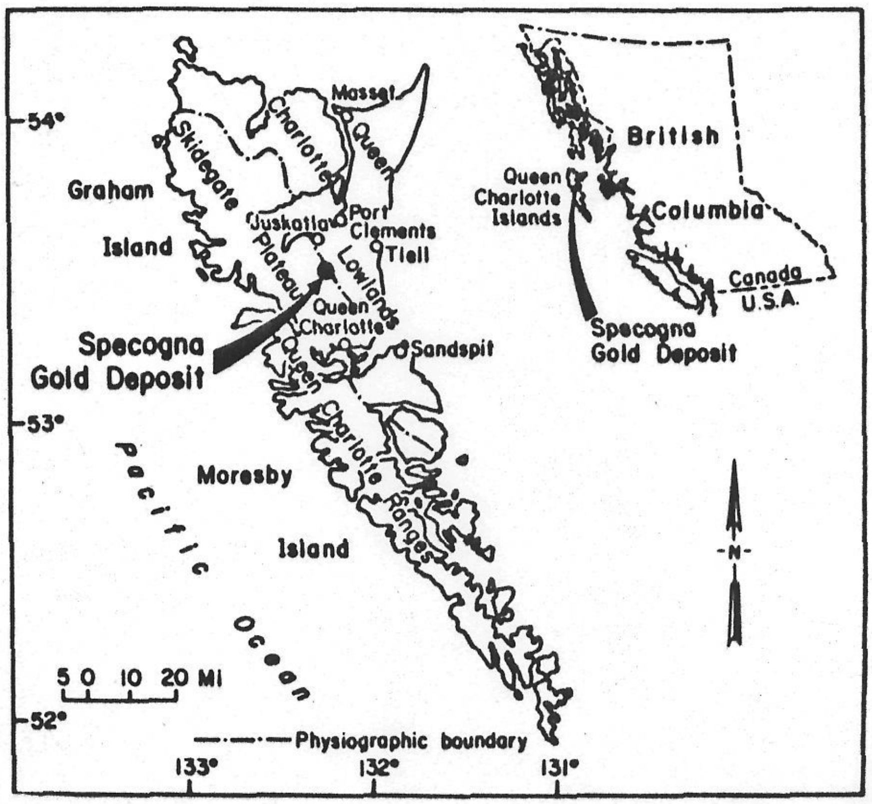
Specogna (Babe) gold property consisting of 41 full claims and seven fractions is 17.6 km (11 miles) south of the town of Port Clements on Graham Island (Fig. 1). The showing is a prospecting discovery, founded in late 1970 by Efrem Specogna and Johnny Trico. Five companies optioned the property successively from 1971 to 1975 during which time geochemical sampling, trenching, and diamond drilling were conducted. Consolidated Cinola Mines Ltd., the present owner, bought the claims in 1977 and diamond drilled a total of 708 m (2323 ft) the same year. Another 1 254 m (4114 ft) of diamond drilling in 1978 and 2 041 m (9977 ft) in the first eight months of 1979 have been completed. Sutherland Brown and Schroeter (1975) were the first to describe the showings formally and produced a generalized geological cross-section of the deposit. A more detailed description was given by Richards, et al. (1975) who emphasized the fine-grained character of the siliceous ore and the general geochemical expression. Our study is based on detailed geological examination of 5 506 m (18,064 ft) of diamond-drill core and limited surface exposure during the summer of 1979. Computerized logging techniques (GEOLOG System) were used as a basis for the work (Blanchet and Godwin, 1972; Godwin, Hindson, and Blanchet, 1977). The GEOLOG System proved to be a useful tool for rigorous description of such a large amount of drill core.

REGIONAL GEOLOGY

The general area about the Specogna gold deposit includes a major fault system and four main rock formations (Sutherland Brown, 1968). These include Sandspit fault system, the Haida and Honna formations of Cretaceous age, the Masset formation of Early Tertiary age, and the Skonun formation of Mio-Pliocene age (Fig. 2).

Sandspit fault system separates the two main physiographic provinces of the area, Queen Charlotte lowlands on the east and the Skidegate plateau to the west. The fault zone strikes about 143 degrees and seems to have involved large vertical movement. Southwest of the deposit, the Haida

FIG. 1. Location of the Specogna gold deposit, British Columbia.



*Reprinted from "Progress Report on the Geology of the Specogna (Babe) Gold Deposit," by N. Champigny and A. J. Sinclair, *Geological Fieldwork, 1979*, Province of British Columbia, Ministry of Energy, Mines and Petroleum Resources, 1980, pp. 159–171. Used by permission.

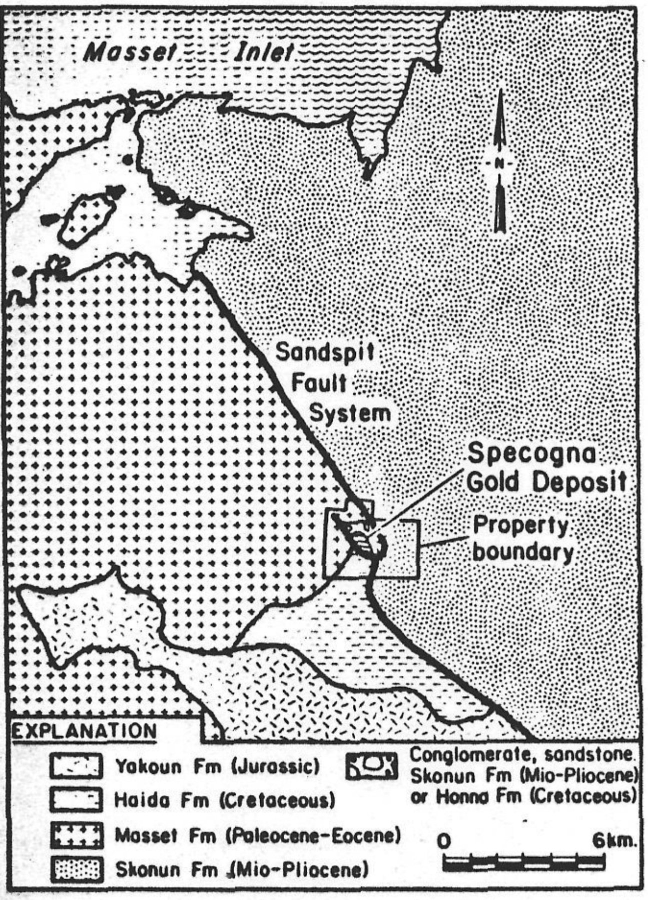


FIG. 2. Rock formations of the area around the Specogna gold deposit.

formation is divided into a lower sandstone member and an upper shale member (Sutherland Brown, 1968). The overlying Honna formation was mapped originally as an extension of the Haida formation. Identified lithologies are conglomerate with coarse pebbles to small cobbles, coarse sandstone, and minor siltstone or shale. Sutherland Brown and Schroeter (1975) remapped these sedimentary rocks as part of the Skonun formation. West of the gold prospect the Masset formation marks the beginning of the Skidegate plateau. It is composed exclusively of volcanic rocks ranging from mafic to felsic in composition. East of the Sandspit fault system, the Queen Charlotte lowlands are underlain by the Skonun formation consisting of poorly lithified sands, shale, and conglomerate (Sutherland Brown, 1968).

STRATIGRAPHY

The deposit is situated on two small hills [210 m (689 ft) above sea level] between the Skidegate plateau and the Queen Charlotte lowlands. A shale sequence representing the Haida formation and an overlying interbedded sequence of pebble conglomerate and coarse sandstone of Skonun age are both intruded by a stock of rhyolite porphyry (Fig. 3). A thin cover of glacial till and sand overlies all rocks.

SHALE SEQUENCE—HAIDA FORMATION

This formation extends from the Masset volcanic rocks on the west side of the property to the overlying coarse clastic sequence on the east. The thickness of the shale sequence on the property is unknown although Sutherland Brown (1968) reported that the upper shale member of the Haida formation is 320 m (1050 ft) thick at the type locality. A maximum thickness of 34 m (112 ft) was penetrated in drill hole 79-5. The sequence is composed of dark grey to black, poorly consolidated and thinly bedded calcareous shale. Minor sandy layers have been observed. Near the contact with the rhyolite porphyry, the shale sequence becomes an argillite or hornfels due to intense silicification. On the basis of lithology this shale sequence appears to correlate with the upper member of the Haida formation.

CONGLOMERATE—SANDSTONE SEQUENCE

A coarse sedimentary sequence overlies the Haida formation to the west and extends to the Sandspit fault system on the east (Fig. 3). The contact between the two sequences has not been observed clearly in drill core because of pervasive silicification and intrusion of the rhyolite porphyry (Figs. 3, 4, and 5). Thickness of the sequence throughout the drilled area varies from 0 to 300 m (984 ft). Strike changes from northwesterly to northeasterly with most of the values around 015 degrees. Strata consistently dip 15 degrees to 25 degrees to the east. Thicknesses of mappable units range from 0.1 to 30 m (0.3 to 98 ft), with a 2-m (6-

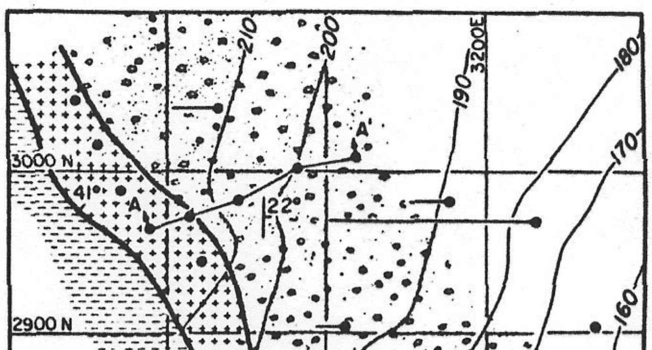


FIG. 3. Stratigraphy of the Specogna gold deposit.

ft) average. The sequence contains about 62 percent conglomerate, 31 percent coarse sandstone, and 7 percent interbedded sandstone and siltstone with minor shale interbeds. Contacts between adjacent units in the sequence are generally sharp but transitional contacts are also observed. Mafic volcanic pebble-rich conglomerate, interbedded sandstone, and shaly siltstones and some sandstone units have been used successfully for stratigraphic correlation between drill holes (Figs. 4 and 5).

The principal rock type is a medium grey to pale brown polymictic conglomerate with well-rounded to subangular large pebbles and small cobbles. Graded bedding and load cast structures are abundant. The coarse fraction totals 70 percent of the rock with an average fragment diameter of 3 cm (1.2 in.). Particles are moderately poorly sorted and sphericity is low to intermediate. Most of the conglomerate units are pebble supported. Pebble and cobble lithologies are 60 percent felsic volcanic rock, 20 percent mafic volcanic rock, 10 percent granite, 5 percent argillite and shale, and 5 percent conglomerate, sandstone, and siltstone. Acid volcanic clasts include massive and banded rhyolite, rhyolite porphyry, quartz, and rare pyroclastics, chert, and hematitic rhyolite porphyry. Mafic volcanic pebbles are mostly dark green porphyritic andesite with feldspar and hornblende phenocrysts. Granitic fragments consist of a quartz feldspar mosaic with about 10 percent disseminated mica. Commonly 1 to 3 percent of wood fragments are intermixed with the coarse and fine fraction. The matrix of these conglomerates occupies 30 percent of the volume of the rock, and grains are a medium to coarse-grained sand size.

Sandstone units are medium grey to dark brown, medium to coarse grained with bedding and graded bedding commonly apparent. Two to 15 percent wood fragments are present with rare occurrences of leaves and shells.

Minor but persistent medium to pale grey interbedded sandstone and siltstone-shale units are found locally. They show bedding, graded bedding, crossbedding, ripple marks, and rare convolute bedding and flame structures. Local soft sediment slumping is indicated by conglomerate lenses in sandstone units, disrupted bedding, and matrix replacement.

The coarse nature of the sediments, their polymictic character, and rapid changes from conglomerate to sandstone units suggest a marine near shore environment of deposition for the clastic sequence. The sequence appears to correlate with the Skonun formation based on lithologic similarity (Sutherland Brown and Schroeter, 1977).

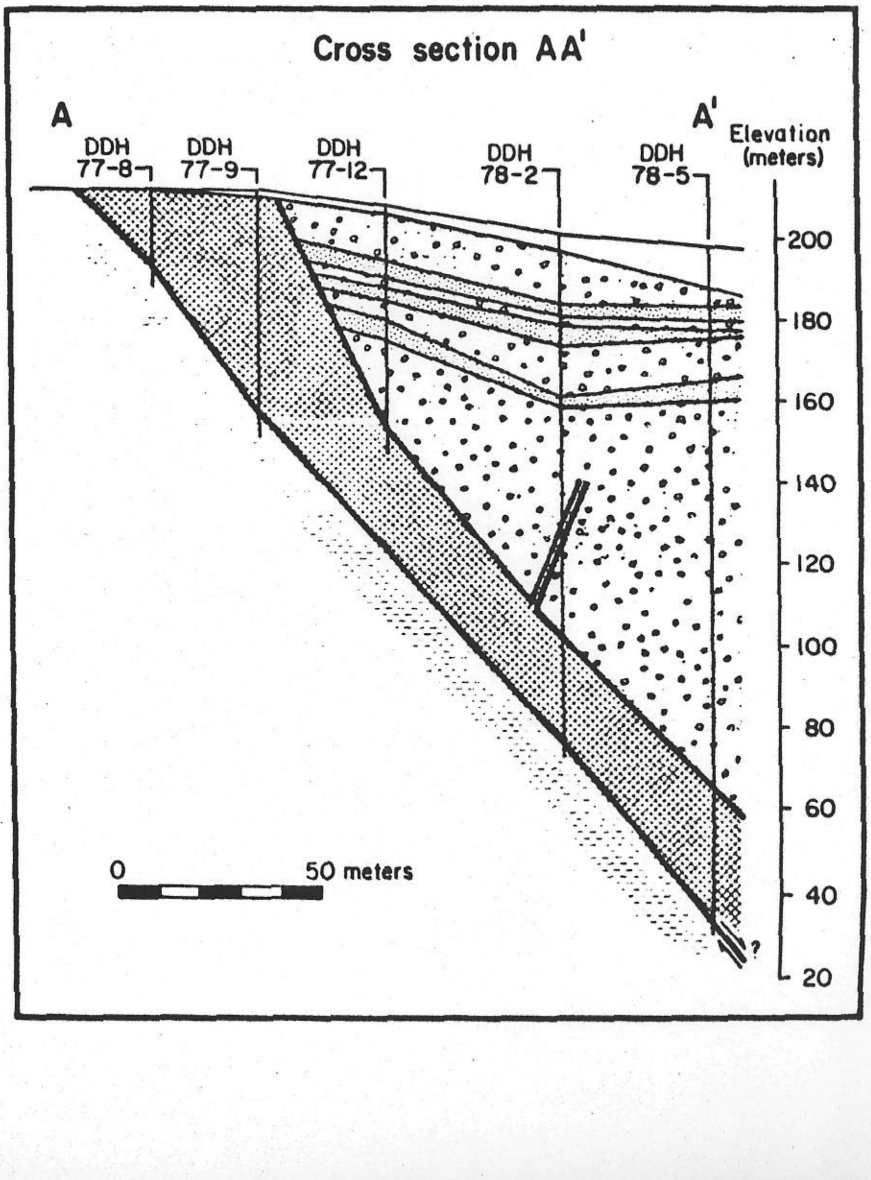


FIG. 4. Cross-section A–A' (location shown on Fig. 3; see Fig. 5 for legend).

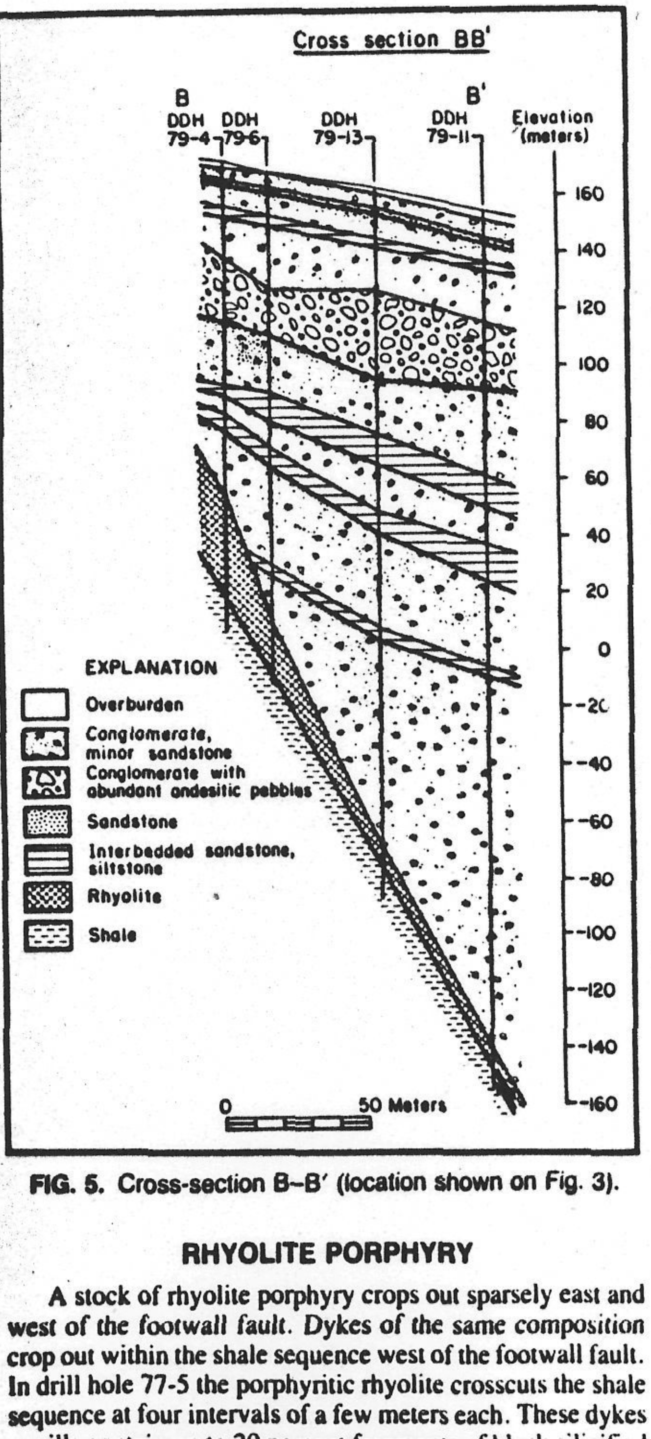


FIG. 5. Cross-section B–B′ (location shown on Fig. 3).

RHYOLITE PORPHYRY

A stock of rhyolite porphyry crops out sparsely east and west of the footwall fault. Dykes of the same composition crop out within the shale sequence west of the footwall fault. In drill hole 77-5 the porphyritic rhyolite crosscuts the shale sequence at four intervals of a few meters each. These dykes or sills contain up to 20 percent fragments of black silicified shale. In drill hole 79-4, from 144 to 147 m (472 to 482 ft), a series of shale lenses is intermixed with the porphyritic rock. Sandstone and conglomerate fragments are found in the quartz feldspar porphyry in drill hole 78-3 from 102 to 103 m (335 to 338 ft). A porphyritic dyke intersects a conglomerate unit from 44.3 to 44.7 m (145 to 147 ft) in drill hole 78-4. These field relations indicate that the rhyolite porphyry is younger than both the shale and conglomerate-sandstone sequence. Locally the contact with the coarse clastic sequence is sharp but in many places a transition zone exists. The contact zone is composed of a mixture of highly deformed conglomerate, sandstone, and rhyolite fragments in an aphanitic bluish grey siliceous matrix.

The thickness of the main rhyolite porphyry mass decreases to the east (Figs. 4 and 5). Drill hole 75-4 intersected 155 m (509 ft) of intermixed rhyolite porphyry and shale after penetrating the footwall fault.

The rock is pale grey and contains 2 to 3 percent bluish grey subrounded quartz eyes 1 to 4 mm (0.04 to 0.16 in.) in diameter and 5 to 10 percent white subhedral to euhedral feldspar phenocrysts. The rhyolite is brecciated in many places with the fragments contained in a dark grey to black siliceous matrix. Aphanitic fragments of rhyolite in a white glassy matrix and streaky banding with preferential orientation of the phenocrysts are observed. These two features are possibly characteristic of an extrusive phase of the porphyry.

STRUCTURE

The major structural feature of the Specogna gold deposit is the footwall fault, which strikes 157 degrees and dips 40 to 60 degrees to the east (Figs. 4 and 5). The footwall fault parallels the Sandspit fault system and is probably a part of that system. In the drill core the footwall fault is recognized by an abrupt change from silicified shale to soft, relatively fresh shale. Slickensides have been found in drill hole 79-4 at 153.5 m (504 ft) in altered rhyolite porphyry. On surface the fault is visible as a scarp near the southwest boundary of the deposit (Fig. 3). Northwest of the present drilling area, an outcrop called the Marino showing exposes the fault contact. At the base of the exposure a gouge zone, 20 cm (7.9 in.) wide, separates the rhyolite porphyry from a black homogeneous shale. Slickensides are abundant in the shale. There the footwall fault strikes 150 degrees and dips 55 degrees to the east.

In drill hole 75-4, located 250 m (820 ft) northwest of the Marino showing, the rhyolite porphyry is observed both beneath and above the footwall fault. Thus, faulting occurred at least in part after the intrusion of the rhyolite porphyry. Displaced gold geochemical anomalies, drainage patterns, and topography suggest a dextral fault with a downward movement of the east block. This is the same movement picture observed for the Sandspit fault system (Sutherland Brown, 1968).

DISTRIBUTION, FORM, AND SETTING OF THE DEPOSIT

The gold-silver deposit terminates abruptly against the footwall fault to the west and dies out gradually to the north and east (Fig. 3). The rocks are highly anomalous in mercury and arsenic and less anomalous in antimony, copper, and zinc. Gold and silver values are plotted on Figs. 6 and 7. Two distinct populations are recognized: a first population of low-grade gold and silver values with a wide range of gold/silver ratios, and a second population of high-grade gold values with gold/silver ratios of about 2:1. Gold values range between 0.0003 and 0.078 kg/t (0.01 and 2.50 oz per

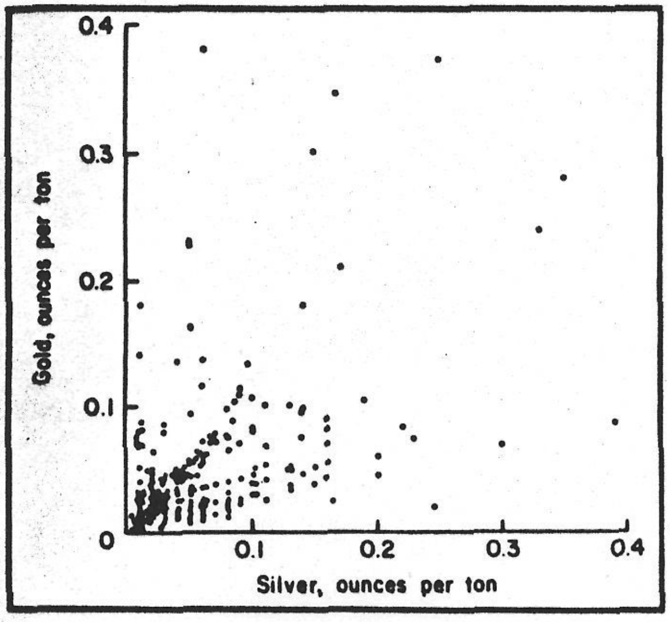


FIG. 6. Gold-silver scatter diagram for low-grade assays from drill core, based largely on 2-m (6.6-ft) core lengths.

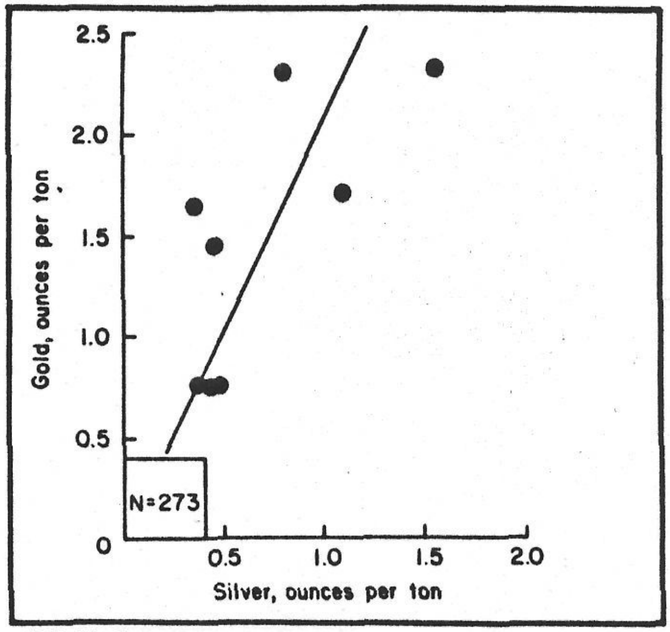


FIG. 7. Gold-silver scatter diagram for high-grade assays (> 10 g/t gold), based on 2-m (6.6-ft) core lengths. The straight line represents a gold/silver ratio of 2:1.

st). High-grade gold values (that is, greater than 5.7 ppm) are found in quartz veins and at the contact zone between the rhyolite porphyry and the coarse sediments (Fig. 8).

Intense silicification characterizes the host rocks. Leached rims of pebbles and cementation of the matrix in pebble conglomerate units by very fine-grained silica is common. The degree of silicification of the host rocks increases toward the rhyolite porphyry body.

Several generations of veins and stringers crosscut the host rock. Larger veins strike 020 ± 20 degrees and dip 60 to 90 degrees in either direction. Their widths range up to several meters. Increased quartz veining toward the rhyolite porphyry has been measured quantitatively in most drill holes (Fig. 8). Individual veins present clear accretionary features such as crustification, chalcedonic quartz, and development of well-formed quartz and calcite crystals reaching 2 cm (0.79 in.) in size. Wallrock silicification is common. Some veins contain numerous angular fragments of host rock. Banding in the veins is common; several coloured bands of quartz show the different episodes of veining. Microveins and stringers commonly pervade wood fragments, producing a chessboard texture on a hand specimen scale. Crosscutting relationships support the following sequence of veining in order of decreasing age: (1) massive sulphide viens; (2) dark grey to black quartz veins, (3) bluish grey quartz veins, (4) white and cherty quartz veins, and (5) calcite veins.

MINERALOGY

Opaque minerals identified in drill cores and hand specimens include in decreasing order of abundance: pyrite, marcasite, limonite, hematite, native gold, and cinnabar. Chalcopyrite and sphalerite have been identified in polished sections of rhyolite porphyry from 157 to 173 m (515 to 568 ft) in drill hole 78-6.

Limonite staining (a pale yellow to reddish brown fine-grained mixture) is present on surface exposures and up to a depth of 20 m (66 ft) in drill holes. Hematite occurs as finely disseminated grains in quartz veins and massive veinlets in brecciated rhyolite porphyry.

Iron sulphides are encountered throughout the gold-bearing rocks. Sulphide content ranges from 0.5 to 10 percent, with an average of about 3 percent. No definite correlation can be obtained between sulphide contents and gold values (Fig. 8). Pyrite and marcasite are the most common sulphides. Pyrite is found as rims, disseminations, blebs, veins, and euhedral crystals. Rims of pyrite consist of dark brown very fine-grained coatings on pebbles in conglomerate units. These rims are thought by some geologists to be melnikovite, but verification is required. Needles, rosettes, veins, and rarely crystals are the forms observed for marcasite. Both pyrite and marcasite are present in petrified wood.

Native gold was recognized in quartz veins, with most occurrences in dark grey and bluish grey quartz veins. The gold apparently exists in a very fine form in varying amounts in most of the rock types that have undergone silicification. At the Marino showing abundant fine free gold is visible in white cherty quartz veins. Cinnabar is rare and was noticed only in a few drill holes.

Two general mineral associations are present in high-grade gold-bearing rhyolite porphyry: (1) pyrite-marcasite and (2) pyrite-marcasite-sphalerite-chalcopyrite-native gold. Sphalerite and chalcopyrite have an average grain size of about 0.2 mm (0.0078 in.) in the six polished sections examined. Native gold was observed as monomineralic grains

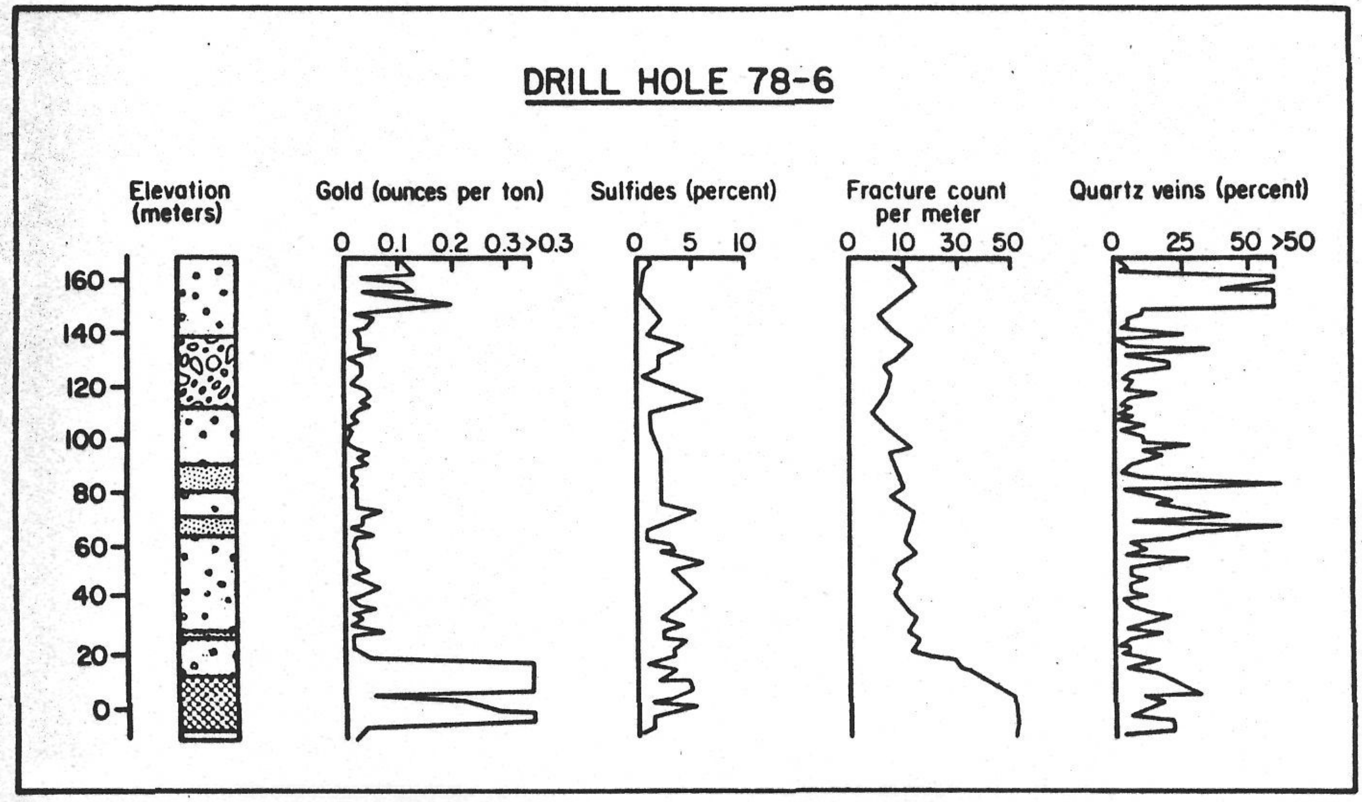


FIG. 8. Graphic log of diamond-drill hole 78-6 showing geology, gold assays, percentage sulphides, fracture density, and volume percent of quartz vein in core. Quantitative data are based on core lengths of 2 m (6.6 ft). See Fig. 5 for legend.

in quartz and in places as inclusions in chalcopyrite. Several soft, white unidentified minerals have been observed associated with sphalerite, chalcopyrite, and native gold. Sphalerite is not readily apparent in hand specimen, and minute grains of chalcopyrite can be confused megascopically with native gold. Paragenesis is summarized on Fig. 9.

ALTERATION

Three alteration minerals have been identified in the gold-bearing host rock: a clay mineral (species unidentified), sericite, and chlorite. Clay and sericite alteration are the most extensive. Clay occurs in gouge zones with a white to greyish matrix and containing isolated pebbles. Feldspar phenocrysts in porphyritic pebbles and in the rhyolite porphyry are also commonly altered to a very fine mixture of clay and sericite. Sericitic alteration is also found as disseminated grains in conglomerate pebbles and matrix and in fine-grained units. Chlorite occurrences seem to be limited to within 20 m (66 ft) of the contact zone with the rhyolite porphyry where it occurs as stringers or finely disseminated grains.

GENESIS

Sutherland Brown and Schroeter (1975) suggested that the Specogna gold mineralization occurred in a vein system in the rhyolite porphyry which is onlapped by sedimentary rocks of the Skonun formation. Richards, et al. (1976) consider the deposit to be of the Carlin type, and indicate that the rhyolite porphyry is mineralized and is younger than or equivalent to unmineralized Skonun conglomerates, suggestions accepted by Sutherland Brown and Schroeter (1977).

After careful examination of new information available from diamond drilling from 1977 to 1979, there is little doubt that the rhyolite porphyry crosscuts the conglomerate-sandstone sequence. The gold mineralization is superimposed in part on the rhyolite porphyry and appears to be spatially related to the intrusion. Intrusion of the porphyry probably created a hydrothermal system in which ascending fluids rich in gold, silver, mercury, arsenic, and antimony percolated through the porous clastic sequence. Deposition

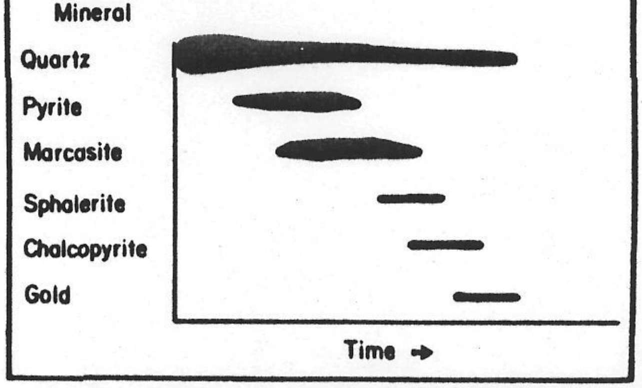


FIG. 9. Paragenetic line diagram for high-grade gold occurrences in drill hole 78-6.

of the gold occurred in an early stage of fluid circulation and was followed by later stages of quartz veining.

ACKNOWLEDGMENTS

The pleasant assistance of K. G. Sanders and A. McKillop of Consolidated Cinola Mines Ltd. is acknowledged with thanks. H. J. Mah and P. H. Blanchet (International Geosystems Corp.) advised on the use of the GEOLOG System. Mr. John Gardiner provided technical assistance in the field.

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