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MINERAL RESOURCES OF TERRACE AREA, COAST DISTRICT, BRITISH COLUMBIA

BY

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Gold Deposits of Elbow-Morton Area, Manitoba

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Gold Deposits of Elbow-Morton Area, Manitoba

GENERAL GEOLOGY

INTRODUCTION

Elbow-Morton area is 38 miles east of Flinflon, Manitoba. It is about 26 miles long, north and south, and 22 miles wide, east and west, and includes the country lying between Elbow and Morton lakes and extending south to Grass river (*See* Map 321A). The map-area is bounded by latitudes 54 degrees 35 minutes and 54 degrees 52 minutes and longitudes 100 degrees 25 minutes and 100 degrees 58 minutes.

Elbow lake is easily reached by canoe or motor boat from Cranberry Portage on the Flinflon branch of the Hudson Bay railway. A wagon road leads from Cranberry Portage to First Cranberry lake. From this lake a water route, without rapids or portages, follows a northeasterly course for about 25 miles to the south end of Elbow lake. Elbow lake is only 9½ miles east of Heming lake on the Sherridon branch of the Hudson Bay railway, but there is no summer route across the intervening country. Reed and Morton lakes are reached from Elbow lake by canoe along Grass river.

Following exploratory work in the area by Bruce[1] and Alcock[2] gold was discovered at Elbow lake in 1921 by Mr. Gordon Murray. Several other gold deposits were found at Elbow lake immediately after the original discovery was made and the deposits were examined by Armstrong[3] during the following summer. In 1927 Mr. Lambert Nelson discovered a gold deposit at a locality 4 miles west of Morton lake and other gold deposits were soon found nearby. In 1930 Wright[4] examined a few of the deposits at Elbow and Morton lakes.

Prospecting activity was renewed in the area during the summer of 1934 when the writer made a careful study of most of the known gold deposits and revised the early geological maps of the area. In this work he was ably assisted by Messrs. G. M. Proudfoot, H. C. Lane, and J. Spivak. The writer is grateful for assistance given by everyone encountered in the field. Particular thanks are due to all prospectors for their many courtesies, to officers of Canadian Mining Projects, Limited, who gave data on surveys of their mineral deposits and rendered other valuable assistance, and to Professor G. H. Herriott, who kindly supplied field maps of surveyed claims.

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[1] Bruce, E. L.: "Amisk-Athapapuskow Lake District"; Geol. Surv., Canada, Mem. 105 (1918).
[2] Alcock, F. J.: "The Reed-Wekusko Map-area, Northern Manitoba"; Geol. Surv., Canada, Mem. 119 (1920).
[3] Armstrong, P.: "Geology and Ore Deposits of Elbow Lake Area, Northern Manitoba"; Geol. Surv., Canada, Sum. Rept. 1922, pt. C, pp. 37-44.
[4] Wright, J. E.: "Geology and Mineral Deposits of a Part of Northwest Manitoba"; Geol. Surv., Canada, Sum. Rept. 1930, pt. C, pp. 1-124.

The district forms part of the Canadian Shield and lies just north of the south edge of this large area of Precambrian rocks. Like many other parts of the Shield, bedrock is extensively exposed on hills and ridges that rise above low areas filled with muskeg, swamp, or lakes. Rock hills rarely rise as much as 50 feet above their immediate surroundings. Hills and plateaux of rock are numerous along and near the main water routes and large lakes. Much of the country underlain by granite between Elbow lake and Morton lake is a rocky plateau or is covered with muskeg with scattered rock hills protruding through. Wide areas of this muskeg country are barren of trees or are sparsely timbered with scattered, small evergreens. Elsewhere the district is generally well mantled with green woods. Much of the timber west of Reed and Loonhead lakes has been killed by forest fires.

Glacial striæ are preserved on many rock outcrops and indicate that the continental ice-sheet of Pleistocene time moved south 25 degrees west.

The Precambrian rocks in the Elbow-Morton area are divided into two main groups as follows:

Table of Formations

Intrusives.....	Diabase. Garnetiferous granite, hornblende granite, and quartz-feldspar porphyry. Basalt and basalt porphyry.
	Aplite and pegmatite. Granodiorite, quartz diorite, and granite-gneiss.
	Quartz porphyry, quartz-feldspar porphyry, feldspar porphyry, and rhyolite. "Quartz-eye" granite. Granodiorite, quartz diorite, and hornblendite. Fine-grained quartz diorite. Meta-diorite, quartz diorite, and gabbro.
Wekusko group.....	Sediments: sedimentary gneiss and schist, quartzite, and arkose.
	Volcanics: basaltic and andesitic lava, dacite, rhyolite, tuff, and iron formation.

The sedimentary and volcanic parts of the Wekusko group are interbedded with one another and are of the same age. This group is older than all the intrusive rocks, but these were injected at several different times as shown by crosscutting relationships. Some bodies of granite or more basic rocks are apparently about the same age as, or older than, the " quartz-eye " granite. Dykes of garnetiferous granite and basalt porphyry are probably much younger than this granite, and some large bodies of granitic rock may also be younger than this granite. Age relations between many of the rock types, however, is unknown and all of the various intrusives cannot be arranged in chronological order, although this is attempted in the above table of formations. The " quartz-eye " granite is lithologically similar to certain bodies of granite in other parts of northern Manitoba that may be

pre-Missi in age. Bodies of this granite in the Elbow-Morton area are of particular interest because of their apparent genetic relationship with many of the gold deposits.

WEKUSKO VOLCANICS

The Wekusko volcanic rocks are extensively exposed about Elbow lake, along Grass river, and west of Morton lake (formation 1, Map 321A). Andesitic and basaltic lava flows predominate. These are dark green, massive or schistose, hornblende-rich rocks altered in various places to chlorite schist, hornblende schist, or distinctly banded, garnetiferous, hornblende gneiss. On many islands in Elbow lake the lavas are much replaced by specks of brown-weathering carbonate and the rock is a chlorite-carbonate schist. A few of the andesitic and basaltic flows are porphyritic with phenocrysts of feldspar, and others are amygdaloidal or exhibit pillow structure, or carry elongated lumps of light green rock composed chiefly of epidote. The basic lavas are locally interlayered with flows of dark green, schistose dacite, and grey, fine-grained, massive or laminated rhyolite.

Many layers in the flows are of fragmental volcanic rock and a few layers are of dark grey, fine-grained, bedded rock that may be a tuff. A few beds and lenses of iron formation are interlayered with the volcanic schists. The iron formation is either of alternating thin layers of magnetite and bluish grey or white chert or of pale green and black sedimentary schist carrying many grains of magnetite in some beds. Lenses of white, grey, blue, and red chert lie in schistose lava near the bodies of iron formation.

WEKUSKO SEDIMENTS

These rocks underlie two extensive areas, the one extending from Loonhead lake to Morton lake, and the other forming a northerly striking belt 5 miles west of Morton lake (formation 2, Map 321A).

The sediments on and about Loonhead lake are grey and black, quartz-mica gneiss and quartzite. The beds are nearly horizontal in some outcrops and apparently the axis of an anticlinal fold passes northwest across the lake.[1] Black staurolite schist outcrops on the south shore of Corley lake and on the southwest shore of File lake.[2]

Arkose outcrops on a small, burnt island in Morton lake and is exceptionally well exposed for study. Most of the arkose is a fine-grained, grey rock carrying scattered, small grains of blue quartz. Some beds from 3 inches to 1 foot wide are of coarse, gritty arkose in which grains of quartz and feldspar and small fragments of green volcanic rock are clearly visible. Some of the strata show excellent crossbedding. The beds strike about north and dip vertically. A study of the crossbedding and variation in grain size in individual beds shows that the tops of the beds face west. A band of sediment extending southwest from the west shore of Morton lake carries scattered small grains of quartz and is usually like the fine-grained

[1] Wright, J. F.: "Geology and Mineral Deposits of a Part of Northwest Manitoba"; Geol. Surv., Canada, Sum. Rept. 1930, pt. C, p. 66.
[2] Alcock, F. J.: Geol. Surv., Canada, Mem. 119, p. 22.

arkose on the small island. In the green woods it is generally difficult to distinguish this rock from quartz porphyry, but bedding is distinct on a few outcrops.

The belt of sediments 5 miles west of Morton lake is chiefly a fine-grained to coarse-grained sedimentary gneiss composed of biotite or hornblende with quartz and feldspar. Many layers of the gneiss are garnetiferous. A few beds of fine-grained, grey quartzite from 2 feet to 5 feet thick are interstratified with the gneiss. Beds and gneissic structure strike in many directions but generally trend north and dip vertically or nearly so. This belt of sediments is bounded on the east by a wide area of lava flows. In the vicinity of the boundary beds of sedimentary gneiss alternate with flows of lava for as much as 1,200 feet across the strike, and it is evident that the two formations are interlayered with one another and are of the same general age.

META-DIORITE, QUARTZ DIORITE, AND GABBRO

Several large, sill-like bodies of these rocks lie in sediments and volcanics west and north of Reed and Morton lakes (formation 3, Map 321A), and numerous small bodies lie in the lavas about Elbow lake and west of Morton lake.

Meta-diorite is the most common rock type in these masses. This is a grey rock in which hornblende is plentiful and feldspars have been almost completely altered to zoisite and epidote. This alteration gives the feldspars a milky white colour that is characteristic of the rock. Other parts of the intrusive bodies are of dark green quartz diorite and gabbro. Both these types carry much hornblende. The quartz diorite carries grains of blue quartz and some of the quartz, as seen under the microscope, is graphically intergrown with feldspar. The meta-diorite and other rocks carry accessory apatite and grains of magnetite, pyrite, and pyrrhotite. All these rocks are massive over large areas. In some parts of the bodies, however, bands of grey meta-diorite alternate with layers of dark green gabbro and the outcrops have a gneissic appearance. At other localities it is common to find patches of the grey rock intermixed with irregular areas of the darker, more basic rock and the outcrops have a mottled appearance. The three rock types commonly pass gradually from one to another. In some localities the gabbro is cut by small dykes of meta-diorite or the meta-diorite is cut by dykes of milky white aplite and all these rocks are crossed by stringers of epidote.

Many small bodies of meta-diorite and gabbro are rather fine grained, are difficult to distinguish from lava flows of andesite or basalt, and may be intrusive equivalents of these flows. Other bodies, however, are probably early phases of " quartz-eye " granite. This relationship is shown in the northern part of the large body that extends north from the southwest shore of Reed lake. Here, the quartz diorite passes gradually into meta-diorite and gabbro, and also passes without intrusive relations into typical " quartz-eye " granite. In places the gabbro and quartz diorite are cut by dykes of " quartz-eye " granite and by dykes of porphyry that are related to this granite.

FINE-GRAINED QUARTZ DIORITE

Dykes and other small bodies of fine-grained quartz diorite were seen in andesitic lava on a half dozen mineral claims and may occur elsewhere. The dykes commonly lie parallel to the cleavage direction of the invaded lavas and do not continue far along their strike. The fine-grained quartz diorite is a grey rock that is either massive or has a pronounced gneissic structure. The rock is composed of quartz, oligoclase, biotite, hornblende, and titanite and carries disseminated grains of pyrite, pyrrhotite, and chalcopyrite. The feldspar is locally much altered to sericite and carbonate.

GRANODIORITE, QUARTZ DIORITE, AND HORNBLENDITE

A large body of the rocks of this group (part of formation 5, Map 321A) lies northwest and north of Elbow lake and is embayed by a tongue of lava extending from Elbow lake to Webb lake. Dark grey, hornblende-quartz diorite commonly forms a border phase of the body and varies in width from a few hundred feet to half a mile. The quartz diorite immediately at the contact with lava is locally porphyritic with phenocrysts of feldspar. The normal non-porphyritic quartz diorite locally holds patches of hornblendite that are up to several hundred feet across and have indefinite contacts with the enclosing rock. The main part of the intrusive body is of grey and pink, massive, biotite granodiorite. Oligoclase feldspar of the granodiorite and quartz diorite is partly altered to epidote and sericite. Accessory constituents include apatite and titanite.

The lavas near the edge of the intrusive body and the fine-grained quartz diorite described in the previous section of this report are locally cut by dykes of dacite porphyry. The dacite porphyry is similar to the porphyritic border phase of the hornblende-quartz diorite and is probably an offshoot from it.

A small body of dioritic rock lies in lavas 2 miles northeast of Elbow lake and another lies in lavas ¼ of a mile northeast of Claw lake. These bodies are similar to the quartz diorite phase of the large body described above.

"QUARTZ-EYE" GRANITE

Several large and small bodies of "quartz-eye" granite (formation 4, Map 321A) and closely related granitic rocks outcrop about Elbow and Sewell lakes. Other smaller bodies of "quartz-eye" granite occur in the lavas at these localities and several bodies lie in the body of granodiorite, quartz diorite, and hornblendite northwest and north of Elbow lake and in granitic rocks southeast of Claw lake.

The "quartz-eye" granite is a medium- to coarse-grained rock that varies from light grey to pink and greenish. Much of the rock is slightly schistose or massive and some small bodies are altered to sericite schist or are much crushed and broken. As the name implies, the rock is characterized by distinct eyes of quartz. These are up to ½ inch across, are blue or

white, and are conspicuous on weathered surfaces of outcrops. In thin section under the microscope, each quartz-eye is seen to consist of an aggregate of small quartz grains that are slightly strained. Other constituents are feldspar and smaller amounts of biotite, hornblende, muscovite, apatite, titanite, magnetite, pyrite, and carbonate. The feldspar crystals are commonly euhedral and project into the quartz eyes. The feldspar varies in composition from albite to oligoclase and andesine. The " quartz-eye " granite accordingly varies from albite granite to quartz diorite. Since no potash feldspar is present, intermediate types such as quartz monzonite and granodiorite are lacking. Commonly even the basic types carrying andesine are light coloured and look like granite. The feldspar crystals are partly altered to a mixture of sericite, epidote, and zoisite and some crystals are almost completely altered to these minerals. The epidote-zoisite alteration, however, is not as intensively developed nor as widespread as in the meta-diorite. Much of the biotite is almost completely altered to chlorite. Cracks in the crushed and broken " quartz-eye " granite are filled with microscopic veinlets of chlorite, epidote, and carbonate.

In some bodies composed chiefly of " quartz-eye " granite, the granite passes into other types of granitic and more basic rocks that do not carry eyes of quartz. These types include porphyritic granite with closely packed phenocrysts of red or greenish feldspar, grey granite, hornblende-quartz diorite, and hornblendite. The last two rock types are similar in appearance to the quartz diorite and hornblendite described in the previous section of this report.

A peculiarity of some of the bodies of " quartz-eye " granite and associated phases is that their contacts, in part, cross the schistose structure of adjacent lavas. This relationship is well shown along the north edge of a large body just west of Sewell lake where the granite contact trends west at right angles to the cleavage of nearby lavas. The northerly striking cleavage in the lavas was apparently developed before the invasion of the granite, for dykes derived from the granite and lying in the nearby lava generally follow the cleavage direction of the lava. Cross-cutting relationship is also well shown along the edge of a lobe of granite that projects from the west side of a body of " quartz-eye " granite lying just east of Elbow lake. The south edge of the lobe strikes west almost at right angles to the strike of the cleavage of adjacent lava. Here, also, a north-striking cleavage was developed in the lava before the invasion of the granite, for tongues of granite, which project outward from the main mass, follow the cleavage direction of the lavas and cleavage tongues of lava project into the granite. After the solidification of the granite, another north-striking cleavage was developed in both lava and granite and cleavage planes are continuous across the contact between these two rocks.

The " quartz-eye " granite in Elbow-Morton area is lithologically similar to " quartz-eye " granite at Gods lake, to bodies of granite on Lookout and Missi islands in Amisk lake, and to the Cliff Lake granite porphyry east of Cliff lake in the Amisk-Athapapuskow Lake district. Wright gives evidence indicating that the granite at Gods lake may be older

than the Oxford sediments[1], and that the granite on Lookout island may be older than the Missian sediments[2]. Opinions differ regarding the age of the Cliff Lake granite porphyry, for Bruce[3] considers that it is pre-Missi, Alcock[4] places it as post-Missi, and J. F. Wright on Map 268A classifies it as pre-Missi. It is possible that the "quartz-eye" granite in Elbow-Morton area is of the same age as some, at least, of the lithologically similar granite bodies of northern Manitoba and Saskatchewan, and it may be older than the Missi and Oxford sediments. The relationship, however, cannot be proved, for these sediments are not known to occur in the Elbow-Morton area.

Dykes of "quartz-eye" granite cut patches of hornblendite that lie in bodies of "quartz-eye" granite. Dykes of "quartz-eye" granite and quartz diorite also cut lavas and sediments near large and small bodies of "quartz-eye" granite. The dykes are generally not abundant except near the north edge of the large body of "quartz-eye" granite west of Sewell lake and also near small stocks of granitic rock north of this large body where dykes are locally so numerous that the outer limits of the stocks are indefinite. Elsewhere, contacts of bodies of "quartz-eye" granite are sharply defined.

PORPHYRY AND RHYOLITE RELATED TO "QUARTZ-EYE" GRANITE

The rocks of the group include dykes of quartz porphyry, quartz-feldspar porphyry, feldspar porphyry and rhyolite, and small stocks of quartz-feldspar porphyry (part of formation 6, Map 321A). A stock of quartz-feldspar porphyry, ½ mile across, lies in lava north of Elbow lake and many other bodies of similar porphyry up to 100 feet across lie in lavas near this stock. The dykes of porphyry and rhyolite cut lava, sediments, fine-grained quartz diorite, the granodiorite, quartz diorite, and hornblendite northwest and north of Elbow lake, and dykes of dacite porphyry. Dykes of rhyolite locally cut "quartz-eye" granite. Porphyry dykes are especially abundant in lavas near small bodies of "quartz-eye" granite north and northwest of Elbow lake and in lavas north of the large body of "quartz-eye" granite lying west of Sewell lake. Most of the dykes are less than 5 feet wide; a few are from 5 to 90 feet wide. Some extend for only a few feet along their strike, whereas others have been traced for almost a mile. The dykes in the lava commonly trend along the cleavage of enclosing rocks or cross this structure at slight angles; a few cross the cleavage of the lavas at right angles.

The porphyry and rhyolite vary from red to grey and from fine to medium grained. Many bodies are massive and others are schistose. A few dykes are massive in the middle and are altered to schist along the edges. The stocks and many porphyry dykes carry phenocrysts of both

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[1] Wright, J. F.: "Oxford House Area, Manitoba"; Geol. Surv., Canada, Sum. Rept. 1931, pt. C, pp. 7, 10, and 22.

[2] Wright, J. F.: "Amisk Lake Area, Saskatchewan"; Geol. Surv., Canada, Sum. Rept. 1932, pt. C, pp. 84-86.

[3] Bruce, E. L.: "Amisk-Athapapuskow Lake District"; Geol. Surv., Canada, Mem. 105, p. 30 (1918).

[4] Alcock, F. J.: "Flinflon Map-area, Manitoba and Saskatchewan"; Geol. Surv., Canada, Sum. Rept. 1922, pt. C, p. 15.

quartz and feldspar; some porphyry dykes carry phenocrysts of either quartz or feldspar. The phenocrysts are locally as much as from ¼ to ½ of an inch across, whereas in other bodies they are very small and difficult to detect. The quartz of the phenocrysts is blue or white. It is generally strained and some large phenocrysts consist of an aggregate of intergrown quartz grains as if an original large crystal had been granulated. The feldspar phenocrysts are commonly of albite, but in some bodies they are of oligoclase and in a few dykes of feldspar porphyry they are of andesine. Some of the feldspar phenocrysts are crushed and broken. The groundmass is of quartz and plagioclase with or without biotite and accessory apatite and magnetite. The feldspar phenocrysts are commonly much altered to sericite, epidote, and zoisite and the groundmass is also generally partly altered to these minerals. Biotite is partly or completely altered to chlorite. The rhyolite is like the groundmass of the porphyries. Sheared porphyry and rhyolite are altered to sericite schist and chlorite schist and some of these schists carry much brown-weathering carbonate. The porphyry and rhyolite almost everywhere carry disseminated grains and cubes of pyrite and are locally crossed by stringers of pyrite. It is reported that many such bodies carry low values in gold.

The distribution of the dykes indicates that they are genetically related to the "quartz-eye" granite. This relationship is especially well shown northwest of Sewell lake where the dykes are largest and most numerous near the large body of "quartz-eye" granite and near stocks of similar granite north of the main mass. A body of "quartz-eye" granite that lies in granodiorite and quartz diorite 1¼ miles west of the mouth of Webb creek is cut by numerous dykes of rhyolite and a few of these dykes cut nearby granodiorite and diorite as if the dykes originated in the "quartz-eye" granite. The dykes are similar in composition and manner of alteration to the "quartz-eye" granite.

GRANODIORITE, QUARTZ DIORITE, AND GRANITE-GNEISS

(Part of formation 5, Map 321A)

A large body of granitic rock about Norris lake is of red, biotite granodiorite with a border phase of grey, hornblende-quartz diorite. Cleavage of the lavas south of the intrusive body normally strikes about north. Within a zone ¼ of a mile wide, adjacent to the granitic body, the cleavage diverges from the normal and the cleavage of lava immediately at the contact of the granite strikes parallel to the contact. The disturbed nature of the lavas near this body of granite is in contrast with the character of the lavas adjacent to bodies of "quartz-eye" granite.

A large body of granitic rock extends north across the middle of the map-area and is at least 25 miles long and up to 8 miles wide. The body is composed chiefly of massive, pink biotite granodiorite and grey, biotite-quartz diorite. Some phases of the granodiorite are porphyritic with large phenocrysts of feldspar. Granite-gneiss underlies an extensive area northeast of Loucks lake and occurs elsewhere in the large body. Cleavage of the lavas and sediments strikes parallel to the edges of the large body.

Extensive areas within the large granitic body southeast of Claw lake are underlain by " quartz-eye " granite, but the age relations between the " quartz-eye " granite and nearby granodiorite are unknown.

The constituent minerals of both of the above described large bodies of granitic rock are fresh and unsheared as contrasted with the altered and schistose nature of the " quartz-eye " granite and related dykes. This is insufficient evidence to prove that the " quartz-eye " granite and related rocks are older, but it is, nevertheless, suggestive that they may be older and that the pressure that caused the shearing in these rocks may have accompanied the invasion of the large bodies of granodiorite, quartz diorite, and granite-gneiss. No dykes of " quartz-eye " granite or porphyry were found cutting the granodiorite and associated rocks nor were any dykes derived from the granodiorite or associated rocks found to cut the " quartz-eye " granite.

APLITE AND PEGMATITE

The granodiorite, quartz diorite, and granite-gneiss of the large body extending north across the middle of the map-area and the granodiorite and quartz diorite of the large body about Norris lake are locally cut by dykes of red aplite and a few of red pegmatite. Dykes of similar rocks cut the lavas, sediments, and meta-diorite near the edges of these intrusive bodies as if the dykes were derived from them. No dykes of pegmatite were found in or near bodies of " quartz-eye " granite.

BASALT AND BASALT PORPHYRY

Dykes of basalt porphyry are abundant in the lavas and sediments north of the large body of " quartz-eye " granite west of Sewell lake and a few cut this body of granite. The dykes are up to 5 feet wide and 700 feet or more long. They lie parallel or nearly parallel to the cleavage of enclosing rocks. The porphyry is a dark grey or black, massive, fine-grained rock holding scattered, large phenocrysts of labradorite in a groundmass of labradorite, hornblende, and a small amount of biotite. The edges of some of the dykes are of slightly chilled rock without phenocrysts. The dykes of basalt porphyry cut gold-bearing quartz veins that are genetically related to the " quartz-eye " granite.

A few dykes of basaltic rock without phenocrysts cut lavas, sediments, " quartz-eye " granite, and intrusive rhyolite. One dyke crosses a quartz vein and adjacent hornblende-quartz diorite.

GARNETIFEROUS GRANITE, HORNBLENDE GRANITE, AND QUARTZ-FELDSPAR PORPHYRY

Dykes of garnetiferous granite cut lavas and gold-bearing quartz veins west of Morton lake. The dykes are commonly less than 10 feet wide and rarely extend for more than 100 feet along the strike. Some of the dykes lie along the cleavage of enclosing lava and others cross the cleavage at various angles. The dykes that cross the cleavage have jagged walls

resulting from projecting tongues of the schistose lava. The garnetiferous granite is a medium to fine-grained, pink rock carrying small, red garnets and small amounts of biotite and muscovite.

Two dykes of hornblende granite without garnets cut gold-bearing quartz veins west of Morton lake. One of these dykes is of a medium-grained, grey rock carrying biotite in addition to hornblende and the other is a fine-grained, dark grey rock carrying diversely oriented laths of hornblende.

The dykes of garnetiferous granite and hornblende granite are younger than the "quartz-eye" granite and related porphyry for they cut quartz veins that cross the porphyry and that are derived from the porphyry and "quartz-eye" granite. Age relations between the garnetiferous granite and basalt porphyry, described in the previous section, are not definitely known. On the North Star No. 2 claim a dyke of the porphyry crosses a dyke of the granite, but the porphyry at the contact is cut by stringers of the granite that project outwards from the granite dyke. It is probable that the garnetiferous granite is later than the basalt porphyry and that the fracture filled by the granite dyke was not strong enough to pass completely through the massive porphyry.

Three stocks of quartz-feldspar porphyry (part of formation 6, Map 321A) mixed with hornblende granite lie in lavas west of Morton lake. The stocks are from a quarter of a mile to 2 miles long. The rocks of these stocks are somewhat like, lithologically, the above described dykes of garnetiferous granite and hornblende granite that cut gold-bearing quartz veins and, therefore, the stocks may be the same age as these dykes. The quartz-feldspar porphyry is a fine-grained rock that varies from light grey to dark grey and commonly has a well-developed gneissic structure. Much of the porphyry carries garnets and holds laths of hornblende that lie at all angles. Phenocrysts of blue quartz, albite, and oligoclase are small and are not easily detected. The phenocrysts, garnets, and laths of hornblende lie in a fine-grained groundmass composed of quartz, acid plagioclase, and biotite with small amounts of chlorite, sericite, and epidote. Much of the quartz is graphically intergrown with the plagioclase. Some parts of the porphyry bodies are of fine-grained, grey granite locally carrying red garnets. Grains of pyrite are scattered through the porphyry and granite. The bodies hold many included bands of andesitic and rhyolitic lava and the lavas for a mile from the edges of the stocks are cut by dykes of porphyry and fine-grained granite similar to the rocks of the main masses. Most of the dykes lie along the cleavage of enclosing lavas, but some of them cross the cleavage nearly at right angles.

A body of quartz-feldspar porphyry on the west shore of Reed lake is a fine-grained grey rock with small phenocrysts of blue quartz and a few of albite-oligoclase. The rock has a pronounced banding such as might be expected in a lava flow. The porphyry is probably intrusive, however, for it holds included bands of andesitic schist that are cut by stringers of the porphyry.

DIABASE

Dykes of diabase are rare within the map-area, but were observed cutting across lava, "quartz-eye" granite, and granodiorite. The dykes strike northwesterly and show chilled margins. One dyke in "quartz-eye" granite $\frac{3}{4}$ of a mile northeast of Webb lake is 6 feet wide and is apparently at least 1,000 feet long.

CHAPTER II

ECONOMIC GEOLOGY

Some of the gold-bearing deposits of Elbow-Morton area are of sulphides without important amounts of vein quartz, and others are of fine-grained, cherty quartz, as described later, but the great majority of the deposits are of ordinary vein quartz and these are apparently the most important.

Most of the vein quartz deposits are located about Elbow lake and in a small area west of Morton lake. The quartz commonly occurs along shear zones that lie in the lava and locally cross dykes of fine-grained quartz diorite, dacite porphyry, and quartz-feldspar porphyry that cut the lavas. The shear zones either follow the regional cleavage of the lava or cross this structure at various angles. Other quartz deposits follow shear zones that either lie along dykes of rhyolite or cross bodies of sedimentary gneiss, meta-diorite, hornblende-quartz diorite, "quartz-eye" granite, or quartz porphyry. In some shear zones in lava, stringers and lenses of quartz porphyry and rhyolite as well as vein quartz lie along cleavage planes of the sheared lava, and the porphyry and rhyolite are cut by the quartz. Locally, vein quartz fills irregular fractures in large bodies of fine-grained quartz diorite or in dykes of quartz-feldspar porphyry.

The shear zones are rarely exposed for more than 300 or 400 feet along their strike, although one is 2,100 feet long and there is evidence to indicate that another is at least 3,500 feet long. Generally, no evidence is found to indicate that the rocks on one side of a shear zone are displaced relative to those on the other side. Along a few shear zones, however, dykes have been offset a few feet, and the horizontal displacement along one shear zone is about 750 feet. Andesitic and basaltic lavas in the shear zones are commonly altered to chlorite schist. In many deposits the chlorite schist is partly altered to bands of biotite schist, and the biotite schist locally carries hornblende crystals lying at many angles. The bands of biotite schist with or without hornblende crystals generally lie adjacent to lenses and veinlets of quartz and it is evident that the biotite schist and hornblende crystals are an alteration of the chlorite schist produced at the time of the deposition of the quartz. Locally the lavas along the shear zones have been altered to a coarse-grained, hornblende gneiss.

The quartz in the shear zones is commonly in the form of lenses and stringers that are elongated parallel to the cleavage of enclosing schists. Most of the lenses are less than 6 inches wide and 3 or 4 feet long; a few are as much as 4 feet wide and 100 feet long. It is usual to find many lenses and stringers of quartz across widths of from 1 foot to 15 feet or more and the quartz constitutes from a small proportion to over half of the material

present across these widths. The vein quartz is not found along the full length of all the shear zones, the longest body of mixed quartz and schist being 600 feet. In a few shear zones narrow bodies of quartz persist for considerable distances along the strike and are of the nature of veins. The veins are up to 450 feet long. The quartz of the lenses, stringers, and veins is sugar-grained or more coarsely crystalline and varies from milky white to grey or glassy. The quartz almost everywhere holds shreds of schist that lie roughly parallel to one another and to the long dimension of the deposits. The quartz commonly holds small patches and stringers of iron-bearing carbonate and locally carries a few stringers and crystals of red feldspar and rare crystals of black tourmaline. The quartz in almost all of the deposits carries disseminated grains or streaks of pyrite and, in some deposits, carries one or more of the following minerals: chalcopyrite, sphalerite, galena, pyrrhotite, native gold, and, rarely, arsenopyrite. Schistose lava within and near the bodies of quartz is locally cut by stringers of carbonate and red feldspar, commonly carries grains of pyrite, and rarely carries small amounts of pyrrhotite and chalcopyrite.

Most deposits of vein quartz lie in volcanics either near large or small bodies of "quartz-eye" granite or near dykes of porphyry or rhyolite that are related to this granite. The association with these soda-rich rocks is so common that it is safe to conclude that the deposits are genetically related to the "quartz-eye" granite and derived dyke rocks. The association is also clearly indicated in a few deposits of mixed quartz and schist where the schist holds lenses and stringers of quartz-porphyry and rhyolite. The conclusion that the veins are genetically related to the "quartz-eye" granite is supported by the fact that, in one area, chloritic schists in the deposits become more highly altered to biotite schist and hornblende schist and gneiss as a large body of "quartz-eye" granite is approached. A few small bodies of "quartz-eye" granite and a few dykes of quartz-feldspar porphyry hold irregular patches of quartz that are probably late segregations in this rock. Short, irregular veinlets of quartz are also abundant in such bodies and generally do not penetrate adjacent lava. That gold-bearing quartz veins are related to bodies of porphyry and rhyolite is also suggested by the fact that these intrusive rocks are everywhere mineralized with sulphides and carry values in gold.

Prospectors in search of gold deposits in Elbow-Morton area should concentrate their efforts in areas of lava about bodies of "quartz-eye" granite or in areas where the lavas are cut by dykes of porphyry or rhyolite that are related to this granite. Especially favourable localities appear to be in areas of lavas at and comparatively near the edges of bodies of "quartz-eye" granite where the granite contact crosses the cleavage of the lavas at a large angle. Quartz is apt to be deposited in zones of weakness developed along cleavage planes of the lava, and where the zones of weakness strike toward the granite they are very favourably situated for deposition of quartz derived from the granite. Such a favourable area is that underlain by lavas north of the body of "quartz-eye" granite just west of Sewell lake. Although this area has already been closely prospected, further search should be made near the known

deposits and north of these deposits. Another area that appears to be geologically favourable for the deposition of gold-quartz veins is that underlain by lavas about the irregular-shaped, elongated body of " quartz-eye " granite just east of Elbow lake. Only a few deposits have been located here and prospecting should be more intensively undertaken in lavas outwards from irregularities in the outer edge of the granite and in lavas outwards from both ends of the granite. More intensive prospecting would also seem advisable in lavas about the north half of the large body of " quartz-eye " granite lying between Claw lake and Elbow lake, as well as in lavas at several localities about Elbow lake where small bodies of " quartz-eye " granite or related dyke rocks are found. Bodies of massive meta-diorite are apparently less favourable than the lavas for deposition of gold-quartz deposits derived from " quartz-eye " granite.

Although the majority of gold-quartz deposits are related to the " quartz-eye " granite and derived dyke rocks, a few may have a different origin. A gold-quartz deposit on the Senior claim, for example, lies in meta-diorite near a large body of granitic rock varying from granodiorite to quartz diorite and the deposit may have been derived from this granitic body. This deposit carries abundant arsenopyrite and tourmaline, minerals that are generally lacking in other quartz deposits of the area.

The deposits of cherty quartz are found about Elbow lake and most of them are on islands in the lake. The deposits lie either in andesite lava or, more commonly, in chlorite-carbonate schist derived from lava and many are near beds of cherty iron formation or near beds of dark sedimentary schist carrying grains of magnetite. The cherty quartz occurs in bodies up to 600 feet long and 50 feet wide and the bodies are usually lenticular. At some localities many small lenses of the cherty quartz lie close to one another in schist. The cherty quartz, whether in large or small bodies, is very fine grained and varies from pearly white to grey, blue, red, and black. The chert locally holds spots of magnetite, or is crossed by cracks filled with magnetite, red hematite, or specularite, and is commonly mineralized with a few disseminated grains of pyrite and is cut by veinlets of pyrite. Some of the cherty quartz is banded with alternating layers of various shades of colour and is probably a sediment. Much of the chert, however, cuts the lavas and it is common to find veins of chert branching from the main bodies into adjacent lavas. It is suggested that the deposits of cherty quartz are related in origin to the iron formation, which they resemble, are probably closely related to the flows, and were deposited from siliceous solutions on or near the surface of the lava flows. The bodies of cherty quartz are everywhere cut by irregular veinlets of milky white quartz and the milky white quartz locally carries pyrite and arsenopyrite.

The sulphide deposits are common about the north end of Elbow lake, the north end of Morton lake, and in sediments 4 miles west of Morton lake. They are reported to occur along Grass river and about Reed and Loonhead lakes. Several of the deposits examined consist of mineralized intrusive bodies of massive or schistose, fine-grained quartz porphyry, quartz-feldspar porphyry, and rhyolite. The massive rocks carry disseminated grains of pyrite and locally of pyrrhotite and arsenopyrite. The schistose rocks carry disseminated grains of these minerals and bands and

veinlets of pyrite that lie parallel to the cleavage of enclosing schist. Gold values are generally low in these deposits. The fact that sulphides are everywhere found in intrusive bodies of porphyry and rhyolite and that the sulphides are generally not found in adjacent lava strongly suggests that the sulphides are either original constituents of the intrusive rocks or are very closely related in origin to these rocks. These intrusives, as already stated, are probably closely related in origin to the "quartz-eye" granite.

Other sulphide bodies are replacement deposits in schistose lava and sediment. In these deposits pyrrhotite is the most characteristic sulphide and occurs as disseminated grains and veinlets, or forms essentially pure masses up to 35 feet wide. Minerals locally associated with the pyrrhotite include pyrite, chalcopyrite, and sphalerite. Gold values are generally low and some of the deposits carry nickel. Several of these deposits lie near bodies of meta-diorite or related quartz diorite and gabbro and may be related in origin to this group of rocks. Other deposits may be related to granitic rocks of the area.

Individual deposits of vein quartz are described in the following chapter. Deposits of cherty quartz are next described and, lastly, a brief account of some of the sulphide deposits is given.

5322—2½

CHAPTER III

DESCRIPTIONS OF MINERAL PROPERTIES

Bell, Apex, and Dan Claims (1-4)[1]

General Account. This group of five claims lies on the west side of Elbow lake near the north end. The Bell claim was staked in 1932 by Mrs. Ella A. Hanna. The Apex No. 1 claim lies immediately west of the Bell and was staked in 1933 by Mr. Roy Rundle. In the same year Mr. John Vanberg staked the Apex No. 2 and Apex No. 3 claims; these lie north of Apex No. 1. The Dan claim lies immediately south of Apex No. 1 and was staked in 1924 by Mr. Oliver Dickson. Gold-bearing deposits of quartz and schist on each of the claims may be reached over poorly marked trails that lead from a small cabin on the west shore of Elbow lake.

Bedrock outcropping on and near the claims comprises chiefly lava, meta-diorite, and "quartz-eye" granite (*See* Figure 1). Most of the lava is andesitic in composition and varies from a massive rock to a hornblende schist and chlorite schist. Rhyolite lava is widespread in the northwest part of the area. The rhyolite and andesite carry disseminated grains of pyrite over extensive areas. The lavas are invaded by several bodies of meta-diorite, but only one of these is sufficiently large and important to show on the accompanying figure. Outcrops of this rock have either a mottled or a banded appearance. The lavas are also invaded by some half dozen bodies of "quartz-eye" granite from 50 to 200 feet across and by one large body of similar granite 1,700 feet long and 700 feet wide. Numerous dykes of rhyolite, quartz porphyry, and quartz-feldspar porphyry cut the lavas and a few dykes of porphyry cut the meta-diorite. The dykes vary in width from 1 foot or less to 25 feet and strike in many directions but commonly trend northeast. The lavas are cut by a northwesterly striking dyke of diabase.

Regional schistosity in the lavas, meta-diorite, and small bodies of granite commonly trends north 70 degrees east and dips steeply to the south or north. A dozen shear zones were seen in the area and all of these strike northerly, about at right angles to the regional schistosity, and dip from 70 to 80 degrees west. The shear zones cross lava, meta-diorite, granite, and porphyry dykes. One shear zone extends for at least 3,500 feet along the strike. It crosses the large body of meta-diorite and extends into the lavas to the north and south. This large shear zone is a fault, for the rocks on one side are considerably displaced with reference to those on the other side. The net result of the movement along the fault zone is that

[1] The number or numbers following the names of the mineral properties are the symbols used on Map 321A to indicate the location of the deposits.

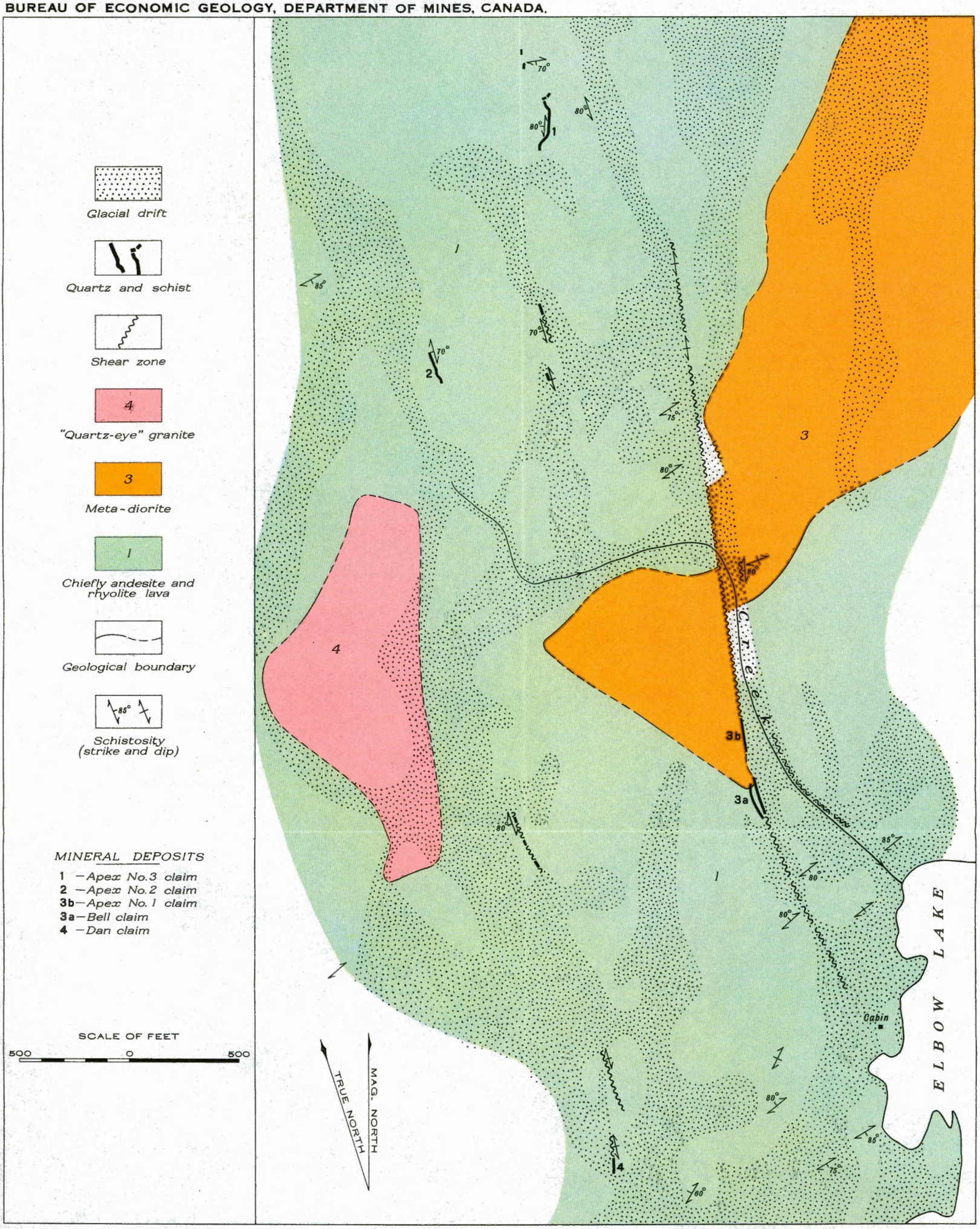

FIGURE I.

BELL, APEX NO. 1, 2 AND 3, AND DAN CLAIMS

(mineral localities No. 1, 2, 3 and 4 on Map 321 A, "Elbow-Morton Area")

the rocks on the west side moved 750 feet south relative to those on the east side, as evidenced by displacement of the meta-diorite by this amount. What appears to be a branch fault extends southeasterly from the side of the main fault. A wedge-shaped block of lava between the main fault and the branch fault moved only half as far south as the rock on the west side of the main fault, as evidenced by displacement of a large porphyry dyke. Although the fault planes are very largely obscured by a thick covering of drift and swamp, the presence of the faults is indicated by the displacement of meta-diorite and porphyry by the alinement of low cliff faces of meta-diorite and lava, and the local exposures of northerly striking schist on these cliff faces.

The shears and faults are important because gold-bearing quartz and sulphides have been deposited along many of them. The quartz occurs as large and small veins, lenses, and stringers mixed with the schist. The quartz is white, grey, or glassy and generally holds many parallel shreds of chlorite, a few patches and veinlets of buff carbonate, and rare crystals of red feldspar. The quartz carries disseminated grains, streaks, and veinlets of pyrite and chalcopyrite and, rarely, a few grains of galena. Schistose lava near the quartz bodies commonly holds disseminated grains of pyrite. The deposits are described in the following paragraphs.

BELL CLAIM

The deposit on the Bell claim lies in the main fault (Locality 3a, Figure 1). Here a wide zone of chloritic schist is poorly exposed for 175 feet along a strike of north 3 degrees east. Veinlets of quartz and carbonate outcrop here and there along the schist zone and the deposit is well exposed in a prospect trench at a point 70 feet from the west boundary of the claim. The trench crosses 17 feet of mixed schist and quartz. For a width of 5 feet at each end of the trench the schist carries a small amount of disseminated pyrite and many tiny parallel stringers of buff carbonate, but only a few small lenses of quartz. The schist locally holds stringers of red carbonate and red feldspar. Across a width of 7 feet in the middle of the trench, vein quartz constitutes about half of the material present. The quartz occurs as an irregular patch 3 feet wide and as bands and lenses up to 1½ feet wide. The quartz carries veinlets and blebs of pyrite and chalcopyrite. The chloritic schist that encloses the quartz bodies is penetrated by stringers of buff carbonate and carries disseminated grains of pyrite. It is reported that chip samples of quartz and sulphide across 8 feet assayed 0·40 ounce of gold a ton.

Another quartz vein lies 20 feet west of the deposit in the main fault on the Bell claim and strikes about parallel to this fault for an exposed length of 200 feet. The vein lies in andesitic lava for most of its length and passes into a meta-diorite at the north end where it narrows and pinches out. A prospect trench on the vein crosses 3½ feet of quartz holding a few scattered grains of pyrite and chalcopyrite. The trench extends west from the vein through 2 feet of chloritic schist penetrated by small stringers of quartz and carbonate.

The main fault zone is drift covered for 125 feet north of the outcrop on the Bell claim and is again exposed on the west boundary of this claim and continues north into Apex No. 1 claim.

APEX NO. 1 CLAIM

The fault zone on the west boundary of the Bell claim and on the Apex No. 1 claim is exposed in natural outcrops and in three prospect pits for a length of 150 feet (Locality 3b, Figure 1). Here the shear zone varies from 11 to 22 feet wide and the chloritic schists in the zone are in sharp contact with massive meta-diorite on the west and massive andesite on the east. The west half of the schist within the shear zone is sheared diorite and the east half is darker coloured, sheared andesite. The schists across the whole width of the zone are very sparsely mineralized with disseminated grains of pyrite. Near the west wall quartz lenses are abundant for a length of 60 feet and cross a width of 2 or 3 feet. Individual lenses are up to 10 inches wide and 6 feet or more long. In one pit a quartz vein lies along the contact between sheared diorite and sheared lava. This vein for the most part varies from 1 foot to 2½ feet wide, but locally narrows abruptly to 3 inches wide. A few small lenses of quartz are present elsewhere in the schist zone. Much of the quartz carries a few grains of pyrite and chalcopyrite and the large vein that lies between diorite and lava is well mineralized with streaks and grains of these two sulphides. The owner of the property says that a channel sample taken across this large vein and extending into the schists on both sides for a total distance of 14 feet assayed 0·24 ounce of gold a ton. Channel samples across the schist with few quartz lenses are said to have given fair values in gold and none, it is stated, assayed less than 0·05 ounce of gold a ton.

Bedrock north of the deposit on the Apex No. 1 claim is covered, but the strong fault zone in which the deposit lies no doubt continues north for 650 feet along or near the base of a steep cliff of meta-diorite. North of this the fault passes beneath swamp for 900 feet. North of the swamp the fault probably continues for 700 feet beneath drift and swamp along or near the base of a low cliff of lava in the northeast part of Apex No. 2 claim. Prospecting along the fault zone north of the deposit that is exposed on the Apex No. 1 claim and south of the deposit on the Bell claim is very difficult because of the thick overburden. Should drilling or some other exploration method be undertaken along this extensive fault zone it should be borne in mind that movement along the fault may have taken place along several parallel shear zones and that these may possibly be distributed across a width of as much as 100 feet.

APEX NO. 2 CLAIM

In the northwest corner of Apex No. 2 claim a northerly striking shear zone in rhyolite is exposed in four test pits and on natural outcrops for a length of 200 feet (Locality 2, Figure 1). Some sections along the strike of the sheared rhyolite carry only small amounts of vein quartz. One section 65 feet long holds considerable vein quartz across widths of from 3 to 8 feet. Here one quartz vein is from 1 to 1½ feet wide and continues

along the full length of the section. Another pit crosses 5 feet of schist holding quartz veins up to 2½ feet wide. The quartz in this pit and elsewhere along the shear zone carries scattered grains of pyrite and chalcopyrite and is locally well mineralized with streaks of finely crystalline pyrite. Sheared rhyolite in the vein zone and nearby massive rhyolite carry disseminated grains of pyrite.

APEX NO. 3 CLAIM

On the Apex No. 3 claim a zone of vein quartz in andesitic schist and quartz porphyry has been traced in seven prospect pits for a length of about 250 feet (Locality 1, Figure 1). The schist zone curves slightly, but, as a whole, strikes about north and dips from 70 to 80 degrees west. Along the southern 75 feet of the deposit the zone of quartz and schist varies from 6 to 12 feet wide as exposed in three prospect pits. Here one quartz vein may continue for the full 75 feet and is from 1½ feet to 4 feet wide. Other quartz bodies in the schist zone occur as small stringers and lenses. The quartz is white and carries a few scattered grains of pyrite and chalcopyrite. Some dark streaks in the quartz are an inch wide and are well mineralized with pyrite and a little chalcopyrite. The owner reports that channel samples taken across 8 feet of quartz and schist in one trench, and across 9 feet of quartz and schist in another trench, assayed 0·12 ounce of gold a ton, and that similar material in the third pit assayed about the same.

In the next two pits, 50 feet and 100 feet, respectively, to the north, the schist zone is from 4 to 8 feet wide and holds many stringers of quartz. In the remaining two pits in the north part of the deposit the zone of mixed quartz and schist is from 3 to 5 feet wide. Some of the quartz in these two pits is well mineralized with chalcopyrite or carries small amounts of pyrite and galena. Channel samples taken across 3 and 5 feet of quartz and schist in these pits are said to have assayed respectively 0·18 and 0·17 ounce of gold a ton. Massive quartz porphyry lying adjacent to the schist zone in some of the pits is 12 feet or more wide and the porphyry carries disseminated grains of pyrite and is cut by a few stringers of quartz. A channel sample across 6 feet of mineralized porphyry cut by a few quartz stringers is said to have assayed 0·06 ounce of gold a ton.

DAN CLAIM

On the Dan claim a prospect pit has been sunk to a depth of 12 feet across 8 feet of quartz and andesite schist (Locality 4, Figure 1). Quartz constitutes more than half of the material in the pit and individual bodies vary from small stringers to masses up to 3½ feet wide. The quartz carries scattered grains and streaks of pyrite. The schist between stringers of quartz holds disseminated grains and bands of pyrite. It is said that samples taken from a channel from the west side to the east side of the pit assayed in gold a ton as follows: 1½ feet, 0·14 ounce; 1½ feet, 0·23 ounce; 5 feet, 0·06 ounce. At a point about 40 feet to the north along the strike of the deposit, vein quartz outcrops across a width of 8 feet. Bedrock is covered both north of this outcrop of quartz and south of the prospect pit.

H.M.B. (5)

This claim was staked in 1933 by H. M. Burkland on the west side of a small bay on the northwest shore of Elbow lake. Rocks on the claim are schistose andesitic lava cut by dykes of quartz porphyry and by a body of sheared "quartz-eye" granite. The body of granite is 2,500 feet long in a northeast direction and up to 500 feet wide.

A prospect pit 500 feet from the lake shore has been sunk to a depth of 6 feet in a shear zone in the granite near its northwest edge. The granite in the pit is altered to a sericite schist and the schist is penetrated by a few quartz lenses and carries disseminated grains and cubes of pyrite. Specimens of the mineralized schist are said to carry 0·15 ounce of gold a ton. The shear zone dips 80 degrees east and extends south 15 degrees east across a hill of granite for about 200 feet from the pit. The shear zone on the hill is 5 or 10 feet wide, but no work has been done here.

The same shear zone has been picked up in a prospect pit on the Frank claim at a point 30 feet north of the pit on the H.M.B. claim.

Gunwor (7)

In the early spring of 1933 Mr. Gus Lindgren discovered coarse gold in narrow veinlets cutting a quartz porphyry dyke near the west shore of Elbow lake just south of Webb creek. Further prospecting revealed gold-bearing quartz veins cutting schistose andesitic lavas and other rocks at several localities from 200 to 1,400 feet southwesterly from the original locality. On April 1, 1934, Elbow Lake Gold Mines, Limited, was incorporated to further explore the property. By September, 1934, six quartz veins had been uncovered in about forty-five trenches and two prospect shafts. The company holds four claims and two fractions, the principal showings being on Gunwor No. 2 claim.

Rocks in the immediate vicinity of the deposits are chiefly andesitic lava flows (*See* Figure 2). Cleavage in the lavas commonly strikes northeast and dips from 50 degrees to 65 degrees southeast. The schistose lava is invaded by numerous dykes and small, irregularly shaped bodies of fine-grained quartz diorite that carries small grains of pyrite. The dykes and other bodies trend roughly parallel to the cleavage of the lava. The lava lies in an embayment projecting into a large body of granitic rock that extends for many miles to the west and outcrops a short distance to the south and west of the deposits. The granitic body varies from granodiorite to hornblende-quartz diorite and hornblendite. The lavas and fine-grained quartz diorite are cut by a few dykes of dacite porphyry that are probably offshoots from the large body of granitic rock. The dykes of dacite porphyry trend either parallel to the cleavage of the lavas or form broad curves crossing the cleavage at various angles. Dykes of rhyolite and quartz-feldspar porphyry cut the lavas, fine-grained quartz diorite, hornblende-quartz diorite, and dacite porphyry. These dykes trend slightly north of east, crossing the cleavage of the lavas at an angle of about 30 degrees.

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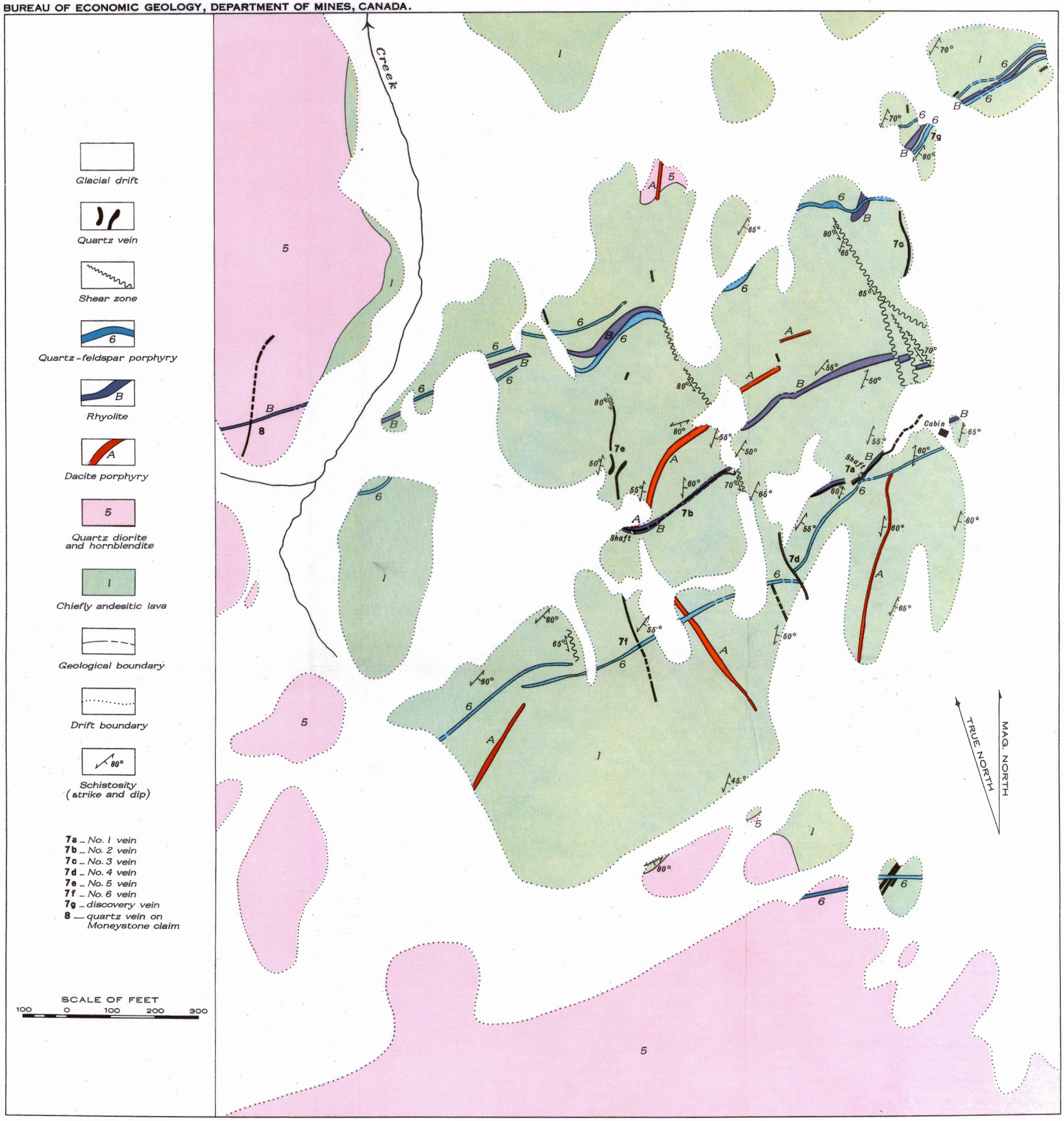

FIGURE 2

GUNWOR GROUP

(mineral locality No. 7 on Map 321 A, "Elbow-Morton Area")

The quartz veins lie in shear zones that cross the rhyolite, quartz-feldspar porphyry, and all older rocks. Some of the veins strike slightly north of east and dip from 50 degrees to 60 degrees northerly; other veins strike about north and dip from 55 degrees to 70 degrees west. Since the cleavage of the lavas strikes northeast and dips southeast, the veins cross the structure of the lava both along the strike and down the dip. Exploration work has been concentrated chiefly on two veins that strike slightly north of east and are locally known as No. 1 and No. 2 veins. The shear zones in which these two veins lie follow dykes of rhyolite, although the lavas adjacent to the dykes have been sheared locally. The sheared rhyolite is much altered to brown-weathering carbonate and the rock is coarser grained than the lava but does not differ much in colour from the dark green flows. Veins No. 3 to No. 6 strike north and dip steeply west. They lie along shear zones that cross lava, fine-grained quartz diorite, and quartz-feldspar porphyry. One of these shear zones is a fault, for a dyke of quartz-feldspar porphyry that is crossed by the shear has been displaced 30 feet horizontally. Other northerly striking shear zones without vein quartz are also faults.

It is understood that part of No. 1 vein was systematically sampled and assayed during the early stages of development of the property. Since that time, Elbow Lake Gold Mines, Limited, has published assay values of a number of chip and grab samples that were evidently selected from exceptionally rich parts of the veins. Such assays are apt to be misleading to people unfamiliar with approved methods of sampling. It is recommended that the deposits be thoroughly sampled by a competent engineer, if this has not already been done, and that further development work be undertaken only on the recommendation of such an engineer. The veins are described in detail in the following paragraphs.

Number 1 vein (Locality 7a, Figure 2) outcrops on a hillside and is well exposed in a shaft and seven prospect pits for a length of 180 feet. The western 80 feet of the vein has been offset about 15 feet to the north. To the east the vein passes beneath drift at the base of the hill and it is reported that the vein has been traced for an additional 120 feet in prospect pits in this low ground. If exploration work is continued in drift still farther easterly it should be borne in mind that fault zones, exposed in outcrops to the north, may cross the vein and offset it to the south.

The vein on the hillside varies in width from 6 inches to 3 feet and is from 1½ feet to 3 feet wide for a length of 70 feet easterly from the shaft. In the shaft the vein for the most part is from 1 foot to 2 feet wide; it continues from the surface for at least 24 feet down the dip to the bottom of the shaft. The vein in most places lies between sheared lava on the foot-wall and sheared rhyolite on the hanging-wall, although for short distances along its strike it lies wholly in the one or the other type of schist. The quartz carries grains of pyrite either scattered through the quartz or, more commonly, arranged in bands lying parallel to the walls of the vein. The quartz also carries small amounts of chalcopyrite and sphalerite. Microscopic study shows that some of the pyrite grains hold a few specks of gold. During the early stages of the development of the property, the discoverer, with the help of two men, panned about 7 ounces of gold in one

day from a pit on the vein 30 feet east of the shaft. A specimen said to have been obtained from this pit carries abundant large flakes and irregular veinlets of gold in milky white quartz.

The shear zone in which the quartz vein lies is uniformly about 4 or 5 feet wide and the schistose rhyolite and lava locally hold small lenses and stringers of quartz in addition to the main quartz vein. In the shaft, the schists are exposed across a width of from 3 to 4 feet between the main quartz vein and the hanging-wall. Small cubes of pyrite are disseminated through the schists across this width and are abundant in the schists for 2 or 3 inches from the edge of the quartz vein. Much of the schist is penetrated by small lenses and stringers of quartz and these are most plentiful immediately at the hanging-wall where shearing is most pronounced. Cubes and blebs of pyrite lie in some of the small quartz lenses and stringers. It is reported that coarse gold was found in vein quartz in the hanging-wall. Narrow bands of fine-grained, grey, schistose, quartz porphyry lie along the foot-wall of the main quartz vein in the shaft and occur as inclusions in the quartz. The quartz porphyry is well mineralized with small, disseminated grains of pyrite.

Number 2 vein (Locality 7b, Figure 2) lies along a narrow, drift-covered depression between low hills of lava. Prospect pits sunk through the drift at intervals over a length of 290 feet have exposed sheared rhyolite penetrated by discontinuous bodies of vein quartz.

At the west end of the explored zone a quartz lens 50 feet long is exposed in a pit and prospect shaft. The lens narrows to a stringer at both ends and maintains a width of from 1½ feet to 2 feet for a length of 15 feet near the middle where the shaft has been sunk. The quartz continues to the bottom of the shaft, 24 feet vertically beneath the surface. The quartz varies from grey to white and is well mineralized with grains, bands, and an irregular network of short veinlets of pyrite and chalcopyrite. Microscopic study shows that the pyrite is much fractured and that the cracks are filled with chalcopyrite. The quartz lens lies along the middle of a dyke of massive and schistose rhyolite up to 10 feet wide. The rhyolite carries disseminated grains of pyrite and is cut by a few veinlets of quartz and carbonate.

A large area of drift and swamp lies west of the quartz lens. To the east the lens pinches out in sheared rhyolite. A vein of quartz from 2½ feet to 4 feet wide is said to have been traced for 150 feet in prospect pits farther east along the drift-filled depression. At the time of the writer's visit this vein was well exposed in the most easterly of these pits.

In the most easterly pit vein quartz and schist are exposed across a width of 12 feet. Sheared, grey rhyolite in the pit has a highly contorted, schistose structure and is cut by quartz veins that are commonly drag-folded and contorted. The veins are 4 inches or more wide and, where drag-folds are closely compressed, widths up to 3 feet are chiefly of quartz. The quartz carries pyrite in grains and bands similar to those in Number 1 vein. On the south side of the pit a quartz vein lies between andesitic lava on the south and rhyolite on the north. This vein averages about 1 foot wide. It has been stripped to the east along the strike for about 20 feet and ends in a sharp curve against a northerly striking shear zone. On the

opposite side of the shear zone and 50 feet north of the vein is a carbonated rhyolite dyke that may be the continuation of the rhyolite in which the vein occurs and, if so, has been faulted to its present position by movement along the northerly striking shear zone. It might be expected that the quartz vein would be found in the rhyolite east of the fault. The rhyolite, however, is commonly unsheared and quartz veins known in it are small.

Number 3 vein (Locality 7c, Figure 2) has been explored in four test pits sunk in drift along the east edge of a hill of andesite. It is said that vein quartz was found in all of these pits, indicating that the length of the body of quartz and schist is 150 feet. At the time of the writer's visit lenses of quartz were exposed across 7 feet of sheared lava in one pit. The lenses are from 1 inch to 18 inches wide and locally carry patches of carbonate and a few grains of pyrite and chalcopyrite. Schistose lava near the quartz lenses carries disseminated grains of pyrite.

Number 4 vein (Locality 7d, Figure 2) is exposed in five test pits sunk along a shear zone in lava that has been cut by many irregular bodies of fine-grained quartz diorite and by a dyke of quartz-feldspar porphyry. The porphyry dyke has been offset by movement along the shear zone. Quartz bodies up to 6 inches wide lie along the shear zone and in one pit small lenses of quartz lie across 5 feet of the schist. It is reported that gold can be panned from rusty schist in one of the pits. The zone of mixed quartz and schist has been traced for 150 feet along the strike and passes beneath a thick covering of drift to the south.

Number 5 vein (Locality 7e, Figure 2) consists of several disconnected veins and lenses of quartz traced along the strike for 200 feet. The bodies of quartz lie in a shear zone that crosses lava and fine-grained quartz diorite. One quartz lens is up to 8 feet wide and 30 feet or more long. One vein is up to 6 inches wide and 35 feet long. The quartz holds patches and veinlets of carbonate, is well mineralized with pyrite, and carries a small amount of chalcopyrite and sphalerite. Sheared rocks near the large quartz bodies carry pyrite and are cut by stringers of quartz and carbonate. The combined width of quartz and mineralized rock varies from 3 feet to 19 feet and in most pits is more than 10 feet.

Number 6 vein (Locality 7f, Figure 2) follows a shear zone in andesitic lava and is exposed at intervals in prospect pits for a length of 250 feet. The sheared lava is commonly not more than 1 foot or 1½ feet wide. Vein quartz in the shear zone varies from 1 inch to 1 foot wide. In one pit several small quartz stringers lie across 1 foot of schist. The quartz is commonly well mineralized with disseminated grains and bands of pyrite. Narrow bands of pyrite locally lie in the sheared lava.

The original discovery (Locality 7g, Figure 2) consisted of gold-bearing veinlets in a dyke of quartz-feldspar porphyry. The dyke cuts lava that carries disseminated grains of pyrite and is crossed by veinlets of quartz and pyrite. The porphyry is cut in all directions by small veinlets of quartz some of which carry carbonate, pyrite, and chalcopyrite. A few short cracks in the porphyry are filled with arsenopyrite or with pyrite mixed with sphalerite. The discoverer reports that he panned 4½ ounces of coarse gold from such stringers in the porphyry. Immediately following

this discovery a veinlet of sphalerite an inch wide and carrying abundant coarse gold was found in lava near a rhyolite dyke 40 feet southwest of the original discovery.

Moneystone (8)

A quartz vein on this claim is 3,200 feet west of the west bay of Elbow lake. Old workings on the vein consist of a shaft 11 feet deep and a few prospect trenches. The deposit lies in a large body of quartz diorite and is about 150 feet northwest of the contact between the quartz diorite and invaded volcanic rocks (Locality 8, Figure 2). The quartz diorite is cut by an easterly striking dyke of feldspar porphyry.

The quartz vein dips 65 degrees northwest, strikes north 30 degrees east, and follows a weak shear zone that crosses the body of quartz diorite and the dyke of feldspar porphyry. The quartz diorite is altered to chloritic schist along the shear zone. The vein is well exposed in the shaft and for 60 feet to the south where it varies from ½ to 3½ feet wide and commonly holds included bands of schist. Schist adjacent to narrow parts of the vein carries small lenses and stringers of quartz. The quartz is white or glassy and locally carries blebs and small grains of pyrite. A light covering of drift obscures the bedrock for 150 feet northeast along the strike of the vein to two outcrops of quartz a foot wide.

Beta (9)

A few small quartz veins have been discovered near the middle of this claim about 2,000 feet north 60 degrees west from the south end of the most westerly bay of Elbow lake. The claim was staked in 1933 by Mr. T. Emberg. Only a few small prospect pits have been dug on the deposits.

The veins lie in a large body of quartz diorite and hornblendite about 1,000 feet from its eastern edge. The quartz diorite near the veins is cut by dykes of quartz-feldspar porphyry that carry a few grains of pyrite and are cut in many directions by stringers of quartz.

Five outcrops of vein quartz lie within an area 500 feet long in a northerly direction and 250 feet wide. The largest body of quartz is exposed on a low hillside for 30 feet along a strike of north 35 degrees east. The vein dips 65 degrees southeast. The quartz is 3½ feet wide for most of its length, pinches out in schistose quartz diorite at the northeast end, and passes beneath drift at the southwest end. The vein carries a few patches of brown-weathering carbonate, a few grains of pyrite, and many, small, irregularly shaped patches and short veinlets of chalcopyrite. This quartz vein and adjacent quartz diorite are crossed by a dyke of basalt 2 feet wide.

In the remaining four exposures the quartz is from 1 to 1½ feet wide. One of the veins strikes north 30 degrees west and carries a little pyrite. The other three lie along a southwesterly striking zone 300 feet long, but the quartz is probably not continuous beneath drift between the three exposures.

Rod (10)

A deposit of vein quartz on this claim lies at a point about 1,300 feet west of the south end of the most westerly bay of Elbow lake. The claim was staked in 1933 and Mr. I. McDougall is part owner.

The quartz lies along a shear zone that crosses quartz diorite. The shear has been traced for about 350 feet along a strike of north 10 degrees west and dips 80 degrees west. To the south the body of quartz and schist passes beneath a thick covering of drift that is probably underlain by volcanic rocks.

The deposit is well exposed in a large test pit on a steep hillside that rises above the area of drift. Sheared quartz diorite in the pit holds a quartz vein that varies from 2 feet to 4 feet wide. The vein quartz is white or grey and carries pyrite as disseminated grains and streaks up to 3 feet long and 3 inches wide. A sample across 4 feet of the quartz is said to have carried 0·25 ounce of gold a ton. Sheared diorite, on lower ground for 50 feet to the south, carries pyrite-bearing quartz stringers and veins up to 3 feet wide across a width of 4 feet. For 300 feet north of the large pit the schist zone is exposed at a few places and carries stringers of quartz across widths of from 3½ to 5 feet. At the most northerly exposure the shear zone is only 2 feet wide, is poorly developed, and does not carry vein quartz.

Jessie (11)

The claim lies on a peninsula on the west side of Elbow lake, 1,500 feet east of the mouth of Webb creek. The claim was staked in 1932 by Mr. Alfred Peterson. Workings comprise two prospect pits on the north shore of the peninsula in the northwest part of the claim.

One pit is in a low cliff of schistose andesitic lava with a cleavage striking north 70 degrees west and dipping 70 degrees northerly. The schist is penetrated across a width of 10 feet by a few stringers and veins of quartz up to 6 inches wide. For 3 feet from the foot-wall side of the zone the schist between the quartz stringers is well mineralized with pyrite.

The second pit is 75 feet to the east and on top of the cliff. Schistose andesite and meta-diorite in the pit carry a few lenses of quartz across 3 feet. The schist is well mineralized with pyrite, and a few grains of this mineral are scattered through the quartz.

G.H. (12)

This claim is on a peninsula near the west shore of Elbow lake, 3,500 feet southeasterly from the mouth of Webb creek. The property was staked in 1932 and is owned by Messrs. C. H. Brander and Hans Hallgren. A deposit of quartz veinlets in quartz porphyry has been opened up in three trenches at a locality 1,000 feet from the north shore of the peninsula.

Massive and schistose, andesitic lava outcrops north of the deposit, but bedrock is covered west and south of the trenches. Quartz porphyry outcrops for at least 150 feet east of the deposit. The porphyry in the trenches and to the east is much altered to carbonate that weathers brown.

One trench crosses 40 feet of the porphyry cut by numerous irregular stringers and lenses of white quartz up to 1 foot wide. The quartz holds patches of brown-weathering carbonate. A second trench 50 feet to the south crosses 30 feet of similar material. In one part of this trench the quartz constitutes about half of the material across 15 feet and holds angular blocks of the porphyry. The porphyry in this trench carries disseminated crystals of arsenopyrite and a few of pyrite. The quartz holds patches of carbonate, pyrite, and arsenopyrite, and a few small grains of chalcopyrite. The third trench is 50 feet still farther south and exposes rusty weathering porphyry with almost no vein quartz.

Fred (13)

This claim is on a small island close to the west shore of Elbow lake. A dyke of red quartz-feldspar porphyry strikes north along the east shore of the island and is at least 40 feet wide. The dyke rock is cut by a few veinlets of white quartz and scattered patches and short films of pyrite. A small pit in andesitic schist on the west side of the dyke exposes stringers and veins of white and dark bluish grey quartz up to 1 foot wide. The material in the pit is said to carry gold values.

Long (16)

This claim is 1 mile north of the northeast bay of Elbow lake. The claim was staked in 1929 by Mr. Pete Johnson and was restaked in 1934 by Mr. John Vanberg. On this property two shear zones in andesitic lava have been penetrated by quartz veins and lenses. The deposits are exposed in three prospect pits.

The deposits lie in andesitic lava at a point 1,000 feet or less south of a large body of granodiorite with a border phase of quartz diorite. To the south and east of the deposit the lavas are intruded by several bodies of quartz porphyry and quartz-feldspar porphyry. The quartz diorite and the lavas near the porphyry bodies are cut by dykes of quartz porphyry and feldspar porphyry. Cleavage of the lava generally trends northwesterly, roughly parallel to the southern edge of the large granitic body.

Cleavage of the lava in the shear zones strikes about 20 degrees east of north, or roughly at right angles to the regional cleavage of the lavas. One of the shear zones is exposed in two prospect pits 120 feet apart. In the southwest pit the sheared lava dips vertically and is intruded by a small amount of brown rhyolite. The sheared lava and the rhyolite are cut along cleavage planes by lenses and veins of quartz up to 1 foot wide and the mixture of quartz and schist is uncovered across a width of 6 feet. The quartz varies from white to grey and carries disseminated grains and scattered blebs, up to 2 inches across, of pyrite and chalcopyrite. The sheared lava and rhyolite are mineralized with disseminated grains and small cubes of pyrite. The owner reports that

picked samples assayed up to 1·3 ounces of gold a ton and that a channel sample taken across 3 feet of a part of the deposit consisting chiefly of quartz assayed 0·62 ounce of gold a ton. In the northeast pit on this shear zone, the schistose lava dips 75 degrees to the northwest. The schist is mixed with quartz over a width of 5½ feet and individual bodies of quartz are up to 3½ feet wide. Much of the quartz is apparently barren of sulphides, but some small lenses of quartz hold a few grains of pyrite. Pyrite is disseminated in the schist adjacent to these mineralized veinlets, and weathered schist on the hanging-wall is said to yield gold on panning.

The second shear zone is exposed in a test pit about 70 feet east of the deposit described above. Here the schist dips irregularly from 30 degrees to 70 degrees east. The schist is cut by veinlets and lenses of quartz and carbonate. The quartz veins are up to 2 feet wide and the larger ones lie nearly horizontal. Scattered blebs of chalcopyrite and pyrite lie in the quartz and carbonate. Some of the schist carries disseminated small grains of pyrite. Quartz is mixed with mineralized and unmineralized schist across a horizontal width of 15 feet. The owner of the property reports that a channel sample taken across 4 feet of quartz and schist carried 0·23 ounce of gold a ton and that a picked sample assayed 0·69 ounce of gold a ton.

Not enough work has been done on the property to show whether or not the deposits are of economic value. The present exposures of the deposits should be thoroughly sampled and if the results offer encouragement trenches should be dug at close intervals along the shear zones to give further information about the size and value of the deposits.

Bow (18)

A quartz vein on this claim is located near the north shore of a large island in the northern part of Elbow lake. The claim was staked in 1919 by Messrs. Thomas R. Webb and Wm. Garbutt and is now owned by Mr. Wm. Garbutt of The Pas, Manitoba.

Rocks along the north shore of the island in the vicinity of the deposit consist of massive and schistose, andesitic lava flows. Some layers in the flows are amygdaloidal and others are fragmental or hold elongated lumps of epidote. Some of the massive flows are porphyritic with phenocrysts of feldspar and the porphyritic rock locally exhibits pillow structure. The flows are cut by a few dykes of basalt and a few, small, irregular bodies of gneissic granite. The granite carries disseminated grains of pyrite and holds segregations and stringers of quartz sparingly mineralized with pyrite and galena.

The quartz vein on the Bow claim lies in schistose andesitic lava with a cleavage that strikes irregularly, but generally trends northeasterly and dips steeply toward the southeast. The vein is exposed at intervals in natural outcrops and in four test pits for a distance of 250 feet along a northeasterly strike. The vein, however, follows a crooked course so that the length of quartz measured along the curves and crenulations is at least 350 feet (*See* Figure 3). The vein varies from 3 inches to 4 feet in width and is from 1 to 2 feet wide along most of its length. The quartz varies from white to

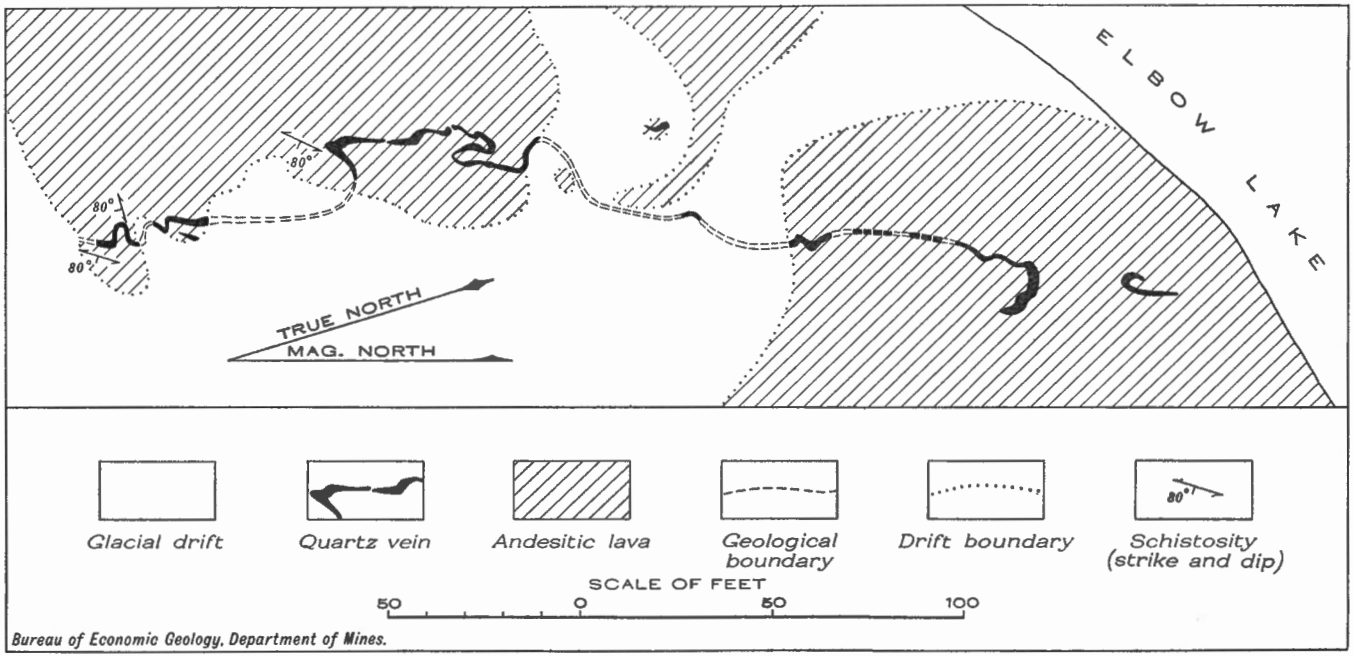

Figure 3. Bow claim (mineral locality No. 18 on Map 321A, "Elbow-Morton Area").

grey and locally holds patches and veinlets of brown-weathering carbonate and a few crystals of red feldspar. Much of the quartz carries disseminated grains of pyrite and some of the quartz is well mineralized with patches and bands of pyrite and galena and a few grains of chalcopyrite, sphalerite, and pyrrhotite. A microscopic study of the vein material shows that a few specks of gold lie in crystals of pyrite and on the edges of these crystals. Andesitic schist near the vein carries scattered cubes of pyrite and holds a few veinlets of quartz, red feldspar, and carbonate. The owner of the property states that samples taken across about 5 feet of quartz at four localities along the vein assayed, respectively, 0·60, 1·20, 0·28, and 0·34 ounce of gold a ton and that a grab sample of the wall-rock assayed 0·16 ounce of gold a ton.

An extensive area of glacial drift lies southwest of the vein. Several trenches have been dug in this drift at intervals for 180 feet southwest of the outcrops of the vein, but the walls of the trenches have caved so that the character of material encountered in the bottoms of the trenches could not be observed at the time of the writer's visit.

Webb and Garbutt Claims (19)

These two claims are located on the east end of a large island in the northern part of Elbow lake. The claims were staked in 1919 by Messrs. Thomas R. Webb of Saskatoon, Saskatchewan, and Wm. Garbutt of The Pas, Manitoba. At present the Webb claim is owned by Mr. Garbutt and the Garbutt claim is owned by Mr. Webb. A dyke of mineralized quartz porphyry and nearby quartz veins have been explored in trenches and in a shaft, crosscut, and drift. A small mining plant and mill were installed, but this equipment was dismantled during the winter of 1934 and was moved to the Murray property at the south end of Elbow lake. No exploration work has been done on the claims since about 1931.

Rocks in the vicinity of the deposit are massive and schistose andesitic lava flows. Cleavage of the schistose lava is greatly contorted locally but commonly strikes about north 20 degrees west and dips vertically. Some of the flows are much altered to carbonate and others carry amygdules of quartz or exhibit poorly developed pillows. On the north shore of the island about 500 feet east of the deposits the lavas are invaded by a small body of feldspar porphyry carrying disseminated grains of pyrite and cut in many directions by stringers of quartz.

The dyke of quartz porphyry is exposed at intervals in natural outcrops and in test pits for a length of 1,000 feet along a strike of north 18 degrees west, extending from the north shore of the island to near the south shore (*See* Figure 4). The northern half of the dyke is on the Webb claim and the southern half is on the Garbutt claim. The dyke varies in width from 3 feet to 10 feet. Much of the porphyry is somewhat sheared and the edges of the dyke in some outcrops are altered to a sericite schist. Wherever exposed the porphyry carries disseminated cubes of pyrite, is crossed by veinlets of quartz, and locally holds lenses and irregular, branching masses of quartz up to 6 feet long and 3 feet wide. Some of the irregular bodies of quartz hold angular inclusions of the porphyry. Although the

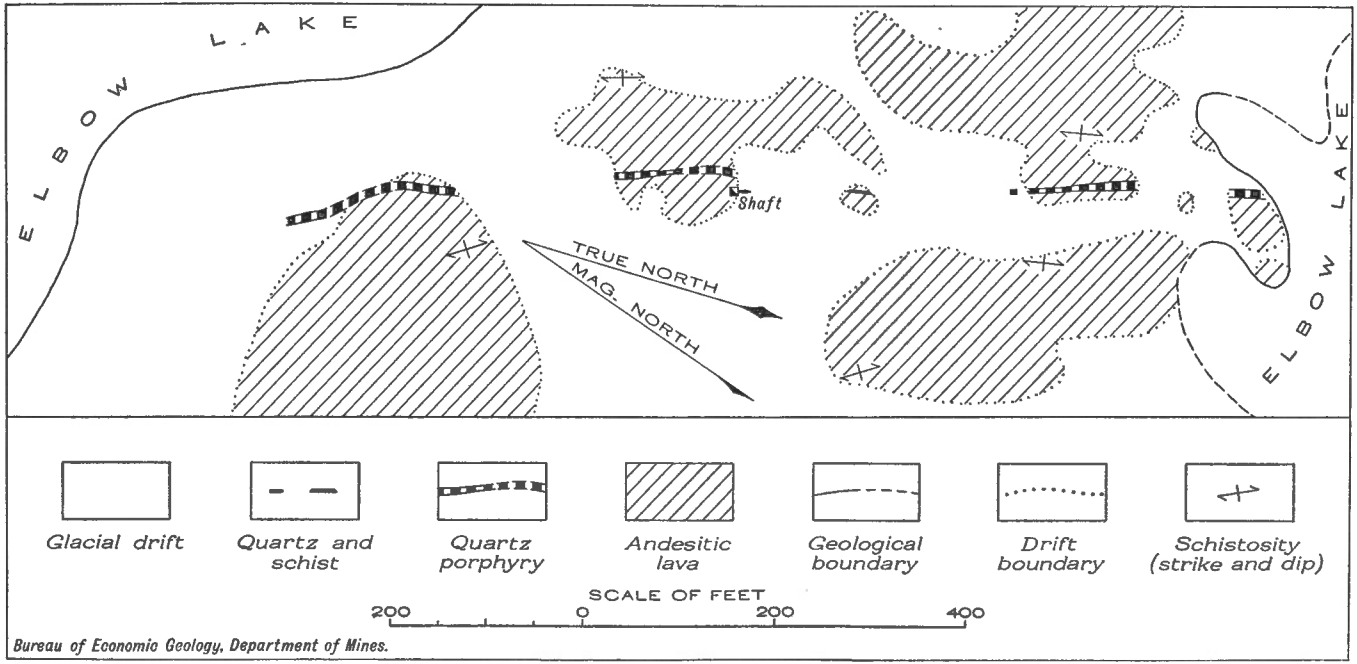

Figure 4. Webb and Garbutt claims (mineral locality No. 19 on Map 321A, "Elbow-Morton Area").

bodies of quartz trend in many directions they commonly lie about parallel to the walls of the dyke. Locally the quartz constitutes as much as one-quarter of the material between the walls of the dyke. The quartz is white and locally holds patches of brown-weathering carbonate. Some of the veinlets and other bodies of quartz carry pyrite and many of those in the porphyry on the Webb claim are well mineralized with pyrite, galena, and chalcopyrite. According to the owner of the Webb claim samples taken at four localities across 5 feet or more of the porphyry and quartz on this claim assayed from 0·06 to 0·14 ounce of gold a ton. Schistose andesite adjacent to the dyke locally carries disseminated grains of pyrite.

The shaft is on the Garbutt claim at a point 80 feet from the north boundary and 15 feet east of the porphyry dyke. The shaft is sunk on a quartz vein in schistose andesite. Although the shaft was almost filled with water at the time of the writer's visit, a quartz vein could be seen on the north wall. The vein is about 2 feet wide and dips vertically but does not appear along the strike on the south wall. It is reported that the shaft is 70 feet deep and that it followed quartz and schist to this depth. At a depth of 57 feet a crosscut was driven west through 15 feet of schistose lava holding a vein of quartz 2 feet wide, and was continued for 8 feet through the porphyry dyke. From the end of the crosscut a drift was driven north for 26 feet along the dyke. It is said that the vein quartz encountered in the shaft and crosscut carried free gold and that the porphyry with admixed vein quartz assayed 0·20 ounce of gold a ton across 8 feet.

On the Webb claim quartz veins are exposed across 5 feet of andesitic schist in two prospect pits 120 feet and 140 feet, respectively, north of the shaft. The veins are up to 6 inches wide. They carry patches of carbonate, a few grains of pyrite, and are said to be well mineralized with gold. Pyrite is abundant in the schist along the walls of the veins and in streaks of chlorite that lie in the quartz. The veins strike toward the shaft and may be connected with the quartz in the shaft. The intervening area, however, is covered with drift and the walls of pits in the drift have caved so as to cover any quartz that may have been found.

Mack and Van (21, 22)

These claims are on and near the east shore of Elbow lake at a locality about 1½ miles from the north end of the lake. The Mack claim was staked in 1924 by Mr. P. Johnson. In 1925 a zone of quartz and schist on this claim was explored in a few trenches and a prospect shaft. The Van No. 1 and Van No. 2 claims were staked in 1933 by Mr. John Vanberg. Shallow pits on these two claims have exposed several veins of quartz and bodies of quartz mixed with schist.

Rocks in the vicinity of the deposits comprise chiefly andesitic lava and "quartz-eye" granite (*See* Figure 5). A patch of hornblendite lies in the granite and a small body of hornblendite outcrops in the lavas south of the granite. The granite is cut by a few dykes of red rhyolite and the lava and hornblendite are cut by a few dykes of granite. Lavas near the main body of granite locally hold a few small bodies of "quartz-eye" granite and quartz porphyry.

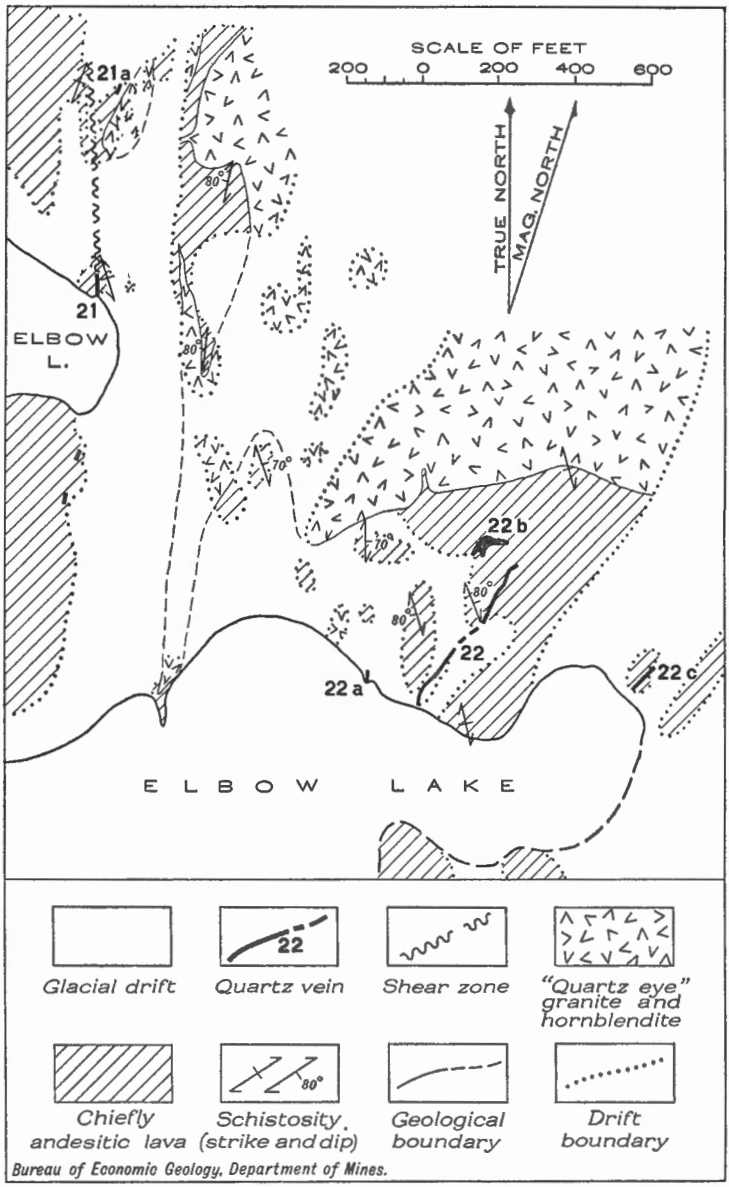

Figure 5. Mack and Van claims (mineral localities Nos. 21 and 22 on Map 321A, "Elbow-Morton Area"). 21, deposit on Mack claim; 21a, deposit on Van No. 1 claim; 22, 22a, and 22b, deposits on Van No. 2 claim.

The lavas are altered to hornblende and chlorite schists and the cleavage of these rocks generally strikes about north. The main body of granite on the claims is part of a lobe that projects west from a large body of " quartz-eye " granite. The south edge of the lobe crosses the cleavage of the lavas nearly at right angles. Along the edge of the granite, narrow embayments of lava extend into the granite and tongues of granite extend outward from the main granite mass into the lavas. The embayments and tongues trend north, parallel to the regional cleavage of the lavas, and this relationship strongly suggests that the cleavage was developed before the intrusion of the granite. Schistose structure is well developed in the granite along the south edge of the lobe and the cleavage here trends south across the contact into the adjacent lavas. This cleavage was evidently developed after the solidification of the granite and was superimposed on the earlier cleavage of the lavas, although lying parallel to this earlier cleavage.

Although a few small tourmaline-bearing quartz veins cut the granite, the more important deposits of quartz are in shear zones in the andesite and these zones lie from 200 feet to 500 feet from the edges of the granite. On the west side of the lobe the sheared lava and quartz strike about north and cross the regional cleavage of the lavas at only a slight angle. On the southeast side they strike northeasterly at a large angle to the regional cleavage. The deposits are described in the following paragraphs.

MACK CLAIM

A deposit of quartz and schist on this claim is exposed on the north shore of a small bay west of the granite (Locality 21, Figure 5). The deposit has been trenched and stripped for a length of 120 feet and has been opened up in a prospect shaft 28 feet deep. The schist in the deposit strikes north 6 degrees west and dips about vertically. Cleavage of nearby lava strikes north 18 degrees west. At the water's edge and for 65 feet to the north the schist holds many lenses and veins of quartz from a foot or less to 3 feet wide. The schist carries these bodies of quartz across a width of 5 or 6 feet and the quartz constitutes about half of the material present. The shaft is in the middle of this part of the deposit and was filled with water at the time of the writer's visit. Quartz on the dump varies from white to grey and commonly carries many thin, parallel bands and shreds of chlorite. Specks of pyrite and a few small grains of pyrrhotite and chalcopyrite lie in the bands and shreds of chlorite. The quartz carries a few patches of buff carbonate and a few blebs of chalcopyrite. It is reported that coarse gold was found in the shaft. Channel samples taken across the deposit in the shaft are said to have assayed 0·02 ounce of gold a ton at the surface and to have increased to 0·27 ounce of gold a ton at the bottom where values in silver were also obtained.

For at least 50 feet north of this 65-foot, quartz-rich part of the deposit the sheared lava is 8 feet wide and is penetrated along cleavage planes by numerous small lenses and stringers of brown-weathering carbonate and a few of quartz. South of the shaft the deposit passes beneath the bay, and bedrock on the south side of the bay along the projected

strike of the deposit is heavily covered with drift. A few pits in the drift did not reach bedrock and the vein has not been found here. Lava outcropping just west of this drift area is cut by two small quartz veins.

VAN NO. 1

This claim lies immediately north of the Mack claim. A few small quartz veins lie in sheared lava at a locality 350 feet north of the Mack shaft and on the projected strike of the Mack deposit. At a point 200 feet farther north along the same strike, vein quartz was found in a small pit on the east side of an outcrop of lava and the shear zone may continue beneath drift along the east edge of this outcrop.

Small bodies of "quartz-eye" granite and coarse and fine-grained, quartz porphyry cut the lavas just east of these small showings of quartz. Fine-grained porphyry in one prospect pit carries small cubes and veinlets of pyrite. Another prospect pit at the south edge of a large area of drift and swamp crosses 10 feet of schistose lava penetrated by dykes of fine-grained porphyry (Locality 21a, Figure 5). The schist and porphyry are cut by a few stringers and lenses of quartz, and the porphyry is well mineralized with shreds and grains of pyrite. The mineralized porphyry is said to carry values in gold.

VAN NO. 2

This claim is north of a large bay southeast of the Mack deposit. A quartz vein on the Van No. 2 claim outcrops at a point 25 feet from the north shore of the bay (Locality 22, Figure 5) and is exposed at intervals in trenches and in natural outcrops for a length of 450 feet along the strike of north 38 degrees east. The vein follows a shear zone in andesitic lava and crosses the regional cleavage direction of the lavas, at an angle of 50 degrees. Schistose lava in the shear zone dips from 75 degrees to 85 degrees southeast. The vein curves slightly along the strike. It varies in width from 1 foot to 5 feet and is commonly from 2 feet to 3 feet wide. Sheared lava adjacent to the vein is locally penetrated by stringers and veins of quartz up to 1 foot wide and the combined width of quartz and schist averages between 3 feet and 5 feet. The quartz varies from white to glassy and is commonly well banded with streaks of dark chloritic material. Grains of pyrite and a few of chalcopyrite lie along many of the dark bands and are disseminated through the quartz. For 175 feet from the northeast end of the vein the quartz carries only a small amount of pyrite, and no chalcopyrite was seen here. The schist adjacent to the quartz locally carries many cubes of pyrite. The owner of the deposit reports that two grab samples of quartz with sulphides assayed, respectively, 0·44 and 0·17 ounce of gold a ton. The quartz and schist should be channel sampled at close intervals along the strike.

Another vein outcrops on the north shore of the bay at a point 150 feet west of the long vein described above (Locality 22a, Figure 5). The vein is 3 or 4 feet wide and passes beneath drift a few feet to the north. No sulphides were seen in the quartz. Another body of quartz lies 100 feet

northwest of the north end of the long vein (Locality 22b, Figure 5). This is an irregular-shaped mass of quartz 100 feet long and 20 feet wide at its widest point. No sulphides were seen in the quartz.

A large quartz vein cuts andesite at a locality 450 feet east of the long vein and a short distance east of the west boundary of the Van No. 2 claim (Locality 22c, Figure 5). The vein strikes north 40 degrees east and dips from 75 to 85 degrees southeast. The vein and associated schist are exposed for a length of 80 feet. The quartz varies in width from 4 feet to 6½ feet. It is locally mixed with included shreds of schist and holds a few angular fragments of andesite and rhyolite and a few patches of coarsely crystalline, buff carbonate. Pyrite is plentiful in the angular fragments and is locally abundant in sheared lava adjacent to the quartz body. The quartz is poorly mineralized with streaks and grains of pyrite.

Smith Island (30, 31)

This group comprises three claims on a group of islands in the southern part of Elbow lake. The claims were staked in 1933 by Mr. James A. Smith of Flinflon, Manitoba. Old pits on the property have been dug in a dyke of quartz porphyry. The dyke strikes north 10 degrees east and follows the cleavage of andesitic lava that dips from 75 to 80 degrees east. The porphyry is everywhere cut by a network of stringers of white quartz and red albite.

On Smith Island No. 1 claim the dyke varies in width from 4 to 8½ feet and is exposed at intervals along the strike for about 450 feet from the north shore of an island. In two prospect pits 300 feet apart the porphyry is sparsely mineralized with disseminated crystals of arsenopyrite and pyrite and some of the stringers of quartz and feldspar carry grains of these two sulphides and a small amount of sphalerite. In one pit schistose andesite adjacent to the dyke is penetrated by quartz stringers and the schist and quartz carry small cubes of pyrite. Combined width of mineralized porphyry, andesite schist, and quartz in this pit is 12 feet.

The dyke is again exposed on a small island on Smith Island No. 3 claim about 2,000 feet to the south. Here the dyke has been traced for a length of 80 feet and varies in width from 2½ feet to 3½ feet. In a pit 150 feet from the north shore of the island the porphyry is poorly mineralized with pyrite. Andesitic schist on both sides of the dyke carries more pyrite than the porphyry and is cut by stringers of quartz and red feldspar. The width of mineralized porphyry and lava in this pit is 12 feet.

Gold Pan (32)

This claim is on a small island near the southeast shore of Elbow lake 4 miles from the south end of the lake. The claim was staked in 1921 by Mr. Thomas Hanna, was later allowed to expire, and was re-staked in 1926 by the original owner. Exploration work on the property has been confined chiefly to two quartz veins which may be called Number 1 vein and Number 2 vein, respectively. In 1929 a small gasoline-driven mining plant was installed and a shaft was sunk on Number 1 vein. The shaft is now 45 feet deep. Number 2 vein has been uncovered in four prospect trenches.

Rocks on the island are massive and schistose andesitic lava. Cleavage of the schistose lava strikes northeasterly. The lava is cut by a dyke of meta-diorite and is locally invaded by small, dyke-like bodies of fine-grained quartz diorite carrying disseminated grains of pyrite. A large body of " quartz-eye " granite lies 1½ miles southeast of the deposit.

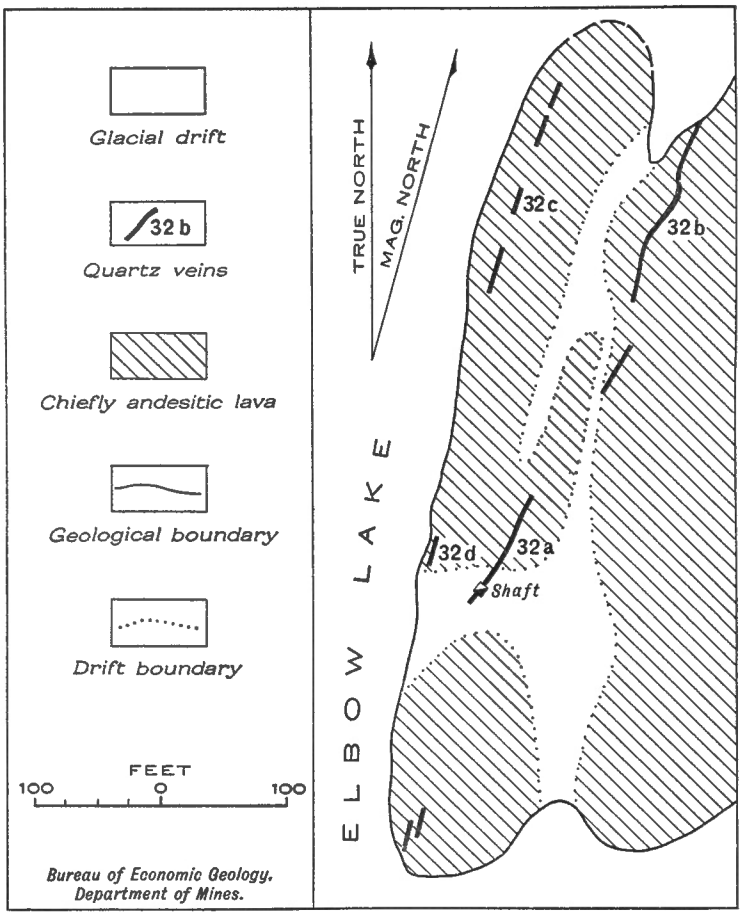

Figure 6. Gold Pan claim (mineral locality No. 32 on Map 321A, "Elbow-Morton Area"). 32a, No. 1 vein; 32b, No. 2 vein; 32c and 32d, quartz veins.

Number 1 vein (Locality 32a, Figure 6) is exposed in the shaft and at intervals in a shear zone that extends for 90 feet northeasterly from the shaft. The shear zone northeast of the shaft varies in width from 1 foot to 2½ feet, strikes north 30 degrees east, and dips from 80 degrees northwest to vertical. Along the northeast half of the shear, only a few stringers of quartz lie in the schist. Elsewhere the schist across 2½ feet holds small lenses of quartz and a vein 6 inches wide of fine-grained, greyish quartz carrying pyrite and chalcopyrite.

The shaft was filled with water at the time of the writer's visit. In 1930 when the shaft was 20 feet deep, Wright[1] reported that two quartz veins about 5 feet apart and 12 inches and 18 inches wide, respectively, were exposed on the walls and bottom of the shaft. The quartz carried pyrite, chalcopyrite, galena, and free gold. Mr. Hanna reports that one of these veins continues to the present bottom of the shaft and that the vein is 2 feet wide at the bottom. He says that a sample across 16 inches of quartz and adjacent schist near the surface assayed a little over 5 ounces of gold a ton and that other samples taken at intervals down the shaft across 16 inches to 2 feet of quartz or of quartz and schist assayed from 2·77 to 8·6 ounces of gold a ton. Good values in gold were obtained elsewhere across the full width of the shaft. It is also reported that trench samples taken across the dump carried 0·60 ounce of gold a ton and that a 100-pound sample of quartz and schist taken in about equal amounts from the dump was run through a mill and yielded gold at the rate of 1·75 ounces a ton. Material at present on the dump at the shaft consists of andesitic schist and quartz. The schist carries scattered grains and streaks of pyrite. The quartz varies from grey to milky white and veinlets of white quartz cut the grey. The white quartz is coarse grained and much of it is unmineralized although it locally carries a few grains of pyrite and chalcopyrite. The grey quartz is fine grained and commonly has a banded structure due to roughly parallel layers of quartz of various shades of grey and to streaks of dark chloritic material and shreds of schist. The grey quartz carries disseminated grains and streaks of chalcopyrite, pyrite, and sphalerite, and a few grains of pyrrhotite. Cubes of pyrite are abundant along some layers $\frac{1}{8}$ of an inch wide and the pyrite, as seen on microscopic examination, carries a few blebs of gold. Some of the quartz carries grey carbonate and grey and red feldspar.

Number 2 vein (Locality 32b, Figure 6) commences at a point 250 feet northeast of the shaft and extends for 150 feet north 20 degrees east to a small bay near the north end of the island. This vein is from 2 inches to 1 foot wide for much of its length, but at one place is from $1\frac{1}{2}$ feet to 4 feet wide for a length of 35 feet. The quartz is generally rather fine grained and grey and is sparsely mineralized with pyrite. Locally the quartz carries crystals of red feldspar and patches of carbonate and black tourmaline. At one locality schistose andesite in the vein zone is cut by stringers of quartz across a width of 4 feet and is well mineralized across this width with cubes and bands of pyrite. The owner reports that samples taken from this vein assayed as high as 1·60 ounces of gold a ton across widths of 2 feet. A few stringers of quartz and carbonate lie in schistose lava across widths of from 30 to 40 feet west of the main vein.

Other small quartz lenses and veinlets lie in lava between Number 1 vein and Number 2 vein and occur elsewhere on the island. A series of quartz lenses lie 100 feet west of Number 2 vein and outcrop at intervals for 200 feet along a strike of north 17 degrees east (Locality 32c, Figure 6).

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[1] Wright, J. F.: "Geology and Mineral Deposits of a Part of Northwest Manitoba"; Geol. Surv., Canada, Sum. Rept. 1930, pt. C, p. 46.

The lenses are up to 40 feet long and 1½ feet wide and lie adjacent to dyke-like bodies of fine-grained quartz diorite carrying disseminated grains of pyrite. Quartz veins in sheared lava and fine-grained quartz diorite, on the strike of this series of quartz lenses, are exposed in a small pit on the lake shore 50 feet west of the shaft (Locality 32d, Figure 6). Good values in gold are said to have been found in this pit and a channel sample extending from this pit to the shaft is reported to have assayed 0·18 ounce of gold a ton.

Big Dome No. 6 (33)

A deposit of vein quartz on this claim lies 600 feet northeast of the mouth of a creek that flows from Claw lake into the east side of Elbow lake. The claim was staked in 1933 by Mr. Harvey LeBlanc. Workings on the deposit are several years old and consist of a few trenches and prospect pits.

Rocks exposed in the vicinity of the deposit consist chiefly of andesitic lava flows with a poorly developed cleavage trending slightly west of north. The lavas are cut by irregular, dyke-like bodies of fine-grained quartz diorite carrying disseminated grains of pyrite and chalcopyrite. A body of "quartz-eye" granite invades the lavas to the northeast and comes to an end in a narrow tongue one-half mile east of the deposit.

The deposit consists of a series of quartz lenses that lie partly in disconnected, dyke-like bodies of fine-grained quartz diorite and partly in andesitic lava between the dyke-like bodies. The deposit strikes north 10 degrees west and cleavage of nearby lava strikes the same direction and dips from 65 degrees to 80 degrees east. The quartz is best exposed on a hill where it is seen at intervals in test pits and in natural outcrops for a length of 250 feet. The largest quartz lens is 70 feet long and varies in width from 2 feet to 7½ feet. In one pit the large lens is followed west by 6½ feet of fine-grained quartz diorite cut by small lenses and veinlets of quartz. For 130 feet north of the large lens, quartz lenses and stringers are small and lie across widths of country rock up to 6 feet. A test pit 50 feet south of the large lens crosses 15 feet of fine-grained quartz diorite cut by small quartz stringers. Much of the quartz in the large and small bodies is barren of sulphides, but some of it is well mineralized with pyrite in scattered blebs or pockets up to 6 inches long and 2 inches wide.

Bedrock is covered for 250 feet south of the hill to another outcrop where a test pit exposes a quartz vein lying along a contact between lava and a small body of fine-grained quartz diorite. The vein is exposed for 25 feet along the strike of north 40 degrees west, varies in width from 1½ feet to 3 feet, and carries scattered grains of pyrite.

Pato (34)

This claim is about three-fourths mile south of the mouth of a creek that flows from Claw lake into the east side of Elbow lake. The claim was staked in 1933 by Mr. Albert McBrearthy. Bedrock in the immediate vicinity of quartz veins on this claim is schistose andesitic lava cut by a few dykes of granite. To the south, the lavas are invaded by a large body of "quartz-eye" granite. The granite carries a small amount

of disseminated pyrite and is cut by a few lenses of quartz. The veins lie in the lava close to the body of granite and strike slightly north of west or about parallel to the trend of the granite contact.

One quartz vein outcrops 150 feet east of Number 4 post of the Pato claim and lies 40 feet north of the granite. The vein is exposed for 100 feet along the strike of north 80 degrees west. The dip is commonly 70 degrees south, but is locally as flat as 20 degrees south. Some of the quartz holds included bands of schistose lava and the width of quartz and included schist commonly varies from 2 feet to 3½ feet. At the west end the quartz narrows to 6 inches or less and pinches out between lava and a granite dyke. The quartz is glassy or sugar-grained and carries a few scattered grains of pyrite and chalcopyrite. A crescent-shaped exposure of quartz 4 feet wide and 25 feet long occurs at a point 30 feet northeast of the main vein. This quartz may or may not continue beneath intervening drift to join with the main vein.

A shear zone in the lava has been traced in prospect pits from a point 20 feet south of the west end of the quartz vein to a point 5 feet south of the east end of the vein and continues for 150 feet farther east. Soft schistose lava in the shear zone dips 80 degrees north, varies in width from 2 feet to 4½ feet, and locally holds lenses of vein quartz up to 1 foot wide.

At a locality 500 feet northeasterly from the deposits described above, a narrow shear zone strikes northwest and dips 80 degrees northeast. It is about 1 foot wide and is exposed for 60 feet along the strike. The shear lies in andesitic lava and crosses a granite dyke. The dyke on the southwest side of the shear has been displaced about 2 feet northwest of the dyke on the other side of the shear. The sheared lava is penetrated along cleavage planes by a few stringers of rhyolite and lenses of quartz. The quartz is sparsely mineralized with pyrite, chalcopyrite, and galena and is reported to carry free gold. Little work has been done on this deposit.

Murray (36)

This claim is on the east side of Grass river at the outlet of Elbow lake. The claim was staked by Messrs. A. C. and K. C. Murray following their discovery of gold on the property early in 1921.[1] The claim was optioned in October, 1921, by a group of men closely associated with the Hollinger Consolidated Gold Mines, Limited, and the deposit was thoroughly explored by surface trenching before the option was dropped in 1922. The property was then taken over by the Gordon Murray Gold Mines, Limited, and, later, by the Murray Consolidated Mines, Limited. In 1933 the property was optioned from the last named company by the Elbow Lake Shore Gold Mines Syndicate and, in 1934, was acquired by Manco Gold Mines, Limited. It is reported that this company commenced diamond drilling on the deposit in March, 1934. They also purchased mining and milling machinery that had been used on the Webb-Garbutt property. This machinery was moved to the Murray property, but had not been assembled there by the autumn of 1934.

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[1] Armstrong, P.: "Geology and Ore Deposits of Elbow Lake Area, Northern Manitoba"; Geol. Surv., Canada, Sum. Rept. 1922, pt. C, p. 37.

Prospect workings on the property comprise two shafts, an adit, and about 2,000 feet of trenching. Most of the workings are on a hill between Grass river and a creek that enters the river from the northeast. A small amount of trenching was done on the south side of the creek where cabins have been built.

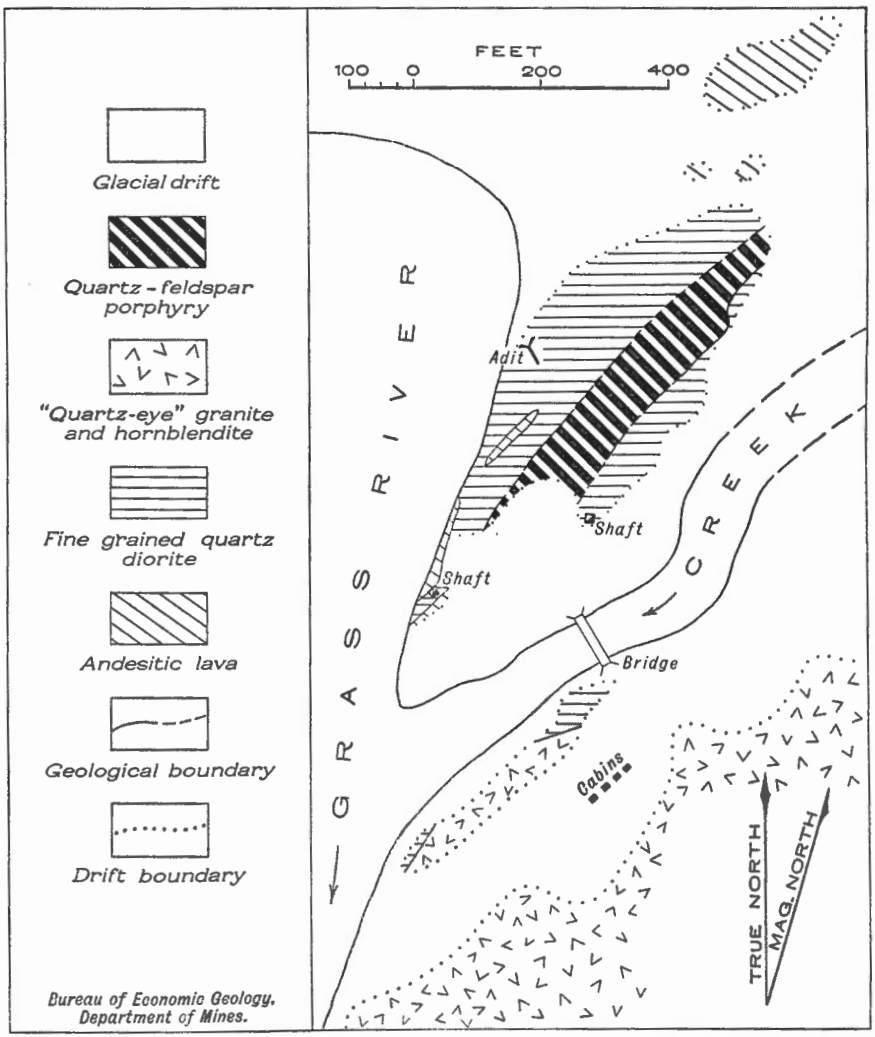

Figure 7. Murray claim (mineral locality No. 36 on Map 321A, "Elbow-Morton Area").

The workings are chiefly in grey, fine-grained, quartz diorite that outcrops between andesite lava to the north and west and a large body of " quartz-eye " granite to the south and east (*See* Figure 7). The main body of quartz diorite holds inclusions of the lava and small dykes of the

quartz diorite cut the lava. The quartz diorite is cut by a few dykes of "quartz-eye" granite and by many dykes of quartz-feldspar porphyry with closely spaced phenocrysts of plagioclase and a few of quartz. One of the porphyry dykes north of the creek is 90 feet wide and has been traced along its northeasterly strike for 600 feet.

The body of fine-grained quartz diorite on the hill north of the creek is divided into two parts by the large dyke of porphyry. The part that lies northwest of the dyke is well exposed in excavations and in natural outcrops for a length of 800 feet in a northeast direction and across widths of from 12 to 140 feet. The quartz diorite that lies on the southeast side of the dyke is exposed at intervals in trenches and a prospect shaft for a length of 480 feet and widths up to 60 feet. On the south side of the creek two small exposures of fine-grained quartz diorite lie at the end of an elongated outcrop of "quartz-eye" granite. The fine-grained quartz diorite commonly has a gneissic structure that trends northeast, is everywhere sparingly mineralized with disseminated grains of pyrite, pyrrhotite, and, locally, chalcopyrite, and is crossed by a few cracks up to 2 feet long that are filled with pyrite. The quartz diorite is crossed by joint planes that strike in many directions and dip from 20 degrees to vertical. A few of these joints are filled with vein quartz. Most of these stringers and veinlets of quartz are less than 2 inches wide, but some are 6 inches wide. None of them is exposed for more than a few feet along the strike. Many of the quartz veins hold crystals of feldspar and patches of finely crystalline chlorite. Other minerals noted in the vein quartz include carbonate, biotite, muscovite, and black tourmaline. The veins are barren of sulphides or carry pyrite and a small amount of pyrrhotite, but sulphides are generally less abundant than in the adjacent quartz diorite. It is reported that some of the veinlets found in the workings were extraordinarily rich in gold, which occurred as thin leaves along cracks in the quartz.[1] The quartz stringers are so widely spaced, however, that their gold content could not be recovered without the mining of a large amount of the associated quartz diorite. Unless this mineralized quartz diorite carries good values in gold it is unlikely that the gold in such widely spaced quartz stringers could be recovered profitably.

The quartz-feldspar porphyry and the "quartz-eye" granite locally carry grains of pyrite and are cut by a few veinlets of blue and white quartz. Two of these veins are larger than any seen in the fine-grained quartz diorite, but are apparently barren of sulphides.

Wire (37)

This claim is on the west side of Grass river 1½ miles south of the outlet of Elbow lake. The claim was staked in 1933 by Mr. Thomas R. Webb. During the summer of 1934 a zone of vein quartz in schist near the river bank was uncovered in a few prospect pits.

The deposit lies in a narrow belt of andesitic lava with a schistose structure that strikes slightly east of north. The lava is cut by several dykes of "quartz-eye" granite that either lie along or cut across the

[1] Armstrong, P.: "Geology and Ore Deposits of Elbow Lake Area, Northern Manitoba"; Geol. Surv., Canada, Sum. Rept. 1922, pt. C, pp. 40, 43.

cleavage of the lava. The edge of a large body of "quartz-eye" granite outcrops on the east side of the river 200 feet east of the deposit. A high ridge of granite carrying much disseminated pyrite and holding long included bands of lava outcrops 500 feet west of the deposit.

The zone of vein quartz and schist has been uncovered at intervals for a length of about 320 feet and passes beneath drift at both ends. The schist and quartz strike north 25 degrees east and dip 80 degrees southeast. A dyke of red granite up to 3 feet wide outcrops along the west side of the quartz zone. The granite dyke carries many cubes and grains of pyrite and is cut by veinlets of quartz and carbonate. Along the southern 140 feet of the deposit the quartz varies from 2 inches to 1 foot wide. The schist adjacent to this vein is penetrated locally by small lenses and stringers of quartz and at such localities the combined width of schist and quartz is up to 2½ feet. The remainder of the deposit to the north is poorly exposed and apparently consists of small lenses and stringers of quartz lying across widths of schistose andesite up to 2½ feet. Here and there throughout the length of the deposit the quartz carries a few disseminated grains of pyrite.

At a locality 10 feet east of the south end of the above described deposit, an exposure of quartz 17 feet long and from 5 feet to 8 feet wide has been uncovered by stripping and in a test pit. Most of the quartz in this body is milky white, is commonly barren of sulphides, but is locally well mineralized with patches of pyrite and galena and is crossed by small veinlets of galena and chalcopyrite. It is reported that the quartz carries values in gold. The quartz body ends abruptly to the north against lava and a dyke of granite. To the south the quartz passes beneath a thick covering of drift.

Little A and Big A (38)

These claims are at the first rapid on Grass river 3½ miles south of Elbow lake. The claims were staked in 1920 by Mr. Thomas Hanna. Workings consist of a few old prospect pits in a deposit of quartz and schist on the west side of the river.

Rocks in the vicinity of the deposit are chiefly schistose andesitic lava that is locally well banded. The cleavage and bands strike north 35 degrees east and dip from 70 degrees to 80 degrees southeast. The lavas along the west side of the deposit are cut by a dyke of red granite from 3 feet to 10 feet wide and striking parallel to the cleavage of the lava. The granite dyke carries much disseminated pyrite and is cut by many stringers of quartz. The edge of a large body of "quartz-eye" granite outcrops on the east shore of the river and on an island in the river 50 feet east of the deposit. Another body of "quartz-eye" granite outcrops about 700 feet west of the deposit.

Quartz veins on the property strike parallel to the cleavage of the lava. A large vein outcrops on the east bank of the river at the foot of the rapids. This vein outcrops for 130 feet along the strike and is exposed across widths of from 2 feet at the north end to 25 feet at the south end. No sulphides were seen in the quartz and the owner has made no assays of the vein

material. The vein passes into the river at the southwest end and is covered by drift at the northeast end.

At a point about 200 feet northeast of the large vein a trench crosses about 40 feet of schistose lava cut by lenses and stringers of quartz. The owner of the claims reports that a channel sample along the full length of this trench assayed 0·16 of an ounce of gold a ton. Lava outcrops for 50 feet south of the long trench and is penetrated by widely spaced quartz lenses across a width of 30 feet. One test pit here crosses 10 feet of schistose lava holding quartz lenses up to 2 feet wide.

The owner of the property says that vein quartz carrying sulphides outcrops here and there for thirteen claims in length to the southwest and that the quartz in some of the trenches on these claims assays from 0·15 to 0·35 ounce of gold a ton. He also reports that a large deposit of iron sulphide just west of a deposit of quartz on the fourth claim south of the rapids carries some values in gold.

Arcana (39)

This claim is 2 miles west of Norris lake and is owned by Mr. Oliver Dickson. Rocks in the vicinity of a large deposit of quartz on the claim are andesitic lava flows with a northerly striking cleavage. A large body of granitic rock lies about 1,000 feet east of the deposit.

The deposit was seen in two trenches 60 feet apart along the strike. It is said that other outcrops of quartz indicate that the total length of the deposit is 600 or 700 feet. The two trenches cross 25 feet or more of schistose andesite holding lenses and stringers of quartz. In one trench quartz constitutes about half of the material present across 25 feet and in the other trench quartz greatly predominates over schist across 12 feet. Cleavage of the schist strikes north 15 degrees west and dips 70 degrees easterly. No sulphides were seen in the quartz in the two pits, but a specimen said to have been collected from the deposit carries pyrite and pyrrhotite. The owner reports that a sample of quartz from the deposit assayed 0·17 ounce of gold a ton.

North Star, Gold Rock, Jupiter, and Nearby Claims (40 to 55)

General Account. A deposit of gold-bearing quartz on the North Star No. 1 and No. 2 claims was discovered in the spring of 1927 by Mr. Lambert Nelson and was staked in December, 1927.[1] Subsequently, many additional claims were staked in the surrounding country and other gold deposits were found in an area 3 miles long in a northerly direction and up to 1 mile wide. Noteworthy among these later discoveries are deposits on the Gold Rock and Jupiter No. 2 and No. 3 claims.

The claims may be reached from Cranberry Portage by canoe along Grass river and Reed, Krug, and Sewell lakes, to a small lake that lies

[1] Wright, J. F.: "Geology and Mineral Deposits of a Part of Northwest Manitoba"; Geol. Surv., Canada, Sum. Rept. 1930, pt. C, p. 68.

north of Sewell lake and is locally known as Peterson lake. From Peterson lake a rough trail about 2½ miles long leads in a northwesterly direction to cabins on the North Star No. 2 claim. From a point on this trail about ½ mile from Peterson lake a branch trail leads west for ¾ mile to a small cabin on the Jupiter No. 4 claim. From the cabins on the North Star No. 2 claim a trail follows a northerly course for 1,000 feet to a lake locally known as North Star lake, which serves as a good landing place for airplanes. During the summer of 1934 all supplies, men, and drilling machinery used in connexion with exploration work on the properties were brought in by airplane.

The Consolidated Mining and Smelting Company held the original discovery under option during the summer of 1930 and the deposit was thoroughly trenched and sampled. Late in 1930 the option was dropped. The deposit on the Gold Rock claim was known at the time the work was done on the North Star claims, but was not systematically trenched and sampled until some time later when Canadian Minerals, Limited, optioned the Gold Rock claim and other properties in the district. In 1932 the Consolidated Mining and Smelting Company optioned and sampled the deposits on the Jupiter No. 2 and No. 3 claims. In 1934 Canadian Mining Projects, Limited, optioned the North Star No. 1 and No. 2, Gold Rock, and many other claims, including the following that are described in subsequent sections of this report: Gold Shower, Key fraction, North Star No. 4, Beaver, Eva, Apex fraction, North Star No. 7, and K.U. No. 1. Most of these claims and others in a block over 3 miles long in a northerly direction were surveyed during the summer. All the important deposits on the claims were thoroughly sampled and some two hundred and seventy prospect trenches on the deposits were accurately mapped. The company then undertook a diamond drilling program and drilling was commenced in August on the deposit on the North Star No. 1 and No. 2 claims. Financial difficulties, due to failure to raise sufficient capital, forced the company to abandon operations before the drilling program was completed.

Rocks in the vicinity of the deposits held by Canadian Mining Projects, Limited, and on other nearby claims are chiefly andesitic and basaltic lava flows. Only a few of the flows exhibit amygdaloidal or pillow structure or hold lumps of epidote. The lavas almost everywhere have a schistose structure that strikes north and commonly dips from 70 degrees to 80 degrees east and locally dips steeply west. The lavas are followed west by a wide belt of sedimentary gneiss. Near the contact between the two formations the lava holds thin beds of sedimentary gneiss and the main body of sediments holds a few flows of lava. The lavas are invaded by a few small bodies of meta-diorite and related gabbro and quartz diorite. Large bodies of granitic rock lie northeast, west, and south of the deposits. The granite body to the south is of "quartz-eye" granite and the north edge of this body trends east at right angles to the cleavage of the lavas. The normal fine-grained, chloritic or hornblendic, schistose lavas are commonly altered to more massive, coarse-grained, hornblende rocks for a mile or so north of the granite contact. Four small stocks of "quartz-eye" granite and related quartz

BUREAU OF ECONOMIC GEOLOGY, DEPARTMENT OF MINES, CANADA.

Glacial drift

Quartz and schist

Shear zone

4 — "Quartz-eye" granite and quartz-diorite

3 — Meta-diorite and quartz diorite

2 — Sedimentary gneiss

1 — Andesite, basalt, and dacite lava

Geological boundary

80° — Schistosity (strike and dip)

DEPOSITS

40 — *Gold Shower claims*
41 — *Gold Rock claims*
42 — *Key Fraction*
43a — *North Star No. 4*
43b — *North Star No. 2*
43c — *North Star No. 2 and No. 4*
44 — *North Star No. 1 and No. 2*
45 — *Beaver and North Star No. 3*
46 — *Eva*
47 — *Snow*
48 — *Apex Fraction*
49 — *North Star No. 7*
50 — *K. U. No. 1*
52a,b,c,d,e — *Jupiter No. 2 and No. 3*
52f,g — *Jupiter No. 4*
53a — *Winnipeg claim*
53b — *Winnipeg and Jupiter No. 7*
53c,d — *Jupiter No. 7*
54 — *Bonny-Castle*

SCALE OF FEET
1000 0 1000

NORTH STAR LAKE

TRUE NORTH
MAG. NORTH

FIGURE 8

NORTH STAR, GOLD ROCK, JUPITER AND NEARBY CLAIMS

(mineral localities No. 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 52, 53 and 54 on Map 321 A, "Elbow-Morton Area")

diorite lie in the lavas north of the main granite body and are probably offshoots from this main body. The stocks are roughly circular in outcrop and vary from 250 feet to 2,000 feet in diameter. They lie along a nearly straight line and outcrop at localities ½ mile, 1¼ miles, 1½ miles, and 1¾ miles north, respectively, of the main body of granite. The three most northerly stocks are shown in Figure 8. Numerous dykes of coarse-grained, quartz-feldspar porphyry, feldspar porphyry, quartz diorite, and granite cut the lavas between and alongside the stocks, and a few dykes of similar rocks outcrop here and there in the lavas for at least 1½ miles north of the most northerly stock. Granite dykes are most abundant near the north edge of the main body of granite. All the dykes strike about north, either following the cleavage of the lavas or, rarely, crossing this structure at a slight angle.

The deposits of gold-bearing quartz (*See* Figure 8) lie in this northerly striking zone of stocks and dykes and locally cut the dyke rocks. The deposits of quartz, like the dykes, strike about north either following the cleavage of the lavas or crossing the cleavage at a small angle. The quartz in many of the deposits is intimately mixed with schist and the normal chloritic schist is commonly altered to biotite schist near the vein quartz. Much of the biotite schist and some of the chlorite schist holds diversely oriented laths of hornblende. The alteration to biotite and hornblende becomes more common and the schists become coarser grained as the main body of "quartz-eye" granite is approached.

The vein quartz and rocks older than the quartz are cut at several localities by dykes of basalt porphyry that trend parallel or nearly parallel to the strike of the quartz deposits. The dykes of basalt porphyry are widely distributed in the area and are neither confined to the neighbourhood of the gold deposits nor serve as a guide in searching for such deposits. The vein quartz is also cut by dykes of garnetiferous granite that may be younger than the basalt porphyry. Individual deposits of quartz are described in the following paragraphs.

GOLD SHOWER, K. D. FRACTION

The Gold Shower claim was staked in 1928 by Mr. Ole Birkeland and is now owned by Canadian Minerals, Limited, and Mr. V. A. Lackner. A large quartz vein on the two claims lies in basaltic and andesitic lava (Locality 40, Figure 8). The vein strikes north 5 degrees east, following the cleavage of enclosing lavas, and dips from 75 degrees east to vertical. It is exposed almost continuously in natural outcrops and in eleven test pits for a length of 250 feet. The width of the quartz with small amounts of included schist varies from 8 feet to 15 feet and averages 11 feet. Thin, parallel shreds of biotite schist and chlorite schist are common in the quartz. The schist of some of these shreds carries laths of hornblende lying in many directions. The quartz is coarsely granular and varies from white to grey. Much of the quartz is barren of sulphides, but some of it carries scattered grains, patches, and streaks of pyrite and a few streaks of pyrrhotite and sphalerite. Some elongated cavities up to 3

inches long are lined with cubes of pyrite and others are filled with limonite probably derived from pyrite. The deposit is said to be disappointingly low in gold values. The quartz and included schist are cut at a very small angle to the cleavage of the schist by two dykes a foot wide. One of these dykes is of basalt porphyry and the other is of fine-grained, garnetiferous, biotite granite. The vein passes beneath a thick covering of drift at the north end and ends abruptly at the south end.

Another body of quartz and schist is exposed in a pit 60 feet south of the large quartz vein and continues south for at least 50 feet. This body of quartz and schist is up to 9 feet wide.

GOLD ROCK

This claim was staked in 1928 by Mr. Ole Birkeland and is owned by him and Canadian Minerals, Limited. Zones of schist carrying lenses and stringers of quartz lie in andesitic and basaltic lava in the northwest part of the claim (Locality 41, Figure 8). The deposit is known as the Gold Shower vein. Cleavage of the lavas strikes north 5 degrees east and dips 80 degrees easterly. The lavas just southeast of the deposits are cut by a dyke of feldspar porphyry. The lavas and vein quartz are cut by dykes of basalt porphyry. The dykes strike about parallel to the cleavage of the lavas.

The zones of quartz and schist lie along the structure of the lavas or cross the cleavage at a slight angle. The deposits are exposed in forty prospect trenches for a distance of 630 feet from the north boundary of the claim. Four distinct vein zones are exposed and these are arranged *en échelon* (*See* Figure 9) so that their combined length is 870 feet.

The quartz in all the deposits is coarsely granular and varies from milky white to glassy grey. It locally exhibits a faint banded structure and the banding is accentuated by numerous included shreds of schist arranged roughly parallel to one another. The schist in which the vein quartz lies is banded, due to layers of chloritic andesite alternating with bands of biotite schist. Many of the bands of biotite schist hold diversely oriented laths of hornblende.

The most northerly vein zone is exposed at intervals for a length of 320 feet (Locality 41a, Figure 9). The quartz follows a shear zone that strikes north 20 degrees east and accordingly crosses the regional cleavage of the lavas at an angle of 15 degrees. Cleavage of the schist along the shear zone dips from 65 degrees to 75 degrees easterly. For a length of 60 feet at the north end of the zone the quartz is from 3 inches to 8 inches wide. South of this outcrop the vein zone is covered for a length of 65 feet. In the next three pits to the south the zone of quartz and schist is exposed across 5 feet for a length of 40 feet. Veins of quartz in these pits vary in width from 1 foot to 4½ feet. Locally, the quartz holds a few specks of red feldspar and is crossed by tiny stringers of red feldspar and carbonate. Some of the quartz is well mineralized with disseminated grains and streaks of pyrite, pyrrhotite, chalcopyrite, sphalerite, and galena. The schist in the trenches carries scattered grains of pyrite and chalcopyrite. The schist for 80 feet farther south holds only a few disconnected lenses of quartz from a fraction of an inch to 18 inches

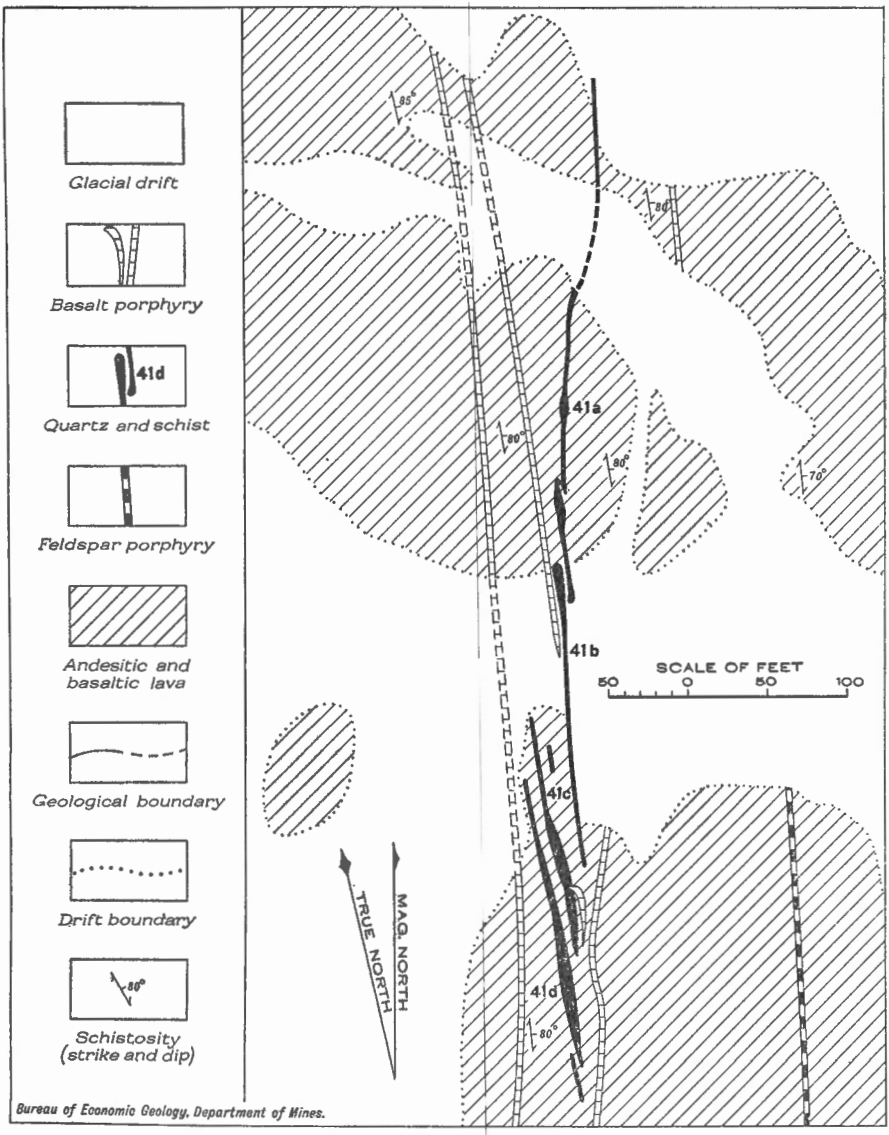

Figure 9. Gold Rock claim (mineral locality No. 41 on Map 321A, "Elbow-Morton Area"). 41a, 41b, 41c, and 41d, vein zones.

wide. The remaining 75 feet of schist along the south part of the zone holds several small lenses and stringers of quartz and one large lens 50 feet long and up to 5 feet wide. A few grains of pyrite were seen in the quartz of the large lens and in nearby schist.

The next vein zone to the south is 190 feet long (Locality 41b, Figure 9). This zone strikes north 12 degrees east and dips about 70 degrees east. For 60 feet from the north end the schist is about 5 feet wide and carries stringers and veins of quartz up to 1 foot wide. Some of the quartz carries grains and streaks of pyrite, galena, and sphalerite, and holds specks of gold that are visible without the aid of a lens. For 50 feet farthur south the vein zone is covered in three pits in drift. The southern 80 feet of the deposit is a narrow schist zone holding a few small quartz lenses and one quartz vein from 3 inches to 6 inches wide and about 50 feet long. This vein carries grains of pyrite, chalcopyrite, sphalerite, and galena. The schist near the vein carries disseminated grains of pyrite.

Another zone of quartz and schist west and south of the one just described is 150 feet long and follows the strike of the regional cleavage of the lavas (Locality 41c, Figure 9). The deposit is 8 feet wide in the middle and narrows towards both ends. The quartz carries a few crystals of red feldspar and is cut by a few stringers of carbonate. Most of the quartz is barren of sulphides but locally carries a few grains of pyrite. Some of the streaks of schist in the quartz carry grains of pyrrhotite.

The most southerly vein zone is 210 feet long and strikes parallel to the regional cleavage of the lavas (Locality 41d, Figure 9). The zone of mixed quartz and schist is 9½ feet wide near the middle and narrows toward both ends, where it passes into a series of disconnected small quartz lenses. The quartz is sparingly mineralized with grains of pyrite and pyrrhotite. In one pit lenses of grey quartz carrying pyrite are crossed by veinlets of white barren quartz. In another pit a small lens of diorite carries pyrite and pyrrhotite and is cut by veinlets of quartz.

Canadian Mining Projects, Limited, has published assay results obtained from channel samples collected on the Gold Shower vein: a section 55 feet long averaged 0·434 ounce of gold across an average width of 3·12 feet; an adjoining section 170 feet long averaged 1·15 ounces of gold across an average width of 14 inches; and a third section 80 feet north on the edge of a muskeg gave the following assays from three trenches cut at 10-foot intervals: 1·0 feet—$36, 2·0 feet—$18, 8·6 feet—$8.40.

Small, disconnected bodies of vein quartz are exposed in prospect trenches at six localities for 500 feet south 15 degrees east from the most southerly deposit described above. One of these quartz bodies, 435 feet south of the same point, carries coarse gold. This quartz body is exposed on a north-facing cliff of lava. The quartz with schist inclusions is 3 feet wide and pinches out in a pit 20 feet to the south. In addition to gold, the quartz carries pyrite, chalcopyrite, and sphalerite.

Southerly along the strike of this zone of disconnected deposits, bedrock is thickly covered for 500 feet to an outcrop on which a deposit on the Key fraction is exposed.

KEY FRACTION

This fraction was staked in 1933 by Mr. Oliver Dickson and is at present owned by Mr. Gisli Gislason. The deposit on this fraction (Locality 42, Figure 8) is of vein quartz along a shear zone in andesitic lava. The lava is cut, at a locality 150 feet west of the deposit, by a narrow dyke of red granite.

The shear zone strikes north 17 degrees east and dips 75 degrees easterly. The zone of mixed quartz and schist is exposed in seven prospect trenches for a length of 200 feet along a drift-filled depression. The schist varies from 5 feet to 10½ feet wide and quartz lenses are generally distributed across the full width of the schist. For 100 feet along the middle of the deposit vein quartz predominates over the schist across widths of from 3 feet to 6½ feet. The quartz is white or grey, coarsely granular, and holds numerous parallel shreds of biotite-hornblende schist. A few grains of pyrite were noted in the quartz and schist of all of the pits and locally the schist is well mineralized with grains and streaks of pyrite. The quartz holds a few patches of carbonate and is crossed by a few stringers of carbonate and red feldspar.

Quartz is narrow in a pit at the north end of the deposit and the shear zone is weak in the next pit to the north at the edge of swamp. To the south the deposit passes beneath swamp that continues for 770 feet southerly along the strike of the deposit to a vein zone on the North Star No. 4 claim.

NORTH STAR NO. 4

This claim was staked in 1927 by Mr. Hjalmer Peterson who is the present owner of the property. The deposit on the claim (Locality 43a, Figure 8) is a mixture of quartz and schist along a shear zone in andesitic lava. Schistose structure of the lava near the shear zone strikes north 8 degrees east and dips about 75 degrees easterly. The shear zone strikes north 25 degrees east and accordingly crosses the structure of nearby lava at an angle of 17 degrees. The shear zone dips from 75 to 85 degrees easterly.

The deposit is exposed in ten prospect trenches for a length of 225 feet. Pits for 120 feet along the middle part of the deposit cross from 10 feet to 16 feet of mixed quartz and schist. At the north end the deposit narrows to 6 feet, carries only a little quartz, and passes beneath swamp. At the south end the deposit narrows to a quartz stringer in 2 feet of schist and pinches out in the lavas. Lenses of quartz in the deposit are up to 2½ feet wide and 25 feet long. The larger lenses are of white quartz and carry only a few shreds of schist. The smaller lenses are of grey, granular quartz and hold numerous, roughly parallel shreds of dark schist. The quartz locally holds small patches of carbonate. Much of the quartz is barren of sulphides, but a few grains of pyrite lie in some of the quartz and schist of most of the pits. In one pit near the north end of the deposit the quartz is well mineralized across 2 feet with disseminated grains, patches, and short, irregular veinlets of pyrite.

For 1,500 feet southerly from this deposit, ten bodies of quartz outcrop at scattered localities across a width of 425 feet. Most of the deposits are small and unimportant.

One of these deposits is wide but is exposed for only a short distance along the strike and passes beneath swamp at the north end. This deposit lies in the northeast corner of the North Star No. 2 claim (Locality 43b, Figure 8). Here a shear zone is exposed in four prospect pits for a distance of 40 feet south 25 degrees west from the swamp. The shear zone is 12 feet wide at the edge of the swamp and narrows to 3 feet in the southern pit. Lenses of quartz are generally distributed across the full width of the schist and these are from a fraction of an inch to 5 feet wide. The quartz and schist carry disseminated grains of pyrite. The quartz and schist are cut by two narrow dykes of basalt porphyry.

Another deposit lies 425 feet to the west and is partly on the North Star No. 4 claim and partly on the North Star No. 2 claim (Locality 43c, Figure 8). At this locality a dyke of basalt porphyry is exposed for 350 feet along the strike of north 20 degrees east. Sheared andesite is exposed in eleven trenches along or near the east side of the dyke and may be a continuous shear zone 200 feet long. The schist dips from 75 degrees to 80 degrees easterly. The shear zone is commonly from 1 foot to 2 feet wide and lenses of quartz are locally present across this width of schist. Much of the quartz and schist is apparently barren of sulphides. However, the quartz in two pits 25 feet apart at the north end of the deposit carries much pyrite and small amounts of pyrrhotite, chalcopyrite, and sphalerite. On the west side of the dyke near the south end two trenches 15 feet apart cross from 2 feet to 10 feet of schist mixed with quartz. The quartz in one of the pits is heavily mineralized with streaks of pyrite. Bedrock is covered at both ends of the explored zone. Southerly along the strike of the deposit drift extends for 925 feet to the deposits on the North Star No. 1 and No. 2 claims.

NORTH STAR NO. 1 AND NO. 2

Two parallel zones of schist holding lenses and veins of quartz lie on the northern part of the North Star No. 1 claim and extend northerly into the North Star No. 2 claim (Locality 44, Figure 8). The deposits were staked in 1927 by Messrs. Lambert Nelson and George M. Solberg who are the present owners.

Rocks in the vicinity of the deposits (*See* Figure 10) are chiefly schistose andesitic lava flows with a cleavage that commonly strikes about north 15 degrees east and dips from 75 degrees to 80 degrees easterly. Some layers in the lava are amygdaloidal and others hold elongated bombs and lumps of epidote. The layers holding these structures trend parallel to the cleavage of the lava. The lavas from 150 feet to 300 feet west of the deposits are interlayered with beds of garnetiferous sedimentary gneiss. This zone of interbedded sediment and lava is followed to the west by a wide area of sedimentary gneiss. The lavas between the two parallel deposits of quartz and schist are invaded by a body of metadiorite. A narrow dyke of pyrite-bearing granite lies from 20 to 40 feet west of the deposits and strikes about parallel to the cleavage of enclosing lava. The quartz of the deposits is younger than the lava and metadiorite and is probably younger than the dyke of pyrite-bearing granite. The quartz and older rocks are cut by dykes of basalt porphyry and

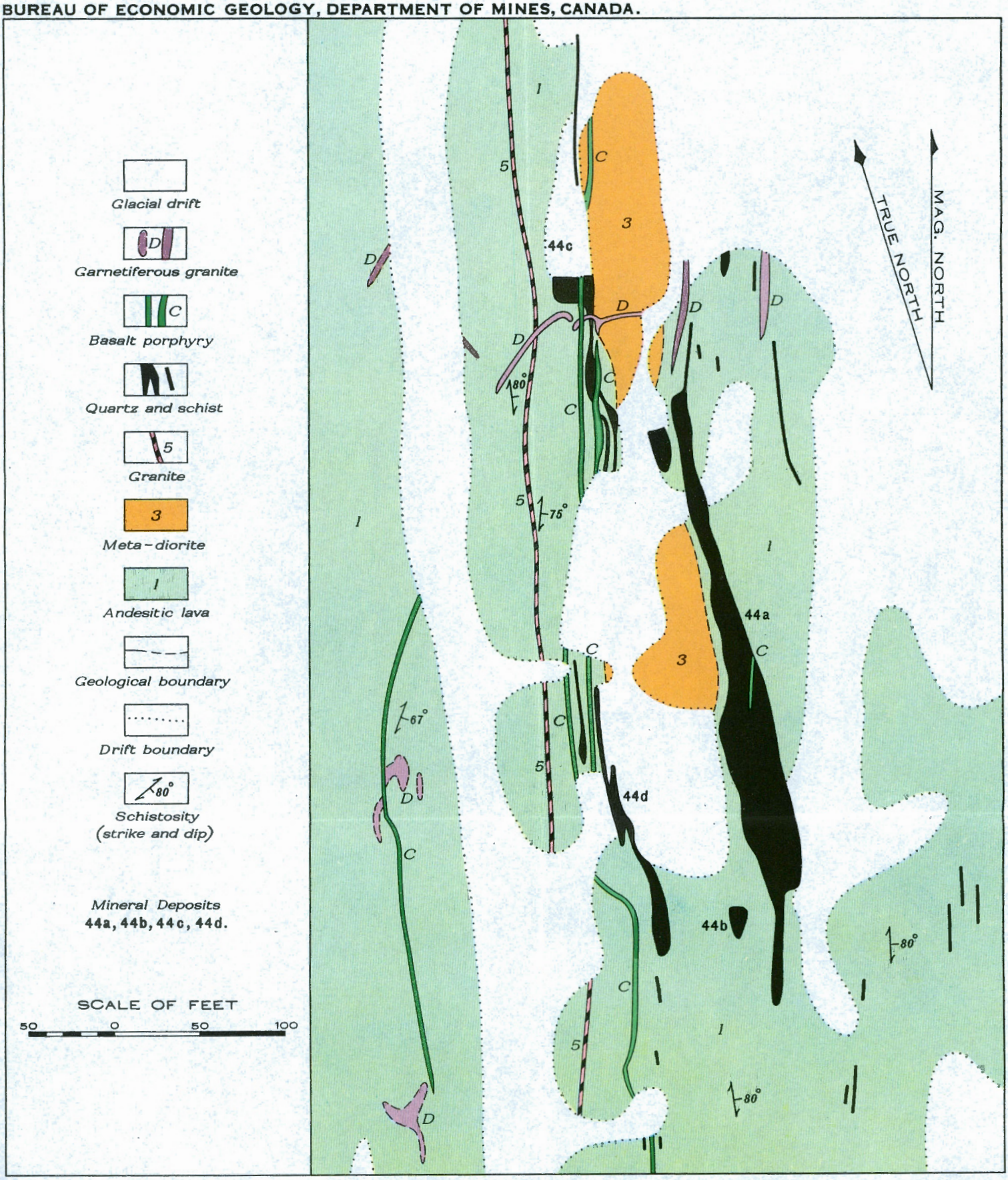

FIGURE 10

NORTH STAR NO. 1 AND NO. 2 CLAIMS

(mineral locality No. 44 on Map 321A, "Elbow-Morton Area")

garnetiferous biotite granite. The dykes of basalt porphyry cross the vein zones and other structures at a slight angle and the bodies of garnetiferous granite lie either along these structures or cross them at large angles. Age relations between the basalt porphyry and garnetiferous granite are not definitely known, but the granite is probably younger than the porphyry.

The east deposit of quartz and schist (Locality 44a, Figure 10) strikes about north 5 degrees east. Cleavage of the schist at the surface dips from 75 to 80 degrees easterly, but drilling has shown that the deposit as a whole dips vertically. The deposit is exposed in thirty-nine trenches for a length of 400 feet along the strike and pinches out in fairly massive andesite at both ends. One part of the deposit varies from 20 feet to 33 feet wide and averages 28 feet wide for a length of 110 feet. An adjoining section to the north varies from 5 feet to 20 feet wide and averages 11 feet wide for a length of 180 feet. The schist in the deposit is chiefly a chloritic variety holding thin layers of biotite schist with laths of hornblende lying at many angles. The schist carries a few grains and stringers of pyrite and chalcopyrite and rare specks of pyrrhotite. Numerous lenses of quartz in the schist are less than 2 inches wide and 6 inches long; a few are a foot or two wide and up to 100 feet long; one holding a few inclusions of schist is 15 feet wide and apparently about 60 feet long. In many of the trenches vein quartz constitutes only about one-quarter of the material present. The quartz is sugar-grained and varies from white to grey. It commonly holds shreds of schist, and some lenses hold dark streaks that give the quartz a banded appearance. A few lenses carry patches and veinlets of buff carbonate. Most of the small quartz lenses are apparently barren of sulphides, but many of the small lenses and the largest lens carry grains and shreds of pyrite, chalcopyrite, and sphalerite. Two long lenses of banded quartz near the north end of the deposit are well mineralized with chalcopyrite, sphalerite, and pyrite and carry a few grains of pyrrhotite and specks of gold. One of these well-mineralized lenses varies from 6 inches to 2 feet wide and has been traced in prospect pits for a length of 70 feet southerly from the north end of the deposit. The southern half of this lens lies on the east wall of a zone of mixed quartz and schist 9 feet wide. The other well-mineralized lens lies on the west wall of this mixed zone and continues southerly for a length of 100 feet; this lens is commonly from 1½ to 2 feet wide.

Canadian Mining Projects, Limited, has published assay results in dollars, of gold a ton, from forty-six samples apparently taken at intervals for 380 feet along the east deposit. Their results, calculated to ounces of gold a ton, may be summarized as follows: 8 trenches sampled gave values below 0·05 ounce; 13 samples gave values from 0·10 ounce to 0·20 ounce, mostly across widths of from 2½ feet to 5 feet and one across 30 feet assaying 0·167 ounce; 11 samples assayed between 0·20 ounce and 0·40 ounce mostly across widths of from 2·8 feet to 6·8 feet; 12 samples gave values from 0·50 ounce to 1·09 ounces, 7 of which were across from 0·5 to 1·7 feet, 2 across 3 feet, 2 across 5 feet, and 1 across 13 feet; one sample across 5 feet assayed 1·4 ounces and another across 0·4 feet assayed 3·11 ounces.

In 1933 Canadian Minerals, Limited, obtained about 500 pounds of ore from this deposit and shipped it to the Mines Branch, Department of Mines, Ottawa, for sampling and testing. The sample assayed 0·57 ounce of gold a ton and carried small amounts of silver, zinc, and copper. Experimental tests made on the shipment indicated that cyanidation was the best process for treating the ore. Microscopic study showed that the ore carried stringers of pyrrhotite, arsenopyrite, pyrite, sphalerite, and chalcopyrite in a quartz gangue and that native gold occurred in the sphalerite and quartz. The relationships of the minerals indicate that the gold is contemporaneous with the sphalerite-chalcopyrite mineralization and that the gold is to be expected in this association.[1]

At a point 20 feet west of the east vein and 55 feet from the south end, a shaft has been sunk in a body of quartz and schist 10 feet wide (Locality 44b, Figure 10). The largest quartz lens is 8 feet wide and carries a few shreds of hornblende schist. The quartz and inclusions of schist carry scattered grains of pyrite. A lens of quartz 1½ feet wide on the west wall of the shaft carries pyrite and sphalerite. Much of the material on the dump is of white and grey, sugary quartz carrying shreds of schist and small quantities of pyrite, chalcopyrite, and sphalerite. Some of the white, sugary quartz on the dump holds patches of coarsely crystalline pyrite and abundant coarse native gold. The gold lies both in the fresh quartz and on the walls of iron-stained cavities in the quartz.

The west deposit of quartz and schist is nearly parallel to the east deposit and lies from 35 feet to 65 feet west of it. The west deposit strikes about north 15 degrees east and the cleavage of the schist in the deposit dips from 70 to 80 degrees easterly. The north part of the deposit is exposed fairly continuously in 17 prospect trenches for a length of 250 feet (Locality 44c, Figure 10). The schist zone commonly varies from 3 feet to 8 feet wide and in one pit is 24 feet wide. One quartz vein is apparently continuous for the full length of the schist zone, except where crossed by dykes of basalt porphyry and granite. This vein varies from 6 inches to 4½ feet wide and averages about 1½ feet wide. Small lenses of quartz locally lie in the schist near the main vein. The quartz of the vein and nearby lenses is sugar-grained, varies from grey to white, holds shreds of hornblende schist, and carries disseminated grains and a few streaks of pyrite and chalcopyrite. The schist in and near the bodies of quartz carries only a small amount of pyrite. This northern part of the deposit passes beneath drift at both ends. The drift at the south end continues along the strike of the deposit for 110 feet to the north end of the southern part of the deposit.

The southern part of the west deposit of quartz and schist (Locality 44d, Figure 10) is exposed in fourteen prospect pits for a length of 160 feet and across widths of from 3 feet to 15 feet. In the southern three pits small lenses of quartz are intimately mixed with schist. Elsewhere larger bodies of quartz are separated by bands of schist from 1 foot to 4 feet wide without vein quartz. One of these bodies of quartz is irregular in shape and up to 10 feet wide and at least 50 feet long. Another is 45 feet long and from

[1] "Investigations in Ore Dressing and Metallurgy, January to June, 1933"; Mines Branch, Department of Mines, Canada.

1 foot to 3½ feet wide. The quartz holds shreds of hornblende schist and is poorly mineralized with disseminated grains of pyrite. At the north end of this deposit, bodies of quartz appear to die out in the schist and may not continue beneath the drift area to join with the northern part of the deposit. At the south end the body of quartz and schist comes to an end in fairly massive lava, although a few stringers of quartz are exposed in small prospect pits for 100 feet farther south.

Other deposits of quartz are exposed at scattered localities for 650 feet southeast and 850 feet south of the main deposits described above. Most of these deposits are small and all are apparently unimportant.

APEX FRACTION

This fraction was staked in 1933 and is now owned by Mr. Oliver Dickson. A deposit of quartz and schist on this claim (Locality 48, Figure 8) lies about 700 feet southeasterly from the deposit on the Key fraction. The deposit has been traced for a length of 130 feet in four prospect pits sunk along a drift-filled depression. The deposit strikes north 12 degrees east and the cleavage of the schist dips 75 degrees easterly. The deposit of mixed quartz and schist is 16 feet wide in the most southerly pit and is exposed across about 2 feet in the other pits. At the north end one vein of quartz, about 1½ feet wide, is exposed for a length of 35 feet and may continue beneath drift to the other pits. Small lenses of quartz also lie in the schist. The quartz is white, sugar-grained, or massive, and carries a small amount of pyrite as disseminated grains or streaks along dark bands in the quartz.

The deposit passes beneath drift at both ends. Southerly from the deposit bedrock is covered for 1,700 feet to the exposure of a deposit of quartz lying on the North Star No. 7 claim at a locality a short distance east of the projected strike of the deposit on the Apex fraction.

NORTH STAR NO. 7

This claim was staked in 1927 and is at present owned by Mr. W. Williamson. The deposit on the claim is exposed along the west side of a narrow outcrop of andesitic lava (Locality 49, Figure 8). Cleavage of the lava near the deposit strikes north 15 degrees east and dips from 70 degrees to 85 degrees easterly and the deposit strikes parallel to this structure. Sheared lavas along the deposit hold bands of gneissic, fine-grained, quartz diorite, and both these rocks are older than vein quartz in the deposit. The quartz and older rocks are cut by a few dykes of basalt porphyry. A dyke of grey biotite granite outcrops 40 feet east of the south end of the deposit and outcrops at intervals along the strike of south 25 degrees west for a length of 400 feet.

The deposit is exposed by stripping and a few shallow test pits for a length of 250 feet. Lenses of quartz lie in schist and gneiss across widths of from 8 feet to 18 feet near the north end of the exposures and are uncovered across about 5 feet along the southerly part of the deposit. The largest lens of quartz, with included shreds of schist and gneiss, is about 50 feet long and varies from 3½ feet to 6 feet wide. Other lenses

are from an inch or less to 3 feet wide. The quartz varies from white to grey and is sugar-grained or more coarsely crystalline. Much of the quartz is rusty on the weathered surface and some of it carries pyrite as small scattered grains or aggregates of large crystals. Other deposits of quartz in schist lie near the main deposit. These are up to 5 feet wide, but apparently do not continue far along the strike.

K.U. NO. 1

This claim is owned by Mr. George Keenan who staked it in 1928. Quartz lenses lie in a shear zone on the claim close to its west boundary (Locality 50, Figure 8). Basaltic lava outcrops in the vicinity of the deposit. A dyke of feldspar porphyry crosses the lava 250 feet west of the deposit.

The deposit has been traced in three prospect trenches for a length of 160 feet along the strike of north 5 degrees west. The lava along the shear zone is locally altered to hornblende and biotite schists and carries scattered, small lenses of quartz across widths of from 4 to 6 feet. The quartz is sugar-grained, grey, or glassy, and carries shreds of chlorite, patches of carbonate, and a few specks of pyrite and chalcopyrite. In one of the pits the quartz and schist are cut parallel to and across the structure by small dykes of garnetiferous granite that is locally porphyritic with phenocrysts of feldspar.

The shear zone and quartz pass beneath drift at both ends. Drift and swamp continue for 2,800 feet south along the strike of the deposit to a body of quartz and schist in a strong shear zone on Jupiter No. 2 and No. 3 claims.

JUPITER NO. 2 AND NO. 3

Deposits of quartz and schist on these claims (Localities 52A to 52E, Figure 8) were discovered in 1930 and the claims were staked in June of that year by Messrs. Axel Nieme and Charles Foss of The Pas, Manitoba.

Rocks in the vicinity of the deposits consist chiefly of andesitic, basaltic, and dacite lava flows with a schistose structure that strikes slightly east of north. Some layers in the lava are well banded and others carry a few elongated lumps of epidote. The lavas east of the deposits are invaded by a body of meta-diorite and related dark green quartz diorite. The lavas west of the deposits are invaded by three small stocks of "quartz-eye" granite and related quartz diorite and the lavas near these stocks are penetrated along their cleavage planes by numerous dykes of quartz-feldspar porphyry, feldspar porphyry, quartz diorite, and granite. Locally the schistose lava in the deposits holds lenses from 1 inch to 6 inches wide of grey rhyolite and fine-grained, grey quartz porphyry. All of these intrusive rocks are older than the vein quartz. The lavas and vein quartz are cut by a few dykes of basalt porphyry.

The vein quartz lies in a shear zone that has been traced for a length of 2,100 feet. The shear zone generally strikes from 18 degrees to 28 degrees east of true north and dips from 80 degrees east to vertical. A small part of the rock in the shear zone consists of schistose hornblende andesite only slightly more sheared than nearby lavas. A large part of

the material, however, consists of alternating thin layers of chlorite schist and biotite schist. Hornblende andesite or chlorite schist is commonly altered to biotite schist for ¼ to ½ of an inch from the edges of quartz bodies. Numerous crystals of hornblende lie at all angles in many of the schist bands and are most common in layers of biotite schist adjacent to lenses and stringers of quartz. In some parts of the shear zone the lavas are altered to coarse-grained hornblende gneiss and this rock increases in quantity toward the south end of the shear zone. Banding and cleavage of the schists and gneiss most commonly parallel the trend of the shear zone, but at many localities these structures are crenulated and drag-folded.

Several sections along the shear zone are without vein quartz. Other parts carry numerous, closely spaced, veinlets and large and small lenses of quartz. The bodies of mixed quartz and schist are from 35 feet to 600 feet long. Much of the quartz is sugar-grained and varies from white to grey. The larger lenses are of coarse, white quartz that locally holds bands of fluidal inclusions such as are common in the quartz of pegmatite dykes. The lenses and stringers of quartz commonly hold many included shreds of schist. Some of the quartz bodies carry patches of buff carbonate, and the quartz and nearby schist are cut by veinlets of carbonate. The white quartz locally carries a few crystals of red feldspar, and a few cracks in quartz and schist are filled with red feldspar. The quartz and nearby schist are sparsely mineralized with small grains of pyrite, chalcopyrite, and pyrrhotite. Many of the small quartz lenses and adjacent schist carry more sulphide than the large lenses of white quartz. Individual bodies of mixed quartz and schist are described in the following paragraphs.

Number 1 deposit is on Jupiter No. 2 claim and lies along the north part of the shear zone (Locality 52a, Figure 11). The deposit is 600 feet long and is well exposed in thirty trenches and in a prospect shaft. The shaft is 12 feet deep and is located about midway along the strike of the body. For 75 feet from the south end, the zone of mixed quartz and schist varies from 2 to 3 feet wide. Elsewhere it varies from 4 to 15 feet and averages 8 feet wide.

For 125 feet from the north end of the deposit the schist holds only a few small quartz stringers. Along the remaining 475 feet the quantity of quartz is estimated to vary from 10 per cent to 75 per cent of the material present. Most of the quartz lenses and stringers are from a fraction of an inch to 2 inches wide, but several of the pits expose one or more lenses from 6 to 18 inches wide and from 2 to 6 feet long. The largest quartz lens is 4 feet wide where exposed in the shaft and continues south from the shaft for 120 feet where it is from 2 to 2½ feet wide.

In many of the trenches small grains of pyrite were seen in some of the quartz lenses. Less commonly the quartz carries grains of chalcopyrite and pyrrhotite. The schist carries disseminated grains and films of pyrite and locally a few grains of chalcopyrite and pyrrhotite. In the shaft chalcopyrite is apparently more plentiful than the other sulphides. It is reported that samples across 10 feet of quartz and schist in the shaft assayed

from 0·91 to 1·90 ounces of gold a ton. Some visible gold was found during the sinking of the shaft and it is said that much of the deposit elsewhere shows gold on panning.

The deposit pinches out at the north end between lava and a dyke of basalt porphyry. A nearby, narrow quartz vein continues for 100 feet farther north to the edge of a swamp. At a point 225 feet farther north a dyke of feldspar porphyry outcrops near an area of lava. The porphyry is no doubt the northern continuation of a dyke of feldspar porphyry that lies along the east side of Number 1 deposit. It is possible that the main shear zone may continue beneath a narrow drift-covered depression between the northern outcrop of porphyry and nearby lava. No trenching has been done here.

Number 2 deposit (Locality 52b, Figure 11) commences at a point 20 feet west of the south end of Number 1 deposit and continues southerly for 170 feet. The body has been opened up in seven trenches and in a prospect shaft about 12 feet deep located about midway along the strike of the deposit. The body averages 7 feet wide and attains a maximum width of 12 feet at the shaft.

Along the southern 35 feet of the deposit vein quartz constitutes less than 10 per cent of the material present, but elsewhere is from 25 to 50 per cent and in the shaft is over 75 per cent of the whole. Most of the quartz in the shaft is white and forms large lenses up to 7 feet wide. Only a few grains of chalcopyrite were noted in the white quartz. A relatively small amount of quartz in the shaft is greyish and sugar-grained. The greyish quartz forms small lenses and stringers and holds many inclusions of schist. This quartz and adjacent schist carry disseminated grains of pyrite, chalcopyrite, and pyrrhotite. The quartz and schist in other pits on this deposit locally carry a few grains of pyrite.

Number 3 deposit (Locality 52c, Figure 11) lies 10 feet east of Number 2 deposit. Quartz lenses have been deposited in schist for a length of 60 feet and across widths of from 2½ feet to 6 feet. Only a few small quartz lenses lie in the schist along the southern half of the deposit. The northern half carries about 25 per cent of quartz in lenses up to 6 inches wide and 2 feet long, but most of the quartz bodies are less than 2 inches wide. No sulphides were noted in this deposit.

The shear zone, 3 feet to 10 feet wide, continues southerly for 175 feet from Number 2 deposit. Judging from material seen in prospect trenches and on the dumps, hornblende gneiss is the dominant rock along this stretch of the shear zone and the gneiss holds only unimportant amounts of vein quartz. Bedrock is covered for 175 feet still farther south.

At the south edge of this covered area the shear zone is again exposed in test pits and two prospect shafts along a drift-covered depression that extends southerly for 600 feet. Vein quartz has been deposited in schist and gneiss along two sections of the drift-covered depression and these sections are described below as Number 4 and Number 5 deposits.

Number 4 deposit (Locality 52d, Figure 8) lies at the north end of the depression and is said to cross the boundary line between Jupiter No. 2 and Jupiter No. 3 claims. The deposit is 7 feet wide and is exposed in a test

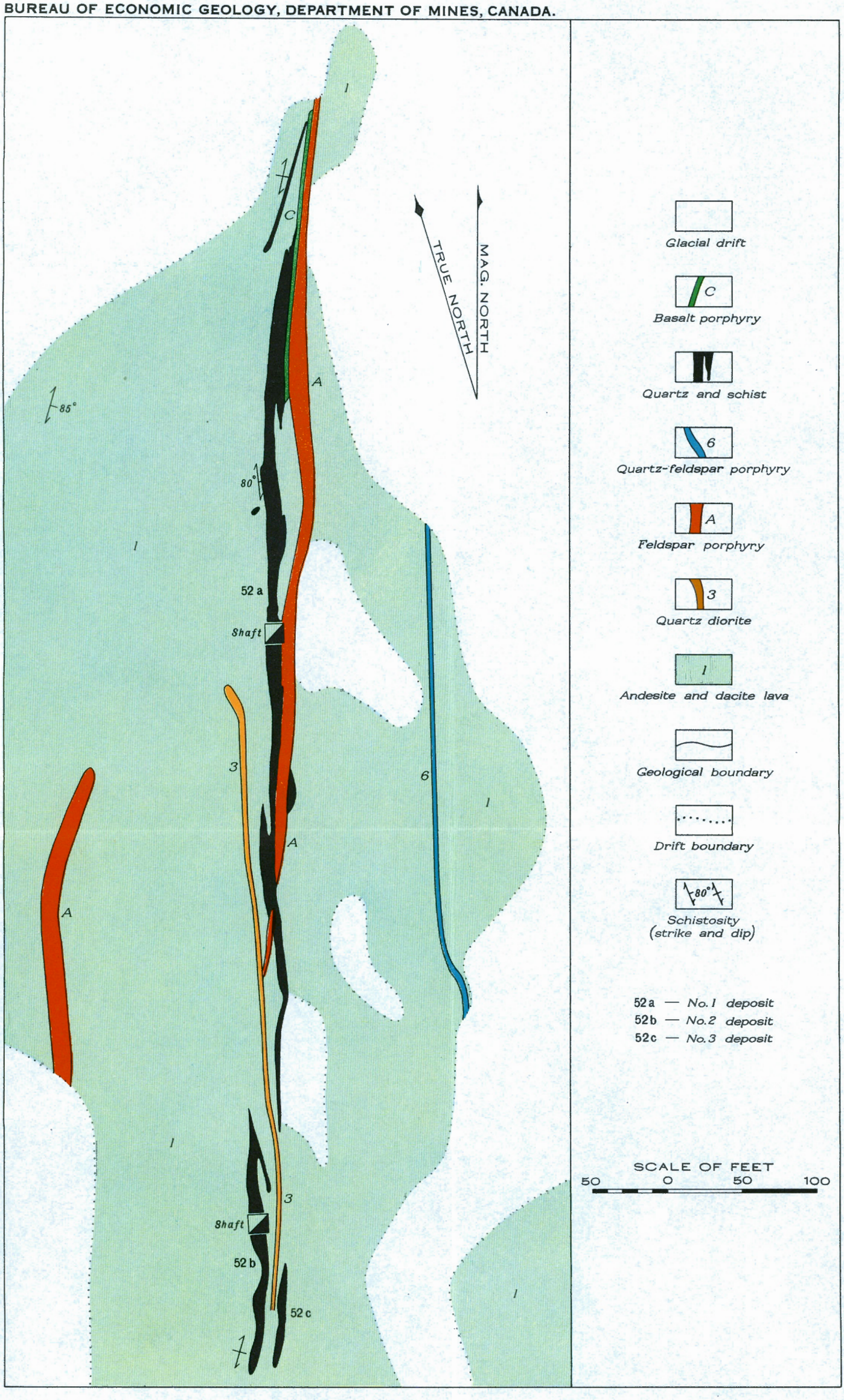

FIGURE 11

JUPITER NO. 2 CLAIM

(mineral locality No. 52 on Map 321 A, "Elbow-Morton Area")

pit and in a shaft 35 feet south of the pit. Quartz lenses in the deposit vary from a fraction of an inch to 7 feet wide. Most of the quartz is white and apparently barren of sulphides. Some of the quartz holds parallel streaks of dark material along which small grains of chalcopyrite have been deposited.

Number 5 deposit (Locality 52e, Figure 8) is 175 feet south of Number 4 deposit and lies on Jupiter No. 3 claim. The deposit is exposed in two pits and a prospect shaft, and the workings suggest that the deposit is at least 175 feet long. In the pits and shaft quartz lenses occur across from 2 to 10 feet of chloritic schist and hornblende gneiss. The quartz constitutes only about 5 or 10 per cent of the material across these widths. A few grains of pyrite and pyrrhotite lie in some of the quartz lenses and in nearby schist.

South of Number 5 deposit the shear zone is poorly developed and finally ends in a distance of 300 feet south of the drift-covered depression. In this distance a few unimportant quartz lenses lie in hornblende gneiss and, at the south end, quartz lenses and schist are exposed across a width of 1 foot at intervals for a length of 70 feet. The quartz and schist in this 1-foot zone carry a few grains of chalcopyrite.

JUPITER NO. 4

This claim lies immediately south of Jupiter No. 3 claim and is owned by Mr. Mike Talo. A cabin has been built near the north boundary of the claim and several deposits of quartz have been explored in prospect pits south and southeast from the cabin. Bedrock in the vicinity of the deposits is chiefly andesitic anad basaltic lava. One pit (Locality 52f, Figure 8) 200 feet south of the cabin crosses 9 feet of quartz mixed with hornblende gneiss and carbonate. The deposit passes beneath drift to the north and pinches out within a few feet south of the pit. Four pits have been dug at intervals for 500 feet along a northeasterly striking zone southeast of the cabin (Locality 52g, Figure 8). The pits cross from 5 to 8 feet of hornblende gneiss holding lenses and stringers of quartz. The deposits are from 30 to 100 feet long and are not connected with one another. The quartz and gneiss carry small amounts of pyrite and pyrrhotite. At a locality 100 feet east of the row of separated deposits a shear zone follows a depression in the lavas for a length of 400 feet along a northeasterly strike. Only a few veinlets of quartz are exposed in the sheared lava.

WINNIPEG AND JUPITER NO. 7 CLAIMS

The Winnipeg claim was staked in 1928 by Mr. George Solberg and the Jupiter No. 7 claim was staked in 1930 by Mr. Mike Talo. Deposits of vein quartz on these claims lie in andesitic lava 1,500 feet west of the shear zone on the Jupiter No. 3 claim. The deposits lie just south of a trail that leads northwesterly from the cabin on the Jupiter No. 4 claim. A few prospect pits on the claims expose four zones of sheared lava penetrated by stringers and lenses of quartz. The shear zones strike from north to 15 degrees east of north and dip vertically.

A deposit on the Winnipeg claim is 250 feet long (Locality 53a, Figure 8). Two prospect pits on this deposit cross 5 or 6 feet of schistose lava penetrated by stringers and lenses of quartz up to 3 feet wide. The quartz is coarsely granular, holds patches of carbonate, shreds of biotite schist, and chlorite schist, and a few stringers of red feldspar. A few grains of pyrite lie in the shreds of schist.

Another deposit is exposed at intervals for 225 feet along the strike (Locality 53b, Figure 8). The north end is on the Winnipeg claim and the south part lies on the Jupiter No. 7 claim. A prospect pit on this deposit crosses 6½ feet of coarse hornblende gneiss holding stringers and lenses of quartz, a few streaks of biotite schist, and a few narrow bands of grey rhyolite. Grains of pyrite are disseminated through the gneiss, schist, and rhyolite. The quartz is sugar-grained and carries grains of chalcopyrite, pyrite, and pyrrhotite, and a few crystals and stringers of red feldspar.

The third deposit lies on Jupiter No. 7 claim and is exposed for about 90 feet along the strike (Locality 53c, Figure 8). The deposit is 10 feet wide in the middle and is very narrow at both ends. A pit across the wide part exposes hornblende gneiss holding quartz lenses up to 3 feet wide. The lenses of quartz carry scattered crystals of red feldspar and many shreds of hornblende gneiss, biotite schist, and chlorite schist. Pyrrhotite is abundant in the shreds of schist and in the quartz adjacent to these shreds. A few grains of pyrite and chalcopyrite occur elsewhere in the quartz.

The fourth deposit (Locality 53d, Figure 8) consists of quartz lenses up to 2 feet wide in a strong shear zone that follows a straight depression 6 feet wide and 350 feet long. The lenses of quartz are well exposed in a pit across the depression and outcrop elsewhere along the sides of the depression. No sulphides were seen in the quartz and only a few grains of pyrite occur in the schist. Vein quartz outcrops at wide intervals along the strike for 450 feet farther south and at one locality the quartz is 3 feet wide where it crosses a dyke of quartz-feldspar porphyry.

BONNY-CASTLE

This claim was staked in 1932 by Mr. Oliver Evans. A small amount of trenching has been done on five small deposits of quartz on the claims. The deposits (Locality 54, Figure 8) are about 1,300 feet southwesterly from the most southerly pit on Jupiter No. 7 claim. The deposits are in meta-diorite and hornblende schist that has been derived from andesitic or basaltic lava.

The five deposits lie within an area 250 feet across. The most westerly deposit consists of a lens of quartz 10 feet wide and 20 or 30 feet long. The other four deposits consist of quartz lenses lying in weak shear zones that strike northerly and vary from 60 to 150 feet long. The shear zones are from 4 to 6 feet wide and individual lenses of quartz in the sheared rock are up to 25 feet long and 5 feet wide. Sulphides are generally rare or lacking in the quartz and schist. A small amount of pyrrhotite was seen in the quartz of the most easterly deposit, and schistose meta-diorite near the quartz carries disseminated specks of pyrite. The quartz in this deposit is cut by a narrow dyke of fine-grained, grey granite carrying small needles of hornblende.

The End Claims (55)

A body of quartz and schist on these two claims lies about 4,000 feet southwesterly from the deposits on the Bonny-Castle claims. The deposit lies along the contact between meta-diorite on the east and andesitic lava on the west. The schist zone is stripped at intervals for 120 feet along the northerly strike. The schist holds stringers and lenses of white, coarsely granular quartz up to 2 feet wide across total widths of from 4½ to 5½ feet. The quartz carries a few crystals of red feldspar and is locally iron-stained, but no sulphides were seen. It is said that a grab sample of the quartz assayed 0·04 ounce of gold a ton.

Eva (46)

This claim is owned by Mr. Oliver Evans who staked it in 1930. A quartz vein on the claim (Locality 46, Figure 8) lies 2,500 feet southwest of the deposit on the North Star No. 1 and No. 2 claims. Rocks in the vicinity of the deposit are garnetiferous sedimentary gneiss interlayered with northerly striking bands of andesitic lava up to 200 feet wide. The deposit lies along the contact between lava on the east side and a 20-foot wide band of sediment on the west side.

The quartz vein has been traced in nine prospect trenches for a length of 95 feet along the strike of about north 20 degrees east. The quartz in the trenches is from 1½ feet to 5½ feet wide. It is commonly coarse grained and milky white and holds a few shreds of chlorite and patches of carbonate. The quartz is well mineralized with patches and veinlets of pyrite and carries scattered blebs of pyrrhotite and rare veinlets of sphalerite. The sediment and lava near the vein carry disseminated grains of pyrite and pyrrhotite.

Mars Group (51)

This group of claims was staked in 1933 by Messrs. Oliver Dickson, Wm. Kerr, G. Leviea, and M. Peterson. Several deposits of quartz occur on the claims that lie along a northerly striking belt about a mile long. Rocks in the vicinity of the deposits include andesitic lava and meta-diorite. The lava is cut by a few dykes of quartz porphyry and fine-grained quartz diorite. The main quartz is later than these rocks and the quartz and older rocks are cut by a dyke of grey, hornblende-biotite granite.

The largest deposit is on the Mars No. 3 claim at a locality 2,300 feet south 70 degrees east from the deposit on the K.U. No. 1 claim. This deposit is exposed by stripping and a few trenches for a length of about 300 feet along the northerly strike. The trenches expose hornblende-rich lava that is penetrated along the strike by several parallel dykes of gneissic, grey, fine-grained quartz diorite from 1 foot to 10 feet wide. The quartz diorite and lava hold lenses and stringers of quartz across widths of from 3 feet to 20 feet or more. In some places the quartz constitutes less than 10 per cent of the material across these widths. In one trench the quartz is essentially solid across 12 feet. The quartz is sparingly mineralized with grains of pyrite and chalcopyrite and the nearby country rock carries disseminated grains of pyrite and pyrrhotite. The deposit ends abruptly in

lava at the north end. A few small bodies of quartz are exposed here and there for 3,500 feet farther north. On Mars No. 1 claim at the north end of this belt, a stringer of quartz is said to have carried abundant coarse gold, but the stringer is only from 1 inch to 3 inches wide and a few feet long.

At localities 250 feet and 400 feet south of the large deposit on Mars No. 3 claim, schistose lava holds small lenses of quartz and these occurrences of quartz may be parts of the large deposit. At a locality 800 feet still farther south a deposit of quartz lies in meta-diorite on the Mars No. 4 claim. The deposit has been traced along the strike of north 30 degrees west for about 200 feet and consists of lenses of quartz up to 4 feet wide lying across widths of schistose meta-diorite up to 10 feet. Another deposit, 150 feet to the southeast, on Mars No. 7 claim, also consists of lenses of quartz in schistose meta-diorite. The deposit is 4 feet wide in a pit on the south edge of an outcrop and pinches out 35 feet to the north. Some of the quartz in the pit is well mineralized with blebs of chalcopyrite.

Senior Group (56)

This group of nine claims was staked in 1933 and 1934 by Mr. Charles Foss. A deposit of quartz on one of the claims is exposed on the east shore of a small lake 3,500 feet north of the northeast arm of Norris lake. The quartz lies along a shear zone in meta-diorite. A large body of granite lies 1,000 feet southwest of the deposit and the meta-diorite in the vicinity of the deposit is cut by a few dykes of granite and pegmatite.

The deposit outcrops on the east shore of the small lake and has been traced by stripping and trenching for a length of about 400 feet along a strike of south 45 degrees east to the edge of a drift-filled depression. The normal, massive, hornblende-rich meta-diorite is altered along the shear zone to a hornblende gneiss and biotite gneiss. Foliation of the gneiss dips from 65 degrees to 70 degrees northeast. Lenses and stringers of vein quartz follow the structure of the gneiss. One lens near the lake is about 100 feet long and commonly is from 1 foot to 3½ feet wide. Other quartz lenses lie adjacent to this large lens so that the combined width of quartz and gneiss is up to 5 feet. The quartz in the large lens carries a small amount of pyrite and arsenopyrite. For 250 feet southeast of the large lens the shear zone varies from 1 foot to 10 feet wide. Individual quartz lenses here are small and are generally scattered across the full width of the sheared rock. For a length of 50 feet at the southeast end of the exposed part of the deposit vein quartz generally constitutes over half of the material present across 5 feet and in one pit the quartz is essentially solid across this width. Some of the quartz in this pit is well mineralized with arsenopyrite and small amounts of pyrite and coarse gold. The sulphides and gold lie chiefly along dark streaks of schist and tourmaline in the quartz. The quartz here and elsewhere in the deposit is coarsely granular and varies from glassy to milky white. The owner of the property reports that a channel sample taken across 4 feet of the deposit assayed 0·70 ounce of gold a ton.

It is reported that another quartz vein cuts meta-diorite at a locality 1¾ miles southeasterly from the Senior claim and just north of the portage

trail between File lake and Norris lake. The vein is said to carry visible gold and to be from 3 inches to 6 inches wide and 300 feet long.

Whynot (57)

This claim was staked in 1924 and is owned by Mr. Harry Kramer. A deposit of vein quartz on the claim is about ½ mile north of Morton lake. The vein lies on the west slope of a ridge of sedimentary gneiss with a banded structure that strikes north and dips 80 degrees west. The vein follows the strike of the gneiss and is exposed in test pits for a length of about 250 feet. One pit crosses 7 feet of coarse, granular, white quartz that is mostly barren of sulphide, but locally holds a few disseminated grains of pyrite.

Sherlock (6)

This claim is on the west shore of Elbow lake 1,400 feet southwest of the mouth of Webb creek. The claim was staked in 1919 by Mr. Thomas R. Webb following the discovery of gold-bearing quartz on the top of a hill rising abruptly from the lake shore. Mr. Webb is reported to have panned about $800 of coarse gold from a small quartz lens during the preliminary prospecting of the deposit. In 1922 the Exploration Company, Limited, of London, England, optioned the property and uncovered a second quartz lens, about 8 feet long and 20 inches in maximum width, that proved to be spectacularly rich in gold.[1] The property is now owned by Garbutt Sherlock Mines, Limited. Prospecting work on the top and sides of the hill includes a prospect shaft at least 30 feet deep and ten trenches with an aggregate length of 650 feet. An adit 100 feet long runs into the hill from just above lake level and two crosscuts, each 25 feet long, run south from the adit so as to pass one on each side of the shaft.

Rocks on the hill consist of schistose andesitic lava with layers of volcanic breccia and beds of dark grey, sedimentary schist. The layers of breccia and sediment are up to 10 feet wide. Thin layers in the sediment carry many small grains of magnetite. The strata are, evidently, closely folded in an irregular manner, but exposures are not continuous enough to enable details of the complex structure to be determined. The general trend of the bedded rocks is northeasterly. Cleavage of the lavas follows the trend of the sediments and commonly dips from 70 degrees southeast to vertical.

Quartz lenses are irregularly distributed in the volcanic rocks and sediments over an area 450 feet long in a northerly direction and 250 feet wide. Eighteen such lenses are from 3 to 40 feet long and from 1 to 7 feet wide. The quartz of most of these bodies is a fine-grained, cherty variety that varies from dark grey to bluish. Small grains of pyrite are sparsely disseminated through the cherty quartz and are locally abundant in adjacent volcanic or sedimentary rocks. A few of the lenses are of

[1] Armstrong, P.: "Geology and Ore Deposits of Elbow Lake Area, Northern Manitoba"; Geol. Surv., Canada, Sum. Rept. 1922, pt. C, p. 42.

coarse, white quartz and stringers of white quartz cut the large lenses of grey and blue quartz at many angles. In addition to the eighteen larger lenses, many small lenses of cherty grey quartz lie along cleavage planes of the magnetite-bearing sediment and a few stringers and lenses of white quartz and buff carbonate locally cut the sediments and volcanics. Schistose andesite in the adit and crosscuts carries only a few irregular lenses of white quartz up to 6 inches wide and 4 feet long.

I.X.L. (20)

This claim is on the south end of a point of land that projects into the north part of Elbow lake. Several large bodies of cherty quartz near the shore have been explored in three large prospects pits. The bodies of chert lie in andesitic lava and pale green, magnetite-bearing schist and are followed to the east and north by andesitic lava.

Four roughly circular or elongated bodies of cherty quartz 50 feet across lie within an area 200 feet long in a northwesterly direction and 100 feet wide. The cherty quartz is very fine grained, breaks with a conchoidal fracture, and varies from black to grey, white, and red. The chert in these large bodies is massive, although included parallel shreds of pale green schist give some outcrops a banded appearance. The chert is cut in many directions by veins of coarse white quartz up to 1 foot wide. The chert and veins of coarse, white quartz hold a few grains and streaks of pyrite and are crossed by cracks filled with coarsely crystalline specularite.

Pale green magnetite-bearing schist adjacent to some of the large bodies of chert holds numerous small lenses of black and grey chert and red jasper. The lenses are commonly less than 6 inches long and 3 inches wide. They lie across widths of from 5 to 40 feet of the schist and are so closely spaced that they constitute half or more of the material present. A few of the lenses exhibit a banded or bedded structure on the weathered surface and one lens 4 inches wide and 2 feet long is composed of alternating thin layers of black, grey, white, and red chert.

Little Did

This claim is on a small island 1,500 feet southeast of the shaft on the Webb-Garbutt property in the north part of Elbow lake.

The northeast end of the island is of "quartz-eye" granite. The whole of the granite is sheared and parts of it are gone to sericite schist. Fragmental andesitic lava predominates elsewhere on the island. The lava is cut by a dyke of granite that extends outwards from the main granite mass. Highly schistose zones in the lava are extensively altered to brown-weathering carbonate carrying shreds of bright green mica.

On a steep hillside on the west side of the island the lavas hold a body of cherty quartz from 1 to 30 feet wide and 100 feet or more long. Branches of similar quartz project laterally from the main mass. Bands up to 30 feet wide of schistose and carbonated lava near the large quartz body hold many small lenses of cherty quartz. The quartz of the large body and small lenses varies from grey to bluish and pink and is locally poorly banded. The cherty quartz and the "quartz-eye" granite are

cut by veinlets and lenses of coarse white quartz. A few cubes of pyrite are scattered through the chert and coarse quartz.

Century Fraction (23)

This claim is on the northern part of an island in the northeast part of Elbow lake. It was staked in 1921 by Mr. Thomas Hanna of The Pas, Manitoba. A deposit of iron sulphide and quartz has been trenched at a point on the west shore of the island near the north end. Rocks in the vicinity of the deposits are grey and black schists that strike north and form a belt at least 200 feet wide. The schists are followed to the east by a band of schistose quartz porphyry and a body of meta-diorite.

The trench crosses 40 feet of black schist, quartz porphyry, and lenses of quartz. The quartz lenses are up to 4 feet wide and consist of a bluish variety of quartz cut by stringers of white quartz. The blue quartz is crossed by a few films of magnetite and holds scattered cubes of pyrite. The quartz porphyry is strongly sheared and carries disseminated grains and bands of pyrite.

Florence (25)

This claim is on a small island in the northern part of Elbow lake. It was staked in about 1922 by Mr. Oliver Dickson who had discovered a large body of cherty quartz on a steep hillside near the north end of the island. Only a small amount of stripping and trenching has been done on the quartz body. The quartz lies in schistose andesitic lava that is locally much altered to carbonate. Cleavage of the lava strikes irregularly, but commonly trends about 10 degrees west of true north.

The quartz body trends north 60 degrees west for most of its length, but near the east end swings to north 10 degrees west. The quartz is well exposed at intervals along the strike for about 600 feet. The body is commonly from 10 to 20 feet wide and locally widens abruptly to 50 feet. Branches of quartz extend laterally from the main body, giving the whole an irregular shape. Much of the quartz is very fine grained or cherty and varies from pearly white to bluish grey and dark red. The cherty quartz locally carries grains and small scattered cubes of pyrite. In one area 10 feet across the bluish and red quartz is spotted with small patches of magnetite and is well mineralized with cubes of pyrite. A chip sample of this material is reported to have assayed 0·40 ounce of gold a ton. The cherty quartz is cut by numerous stringers and a few veins of coarse white quartz up to 1 foot or more wide. Some of the stringers and veins of coarse quartz carry disseminated crystals of pyrite and arsenopyrite and are said to pan coarse gold. Locally, angular fragments of red chert or jasper lie in white chert and in the coarse vein quartz.

June Bug (26)

This claim is on the north end of a large island near the east shore of Elbow lake. Large bodies of cherty quartz are exposed at two points 300 feet apart on the west shore of the island near the north end. Rocks near the quartz bodies are of schistose andesitic lava.

At the northern locality a trench crosses 30 feet of schist alternating with bands of white and blue, cherty quartz up to 5 feet wide and veins of coarse white quartz. The cherty quartz and schist carry streaks of red hematite and a few crystals of pyrite. At the southern locality a body of cherty quartz from 15 to 20 feet wide extends south from the lake shore for 50 feet. The cherty quartz varies from white to dark grey, carries a few crystals of pyrite and arsenopyrite, and is cut in many directions by stringers of white quartz.

Independent (27)

A large body of cherty quartz outcrops on this claim on a point of land on the west side near the north end of a large island close to the west shore of Elbow lake. Rocks in the vicinity of the quartz are schistose andesitic lava with a cleavage trending about north and dipping vertically.

The quartz is 10 feet wide in a prospect pit at the lake shore. The body extends northeast from the pit for 120 feet and gradually widens in this direction to form a wedge-shaped mass 60 feet wide at the northeast end. The cherty quartz in the pit varies from pearly white to bluish grey and is crossed by a network of dark streaks along which cubes and grains of pyrite have been deposited. A shear zone 6 inches wide in the quartz holds much pyrite.

Harbour Claim (28)

The Harbour mineral claim was staked on a small island in the middle of Elbow lake, by Mr. Thomas Hanna in 1921. The Exploration Company, Limited, of London, England, held the property under option in 1921 and 1922. A deposit of iron formation and quartz veinlets in schist near the east side of a bay at the north end of the island has been explored in three prospect trenches. A cabin has been built at the south end of the island.

Rocks in the vicinity of the deposit are chiefly lava flows now altered to carbonate-chlorite schists. The schist is grey on fresh and weathered surfaces, but is rusty for an inch or less beneath the weathered surface. Grains of carbonate in schist fragments taken from the prospect pits weather brown, indicating that the carbonate is an iron-bearing variety. On such surfaces the carbonate is readily seen to constitute well over half of the material of the schist. Shreds of chlorite lie parallel to one another in the carbonate and give the rocks a cleavage that generally trends north 15 degrees east and dips vertically or nearly so. The schist locally carries disseminated grains of pyrite and is cut by a small, irregular-shaped, dyke-like body of sheared quartz porphyry. A small island about 200 feet south of the island on which the deposit occurs is entirely of sheared and brecciated, fine-grained " quartz-eye " granite.

The deposit strikes parallel to the cleavage of enclosing schists and is exposed at intervals on natural outcrops and in the workings for a length of 200 feet. In two of the trenches stringers of white, medium-grained quartz and lenses of grey, cherty quartz lie in schist across widths of from 30 to 40 feet. The third and most northerly pit has exposed a lens of iron formation about 40 feet long and up to 8 feet thick. At the north end the lens is folded back on itself so as to give an apparent width of 12 feet. The

iron formation is of bluish grey to white chert holding a layer up to 4 feet wide in which bands of magnetite up to 1 inch wide alternate with bands of chert up to 3 inches wide. The iron formation is well mineralized with scattered grains, veinlets, and bands of pyrite. The iron formation and pyrite bands are crossed by veinlets of white quartz mixed with iron carbonate. The owner reports that a channel sample across 8 feet of rock in this pit assayed 0·25 ounce of gold a ton.

Hanna Claim (29)

This claim is located on a small island near the east shore of Elbow lake. It was staked in 1921 by Mr. Thomas Hanna of The Pas, Manitoba. During 1921 and 1922 the claim was under option to the Exploration Company, Limited, of London, England. Workings on the claim comprise six prospect trenches along a zone of quartz and schist that extends south from a small bay on the north side of the island.

The quartz lies in a belt of lava altered to carbonate-chlorite schist. The schist is spotted with brown-weathering carbonate crystals that locally comprise over half of the material of the rock. The schist is cut along cleavage planes by small stringers of carbonate and holds a few irregular masses of carbonate up to 6 feet long. Some of the carbonate carries cubes and streaks of pyrite and patches of black tourmaline. Chlorite flakes give the schist a cleavage that strikes 15 degrees east of true north and dips from 80 to 85 degrees westerly. The belt of carbonate-chlorite schist is at least 75 feet wide and is followed to the west by dark green andesitic lava.

The lenses and veinlets of quartz are exposed in natural outcrops and in prospect trenches for 110 feet southerly from the lake shore. At the time of the writer's visit, no rock or vein material was exposed in other trenches that lie in a drift-covered area still farther south. The largest exposed lens of quartz extends for 60 feet south of the lake and is 8 or 9 feet wide for most of this length. The quartz in this lens is a fine-grained, cherty variety exhibiting a faintly banded structure on the weathered surface. Most of the quartz is bluish grey. A few small areas are of dark red quartz and these pass without sharp boundaries into the blue variety. The large body of blue quartz is cut by a few stringers of coarse white quartz. The blue quartz locally carries scattered grains of pyrite and some of the veinlets of white quartz are well mineralized with pyrite. A few small lenses of blue quartz lie in the schist near the walls of the large lens.

Two trenches, 25 feet and 50 feet, respectively, south of the large quartz body, cross 8 to 10 feet of schist holding lenses of quartz up to 2 feet wide. Some of these lenses are of coarse-grained white quartz and others are of cherty, bluish quartz with a banded structure. A small quantity of pyrite is disseminated through both varieties of quartz and the schist near some of the white quartz bodies is well mineralized with grains and streaks of pyrite. The quartz and schist in these two trenches are said to carry up to 0·25 ounce of gold a ton.

Tee Lake No. 4 and No. 10 (14)

Sulphide deposits on these claims are exposed in a few prospect pits from 100 feet to 700 feet southwest of a small lake 1 mile north of the northwest bay of Elbow lake. A small body of "quartz-eye" granite lies a short distance west of the deposits.

The prospect pits expose rusty-weathering, fine-grained, quartz porphyry carrying disseminated grains of pyrite and short veinlets of pyrite. At one locality the mineralized quartz porphyry is exposed across a width of 100 feet or more. The fresh and rusty porphyries are said to pan coarse gold and to assay from 0·10 to 0·18 ounce of gold a ton.

Veda No. 2 (15)

A sulphide deposit on this claim is three-fourths mile northeast of the northwest bay of Elbow lake. The deposit lies a few hundred feet northwest of a circular body of quartz-feldspar porphyry measuring about one-half mile across.

The deposit is exposed in a prospect pit on a hillside overlooking a swamp to the southwest. The pit is in light grey, fine-grained quartz porphyry with rare phenocrysts of quartz and a schistose structure that strikes northwest and dips at an angle of 60 degrees to the southwest. The porphyry carries specks and stringers of pyrite and pyrrhotite across a width of 15 feet and holds a band a foot wide of nearly solid pyrite. Iron-stained, weathered bands in the schistose porphyry are said to pan plentiful free gold.

Other pits were also seen in sulphide deposits close to the edge of the circular body of quartz-feldspar porphyry. One of these pits is near the west edge of the circular body and crosses rhyolite carrying disseminated grains of pyrite. A trench near the northeast edge of the circular body crosses 60 feet of rhyolite carrying grains of pyrite, pyrrhotite, and arsenopyrite. At a locality 2,500 feet northwest of the deposit on the Veda No. 2 claim, a few shallow pits have been dug in bodies of rusty-weathering quartz porphyry and feldspar porphyry carrying disseminated grains and stringers of pyrite. Partly weathered material in these pits is said to assay from 0·07 to 0·45 ounce of gold a ton.

Silverton Group (17)

This group comprises nine claims that extend northerly from the northeast bay of Elbow lake. The claims were staked by Mr. Harry Hawes who has done some surface work on deposits of sulphides, schist, porphyry, and quartz. During the summer of 1934, the Silverton group and an adjoining group of nine claims, known as the Big Four group, were under option to the Dwyer Elbow Lake Mining Syndicate, Limited, of Montreal. At the time of the writer's hurried visit on July 20, 1934, cabins were under construction on the property and the Syndicate was making plans for further exploration of the deposits.

Bedrock on the claims is chiefly andesitic lava with a northerly striking cleavage. The lava in the northwest part of the group is invaded by a body

of granite that extends for many miles to the north. Elsewhere, the lavas are cut by a small body of "quartz-eye" granite and by several dykes and other bodies of quartz porphyry. The "quartz-eye" granite and quartz porphyry carry disseminated grains of pyrite and are locally cut by veins and stringers of quartz. The lavas near these intrusive bodies and elsewhere on the claims should be closely prospected for gold-bearing quartz veins. Some small quartz veins have been found in the lavas and a small amount of work has been done on bodies of porphyry carrying quartz veinlets, but most trenching has been done on bodies of sulphide or sulphide-bearing schist or porphyry.

The principal showing is on Silverton No. 2 claim, about a mile north of the lake and 1,000 feet east of the large body of granite. The deposit is exposed across a width of 50 feet in the middle part of an easterly trending prospect trench 125 feet long. The west part of the trench is in glacial drift and the east part is in swamp. The western 35 feet of the exposed part of the deposit is of fine-grained, massive pyrrhotite. The pyrrhotite holds a few small patches and veinlets of quartz and a few nodules and irregular veinlets of coarse pyrite. The patches and veinlets of quartz carry grains of pyrite and a small quantity of chalcopyrite and are reported to carry good values in gold. Mr. Hawes reports that the deposit as a whole carries an average value of $5.40 a ton in gold, nickel, and copper. There is no evidence that channel samples have been taken from the deposit and it appears that the material assayed was obtained by the less reliable method of chip or grab sampling.

A prospect shaft has been sunk to a depth of 21 feet in soft schist in the trench at the east end of the pyrrhotite body. The cleavage of the schist strikes northerly and dips about vertically. As exposed on the sides of the shaft and trench the schist is about 15 feet wide and is much weathered to yellow and black alteration products. The schist is cut by a few quartz stringers. The weathered schist and quartz are reported to show gold on panning and to assay high in gold. Assay results from the weathered schist, however, are apt to be misleading and the shaft has not yet penetrated beneath the weathered zone. Further work will be necessary to prove the extension of the body of pyrrhotite and schist along the strike to the north and south.

At a point about three-fourths mile south of the principal showing another prospect pit is located west of a small creek and west of the cabins. This pit is in quartz porphyry that is partly altered to sericite schist. The porphyry carries cubes, grains, and shreds of pyrite and is reported to assay 0·15 ounce of gold a ton. Quartz porphyry carrying grains of pyrite is exposed on a hillside 50 feet to the west and outcrops at intervals for a half mile, or thereabouts, to the north. Soil adjacent to some of these outcrops is heavily stained with iron and locally holds fragments of yellow gossan.

Gold Dust Claim (24)

This claim is on the southern part of an island in the northeast part of Elbow lake. The claim was staked in 1921 by Mr. Thomas Hanna of The Pas, Manitoba. Trenching has been done on quartz veins and bodies of

iron sulphide in andesitic schist along the east shore of the island. The schist strikes north and dips about vertically. A body of meta-diorite forms a hill in the middle of the island.

One trench at the lake shore crosses 30 feet of iron-stained schist carrying iron sulphide. Just west of this trench another pit crosses 30 feet of similar schist holding much pyrite and many lenses and stringers of quartz.

At a point a few hundred feet south of these trenches, across a bay, some trenching has been done on bodies of quartz in schistose lava. A test pit on the lake shore on the south side of the bay exposes quartz lenses across 12 feet of schist. The lenses are up to 3 feet wide and 15 feet or more long. They extend south for 30 feet from the lake shore and pinch out in the lava.

A quartz vein outcrops at a point 100 feet south of this deposit and is exposed in natural outcrops and in trenches for 150 feet farther south. The vein is less than 1 foot wide for most of its length, but locally widens to 2 feet and, in one trench, quartz lenses and stringers are mixed with schist across 7 feet. The quartz and schist carry a few grains of pyrite.

A prospect pit on the east shore of the island about 800 feet south of this deposit exposes lenses and veinlets of quartz across 12 feet of contorted schist. The quartz and schist are well mineralized with cubes and patches of pyrite.

Mr. Hanna has assayed the material in several of the trenches on the property. He says that sulphides and schist in one trench carried from 0·12 to 0·19 ounce of gold a ton, that a sample across 32 feet in another trench mostly in schist assayed 0·70 ounce of gold a ton, and that material in another trench ran 0·21 ounce of gold a ton.

Hanson (35)

This claim lies near the south end of Elbow lake and was staked in 1933 by Mr. J. McDougall. A trench on the property crosses about 35 feet of alternating bands of chloritic schist and sericite schist, derived, respectively, from andesitic lava and fine-grained quartz porphyry. Cleavage of the schists strikes north and dips vertically. Both kinds of schist are much altered to brown-weathering carbonate and hold a few stringers and lenses of white quartz mixed with carbonate, feldspar, and bright green mica. One band of the sericite schist is 6 inches wide and two are 5 feet wide. No sulphides were seen in the chloritic schist, but the sericite schist carries disseminated grains of pyrite. Grab samples of quartz and schist are reported by the owner to have carried from 0·12 to 0·16 ounce of gold a ton.

Beaver (45)

This claim was staked in 1928 and is now owned by Mr. Nels Moe. A shear zone, carrying pyrite and a small amount of vein quartz, is exposed on this claim and extends northeast into the North Star No. 3 claim (Locality 45, Figure 8). Andesitic lava near the deposit holds beds of garnetiferous sedimentary gneiss from 5 feet to 50 feet or more wide. The

lava and sediment are cut by northeasterly striking dykes of quartz porphyry and thinly laminated rhyolite. The quartz porphyry carries small phenocrysts of blue quartz and a few of feldspar. The dykes of porphyry are from an inch to 20 feet wide.

The deposit is exposed in eleven prospect trenches for 360 feet along the strike of about north 35 degrees east and is exposed across widths of from 5 feet to 30 feet with an average width of about 15 feet. Cleavage of schistose lava in the trenches dips from 85 degrees northwest to vertical. The schist is commonly a banded rock composed of alternating layers an inch or so wide of hornblende schist and biotite schist. Some layers in the schist carry many small red garnets. A few lenses of quartz porphyry lie in the schist zone. The schist is stained with iron oxide wherever exposed. In several pits the lava and porphyry hold shreds and bands of pyrite. A few veinlets of pyrite in the schist are from 1 inch to 6 inches wide and hold blebs of milky quartz that locally carry a small amount of chalcopyrite. A few small lenses and veinlets of quartz lie in the schist and porphyry and some of the bodies of quartz carry abundant pyrite.

At a locality a few feet west of the deposit near the north end, the lava is cut by several parallel lenses of quartz up to 1½ feet wide and 50 feet long. The lenses strike north 15 degrees east, at an angle of 20 degrees to the trend of the main deposit.

Snow (47)

Deposits on this claim are located about 1,000 feet west of the main veins on the North Star No. 1 and No. 2 claims (Locality 47, Figure 8). The claims were staked in 1928 by Mr. Hjalmer Peterson. The deposits are of sulphides and quartz that lie in sedimentary gneiss with a banded structure, striking north and dipping 80 degrees east. The quartz and sediment are cut by a few dykes of basalt porphyry.

A large pit has been sunk on a deposit of schist carrying disseminated grains of pyrite and pyrrhotite and masses of pyrrhotite. A small amount of milky white quartz in the schist carries sphalerite. The owner of the property reports that a sample taken across 12 feet of the deposit assayed 0·41 per cent nickel, 0·42 per cent copper, 0·26 per cent zinc, 0·22 per cent lead, 0·5 ounce of silver a ton, and 0·02 ounce of gold a ton. At a locality about 200 feet north 40 degrees east of this large pit, a small pit crosses 15 feet of garnetiferous sediment well mineralized with grains and stringers of pyrrhotite. At a locality 100 feet farther northeast on the south edge of a wide area of drift, a small pit exposes 2 feet of vein quartz crossed by short veinlets of pyrite and sphalerite. A thin covering of soil near this deposit and extending southwest to the other pits is much stained with iron oxide.

At a locality 200 feet southwest of the large pit, a small open-cut crosses 5 feet of sedimentary schist holding lenses of vein quartz. The deposit strikes north 15 degrees east. Northeast along the strike of this exposure, vein quartz is exposed here and there for 200 feet along a shallow depression. The quartz carries a few grains of pyrrhotite and holds inclusions of schist mineralized with scattered grains of pyrite.

Copper Valley (58)

A sulphide deposit on this claim was examined by Wright[1] who says in part:

"This deposit is one-half mile north and one-quarter mile west of the north end of Morton lake. The deposit was explored by trenching and two diamond drill holes, in the winter of 1930, by Messrs. Bartlett and C. E. Herman. This work was done on the Copper Valley No. 1 mineral claim. Near the south side of this claim a trench on the east side of a hill exposes 18 feet of jointed and schistified andesite carrying fine-grained, light-coloured pyrrhotite and small bits of chalcopyrite. The sulphides occur disseminated through the rock and in small veins and lenses, in some of which dark-coloured layers of chloritic material and pyrrhotite alternate with light-coloured layers of more massive pyrrhotite. . . . The strike of the schistosity of the lava is south 55 degrees east and the dip 68 degrees northeast. The continuation of the deposit north and south is covered by swamp which also extends for 250 feet east of the trench. The first drill hole was put down in the swamp 160 feet east of the trench. The second drill hole was put down 4,000 feet northeast, supposedly along the continuation of the deposit in this direction. The pyrrhotite is reported to carry nickel."

White Star No. 2 (59)

A sulphide deposit on this claim is exposed near the west shore of Morton lake at a locality about one-half mile from the north end of the lake. The claim was staked by Mr. Axel Nieme in 1934. Rocks in the immediate vicinity of the deposit are grey, sedimentary gneiss with a cleavage that strikes about north and dips 80 degrees west. At the lake shore the sediment is cut by a pegmatite dyke.

The deposit is exposed in a trench at a locality 100 feet from the shore of the lake. The trench is 6 feet deep and crosses about 28 feet of grey, biotite gneiss that is cut by a few stringers of white quartz and rhyolite. The quartz carries blebs of chalcopyrite and is said to assay high in gold, but the quartz constitutes a very small part of the material in the trench and the veinlets are widely spaced. The gneiss across the full length of the trench carries disseminated grains of chalcopyrite and a few of pyrite and is crossed in many directions by small veinlets of chalcopyrite. Chalcopyrite is abundant across a zone 3 or 4 feet wide near the middle of the trench. A specimen of the mineralized gneiss is said to have assayed 0·07 ounce of gold a ton. A small outcrop 12 feet south of the heavily mineralized zone in the trench carries abundant chalcopyrite across 1½ feet. Another outcrop 30 feet farther south is heavily stained with iron oxide.

White Star No. 1 (60)

A sulphide deposit on this claim is exposed on the south shore of a small bay on the west side of Morton lake at a locality about a mile from the north end of the lake. The claim was staked by Mr. Axel Nieme in 1934. The deposit is uncovered across 20 feet and consists of fine-grained, well-bedded, dark grey quartzite that is brecciated and crossed by an irregular network of fractures filled with pyrrhotite and pyrite. Tiny grains of pyrrhotite are also disseminated through the quartzite. The owner of the

[1] Wright, J. F.: "Geology and Mineral Deposits of a Part of Northwest Manitoba"; Geol. Surv., Canada, Sum. Rept. 1930, pt. C, pp. 67-68.

property says that samples from the deposit carry no nickel and about 0·05 ounce of gold a ton. Pale green rhyolite outcrops on the west side of the sediment and carries disseminated specks of pyrrhotite.

Copper Group (61)

A sulphide deposit on this group of claims was examined by Wright[1] who reports as follows:

"This deposit is about 500 feet south of Gordon lake, and is reached by a trail, about 1½ miles long, leading from the west shore of Morton lake about ½ mile south of the north end of this lake. A syndicate of residents of The Pas did some surface work on the property during the summer of 1929. A shaft was sunk about 50 feet and trenching was done at several points south and east of Gordon lake. The bedrock is slightly schistose andesite. The shaft is sunk in a zone of chloritic schist about 4 feet wide. Some of the schist on the dump contains abundant light-coloured pyrrhotite, specks of chalcopyrite, quartz veinlets, and iron carbonates. The schist zone was not traced more than 500 feet south of the shaft. North of the shaft the drift is thick. Other nearby zones of schist carry only small quantities of sulphides and vein quartz."

A trench on the east side of Gordon lake near the south end crosses 40 feet of iron-stained schist carrying disseminated pyrrhotite, concretionary balls of pyrite, and a few small lenses of vein quartz. The schist in the trench is crossed by a dyke of basalt porphyry.

Another trench on the east side of Gordon lake near the north end crosses 13 feet of massive aplitic rock and rusty schist. Both of these rocks are well mineralized with disseminated grains of pyrrhotite. The rusty schist is crossed by stringers of pyrrhotite and holds a lens of quartz carrying pyrite and small amounts of pyrrhotite, feldspar, and carbonate. Another pit lies 170 feet north along the strike of the schist. Material on the dump at this northern pit includes sericite schist well mineralized with pyrrhotite and pyrite, pieces of pyrrhotite a foot across, and fragments of vein quartz carrying pyrite.

[1] Wright, J. F.: "Geology and Mineral Deposits of a Part of Northwest Manitoba"; Geol. Surv., Canada, Sum. Rept. 1930, pt. C, p. 68.

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