

Geological Reports
on the Redfort Group
comprising the

RED, FORT AND PLUS CLAIMS (192 Claims)

Claim Sheets 95D-12 and 95D-5 (Yukon)

Lat. 60°-30' North
Long. 128°-00' West

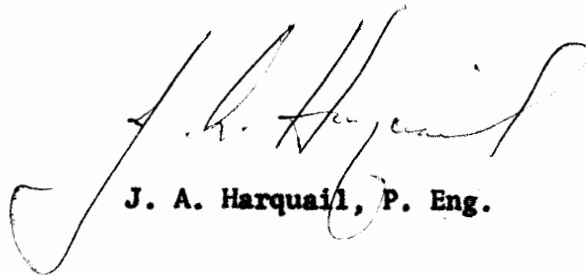
Authors:

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Prepared for the Redfort Syndicate under the supervision of

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Period during which studies were completed -
January 1, 1966 to November 28, 1966



J. A. Harquail, P. Eng.

Toronto, Ontario
November 28, 1966

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Certificate of R. F. Hayduk	Enclosed

ADDITIONAL REPORTS AND REFERENCES

- Private Geological Report on the Liard River and Redfort Properties by A. G. Hodgson, Consulting Geologist, March, 1966 Enclosed
- Private Report on a Photographic and Structural Study of the Redfort Properties by Chew-Walker Associates, April, 1966 Enclosed

Published Reports and Maps

- The MacKenzie and Yukon Basins - Map 308 - Annual Report 4, G.S.C.
- The Liard River Coal Area - Map 1435 - G.S.C. Memoir 69
- Geology along the Alaska Highway - Williams - G.S.C. Map 44-28-1944

MAPS ACCOMPANYING THIS REPORT

Map No. R-1

Plan showing outside boundary of Liard River Mining Company holdings and all claims owned by Redfort Prospecting Syndicate.

Insert map shows general geology of McMillan Ore Zone with location of important drill holes.

Map No. R-2

Structural Geology Map drawn as a result of photographic study by Chew-Walker Associates, Toronto.

Map No. R-3

General Geology of South Half - Redfort Syndicate Property.

Map No. R-4

General Geology of North Half - Redfort Syndicate Property - including a cross section of geology of north-east portion of property.

A REPORT ON THE REDFORT PROSPECT
by R. F. Hayduk, geologist

PROPERTY AND LOCATION

The area under investigation is located approximately 40 miles north-east of Watson Lake, Yukon Territory, Canada. The Redfort property consists of 192 contiguous claims located by coordinates 128°-00' west longitude and 60°-30' north latitude and shown on claim sheets 95D-12 and 95D-5. The group consists of the Red 1 to 96 inclusive, numbers 89489 to 89584 inclusive; Fort 1 to 24 inclusive, numbers 89828 to 89851 inclusive; Fort 25 to 64 inclusive, numbers 89868 to 89907 inclusive; and Plus 1 to 32 inclusive, numbers 13049 to 13080 inclusive. The property surrounds on all sides the property of Liard River Mining Company Limited. The registered owner of these 192 Redfort claim groups is J. A. Harquail, 80 Chaplin Crescent, Toronto, Ontario.

The property can be reached by float or ski-equipped plane or by helicopter. Quartz Lake, on the north-east corner of the property is the only lake large enough to land a plane. The work on the property was done during the months of June, July and August, 1966, with a party of four men under the direct supervision of the writer.

There is no road at present between Watson Lake and the property although the construction of such a link would not be a difficult undertaking. There is a "jaep" road from the Redfort camp near the north-west corner of Quartz Lake and the old Liard River drill camp. The last drilling program of Liard River Mining was completed during the summer of 1956.

PURPOSE AND METHOD OF INVESTIGATION

The purpose of the investigation was to investigate the economic possibilities of the Red, Fort and Plus groups owned by the Redfort Prospecting Syndicate.

The method used in this investigation was surface geological mapping. An air photo mozaic (1 inch = 1000 feet) and "pace and compass" traverses were used for control for the geologic mapping. A complete set of stereo photos at 1 inch = 1/2 mile, covering the area, were also used. The property was mapped at a scale of 1 inch = 500 feet.

The writer was also able to use as a structural guide both the map prepared by Chew Walker Associates and the report written by Mr. Walker of that firm. Mr. Hodgson, Consulting Engineer, reviewed the technical data made available by the Liard River Mining Company. Both Mr. Walker's and Mr. Hodgson's reports accompany this report.

PHYSIOGRAPHY AND OUTCROP DISTRIBUTION

The maximum relief in the area is 2,000 feet with the highest elevation being 5,500 feet in the southern part of the property (Redfort Mountain). The minimum elevation is 3,500 feet at Quartz Lake, which formed the base of operations. Quartz (Mine) Creek, on the south-west part of the property, flows through the Liard River Mining property and flows into the Hyland River to the west. Pyrite Creek, on the east side of the property, flows into Camp Lake which drains into Quartz Lake. Quartz Lake is then drained by Quartz Creek which forms a tributary of the Coal River, a main branch of the Liard River. There are also a number of minor creeks in the area. In places, the major creeks, Quartz (Mine) Creek and Pyrite Creek,

are surrounded by very large swampy areas due to the low gradient and the presence of beaver dams.

The topography for the most part is quite mountainous with the slopes to the creeks relatively steep. In places the creeks have been eroded to bedrock. Just above Quartz Lake, the slope angle is 60 degrees and rises to 4,500 feet at the northern limit of the property, a thousand feet above the elevation of the Redfort camp on Quartz Lake.

Large alluvial terraces are present on the east side of the property along Pyrite Creek. They completely cover the outcrop and preclude any information being obtained about the bedrock.

Most of the map area is covered by dense vegetation consisting of 20' - 40' spruce and pine (maximum 80') which would supply the logging requirements for the initial stages of a mining operation.

Outcrop is extremely scarce and scattered because of the extensive overburden in the map area. There are large areas on the property with one percent or less exposure of outcrop. There are two areas where the outcrop averages 15 percent. One area is in the north-east corner of the property where, due to the steep slope and less dense vegetation, rock exposure averages 30 percent. The other area is in the south end of the property on Redfort Mountain, where little vegetation is present.

Because of the nature of the outcrop, it was very difficult to obtain the attitude of bedding and to observe lithologic contacts.

GENERAL GEOLOGY

There has been no government geological study of this area. The 1957 Geological Map of the Yukon Territory shows Paleozoic sediments were intruded by Mesozoic acidic rocks, probably as a large number of small intrusives. The area is part of the Hyland plateau, which lies north-east of the Rocky Mountain trench, and as such, is the eastmost part of the Western Cordillera.

The major faults mapped by the Geological Survey of Canada trend north-north-west and north-north-east, controlling the arms of the reaches of the Hyland, Rock and Coal Rivers.

TABLE OF FORMATIONS (According to Lithology)

A. Limestone Formation

5. Sandstone Member
4. Limestone Member

B. Quartzite-Shale Formation

3. Shale Member
2. Quartzite Member
1. Quartzite-Shale Member

DISCUSSION OF FORMATIONS

A. Limestone Formation

5. Sandstone Member

This unit consists of a massive, medium grey-brown, fine-grained sandstone. The well rounded quartz grains are cemented by a carbonate. Five to ten percent disseminated limonite is present and in a few places carbonaceous traces were observed. This unit overlies the limestone member and

was observed in only two places; the north-east corner of the property and on the east side of the property. This rock is not very competent and is thus easily weathered.

4. Limestone Member

This unit consists of a black, very fine grained limestone. It weathers light grey or light buff depending on the amount of limonite present. In most areas it is very finely laminated and distinctive argillaceous layers (1/8 - 1/2 inch thick) occur in places. Calcite veins are present. Limonite is present on the bedding planes.

The limestone on the north end of Redfort Mountain contains iron nodules (2" x 1/2") and is severely deformed. The limestone in the south-west corner is also severely deformed and contains very thin (up to 2 inches) shaley beds with sericite developed on the bedding planes.

B. Quartzite-Shale Formation

3. Shale Member

This unit consists of a smooth, thinly bedded shale that alternates in colour from a medium grey to a light olive green. A trace of calcite as a matrix constituent is present. The shale is fissile with limonite on the cleavage and bedding planes. A few quartz veins with limonite included were observed. The shale, in the majority of outcrops, is severely deformed.

A purple shale is present at only one place on the property, on claim FORT 50. It is included in this unit because of the solitary outcrop. There are green bands in this shale which aid in bedding attitude determinations. A good exposure shows cleavage perpendicular to the bedding.

There are shears in this shale which disrupt the bedding making bedding attitudes difficult to obtain.

Grouped in this unit is a pale olive green argillite which did not outcrop enough to warrant a separate classification.

2. Quartzite Member

This rock unit, for the most part, is a fine to medium grained, light to medium grey quartzite. Near minor faults, the quartzite is grey-green indicating the presence of chlorite which is probably pre-metamorphic. A few quartz eyes are discernable in the quartzite. Present in all the quartzites is limonite in varying concentrations which go as high as 10 percent. It occurs mainly as disseminations but is also present in the quartz vein which cut all the quartzites. The areas of high limonite concentrations are indicated on the accompanying map by notes. The white quartz veins, cutting all quartzites, vary in density. On RED 70, a very high density was observed. The veins here reach a width of two feet. Traces of pyrite are present in many places. The occurrence of pyrite and limonite in the quartz veins, which was pseudomorphed after pyrite, points to a secondary (horizontal) origin for the high concentrations of limonite. The quartzite is massive and very hard, especially where the vein density is the greatest. Bedding was rarely distinguishable in this metamorphic rock.

The quartzites are severely fractured and jointed. Shearing is also present and sericite has developed on the shear planes. These attitudes were very difficult to obtain because the outcrop is badly weathered in the shear zones.

There are also very minor occurrences of an argillaceous sandstone which is weakly metamorphosed and unmetamorphosed. It occurs in the quartzite unit and since it is not very extensive, a separate number was not created.

Another rock type which has been included in this unit is a quartz pebble conglomerate which occurs as lenses near the base of the quartzite. The outcrops are noted on the map. The quartz grains are well-rounded and are elongated. They reach a size of 1.5 centimeters. Bedding attitudes were obtained where a contact between the lense and the quartzite was observed. Altered feldspar grains, which reach a size of 5 mm constitute up to 10 percent of the rock. Quartz veins and limonite are present as in the quartzite.

On claim RED 80, 5 percent sulphide was observed in the quartz-pebble conglomerate. Of this, less than 1 percent was a grey sulphide (tetrahedrite) and the rest was pyrite. A grab sample gives an assay of:

Silver - trace

Lead - trace

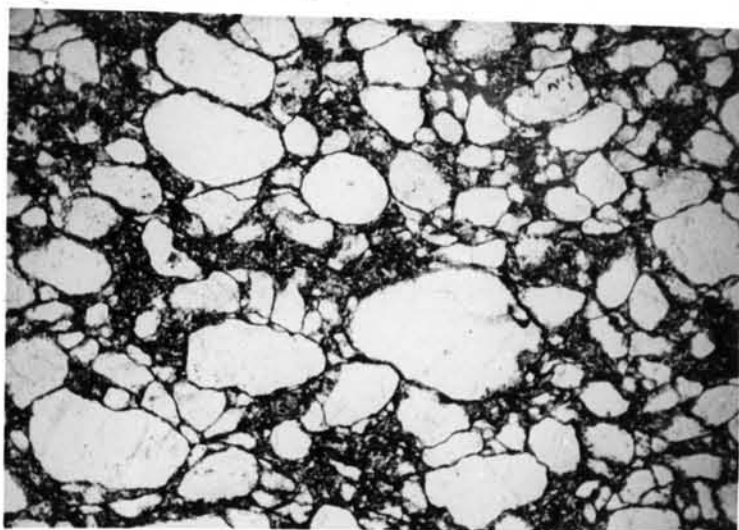
Copper - .02%

According to the report on this area prepared by A. C. Hodgson, this grey sulphide indicates proximity to a fault structure. The grey sulphide is present three hundred feet south of a fault on the south shore of Quartz Lake.

1. Quartzite-Shale Member

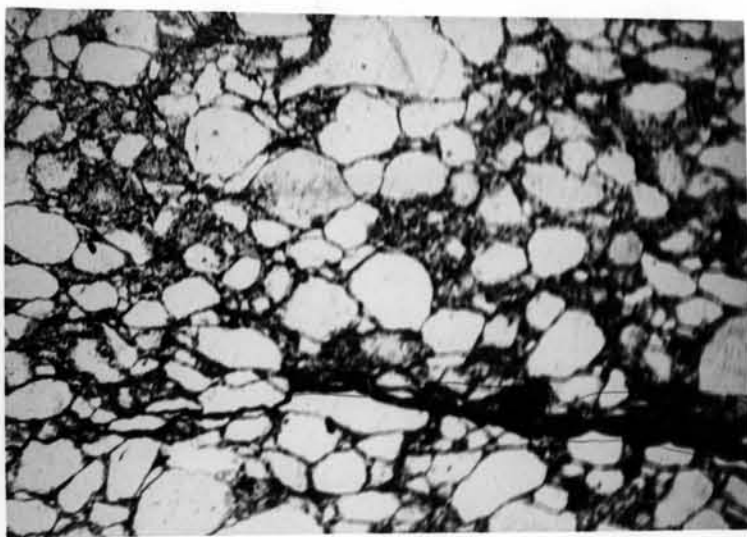
This unit is composed of shale and quartzite as described in members two and three. A distinct member was formed because of the nature of the interbedding of these two lithologies. The beds are thin (up to one foot) and are intimately interbedded. This combination of members two and three was recognizable enough to be traced and mapped as a distinct member.

Thin-section Photographs of Redfort Rock Types
University of Alberta - October, 1966



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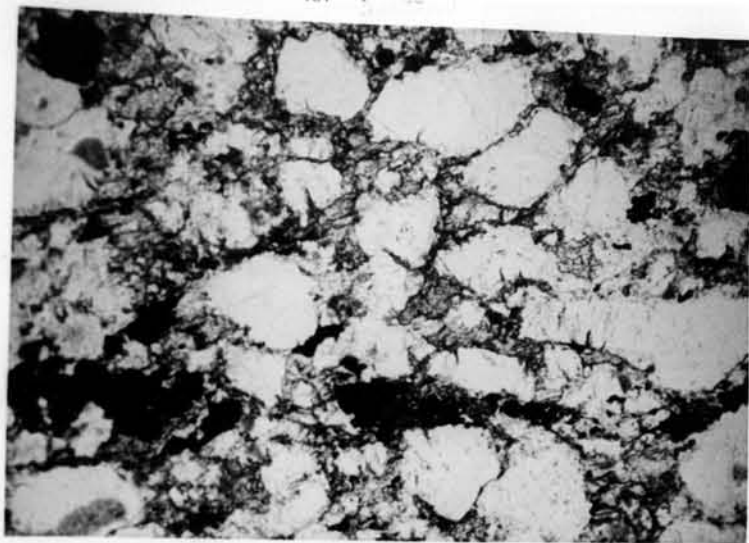
Photo No. 56 - Sample No. S-8
Magnification 27 Times - Crossed Nicols Showing - General View



58

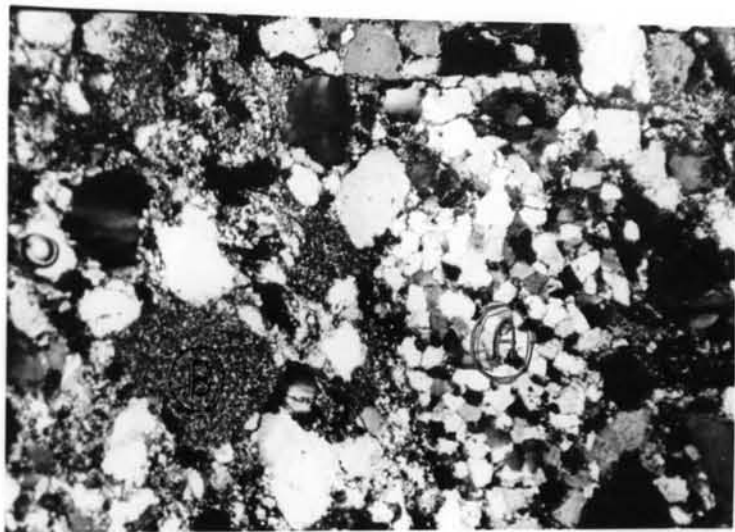
Photo No. 58 - Sample No. S-8
Magnification 27 Times - Crossed Nichols Showing - View of Limonite (A)

Thin-Section Photographs of Redfort Rock Types
University of Alberta - October, 1966



60

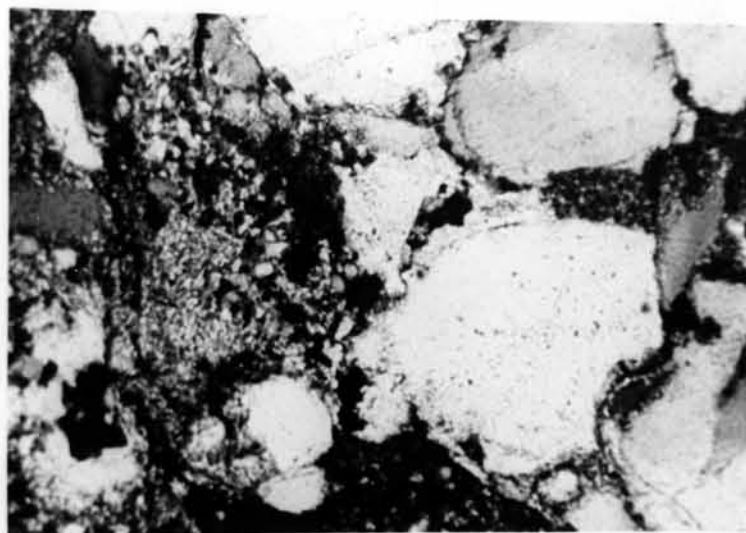
Plate No. 60 - Sample No. S-5
Magnification 27 Times - crossed Nichols Showing Limonite (Black Sections) sheared and pseudomorphed after pyrite.



62

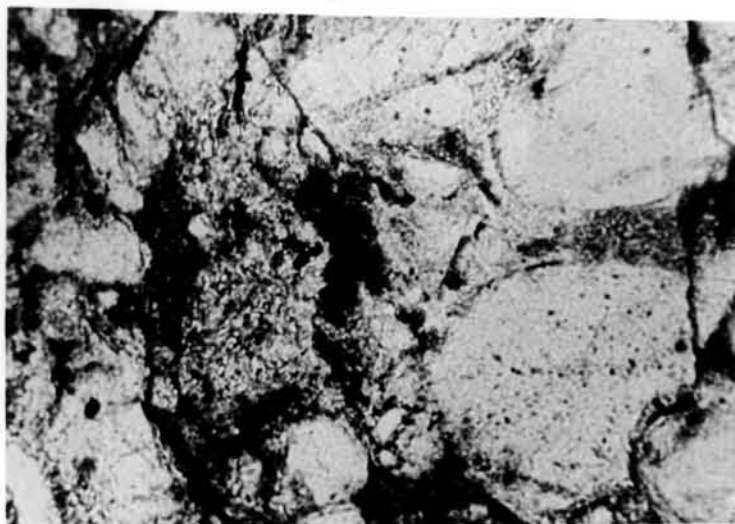
Plate No. 62 - sample No. S-14
Magnification 27 Times - Crossed Nichols Showing Composite Quartz Pebble (A) and Argillaceous Rock Fragments (B).

Thin-Section Photographs of Redfort Rock Types
University of Alberta - October, 1966



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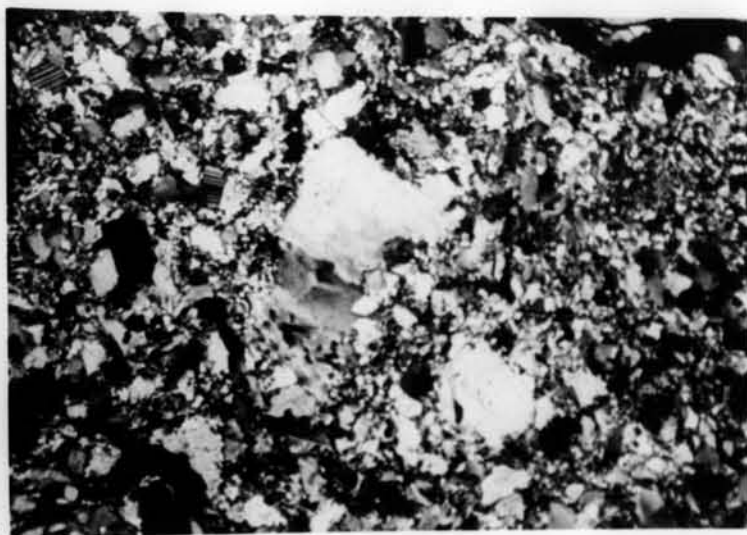
Photo No. 64 - Sample No. S-14
Magnification 68 Times - Crossed Nichols Showing Muscovite (darker section) and quartz intergrowths also showing silica overgrowths on quartz grains (white)



66

Photo No. 66 - Sample No. S-14
Magnification 68 Times - Plane Light showing muscovite (darker section) and quartz intergrowths also showing silica overgrowths on quartz grains (white).

Thin-Section Photographs of Redfort Rock Types
University of Alberta - October, 1966



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Photo No. 68 - Sample No. S-2
Magnification 27 Times - Crossed Nicols showing muscovite blades near
bottom of photo also albite and composite quartz pebble.

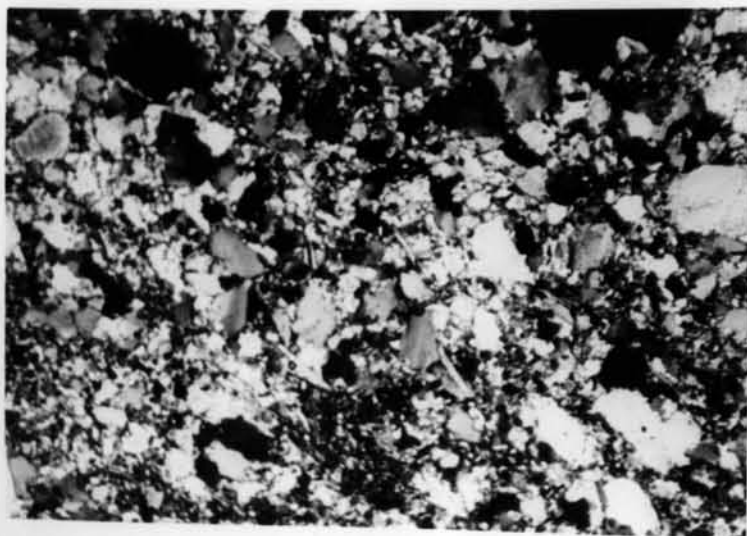


Photo No. 70 - Sample S-2
Magnification 27 Times - Crossed Nichols showing muscovite blades
and some albite.

B. Petrographic Description

Sample S-8 Location: Red 27 Photo Nos. 56, 58

Metamorphosed Argillaceous Sandstone

Minerals Present

Quartz	85%
Argillaceous Material	12%
Limonite	2%
Muscovite	less than 1%

Description

This rock consists of well rounded quartz grains (approx. size 12 mm) set in an argillaceous matrix consisting of a very fine grained mixture of quartz and feldspar with a ferruginous cement. Incipient development of muscovite in the matrix is an indication that the rock is in the greenschist metamorphic facies.

Sample S-5 Location: Red 69 Photo No. 60

Metamorphosed Calcareous Sandstone

Minerals Present

Quartz	75%
Calcite	20%
Limonite	4%
Muscovite	less than 1%

Description

The quartz grains in this rock are poorly rounded and the carbonate matrix is only slightly recrystallized. This indicates that the rock has not been severely metamorphosed and the presence of strain shadows in the quartz must be indicative of a metamorphic source. The limonite is slightly sheared

indicating a premetamorphic origin and in some cases there is a suggestion that it is pseudomorphic after pyrite.

Sample: S-14 Location: Fort 22 Photo Nos. 62, 64, 66

Quartzite

Minerals Present

Quartz	80%
Argillaceous Material	17%
Muscovite	less than 1%
Chlorite	1%
Limonite	less than 1%

Description

Large (up to 3 mm) fragments of quartz in an argillaceous matrix consisting of quartz and feldspar (clay) fragments. The development of muscovite is pronounced in the matrix but muscovite crystals are not as bladed as in specimen S-2 indicating that metamorphism has not been severe. This is supported further by the fact that welding is only incipient. In some cases, fragments of a fine grained quartzite indicate the metamorphic origin of the rock.

Sample: S-2 Location: Red 46 Photo Nos. 68, 70

Quartzite (Green Schist Facies)

Minerals Present

Quartz	95%
Albite	2%
Muscovite	1%
Limonite	less than 1%

Description

Very angular fragments of quartz are irregularly and lightly welded in this rock. The fragments range from powder size to 1 mm in diameter. The albite is fairly euhedral indicating that it is a product of metamorphism. The growth of muscovite is more pronounced in this specimen than in the other specimens observed in this section.

C. Summary of Thin Section Investigation

The thin section viewed indicate that the general grade of metamorphism in this area is that of the greenschist facies of regional metamorphism. (Turner & Verhoogen, Ch. 20) The sections also indicate the source area for the sediments was a metamorphic one. Even the course rocks contain no detrital feldspar. The source was, therefore, probably quartzite. The degree of rounding varies considerably. The structure of the limonite in section S-5 seems to indicate clearly that it is pseudomorphic after sedimentary pyrite.

STRATIGROPHY

Within the map area, formation A (Limestone Formation) is interbedded with formation B (Quartzite-Shale Formation) thus precluding the establishment of a stratigraphic sequence. The stratigraphy is further complicated by the interbedding of the members within each formation. In a more general study of this region, all of the units distinguished here would properly belong to a single formation.

STRUCTURAL GEOLOGY

A. Faulting

The majority of faults in the area strike north-north-east and north-north-west. There is also a set along Quartz Lake, which strikes east-north-east. Minor faults strike north-south and east-west. Dips were not obtainable because of the overburden and poor exposure.

The MacMillan ore zone located on the Liard River Mining property is adjacent to the Black Fault and is believed to be controlled by it. The deposit also follows a north-north-west fault. The Black Fault strikes north and crosses claim Red 42 but no mineralization was found.

B. Folding

The folding observed is present in the north-east corner of the property. A syncline and an anticline striking north-north-west and plunging approximately 15 degrees in the same direction were mapped. Folding probably occurs in the south-west corner and the south central part of the property as well.

ECONOMIC CONSIDERATIONS

Pyrite was the only mineralization observed on this property. However, reasonable possibilities for the presence of ore-forming minerals still exist since the extensive overburden covers the bedrock in crucial areas.

From geologic mapping it seems that suitable fault structures for concentration of ore minerals are present on the property. The Black Fault is the major structural control of the MacMillan ore body. The ore body follows a north-north-west subsidiary fault. Similar sets of faults on Redfort's property are favourable sites for ore deposition. Faults along Quartz (Mine) and Pyrite creeks which strike north-south, north-north-east, and north-east, are major breaks similar to the Black Fault. The most promising areas are those where the major faults are met or crossed by faults striking approximately east-west.

On claims Plus 8, 9, 10 and 11, in the south-west corner of the property, such a condition exists. A major north-north-east fault is met by a east-north-east subsidiary fault. The lithology in this area is limestone and quartzite; the limestone being the most probable host for ore deposition. There are numerous east-west and west-north-west faults along the west side of the property but the only rock types observed were quartzites and shales.

A preliminary electromagnetic map supports the proposal that the south-west corner has good economic possibilities. There are also interesting anomalies along the entire west side of the property. A detailed report on the geophysics has not been received at present. When available, it should be combined with the contents of this report.

CONCLUSIONS AND RECOMMENDATIONS

The geological mapping has indicated good structural environment for the localization of ore deposits on the Redfort property. The pyrite mineralization in the quartzites indicates the presence of sulphides in a favourable host rock. There is abundant pyrite associated with the ore mineralization on the adjoining Liard River property.

At the time of writing this report, the results of the airborne magnetic and electromagnetic surveys were not available to the writer. It would seem that because of the very extensive overburden on the property that geophysical and geochemical methods are the most suitable to detect hidden structures and mineralization. It is recommended that once the geophysical interpretation is available that a study be made of all available geological and geophysical data. The geophysical interpretation must be carefully correlated with the known geology of the property before any definite recommendations can be formulated concerning further surface exploration.

Respectfully submitted,

Richard F. Hayduk

Richard F. Hayduk, B.Sc.
Geologist

Edmonton, Alberta
October 31, 1966

C E R T I F I C A T E

I, Richard F. Hayduk, residing at Lac La Biche, in the Province of Alberta, do hereby certify:

1. That I am a practicing geologist.
2. That I am a graduate of the University of Alberta where I received a Bachelor of Science degree in Geology (Honors Course) in May, 1966.
3. That during an eleven week period from early June to late August, 1966, I was engaged exclusively by Surveymin Limited to supervise surface exploration on the Redfort group of 192 claims in the Yukon. I spent the entire period supervising work at the property with a crew of four men.
4. That I do not have, nor do I expect to receive, any interest directly or indirectly in the Redfort properties reviewed in my report dated October 31, 1966.

Respectfully submitted,

Richard F. Hayduk

Richard F. Hayduk, B.Sc.

Edmonton, Alberta
October 31, 1966

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NOTES ON LIARD RIVER MINING CO.
AND
APPLICATION OF EXPLORATION RESULTS
TO
RED AND FORT GROUPS OF REDFORT SYNDICATE
HYLAND PLATEAU
YUKON TERRITORY

GENERAL

The Redfort Syndicate holds 160 mineral claims on the Hyland Plateau between Hyland and Coal rivers approximately 40 miles northeast of Watson Lake. The claims enclose on all sides the Liard River Mining Company Limited property which is controlled by American Smelting & Refining Company Limited (AS&R). Noranda Mines Limited retains a minor interest.

Exploration by Noranda in 1949 and AS & R from 1951 to 1956 cost a total of \$385,000.00 and included trenching, geologic mapping, geophysical and geochemical investigations, and 19,571 feet of diamond drilling in 83 drill-holes. This work produced a modest reserve of silver-lead-zinc ore in the "MacMillan orebody".

The writer examined the exploration records made available by AS&R, and these notes summarize the results of their work which, in the writer's opinion, may provide a valuable basis on which to plan the most effective program for the Redfort holdings. No part of these notes is based on a personal knowledge of the properties or area, and the information herewith was gleaned from voluminous reports and maps in a much shorter time than would have been ideal for such an undertaking.

These notes are accompanied by a 1/2-mile plan showing the Redfort claims and some geology, and a 2000-foot plan showing AS&R drill-holes on the Liard River Mining Co. property.

THE MACMILLAN OREBODY

The MacMillan orebody - called after its original staker - contains a calculated reserve of 1,000,000 tons grading 1.83 oz Ag, 4.70% Pb and 9.97% Zn. Extensions are deemed improbable.

The orebody is a replacement in a limestone member of a series of flat-lying argillite, shale, quartzite and limestone strata that trend, for the most part, in an east-west direction and dip 15 to 25 degrees north. It is localized in the hanging wall block of the Black Fault, a low-angle thrust that trends a few degrees east of north and dips 20°± easterly.

The Black Fault - the most significant structural element recognized on the property - follows roughly the course of Quartz(Mine) Creek and has been defined on surface and by drilling for almost 2 miles.

Pyrite is the most abundant sulfide in the ore; sphalerite and galena occur in lesser, important amounts; and arsenopyrite, tetrahedrite, chalcopyrite, stannite, bournonite and boulangerite are minor components. Calcite, siderite and quartz are the main gangue minerals.

Sulfides are finely divided, and exhibit typical medium-temperature, replacement structures and textures.

The orebody has dimensions of approximately 1300 by 300 feet in plan and varies in thickness from 8 to 80 feet with an average of about 30 feet.

Drill-holes ranging 1800 feet north and 6500 feet south of the MacMillan orebody failed to enlarge the above ore picture although spot intersections of ore-grade were encountered in several drill-holes.

SUMMARY OF AS & R EXPLORATION RESULTS

There follows, in no particular sequence and in outline form, the basic results and conclusions of 6 years exploration by AS&R. Recorded is only that information that may prove useful, directly or indirectly, when plans are formulated to explore the Redfort property:

- (1) A low-angle thrust - the Black Fault - is one major structural control, and along or near it, or subsidiary structures, is the best ground on which to search for recurrent silver-lead-zinc mineralization.
- (2) Limestone is the most favorable wall-rock.
- (3) Mineralization appears limited to the hanging wall of the fault; thus south and east of the MacMillan orebody provides the best prospecting ground.

- (4) The Black Fault is characterized by slickensided, graphitic slips, intense shattering and brecciation (440 feet or more wide) accompanied by pyrite, boulangerite and jamesonite(?) and a conspicuous lack of lead and zinc mineralization (these features should be watched for in the field as indicating proximity to the Black or other similar fault structures).
- (5) Drilling south of the MacMillan orebody returned much pyrite mineralization as well as a few ore-grade intersections, showing that mineralization is not confined to a small area (hole #68, located 6500 feet south, gave a 5-foot section of 81.4 oz Ag, 2.9% Cu with low lead and zinc values suggesting that other types of structures may occur in the area subject to different controls).
- (6) Eight holes in the south part of the drilling gave a recovery varying from 29.4 to 64.3 percent, with a somewhat higher core recovery from mineralized sections.
- (7) In the south area all but 3 holes showed in excess of 45 feet of overburden (hole 78 was lost at 213 feet, still in overburden). Such deep cover, if widespread in the area, could limit the effectiveness of certain geophysical and geochemical techniques that might otherwise be employed as part of an exploration program.
- (8) An electromagnetic survey (McPhar) covering 1620 acres indicated numerous conductors which drilling subsequently showed to be either graphitic slips related to faults, or pyrite - filled fractures in rocks of various types.
- (9) Soil testing and twig analysis were employed on the property in selected areas with unimportant results.
- (10) Detailed geologic mapping along the Black Fault was later broadened to a reconnaissance survey covering 1000 square miles (presumably including the present Redfort claims). This work, not seen by the writer, disclosed similar rocks underlying most of the area covered; the nearest intrusive rocks are granitic and 15 miles westward across the Hyland River. Mapping also disclosed other areas of potentially productive limestone but no significant mineralization (it is not known whether or not mapping was co-ordinated with, or followed by, detailed prospecting).

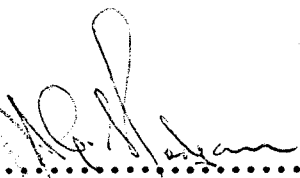

CONCLUSIONS

Work in the area has indicated a satisfactory grade but insufficient tonnage of silver-lead-zinc ore to be economic under present conditions. The geologic environment is such that tonnage additions might be disclosed by further work in the area.

The Redfort ground covers the northward and southward projections of the Black Fault, which is at present the most important structural control recognized in the area and should provide the focal point for initial investigations on the property. A careful study of aerial photography would be a

logical first step, and should be followed by a detailed investigation on the ground. At best, the fault zone would be reflected as a linear element on the photos that would be readily identifiable on the ground, where the presence of one or more of the fault characteristics previously described (par.4) would more or less confirm the presence of the fault. Simple projection carries the fault onto Redfort ground in the vicinity of RED #42 on the north and RED #6 on the south. However, owing to the flat attitude minor changes in topography will effect rapid changes in the surface trace of the fault zone, and this should be kept in mind during any photo interpretation or ground investigations.

If the fault is located the next step would be to select target areas for intensive investigation by prospecting for areas of limestone or brecciated limey quartzite. If overburden precludes the effectiveness of prospecting then geophysical investigations in some form would likely be considered. Since soil sampling and electromagnetic methods have been found by AS&R to be of little value (except the latter's possible application to tracing the fault zone itself) consideration should likely be given to some technique using induced potential and having good depth penetration and sensitivity to massive sulfide mineralization.


 A.G. Hodgson P. Eng.


Vancouver, B.C.
 20 March, 1966

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Structural Geology
Quartz Lake Area
Hyland Plateau, Yukon Territory
for
Surveymin Consultants Limited
by
W. Walker, F.G.A.C.

Chew-Walker Associates
164 Nipigon Avenue
Willowdale, Ontario

April 1966

Structural Geology
Quartz Lake Area, Yukon Territory
by
W. Walker, F.G.A.C.

Summary

Aerial photographs have been interpreted to provide structural data to complement existing field mapping which, although not seen, are presumed to be primarily lithological.

The Mississippian limestone, shale, sandstone beds (commonly metamorphosed) trend northwest and dip at various degrees to the northeast. NNW and NNE faults are members of the principal regional sets. NE and ENE members of subordinate regional fault sets are also recognised.

The Black Fault which is considered to control the Mac Millan zinc-lead-silver deposit belongs to the NNE system. A small NNW fault is followed by the deposit, and the present study indicates cross faults which merit consideration as localisers of mineralisation.

Further staking and exploration may in part be guided by faults now indicated.

Introduction

Surveymin Consultants are managing the exploration programme of the Red and Fort claims groups which enclose on all sides the Liard River Mining Company Limited (AS&R controlled) property which includes the Mac Millan zinc-lead-silver deposit.

In the present study, aerial photographs have been interpreted and correlated with the data from AS&R records summarized for Surveymin by A. G. Hodgson to indicate mineralisation controls.

The area, location and access studied on the contact prints, at the 1 mile scale, includes Quartz Lake and the surrounding area of about 500 square miles. The part of the mosaic of these aerial photographs depicting the area surrounding the Red and Fort groups, generally south and west of Quartz Lake, has been enlarged to a scale of 1000ft to the inch. It forms the map area of direct concern, about 100 square miles.

The geographic coordinates Lat $60^{\circ} 30'N$, Long $128^{\circ} 00'W$, intersect about 2 miles west of the Mac Millan ore body. National Topographic Series sheets 95D and 105A include the area. Quartz Creek, which drains Quartz Lake, is a tributary of Coal River, one of the main branches of the Liard. The area is about 40 air miles northeast of Watson Lake, which is at the end of a short spur off the Alaska Highway at mile 630.

Previous work. There has been no government study of the area. The 1957 Geological Map of the Yukon Territory shows patches of blue and pink, indicating that largely Palaeozoic sediments were intruded by Mesozoic acidic rocks, probably as a large number of small intrusives. These data have been compiled from Geological Survey of Canada publications: from McConnell's Mackenzie and Yukon Basins Map 308, sheet 4, Annual Report IV, 1890; from Dowling's Liard River coal area, Map 1435, in Memoir 69; and from Williams work on the Alaska Highway, Map 44-28, 1944.

The Watson Lake area to the west (N&S sheet 105A) has been covered by an aeromagnetic survey: Sheet 7000G is the 4 mile compilation and sheets 1327G and 1328G are the appropriate 1 mile sheets. The Finlayson, Frances, and Wolf lakes 4 mile sheets (7000G, 7001G, 7006G, and 7007G) provide correlation with mapped areas.

Mr. Hodgson notes that exploration by Noranda in 1949 and AS&R from 1951 to 1956 included geological mapping, geophysical and geochemical investigations, trenching, and drilling. The reconnaissance geological survey covering 1000 square miles, noted but not seen by Mr. Hodgson (nor the writer) is of particular importance to the present study, with which if possible it should be correlated.

General Geology

The 1957 Geological Map of the Yukon shows Palaeozoic sediments intruded by Mesozoic granites in the general area. The aeromagnetic 4 mile series amplify this picture.

The area is part of the Hyland plateau, which lies northeast of the Rocky Mountain trench, and as such is in the eastmost part of the Western Cordillera. On the east bank of the Hyland River is what appears on the aerial photographs to be a patch of N-S trending Palaeozoic sediments typical of those in the Virginia Falls area (G.S.C. pages 60-19) a short distance to the northeast, in the Eastern Cordillera. The Mississippian sediments trend SE to SSE.

The major faults trend NNW and NNE, controlling the arms of

- 4 -

Frances Lake and reaches of the Hyland, Rock, and Coal rivers. The emplacement of volcanics, or perhaps squirts of more basic material, appears to have been controlled along the Hyland Valley by these faults. NE and ENE faults cut the formations.

Local Geology

The available maps and aerial photographs together indicate a succession of Mississippian limestones, shales and argillites, and quartzites, presumably cyclothemic, trending north-northwest except where disturbed by faulting, and with low to high north-easterly dips.

No regional faults cross the area, but several examples of subsidiary faults parallel to them are evident from field mapping and the photo-interpretation. Black Fault and the Pyrite Creek faults are members of the NNE, and part of Quartz Creek, where it crosses the Red group, follows part of a NNW fault zone. Noranda Lake follows the less regionally important ENE direction. Members of a north-south fault set are followed by the upper reaches of Quartz and Pyrite creeks and cross Quartz Creek near the Mac Millan orebody.

No synthesis of the history of movement on the various sets of faults has been systematized. Nevertheless, it is likely that, from their angular relationship to the fold (bedding) direction, the NNE (Black Fault) set has undergone right hand movement and the ENE (Noranda Lake) set has undergone left hand movement at the time of folding. No evidence is forthcoming for earlier or later movements.

Corrie type, local glacial erosion is common on the uplands, and ancestral Quartz and Pyrite creeks have both produced alluvial terraces. The slopes between the terraces and upland outcrops are susceptible to creep, but otherwise their cover is essentially residual. In places, the creeks have eroded to bedrock.

Economic Geology

The MacMillan orebody, on Quartz Creek where it is joined by Pink Creek, contains a calculated reserve of one million tons grading 1.83oz Ag, 4.70% Pb and 9.97% Zn, with dimensions 1300ft by 300ft in plan, and thickness from 8 to 80ft, with an average of about 30ft.

Drill holes range 1800ft to the north and 6500ft to the south. Hole 68, 6000ft to the south, assayed 81.4oz Ag, 2.9%Cu, 1.3%Pb and 6.5% Zn over 5.0ft.

The Black Fault is the major structural control. It is described as a low angle thrust with an easterly dip 20° X, west wall downthrown. The straightness of the fault over a distance of 3 miles (of which 2 miles have been defined on surface and by drilling) makes one question the low dip. Hodgson notes that the Black Fault itself is characterized by "a conspicuous lack of lead and zinc mineralization". The ore body follows a NNW subsidiary. ESE faults follow a left bank tributary of Pink Creek and this cross-fracturing may have provided the physical conditions for ore deposition in the limestone. The rich DDH68 is at the intersection of another ESE fault zone and the "South Fault" set of N-S faults.

Conclusions Recommendations

Structural information is forthcoming from the aerial photographs to complement the lithological data from field mapping. The two products should be merged. As is common in Mississippian deposits, at the Mac Millan deposit faulting and limestone wall rock have favoured mineralisation.

The stronger faults of the area have been eroded to form valleys. It is this faulting that controls the Mac Millan deposit, and as the hill outcrops were presumably mapped and showed no significant mineralisation, future work may well give priority to the fault valleys. The west slope of the ridge near the south boundary of the Liard River property follows members of the South Fault set and is an exception to this valley fault priority.

Quartz and Pyrite creeks follow N-S, NNE, and NE faults. Where these intersect and particularly where they are met or crossed by more or less E-W faults, further staking and prospecting is recommended. In general, this necessitates an extra claim round the Fort group. The precise location of the claims will determine staking requirements in the field: three blocks totalling 39 claims are proposed.

The higher reaches of the two creeks are also on the fault systems and should be considered in regional studies.

The major fault zones of the Red group are followed by lower reaches of Quartz Creek, trending NW and NNW, and Noranda Lake, trending ENE. These faults compare in strength with Black Fault and may be comparable in having controlled mineralisation rather

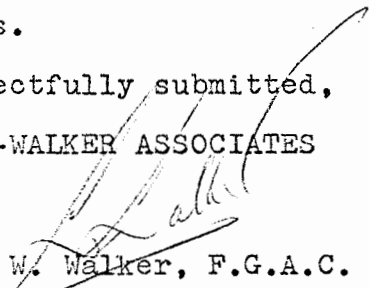
than being themselves mineralised. Exploration may well be concentrated along the NNE and NNW fault zones northwest of Camp Lake, and further staking to the north considered from the outcome of this work.

Mr. Hodgson notes that since soil sampling and electromagnetic methods have been found by AS&R to be of little value (except the latter's possible application to tracing the fault zone itself) consideration should be given to some technique using induced potential and having good depth penetration and sensitivity to massive sulphide mineralisation.

The validity of induced polarisation and the resistivity data which accompany the I.P. results are being amply demonstrated in the search for Mississippian type deposits, in Ireland and at Pine Point, for example. At Quartz Lake, drilling to follow up an E.M. survey by McPhar indicated that many conductors are graphitic slips. These also give trouble with I.P., and some accompanying discriminatory technique should be looked for. Gravity work may prove best, but soil sampling should be re-evaluated as techniques have improved greatly in recent years.

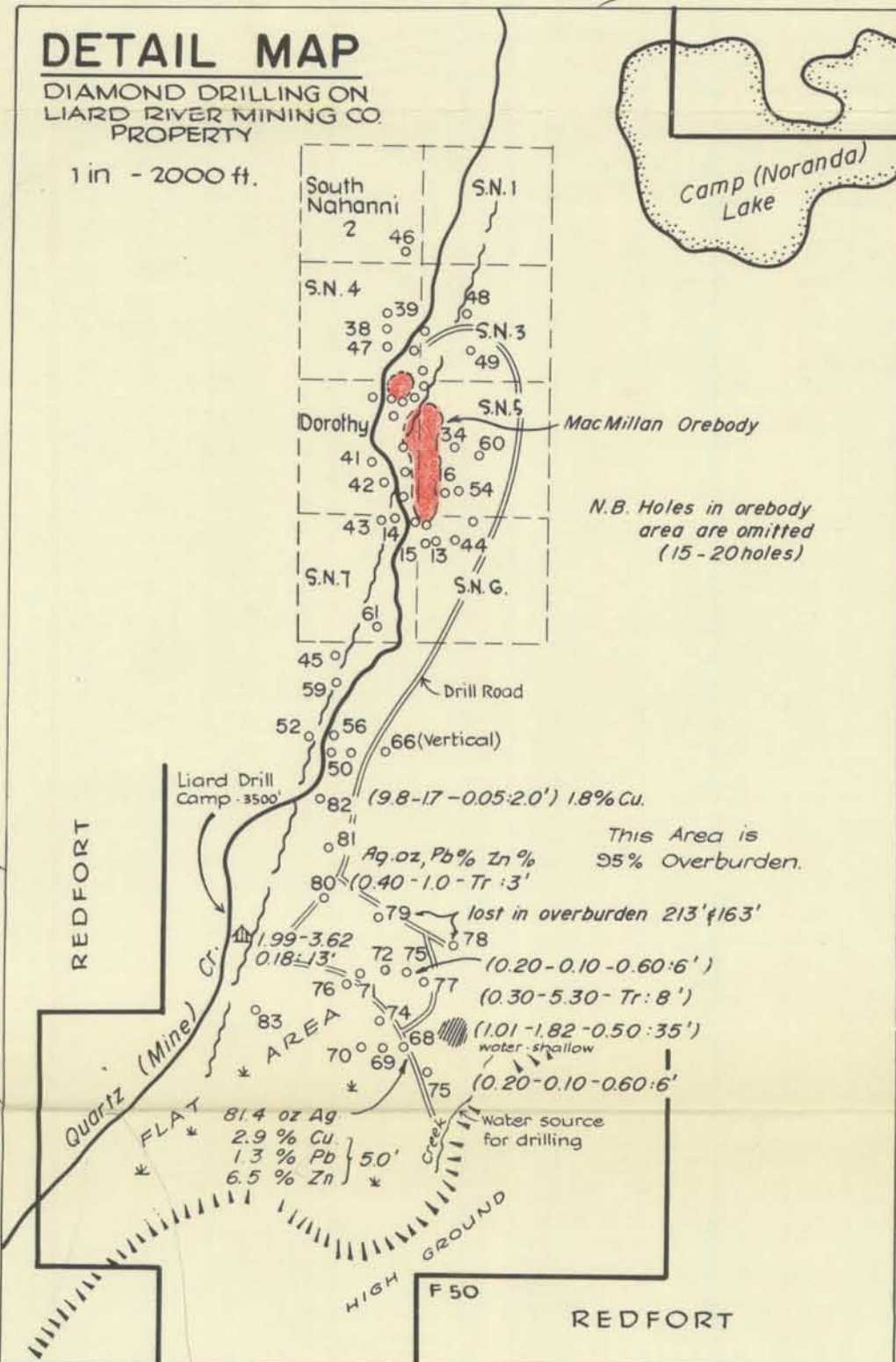
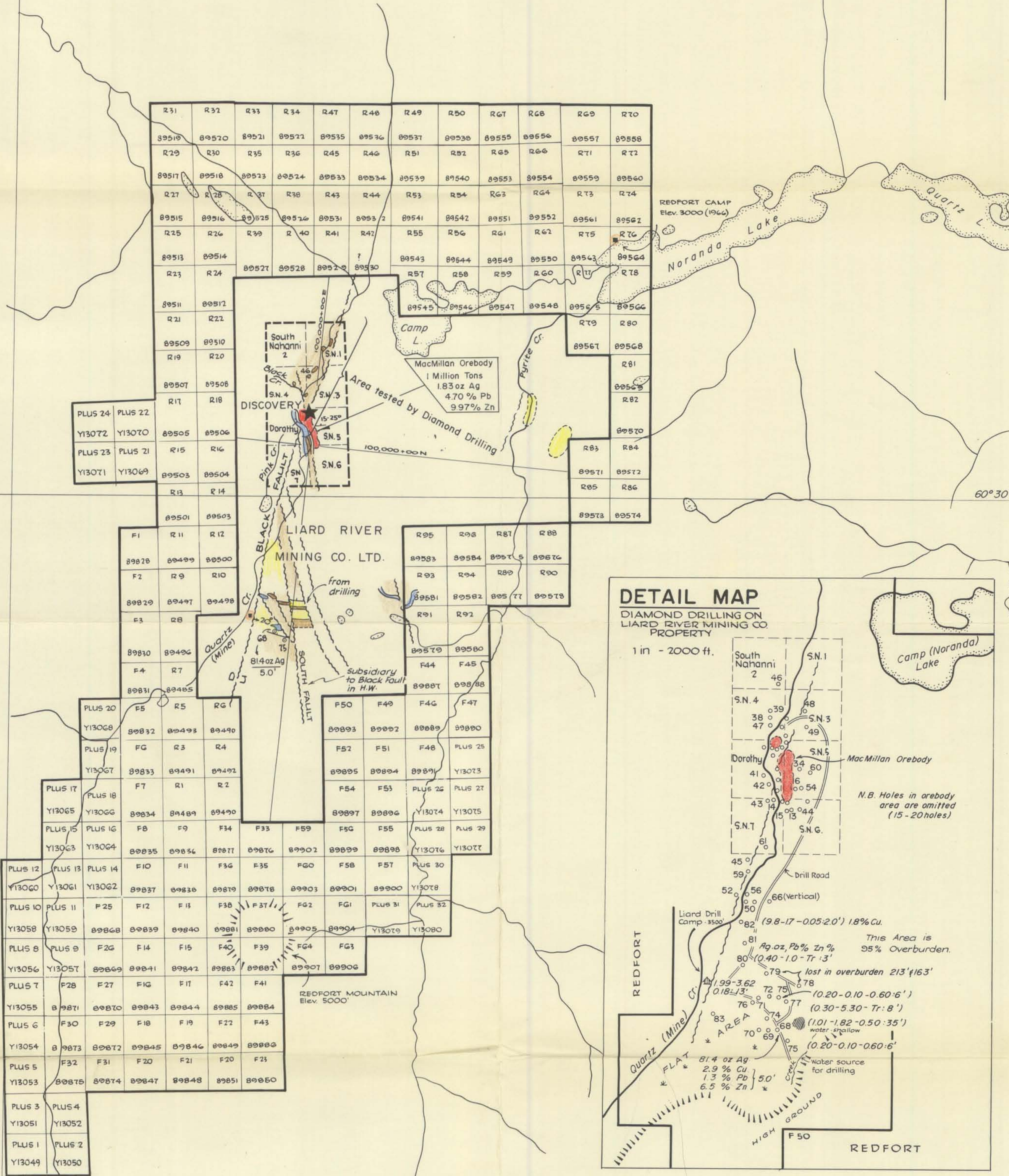
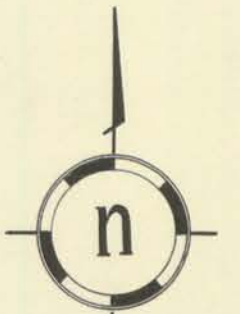
Respectfully submitted,

CHEW-WALKER ASSOCIATES


W. Walker, F.G.A.C.

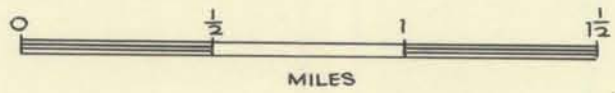
LEGEND

- MacMillan orebody
 - Limestone
 - Argillite - shale
 - Quartzite
 - Fault
 - Drill hole
- } PALAEOZOIC



REDFORT SYNDICATE
YUKON TERRITORY

PROPERTY PLAN
RED, FORT AND PLUS GROUPS



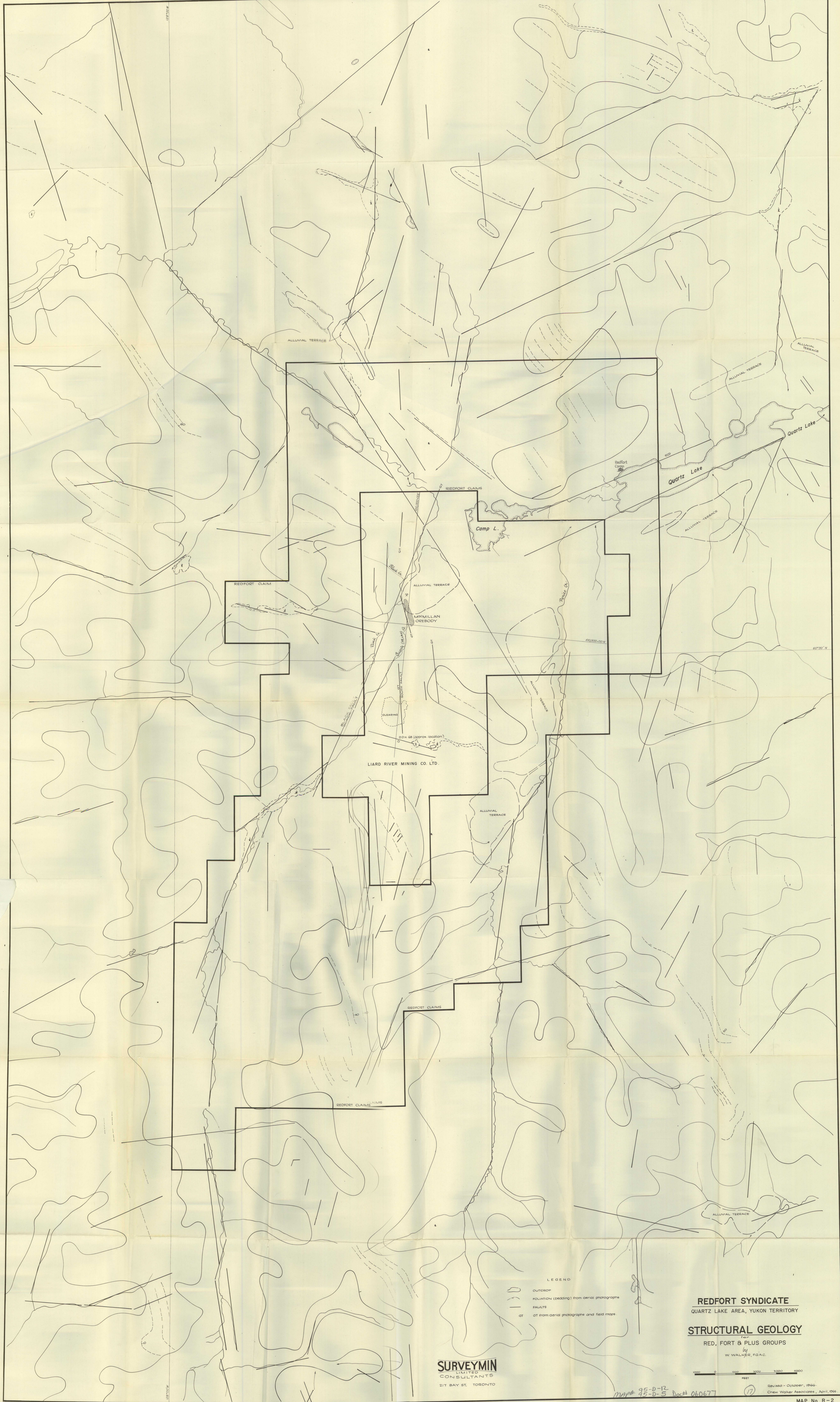
SURVEYMIN
LIMITED
CONSULTANTS
217 BAY ST., TORONTO

N.B. RED GROUP claims 1 - 96 (incl.)
FORT GROUP claims 1 - 64 (incl.)
PLUS GROUP claims 1 - 32 (incl.)

MAP# 95-D-12
95-D-5 Doc# 060677

(14)

Revised, Nov, 1966



ALLUVIAL TERRACE

ALLUVIAL TERRACE

Quartz Lake

Redfort Camp

REDFORT CLAIMS

Camp L.

REDFORT CLAIM

ALLUVIAL TERRACE

MCKILLAN JOBBODY

BLACK FAULT

CLEANING

DOCK GR (approx location)

LIARD RIVER MINING CO. LTD.

ALLUVIAL TERRACE

REDFORT CLAIMS

REDFORT CLAIMS

ALLUVIAL TERRACE

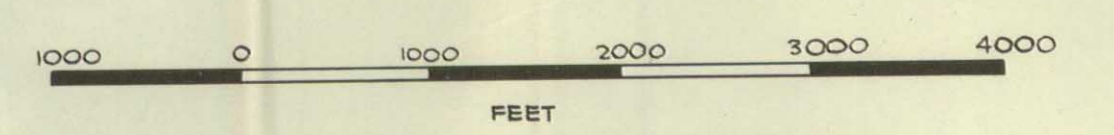
LEGEND

- OUTCROP
- POLYATION (bedding) from aerial photographs
- FAULTS
- OT OT from aerial photographs and field maps.

REDFORT SYNDICATE
QUARTZ LAKE AREA, YUKON TERRITORY

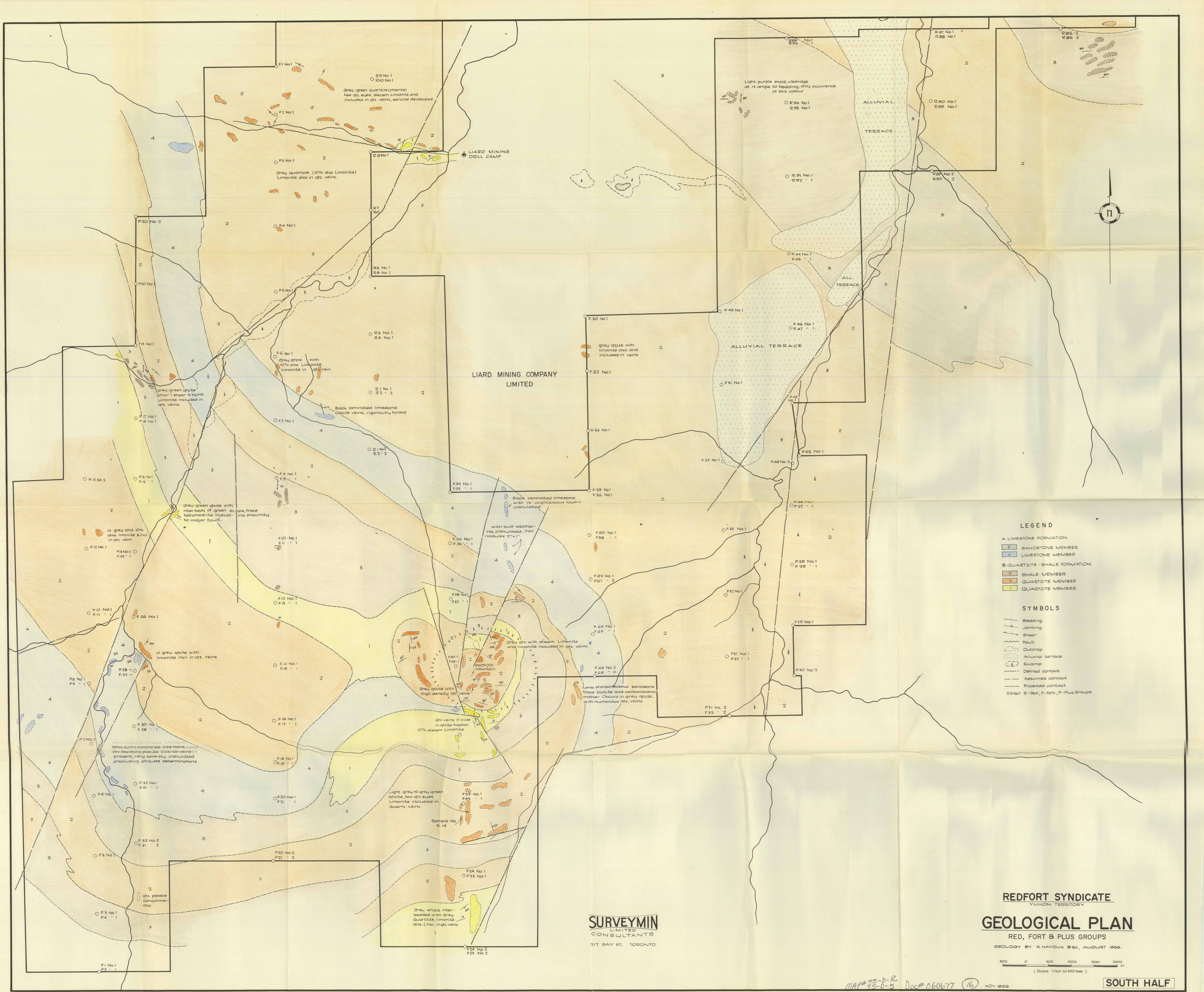
STRUCTURAL GEOLOGY
FOR
RED, FORT & PLUS GROUPS
by
W. WALKER, F.G.A.C.

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Map# 95-D-12 Doc# 060677

Revised - October, 1966
Chew Walker Associates, April, 1966

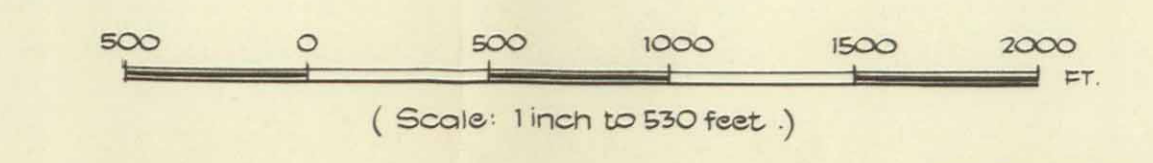


LIARD MINING COMPANY LIMITED

- LEGEND**
- A. LIMESTONE FORMATION
 - 5 SANDSTONE MEMBER
 - 4 LIMESTONE MEMBER
 - B. QUARTZITE-SHALE FORMATION
 - 3 SHALE MEMBER
 - 2 QUARTZITE MEMBER
 - 1 QUARTZITE MEMBER

- SYMBOLS**
- Bedding
 - Jointing
 - Shear
 - Fault
 - Outcrop
 - Alluvial terrace
 - Swamp
 - Defined contact
 - Assumed contact
 - Projected contact
 - RQ No. 1 R - Red, F - Fort, P - Plus groups

REDFORT SYNDICATE
YUKON TERRITORY
GEOLOGICAL PLAN
RED, FORT & PLUS GROUPS
GEOLOGY BY R. HAYDUK B.Sc., AUGUST 1966.



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MAP 95-D-12 Doc# 060677 (16) NOV. 1966

SOUTH HALF

