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PRELIMINARY GEOLOGICAL REPORT

ON THE

BRANDY MINERAL CLAIMS

LOCKEPORT, QUEEN CHARLOTTE ISLANDS

BRITISH COLUMBIA

FOR

ANA LAKE MINING LTD. (N.P.L.)

BY

R. D. WESTERVELT, P.ENG.

SEPTEMBER 30, 1969

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PRELIMINARY GEOLOGICAL REPORT ON THE BRANDY MINERAL CLAIMS OF ANA LAKE MINING LTD (N.P.L.)

1. INTRODUCTION:

An intensive exploration program has been undertaken by Ana Lake Mining Ltd (N.P.L.) to evaluate the old "Swede" and "Last Chance" copper showings near Lockeport in the Queen Charlotte Islands. During 1969, trenching, bulk sampling and diamond drilling has been carried out and additional surveys are currently underway.

Exploratory work is being directed by Weymark Engineering Ltd. of Vancouver. In August, the writer was retained by Mr W. J. Weymark to make a preliminary geological examination of the showing areas and advise on the geological features which might affect further exploration.

2. SCOPE OF PRESENT REPORT:

The present report outlines the results of the writer's field investigation and subsequent core examination of the twenty-one (21) holes drilled by Ana Lake Mining. Following logging of the core, Petrographic Analyses were received from Dr. H. T. Carswell and are included in this report as Appendix: C. Detailed relogging of the diorite phases may be warranted to determine the extent of the tuffaceous sections.

Field work, carried out during the period August 9th-16th, 1969 was limited to the immediate showing areas and included:

(a) 200' scale reconnaissance mapping of the Anna Inlet, Salmon Creek and Last Chance areas

(b) 50' scale mapping of the Nos: 1, 2 and 3 adits and adjacent open cuts (Anna Inlet area)

(c) A prospecting traverse and Brunton survey along a control line crossing the peninsula between the Anna Inlet and Salmon Creek areas

(d) Tying in of bulk sample and drill hole locations.

As no survey grid existed on the property, Brunton and chain traverses were used for control throughout the field examination.

3. PROPERTY, LOCATION AND ACCESS:

For property detail regarding registration numbers, location dates etc., reference is made to Weymark Engineering's earlier report of January 21st, 1969.

The Brandy claims are located near the abandoned town of Lockeport on the east shore of Moresby Island in the Queen Charlotte group (latitude 52°42'North-longitude 131°50'West). The claims include the prominent peninsula between McEchran Cove and Anna Inlet on Klunkwoi Bay.

Preliminary Geological Report on the Brandy Mineral Claims of Ana Lake Mining Ltd (N.P.L.), September 30, 1969 (continued):

3. Property, Location and Access(continued):

The claims group is situated 35 miles due south of Sandspit and approximately 470 miles northwest of Vancouver.

Access to the property is by means of float-equipped aircraft or boat. Landing points are limited by tidal fluctuation and steep shoreline topography to a few small coves.

4. PHYSIOGRAPHY:

The main showings presently being tested are situated on the peninsula between Anna Inlet and Salmon Creek. The peninsula is rocky and rugged with steep slopes rising at 40° from the shores to a central elevation of 1600 feet. The area is characterized by near vertical rock bluffs, heavy timber and extensive moss and underbrush cover.

The sharp ledges and topography inhibit ready access and preclude the use of a standard cut-line grid for geological and geophysical survey control.

5. HISTORY:

The "Swede" and "Last Chance" showings were originally staked in 1907 and have received sporadic exploration attention in the intervening years. The exploratory work is described and documented where possible in Weymark Engineering's report of January 21st, 1969.

In summary, three short adits were driven on the Swede showing on the Anna Inlet side of the peninsula prior to 1915. In 1916, Granby Mining carried out prospecting and drilled nine holes totalling 2000 feet in the vicinity of the Swede showing, along the east side of the peninsula and on the Last Chance zone east of Salmon Creek. Although much of this core is reported to have been lost in transit, further researching of the records has indicated detailed logs were made of all the holes and complete assays were obtained from three holes. These results, in condensed form, are presented in Appendix: A of the present report.

In 1951 a further reconnaissance examination was made by Granby and in 1956 New Jersey Zinc carried out limited mapping, sampling and drilling of three holes totalling 326 feet.

In 1967, the property was acquired by Cosmic Lode Mines and some drilling was completed in the vicinity of the Last Chance showings.

Unfortunately the results of prior exploration work are largely unavailable. The available data suggests much of the work was surficial and restricted to local areas and the owners may have been discouraged by the then low grade of mineralization and falling copper prices.

6. GENERAL GEOLOGY:

The "Geology of the Queen Charlotte Islands: has recently been published (Bulletin 54, B.C. Department of Mines, by A. Sutherland Brown) with geological maps on a 2 mile scale.

Preliminary Geological Report on the Brandy Mineral Claims of Ana Lake Mining Ltd (N.P.L.), September 30, 1969 (continued):

6. General Geology (continued):

The Brandy claims group is situated within an extensive area of Karmutsen basic volcanics overlain by local remnant cappings of Kunga limestone.

Extending northward from Vancouver Island, the Karmutsen Formation represents an accumulation of Triassic submarine basic lavas in excess of 14,000 feet in thickness. Massive basalt, pillow lava, pillow breccia and tuff are dominant rock types with minor interlava limestone, sandstone and shale. In general, the Karmutsen flows are fresh in appearance and alteration is limited to weak pervasive chloritization. In the vicinity of major intrusives, progressive metamorphism has resulted in fine derived amphibolites and amphibolite migmatites.

The Upper Triassic-Lower Jurassic Kunga limestone conformably overlies the Karmutsen and is equivalent to the Quatsino-Lower Bonanza Formation of northern Vancouver Island.

No major intrusives into the Karmutsen are indicated in the immediate vicinity of the Brandy claims. The major Jurassic(?) quartz diorite batholith along the western coast outcrops some 3 miles to the west and a small acid stock of Cretaceous or Tertiary age is exposed 2 miles to the north.

In the Queen Charlotte Islands, folding of the Karmutsen volcanics is generally low order and is often related to major northwestward trending fault systems. Sutherland-Brown interprets a low order anticlinal fold axis trending northwesterly across the mouth of Klunkwoi Bay. The Brandy claims would then be located on the shallow south-west dipping flank of an anticline. A subsidiary fault to the major regional faults is interpreted extending along Anna Inlet.

7. PROPERTY GEOLOGY:

(a) General Description:

As observed during the field examination, the showings areas and peninsula between Anna Inlet and Salmon Creek are entirely underlain by Karmutsen basic volcanics and related dykes and sills. The Karmutsen flows are composed of slightly chloritized and epidotized massive and amygdaloidal basalts. In surfaces exposures and drill cores, no pillow lavas or tuffs were observed and sharp interflow contacts are lacking.

The Kunga limestone capping mapped by Sutherland-Brown lies to the south of the reconnaissance traverse made by the writer and was not tied in in the field. As found in talus, the limestone is massive, medium grey and moderately crystalline with no indication of alteration.

As evidenced by the Kunga limestone capping, the Anna Inlet and Salmon Creek showing areas are located in the upper portion of the Karmutsen some 200-1200 feet below the top of the formation.

(b) Rock Types:

In the showing areas, three major rock types are encountered as follows:

Preliminary Geological Report on the Brandy Mineral Claims of Ana Lake Mining Ltd (N.P.L.), September 30, 1969 (continued):

7. Property Geology

(b) Rock Types (continued):

(i) Diabase Flows: The Karmutsen basaltic flows are quite variable in colour, texture and grain size. In general, the volcanics are medium to fine-grained, dense and medium to dark grey to green in colour. The flows are commonly amygdaloidal and more rarely finely porphyritic. Epidote, chlorite, calcite and quartz amygdules from 1/16" to ½" are widespread. Within the dense massive flows, epidote patches and mottling is common.

Although considerable variation occurs in appearance, earlier petrographic work has indicated only minor mineralogical differences in the volcanics. They are largely composed of plagioclase, pyroxene and chlorite with minor accessory magnetite - sub-ophitic textures are commonest and the flows are consequently classified as diabases.

Within the diabase sequence, flow contacts, flow structures and primary features are lacking and individual flows cannot be distinguished. The observed variations are gradational and erratic with no lateral continuity. Even coarsely amygdaloidal flows grade into dense non-amygdaloidal diabase over a few tens of feet. On the basis of the present evidence, the variations noted probably have resulted from normal differentiation within a thick lava flow.

(ii) Diorite: A medium to coarse grained light greenish grey diorite with a distinctive granular "salt and pepper" texture is evident in all the working areas. The diorite, varying from 3 to 30 feet in width, is almost invariably in gradational contact over several feet with the diabase flows. Present data indicates little continuity of the dioritic sections and suggests the diorite in part may be a normal gradational phase of the diabase.

In only one case has the diorite been observed in obvious intrusive contact. In Hole no: 18 a diorite dyke with sharp contacts and chilled margins cuts the volcanics. This one observation presents the possibility that the diorite may have intruded the diabases as late-stage dykes, sills and lenses which have been partially assimilated by the still hot lavas.

As the diorite is unmineralized and carries only trace amounts of pyrite, the bulk grade of copper mineralization can be adversely affected by a preponderance of dioritic material. Unfortunately, the present limited information precludes any conclusions on the pattern and distribution of the diorites. No relative increase in the amount of diorite is obvious between the Anna Inlet, Salmon Creek and intervening areas.

(iii) Diabase Dykes: Occasional fine to medium grained dark grey to black diabase dykes are present throughout the examination area. The dykes, varying from 1 foot to 30 feet in width, are generally steeply dipping. Chilled margins are common and narrow quartz-carbonate veinlets are frequent. The dykes are virtually unmineralized but infrequently carry coarse chalcopyrite seams remobilized from the adjacent volcanics.

Preliminary Geological Report on the Brandy Mineral Claims of Ana Lake Mining Ltd (N.P.L.), September 30, 1969 (continued):

7. Property Geology

(b) Rock Types

(iii) Diabase Dykes (continued):

The diabase dykes most probably represent the latest stage of intrusion associated with the Karmutsen accumulation. As evidenced in Hole no: 15, the dykes are later and intrude the typical diorite sections.

The diabases, diorites and dykes are variably weakly magnetic to non-magnetic. Magnetite is ubiquitous to all the rock types and shows no preferential association with the various phases or with the mineralization.

(c) Structure:

Due to the lack of primary features and marker horizons within the volcanics, the altitude of the flows is somewhat uncertain. As determined from amygdaloidal lenses east of Salmon Creek and indicated by the nearby conformable Kunga limestone, the volcanics generally trend 320°-350° (magnetic) and dip shallowly to the west at 25°-30°.

A major steeply dipping fault has been interpreted by Sutherland-Brown passing along Anna Inlet. A second similar fault is postulated trending 345° (magnetic) along Salmon Creek. Between these faults, two distinct sub-parallel linears are noted on the airphotos crossing the peninsula. Although no direct correlating evidence was found on the ground, these linears may indicate the limits of a zone of dilatency and weak shearing developed across the peninsula between the two fault systems.

No indication of strong structure or faulting was observed in the immediate examination area. A few tight chloritic shears are present in the adits and vague areas of weak brecciation and fine chloritic fracturing are evident. These features appear to be related to local cooling phenomena within the volcanics rather than to crustal disturbances. Jointing in several directions is moderately developed within the diabase.

(d) Mineralization:

Mineralization is confined to the diabase flows and consists of fine disseminations, blebs, hair-line veinlets and stringers of chalcopyrite and minor bornite. Pyrite is present only in trace amounts and where evident is generally unaccompanied by copper minerals. Bornite appears to be primary rather than secondary.

The mineralization is extremely erratic and is found scattered throughout all phases of the diabase with no obvious structural control. Disseminated sulphides show some preferential concentration in the finer grained and epidotized phases and in flows with heavy epidote amygdules. Within the amygdules, fine kernels and blebs of chalcopyrite following the radiating epidote crystals are often observed. Fine vein type mineralization is more commonly encountered in the weakly chloritized and finely fractured volcanics.

Preliminary Geological Report on the Brandy Mineral Claims of Ana Lake Mining Ltd (N.P.L.). September 30, 1969 (continued):

7. Property Geology

(d) Mineralization (continued):

Although this preferential association is evident, large amounts of similar rock are present which are unmineralized or carry only trace amounts of copper. Conversely, the coarser grained dense flows are occasionally heavily mineralized with stringers and blebs of sulphides.

Due to the extremely erratic distribution of the mineralization, representative grades are difficult to estimate without detailed sampling. Present evidence indicates the higher grade sections (e.g. in excess of 1½% copper) although widespread, have limited lateral continuity and grade into weakly mineralized rock.

As shown on the accompanying plans, copper mineralization has been tested over a width of some 300 feet along Anna Inlet and 500 feet on the Salmon Creek side. Both areas fall within the zone of shearing postulated crossing the peninsula. Notably, the full width of the zone has not been tested and broad gaps exist between individual workings.

Although copper showings are reported outside this zone, some concentration of mineralization is implied within the structure. This relationship may simply be apparent due to the amount of work completed but more probably reflects some remobilization of the sulphides within the zone of weak fracturing.

On the reconnaissance traverse across the peninsula, similar volcanic rocks and fracturing were encountered. Mineralization was not observed in outcrops above the 800 foot elevation but has been reported previously. Throughout much of the area, weathering has leached copper to a depth of a few feet and sulphides are rarely observed on surface exposures.

The present evidence favours a primary origin of the sulphides as original constituents of the flows with some minor early remobilization of the copper minerals.

(e) Alteration:

No significant alteration accompanies the mineralization. All the flows are variably and weakly chloritized and epidotized and are cut by occasional random quartz-calcite stringers and veinlets.

Amphibolite development, normally extending for some distance from the intrusive bodies, is entirely lacking.

8. DISCUSSION:

The Karmutsen Formation has long been recognized as a basic volcanic sequence enriched in copper. Many investigators regard the Karmutsen as the source of the copper and iron found in the important skarn deposits of the overlying Quatsino (Kunga) Formation.

Preliminary Geological Report on the Brandy Mineral Claims of Ana Lake Mining Ltd (N.P.L.), September 30, 1969 (continued):

8. Discussion (continued):

Mineralization similar to that on the Brandy claims is widespread throughout the Karmutsen and is notable particularly on northern Vancouver Island. The Brandy group mineralization appears to be somewhat more extensive and stronger than recognized elsewhere.

As outlined above, the preliminary examination has indicated little continuity of the higher grade (e.g. 1.5%) copper zones on the Ana Lake Property. A large tonnage of low-grade rock is evident but whether sufficient higher grade sections are present to give a viable bulk grade has yet to be established. Conceivably, further work may indicate one or more areas where selective bulk mining might be warranted.

9. CONCLUSIONS:

An extensive area of low-grade copper mineralization is present on the Brandy claim group. Insufficient work has been completed to determine possible grades or define areas of greater potential.

Mineralization is related to the upper Karmutsen sequences and appears to be a primary constituent of the basic flows. As no nearby intrusives are evident depth continuity is probably considerable.

Further evaluation of the property will necessitate delimiting of the non-mineralized diorite zones and detailed sampling of the diabases. As evidenced by the present drilling, core recovery is excellent and diamond drilling can be used effectively to sample the property.

The present core has only been visually estimated for grade. Consideration should be given to splitting this core for assay and correlating these results with the surface sampling to give local grade extimates.

The present high copper price, lower bulk mining costs and advantageous tide-water location are favourable features affecting further development of the property. The sharp topography, although inhibiting surface access, may be beneficial if future production is warranted.

Respectfully submitted,

R. D. Westervelt

Vancouver, British Columbia.
October 7th, 1969

R. D. WESTERVELT, P.Eng.

CERTIFICATE OF QUALIFCATIONS

I, Ralph D. Westervelt, do declare that:

1. I reside at 740 Crystal Court, North Vancouver, British Columbia.

2. I am a graduate of the University of Toronto (1956) with a degree of Bachelor of Applied Science in Mining Geology and that I obtained the degree of Master of Applied Science in Economic Geology from Queen's University in 1960.

3. I am registered member of the Association of Professional Engineers in the Provinces of Ontario and British Columbia.

4. I have been practising my profession as a Geologist continuously since graduation in the fields of exploration, mine production and management.

5. This report is based on my personal field examination and core logging of the drill holes on the Ana Lake Property.

6. I have no interest nor do I expect to receive any interest in the properties or securities of Ana Lake Mining Ltd (NPL).

R. D. Westervelt

Vancouver, British Columbia.
October 7th, 1969

R. D. WESTERVELT, P. Eng.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
R. D. WESTERVELT