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GEOLOGICAL SURVEY

MEMOIR 208

GOLD DEPOSITS OF HERB LAKE AREA, NORTHERN MANITOBA

BY
C. H. Stockwell

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Gold Deposits of Herb Lake Area, Northern Manitoba

CHAPTER I

INTRODUCTION

Gold deposits are known to occur at several localities about Wekusko lake, Manitoba, and are most numerous along and near the east shore where prospecting and development work are being actively undertaken. This eastern section, or Herb Lake area, as it is here called, was studied and geologically mapped in considerable detail during the summer of 1935 with the hope of obtaining information that might prove useful in development operations and in searching for new deposits. The results of this field work form the subject matter of this report.

Herb Lake area is 90 miles northeast of The Pas, Manitoba, and about 18 miles north of the station of Wekusko on the Hudson Bay railway. The area is reached by automobile over a road 11 miles long leading from Wekusko to the south end of Wekusko lake and thence by motor boat for 9 miles along the lake to the settlement of Herb Lake. This settlement is on the east shore of Wekusko lake and lies within the map-area, which is 9 miles long in a northeasterly direction and up to 4 miles wide (*See* maps). Accommodation for travellers is available at both ends of the road and at Herb Lake. About four hundred people live along the lake shore within the area, most of whom are in Herb Lake settlement and at the nearby Rex deposit which is under development by Laguna Gold Mines, Limited.

Following early explorations of Wekusko lake by J. B. Tyrrell[1] and Wm. McInnes[2] gold was discovered in the map-area in 1914 by Messrs. M. J. Hackett and R. Woosey. Many other deposits were found during the next three years when the area was being studied and mapped by E. L. Bruce[3] and F. J. Alcock.[4] More recent discoveries and developments are described by J. F. Wright.[5] Interest has centred in the Rex mine, which produced 7,122 ounces of gold at intervals from 1918 to 1925. The mine was reopened in 1934 for further development, and started production again on August 1, 1936. Three other properties have produced small amounts of gold, and the total output from the area prior to August 1936 has amounted to nearly 8,000 ounces with a value of about $166,000.

[1]Geol. Surv., Canada, vol. XII, 1896, pt. F, p. 17.
[2]Geol. Surv., Canada, Mem. 30, p. 52 (1913).
[3]Geol. Surv., Canada, Sum. Rept. 1914, p. 68. Geol. Surv., Canada, Sum. Rept. 1915, p. 129. Geol. Surv., Canada, Sum. Rept. 1916, pp. 166-169.
[4]Geol. Surv., Canada, Sum. Rept. 1917, pt. D, pp. 8-17. Geol. Surv., Canada, Sum. Rept. 1918, pt. D, pp. 9-10. Geol. Surv., Canada, Mem. 119.
[5]Geol. Surv., Canada, Sum. Rept. 1930, pt. C, pp. 74-88.

The district forms part of the Canadian Shield and lies only 6 miles from the southwestern edge of this large area of Precambrian rocks. Within the map-area, bedrock is almost continuously exposed along the shore of Wekusko lake and rocky cliffs rise to 50 feet or more above the water. Inland from the lake, rock hills and ridges rise above low areas of muskeg or protrude through extensive flat areas of clay. Much of the country was burnt over many years ago and rock outcrops, although now partly covered by second growth, are well exposed for study, and are less obscured by moss and lichen than in unburnt areas. Firewood is scarce in the settled area along the lake shore and much of it is obtained from points inland or from distant localities on the lake shore.

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

The writer is grateful for assistance given by prospectors and mining companies working in the area. Mr. D. C. Leggett, mine manager of Laguna Gold Mines, Limited, and other officers of this company freely gave access to underground workings. They also permitted the use of their mine plans and gave other information. Messrs. M. J. Hackett and J. H. C. Waite, and Dr. G. C. McCartney, gave valuable information on drilling operations on the Rainbow group. Mr. W. N. McClintock of Bailor Gold Mines, Limited, kindly supplied data on drilling results obtained by this company on the McCafferty vein. The Manitoba Department of Mines and Natural Resources supplied maps of surveyed claims and gave information on dates of staking and ownership of claims. Assistance in the field work was rendered by Messrs. F. Willows, J. K. Whatmough, H. K. Scott, R. J. Coates, G. N. Fasken, A. M. Cormie, H. G. Trott, and G. C. Camsell.

CHAPTER II

GENERAL GEOLOGY

All the solidified rocks of the area are Precambrian and are grouped as follows:

Table of Formations

Intrusives	Granite, granodiorite, quartz diorite, and pegmatite. Lamprophyre. Porphyry and rhyolite. "Quartz-eye" granite (albite, granite, and oligoclase-quartz diorite). Quartz-feldspar porphyry.
	Biotite dacite (intrusive?), and dacite breccia.
Sediments and volcanics	Andesitic and basaltic lava with interbeds of rhyolite lava, and of laminated feldspathic chert and greywacke. Conglomerate, arkose, tuff, and breccia. Greywacke and conglomerate. Slate and staurolite schist.

The sediments and volcanics underlie the greater part of the area and have been folded into a syncline that trends northeast and extends from one end of the area to the other (*See* maps).

Lava flows with minor amounts of sediments occupy the central, canoe-shaped basin of the fold. Sedimentary formations underlie the lavas and outcrop on the limbs of the fold. On the northwest limb the lowest exposed member is slate and staurolite schist. This is overlain conformably by greywacke and conglomerate which pass upwards into interbedded conglomerate, arkose, tuff, and breccia. On the southeast limb of the syncline the sediments are complexly folded and, although it is known that greywacke, outcropping along and near the contact with volcanics, underlies the volcanics, there is some evidence suggesting that similar sediments nearby may overlie this greywacke unconformably. The relationship is uncertain, however, and all the sediments here have been mapped as one formation.

The volcanics and underlying sediments have been named the Wekusko group by F. J. Alcock.[1] However, if some of the sediments on the southeastern limb of the syncline lie unconformably on this group they probably should be correlated with the Missi series that are so well developed at Amisk lake, Saskatchewan,[2] and Flin Flon, Manitoba.[3]

The lavas and older sediments have apparently been injected by large and small, irregular-shaped bodies of rather fine-grained biotite dacite that is much brecciated in part. The dacite and older rocks are cut by small stocks and dykes of quartz-feldspar porphyry and "quartz-eye" granite, which are characterized by an abundance of sodic plagioclase. Dykes of lamprophyre cut all of these rocks. Schistose structure

[1] "The Reed-Wekusko Map-Area, Northern Manitoba"; Geol. Surv., Canada, Memoir 119.
[2] Wright, J. F.: Geol. Surv., Canada, Sum. Rept. 1932, pt. C, pp. 86-87.
[3] Alcock, F. J.: Geol. Surv., Canada, Sum. Rept. 1922, pt. C, pp. 13-15.

is generally well developed in the lamprophyre and all older rocks. The sediments have been invaded by bodies of granitic rock varying from granite to granodiorite and quartz diorite. Age relationships between these and other intrusive rocks in the area are unknown, but these granitic rocks are massive, a feature that suggests that they may be younger than the schistose quartz-feldspar porphyry and "quartz-eye" granite.

A more detailed account of the various rocks of the area is given in the following paragraphs.

SLATE AND STAUROLITE SCHIST

Fine-grained, slaty, sedimentary rocks form the lowest exposed member of the sedimentary-volcanic group and outcrop on two projecting points along the shore of Wekusko lake, on nearby islands, and to the north on the west shore of a narrow arm of the lake. The sediments on the shore of this arm and on small islands nearby lie close to the contact of a large intrusive body of granitic rock, and the fine-grained slate is altered to a somewhat coarser grained schist carrying numerous crystals of staurolite and garnet. The staurolite crystals are up to 1 inch long and are abundant in certain beds that alternate with other beds carrying small red garnets. The member contains also a few beds of greywacke.

GREYWACKE AND CONGLOMERATE

The slate is overlain by greywacke that is typically exposed on the northwest limb of the syncline along and near the shore of Wekusko lake. Here the greywacke is a rather fine-grained, dark grey, schistose rock composed chiefly of biotite, quartz, and feldspar. Many outcrops show bedding lines and excellent crossbedding. In many places the rock carries scattered, round pebbles of quartz and a few of rhyolite. A few lenses and thin beds of pebble conglomerate are interlayered with the greywacke. In the vicinity of the Rex vein such pebbly layers become more abundant in the upper part of the formation, and the rock passes gradually into conglomerate of the next overlying group. The greywacke is from 100 to 200 feet thick at Herb Lake settlement and increases to a thickness of about 500 feet near the Rex property. To the north, greywacke and associated conglomerate are up to one-half mile across the strike, but the structure there has not been determined. The thickness of the strata is, therefore, unknown, but it is apparent that there has been some duplication of thickness as a result of close folding. Garnets occur locally in the rock in the narrow, southwest part of the belt and are present almost everywhere in the wide northeast part.

Similar rocks are exposed immediately adjacent to andesitic lava on the southeast limb of the syncline between a point just southwest of Stuart lake and the north end of Lostfrog lake. Crossbedding shows that the tops of beds face northwest and that the sediments stratigraphically underlie the lavas. Elsewhere in the eastern part of the map-area, as north of Lostfrog lake, between this lake and Stuart lake, and along the southeast shore of the northeast arm of Puella bay, the sediments are generally more arkosic in nature, coarser grained, and in places consist of

conglomerate holding boulders of granite and other rocks up to a foot in diameter. Crossbedding in these arkosic sediments shows that the tops of beds commonly face southeast, as if possibly overlying the finer grained greywacke. The two types are not easily distinguishable and more detailed work would be necessary to map them separately and to determine their true structural relations.

CONGLOMERATE, ARKOSE, TUFF, AND BRECCIA

The rocks of this group outcrop along the northwest limb of the syncline as a band between underlying greywacke and overlying andesitic lava. The conglomerate is typically exposed as a narrow band nearly 1½ miles long extending from the Rex mine southwest to Herb Lake settlement. The conglomerate attains a thickness of 300 feet or more in the vicinity of the mine and narrows to 10 or 20 feet thick at the village. Pebbles in the conglomerate are well rounded, are up to 5 inches in diameter, and consist chiefly of quartz and acid volcanics with a few of granitic rocks and basic volcanics. The pebbles lie in an arkosic matrix and the conglomerate holds a few thin beds of crossbedded, coarse arkose and greywacke.

This band of conglomerate is overlain to the east by tuff and volcanic breccia which are well exposed near the east boundary of the Moore claim. At this locality, fine-grained, well-bedded tuff composed of tiny fragments of acid volcanics, quartz, and dark schist is interlayered with a few beds of quartzose sediments and passes across the strike into coarse volcanic breccia. The breccia does not commonly show bedding and is made up almost entirely of closely packed, angular fragments of rhyolite. The rhyolite is a dense, light grey rock carrying small phenocrysts of quartz and oligoclase lying in a groundmass that is schistose due to the presence of parallel flakes of sericite and biotite. The surficial origin of the breccia is indicated by bedding in places and by the presence of a few pebbles of quartz. The tuff and breccia apparently represent material thrown out by volcanoes during periods of explosive activity. Much fine-grained, bedded and unbedded tuff is exposed along and near the shore of Wekusko lake for one-half mile north of the Wekusko claim.

North of the Rex mine the conglomerate band is interbedded with a peculiar kind of arkose and grades along the strike into this rock, and the arkose becomes the dominant sedimentary rock in a belt extending northeast from the south boundary of the Trapper claim for nearly 3 miles to the Star claim. The arkose in this belt is a medium-grained, light grey, schistose rock carrying grains of quartz and feldspar that are easily distinguishable on weathered surfaces. As seen under the microscope, many of the quartz grains are granulated, the feldspar crystals are much sericitized, and both of these minerals are mixed with biotite, sericite, and a few small crystals of tourmaline. On some outcrops the rock is entirely unbedded, is uniform in grain, and has the appearance of an igneous rock, especially in some places where feldspar crystals give the rock a porphyritic-like texture. At most localities, however, the rock has a distinctly banded structure resulting from thin, alternating laminations of material of varying grain size, but no undoubted bedding was seen.

However, the sedimentary origin of both the massive and banded rock is indicated by the fact that it carries a few well-rounded pebbles of quartz and a few fragments of dark schist and rhyolite. Moreover, the rock passes laterally without definite contacts into beds of pebble conglomerate, finer grained quartzose sediments, and into tuffaceous material and volcanic breccia carrying abundant fragments of dark schist and rhyolite and a few round pebbles of quartz. The banded structure in the arkose is either straight or contorted and in both cases is commonly crossed at various angles by a schistose structure along which many quartz stringers have been injected. The banding either parallels the contacts with adjacent conglomerate beds or is truncated at angles of from 10 to 20 degrees by such beds. These truncations represent minor, local unconformities and the truncated rock everywhere lies west of the contact, indicating that the tops of the formations face southeast.

Northeast of this belt of arkose the rocks comprise well-bedded, feldspathic sediments and pebble conglomerate. These sediments are locally interlayered with andesitic lava flows similar to the overlying lavas. Basic, feldspathic sediments outcrop as a narrow band within the lavas for a mile northeast of McCafferty liftover at the south end of the area.

ANDESITIC AND BASALTIC LAVA

Andesitic and basaltic flows constitute the dominant rock type in the middle, canoe-shaped part of the syncline. The lavas are dark grey to green rocks varying from fine-grained, schistose types to coarse-grained varieties that locally resemble diorite in general appearance. The coarse rock is composed chiefly of andesine and hornblende with smaller amounts of biotite, apatite, magnetite, epidote, and carbonate, and is locally porphyritic due to the presence of lath-shaped phenocrysts of andesine. Many of the laths are up to one-half inch long and in some coarser layers the phenocrysts are as much as 1½ inches long. Locally the porphyritic rock forms irregularly rounded or elliptical masses up to 2 feet in diameter lying in the finer grained phase. In such masses the lath-shaped phenocrysts lie roughly parallel to the peripheries of the rounded and elliptical bodies, suggesting flow structure. Typical pillow structure is lacking, however, except in fine-grained hornblende schist lying along and near the shore of Wekusko lake for one-half mile south of the Kiski claim. Much of the fine-grained lava in the map-area holds scattered lumps of green epidote, and the feldspar is partly altered to this mineral. Many northeasterly trending layers in both the fine-grained and coarse-grained, porphyritic and non-porphyritic lava hold numerous amygdules filled with quartz.

Some of the dark-coloured flows are probably basalt and others are light grey, carry small amounts of quartz, and may be classed as dacite. Associated with the lava flows are patches and bands of basic volcanic breccia and agglomerate that were not mapped separately.

LAMINATED FELDSPATHIC CHERT AND GREYWACKE

Beds of thinly laminated sediment lie between some of the andesitic flows. Individual bands of the laminated rock vary from 10 to 100 feet thick, and alternate with thin flows of andesite and sills of lamprophyre

across widths up to 700 feet. The sediments with interbedded lavas and lamprophyre dykes occur almost entirely at one horizon in the large basin of andesitic and associated rocks, and outcrop as a fairly regular, nearly closed, elliptical curve within the synclinal basin. Bedding laminations in the sediment are commonly from 1 inch to 3 inches wide and consist of alternating layers of fine-grained material of various shades of grey and red. Laminations of pink and light grey, dense, hard, cherty material consist of quartz and oligoclase in about equal amounts, mixed with small quantities of muscovite, sericite, biotite, chlorite, carbonate, and pyrite. Darker coloured, greywacke-like laminations carry a larger proportion of biotite, are more schistose, and weather out more deeply than adjoining layers, giving the rock a ribbed appearance. At a few localities deeply weathered, thin beds of impure, limy sediment are interlayered with the other sedimentary material. Crossbedding is rarely seen.

RHYOLITE LAVA

Rhyolitic rock occurs chiefly at three horizons within the basin of andesitic and basaltic lava. One layer lies on the southeast limb a few hundred feet below the horizon of laminated sediments, another lies along the northwest limb immediately above this horizon, and the third lies considerably higher in the succession of basic lava flows and outcrops as a long, U-shaped curve in the central part of the basin. The rhyolite is a fine-grained, pale, reddish weathering rock that varies from red to light and dark grey on fresh surfaces. Parts of the rock are brecciated and much of it is banded with straight, parallel streaks and lines resembling flow structure. The banding is parallel to the edges of the rhyolite bodies. Where examined in detail, there are eight or ten streaks or lines to an inch and they are generally from an inch to a foot long. Flakes of biotite are readily seen in much of the rock and lie parallel to the flow lines. Most of the rock is porphyritic, the phenocrysts consisting of small, scattered crystals of albite and oligoclase and rarely of quartz and microcline. These phenocrysts lie in a groundmass of quartz and acid plagioclase varying from albite to oligoclase, mixed with smaller amounts of sericite, magnetite, and, rarely, with small amounts of tourmaline and microcline. The banded structure, conformable relations with nearby flows and sediments, and lack of any evidence of intrusive relations, suggest that the rhyolite bodies are lava flows, although no amygdules, pillows, or other definite evidence of extrusive origin was found.

BIOTITE DACITE AND DACITE BRECCIA

Many large and small bodies of these rocks outcrop here and there in the sediments on the limbs of the syncline and lie along the contact between these sediments and overlying andesitic and basaltic lava. The dacite is a rather fine-grained, grey to reddish grey, schistose rock generally characterized by relatively large flakes of biotite lying parallel to one another. Feldspar grains are distinctly visible on weathered surfaces. Under the microscope quartz is seen to be an important constituent of the rock. The feldspar is oligoclase and is much altered to sericitic material

The biotite flakes are partly altered to chlorite. Other constituents include muscovite, apatite, titanite, magnetite, carbonate, and, rarely, hornblende.

The bodies of dacite are of irregular shapes with long tongues branching outwards from the main bodies. The tongues and main bodies are generally elongated parallel to the strike of enclosing rocks, but the mapping has indicated that some of the bodies cross bands of sediments at large angles. These features show that at least some of the bodies are intrusive. The dacite, moreover, is of uniform appearance over large areas and lacks alternating layers of materials of various grain size such as might be expected in a series of lava flows. Likewise, no amygdules or other typical volcanic structures are present. Locally the rock holds a few, included, angular blocks of dark schist. The sediments and andesitic lava are cut by a few dykes of rock similar in appearance and composition to that forming the larger bodies and which may be offshoots from them.

The dacite passes gradually into dacite breccia and the latter rock constitutes the major part of some large bodies. The dacite breccia is typically exposed in a large body along and near the northwest shore of the northeast arm of Puella bay. The breccia consists of closely packed, angular blocks, generally less than a foot across, of biotite dacite like the rock described above. The angular blocks lie in a matrix of similar rock, or of finer grained, more schistose dacite. The breccia shows no sign of sorting, bedding, or admixture with sedimentary material.

QUARTZ-FELDSPAR PORPHYRY

A row of some half dozen small stocks of quartz-feldspar porphyry occurs in a narrow belt nearly 6 miles long on the northwest limb of the syncline. They have been injected along and near the contact between andesitic lavas and underlying conglomerate, arkose, tuff, and breccia. The stocks are lenticular or irregular in outline, are from 800 to 6,000 feet long, and are elongated parallel to the strike of enclosing rocks.

The porphyry consists of small, inconspicuous phenocrysts of quartz and feldspar in a fine-grained, schistose groundmass, varying from dark grey to greenish grey and pink on fresh surfaces, and presenting lighter shades of grey and pink on weathered surfaces. The quartz phenocrysts, as seen under the microscope, consist either of single, strained quartz crystals or of aggregates of small, intergrown quartz grains. The plagioclase phenocrysts vary from albite to oligoclase and are commonly much altered to sericite and carbonate. The groundmass is composed chiefly of quartz, acid plagioclase, and parallel flakes and shreds of sericite. Other minerals noted include tourmaline, biotite, magnetite, and, rarely, small amounts of orthoclase and microcline. At some localities the rock has a faint, banded structure close to the contacts with invaded rocks and the banding parallels the contacts. In addition to this primary banding the rocks are crossed by a schistose structure along which numerous quartz stringers have been deposited. In some parts of the stocks the porphyry is brecciated, and some dykes cutting nearby sediments and lavas are of brecciated porphyry.

The intrusive stocks of porphyry on the Rex, Elizabeth-Dauphin, and other properties were considered by former investigators[1] to be acidic or rhyolitic lava flows, although Bruce,[2] believed that some of this rock was possibly intrusive. Detailed mapping and study have revealed the intrusive nature of this rock, as well shown at several localities described below. The porphyry stock on the Rex group of claims (*See* Figure 3) cuts across the bedding planes of sediments at the south end, holds included bands of sediments, and sends branch dykes into underlying and overlying sedimentary rocks. The stock on the Elizabeth-Dauphin claims (*See* Figure 2) holds inclusions of conglomerate and the inclusions are cut by dykelets of the porphyry. A dyke of porphyry branches from the northeast end of the same porphyry stock and extends into adjacent sediments. The porphyry body on the Kiski-Wekusko claims (*See* Figure 5) sends a branch dyke eastward into adjacent andesitic lava. Andesite on the east contact of this porphyry body has apparently been brecciated and the porphyry has been injected into angular spaces between the broken blocks and into long cracks extending outwards from these spaces. Just east of Herb Lake settlement an irregularity in the west boundary of a large stock of porphyry cuts at right angles across interbanded dacite and sediments. Near the west boundary of the Ballast claim dykes of porphyry branch outwards from the same stock and cut adjacent sediments.

The intrusive quartz-feldspar porphyry is much like the rhyolite lava already described except that the lava has a more pronounced banding, does not generally carry phenocrysts of quartz, and usually carries more biotite. The intrusive porphyry is identical in appearance with the porphyritic rhyolite fragments that lie in the tuff and constitute the major part of the volcanic breccia of surficial origin, as already described. This similarity suggests that the intrusive porphyry is genetically related to the lava and to the tuff and breccia and that it represents an intrusive phase of these surficial rocks. However, the tuff and breccia were injected by the bodies of biotite dacite before the intrusion of the porphyry. This indicates that a considerable time interval may have elapsed between the deposition of the surficial rocks and the intrusion of the porphyry, and that the relationship may not be as close as the lithological similarity would suggest. The quartz-feldspar porphyry also resembles, in composition and texture, the "quartz-eye" granite described in the following paragraph and, more probably, is a fine-grained phase of this rock.

"QUARTZ-EYE" GRANITE

Three stocks and a few other small bodies of granitic rock varying from albite granite to oligoclase quartz diorite have been mapped in the northern part of Herb Lake area. The stocks are from ½ to nearly 3 miles long and up to 2,000 feet wide and are elongated parallel to the bedding or schistose structure of the invaded rocks. The granite and granodiorite

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[1]Alcock, F. J.: "Wekusko Lake Area, Northern Manitoba"; Geol. Surv., Canada, Sum. Rept. 1917, pt. D, p. 12. "The Reed-Wekusko Map-Area, Northern Manitoba"; Geol. Surv., Canada, Mem. 119, pp. 18, 34, 36, 37. Wallace, R. C.: "Mining and Mineral Prospects in Northern Manitoba"; Northern Manitoba Bull., 1919, pp. 33, 35. Wright, J. F.: "Geology and Mineral Deposits of a part of Northwest Manitoba"; Geol. Surv., Canada, Sum. Rept. 1930, pt. C, pp. 75, 77, 79, 83, 84.

[2]Bruce, E. L.: "Schist Lake and Wekusko Lake Areas, Northern Manitoba"; Geol. Surv., Canada, Sum. Rept. 1916, p. 167.

are schistose, grey to pink rocks in which parallel flakes of biotite and scattered, phenocryst-like, eye-shaped masses of quartz are readily seen on weathered surfaces. The quartz "eyes" are commonly about one-quarter inch long. The descriptive name, "quartz-eye" granite, has been applied to this rock because of the characteristic masses of quartz. Microscopic examination shows that each quartz "eye" consists either of a single large quartz grain or, more commonly, of an aggregate of small quartz grains generally mixed with small quantities of sericite, carbonate, and acid plagioclase. A few phenocrysts of plagioclase, varying from albite to oligoclase, are also present; these are much crushed and broken and the cracks are filled with sericite. The quartz and feldspar phenocrysts lie in a fine-grained groundmass composed chiefly of quartz, acid plagioclase varying from albite to oligoclase, and parallel flakes of biotite. In some specimens parallel flakes of sericite are more plentiful than those of biotite. Orthoclase, microcline, and muscovite are rarely present.

Many dykes of schistose, biotite, "quartz-eye" granite cut biotite dacite, sediments, and lavas in the vicinity of the three stocks in the northern part of the area and are especially numerous in the country around the two stocks lying just north and northeast, respectively, of McCafferty lake. Similar dykes are scattered here and there for nearly 1½ miles southwest, and for a mile northeast, of the smaller stock lying northeast of this lake. The rock constituting the dykes is identical in appearance with that forming the stocks and the two are, no doubt, closely related in origin. These dykes, like the stocks, follow the structure of enclosing rocks. No pegmatite dykes were found in association with the "quartz-eye" granite.

DYKES OF PORPHYRY AND RHYOLITE

Dykes of quartz-feldspar porphyry, feldspar porphyry, quartz porphyry, and rhyolite are widely scattered throughout much of the area, but were not found cutting the stocks of quartz-feldspar porphyry, "quartz-eye" granite, or bodies of other granitic rocks. No porphyry dykes were seen in the areas in which dykes of "quartz-eye" granite are abundant, although fine-grained aplitic or rhyolitic dykes were noted there. The dykes are generally less than 20 feet wide.

Dykes of fine-grained, quartz-feldspar porphyry branch outwards from stocks of this rock, as already described. Similar dykes with inconspicuous, small phenocrysts of quartz and feldspar, found near these stocks but without any evident connexion with them, have no doubt the same origin.

Dykes of coarser grained, quartz porphyry cut sediments lying just west of the north half of Stuart lake and between this lake and Lostfrog lake. These dykes strike northeast. Similar dykes occur elsewhere at widely separated localities and generally strike from northwest to west almost at right angles to the regional structure. The coarse-grained quartz-porphyry dykes carry large, round phenocrysts of white and bluish quartz lying in a fine-grained, red or grey groundmass. Some of the dykes carry biotite, are highly schistose, and approach the "quartz-eye" granite in appearance and are probably related to this rock. Dykes of fine-grained feldspar porphyry and of rhyolite without phenocrysts are widely scattered but are not abundant.

LAMPROPHYRE DYKES

Dykes of dark grey to black rock to which the general term of lamprophyre is applied cut dykes of "quartz-eye" granite, stocks of quartz-feldspar porphyry, and older rocks. The dykes are rarely seen in the northeast part of the area and along the southeast half of the syncline, but occur abundantly along the northwest half of the syncline from the southwest end of the area as far northeast as the most northerly stock of quartz-feldspar porphyry.

The dykes strike in many directions, but most commonly trend northeasterly. Along the wide part of the belt of laminated, feldspathic chert and associated greywacke on the northwest limb of the syncline the dykes are larger than elsewhere, reaching a maximum width of 200 feet and commonly being about 50 feet wide. One dyke there is exposed intermittently along the northeasterly strike for about a mile. Elsewhere the lamprophyre dykes can rarely be traced for more than a few hundred feet along the strike. Some of the dykes have irregular-shaped branches.

Many of the dykes are of rather coarse-grained rock composed of hornblende with smaller amounts of biotite, carbonate, quartz, and feldspar; the feldspar varies in composition from oligoclase to bytownite. Other dykes are of fine-grained, biotite-rich rock, with or without garnets. Still others carry large phenocrysts of andesine in a fine-grained groundmass composed of hornblende, biotite, and feldspar. In a few dykes, coarse hornblende lamprophyre passes gradually into fine-grained, garnetiferous lamprophyre.

GRANITE, GRANODIORITE, QUARTZ DIORITE, AND PEGMATITE

Rocks of this group form a large body in the northwest part of the area and a small stock in the southwest part.

The body in the northwest part consists of massive, light grey to pink, microcline-biotite granite, and granodiorite with a border phase of coarse, dark grey, hornblende quartz diorite. The grey quartz diorite is cut by a few dykes of pink granite. A few dykes of pegmatite cut the granite and more basic phases, as well as nearby sediments, and are no doubt derived from the granite. Some of the pegmatite dykes within the granitic body carry spodumene in addition to common rock-forming minerals, as described at the end of this report. The massive character of the granite, granodiorite, and quartz diorite suggests that this intrusive body may be younger than the highly schistose bodies of "quartz-eye" granite and quartz-feldspar porphyry.

The stock in the southeast part of the area is a massive, reddish, biotite-bearing, granitic rock that grades into a grey hornblende quartz diorite which carries a few conspicuous grains of bluish quartz.

STRUCTURE

The sedimentary and volcanic rocks have been folded for the most part, as already stated, into a large canoe-shaped syncline. As a result of the folding, dominantly volcanic rocks fill the interior of the basin and outcrop in a large, lenticular area over 9 miles long and almost 2 miles wide at

the widest point. The volcanic basin is almost completely surrounded by underlying sedimentary rocks. The structure is well shown in certain layers of rhyolite and sediment that lie within the basic lava and outcrop as long, U-shaped bands. These bands are closed at the southwest ends and are open at the northeast ends where they apparently pinch out. The axis of the fold curves slightly, but generally strikes north 45 degrees east. Bedding of the sediments usually stands vertically, or nearly so, although steep dips toward the axis of the fold are most common on the northwest limb, whereas the sediments on the southeast limb generally dip away from the axis and are overturned. At a few localities the sediments have been compressed into minor, close folds and crenulated structures.

The sediments, volcanics, and most of the intrusive rocks, usually have a schistose structure that strikes northeasterly and dips at steep angles. The cleavage is pronounced in some types of rock and is barely recognizable or lacking in others. Where well developed, the cleavage maintains its northeasterly strike through minor, irregular folds and continues across contacts between intrusive and older rocks regardless of their attitude. At many localities in quartz-feldspar porphyry and nearby sediments, many, long, straight stringers of quartz have been deposited along cleavage planes.

CHAPTER III

ECONOMIC GEOLOGY

GENERAL ACCOUNT

The gold deposits of Herb Lake area comprise rather definite quartz veins and also schist zones holding irregular lenses and stringers of quartz. Most of the known deposits lie along two northeasterly trending belts, the one lying along the northwest limb of the synclinal basin of sediments and lavas, and the other lying along and near the axis of the syncline.

The belt that lies along the northwest limb of the syncline extends north 30 degrees east along and near the shore of Wekusko lake from the Kiski claim to the Rex claim and thence swings inland, north 50 degrees east, to the Molly vein. The belt follows a row of some half dozen stocks of quartz-feldspar porphyry that have been injected along and near the contact between andesitic lava flows and underlying sediments with associated tuff and acid volcanic breccia. The sediments and breccia were invaded by bodies of biotite dacite before the intrusion of the porphyry, and the porphyry and older rocks were cut by lamprophyre dykes before the deposition of the gold deposits. A few dykes of coarse quartz-porphyry and "quartz-eye" granite cut the sediments, andesite, and dacite in the belt and are also older than the gold-bearing quartz veins.

The gold deposits occur here and there along the belt for a length of nearly 6 miles and a width of less than ½ mile. Of the twenty-four deposits examined in the belt over half lie wholly or partly in the porphyry and the remainder are in other rocks less than 1,200 feet from the edges of the porphyry bodies.

Of the four properties in Herb Lake area that have produced gold, three, namely the Rex, Bingo, and Moose Horn-Ballast, lie within this belt and, moreover, lie within the porphyry or within lamprophyre dykes cutting the porphyry.

The veins lying wholly or partly in the porphyry commonly strike from north 25 degrees east to north 55 degrees east and generally cross the schistose structure of enclosing porphyry which trends north 40 to 50 degrees east. A few of the veins lie along the cleavage planes and one vein cuts this structure at right angles. The veins commonly dip from 70 degrees southeast to vertical. They cross dykes of lamprophyre and inclusions of sediments and locally cross the edges of the porphyry bodies and extend into adjacent rocks. The Rex vein is widest in porphyry and apparently dies out on entering adjacent sediments, whereas veins on the Kiski-Wekusko claims are wider in the lavas than in the porphyry. The veins lying in rocks bordering the porphyry stocks strike irregularly from north 5 degrees east to north 70 degrees east and dip vertically or steeply southeast. They lie in sediments, volcanic breccia, andesite, and biotite dacite, and a few of them occur along contacts between these rocks or along the edges of lamprophyre dykes. One vein lies in a fault of small horizontal displacement.

Most of the veins in the porphyry belt vary in width from a few inches to 1½ feet and have been traced along their strike for only a few hundred feet or less. Two veins in the porphyry, however, are up to 6 feet wide, average about 2½ feet wide, and have been traced for 1,000 feet and 2,100 feet, respectively. One vein in andesite has a maximum width of 11 feet and averages 3 feet wide for a length of 680 feet. Most of the veins vary greatly in width and, although locally pinching out entirely for short distances along the strike, are essentially continuous. Some of the deposits consist of numerous small lenses and stringers of quartz lying in schistose rock across widths of 2 feet to 12 feet. This type of deposit is less common in the porphyry than in bordering rocks. The vein quartz does not as a rule appear to have been introduced along strong shear zones for schistose structure is usually not much more pronounced adjacent the quartz than elsewhere. In some places, however, coarse hornblende andesite is altered to fine chloritic schist for as much as 3 feet from the veins, and porphyry, dacite, and sediments are altered to sericite schist for a few inches from the quartz.

The quartz of these deposits varies from bluish grey or glassy to white and is sugar-grained or more coarsely crystalline. Some of the veins present a poorly developed banded structure due in part to alternating layers of dark and light quartz and shreds of sericitic material that lie parallel to the vein walls. Arsenopyrite is the most abundant metallic mineral present and occurs in all the veins cutting porphyry and in most of those in bordering rocks. It is also commonly present as disseminated crystals in the wall-rocks. It occurs in the quartz as scattered, small crystals or, more commonly, as parallel streaks of finely crystalline material that accentuate the banded structure of the veins. Other minerals found in the quartz include pyrite, galena, sphalerite, chalcopyrite, pyrrhotite, native gold, tourmaline, feldspar, muscovite, and carbonate.

The belt lying along and near the axis of the syncline is known to carry gold deposits for only 1½ miles along the strike, although the syncline extends for 7 miles or more. The belt in which the deposits lie extends from the Wizard claim to the Lingo claim and is up to 1,400 feet wide. About a dozen deposits are known here, and a small amount of gold has been produced from one of the properties.

These deposits lie in andesitic lava that varies from fine to coarse grained and is partly porphyritic and amygdaloidal. The lavas are commonly schistose with cleavage striking northeasterly and dipping about 80 degrees to the southeast. A few dykes of fine-grained feldspar porphyry, coarse-grained quartz porphyry, and "quartz-eye" granite cut the lavas and strike in various directions. The deposits, unlike the continuous quartz veins along the belt on the northwest limb of the syncline, consist characteristically of many small lenses and stringers of quartz deposited along schist zones in the lavas. The normal hornblendic lava near the deposits is altered to a biotite schist immediately adjacent the quartz bodies. The deposits commonly strike from north 20 degrees east to north 50 degrees east and dip steeply southeast. They, accordingly, strike roughly parallel to the axis of the syncline which trends about north 40 degrees east at this locality. Branch veins extend outwards from some of the deposits and strike at right angles to the axis. Most of the deposits have been traced from 50 to a few hundred feet along the strike, and one

deposit of quartz and schist is more or less continuous for 2,100 feet. The zones of mixed quartz and schist vary from 4 to 20 feet wide. The quartz is sparingly mineralized with pyrite, chalcopyrite, pyrrhotite, native gold, tourmaline, muscovite, and carbonate. Most of these minerals, including native gold, are locally seen in the schist as well. Arsenopyrite has been reported in one of the deposits, but this mineral is not characteristically present as it is in the deposits on the limb of the syncline.

A few other gold deposits lie neither in the belt along the synclinal axis nor in the belt that follows the stocks of quartz-feldspar porphyry. Chief among these is the McCafferty vein which occurs near the north end of the area and is one-half mile northwest of the projected strike of the row of porphyry stocks. Rocks in the vicinity of this vein and nearby deposits include biotite dacite, cut by a large stock of "quartz-eye" granite and by dykes of "quartz-eye" granite and lamprophyre. The veins cross the dacite and dyke rocks, strike north 45 degrees east, and dip steeply southeast. The wall-rocks are altered to schist for a few inches from the vein quartz. The character of the vein material is much like that in the zone that follows the porphyry stocks.

ORIGIN OF THE GOLD DEPOSITS

During his studies in 1917 and 1918 of a large area in the vicinity of Wekusko lake, Alcock[1] noted that quartz veins cut granitic intrusives and all older rocks, and found that all gradations exist between quartz veins and pegmatite dykes that were undoubtedly derived from the granite. Arsenopyrite was found in all the gold-bearing veins known at that time and this mineral locally occurred in the granite apparently as an original constituent. After considering these facts he concluded that the gold-bearing quartz veins were genetically related to the granite intrusives. Moreover, he found that the main veins of this area, which included the Rex, Kiski, and other veins described in the present report, are situated along the borders of a granite stock lying between Herb bay and Grass river, and concluded that this stock was responsible for the formation of the veins.

Part of the southeast edge of this granite body lies in the northwest part of Herb Lake area, as shown on the map that accompanies the present report. Within this area a few pegmatite dykes were seen in the granite body and in sediments close to its edge, and these dykes undoubtedly are derived from this granite. In this area, however, there is no indication of a gradation between pegmatite dykes and gold-bearing quartz veins. Detailed work has shown that many of the gold deposits, on the other hand, are closely associated with small stocks and dykes of quartz-feldspar porphyry and "quartz-eye" granite, which are without associated pegmatite dykes.

The association with small stocks of quartz-feldspar porphyry is well shown in the belt of deposits that follows a row of these stocks. In this belt the veins lie in and near the porphyry bodies and are so closely allied with them as to suggest a genetic relationship between the two. By this it is meant that the veins may have been derived either from considerable

[1]Alcock, F. J.: "The Reed-Wekusko Map-Area, Northern Manitoba"; Geol. Surv., Canada, Mem. 119, pp. 32-33.

depths in the porphyry bodies themselves, or, more probably, from an underlying magma that gave rise to both the porphyry bodies and the veins. In any case, the upper parts of the porphyry stocks, as now exposed, had solidified, were injected by lamprophyre dykes, and had been rendered schistose before the gold-bearing veins were introduced.

The McCafferty vein and nearby deposits lie in rocks that are cut by many, irregular, dyke-like bodies of "quartz-eye" granite that are undoubtedly offshoots from nearby stocks of "quartz-eye" granite. The association suggests that the veins are genetically related to this granite.

As already stated, the quartz-feldspar porphyry and "quartz-eye" granite are probably closely related to each other in origin. As might be expected, the character of the mineralization in veins associated with the granite is similar to that in veins associated with the porphyry. Dykes of coarse-grained quartz porphyry, which are scattered throughout much of the area, are also probably related to the "quartz-eye" granite. These dykes are cut by numerous quartz stringers that do not generally extend into bordering rocks and appear to have been derived from the dyke rock itself. At several localities the vein quartz and dyke rock carry arsenopyrite and tourmaline, a type of mineralization similar to that in the veins associated with the stocks of poryhyry and granite. Gold deposits in the belt lying along and near the axis of the syncline are probably derived from the same source as nearby dykes of porphyry and "quartz-eye" granite.

The stocks of quartz-feldspar porphyry and "quartz-eye" granite, and the dykes of quartz porphyry, consist largely of soda feldspar. It is interesting to note that gold deposits in Elbow-Morton area, Manitoba,[1] and in certain parts of western Quebec[2] are likewise associated with soda-rich rocks characterized by "eyes" of quartz. Wright[3] also has noted that bodies of granite carrying eyes of quartz outcrop near gold deposits in many areas in Manitoba and gives evidence suggesting that the veins were derived from such bodies of "quartz-eye" granite.

Structural features have played an important part in the localization of the gold deposits. During the folding of the syncline, shearing movement was probably most pronounced along contacts between different kinds of volcanic or sedimentary rocks. The contacts between major rock units, such as between andesitic lava and underlying sediments, would suffer most in this respect. This apparently was an important factor in the localization of the row of quartz-feldspar porphyry stocks and, consequently, of the veins associated with these stocks. The strata have been more sharply flexed along the axis of the syncline than elsewhere; this feature may account for the presence of veins along and near this axis.

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[1]Stockwell, C. H.: "Gold Deposits of Elbow-Morton Area, Manitoba"; Geol. Surv., Canada, Mem. 186, p. 13.
[2]Bell, L. V.: "Geology in Prospecting, with Special Reference to Western Quebec"; Bull. Can. Inst. Min. and Met., May 1936, pp. 249 and 251.
[3]Wright, J. F.: "General Geological Features of the Mining Fields of Manitoba and Adjoining Districts"; Trans. Can. Inst. Min. and Met., vol. XXXVIII, 1935, p. 259.

SUGGESTIONS TO PROSPECTORS

According to the theory of origin outlined above, the gold deposits are genetically related to intrusive bodies of porphyry and "quartz-eye" granite. Since dykes or other bodies of these soda-rich rocks are widely scattered throughout the area, gold deposits might be expected to be widely distributed also; almost the whole region should, therefore, be more closely prospected than hitherto. Particular attention, however, should be given to certain belts within this area.

Intensive search should be made along and near the contacts between major units of the sedimentary and volcanic rocks, for shearing movement during the folding of the syncline was probably most pronounced at such localities. The belt of gold deposits that follows the zone of porphyry stocks along and near the contact between andesitic lava and underlying sediments and breccia has received the most attention to date, and it is there that most of the discoveries have been made. Further search along this belt may reveal other veins either in the porphyry or in nearby rocks.

The corresponding belt on the opposite side of the syncline has not, so far as known, been thoroughly prospected. No stocks of porphyry have been injected along this contact, but dykes of porphyry, in larger numbers than are usual in the area, have been injected into the greywacke close to the contact with overlying andesitic and basaltic lavas. Although no gold deposits are known there, the zone along and near the contact between andesitic lava and greywacke should be closely prospected for one-third mile from the west shore of Stuart lake and northeast to the west shore of Lostfrog lake.

Shearing movement during the folding and consequent favourable conditions for deposition of gold-bearing veins would also be expected along the contacts of bands of rhyolite lava and laminated sediments which lie within the central basin of andesitic and basaltic lavas.

A narrow belt along and near the axial plane of the syncline is also favourable prospecting ground. The strata there have been sharply folded, and this is apparently a favourable condition as several deposits are known to occur along and near a part of the axis. Further prospecting, accordingly, would be advisable near the axis for its full length of 7 miles or more, as shown on the accompanying maps.

DESCRIPTIONS OF MINERAL PROPERTIES

Detailed descriptions of mineral deposits examined in the area are given in the following paragraphs.

Bachelor Claim

This claim was staked in 1932 by Richard Ellis, and is owned by Edna K. Whitaker of The Pas, Manitoba. A deposit of vein quartz in schist (Locality 1 on Map 374A) has been found near the northwest boundary of the claim and has been traced across the boundary into the adjoining McCafferty (shown on map as Concord) claim. Rocks in the

vicinity of the deposit consist of intrusive biotite dacite cut by a few dykes of "quartz-eye" granite, but they are largely covered by a mantle of clay. The dykes are up to 5 feet wide and strike northeasterly. Workings on the deposit comprise fourteen small trenches and two diamond drill holes placed so as to cut the deposit at a depth of about 40 feet. The results of the drilling are said to have been disappointing. The clay walls of several of the pits had caved in at the time of examination, but the deposit is well exposed by stripping for 140 feet and has been traced for a total length of 350 feet along the strike of north 45 degrees east. In the workings normal dacite is altered to a darker coloured biotite schist with a cleavage dipping 80 degrees to the northwest. Lenses and stringers of quartz carrying rusty weathering carbonate and small amounts of pyrrhotite, pyrite, muscovite, red feldspar, black tourmaline, and a few tiny flakes of molybdenite have been injected along cleavage planes in the schist. The zone of mixed quartz and schist varies from 1 foot to 4 feet wide and the maximum width of individual quartz lenses is 2½ feet.

McCafferty Vein

A quartz vein, generally known as the McCafferty vein (*See* Figure 1 and Locality 2 on Map 374A), lies on the King George and Prince Edward claims, which were staked in 1915 by H. A. McCafferty and are now owned by Wm. S. Barclay. The claims are reached from Wekusko lake over a road slightly more than 2 miles long. The vein strikes northeast and dips steeply southeast. Soon after the discovery of the deposit in 1915 the vein was traced by trenches for a length of 1,600 feet, and had been explored to a depth of 27 feet in a two-compartment shaft, known as the No. 1 shaft. Bingo Gold Mines, it is reported, later sunk No. 2 shaft to a depth of 90 feet and then drifted about 75 feet along the vein. This shaft is on the vein at a point 300 feet northeast of No. 1 shaft. During the summer of 1930 the Consolidated Mining and Smelting Company held an option on the property and did additional trenching; after sampling the vein they dropped the option in the autumn of 1930. In 1934 the Canadian Mining Projects, Limited, held the property under option, did further trenching and sampling, and tested the vein at depths of about 100 feet in thirteen diamond drill holes. Financial difficulties forced the company to abandon operations in the autumn of 1934. Diamond drilling was resumed during the summer of 1935 by Bailor Gold Mines, Limited, who had optioned the property in April of that year. This company tested the vein in nineteen additional diamond drill holes. Nine of these holes cut the vein at a depth of 100 feet, and these, together with the drilling done by the previous operators, have cut the vein at intervals of 50 to 100 feet for a total length of 1,600 feet along the strike. Seven of the nineteen drill holes cut the vein at vertical depths of about 300 feet and were placed so as to penetrate a section of the vein extending for 350 feet northeast, and 250 feet southwest, of No. 1 shaft. The remaining three holes cut the vein at vertical depths of 400 to 600 feet in a part of this section. Two small veins outcropping at localities 300 feet and 500 feet, respectively, northerly from No. 2 shaft, were also tested by diamond drilling.

Rocks near the vein are largely covered by clay and glacial drift. Rock outcrops and drill cores consist chiefly of rather fine-grained, schistose, biotite dacite that varies in colour from grey to reddish grey. The grain

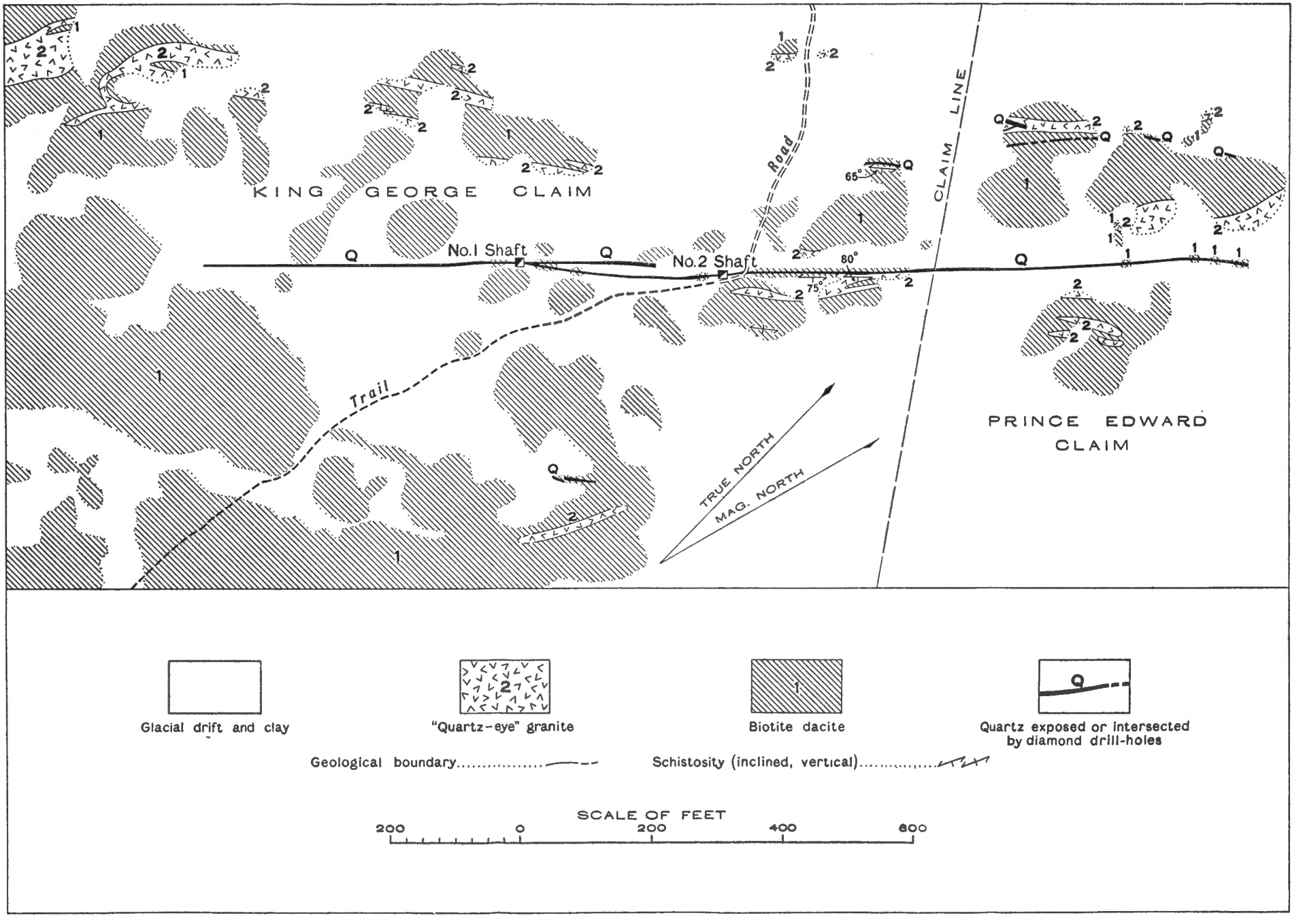

Figure 1. McCafferty vein.

size varies slightly from place to place and some of the rock is brecciated. Planes of schistosity in the dacite strike north 50 degrees east and are roughly paralleled by irregular, dyke-like bodies of schistose "quartz-eye" granite, and by a few small dykes of lamprophyre. The granite dykes are identical in appearance with a large body of "quartz-eye" granite outcropping 400 feet northwest of the northeast end of the vein. Some of the lamprophyre dykes are of fine-grained biotite-rich rocks and others have large feldspar phenocrysts.

The main vein strikes north 45 degrees east and dips from 75 to 80 degrees to the southeast. It crosses dacite and dykes of "quartz-eye" granite, and these rocks are more schistose than normally for 1 to 6 inches outwards from the vein. In a section that has been stripped continuously in a long trench extending from 40 to 280 feet northeast of No. 2 shaft, the vein varies from 1½ to 4½ feet wide and averages 2½ feet wide. Elsewhere on the surface the quartz varies from 3 inches to 4 feet wide and is generally a foot or two wide. In some of the drill holes quartz is mixed with schist across widths of 6 feet. At No. 1 shaft the vein splits into two branches. The results of the diamond drilling suggest that the two branches lie side by side for at least 200 feet northeast of the shaft.

In the long trench northeast of No. 2 shaft the quartz varies from white to grey and commonly holds thin shreds of sericitic schist that lie parallel to the walls and give the quartz a banded appearance. Finely crystalline needles and grains of arsenopyrite are plentiful along the shreds of schist and in dark streaks in the quartz. The quartz also carries a few grains of pyrite and carbonate and much black tourmaline. Crystals of arsenopyrite lie in the wall-rocks for a foot or more from the vein. At No. 1 shaft the quartz carries galena in addition to arsenopyrite and tourmaline. In a pit just south of No. 2 shaft, free gold was seen in quartz carrying scattered small grains of arsenopyrite, chalcopyrite, galena, sphalerite, and tourmaline.

Canadian Mining Projects, Limited, have reported that channel sampling of a section of the vein northeast of No. 2 shaft indicated an average gold content of 0·47 ounce a ton across an average width of 2½ feet for a length of 286 feet. Since the completion of the drilling by Bailor Gold Mines, Limited, it has been reported that an average value of $8.60 a ton has been obtained over an average width of 37 inches for a length of 700 feet.

The small quartz vein outcropping 300 feet north of No. 2 shaft is exposed for 50 feet along the strike of about north 45 degrees east. The vein dips 65 degrees southeast, is 1 foot wide, and carries arsenopyrite, pyrite, pyrrhotite, and black tourmaline. At a point 500 feet northerly from No. 2 shaft an irregular mass of barren quartz up to 8 feet wide lies in a dyke of "quartz-eye" granite.

Several other narrow quartz veins are known on the property.

Molly Claim

This claim is owned by Mr. John Blain who staked it about 1925. A narrow quartz vein (Locality 3 on Map 374A) lies near the northwest boundary of the claim and may be reached from Wekusko lake over a trail nearly 2 miles long.

The vein lies 700 feet east of the northeast end of a large body of quartz-feldspar porphyry and follows closely the northeasterly striking contact between rhyolite breccia and cherty sediment, but generally lies in one or the other of these rocks. The rhyolite breccia lies to the southeast, is locally poorly bedded, forms a band about 6 feet wide, and is overlain to the southeast by fine-grained arkose. The layer of cherty sediment lying northwest of the narrow band of breccia is from 10 to 20 feet wide. It is composed of dense, red rock in layers from 1 inch to 6 inches wide, separated by thin partings of pale green sericite schist. The cherty sediment is followed to the northwest by a sill of highly sheared " quartz-eye " granite that has been intruded along the contact between the cherty sediment and a 50-foot wide band of rhyolite breccia still farther to the northwest. A 15-foot wide dyke of biotite lamprophyre lies along the middle of the granite sill and another similar dyke has been intruded along the northwest edge of this granite body. A few dykes of quartz porphyry cut biotite dacite about 300 feet west of the south end of the deposit.

The deposit has been explored in a prospect shaft, has been traced in trenches for a length of 500 feet, and passes beneath drift at both ends. The vein strikes north 48 degrees east and dips 80 degrees southeast. The quartz commonly varies from 1 inch to 1 foot wide and averages about 6 inches wide. A few small quartz stringers lie near the main vein and strike parallel to it. At a few localities several closely spaced stringers of quartz branch outwards from either side of the main vein and extend for a few feet into the wall-rock. The branch veinlets are contorted, or strike north at an angle to the banding or cleavage of the enclosing rocks. At such localities the combined width of vein quartz and rock is up to 5 feet. A few specks of pyrite were seen in the quartz at several places in the deposit. In the shaft the quartz is sparsely mineralized with disseminated pyrite, pyrrhotite, and chalcopyrite, and carries visible gold. It is reported that material from the shaft carried high values in gold.

Nemo Group

This group includes the Bing, Nemo, Peter, Roy, and several other claims acquired in June 1935 by the Kusko Exploration Syndicate, of which M. J. Hackett, Herb Lake, Manitoba, is trustee. A trail 1 mile long leads from the shore of Wekusko lake to a cabin on the property, from which branch trails lead to various deposits that have been discovered on the property. Nine or more deposits have been found and four of these were tested during the summer of 1935 by shallow diamond drill holes put down by the Kusko Exploration Syndicate. The deposits lie in and near a lenticular stock of quartz-feldspar porphyry.

The *Bing claim* was staked in 1922 by Gaspard Richard. Four deposits have been discovered on this claim.

Number 1 deposit (Locality 4 on Map 374A) is a quartz vein lying for the most part along a contact between rhyolite breccia and dacite. The vein strikes north 45 degrees east, dips about 80 degrees southeast, and is exposed for 140 feet. The quartz varies from 2 inches to 1 foot wide,

and in one pit two small veins lie parallel to one another and are 5 feet apart. The quartz is sparingly mineralized with pyrite and arsenopyrite and is said to assay up to 0·40 ounce of gold a ton. Dark streaks in the quartz parallel the walls and give the vein a banded appearance. The vein pinches out at the southwest end. To the northeast it passes beneath drift and may join with a small quartz stringer outcropping 140 feet farther northeast.

Number 2 deposit (Locality 5 on Map 374A) follows closely a band of andesitic lava from 4 to 6 feet wide that lies along a contact between rhyolite breccia and quartz-feldspar porphyry. The rocks along the contact are sheared, and their cleavage strikes north 40 degrees east and dips vertically. A few irregular lenses and stringers of quartz lie in the schist across widths of 4 to 8 feet and are exposed in prospect workings for a length of 200 feet along the strike. The schist and quartz are stained with iron oxide and carry a few specks of pyrite.

Number 3 deposit (Locality 6 on Map 374A) is a quartz vein lying in quartz-feldspar porphyry. The porphyry near the vein is cut by lamprophyre dykes striking about north 80 degrees east and has a schistose structure striking north 50 degrees east and dipping about vertically. The vein has been traced in prospect pits for a length of 220 feet. For most of this length the strike is north 50 degrees west, crossing the dykes and the cleavage of the porphyry at high angles, and dipping as low as 20 degrees northeast. This part of the vein is about 1 foot wide. Small quartz stringers locally branch from the gently dipping vein and extend upwards into the hanging-wall for a few feet along the cleavage direction of the porphyry. Near the northwest end the vein swings sharply to the southwest and follows the cleavage direction of enclosing porphyry for a distance of 50 feet before pinching out. This part of the vein dips 40 degrees northwest and is commonly only 2 to 4 inches wide. Much of the quartz is white and apparently barren of sulphides, but some of it is dark coloured and holds streaks of finely crystalline arsenopyrite, parallel to the walls of the vein. It is said that free gold has been found in a large pit on the narrow, southwesterly trending part of the vein.

Number 4 deposit (Locality 7 on Map 374A) is a quartz vein lying in quartz-feldspar porphyry. The vein is exposed for a length of 75 feet along the strike of north 35 degrees east. It pinches out at the southwest end and passes beneath drift at the other end where it has been tested by a diamond drill hole placed so as to cut the vein at a depth of about 30 feet. The vein varies from 2 inches to 1½ feet wide; a few stringers alongside the vein give a total maximum width of 2½ feet of mixed rock and vein material. The quartz carries a small amount of disseminated arsenopyrite.

The *Nemo claim* was staked in 1915 by Percy McDavitt. On this claim a quartz vein (Locality 8 on Map 374A) is exposed along the top of a low rock hill. Early workings were confined to the high ground and consist of a prospect shaft 20 feet deep and a few shallow pits. During the summer of 1935 the vein was tested in six diamond drill holes, each placed so as to cut the vein at a depth of about 50 feet. Three of the holes were put down beneath the vein exposures on the hill and three were placed in low ground along the strike to the southwest and within a distance of 120 feet from the base of the hill.

The vein lies in arkosic rock that has a poorly developed cleavage striking north 45 degrees east and dipping from 70 to 80 degrees northwest. The vein follows a slightly curved course, striking parallel to the cleavage of the enclosing rock at the south end and crossing the cleavage toward the north, where the vein strikes north 10 degrees east. In the shaft near the north end of the deposit the vein dips 85 degrees east, crossing the cleavage of the arkose.

The vein is exposed at intervals in the surface workings and on natural outcrops for a length of 280 feet and passes beneath drift at both ends. The quartz commonly varies from 1 foot to 2 feet wide, although it is 5 feet wide in the shaft. The quartz carries chalcopyrite, sphalerite, galena, pyrite, and black tourmaline, and is reported to assay up to 0·38 ounce of gold a ton.

The *Peter claim* (shown on Map 375A as Buster claim) was staked in 1928 by Mary Chartrand. Three deposits are known on the claim and these lie in quartz-feldspar porphyry. The porphyry has a schistose structure striking north 45 degrees east and is cut by dykes of lamprophyre.

Number 1 deposit (Locality 11 on Map 375A) is the largest of the three and is exposed at intervals for a length of 300 feet and has been tested by two shallow diamond drill holes. The deposit as a whole strikes north 25 degrees east, crossing the cleavage of enclosing porphyry at an angle of 20 degrees. Individual quartz stringers that comprise the deposit, however, generally lie along cleavage planes of the porphyry and so strike at an angle to the deposit as a whole and form a ladder-like structure. A few quartz veinlets lie along short shear zones that follow the general strike of the deposit. Individual quartz bodies are usually less than 10 feet long and only a few inches wide. The width of mixed quartz and porphyry varies from 3 to 5 feet along most of the exposed length. The quartz and adjacent schistose porphyry carry disseminated grains and crystals of arsenopyrite, and some of the quartz carries a little feldspar or is well mineralized with streaks of fine and coarse arsenopyrite.

Number 2 deposit (Locality 13 on Map 375A) consists of a broad zone of quartz stringers and lenses in porphyry. The lenses and stringers vary from ½ inch to 8 inches wide and generally strike about parallel to the cleavage of enclosing rock. The quartz bodies are fairly abundant in a large pit for a length of 30 feet along the strike and across a width of 5 feet, and are scattered here and there across a total width of 50 feet. The quartz carries small amounts of red feldspar and black tourmaline, and the porphyry carries disseminated grains of pyrite and arsenopyrite. The porphyry and quartz are crossed by a few veinlets of muscovite. Gold values are said to be low.

Number 3 deposit (Locality 12 on Map 375A) consists of a zone of quartz stringers in porphyry. The zone of mixed quartz and schistose porphyry varies from 1 foot to 3 feet wide and is exposed for 80 feet along the strike of north 45 degrees east. The porphyry near the quartz stringers carries pyrite and arsenopyrite; the quartz carries feldspar and muscovite.

The *Roy claim* was staked in 1919 by Roy N. Leslie. A narrow quartz vein in the southwest part of the claim (Locality 14 on Map 375A) has been stripped for 100 feet along the top and down the steep northern slope of a hill of dacite. Pits have been dug in clay along the strike of the vein for 70 feet northeast, and 200 feet southwest, of the exposure on the hill.

During the summer of 1935 the vein was tested at depths of 50 or 60 feet by five diamond drill holes. Three of the holes were put down within a distance of 100 feet north of the hill, and two were sunk within 150 feet south of the hill.

The vein strikes north 20 degrees east and dips 85 degrees southeast. On the north face and top of the hill the vein is commonly less than 6 inches wide. Locally the quartz holds inclusions of country rock and at such localities the zone of mixed quartz and schist is up to 2 feet wide. The wall-rock is partly altered to sericite schist. Much of the quartz is sugar-grained and white and some of it is coarse and glassy. The quartz carries small amounts of muscovite, pyrite, and black tourmaline. The trenches in the clay had caved in at the time of examination, so that vein material could be seen only in a long trench 100 feet south of the hill where the vein is 10 inches wide and is exposed for a length of 10 feet. The vein is reported to assay up to 0·50 ounce of gold a ton.

Jack Pot Claim

A vein of quartz (Locality 15 on Map 375A) in the southwest corner of the Jack Pot claim may be reached from a bay in Wekusko lake over a trail 1,600 feet long. The claim was staked in 1923 by Marshall Ballard and is owned by him and John Hone of The Pas, Manitoba.

An elongated body of biotite dacite crosses the northwest part of the claim and is bordered by greywacke with phases of pebble conglomerate. The deposits lie in the dacite near its southwest end. Workings completed at the time of examination comprised nine prospect pits and a diamond drill hole placed so as to cut the vein quartz at a vertical depth of about 50 feet.

Four of the pits are about equally spaced for 400 feet along a drift-filled depression striking north 65 degrees east. The depression is poorly defined along the southwest part, but toward the northeast is well marked between steep rock walls. There the depression is 20 feet wide and continues for about 200 feet beyond the most northeasterly pit. A few stringers of quartz are exposed in sheared dacite in two of the pits, and vein quartz is said to be 1½ feet and 3 feet wide, respectively, in the other two pits which are now caved in. Quartz is better exposed along what appears to be a branch vein extending west for 150 feet from the vein zone just described. In the branch vein, quartz, with or without included bands of dacite, varies from 2 feet to 4 feet wide on the surface, and is said to be 11½ feet wide where cut by the diamond drill hole. The quartz is sparingly mineralized with finely crystalline arsenopyrite. Other small veins lie here and there across a maximum width of 50 feet between the branch vein and the vein zone along the depression.

At a point 350 feet east of the most northerly pit in the depression another deposit has been uncovered in two prospect pits 30 feet apart, exposing schistose dacite with quartz lenses and stringers across a width of 6 feet. This quartz carries pyrrhotite.

The owners report that, during the winter of 1935-36, five shallow diamond drill holes were put down along the drift-filled depression and that these cut narrow widths of vein quartz.

Harry Bill Claim

This claim was staked in 1922 by Mabel Billings and is now owned by Marshall Ballard of Herb Lake, Manitoba. A prospect pit (Locality 25 on Map 375A) has been dug near the east boundary of the claim at a locality 100 feet northeast of a small cabin. The pit is 15 feet long in a direction north 50 degrees east and lies in quartz porphyry. Vein quartz on the dump carries disseminated pyrite, galena, and black tourmaline; the porphyry on the dump carries disseminated pyrite.

Other pits lie in porphyry nearby, but no important amount of vein material is exposed.

Pine Claim

This claim was staked in 1919 by Kathleen C. Rice and is now owned by Dr. S. E. Shaw and J. G. Munroe. Near the south boundary of the claim prospect pits have exposed a zone of schist carrying veins of quartz (Locality 26 on Map 375A). The deposit strikes north 70 degrees east and is exposed along the northwest edge of an outcrop of conglomerate carrying garnets and pebbles of quartz from 1 inch to 8 inches in diameter. Wright[1] reports that the zone of quartz-sericite schist is 12 feet wide, is exposed for a length of 180 feet, and carries stringers of white quartz. In one pit, in a breadth of 8 feet of schist, the total width of quartz is 3 feet. The quartz and schist carry some pyrite.

Elizabeth-Dauphin Claims

These two claims were staked in 1915 by J. M. Wanless, of The Pas, Manitoba, and are now owned by him, J. R. Campbell, M. J. Hackett, and E. H. Gurton. The claims are reached from Wekusko lake over a road about a mile long. Following the discovery of a gold-bearing quartz vein on the property, the claims were optioned in 1915 to Mines Exploration Syndicate, which was managed by Makeever Brothers. This syndicate dropped the option after doing some preliminary work on the vein. In 1917 the claims were sold to The Pas Consolidated Mines which had been organized to develop the property. By the following year the vein had been explored in a shaft to a depth of 50 feet and had been traced in trenches for a length of 800 feet or more. Little work has been done on the deposit since that time.

The vein on which the shaft has been sunk (Locality 29 on Map 375A) lies in the southwest part of a lenticular stock of quartz-feldspar porphyry nearly a mile long. In the vicinity of the deposit (*See* Figure 2) the porphyry is bordered on the southeast side by coarse, amygdaloidal, andesitic lava. The lava is cut by a lens of fine-grained, red rock that carries numerous, large eyes of quartz and is possibly a phase of the "quartz-eye" granite. The quartz-feldspar porphyry holds bands and patches of conglomerate, and some of the inclusions are cut by dykes and lenses of the porphyry. A few bands and patches of acidic volcanic breccia lie in the andesite, conglomerate, and porphyry. The conglomerate,

[1]Wright, J. F.: "Geology and Mineral Deposits of a Part of Northwest Manitoba"; Geol. Surv., Canada, Sum. Rept. 1930, pt. C, p. 82.

breccia, and porphyry are cut by dykes of biotite and hornblende lamprophyre that locally carry small garnets and large phenocrysts of plagioclase.

The quartz vein dips about vertically and follows a slightly curved course, changing gradually from north 40 degrees east at the northwest end to north 70 degrees east at the southwest end. At different localities along the strike the vein cuts conglomerate, breccia, quartz-feldspar porphyry, and lamprophyre dykes. At the time of examination the quartz was exposed by stripping and trenching at intervals for 830 feet along the strike and is said to have been traced for 200 feet farther southwest in pits sunk in clay and swamp. In the most southwesterly of the pits in the swamp the quartz is said to be 12 feet wide. Where exposed in the trenches the vein varies from 1 foot to 4½ feet wide and averages about 2½ or 3 feet wide. At the shaft the vein is reported[1] to be 6 feet wide at the surface and 3 feet at the bottom. The quartz carries a small amount of carbonate, is sparingly mineralized with patches of pyrite and small grains of arsenopyrite, pyrrhotite, and chalcopyrite, and is reported[2] to carry galena and free gold. Streaks of finely crystalline arsenopyrite lie along shreds of sericite schist in the quartz.

At many localities near the main vein the porphyry is cut by quartz stringers along cleavage planes that strike about north 45 degrees east. A few pits have been dug across zones up to 25 feet wide in which the stringers are abundant and in which both quartz and schistose porphyry carry scattered grains of pyrite.

It is said that seven quartz veins were crossed in a trench dug in clay for nearly 500 feet northwest from a point 300 feet north of the shaft. Some of these veins are reported to carry good values in gold and to be mineralized with arsenopyrite, pyrite, sphalerite, and galena. Trenches were dug along the strike of two of these veins (Locality 28 on Map 375A) near the west boundary of the Elizabeth claim. All the trenches had caved at the time of examination so that almost no bedrock or vein quartz could be seen. .

Bingo Group

This group includes the Bingo, LeRoy, Gold Eagle, and other nearby claims. The three claims were staked in 1915 by James McCormack, Frank Moore, and Robert Hassett, and are now owned by Bingo Gold Mines, Limited. The interests of shareholders in this company are represented by the Northern Trust Company, 333 Main street, Winnipeg, Manitoba. Some surface work has been done on deposits on the LeRoy and Gold Eagle claims, but interest has centred on a deposit on the Bingo claim where underground work has been done.

Bingo Claim. Preliminary work is reported to have been done on gold-bearing quartz veins on the Bingo claim as early as 1917. From 1922 to 1924 the deposit (Locality 32 on Map 375A) was under development by Bingo Mines, Limited, who sank a shaft to a depth of 400 feet, drifted slightly over 600 feet on each of four levels, and did some 200 feet of crosscutting. The shaft at the surface is inclined 80 degrees toward the northwest. Uniformly high values were reported in the drifts and cross-

[1]Wallace, R. C.: Manitoba Bulletin, p. 35, 1919.
[2]Wright, J. F.: Geol. Surv., Canada, Sum. Rept. 1930, pt. C, p. 84.

cuts, and the foundation and frame of a large mill had been completed in 1924 when the mine workings were thoroughly sampled independently by J. A. Reid and J. D. Dresser for Bingo Mines, Limited. Their assay results were published in detail[1-2] and showed that average values were low and that no commercial ore-body had been developed. Dresser found an average value of $1.69 over an average width of 61 inches for all drifts in the mine totalling 2,434 feet long. The best section in the mine averaged $8.87 over a width of 49 inches and a length of 80 feet. All values of importance are confined to the vein which apparently averages 16 inches wide.

The great discrepancy between the results obtained by these engineers and those reported at an earlier date resulted in a series of court actions. Bingo Mines, Limited, was liquidated and the assets were purchased by a new company known as Bingo Gold Mines, Limited. The new company reopened the property and in 1926 installed a 10-ton mill to make mill tests of the ore. Production amounted to 128 ounces of gold.[3] Following this test, diamond drilling was done from the underground workings and from the surface on nearby claims to the west and north. It is reported that twelve holes in all were drilled. Four of these were seen on the Trapper and LeRoy mineral claims at points from 300 to 800 feet northwest of the projected strike of the vein. One was put down at an angle of 45 degrees, and the others at from 80 to 85 degrees toward the vein. No work has since been done and the test mill was later sold and removed from the property.

Rock outcrops in the vicinity of the shaft are of fine-grained, schistose, quartz-feldspar porphyry that forms a body about 400 feet wide and probably 1,000 feet or more long. This is followed on both sides by arkosic rocks with layers of conglomerate, volcanic breccia, and tuff. All these rocks are cut by lamprophyre dykes.

The vein on which the shaft was sunk is covered with the mine dump and its approximate location as shown on Map 375A has been determined from descriptions of underground workings. The only vein quartz now exposed occurs as stringers and lenses in prospect pits on three narrow zones from 200 to 300 feet southwesterly from the shaft. In 1919, however, before the shaft was sunk, the property was examined by R. C. Wallace[4] who reports that four, parallel, narrow veins were exposed within a width of 60 feet and that one of these varied from 8 inches to 24 inches wide, had unusually numerous showings of gold on the surface, and carried a fair amount of galena. Wallace[5] again visited the property in 1923 when the shaft was 225 feet deep and some drifting and crosscutting had been done. He reports that the vein on which the shaft is sunk, and a parallel vein to the east, dip about 75 degrees east and are mineralized with pyrite, galena, and free gold. Material at present on the mine dump consists chiefly of massive, grey, and schistose, pale green quartz-feldspar porphyry with lesser amounts of vein quartz. Some of the porphyry carries disseminated crystals of arsenopyrite and some pieces of quartz carry a small amount of black tourmaline and are mineralized with scattered grains and streaks of finely crystalline arsenopyrite.

[1] "Sampling of the Bingo Mine by Reid and Dresser"; Can. Min. Jour., vol. 46, pp. 472-473 (May 8, 1925).
[2] Wright, J. F.: Geol. Surv., Canada, Sum. Rept. 1930, pt. C, pp. 81-84.
[3] Robinson, A. H. A.: "Gold in Canada 1935"; Mines Branch, Dept. of Mines, Canada, p. 57.
[4] "Mining and Mineral Prospects in Northern Manitoba"; Northern Manitoba Bulletin 1919, p. 35.
[5] "The Pas Mineral Belt in 1923"; Can. Min. Jour. 1923, vol. 44, p. 758.

LeRoy Claim. Three deposits were examined on this claim. One of these is on the east boundary (Locality 30 on Map 375A). Rocks in the vicinity of the deposit include alternating layers of arkose and pebble conglomerate cut by a dyke of garnetiferous lamprophyre, and a dyke of biotite dacite. The dyke of dacite is 30 feet wide and strikes north 40 degrees east. The deposit consists of lenses and stringers of quartz in a schistose zone that lies partly in the sediments and partly in the dacite dyke. The zone strikes north 35 degrees east and dips about 85 degrees northwest. The quartz and schist are well exposed in prospect pits for 140 feet along the strike. The deposit pinches out in dacite at the northeast end and passes beneath swamp to the southwest where it is reported to have been followed in prospect pits for an additional 80 feet. Lenses and veins of quartz are distributed at intervals in the schist across widths of 3 to 8 feet. Individual bodies of quartz are up to 1 foot wide and strike parallel to the cleavage of enclosing schist. Some of the lenses carry small amounts of muscovite and red feldspar. Crystals of arsenopyrite are numerous in the schist. Arsenopyrite is somewhat less abundant in the quartz where it occurs as scattered crystals and streaks of finely crystalline material. It is said that free gold, also, has been found in the deposit.

In the northeast corner of the claim a small amount of stripping has been done along a dyke of grey rhyolite cut by lenses and stringers of quartz. The dyke cuts arkose, varies from 1 foot to 3 feet wide, and has been traced for 170 feet along the strike of north 5 degrees west. Both the dyke rock and vein quartz are mineralized with shreds of fine-grained arsenopyrite.

In the southeast corner of the claim (Locality 31 on Map 375A) several pits have been sunk in a swamp for 130 feet along a strike of north 45 degrees east. Mr. Marshall Ballard says that in one of the pits three veins 4 inches, 9 inches, and 16 inches wide, respectively, were found across a total width of 4½ feet, and that abundant free gold was found in one of these veins. Pieces of vein quartz near the pits, and apparently taken from them, carry streaks of finely crystalline arsenopyrite.

Gold Eagle Claim. A quartz vein in the southwest part of this claim (Locality 27 on Map 375A) lies along a fault that has been traced for 350 feet along the strike of north 5 degrees east. The rock on the east side of the fault is chiefly pebbly conglomerate, whereas arkose lies along the whole of the west side of the fault.

The vein outcrops on a steep southerly facing cliff where the quartz varies from 2 feet to 3 feet wide. The quartz is fine grained, and both it and nearby sediments carry a small amount of finely crystalline arsenopyrite. North of the cliff face the vein narrows until finally only a few quartz stringers are exposed in the narrow schist zone and drift-filled depression that mark the continuation of the fault. South of the cliff face bedrock is covered and three deep test pits have been sunk in clay along the strike of the vein for 70 feet from the base of the cliff. Three other deep pits have been dug in clay along the base of the cliff, which trends almost at right angles to the vein. All the pits in the clay were partly filled with water and the walls had caved at the time of the writer's visit.

Rex Group

The Rex group, owned by Laguna Gold Mines, Limited, comprises some fifteen claims and fractions on the east shore of Wekusko lake. A gold-bearing quartz vein (Locality 33 on Map 375A) was discovered on the property in 1914 and was staked by Messrs. J. A. Campbell, Robert Hassett, and Frank Moore. The vein was soon traced by stripping and trenching for a length of about 1,800 feet along the strike of north 35 degrees east. In the following year Makeever Brothers took over the property and commenced sinking two shafts on the vein. One of these was sunk near the northeast end of the vein and became known as the main shaft. The other is a prospect shaft, and was sunk at a point 860 feet southwest of the main shaft. In 1918 Makeever Brothers promoted Herb Lake Gold Mines, Limited, who immediately built a mill with a capacity of 30 tons a day. This company operated the mill from the first of May to the end of November 1918, with a production of 1,377 ounces of gold. The mill was then closed and was not operated again until 1920 and 1921 when 268 ounces of gold was produced.[1]

Following a thorough sampling of the vein and a metallurgical test of the ore,[2] the mine was again operated from March 1924 until October 1925 by Manitoba Metals Mining Company, Limited, a subsidiary of Mining Corporation of Canada, Limited. Production during this period amounted to 5,517 ounces of gold.

At that time the prospect shaft had been sunk to a depth of 110 feet, the main shaft had been sunk to a depth of 423 feet, some 1,800 feet of drifting had been completed on the 100-, 200-, and 350-foot levels, and a raise had been completed from the southwest end of the 100-foot level to the surface, at a point on the vein 560 feet southwest of the main shaft. Most of the ore had been taken from stopes above the 100-foot and 200-foot levels, and had been mined chiefly from two ore shoots. These shoots come to the surface at about 50 feet and 250 feet, respectively, southwest of the main shaft, and both of them pitched steeply northeast.

No further work was done in the mine until June 1934, when the property was acquired by Laguna Gold Mines, Limited, another subsidiary of Mining Corporation of Canada, Limited. Laguna Gold Mines, Limited, dismantled the old mill, and installed new mining equipment and a Diesel electric plant for generation of power. Under the management of Mr. D. C. Leggett, the company then undertook an extensive underground development program and, by March 1936, additional drifting had been completed on the 350-foot level, new levels had been opened up at 500, 625, and 750 feet as measured down the incline, and some diamond drilling had been completed laterally from the underground workings. Several commercial ore shoots have been found and the two major shoots which earlier operators had discovered in the upper levels are reported to continue to the 750-foot level. The company officials, in March 1936, estimated positive and probable ore reserves between the 350- and 760- foot levels at 30,806 tons with an average grade, depending on the method of calculation, of either 0·63 or 0·507 ounce of gold a ton, after making allowances for

[1]Robinson, A. H. A.: "Gold in Canada, 1935"; Mines Branch, Dept. of Mines, Canada, p. 57.
[2]Parsons, C. S.: "Investigations in Ore Dressing and Metallurgy, 1924"; Mines Branch, Dept. of Mines, Canada, pp. 58-61.

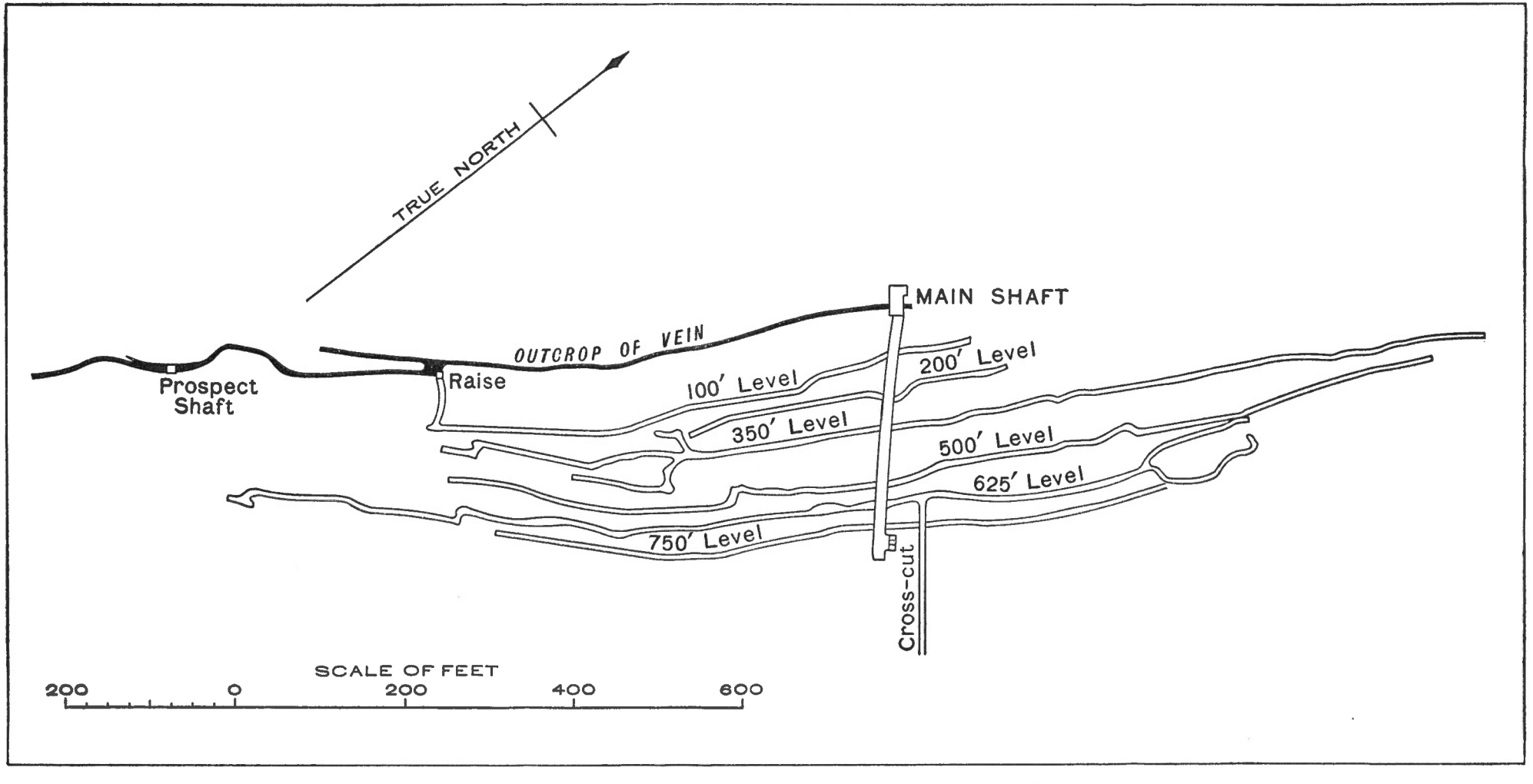

Figure 4. Generalized plan of main underground workings, Rex group of claims.

dilution in stoping. In addition there was on the surface dump 4,200 tons carrying 0·27 ounce of gold a ton. They announced that $300,000 had been spent since June 1934 upon the equipment and development of the property, and that it was proposed to build a mill with a capacity of 50 tons a day. The mill went into operation on August 1, 1936. Since the completion of the field work on which this report is based, a new vertical shaft has been completed and two new levels were being opened up at 875 feet and 1,000 feet.

Rocks in the vicinity of the deposit (*See* Figure 3) include chiefly sediments intruded by lenticular stocks of quartz-feldspar porphyry. Bedding planes in the sediments commonly strike about north 35 degrees east and dip from 85 degrees southeast to vertical, or are overturned. Tops of the beds face southeast. A band of crossbedded, quartzose greywacke outcrops along and near the shore of Wekusko lake. The greywacke passes upwards into conglomerate interbedded with some layers of coarse arkose and greywacke, as exposed on outcrops surrounding the larger porphyry stock. The conglomerate and associated strata are overlain by tuff and volcanic breccia interlayered with a few beds of quartzose sediment, as well exposed near the east boundary of the Moore claim. Here the tuff is a well-bedded rock composed of small fragments of a variety of rock types. The volcanic breccia is made up almost entirely of closely packed, angular blocks of acid volcanic rock carrying small phenocrysts of quartz and feldspar. The breccia is clearly of surficial origin, for it is locally bedded and carries a few pebbles and grains of quartz.

The lenticular bodies of quartz-feldspar porphyry lie with their long axes about parallel to the bedding of the sediments. The porphyry is a fine-grained, grey, schistose rock carrying inconspicuous, small phenocrysts of quartz and feldspar. The rock is quite similar in appearance to the fragments of the volcanic breccia of surficial origin described above. However, the larger body of porphyry, which extends from the Bendigo claim to the Moore claim, is clearly intrusive into the sediments and surficial fragmental rocks, for it sends branch dykes outwards into these rocks and holds included bands of the sediments. This porphyry body is slightly brecciated along its southeast edge in the northwest part of the Moore claim. The smaller porphyry lens, which lies on the Rex claim and is exposed on a few small outcrops just east of the larger lens, is not definitely known to be intrusive. This body is locally unbrecciated like the greater part of the larger lens, but is commonly much broken into angular blocks. This brecciated porphyry is unbedded and is not associated with sedimentary material, but otherwise resembles somewhat the volcanic breccia of surficial origin.

The quartz-feldspar porphyry and sediments are cut by several, irregular-shaped, dyke-like, and branching bodies of lamprophyre that commonly trend from north to northeast. The lamprophyre varies from a coarse-grained, hornblende-rich rock to a fine-grained, biotite-rich rock, and locally carries small garnets and large feldspar phenocrysts.

Schistose structure is well developed in the quartz-feldspar porphyry and is locally seen to cross the contacts and extend, without change in strike, into nearby sediments and through lamprophyre dykes. The cleavage was clearly developed after the solidification of all of these rocks.

The cleavage in the larger porphyry lens generally strikes about north 45 degrees east, crossing the long axis of the body at an angle of 10 or 15 degrees.

Stringers of vein quartz are abundant in the lenses and dykes of quartz-feldspar porphyry, where they usually follow the northeasterly striking cleavage of enclosing rock. The stringers are as a rule only an inch or less wide and are remarkably straight for distances of 50 feet or more along their strike. Most outcrops show many such parallel stringers from 6 inches to 2 feet apart over areas 20 feet or more wide. Although the veinlets are more plentiful in some parts than others, they occur almost everywhere throughout the porphyry and are not confined to any particular zone or zones. Quartz stringers also cut the sediments and lamprophyre, but have a marked preference for the porphyry. This feature is well shown in a branch dyke that extends easterly from the larger porphyry lens. The dyke is crossed nearly at right angles to its strike by numerous lenses and stringers that follow the regional northeasterly cleavage and pinch out at or near the edges of the dyke without penetrating into the adjoining tuff. The stringers within the main body of porphyry likewise generally pinch out before contacts with lamprophyre dykes are reached, although some of them cross the contacts and penetrate the lamprophyre. Although most of the stringers in the larger porphyry body follow the cleavage and lie at an angle to the long axis of the mass, a few strike parallel with the long axis, like the main vein described below, and, at one locality, are cut by the stringers that follow the cleavage.

The main vein (*See* Figure 3), as already stated, strikes parallel to the long axis of the porphyry body. The wall-rock on both sides of the vein, as shown in underground workings, is cut by many small quartz stringers that strike somewhat more easterly than the main vein and lie about parallel to the abundant quartz stringers that follow the cleavage of the porphyry on the surface. Some of the stringers underground seem to branch from the main vein and others definitely cross it and are younger.

The main vein is now exposed at intervals in trenches for 1,520 feet southwest of the main shaft and is said to have been traced as a narrow stringer in early surface work, now largely obscured, for 260 feet northeast of this shaft. On the 350-foot level the vein has been followed for 580 feet northeast of the main shaft, giving a total known length of 2,100 feet. Southwest of the shaft, the vein outcrops for the most part just within the larger porphyry body close to its northwest contact with sediments and locally follows the contact or lies within the sediments. The early work north of the shaft apparently indicated that the vein continues along or near the northwest contact of a porphyry dyke that branches from the main body. On the 350-foot level northeast of the shaft the vein lies in porphyry for most of its length, but locally lies along the contact between porphyry to the southeast and sediment to the northwest. As no lateral work has been done here it is not known whether this porphyry is the downward continuation of the dyke or the main lens.

The main shaft closely follows the dip of the vein, which averages from 70 to 75 degrees southeast, and the drifts on the various levels (*See* plan of workings, Figure 4) likewise generally follow the vein. Except as mentioned above, the vein in the underground workings lies within the limits of the main porphyry stock. At many localities, narrow patches of

lamprophyre occur here and there along one or both walls of the quartz vein and seem to have been injected along a zone of weakness that later controlled the deposition of the vein material. In places lamprophyre and porphyry are highly schistose immediately adjacent the vein, but the zone along which the quartz has been deposited is not a strong shear.

The quartz varies greatly in width up to 6 feet and averages possibly about 2½ feet. At a few places the vein curves sharply along the strike and down the dip, or splits into two or more branches. The quartz generally continues unbroken from 200 to 500 feet along the strike, but locally pinches out, only to be found again within a few feet along the strike or nearby on either side. At the most southerly surface exposure the vein narrows abruptly to a stringer at the contact with an inclusion or tongue of sediment in the porphyry. At the most northerly explored points the vein likewise narrows to small stringers and apparently dies out. At neither end has the vein been found to continue for any distance into the sediments, indicating that the main vein, like the small stringers described above, shows a preference for the porphyry.

According to information kindly supplied by the mine officials, diamond drilling has shown that the two porphyry stocks approach one another in depth and finally meet to form a single body (*See* section on A-B and C-D, Figure 3). Accordingly, it might be expected that porphyry continues to a great depth down the dip of the vein.

The quartz of the main vein varies from white to bluish, and from coarse grained to sugary. Finely crystalline arsenopyrite is the most abundant metallic mineral present; it occurs as disseminated grains in the quartz and wall-rock and, more commonly, along dark streaks in the quartz. These streaks lie parallel to the walls and give the vein a banded appearance. Small amounts of galena, sphalerite, pyrite, and native gold are mixed with the finely crystalline arsenopyrite in some of the bands. Pyrrhotite is locally plentiful in the quartz on the 500- and 625-foot levels, but has not been reported from the upper levels. The phyrrhotite is associated with chalcopyrite and other minerals mentioned above. The quartz carries small amounts of tourmaline, carbonate, red feldspar, and muscovite.

Moose Horn-Ballast Claims

A small, high-grade quartz vein in the northwest corner of the Ballast claim (Locality 35 on Map 376A) was staked in 1914 by Richard Woosey of Herb Lake, Manitoba, and is now owned by the Kiskoba Mining Company, Limited. After preliminary work on the deposit by a syndicate headed by Robert Kerr, the Northern Manitoba Mining and Development Company was formed to work the deposit. In 1917, 28·5 tons of ore, obtained from a shaft sunk to a depth of 80 feet on the vein, were treated at Trail, British Columbia, with the recovery of 108 ounces of gold. This property and the Mandy mine on Schist lake, which was primarily a copper mine, have the distinction of being the first gold producers in Manitoba. In 1918 the property was held under option by Makeever Brothers who were then operating the nearby Rex mine. They continued the shaft to a depth of 117 feet, drifted 50 feet along the vein, and recovered 52 ounces of gold from ore that was treated in the Rex mill. Operations ceased in

October 1918. In 1919 or 1920 the Northern Canada Exploration Company became interested in the property. At some time between that date and 1926 the property was taken over by the Kiskoba Mining and Development Company which was formed by the amalgamation of the Northern Manitoba Mining and Development Company and the owners of the nearby Kiski-Wekusko claims. In 1931 the Kiskoba Mining and Development Company shipped 17·6 tons of ore from the deposit to Trail, British Columbia, with the production of 34 ounces of gold and 9 ounces of silver.[1] The property has been inactive since that time.

The vein on which the shaft was sunk is in a small outcrop of biotite lamprophyre that may be a dyke cutting a body of quartz-feldspar porphyry as exposed on hills to the east and west. Some of the porphyry was apparently encountered in the underground workings, for pieces of this rock are found on the dump. During the summer of 1935 the shaft was filled with water and the underground workings could not be examined. In prospect workings on the surface small, unconnected lenses, stringers, and veins of quartz are exposed here and there in the lamprophyre for a length of about 75 feet along a strike of north 50 degrees east. The quartz bodies are locally distributed across widths of 2½ feet or more, but no large, continuous body of quartz is exposed. Most of the quartz seen is white and carries black tourmaline. During early operations some of the tourmaline-rich quartz carried abundant coarse gold. One vein is of blue quartz carrying streaks of finely crystalline arsenopyrite, galena, and free gold. This vein varies from 2 inches to 6 inches wide, is exposed for 20 feet along the strike, and dips 75 degrees southeast.

According to several observers[2] who examined the property when the underground workings were accessible, the vein varied from 6 inches to 30 inches wide, averaged about 18 inches wide, and carried tourmaline, arsenopyrite, pyrite, chalcopyrite, galena, sphalerite, native gold, and a gold telluride, probably petzite.

In the northwest corner of the Moose Horn claim a quartz vein (Locality 34 on Map 376A) is well exposed on a steep hillside of quartz-feldspar porphyry and also in a prospect pit at the base of the hill. This claim was staked in 1914 by Hugh Vickers and is now owned by Kiskoba Mining Company, Limited. The vein dips vertically, is exposed for 50 feet along the strike of north 55 degrees east, and varies from 1 foot to 3 feet wide. At the top of the hill, where the vein pinches out, several quartz lenses are distributed across a width of 20 feet. Some of the quartz is heavily mineralized with coarse and fine arsenopyrite and small amounts of sphalerite, galena, and pyrite.

Kiski-Wekusko Claims

A gold-bearing quartz vein on these claims (Locality 36 on Map 376A) was the first to be discovered in Herb Lake area, and was staked on September 22, 1914, by Messrs. Richard Woosey and M. J. Hackett. The

[1]Data on production have been taken from "Gold in Canada," 1935, by A. H. A. Robinson, Mines Branch, Dept. of Mines, Canada, p. 56, and from the 4th Annual Report on Mines and Minerals, Manitoba Dept. of Mines and Natural Resources, Mines Branch, 1931, p. 40.

[2]Bruce, E. L.: Geol. Surv., Canada, Sum. Rept. 1916, p. 168. Campbell, J. A.: "Northern Manitoba", 1917, pp. 10 and 16. Alcock, F. J.: Geol. Surv., Canada, Mem. 119, pp. 35-36.

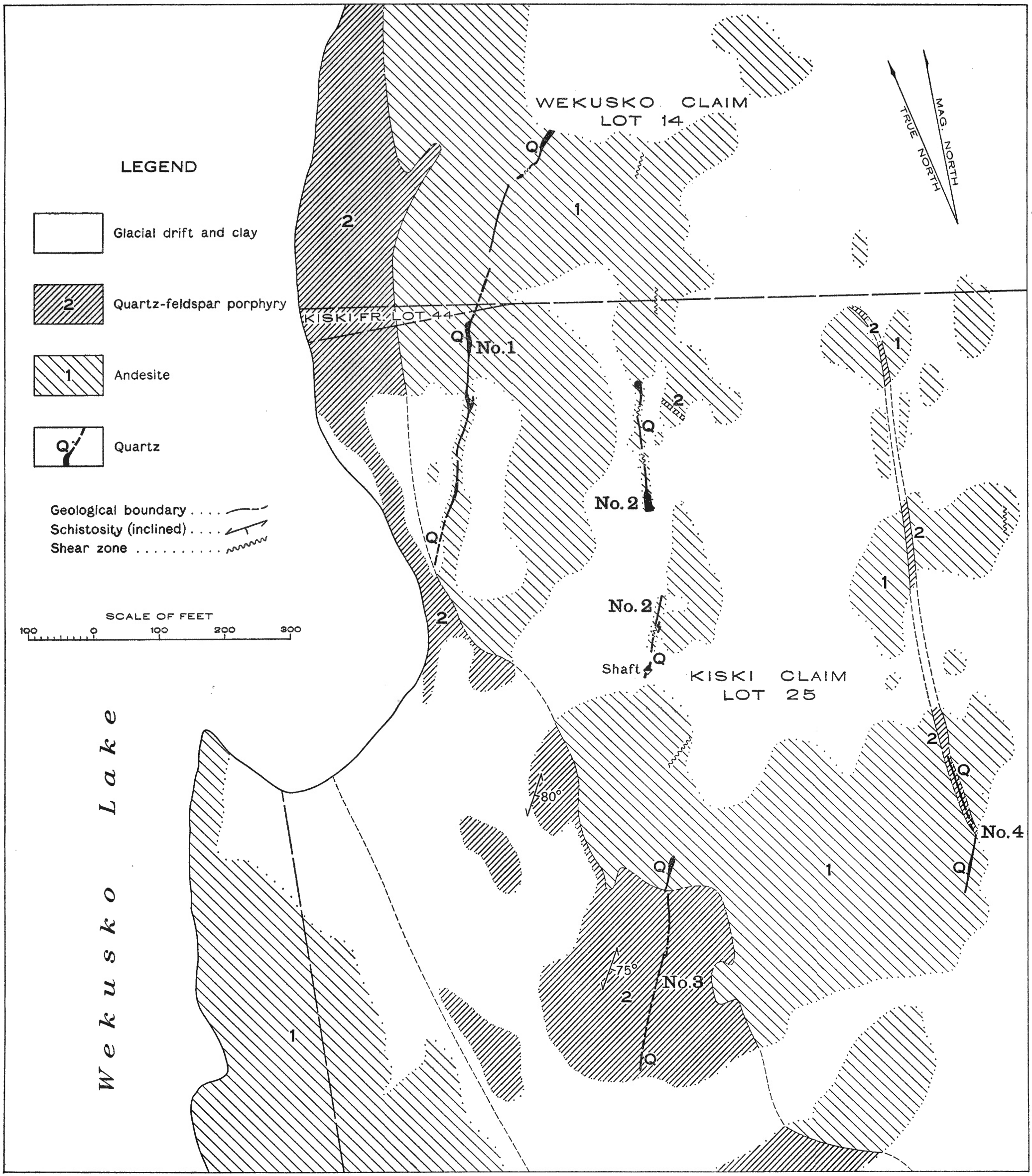

Figure 5. Kiski-Wekusko claims.

claims are now owned by the Kiskoba Mining Company, Limited. Stripping and test pitting subsequently revealed three other quartz veins on the property (Localities 37, 38, and 39 on Map 376A). Soon after the discovery, the Kiski Mining and Development Company was organized to develop the property, and a shaft was sunk to a depth of 53 feet on one of the veins. This company was later amalgamated with the Northern Manitoba Mining and Development Company to form the Kiskoba Mining and Development Company. In 1930 the Consolidated Mining and Smelting Company, Limited, did further stripping on the veins and systematically sampled all the deposits. As far as known no further work has been done since that time.

Rocks in the vicinity of the veins comprise chiefly andesite lava flows invaded by bodies of quartz-feldspar porphyry (*See* Figure 5). The lava and porphyry are cut by a few small dykes of biotite lamprophyre. The lava varies from a fine-grained, andesitic rock to a coarse-grained, andesine-hornblende-biotite rock that looks like diorite and is locally porphyritic with large, lath-shaped phenocrysts of plagioclase. Lumps of epidote a foot across lie in some of the coarse andesite, and the plagioclase crystals are generally partly altered to epidote. In places the porphyritic phase forms irregularly rounded or elliptical masses up to 2 feet in diameter lying in the fine-grained phase. Although no amygdules were seen in the rock at this locality, the whole is probably a lava, for rock exhibiting similar variations elsewhere in the Herb Lake area carries abundant quartz amygdules and is undoubtedly a lava.

The quartz-feldspar porphyry is a very fine-grained rock carrying small, inconspicuous phenocrysts of quartz and a few of feldspar. Much of the rock is altered to a sericite schist with cleavage striking north 40 degrees east and dipping steeply southeast. The porphyry outcrops as a northerly striking band, up to 450 feet wide, along and near the shore of Wekusko lake, and also as a northerly striking dyke some distance inland. The intrusive nature of the porphyry is well shown west of No. 1 vein where dioritic-looking andesite close to the east edge of the larger porphyry mass is cut by several dykes and stringers of the porphyry, and one dyke holding angular inclusions of the andesite is seen to branch from the main mass and extend for a few feet into the andesite. The relationship is less definite along the same contact west of No. 3 vein where irregular-shaped, angular patches of the porphyry appear to lie in the coarse andesite and look much like inclusions. This may be the locality studied by Wright[1] who concluded that the rock here called andesite lava was a diorite intrusive into the porphyry and that the porphyry was a lava. However, long, narrow stringers of the porphyry project outwards into the andesite from some of the angular patches of porphyry, and some porphyry dykes nearby definitely cut the andesite. It seems probable that the andesite was brecciated along the contact and that the angular patches of porphyry are the result of intrusion into spaces between the broken blocks.

The four quartz veins that have been discovered on the claims are explored in numerous trenches and in a prospect shaft 53 feet deep. Two of the veins lie in the andesite just east of the larger body of porphyry and

[1]Wright, J. F.: Geol. Surv., Canada, Sum. Rept. 1930, pt. C, p. 76.

two of them lie partly in andesite and partly in porphyry. The veins strike northeasterly and dip vertically or steeply southwest. They, accordingly, lie at an angle to the long direction of the large porphyry mass, but about parallel to the direction of cleavage in the porphyry. The andesite along the vein zones is altered to chlorite and biotite schists.

No. 1 vein is in andesite and has been traced for a length of 680 feet along the strike of north 35 degrees east. At the southwest end the vein pinches out at the contact with porphyry and, at the northeast end, passes beneath a thick covering of drift. The quartz varies greatly in width from place to place along the strike and at several localities pinches out entirely. The average width is about 3 feet and the maximum is 11 feet. Much of the quartz is white and unmineralized, but some of it, particularly along the walls of the vein, carries abundant arsenopyrite and a little tourmaline. The schist for as much as 3 feet away from the vein carries numerous scattered crystals of arsenopyrite.

No. 2 vein zone lies in andesite and is exposed at intervals for 450 feet along an average strike of north 20 degrees east. This zone consists of a series of separated quartz lenses in schist. One quartz lens is up to 10 feet wide and 70 feet or more long. Other lenses are shorter and are commonly from 1 foot to 3 feet wide. The quartz carries patches and streaks of arsenopyrite and tourmaline with a little chalcopyrite and sphalerite. Some of the wall-rock schist is well mineralized with disseminated crystals of arsenopyrite. A few pieces of white quartz on the dump at the shaft near the southwest end of the vein carry blebs of tetrahedrite.[1]

No. 3 vein zone lies in andesite and quartz-feldspar porphyry. The deposit consists of a series of unconnected, small quartz lenses exposed for 350 feet along the strike of north 30 degrees east. Some of the quartz and wall-rock carries arsenopyrite.

No. 4 vein zone is partly in andesite, where it strikes north 30 degrees east and then swings north along the dyke of quartz-feldspar porphyry. Vein quartz occurs as small lenses here and there for a total length of 200 feet, and across schistose andesite and porphyry for widths up to 8 feet. The quartz carries tourmaline and arsenopyrite.

Rainbow Group

The Rainbow group includes the Beaver, Lingo, Rainbow, and other claims. The three claims named were staked in 1923 by Alex. Chartrand, A. Damour, and M. J. Hackett, immediately following discoveries of gold on the Pocohontas and Ferro claims to the southeast. They were optioned soon afterwards to the Mining Corporation of Canada, Limited, who thoroughly sampled a series of quartz deposits in schistose andesite that had been traced in trenches at intervals across the Rainbow claim and across the southwest corner of the Lingo claim into the Beaver claim (Localities 9 and 10 on Map 375A). The option was dropped and the claims were taken over by the Hackett Gold Mining Company which is the present owner of the group. The property was then sampled by the Consolidated Mining and Smelting Company. During 1932 and 1933 the property was

[1]Determined by H. V. Ellsworth, Mineralogical Division, Dept. of Mines and Resources, Ottawa.

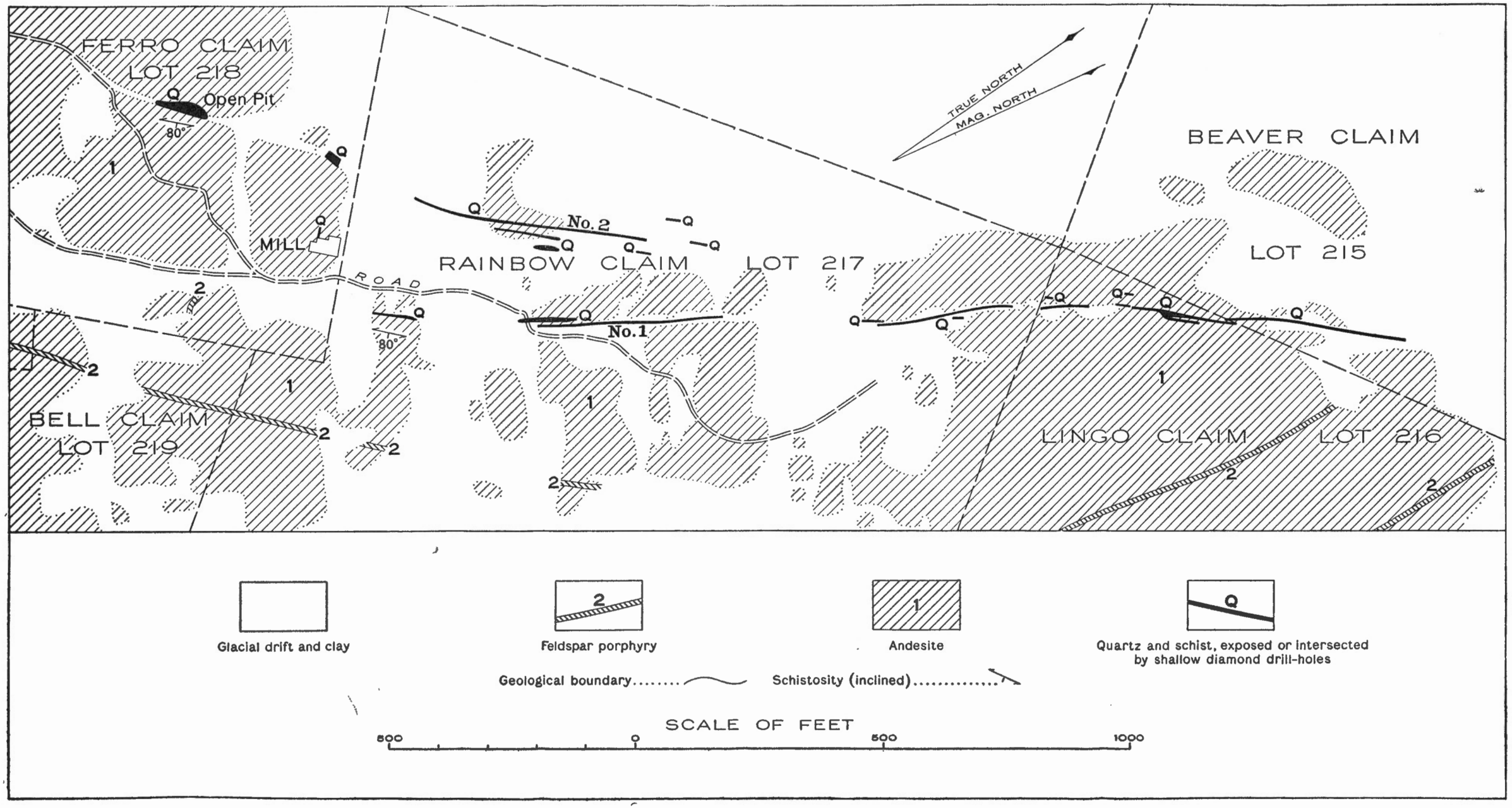

Figure 6. Rainbow group and Ferro claim.

under option to the North British Mining and Milling Company and 20 tons of ore from the Rainbow claim were run through this company's mill located on the adjoining Ferro claim. During the winter of 1934-35 the Hackett Gold Mining Company explored the deposit by forty-three shallow diamond drill holes. These holes were generally spaced at intervals of 50 to 100 feet and most of them cut the deposits at vertical depths of 30 to 60 feet. This work was completed in March 1935, and an option was then taken on the property by Mr. J. H. C. Waite who diamond drilled certain sections known as No. 1 and No. 2 zones where the shallow drilling had indicated more encouraging values than elsewhere; eight holes were put down to depths of about 200 feet during May and June, 1935. The option was then dropped and no further work was done on the property during the summer and autumn of that year.

Rocks in the vicinity of the deposits (*See* Figure 6) consist of dark green and grey, andesitic lava that varies from a fine-grained, hornblendic rock with scattered lumps of green epidote, to coarse-grained, porphyritic rock with phenocrysts of lath-shaped andesine in a dark groundmass composed chiefly of hornblende and biotite. Many of the feldspar laths in the porphyritic phase are ½ inch long and in some layers of the lava the phenocrysts are from 1 inch to 1½ inches long. In some northeasterly trending layers the porphyritic and non-porphyritic lavas hold numerous large amygdules of quartz. The lavas are schistose with cleavage striking northeasterly and dipping about 80 degrees to the southeast. A few dykes of grey, fine-grained feldspar-porphyry cross the lavas in various directions.

The deposits consist of quartz lenses and stringers lying along planes of schistosity in shear zones in the lava. Normal lava near the deposits is altered to biotite schist along the shear zones. The quartz and schist hold buff-weathering carbonate, and small amounts of black tourmaline, pyrite, pyrrhotite, chalcopyrite, and free gold; arsenopyrite has been reported in the quartz.[1] The shear zones strike from north 25 degrees east to north 45 degrees east, closely paralleling the cleavage of nearby lavas. Most of the zones lie nearly in line with one another and occur at intervals for a length of 2,100 feet, crossing the Rainbow claim and extending into the adjoining Lingo and Beaver claims to the north. Other deposits lie on the Rainbow claim about 200 feet northwest of the main belt.

The most northerly part of the main belt is on the Beaver claim. It has been traced by means of five shallow diamond drill holes and a few prospect trenches for a length of 350 feet along the strike of north 43 degrees east. At the time of examination the zone was nowhere exposed except for a length of 100 feet at the southwest end. At the northeast end of the exposure, stringers and lenses of quartz, sparingly mineralized with pyrite, are distributed across 3 feet of schist. To the southwest the schist zone narrows, holds almost no vein quartz, and finally dies out.

Another zone starts on the Lingo claim, just east of the southwest end of the deposit described above, and continues south 45 degrees west for a distance of 220 feet. This deposit has been stripped in a deep trench along the full length. The deposit has been thoroughly sampled on the surface by the Mining Corporation of Canada and has since been tested at shallow

[1]Wright, J. F.: Geol. Surv., Canada, Sum. Rept. 1930, pt. C, p. 87.

depth by five diamond drill holes put down by the Hackett Gold Mining Company, Limited. As exposed in the trench, a main zone has a maximum width of 15 feet, narrows toward both ends, and carries plentiful vein quartz only in the wider parts where the largest individual quartz lens is 2 feet wide. A zone of schist branches from the widest part of the main zone and continues northeasterly for about 70 feet. The branch zone is 2 feet wide, holds small quartz stringers, and for most of its length is separated from the main zone by a belt of amygdaloidal lava up to 7 feet wide. The quartz and schist of the main deposit and branch zone carry brown-weathering carbonate and a small amount of pyrite. Cleavage of the schist in the deposits dips from 85 degrees northwest to vertical.

For a length of 550 feet southwesterly from this deposit, several, apparently unconnected shear zones are exposed here and there in nine prospect pits and have been explored at shallow depths by four diamond drill holes. They extend from the Lingo into the Rainbow claim. The schist dips from 87 degrees southeast to vertical and generally holds veinlets of quartz across widths of 2 to 3 feet. Muskeg extends for 200 feet still farther southwesterly and this interval has been explored by four shallow diamond drill holes.

From the southwest edge of the muskeg and on the projected strike of the other deposits, a pronounced depression extends southwesterly between hills of andesite. Along this depression, which is on the Rainbow claim, a vein zone, locally known as No. 1 zone, has been traced for 400 feet by means of nine trenches and fifteen diamond drill holes. Seven of the holes were put down by the Hackett Gold Mining Company; these were placed at intervals of 50 to 100 feet and cut the deposit at depths of from 30 to 60 feet. The remaining eight holes were drilled by J. H. C. Waite, four cutting the vein zone at depths of around 200 feet and at intervals of 100 feet along the strike, and four cutting the zone at shallow depths and alternating with the others along the strike. Although the trenches are partly filled with water and clay it appears that a single shear varying from 5 to 15 feet wide extends for almost the full length of the deposit and that this is paralleled at the southwest end and 5 feet to the west by a short shear zone 8 feet wide. The zones strike north 32 degrees east and the cleavage of the schist dips from 80 to 85 degrees southeast. This short zone was thoroughly sampled for a length of 80 feet by the Mining Corporation of Canada soon after the discovery of the deposit. The ore that was run through the mill on the Ferro claim was taken from an open pit on this deposit. Vein quartz is as a rule not abundant in the shear zones. A small amount of black tourmaline was detected in the deposit, and both the quartz and schist carry veinlets and patches of brown-weathering carbonate and a few scattered grains of pyrite, chalcopyrite, and pyrrhotite. Material found in the drill holes is similar to that at the surface. Free gold is said to have been found in the pits and a few specks were seen in quartz and schist in the drill cores.

Two shallow drill holes have been put down in a swamp to the southwest of this deposit. South of the swamp the zone of quartz and schist is again exposed in a few prospect pits.

Another deposit, locally known as No. 2 zone, lies on the Rainbow claim about 200 feet west of No. 1 zone. No. 2 zone is exposed in a few

prospect pits on a small outcrop surrounded by swamp. The largest pit crosses 30 feet of massive andesite cut by a few quartz stringers and crossed by a few, narrow, northeasterly striking zones of schist. Two of these schist zones, 20 feet apart, are somewhat more prominent than the others and have been traced by stripping and small pits for the length of the outcrop. The schist zones are up to 2 feet wide, dip 85 degrees southeast, and are penetrated by a few stringers of quartz that is said to carry free gold. The deposits have been explored beneath the outcrop and along the strike, under swamps, to the northeast and southwest by ten shallow diamond drill holes put down by the Hackett Gold Mining Company. This work indicated that the northwestern of the two more prominent zones continues for a length of at least 470 feet. The strike is north 43 degrees east for most of this length, but at the southwest end the strike swings more westerly so as to point toward the main deposit on the Ferro claim and the two may join. This drilling also indicated that the southeasterly of the two more prominent zones extends for only 150 feet, or thereabouts, along the strike. At a point about 20 feet still farther southeast a third zone was penetrated at a depth of 60 feet by one drill hole. The four diamond drill holes that were put down by J. H. C. Waite and which penetrated No. 1 zone at shallow depths, were sunk primarily with the object of cutting No. 2 zone at depths of about 200 feet. Actually, they cut schist and quartz at depths varying from about 160 feet in the most southwesterly hole to about 225 feet in the most northeasterly hole. A line joining the points of intersection strikes about north 37 degrees east and lies at a considerable angle to the strike of the deposits as found in shallow drilling. Some of the deep holes were continued to points vertically beneath the most northwesterly zone found by a shallow drilling, but did not cut this zone. The information at hand is insufficient to determine the size and form of the various bodies of quartz and schist, but apparently No. 2 zone as a whole is quite irregular in character.

Another deposit lies at a locality about the middle of the Lingo claim (*See* Map 375A). This deposit, which has been stripped for only a few feet along the strike, consists of sheared andesitic lava penetrated by stringers of quartz across a width of 5 feet. The deposit lies on the southwest edge of a dyke of "quartz-eye" granite that outcrops along the strike of north 37 degrees east for 750 feet to the northeast boundary of the claim. The dyke is 50 feet wide and lies along the contact between fine-grained amygdaloidal andesite on the southeast side and coarse-grained porphyritic andesite on the northwest side. The dyke rock has a pronounced schistosity and is cut by a few veinlets of quartz. At the northeast boundary of the claim two diamond drill holes have been put down to cut the dyke at a depth of about 50 feet.

Ferro Claim

This claim was staked in 1923 by Louis Revord, of Herb Lake, Manitoba, after his discovery of a gold-bearing quartz vein on the property. The claim is now owned by him and C. B. Morgan of The Pas, Manitoba. In 1930 several veins on the property were sampled by the Consolidated Mining and Smelting Company and, in the same year, four zones of schist

and vein quartz were examined and described by Wright[1]. Subsequent exploration along a depression, described by Wright as extending southwest from what he called the second of two northerly deposits, resulted in the discovery of a lens of ore carrying high values in gold. The North British Mining and Milling Company, which was soon organized to develop the deposit, built a summer road into the property, and purchased a 10-ton mill that had previously been used on the Bingo claim. The mill and camp buildings were set up near the deposit in the northeast part of the Ferro claim. Milling operations commenced on May 19, 1932, and continued throughout the year. About 523·5 ounces of gold and a small amount of silver were produced from 1,109 tons of ore milled. Most of this ore was mined from an open-cut in a lenticular deposit near the mill. The pit from which the ore was obtained is about 60 feet deep and, at the surface, is 100 feet long and from 10 to 20 feet wide. No work was done on the property during the summer of 1935.

The deposit on which the open-cut was sunk (*See* Figure 6 and Locality 16 on Map 375A) lies in a depression between steep walls of andesite. The pit was filled with water at the time of examination and little could be seen of the workings or character of the vein material. It has been reported, however, that the surface of the deposit showed a value of $28.16 a ton across an average width of 5·7 feet for a length of 90 feet, and that the ore consisted of a main vein paralleled by several stringers enclosing lenses of andesite similar to the wall-rock.[2] Material on the waste dump shows andesite altered to biotite schist adjacent to lenses and stringers of quartz. Some of the schist is cut by tiny stringers of carbonate and carries disseminated grains of pyrite and chalcopyrite. The quartz varies from white to grey and carries small amounts of red feldspar, muscovite, carbonate, pyrite, chalcopyrite, and pyrrhotite. Schistose structure is well developed along the southeast wall of the pit and strikes north 50 degrees east and dips 80 degrees southeast.

The depression continues for 100 feet southwest of the open pit, but trenches there expose only a small amount of quartz, and schistose structure is confined to narrow zones along the walls of the depression which is 10 feet wide. At the northeast end of the open-cut the shear zone in which the deposit lies narrows abruptly to 5 feet or less in a narrow, steep-walled depression. For 250 feet farther northeast along the strike the vein zone is said to have been traced in trenches, but these are now covered with waste rock taken from the open pit. At this distance, however, a pit 30 feet long exposes a zone of biotite schist carrying lenses and stringers of quartz across widths of 10 to 20 feet. The quartz carries small amounts of muscovite and pyrite and is reported to carry free gold.

On the Ferro claim at a point 800 feet southwesterly from the open-pit mine, but not on the strike of this deposit, a shaft 40 feet deep has been sunk on a poorly defined shear zone striking north 50 degrees east and dipping 75 degrees southeast (Locality 17 on Map 375A). The zone has been traced for 50 feet southwest of the shaft in a deep pit showing schist which is well developed across a width of only one foot along the hanging-

[1]Wright, J. F.: Geol. Surv., Canada, Sum. Rept. 1930, pt. C, p. 87.
[2]Sixth Annual Report on Mines and Minerals, Manitoba Dept. of Mines and Natural Resources, Mines Branch, pp. 39-42.

wall. The schist is penetrated by lenses and veinlets of quartz. No sulphides were seen in the quartz, but a specimen, said to have been taken from the shaft, shows plentiful coarse gold along a contact between vein quartz and schist.

Another shear zone 50 feet northwest of the shaft has been traced in prospect pits along a poorly defined depression for a length of about 500 feet to the southwest boundary of the claim. The schist zone strikes about north 50 degrees east and is penetrated here and there across widths up to 5 feet by lenses and stringers of quartz carrying buff carbonate and small amounts of biotite and red feldspar. It is reported that about $75 worth of gold was panned from a deep pit on this zone at a point 80 feet east of the shaft. From a locality 50 feet northeast of this deep pit a branch vein of quartz 1½ feet wide strikes nearly at right angles to the shear zone and outcrops along the strike for 80 feet northwest to a third shear zone. There a few prospect pits have been dug in a schist zone that is 3 feet wide and strikes parallel to the other zones.

Pocohontas Claim

This claim was staked in 1923 by Mabel Ballard and is now owned by Marshall Ballard of Herb Lake, Manitoba. The major part of the claim lies immediately southwest of the Ferro, and a northeast arm of the claim lies between the Ferro and Bell claims. Three deposits of quartz are now known on the claim and have been exposed in a few prospect pits. The rocks in the vicinity of the deposits consist of andesitic lava carrying amygdules of quartz and large phenocrysts of feldspar.

One of the deposits on the Ferro claim (Locality 17 on Map 375A), which has been described, continues southwesterly across the claim boundary in the Pocohontas. On the latter claim the shear zone has been traced for 200 feet in a few trenches along a narrow drift depression striking south 50 degrees west. The deposit is well exposed in a large pit just southwest of the claim line. In this pit the sheared andesite is 8 feet wide and carries a small amount of vein quartz in lenses up to 1½ feet wide and 6 feet long. The andesite is altered to a biotite schist adjacent to the quartz bodies. The quartz varies from white to grey, is coarse grained, and carries a small amount of carbonate and little or no sulphides. At the southwest end the zone passes beneath an area of boulder drift and clay that continues southwesterly for 300 feet to the northeast end of a second deposit.

The second deposit (Locality 18 on Map 375A) consists of vein quartz deposited here and there along a shear zone. The deposit is exposed at intervals in six prospect pits for a length of 200 feet along the strike of north 35 degrees east. A deep pit at the north end exposes biotite schist injected by a few lenses and stringers of quartz across a width of 12 feet. Shallow trenches along the middle part of the deposit expose schist across narrower widths and without vein quartz. At the south end of the zone a lens of quartz up to 5 feet wide is exposed for 50 feet along the strike. The quartz is white, coarse grained, and carries small amounts of buff carbonate, muscovite, red feldspar, and little or no sulphides. The discovery of gold in this quartz lens initiated prospecting in the vicinity that resulted

in the subsequent discovery of deposits on the Ferro, Rainbow, and other claims to the northeast and southwest. At the southwest end the lens breaks into small stringers and passes beneath a swamp.

The third deposit on the Pocohontas lies in the narrow northeast arm of the claim (Locality 19 on Map 375A). The deposit lies on the projected strike of the long vein zone that passes through the Beaver, Lingo, and Rainbow claims and outcrops at a point 1,100 feet from the most southwesterly vein exposure on the Rainbow. Normal andesite porphyry is altered to biotite schist within the deposit, which has been traced in prospect pits for a length of 100 feet along the strike of north 20 degrees east. The schist is penetrated by lenses of quartz up to 5 feet wide and quartz constitutes from one-half to three-quarters of the material present across widths of 10 to 20 feet. The quartz carries small amounts of buff-weathering carbonate, muscovite, and black tourmaline and is fairly well mineralized with pyrite and chalcopyrite.

Gold Dust Claim

The claim was staked in 1923, by the present owner, Marshall Ballard, who discovered a deposit of vein quartz on the property at that time. The deposit (Locality 20 on Map 375A) lies in porphyritic andesite lava and has been opened up here and there by stripping and trenching for a length of 200 feet. The deposit follows a slightly curved course, but strikes roughly north 45 degrees east. A pit in a drift depression 10 feet wide crosses 6 feet of massive and schistose lava holding two lenses and several small stringers of quartz. Lava lying between the quartz bodies is generally massive and porphyritic and is altered to biotite schist only immediately adjacent to the vein quartz. The quartz is white and coarsely granular and carries a little pyrite and much black tourmaline. Southwest of the pit the vein varies from 3 inches to 2 feet wide for 100 feet along the strike and then pinches out in massive andesite. Northeast of the pit bedrock is generally obscured by a light covering of drift.

Lieury Claim

This claim was staked in 1923 by the present owner, Andrew Paterson of Sherridon, Manitoba, who discovered a quartz vein on the property and has explored the deposit by trenching. The vein (Locality 21 on Map 375A) lies just northeast of a cabin, locally known as the relief camp, on the road to the Ferro and Rainbow claims. The deposit lies in andesite lava that locally carries amygdules of quartz and has a schistose structure striking about north 35 degrees east. Near the vein quartz the lava is partly altered to biotite schist.

The vein has been explored in a series of trenches along the strike of north 30 degrees east. Most of the trenches are in glacial drift between low outcrops of andesite, but their walls had caved at the time of examination so that little vein material could be seen. However, a section of the vein from 3½ to 4 feet wide is still exposed for a length of 40 feet southwest of a big pit, and a branch vein up to 2½ feet wide strikes at right angles

to the main vein and outcrops for 60 feet northwest of the big pit. The main vein dips 70 degrees to the southeast and the branch vein dips about 25 degrees to the southwest. Both veins carry streaks of fine-grained, black tourmaline and the branch vein carries cubes of pyrite. Gold values are said to be higher in the branch vein than in the main vein and to be particularly good at the junction of the two.

The deposit was examined in 1930 by J. F. Wright[1] when vein material in the trenches was better exposed. He reports that the main zone of schist and quartz was, at that time, exposed by trenching for 350 feet along the strike and passed beneath swamp at both ends. His report continues: "For 100 feet from the north end, the zone of schistose andesite averages 4 feet across and carries only stringers of quartz. Twenty feet farther south, just north of a big prospect pit, the quartz is 4 feet wide and a quartz vein 1½ feet wide branches to the west nearly at right angles to the main deposit. Free gold is abundant in the branch vein at, and just beyond, its junction with the main quartz body. The quartz here carries cubes of pyrite and in specimens from which the pyrite is weathered, free gold is abundant along the walls of the rusty-coated cavities. For 50 feet south from the large prospect pit, the quartz vein averages 3½ feet wide. The schist zone continues 180 feet farther south, but in this section the quartz is in stringers only."

Orcadian Claim

This claim was staked in 1923 by John Dickson of Herb Lake, Manitoba, who is the present owner of the property. A deposit of quartz veinlets in schistose andesitic lava has been opened up by stripping and two test pits (Locality 22 on Map 375A). Rocks in the vicinity of the deposit are andesitic lava locally carrying amygdules of quartz and cut by a few northwesterly striking dykes of quartz porphyry.

The deposit passes beneath a swamp at the northeast end. From the edge of the swamp it is exposed for 30 feet along a strike of south 30 degrees west and then divides into two branches. One branch strikes south 60 degrees west and has been followed for 15 feet. The other branch strikes south 20 degrees west and is exposed for 30 feet. The deposit and its two branches consist of sheared andesitic lava locally altered to a biotite schist and cut by irregularly striking stringers of quartz. The maximum width of mixed quartz and schist is 8 feet. Some of the quartz stringers carry flakes and veinlets of muscovite, and the quartz stringers and nearby rock are cut by veinlets of carbonate. Tiny specks of pyrite are common in shreds of schistose andesite lying in the quartz, but this sulphide is rare in the quartz and carbonate. According to the owner of the claim, plentiful free gold was found along the southeast wall of the shear zone in a large pit at the edge of the swamp. Some of the material on the dump shows abundant coarse gold along contacts between schist and quartz.

This is apparently the deposit described by Wright[2] as the northern zone. This author also describes a southern zone, 225 feet to the south,

[1] "Geology and Mineral Deposits of a Part of Northwest Manitoba"; Geol. Surv., Canada, Sum. Rept. 1930, pt. C, p. 88.

[2] Geology and Mineral Deposits of a Part of Northwest Manitoba; Geol. Surv., Canada, Sum. Rept. 1930, pt. C, p. 88.

composed of schist varying from 2 to 8 feet wide and traced for a length of 80 feet along a contact between granite porphyry and andesite. The schist carries lenses and stringers of quartz and the quartz and schist are mineralized with pyrite, chalcopyrite, and calcite.

Wizard Claim

This claim adjoins the Orcadian to the southeast and was staked in 1927 by W. G. Bissett of Herb Lake, Manitoba, who is the present owner of the property. At a locality just west of the road leading to the Ferro and Rainbow claims (Locality 23 on Map 375A) a prospect pit exposes an area about 30 feet long and 10 feet wide of andesitic lava cut by contorted and irregularly branching stringers of quartz. The stringers are generally less than one-quarter inch wide and carry pyrite and a little muscovite. Other pits here and there for 150 feet along a northerly direction expose only boulder clay or a few quartz stringers in andesite lava. Apparently no well-defined zone of shearing or vein material has been found.

A dyke of quartz porphyry outcrops in andesitic lava 100 feet west of these pits and has been traced by stripping and a few trenches for a length of about 500 feet along the strike of north 20 degrees west. The porphyry varies from grey to pink and consists of large phenocrysts of blue quartz in a dense groundmass carrying small patches and gash veinlets of pyrite. The dyke, which varies from 10 to 20 feet wide, is cut by veinlets of white quartz that trend in many directions and apparently do not continue into adjoining lava. It is said that the porphyry dyke and the deposit in the andesite have been sampled by the Consolidated Mining and Smelting Company, Limited.

Le Blanc Claim

This claim is owned by Henry Makouse who staked it in 1932. A half dozen prospect pits on the claim are said to have been dug about 1924. The workings lie just southeast of a trail leading to the Rainbow group of claims (Locality 24 on Map 375A). Two of the pits are in drift-filled, elongated depressions in rhyolite, which is the dominant rock in the vicinity. The other pits are in a dyke of hornblende lamprophyre that cuts the rhyolite and has been traced for a length of 200 feet along the strike of north 40 degrees east. The dyke varies from 10 to 12 feet wide and is cut by a few, irregular veinlets of coarse white quartz. The quartz locally carries black tourmaline.

Lithium Deposits on the Gold Reef Claims

Lithium-bearing pegmatite dykes on the Gold Reef group of claims were discovered and staked in June 1931 by Peter Kobar of Herb Lake, Manitoba. The deposits lie just off the northwest edge of the area covered by Map 374A. They are reached over a trail about 1,700 feet long leading westerly from a locality on the shore of the narrow arm of Wekusko lake opposite the point where the road to the McCafferty deposit meets the lake. Three lithium-bearing pegmatite dykes are reported to have been found on

the property. Two of these were examined by the writer. They lie in coarse-grained quartz diorite and have been exposed by stripping and a little blasting. They strike north 50 degrees west, and are about 250 feet apart.

The more southerly of the two dykes is exposed at intervals for about 900 feet along the strike and varies from 30 feet wide at the southeast end to 3 feet wide at the northwest end. The dyke consists largely of pink feldspar, quartz, and pale greenish spodumene. Small amounts of muscovite, black tourmaline, and red garnet are also present. Spodumene crystals occur in most exposures of the dyke. They are generally rather evenly distributed from one wall to the other, although in the widest part of the dyke they are confined to a middle layer 15 feet wide. The spodumene forms blade-shaped crystals that are rarely as much as 1 foot long and 2 inches wide. Most of the crystals stand vertically or at steep angles. The spodumene crystals are intimately mixed with quartz, feldspar, and muscovite and constitute about one-third or less of the material of the dyke. The spodumene-bearing rock must be quite low in lithium content, and the spodumene is so closely mixed with other minerals that it would not be practical to separate a high-grade product by hand sorting. Many of the spodumene and tourmaline crystals are broken and the cracks are filled with quartz, feldspar, and muscovite, similar to the material in which the crystals lie.

The more northerly dyke is, more accurately speaking, a series of closely spaced dykes lying end to end or, less commonly, side by side across widths up to 50 feet. The zone of dykes is exposed fairly continuously for about 1,700 feet along the strike. The dykes vary from 2 feet to 10 feet wide. Most of them carry spodumene and are similar to the large dyke described above.

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