

THE MT. MILLIGAN DEPOSIT  
A STRUCTURAL AND GENETIC APPROACH

by

Michael W. Harris  
Continental Gold Corp.

Presentation to CIM 93rd Annual General Meeting  
Geological Society Technical Session

Vancouver, British Columbia, Canada  
April 30, 1991

#### INTRODUCTION

A major alkaline gold-copper porphyry deposit has recently been defined by a joint venture between Continental Gold Corp. and BP Resources Canada Ltd. The deposit occurs beneath shallow overburden, and is well positioned for large scale, open pit development. This paper describes the geological characteristics of the deposit as envisaged by Continental Gold Corp., and presents a possible synthesis for this porphyry system.

The Mt. Milligan deposit is in the Omenica Mining Division, approximately 160km NW of Prince George, British Columbia, Canada. Accelerated programs of delineation and infill diamond drilling were conducted during 1989 and 1990. In October 1990, all joint venture interests in the project were acquired by Placer Dome Inc. for a collective sum of \$258,000,000CAN.

#### REGIONAL SETTING

The deposit is hosted by volcanic strata of the Mesozoic Quesnellia Terrane, part of the Intermontane Belt of the Canadian Cordillera. This terrane, which extends in a north-northwesterly direction for 1200 kilometres and is from 30 to 50 kilometres in width, consists of alkaline to subalkaline rocks which range in age from 240 to

160 Ma. Coeval and later batholiths are distributed intermittently along this terrane. Deformed and uplifted rocks of the Palaeozoic Cache Creek Terrane are separated from the Quesnellia Terrane 70 kilometres west of the deposit by the Pinchi Fault Zone. The Manson Fault Zone separates the Quesnellia Terrane in a complex manner from isolated blocks of Proterozoic/Early Palaeozoic Wolverine Metamorphic Complex and the Carboniferous/Permian Slide Mountain Terrane 10 kilometres to the east of the deposit. The Rocky Mountain Trench and McLeod Lake Fault systems constitute the western border of the Precambrian Cassiar Terrane 70 kilometres to the east.

#### DEPOSIT GEOLOGY

Porphyry gold and copper mineralization has developed within and around a pair of west-dipping, elongated monzonite stocks which have a combined strike length of over two kilometres. These stocks are closely related, and have injected a subalkaline, submarine volcanic sequence of andesitic and trachytic flows and pyroclastic rocks of the Triassic/Jurassic Takla Group. The monzonite intrusions are roughly coeval with the surrounding volcanic assemblage.

The geometry of the mineralized area is controlled in part by local irregularities in the shape of the stocks, and by the presence of a

large, V-shaped mineralized dyke projecting from the eastern contact of the northern stock. The present morphologies of the intrusions are closely linked to a network of pre-intrusive structures.

The intrusive-volcanic package which hosts the Mt. Milligan porphyry system has been influenced by several episodes of post-mineral extensional tectonism, which ranged from at least Eocene to Pleistocene time. These tectonic events produced a series of linear, northwest-trending horsts and grabens which exhibit displacements ranging from a few metres to over 200 metres. Current structural interpretations suggest that the porphyry system had been rotated to an inclination of 25 degrees to the west, prior to these intervals of extensional faulting.

#### ECONOMIC MINERALIZATION

Two distinct ore associations have been identified within the porphyry system. Approximately 85 % of the mineralized material outlined to date consists of disseminated and stockwork-controlled gold and copper mineralization within the monzonite intrusions and their enclosing volcanic rocks. Five partially coalescing areas of this mineralization style have been defined and are known as the MBX, WBX, DWBX, Creek, and Southern Star Zones.

The remainder of the porphyry mineralization is situated in the east-central section of the deposit. This area, known as the 66 Zone, consists of a southeast-dipping group of nebulous, gold-rich, pyritic bodies which are hosted entirely by the volcanic rock package. Copper mineralization is insignificant in this area. The alteration and sulphide mineralization signatures of this enigmatic zone do not correlate with the distribution of gold; these patterns are also spatially independent from those associated with the intrusion-centred mineralization. The origin of this gold-dominated porphyry mineralization is currently under debate.

Many auriferous polymetallic vein systems have been intersected on the peripheries of the disseminated mineralization within propylitically altered volcanic rocks. The economic implications of these vein systems have not yet been assessed.

Surface oxidation of the deposit is minimal, with oxidized material accounting for less than 2% of the defined tonnage.

#### ALTERATION PATTERNS

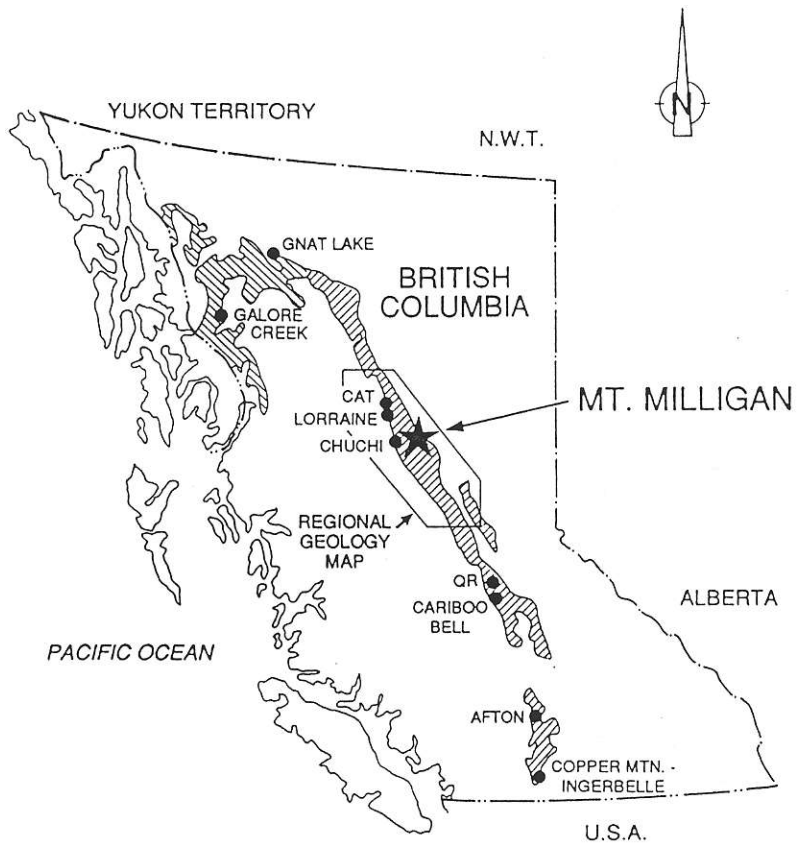
The Mt. Milligan deposit exhibits a proximal shell of K-silicate alteration centred on the monzonite stocks and their lateral protrusions, surrounded by a distal, heavily pyritized propylitic aureole. Disseminated and stockwork-controlled gold-copper mineralization is roughly coincident with the K-silicate altered areas. This alteration zonation is consistent with previously described alteration models for alkaline porphyry systems.

Alteration patterns in the gold-dominated 66 Zone are complicated, with large areas being affected by Na-silicate in addition to K-silicate alteration. The 66 Zone exhibits considerable overprinting and telescoping of different alteration regimes.

#### RESERVES

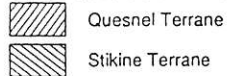
Placer Dome Inc. is presently calculating a new geological resource figure for the entire deposit, based on over 190,000 metres of diamond drilling. Continental Gold Corp. published an estimate of geological reserves in July 1990, of 349 million tonnes grading 0.534 g/t gold and 0.221 % copper. This estimate does not include newly discovered mineralization outlined during late 1990, which should add an additional 65 to 70 million tonnes of material of comparable grade to Continental Gold's resource quote.

The potential for the addition of further reserves to the west of the WBX and DWBX Zones is considered good.



LEGEND

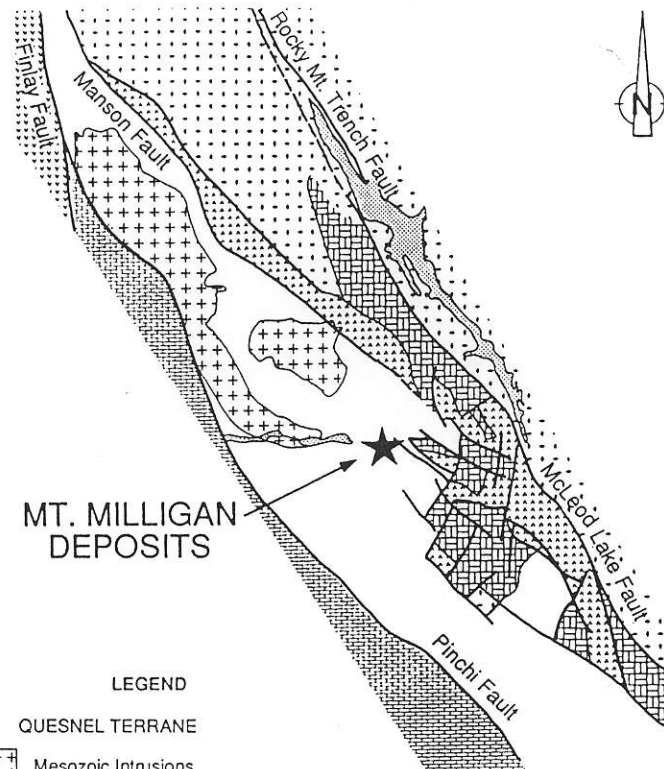
TRIASSIC-JURASSIC VOLCANIC ROCKS



● Alkaline Cu-Au porphyry deposits

CONTINENTAL GOLD CORP.  
MT. MILLIGAN PROJECT

LOCATION



LEGEND

QUESNEL TERRANE

++++ Mesozoic Intrusions

□ Triassic - Jurassic Takla Group

STIKINE TERRANE

□ Triassic - Jurassic Hazelton Group

CACHE CREEK TERRANE

▒ Palaeozoic Cache Creek Group

SLIDE MOUNTAIN TERRANE

▒ Palaeozoic Slide Mountain Group

CASSIAR TERRANE

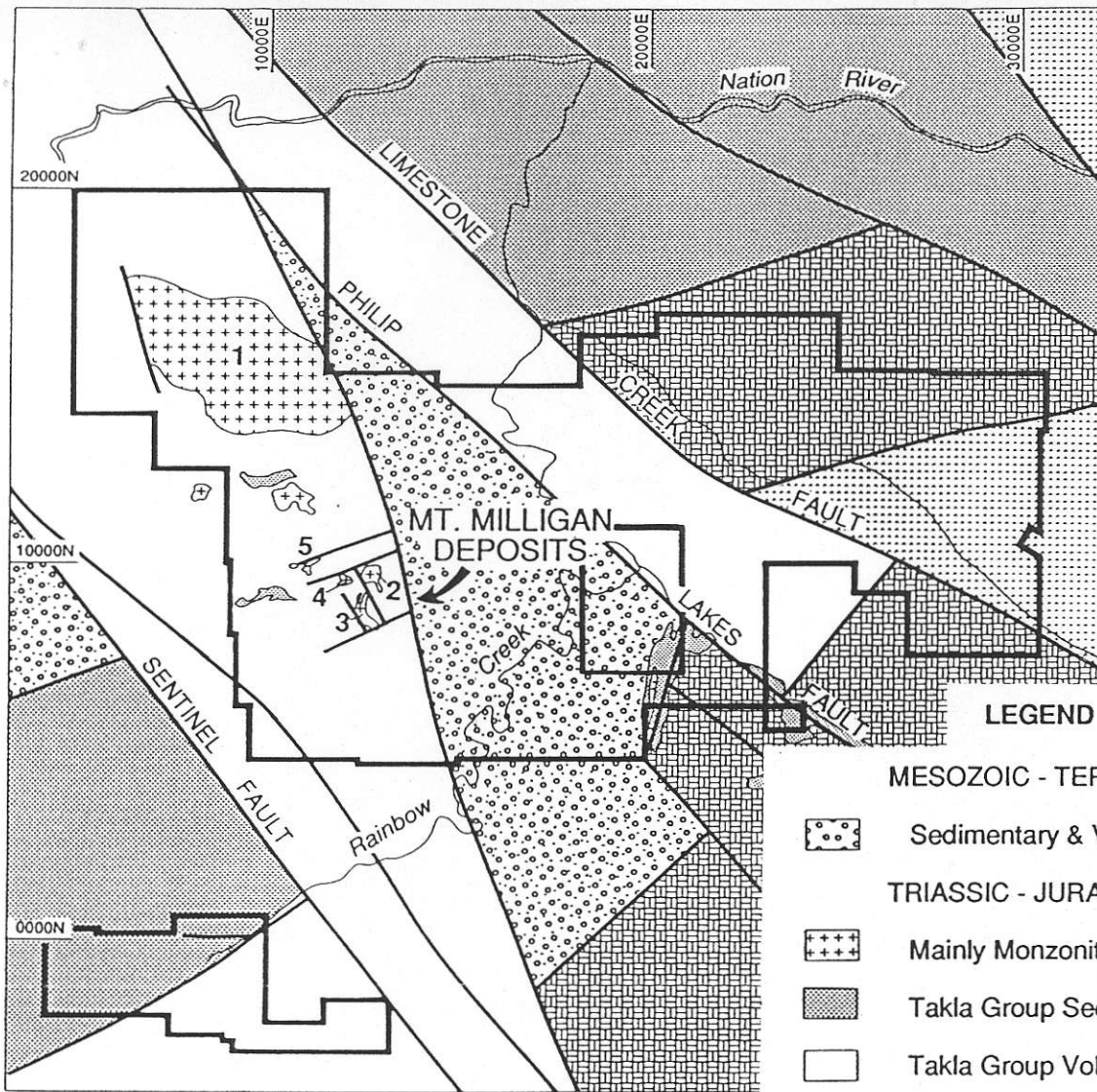
□ Precambrian Strata

▒ Wolverine Complex

Modified from Nelson et al. 1991

CONTINENTAL GOLD CORP.  
MT. MILLIGAN PROJECT

REGIONAL GEOLOGY



**LEGEND**

**MESOZOIC - TERTIARY**

Sedimentary & Volcanic Rocks

**TRIASSIC - JURASSIC**

Mainly Monzonite Intrusive Rocks

Takla Group Sedimentary Rocks

Takla Group Volcanic Rocks

**UPPER PALAEOZOIC**

Slide Mountain Group

**PROTEROZOIC**

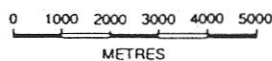
Wolverine Complex

Major Regional Fault

Placer Dome Inc. Claims  
Mt. Milligan Property

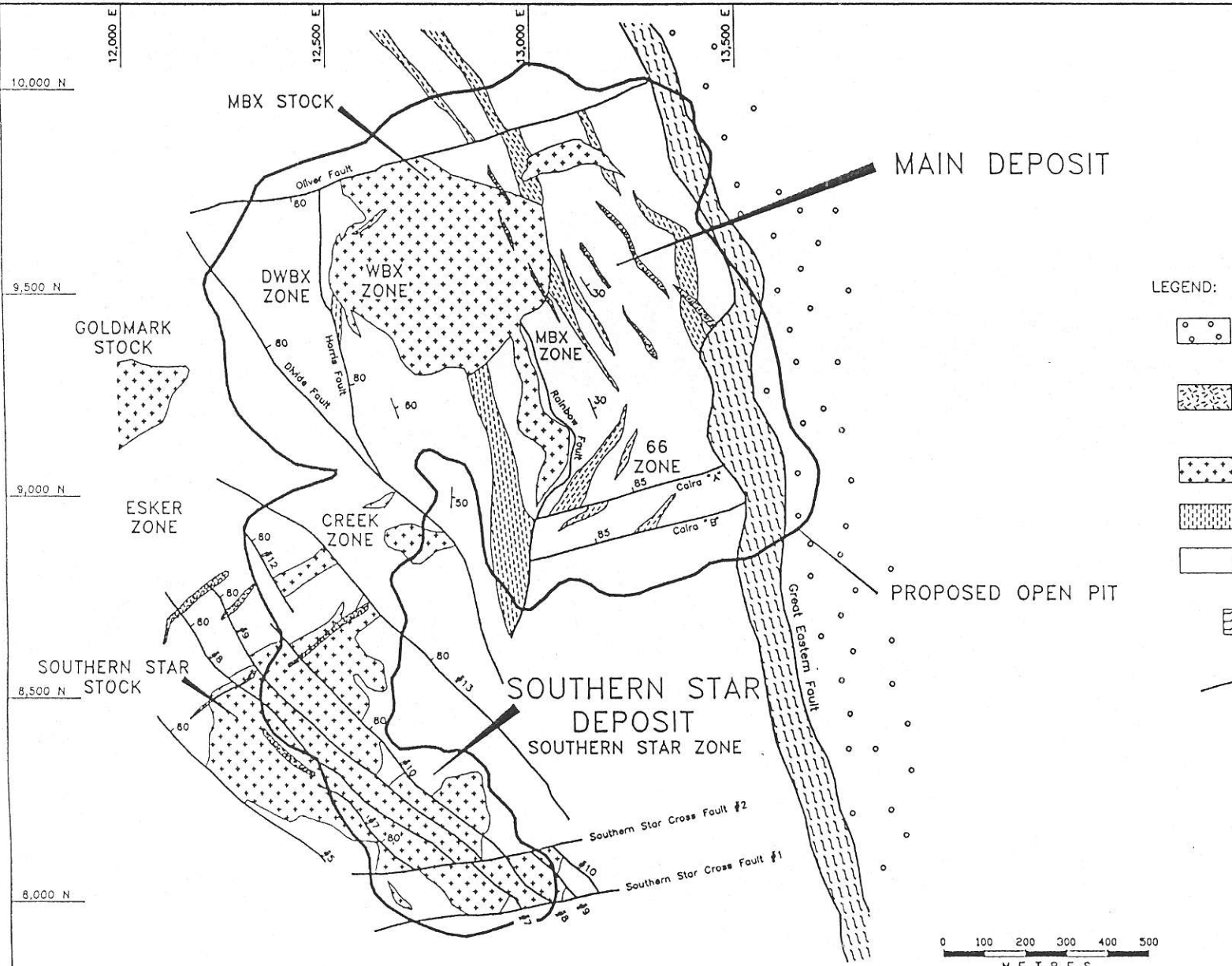
Modified from Nelson et al. 1991








- 1** Mt. Milligan Intrusive Complex
- 2** MBX Stock
- 3** Southern Star Stock
- 4** Goldmark Stock
- 5** North Slope Stock



**CONTINENTAL GOLD CORP.  
MT. MILLIGAN PROJECT**

**PROPERTY GEOLOGY**



- LEGEND:
- TERTIARY - MESOZOIC
  -  SEDIMENTARY AND VOLCANIC ROCKS
  - CRETACEOUS - EOCENE
  -  POST MINERAL DYKES (DIORITIC, MONZONITIC, TRACHYTIC)
  - TRIASSIC - JURASSIC
  -  MONZONITIC STOCKS AND DYKES
  -  TRACHYTIC VOLCANIC ROCKS
  -  ANDESITIC - LATITIC VOLCANIC ROCKS
  -  FAULT ZONE
  -  FAULT

CONTINENTAL GOLD CORP.  
MT. MILLIGAN PROJECT

**DEPOSIT GEOLOGY**

