CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

PAPER 53-15

BLACK BAY MAP-AREA, SASKATCHEWAN

(Preliminary Account)

By
W. E. Hale

OTTAWA
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Price, 50 cents

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CONTENTS

Illustrations

BLACK BAY MAP-AREA, SASKATCHEWAN

INTRODUCTION

Black Bay map-area[1] occupies an area of about 150 square

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[1]Referred to by the Topographical Survey, Ottawa, as the West Half of the Uranium City map-area.

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miles in northern Saskatchewan between latitudes 59°30' and 59°45' and longitudes 108°45' and 109°00'. It extends northward from the north shore of Lake Athabasca about 4 miles west of the recently organized mining community of Uranium City, and occupies a western part of the general Goldfields uranium region. Preliminary field work was done by the writer during the season of 1951, and more detailed examinations of selected parts made in the summer of 1952. A principal purpose of the work was to investigate the possibilities of commercial production of uranium in the area, and to assist prospectors by describing the more favourable conditions for localization of pitchblende.

Previous geological mapping in the area was done by Alcock[2] in 1934, and in 1947 and 1948 Christie[3] mapped the adjacent

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[2]Alcock, F. J.: Geology of Lake Athabaska Region, Saskatchewan; Geol. Surv., Canada, Mem. 196, 1936.

[3]Christie, A. M.: Goldfields and Martin Lake Map-areas, Saskatchewan; Geol. Surv., Canada, Paper 49-17, 1949, and Mem. 269, 1952.

Goldfields and Martin Lake areas on a scale of 1 inch to 1 mile.

The writer is indebted to officers of the several companies doing exploratory work in the area for giving freely of their time and information during the examinations of their properties. Plans and assay information were made available to the writer by these companies, and the descriptions of properties included in this report are, to a large extent, dependent on this courtesy.

The writer was ably assisted during the 1951 field season by C. E. Head, J. C. Finlay, J. R. Digby, and A. M. Hale, and in 1952 by R. J. McNeill, F. Johnston, R. H. Heise, and M. D. P. Jones.

SURFACE FEATURES

Black Bay map-area is rugged, with rocky ridge tops rising, on an average, about 350 feet above the intervening valley bottoms, which are mostly drift covered. The ridges themselves have a general northeasterly trend, and are mainly a result of differential erosion, controlled by faults, folds, and the varying competency of the gneisses. Other topographic lineaments are a result of faults, joints, and folds. The main drainage system from Tazin Lake to Lake Athabasca follows the northeasterly trending lineaments.

Travel by canoe in the map-area is limited chiefly to the lakes, the streams that join them being in general unnavigable. About 80 per cent of the land area has been burned over, and travel on foot is difficult.

Bedrock is exposed over at least 70 per cent of the map-area.

GENERAL GEOLOGY

The rocks of the map-area present many difficult geological problems. Their high degree of deformation, extensive metamorphism, and red alteration, together with the lack of known primary structures and uncertainty regarding the relative ages of the various rock types, have resulted in much geological complexity.

The ages of the granitic types of rock in the area is a matter of considerable importance from the standpoint of economic geology. Three ages of granitic type rocks are indicated in the map-area, but the distribution of the individual types is at present uncertain.

Relative ages of the stratified and partly stratified rocks in the map-area have been interpreted chiefly on the basis of the law of superposition, where such interpretations are not rendered invalid by unknown amounts of overturning and repetition of strata due to complex folding and faulting.

The following table represents a tentative classification of the rocks of the map-area according to relative age and origin.

TABLE OF FORMATIONS

Age	Stratified rocks	Intrusive rocks
Proterozoic		Diabase, aplite, and, possibly, some granitic rocks
	Folding	
	Athabasca series(?): Conglomerate and arkose	
	Folding	
Archaean or Proterozoic		Red granite White Lake granite
	Folding	
	Tazin group: Paragneisses and migmatites Quartzitic rocks Stratified amphibolitic rocks	Amphibolite Granite(?)

DESCRIPTION OF ROCK TYPES

Tazin Group

Stratified Amphibolitic rocks

The stratified amphibolitic members of the Tazin group are believed to have been deposited as either pyroclastic or sedimentary material.

They outcrop on the small island at the mouth of Cabin Bay; on Fold Island, near Long Bay; near Prospectors Bay and the lake northeast of that bay; and partly surrounding the large mass of White Lake granite in the southwest quarter of the map-area. In addition, much of the amphibolitic rock included tentatively with the intrusive rocks of the area may be of sedimentary origin.

The aggregate thickness of amphibolitic rocks is unknown, but it is probable that in many occurrences of this rock there has been much repetition of bands by folding.

The stratified amphibolite is composed essentially of amphibole, with varying amounts of feldspar, which has been altered to secondary white mica. The amphibole is dark green to black, and the feldspar is generally confined to layers in the rock, which accounts for its stratified appearance. In general, this rock is fine grained as compared with some other amphibolites in the area. It is cut by narrow veinlets of white quartz.

The distinctive feature of this amphibolitic rock as compared with others of similar composition is its stratification. On the island at the mouth of Cabin Bay, fine bands in this rock, varying in width from 1/4 inch to several inches, can be traced for nearly 50 feet. The bands are offset along tiny fractures. Some parts of the outcrops appear relatively massive, probably as a result of partial recrystallization.

In the places noted, this amphibolite does not exhibit any features suggestive of igneous origin and, apparently, conformably underlies quartzite or a complex of paragneiss and migmatite.

The age of the finely banded amphibolitic rock is not known with certainty, but at Cabin Bay and north of Seeger Lake it appears to be older than the quartzite and paragneiss and, in consequence, the oldest in the map-area.

Quartzitic Rocks

Quartzitic rocks are abundant in the map-area. They occur as fairly well-defined bands in the southeast quarter of the area mapped and are, in many occurrences, associated with amphibolitic rocks. A band of quartzitic rock about 1/2 mile wide extends from near Triangle Lake to Heron Lake, Island Lake, Horse Lake, and at intervals along the west side of the southwestern body of the White Lake granite. Quartzitic rocks are common near Ruby Lake, where they are intimately associated with amphibolitic rocks in a series of tight folds; the whole complex shows evidence of extensive granitization and intrusion by small granitic dykes. Quartzitic rocks are found near the east end of Webb Lake, and others, some of which are highly chloritic and schistose, occur in the mylonitized zones north and south of the Garry Lake mass of White Lake granite. This is also true of the mylonitized zone extending northeast and southwest of Plug Lake to near Tazin Lake. Lenses and narrow bands of quartzitic rock occur within the paragneiss-migmatite complex.

Lithologically, the quartzitic rocks show several variations, though generally there is no well-defined boundary between the different types. Gradations from fairly pure quartzite to a banded rock containing quartz and impurities such as garnet, chlorite, epidote, biotite, feldspar, and hematite are common. The rock varies in colour from blue and grey in the purer varieties to shades of pink, green, red, grey, and white, depending on the impurities and their distribution. Within the band of this rock that extends from Griffith Bay to Spot Lake, there are zones of dark red to reddish grey quartzite containing abundant hematite, which occurs as fillings in minute fractures. Near Ruby Lake, the quartzitic rocks exhibit great variation in texture, composition, and colour, including dark reddish green varieties containing chlorite, epidote, and garnet. The rock has been granitized and recrystallized to such an extent that it is locally difficult to distinguish the quartzitic rocks from the white, granitic and pegmatitic material that appears to have effected the alteration. Porphyroblasts of garnet and feldspar ranging in size from very small to an inch or more in diameter are common in the quartzitic rocks.

The rocks in the mylonitized zones are usually very fine grained, and vary in composition from nearly pure quartz, as in the district northwest of Camel Lake, to a fairly massive red rock composed essentially of quartz and red potash feldspar. The latter rock is indistinguishable from fine-grained rocks of similar composition believed to be chiefly of igneous origin. Interbanded with the pure quartzite and the red quartzo-feldspathic rock are zones of grey-green rock composed chiefly of varying proportions of chlorite, epidote, mica, and quartz. The chloritic varieties are commonly very schistose.

The age of the quartzitic rocks is believed to be about that of the stratified amphibolitic rocks. The apparent relations between the two rocks in the vicinity of Cabin Bay and the adjacent White Lake granite mass have been mentioned. Elsewhere in the area, where the quartzite is associated with amphibolitic rocks, overturned folds and faults mask the stratigraphic relations. It is considered probable, however, that the quartzitic rock is of sedimentary origin, and that it has been laid down on top of the fine-grained, banded, amphibolitic rocks.

In the complex assemblage of rocks near Ruby Lake, several blue quartz veins known to be hydrothermal fracture fillings were noted. In the hand specimen, this quartz is not unlike the bluish quartzite believed to be of sedimentary origin.

Paragneisses and Migmatites[1]

Paragneisses and migmatites comprise about 75 per cent of the rock exposures in the map-area. Assigned to this map-unit are all rocks believed to have been originally sedimentary in origin and to have undergone granitization, recrystallization, and lit-par-lit injection of granitic and possibly gabbroic material, with associated vein material composed of quartz, chlorite, epidote, calcite, and hematite; the map-unit includes the most varied and least understood rocks in the map-area.

Lithologically, these rocks vary from pure quartz and quartzo-feldspathic bands alternating with narrow (up to 1 foot) bands composed of a ferromagnesian mineral, which may be biotite, amphibole, chlorite, or more than one of these minerals, with or without quartz, to a dark grey rock consisting essentially of the ferromagnesian minerals. Most of this rock is composed essentially of quartz and potash feldspar. Porphyroblasts of feldspar are generally abundant, and vary from 1/8 inch to 6 inches in diameter. Much of the feldspar is highly altered.

Much of the structure seen in the paragneiss-migmatite complex is secondary, but original bedding is considered to be represented to some extent by variations in colour and chemical composition of bands. In general, the rocks are highly deformed, and large and small fractures in them contain typical vein minerals.

The paragneiss-migmatite rocks undoubtedly have had a complex history, but an accurate analysis of the relative proportions of original sediment to introduced material is not possible at present. The rocks are believed to be relatively younger than, or possibly contemporaneous in age with, the quartzitic rocks.

Tazin Intrusive Rocks

A possible intrusive origin for some of the amphibolites has been inferred by workers in nearby areas[2,3]. Discordant

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[1]The paragneiss-migmatite complex referred to in this report represents rocks that are similar to much of the "granite-gneiss" of the adjacent area to the east (Christie, A. M.: op. cit.).

[2]Christie, A. M.: op. cit.

[3]Blake, Donald A. W.: Forget Lake Map-area, Saskatchewan; Geol. Surv., Canada, Paper 51-7, 1951; and Nevins Lake Map-area, Saskatchewan; Geol. Surv., Canada, Paper 52-1, 1952.

contacts between amphibolite and adjacent rocks have been noted in the Black Bay map-area, but the extent to which this feature may have been produced by differential reaction to deformation and processes of recrystallization is not known. There are, however, some amphibolites that exhibit igneous textures and composition.

Amphibolites of possible igneous origin occur near Run Lake, Hump Lake, Little Lake, and Ruby Lake. These are medium- to coarse-grained, black to dark grey rocks, composed of dark greenish black amphibole, biotite, chlorite, plagioclase (An_{10-55}), quartz, sericite, black oxides, and titanite.

The rocks are generally gneissic or schistose depending in part on the mineralogical variations. They are cut by numerous fractures, which are generally filled with white or bluish quartz or granitic material. The degree and direction of gneissosity and schistosity vary greatly. In many bands of amphibolite, the gneissosity trends at a considerable angle to the surface trace of the band. In many occurrences, too, the amphibolite bands are intensely folded, particularly near Run and Mafic Lakes, north of Orbit Lake, near Triangle Lake adjacent to the Orbit lineament, and in the vicinity of Ruby Lake.

Discordant contacts have been observed between the amphibolite and both quartzite and paragneiss. The amphibolite is, therefore, considered to be younger than these rocks, but it has been folded with the paragneisses and, apparently, intruded by the White Lake granite. It is believed, therefore, that the amphibolites of this map-unit do not differ greatly in age from the rocks of the Tazin group.

Another type of rock that is probably of igneous origin is represented by the gabbroic masses that occur very locally in the map-area, none of the observed occurrences being exposed over an area sufficiently large to be shown on the accompanying map. Several small outcrops occur on the south side of Orbit Lake, where the paragneiss-migmatite complex is folded around small domes of gabbroic material. Another outcrop of similar material occurs near Dye Lake; this occurrence is associated with amphibolite, and the whole mass is indicated as amphibolite.

The assignment of some of the red granitic rocks to a pre-White Lake granite age is based on the observation that much of the granitic material intimately associated with the Tazin group has dynamic metamorphic structures that are conformable with the surrounding paragneiss. It is believed, therefore, that some granitic material has been added to the Tazin group of rocks prior to the intrusion of the White Lake granite, but there seems no present way of distinguishing granitic material that has been added prior to the intrusion of the White Lake granite from that that may have been added later.

White Lake Granite

The White Lake granite is exposed in two large masses, one in the southwest quarter of the map-area and the other in the area of Garry and White Lakes. Smaller bodies were recognized throughout the area, some of sufficient size to map, such as those just south of Tazin Lake, north and south of Webb Lake, near Court Lake, and near Little Lake.

The rock is generally coarse grained, and varies from white through grey to almost black in some border areas; in the vicinity of diabase dykes and faults, it is, in part, stained red. The granite generally carries abundant quartz, but near the margins of the intrusive masses becomes noticeably richer in ferromagnesian minerals, chiefly biotite. It contains abundant inclusions of amphibole-biotite schist.

In most places the White Lake granite is in conformable contact with the adjacent rocks. Elsewhere, as near Ruby Lake, dykes of granitic material resembling the main masses of White Lake granite, cut amphibolitic rocks. The borders of the granite bodies are generally gneissic. This feature is so pronounced in places, notably in border hybrid zones, that it is difficult to establish the boundary between the granite and the layered amphibolitic and quartzitic rocks, at Seeger Lake, and between the granite and the paragneiss-migmatite complex, near Garry Lake. Along the east and west sides of the southwest mass of White Lake granite, the contact with the paragneiss is sharp and conformable, whereas the north and south contacts of the northern granite mass are marked by mylonite. Around the smaller bodies of White Lake granite, shown on the accompanying map, the contact relations are none too clear, but in general appear to be conformable.

Apart from the border effects noted above, the White Lake granite does not appear to have been greatly affected by metamorphism except for the development of gneissosity. In the central parts of the larger masses, the rock is fresh looking, and many inclusions are angular. North of the waterway joining Garry and White Lakes, one outcrop of the granite contains abundant red garnets.

The disposition of the White Lake granite with respect to known folds - including the apparent modification of these folds by the granite, the development of mylonite at the margins of this rock in the vicinity of White and Garry Lakes, and the general lack of discordant contacts - suggests that the granite is roughly contemporaneous with the major period of folding in the Tazin group of rocks. The sequence of events indicated by the structural features of this granite is: folding of the Tazin group, intrusion of the White Lake granite into spaces produced by the folding, and additional folding of the adjacent rocks and development of mylonite after the consolidation of the granite.

It has not been found possible to determine the age relation between the White Lake granite and the massive red pegmatites and granites that occur throughout the map-area but most commonly in zones of intense deformation.

Chemical analyses of representative samples of these two types of granite indicate more alumina, ferrous iron, and calcium in the White Lake granite as compared with the relative increase in ferric iron, titanium, and potassium in the red variety of granite.

Spatially, the red, potash-rich granites and pegmatites do not appear to be related to the White Lake bodies. Crosscutting relations between the two types have not, as yet, been definitely established in the map-area, and it is possible that the red varieties of granite developed as more acidic differentiates of the White Lake granite. The red granite and pegmatite are known to contain radioactive minerals, locally in appreciable amounts, whereas the White Lake granite is not known to contain abnormal concentrations of these minerals.

Conglomerate and Arkose

Red conglomerates and arkoses occur locally in the map-area. The largest exposures of these rocks are along the shore of Tazin Lake, in the northern part of the map-area. Smaller exposures of similar rocks were found north of Garry Lake, along the west boundary of the map-area near White Lake, and along the waterway from Webb to White Lakes. The conglomerate is more abundant than the arkose.

The conglomerate is generally brick-red and very coarse. Its boulders consist of granitic gneisses, quartz, amphibolite, and all rocks that underlie the conglomerate. Pebbles, cobbles, and boulders are generally rounded to subrounded, but include a few angular fragments. The matrix consists of arkosic material with a large proportion of quartz; hematite is also a major constituent. Veins of carbonate, quartz, and hematite cut the conglomerate, and arkose 'dykes' occur within it.

The arkose consists of a fine-grained mixture of quartz and feldspar in a matrix largely composed of hematite. Veins of quartz, carbonate, and hematite cut the arkose.

All exposures of the conglomerate and arkose are cut by diabase, and the exposure of arkose north of Garry Lake is apparently cut by a fine-grained granitic rock. There, a tabular mass of fine-grained granitic rock is in contact with Athabasca-type arkose, the axes of the folds in the arkose striking at about right angles to the apparent strike of the granitic dyke. A zone of discoloration and deformation extends for about 2 feet from the contact into the arkose, and the exposed contact can be followed for about 30 feet to where it is lost in overburden.

The aggregate thickness of conglomerate and arkose is not known, but these rocks appear to lie in structural depressions in the underlying rocks. The internal structure of the larger masses and of the exposure near the west boundary of the map-area, is uncertain due to the scarcity of bedding-plane data. The arkosic rocks north of Garry Lake, however, are intensely folded, and the folds plunge northeast.

Due to the general lack of dependable attitudes in these rocks within the map-area, it is difficult to determine accurately the nature of the contact of the conglomerate and arkose with the underlying formations. Generally, the rock immediately underlying the conglomerate and arkose is mylonitized where exposed, as in the vicinity of Dog Lake, near White Lake, and along the southeast margin of the exposure north of Garry Lake, and the high degree of mylonitization characteristic of these underlying rocks suggests a time unconformity of considerable duration. However, the folds in the arkosic rock north of Garry Lake are in general conformity with the interpreted structure of the underlying rock. The boundary of the conglomerate in the north-central part of the area, along Tazin Lake, is to a large extent masked by overburden.

The correlation of these sedimentary rocks is of considerable importance in view of the occurrence of granitic rock apparently younger than the arkose. With the limited exposures available in the area it is probably best to refer to this rock as of 'Athabasca-type', and await further evidence before attempting to correlate it with the relatively undeformed Athabasca sediments on the south side of Lake Athabasca.

Diabase Dykes

Diabase dykes cut all consolidated rocks of the map-area with the exception of minor known amounts of aplitic and related rock material. The dykes vary in width from less than a foot to more than 100 feet, average about 15 feet, and in many instances can be traced along strike for 100 feet. Only the larger bodies of diabase are shown on the accompanying map.

Several large dykes of diabase occur along the west boundary of the area near White Lake, and several large and fairly continuous dykes are well exposed along the shore of Black Bay, near Long and Prospector Bays. Some of the dykes change along strike into sills. Such an exposure is believed to occur near Cabin Bay and on Fold Island. The dykes generally strike within a few degrees of east, and dips are mostly steep.

The diabase is generally composed of lath-shaped crystals of plagioclase in a groundmass of dark green to black ferromagnesian minerals. Quartz is present in granophyric intergrowths. Pyrite occurs in many of the dykes. A few of the dykes are amygdaloidal, and the amygdules are generally composed of carbonate.

A few diabase dykes containing rounded to angular fragments of granitic material have been noted northwest of the junction of Garry and White Lakes, south of White Lake, and north of Clover Lake.

Aplite dykes and small veins of quartz, carbonate, and hematite cut the diabase.

STRUCTURAL GEOLOGY

FOLDS

All the rocks of the map-area, with the exception of the diabase and related rocks, have been complexly folded. Both upright and overturned folds occur, and plunges are both northeast and southwest. Congruent and incongruent drag-folds occur, and the distinction between the two types is generally difficult. In the northern and northeastern part of the area, most of the fold axes plunge northeast, but folds south of White Lake plunge nearly vertically, and those on the north side of Orbit Lake generally plunge southwest whereas those south of the lake plunge northeast. In the southern part of the map-area, in the highly deformed areas near the Orbit lineament and Ruby Lake, plunges occur in both directions. Overturning of folds appears to be partly dependent on the disposition of the larger exposures of White Lake granite. North of the Garry-White Lakes exposures of this granite, the folds are generally overturned to the south, but on the south side of the same mass most of the folds are overturned to the north.

FAULTS

Three main sets of faults are recognized in the map-area, namely, northeast-trending, east-trending, and northwest-trending faults. Several other faults that trend roughly north have been recognized near the south end of Orbit Lake, but they are of local extent.

Faults trending northeast are usually difficult to recognize as they parallel the strike of the rocks along the limbs of the northeast-trending folds. Examples of this type of fault are: the Clear-Plug Lakes fault, the Clover Lake faults, the Orbit fault, and the Ruby Lake fault. Probably the White-North Garry-Guest Lakes lineament is a fault of this type. The Seeger-Island Lakes fault might also be included, although it has a more northerly trend than the average for these faults. Most of the valleys along these faults are drift filled. Where horizontal separation is evident, it appears to have been right handed. However, the direction of movement along the Orbit fault is not known. Drag-folds adjacent to these faults plunge both northeast and southwest, and the plunges are usually at angles of 45 degrees or more.

East-trending faults are in many cases marked by diabase dykes. Examples of this set of faults include: the Maimann-North Garry Lakes fault, those along the north shore of Webb Lake, the Prospector-Long Bays faults, and those east-trending faults in the southeast part of the map-area. Horizontal separations on these faults are generally right handed. Locally, however, several left-hand, horizontal separations have been recorded.

Northwest-trending faults are the least well-defined set, due, at least in part, to the fact that they are roughly at right angles to the direction of greatest glacial erosion. Faults of this type occur northeast of Run Lake, east of Hump Lake, north of Webb Lake, in the Ruby Lake and Orbit Bay area, and along Long Bay. Many faults with a northwest trend occur along the shore of Black Bay, but most of these are too small to be shown on the accompanying map. Horizontal separations on these faults may be either right or left handed. In the northern part of the map-area, the northwest-trending faults that cut the amphibolite northeast of Run Lake have a right-hand, horizontal separation. Northwest-trending faults in the southern part of the map-area show many examples of left-hand, horizontal separation, namely, along Long Bay and southwest of the south end of Ruby Lake.

STRUCTURAL CONTROL OF PITCHBLENDE DEPOSITS

The most important uranium deposits so far discovered in the Goldfields region and in the map-area are epigenetic pitchblende deposits. All such deposits discovered to date in the map-area show some evidence of structural control for their localization.

Pitchblende occurs in a variety of rocks, ranging from amphibolite to granite. However, regardless of the composition of the rock in which it occurs, the pitchblende is invariably localized in certain zones. Fractures may extend for several hundreds of feet, but the same fractures usually contain pitchblende for only a fraction of their total length. In all occurrences examined by the writer this condition could be related either to variations in the strike of the fracture and a component of differential movement parallel with its trend, or to the intersection of fractures or sets of fractures. The concept involved in the first of these conditions requires the development along the fractures of alternating bearing-surfaces and open fractures. The pitchblende would then occupy the dilatant or expanded parts. Where a fracture crosses rocks of different physical characteristics, such as granite as compared with rocks high in ferromagnesian minerals, a deflexion in the strike of the fracture is generally apparent. Subsequent movement along the fracture may have resulted in an open space in one or the other of the rocks, depending on the amount and direction of deflexion of the fracture and the relative movement along the fracture. All occurrences of pitchblende in the map-area can be related, in at least a general way, to this theory. When prospecting there appears to be good reason, therefore, to concentrate on any areas where deflexion in the strike of fractures are known, or where one set of fractures intersects another. On this basis, promising zones might be expected to occur normal or *en échelon* to the mineralized part of a fracture.

ECONOMIC GEOLOGY

GENERAL STATEMENT

Since 1949, three companies have been actively engaged in the surface exploration and development of radioactive mineral occurrences in the map-area. The original holdings of the companies were concessions of 25 square miles in area, or fractions of these. During 1952, the radioactive mineral prospects within the concessions were staked and the unstaked parts of the original holdings opened for general staking. For convenience, however, in describing the radioactive mineral occurrences reference is made to the original concession boundaries (*See* Figure 1).

Radioactive mineral occurrences of two types have been found within the map-area; pitchblende vein deposits, and pegmatite deposits containing uraninite. At present, the pitchblende deposits are considered the most promising.

In general, the pitchblende deposits occur in fairly well-defined fractures, and in host rocks that vary greatly in composition and physical characteristics. The mineralogy of the veins is simple; hematite, carbonate, and pitchblende are the most common vein minerals, but quartz and chlorite are not uncommon and sulphides occur in some veins. Red wall-rock alteration is characteristic of most of the pitchblende-bearing fractures.

A description of the most important radioactive mineral occurrences follows[1]:

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[1]Assay results given are those of samples collected by the writer during the 1951 field season. The results all represent percentage U_3O_8 equivalent as determined by radiometric assaying in the Radioactivity Laboratories of the Geological Survey. To conserve space, the letter "R" is used to denote "per cent U_3O_8 equivalent".

DESCRIPTION OF PROPERTIES

Beta-gamma Uranium Mines Limited (former QQ Concession)

This company staked the B. T. group of thirty-two claims to cover its discoveries in the former QQ concession.

The most important discoveries on these claims, within the map-area, are concentrated near Boot Lake. Workings to date are confined to surface trenching and a little diamond drilling. The occurrences are alined along two subparallel lineaments trending a few degrees north of east, and are associated with pegmatitic and hybrid rocks containing numerous lenses of amphibolitic, chloritic, and biotitic material. The host rocks strike east to northeast and dip to the north or northwest. Radioactivity was detected sporadically over a total distance of about 1 mile. High Geiger counter readings were recorded in biotitic and amphibolitic lenses in the hybrid rocks and in a brick-red pegmatitic rock. Six grab samples taken from the more radioactive anomalies gave the following assay results: 0.005 R, 0.14 R, 0.011 R, 0.002 R, 0.33 R, and 0.20 R.

Orbit Uranium Developments Limited (former PP Concession)

Three groups of claims in the map-area have been staked by Orbit Uranium Developments Limited. These are called the Orb groups Nos. 1, 2, and 3. The occurrences within the staked ground include pitchblende veins and pegmatite deposits. The deposits are spatially related to the Orbit fault, which extends from Orbit Bay to Orbit Lake. Trenching, sampling, and diamond drilling have been done on the three groups of claims.

Orb Group 1

Zone 6A lies between Augier and Orbit Lakes. Thirteen small trenches and nine x-ray diamond drill-holes have outlined a northeast-trending radioactive fracture zone of undetermined width, which is exposed at intervals for a distance of about 500 feet. The host rock, which is amphibolite, has been intruded concordantly by pegmatitic lenses. Radioactivity is fairly high in most of the trenches, but the higher Geiger counter readings were obtained in fractures along the contacts of the amphibolite and pegmatite, particularly where the strike of the fracture changes slightly. The deposit apparently occurs on the north limb of an anticlinal fold, the nose of which lies between Orbit and Augier Lakes. A fault occurs on the south limb of the same fold.

Pitchblende is visible in several of the trenches. Other vein minerals are hematite, calcite, quartz, chlorite, and disseminated sulphides. Along part of the fracture zone the vein material consists of a breccia formed of fragments of the amphibolite wall-rock.

Thirteen grab samples gave the following assays: 0.6 R, 0.003 R, 0.02 R, 0.01 R, 0.5 R, 0.005 R, 0.2 R, 0.6 R, 0.003 R, 0.2 R, less than 0.001 R, 0.003 R, and 0.005 R. Three chip samples gave the following assays: 0.043 R, across a width of 2 1/2 feet in trench No. 7; 0.21 R, across 2 feet in trench No. 1; and 0.2 R, across 2 feet in trench No. 4.

Three smaller pitchblende occurrences have been found to the northeast, roughly on strike with that of Zone 6A.

Orb Group 2

Two radioactive zones, Zone 2 and Zone 3, are known to occur within this group of claims.

Zone 2 lies about 1,000 feet north of the camp site on Orbit Bay. Radioactivity there is associated with fractures in a complex assemblage of amphibolitic and pegmatitic rocks, and high Geiger counter readings were obtained in what may be unreplaced remnants of the mafic rocks. Chalcopyrite and secondary uranium products are abundant in the several test pits, and assays on three grab samples gave the following results: 0.7 R, 0.004 R, and 0.1 R.

Zone 3 is about 500 feet northeast of the northeast end of Orbit Bay. Radioactivity there is associated with well-defined fractures that cut paragneiss-migmatite rocks composed of alternating bands of granitic and amphibolitic-chloritic composition. No appreciable difference in amount of radioactivity associated with different bands was detected. Three sets of fractures are represented. Two of these sets strike northwest and west and dip steeply; they contain visible pitchblende and abundant alteration products. A third set of fractures roughly parallels the trend of the banded gneiss, which strikes northeast and dips steeply southeast. Pitchblende is concentrated at the intersections of the first two sets of fractures and at points along the fractures where a change in the strike occurs. Two grab samples each assayed more than 0.1 R.

At a second occurrence, about 300 feet north of the Orbit camp site on Orbit Bay, pitchblende was found in two sets of short, shallow fractures cutting granitic gneiss. One set strikes northeast, and the other strikes north 65 degrees west and dips 35 degrees southwest. Pitchblende commonly occurs at the intersections of the two sets of fractures, which are probably related to the Orbit fault. One grab sample assayed 0.003 R.

Orb Group 3

This group of claims was staked around Cabin Bay. It includes two known radioactive zones, one, Zone 5, on the east side, and the other, Zone 5A, on the west side of the bay.

Zone 5 consists of a series of fractures in red granitic gneiss. In it, radioactivity is associated with fractures trending between north 20 and 60 degrees west, one of which can be traced for about 350 feet. However, radioactivity is intermittent and low. One grab sample taken from this zone gave an assay of 0. 03 R.

Zone 5A occurs in the White Lake granite. Radioactivity there is associated with fractures that strike northeast and northwest. Vein material resembling thucholite was taken from one of these fractures, and one grab sample from the zone assayed more than 0. 1 R.

Other Occurrences

Orbit Uranium Developments Limited has also done some preliminary work on several other smaller occurrences within the PP concession. Near Smooth Lake, radioactive anomalies were discovered in a hybrid rock that may have been derived from amphibolitic material. The nearness of this prospect to the Orbit fault suggests a relation to that structure.

Several radioactive pegmatites near Dive Lake were examined by the operators of this company. Radioactivity appears to be associated with short fractures in the pegmatite, along which uranium stain is fairly abundant.

Goldfields Uranium Mines Limited (former NN Concession)

At the close of the 1952 field season, only one prospect within that part of the concession lying west of longitude 108°45' had been at all intensively explored. This property, referred to as 50-NN-31, contains two separate radioactive occurrences.

The first occurrence is on a point in Griffith Bay, on Lake Athabasca. The host rock is paragneiss-migmatite of granitic composition. At least two sets of fractures cut the gneiss; one set strikes between north 50 and 75 degrees west and the other is roughly parallel with the gneissosity of the host rock, which strikes northeast and dips vertically to steeply northwest. A shear zone along one of the fractures varies in width from 1 inch to 1 foot, and can be traced for about 200 feet. It affords one of the best examples of pitchblende being concentrated at dilatant zones along the strike of a crooked fracture. In the most radioactive fracture, high Geiger counter readings were obtained for a length of more than 50 feet, but the highest readings were obtained along a section about 25 feet long, where the attitude differs from that of the rest of the radioactive fracture.

The second occurrence is about 200 feet northeast of the first. The prospect there consists of a strong, radioactive fracture in garnetiferous quartzite, and the strike of the fracture parallels that of the banding in the quartzite, which is apparently conformable with the gneissosity of the paragneiss-migmatite at the first occurrence. Associated with the main fracture is a series of smaller, northwest-trending fractures. The main fracture can be traced for about 350 feet to the northeast where it is lost in swampy ground. Pitchblende is reported to have been taken from it; one grab sample assayed 0.6 R.

Goldfields Uranium Mines Limited (former DD Concession)

The important radioactive occurrences in that part of this concession lying within the map-area are spatially associated with a prominent lineament extending from Griffith Bay to Spot Lake or to lineaments that appear to join this feature.

50-DD-10 Occurrence

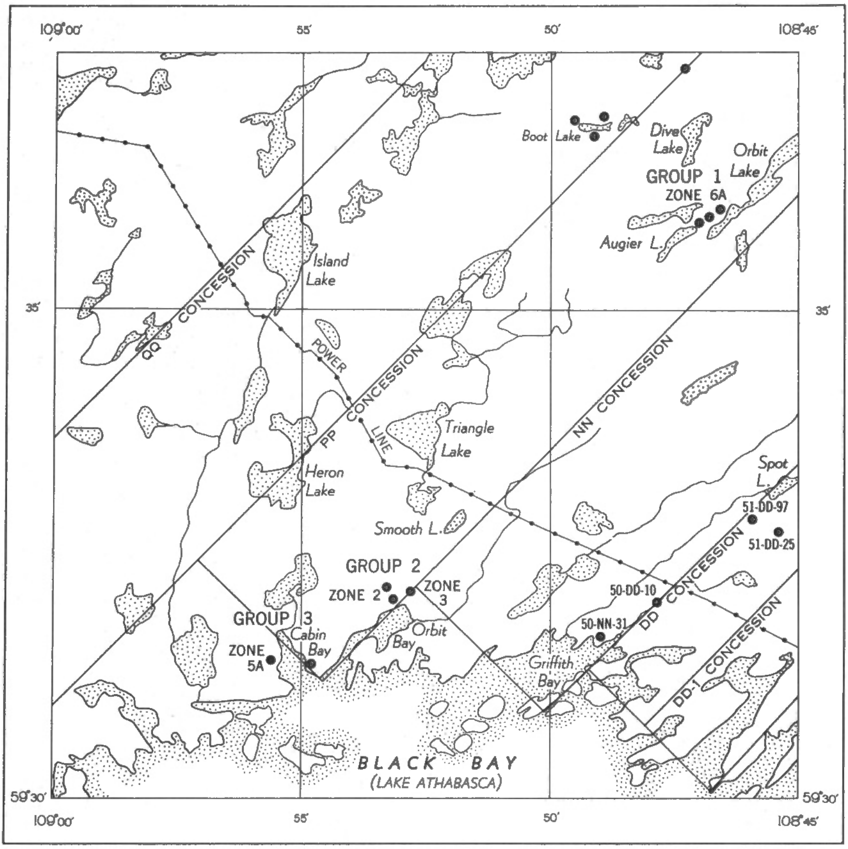
This occurrence is along the edge of a northeast-trending valley near Griffith Bay. The host rock is paragneiss-migmatite, which strikes north 65 degrees east and dips 60 to 80 degrees southeast. Several fractures and shear zones related to the fractures parallel the strike of the gneiss, and one strong fracture and shear zone has been traced for more than 150 feet. These fractures are in part very radioactive. A few fractures trend about north 30 degrees west, but are not radioactive or only weakly so. One grab sample assayed more than 0.1 R.

51-DD-97 Occurrence

This occurrence is roughly on strike with the 50-DD-10 occurrence, but lies about 2 miles northeast of it, and is in similar host rock. Radioactivity has been detected for about 400 feet along the southeast side of the valley that runs southwest from Spot Lake, near the 51-DD-97 occurrence. The prospect itself occurs in a fracture that varies in strike from north 65 to 85 degrees east. The fracture extends westward into the drift-filled valley. Here again, the most radioactive zone in the fracture is along a length of about 10 feet where the strike differs from that of the less radioactive parts of the fracture. One grab sample assayed more than 0.1 R.

50-DD-25 Occurrence

This occurrence is near the east boundary of the map-area, about 1/4 mile southeast of the 51-DD-97 occurrence. It is on a lineament that trends northwest and appears to intersect the lineament from Griffith Bay to Spot Lake. The occurrence is exposed in one test pit, in a siliceous carbonate rock not recognized elsewhere in the map-area, and is associated with a fracture striking about north 85 degrees west. Geiger counter readings at this occurrence were of medium intensity. A single grab sample failed to show any appreciable radioactivity.



G. S. C.

Figure 1

Key map, showing position of radioactive mineral occurrences, and approximate boundaries of former concessions in Black Bay map-area

Scale of Miles

1 0 1 2 3