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BRALORNE CAMP
and
PACIFIC EASTERN CLAIMS
Review and Exploration Potential

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INTRODUCTION

This report is based mainly on a paper study of the fairly voluminous available literature, and on talks with several other parties currently interested in the area. My own field experience is restricted to areas in the district but well outside the main Bralorne camp.

BRIDGE RIVER DISTRICT

General Aspects

Encompassing the Bralorne mine is a NW-SE trending synclinal belt of Permian to Jurassic oceanic sediments, some 10 km wide, cored by an elongate soda granite stock, augite diorite, and andesitic greenstone. The core is bordered by major faults which have partly coextensive serpentine bodies.

An interesting aspect of the district is that the synclinal belt is slightly arcuate, and that together with several mineralized and topographical features, it forms a district-scale elliptical feature roughly centred on the 4 km by 10 km 57 m.y. old Bendor batholithic stock (see attached map by Drysdale, 1922).

Drysdale's mapping implies a steep batholithic contact, as does the steepness of the axial planes of the adjacent folded sediments and the apparent lack of vertical zoning in the veins.

One reasonable explanation incorporating all the above features is that (a) the Bendor batholith was intruded forcefully with concomitant compression and uplift and (b) it is now well-unroofed. Forceful intrusion has been inferred by one observer for the diorites, and these are a probable early differentiate of the same batholith. Contact metamorphic effects of the batholith reach some 1 km or more from the contact, just barely into the Bralorne camp.

Somewhat older (70 vs 57 m.y.) batholithic rocks are present on the SW side of Bralorne. These too could be implicated in the folding, as could plate tectonism. Low angle thrusts are not known in the area but the presence of oceanic basin rocks (the Bridge R.-Cache Ck. assemblage) between island arc assemblages is curious. At the very least the evidence necessitates a suture zone of major extent. According to Monger (1977) this zone is 1400 km long, and the curious juxtaposition of assemblages is either an obduction or entrapment phenomenon.

The greenstone and the soda granites are also taken, on the basis of contact relations, to be comagmatic with the Bendor batholith, though having earlier and slightly differing dates of emplacement. The accompanying table (Fig.1) provides the most reasonable stratigraphic succession, but doubts remain e.g.

1. As to the age of the serpentine
2. Whether the Cadwallader series is later than or partly correlative with the Fergusson rocks and
3. The age of mineralization. A 47 m.y. date is available from the Minto vein but this is not necessarily the age of the Bralorne mineralization.

PERIOD	FORMATION	LITHOLOGY	ALTERATION	VEIN HOST	
	BENDOR intrusives 57 m.y.	Granodiorite,* related dykes	None	Never	
TERTIARY		Albitite dykes*(quartz feldspar porphyry, feldspar hornblende porphyry, and other felsites)	Minor quartz-sericite-py-asp	Rarely	
	Serpentine	Serpentine	Carbonate-silica (unrelated to Au) Talc (near W. end of veins)	Rarely	
CRETACEOUS	BRALORNE intrusives 62m.y. (near Arizona mine, 67 m.y. on dyke at Minto)	Soda granite(sodaclase tonalite* or albite quartz diorite)*	Quartz-sericite-carbonate	Sometimes	
		Augite diorite* (augite sodaclase diorite)	Early stage: clinozoisite or prehnite + quartz Later: ankerite, sericite, silica, local py and chlorite	Often	
	COAST PLUTONIC COMPLEX (73 to 78 m.y.)	Quartz diorite			
TRIASSIC	Cadwallader Series	HURLEY group	Sediments: argillaceous, tuffaceous and limy		
		PIONEER formation	Greenstone lavas*(possible minor rhyolite ?) (possible u m flows)	Early?: carbonate Later: quartz-albite py-asp Local: Kaolin(BRX) Biotite (Pioneer)	Often
		NOEL	Sediments: argillaceous and tuffaceous. (Possibly correlate with Ferguson)		
Permian (to mid Jurassic?)	FERGUSON group (Bridge River Series)	Cherty sediments and some lavas	Lavas have ankerite, py, asp.		

* Probably one family

The ultramafics (mainly serpentine) represent particularly puzzling occurrences with respect to age, mode of emplacement on mineralization. Later writers have favoured an intrusive origin, hot or cold, or both. Earlier ones suggested an extrusive origin for at least some of the ultramafics, based on the frequent presence, albeit with faulting, at the contacts between the Pioneer and Noel Formations. This would also imply an earlier age than the post-diorite/pre-mineralization age otherwise suggested for the serpentine. Virtually no mineralization in the Bralorne-Pioneer camp cuts the serpentines. These have, on the contrary been regarded as dams to hydrothermal flow, an interpretation which is probably correct. Nevertheless some care is needed not to totally write off the serpentines as potential host rock. In almost identical systems in California, the serpentine itself is a common host. It is also a host to some small deposits to the NE on the Yalakom Fault zone.

Relation to other Districts

A most interesting comparison can be made to other districts within, and even outside, the Cordillera.

The striking common features (as listed on the accompanying table) are the grades, metal ratios, great vertical extent, general lack of vertical zoning, relation to major faults, proximity to serpentine and mineralogy. An indisputable similarity is present in the Coquihalla belt, B.C. and the Grass Valley and Mother lode districts of California. Deposits in the Juneau district of Alaska, the Timmins of Ontario, the Kalgoolie of Australia and the Cassiar of B.C. may also belong in this class.

SHARED CHARACTERISTICS OF SEVERAL Au DISTRICTS

	Bralorne B. C.	Coqui- halla B.C.	Grass Valley Calif.	Mother Lode Calif	Juneau Alaska	Timmins Ontario	Kalgoolie Australia
Av. grade Au, oz.	0.5		0.5	0.3		0.5	0.4
Au:Ag Ratio	1:5	1: 6	1:3·7	1: 10		1:6·5	1: 8
Vertical extent mining; m	1830		+1300	+1740		Deep	
Veins: Nature	Ribbon	Cavity	Cavity & ribbon	Fissure fill			
% sulphides	3	2	Up to 20	3.5			
sulphides	Py, asp	Py, asp, po	Py, asp minor b.m.	Py, asp minor b.m.			Py
gangue	Qtz, mari, talc, ank, rutile	Qtz	Qtz, ank, cal, ser	Qtz, ank, cal, mari.	Qtz, rutile cal, carb, alb, adul, ser, mari, tm	Qtz, cal, alb, ortho- cl, ank, ba, tm	Qtz, ank, cal
Wallrock: Lithology	Greenstone Granite Diorite	Greenstone felsite, seds	Granod.	Seds, greenstone, granitics		Syenite, feld.por., lavas, seds.	Dolorite
Alteration	Qtz, ser, ank, alb,	Alb, fuch	Ser, ank chl, epi	Ank, ser	Alb	Ser, fuch, carb, qtz	Chl, ank cal, ser
Non-vein ore	Network q. at Dan Tucker?	Rpemt? in seds Qtz.net works		Ank, ser alb, qtz bodies in greenstone & schist		Sil, ank, fuch bodies	
Relation of ore to serpentine	Close	Close	Close, occasion- ally within	Close,	Close?	Ultramatic flows only	Close
Distance of ore to batholith, km	1½	5		5 to 15		3	

Three useful conclusions emerge from this comparison:

- a) The composition of the felsic intrusives is unimportant. It is likely that their significance lies in ground-preparation capacity and possibly as heat sources for local hydrothermal cells.
- b) Non-vein type Au mineralization is often present, e.g. as in the Idaho deposit in the Coquihalla belt. There is no obvious reason why such deposits should not also be present in the Bridge River district
- c) The ores have close proximity to serpentine bodies, but not necessarily the reverse. The relationship appears to be indirect, mediated by structure. Alteration associated with the serpentine may provide a precipitating factor for Au deposition.

Tectonic Setting

Monger (1977), emphasized the distinctive features of a 1400 km x 75 km belt that he called the Cache Creek-Bridge River oceanic assemblage, which includes the Fergusson and Cadwallader rocks. The choice of mega-tectonic mechanisms responsible for the emplacement of this assemblage has yet to be resolved among the academics sutured to sliding sheets, but the Bridge River area has attracted much attention as a result of their efforts. John Potter at U. of Washington has just completed a thesis on the Bridge River Complex itself, and Margaret Rusmore, also in Washington, is half way through assembling a dissertation on the Cadwallader series. She has also worked in some detail in Grass Valley, California and confirms the similarity of geological setting to that of Bralorne.

Meanwhile Jim Monger has been examining the Ashcroft area where Bridge^{R.} rocks also occur. Out of all this interest it is probable that new information regarding the setting of the Bralorne deposits will arise, with attendant aid to exploration. For example, trace element analyses of the Bridge River (Fergusson) rocks were carried out by Potter, and similar analyses by Rusmore of the Cadwallader rocks in 1984 will allow a comparison that may substantially affect our understanding of the host structures at Bralorne.

BRALORNE-PIONEER MINES

Economics:

Production:

Bralorne (including king section) 5.5 m.t. @ 0.51 oz/t.Au
Pioneer 2.5 m.t. @ 0.54 oz/t.Au

Cut-off grade: (at closure) 0.3 oz/t.Au

Mine Depth: 1830 m below surface
Temperature at botton 135°F

Reserves: In 1982 E & B Explorations estimated total
(including inferred) reserves at 915,115 t.
@ 0.25 oz/t.Au, based on a cut-off of 0.14 oz/t.
and a mining width of 122 cm.

Upon closure, good grade ore was present at the deepest mine level and the deposit can be considered open at depth.

Metal Ratio : Au:Ag = 1:5

Veins

The veins comprise notably ribboned quartz fissure fillings with local footwall brecciation. Some 20 to 40% of the veins encountered proved to be productive.

The best grades are reported to be present in undulating rather than straight veins, near vein branchings, and near serpentine bodies.

The ore systems appear to have a rhythmic distribution, being centred at intervals of roughly 1.7 km along the mineralized belt.

A major feature is the consistency of grade, mineralogy and Au:Ag ratio over the full vertical extent of the workings. Vein minerals comprise approximately 3% total sulphides, including pyrite and arsenopyrite with minor base metals and scheelite. The gangue includes some calcite, mariposite, talc, ankerite, and rutile. Wall rock alteration includes quartz, sericite, ankerite, albite, pyrite and arsenopyrite. In general the walls are depleted in Si and Na and enriched in CO_2 , H_2O , S, and K_2O .

Host Rocks:

The major hosts are an andesitic greenstone, an augite diorite and a soda granite. The relationships between these three are suggestive of a co-magmatic origin, supplied perhaps by the Bendor granodiorite batholith $1\frac{1}{2}$ km to the north. There are very minor vein incursions into sediments adjacent to the volcanic-intrusive complex.

Ore Controls

These are:

1. The structural belt parallel to the batholithic contact, bounded in part by the major Cadwallader and Fergusson Faults.
2. The mainly linear serpentine bodies which lie adjacent to the above major faults. The serpentine may be effective either by damming (channeling) hydrothermal fluids or by the chemistry of its associated talc-rich alteration halo.*
3. The periphery of the soda-granite - almost certainly a structural rather than chemical control.
4. Flexures in the Cadwallader Fault, present at both the King and the Bralorne proper.

* One writer (Coveney, 1971), in relation to the remarkably similar Grass Valley mineralization, has suggested that hydrogen released by crushed magnetite could act as a Au precipitant in such situations.

PACIFIC EASTERN CLAIMS

General Description

These claims cover a 6½ km strike length, roughly on line with the King-Pioneer deposits. It incorporates ground formerly known as the Pioneer Extension, the Plutus, the President Group and the Dan Tucker. The Paymaster, Red Hawk, and Bramoose all lie within a km of the Pacific Eastern claim boundary.

A total of some 1400 m of drifting and cross-cutting has been carried out at the western end of the claims as well as some exploration drilling, but the assay records are incomplete. Relogging of the core was undertaken by J.S. Stevenson in 1953 however and his logs are available.

The Cadwallader and Fegusson Faults certainly extend through this ground, but there are two possible loci for the former. All the Bralorne-Pioneer lithologies are present, though in differing proportions, and there is in addition some feldspar porphyry dyking. The major change appears to be that a greater width of greenstone and diorite and a lesser of the soda granite are found within the Pacific Eastern block. Locally intense sericite, carbonate and talc alteration is reported.

A moderately well developed vein system is present also, but reports on mineralization are sparse. The principal vein where drifted on has 0.58 oz/ton Au over a 33cm width and 28m length, and where winzed, average values of 0.15 oz/t. over 48cm x 10.5m and 0.2 oz/t over 44cm x 29m. Other reports are vaguer e.g. "Free gold" in drill hole S13, "some spectacular values", etc.

The narrow granite on the Pacific Eastern ground is stated to be more broken than at Bralorne. This fracturing could be pre-ore in that at least one vein is present in it, with a length of 36m and a width of 122 to 336cm. No mention is made however of mineralization in this vein.

At the other (E) end of the claims block on the former Dan Tucker group shears up to 15m wide are reported to contain a 1m wide section of crushed quartz (or quartz stringers) within greenstone near albite dykes. Occasional free gold was seen in the quartz. This is not particularly exciting but two other features add to this areas exploration potential. These are the presence of serpentine on both sides of the showing and the probability of a major fault flexure or flexures in this vicinity (Map 431A) (E & B Fig. 3.2).

Exploration Methods

No modern prospecting techniques appear to have been employed on the Pacific Eastern ground. Au:Ag and Au:W ratios may prove to be useful. Also volatiles, such as Hg. An interesting sidelight is that methane is being produced in fairly substantial quantities from at least one location within the Pacific Eastern workings, attesting to a currently open fracture system.

Warren (personal communication) states that he found biogeochemically anomalous Au (up to 7.3 ppb, dry weight, in Douglas Fir) in a few samples taken from the Pacific Eastern ground. He estimates a conservative threshold at 5 ppb with background levels of 1 to 3 ppb. His sampling over the King section of the Bralorne mine yielded values between 3.7 and 7.2 ppb. This is interesting in view of the fact that no placer Au has been found upstream from the Pioneer mine in

Cadwallader Creek. However much of the creek sediments must originate from much further upstream and from high on the steep valley walls, effectively masking residual sediments in the creek floor.

Harrop (1984), in a somewhat theoretically oriented computer study of mineral deposits in the Bridge River District, has studied Au:Ag ratios. Production records suggest a moderate increase in ratio with depth within the Bralorne and King deposits (combined) but a weak decrease with depth at the Pioneer. The significance is not entirely clear, but a refinement of this study could yield a good pragmatic exploration guide.

One obvious and cheap surface approach is by magnetometer. This would have the very important advantage not only of outlining the ultramafic zones and probably the greenstone but of showing flexures in the major serpentized faults. The interpretation can be supplemented in part by a precise knowledge of bedrock depths. Associated electro-magnetic work could do much to additionally outline the major fault structures.

Reopening of the workings at Pacific Eastern will be initially expensive. It seems probable that much of the 150m long adit is caved. For this reason the Bema group and Stevenson have suggested surface drilling prior to any attempt to re open the mine. Such drilling too will be expensive in view of the deep bouldery overburden in Cadwallader Creek and necessary depth of penetration. However it should be emphasized that the spacing of these drill holes can be fairly sparse. A longitudinal section of the Pioneer Mine shows major stoping, and therefore ore, to comprise some 60% of the area of the entire section. This is quite a high ore to waste ratio.

This fact, along with the size and strike separation of the King, Bralorne and Pioneer mines, suggest that a series of drill holes spaced at 1km intervals along the belt would have had an approximately 80% chance of yielding an ore grade intersection in one of the 3 deposits.

Summary of Potential

1. The claims are located within the same structurally and lithologically anomalous slice as the highly productive Bralorne-Pioneer mines.
2. Favourable contributory factors include the presence of vein systems with associated Au of sub-economic but interesting tenor and extent.
3. Two zones within the 6½ km strike length of the claim block are known to have promise. This length, and the theoretical consideration of rhythmic distribution of deposits, suggest the possibility of at least one more, - perhaps in the vicinity of the former Plutus ground.
4. Theoretical data now becoming available may provide new insights on ore emplacement.
5. Modern exploration techniques have not been applied to the Pacific Eastern ground, and several are directly applicable. Except for surface mapping only 12% of the favourable trend has been explored with intensity.

CONCLUSIONS

The potential of the Pacific Eastern ground represents a valuable opportunity for participation in the immediate vicinity of a proven and pre-eminent mining camp..

The high initial exploration costs are ameliorated by the quantity of data already collected and by the availability of Normines Resources Ltd. as a contributing partner.

Unless the terms of partnership are particularly onerous, participation by Kerr Addison Mines Ltd. is strongly recommended.

SPECIFIC RECOMMENDATIONS

Approx. Cost

- | | |
|---|-----------|
| 1. Preliminary studies covering metal ratios and relation to other (epithermal) deposits in the district. Examination of Pacific Eastern core logs, and core itself if available. | \$ 5,000. |
| 2. Surface program:
Geological mapping, Magnetometer and EM work, on scale 1:5000. | 90,000. |
| 3. Diamond drilling from surface 2-500m holes at E & W ends of claims. | 150,000. |
| 4. Fill-in drilling reconnaissance on 500m to 1 km intervals along trend, re-opening of Pacific Eastern workings, etc., as desirable. | ? |

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