

Aynak Information Package
Part IV The Darband copper deposit

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1 Introduction

The Darband copper deposit is located 35 km south-southeast of Kabul and 7 km east of the Aynak copper deposit. The deposit lies between latitudes $34^{\circ}14'13''$ and $34^{\circ}17'15''$ N, and longitudes $69^{\circ}21'20''$ and $69^{\circ}26'35''$ E.

Mineralisation is hosted within metasedimentary and metavolcanic rocks of the Loy Khwar and Welayati Formations, and can be traced for 7000 m along strike over a width of 100 to 1000 m. The mineralised zone is broadly stratiform within silicified micaceous marble with interbedded biotite-amphibole schist and amphibolite, dipping $70\text{--}80^{\circ}$ to the north.

Information on the exploration work undertaken at Darband up until 1979 is summarised in Minchenok et al., (1979).

2 Previous exploration

The first copper occurrences in the area were discovered in 1971 during a Soviet geological mapping survey working at a scale of 1:500 000 (Denikaev et al., 1971). Further work between 1973 and 1974 discovered over 70 copper occurrences and mineralized zones.

More detailed follow-up exploration divided the area into four prospects, designated Eastern Darband, Central Darband, Western Darband and Lagernaya (Figure 1).

The entire area was mapped at a scale of 1:2 000 and the mineralisation sampled by surface trenches that were initially spaced 100 m apart and later with 50 m spacing. Eleven exploratory adits, totalling 9062 m in length, were driven into the deposit at Eastern and Central and Western Darband. These were used for sampling and as access for underground drilling, details of which are given in Table 1. Fifty seven surface boreholes were drilled with a total length of 8752 m. Of these 14 boreholes were drilled in the Lagernaya prospect, and the remainder in Eastern, Central and Western Darband.

Table 1: Details of underground exploration at Eastern, Central and Western Darband

	Number of adits	Length of adits (metres)	Number of underground boreholes	Metres drilled underground
Eastern Darband	3	2675	47	4085
Central Darband	5	4155	31	2718
Western Darband	3	2232		

3 Stratigraphy

The oldest rocks in the Darband area are Upper Proterozoic metamorphic rocks, including metavolcanic rocks, of the Welayati Formation. These are conformably overlain by Vendian–Cambrian calcareous-terrigenous metasedimentary rocks of the Loy Khwar Formation, and Vendian–Cambrian metavolcanic rocks of the Gulkhmid Formation. Keratophyre and

amphibolitic gabbro intrusions cross-cut the sequence. Poorly consolidated Neogene intermontane basin sediments overlie these older formations.

4 Structure

The Darband copper deposit contains several recognisable tectonic features.

Asymmetrical folds indicating possible movement towards the northwest represent the oldest tectonic event, of pre-Upper Paleozoic age. This is comparable with the orientation of early fold structures in the Aynak area.

A distinctive structural feature at the Darband deposit is a system of numerous steeply dipping normal faults. The fault system appears to be a part of transtensional shear zone of probable Tertiary age.

A simplified geological map and cross section of the area of the Darband copper deposit is provided in Figure 1.

5 Mineralisation

5.1 STYLE OF MINERALISATION

The mineralisation at Darband occurs as disseminations, as disseminated-veinlets and as clusters. A number of zones of mineralisation have been delineated and within these the Soviet exploration distinguished 25 so-called ore-bodies using a cut-off grade of 0.4% Cu. These bodies are predominantly of stratiform-lenticular form, although a few are cross-cutting and are associated with silicification and veinlets of quartz and calcite that appear to be tectonically controlled by faults or crush-zones.

The main sulphide minerals are chalcopyrite and bornite, with chalcocite and, to a lesser extent, pyrite and pyrrhotite. Other minerals associated with the mineralisation include molybdenite, haematite, magnetite and minor galena, sphalerite, cobaltite, arsenopyrite, nickel minerals and gold. Secondary copper minerals are also present in oxidized zones.

Bornite is the dominant mineral in the deposit, comprising 67-100% of the mineralisation, and is associated with chalcopyrite. A primary mineral zonation is evident, both vertically and horizontally, which follows the host rock lithology. Bornite predominates in the central parts of mineralised zones and gives way gradually to bornite-chalcopyrite and finally chalcopyrite in marginal areas. In addition to the primary sulphide mineralisation, secondary mineral zoning occurs as a result of oxidation, resulting in oxidised and mixed oxidised-sulphide mineral assemblages. The predominant minerals in the oxidised zone are malachite, cuprite, covellite, azurite and chrysocolla, gradually giving way at depth to a mixed zone of native copper, chalcopyrite and cuprite. The mixed zone reaches a depth of 150-200 m, below which primary sulphide mineralisation occurs. Supergene copper enrichment does not occur in the Darband deposit.

The Darband copper deposit

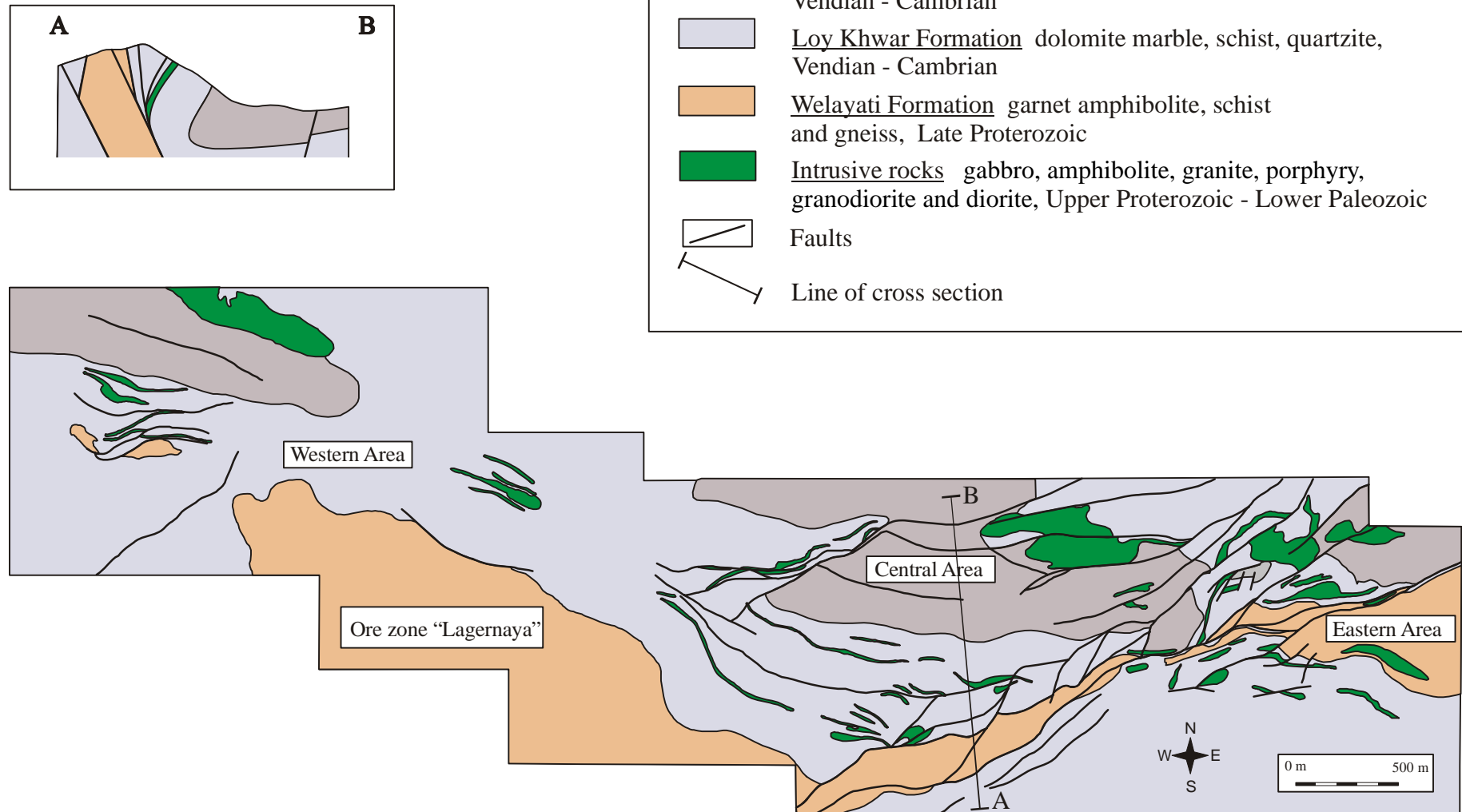


Figure 1. A simplified geological map and cross section of the area of the Darband copper deposit (based on Minchenok J.M. et al., 1977)

5.2 WESTERN DARBAND

Neogene sedimentary deposits, 10 to 100 m thick overlie the Western prospect. As a result the mineralisation is concealed and was defined by electrical geophysical techniques and tested by drilling. The mineralised zone is 3–100 m wide and grades between 0.66 and 2.06 % Cu.

Three (so-called) orebodies were defined by the Soviet exploration geologists within a relatively narrow mineralised copper-bearing zone. Body No.1 consists of chalcopyrite-bornite mineralisation hosted by calcareous-mica schist in the northern part of Western Darband. Body No.2 is located 120–160 m south of No.1 and consists predominantly of chalcopyrite mineralisation hosted in dolomite with intercalations of calcareous-mica schist. Body No.3 is situated 15–45 m south of No.2 and is similarly hosted by dolomite with chalcopyrite dominating the mineralisation.

5.3 CENTRAL DARBAND

Mineralisation at Central Darband is hosted by calcareous-mica and calcareous-quartz-mica schists and dolomites of the Loy Khwar Formation. The rocks in the area are folded and the mineralisation is bounded by younger normal faults.

Soviet exploration delineated three copper-bearing zones, each containing two to five so-called ore-bodies. The overall length of the three copper-bearing zones is in excess of 1500 m and the width is up to 450 m. The zones consist of veinlets and disseminations of chalcopyrite and bornite assaying between 0.55–1.27 % Cu.

Copper-bearing zone No.1 consists of three stratiform mineralised bodies striking almost east–west. The main body is hosted by calcareous-mica schist and extends along strike for 1 km with a variable thickness of up to 100 m. The mineralisation is disseminated and consists of bornite, chalcopyrite and minor chalcocite. The bornite mineralisation occurs in the central part of the body and gradually changes to bornite-chalcopyrite and to chalcopyrite mineralisation at the margins. A further two smaller mineralised bodies are hosted by dolomites, which overlie and underlie the calcareous-mica schist.

Copper-bearing zone No.2 occurs in the southern part of Central Darband. Here Soviet exploration defined five so-called ore bodies. Calcareous-mica schist hosts three of the bodies, the fourth is located in micaceous dolomite, and the fifth is hosted in quartz dolomite within the tectonic zone.

Copper-bearing zone No.3 is located in the northwestern part of Central Darband. The zone strikes northeastwards and is 50–60 m wide and approximately 760 m long. The mineralisation is hosted in tightly folded and faulted dolomites and schists and comprises a dense network of quartz-calcareous veinlets with bornite-chalcopyrite mineralisation.

5.4 EASTERN DARBAND

The mineralisation at Eastern Darband is hosted by micaceous dolomites, carbonaceous dolomites, calcareous-mica schists, carbonaceous-quartz schists and quartzites of the Loy Khwar Formation. The mineralisation strikes east–west and is limited to the south and the northwest by numerous steeply dipping normal faults. An anticlinal structure occurs in the western part of the Eastern Darband, the axis of which strikes northeast–southwest and dips towards the southeast. This anticline is cut by numerous northeast trending reverse faults.

The copper-bearing zone at Eastern Darband is approximately 1.4 km long and 18–120 m thick. The mineralisation, which does not appear to be continuous along strike nor down dip, grades between 0.58–1.55% Cu. The primary mineralisation consists of chalcopyrite, bornite and pyrite.

The oxidised zone is poorly developed. Up to six bodies of mineralisation were delimited by the Soviet exploration.

Body No.1 occurs in the west of Eastern Darband and is hosted by folded micaceous dolomites and quartz-mica schist. The dolomite contains disseminated or clusters of chalcopyrite, while the schist hosts disseminated chalcopyrite-bornite.

Quartz-calcareous-mica schist hosts body No.2. The mineralisation comprises disseminated chalcopyrite-bornite and is restricted by north–south and east–west trending faults.

Body No.3 occurs east of No.2. It is hosted by carbonaceous quartz schist and by micaceous dolomites with intercalations of quartzites in the upper part of the Loy Khwar Formation. The deposit is delineated by north–south and east–west trending faults.

Bodies 4, 5 and 6 occur in the eastern part of the Eastern Darband and are hosted by grey to dark grey, partly micaceous dolomites and micaceous-calcareous schists with intercalations of carbonaceous quartz schists and quartzites. The mineralisation consists predominantly of chalcopyrite with lesser amounts of bornite.

5.5 LAGERNAYA

The Lagermaya sector contains two mineralised areas situated to the south of Western Darband. The mineralisation is hosted by amphibole schists of the Welayati Formation in a contact zone with so-called porphyries. The dominant sulphide minerals are disseminated chalcopyrite with less abundant bornite and minor galena.

6 Evaluation of reserves of the Darband deposit

The entire Darband deposit was estimated by the Soviet geologists to contain 84.59 million tonnes of inferred or possible reserves of C2 category, with 665.7 thousand tonnes of contained copper, using a cut-off grade of 0.4%. Minchenok et al., (1979) believed that additional resources existed beneath areas of Neogene cover that were not explored.

7 References

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