ONTARIO
DEPARTMENT OF MINES

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Geology of
The South Half of Bateman Township
District of Kenora

By
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Geological Report No. 6

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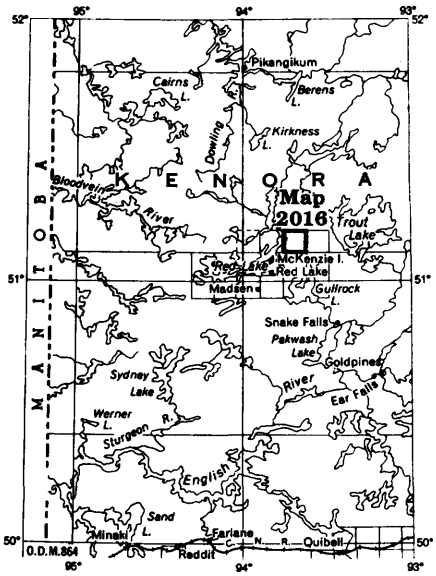


Key map showing location of the southern part of Bateman township. Scale, 1 inch to 50 miles.

This report deals with the general, structural, and economic geology of the south half of Bateman township, Red Lake area, District of Kenora (Patricia Portion). Previous geological maps were published by the Ontario Department of Mines in 1924, 1927, and 1940, and certain properties in the township were described in 1935. The Precambrian basalts, rhyolites, and sediments are cut by granite and by minor intrusives. Prospecting and exploration in the district has been for gold, although certain veins and replacement zones contain a considerable amount of sulphides. Several properties have been explored on surface and by drilling; on two properties exploration shafts have been sunk, and underground workings have been established.

South Half of Bateman Township

BY

Stewart A. Ferguson[1]

Introduction

The producing gold mines at the east end of the Red Lake area are located in Dome and Balmer townships. Bateman township is immediately north of Balmer township and lies northeast of Dome township. The 9th Base Line was surveyed in 1926 and, between mile 30 and mile 36, forms the south boundary of Bateman township.

View, looking northeast from the south end of Walsh Lake.

In 1959 remapping of the area was undertaken to try to extend the known continuity of the rock types and structures mapped in the adjacent townships. Prospecting has been in progress for many years, having begun with the rush in 1925 that followed the discovery of the showing in Dome and Heyson townships, which was acquired by Howey Gold Mines Limited. Mining companies have been active in this area, and during the summer of 1959, drilling was in progress within Bateman township and in Balmer township near the south boundary of Bateman.

[1]Geologist, Ontario Department of Mines.

South Half Bateman Township

The base map, on a scale of 1 inch to 800 feet, was compiled for field use by the staff of the cartography section, Ontario Department of Mines, using the original notes of the township survey and survey notes of individual claim surveys. Shorelines and other topographic details were added from air photographs taken in 1951 for the Forest Resources Inventory of the Ontario Department of Lands and Forests. The township lines, many surveyed claim lines, and grid lines cut for geophysical surveys were reopened; chainage pickets were established at 200-foot intervals to provide control for geological and magnetic traverses. Where no established survey lines existed, lines were blazed and picketed, and were located by tie-lines with existing survey points. All magnetic traverses were done along previously surveyed lines, or along chain-and-compass lines, which began and ended in established survey positions. The maximum traverse interval was 1,200 feet for magnetic traverses and 600 feet for geological traverses; thus, alternate lines became combined geological and geophysical lines. Within surveyed claims, outcrops were located by the pace-and-compass method of traversing between chainage pickets established on the claim boundaries. In the eastern part of the map-area, where few surveyed claims exist, geological traverses were by the chain-and-compass method.

The southwest cornerpost of the township was in place; the southeast cornerpost was not located, although the spot was marked by a claim survey post. All the mileposts that occur on the land-area of the south half of the township were found, although some were no longer upright, and some may not have been exactly in the original location. Most of the claim lines that are not adjacent to the shores of Red Lake can be found and followed with little difficulty.

The geology of Bateman township is shown on the geological map, (No. 2016, in map case), on a scale of 1 inch to 1,000 feet.

ACKNOWLEDGMENTS

Geological and geophysical maps and reports, and diamond-drill logs and drilling plans by the staffs and consultants of mining companies were most helpful. Some of this information had been filed for assessment work credit; other information was freely supplied to the author by mining companies for use in this map and report. Former resident geologists of the Ontario Department of Mines, at Kenora, built up files on certain properties and recorded their own observations when exploration work was in progress.

During the summer of 1959, McFinley Red Lake Gold Mines Limited allowed the field party to use the cottage and tent frames on their property. During the weekends the field party was allowed to use an office, then owned by Gold Eagle Gold Mines Limited, in McKenzie Island. When the party was at Walsh Lake, it had the use of a cabin and a canoe owned by Cordoba Mines Limited. Cochenour Willians Gold Mines Limited welded certain castings on the magnetometer tripod and thus quickly returned the instrument to service. Leo Goldsmith, on Mackenzie Island, extended many courtesies to the party.

P. E. Schenk served as senior geological assistant, and Leslie Kiss operated the magnetometer for much of the summer. D. K. Fountain and J. T. Shaw were junior assistants whose duties included the calculating and plotting of the magnetometer readings. A series of rock specimens was analyzed by the Provincial Assay Office to determine the content of silica and carbon dioxide. D. A. Moddle, Provincial Assayer, stained a suite of rock specimens as a check on the content and relationships of potassium feldspar and plagioclase feldspar.

MEANS OF ACCESS

The southern section of East Bay, a part of Red Lake, lies within the map-area; the land adjacent to the lake has long been accessible by water routes from the settlement of Red Lake and from McKenzie Island, both located in Dome township. Walsh Lake, in the eastern part of the map-area, is most easily reached by aircraft equipped with floats. Trails and winter roads, cut by mining and lumbering companies, lead from the shores of these lakes. From the shaft at Marboy Mines Limited in Dome township, a tractor road leads to the south end of East Bay; this was one of the routes used to carry supplies to the McFinley Red Lake mine when mining development was in progress. In 1959, Abino Gold Mines Limited constructed an all-weather road from the shaft at Marboy mine to their shaft site just inside the southwest corner of Bateman township.

PREVIOUS GEOLOGICAL WORK

Previous work done in the area by government geologists has been described in a number of reports (Bell 1885, p. 5: Dowling 1896, pp. 45–50: Bruce 1924, pp. 12–39: Bruce and Hawley 1928, pp. 1–72: Hurst 1936, pp. 1–52: Horwood 1945).

GEOLOGICAL AND GEOPHYSICAL REPORTS

Several geophysical reports have been submitted to the Ontario Department of Mines to be recorded as assessment work. Some diamond-drill logs and other geological data have also been recorded as assessment work.

This information, collected by the Resident Geologist of the Ontario Department of Mines at Kenora, and other details about these properties are contained in the Kenora file on several individual companies. The company names, types of information collected, and the Kenora and Toronto file numbers, are shown in the table below.

Company Name	Type of Information	Toronto File	Kenora File
Abalard Gold Mines Ltd.	geological	—	K.R.L.6
Abino Gold Mines Ltd.	geological, geophysical	63.27A	K.R.L.6
Beatrice Red Lake Gold Mines Ltd.	geological	—	K.R.L.6
Cordoba Mines Ltd.	geophysical	—	K.R.L.4
Duchesne Red Lake Mines Ltd.	geological	—	K.R.L.6
Inore Gold Mines Ltd.	geological	—	K.R.L.6
Janet Red Lake Mines Ltd.	geophysical	63.67	K.R.L.6
Hodgson Claims	geological	—	K.R.L.6
Leemac Red Lake Mines Ltd.	geophysical	—	K.R.L.6
Marshall Red Lake Mines Ltd.	geological, geophysical	63.60	K.R.L.6
McFinley Red Lake Mines Ltd.	geological, geophysical	63.6	K.R.L.6
Norlee Red Lake Gold Mines Ltd.	geophysical	63.76	K.R.L.6

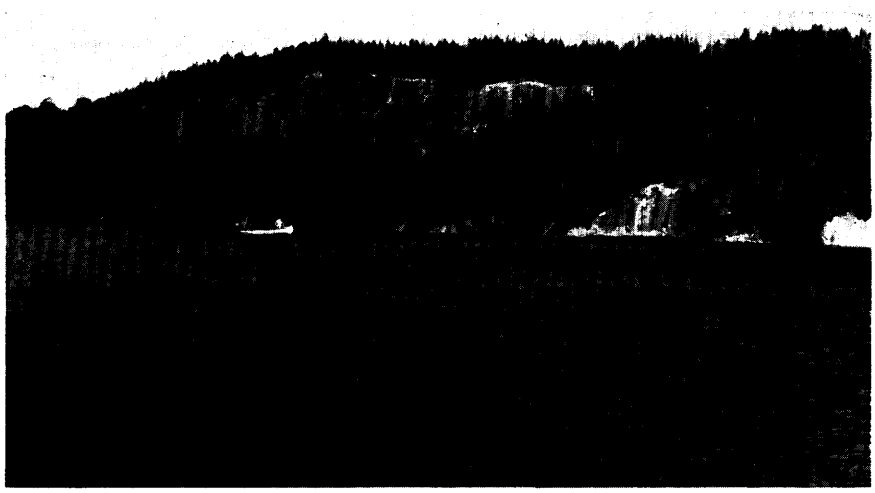
TOPOGRAPHY AND DRAINAGE

The two major depressions within the map-area are occupied by part of Red Lake and by Walsh Lake. The elevation of Red Lake is given as 1,157 feet above sea-level (Horwood 1945, p. 6), and the total relief in the area is estimated to be about 100 feet. A pronounced north-south valley is present between East Bay and Walsh Lake and is occupied by Pindar Lake and Pindar Creek.

A steep granite ridge crosses the east township line about 2½ miles north of the corner of the township, with a nearly vertical face rising about 60 feet above

Walsh Lake. West of Walsh Lake, the large outcrop in claim K.R.L.20221 has a steep western face that rises for 40 feet. Southwest of Pindar Lake a small, steep, conical hill of diorite rises about 50 feet above the surrounding countryside.

Near the east shore of East Bay, a prominent ridge lies parallel to the shore, except where interrupted by westward-flowing creeks, and rises to 50 feet above the lake. McFinley Peninsula has steep shores, but the central part of the peninsula is occupied by a narrow swampy valley. The peninsula south of East Narrows also has a moderately steep rise from the shoreline; here also a pronounced linear valley occupies a central area and persists throughout the length of the peninsula.



High cliffs of granite near the township line on the bay of Walsh Lake between Mileposts 2 and 3.

Much of the area is covered by a mature spruce forest. Because of the gentle slopes and the uniformity of the vegetation, there is often considerable doubt about where swamp boundaries should be drawn. On the map, only the wet areas are shown as swamp. In the field notes, the areas between swamp and higher ground were designated as spruce flats.

The western part of the map-area drains into Red Lake; the eastern part is drained by courses that flow via Walsh Lake to Ranger Lake, and then into Gullrock Lake where the flow joins the Chukuni River. Small creeks empty directly into the southern section of East Bay, a part of Red Lake that is within the map-area. Headwaters of the Pindar Creek unite at Pindar Lake, and the main creek flows northward to discharge into the northern part of East Bay.

NATURAL RESOURCES

Lumbering, and the cutting of timber for lagging, have been in progress on the two peninsulas near the west edge of the township and along the east side of East Bay for a distance up to ¼ mile from the shoreline. On the Abalard property an area has been burned on claims K.R.L.2774 and K.R.L.2775;[1] also, on the east boundary of the township, about 2,000 feet north of the township corner, a burn occurred on a ridge. Both of these burns are estimated to be about 15 years old and are now covered with a new dense growth of small spruce.

[1]Restaked as K.R.L.20333 and K.R.L.20336, respectively.

In areas of virgin forest, large stands of timber are almost exclusively spruce that grows to a maximum diameter of about 8 inches. The deciduous trees are mainly poplar and birch, with alders growing in wet places. In the mature forest there is little undergrowth and, as there is only a small amount of deadfall, travel is fairly easy.

Moose and bear are occasionally seen in the area. Beaver are plentiful, and their dams have flooded extensive areas along the creeks. Pike and pickerel are plentiful in the lakes.

General Geology

The country rocks of the area consist of Precambrian volcanic and sedimentary rocks that have been invaded by later major and minor intrusive rocks. The major intrusives consist of a batholith and a stock of granitic rocks, and the minor intrusives are several kinds of dike rocks and one small stock of quartz-feldspar porphyry. Throughout most of the map-area, the amount of exposed bedrock is very small. The low-lying areas are covered by lakes and glacial deposits; the outcrop areas are covered by thick moss, vegetable mould, and tree roots. Stripping is often necessary to expose the rock for inspection.

No outcrop is known to exist in the triangular area from Pindar Lake southward to Mileposts 32 and 33. Magnetic surveys have provided supplementary information about the existence of belts of magnetic rocks, and about geological contacts and trend lines in areas where surface geological information is either scanty or nonexistent.

The geological succession is summarized in the accompanying table of formations.

TABLE OF FORMATIONS

CENOZOIC	
RECENT:	Peat, humus, silt.
PLEISTOCENE:	Stratified clay, boulder clay, sand, gravel, and boulders.
	Great Unconformity
PRECAMBRIAN	
POST-KEEWATIN:	Intrusive rocks: lamprophyre; diorite; quartz-feldspar porphyry; syenodiorite; grey granite (granodiorite), porphyritic granite, pink granite (quartz monzonite); serpentinite, chlorite-talc-carbonate schist; metagabbro.
	Intrusive Contact
KEEWATIN:	Sedimentary and metasedimentary rocks: argillite, greywacke, chert-carbonate rock, paragneiss, chert and lean iron formation.
	Acid volcanic rocks: porphyritic (quartz, feldspar) rhyolite, rhyolite breccia; lean iron formation.
	Basic volcanic rocks: pillowed basalt, massive basalt, basaltic flow-top breccia, variolitic basalt, amphibolite, interflow sediments.

PRECAMBRIAN

Keewatin

The Keewatin rocks consist of three distinct groups: basic volcanic rocks, acid volcanic rocks, and sediments. Little evidence concerning their relationships is found within the map-area, because each group tends to occur in belts, and

contacts between groups are not exposed. From the evidence of mapping in Dome and Balmer townships, it would appear that the basic volcanic rocks are the oldest group and that the sediments either are the youngest group or may be partly contemporaneous with the acid volcanic group.

BASIC VOLCANIC ROCKS

This group includes all the darker-coloured rocks; no flows of andesitic composition were recognized. Basaltic flows range in colour from light- to dark-grey, and are often of a greenish shade. The basalts (more properly meta-basalts) are generally uniform fine-grained rocks that in many places contain a few scattered amygdules filled with carbonate. Pillowed basalt zones are associated with the uniform basalt. The pillow rims are ordinarily ¼–½ inch wide and are of a composition and colour similar to that of the rest of the rock so that they are not particularly conspicuous. In most areas the pillows are of irregular shape; maximum dimensions of the pillows range from 1½ to 3 feet. A flow top was recognized on the west side of McFinley Peninsula near the north end. This flow-top breccia consists of small angular fragments in a carbonatized, rusty-weathering matrix. Another flow top is exposed on the east side of McFinley Island, where a 2-foot band of rusty-weathering ropy lava marks the contact between uniform lava and pillow lava.

As a rule, fine-grained lavas may be accompanied by coarser-grained phases that represent the central parts of flows. Such coarser-grained rock types are probably present in this area, but they cannot be distinguished from sills or dikes of similar composition. Because of this difficulty, all the coarser-grained types have been mapped as metagabbro.

Variolitic Basalt

Near the southwest corner of the township, on Abino Gold Mines' claim K.R.L.18032, drillhole No. C-7, collared 200 feet east of the township corner, has intersected variolitic basalt from footage 95 to footage 221, except for a dike 15 feet wide. Variolitic basalt is shown in the core log as occurring on the McFinley property on claim K.R.L.246 in drillhole M-83, about 800 feet southwest of the shaft.

A similar rock type is exposed on the northwest side of an island 3,500 feet southwest of the west end of East Narrows. These lavas usually have pillow rims as thick as 2 inches, and in the diamond-drill core the variolites are concentrated in a zone near the margins of the pillows. The variolites are white on the weathered surface and a pale greenish colour in the drill core; in cross-section they are rounded to oval, with maximum diameters of about ¼ inch. The variolites are composed of carbonate and feldspar with the enclosing rock of about equal parts of biotite and chlorite with a small amount of magnetite.

Moorhouse (1959, p. 188) has commented on the misuse of the name andesite to describe certain Keewatin rocks:

> A further misuse of the term andesite is the application of it to altered basalts, such as greenstones of the Keewatin. The usage stems from the sodic feldspars they contain and their lighter colour, due to chloritization and carbonatization of the ferromagnesian [minerals]. It should be avoided.

In order to provide some additional information on the composition of the volcanic rocks it was decided to determine the amount of silica present. Some specimens, taken from other areas and used in this project, contained a considerable amount of carbonate, and it was decided to determine the amount of carbon

Partial Analyses of Basic Volcanic Rocks

(Analyses by the Provincial Assay Office)

Specimen No.	Location	Description	CO_2 Content	SiO_2 Content	Silica Content in Original Rock[1]
			percent	percent	percent
R.L.1	McFinley property, shoreline, claim K.R.L. 18735.	Lava, light-grey, fine-grained; contains a few amygdules.	1.38	43.2	43.8
R.L.2	Leemac property, south boundary claim K.R.L.17697.	Lava, dark-coloured; some small feldspar crystals and elongated amphibole crystals up to 1/8 inch long.	0.78	43.2	43.6
R.L.4	Abino property, at 109 feet in drillhole C-7, located on south boundary of claim K.R.L.18032.	Uniform part of variolitic lava; medium-grey, fine-grained.	2.86	42.9	44.2
R.L.6	Abalard property, at 20 feet in drillhole 6, located in southwest quarter of claim K.R.L.2773 (later restaked as K.R.L. 20329).	Lava, uniform, fine-grained, light-grey.	1.5	40.3	40.9
R.L.7	Marshall Red Lake, at 17 feet in drillhole C, located 2,800 feet east of Beatrice claim K.R.L.253.	Lava, uniform, fine-grained, light-grey.	0.15	43.4	43.4
R.L.8	Marshall Red Lake, at 101 feet in drillhole B, located 2,800 feet east of Beatrice claim K.R.L.255.	Lava, uniform, fine-grained, light-grey.	0.09	48.8	48.8
R.L.9	Marshall Red Lake, at 327 feet in drillhole B, located 2,800 feet east of Beatrice claim K.R.L.255.	Lava, uniform, fine-grained, medium-grey.	0.74	48.5	48.9
		Average	1.04	44.3	44.8
		Average basalt[2]			47.71
		Average andesite[3]			54.20

(1) CO_2 subtracted from total, and SiO_2 recalculated as a percentage of the balance.
(2) Nockolds (1954, p.1021); the average given is the average for the six varieties of basalt described here.
(3) Nockolds (1954, p.1019).

dioxide present in each of the specimens. It is assumed that no materials have been removed from the original rock composition, and that the only material added is carbon dioxide. If these two assumptions are correct, then the percentage of silica in the original rock can be determined by subtracting the percentage of carbon dioxide from 100 and recalculating the silica as a percentage of this balance.

The table on page 7 gives the locations, descriptions, and chemical data for the seven specimens for which partial analyses were made. Also included in the table is the average silica content for basalt and for andesite. A comparison of these percentages indicates that these rocks were originally basalts (now metabasalts) rather than andesites. Nockolds (1954, p. 1021) in his tables of analyses, reports the average silica content of olivine basalt as 43.69 percent. This figure corresponds closely to the average silica content of the seven specimens analyzed.

Metamorphism of Basic Volcanic Rocks

Up to a distance of 3,800 feet from the granite contact the basalts have been metamorphosed into a black amphibolite with fibrous amphibole 1–2 millimetres long. Some other types of metamorphism seem to be more erratically distributed and are confined to local areas. Some outcrops occur east of Beatrice Red Lake's claim K.R.L.251, where clusters of dark-coloured material, ⅛–¼ inch in diameter, weather in relief on the rock surface. When investigated under the microscope, fragments of these minerals proved to be hornblende. Drillholes on the Duchesne property near the shore of East Bay intersected alternating greenish and brownish bands ranging in width from a fraction of an inch to 3 inches. The brownish bands contain an abundance of biotite, and the green bands amphibole. A similar specimen was obtained from the Marshall Red Lake drillhole No. 1 at a depth of 771 feet. A thin-section from this specimen showed that the brownish bands consist of biotite and fibrous amphibole and that, in the greenish-grey bands, large crystals of augite have developed with growth beginning at many centres but maintaining optical continuity over considerable areas. On the McFinley property, small and irregularly distributed garnets have been reported in the drill core; in the underground workings at Abino, garnets have been observed adjacent to small quartz veinlets.

Interflow Sediments

Interflow sediments associated with the basaltic lavas are mainly of lean siliceous iron formation that grades into banded cherts. Other interflow rocks are chert-carbonate rock and some thin bands of slate. A persistent zone that contains interflow rock types has been traced, by drilling and trenching, along the McFinley Peninsula and along McFinley Island. On the peninsula, lean iron formation is exposed on the shoreline near the north boundary of claim K.1499, and there is one outcrop a short distance inland from the shore. At the shoreline, two bands of cherty iron formation, each about 5 feet wide, are present. Some specimens from these outcrops are strongly magnetic. Closely spaced drillholes have traced the extension of these and adjacent iron formation bands for a mile southwest along the strike; drilling has also shown the zone to persist for 500 feet in a northeasterly direction.

From the north end of McFinley Island a zone of iron formation was followed for most of the length of the island. This band is exposed at both the north and south ends of the island and, for the intervening 2,300 feet, was uncovered in numerous trenches and intersected by drilling. In the southern part of the island, only one band of iron formation is present, but in the northern part two

or three parallel bands are present within a distance of 50 feet. The individual iron formation bands range in thickness from a few inches to 3 feet and consist mainly of light-coloured sugary chert with some interbanded dark chert. The weathered iron formation in many places has a reddish colour due to the oxidation of sulphides. Magnetism, in specimens taken from these iron formation bands, varies from weak to strong. In many places near the contact with the iron formation, the basalts have been considerably carbonatized.

Iron formation is exposed on the east side of East Bay on the Duchesne property, near the mouth of Abalard Creek. On the point west of the creek mouth, the outcrop on the west shore is a weakly magnetic band of grey chert 3 feet thick. Farther east, this same band of iron formation is exposed in a trench near the creek bank. At this point the iron formation is 10 feet wide and consists mainly of grey chert enclosing one band of jasper 2 feet wide. Magnetic iron formation is exposed 500 feet farther east and is probably the continuation of the same band.

Some outcrops of chert-carbonate rock are present on the northeast shore of McFinley Peninsula on claims K.1499 and K.R.L.18375. This rock has a very irregular surface owing to the weathering-out of small lenses of carbonate, which leaves elongated depressions along the schistosity. Also, it contains thin bands of cherty quartz, ¼ to ½ inch wide, which weather in relief. These outcrops extend along the shoreline for 450 feet, and any particular outcrop has a width of about 20 feet. These rocks are considered to be a carbonate type of iron formation.

Some drill logs for holes drilled on McFinley Peninsula record widths of black slate up to 5 feet. In the underground workings at McFinley and at Abino, some rocks are described as siliceous sediments or banded chert. In local areas, where chert predominates and little, if any, iron is present, these rocks are believed to represent the end member of the chert–iron–formation series.

ACID VOLCANIC ROCKS

Acid volcanic rocks are exposed in the northwestern part of the map-area, both north and south of the western part of East Narrows, and are well exposed on some of the islands in Hoyles Bay. Map No. 49b (Horwood 1940) and maps by company geologists indicate that rocks of this type persist both northeast and southwest of the area mapped.

Outcrops of uniform, porphyritic rhyolite without fragments can be differentiated from quartz-feldspar porphyry dikes only if the outcrops have a greater width than the width (2–20 feet) for these dikes, or if they occur within belts of rhyolitic rocks and are associated with iron formation. In two localities where outcrops have been found it is uncertain to which group of rocks the outcrops should be assigned. On the shoreline of claim K.954, north of McFinley Island, an outcrop of porphyritic rock occurs adjacent to an outcrop of lean iron formation. In both directions along the strike, these rocks pass beneath the waters of Red Lake. Two outcrops appear north of Pindar Lake; the outcrop nearest the lake is small, but the outcrop farther north is a cliff face about 250 feet in length. These two outcrops are present in an area between the basalts and sediments; they are, therefore, in the position where rhyolite would be expected, according to the known stratigraphic sequence.

The rhyolites weather to a light-buff colour and, although most contain phenocrysts of quartz and feldspar, many outcrops also contain zones or patches of rhyolite breccia. In Hoyles Bay on the island that is partly within claim K.R.L.11495, the outcrop contains light-coloured angular fragments of rhyolite enclosed in a matrix of rhyolite. The larger fragments, whose maximum dimension

is about 10 inches, tend to occur in patches with apparently random distribution. Some outcrops contain narrow parallel bands of slightly different colour.

These rocks, consisting mainly of quartz and feldspar, also contain about 5 percent each of carbonate and white mica. The feldspars consist of untwinned albite, and staining tests did not indicate the presence of any potassium feldspar. A partial analysis of a specimen of these rocks by the Lakefield Institute (Turner 1960, p. 39) gave a silica content of 72.78 percent.

Bands of lean iron formation are associated with these rhyolitic rocks. The widest band is located near the central part of the rhyolite zone on both shores of the west end of East Narrows. The iron formation is 20–30 feet wide and consists mainly of grey chert with narrow bands of magnetite. The magnetic traverse over these rocks gave an anomaly with a peak value of about 2,000 gammas, which indicates that the content of magnetite is fairly low. Another band of lean cherty iron formation is exposed on the shoreline on claim K.R.L. 11478, about 1,500 feet southwest of East Narrows. This bed is located near the base of the rhyolite unit, is about 2 feet thick, and consists mainly of banded white chert.

Argillite, claim K.R.L.20211.

SEDIMENTARY AND METASEDIMENTARY ROCKS

Sedimentary rocks are exposed near the granite batholith, but occur mainly as isolated outcrops rather than as persistent ridges. The outcrops northeast and southeast of Pindar Lake are thin-bedded grey argillites. Narrow zones contain beds of alternating light- and dark-coloured argillite $\frac{1}{8}$–$\frac{1}{16}$ inch thick. These variegated zones alternate with wider beds of uniform colour. On these outcrops the strikes and dips are nearly constant; no dragfolds were observed.

The outcrops that are on the township's south boundary east of Milepost 32, and the outcrops that are about 1 mile north on claims K.R.L.20211, K.R.L. 20212, and K.R.L.20214, are also thin-bedded argillites in which the bedding is outlined by narrow, lighter-coloured beds; these argillites are greenish-grey in colour and, here and there, contain some granitic material injected in a *lit par lit* arrangement along the bedding. In both these outcrop areas, the bedding is strongly contorted owing to the presence of many dragfolds. A narrow band of

magnetic iron formation is contained within the sediments on the outcrops immediately south of the township boundary.

Many, but not all, of the outcrops of paragneiss are located close to the contacts with the larger masses of granite. The paragneiss contains small, black crystals of hornblende with fine flecks of light-coloured feldspar. On the weathered surface, the feldspar appears as a series of closely spaced, parallel, threadlike masses. Small veinlets of white, granitic material have been injected along the bedding.

Argillite cut by syenodiorite dike, claim K.R.L.20214.

Post-Keewatin

INTRUSIVE ROCKS

Metagabbro

Medium-grained rocks generally similar to the coarser-grained parts of basalt flows are widely distributed. Some of these rocks are associated with porphyritic rhyolite and are believed to intrude the rhyolite, although no good contact relations can be seen. In certain places these rocks form moderately wide zones, as along the shores of McFinley Bay and farther northeast along strike. A rather persistent line of outcrops, located along the southeast side of a magnetic anomaly that exists southwest of East Narrows, is believed to be a marginal phase of the intrusive rock underlying the anomalous area. Some of the narrower zones of these rocks are most probably the coarser-grained parts of flows. However, the wider zones are dikes or sills and, if they cut the rhyolite, are younger than the basaltic flows. Rocks of different origins and different ages are included in this group of medium-grained basic rocks because they are indistinguishable in appearance.

The metagabbros exhibit on their weathered surface, small, tabular, cream-coloured feldspars 1–2 millimetres long, associated with dark-green amphibole. The estimated mineral composition of these rocks is: actinolite, 50 percent; feldspar, 25 percent; biotite, 13 percent; and a small amount of magnetite. The feldspars are clear and without twinning, and have a refractive index higher than

balsam. Tremolite needles extend into the feldspar and are partly enclosed by feldspar. Magnetic readings, taken over rocks of this type, correspond to the general background of the country rocks. A partial analysis of a specimen from claim K.R.L.18457, on the west shore of McFinley Peninsula, showed that the rock contains 49.3 percent silica and 0.9 percent carbon dioxide.

Serpentinite

The East Bay serpentinite sill occurs mainly beneath the waters of East Bay and is exposed on two small islands near the shore and on the point on the east side of the Bay on Duchesne Red Lake claims K.R.L.260 and K.R.L.11036. Diamond-drilling on the properties of Forsyth Mines Limited, Duchesne Red Lake Mines Limited, Inore Gold Mines Limited, and Abino Gold Mines Limited, has provided additional subsurface information on the continuity of the sill. The outcrops, on the two islands and on the mainland part of the Duchesne Red Lake property, are soft, very light-weathering, fine-grained rocks that contain thread-veinlets of asbestos in a few places.

Two diamond-drill holes northwest of Pindar Lake intersected serpentinite beneath a linear magnetic anomaly. This is a fine-grained, light-green rock with a soapy feel.

A thin-section from a specimen on the Duchesne property showed that about 65 percent of the rock is antigorite; the remaining 35 percent is mainly tremolite with a few grains of pyrite and small grains of magnetite. Much of the tremolite surrounds masses of antigorite and outlines the borders of pyroxene crystals that formerly existed in the rock. Some pyroxene crystals have been completely replaced by tremolite. Antigorite also occurs in veinlets associated with carbonate. A specimen of serpentinite from the drilling northwest of Pindar Lake showed that this sill now consists almost entirely of antigorite with magnetite in thin stringy masses outlining the boundaries of former crystals. Thin-section examination indicates that the serpentinite resulted from the alteration of a pyroxenite.

Certain rocks encountered in drilling beneath East Bay on the McFinley property and also west of the Beatrice stock have been described in drill logs as talc-chlorite-carbonate schist. These rocks may be similar to the East Bay serpentinite, but they have not been seen by the author; it is not known whether or not a magnetically high zone is associated with these rocks.

GRANITIC ROCKS

The western part of a large granitic batholith is present in the eastern part of Bateman township. A small stock of granodiorite is exposed on Beatrice Peninsula.

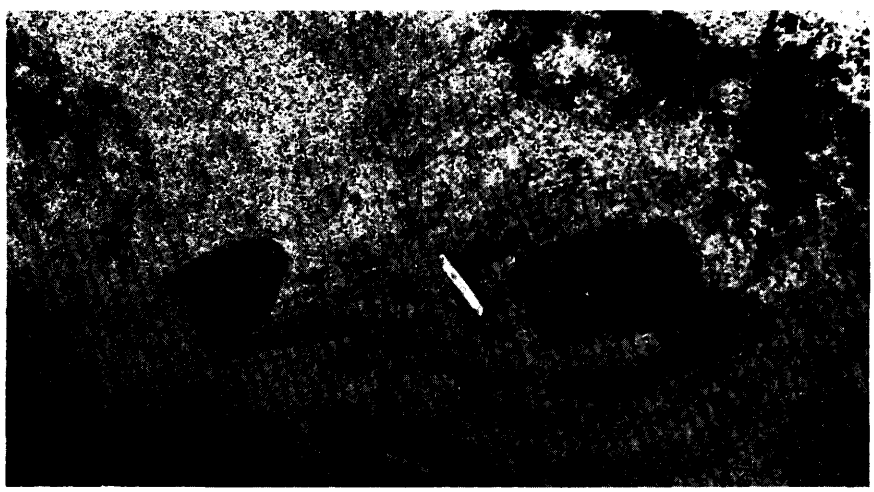
Granite Batholith

Three distinct types of granitic rocks have been recognized within the batholith. The oldest is a grey biotite-hornblende granite cut by dikes of porphyritic pink granite. The largest part of the batholithic material within the map-area is a pink granite. This pink granite is assumed to be the youngest of the three varieties of granitic rocks although its contacts with the other granitic rocks were not seen. A limited thin-section examination showed that the grey biotite-hornblende granite is a granodiorite, and the pink granite is a quartz monzonite.

Grey Biotite-Hornblende Granite (*Granodiorite*).—The largest group of exposures of this rock type is the first group of outcrops on the east township

boundary north of the southeast corner post. Other outcrops are located at 4,000 feet west and 2,500 feet southwest of Shaver Lake. The rock is equigranular and medium-grained with buff-coloured feldspars and black ferromagnesian minerals. The maximum diameter of the largest feldspar crystals is 4–6 millimetres, and grains of quartz are about 3 millimetres in diameter.

An estimated 45 percent of the rock is feldspar, of which 10 percent is microcline, and the balance is albite with a small amount of myrmekitic intergrowth. Quartz constitutes 20 percent of the total; biotite and hornblende each form about 15 percent; apatite, titanite, and magnetite are each present in minor amounts.



Granite containing inclusions of altered basalt.

Porphyritic Granite.—Dikes of porphyritic granite, including one dike 150 feet wide, cut the older biotite-hornblende granite on the township's east boundary near the north edge of claim K.R.L.20390. Porphyritic granite is exposed as outcrops 2,500 feet southwest of the south end of Shaver Lake and, elsewhere, west of Walsh Lake, 900 feet east of claim K.R.L.20221.

This granite is light-pink and contains tabular feldspar phenocrysts 2.5 centimetres in length. The phenocrysts are microcline with inclusions of albite with polysynthetic twinning and small amounts of myrmekitic intergrowth. The percentage mineral content is estimated as: microcline, 60; quartz, 15; albite, 10; biotite, 10; and magnetite, 2. The albite is clear and unaltered; the microcline is relatively clear but contains some centres of oriented albite growing within it and, along cracks, there is some replacement by a later feldspar. In some places there are a few crystals of clinozoisite growing within the microcline.

Pink Granite (Quartz Monzonite).—This type of granite is widely distributed in the part of the batholith within the township. It is a light-pink medium-grained granite containing feldspar crystals 2 millimetres in diameter. In some localities the dark minerals tend to occur in streaks about 1 centimetre in length. The percentage mineral content is estimated as: albite, 40; quartz, 25; microcline, 20; biotite, 10; hornblende, 2; and small amounts of graphic intergrowth of quartz and feldspar, titanite, apatite, magnetite, and ilmenite. The microcline has a well-developed grid-pattern, and most of the albite is untwinned. Staining tests for the feldspars indicated that the untwinned feldspar is plagioclase.

BEATRICE PENINSULA GRANODIORITE STOCK

Outcrops of this stock appear only on Beatrice Peninsula. On the west side of the stock, the contact with the adjacent rocks was found by diamond-drilling; near the southern tip of the Peninsula the eastern contact also was found by drilling. The rock is light-coloured; quartz is prominent on the weathered surface. Many of the mineral grains have maximum dimensions of 2 millimetres.

The following is taken from an analysis and a calculation by G. G. Suffel presented by Bruce and Hawley (1928, p. 44):

Analysis	Percent	Calculation	Percent
SiO_2	68.47	Quartz	27.18
Al_2O_3	16.24	Orthoclase	4.90
Fe_2O_3	0.28	Albite	39.98
FeO	2.49	Anorthite	8.34
MgO	0.61	Biotite	11.63
CaO	2.48	Sericite	3.27
Na_2O	4.73	Calcite	1.43
K_2O	2.39	Kaolin	2.34
CO_2	0.63	Chlorite	trace

By calculation the feldspar is found to be oligoclase (An_{17}). In thin-section, the feldspar shows a few Carlsbad twins but no albite twinning. Staining tests confirmed the fact that the main part of the feldspar is plagioclase with orthoclase in narrow discontinuous replacement zones along the edges of the oligoclase. The development of fine flakes of mica within the feldspars was the only alteration observed.

QUARTZ-FELDSPAR PORPHYRY

These rocks occur mainly in dikes usually less than 25 feet in width. A large number of these dikes intrude the basalts near the east shore of East Bay. A few dikes are found on McFinley Peninsula, on McFinley Island, and near the shoreline on claims K.R.L.954 and K.R.L.958, west of Beatrice Peninsula. A small porphyry stock, about 500 feet wide, is exposed on the Leemac property.

These porphyries weather light buff and usually contain prominent phenocrysts of quartz and feldspar. In the underground workings at Abino, two ages have been recognized in these dikes. The older dikes have been sericitized so that feldspar phenocrysts have been destroyed.

Horwood (1945, p. 41) reported on these rocks as follows:

> Microscopic work on thin sections from various parts of the area indicates that albite, $Ab_{95}An_5$, is by far the most abundant feldspar present. In some of the more acid phases pure albite is present, whereas in the tonalitic varieties the feldspar is oligoclase, $Ab_{71}An_{29}$. Orthoclase, which in one section occurs as small phenocrysts, was noted in only the more acid phases. Chemical analyses, however, indicate that small amounts probably occur in the tonalite porphyry. Larger amounts of biotite and chlorite were found in the latter rock. In some of the acid porphyries the femic constituents do not make up more than 1 or 2 per cent of the rock.

The author is in substantial agreement with the above description and has found that the thin-sections examined contained: plagioclase, 65 percent; quartz, 20 percent; biotite, 10 percent; and small amounts of white mica and magnetite. The size of the quartz grains ranges from a maximum of 3 millimetres to very small. Some feldspar crystals show albite twinning, but others are untwinned; all the feldspar contains cloudy masses of micaceous material. Staining of the feldspars indicated that plagioclase is the predominent type with a very little potassium feldspar along the edges of the plagioclase and within it. Biotite occurs as stringy aggregates; white mica occurs in the groundmass as small scales and a few larger crystals.

A partial analysis, by Lakefield Institute (Turner 1960, p. 39), of a specimen of this rock type from Marshall Red Lake drill core gave a silica content of 66.92 percent.

SYENODIORITE

The largest dike found within the map-area crosses the township's south boundary 2,000 feet east of Milepost 32. This dike has an observed width of 150 feet and is exposed along strike for 4,000 feet. Two similar dikes intrude the sediments and metasediments north of the dike just described; two other dikes are found 2,100 feet and 1 mile, respectively, west of Pindar Lake.

These rocks are dark-coloured and contain prominent euhedral hornblende crystals and grey to pinkish interstitial feldspar. The grain is medium to coarse, and contains hornblende that measures up to 4 millimetres in cross-section and 6 millimetres in longitudinal section. The thin-section examined contained: hornblende, 45 percent; untwinned albite, 30; microcline, 10; quartz, 5; and biotite, 5 percent; and apatite in small amount.

DIORITE

Southwest of Pindar Lake, fresh diorite is exposed on a conical hill on the Marshall Red Lake base line. The large main outcrop on this hill, is a medium-grained rock containing approximately equal amounts of dark minerals and grey to buff feldspar. A thin-section examination showed the feldspar to be andesine (An_{40}) forming about 55 percent of the rock. The associated minerals are: actinolite, 30 percent in fibrous aggregates; biotite, 10 percent; and magnetite and apatite in small amounts. About 800 feet south of the main outcrop of diorite there are smaller outcrops of fine-grained material; these two outcrops of fine-grained basic rock east of the main outcrop area are included as part of this mass.

LAMPROPHYRE

Small dikes, ranging in width from a few inches to 10 feet, are present in the core from many drillholes; a few dikes have been seen on surface. They are fine-grained, dark-brown to black, and contain crystals of hornblende or biotite or both.

CENOZOIC

Pleistocene

The area is covered with a mantle of glacial deposits of varying thickness. Glacial striae indicate that the movement of the ice was generally in a direction S.20°–45°W., although in certain areas the movement may have been influenced by local topography. The direction of this glacial trend is similar to the direction of the regional strike and to the trend of the bedrock topography developed in a long period of weathering in preglacial time.

Many of the larger hills show a crag-and-tail effect with an outcrop on the northeastern face and a boulder train southwest of the outcrop. In the southeast quarter of the map-area, particularly near the south end of Walsh Lake, there are many small ridges consisting of boulders of various sizes in a sandy or gravelly matrix. Some of these ridges are at right angles to the direction of ice movement; they are considered to be small terminal moraines caused by local advances and retreats of the ice, and are called washboard moraines.

On the south side of Abino Point in Balmer township, a section of the glacial deposits, about three feet in height, consists of one foot of bedded clay overlain by boulder-clay containing very fine pebbles. Hurst (1936, p. 7) has reported the existence of varved clay in a trench on Beatrice Peninsula, but no varved clays were seen by the author.

The only sandy beach in the area is on the Duchesne property on claim K.R.L.11036. Along the east side of East Bay a few sections of bedded sand have been exposed by wave action.

Glacially smoothed outcrop of granite on the west shore of Walsh Lake near the witness post of No. 1 post of claim K.R.L.20204.

Recent

Recent deposits consist mainly of organic material now collecting in swamps and muskegs. Along shorelines there is some reworking of glacial deposits by wave action.

Magnetic Surveys

Several ground magnetic surveys had been included with the assessment work reports for Bateman township and adjacent parts of Balmer township. Additional magnetic traverses were made by the author's field party over the land-areas in order to provide a body of data from which magnetic contours could be drawn.

During the survey, a one-man, vertical-intensity type, Sharpe magnetometer was used with a scale-constant of 25.1 gammas per scale division. The magnetic base-level that was used by Mining Geophysics Corporation Limited for surveys in Balmer township was chosen for this survey. Because of the reconnaissance nature of the work the base station could be read only at the beginning and end of the day. Magnetic values were calculated for each station and plotted on the geological work sheet. The magnetic surveys that had been made previously of the properties held, or held formerly, by Abino, Leemac, Marshall Red Lake, Norlee Red Lake, Janet Red Lake, and O'Keefe mining companies were used; those surveys that were not at the magnetic base-level chosen were incorporated with this survey by rereading a group of stations in order to adjust the station data to the new base-level.

Preliminary Ground Geophysical Map No. P. 47, Township of Balmer, was released by the Ontario Department of Mines in March 1960. In the fall of 1960, Map No. 852G, Red Lake, part of the Aeromagnetic Series, was released jointly by the Geological Survey of Canada and the Ontario Department of Mines.

Structural Geology

Structural interpretation in the map-area is limited by the presence of widespread overburden and by the scarcity of good outcrops. Strikes and dips were obtained from pillow lavas and sediments. Diamond-drill and geophysical data have been used to supplement surface information. The author's interpretation is shown by the lighter colours on the map.

The elongation of pillows and the mapping of flow contacts provided direct information on the attitude of the lavas; additional structural information may be obtained from narrow bands of interflow sediments. Only one determination of tops, from the shape of pillows, was obtained. In other localities, the pillows, where present, have been greatly deformed; therefore, no top determination could be made. The bedding planes of dragfolds in sediments were used to determine plunge; in a few places, lineation is developed on planes of schistosity.

The stratigraphic sequence of sediments overlying basaltic volcanic rocks has been well established by mapping and by mining operations in Balmer township. Owing to this stratigraphic relationship, the sedimentary bands are believed to be infolded synclines. Mapping in Bateman township, and later mapping in Dome township, have shown that a rhyolitic rock unit exists in certain places and appears to lie directly upon the basic volcanic rocks. The rhyolite, where present, is assumed to occur between the basic volcanic group and the sediments.

The strongest and most persistent structural feature is the East Bay serpentinite zone. This zone of soft rocks is deeply eroded and lies mainly beneath the waters of East Bay, near the east shore. The serpentinite zone is 300 to 500 feet in width and contains horses of country rock. Structurally, the serpentinite appears to be conformable, or nearly so, with the rocks to the west, but in certain places is not conformable with the rocks to the east.

A persistent magnetic anomaly extends southwest from East Narrows down the peninsula between Hoyles Bay and McFinley Bay. Two outcrops within the magnetic high are mapped as metagabbro. The magnetic relief and information from mapping done farther southwest in Dome township lead to the assumption that the dike or sill is an altered basic or ultrabasic rock. A zone described in drill logs as talc-chlorite schist probably similar to the East Bay serpentinite, was located by drilling along the east shore of the McFinley property and probably connects with a magnetic anomaly on the Inore property. Small anomalies within basic volcanic rocks are considered to be caused by a local concentration of magnetite in a flow; the more persistent linear anomalies are probably caused by dikes or sills of a composition similar to that of the East Bay serpentinite. The serpentinite bodies near Pindar Lake are examples of dikes or sills that cause the more persistent anomalies.

FOLDING

The rocks west of the East Bay serpentinite strike northeast and dip 60°–70°NW. Surface drilling on the Inore property and McFinley Peninsula has shown that a zone of interflow sediments, consisting of lean iron formation and some associated slate, extends along the strike throughout the Peninsula. These sediments are not strongly contorted; their dip and strike remain unchanged

throughout the McFinley Peninsula. The bands of iron formation on McFinley Island have the same general strike but may be a parallel zone rather than an extension of the zone on the peninsula.

The existence of a synclinal dragfold at Abino Point has been established by surface mapping, diamond-drilling, and underground mapping. The axial trend of the syncline, as outlined by pillow lavas and the contact between lavas and serpentinite, is westward; the plunge is 55°–60°W.

A syncline is presumed to be present north and south of the western part of East Narrows. The presence of rhyolite and sediments in this area can best be explained by down-folding of the stratigraphically higher beds.

Beds of slate, with some associated metamorphosed sediments, exist in areas adjacent to the granite batholith and have conformable contacts with the granite. These sediments strike in a northerly direction and dip 40°–65°W.; in a few places, plunges of about 30°S. may be found. Here also, the sediments are assumed to be present in synclinal areas.

On the Abalard property, and on the southern part of the Duchesne property, the strikes of the pillow lavas are approximately northwest. These northwest trends mark the north limit of the east-west folding found in part of Balmer township.

FAULTING

No direct evidence of faulting was observed during surface mapping. In the underground workings at the McFinley property one cross-fault, with an apparent horizontal displacement of 140 feet, was mapped; other cross-faults in these workings have lesser displacements.

The East Bay serpentinite generally conforms with the regional trend of those rocks that are on the west side, but in several places the rocks on the east side trend in a direction almost perpendicular to the strike of the East Bay serpentinite. This abrupt discordance may be due to faulting.

SHEARING

Shearing is best developed in the country rocks near the shores of East Bay, where the basalts are near the contact with the serpentinite, or talc-chlorite schist intrusives. The most highly sheared rocks are along the east side of McFinley Peninsula and along the east shore of East Bay. Where the regional trend and the strike of the altered basic intrusives are parallel, the schistosity conforms with the regional strike and dip; but, where the trend of the volcanic rocks makes a large angle with the trend of the intrusive rocks, the schistosity conforms to the trend of the country rocks. From this relationship, it would appear that the schistosity is related mainly to folding and corresponds in orientation to axial-plane cleavage, rather than to later shearing stresses, although later shearing may accentuate the development of schistosity where shearing stresses coincide in direction and dip.

Porphyry dikes of two ages have been found on those mining properties on which intensive geological work has been done. Earlier "waxy porphyry" dikes now consist of quartz and sericite, the original phenocrysts having been totally or partly destroyed. Such alteration is related to shearing or folding stresses. Later dikes of similar composition contain prominent phenocrysts of quartz and feldspar.

Economic Geology

Gold

The first claim surveys were made in the map-area before 1933. There has been no production of gold in the south half of Bateman township, though at each of two properties a shaft has been sunk and underground workings have been established.

The host rocks for the gold are basalt, chert and lean iron formation, and quartz-sericite porphyry. Gold-bearing structures consist of quartz veins and stringers, and zones of massive sulphides.

Sulphides

Small amounts of sulphides are associated with quartz veins, and massive sulphides replace zones in siliceous sediments. The most abundant sulphide in these deposits is pyrrhotite with associated arsenopyrite, pyrite, sphalerite, and galena. On the Abino property a trench on the township line east of East Bay exposes pyritized basalt. A zone of massive pyrite with some magnetite occurs in recrystallized basalt about 6,600 feet east of the south end of Pindar Lake. This pyrite zone, 2 to 3 feet wide and dipping almost vertically, has been exposed in pits for a length of 250 feet.

Gravel

No extensive gravel deposits are known to exist in the area mapped, though sand and gravel forms the matrix for the small moraines scattered throughout the southeast quarter of the map-area.

Description of Properties

ABINO GOLD MINES LIMITED

This property was briefly described in 1951 by Chisholm (1954, pp. 32, 33); later information (Kuryliw 1960: Holbrooke 1960) has been made available to the author by the company.

Location and History

This company was incorporated in 1939 and acquired a group of 18 claims. Four claims, K.R.L.18036 to K.R.L.18039 inclusive, are within Bateman township; three other claims, K.R.L.18032, K.R.L.1006[1], and K.R.L.1008[2], are partly within Bateman township. The claim group extends beyond Bateman township into Balmer, Dome, and McDonough townships.

Part of East Bay is within the claim group and provides a water route to the property. In the fall of 1959 the company built a private road, about 3 miles long, from the shaft at Marboy Mines to Abino Point on East Bay. This road connects with highway No. 125.

Development

Between 1939 and 1945, trenches were excavated and 13 diamond-drill holes were put down. In 1946 a geological survey and a magnetic survey were made of the property, and 20 holes with a total length of 14,378 feet were drilled. Most of this drilling was at Abino Point; drillhole No. 19 was drilled eastward from the east shore of East Bay. During the summer of 1959, seven more holes were drilled in the same vicinity to check the geological structure and indications of

[1]Restaked as K.R.L.18033.
[2]Restaked as K.R.L.18034.

gold that had been obtained in previous drilling. In December 1959 a power line, 11,900 feet long, was completed from Marboy No. 2 shaft to Abino Point. Also in 1959, construction included: a building combining the machine shop, dryhouse, and hoistroom; a building combining an office, a warehouse, and a residence; a cookery; a bunkhouse; and several other buildings for supplies and equipment. A three-compartment shaft was sunk to a depth of 530 feet, and levels were established 200, 350, and 500 feet below surface. The total amount of lateral work on the three levels, including a small amount of raising, was 3,100 feet. Underground work was suspended in September 1960, and the workings were allowed to flood. About $500,000 (Northern Miner 1960, p. 876) was spent during 1959 and 1960.

Shaft area of Abino Gold Mines Limited, showing headworks, hoistroom and general service building.

Surface Geology

The surface geology of the claim group is very poorly known, owing to the fact that overburden is widespread. Two outcrops have been found on the inland portion of the claims; all other outcrops are along the shores of East Bay.

Surface mapping on the west shore of East Bay near Abino Point shows that a band of pillow lava is present along the shoreline. Strikes on the pillows indicate that the trend of the geological structure conforms with the shoreline, and that Abino Point is the topographic expression of a fold. On claim K.R.L. 17789, near the Dome–Balmer township line and 800 feet south of the southwest cornerpost of Bateman township, coarser-grained unpillowed lava is exposed on the shore. About 100 feet east of this outcrop, a narrow band of strongly magnetic iron formation strikes N.70°E. and appears to be along the contact between pillowed and unpillowed phases of the lava. On the east shore of East Bay the rocks are mainly uniform basalts with a few narrow diorite dikes. Along the shore the basalts show a platy structure that is parallel to the schistosity.

Ground magnetometer surveys show that a belt of higher magnetic intensity occurs both north and south of Abino Point, but the magnetic contours do not curve around Abino Point to conform with the geological trend. Surface drilling indicated that a band of talcose rock is present under this part of East Bay and

conforms with the structure of the lavas. Drillholes, collared on the township line 200 feet east of the southwest corner of Bateman township and drilled northward, intersected variolitic pillowed basalt near the collar of the drillholes.

Underground Geology

The country rocks encountered in the workings are pillow lavas; brownish, carbonatized, basaltic pillow lava is predominant, but smaller amounts of greenish chloritic pillow lava are also present. The brownish colour is due to the presence of biotite; garnets are also present in the lavas near the contacts of quartz-carbonate veinlets. A bed of poorly-banded green chert, 1–10 feet wide, exists in discontinuous lenses within 50 feet or less of the contact of the lavas and the talcose rocks. In many places the chert band contains abundant pyrrhotite with some pyrite and chalcopyrite.

The oldest intrusive rock is the talc-carbonate rock; it is considered to be a further alteration of the East Bay serpentinite sill. Drilling has indicated that the talc-carbonate rock is about 300 feet thick, and that it contains a lenticular horse of country rock up to 40 feet wide. The talc-carbonate rock is almost white and is very soft and schistose where it has been intersected in the workings.

Two types of porphyry dikes, similar to one another in composition, have been differentiated in underground mapping. The older type is a quartz-sericite rock locally called waxy porphyry; the younger dikes are less altered than the older and contain phenocrysts of quartz and feldspar.

Abino Gold Mines Limited drawings, (Chart A, plan; Chart B, section; in map case), show a gabbro sill, 40–60 feet wide, that has been intersected in the drives on the two lower levels. Narrow dikes of biotite lamprophyre cut all the older rocks and the quartz veins.

Structure

Work on surface and underground has established the presence of a syncline at Abino Point. This fold trends west and plunges at 55°–60° in this direction. The syncline is outlined by the contact of the talc-carbonate rock with the lavas and by the attitudes of the pillows observed on surface and in underground workings. Dips taken on the pillows and on the chert band show that the limbs of the fold dip toward the axis at angles of 60°–70°. The banded chert is considered to have been a continuous bed, which became separated into blocks during folding due to flowage of the more plastic basalt. It appears likely that the banded chert, containing abundant pyrrhotite and found in the underground workings, is the same bed that was mapped as magnetic iron formation on claim K.R.L.17789.

Description of Deposit

Veins and stringers, a banded chert zone, and silicified lavas, are the three environments in which gold was found in the underground workings and by diamond-drilling. The gold-bearing veins and stringers consist mainly of bluish quartz or quartz-carbonate contained within the basalt. These veinlets are of a relatively early age and are distinct from the numerous, later, barren quartz-carbonate stringers cutting the lavas and the stockwork of quartz veins present in the serpentine-talc-carbonate rock near the west margin. The pyrrhotite-pyrite mineralization of the banded chert contains only minor amounts of gold, and gold mineralization within the serpentine-talc-carbonate rock is limited to silicified lenses of country rock.

The most persistent vein occurs 215 feet east of the shaft on the 350-foot level; it extends downward to the 500-foot level and splits into two branches above the 350-foot level. This vein is thought to be about 200 feet in length, and to consist of a zone, 6–14 inches wide, of quartz stringers. About 2 percent sulphides, mainly pyrite with small amounts of sphalerite, galena, and arsenopyrite, are associated with the quartz. The arsenopyrite tends to be concentrated in local zones. The best assay obtained (Holbrooke 1960, p. 4) from this vein was 1.0 ounce of gold over an average width of 12 inches.

Short veins are found also near the banded chert. Veins that enter the chert show a substantial increase in gold content near the edge of the chert. The best member of this group of scattered veins was originally intersected in surface drillhole No. 11A, and was later found on the 500-foot level as a weakly mineralized quartz vein, 4–12 inches wide, that was followed for 50 feet in a north-south direction. A raise was driven on the vein for a vertical distance of 100 feet. For the first 30 feet of the raise, the vein was in basalt, showed visible gold, and gave an average value (Holbrooke 1960, p. 5) of 1.30 ounces of gold per ton across a width of 1.8 feet. In this part of the raise the vein was immediately adjacent to the block of chert; in the next 35 feet, it entered the chert, became weaker, and pinched out.

The chert band occurs in discontinuous blocks, 10 feet or less in width and about 50 feet in length. Banding is poor, and metallic minerals compose 10 to 50 percent of the rock. The sulphides are mainly pyrrhotite and pyrite with a very small amount of chalcopyrite. A little magnetite is associated with the sulphides. A small but measurable amount of gold is present.

Silicified basalt is present within the serpentine-talc-carbonate zone that is near a lenticular dike of sericitized quartz porphyry. This horse of basalt has a maximum width of 40 feet and a known length of 400 feet. The silicified basalt is brownish in colour, is cut by numerous quartz veinlets, and is mineralized with pyrite and a small amount of arsenopyrite. Twelve holes, drilled from the three underground levels, intersected this zone of silicified basalt. Generally the assays (Holbrooke 1960, p. 5) range from 0.02 ounces to 0.15 ounces per ton of gold, but the mineralization is uniform and persistent. The three best assays for gold in this zone were 0.76 ounces across 3.5 feet, 0.84 ounces across 3.0 feet, and 0.32 ounces across 4.0 feet; these were obtained from core samples in surface drilling, from bulk samples on the 350-foot level, and from bulk samples on the 500-foot level, respectively.

BEATRICE RED LAKE GOLD MINES LIMITED

Introduction

Beatrice Red Lake Gold Mines Limited was incorporated in 1945 and holds a group of 18 patented claims formerly held by Wilson Red Lake Gold Mines Limited. Trenching was carried out on Beatrice Peninsula during the summer of 1933, and on claims K.R.L.250, K.R.L.252, K.R.L.254, and K.R.L.10326 at a later date.

Description of Deposit

The following excerpt is from a previous report (Hurst 1936, p. 7):

> On the east side of the peninsula just south of the camp, trenching has exposed a 3-foot width of quartz. The vein appears to strike N.75°E. and to dip northwest. Toward the west it is deeply covered by sand and varved clay and toward the east it passes beneath the lake. According to the management, sampling of the showing yielded encouraging values in gold.

Farther south, near the boundary between claims Nos. 10,286 and 10,287 [K.R.L.10286 and K.R.L.10287], a shear zone has been exposed at intervals for a distance of about 200 feet. This zone strikes in a north-south direction and intersects grey biotite granite. It contains stringers and bulges of quartz that are erratic in strike, dip, and continuity. They range in width from a fraction of 1 inch to 7 feet. Some of the veinlets contain visible gold in addition to small percentages of pyrite, pyrrhotite, chalcopyrite, zinc blende, and tourmaline.

At the south end of the peninsula, the granite is cut by gash veinlets of quartz, 1 to 4 inches in width. These veinlets are widely separated and quite variable in strike and dip. Visible gold was observed in some of the exposures.

SUMMARY OF DRILLING

Year	Claim No.	Description
1937....	K.R.L.10287?....	Six short drillholes (not shown on map).
1941....	K.R.L.252.....	Set-up on shore, one hole directed east-southeast, dip 30°, length 305 feet. Another hole drilled in the opposite direction under bay for 87 feet.
	K.R.L.10323.....	Set-up on shore, one hole drilled southeast, dip 40°, length 798 feet. Another hole also drilled southeast, dip 40°, length 650 feet. The first hole reached the granodiorite contact at 300 feet and the second at 600 feet (not shown on map).
1945?...	K.R.L.10323.....	Hole B1, drilled west, intersected granodiorite contact.
	K.R.L.10322.....	Holes B2, B3, B4, drilled west from near shore, intersected granodiorite; hole B4 cut the contact of granodiorite with chlorite-talc-carbonate schist.
	K.R.L.2154.....	Holes B5 and B6, drilled from small island, intersected serpentinite east and west.

CORDOBA MINES LIMITED

Cordoba Mines Limited holds a large group of claims in Bateman and Balmer townships. Three surveyed claims in Bateman township form the northern part of the claim group and are part of a property formerly held by O'Keefe Red Lake Mines Limited. Geological and magnetic surveys have been made of these claims, and some trenching has been done.

DUCHESNE RED LAKE MINES LIMITED

This property consists of 23 surveyed claims; 19 of these claims were acquired before 1947; 4 are land claims purchased from Beatrice Red Lake in 1959. Work done on the property consists of geological mapping, trenching, and diamond-drilling; 11 holes, with a total length of 4,000 feet, have been drilled.

The country rocks consist of both pillowed and massive basalt. Near the shore of East Bay, mapping and drilling have shown that the basalts are metamorphosed; they consist of alternating brown and green bands, 1–3 inches wide, that are characterized respectively by biotite and amphibole. The East Bay serpentinite is exposed along the common boundary of claim K.R.L.260 and K.R.L. 11036, where it is a fine-grained, light-weathering rock containing some thread-veinlets of asbestos. In drilling, talc has been reported along the edge of the serpentinite. Other intrusive rocks that are present are dikes of quartz-feldspar porphyry and lamprophyre.

Small amounts of sulphide minerals are widely disseminated throughout the rocks; they are not abundant in the drill core, although visible gold was present. Pyrite, pyrrhotite, chalcopyrite, galena, and sphalerite have been observed in drill core and in trenches.

Eight holes (Lees 1947) were drilled in the vicinity of the main gold occurrence, on claim K.R.L.19526. Five of the drillholes intersected gold mineralization over a length of 350 feet. Visible gold occurs in the drill core, but the

adjacent quartz gives low assays for gold. Three drillholes explored part of the serpentinite zone and the adjacent volcanic rocks, but no significant mineralization was located.

FORSYTH MINES LIMITED

Forsyth Mines Limited was incorporated in 1956 and holds a group of 11 patented claims. Before 1947 a geological map was made of the property and, in that year, 2,000 feet of drilling was done, three holes reached bedrock.

Drilling on claim K.R.L.18127 indicated that there is a depression in the bedrock topography in the area that is underlain by the East Bay serpentinite; the bottom of the depression is calculated to be more than 160 feet below the level of the outcrops of volcanic rock to the east. Zones of carbonatization and silicification have been observed in the core taken from bore holes put down east of the serpentinite. These altered zones contain small amounts of pyrite, pyrrhotite, and chalcopyrite. Specks of visible gold were found in quartz stringers in the drill core (Crull 1947, p. 7).

INORE GOLD MINES LIMITED

This company was formed in 1945 and holds a group of 19 claims formerly held by East Bay Mines of Red Lake Limited (Horwood 1945, p. 103). The property lies partly in Bateman township and partly in McDonough township, and adjoins the Abino and McFinley properties. Previous work on the property consisted of geological mapping, trenching, and drilling.

Much stripping and trenching was done on hillsides and near shorelines in order to expose the bedrock. Eleven diamond-drill holes, with a total length of 6,732 feet, were put down. Two of the drillholes were near the common boundary with Abino Mines Limited and the balance of the drilling was on claims K.R.L. 2755 and K.R.L.2756, along the southwestern extension of the McFinley zone of mineralization. Stringers and zones of mineralization, a few inches to 10 feet wide, have an appreciable gold content that is usually associated with sulphide mineralization. The sulphides consist of pyrrhotite, pyrite, arsenopyrite, and sphalerite, which are massive in narrow, local zones. The following is an excerpt from a report by Newman (1947, p. 10).

> The ore shoot known as K will pass into Inore ground at approximately 500 feet vertical depth. Nine feet of the core was lost in I4 in the section immediately preceding the assay of $7.00 (0.20 oz. gold per ton) over 1.9 feet, used in calculating this ore shoot, thereby lowering the probable width and grade of this shoot.
>
> Another ore zone known as L lies partly in McFinley and partly in Inore. About 100 feet of this shoot, averaging $17.63 (0.50 oz. gold per ton) over 4.9 feet is in McFinley and will dip into Inore at an approximate vertical depth of 400 feet.

LEEMAC RED LAKE MINES LIMITED

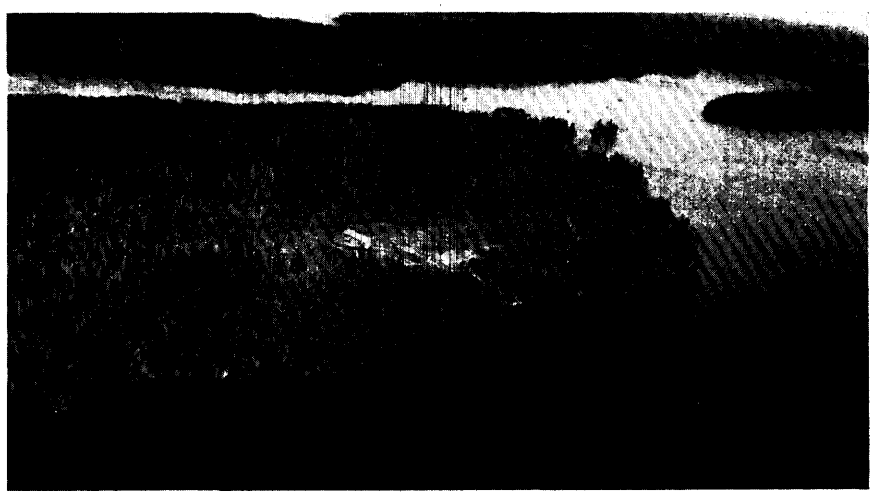
The company was incorporated in 1945 and holds a group of 12 patented claims on the east side of the Duchesne Red Lake property. Prospectors had sunk a pit on quartz stringers that carry visible gold in altered quartz-feldspar porphyry. In 1946 geological and magnetic surveys that were made of the property showed only that few outcrops of porphyry exist, and that the magnetic contrast is slight between areas underlain by porphyry and by basalt. Consequently, the size of the porphyry intrusion was not ascertained. Nine short drillholes were put down in the immediate vicinity of the pit.

MARSHALL RED LAKE MINES LIMITED

Marshall Red Lake Mines Limited was incorporated in 1945 and held a group of 22 claims.

The claim group included Pindar Lake and an area north and west of Pindar Lake adjoining the properties of Beatrice Red Lake Mines Limited and Forsyth Mines Limited.

In 1946 a magnetic survey of the property was made, and three holes totalling 1,673 feet were drilled. The first hole, 803 feet long, was drilled to give information for a cross-section of the property. This hole intersected uniform basalts showing only one band of serpentinite, which was associated with a small magnetic high. The other two drillholes were collared near the base line and drilled east; they indicated that a persistent magnetic high lying to the east was also associated with serpentinite.



Shaft area of McFinley Red Lake Gold Mines Limited.

McFINLEY RED LAKE GOLD MINES LIMITED

History and Ownership

The company holds 30 land and water claims. The land claims are on the northern part of McFinley Peninsula, on McFinley Island, on another small island farther to the northeast, and on the mainland north and south of the eastern part of East Narrows. In 1933 most of the claim group was held by Wilson Red Lake Gold Mines (Hurst 1936, p. 7). At that time, the Wilson group of claims had been surveyed, but only the showings on Beatrice Peninsula were being investigated. McCallum Red Lake Mines, incorporated in 1926, purchased a group of eight claims on the east shore (Horwood 1945, pp. 154–55) of McFinley Peninsula. From December 1943 to April 1944, McFinley Red Lake Gold Mines acquired various groups of claims from the aforementioned companies to form the present property.

Development

McCallum Red Lake Mines did stripping and trenching along the west shore of East Bay. During the winter of 1941-42, some drilling was done. In

1944 a magnetometer survey was made of McFinley Island and the adjacent water claims forming the northern part of the property. Geological mapping was in progress in the summer of 1944; extensive trenching was done, mainly on McFinley Island, during that summer and in 1945. Diamond-drilling was carried on from March 1944 until November 1946. Diamond-drilling footage totals are as follows: McFinley Peninsula, 48,598; McFinley Island, 10,898; holes drilled from the ice, 4,877.

A shaft site was selected on claim K.R.L.246, and a surface plant was erected near the shaft. In February 1957 the shaft was completed to a depth of 423 feet, and levels were established at 150, 275, and 400 feet. Underground development was carried on until July of that year; work was suspended then, and the mine was allowed to fill with water.

SUMMARY OF UNDERGROUND DEVELOPMENT

Level	Drifting	Crosscutting	Raising	Diamond-drilling
	feet	feet	feet	feet
150-foot.....	702	287	40	1,745
275-foot.....	—	—	—	500
400-foot.....	77	292	—	690
	779	579	40	2,935

Geology

Most of the outcrops are found along the shorelines. The country rocks are basalts with associated bands of interflow sediments. Pillow lava is exposed on the shore near the southwest corner of the property, and pillows are found at two other places along the shore in the northeast part of the property. This band of pillow lava is believed to be continuous along the shore for 5,000 feet, but outcrops are poor, and shearing is strong so that pillows can be identified only in a few places. The basalts are light-green and fine-grained.

Lean iron formation and other sediments are exposed in outcrops and trenches on McFinley Peninsula and McFinley Island. The thickness of these sedimentary beds ranges from a few inches to 20 feet. The weathered iron formation is a banded rock whose reddish colour is due to the oxidation of the sulphides that formerly were present. Magnetite and hematite are present in small quantities, and magnetism in specimens ranges from weak to strong. Included with the lean iron formation bands, are banded cherts where chert beds alternate with chloritic beds. Quartzite has also been described in drill core as a light-coloured siliceous rock, having excellent banding due to the slightly darker colouring of some of the beds. Local beds of chloritic slate are also present.

Diorite sills intrude the lavas and form a few prominent outcrops on surface. In the underground workings, one sill of this type of diorite was found; narrow cross-cutting dikes of younger diorite were also observed. A few dikes or sills of quartz-feldspar porphyry are exposed on surface and have been intersected by drillholes. Narrow lamprophyre dikes are present in most of the drillholes.

Small pink garnets are irregularly distributed throughout the basalt. Locally the basalts have been strongly carbonatized and, in such localities, have become brownish owing to the development of fine biotite. Chlorite-talc schist and chlorite-talc-carbonate schist have been intersected in all holes drilled east of the shoreline of McFinley Peninsula and McFinley Island. It is not known whether these schists result from alteration of basalt or from alteration of an intrusive rock.

Structure

The structural trend is northeasterly and is generally parallel to the shoreline, as indicated by the strike of pillows and the contacts of diorite sills with the volcanic rocks. Trenching and drilling have supplemented the scanty information from outcrops; together, these have established the fact that a zone of interflow sediments, mainly lean iron formation, extends throughout most of McFinley Peninsula and McFinley Island. Drilling and underground workings indicate that there is a constant dip of 60°–70°NW. Minor cross-faults have been found in the underground workings, but no evidence of fault displacement was found on surface.

Description of Deposit

Trenching and drilling on McFinley Island have proved the existence of a mineralized zone in iron formation, averaging 0.22 ounces of gold per ton across an average width of 4.7 feet over a length of 420 feet (Newman 1947, p. 1). The limited drilling to date has shown that the mineralization continues to the depth of drilling.

Newman (1947, p. 1) reported on 12 mineralized zones on McFinley Peninsula, giving gold content in terms of dollars. The following table presents the information, showing the dollar values converted to ounces of gold per ton.

Zone	Gold content	Width	Assumed Length
	ounces per ton	feet	feet
A	0.20	2.0	300
B	0.44	4.2	250
C	0.44	1.9	100
D	0.17	11.3	200
E	0.64	1.5	100
F	1.00	2.6	100
G	1.00	2.0	100
H	0.19	10.7	100
I	0.62	3.0	100
J	0.72	4.9	100
K	0.20	4.2	300
L	0.50	4.9	100

Some of the mineralized zones were extended for 50 feet on either side of a drill intersection. All assays over one ounce were cut to one ounce; the B zone had a number of high assays, and the calculated grade was drastically reduced by the procedure of cutting.

Three types of gold occurrences found on this property are: (1) gold-bearing veins usually consisting of bluish quartz, sulphides, and a little visible gold; (2) fractured iron formation or siliceous sediments containing quartz veinlets and sulphide mineralization; (3) massive sulphides replacing iron formation or siliceous sediments.

The earliest prospecting on the B zone was trenching in search of galena. Silver assays of several ounces per ton were obtained in massive sulphide zones.

The shaft location was chosen to explore the B and D zones. Although surface drilling had indicated that the B and D zones were two parallel but different structures, the underground work now shows that they are the same structure, the D zone being displaced 140 feet to the northwest by a fault. On the 150-foot level, the B vein was followed by drifting for 200 feet and, at the northeast end, is pinched to a width of four inches. The vein consists of blue-

white quartz; arsenopyrite, pyrrhotite, pyrite, sphalerite, chalcopyrite, and galena make up about 50 percent of the total content. The gold content of the vein is quite erratic, and visible gold is found only in small amounts in association with the quartz. Drifting on the D zone disclosed a vein, of similar appearance and about a foot wide, which tends to pinch and swell along the strike. Gold content is erratic, ranging in grade from a low of 0.04 ounces per ton across a width of 0.7 feet to a high of 0.50 ounces across 1.6 feet; the average grade was 0.13 ounces per ton across a mining width of 4.0 feet (McCarthy 1957b, p. 3).

The second type of gold occurrence investigated in the underground workings was the mineralized iron formation. The sulphides in the mineralized iron formation are arsenopyrite, pyrrhotite, pyrite, sphalerite, chalcopyrite, and galena; the associated gold is very erratically distributed. In the three short raises driven on iron formation above the 150-foot level, one assay of 2.12 ounces per ton was obtained. However, the average assays were: in No. 1 raise, 0.15 ounces per ton across a width of 5.2 feet; in No. 2 raise, 0.05 ounces per ton across 7.7 feet; and in No. 3 raise, 0.06 ounces across 8.3 feet. Many of the better gold occurrences, as outlined by surface drilling (McCarthy 1957b, p. 2), were found in this mineralized iron formation.

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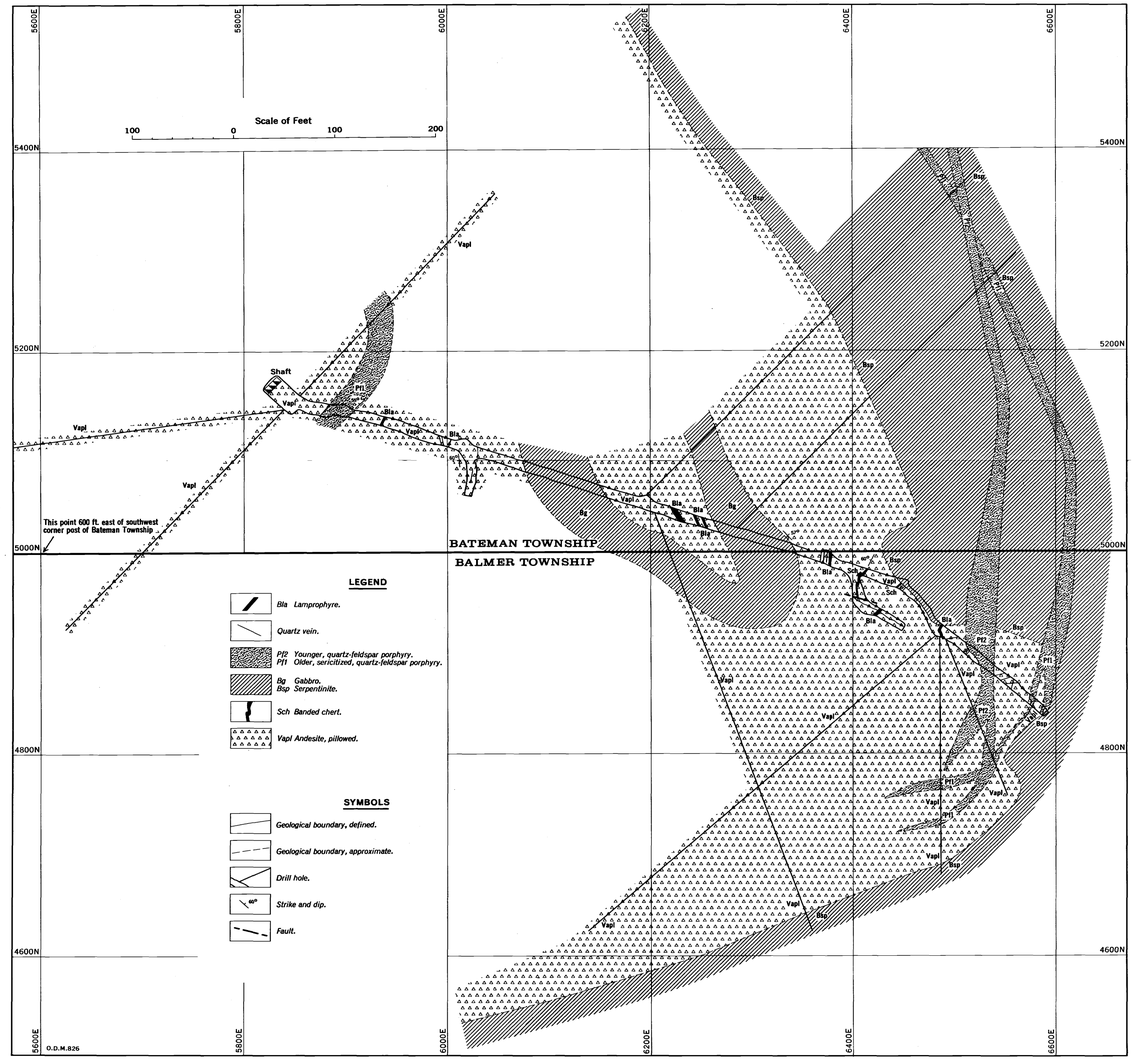


Chart A—Abino Gold Mines Ltd. Geological plan of 350-foot level

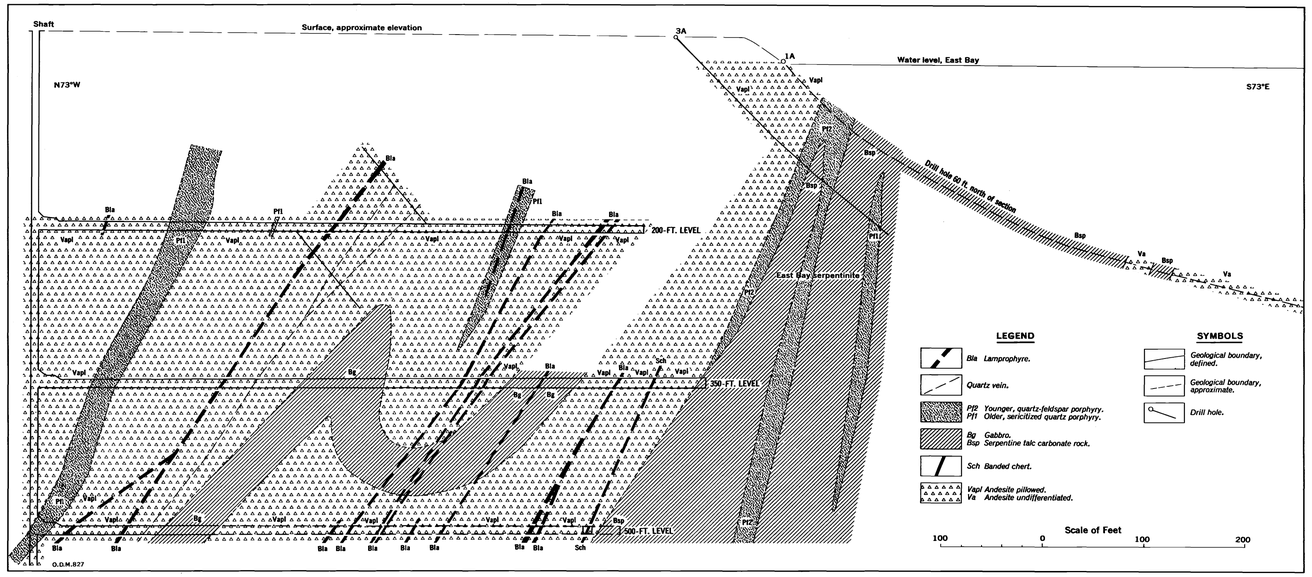


Chart B—Abino Gold Mines Ltd. Vertical geological section through workings

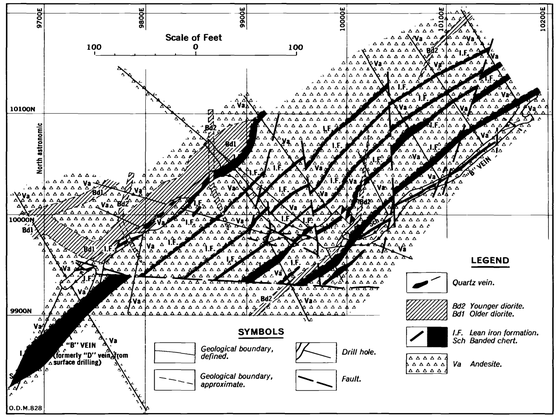


Chart C—McFinley Red Lake Gold Mines Ltd. Geological plan of 150-foot level

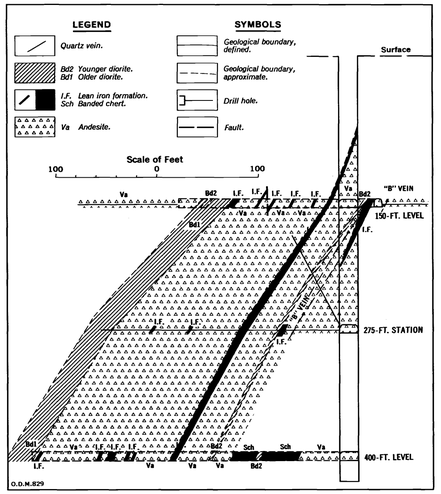
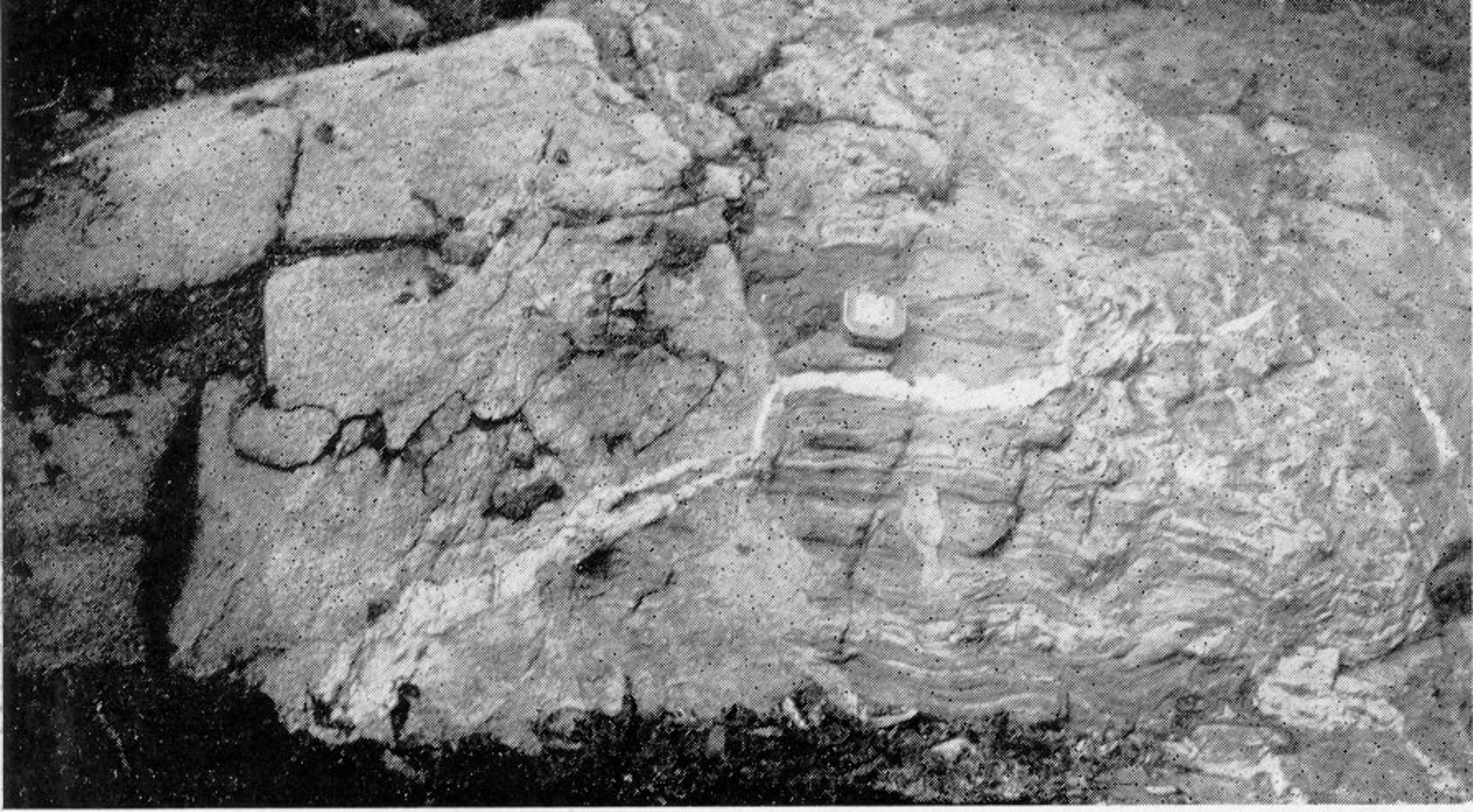
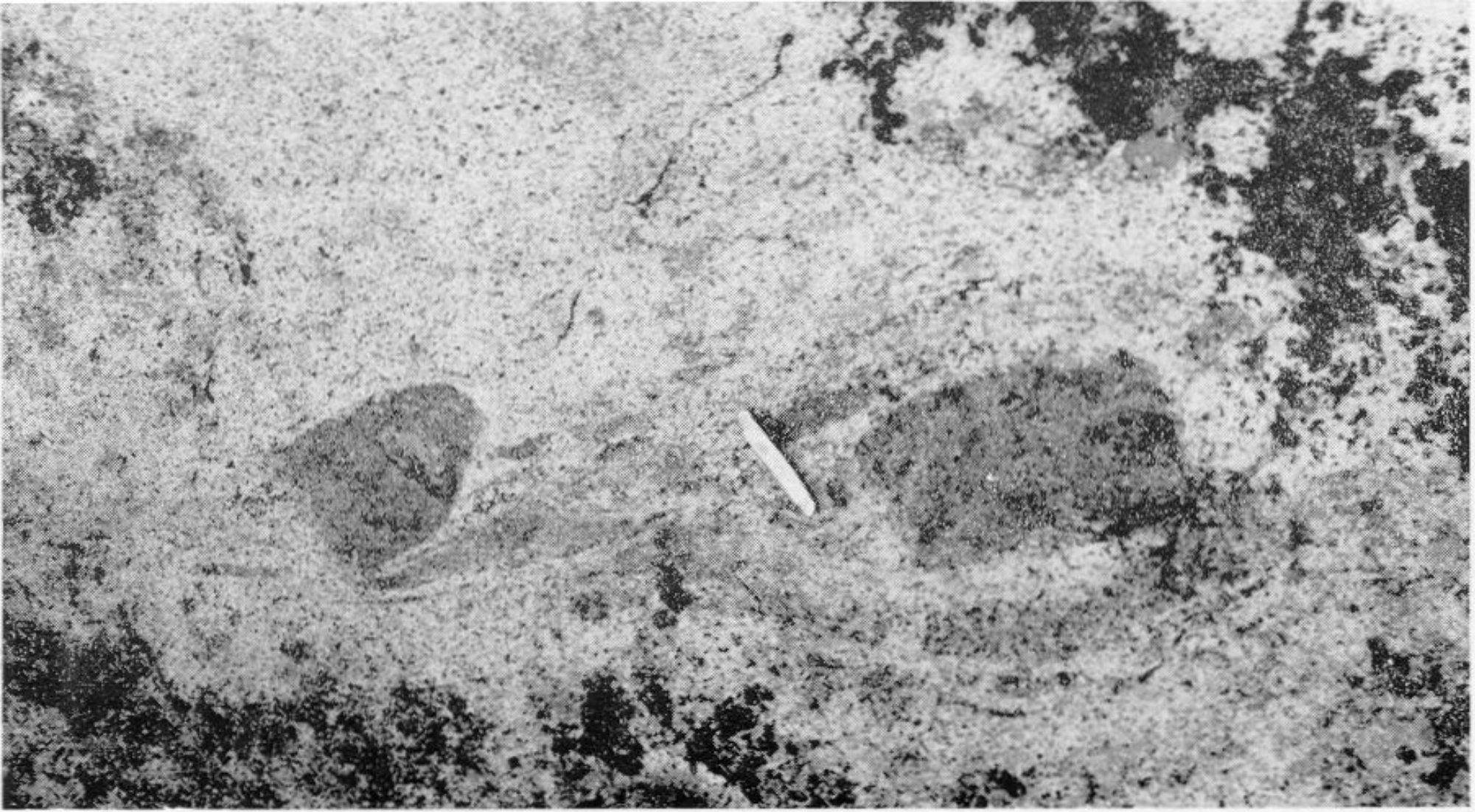


Chart D—McFinley Red Lake Gold Mines Ltd. Vertical geological section through workings





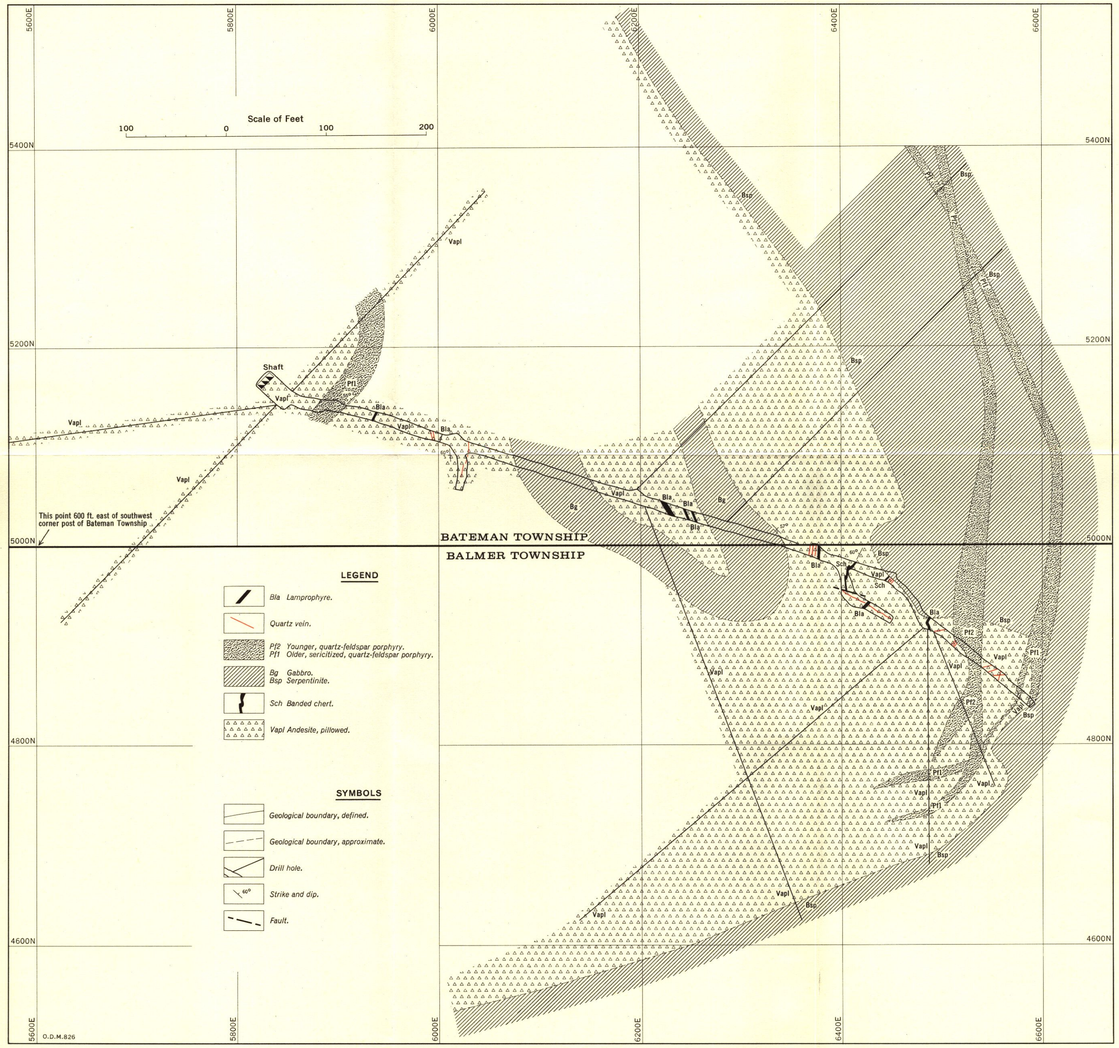


Chart A—Abino Gold Mines Ltd. Geological plan of 350-foot level

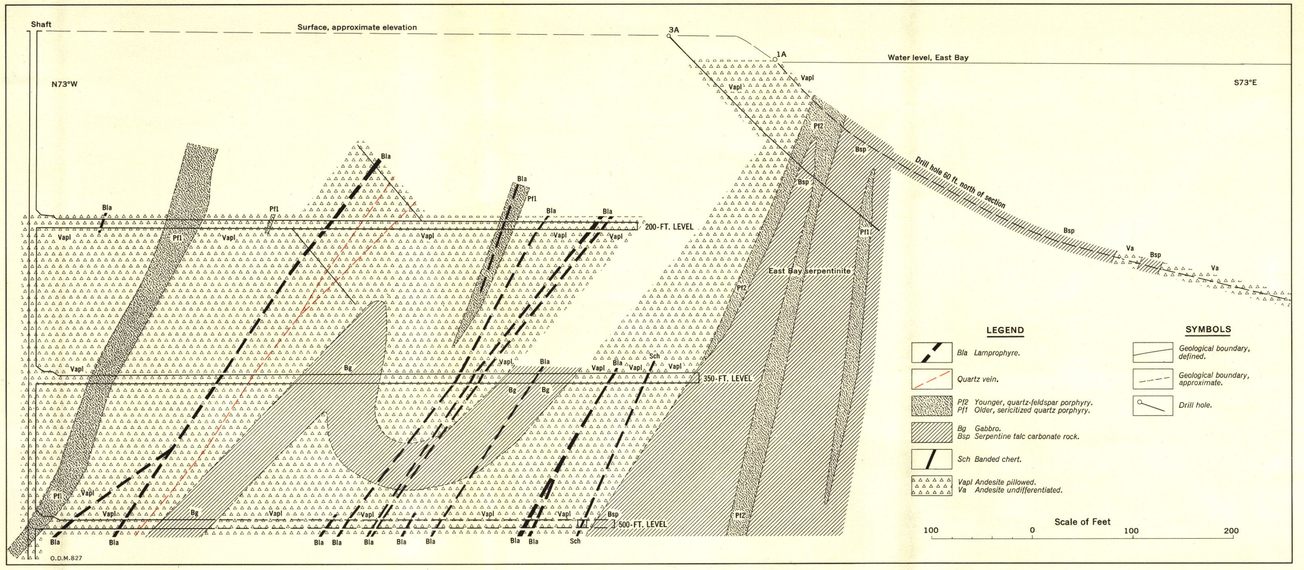


Chart B—Abino Gold Mines Ltd. Vertical geological section through workings

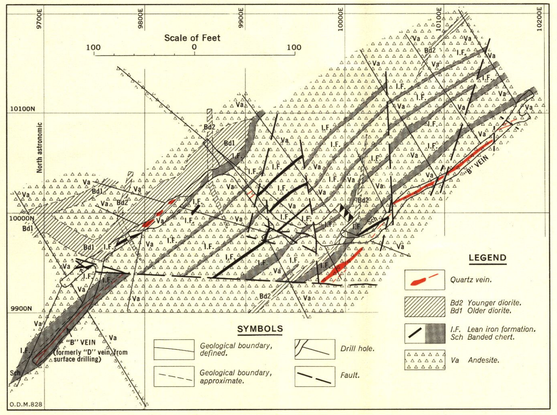


Chart C—McFinley Red Lake Gold Mines Ltd. Geological plan of 150-foot level

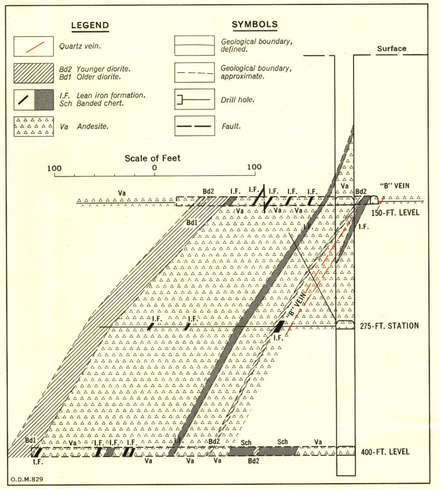
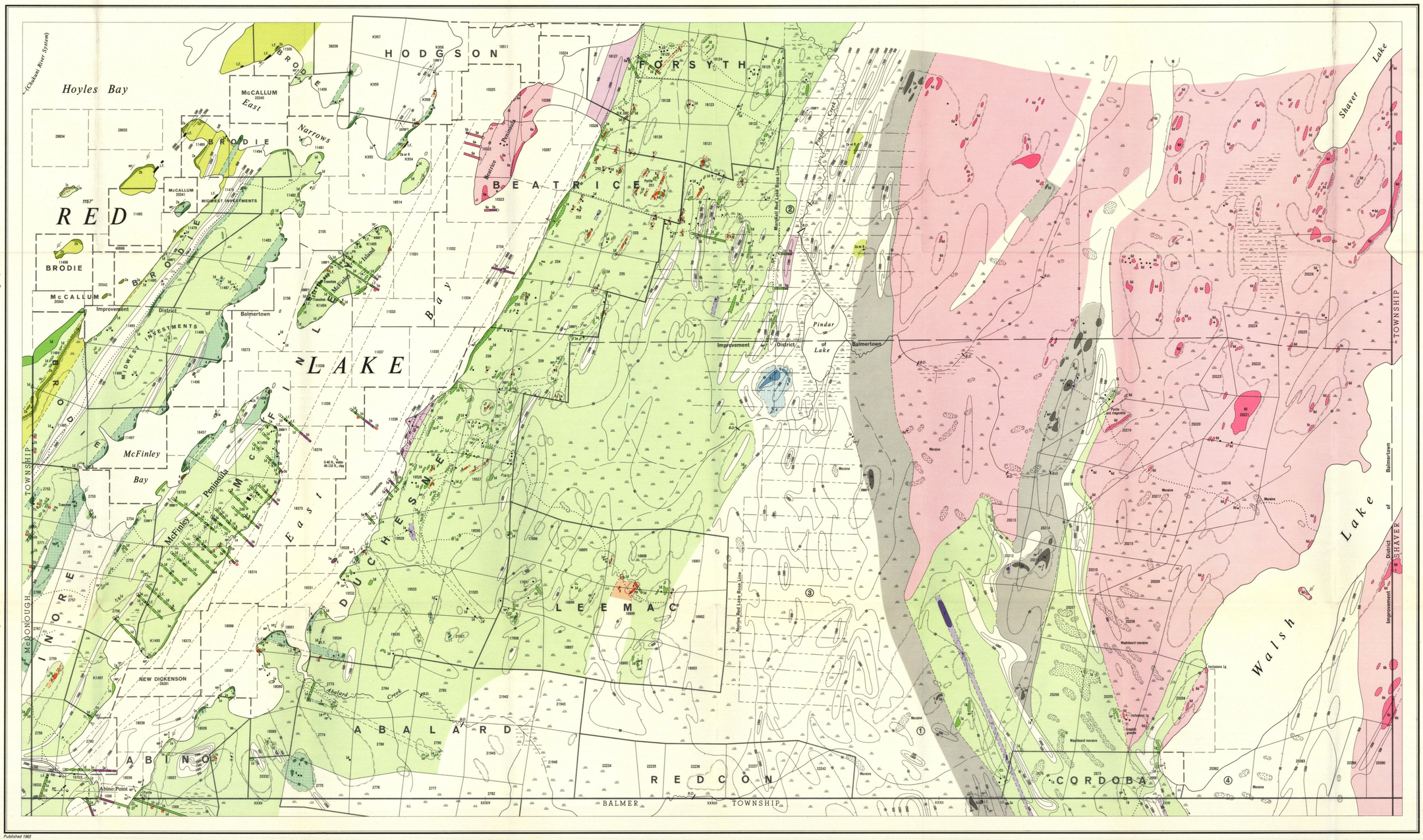


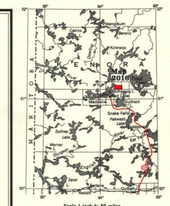
Chart D—McFinley Red Lake Gold Mines Ltd. Vertical geological section through workings

ONTARIO
DEPARTMENT OF MINES

HON. G. C. WARDROPE, *Minister of Mines*
D. P. Douglass, *Deputy Minister* M. E. Hurst, *Director, Geological Branch*

Map 2016
BATEMAN TOWNSHIP
SOUTHERN PART





SYMBOLS

- Glacial striae.
- Drift features.
- Small rock outcrop.
- Boundary of rock outcrop.
- Geological boundary, defined.
- Geological boundary, assumed.
- Magnetic contour, value in gammas. Magnetic spot readings in gammas.
- Magnetic depression contour, value in gammas.
- Strike and dip.
- Strike and vertical dip.
- Flow contact, direction of top unknown.
- Direction in which lava flows face as indicated by shape of pillows.
- Synclinal axis.
- Direction of plunge of fold axis.
- Strike and dip of schistosity.
- Strike of vertical schistosity.
- Strike of schistosity, dip unknown.
- Lineation with plunge.
- Drag-fold.
- Carbonatized rock.
- Higher ground.
- 1157' Altitude in feet above mean sea level.
- Muskeg or swamp.
- Open muskeg, swamp or marsh.
- B.D. Beaver dam.
- Electric power transmission line.
- Motor road.
- Trail, portage, winter road.
- Building.
- Shaft, vertical.
- Test pit.
- Trench.
- Mine dump.
- Drill hole, inclined.
- Drill hole, geology projected vertically to horizontal plane.
- Drill hole, geology projected up dip of formations to horizontal plane.
- O.B. 150' Depth of overburden in feet.
- Township boundary.
- Boundary of surveyed mining property.
- Claim line, surveyed.
- Picket line.
- (2) Location of unsurveyed mining property.

UNSURVEYED PROPERTIES

1. Janet Red Lake Mines, Limited
2. Marshall Red Lake Mines, Limited.
3. Norlex Red Lake Gold Mines, Limited.
4. O'Keefe Red Lake Mines, Limited.

LEGEND

CENOZOIC

RECENT AND PLEISTOCENE*
Clay, till, sand, peat.

GREAT UNCONFORMITY

PRECAMBRIAN

POST-KEEWATIN

INTRUSIVE ROCKS

- 9 Diorite.
- 8 Quartz-feldspar porphyry.
- 7 Syenodiorite (tilikes).
- 6d Pink granite (quartz monzonite).
  6c Porphyritic granite.
  6b Grey biotite-hornblende granite (granodiorite).
  6a Grey biotite granite (granodiorite).
- 5a Serpentinite.
  5b Chlorite-talc-carbonate schist.
- 4 Metagabbro.**

INTRUSIVE CONTACT

KEEWATIN

SEDIMENTARY AND METASEDIMENTARY ROCKS

- 3a Argillite.
  3b Greywacke.
  3c Chert-carbonate rock.
  3d Paragneiss.
- I.F. Chert and lean iron formation.

ACID VOLCANIC ROCKS

- 2a Porphyritic (quartz, feldspar) rhyolite.
  2b Rhyolite breccia.

BASIC VOLCANIC ROCKS

- 1a Basalt, fine-grained with pillows and amygdules.
  1b Flow top breccia.
- 1c Variolitic basalt.
- 1d Basalt, uniform, massive.
  1e Basalt, sheared.
  1g Amphibolite, fine-grained recrystallized lava.
  1h Carbonatized basalt.

*Except for some moraines, these deposits are not differentiated on the map. For the most part they coincide with the lighter coloured and uncoloured parts of the map.

**May include the coarser grained parts of basalt flows and intrusive sills of Keewatin age.

Bedrock geology. Outcrops and inferred extensions of each rock unit are shown, respectively, in deep and light tones of the same colour.

Unconsolidated deposits. Cenozoic deposits coincide with light toned or other areas in which outcrops are absent or have not been mapped.

Magnetic declination is 7° East, approximately.

SOURCES OF INFORMATION

Geology and ground geophysics by S. A. Ferguson and assistants, 1959.

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Base map from plans and surveys of the Division of Surveys and Engineering, Ontario Department of Lands and Forests, with additional information by S. A. Ferguson.

The designating letters "KRL" have been omitted on this map from the numbers marking the mining claims recorded at the office of the Red Lake Mining Division.

Published 1962

Map 2016

BATEMAN TOWNSHIP

SOUTHERN PART

DISTRICT OF KENORA, ONTARIO

Scale 1:12,000 or 1 Inch to 1,000 Feet

Feet 1000 0 1000 2000 3000 4000 5000 Feet
Chains 10 0 ¼ ½ ¾ 1 Mile
Metres 100 0 0.2 0.4 0.6 0.8 1 Kilometre