

RED CHRIS  
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**AMENDMENTS TO**

**APPLICATION FOR A PROJECT**

**APPROVAL CERTIFICATE**

**FOR THE**

**RED CHRIS PROPERTY**

**by**

**AMERICAN BULLION MINERALS LTD.**

**January, 1996**

## **1.2 MAJOR COMPONENTS OF THE PROJECT (Amended January, 1996)**

The Red Chris property mine development project will include the following major components (discussed in detail in section 3 of this report):

- An open pit approximately 1750 m by 950 m wide and approximately 300 m deep, in the plateau area;
- A low-grade ore stockpile;
- A 50,000 tonne/day mill producing copper-gold concentrate, located on the plateau to the north of the open pit;
- A tailings and waste rock disposal facility with a volume of approximately 500 million m<sup>3</sup>, located approximately 4 km to the east of the deposit;
- Various ancillary facilities for the mine, such as an assay laboratory and lodging and catering buildings for mine personnel, located on the plateau to the northeast of the open pit;
- An access and haul road from the Ealue Lake road, near the Klappan River, to the mine site;
- Air access via the Dease Lake or Iskut airstrips;
- Powerline from Meziadin Junction to the Red Chris Project (Option A) or powerline from the Skeena sub-station near Terrace to the Red Chris Project (Option C); and
- Loadout facilities in the Port of Stewart.



Province of  
British Columbia

Ministry of  
Energy, Mines and  
Petroleum Resources

# MEMORANDUM

Smithers — Telephone (604) 847-7383 Fax (604) 847-7603

TO: Ted Hall

JAN 23 1996

January 10, 1996

FROM: Paul Wojdak

Project # 38

Document # 73

RE: Red Chris Application for a Project Approval Certificate

## General

The concerns of the Regional Geology section of the Ministry of Energy, Mines & Petroleum Resources (MEMPR) on mine development at Red Chris relate to achieving maximum utilization of the Province's mineral endowment. To do so, the resource must be adequately defined by exploration before the site is developed, and all geological problems that might compromise accurate resource assessment or an effective mine plan (and hence a profitable and sustainable operation) should be identified and addressed by the proponent.

I am satisfied with this application and it should be an acceptable mine development. Infrastructure requirements, most notably a power transmission line, stand to assist development of other projects in the region.

## Resource Definition

- The Project Report should contain reserve sections showing assay intercepts and pit profiles to provide a sense of utilization of the resource and sufficiency of exploration beyond the pit limits. I am concerned about identification of resources at Red Chris below mine cut off (0.3% Cu?) but above 0.2% Cu, that might be compromised by the mill site, waste rock dumps, tailings or other infrastructure. Essentially all open pit copper mines in British Columbia are ultimately mined to a 0.2% Cu cut off, although a higher cut off is necessary at the project feasibility and design stage, in order to recover capital costs. Fortunately the axis of mineralization at Red Chris is ENE so that the proposed mill site appears to be located away from potential low grade resources. MEMPR recognizes that it may not be possible to prepare an economically viable mine plan at the pre-production stage that entirely protects low grade resources which may or may not be economic in the future.

- With respect to accurate resource assessment and future grade control, a better understanding of the nature and distribution of barren Late Phase porphyry appears necessary. I am concerned that unsuccessful separation of Late Phase porphyry during mining will lead to unanticipated dilution and/or loss of ore. Sections or plan maps should demonstrate an adequate understanding of the geometric distribution of Late Phase porphyry. Likewise, post-ore dikes must be correctly assessed for grade control purposes, as they are likely too narrow to be separated and will have to be taken as internal dilution.
- Any localized areas of poor core recovery that might impact on reserve estimation or rock stability should be identified and addressed.
- Faults that may impart discontinuities in grade distribution, or affect rock stability should be adequately defined. Based on wide spaced pre-1994 drilling, Newell and Peatfield (1995) comment that complex faulting at Red Chris renders drill hole correlation difficult. Pre-mineralization ore controlling faults and post-ore offsetting faults should be distinguished. The most significant post-mineral faults appear to be a northerly set, which step the deposit progressively downward to the west.
- Rock in the Main and East zones, from available data, has moderate potential to generate acid. ARD potential appears greater to the west (in the Gully and Far West zones) where the deposit's pyrite halo is developed best. There is a good chance the Gully and/or Far West zones will become part of Red Chris ore reserves, so that early planning for ARD waste rock may be necessary.
- I am pleased that a low grade stockpile figures into the mine design. This increases assurance that maximum benefit of the copper-gold resource will be achieved. What grade of material will be stockpiled?

### **Geotechnical Considerations**

Geotechnical concerns are addressed more completely by Mine Review and Permitting Branch (geotechnical engineering), but some comments are made herein. I am pleased that angle holes (mainly to the south) are being drilled to determine the Red Chris resource. However enough northerly oriented holes should be drilled to characterize rock quality and locate faults along the north wall of the pit. The proponent appears to realize already that geotechnical characteristics in Bowser Lake sedimentary rocks south of the South Boundary fault may be sufficiently different to require a different pit wall design.

## **Mineralogy and Metallurgical Recovery**

Gold correlates fairly well with copper, suggesting that gold recovery should be acceptable. However, the copper to gold ratio decreases westward in the deposit and the mode of occurrence of gold should be determined in the course of metallurgical testwork, to ensure there are no "surprises" in gold recovery. The application notes the presence of covellite at Red Chris but, from other reports it does not appear to be a significant ore mineral. Surface oxidation and supergene mineralization appear not to be significantly developed, so these factors should not detract from good copper recovery.

# ENVIRONMENTAL ASSESSMENT

## RED CHRIS COPPER/GOLD MINE PROJECT

American Bullion Minerals Ltd.

### FINAL PROJECT REPORT SPECIFICATIONS

### VOLUME I

*Prepared by the Red Chris  
Project Committee under the  
Environmental Assessment Act,  
SBC 1994*

June 18, 1996



BRITISH  
COLUMBIA

Environmental  
Assessment Office

**Red Chris Copper/Gold Mine  
Project Report Specifications**

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### **1.3 Purpose of the Project**

The purpose of the project, as stated in the application, is "to develop the Red Chris property into an economic mine producing copper/gold concentrate." The project will involve the removal of approximately 245 million cubic meters from the pit, of which approximately 97 million cubic meters would be ore and 148 million cubic meters would be waste rock. The mine is anticipated to have a 15 year life.

### **1.4 Scope of the Project**

The reviewable project consists of the following on-site facilities:

- an open pit approximately 1750m x 950m wide and 300m deep;
- a low-grade ore stockpile;
- a 50,000 tonne/day mill;
- a tailings and waste rock disposal facility; and
- ancillary facilities (i.e. assay laboratory, lodging and catering buildings, etc.).

and the following off-site facilities:

- a 12 km mine access and haul road (from the existing Ealue Lake Road near the Klappan River);
- power supply from:
  - a) an extension of the BC Hydro transmission line approximately 184 kilometers north from Meziadin Junction along the Stewart-Cassiar Highway with supplementary on-site diesel generation; or
  - b) an upgrade of the existing transmission line from Skeena Substation to Meziadin Junction and an extension of the BC Hydro transmission line approximately 184 kilometres north from Meziadin Junction along the Stewart-Cassiar Highway; or
  - c) an on-site diesel-fueled generating plant;
- shipping concentrate from the Port of Stewart; and
- impacts on existing infrastructure and/or infrastructure improvements related to the transportation of ore from the mine-site to the Stewart-Cassiar Highway to Stewart.

### **1.5 Requirement to Apply for a Project Approval Certificate under the EA Act**

In accordance with section 20 (1) of the Reviewable Projects Regulation under the EA Act the Red Chris mine proposal is a reviewable project because:

- a) the facility is a mineral mine; and

## VITAL STATISTICS OF PROJECT AND PROPONENT

(B.C. Environmental Assessment Act: Part 2, Division 2, Section 7(2))

**PROPERTY:** Red Chris Property

**PROJECT NAME:** Red Chris Project

**PROponent:** American Bullion Minerals Ltd.  
1500 - 675 West Hastings Street, Vancouver, B.C., V6B 1N2  
Manager/Operator for the American Bullion Minerals/Teck Corporation Joint Venture

Head Office Telephone: (604) 687-4951; Fax: (604) 687-4991  
Contact: Wayne Roberts, Vice President, Exploration

**PROJECT LOCATION:** Latitude 57° 42' North, Longitude 129° 47' West; N.T.S. Map Sheet 104H/12W; approximately 18 km southeast of Iskut, B.C.

**ACCESS:** Site access is primarily by helicopter from Tatogga Lake Resort, approximately 15 km south of Iskut. An existing abandoned road provides secondary access to the site by track and all-terrain vehicles (ATVs). The road connects to the Ealue Lake Road approximately 7 km east of Highway 37. The road is not currently accessible by road vehicle as it crosses through Coyote Creek and contains steep sections with grades up to approximately 30%.

**GEOLOGY:** Chalcopyrite and lesser bornite occur as disseminations and fracture fillings associated with well developed quartz-sulphide stockwork zones and intensely sheeted quartz veining. These zones are spatially and probably genetically related to east-northeasterly, sub-vertical faulting along the central east-northeasterly axis of the Red stock. Pyrite and covellite also occur within the mineralized vein stockwork zones; however, pyrite is most abundant in a halo peripheral to the copper-rich mineralization. Gold grains are intimately associated with the copper sulphide minerals and their respective grades are proportional.

**METALS:** Copper, gold and lesser amounts of silver are the metals of economic importance.

**MINERAL INVENTORY:** 320.4 million tonnes of copper at a grade of 0.379%, and 0.296 g/t gold at a cut-off grade of 0.2% copper. The deposit is currently open for expansion.

**1994 MINEABLE RESERVES:** 263 million tonnes of copper at a grade of 0.39%, and 0.30 g/t gold at a cut-off grade of 0.2% copper (Fluor Daniel Wright, 1995).

**1995 OBJECTIVE:** Increase reserves by 50%.

**MINE:** Open pit 1750 m long, 950 m wide and 300 m deep containing 245 million cubic metres of material. Waste rock and tailings will be deposited in a disposal facility approximately 4 km to the east of the deposit.

**MILL:** The current mill design will process 50,000 tonnes/day. Ore will be wet ground and treated by flotation to produce a copper-gold concentrate which will likely be shipped to smelters in the Pacific Rim via the sea port of Stewart, B.C.

**INFRASTRUCTURE:** Camp on-site for 250 to 350 employees.



## PURPOSE AND MAJOR COMPONENTS OF PROJECT

The 'Late Phase' rocks are similar in composition, notably fresh to very weakly altered, usually barren of copper-gold mineralization, and represent approximately 10% to 18% of the stock. The late-stage dykes vary from dioritic to monzonitic composition, and constitute the minor remaining volume of the stock. Regional and property geology maps are provided in Figures 1.3 and 1.4, respectively.

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As a direct result of the 1994 exploration program, the mineral inventory of the Red-Chris deposit has been increased significantly. The drill-indicated geological resources of the deposit as of December 31, 1994, as calculated by an independent mining engineer (Giroux, 1995), are tabulated as follows:

Cut-off Grade (Copper %)	Resource (tonnes)	Copper (%)	Grade	Gold (g/t)
0.200	320,380,000	0.379		0.296
0.250	251,640,000	0.421		0.328
0.300	186,140,000	0.473		0.364
0.350	137,400,000	0.526		0.410
0.400	100,110,000	0.584		0.458
0.450	77,700,000	0.630		0.505
0.500	60,830,000	0.674		0.549

The 1994 mineable reserves calculated by engineering consultants Fluor Daniel Wright for their 1995 "Red Chris Project Scoping Study" are as follows:

Cut-off Grade (Copper %)	Reserve (tonnes)	Deposit Grade		Contained Metal	
		Copper (%)	Gold (g/t)	Copper (billion lb.)	Gold (million oz.)
0.2	263,000,000	0.39	0.30	2.1	2.5
0.3	157,000,000	0.48	0.37	1.5	1.9
0.4	88,000,000	0.59	0.47	1.0	1.3
0.5	55,000,000	0.68	0.55	0.8	1.0

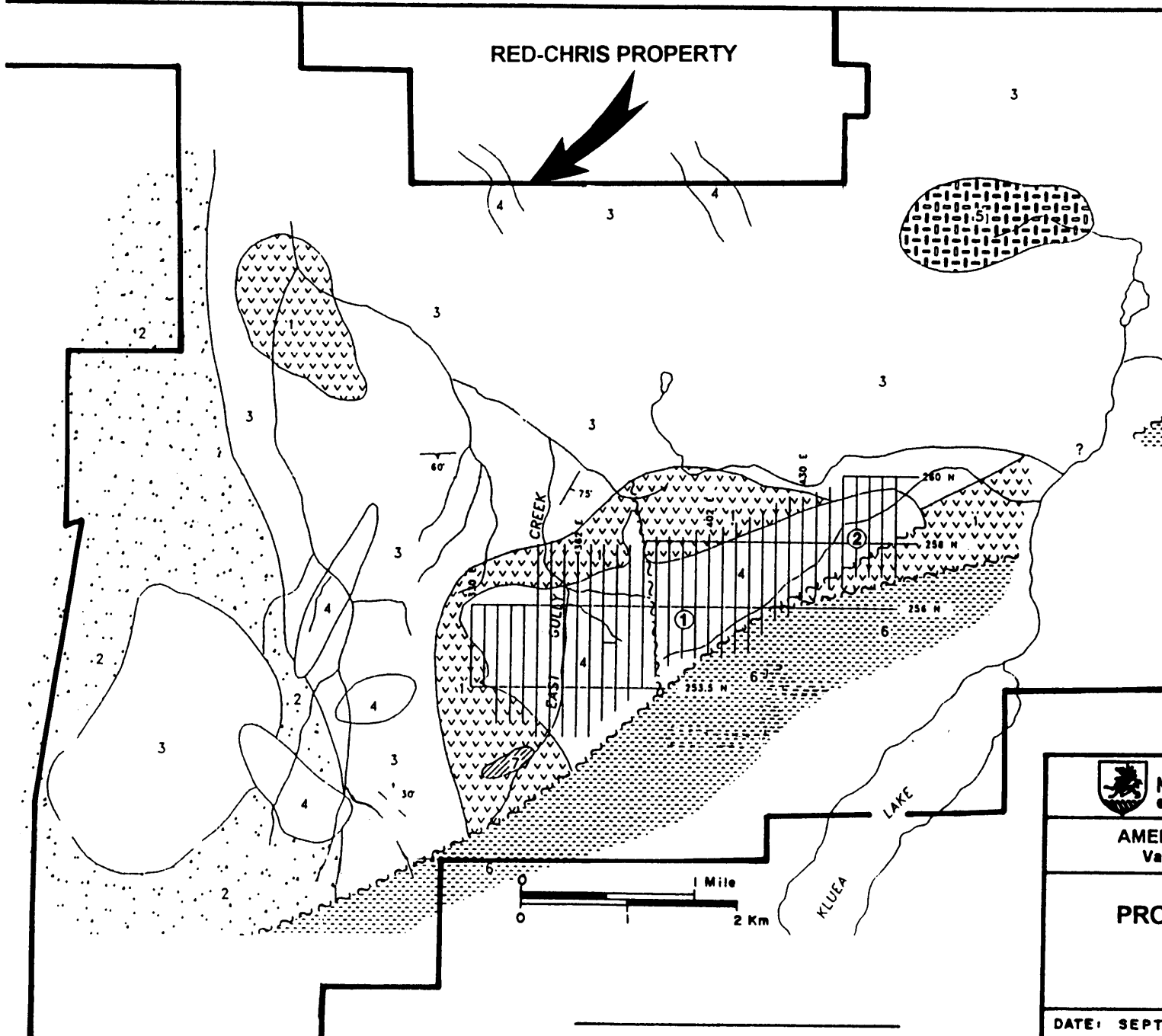
*Hallam Knight Piésold Ltd.*

**RED-CHRIS PROPERTY**



**LEGEND**

- TERTIARY/QUARTERINARY
  - OLIVINE BASALT
- MIDDLE JURASSIC
  - BOWSER LAKE GROUP SEDIMENTS
- UPPER TRIASSIC/LOWER JURASSIC
  - HORNBLENDE GRANODIORITE
  - RED STOCK MONZODIORITE
- STUHINI GROUP
  - VOLCANIC WACKE, SANDSTONE AND TUFF
  - TRACHYANDESITE BRECCIA AND TUFF
  - MAFIC VOLCANICS
- ① MAIN ZONE
- ② EAST ZONE
- ~ ~ FAULT



**MINOREX CONSULTING LTD.**  
GEOLOGICAL CONSULTANTS, VANCOUVER, B.C.

**AMERICAN BULLION MINERALS LTD.**  
Vancouver, British Columbia, Canada

**PROPERTY GEOLOGY MAP**

**RED-CHRIS PROPERTY**  
LIARD MINING DIVISION  
BRITISH COLUMBIA, CANADA

DATE: SEPT., 1995

SCALE: 1:50,000

DRAWN BY: D. MILLER

DWG. NO. 1.4

Modified after Rebagliati, 1994

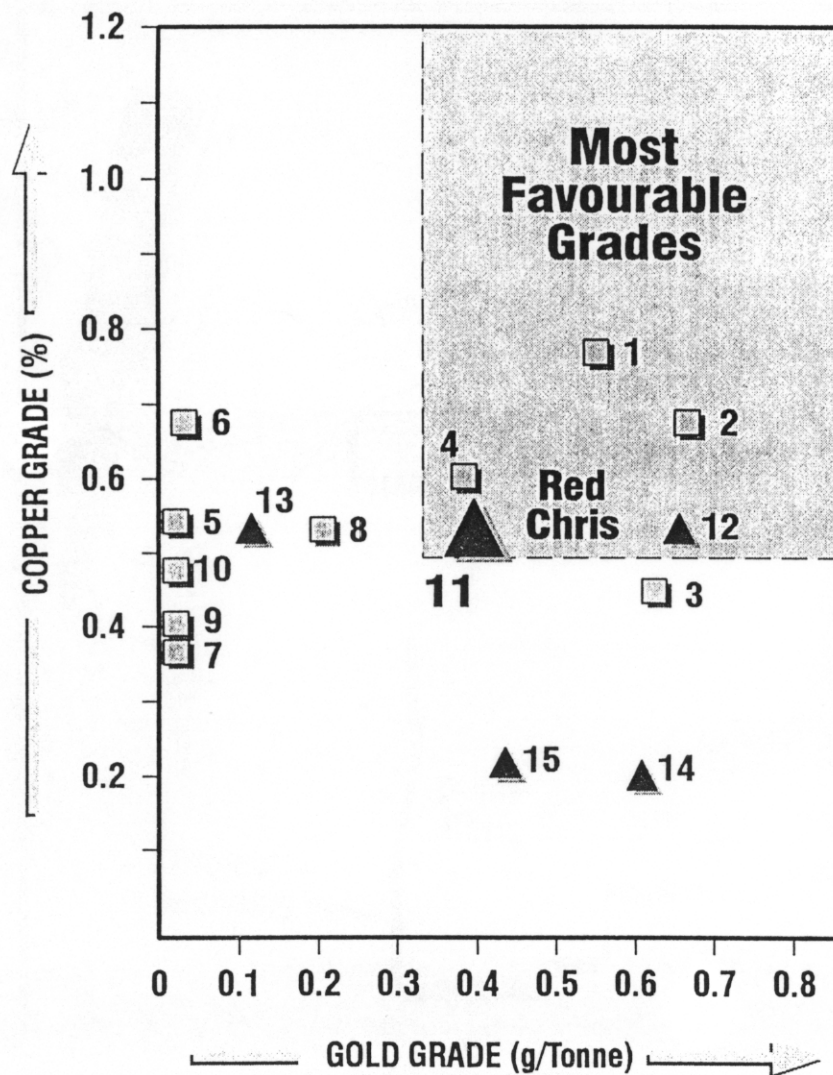
TO ACCOMPANY REPORT BY J. D. BLANCHFLOWER, P. GEO.

## PURPOSE AND MAJOR COMPONENTS OF PROJECT

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- Air access via the Dease Lake or Iskut airstrips;
- Powerline from Meziadin Junction to the Red Chris Project (Option A) or an extension of the proposed Kemess mine powerline (Option B), and
- Loadout facilities in the Port of Stewart.



## Grade Comparison of Several Copper-Gold Porphyry Deposits

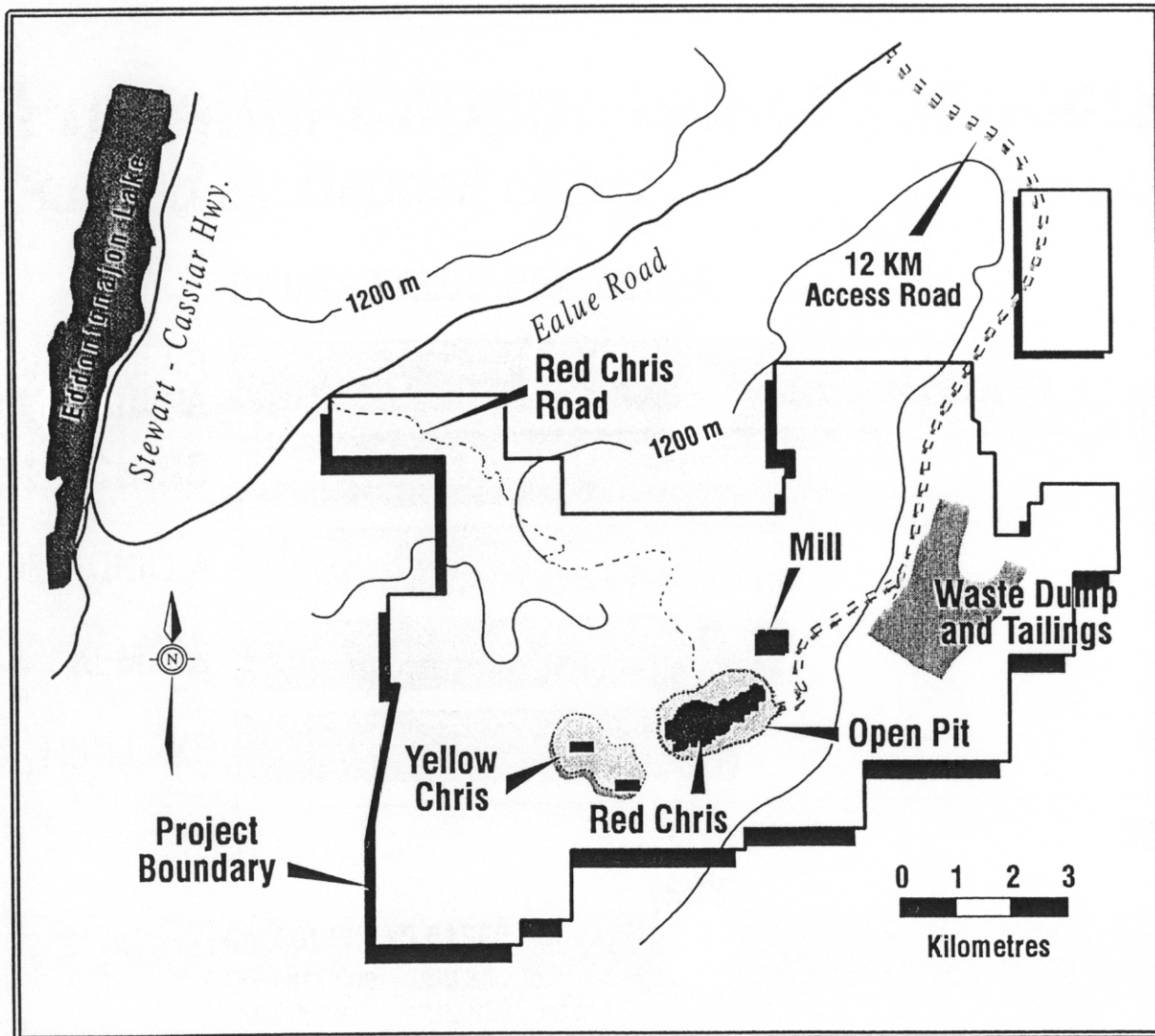
□ PRODUCING MINE

▲ POTENTIAL PRODUCERS

- 1 AFTON
- 2 OK TEDI
- 3 BOUGAINVILLE
- 4 BINGHAM CANYON
- 5 MORENCI/CHINO
- 6 MISSION/RAY
- 7 GIBRALTAR
- 8 ISLAND COPPER
- 9 LORNEX
- 10 VALLEY COPPER

- 11 RED CHRIS**
- 12 BAJO DE LA ALUMBRERA
- 13 PETAQUILLA
- 14 KEMESS
- 15 FISH LAKE





# Red Chris

## Project Site Layout

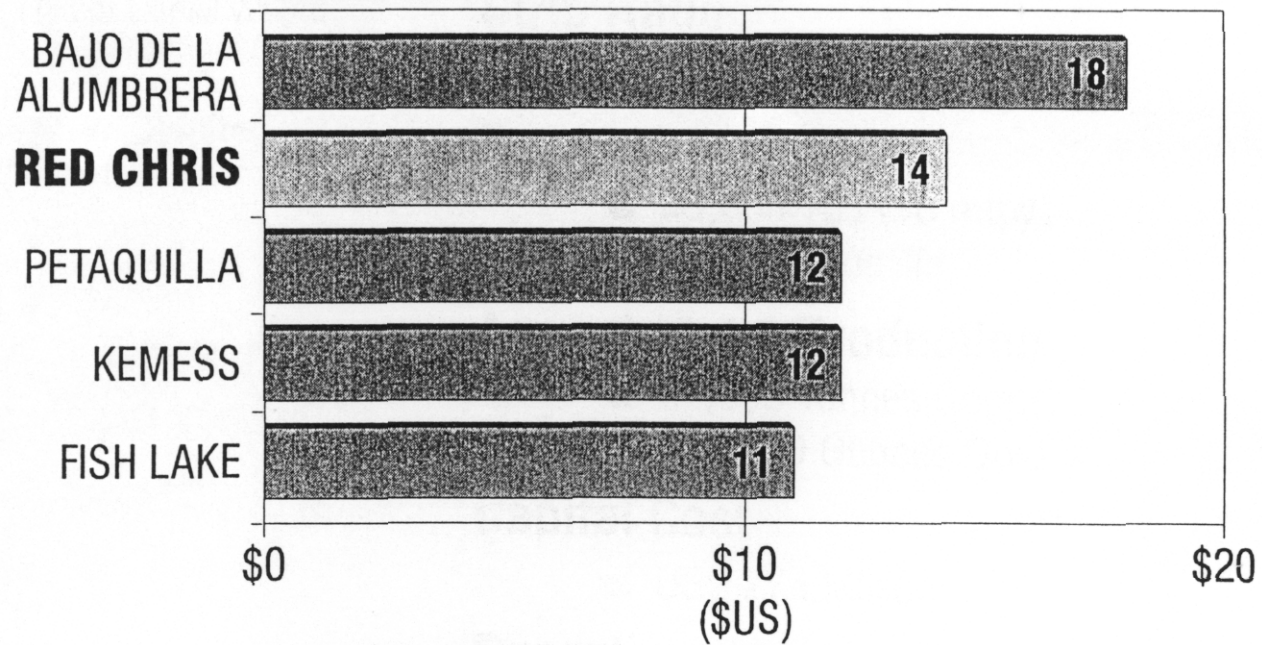




# Potential Copper-Gold Producers

*Ranked By Deposit Grade*

## GROSS VALUE PER TONNE



## DEPOSIT GRADES

Cu (%)	Au (g/t)	CuEq (%)
0.52	0.66	0.92
0.48	0.37	0.70
0.53	0.12	0.60
0.22	0.63	0.59
0.24	0.43	0.50

**CALCULATIONS BASED ON:**  
 Copper Price: US \$1 / lb.  
 Gold Price: US \$375 / oz.

