LEAD CONTAMINATION IN NO. 6 OREBODY AND ITS POSSIBLE
RELATIONSHIP TO THE EASTERN SILVER – LEAD – ZINC BODY

ORLANDO MINE

by

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ABSTRACT

Lead was first detected in ore from the No. 6 Copper Orebody at Orlando Mine in May, 1973. As lead constitutes a serious contaminant in a copper orebody due to metallurgical problems and since this was the first time lead had been indicated in No. 6 Orebody, an investigation was carried out to define the extent, grade and possible source of the lead.

This investigation proved 8,700 tonnes of contaminated ore in current workings in No. 6 Orebody containing 13% Pb.

Stratigraphic and structural evidence indicated that the source of lead contamination was the nearby Eastern Silver – Lead – Zinc Body. Lead grades were also found to be of the same order of magnitude and gross similarities were observed in the Lead – Zinc mineralogy of both bodies.

INTRODUCTION


The slip complex has been subdivided into a number of units represented by textural and lithological changes (Le Messurier, 1973, McNeill, 1966) which may be regarded as a stratigraphic sequence commencing with the uppermost unit as follows:-

Chaotic Zone – Disturbed Sediments
Slip Breccia
Flowsheared Pelletoid Zone
Disturbed Sediments

The units are all conformable with the regional dip of 60° S.S.E. See Fig. 1 modified after McNeill, 1966. The orebody depicted is No. 6 Orebody which is located within the flowsheared Pelletoid Zone and the Slip Breccia. It extends from above the 260 foot Level to below the 720 foot
Level and its economic strike length on the 550 foot Level is 300 feet from 1700E to 2000E. The Eastern Silver - Lead - Zinc Body occurs in the slip breccia to the West of No. 6 Orebody and is much smaller.

**STRATIGRAPHIC SETTING.**

No. 6 Orebody is divided into A Lens and B Lens on the basis of mode of mineralisation. A Lens is further sub-divided into secondary enriched copper ore in the oxidized zone and primary lode below the limit of oxidation - 620' R.L. B Lens occurs only in the oxidized zone.

A Lens occurs in the Flowsheared Pelletoid Zone.

B Lens occurs in the hangingwall of A Lens in the oxidized zone.

The rock-types in which B Lens mineralisation occurs are elements of the Slip Breccia which is stratigraphically above the host of A Lens.

The Eastern Silver - Lead - Zinc Body consists of silver - lead - zinc mineralisation defined by drilling to occur between the vertical limits of 630' R.L. and 810' R.L. Its strike length on the 720' Level is 200 feet from 1450E to 1650E. It occurs in the Slip Breccia which places it in the same stratigraphic unit as B Lens but further to the west and down dip. On the 720' Level it is located 90 feet west of the westernmost extremity of A Lens.

Diamond drilling carried out to ore-block the Silver - Lead - Zinc Body has shown that it increases in strike length at the top. Also, it is seen to flatten slightly in dip at the top, thus the top is in a stratigraphically lower position than that part of the body on the 720' Level. If the body were to continue upwards to, say, above the 550' Level, this trend would perhaps bring it into rocks of a comparable stratigraphic position to those in which A Lens occurs at that Level. Between 1450E and 1650E drilling has indicated that it does not continue up to the 550' Level, however, an upward continuation of the eastern lobe as postulated herein is quite possible.

**CONTAMINATION IN NO. 6 OREBODY.**

Following notification from the mill of poor copper recoveries and the occurrence of appreciable lead in mill-feed from Orlando in Period 12 1972/73, chip-sampling programmes were carried out, firstly to locate contaminated areas and secondly to define the body of contamination in the area currently being worked.
Above the limit of oxidation, secondary enrichment has converted A Lens to a lode consisting of massive chalcocite with eyes of unaltered chalcopyrite. Limonite - rich and talcose zones are common. Bornite has been recognised adjacent to chalcopyrite and petrographic examination by Amel has also revealed covellite. Grades up to 40% Cu are not uncommon. About six to twelve feet of mineralised sediment consisting of chloritic slate containing veins and stringers of chalcocite and assaying from 2% to 6% Cu occurs on the footwall of the massive lode and is included in economic A Lens.

B Lens consists of limonite - hematite lode and limonite - stained oxidized slate and slate breccia containing large plates and dendrites of native copper and minor stringers of malachite and chalcocite.

**Eastern Silver - Lead - Zinc Body.**

Drilling results indicate this body to be zoned along strike as well as across strike. A lode zone occurs between 1500E and 1600E with mineralised sediments along strike to the east and west and also in the hanging-wall. Lead and zinc minerals occur in all these rock types between 1450E and 1650E and so all form part of the Silver - Lead - Zinc Body.

The massive lode consists of pyrite with galena, sphalerite and siderite and is 27 feet wide on 1500E section while on 1600E section it is 25 feet wide and consists of chlorite - talc - magnetite containing galena and minor pyrite.

For 34 feet into the hanging-wall of this lode zone on 1600E section is a leached and brecciated chlorite - carbonate rock which also contains lead mineralisation in the form of minor galena throughout. To the east of the lode zone, along strike there is a brecciated chloritic slate with galena, sphalerite and pyrite and nodules of magnetite. Along strike to the west there are brecciated, oxidized sediments, heavily stained with iron oxides and containing carbonate throughout.

All of these sediments are part of the slip breccia which is the host of both the eastern Silver - Lead Zinc Body and B Lens of No. 6 Orebody. The lithology in the hanging-wall of the lode zone is possibly a transitional phase to the dolomitic breccia. The sediments along strike to the west of the lode strongly resemble B Lens because oxidation is of similar intensity. No galena is recorded in these sediments although they
contain a 15 ft intersection of ore-grade lead at 1475E. Consequently, some of the carbonate recorded in drill-logs west of the lode zone is possibly cerussite.

Lead - Contaminated Zone in No. 6 Orebody.

On the 1750E section between the 550 feet Level and the 450 feet sub-level, A Lens and B Lens are separated by a lens of waste, 2 to 15 feet wide, consisting predominantly of talc but also containing minor magnetite, chalcocite and malachite.

The lead mineralisation in A Lens consists of veinlets of colourless, glassy cerussite cutting the chalcocite lode. In B Lens, magnificent specimens of limonite-stained oxidized slate containing large crystals of cerussite with powdery, silver-grey inclusions of galena were observed at one stage of mining operations.

Detailed mineralogical studies were carried out by Amlad on two samples of ore from the 1750E stope. These showed that lead phases present were secondary while zinc was primary. Rims of supergene cuprian galena were observed coating chalcocite grains adjacent to and included within cerussite veins. The cuprian galena is thought to be galena with submicroscopic inclusions of chalcocite. Sphalerite, described as a remnant primary phase, occurs as masses of small grains less than 0.05mm in diameter, and contains numerous micron sized, exsolved blebs of chalcopyrite. No independent silver phase was detected although silver assays over 500 g/t were obtained. The silver is probably present in solid solution in the copper sulphides although this could not be substantiated using electron probe microanalysis due to interference from copper. No silver was found in cuprian galena. (Watmuff, 1973).

It would appear that supergene enrichment has occurred for lead where it occurs in No. 6 Orebody as well as for copper. There is no record of a detailed mineralogical study of the Eastern Silver - Lead - Zinc Body having been carried out previously. The lode zone between 1500E and 1600E, from descriptions in diamond drill-logs, appears to contain only primary lead and zinc minerals. However, the brecciated mineralised sediments to the west of the lode along strike and in the hanging-wall of the lode possibly contain secondary lead minerals similar to those occurring in No. 6 Orebody.

This provides some evidence, tenuous though it may be, of mineralogical similarity of the two bodies. The main evidence of a connection between them remains structural and stratigraphic.
CONCLUSIONS.

The occurrence of this lead contamination illustrates the mobility of lead and zinc in the emplacement environment. McNeil lists four mineral associations at Orlando:

- chlorite - magnetite - chalcopyrite - pyrite - bismuthinite - gold,
- talc - magnetite - carbonate,
- silver - lead - zinc and
- pyrite - chalcopyrite.

(McNeil, 1966).

It is concluded from this investigation that these associations are not necessarily spatially independent. Particularly, the highly mobile silver - lead - zinc association can be expected to infiltrate into any of the other associations.

As a consequence of this conclusion, it would be advisable to assay routinely for lead and zinc in addition to the normal copper, gold and bismuth when drilling out a copper orebody in the vicinity of known lead - zinc mineralisation. Zones of contamination could then be adequately defined at the time of ore - definition and provision made to avoid them.

Similar problems are anticipated if mining of No. 5 Orebody at Orlando is contemplated. An ill-defined silver - lead - zinc body is located in the hanging-wall of this copper orebody at a closer distance than the body causing the contamination in No. 6 Orebody. Again, the extent of contamination is unknown because lead and zinc assays were not considered necessary in the initial ore-blocking programme.

REFERENCES


