Island Copper
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REPORT ON THE ALTAIR MINING CORPORATION LTD. AND MARSHALL CREEK COPPER CO. LTD. PORT HARDY VANCOUVER ISLAND, B.C. 92L/12E

SUMMARY AND CONCLUSIONS

The claim blocks of Altair Mining Corporation Ltd. and Marshall Creek Copper Co. Ltd. lie immediately west of the Utah claim block which hosts the Island Copper porphyry deposit. The properties lie in a belt of intrusive stocks which exhibit hydrothermal alteration, silicification, and development of skarn - i.e., an area of high mineral potential.

The claim groups are underlain chiefly by volcanic rocks of the Bonanza Subgroup. Mineralization is mostly concentrated in the tuff to breccia horizons and is entirely pyrite.

Geochemical surveys have indicated several small anomalous areas, but none of any significance. One more prominent anomaly in the northeastern part of the claim block may require an induced polarization survey and subsequent drilling to explain it.

Geological surveys over the entire claim block have shown that there are no areas of significant alteration or mineralization.

Ground magnetometer surveys and an induced polarization survey (12 line miles) were run over parts of the claim block, but neither proved to be of any significance.

Three vertical diamond drill holes totalling 3,147 feet have been drilled and all three encountered pyrite as the only sulphide (up to 5%).

Further induced polarization surveys over geochemically anomalous areas is required to further evaluate the potential of the properties.

RECOMMENDATIONS

The claim blocks of Altair Mining Corporation Ltd. and Marshall Creek Copper Co. Ltd. are not recommended for option at this time. A reassessment of the data with reference to specific target areas will be contingent on the outcome of the aeromagnetic filtering project being carried out on the regional area by Lockwood Surveys on behalf of Amoco.

DESCRIPTION OF PROPERTIES

ALTAIR:- The Bid and Bon claims, consisting of 84 contiguous claims, were staked in 1968 and are located in the Nanaimo Mining Division. They are recorded as follows:

BON 1 - 36	BID 1-40
41 - 44	
53 - 56	

In addition, the following 26 claims were recorded in February of 1970.

WIZ 1 - 20
23 - 28

These claims adjoin the Marshall Creek claims to the east and IDA claims to the west optioned by Ron Stokes to Cyprus.

(See Fig. 2 for exact locations)

MARSHALL CREEK:- The property consists of a contiguous block of 40 claims located in the Nanaimo Mining Division. The claims are recorded as follows:

Name	Record No.
Mar 1 - 14 incl.	20741 - 20754 incl.
Mar 15 - 36 incl.	20755 - 20776 incl.
Mar 39 - 44 incl.	20777 - 20782 incl.

Marshall Creek Copper Co. Ltd. (N.P.L.) owns the precious and base metal rights to all of the above claims, except Mar Nos. 18 - 23 inclusive. Mar No. 15 and Mar No. 17 have recently been dropped.

(See Fig. 2 for exact location)

LOCATION AND ACCESS

The properties are located between Coal Harbour on the south and Quatse Lake on the north on the north side of Holberg Inlet on the West Coast of Vancouver Island at a latitude of approximately 50° 37' and longitude of approximately 127° 33' (see Figs. 1 and 2). The distance from Port Hardy to Coal Harbour by road is about 12 miles. This road cuts across the claim groups and local logging roads provide additional access (see Fig. 2).

Coal Harbour has access to the Pacific Ocean through Quatsino Sound.

Port Hardy has ocean, air, and road connections.

The newly opened Island Copper deposit is located only 2 miles due east of the claim groups. Thus, transportation, electrical power, etc. would be available.

OWNERSHIP

At present the properties of Altair and Marshall Creek are being looked after by the firm of Carlisle, Douglas and Co. Ltd. The author was in touch with Dave Douglas. Another person who may be contacted is Mike Warren, a lawyer for the two companies. The data on the two properties was obtained from Helmut Wober of MacDonald Consultants. Apparently, any option agreement would involve both Altair and Marshall Creek.
At present the properties are available for option.

HISTORY AND EXPLORATION TO DATE

A frantic staking rush started in the late summer and fall of 1967 with the announcement that Utah Construction and Mining Co. had located what appeared to be a major deposit in the area (now Island Copper). Marshall Creek Copper Co. Ltd. (N.P.L.) acquired its ground from local prospectors early in 1968.

Work on the Altair and Marshall Creek properties was first carried out by MacDonald Consultants during 1968. A geochemical survey was carried out on the BON 1-36, 41-44, 53-56, 58-70, and BID 31, 33, 35, 37, and 39 mineral claims between January 18, and June 8, 1968. A total of 1,693 soil samples were collected over approximately 49 miles of line. Some geological work was done concurrently with the geochemistry. A similar program of geological mapping, soil sampling, and stream silt sampling on the Marshall Creek Copper Co. Ltd. (N.P.L.) property was carried out by MacDonald Consultants Ltd.

during 1968.

A total of 24.98 line miles was done. A total of 689 samples were collected (mainly soils).

Field work in the form of geological, geophysical, and geochemical surveys and diamond drilling was performed on the Altair-Marshall Creek properties from July through November, 1970.

This work was done for Inspiration Development Company by MacDonald Consultants Ltd., Seigel and Associates Ltd., and Pacific Diamond Drilling Ltd., all of Vancouver, B. C.

The Altair-Marshall Creek properties were held under an option agreement by Inspiration Development Company.

Three diamond drill holes totalling 3,147' were completed on the properties.

Besides ground magnetometer surveys, an induced polarization survey was carried out from August 2 to August 11, 1970 by Seigel on behalf of Inspiration Consolidated Copper Co. Ltd.

GEOLOGICAL SURVEYS

Reconnaissance geological surveys of both the Altair and Marshall Creek properties were carried out by MacDonald Consultants in 1968. A geologic map of the Marshall Creek claims was prepared at a scale of 1" = 500'.

Detailed geological mapping on a scale of 1" = 50' was performed over selected parts of the NE section of the claim blocks and surroundings. Mapping was also detailed in the area of Mamoser Creek.

Fracture patterns and fillings, shearing and faulting directions were especially detailed.

A zone of silicified and pyritized Bonanza Subgroup volcanic rocks was outlined in proximity to a NE trending fault structure. Chip samples taken were very negative (eg., Au - tr; Ag - tr; Cu - tr; MoS_2 - tr).

A regional geological map of the claim blocks at a scale of 1" = 1000' was prepared by C. F. Dyson of MacDonald Consultants.

GEOCHEMICAL SURVEYS

MARSHALL CREEK:- (1968) A total of 24.98 line miles was completed on the Mar 1-14, 17-36, 39-44 group. A total of 689 samples were collected, mainly soils, at 200' intervals on lines 400' apart.

Second check samples were taken at regular intervals in order to control sampling and assaying procedures. All samples were assayed for copper and molybdenum. Hot aqua regia digestion was used. The copper values were determined by the atomic absorption method; the molybdenum values, calorimetrically.

Background values for copper in the soil were established to be approximately 30 ppm. Anomalous values range from 80 - 100 ppm.
The background for molybdenum is extremely low and ranges from 0 - 3 ppm. Anomalous values range from 8 to 16 ppm.

ALTAIR:- (1968) Samples were taken at 200' intervals on lines spaced 400' apart on Bon 1-36, 41-44, 53-56, 58-70, and Bid 31, 33, 35, 37, and 39 mineral claims. All samples were analyzed for copper and every second sample for zinc. Several low intensity anomalies were outlined. In detail zinc and copper anomalies are not coincident, but on a broad scale, there is some correspondence of generally high metal content.
The most significant area is in the NE corner of the property. Here many anomalies occur within an area of 3400' x 6000'. One of the copper anomalies (see Fig. 4 for approximate location) has a known length of 1,200' and a width of 600', with a broad peak of values ranging from 198 to 460 ppm.
The following geochemical surveys have thus been completed.

(1) Bid 7-10, 17-20, 20-30 claims - 314 samples over approximately 12.5 miles of line grid
(2) EB 1-13, 15-16 claims - 400 soils over 16 miles
(3) WIZ 1-20, 23-28 - 621 soils over 26.5 miles
(4) MAR near "pyrite zone" - 71 samples

(1) Bid 7-10, 17-20, 20-30

Background values for copper were estimated to lie between 35 and 50 ppm. Values greater than 100 ppm. were considered significantly anomalous.

The most prominent area exists in the vicinity of BID 7, 8, 9, 10, and 29. In general, the anomaly shows a NE trend approximately paralleling a major fault. In general there is a fair correspondence between the geochemical 'highs' and a magnetometer 'low'.

Further investigation would be required to firmly establish the nature of the geochemical anomaly (i.e., an expression of underlying mineralization, drainage features, or transported metal-rich till?).

(2) EB 1-13, 15-16

Background values for copper were estimated to lie between 35 and 50 ppm. Values greater than 70 ppm. were considered significantly anomalous. Small areas of such readings exist in the vicinity of EB 2, 5, 7, and 9 claims. Anomalous values are probably the expression of metal-rich glacial till covering Lower Cretaceous sediments.

(3) WIZ 1-20, 23-28

Background values for copper were estimated to lie between 30 and 35 ppm. Values greater than 70 ppm. were considered significantly anomalous. Anomalous values exist in the vicinity of the WIZ 7, 9, 19, 20, and 28 mineral claims. There does not appear to be any correlation between these anomalous values with possible structural or geological trends. The anomalous values are probably the expression of glacially transported metal-rich tills.

(4) MAR

Soil profiles were taken over part of a geochemically anomalous area outlined in the 1968 survey. There is a correlation between anomalous values and an interpreted NE fault structure and a postulated NW geological contact. This response is probably related to the underlying bedrock. The anomalous area lies to the east of the Mar pyrite zone and it has been suggested by MacDonald Consultants that the area underlying the geochemical anomaly may represent a copper-bearing sulphide zone with the pyrite zone to the west, the halo to the copper zone. This suggestion seems doubtful since no copper mineralization at all was encountered in the drilling in the pyrite zone. Some response for copper would be expected if lateral zoning was in effect.

GEOPHYSICAL SURVEYS

Ground Magnetometer - The following ground magnetometer surveys were carried out in 1971.

(a) A survey was performed over a line grid established on the BID 7-10, 17-20, 28, 30 claims in conjunction with a geochemical soil survey.

(b) A survey was completed over 2 long reconnaissance lines that run northeastward across the BID and BON claims.

(c) A survey was perfcrmed over part of the I.P. grid in areas where anomalous values were outlined by the Seigel survey.

A Sharpe MF1 fluxgate magnetometer was used.

(1) BID Claims

The objective was to delineate the contact between Bonanza volcanic rocks and the Nanaimo sediments. This was not realized.

In general, the magnetics were relatively flat with a total relief of approximately 1,000 gammas. The significance of the relative lows on the BID 7, 8, and 10 claims is unknown, but this coincides with a geochemical anomaly. It is possible that low magnetic relief could be the result of variations in overburden depths and not necessarily an expression of bedrock magnetics.

(2) N.E. Reconnaissance Lines

On both lines a pronounced increase in response occurred in the vicinity of the projected Quatsino limestone belt which outcrops east of Quatse Lake. Values in excess of 4000 gammas were recorded in proximity to limestone outcrops. The relatively high response is attributed to the possible development at depth of magnetite in contact areas of the limestone with an underlying batholith (?).

Low magnetic responses correspond with possible fault structures.

A definite correlation between magnetic readings and the diorite was made on the western reconnaissance line.

The magnetic response south of the Quatsino limestone is generally low and represents the expression of the underlying Bonanza sequence of volcanic

rocks. Minor variations are attributed to variation in overburden depths and not attributed to expressions of bedrock magnetics.

(3) I.P. Grid Area

Very little relief was observed. No real magnetic relief was seen on the reconnaissance line run south over the pyritized area on the MAR claims. The response in the northern I.P. area is attributed to expression of underlying bedrock and was thought to represent a small content of pyrrhotite (MacDonald Consultants, 1970).

Induced Polarization Survey

The survey was conducted by Seigel Associates on behalf of Inspiration Consolidated Copper Co. Ltd. in 1970 on property approximately 1 mile NW of Coal Harbour. The claims covered include: Mar 3-10, Mar 14, 22, 24, 26, 28, and Bon 9, 11-14, 41-44. Scintrex MK VI time domain (pulse type) I.P. equipment was used.

A baseline was laid out oriented E-W and grid lines were established perpendicular thereto (see Fig. 5 for survey area). The grid line spacing was 400' for the area south of the baseline, while a line spacing of 800' was used for 3 survey lines north of the baseline. The 3 electrode array with station intervals of 200' were employed.

The chargeability results indicate that over much of the survey grid the background values are generally less than 10.0 milliseconds. Four areas with chargeabilities greater than 10.0 milliseconds were delineated. A uniform subsurface distribution of 1% by volume of metallically conducting mineralization might be expected at this level. The resistivity profiles are quite uniform with resistivities ranging from 100 to 1000 ohm-metres.

There exists an extensive high chargeability area in the north part of the grid with peak chargeabilities in excess of 30.0 milliseconds. This amplitude of response could arise from bedrock containing the equivalent of 3% by volme of metallically conducting material (Seigel, 1970). The other 3 "high" chargeability areas may also contain 2 - 3% by volume of metallically conducting material. However, the electrode spacings are too wide to give good definition of the four bodies.

Diamond Drilling

Pacific Diamond Drilling has completed 3,147' of NQ and BQ wireline drilling in 3 vertical holes which are located in two separate areas.

(i) The Mar No. 1 and Mar No. 2 drill holes were located in the pyrite zone on the Mar 5-8 claims where an I.P. anomaly was outlined. Both holes were spotted close to where the I.P. survey gave maximum response for sulphides. Both holes had very similar geology, cutting thick

sequences of andesitic tuffs - with minor breccia and lapilli sections - and andesitic flows and massive diabase dykes. Mineralization was mostly concentrated in the tuff to breccia horizons and was entirely pyrite. Sulphide content averaged 1 - 2% with locally 4 - 5% in the first 300 feet or so of both holes, and then decreased with depth until minor in amount.

Clay alteration was also predominant in the pyroclastics in both drill holes.

Almost all the mineralized pyroclastic sequences were sampled and assayed for copper and molybdenum, and every tenth one of these samples was additionally assayed for silver and gold. None of the results was of apparent economic significance.

Mar No. 1 was drilled to a depth of 789.0 feet.

Mar No. 2 was drilled to a depth of 613.0 feet.

The drill results indicate that the I.P. anomaly outlines an area of pyritization with no associated copper mineralization at any depth. The pyrite zone thus does not appear to represent an upper or lower alteration halo of the type often associated with a porphyry copper deposit. The drilling, however, does not rule out the pyrite zone representing lateral zoning from a porphyry-type deposit.

(ii) The Mar No. 3 drill hole was located south of Quatse Lake near the northern boundary of the BON claims, in an area having the following

features:

a) anomalous geochemical soil values for copper and zinc
b) a northwest-southeast structure trend traceable to the Bay deposit area from Quatse Lake
c) the presence of small quartz-porphyry plugs (?)
d) the presence of Quatsino limestone to the north and dipping to underlie the area
e) a possible contact area of limestone and intrusive at depth.

The hole mainly cut a massive sequence of volcanic breccias and agglomerates with thin interbedded tuffs and andesite flows. Fossiliferous sediments were seen in the upper part of the hole and argillaceous sediments close to the bottom of the hole. No alteration that could indicate intrusive activity was seen. The Quatsino limestone was not reached in the hole which was stopped at a depth of 1745 feet.

The results of the above hole indicate that there is great variation in the Bonanza Subgroup in the claim areas. There is no similarity between the sequences cut in Mar No. 1 and Mar No. 2 and those cut in Mar No. 3. It would appear that block faulting in the area has had considerably more effect on the regional stratigraphy than was at first realized.

Assay results of mineralized sections in the holes in the pyrite zone on the Mar claims were completely negative for copper, molybdenum, silver, and gold values. The hole Mar No. 3 was also lacking in mineralization.

Thus it appears that block faulting is of greater significance than is apparent from surface geological mapping.

REGIONAL GEOLOGY

The Altair-Marshall Creek properties lie near the eastern end of a belt of intrusive stocks of apparent mid-Jurassic age, which extend from the east of Rupert Inlet northwesterly to the mouth of the Stranby River (see Fig. 3) The stocks suggest that a shallow batholith may underlie the area. The line of intrusives is roughly coincident with the regional trend of the upper part of the Karmutsen Formation, the Quatsino Formation, and the sedimentary and lower pyroclastic part of the Bonanza Subgroup. All of these volcanic rocks and sedimentary rock units form part of the Vancouver Group and are unconformably overlain by Lower Cretaceous sedimentary rocks. Regional block faulting results in local repetition or loss of parts of the stratigraphic column.

Skarn zones are common wherever a contact between Quatsino Limestone and Karmutsen volcanic rocks exists. Quartz feldspar porphyry dykes, thought to be differentiates of Middle Jurassic, felsic, intrusive rocks, are commonly extensively altered and pyritized.

Scattered, fairly widespread zones of propylitic alteration and more local argillic, pyrophyllitic, and siliceous alteration of Bonanza rocks

along the northwesterly trend of acid intrusive stocks extending from the east end of Rupert Inlet to the mouth of the Stranby River is most striking. This alteration is thought to result from hydrothermal solutions emanating from shallow, underlying siliceous intrusives. Such altered rocks occur at Island Copper, Apple Bay, Wanokana Creek, Pemberton Hills, Hep property southwest of Nahwitti Lake, Red Dog property north of Holberg, and on the southwest crest of the plateau east of Stranby Valley. In some places, silicification is intense, with the resulting rock consisting of over 90% silica but with original textures of the rock still visible. The result of intrusive activity on Karmutsen rocks and Quatsino limestone is silicification or development of skarn. Limestone is commonly recrystallized to marble.

The belt of intrusive stocks and the accompanying hydrothermal alteration, silicification, and development of skarn occurring between Rupert Inlet and the mouth of the Stranby River is one of very high mineral potential. Not only are most of the known significant mineral deposits of the area located along this trend, but also widespread alteration suggests that other important deposits may still be found.

The north end of Vancouver Island is in a block faulting structural environment with post-Lower Cretaceous, northwesterly trending faults apparently the major system. This system causes both repetition and loss of

parts of the stratigraphic section. The most significant of these fault systems follows Holberg Inlet, with one branch passing through the west side of Stranby Valley and another branch continuing westerly toward San Josef Bay.

Northeasterly trending faults seem to be the next most important system.

The regional dip of bedding is gentle to moderate southwesterly.

There is little folding or flexuring of bedding.

In general, the area is structurally very complex.

LOCAL GEOLOGY

Bonanza Subgroup

The claim groups are underlain chiefly by green porphyritic andesite and rhyolite agglomerate of the Upper Triassic to Jurassic Bonanza Subgroup.

In some instances, as much as 5% pyrite may occur in the andesites.

Where bedding attitudes are visible in Bonanza rocks, northwesterly strikes and gentle to moderate southwesterly dips prevail. The Mar No. 1 and Mar No. 2 drill holes (see Fig. 4) had very similar geology, cutting thick sequences of andesitic tuffs - with minor breccia and lapilli sections - and andesitic flows and massive diabase dykes. Mineralization is mostly concentrated in the tuff to breccia horizons and is entirely pyrite. The Mar No. 3 drill hole cut a massive sequence of volcanic

breccias and agglomerates with thin interbedded tuffs and andesite flows. Fossiliferous sediments were seen in the upper part of the hole and argillaceous sediments close to the bottom of the hole. No alteration was seen. The varied geology in the limited 3 holes indicates that block faulting in the area has had considerable effect on the regional stratigraphy.

Argillic alteration is the most common, with or without the presence of pyrite.

Feldspar Porphyry ; Granodiorite

A series of apparently northwesterly striking (quartz) feldspar porphyries with minor associated propyllitic alteration crop out on the properties. To the south, Bonanza rocks are overlain unconformably by Lower Cretaceous sandstone, shale, and conglomerate. To the west of Quatse Lake a stock of granodiorite exists.

STRUCTURE

Bedding in Bonanza rocks strikes northwesterly and has gentle to moderate southwesterly dips. The feldspar porphyries were apparently emplaced along a zone which cuts the bedding at a high angle. Northeasterly and northwesterly faults are prominent throughout the area.

East-west faulting is minor except where Cretaceous sediments are in contact with older rocks. In drill sections, fault angles are moderate (i.e., approximately 45°).

As mentioned previously, block faulting within the area has caused repetition and/or loss of sections and thus complicates the geologic interpretation.

MINERALIZATION

Mineralization is mostly concentrated in the tuff to breccia horizons in volcanic rocks of the Bonanza Subgroup and is entirely pyrite. In diamond drill holes Mar No. 1 and Mar No. 2, sulphide content averaged 1-2% with locally 4-5% in the first 300 feet or so of both holes, and then decreased with depth until minor in amount.

EXPLORATION POTENTIAL

The Altair-Marshall Creek claim groups lie in a very favorable belt of known mineralization which extends in a northwesterly direction for some 30 odd miles. The geological environment of the claim group is similar to that of the major Island Copper porphyry copper deposit (approximately 2 miles to the east) and the recently discovered Red Dog porphyry copper to the west. The association or close spatial relationship of Bonanza volcanic rocks with acid intrusive rocks is a most favorable condition for mineralization. The right combination of structural controls

may also enhance localization. All these "requirements" are met on the claim groups.

Thus, a thorough study of the properties was justified.

The geochemical results are not encouraging, although several small anomalous areas have been indicated. The best anomalous area occurs in the NE corner of the claim blocks, an area which has not been tested by I.P. Extremely heavy seasonal rainfalls, deep overburden in places, and the presence of a thick layer of humus under a rain forest type vegetation hamper the use of geochemistry in the area.

Both the surface and subsurface geology has proven to be very uninteresting with regard to alteration and mineralization. Pyrite is the only sulphide visible and all three diamonddrill holes were barren.

The only potential for the area would be to conduct induced polarization surveys across areas of pyritization and adjacent geochemical anomalies in those areas which have not previously undergone I.P. work (see Fig. 5). Diamond drilling of anomalous areas would be contingent on the outcome of the I.P. surveys.

TGS

March 15, 1972 T. G. Schroeter