Major lithologies of the Ajax West pit, an alkalic copper-gold porphyry deposit, Kamloops, British Columbia[1]

Katherina V. Ross[2], Kenneth M. Dawson, Colin I. Godwin[2], and Lorne Bond[3]
Mineral Resources Division, Vancouver

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Abstract

Ajax West pit (50°37'N, 120°24'W), in the Afton mine district, lies 13 km west of Kamloops and 420 km northeast of Vancouver, B.C. The pit, on the southwestern side of the alkalic Iron Mask batholith, was developed on copper-gold mineralization at the intersection of three major rock units: two dioritic units of the Iron Mask pluton and a picritic unit of uncertain origin. Porphyry style mineralization is mainly pyrite and chalcopyrite with minor amounts of bornite and chalcocite. Alteration includes intense albitization and less intense K-feldspar, epidote and chlorite ± anhydrite and diopside.

Field work consisted of pit mapping at 1:750 scale and detailed core logging of representative sections. Eleven major lithologies are recognized and arranged in a preliminary chronological order, from oldest to youngest: (1) picrite, (2) monzodiorite, (3) Sugarloaf diorite, (4) pyroxene gabbro, (5) hybrid diorite, (6) pegmatitic hybrid diorite, (7) dioritic dykes, (8) plagioclase porphyry dykes, (9) Cherry Creek monzonite dykes, (10) magnetite-rich diorite dykes, and (11) quartz-eye latite dykes.

Future work will refine descriptions of the lithologies and explain alteration and structural relationships.

Résumé

Le puits de mine Ajax West (50°37'N, 120°24'W), situé dans le district minier d'Afton, se situe à 13 km à l'ouest de Kamloops et à 420 km au nord-est de Vancouver en Colombie-Britannique. Le puits, situé du côté sud-est du batholite alcalin d'Iron Mask, a été établi sur une minéralisation cuprifère-aurifère à l'intersection de trois grandes unités lithologiques: deux unités dioritiques du pluton d'Iron Mask et une unité picritique d'origine incertaine. La minéralisation de style porphyrique se compose principalement de pyrite et de chalcopyrite accompagnées de petites quantités de bornite et de chalcocite. L'altération inclut une intense albitisation et un degré moindre de formation de feldspath potassique, d'épidote et de chlorite ± anhydrite et diopside.

Les travaux sur le terrain comprenaient la cartographie du puits à l'échelle de 1/750 et la diagraphie détaillée de carottes de sondage prélevées dans des coupes représentatives. On a identifié onze grandes lithologies que l'on a disposées selon un ordre chronologique, de la plus ancienne à la plus récente: (1) picrite, (2) monzodiorite, (3) diorite de Sugarloaf, (4) gabbro à pyroxène, (5) diorite hybride, (6) diorite pegmatitique hybride, (7) dykes dioritiques, (8) dykes porphyriques à plagioclase, (9) dykes monzonitiques de Cherry Creek, (10) dykes dioritiques riches en magnétite et (11) dykes de latite à quartz oeillé.

La recherche future permettra d'affiner les descriptions des lithologies et d'expliquer l'altération et les relations structurales.

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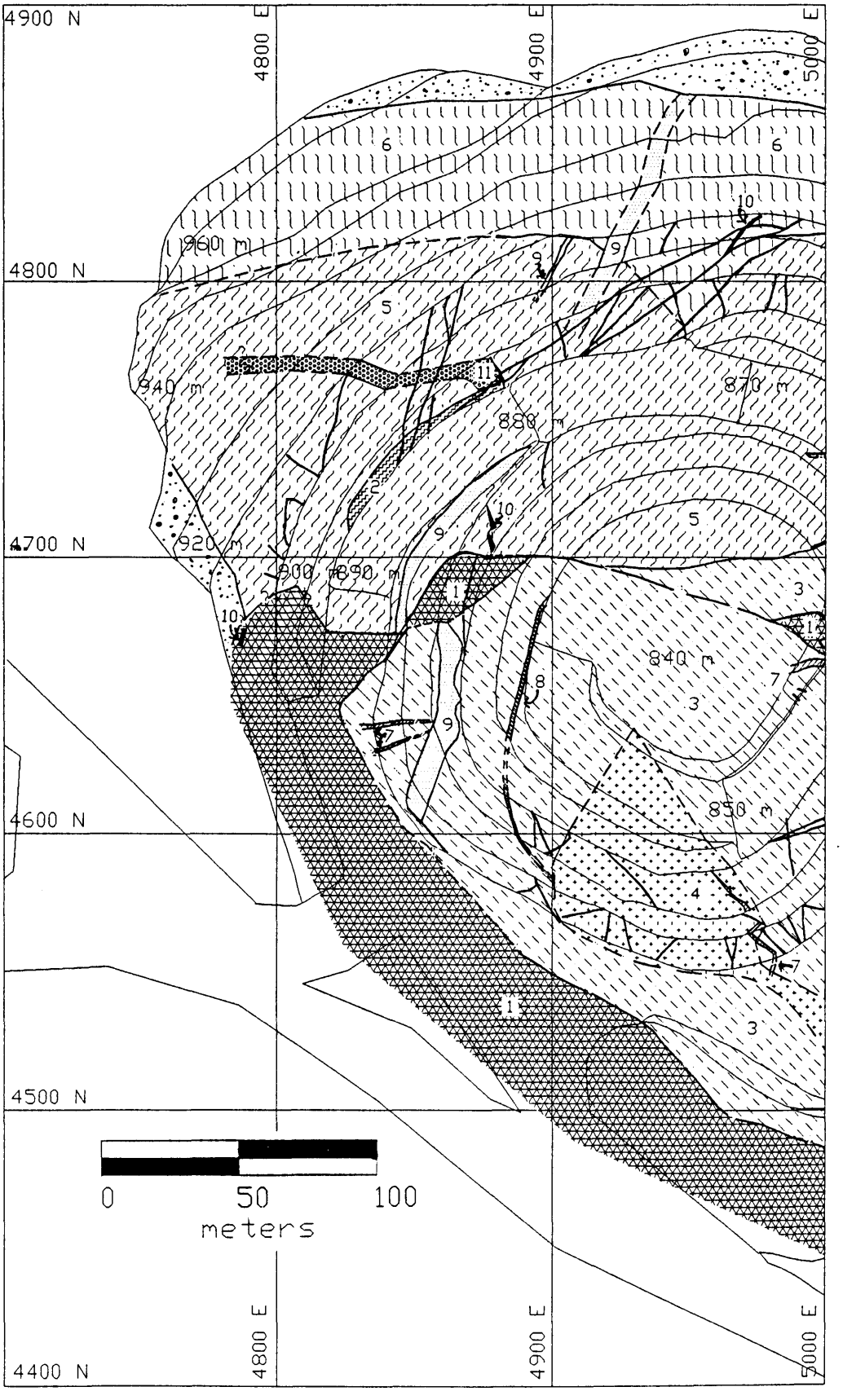
[1] Mineral Deposits Research Unit, Contribution No. 10.

[2] Mineral Deposits Research Unit, Department of Geological Sciences, University of British Columbia, 2449 Stores Road, Vancouver, B.C. V6T 2B4

[3] Afton Operating Corp., P.O. Box 937, Kamloops, B.C. V2C 5N4



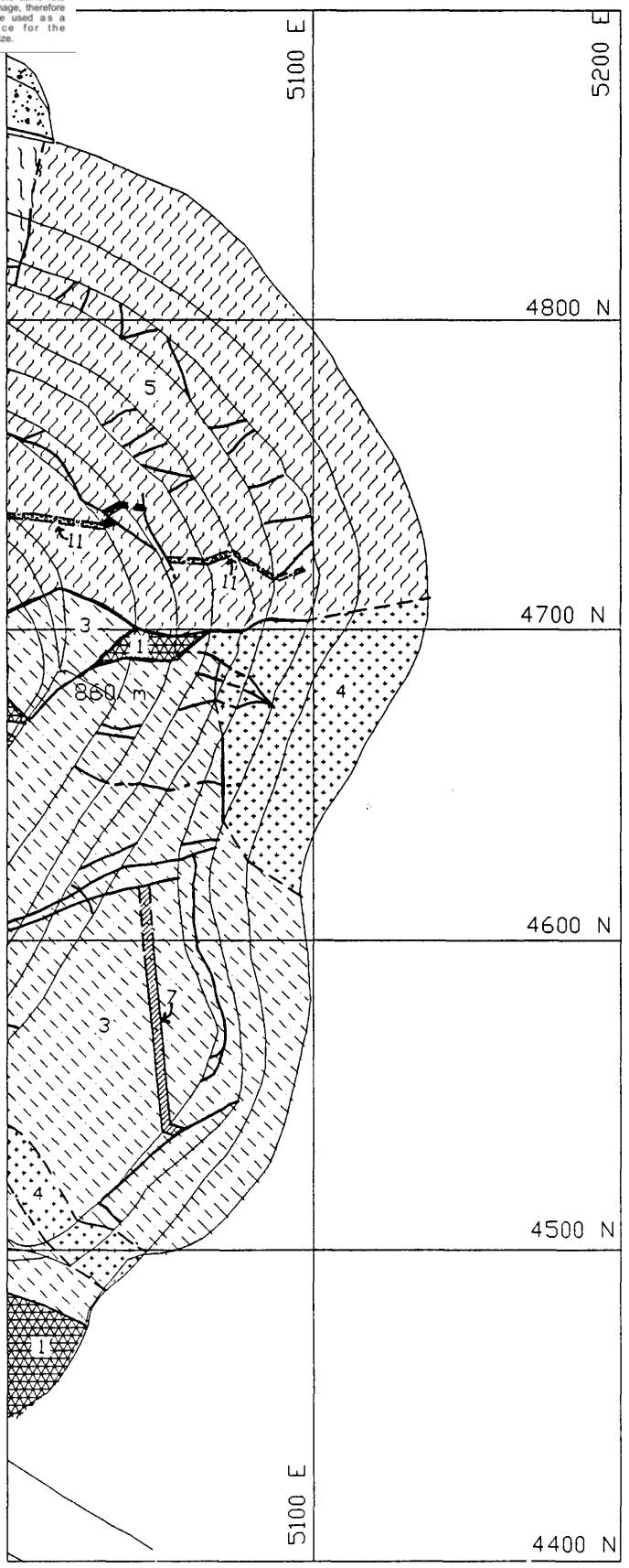


Figure 1. Geology of the Ajax West pit.

LEGEND

Overburden

Tertiary ?

11 Quartz-eye Latite Dyke

Iron Mask Batholith and Related Intrusions
Upper Triassic and Lower Jurassic

10 Magnetite-Rich Dyke

9 Cherry Creek Monzonite Dyke

8 Plagioclase Porphiritic Dyke

7 Diorite Dyke

6 Pegmatitic Hybrid Diorite

5 Hybrid Diorite

4 Pyroxene Gabbro

3 Sugarloaf Diorite

2 Monzodiorite

1 Picrite

Trace of Faults

Geological Contacts, Inferred

Open Pit Bench Contours

INTRODUCTION

Estimated open pit reserves in the combined Ajax West and Ajax East zones are 20.7 million tonnes averaging 0.45% copper and 0.01 ounces of gold per tonne (Teck Corporation, 1990 Annual Report). As of 1991, stage 1 of the Ajax West pit has been completed. A stage 2 pit is planned that will significantly enlarge and deepen the existing pit. The pit is situated on the southwestern side of the alkalic Iron Mask batholith at the intersection of three major rock units: two dioritic phases of the Iron Mask pluton and a picritic unit of uncertain origin. Porphyry-style mineralization consists of pyrite and chalcopyrite with minor amounts of bornite and chalcocite (Bond, 1987).

The objective of fieldwork this year was to determine the temporal and structural relationships of the rock units within the Ajax West Pit, as well as to examine the alteration and mineralization related to these units. Mapping was conducted at 1:750 scale. In addition, core from approximately forty drill holes was examined in detail. In this progress report, only the lithologies are described.

GEOLOGY

Pit mapping has delineated eleven significantly different rock units (Fig. 1). Preliminary order, from oldest to youngest, is: picrite, monzodiorite, Sugarloaf diorite, pyroxene gabbro, hybrid diorite, pegmatitic hybrid diorite, dioritic dyke, plagioclase porphyry dyke, Cherry Creek monzonite dyke, magnetite-rich diorite dyke and quartz-eye latite dyke. This provisional sequence of intrusions, which differs from those of previous field and petrographic workers (Carr, 1956; Kwong, 1987; Northcote, 1977 and Preto, 1968) and is based upon observed contact relations alone, will be confirmed by planned zircon U-Pb dating.

(Unit 1) Picrite: basaltic in composition, is characterized by abundant clinopyroxene and serpentinized olivine phenocrysts, and as much as 25% secondary magnetite (Kwong, 1987). It occurs on the southwest side of the pit and as faulted slices within a major east-west fault that divides the pit in half (Fig. 1). Intensely sheared contacts with other units render its relative age unclear.

(Unit 2) Monzodiorite: a fine- to medium-grained porphyritic unit with weakly aligned pyroxene and plagioclase phenocrysts. It has limited exposure in the wall of the pit and may be a screen of older rock caught up in the hybrid diorite (Fig. 1). The contact between this unit and the surrounding hybrid diorite appears to be gradational and irregular. The unit is weakly mineralized.

(Unit 3) Sugarloaf diorite: a fine- to medium-grained porphyry with elongate hornblende and plagioclase phenocrysts enclosed in a medium grey matrix. This unit has been recognized and mapped on a regional scale (Preto, 1968). The unit occurs mainly to the south of the major east-west fault in (Fig. 1). Intense albite alteration has changed much of this unit to a white structureless mass. High grade copper-gold mineralization is closely associated with intense albitization.

(Unit 4) Pyroxene gabbro: medium- to coarse-grained pyroxene and amphibole phyric unit with a dark grey matrix. It is in sharp contact with the Sugarloaf diorite (Fig. 1), but the two units appear to be interleaved. Copper mineralization is weak.

(Unit 5) Hybrid diorite: a fine grained mafic unit often characterized by the presence of crosscutting veins and alteration envelopes of albite, epidote, potassium feldspar, and calcite. The unit occurs mainly north of the major east-west fault (Fig. 1). Potassic alteration is much more prevalent in this unit than in the Sugarloaf diorite, although the copper content tends to be lower.

(Unit 6) Pegmatitic hybrid diorite: is spatially related to the hybrid diorite and may be a late differentiate and/or zones of recrystallization. It consists of fine- to very coarse-grained plagioclase and hornblende, with or without magnetite. Hornblende crystals up to 3 cm long occur. Contacts with the hybrid diorite are apparently migmatitic and probably gradational. Fine- and coarse-grained phases of the unit crosscut one another. This unit is exposed on the uppermost benches above the north side of the pit (Fig. 1). It is not well mineralized with copper.

(Unit 7) Dioritic dykes: fine- to medium-grained, typically epidotized and mineralized. Several of these dykes cut the Sugarloaf diorite (Fig. 1). The largest dyke is three metres in width.

(Unit 8) Plagioclase porphyritic dyke: white feldspar phenocrysts in a fine grained, greyish purple matrix. A single dyke of this composition was traced up the southern wall of the pit (Fig. 1).

(Unit 9) Cherry Creek monzonite dyke: a fine grained porphyry with hornblende and plagioclase phenocrysts in a potassium feldspar matrix with approximately 2-3% disseminated magnetite. This unit has been recognized and mapped on a regional scale (Preto, 1968). It occurs as a seven metre-wide unmineralized dyke which cuts both the hybrid diorite and Sugarloaf diorite (Fig. 1).

(Unit 10) Magnetite-rich diorite dykes: vary in color from green to grey to purple and are moderately to strongly magnetic. Several small dykes, generally less than one metre in width, and apparently unrelated to mineralization, cut the Sugarloaf and hybrid diorite units (Fig. 1).

(Unit 11) Quartz-eye latite dykes: are hornblende, potassium feldspar, and quartz phyric. These dykes cut the hybrid diorite unit (Fig. 1). The largest dyke is approximately five metres wide. These dykes postdate alteration, mineralization and many of the faults. Similar dykes are reported in the Afton Pit (Kwong, 1987).

CONCLUSIONS

Detailed mapping of the Ajax West pit has delineated eleven major rock units. The relative ages of these units are provisionally defined by contact relationships. Future petrographic work, accompanied by whole rock analyses and isotope dating of the units will help to establish compositions

and age relationships. Studies will also be conducted on correlations among alteration, mineralization, and structure within the pit.

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