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Highland Valley

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**GEOLOGICAL SURVEY OF CANADA**

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**GEOLOGY AND REGIONAL SETTING OF MAJOR  
MINERAL DEPOSITS IN SOUTHERN  
BRITISH COLUMBIA**

**[FIELD TRIP 12]**

**EDITED BY**

**A. LEGUN, R.E. MEYERS and H.P. WILTON**

**With Contributions from:**

**N. Berg, G.L. Dawson, G.D. Delaney, A.D. Ettliger, J.T. Fyles, T. Hoy,  
S.J. Juras, A. Legun, W.J. McMillan, D. McMurdo, R.E. Meyers, K.E.  
Northcote, C.A. Pearson, V.A. Preto, P.W. Ransom, G.E. Ray, R.  
Simpson, W.A. Taylor and H.P. Wilton**

**8TH IAGOD SYMPOSIUM**

**FIELD TRIP GUIDEBOOK**

Chapter 7a  
GEOLOGY AND ORE DEPOSITS OF THE HIGHLAND VALLEY COPPER MINE

W.J. McMillan<sup>1</sup>  
British Columbia Geological Survey  
756 Fort Street  
Victoria, B.C. V8V 1X4

## INTRODUCTION

The Highland Valley district, known for its large low-grade open pit porphyry copper-molybdenum mines, is situated in south-central British Columbia about 350 kilometres northeast of Vancouver (Fig. 1).

Five major deposits constitute the heart of the Highland Valley district. These are: Lornex, Highmont, and Valley Copper, which are operating mines; Bethlehem Copper, which closed in 1982 due to metal prices; and the J.A. deposit which is a potential producer. Two other deposits, Krain and South Seas, which have similar grades but smaller tonnage potential, have also been tested extensively. Numerous small, high-grade vein deposits first attracted attention to the district, and several, OK (Alwin), Snowstorm and Aberdeen, are former small-scale producers.

Aggregate ore reserves for the 13-square-kilometre central part of the Highland Valley district are nearly 2 billion tonnes of 0.45 per cent copper equivalent. This figure includes former production and proven reserves (Table 1), as well as geologically inferred reserves.

## HISTORY AND EXPLORATION METHODS

Prior to Bethlehem Copper coming on-stream in 1957 there were no producing porphyry copper deposits in British Columbia. The success of Bethlehem spurred intense exploration. Within a few years exploration companies discovered Lornex, Valley Copper and the J.A. deposit, and many showings in the district were evaluated thoroughly.

Copper was not a new commodity in the area. What is now Bethlehem Copper mine was first staked in

1899. Work at that time and into the early 1900's explored small high-grade veins of the Snowstorm zone, with shipment of 90 tonnes of hand-cobbed ore during 1915 and 1916. Diamond drilling of Snowstorm began in 1917 and underground testing of what is now the Iona zone began in 1919. Eighty-five metres (280 feet) of 0.64 per cent copper were cut in the Iona zone but at that time the copper price was too low for the zone to be of economic interest. A few more holes were drilled in 1942 then the property lay idle until 1954 when the area was staked by the Huestis-Reynolds-McLellan syndicate. In 1955 work by American Smelting and Refining Company outlined large tonnage, low-grade copper deposits; the exploration focus shifted, the hunt for porphyry copper deposits in Highland Valley began in earnest.

Exploration was intense and exciting in those early years. In 1964 bulldozer trenches spotted by veteran prospector Egil Lorentzen opened up the Discovery zone at Lornex. In 1966 and 1967 an extensive percussion drill program at Highmont outlined the No. 1 orebody. Valley Copper was discovered in 1967 and the J.A. deposit in 1971.

Soaring costs accompanied by low copper prices over the last few years delayed production decisions at Cominco Ltd.'s Valley Copper deposit and Teck Corporation Limited's Highmont deposit. However, Highmont was brought into production in 1980 and Valley Copper in 1982. No production plans appear likely for the J.A. deposit in the near future.

The main exploration tools effective in these discoveries were prospecting, geology, and geophysics (mainly induced polarization). Glacial deposits, particularly till, and lacustrine and glaciofluvial sediments, cover many areas and mask geochemical responses, although auger samples taken in till overlying

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<sup>1</sup> modified from McMillan (1985)

Chapter 7c  
**VALLEY COPPER DEPOSIT<sup>1</sup>**  
 W.J. McMillan  
 British Columbia Geological Survey  
 756 Fort Street  
 Victoria, B.C. V8V 1X4

## INTRODUCTION

The Valley Copper porphyry deposit (latitude 50°29' north, longitude 121°02' west, NTS 921/6E) has been explored extensively by drilling and underground workings; development began in spring, 1982. Published reserves, to a depth of 442 metres, are 790 million tonnes of 0.48 per cent copper. A historical summary of the discovery of the deposit may be found in Allen and Richardson (1970). Except where otherwise acknowledged, data in this paper are mainly after Osatenko and Jones (1976).

## HISTORY

In the 1920's shallow shafts were sunk on high-grade chalcopyrite veins on the Bethsaida claims southwest of the Valley Copper deposit. After the second World War, Western Beaver Lodge Mines Ltd. acquired the claims and performed geochemical surveying and trenching. Kennco Explorations, (Canada) Limited optioned the Bethsaida claims in 1957 and after performing a wide-spaced induced polarization survey, one line of which crossed the western edge of the Valley Copper deposit, Kennco relinquished its option. In 1964 and 1965 most of the mineral claims that comprise the Valley Copper property, including the Bethsaida claims, were acquired by Cominco Ltd. through agreements with Northwest Ventures Ltd., Huestis Mining Corporation Ltd., Buttle Lake Mining Company Limited, B.X. Mining Company Limited, and various individuals. As part of the agreement, Valley Copper Mines Limited was incorporated. Also in 1964, three holes were drilled on the Bethsaida claims. Subsequent drilling of 10 additional holes in 1966 indicated large amounts of sub-ore grade copper mineralization just southwest of the Valley Copper deposit. This find, in addition to information gained from a geologic study of the Guichon Creek batholith and discovery of the Lornex orebody,

nearby to the south-southeast, indicated that the Valley Copper site warranted more intense exploration. Favourable results obtained from an induced polarization survey and percussion drilling over the Valley Copper site in 1967 were followed by a large-scale drilling program that led to discovery of the orebody and to its continuous exploration and development through 1970; production began in the spring of 1982.

## GEOLOGY

The rocks that contain the Valley Copper deposit are mainly porphyritic quartz monzonites and granodiorites of the Bethsaida phase of the Guichon Creek batholith (Fig. 11). These rocks are medium to coarse grained with coarse phenocrysts of quartz and biotite. Accessory minerals are hornblende, magnetite, hematite, sphene, apatite, and zircon.

Feldspar porphyry and quartz feldspar porphyry dykes occur in the western, central, and southern parts of the deposit. These dykes, which vary in width from about 0.6 to 35 metres, dip steeply eastward in the western and central areas, and northward in the southern area. Feldspar porphyry dykes consist approximately of 60 per cent medium to coarse-grained plagioclase and a small number of quartz phenocrysts in a fine-grained matrix consisting of quartz, potassic feldspar, and lesser plagioclase, with trace amounts of magnetite, hematite, and biotite. Quartz feldspar porphyry, which ranges from fine to coarse grained, contains 50 per cent plagioclase and 8 per cent quartz phenocrysts in a fine-grained matrix of quartz and plagioclase that contains minor amounts of potassic feldspar, magnetite, and hematite. These (dykes are invariably cut by mineralized fractures and quartz veinlets. A single potassium-argon determination on biotite gave an age of 204 ± 4 Ma (Osatenko and

<sup>1</sup> Modified from McMillan (1985)