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PAPER 50-18

NORTHEAST PART OF

GIAUQUE LAKE MAP-AREA

NORTHWEST TERRITORIES

(REPORT AND MAP)

By

L. P. Tremblay

OTTAWA

1950

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Northeast Part of GIAUQUE LAKE MAP-AREA, NORTHWEST TERRITORIES

(Preliminary Account)

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Illustration

Preliminary map - Giauque Lake (Northeast Sheet), N.W.T. .. In envelope

NORTHEAST PART OF GIAUQUE LAKE MAP-AREA, N.W.T.

INTRODUCTION

Giauque Lake map-area lies about 52 miles north of Yellowknife. The northeast part, with which this report is concerned, has a length of 7 miles, in a northeast-southwest direction, is 4 miles wide, and lies in the southeast corner of Carp Lakes map-area.[1]

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[1] Miller, M. L.: Carp Lakes, Northwest Territories; Geol. Surv., Canada, Paper 49-8, 1949.

MEANS OF ACCESS

The area is best reached by plane from Yellowknife. There are two possible canoe routes from Yellowknife, but both require at least a dozen portages. Both routes follow Yellowknife River for the first 30 miles, from which point one passes by Duncan and Thistlethwaite Lakes, the other by Johnson Lake and a series of small lakes in part connected by creeks. A winter road suitable for tractor or truck gives access to the area during the winter months. The area itself cannot be traversed by canoe, for though lakes are numerous, they are small and unconnected. The largest, Giauque Lake, provides access to the north and east parts of the area.

HISTORY AND ACKNOWLEDGMENTS

Since the autumn of 1944, when a gold-bearing quartz vein was first discovered on the west shore of Giauque Lake, much work, including trenching, drilling, and mapping, has been done in the area by several mining companies, and one property, that of Discovery Yellowknife Mines Limited, was brought into production in January 1950. The present detailed mapping, commenced in 1948 and continued in 1949, was undertaken to correlate these various discoveries and assess their possibilities and that of the mineral belt in which they occur. In

this work much assistance was given by officials of the various companies, and acknowledgment is extended to all of them and especially to Norman W. Byrne, M.E., consulting engineer for several of the companies, and to Tom Anderson, Manager of Discovery Yellowknife Mines Limited. Keith Bell and Torry Patrick ably assisted the writer in the field, and are responsible for the mapping of large parts of the area.

DRAINAGE

The area is drained by Yellowknife River, but drainage is poorly established, especially in the south where swampy ground and shallow lakes are common features.

TOPOGRAPHY

Giauque Lake is about 830 feet above sea-level, and probably the lowest part of the area. Relief is nowhere pronounced. Near Discovery shaft and on the west shore of Giauque Lake, it reaches 170 feet, about the maximum for the area. A few hills also lie west of Narrow Lake. Areas of volcanic rocks normally stand well above adjacent areas of sedimentary formations, and constitute some of the highest points of the area. Commonly, too, strata at the nose of a major fold or drag-fold will stand above adjacent beds, due to the apparent thickening of any associated siliceous greywacke. Rock ridges generally trend parallel with the bedrock structure, and glaciation, too, may have influenced the trend of some of the rock ridges and valleys, though it is not the main factor. South of Discovery shaft and east of Narrow Lake the area is traversed northeasterly by a large esker, and is in the vicinity of this esker covered by much till and sand.

ROCK EXPOSURES

North and northwest of Giauque Lake about 30 per cent of the surface of the area is rock outcrop, and in the vicinity of the property of Discovery Yellowknife Mines Limited as much as 55 per cent. In the south, however, as little as 15 per cent of the bedrock may be exposed.

TIMBER

Except in the northwest, where much of the area was burned over a few years ago, Giauque Lake area is thickly timbered. In general, the timber is small, but a few large trees can be seen in the valleys and on the less exposed slopes of sand ridges; as a result of mining operations they are becoming increasingly scarce.

GENERAL GEOLOGY

YELLOWKNIFE GROUP

Volcanic rocks

Volcanic rocks of the Yellowknife group are all basic to intermediate types, and occur in small amounts intercalated with the sedimentary members. Five bodies have been mapped, and their field relations suggest that they are parts of one stratigraphic zone as they lie about on strike and appear to outcrop near the same anticlinal axis. Two of the bodies, tentatively joined on the map and representing most of the volcanic rocks of the area, outcrop between the west shore of Giauque Lake and the north end of Narrow Lake, and are each about 4,000 feet long and 500 to 700 feet wide. Four of the volcanic masses are lenticular in plan, and drilling has shown that they narrow in width with depth. The other one, the small, Z-shaped mass at the north end of the area, was probably once a lenticular body that has since been drag-folded to its present position.

These volcanic rocks are fine to coarse-grained; are dark green to greenish black on fresh surfaces, and weather reddish brown to brownish green and dark green. Pillows are rare, and as they are generally deformed and elongated are of little value in structural determinations. A fragmental structure is common in the two main lenses north of Narrow Lake. It affords, however, no suggestion of fragmental flow tops. In places the rock has a patchy appearance, which is believed to represent a deformed fragmental structure. The most common and striking features are gneissic structure and coarse banding, which impart a streaky to layered appearance to the rocks and are in part probably relicts of pillow or fragmental structures.

All the volcanic rocks, which originally probably consisted of pillowed lava, volcanic breccia, and massive basalt to andesite, have been transformed to andesine-hornblende gneisses and amphibolite, with garnet metacrysts developed abundantly in some parts of the rock. Most of them exhibit little alteration under the microscope, and show a definite orientation of the hornblende grains, which are rod-shaped and bluish green.

Sedimentary Rocks

Quartzite and Granulites

The group of rocks referred to on the accompanying map as consisting of quartzite and granulites represents a finely interbedded mixture of metamorphosed, siliceous, argillaceous, and calcareous sedimentary formations. They outcrop near the anticlinal bodies of volcanic rocks and pass westward and upward as well as along strike into greywacke and argillite. They occupy a belt that varies in width from 100 to 1,400 feet and that extends northeasterly from the middle of Narrow Lake to a point about 3,000 feet southeast of Eclipse Lake. In the field, all the rocks of the belt are seen to be finely and intimately interbedded, but the quartzite and granulites

are definitely the dominant rock types.

Quartzite occurs mainly in well-defined beds, but near the northeast end of the first lens of volcanic rocks north of Narrow Lake it forms a thick, structureless deposit that contains many patches of granulites, and occurs also as irregular patches in granulite. All the quartzitic strata are in sharp contact with adjoining rocks, and although beds may not be more than 18 inches thick, they are remarkably continuous along strike. The quartzite is a fine-grained to dense rock, much resembling rhyolite in places, as it normally exhibits a glassy, white to grey, polished weathered surface. Freshly broken surfaces are light to dark grey, with dull lustre, and commonly a fine to dense, sandy appearance. In places, the quartzite carries abundant, small nodules of andalusite, and weathered surfaces are rough, the nodules standing in relief. Thin sections reveal a fresh-looking rock, with obvious relicts of clastic structure, and composed of a few large fragments of quartz and feldspar in a very fine-grained groundmass of interlocking quartz, feldspars (andesine and albite), and oriented mica flakes. Either muscovite or biotite may occur, and together they comprise about 25 per cent of the rocks, biotite averaging 10 per cent.

Granulites are next to quartzite in abundance, and are found in beds or lenses intimately mixed with the other sedimentary types; they may also form lenses and patches in quartzite and greywacke. Two main groups of granulites were observed in the field. Those of one group weather dark to rusty brown, are fine to coarse grained, and generally carry conspicuous garnet metacrysts in a dense, slightly schistose matrix. A narrow, white zone of apparently bleached material commonly surrounds bodies of this rock on weathered surfaces. Fresh surfaces are dark green to black, depending on the predominance of either hornblende or biotite, and the beds themselves, though

greatly variable in thickness along strike, are remarkably persistent. These granulites also form lenticular bodies of fair size interbedded with quartzite, or small lenses, a few inches long, within thick beds of massive greywacke and quartzite. Thin sections have shown that they are composed of about 65 to 80 per cent green hornblende and brown biotite, 5 per cent garnet, and 15 to 30 per cent calcic andesine and quartz, with small amounts of epidote and accessory minerals.

The other group of granulites is more variable in texture and is slightly different in mineral composition. Three main rock types have been recognized. One type is fine grained, of massive appearance, and dark green to black on the weathered surface. This rock is commonly traversed parallel with the bedding by irregularly spaced, thin seams of white feldspar, which impart a streaky appearance to the rock. A second type is represented by a fine- to coarse-grained rock, of dioritic appearance and exhibiting a massive to gneissic texture. Weathered surfaces are light to dark green and commonly show a lighter coloured core. A third type is found between the two main lenses of volcanic rocks north of Narrow Lake, where it occurs in thick beds mixed with greywacke and presenting a sandy, coarsely streaked to banded appearance. Garnet can be found in all three varieties of this group of granulites, but is found mainly in the darker beds; it is not as conspicuous as in the first group of granulites. Hornblende, andesine, and quartz are the principal mineral constituents, but tourmaline was the main mineral of some of the dark green bands. Epidote commonly forms about 5 per cent of the rock.

Greywacke and argillite are interbedded here and there with the quartzite and granulites, and become most abundant where the latter rocks pass westward into the belt of greywacke and argillite. West and north of the property of Discovery Yellowknife Mines Limited, the

eastern contact is more sharply defined, but to the south it is in part gradational.

Greywacke and argillite

Siliceous greywacke and argillaceous greywacke and argillite are the most common and the most widespread rocks of the map-area, and siliceous greywacke is the most abundant. They occur mainly in beds or flat, lenticular bodies, and are commonly intimately interbedded. Beds are normally of uniform thickness along strike, but where closely folded they commonly exhibit a thickening at the nose of the folds, as can be seen on the accompanying map. The contacts between beds are generally sharp, but individual beds may vary in composition either from bottom to top or along strike. In thickness, the beds vary from a fraction of an inch to 30 feet, with greywacke usually more thickly bedded than the argillite. In the southwestern part of the area, where the rocks are better exposed due to a recent burn, it was possible to differentiate them into two main groups, based on colour, coarseness of grain, and abundance of mica flakes. These two groups, siliceous greywacke and argillaceous greywacke and argillite, have been distinguished on the map. Rocks of both groups carry scattered grains of tourmaline.

The <u>siliceous greywacke</u> is a massive rock, with, on weathered surfaces, a pronounced sandy appearance and a faint suggestion of schistose structure. Fresh surfaces commonly exhibit minute, rounded to subangular quartz fragments in a fine, dense, black to grey groundmass, but a general granular texture is apparent. Weathered surfaces are brownish grey to light brown and reddish brown, and generally monotonously uniform in texture and appearance, a feature particularly true of the more thickly bedded greywacke. The coarsest varieties carry rounded to subrounded grains of quartz and feldspars, some reaching ½ inch in diameter, concentrated at the base of a bed.

In most beds this coarse-grained greywacke grades upward into finer and more argillaceous material, and this feature proved useful in determining tops of beds in outcrop areas. Current ripple-marks, channelling, and rare crossbedding were also noted at several places in the finely bedded greywacke. Thin sections of the greywacke are clear, and exhibit a definite clastic texture. The rock is seen to be composed of scattered, large, angular to oval, uniformly distributed fragments of quartz and feldspar (andesine) in a fine-grained, abundant groundmass mosaic of biotite, feldspar, and quartz, the feldspar amounting to as much as four times the amount of quartz. Biotite forms, on an average, about 30 per cent of the rock, and occurs as rods or flakes of variable size all oriented in the same way. There are minor amounts of chlorite, sericite, zircon, and garnet.

A dioritic-like rock, occurring in small, irregular lenses and narrow layers, was observed in many places in the siliceous greywacke, but rarely in the argillite. Most of the lenses are a few inches to a few feet long and a few inches wide, and all occur along the same horizon either individually or linked together by a thin seam of similar material, and all lying in a plane parallel with the bedding planes. The layers also parallel the bedding, and although most of them are only a couple of inches thick, they can be followed along strike for several hundred feet, their contacts with the greywacke being markedly sinuous. Weathered surfaces of these layers and lenses are light to yellowish green, have a dioritic appearance, and may show a banded or faint gneissic structure. Commonly they stand in relief above the surrounding or adjacent rock. A rude zoning can be seen in many of these bodies of "dioritic" rock, characterized by a white, apparently bleached, margin passing into a zone rich in dark minerals and thence to a light-coloured core where the mafic constituents appear to be in

minority. Thin sections of rock from the unzoned lenses or layers give the following average mineral composition: hornblende, 32 per cent; epidote, 7 per cent; plagioclase(An_{49+}), 42 per cent; quartz, 18 per cent; and opaque substances and accessory minerals, 1 per cent. Thin sections of the light-coloured core in the zoned lenses and layers indicate that the amphibole content has remained constant but has been almost entirely bleached of colour; that most of the feldspar has been replaced by epidote; that the quartz content is about the same; and that the little feldspar remaining is albite. Because of these unusual mineral associations, those lenses and layers were probably once sedimentary nodules or concretions and beds rich in calcareous matter, which have recrystallized under the effects of some kind of metamorphism, and may be referred to as hornblende granulite.

The argillite of the map-area is a fine-grained, massive to schistose rock, normally greyish black to black on fresh and weathered surfaces, but the latter may be notably rusty due to oxidation of the abundant pyrite and pyrrhotite of some of the beds. Most of the argillite occurs in wide belts, with beds averaging ½ inch in thickness and grading upward from a grey sandy base to a prominent black, dense, argillaceous top. It occurs also in dense, pitch-black beds that commonly carry abundant pyrite. The zones of thinly bedded argillite when traced along strike commonly grade into argillaceous greywacke and in places to siliceous greywacke. As a result, a wide band of argillite may pass along strike into rock that is mainly greywacke, with only a few narrow beds of argillite remaining, and such beds become difficult or impossible to map. Thin sections show that the argillite is a rock composed of the same minerals as those that constitute the siliceous greywacke, but in

different proportions. Large, ragged, uniformly distributed flakes of brown biotite and chlorite rest in a fine-grained groundmass of quartz, feldspar, and tiny flakes of sericitic and chloritic material. Mica constitutes about 60 per cent of the rock, and the flakes are mostly oriented to impart a schistose appearance to the rock. Quartz and feldspar share about 30 to 35 per cent of the rock, with feldspar probably three times as abundant as quartz.

Rocks intermediate in composition between siliceous greywacke and argillite are not uncommon, and were mapped with either one or the other depending upon which they resembled most.

On the east side and southeast corner of the map-area rock exposures are less plentiful than on the west. A thin veneer of drift and a rather thick growth of small trees obscure most of the bedrock, and where exposed most of the rock surface is obscured by a thick growth of lichens. Furthermore, the rocks there have been more metamorphosed than on the west, and as minute flakes of biotite have developed abundantly throughout and have obscured in part the original colour and texture of the rocks, it was found difficult to distinguish one rock type from another. They appear also to be more finely bedded and more intimately mixed than on the west. Consequently, all the different types of rocks in these parts of the area have been mapped together as a mixture of finely interbedded siliceous greywacke and argillaceous greywacke and argillite. This mixture is believed to be composed of approximately 60 per cent siliceous greywacke and 40 per cent argillaceous greywacke and argillite.

Nodular Schists

The metamorphic group of rocks occupying most of the area north, west, and to a certain extent south, of Giauque Lake, and referred

to on the accompanying map as nodular quartz-feldspar-mica schists or hornfels, is believed to be composed of rocks that were originally similar to the siliceous greywacke and the argillaceous greywacke and argillite. Weathered surfaces of these rocks are grey to brownish grey, have a coarsely granular appearance, and generally exhibit a pronounced nodular structure. The southwest contact of this group of rocks with their less metamorphosed equivalents was drawn arbitrarily where nodules first appear plentifully on weathered surfaces. Fresh surfaces are light to dark grey, of massive, granular appearance, and rarely show conspicuous nodules. Bedding has been commonly preserved in these nodular schists, and although it is not as well defined as in the less metamorphosed sediments, it can easily be recognized, generally by a pronounced banding. Bands containing a high percentage of nodules alternate with others in which nodules are few or lacking. Also, individual beds may show a gradation from a base poor in nodules and apparently rather siliceous in composition to a top where the nodules are abundant and the rock is argillaceous. On weathered surfaces the nodules appear as spherical to ovoid aggregates of biotite and quartz, but under the microscope they are seen to be metacrysts of cordierite, or more rarely of andalusite or staurolite, replete with inclusions of quartz, feldspar, and mica. The nodules reach 2 inches in diameter and rest in a fine- to medium-grained groundmass of interlocking quartz, feldspar, and brown biotite.

INTRUSIVE ROCKS

The <u>altered diorite</u> of the map-area is a coarse-grained, massive to faintly gneissic, dark green rock. It was observed at only one place, south of Narrow Lake, where it appears to be part of a sill or large dyke and where it was seen in contact with an argillite band. At the contact, the diorite is fine grained, and the

argillite is impregnated with dioritic material in the form of dykelets and seams, and is in part recrystallized. Pyrite, pyrrhotite, and some arsenopyrite were noted along the contact and in the rocks on either side, and weathered surfaces are in places quite rusty. The probable extension of this diorite mass was seen farther south beyond the map-area, where it is definitely a sill and the rock a quartz diorite. A thin section of the rock indicates that about 50 per cent is composed of altered feldspar, Hornblende, epidote, and sphene together comprise 45 per cent, and the remainder consists of opaque substances and quartz.

The southern group of outcrop areas mapped as altered diorite, but of doubtful origin, may represent an extension of the altered diorite south of Narrow Lake, as they lie on strike from it. Thin sections, however, suggest much recrystallized, basic to intermediate volcanic rocks.

The quartz-feldspar porphyry is a light weathering, medium- to fine-grained rock, of massive appearance and consisting mostly of light-coloured feldspar and quartz. Only one occurrence was observed in this area, in the southeast corner; there it forms a narrow dyke, which was traced for several hundred feet south beyond the area, and in part follows the bedding planes of the enclosing schists. Thin sections have revealed albite and quartz phenocrysts in a fine-grained matrix of the same minerals, with a little biotite, muscovite, and sphene.

The muscovite granite is a light grey to pinkish white, coarse- to medium-grained, massive rock, in part gneissic, and composed of quartz, pink orthoclase, in part perthitic, white albite, and some muscovite. It occurs as small, irregular masses in areas north of Giauque Lake and east of Eclipse Lake. Two of them are shown on the map.

Gabbro and diabase occur as dykes cutting all other formations. Except for those in the southeast corner of the area, which strike either east or north 40 degrees east, all the dykes trend about 30 degrees west of north. They dip steeply to vertically, vary in width from a few inches to 50 feet, and the narrowest ones usually pinch out along strike within short distances. The dyke rock weathers dark green and brown to reddish brown; is coarse grained, with fine-grained margins; and is massive. The large dyke south of the property of Discovery Yellowknife Mines Limited carries scattered phenocrysts of white feldspar throughout, and has altered the adjacent sedimentary beds for a width of about 20 feet on either side. Thin sections indicate that these dykes are composed mainly of pyroxene, calcic plagioclase, and iron oxides.

STRUCTURAL GEOLOGY

The structure of the map-area is complex, but owing to abundant outcrops it was possible in certain parts of the area to secure much detailed information. This is particularly true of the southwestern part, where even minor structural features are well exposed. Less information could be obtained in the southeastern part, but as the structure there is much simpler than in the southwest, it is probably as well known. North of Giauque Lake the nodular schists provided only relatively scanty data.

BEDDING

Bedding is the most common structural feature, and can be observed almost everywhere in the sedimentary formations. It is particularly conspicuous in the southwestern section of the area, where textures are clear and rock exposures good. It is less apparent in the slightly more metamorphosed sedimentary rocks of the

southeastern part of the area, and is generally obscure in the nodular schists, where it is defined by an alternation of bands rich in nodules with others in which nodules are lacking.

Tops of beds were determined by structural features such as grain gradation from coarse, sandy material at the base of a bed to fine, argillaceous rock at the top; by channelling, ripple-marks, and, rarely, by crossbedding. Graded bedding was the structural feature most commonly and widely used for top determinations, and gave most reliable information. Ripple-marks and channelling were noted at several places, and commonly could be used for top determinations because of their close association with good graded bedding. Crossbedding was rarely seen and even more rarely used as a structural feature. None of these minor structural features was observed in the nodular schists, having been obliterated by recrystallization during metamorphism, but the concentration of nodules in the argillaceous tops of beds was in places made use of in structural determinations.

FOLDS

The formations or strata of the area have been intensely and complexly folded and faulted, possibly as a result of several periods of deformation.

Folds vary in character in different parts of the area, and commonly are steeply plunging; in places they apparently stand on end. In the western and southwestern parts of the area, the axial planes of the folds are warped, and strike northeasterly. Four such major fold structures have been mapped, two of them synclines and two anticlines. In each, the southeast limb of the anticlines or the northwest limb of the synclines are intensely and intricately drag-folded, whereas the other limbs are less deformed. It seems probable

that these folds are all steeply plunging, possibly due to cross-folds, and their warped axial planes may indicate another period of cross-folding.

In the southeastern part of the area and south of Giauque Lake, strata are broadly isoclinally folded in a northeasterly direction, the axes of the folds diverging northward from the southern edge of the map-area and the formations all dipping steeply to the northwest at angles of between 75 and 90 degrees. In general there is no suggestion of intricate and complex folds such as those mapped in the western part of the area, but near the lenses of basic volcanic rocks on the Discovery and LaSalle properties the sedimentary strata are strongly drag-folded, and the structure there is very complex. It is possibly indicative, as suggested in describing the western part of the area, of a position on the east limb of an anticline or the west limb of a syncline.

Attitudes obtained in the nodular schists suggest broad open folds, but are too few to permit a detailed structural interpretation of these rocks.

FAULTS

Faults are numerous in the area, and one of their main features is their sinuous trend. Most of them indicate small, left-hand displacement. The few faults shown on the map are believed to be the most significant both as to continuity and amount of displacement. Most of the faults strike northeasterly, and appear to be later than the folds as they cut across them, and it is possible that some of them, as the Discovery fault, are closely connected with the period of deformation that has warped the axial planes of the folds. They are also related in space, at least in part, to the axial and plunging parts of folds.

Faults have not been observed everywhere in the area, but are apparent only in the area northwest, west, and southwest of, and around, the property of Discovery Yellowknife Mines Limited, where the formations have been intensely and complexly folded. In the area adjoining, and south of, the western end of McGuire Lake, small faults are numerous, and have so complicated the structure that its interpretation, as suggested on the accompanying map, can be regarded as only tentative. Those minor faults show left-hand displacement and most of them strike either northeasterly or northwesterly. Faults of small displacement are also common at the nose of plunging folds, as, for example, at the nose of the anticline near the northeast end of Aladdin Lake. Many minor faults were also noted near the property of Discovery Yellowknife Mines Limited, south of the Discovery fault, particularly on both sides of the main volcanic body near the mine. At none of these places has more than an occasional 'right-hand' fault been observed.

Minor faults are generally exposed, but major faults commonly occur in valleys or along lake bottoms, where they are obscured by much overburden, and their presence is indicated only by the offset of formations on either side.

In general the horizontal displacement on the major faults is probably a matter of a few hundreds or thousands of feet, although accurate data are not available for all of them. Several minor fault fractures are now filled with quartz, which, in rare places, contains a little pyrite. A little shearing has occurred along some of the faults across widths of as much as a foot, and in some instances suggests thrust and rotational movements.

Discovery Fault

The fault passing a few hundred feet north of the Discovery shaft, and trending about north 65 degrees east, has been traced in the field for at least 4 miles, from Giauque Lake to the southwestern corner of the map-area. Much information was obtained on this fault during field work, but not sufficient to indicate the true displacement along it. The following facts are available:

1. Two different markers have been traced across the fault and both are offset. The wide band of quartzite and granulite is one, and although its eastern contact does not appear to have been displaced by the fault its western contact shows definitely a horizontal displacement of at least 750 feet. The other marker is a band of argillite, which shows an offset of at least 250 feet.

2. Both offsets are left-handed.

3. The dips of the formations on both sides of the fault are steep to vertical, but in the case of the quartzite and granulite band it appears that the beds north of the fault dip steeply to the east whereas south of the fault the same beds dip steeply to the west.

4. It is believed that this fault has been intersected by several diamond drill-holes on the Discovery property and, as reported to the writer, the shaft has passed through the fault at a vertical depth of 370 feet. The dip of the fault has been calculated from these several intersections as being about 20 degrees southeast, but in places it may be much flatter.

5. The intersections of the fault by several diamond drill-holes and by the Discovery shaft have shown that the fault is represented by a zone, about a foot wide, of sheared and brecciated rock interspersed with several narrow mud seams, in which pyrite and pyrrhotite

are common and vugs were observed. The fault is bordered above by a zone, about 10 feet thick, of sheeted material that contains, and is cut by, many quartz and carbonate stringers, and below by a zone of similar sheeted material, but there only about 2 feet thick.

Although several hypotheses as to the amount of horizontal displacement in the vicinity of the mine might be deduced from the above facts, two are suggested here as being, in the writer's opinion, most plausible. Each is based in part on certain assumptions, and either or both may have to be discarded as new data become available.

First Hypothesis. As all the formations dip in general very steeply, it may be assumed that the trace of any formation on the fault plane will have its horizontal component essentially vertically above it. So, any hypothesis attempting to explain the offsets on the fault will need to deal with direction only. On this basis, it can be inferred that movements on the fault involve translation parallel with its trend and a rotation of several degrees around an axis near the area of complex drag-folds west of Brein Lake. These two movements were probably contemporaneous, and it is believed that they gave rise to thrusting in the vicinity of the Discovery shaft, whereas southwest of Brein Lake the fault was normal. The maximum horizontal displacement that can be obtained for a point on the fault slightly west of the Discovery shaft would appear to be of the order of 2,000 feet. The dip of the fault should not affect this figure, which is considered a maximum and might, in fact, be much less.

Second Hypothesis. In this hypothesis it is assumed that the movement represented by the offset of the western contact of the quartzite and granulite band is not related to the movement shown by the offset of the argillite band southwest of Brein Lake. In this

case, the two offsets are explained separately as being the result of different movements. As the eastern contact of the quartzite and granulite band does not show any apparent offset, it can be assumed that the movement along the fault was parallel with the trace of this contact on the fault. By assuming such a movement and attempting to match the western contacts, a maximum horizontal displacement that varies between 1,300 and 2,600 feet is obtained. This amount of horizontal displacement would decrease with depth and with increase in the dip of the fault.

On the other hand, because the eastern contact of the quartzite and granulite band does not show any offset, it might be assumed that no displacement took place along the fault east of this contact, but it is not the writer's opinion that this is the case.

SCHISTOSITY

Schistosity varies in strike and character in different parts of the map-area. It is rarely seen in the greywacke, but is particularly common in the argillite and in places in the nodular schists. It may be the result of broad folding, as in the area north and south of Giauque Lake, where schistosity has an apparent constant northerly strike. In the southwestern part of the area, schistosity seems to be a bedding cleavage, as it strikes parallel with, or nearly parallel with, the bedding. The banding or gneissic structure commonly observed in the lenses of basic volcanic rocks appears to be in places a local feature, as it tends to parallel the contacts of the lenses.

JOINTS

Joints are abundant in the area, but are not developed to the same degree in rocks of different types. They were noted especially in the massive greywacke and the nodular schist, and

most commonly are bedding joints, striking and dipping parallel with the bedding; other joints strike at about right angle to the bedding planes; some dip steeply, about 60 degrees in either direction, others are almost flat, thus forming, in addition to the bedding joints, two other main sets.

ECONOMIC GEOLOGY

GENERAL STATEMENT

Gold is the only metal of present economic interest in the area, and is being produced at the property of Discovery Yellowknife Mines Limited. Elsewhere, the area has been prospected rather carefully, judging from the numerous, scattered test pits, trenches, diamond drill cores, and broken fragments of quartz veins and stringers. Much of this work has been concentrated along a belt trending southwesterly from the Discovery shaft past Narrow Lake to the Viking shaft beyond the area. The gold is commonly found in close association with quartz veins and stringers and, apparently, particularly where the quartz veins occur in the volcanic rocks. It is found also in quartz veins cutting sedimentary rocks, but in such places the sedimentary formations are generally closely folded and faulted. The wall-rock adjoining quartz veins in volcanic formations also carries gold in places.

Quartz veins and stringers are numerous in the area, and were observed on almost every group of outcrops. In the sedimentary rocks, they commonly strike parallel with, or at a slight angle to, the bedding. They are more abundant in the argillite than in the greywacke, and are more numerous in areas of sheared, contorted, and folded rocks than where the formations are less disturbed. In the volcanic rocks, they generally strike parallel with the gneissic structure. Some quartz veins and stringers also occupy joint planes

in either type of rocks. The dip of the quartz veins and stringers varies from flat to almost vertical.

Most of the quartz veins and stringers are lenticular bodies a few feet long and generally less than 2 feet wide. Most of them carry a little white feldspar (oligoclase), and in places along their margins show narrow, discontinuous zones of hornblende, chloritic material, or epidote. In places the veins may carry small amounts, generally less than 1 per cent, of pyrite, pyrrhotite, arsenopyrite, and chalcopyrite.

Pyrite and pyrrhotite are rather common minerals of the argillite beds, but are probably syngenetic. The pyrite cubes or nodules found in the greywacke have probably a similar origin, and it is doubtful if any gold is associated with such sulphide occurrences.

Two types of quartz were noted: a black and a milky white quartz. Black quartz is not as widespread as the other; it is commonly well fractured and in places is mineralized with pyrite and pyrrhotite, whereas the milky white quartz is more massive, generally barren, and probably younger than the black quartz.

DESCRIPTION OF PROPERTIES

Discovery Yellowknife Mines Limited

The property of Discovery Yellowknife Mines Limited is near the western shore of Giauque Lake. It comprises the Lux No. 1 to No. 4 claims, the Avis No. 1 and No. 2 claims, and the Discovery and Quinn fractions. The property is bordered on the north by that of Typhoon Yellowknife Mines Limited, on the west by that of Goldpac Yellowknife Mines Limited, and on the south by the holdings of La Salle Yellowknife Gold Mines Limited.

History

The Lux-Avis claims were staked by A.V. Giauque and Sons in the late summer of 1944, and the two fractions were staked since by the present company. The original six claims were subsequently optioned to Jokeway Prospecting Syndicate, who organized Discovery Yellowknife Mines Limited and incorporated it as a company in February 1945. In the following spring, an X-ray diamond drilling program was started to explore a few quartz veinlets in recrystallized basic volcanic rocks, and by August amounted to about 2,400 feet. The results of this drilling were further investigated in November 1945 by N. W. Byrne, who has since acted as consulting engineer for the company. These investigations led to the discovery of the 'North zone' by the prospector Bert Wagenitz, and by the end of November twenty-seven rock trenches had been excavated across the vein at intervals of 20 to 25 feet, the aggregate length of the trenches amounting to 375 feet. In December of the same year the company was reorganized, and a new, extensive diamond-drilling program was inaugurated in January 1946 to explore the North zone and adjoining area. Initial work was with an X-ray machine, but standard drilling commenced in February and continued into September, at which time total drilling aggregated 979 feet of X-ray and 20,087 feet standard drilling. By June 1946 enough information had been obtained from the drilling and surface work to warrant underground development and to indicate the type of plant necessary for such operations. Orders for the necessary machinery were sent in July. During this drilling program, no further surface trenching or stripping was done on the property. Pending the arrival of the machinery, a portable sinking machine was flown to the property in October 1946. Sinking of a three-compartment shaft was begun in November, and by March 1947 the portable sinking machine was replaced by the permanent plant,

which was then installed. Sinking was discontinued for a time to permit development on the 125-foot level, but in July 1947 was resumed, and the shaft deepened to the 250-foot level. Underground work on these two levels continued throughout 1947, and extended into April 1948. Most of the necessary camp buildings were erected in 1947 and those in use during the winter of 1947-48 were of permanent construction and well insulated. Further work was done during the years 1948 and 1949 in preparation for the installation of a 100-ton mill. The mill, purchased in April 1948 from the Mount Washington mine in Montana, was on its way to Yellowknife in September 1948 when the barge carrying it sank on Great Slave Lake. It was immediately replaced by another mill obtained from Cariboo Hudson Gold Mines Limited of British Columbia, and most of it was transported to Yellowknife before the freeze-up in 1948. In the autumn of 1949, underground operations were resumed in order to bring the mine into production by January 1950; the mill was completed, and the shaft deepened to a new level at 375 feet. Work on this level commenced in April 1950, and since January 1950 the mine has been producing at a rate varying from 60 to 100 tons a day, with a total recovery to the end of May of about 5,000 ounces of gold.

Development

The property has been explored from the surface by trenches and diamond drilling. At least sixty rock trenches, varying from the size of a small pit to excavations 60 feet long, 6 feet wide, and 4 feet deep, have explored the North vein, the West zone, the South zone, and several other small occurrences of quartz. Twenty-seven trenches across the North zone gave results that warranted diamond drilling from the surface to explore possibilities at depth. Three are above the West zone. Drilling was also done to explore the other

zones at depth and to explore the contact zones between volcanic and sedimentary rocks. Surface drilling has altogether amounted to at least 3,350 feet with an X-ray machine and 20,087 feet by standard drilling. All this surface work has been concentrated on the Lux Nos. 3 and 4 claims and on the Discovery fraction, and most of it on Lux No. 3.

Underground development has been concentrated on the Lux No. 3 claim close to its boundary with the Discovery fraction. Up to May 1950, underground work included a three-compartment shaft to a depth of 390 feet, with stations cut at 125, 250, and 375 feet, and three levels opened at these stations. Lateral development on the 125-foot level consisted of 958 feet of drift, 425 feet of crosscut, a raise at the nose of the North zone to the surface, and arrangements for stoping. Lateral work done on the 250-foot level comprised 557 feet of drift, 374 feet of crosscut, two raises - one from the west limb of the North zone to the 125-foot level, the other in the West zone up to the 125-foot level - and also stope development. Lateral development is commencing on the 375-foot level. Diamond drilling done underground has aggregated about 11,760 feet.

Geology

The property of Discovery Yellowknife Mines Limited is underlain by volcanic and sedimentary formations, with the latter occupying most of the area. Volcanic rocks occur in a belt that extends southwesterly from the middle of the Lux No. 3 claim to about midway of the La Salle-Discovery boundary, a distance of about 2,000 feet, and continues for 1,300 feet on La Salle ground. This belt is between 400 and 550 feet wide, and is composed mainly of garnetiferous hornblende-feldspar gneiss in places showing pillowed and fragmental structures. Another body of similar volcanic rocks, approximately 700 feet long and less than 100 feet wide, was traced

slightly northeast of the northern end of the main volcanic belt. It is separated from the main body by highly contorted sedimentary strata. North and east of the main volcanic mass lies a complex of greywacke and argillite, now highly folded and altered to quartz-feldspar-mica schists and nodular schists, the nodules being formed commonly of cordierite metacrysts, rarely of andalusite. In close proximity to the northern tip of the main volcanic belt, these sediments are mixed with some beds of dark green material believed to be of similar nature to the granulites seen farther west. A band, 1,300 to 1,700 feet wide, of finely interbedded quartzite and granulites occupies most of the area west of the volcanic belt. A dyke of porphyritic gabbro, which intersects all the other formations in a northwesterly direction, outcrops in the southwestern corner of the property and can be traced beyond for long distances in either direction.

Structure

All the formations on the property have a general northeasterly trend, and apart from the few places where the dip is steeply east they all dip steeply to the west. In the northwestern corner of the property, north of the Discovery fault, on the Lux No. 2 claim, the dip of the formations is from 75 degrees east to vertical. The western contact of the main volcanic mass also dips steeply east to vertically, but its eastern contact dips steeply west to vertically. At its northeastern extremity, the volcanic belt plunges steeply to the southwest, and although its western contact near this northern end is vertical the eastern contact has a dip of between 70 and 85 degrees to the west, suggesting that the belt is a lenticular body narrowing and shortening with depth. The small body of volcanic rock appears also to dip as a unit westerly and parallel with the eastern contact of the main mass, and to narrow with depth.

The trend of the formations is in general northeasterly, but at the nose of the volcanic rocks and near their eastern contact with the sedimentary formations, the latter appear to trend in all directions. The suggestion from field mapping is that they have been intensely and complexly drag-folded, the drag-folds occurring apparently in a continuous series extending from the La Salle property to the Discovery shaft. The axes of these drag-folds trend slightly east of north and, as a deduction from the mapping outside this property, they probably indicate a position on the eastern limb of a major anticlinal structure. The axis of this major anticline would pass somewhere near the western contact of the nose of the main volcanic body. Along their eastern contact, the volcanic rocks show pillows apparently facing east, and all the sedimentary strata east of the volcanic rocks also appear to face east and, therefore, to overlie the volcanic rocks in that direction. On the La Salle ground beyond the Discovery property, there are suggestions of an angular unconformity between the volcanic and sedimentary rocks; on the other hand, all the sedimentary formations west of the volcanic belt face west, suggesting that the structure on either side of this belt is anticlinal.

The property is traversed by several faults. Most of them are of small displacement and of minor importance structurally and economically. One, however, the Discovery fault, is of some significance as its horizontal displacement could be about 2,000 feet. It is not known yet whether the orebodies at Discovery Yellowknife are cut by this fault or are related to it, but if the latter, the fault must be regarded as a potential ore-bearing structure.

Ore Zones

North Vein. This vein occurs in sedimentary rocks about 300 feet northeast of the northeast end of the main body of volcanic rocks. In plan, the vein is U-shaped, open to the south and with the arms trending southerly. At the time of mapping, only discontinuous and small parts of the vein could be seen at the surface, but, as reported in 1945, it was continuously exposed for 600 feet, with a width varying between 2 and 28 feet. As determined by underground exploration, the vein appears to be continuous from the surface to a depth of 375 feet and the whole structure plunges northerly at an angle of 85 degrees. It appears also that the east limb dips from 87 degrees west to vertically, whereas the west limb dips about 73 degrees west, so that the limbs of the U gradually diverge with depth. On the 125-foot level they are 90 feet apart, and, on the 250-foot level, 100 feet.

The sedimentary rocks in which the vein lies have been recrystallized to quartz-feldspar-mica schists and nodular schists. Bedding trends are apparent at several places, but top determinations are rarely possible. However, from the available information, it appears probable that the vein occupies an anticlinal position on a drag-fold on the eastern limb of the main anticlinal structure on this property.

The North vein is now incompletely exposed, due to construction work and surface modifications. Underground developments, however, give much detailed information. The vein was followed on the 125-foot level for 540 feet, and on the 250-foot level for 460 feet, and most of the following details have been assembled from what could be seen underground at the time of examination. In general, the vein is irregular in width, but is continuous from the

southern end of the east limb to the northern end of the west limb. The east limb is almost straight, particularly as exposed along the 250-foot level. Its west limb, however, is much broken and irregular, being represented by a succession of small, sinuous, elongate bodies of quartz difficult to follow. In width, the east limb averages about 1.8 feet on the 125-foot level and 3.8 feet on the 250-foot level. At the nose, its average width is about 5.7 feet on the 125-foot level and 4.2 feet on the 250-foot level. Widths along the west limb vary from a few inches or less to 12 feet, and as the vein is not continuous, no satisfactory average figure could be obtained.

The vein is composed mainly of quartz. Its contacts are sharp, and commonly the quartz adheres firmly to the wall-rock, which is impregnated with large flakes of biotite within a narrow zone along the vein walls. At places where the biotite is most abundant the vein parts more easily from the wall-rocks. Two main types of quartz were noted, a black and a milky white quartz. Although in many places both types appear to grade into each other, in some sections of the vein the milky quartz definitely cuts across the black quartz, and for this reason appears to have formed later. The black quartz contains much biotite, which is commonly distributed either in patches or seams and is not everywhere uniform in texture. Along the east limb of the vein, for example, there is evidence to indicate that the black quartz has digested much of the wall-rock and that its mottled and banded appearance in places is the result of this process. At the nose and along the west limb of the vein, the black quartz is mottled and banded, but not as noticeably as along the east limb, where banding is especially pronounced. Milky quartz occurs in every part of the vein, and in the west limb area extends beyond the vein itself into the adjacent wall-rocks. In

addition to quartz and biotite flakes, the vein contains small amounts of gold, pyrrhotite, pyrite, arsenopyrite, pentlandite, galena, chalcopyrite, magnetite, ilmenite, calcite, apatite, and oligoclase. Altogether, the metallic minerals account for less than 1 per cent of the vein, and commonly are found in close association with concentrations of biotite flakes and in fractures in the quartz.

Gold is the most important ore mineral, and although it is distributed throughout, it is definitely more concentrated in some parts of the vein, particularly at the nose and at places along its west limb and close to its foot-wall, where it forms orebodies. From the surface to a depth of 375 feet, 47,000 tons of ore averaging 0.86 ounce gold a ton are reported to have been proved in this vein. The gold is reported to occur free, and to be quite coarse in places. It is not believed to be closely associated with the sulphides.

West Zone. This zone lies in and near the northern tip of the belt of volcanic rocks, about 450 feet southwest from the nose of the North vein. It is an area of dense, dark green, volcanic rocks cut in a northerly direction by numerous irregular bodies of quartz, most of which are small. The volcanic rock in which they occur has been recrystallized to a dense, dark green, massive to gneissic quartz-feldspar-hornblende rock, in part garnetiferous. The West zone was prospected first from the surface by three trenches and several diamond drill-holes, and later was explored on the 125- and 250-foot levels by 100 feet of drift and lateral slashing, and by a raise from the 250-foot level to about 80 feet from surface.

Both black and milky white quartz occur in the West zone, and as in the case of the North vein, the black quartz is in part mottled and banded, possibly as a result of incomplete digestion of wall-rock. The quartz adheres firmly to the walls and contains a little gold, pyrite, pyrrhotite, chalcopyrite, sphalerite, and

white feldspar. The wall-rocks are also slightly mineralized, and on the whole the percentage of sulphide minerals is greater in the West zone than in the North vein.

Gold has been reported from the West zone, and an orebody of 32,000 tons averaging 0.37 ounce gold a ton has been outlined by drilling and its vertical continuity established between the 125-foot and the 375-foot levels. This orebody is of irregular shape and increases in area and grade with depth, as shown by the following figures:

Level	Area of horizontal section in square feet	Grade Ounces of gold per ton
125-foot	1,332	0.225
165-foot	1,560	0.302
210-foot	1,657	0.382
250-foot	1,890	0.44

Apparently, the gold is found not only in the quartz but also in the wall-rocks, and for this reason the orebody is a mixture of quartz and wall-rock. Gold is in the native state, and is apparently not found in close association with the sulphide minerals.

South Zone. What is known as the South zone at the Discovery Yellowknife mine is a contact zone between volcanic rocks and argillite. It lies along the western contact of the main volcanic belt and about 700 feet southwest of the northern end of the North vein. The South zone was prospected from the surface by trenches and X-ray diamond drill-holes, and was opened on the 125-foot level by 150 feet of drift. Although high assays were obtained from the surface work, underground development has indicated a gold content of less than 0.3 ounce a ton across an average width of 36 inches.

Several quartz stringers were observed in this South zone at the surface, but only a few of them, and these rather small, were encountered underground. The zone is heavily mineralized, pyrite, pyrrhotite, and arsenopyrite being common not only in the volcanic and sedimentary rocks but also in the quartz stringers. A little white feldspar occurs in the quartz, which comprises both black and milky white types.

La Salle Yellowknife Gold Mines Limited

The property of La Salle Yellowknife Gold Mines Limited occupies an area about 7,200 feet long and 4,200 feet wide at the northeast end of Narrow Lake. It is bordered on the northeast by the property of Discovery Yellowknife Mines Limited, on the southwest by that of Oro Yellowknife Gold Mines Limited, and on the west by the holdings of Goldpac Yellowknife Mines Limited. It comprises twelve adjoining claims, Bruce Nos. 1 to 8 claims and Avis Nos. 3 to 6 claims. These claims were staked by A. V. Giauque in August 1944, and later sold to La Salle Yellowknife Gold Mines Limited, which was incorporated late in 1944. Exploration work, consisting of prospecting, trenching, sampling, and drilling, under the direction of J. G. McChesney, commenced soon after, and continued steadily until June 1946. In 1945 work was concentrated in the southwestern part of the property, whereas in early 1946, work was transferred to the northern part of property on the Bruce No. 5 claim. By June 1946, when operations were temporarily suspended, 15,934 feet of drilling had already been done on the property. In November 1946, the company was reorganized. Operations were resumed in April 1947 under the direction of G. M. Webster assisted in the field by J. F. Blue, but were suspended by early August of the same year. During the summer of 1948, H. H. Singer

did some further work on the property, including 535 feet of drilling. The La Salle camp lies at the northeastern end of Narrow Lake.

The property is underlain by large and small lenticular bodies of basic volcanic rocks intercalated in sedimentary formations and dipping steeply to the west. The main mass of volcanic rocks outcrops in a high ridge elongated northeasterly, and occupies most of the ground in the western half of the property. Almost all the exploration work that has been done on this property has been concentrated on this mass of volcanic rock or along its contacts. The rock is now an andesine-amphibole gneiss, with generally a pronounced fragmental structure, and at places is heavily mineralized with pyrite, pyrrhotite, and arsenopyrite and cut at irregular intervals by narrow and commonly short quartz veins and stringers. Due to the abundant iron sulphides the weathered surface of the deposit is in places notably rusty, thereby obscuring most of the structural features and making prospecting and exploration work very difficult. At least fifty stripped areas and rock trenches were counted on the property, most of them located either along and across quartz veins and stringers found in volcanic rocks or in areas of heavily mineralized volcanic rocks. A few of them cross the contact zones of the volcanic and sedimentary rocks, and four were observed to cross quartz stringers in sedimentary rocks.

Several quartz veins and stringers were observed on this property. Most of them trend between north and north 40 degrees east; some, however, strike about northwest. As joint fractures in the neighbouring sedimentary rocks have about the same strike, it is possible that these quartz veins and stringers fill such

fractures. Most of the veins dip westerly at angles of 40 to 55 degrees, and most of them are short, but some have been traced for 100 feet or more. Their width is generally less than 2 feet. The quartz is commonly milky white, but in places, particularly in the best gold-bearing veins found so far on this property, it is light to dark grey and well fractured. It may or may not be slightly mineralized with pyrite, arsenopyrite, and pyrrhotite. The contact of the quartz veins or stringers with the wall-rock is generally sharp, and the wall-rocks themselves are commonly massive and only slightly altered.

Most of the work so far has been concentrated on the main body of volcanic rocks, either close to its eastern contact or at its northern tip. Along its eastern contact, at least eight veins have been tested by rock trenching and sampling, and it is believed that they have provided the best assays on the property. Thus, vein No. 5 has been traced for 92 feet and averages, as reported, 0.787 ounce gold a ton across an average width of 1.37 feet. In December 1947, it was reported that vein No. 4 had been traced for 125 feet and averaged 0.889 ounce gold a ton across an average width of 1.02 feet. Much work in the form of trenches and drill-holes has been done at the northern tip of this lens of volcanic rock. At least seven rock trenches were noted, most of them in rusty mineralized basic volcanic rocks and across narrow, short quartz stringers. No information, however, has been obtained on the result of this work.

Some work has also been done near the southern end of the lens of volcanic rock that extends from the Discovery shaft to near the north end of Winter Lake. No information is available on the results of this work, but in the field at least eleven rock trenches or pits were noted either in the rusty volcanic rocks or across quartz stringers in mineralized sedimentary rocks.

Some stripping has also been done along the western contact of the main lens of volcanic rock, directly opposite to where most of the work was done near the eastern contact.

In summary, it appears that records of the work done so far on this property are fragmentary, and from the information provided by drilling and trenching it is not yet possible to outline the possible ore zones. Except for about half a dozen assays averaging 1.50 ounces gold a ton across widths of 3 to 21 inches, most of the other returns obtained by sampling core and trenches fall below 0.40 ounce gold a ton across an average width of 36 inches.

Oro Yellowknife Gold Mines Limited

Oro Yellowknife Gold Mines Limited was incorporated as a company in February 1946 to take over and explore the Matt and Dorr groups of ten and eighteen contiguous mineral claims that had been previously jointly optioned by American Yellowknife Gold Mines Limited and by Goldcrest Mines Limited. The area occupied by these two groups of claims, about 8,000 feet long in a north 43 degrees east direction, by 7,000 feet wide, extends around Narrow Lake and southwest of Winter Lake. It adjoins to the northeast the properties of LaSalle Yellowknife Gold Mines Limited and Goldpack Yellowknife Mines Limited, and to the southwest that of Circle Yellowknife Mines Limited. The Oro Yellowknife camp lies on the west shore of, and a short distance from, the south end of Narrow Lake, about 1½ miles southwest of the Discovery shaft.

During the summer 1946, much work was done on this property by J. M. Piloski, who mapped geologically the entire ground, and by F. B. Brien, who prospected the area and directed the trench excavations. At least twenty-eight rock trenches and several stripped areas were excavated under Mr. Brien's supervision. None of the results of this work are available to the writer.

Apart from a small mass of volcanic rock at the northeast end of Narrow Lake and small areas of dioritic and possible volcanic rocks southwest of the lake, the property is underlain by sedimentary rocks such as greywacke, argillaceous greywacke, and argillite, all of which are so closely interbedded that commonly it has been impossible to map them separately. West of the southwestern end of Narrow Lake, however, a few large bands of black, dense argillite were differentiated from the other rocks and traced for several hundred feet. These argillite bands are in places heavily mineralized with pyrite and pyrrhotite, and are cut by narrow, short, quartz stringers, which may or may not be mineralized. At least fifteen of the rock trenches seen on this property have been excavated at right angles to the trend of, and in, these argillite bands, and commonly where the effects of mineralization are most noticeable and where quartz stringers are abundant. Generally these quartz stringers contain little or no sulphide minerals, but are slightly pegmatitic, and carry a little white oligoclase, carbonate, green chloritic material, and apatite. Most of the remaining trenches were excavated in volcanic and dioritic rocks, or across the contacts between dioritic rock and greywacke or argillite, and commonly where the rock is heavily mineralized and intersected by a few small quartz stringers.

Several other quartz stringers were seen on this property. They are particularly abundant in a wide zone trending about east across the central part of the property, but in general they are apparently unmineralized and for this reason have not been trenched. Quartz on this property is most commonly milky white, but some of it is grey to bluish grey; most of the stringers strike parallel with the bedding or at a small angle to it.

Typhoon Yellowknife Mines Limited

Typhoon Yellowknife Mines Limited was incorporated as a company in February 1946, and is controlled jointly by Omnitrans Exploration Limited and Continental Diamond Drilling and Exploration Company Limited. The company owns twenty-one claims, consisting of the Joan group of ten claims, the CPS group of six claims, and five others. It adjoins to the south the property of Discovery Yellowknife Mines Limited. Exploration under the direction of E. E. Creelman commenced in early March 1946, was suspended in early autumn of the same year, and consisted of prospecting, mapping, dip-needle surveying, trenching, and diamond drilling. At least six rock trenches were observed on the property, all of them across rusty, mineralized zones containing some pyrite and pyrrhotite and intersected by some quartz stringers. There are several other rusty outcrops that have not been trenched. Diamond drilling on the property aggregates 6,220 feet, and represents part of the exploration work.

Much of the ground owned by this company is under the waters of Giauque Lake. Only the northeastern and southwestern parts are land, and all exploration work has been concentrated so far in the southwestern part of the property on the CPS group of claims and not far from the boundary line with the claims of Discovery Yellowknife Mines Limited.

The property is underlain entirely by sedimentary strata and these trend northeasterly. Apart from a wide band of quartzite and granulites in the southwestern part of the property, all the other rocks are nodular schists. These are highly schistose along the western shore of Giauque Lake included in this property and are intersected at several places by short, narrow quartz stringers. There are also several zones and areas of rusty weathering rocks, commonly black argillaceous types. These are impregnated with grains of pyrite and

pyrrhotite or are cut by seams $\frac{1}{8}$ inch wide of these two sulphide minerals, by carbonates veinlets, and by many quartz seams and stringers that may or may not be mineralized. Most of this quartz is milky white, and in places may be associated with white feldspar. Some of it is glassy.

No assays have been seen by the writer on samples obtained from this property, but gold has been reported.

Wolfpack Yellowknife Mines Limited

Wolfpack Yellowknife Mines Limited owns the AB group of nine claims and was incorporated as a company in early 1946. The company is controlled jointly by Omnitrans Exploration Limited and Continental Diamond Drilling and Exploration Company Limited. It is bordered on the south by the property of Typhoon Yellowknife Mines Limited.

In the summer of 1946, some preliminary surface exploration and dip-needle surveying were done.

All the rocks underlying the property are nodular schists, cut at a few places by short, narrow, unmineralized quartz stringers and veins.

Goldpac Yellowknife Mines Limited

Goldpac Yellowknife Mines Limited owns the BDD group of six claims and adjoins to the northeast Discovery Yellowknife Mines Limited and to the southeast LaSalle Yellowknife Gold Mines Limited. Some surface stripping and trenching were done on the property in 1946, and geological mapping was carried out at the same time by J. M. Piloski. In August 1949, some trenches were excavated on this property.