

PROPERTY FILE

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MERRY WIDOW MINE AREA
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EXPLORATION & GEOLOGY

EMPIRE DEVELOPMENT COMPANY LIMITED

PORT McNEILL, B. C.

STATUS ON JANUARY 1st. 1961

by

JOHN LAMB

JANUARY 1961.

FOREWORD:-

This report supplements two earlier ones by the writer dated February, 1959 and January, 1960.

The following discussion will treat the exploration projects for 1960, the present geological picture and future exploration.

A list of references accompanies this report.

John Lamb

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INTRODUCTION:-

Exploration commenced early in May. The regular staff, including the writer and P. W. Billwiller, were assisted in the field by the following students from the University of British Columbia:

G. E. Wittur - Third year geology honors.
May 23 to September 25.

M. A. Mitchell - Third year geology.
May 9 to September 16.

D. G. Allen - First year.
May 9 to September 16.

J. A. Coates - Graduate (1960) in Honors Geology
September 26 to December 5.

Below is a list of areas or projects on which exploration was done, with a brief description of each. These will be discussed later in detail.

1. MERRY WIDOW & KINGFISHER

Diamond drilling from May to August and detailed geological mapping.

2. RAVEN

Geological mapping in the pit, mined by Mannix Co. during the summer.

3. KEYSTONE

Dip needle surveys and surface stripping by hand labor.

4. SNOWBIRD

Staking claims and re-locating the old trail from Kathleen Lake.

5. AJAX

Detailed geological mapping and dip needle survey.

6. BLACK JACK AND SHAMROCK

Transit and dip needle surveys, geological mapping and claim staking.

7. GENERAL RECONNAISSANCE

Field Traverses to fill in the geological picture on Empire and Coast Copper ground.

8. BRITISH COLUMBIA DEPARTMENT OF MINES

Three months geological field mapping in the Empire-Coast Copper vicinity by a party of two men.

9. OUTSIDE PROPERTY EXAMINATIONS

During the year a number of copper and iron prospects on both Vancouver Island and the mainland coast were examined and reported on.

PRODUCTION:-

Production commenced in May from the Merry Widow and Kingfisher pits. The Kingfisher was worked out in August while the Merry Widow continued to the end of the season. In addition a small tonnage was mined during the summer from the Raven pit.

To the end of the producing year 418,812 long tons of concentrate were produced from 592,274 long tons of ore milled. Concentrate grade was 59.0% iron, some penalties being incurred by excess sulphur in certain shipments.

Since mining commenced three years ago the following tonnages of concentrate have been produced:

Merry Widow -	767,500	tons
Kingfisher -	366,597	tons
Raven -	10,765	tons

An exact separation of the ore from the above three sources is not possible hence the above figures are only an approximation.

MERRY WIDOW - (Figure 5)

By the year end mining had advanced well down in the deep ore which was found in 1958 by diamond drilling. Much waste rock had been removed from the headwall of the pit and the floor stood at elevation 2,342 feet.

Early in the season seven diamond drill holes totalling 2,996 feet were put down to check previous ore reserve estimates and test all potential ground around the Merry Widow pit. As a result of this work we now know that:

- (a) the deep ore projections are substantially as pictured two years ago. Fortunately near the present pit floor a supposed spread of waste rock between two ore bands turned out to be largely ore, meaning that a much higher quantity was mined at this level than was anticipated;
- (b) there are no mineable extensions of deep ore layers southward beneath the South pit;
- (c) the ore layers with the exception of the lowest one next to the diorite contact, fade away down-dip into low grade skarny rock, or, when they encounter limestone, become restricted to narrow pipe-like zones;
- (d) there is a variable sulphide content in the magnetite of the deep ore and it is highest around the north end of the ore bands.

Geology was mapped upon completion of each monthly pit survey. The mapping indicates the chief elements affecting ore deposition to be pronounced folding, strong shearing and intense rock alteration.

A prominent fold can be seen in the trench at the mouth of the pit where limestone beds overturn from a westerly to steep easterly dip and continue below present levels in this attitude. In spite of the alteration in the headwall volcanic rocks, enough bedding remnants have been preserved to indicate a moderate westerly dip. In the centre of the pit the only recognizable structures are the easterly dipping ore bands with their associated slips and shears, the whole sub-parallel to the underlying diorite contact. Based on this evidence the writer sees the overall structure as a large drag fold, overturned westerly (figure 1 opp. page), the strong shearing and the ore bodies lying within its attenuated overturned limb. The fold appears to die out in a short distance accounting for the up and down dip limits of significant mineralization.

Several recent shipments of ore have exceeded the allowable limit in sulphur content. This fact confirms the statement in last year's report (2), page 5 para 4, where it was stated: "Visibly the magnetite appears to contain more sulphide minerals than formerly....".

While sulphides, especially chalcopyrite and pyrrhotite have always been present, they appeared to be in large patchy masses rather than in disseminations. Spectacular showings of these minerals are common in the magnetite around the north rim of the pit but in addition there is disseminated sulphide. It is this latter material that is difficult for the present concentrator to separate from the magnetite.

Of academic interest only was a find of beautiful large, glass-clear crystals of calcite in a gougy fault zone, cutting a band of magnetite. This material is probably of secondary origin, post-dating the emplacement of magnetite and probably formed at comparatively shallow depths where confining pressures were low enough to permit the growth of such crystals.

KINGFISHER (Figure 5)

The Kingfisher ore pipes reached their economic open pit limits by mid summer and all mining ceased. The East pipe floor stood at elevation 2,134 and that of the Central pipe at elevation 2,130. Both have since filled with water to a depth of forty feet.

Between May and July, twenty-seven holes totalling 5,683 feet were diamond drilled in the Kingfisher zone. The purpose of the drilling was to -

- (a) look for an ore pipe between the Central pit and the Merry Widow,
- (b) look for mineralization along the Kingfisher fault zone east of the East pit,
- (c) assess the present ore pipes at depth by drilling below the pit floors.

Of the three holes drilled between the Central pit and the Merry Widow, two intersected about 50 feet of low grade ore beneath 250 feet of limestone. It is concluded from these results that there is no mineable ore in this area.

The three holes drilled to the east of the East pit and along the Kingfisher fault zone failed to locate any magnetite mineralization.

Drilling below the pit floors shows that the Central and East ore pipes merge at a depth of 100 feet and continue to at least elevation 2,000 feet, somewhat reduced in size. Calculations indicate that to this elevation, there are approximately 170,000 tons of magnetite in place grading 46.5% iron (without dilution), which is equivalent to 120,000 tons of recoverable concentrate. Open pit extraction of this material is considered to be uneconomic and underground extraction on the borderline.

Evidence from drilling and geological mapping indicates that mineralization in the East pipe changes from an almost vertical downward trend to a westerly plunge at 30 degrees as it passes beneath a prominent greenstone sill which marks the upper surface of a strong healed breccia zone. Movement in this zone spanned the period of introduction of magnetite and probably made it a major channelway for ore solutions in both pipes.

Large masses of clear calcite were found in the Central pipe ore zone embedded in soft greenish mud, which is probably an alteration product of greenstone dikes and sills. Many fine specimens of botryoidal magnetite were found also in this area. Both of these occurrences, while of academic interest, point towards conditions of low pressure at the time of formation of the ore. As pressure is a function of depth it follows that the Kingfisher ore probably formed not far beneath the original ground surface.

The Rambler zone, a few hundred feet east of and below the Kingfisher was examined and a detailed dip needle survey carried out. Neither the anomaly nor the showing is impressive enough to warrant further exploration.

RAVEN

Mannix Co. Ltd. the mining contractors opened up a small pit at the west end of the Raven zone. Diamond drilling in 1959 had indicated a concentration at this point of magnetite containing sulphide minerals (3). The pit was operated only during the summer months, after which it was abandoned and filled with waste from the Merry Widow. Although the mineralization was not bottomed the pit had become uneconomical to work.

The ore contained more disseminated sulphides than the other two pits. Among these were the usual pyrrhotite and chalcopyrite, some pyrite and even sphalerite (sulphide of zinc). It is the only occurrence of zinc known to the writer on Empire's property.

The magnetite is markedly different than that in the main pits. It is fine grained, bluish-black with a dense texture, forming a much tougher rock to drill and blast. It is associated with a dark brown hard skarny alteration of volcanic greenstone close to a limestone contact.

The mineralized zone trends NNE along a steep fault zone and is about 100 feet in maximum width. The immediate controls localizing this small ore body seem to be (a) the junction of the ENE Raven fault with the NNE fault; (b) the contact between greenstone and limestone.

KEYSTONE

The density of dip needle readings was increased from the 50 foot grid pattern of the 1959 survey to a 25 foot pattern this year. This procedure made no significant difference to the anomalous pattern; i.e. it still indicated a number of small, discontinuous anomalies. Hand stripping was done on the largest anomaly just west of the "Mitchell Stock" (greenstone) contact. It revealed discontinuous mineralization in the form of small gently dipping lenses of high grade magnetite.

In summary the Keystone is an interesting mineralized zone but shows little indication of making an ore body.

SNOWBIRD

Work in this area was confined to re-locating and blazing the old trail up to the Snowbird from the east end of Kathleen Lake. Eight new claims and fractions were staked adjacent to and west of the Snowbird crown granted claims, although only seven claims were recorded. This staking had the purpose of covering a greater area along the diorite-limestone contact. The work was performed in October on behalf of Empire by prospectors L. W. Jorgensen and R. Waller.

AJAX (Figure 2, opposite page)

The Ajax zone lies on the Coast Copper claim, old Sport No. 8 (L 1502), approximately 1700 feet north of the head of the tramway.

The showings are situated on a steep, bluff, easterly facing slope, covered with heavy forest, between elevations 2500 and 2200 feet. The upper showings consist of narrow magnetite bands replacing skarny volcanic rock, with an interlacing of small magnetite veinlets. They outcrop over an area of 100 by 80 feet. The lower showing is a bedded replacement of limestone by magnetite just north of a fault contact between limestone and greenstone. At this point a twenty foot band of massive magnetite dips 30 degrees southwesterly (into the hill). The magnetite is flecked with much green chlorite but appears to be otherwise clean. The outcrop measures about 50 by 40 feet.

Geologically the showings are close to the limestone-volcanic contact, about 500 feet southeast of the main diorite contact. The limestone occupies a northeast facing crotch or angle in the outline of the volcanic rocks and the mineralization is in this vicinity. The volcanics are in part fragmental (resembling the overlying Bonanza formation) and in part fine grained (intrusive greenstone) with an intimate intergradation between these rocks. The writer feels that the lack of conformable relationships between these volcanic rocks and limestone means that the volcanics belong to the intrusive greenstone group rather than to the Bonanza group.

A transit survey was extended down-hill from the main baseline to tie in the Ajax. Using this survey as control a grid was laid out at 50 foot intervals where topography, geology and dip needle readings were taken. At a later date the geology was re-mapped in more detail on 40 scale.

The Ajax showings in themselves are not impressive, nor do they look promising. The upper ones are scattered and low grade while the lower one seems confined to the immediate fault zone with little hope for expansion. The dip needle survey, however, yielded a moderate to strong anomalous pattern covering an area of 400 by 300 feet, as large as the map (Figure 2). Wide variations from positive to negative readings are present and probably due in part to the very steep slope on which readings were taken. It is obvious from this pattern that magnetite must extend beyond the limits of the present showings.

BLACK JACK AND SHAMROCK (Figure 3)

The 1960 exploration target on Coast Copper ground was the Black Jack, which had been reconnoitred briefly the previous season. It was partly explored during the year but because of secondary importance to the Shamrock zone, the existence of which was unknown until July.

The work was performed in the following manner:

1. A chain and transit traverse was run from the tramway to the far end of the Shamrock, a distance of $1\frac{1}{2}$ miles. The course of the traverse was approximately on the ridge separating the Nwt Lake drainage basin from that of the Benson River. At intervals, short spur traverses were run on either side of the baseline, one of which covered the Ajax and another the Black Jack.

The main baseline was an open traverse and could not be balanced for errors in the usual manner. A check was obtained on the survey by a one-mile bearing shot from the Merry Widow area across Nwt Lake to Shamrock summit. It revealed a bearing error of seven minutes of arc, well within the allowable limits.

2. Several closed-loop surveys were run within the Black Jack and Shamrock areas to provide closer control.

3. Compass lines were run on either side of the base line at 100 foot intervals to cover the anomalous zones. Topographic details, geology and dip needle readings were recorded at hundred-foot intervals on each line. The results were later plotted on maps. Following an assessment of these results, the field work was repeated at fifty-foot intervals to provide more precise information in the important areas.

4. Based on interpretation of the final results, a program of diamond drilling on the Shamrock was recommended by Empire's staff and by Dr. A. C. Skerl (4), consulting geologist. Equipment was transported by helicopter from the Merry Widow area to a prepared site on the upper Shamrock zone. Drilling commenced on September 7, continuing until November 22, when heavy snowstorms forced a halt. During this time, twelve holes were completed and a thirteenth had been started; the total drilling amounting to 2,996 feet.

The main Black Jack outcrops (Figure 3) are at 2,700 elevation in a narrow precipitous canyon near the northwest corner of L 1499 (Old Sport #6 M.C.). At this point the magnetite is exposed in a 40 foot bluff on the south wall of the canyon for a width of 50 feet. The lower part of the showing is massive clean blue-black magnetite and the upper has a bedded appearance, with alternate limestone and calcite layers which strike northwest and dip 30 degrees to the southwest. The south edge of the magnetite ends abruptly at a contact with a hard greenish-gray altered volcanic complex which occupies the space between the limestone below and the diorite on the ridge above. A small outcrop of magnetite four feet wide lies on the limestone-volcanic contact about 300 feet lower and 300 feet east of the main showing. A small outcrop of magnetite in skarny greenstone lies about 600 feet to the west at elevation 2,940 feet.

The zone of dip needle anomaly trends west-northwest about 300 feet and is 175 feet across. It spans the contact area between limestone, altered volcanic and diorite. Much of the zone is concealed by forest growth or in the canyon by coarse talus blocks. Sink-holes are numerous and pock the surface in areas underlain by limestone.

It is obvious that there must be more magnetite in the Black Jack zone than is indicated by outcrops. Its form and distribution are unknown but it is probably composed of:

- (a) layers of magnetite dipping toward the diorite contact and replacing limestone,
- (b) stringers and irregular pods of magnetite associated with the thin selvage of volcanic rocks between limestone and diorite.

The Shamrock outcrops are scattered for 1,200 feet along a narrow belt of skarny, altered volcanic rock bounded on the South by diorite and the North by limestone (Figure 3). In elevation they lie between 2,900 feet and 2,350 feet. They consist of disseminated magnetite in the upper part and more massive outcrops at the lower end. Much of the magnetite is clean but in places considerable pyrite is present.

The significant dip needle anomaly is about 1,400 feet by 175 feet, following the limestone-diorite contact zone (Figure 3). Within this zone strong positive and negative readings are common, with sudden changes from one to the other within a short distance. These erratic readings are attributed to the effects of underlying magnetite accentuated by steep topography, where the horizontal attraction on a needle is often as strong or stronger than the vertical.

Diamond drilling on the Shamrock covered approximately the area indicated on the map (Figure 3). The hill side in this vicinity is very steep and forested and the drill was moved about with difficulty. The only dependable source of water was the small pond near the southeast corner of the claim, from which the water was pumped against a 150 foot head over the summit of the hill. The drill is now stored for the winter near station EB-73.

The drill program was laid out on the premise that mineralization formed an almost vertical slice along the steep diorite-limestone contact. The holes were to be drilled from the diorite in an easterly direction in vertical fans of two holes each, at -30 and -60 degrees to span the anomalous zone. As the drill picture unfolded the plan was changed to drilling steep holes downward from the actual outcrop area.

Drilling results to date have been disappointing. They indicate a partial replacement of skarny volcanic rock by magnetite in an irregular fashion. No definite pattern or trend of mineralization can be deduced from these results. An almost barren segment of ground 100 feet long was drilled just north of co-ordinate 57400 N (Figure 3). Mineralization is better in either direction from this segment, especially downhill to the North where the most massive outcrops are found. Hole No. 13 near station EB-73 had reached 51 feet when drilling ceased but it had a 36 foot intersection of 51% iron. Most of the intersections in the other holes were of moderate grade and width and were separated by barren stretches of skarny rock.

To date no mineable ore has been located by drilling in the Shamrock zone. Preliminary calculations by P. W. Billwiller show about 200,000 tons of material containing 26% iron, in the zone drilled. This, of course, is not ore, just mineralization.

The limestone-volcanic contact appears from drill hole interpretation to be very irregular. For this reason it is concluded that the volcanic rock is a greenstone, intrusive into limestone, rather than Bonanza rocks lying in conformable contact with limestone.

GENERAL RECONNAISSANCE:-

During the summer the Staff reconnoitred the country, north, west and south of Empire's claim group, examining the rock types and general structure of the area. Around Merry Widow Peak (two miles southwest of the pits) the area is largely underlain by tuff, agglomerate and flows of the Bonanza group. The large cirque basin east of the peak (headwaters of Merry Widow Creek) is occupied by a small stock of intrusive pink syenitic rock. Its relationship to other rocks or to mineralization is not known.

The easterly contact of the Coast Copper diorite stock was traced from the Whiskey Jack zone north and west to Craft Creek, a distance of two miles (Figure 4) and in most of this distance is believed to be steep. The diorite is in contact with an altered volcanic rock which thins out across the Shamrock claim to a narrow selvedge less than 200 feet wide, finally disappearing on the Don fraction. Limestone lies east of and downhill from the volcanic rock. The volcanic exhibits, over broad areas a definite fragmental texture similar to some Bonanza extrusive rocks on the Bluebird claim (Lot 1538), south of the Merry Widow pit. It does, however, grade imperceptibly into the fine grained type of rock, known locally as intrusive greenstone. On the eastern boundary of Old Sport #6 M.C. (Lot 1499) the fragmental rock is in contact with limestone at elevation 1,600 feet. Below this point the limestone measures 1,600 feet thick down to its base which rests on Karmutsen volcanic rocks. A short distance both to the north and to the south of this point, over 4,000 feet of limestone exists. With these points in mind the writer feels that the contact in question is intrusive, i.e. the volcanic rock has replaced much of the limestone. It follows then that the volcanic rock is not of the Bonanza, rather it is intrusive greenstone. This point illustrates the problem discussed in the 1960 exploration report (2), page 3 under the heading "The Greenstone Problem".

The similarity in form between the eastward bulge in the diorite stock on Lot 1499 and that of the intrusive greenstone in the same area leads to the conclusion that the rocks were emplaced under the same structural control.

THE BRITISH COLUMBIA DEPARTMENT OF MINES:-

As a result of talks early in the year between the writer and officials of the Department it was decided to commence a geological investigation of the district. Dr. W. G. Jeffery and his assistant J. Lund spent several months mapping an area about 6 x 6 miles, centering on Empire's property. They made no attempt to re-map the detail already done by the Empire staff; rather were they concerned with the broader geological framework of the district. The work is unfinished but we hope it will continue next season.

Government mapping such as this, can, in the long run, only be of great help to the mining industry. Little work has yet been done on coastal magnetite deposits and it is hoped that this effort will be the beginning of a better understanding of them.

The above mentioned geologists were partly responsible for the discovery of the Shamrock. Traversing beyond Empire's original survey line to the Black Jack, they reported strong dip needle reactions and the presence of magnetite in the area. Following this lead, Empire's staff outlined by mapping and further surveys the whole Shamrock zone.

OUTSIDE PROPERTY EXAMINATIONS AND REVIEWS

Following is a list of mineral properties examined or reviewed during the year. Each of these was reported on under separate cover.

1. IRON HILL

The maps and sections of this abandoned iron mine near Campbell River were reviewed in February by J. Lamb.

2. INDY RIVER

This property near Campbell River was examined by P. W. Billwiller in March.

3. TEARTUS ISLAND AND SACITA RIVER

Near Barkley Sound, Vancouver Island, these properties were examined by P. W. Billwiller and J. Lamb in March.

4. INDIAN CHIEF

On Sidney Inlet, Vancouver Island, this old copper mine was examined by J. Lamb and P. W. Billwiller in May.

5. LUCKY SEVEN AND PROVINGE GROUPS

Situated in the vicinity of Pender Harbor they were examined in July by J. Lamb and P. M. Stiles.

6. STAR OF THE WEST

Located on Tahsis Inlet, Vancouver Island, the maps and drill logs of this property were studied by J. Lamb and M. Mitchell in August, for Alberta Coal Ltd.

7. PRINCETON SEMONITE

This property was examined by Dr. A. P. Fawley in August.

8. TILAMOSH AREA

Literature on the iron deposits of Lodestone Mountain was reviewed in October by J. Lamb.

9. LEHMAN PROPERTY

Near Powell River, this property was examined by J. Lamb in November.

10. FEGNO PROPERTY

On Mahatta River, Quatsino district, this property was examined in November by J. A. Coates.

11. NEBUCIAT

Review of reports of iron in this part of Vancouver Island was made in November by J. Lamb and E. C. Oates.

12. LITTLE JOE PROPERTY

This property near Port Hardy was examined in November by J. Lamb and P. W. Billwiller.

13. ROMAN RIVER

Following reports of iron in this part of Vancouver Island, an investigation was made in December by J. A. Coates.

14. HEAD BAY IRON SHOWINGS

A study of the maps and sections was made for Mannix Co. Ltd. in October by J. Lamb and P. M. Stiles.

FUTURE EXPLORATION

Exploration this coming season is of prime importance to the Quatsino property of Empire Development Company. How ore must be found if the operation is to continue in 1962. Past exploration located further ore in the Merry Widow and Kingfisher and this ore is now being mined. In addition a number of interesting areas were explored and eliminated as possibilities. The search has been narrowed to a relatively few targets, these being discussed below.

1. MERRY WIDOW

The possibility of finding ore beyond the presently proposed pit limits is remote. Mineralization undoubtedly continues beyond these limits, especially downward, but it is not considered to be economically mineable.

Geological mapping should continue as long as the pit is being mined. No other form of exploration is recommended.

2. RINGSBRED

Provided that Mannix Co. mines the bottom of the ore pipes by underground methods, geological mapping should be done and further exploration by drilling from the underground workings should be carried out.

3. MAX

The anomalous pattern over this zone should again be checked with a good dip needle at an approximate spacing of 25 feet instead of the present 50 feet. If results indicate a favorable anomaly, compatible with the surface outcrops, a few short exploratory diamond drill holes will be justified.

4. SHAMROCK

At least three more holes should be drilled on the good showings near the northwest corner of the Shamrock No. 1 claim before the diamond drill is removed from that area. If these holes are favorable, more drilling will be required.

On the upper Shamrock between stations EB-65 and EB-59, several short holes should be drilled to span the anomalous zone. With favorable results drilling should continue, otherwise further work is not recommended.

5. BLACK JACK

Neither the location nor the appearance of the Black Jack showings is impressive. Were it not for the large area of anomalous readings, the zone might be dismissed as unfavorable. Before the diamond drill on the Shamrock is removed three or four short holes should be drilled, especially under the west end of the zone. Further work would depend upon the results of this drilling.

6. SNOWBIRD

Each year this remote zone has been considered but in the press of other work nothing has ever been done about it. A fly camp should be established by the exploration crew and the whole zone given a detailed survey such as that done last year on the Shamrock. Further exploration will be dependent on the results of this survey.

It is worth repeating that the Snowbird is so located that ore discovered there would mean a whole new mine, not just another ore body to be extracted from the present layout. Certain statements about the

Snowbird have been given much greater importance than they deserve from the available facts, therefore it will be necessary that the exploration be thorough and decisive.

Regardless of the outcome of future exploration at Empire's Quatsino property, the Company has gained invaluable information and experience on magnetite occurrences of this type. Such information and experience should make easier the assessment of other deposits that the Company may consider.

Respectfully submitted,

A handwritten signature in cursive script that reads "John Lamb". The signature is written in dark ink and has a long, sweeping horizontal stroke at the end.

John Lamb, P. Eng., Geologist

Vancouver, B. C.
January 25, 1961.

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