SEG Tour
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WESTMIN RESOURCES LIMITED

PREMIER GOLD PROJECT
GEOLOGICAL SETTING AND MINERALIZATION OF THE SILBAK PREMIER AND BIG MISSOURI DEPOSITS

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INTRODUCTION

The Silbak Premier and Big Missouri gold/silver deposits are located 21 km north of Stewart within Hazelton volcanics of the Stewart gold-silver camp (Figure 1).

The Premier Gold Project will develop separate open pit gold/silver mines on the near surface portions of the famous Silbak Premier underground gold/silver mine which operated from 1918 to 1968 and several deposits on the Big Missouri property. Initial production emphasis will be on the higher grade portion of the Silbak Premier pit. Production, at a rate of 2,000 tonnes per day, is scheduled to begin in early 1989. Final feasibility studies indicate an annual output of approximately 77,000 ounces of gold and 890,000 ounces silver over the first four years of operation. Currently, defined (September 1987) open pit mineable reserves include 5.9 million tonnes at Silbak Premier, grading 2.16 g/tonne gold and 80.23 g/tonne silver and 1.8 million tonnes at Big Missouri, grading 3.60 g/tonne gold and 29.49 g/tonne silver, sufficient for 10.5 years production.

Silbak Premier reserves are based on single pit surrounding the upper part of the old mine workings and include some caved stope fill as well as in situ material. Reserves at Big Missouri are situated in four small pits ranging in size from 300,000 tonnes to greater than one million tonnes (Figure 2).

The emphasis of ongoing exploration at Silbak Premier is to define underground mineable reserves surrounding previously stoped areas and to extend the known deposits to depth, beyond areas explored during past operations. At Big Missouri emphasis is still on open-pittable reserves as there are numerous surface showings which have had only minimal exploration.

Past production from Premier included 4.7 million tons grading 0.384 oz/ton gold and 8.03 oz/ton silver over a period of 46 years, starting in 1918 and operating continuously to 1954 and intermittently to 1968. In contrast, mining at Big Missouri took place for a short period between 1938 and 1943, producing 822,000 tons grading .077 oz/ton gold including less than 1.00 oz/ton silver.

REGIONAL GEOLOGICAL SETTING

Stratigraphy and genesis of both Silbak Premier and Big Missouri deposits continues to generate controversy both within Westmin and with other geological groups working in the area.

The regional stratigraphy consists of Hazelton Group volcanic rocks, are unconformably overlain by Bowser Group sedimentary rocks present to the east, and grade into a sedimentary sequence to the west. Within Westmin we believe the regional stratigraphy is shallow (Big Missouri) to moderate (Silbak Premier) westerly dipping. This observation is based on limited evidence of primary layering in flow banded and fragmental rocks and interpretation of the genesis of "cherty-tuff" horizons which suggest interflow volcanic exhalative beds or sub-seafloor replacement of interflow tuff horizons.

Regionally a potential stratigraphic marker has been identified, called the "Ground Hog Marker", which is indicated to extend from Big Missouri to Silbak Premier. There is considerable warping of these rocks due to folding and/or thrust and block faulting which is particularly evident on the west side of the property where the volcanic rocks grade into predominantly sedimentary rocks.

Recent mapping of the volcanic stratigraphy in the Silbak area has differentiated andesites and dacites, however, the distinction is subtle and often based visually on slight differences in color. In general, it appears however that the dacites are concentrated mainly to the north and west of Silbak Premier (Figure 3). Recent fresh rock exposures in road cuts have shown a greater abundance of fragmental rocks than was previously thought. This is due to subtle differences between fragments and matrix. These fragmentals tend to rapid facies variations and are often discontinuous over short distances and hence have proven difficult to use for developing stratigraphy. Hence, mapping and correlations have generally been on the basis of rock type rather than time-stratigraphic units.

Based on extensive regional mapping particularly along the west side of the properties and along the Granduc Road, Aldrick (1986) has suggested a steep easterly dip to the stratigraphy and a synclinal structural whose axis bounds the east side of the Big Missouri property.

SILBAK PREMIER - GEOLOGICAL SETTING AND MINERALIZATION

The Silbak Premier deposit is situated within generally massive, fine-grained green andesites, locally with monolithic fragmental zones. These andesites are moderately to intensely foliated with an attitude subparallel to the apparent original layering (N-S strike with approximate 40° westerly dip).

The andesite is intruded by very irregular bodies of K-feldspar megacrystic, plagioclase-amphibole porphyritic rock of dacite composition called Premier Porphyry. Although considered intrusive, many porphyry-andesite contacts are very indistinct suggesting emplacement close to the time the andesites were laid down. Both andesite and porphyry are partially overlain by a flow unit which looks compositionally and texturally similar to the intrusive porphyry.

Mineralization consists of silica-K-feldspar-carbonate-sulphide vein and breccia zones, footwall stockwork veining and occasional crustiform banded veins. Some lenses of semi-massive sulphides consisting of pyrite with lesser sphalerite and galena. The main gold bearing mineral is electrum while silver occurs primarily within tetrahedrite and polybasite.

Precious metal mineralization is generally centred within intense silica-K-feldspar alteration zones which are flanked by pyrite-sericite-carbonate alteration. Mineralization appears both concordant and discordant to andesite-porphyry stratigraphy. Siliceous breccia zones, around which the more intense alteration is focused, tend to host the most extensive, precious metal bearing zones although gold and silver mineralization is not uniformly distributed within these bodies. Higher silver ratio mineralization is generally hosted in stockwork veining.

The Glory Hole deposit is centred on the richest part of the old Premier Mine workings. It consists of two zones, the Main and West zones, that intersect roughly perpendicular. The West zone has been chopped into several segments which have been offset by right-lateral faulting resulting in an apparent accurate shape to the deposit. The Northern Lights deposit occurs in the hanging wall of the Main deposit in the Glory Hole and demonstrates two distinct zone orientations similar to the main deposit (Figure 4).

Ore lenses within the Glory Hole deposit vary in width from a few tenths of metres in the footwall stringer zone to 20 metres wide in the hanging wall area. Overall strike length of the Main plus West zones is 1800 metres and dip length is over 500 metres. The Main zone dips about 60° north near the top and flattens to about 30° near 6 Level, whereas the West zone is vertical to steeply north dipping throughout its vertical extent.

BIG MISSOURI - GEOLOGICAL SETTING AND MINERALIZATION

The Big Missouri property is underlain by a southwest-facing, moderately dipping sequence of volcanic and volcaniclastic rocks of the Hazelton Group (Figure 5, 6).

Green andesite flows, tuff and agglomerate form a thick upper sequence that hosts the mineralized zones on the property. They are generally feldspar and amphibole porphyritic with a weak to moderate foliation. Thin (up to 5 m) cherty tuff horizons of exhalative origin separate the individual flows, tuff and agglomerate units. These cherty tuff horizons are silica-rich beds containing sericite and silicified (bleached) andesite fragments, occasional

rounded cherty fragments, carbonate and sulphide mineralization. The footwall andesite usually is brecciated and filled with quartz and/or carbonate, while the hanging-wall andesite is generally a light grey bleached colour, due to silica-sericite alteration.

Cretaceous granitic dykes of the Portland Canal dyke swarm, Tertiary andesite dykes and abundant quartz, quartz-carbonate and carbonate veins cut the volcanic sequence.

Three regionally extensive horizons of cherty tuff and altered andesite are recognized. In the Lower Horizon, the cherty tuff bands within the andesite sequence generally are 8-10 m apart and contain abundant carbon; bands occurring in the Middle Horizon are generally 25-30 m apart and have abundant carbonate; those in the Upper Horizon are thickest and characterized by intense silica-sericite alteration.

In the lower part of the andesite sequence, irregular-shaped intrusions of Premier porphyry can be locally identified. Such intrusions are varied in texture and consist of quartz, plagioclase, amphibole and large potassium feldspar phenocrysts in a fine to medium, dark green andesitic matrix.

In general, semi-massive to massive lenses, pods and stringer zones of pyrite, sphalerite, galena and chalcopyrite occur within and at the contact of thin, cherty tuff horizons. Andesite in the footwall to these zones is bleached from green to grey with abundant sericite and fine, disseminated pyrite. Pyrite commonly replaces altered amphibole phenocrysts. Altered andesite is pervasively silicified and cut by numerous quartz-sulphide veins with or without chlorite and/or carbonate. Andesite tuffs overlying the cherty tuff are similarly bleached and altered, but silicification is more intense. In the immediate hanging wall, abundant sphalerite and galena with appreciable amounts of gold and silver are present in well-developed quartz stringer zones. Further up in the hanging wall, bleaching and disseminated pyrite are less intense, with only minor spalerite and galena. The altered porphyritic andesite may correspond to what was previously termed "Premier Porphyry" and the cherty zones to what were referred to as quartz veins or breccia zones.

Three stratabound mineralized horizons have been recognized based on geological correlation of the host units. The Lower Horizon hosts the Terminus, Golden Crown, Calcite Cuts, S-1, Unity-Unicorn and Martha Ellen zones and, finally, the Upper Horizon hosts the Province, Buena Vista, Northstar-Lindeberg and Rambler zones.

SUMMARY OF MINERALIZATION TYPES, ORE CONTROLS AND MODELS FOR ORE GENESIS AT SILBAK PREMIER AND BIG MISSOURI

At a district scale the ore zones occur in green andesite at similar stratigraphic levels, although there are significant facies differences between the two properties.

The geometry, distribution and textural features of the ores at Big Missouri suggests the ores to be stratabound and syngenetic. The ore zones occur at several stratigraphic levels with deposits at different stratigraphic levels having distinctive features. Use of a stratigraphic model has given good exploration success.

The timing of emplacement of Premier porphyry is controversial; some evidence suggests that at least part of the Premier porphyry is extrusive. Mineralization is hosted in porphyry, and Premier porphyry may intrude earlier mineralized andesite. Within the Glory Hole the contacts of andesite and Premier porphyry are favourable for high-grade ore. Elsewhere, the relationship of mineralization to Porphyry is less clear. Discordant stockwork vein and silica-breccia mineralization at Premier occur within and adjacent Premier porphyry. The intensity of silica-sericite-K-feldspar alteration is greatest in the Glory Hole area and decreases laterally to the West zone and at depth where alteration is mainly silica-chlorite-K-feldspar with little bleaching due to sericite.

Syngenetic Model

The apparent stratabound character of mineralization at Big Missouri is interpreted as an indication that the mineralization was formed essentially at the same time as the enclosing host andesites. Recent work on massive

sulphide deposits in offshore spreading ridges indicates mineralization forming both on the seafloor and in porous zones immediately beneath the seafloor, giving rise to evidence for both syngenetic and epigenetic styles of mineralization both of which are interpreted to occur at Big Missouri.

Semi-massive sulphide deposits found at Premier with associated sulphide-matrix breccias and fine cherty silica deposits demonstrate features of synvolcanic deposition. Relationship of mineralization to stratigraphy at Silbak Premier is less clear, however, where stratigraphy is known the deposits appear to occur over specific stratigraphic intervals and to be grossly stratabound.

Vein Replacement Model

The massive silica-K-feldspar alteration with attendant silica-breccias and peripheral stockwork veining and pyrite-sericite-carbonate alteration, particularly evident at Premier, suggest the mineralization has developed within an epithermal system. Structural control appears to dominate and several pulses of mineralization may be interpreted from the overprinting of numerous vein types.

The zoning of Ag and Au abundance at Premier is complex. A generalized model of high Ag:Au ratios at surface, decreasing to low Ag:Au ratios at depth is misleading and is the reverse of zoning in most epithermal vein systems.

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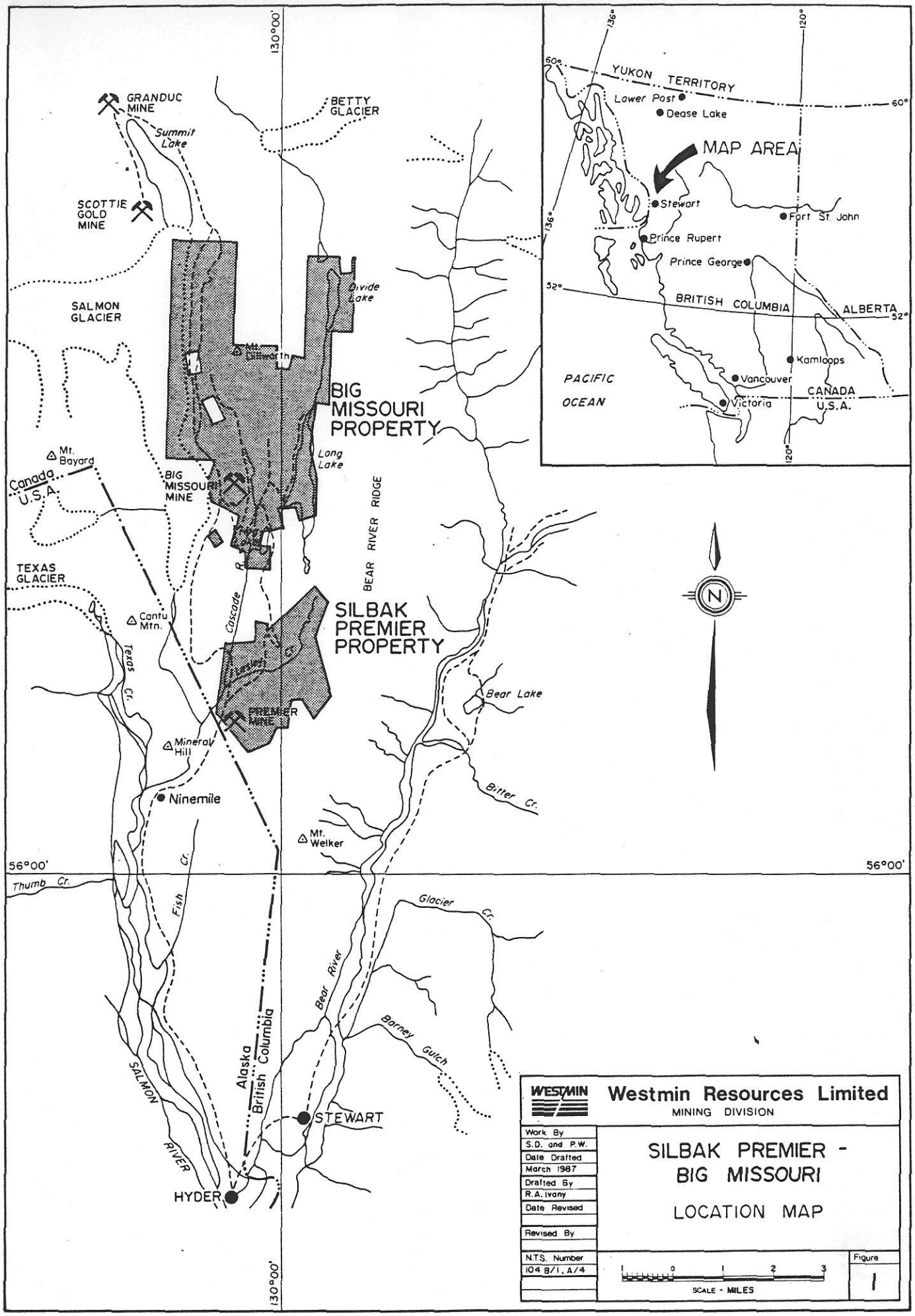


Westmin Resources Limited
MINING DIVISION

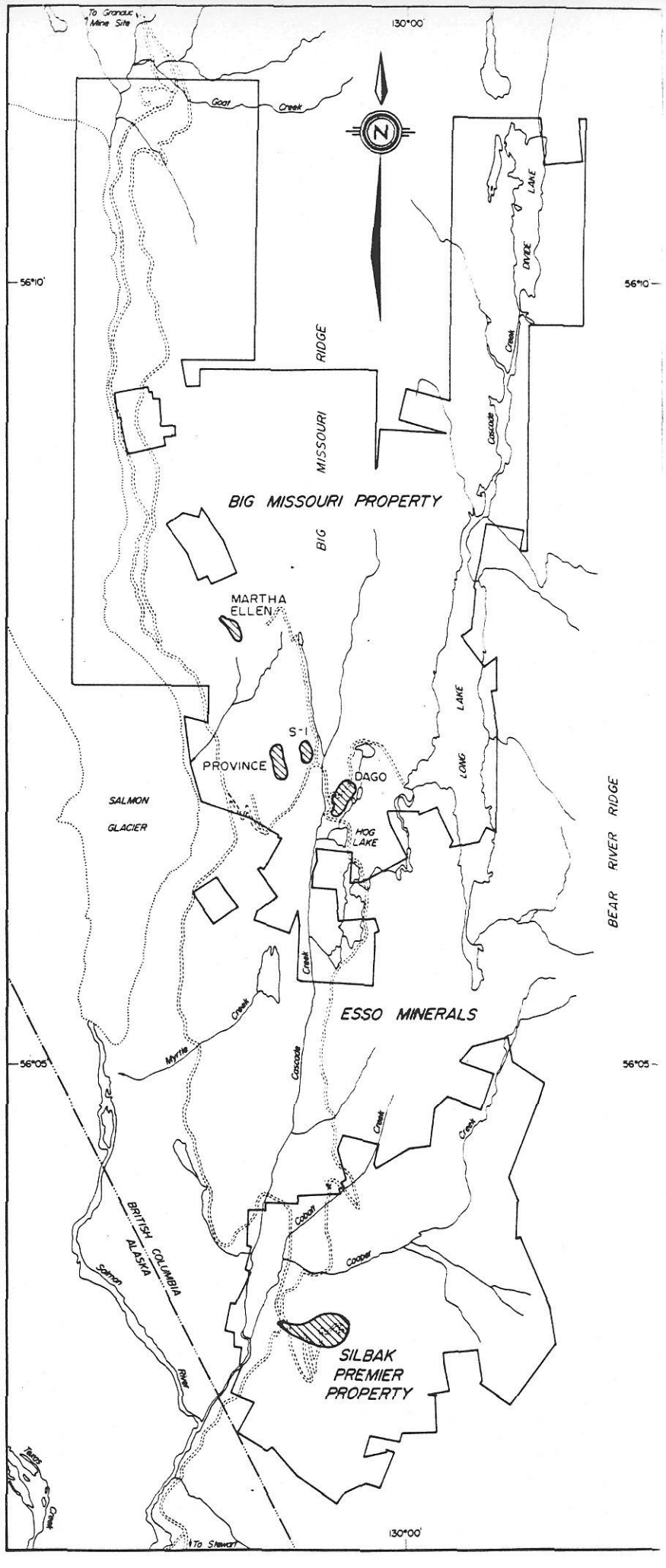
SILBAK PREMIER - BIG MISSOURI

LOCATION MAP

Work By	S.D. and P.W.
Date Drafted	March 1987
Drafted By	R.A. Ivany
Date Revised	
Revised By	
N.T.S. Number	104 B/1, A/4

SCALE - MILES

Figure 1

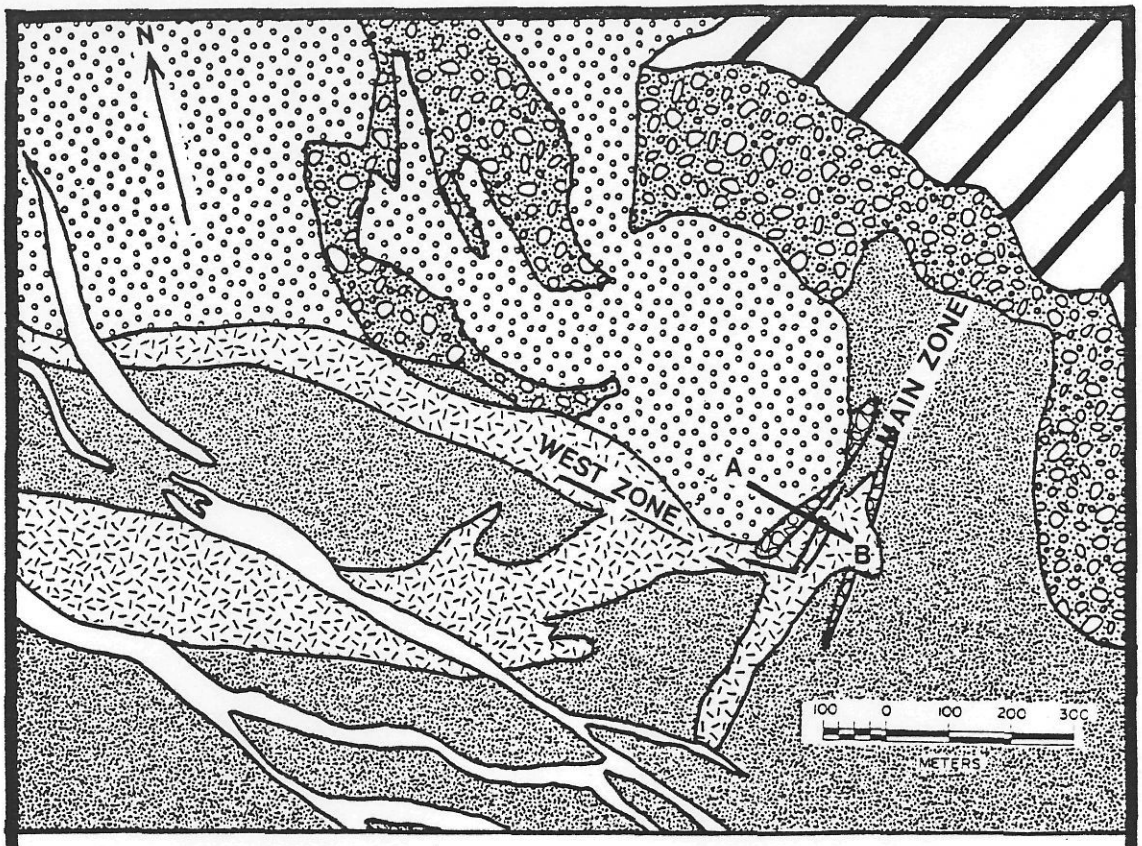


OPEN PIT AREAS

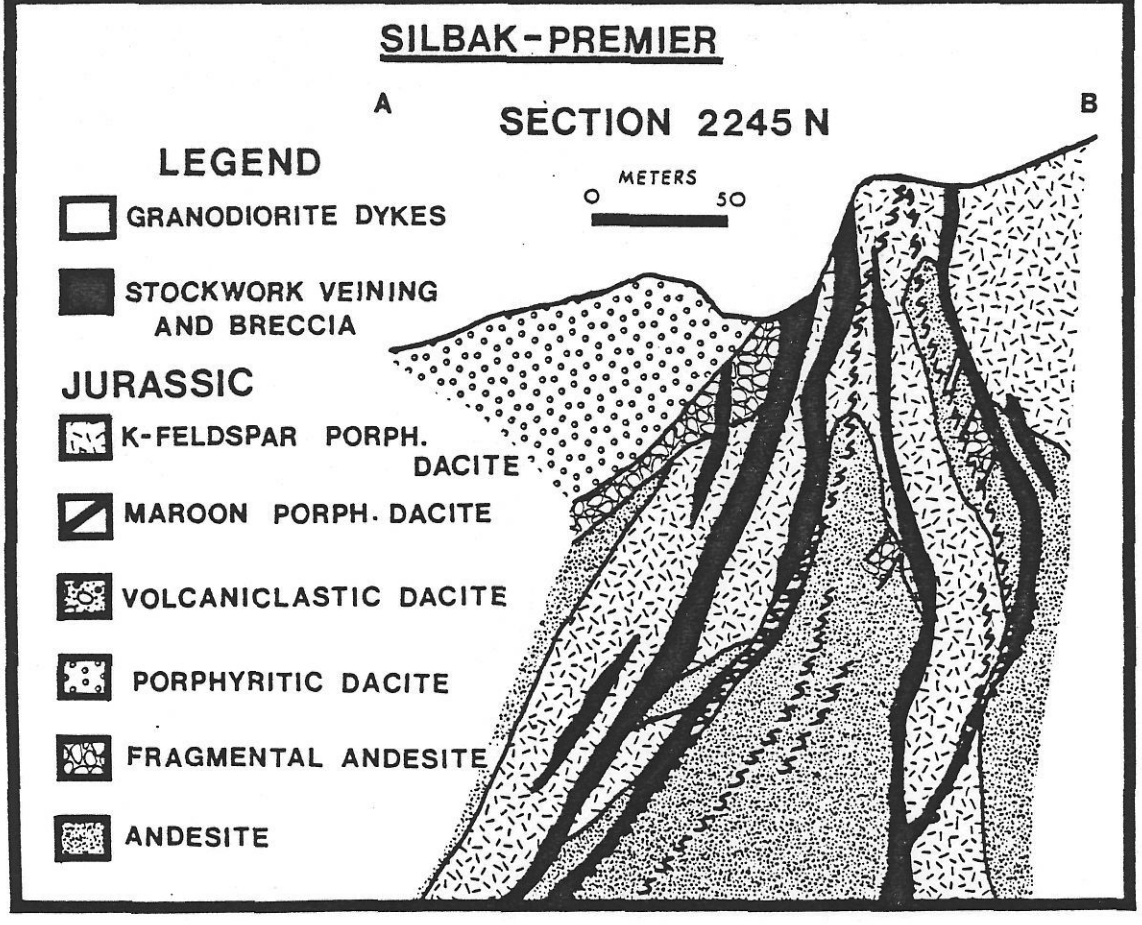
LOCATION MAP

1280 640 0 1280 2560 3840 metres

Figure 2

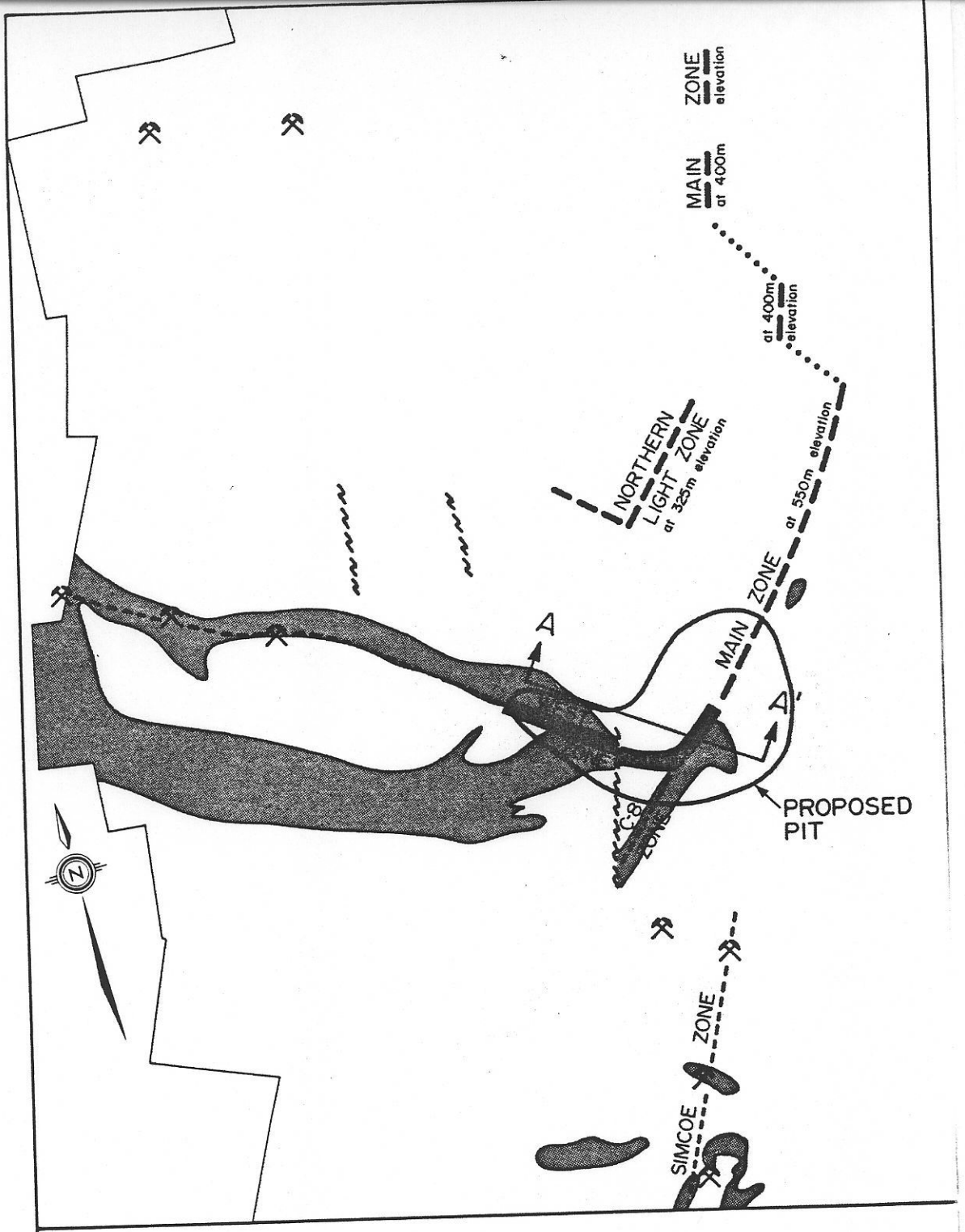


modified from Brown (1987), Payne & Sisson (1987)



Bicentennial Gold 88, Melbourne, May, 1988

Figure 3



JURASSIC (HAZELTON GROUP)

VOLCANIC ROCKS

Andesite (undifferentiated)

SUB-VOLCANIC ROCKS

Main & Footwall Porphyry

ORE ZONE (at surface)

ORE TREND (sub-surface)

MINERALIZED TREND (no past production)

GOLD-SILVER SHOWING

FAULT

EROSIONAL UNCONFORMITY

SILBAK PREMIER

GEOLOGY & ORE ZONES

200 0 200 400 600

METERS

Figure 4

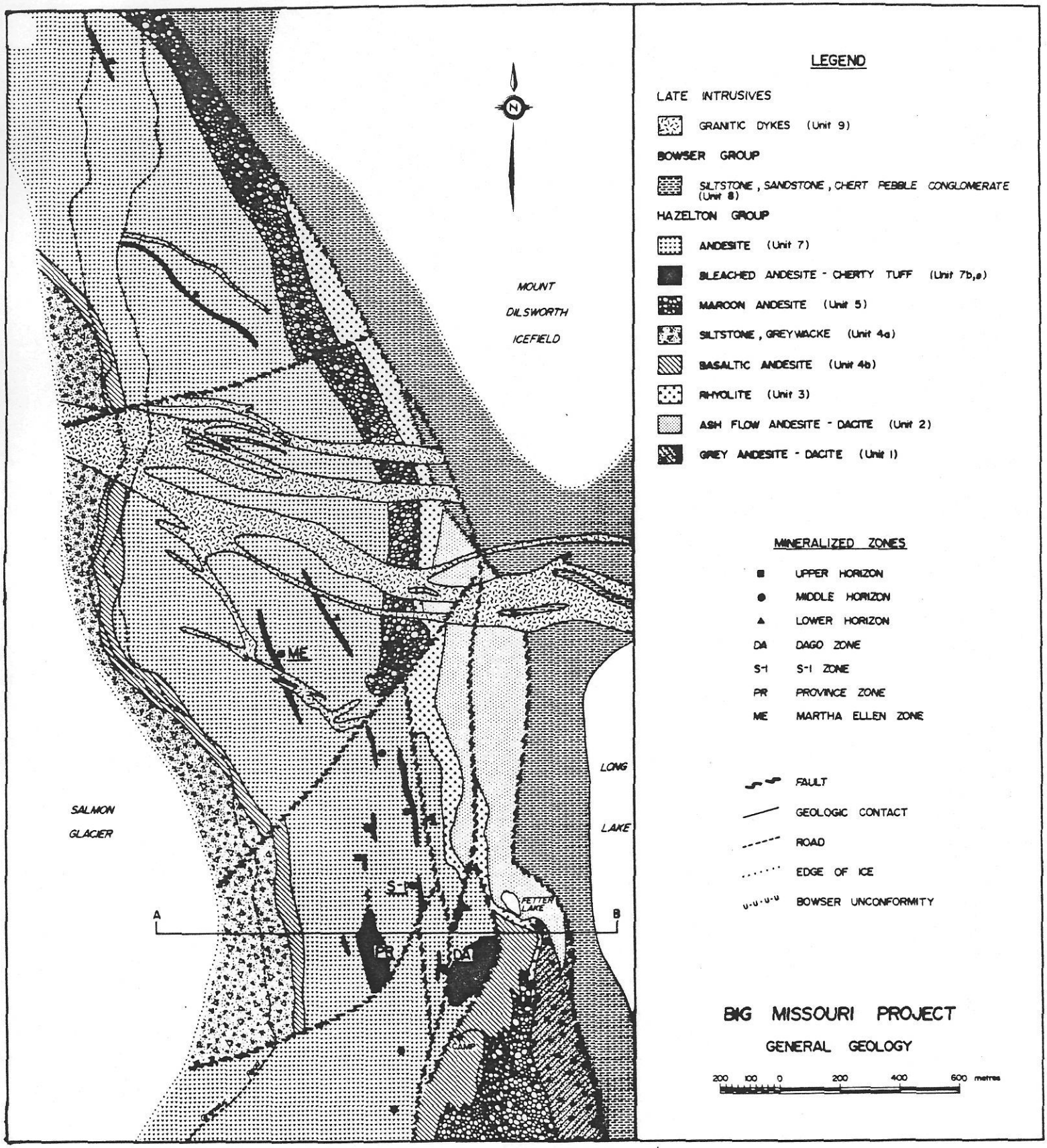

MOUNT
DILSWORTH
ICEFIELD
SALMON
GLACIER
LONG
LAKE
ME
S-I
PR
DA
A
B
FETTEN
LAKE
CAMP
LEGEND
LATE INTRUSIVES
GRANITIC DYKES (Unit 9)
BOWSER GROUP
SILTSTONE, SANDSTONE, CHERT PEBBLE CONGLOMERATE (Unit 8)
HAZELTON GROUP
ANDESITE (Unit 7)
BLEACHED ANDESITE - CHERTY TUFF (Unit 7b,a)
MAROON ANDESITE (Unit 5)
SILTSTONE, GREYWACKE (Unit 4a)
BASALTIC ANDESITE (Unit 4b)
RHYOLITE (Unit 3)
ASH FLOW ANDESITE - DACITE (Unit 2)
GREY ANDESITE - DACITE (Unit 1)
MINERALIZED ZONES
UPPER HORIZON
MIDDLE HORIZON
LOWER HORIZON
DA DAGO ZONE
S-I S-I ZONE
PR PROVINCE ZONE
ME MARTHA ELLEN ZONE
FAULT
GEOLOGIC CONTACT
ROAD
EDGE OF ICE
BOWSER UNCONFORMITY
BIG MISSOURI PROJECT
GENERAL GEOLOGY
200 100 0 200 400 600 metres

Figure 5

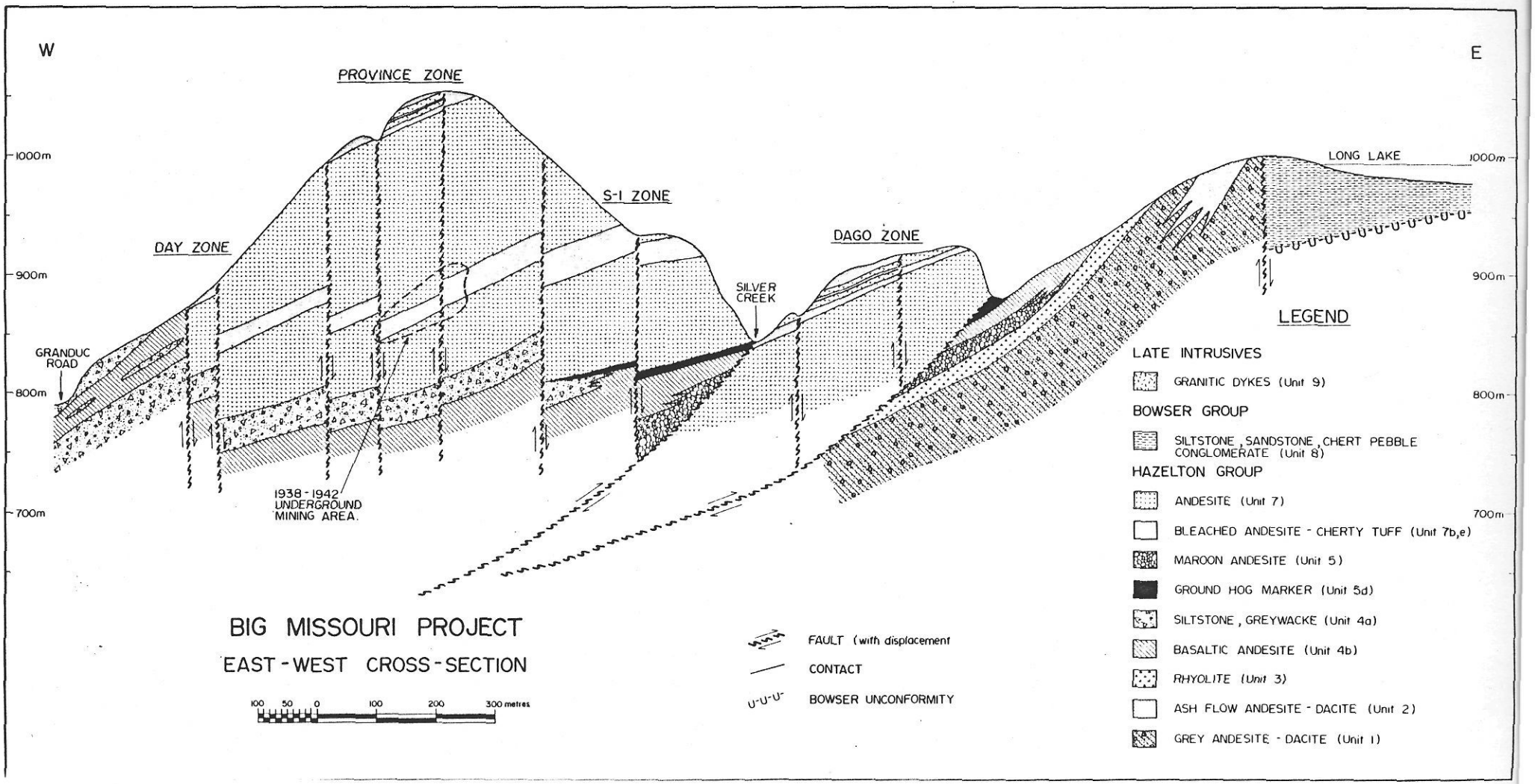

W
E
PROVINCE ZONE
S-1 ZONE
DAY ZONE
DAGO ZONE
LONG LAKE
1000m
900m
800m
700m
GRANDUC ROAD
SILVER CREEK
1938 - 1942 UNDERGROUND MINING AREA.
BIG MISSOURI PROJECT
EAST - WEST CROSS - SECTION
100 50 0 100 200 300 metres
FAULT (with displacement
CONTACT
BOWSER UNCONFORMITY
LEGEND
LATE INTRUSIVES
GRANITIC DYKES (Unit 9)
BOWSER GROUP
SILTSTONE, SANDSTONE, CHERT PEBBLE CONGLOMERATE (Unit 8)
HAZELTON GROUP
ANDESITE (Unit 7)
BLEACHED ANDESITE - CHERTY TUFF (Unit 7b,e)
MAROON ANDESITE (Unit 5)
GROUND HOG MARKER (Unit 5d)
SILTSTONE, GREYWACKE (Unit 4a)
BASALTIC ANDESITE (Unit 4b)
RHYOLITE (Unit 3)
ASH FLOW ANDESITE - DACITE (Unit 2)
GREY ANDESITE - DACITE (Unit 1)

Figure 6