CANADA

DEPARTMENT OF MINES

SIR JAMES LOUGHEED, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER.

GEOLOGICAL SURVEY

WILLIAM McINNES, DIRECTOR.

Summary Report, 1919, Part F

CONTENTS

OTTAWA

THOMAS MULVEY

PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1920

No. 1825

SUMMARY REPORT, 1919, PART F.

INVESTIGATIONS IN NEW BRUNSWICK AND NOVA SCOTIA.

By W. J. Wright.

INTRODUCTION.

June, July, and August were spent investigating the general geology of the Moncton map-area, and the detailed geology of the oil-shale deposits at Albert Mines. In September, two reconnaissance trips were made with A. O. Hayes, of the Geological Survey; one from Hillsborough to Hampton, through the country between the Canadian National railway on the north and Caledonia mountains on the south; the other from St. John city to Quaco. During the last two weeks of September, investigations were begun on the oil-shales of Pictou county, N.S.

Messrs. W. F. James and L. C. Kelley fulfilled their duties as assistants in a thoroughly efficient manner.

SUMMARY OF CONCLUSIONS.

The pre-Carboniferous rocks of the Moncton map-area belong to at least four divisions, as follows, beginning with the oldest: dark felsites (volcanics?), bedded volcanics, basic dykes (different varieties of perhaps different ages), and a batholith of syenite (?).

The sedimentary rocks of the Moncton map-area are Carboniferous, and are divided into five series which have been given the following local names, beginning at the base: Albert, Boyd, Weldon, Hillsborough, and Petitcodiac. Each series except the first two appears to be separated from the other by an unconformity.

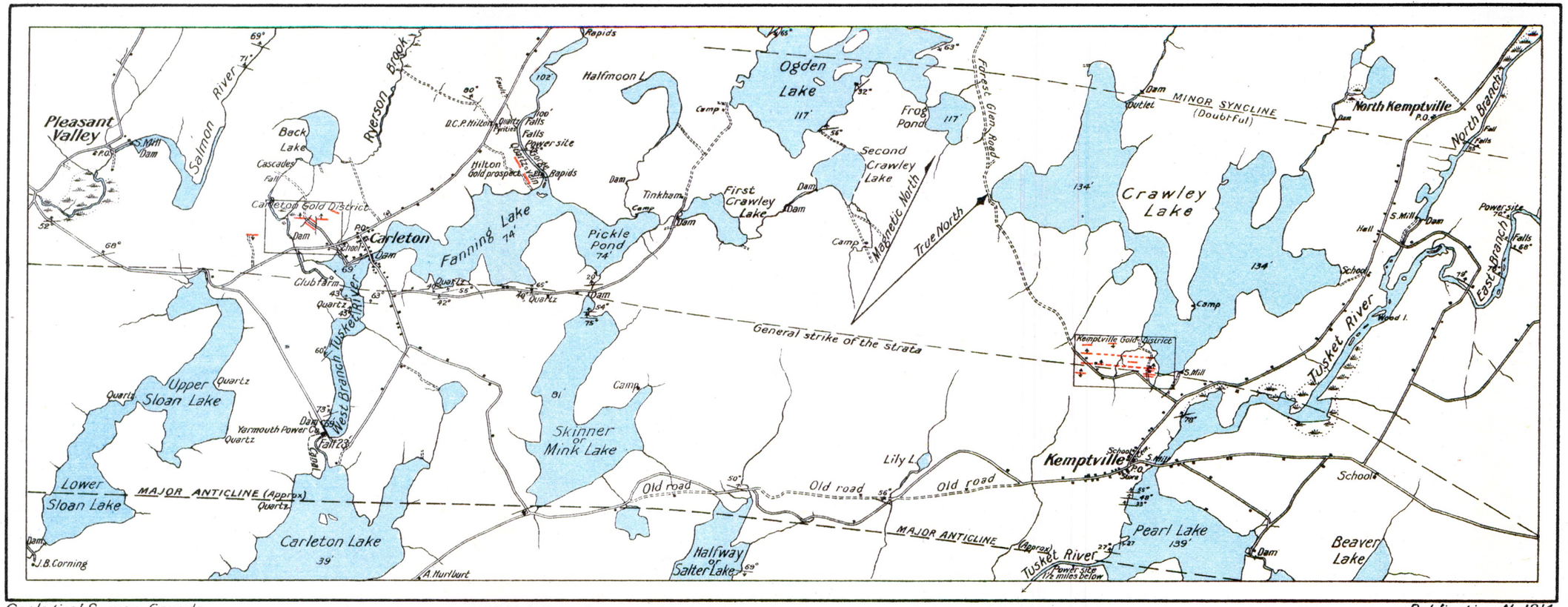
It may be pointed out that on the geological map-sheet 1, N.E., published by the Geological Survey, Canada, an area on Indian mountain, Westmorland county, has in error been coloured as Pre-Cambrian. The rocks along the north and south shore road across the centre of this area are largely, if not wholly, sandstones and shales. Some of the shales are bituminous.

As a result of the reconnaissance trip with A. O. Hayes, it is considered that sufficient evidence was found to warrant the following statements in regard to correlation:

In Kings county, N.B., between the Canadian National railway on the north and Caledonia mountain on the south, nearly all of the rocks mapped as Lower Carboniferous undivided on Sheet 1, N.E., lie conformably above the Lower Carboniferous limestone, and belong to the same series as the gypsum and anhydrite (Windsor series). At least one exception to this occurs on Cedar Camp creek, about 3 miles east of Waterford, where there is a small area of bituminous sandstones and shales which belong probably to the Albert series. The dark and slightly bituminous shales at Ratters Corner, and on Moosehorn brook, are remnants of the upper part of the Windsor series which has been preserved in the trough of a syncline.

Evidence was obtained to support the opinion that the rocks on Kennebecasis island belong to the limestone-gypsum series, and are unconformably above the Albert.

The Albert series, the source of the oil and gas of the Stony Creek field, contains at least 60,000,000 tons of oil-shale. The Windsor series in Nova Scotia has recently been shown to contain commercial supplies of rock-salt, and the presence



Legend

- Quartz veins.
- Dip and strike.
- Faults

74' Elevations in feet above sea level.

Geological Survey, Canada.

Publication No. 1814

Carleton-Kemptville Gold Area, Yarmouth County, Nova Scotia.

Scale of Miles

1 ¾ ½ ¼ 0 1 2

¾ MILE TO 1 INCH
OR 60 CHAINS TO 1 INCH

To accompany report by E.R. Faribault.
Summary Report Part F, 1919.

GEOLOGY AND SURVEYS

E. R. FARIBAULT 1919

of salt springs at Plumweseep and Salt Springs brook proves a salt horizon in the rocks of the same age in New Brunswick. All attempts to find oil and gas outside of the Stony Creek field have so far failed, although considerable money has been spent in prospecting other fields outside that area.

At Albert Mines, and at Rosevale, the quantities of oil-shale, in the opinion of the writer, warrant the establishment of an oil-shale industry.

In Pictou county, Nova Scotia, along McLellan brook, are several seams, up to 4 feet thick, of rich oil-shale. There are, also, several beds, at least 15 feet thick, of low-grade oil-shale, which, the owners report, yield over 20 gallons of oil per ton. If the reported yields be correct, this vicinity contains practically inexhaustible supplies of oil-shale well situated for development.

INVESTIGATIONS IN SOUTHWESTERN NOVA SCOTIA.

By E. R. Faribault.

CONTENTS.

Illustrations.

GENERAL INTRODUCTION.

During the field season of 1919, extending from May 19 to October 24, geological investigations were carried on in Shelburne, Queens, and Yarmouth counties. The greater part of the time was spent in the southeastern part of Shelburne county, in completing the structural geology of the Sable River map-area and the Lockeport map-area, which had been mapped during the previous two seasons. The report on the Lockeport map-area was published in the Summary Report for 1917, Part F, and that on the Sable River area is now given.

Three weeks in September were spent in Yarmouth county in making a detailed survey of the gold mining districts, all now idle, of Kemptville, Carleton, and Cranberry head, in order to study the geological structure of the gold-bearing quartz veins and to obtain information that might be useful in their development. A geological map, No. 1814, on the scale of 2 inches to 1 mile, was made of an area 3½ by 10 miles comprising Kemptville and Carleton, and detailed plans on a large scale were prepared of the two gold districts.

A structural section was made of the Gold-bearing series exposed along the seashore from Cranberry head south to Chegoggin point where the Halifax slate formation is conformably overlain by a belt of garnetiferous mica schist 36 feet thick, a belt of iron pyrites of 20 feet, and a prominent belt of white quartzite 350 feet thick. The garnet belt may be of economic value as a source of abrasive, and the

quartzite belt as silica material for industrial purposes, but the iron pyrites is probably of too low grade to be of value.

The party included J. McG. Cruickshank and C. A. Brown as field assistants, and J. F. Shupe and L. A. Gilbert as student assistants, all of whom performed their duties in a satisfactory manner.

SABLE RIVER MAP-AREA, SHELBURNE AND QUEENS COUNTIES, N.S.

Introduction.

The Sable River map-area, geologically surveyed during the summer of 1919, in Shelburne and Queens counties, measures 18 miles east and west and 12 miles north and south. It joins the Port Mouton sheet on the east, Lockeport sheet on the south, and Indian Garden sheet on the north, all of which previously had been completed and reported on. The southern limit extends from the head of Port Joli westward to near the south end of Wentworth lake, and the northern limit from First lake of Broad river to Jordan river, one mile north of lake John. The southeastern corner is crossed by the Halifax and Southwestern branch of the Canadian National railways, and by a short piece of the main shore road between Port Joli and Port Hebert. The whole area is uninhabited. Wilkins railway station, once the site of the mills of the Sable Lumber Company, is included in the area, but the company ceased operation two years ago, and the place is now deserted. The interior is reached by portage roads leading north up the rivers from Jordan Falls, Sable river, and Wilkins.

The area is drained by Sable and Tom Tidney rivers, the lower part of Jordan, and a short part of Broad rivers. These rivers all flow southerly to the Atlantic through a succession of still waters and short rapids, dissecting a flat or gently undulating, drift-covered plateau of low relief. The only lakes comprised in the area are lakes John, Randy, and Tom Tidney. Lateral moraines of boulder clay of low elevations parallel some of the streams. A few groups of drumlins, in the form of long, elliptical hills, are met with in certain parts, especially in the vicinity of the lakes.

The greater part of the country, once well forested with a fine growth of pine, spruce, and hemlock, has been burnt over repeatedly, and now presents a most lamentable and desolated appearance. Large areas are covered over with burnt woods and barrens, or numerous bogs, swamps, and meadows. The soil, generally, is sandy and too poor for farming. Some of the hills of boulder clay, more particularly the drumlins, are covered with young growths of hardwood and offer a more fertile soil. Farming was attempted on some of the hills when lumbering was being carried on, and a sheep farm was started near the fork of Sable river, but was soon abandoned. All the good timber has been culled, except a few clumps of spruce and pine on Sable river. The reforestation of the vast areas of burnt and waste lands of the interior of Nova Scotia is well worth serious consideration, because the soil and climatic conditions are ideal for the rapid growth of sound spruce and pine, and offer possibilities that are rarely met elsewhere. The amount of precipitation is very great. Records at Halifax covering a period of forty-seven years show an average annual rainfall of 57 inches.

A good source of waterpower is available at Big falls on Jordan river, where there is a descent of about 25 feet in a series of falls and rapids for a distance of two-thirds of a mile, with high banks, and lakes above sufficient for storage facilities. The energy could be electrically transmitted 6 miles to Jordan Falls, where it might be utilized advantageously to supply power for shipbuilding and other wood-using industries, in connexion with the Lewis Miller's sawmills which are annually cutting a large quantity of timber from their limits on the upper waters of Jordan river.

This region and the country extending to the north is one of the best hunting grounds in the province for moose. Of late years, Virginia deer also are becoming quite numerous. The fur-bearing animals are the mink, muskrat, beaver, otter, bear, wildcat, fox, marten, skunk, raccoon, ermine, and weasel. The beaver is protected

and increasing in number. Some of the other species are also increasing, very little trapping having been done during the war, on account of the high wages offered for other work.

General Geology.

The map-area is almost wholly underlain by the quartzites and slates of the Goldenville formation of the Gold-bearing series, or their metamorphic equivalents, gneisses and schists. In the southeastern part of the area, these rocks are intruded by two separate masses of muscovite granite of Devonian age, and by a large and persistent dyke of gabbro that cuts both the sedimentary rocks and the granite in a westerly direction, and extends far beyond the limits of the area.

The rocks of the Goldenville formation are composed chiefly of thick, massive beds of hard, grey quartzite, locally called whin, with intercalated thin layers of slate and schist. In the lower part of the formation, however, the beds of slate and schist are more numerous, and attain considerable thicknesses on Jordan river.

The Halifax slate formation, which elsewhere is conformably overlying the Goldenville quartzite formation, has been completely removed by extensive erosion.

The sedimentary rocks show every gradation of metamorphism, from slightly altered quartzites and knotted slates in the central part of the map-area far remote from granite intrusions, to completely crystallized, coarse, micaceous gneisses, and sericite, staurolite, andalusite, hornblende, and garnet schists in the vicinity of the granitic masses and dykes in the southeastern corner of the area. In the western part, also, the rocks are much altered by the intrusion of two granitic masses that occur outside of, but quite near, the limit of the area.

The rocks, which are much tilted and dip at angles varying from 45 to 80 degrees to the horizontal, have a general northeasterly and southwesterly strike. They are folded in long, parallel anticlines and synclines, the axes of which run nearly northeast and southwest magnetic.

The location of the anticlines and domes has an economic importance, because practically all the ore-bearing quartz veins are found aggregated on domes of pitching anticlines. The greater part of the season was spent in the location and the study of the geological structure of the anticlines and synclines. This entailed much detailed and strenuous field work, on account of the great number of the folds, the scarcity of the rock exposures, and the rough and swampy nature of the country during a wet season.

At least fourteen anticlines and as many intervening synclines traverse the map-area in a southwesterly direction. This series of folds is comprised within a section of 20 miles of gold-bearing rocks measured at right angles to the folding, from near the head of Port Joli to Jordan river above lake John. In the southeastern part of the area the anticlines are, on an average, about 2 miles apart, but in the northeastern part they occur at intervals varying from half a mile to one mile.

The scarcity of rock exposures made it impossible to work out in detail the structure of some of the anticlines, and to locate all the domes, especially on the numerous small folds to the northwest. One well-defined dome was located on the Green Harbour Lake anticline, which crosses Sable river at Lower Pine Hill landing, 3½ miles above the head of tide-water. This dome extends from the portage road on the east side of the river, three-quarters of a mile above Log brook, southwesterly to the head of lake Misery. Shaped like an elongated, elliptical dome, 3 miles in length and very narrow, it is composed chiefly of mica schists with beds of altered quartzite dipping on both limbs of the fold at angles of 50 to 65 degrees. Several quartz veins, some of which are auriferous, occur on the dome. The above-mentioned dyke of gabbro crosses the dome at about its centre, but could not be observed in situ.

Two other domes, less well-developed, were located: one on a minor fold crossing Lead Mine brook, 3½ miles up Jordan river, where quartz veins carrying molybdenite have been prospected; the other on the major anticline crossing Broad river at the mouth of Little Lake Brook, at the eastern border of the map-area, where auriferous quartz has been found.

In the southeastern part of the area the sedimentary rocks are intruded by two separate masses of muscovite granite of Devonian age. The larger batholith extends from Port Joli and Port Hebert northward and westward from 5 to 8 miles to Wilkins, lake Wilkins, and Haley Lake brook, and eastward beyond the limits of the area to Port Mouton. Three miles west of Port Mouton is a smaller mass that measures 4 miles by 2 miles, and crosses the railway and Tom Tidney river one mile north of the main shore road. As a rule, the granite on the border of these batholiths changes in texture and becomes pegmatitic or aplitic; and tongues and dykes of this marginal phase of the granite penetrate the sedimentary rocks.

The pegmatite dykes are often intersected by veins and stringers of quartz that carry black tourmaline, garnets, and other minerals. Some of the dykes have been observed a mile or more distant from, and apparently not connected with, the granite masses. They are composed mostly of quartz, and include not only some of the constituents of the granite in coarse crystalline forms, but also molybdenite in minute flakes, fluorite, the lithium micas lepidolite and ambligonite, and other minerals that may be of economic value. The granite and the pegmatitic dykes are very similar to those of New Ross, and some of the economic minerals found in that district are present in this area also.

The large and persistent dyke of greenish black gabbro which has been traced along the coast in a westerly direction for over 60 miles from West Ironbound island at the mouth of Lahave river to Roseway river 2 miles north of the town of Shelburne, crosses the southeastern corner of the map-area. It runs westerly a short distance north of the railway from Wilkins station to Tom Tidney river, crosses Sable river at the mouth of Log brook, and the southern limit of the map-area one mile north of S. Huskins' house. Actual outcrops of the dyke have been observed only at two places along this distance, near Wilkins station, but its location can be easily traced by following the debris, which forms a characteristic red soil, and the weathered, red rusty boulders with a rounded pitted surface. The course of the dyke appears to have been affected by two transverse faults converging southerly towards the head of Port Joli. One on Mitchell lake gives to the dyke an horizontal displacement of about one-fifth of a mile to the left; the other on Tom Tidney river, above the "guzzle", a displacement of three-quarters of a mile to the right. The width of the dyke varies from 200 to 400 feet. A microscopic examination of thin sections shows the rock to be gabbro, and not diabase as reported before, nor black granite as it is generally called at Shelburne, where the same rock is quarried and cut for monuments. The minerals present are:

Feldspar: labradorite; most abundant mineral in the rock.
orthoclase; present
quartz and orthoclase; fairly abundant in graphic intergrowths.
Augite: abundant, pale colour.
Hypersthene: light colour.
Iron ore: abundant, probably magnetite.
Biotite: a few small scales.

Economic Geology.

The economic minerals discovered in the area under study are gold, molybdenite, infusorial earth, red ochre, and bog-iron.

Gold. Gold quartz veins and float have been discovered at a few places in the gold-bearing rocks, generally on anticlinal folds, but apparently not in paying quantity, and no development work has been commenced.

There was, however, a considerable amount of prospecting for gold 7 miles up Broad river, near the eastern limit of the area, on the western side of Long Point stillwater, on a swampy island formed by two channels of Little Lake brook. About the year 1888, Louis Labrador and Mitchell discovered here a large boulder of quartzite, from 3 to 4 tons in weight, split in two parts; on one of the split faces was a sheet

of quartz, an inch thick, peppered with coarse gold. Since then several attempts have been made by James McGuire and others to find the vein, but the swampy nature and thickness (5 to 7 feet) of the surface covering rendered prospecting difficult. A few small veins are said to have been cut and some gold float was found in the prospecting trenches and pits. The veins in the summer of 1919 were covered over. One of them, reported by McGuire to have a course bearing a little north of west and to intersect the strata obliquely, is believed to be that from which the rich float was derived, although it shows only a little fine gold where it was cut. It is said to be irregular in width, being 4 inches in soft rock and tapering to nothing in hard rock. It is situated on the westerly plunge of a dome extending northeasterly into the adjoining map-area, and quite close to the anticlinal axis, where the geological structure and conditions are generally favourable to the deposition of gold quartz veins. The locality along the western part of the dome is considered well worth the attention of the prospector.

Gold float was found by Labrador and Mitchell three-quarters of a mile northwest of James McGuire's prospect, on the road towards Payzant meadow; also 1½ miles north of the same prospect on the portage road to First lake of Broad river. A few trenches and shallow pits were opened at both places but apparently without success. The geological structure of the rocks does not appear to be favourable for gold-bearing quartz veins.

The most promising locality for gold deposits probably is on the Lake Misery dome which occurs on the Green Harbour Lake anticline, 3 miles north of Sable River station. The structure of the dome has been described above. Several interbedded quartz veins, and numerous loose pieces of quartz have been observed on the dome. Two gold quartz veins, the Lake Misery vein and Peter's vein, have been prospected. The former vein occurs half a mile north of lake Misery, half-way between the head of Green Harbour river and Lower Stoney brook. A pit was sunk on the vein and some prospecting was done in the vicinity about the year 1890, by Dr. Burns and others, apparently to locate the ore-body from which rich float said to have been found at the surface is derived. The vein prospected is said to be 54 inches wide, is interbedded in schist and quartzite, and carries a considerable amount of iron pyrites.

The Peter's vein outcrops in the bed of Sable river, a little over one mile above Log brook. It is 12 inches in width, occurs in slate interstratified between beds of quartzite, dips northwesterly at an angle of 63 degrees, and carries iron pyrites and calcite.

Molybdenite. The occurrence of molybdenite on Lead Mine brook[1], a small eastern tributary of Jordan river, 3½ miles north of Jordan Falls, is comprised in the Lockeport map-area, and the other occurrence, one mile to the northeast, is situated in the area under study. A more detailed examination, made in 1910, of the gold-bearing rocks of the locality shows that the deposits occur on a minor fold of schist and quartzite which terminates a short distance to the southwest, but increases in amplitude toward the northeast. On the brook below the portage road the fold plunges westerly at an angle of 20 degrees, but one mile to the northeast the anticlinal part of the fold appears to plunge easterly at a low angle. Molybdenite in small flakes is found sparingly in a large pegmatitic quartz vein that follows the axis of the fold and cuts the stratification at a high angle, as well as in small quartz veins following the plane of stratification, much in the same manner as the scheelite-quartz veins of Moose River, Halifax county. The deposits have been examined frequently from an economic point of view, but up to the present no attempt has been made to prove their commercial value. It is quite possible, however, that prospecting along the fold towards the northeast may uncover quartz veins carrying economic values of molybdenite, and the locality deserves further investigation.

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[1] Geol. Surv., Can., Sum. Rept., 1917, pt. F, p. 19.

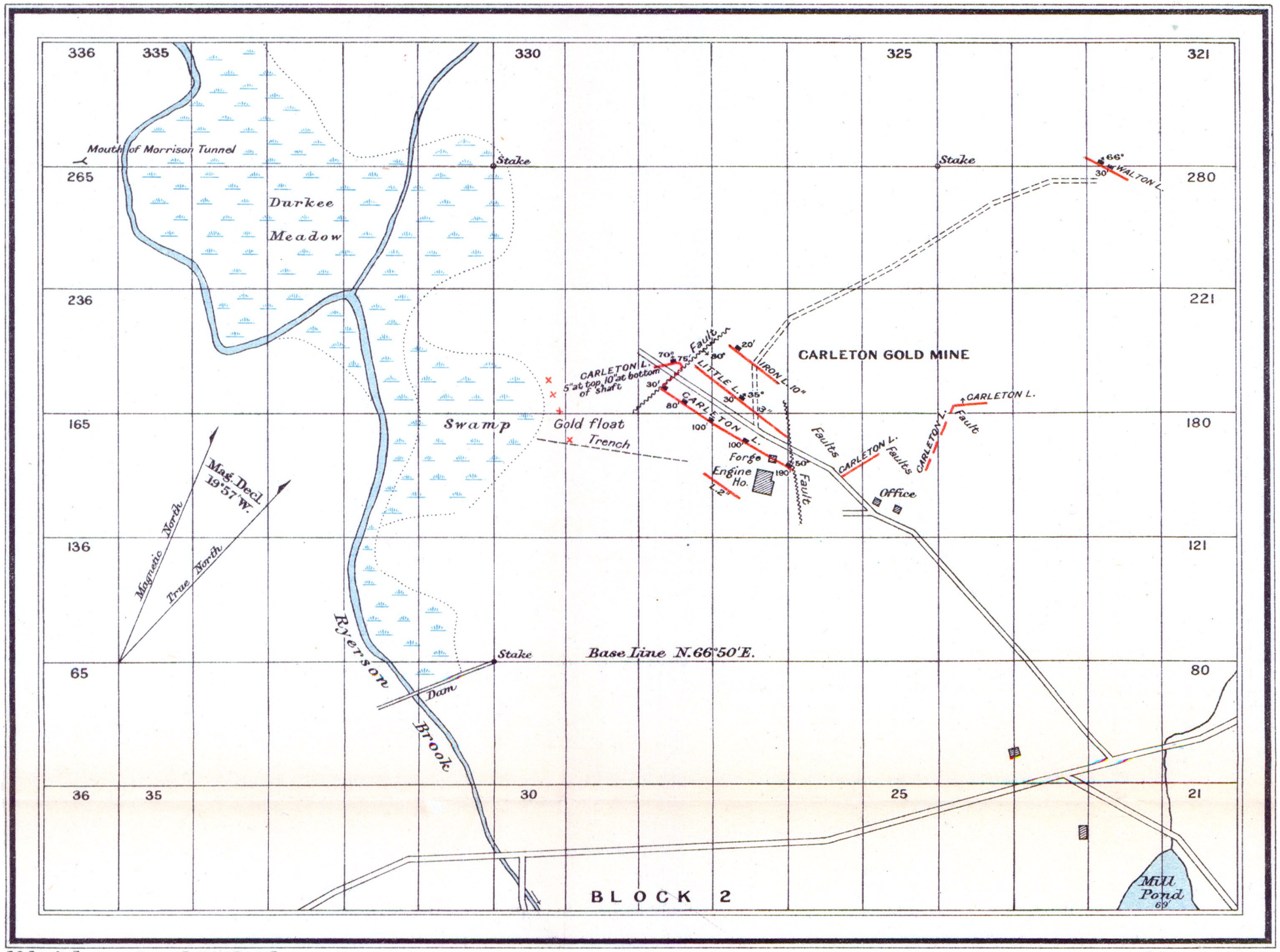
Canada
Department of Mines

HON. SIR JAMES A. LOUGHEED, MINISTER; CHARLES CAMSELL, ACTING DEPUTY MINISTER.

GEOLOGICAL SURVEY

WILLIAM McINNES, DIRECTOR.

Issued 1920



LEGEND

- Quartz veins, thickness in inches (9")
- Quartz veins, concealed
- Fault
- Roads and buildings
- Shafts, depth in feet (75')
- Mining lots (121)
- Rivers and lakes
- Swamp and meadow

C.O. Senécal, *Geographer and Chief Draughtsman.*
A. Braidwood, *Draughtsman.*

Publication N°. 1817

CARLETON GOLD DISTRICT

YARMOUTH COUNTY

NOVA SCOTIA

GEOLOGY AND SURVEYS

E.R. FARIBAULT 1919

Scale $\frac{1}{3000}$

Feet: 200 100 0 200 400 600 800

Metres: 50 0 50 100 150 200

250 FEET TO 1 INCH

To accompany report by E.R. Faribault, Summary Report Part F, 1919.

Infusorial Earth. A deposit of infusorial earth was observed 17 miles up Jordan river, in a marsh bordering the eastern side of the stillwater, 1½ miles above lake John. The samples collected are mostly white and of good quality, but the extent and thickness of the deposit could not be ascertained because it was flooded over by the flowage of the dam at the foot of lake John, which is nearly always kept closed for water storage. For this reason the deposit is not available.

Another deposit is reported by John Bell of Jordan Falls to occur 4 miles farther north, at the foot of Upper lake on west branch of Jordan river. These deposits at present are too far away from shipping facilities to be exploited at a profit.

Ochre. Red ochre and bog-iron of inferior quality have been observed on King Forest brook, a western tributary of Jordan river, 4 miles north of Jordan Falls, but apparently the deposit is not of enough importance to be of economic value, except as a pigment for local use.

CARLETON GOLD DISTRICT, YARMOUTH COUNTY, N.S.

Introduction.

The Carleton gold district is situated near the village of Carleton in the central part of Yarmouth county, 16 miles northeast of Yarmouth and 5 miles east of Brazil Lake station on the Dominion Atlantic railway. Carleton village lies on the west branch of Tusket river, at the outlet of Fanning lake, where the highway crosses the river and a fall of 5 feet is utilized to run a sawmill, a boat factory, and a quartz-crushing mill of eight stamps. Tusket river furnishes important waterfalls; one at a distance of one mile below the village has a drop of 23 feet and is developed by the Yarmouth Electric Light and Power Company which transmits power to the town, another above Fanning lake has a fall of 27 feet in a distance of 2,800 feet in a deep, narrow, rocky gorge and could be easily developed.

Geology.

The geological map of the Carleton-Kemptville gold area, surveyed September, 1919, and published herewith, covers an area measuring 10 miles northeasterly from Pleasant Valley to Kemptville by 3½ miles across, and comprises the gold mining districts of Kemptville and Carleton, detailed plans of which also accompany this report.

All the area is underlain by the Goldenville formation of the Gold-bearing series, composed of interbedded quartzites and slates, the slates predominating and attaining considerable thickness in places. No eruptive rock was observed, but the sedimentaries are somewhat metamorphosed to micaceous quartzites and knotted micaceous slates and schists by a spur of the large granite batholith of the interior of the province, which terminates a few miles east of Kemptville.

The strata strike northeasterly and dip northwesterly, generally at high angles, across nearly the whole area on the north limb of a major anticlinal fold, the axis of which lies along the southern edge of the map-area. On Ogden lake, in the northern part of the area, a few outcrops dip southerly and cause a syncline which, probably, is only local or of minor importance, because the major syncline is much farther northwest, outside of the map-area, in the vicinity of Brazil lake, where a great thickness of the upper slate of the Halifax formation occurs, conformably overlaid by beds of white quartzite similar to the Whiterock quartzite of Kings county. This belt extends southwesterly toward Yarmouth and Chegoggin point, where it was examined last summer and will be described in another report.

Owing to the widespread covering of drift, the axis of the major anticline could not be accurately located; however, it crosses near the northern end of Carleton lake and extends northeasterly to and beyond Pearl lake, where it is one mile to the south of the Kemptville gold mines.

A transverse section of half a mile of strata is well exposed on Tusket river along a deep, narrow gorge above Fanning lake, where knotted slates, wavy micaceous schists, and schistose quartzites are uptilted almost vertically. The farthest south outcrop of this section, opposite small islands at the mouth of the river, appears to dip both north and south and to form an anticline, but the southern dip may be that of a fault plane. Quite near to the west of this outcrop lies the Hilton gold-silver prospect, to the north of which the rocks are in rolls indicating an undulation of the strata.

A zone of slates including a few intercalated beds of quartzite outcrops at several places on the south side of Fanning lake, where the strata dip north at angles decreasing from 65 to 40 degrees, and also farther east on the brook from Mink lake to Pickle lake, where they dip north at angles decreasing from 75 to 20 degrees. This gradual change of dip evidently indicates an undulation of the strata which, probably, extends both northeasterly in the direction of the Kemptville gold mines, and southwesterly toward the north end of Upper Sloan lake, passing a quarter of a mile to the south of the Carleton gold mine.

Owing to the absence at both mines of natural rock exposures and the impossibility of examining the artificial openings, very little information other than that given by local miners could be obtained regarding the geological relation of the quartz veins to the structure of the rocks.

Important faults have been encountered in the workings of the Carleton mine, where the rich ore was found only in certain parts of interbedded veins limited by faults. Outside of the mines, there is evidence that the structure of the rocks has been much disturbed since the folding by dynamic forces that caused dislocations and fractures. The mineralized quartz veins and quartz breccia on Hilton's farm, 1½ miles northeast of the Carleton mine, and the numerous loose pieces of quartz observed elsewhere in the area, are undoubtedly the result of rock disturbances subsequent to the folding.

Gold-Quartz Veins.

Three parallel interbedded veins, the Carleton, Little, and Iron leads, occur within a distance of 145 feet in a block of strata thrown to the south between two faults converying toward the north. These veins strike north 85 degrees west and dip north. The Iron or northern lead was exposed in a test pit 20 feet deep, where it was 10 inches wide and carried iron pyrites; but was of no value. The Little or middle lead was worked by open-cut for a length of about 200 feet, between the two faults, and to a depth not exceeding 30 feet, but was not traced beyond the faults. It is 3 inches wide and " whin "-bound and dips north at an angle of 35 degrees, increasing in depth.

The Carleton or main lead was the only one of importance mined in the district. It has been worked along its whole length of 315 feet comprised between the two faults, by five shafts, to depths of 190, 100, 80, 80, and 30 feet, respectively, from east to west. The lead averaged from 4 to 8 inches of bluish mottled quartz and carried much calcite, some arsenopyrite and iron pyrites, and a little galena and copper pyrite; the gold was finely distributed through the vein. The ore is said to contain the same associated minerals as that of the Cowan lead of Kemptville. The lead followed the foot-wall side of a 6-inch layer of dark grey, hard, siliceous slate carrying ankerite and arsenopyrite which was overlain by a bed of grey quartzite 18 inches thick. Good ore showed throughout the workings, but the lead pinched out at the bottom, except in the deepest shaft where some ore was left, because of the dangerous condition of the shaft. The lead dipped north at an angle varying from 60 degrees at the outcrop to about 35 degrees lower down, but at the bottom of the main shaft resumed its original dip. In certain parts the lead was in rolls with stringers of quartz coming in, and the wall rock was fractured.

Much prospecting has been done to locate and trace the Carleton lead in both directions beyond the two faults. Toward the west it was found 60 feet farther to the

north, where it curved with the strata southeasterly to the fault, and the quartz was much crushed. In 1909 E. F. Beeler sank a 70-foot shaft near the fault where the lead strikes southwesterly, dipping north 75 degrees normally in undisturbed strata, but it proved of no value. A thick quicksand prevented the outcrop of the lead being traced farther west than this shaft.

East of the eastern fault is a zone of faulted strata 350 feet wide, across which several broken up and disconnected pieces of the Carleton lead were discovered striking northeasterly and northerly, and beyond which the lead reassumes its normal attitude, slightly north of east and dipping north at a high angle, apparently in undisturbed strata in line with Beeler's shaft. No ore was found in any of these parts of the Carleton lead.

Gold float was found 275 feet west of the Carleton mine on the eastern side of Burkee's meadow, also to the north in the vicinity of the Iron lead, and at other places near the mine, but the parent veins have not yet been discovered on account of the great thickness of the surface drift.

A few veins have been opened up in the immediate vicinity of the Carleton mine, but apparently none of them showed much value. The Walton lead, 900 feet northeast of the mine, which was tested to a depth of 30 feet, strikes east and west and dips north 65 degrees. A vein, 2,000 feet to the southwest, on the eastern slope of the hill, has been cut by a shaft 40 feet deep; this vein, instead of dipping northerly, like the other veins, appears to strike a little north of east and dips south 52 degrees. No further information could be obtained about this vein, which was opened several years ago. A few veins are said to have been cut by J. Morrison in a tunnel 1,200 feet west of the mine at the foot of the hill on the western side of Ryerson brook; and a lead was reported one mile north of the mine on the eastern side of Back lake.

A large cross-vein carrying gold and silver occurs 1½ miles to the northeast of the Carleton gold mine, on D. Carl F. Hilton's farm, on the eastern side of the main road, near the north end of Fanning lake. The vein strikes north 62 degrees west, diagonally across the strata, and dips northerly 76 degrees. It has been opened up by a shaft 30 feet deep and an open-cut 30 feet east of the shaft; it was also cut 65 feet west of the shaft. In the shaft, the vein occurs in lenses, 15 to 18 inches wide, overlapping one another in depth, and at the bottom 15 inches of ore was still exposed. At the east end of the open-cut the vein widens to 4 feet, but here it curves abruptly at right angles to the south and pinches out within 5 feet; 65 feet west of the shaft it was 6 inches wide. The vein matter is composed of coarse, white, rusty quartz carrying a considerable amount of galena and arsenopyrite, some iron pyrites, and a little zinc blende. An analysis of the sulphides is reported to have given a good percentage of gold and silver. The ore-body is of good size, but only for a short length horizontally; it may extend in depth, however, in the form of an ore-shoot pitching northwesterly; and, if the value of the ore warrant it, further development might be undertaken in that direction by sinking the shaft deeper and drifting northwesterly on the vein. A lenticular vein of quartz 24 inches wide was uncovered about 200 feet southeast of the shaft, but showed no value. Four hundred and sixty feet north of the shaft an excellent waterpower, previously mentioned, is available on Tusket river.

Six hundred feet northeast of Hilton's house, several large pieces of breccia of quartzo-feldspathic rock carrying iron pyrites lie at the surface along a swampy depression running northwesterly, which possibly is due to a fault. An assay made by A. L. McCallum, Halifax, of the pyrites is reported to have given an appreciable percentage of gold. About 200 feet farther north a bed of white quartzite similar to that of Chegoggin point and Gaspereau river is exposed for a width of over 20 feet, and years ago gold prospectors blasted some of the rock. Quartz veins have been reported a quarter of a mile west-northwest of Hilton's house. A quartz vein 4 inches wide outcrops on the western shore of Tusket river, a short distance below Round lake.

History.

Gold [1] was discovered in this district early in the spring of 1886. In the summer of that year the Carleton main lead was exposed and before the close of the year a small, Wiswell crushing-mill, driven by waterpower, was erected at the bridge over the west branch of Tusket river, half a mile from the mine. A shaft was sunk about 100 feet; 300 feet of levels were driven and about 50 tons of ore taken out. It is reported that several tests showed a yield of 2½ ounces per ton.

In 1887 [2] the property was sold by Messrs. Gale and Ross to Messrs. Hatfield and Uhlman; the shaft on the main lead was sunk 100 feet deeper and good ore was followed to the eastward; the Wiswell mill was replaced by an eight-stamp crushing-mill, which is still standing but not in working order. Some veins were prospected on the adjoining property by Messrs. Turner and Company, and about 700 feet north Messrs. Miller, Crosby and Company opened a belt.

After 1887 mining operations were rather intermittent, but no detailed record of the work done is available. In 1911 a two-stamp crushing-mill, operated by steam-power, was erected at the mine, and in 1915 it was removed to Kemptville. Nearly all the ore produced in the district was taken out of the workings on the Carleton main lead; the only other vein worked was the Little lead, which produced little ore. There has been no mining since 1915.

Production.

The following incomplete table, furnished by the Department of Mines of Nova Scotia, shows the yearly production of the district from 1897 to date, and does not include that of the earlier and probably most productive years from 1886 to 1896, when the mine was actively worked and rich ore was produced. The mining returns for those early years are not available.

Production of Gold from Carleton Gold District.

Year.	Ore crushed.	Total yield.		
	Tons.	Oz.	Dwt.	Gr.
1889	63	59	0	0
1897	45	18	5	18
1898	10	42	0	0
1899	12	15	0	0
1900	Nil.			
1901	202	30	5	0
1903	20	12	0	0
1904	103	56	12	0
1910	10	8	0	0
1911	58	37	15	2
1914	20	1	10	0
1915	2	1	15	0

KEMPTVILLE GOLD DISTRICT, YARMOUTH COUNTY, N.S.

Introduction.

The Kemptville gold mines are situated in Yarmouth county, 23 miles northeast of the town of Yarmouth, and one-quarter of a mile north of the village of Kemptville, on Tusket river, 16 miles north of Tusket station on the Halifax and South-

[1] Rept. Dept. of Mines, Nova Scotia, 1886, p. 19.
[2] Rept. Dept. of Mines, Nova Scotia, 1887, p. 29.

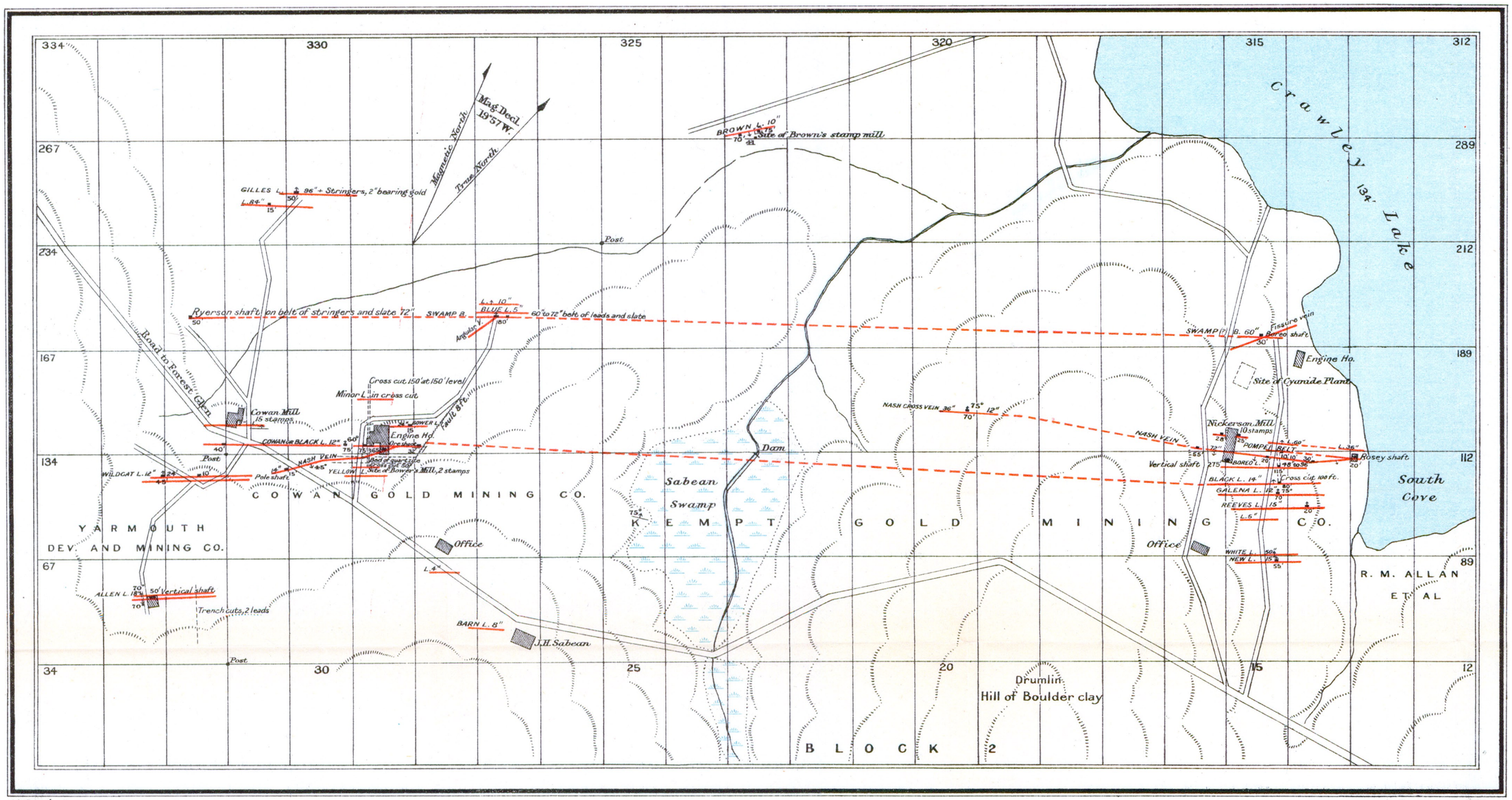
Canada
Department of Mines

HON. SIR JAMES A. LOUGHEED, MINISTER; CHARLES CAMSELL, ACTING DEPUTY MINISTER

GEOLOGICAL SURVEY

WILLIAM McINNES, DIRECTOR.

Issued 1920



LEGEND

- Quartz veins, thickness in inches
- Quartz veins concealed
- Dip and strike
- Fault
- Roads and buildings
- Shafts, depth in feet
- Mining lots
- Rivers and lakes

G.O. Senécal, *Geographer and Chief Draughtsman.*
A. Braidwood, *Draughtsman.*

Publication No. 1816

KEMPTVILLE GOLD DISTRICT

YARMOUTH COUNTY

NOVA SCOTIA

Scale : 1/3000

Feet: 200 100 0 200 400 600 800 1000

Metres: 50 0 50 100 150 200 250

250 FEET TO 1 INCH

GEOLOGY AND SURVEYS

E.R. FARIBAULT 1919

To accompany report by E.R. Faribault, Summary Report Part F, 1919.

western railway. Kemptville is connected by daily stage with Brazil station on the Dominion Atlantic railway, 12 miles distant, and has telephone connexions.

The country is covered with long, gently undulating hills of glacial drift, and is watered by Tusket river and several lakes affording good waterpowers. Two waterpowers are available on the river near the mines, one, 2½ miles above, and the other 2¾ miles below the mines, where, 1½ miles below Pearl lake, Crooked falls have a drop of 17 feet in a distance of 600 feet, 30 feet within 5,000 feet, and 41 feet in 10,000 feet; and there are good bedrock foundation and banks for a dam. The results of an hydrometric survey of Tusket river, made last summer by the Dominion Water Power Branch, co-operating with the Nova Scotia Water Power Commission, will soon be published. The principal industries are lumbering, milling, and farming. Kemptville is one of the best inland centres in the province for moose hunting and fishing.

Geology.

In this district the Goldenville formation of the Gold-bearing series is exposed, consisting of beds of altered, grey, micaceous quartzite with intercalated layers of grey and greenish grey, arenaceous and argillaceous slate and schist. The strata strike southwesterly and apparently all dip northerly at angles increasing from 24 to 75 degrees from south to north on the northern limb of a major anticlinal fold. The axis of the anticline lies more than a mile south of the mines, crossing Tusket river about the outlet of Pearl lake in a southwestern direction toward the head of Carleton lake. Consequently, the gold-quartz veins are not, as in most gold districts in the province, directly connected with the main anticline. They may be the result of some small crumplings of the strata on the north line of the main anticline as appears to be the case in the Allen shaft; but it is more probable that they were developed along a zone of shearing and fractures in high-dipping strata extending southwesterly across Fanning lake to Carleton gold district, 5 miles distant, where the same conditions are found.

Owing to the surface being covered with a great deposit of drift, leaving very few rock exposures, and also owing to the fact that at the time of the survey there was no mining and the workings were consequently inaccessible, the geological structure could not be worked out satisfactorily. Much of our knowledge of the geology of the district is dependent on the information acquired from experienced local miners. Edwin Walton, one of these, acted as guide in the survey of the mines, and deserves the thanks of the Survey for his assistance and courtesy.

Two outcrops only were observed at the mines, one a bed of grey quartzite at the south end of Cowan stamp-mill, and the other an exposure of grey, siliceous, contorted schist on the western side of Sabean swamp, both dipping north at high angles. Outside of the mines, a few exposures of grey quartzite and slate, also dipping north at high angles, were seen along Tusket river above Kemptville bridge; and below the bridge, along the western shore of Pearl lake, are several outcrops of greenish grey and grey, siliceous and argillaceous, altered slates with a few thin beds of grey quartzite, all dipping north at angles gradually decreasing towards the south from 55 to 24 degrees, indicating an anticline near the outlet of Pearl lake. Not a single outcrop could be seen around Crawley lake, which lies immediately north of the mines and has several miles of shore-line.

The developments up to the present have revealed only a few small faults. One, encountered in the eastern workings of the Cowan lead, runs a little east of north and gives a displacement of 8 feet to the north. There are indications of a fault running north and south through Sabean swamp, and of another along the western shore of the south cove of Crawley lake.

Gold-quartz Veins.

All the veins developed lie in two groups at both ends of a rectangle measuring 3,000 feet in a southwesterly direction along the strike of the strata, and 1,000 feet across; in the intervening portion, for a length of 1,500 feet, one vein only, the Nash cross vein, has been opened, this apparent lack of initiative being due to the great thickness of glacial boulder clay and the swamps, which prevented prospecting. Rich float of gold quartz, however, has been found in the Sabean swamp in the central part of the district and there is every reason to believe that auriferous veins occur there as at both ends. The western group of veins lies on the Cowan and the Yarmouth properties, and the eastern on the Kempt and the R. M. Allen *et al* properties adjoining the South cove of Crawley lake.

The veins are not as numerous and as closely segregated in groups, nor are they as persistent in size and extent, as those occurring on anticlinal domes in the districts to the east of Halifax. Some of the developed ore-bodies were very rich in spots, but were all very limited in extent, not more than 200 feet in length and 50 to 200 in depth. Other small bodies of rich ore may still be discovered in some of the veins and operated at a profit if worked economically in a small way, but the district does not offer a promising field for the undertaking of important mining operations.

Both interbedded and cross veins occur in the district, but operations, practically, have been limited to the interbedded veins which usually are called "leads" by miners. The most productive have been the Cowan lead on the Cowan property, and the Black lead on the Kempt; it is claimed by local miners that one lead is the continuation of the other.

The Nash cross vein, however, plays an important part in the distribution of gold; it acts as a "feeder," apparently enriching all the interbedded veins with which it comes in contact. The richest ore mined in the district was found at the intersection of the Nash vein with the Cowan, Black, Pompei, and Boreo leads. The Nash is a very irregular, but persistent, vein which is claimed to have been traced by several openings the whole length of the district. It varies in thickness from a few inches to over 5 feet, and is composed of coarse quartz, with characteristic dark mottled streaks, sometimes in rolls. At the surface, the vein strikes nearly parallel with the stratification, alternatingly following or slightly crossing the strata; whereas in depth, it dips generally to the south at low angles; and, consequently, intersects the strata at right angles. When meeting an interbedded vein, it generally follows it for a short distance before resuming its natural dip, causing rich ore on the lead intersected.

The Cowan lead was worked by four shafts, respectively 32, 165, 75, and 75 feet in depth, for a length of about 200 feet, and was from 11 to 16 inches in width. In the main shaft, for the first 75 feet, the vein dipped northerly 60 degress and yielded 3 ounces to the ton for the whole length of the workings. In the next 25 feet, almost perpendicular, the quartz proved of no value. The lead then dipped to the south 35 degrees for 25 feet, with the Nash vein; thence, leaving the Nash vein, it turned to the north at an angle of about 70 degrees, giving some good ore for a short length to the bottom of the shaft. At the surface, the rich ore began half-way between the main and the east shafts, where the Nash vein came in from the southwest and dipped to the south 45 degrees, cutting the strata which, 20 feet south of the Cowan lead, include a bed of grey quartzite 30 feet wide. At a depth of 150 feet crosscuts were driven north 150 and south 50 feet cutting a few veins that were not worked. Rich float, however, has been found southwest of the Cowan mine and in the Pole shaft on the Nash vein; this float may be derived from the intersection of the Nash with interbedded veins not yet discovered; float was found, also, northeast of the Cowan mine, in the Sabean swamp. Prospecting at these places has been unsuccessful so far, perhaps on account of the great amount of drift.

The most important work on the Kempt property was done from the vertical shaft 275 feet deep. No reliable information could be obtained regarding the character

and structure of the veins developed. The ore was taken mostly from the Black lead, both above and below its intersection with the Nash vein, as well as from the Nash vein itself, which was worked from the Black lead northward on a gentle rise to the surface. The total length of the workings is about 200 feet. The Black lead averaged 14 inches in width, and the Nash vein was very irregular in size and direction. From the 80-foot level in the vertical shaft 180 feet of crosscutting was put in, but no information could be obtained regarding the veins intersected.

At the foot of the hill, 125 feet east of the vertical shaft, ten veins were opened in a line north and south, on the Kempt property; those worked are the Boreo, Nash, and Pompei lying north of the Black, and the Galena, Reeves, and New leads south of it. The Boreo is a strong lead, 4 to 8 feet wide, said to average 4 pennyweights of gold to the ton outside of the rich streak which was mined at the intersection of the Nash vein at a depth of 70 feet. A shaft was sunk 100 feet on the lead and at the 90-foot level a crosscut was driven north 55 feet cutting the Pompei lead, and south 45 feet cutting the Nash vein and the Black lead. The Pompei is composed of a large belt of leads which also carried rich ore at the intersection of the Nash vein, at a depth of a few feet, on the Kempt property, and, in the Rosey shaft, 175 to the east. The Galena lead is 12 inches wide, in a belt of hard, slaty rock, and the ore carried much galena containing silver, which lessened the value of the gold produced to $14 to the ton. The development work is only 70 feet deep and does not quite reach the intersection of the Nash vein which still offers promising ground for development. Very little work was done on the Reeves and New leads farther to the south.

At the 70-foot shaft to the east of the Sabean swamp, the Nash vein dips northerly 70 degrees, apparently with the strata, to near the bottom of the workings where the vein is said to turn and dip southerly.

The Swamp belt, lying 300 feet to the north of the Black lead, is composed of a belt of stringers of quartz and layers of slate, 5 to 6 feet wide. It has been opened at the western end of the district by two shafts, 50 and 80 feet deep, where some good ore was found at the intersection of small angular veins joining the belt from the southwest; also at the east end, north of the Kempt mine, where it is crossed in a northeastern direction by a fissure vein forming a large body of quartz.

In the northwestern part of the district, 250 feet north of the Swamp belt, the Gilles lead, 8 feet wide, was opened up to a depth of 50 feet, and gold was found in a stringer of quartz 2 inches wide.

The Brown vein, the farthest north opened, is 10 inches wide, and, unlike the interbedded veins, strikes north 55 degrees east magnetic and dips to the south 41 degrees to 70 feet where it turns and dips northerly at an angle of about 70 degrees. It was worked by two shafts, 70 and 75 feet deep, for a length of 75 feet, the ore running out at a depth of 70 feet at the change of the dip.

In the southwestern part of the district, on the Yarmouth property, the Allen shaft 50 feet deep, cuts through what is apparently the apex of a saddle-shaped deposit composed of a lead 18 inches wide in a belt of stringers of quartz and slate, 5 feet in thickness, and at the bottom of the shaft a crosscut intersected the north and the south limbs of the saddle within 25 or 30 feet. The quartz, in rolls, kidneys, and stringers, contained much iron pyrites. This description of the deposit suggests a saddle vein on an anticlinal fold, but it may be only a false saddle due to the intersection of a cross vein with an interbedded vein. A vein is said to have been opened about a quarter of a mile to the south of the Allen shaft.

Several other veins, besides those indicated on the plan, are said to have been uncovered from time to time by surface trenches and shallow pits in different parts of the district, but apparently they did not show payable ore and are of little importance. Quartz float and veins have also been observed in a zone extending southwesterly across Fanning lake to Carleton gold district, but no veins of economic value have yet been discovered.

History.

Gold was first discovered in 1881 by James Reeves and Joseph Reeves on area 86, block 2, to the south of the vertical shaft. In 1885, the district received a good deal of attention, and gave promise of becoming one of the most important west of Halifax, returns for that year showing a production of 624 ounces from 133 tons crushed. The two properties that have received the greatest development are the Kempt and the Cowan. Work at both mines has been intermittent, and has been interrupted by the loss from fire of the 15-stamp mill at the Cowan mine in 1885, and the 10-stamp mill at the Kempt mine in 1905. These mills, however, were soon rebuilt, but they are now partly dismantled and can no longer be used. A cyanide plant was erected in 1906 in connexion with the mill on the Kempt property, but was in operation for only a very short time, being destroyed by fire. A 5-stamp mill was built on the Brown lead in 1901 but the licence was surrendered in 1907, and a 2-stamp mill was put up on the Cowan mine in 1915 to crush ore from the Bower lead, which was the last work done in the district.

Some very rich gold ore is reported to have been crushed at times, but the district has never been an important producer. For detailed information regarding the history of development work in the field, the reader is referred to Memoir 20, by W. Malcolm[1]. The information given is very fragmentary and incomplete but is the best that could be obtained.

Production.

The following table of production, furnished by the Department of Mines of Nova Scotia, shows the tonnage of ore crushed since 1885 and the amount of gold recovered. Some of the yearly productions are incomplete, and a few appear to be inaccurate when compared with those recorded from time to time in published reports. Such as it is, the table is given, as it may be of value, especially to those interested in the district. The table shows that the average yield has been 14 dwts. 5 grs. of gold per ton of 2,000 lbs. The average value of the gold produced in Nova Scotia was $19 to the ounce.

Production of Gold from Kemptville Gold District.

Year.	Ore crushed.	Total yield.		
	Tons.	Oz.	Dwt.	Gr.
1885	133	624	0	0
1886	56	231	6	0
1887	106	255	6	0
1888	32	29	16	0
1889	214	190	10	0
1891	100	55	17	0
1892	20	11	9	0
1893	13	2	8	0
1894	265	200	9	0
1895	184	111	15	15
1897	120	56	3	5
1898	468	151	18	15
1899	276	141	14	0
1900	86	26	14	12
1901	501	218	13	0
1902	708	464	0	2
1903	61	29	10	0
1904	190	67	9	0
1905	485	82	17	0
1906	295	39	12	0
1910	77	68	12	0
1914	2	1	10	0
1915	16	16	2	0
1916	7	29	0	0
1917	2	20	17	0
1918	1	6	2	0
Total	4,418	3,133	11	1

[1] Malcolm, W., "Gold fields of Nova Scotia," Mem. 20, p. 162.

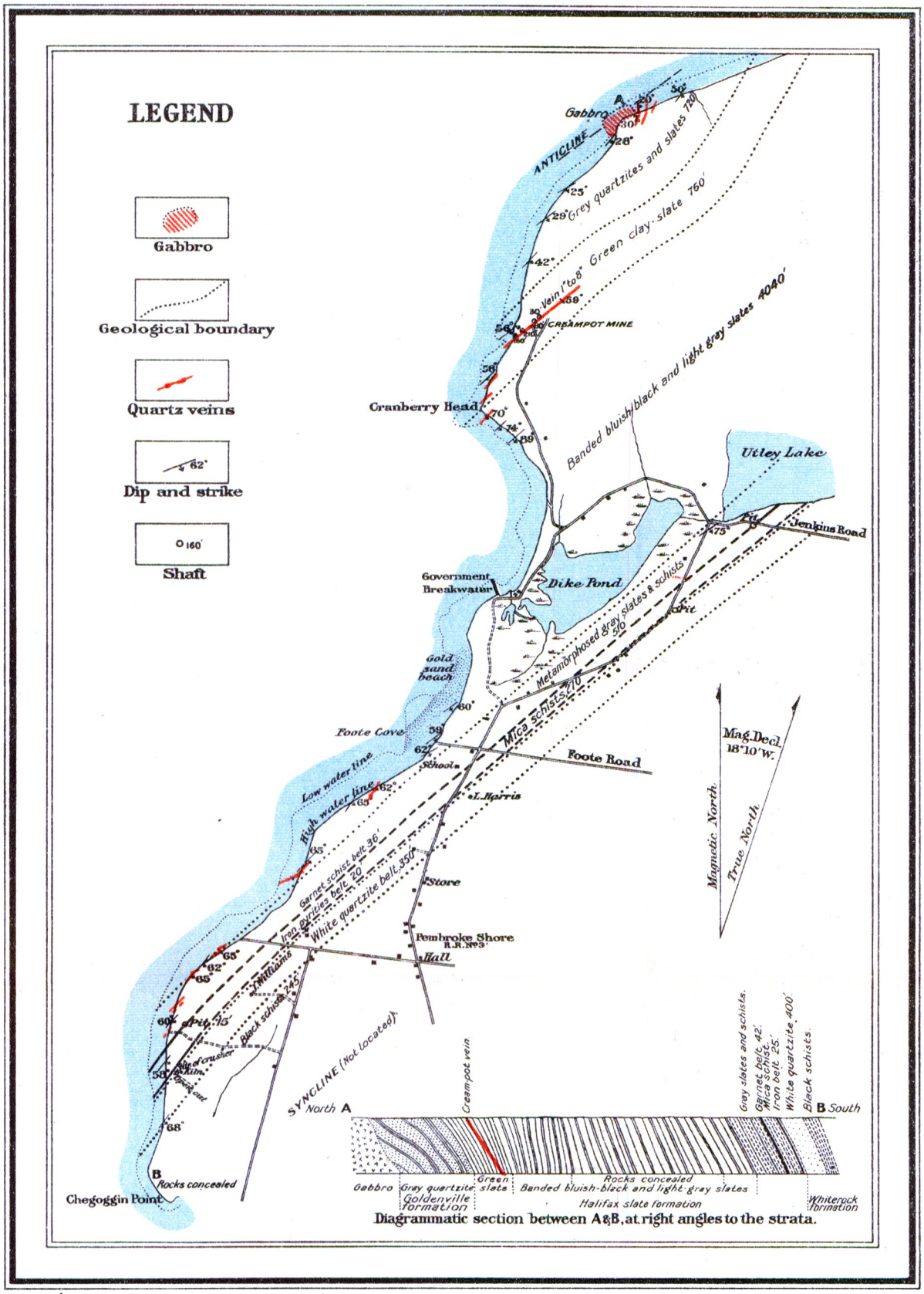
Canada
Department of Mines

HON. SIR JAMES A. LOUGHEED, MINISTER; CHARLES CAMSELL, ACTING DEPUTY MINISTER

GEOLOGICAL SURVEY

WILLIAM McINNES, DIRECTOR.

Issued 1920



C.O. Senécal, *Geographer and Chief Draughtsman.*
A.S. Jost, *Draughtsman.*

Publication No. 1815

GEOLOGICAL PLAN AND SECTION OF THE GOLD BEARING SERIES, CRANBERRY HEAD TO CHEGOGGIN POINT, YARMOUTH COUNTY, NOVA SCOTIA.

Scale of Miles.

1 ¾ ½ ¼ 0 1

To accompany report by E.R. Faribault, Summary Report Part F, 1919.

GEOLOGY AND SURVEYS

E.R. FARIBAULT 1919

SECTION OF UPPER PART OF GOLD-BEARING SERIES, FROM CRANBERRY HEAD TO CHEGOGGIN POINT, YARMOUTH COUNTY, NOVA SCOTIA.

Introduction.

The accompanying plan and section (Map 1815) show the succession, thickness, and structure of the different groups of rocks of the upper part of the Gold-bearing series, as exposed at low tide for a distance of 4½ miles along the seashore from Cranberry head to Chegoggin point, 4 miles north of the town of Yarmouth.

The rocks are of economic importance because they include the Cream Pot gold mine, which for several years has produced good ore; a belt of garnet-bearing schist that might be useful for the production of abrasive; a belt carrying iron pyrites; and a remarkable, wide belt of white quartzite that might become a source of silica suitable for certain purposes. The section is also of geological interest, because it gives an almost complete sequence of the upper part of the series, including the highest strata that are known and some that are nowhere else represented in the province except perhaps on Gaspereau river, Kings county, where there is a similar series of rocks that is probably equivalent and of the same age.

Geology.

The section exhibits the following ascending succession, from north to south, reduced to vertical thickness.

Formation.	Thickness in feet.	Group of rocks.	Thickness in feet.
		Intrusion of gabbro cutting major anticline.	
Goldenville....	720	Thick-bedded, grey, micaceous, feldspathic quartzites or "whin" with thin layers of slates.....	720
		Soft, olive-green and grey, fissile clay and chloritic slates.....	760
		Banded, bluish-black slates striped with thin layers of light-coloured slates.....	4,040
		Metamorphosed grey, knotted slates and mica schists carrying hornblende, actinolite, sericite, and chlorite.....	510
Halifax.....	5,636	Belt of garnet-bearing mica schist with association of hornblende, quartz, biotite, and iron pyrites.....	36
		Grey mica schists.....	270
		Belt of quartzose mica schists heavily charged with iron pyrites..	20
		Belt of thick beds of white and semi-transparent, vitreous quartzite	350
Chegoggin Point or Whiterock.	595	Black mica schists carrying hornblende, etc.....	245
		Bedrock concealed to major syncline and beyond.....	.....
		Total thickness.....	6,951

The seashore has a general north and south direction, facing the Atlantic westerly at the entrance of the bay of Fundy. The strata are well exposed when the tide is low, along a gently inclined seashore 300 to 800 feet wide. Inland, the rocks are exposed only at very few places, being covered with drift made up of weathered debris of the underlying rocks, or with glacial deposits drifted from the north and accumulated in long, undulating hills of moraine origin, 100 to 200 feet in elevation, generally running south parallel with the coast.

The strata cut the coast obliquely, strike northeasterly, and dip to the southeast at an angle varying from 55 to 75 degrees. At the north end of the section, however, the angle of dip decreases gradually, from 68 degrees at the Cream Pot mine to 20 degrees on a point of land three-quarters of a mile north of the mine, where the upper strata of the Goldenville grey quartzites curve toward the north on the apex of an anticline plunging northeasterly. At Chegoggin point, at the south end of the section, the highest rocks of the series dip southeasterly at angles of 60 to 70 degrees. Around the

southern end of Chegoggin point and for some distance beyond along the shore, the bedrock is concealed. The country back of the seashore here was not explored for outcrops, but to the southeast of Chegoggin river, white quartzites were observed which evidently are the Chegoggin Point quartzites reappearing on the opposite limb of the major syncline.

A prominent mass of gabbro at the north end of the section cuts the Goldenville quartzites for a length of 600 feet along the coast, without disturbing the structure of the strata on the anticline. The gabbro, greenish black and finely crystalline, but coarser at the centre than at the border of the mass, is composed chiefly of augite with some labradorite, and a little olivine, and carries specks of iron pyrites. Along the line of contact, the quartzites are slightly altered or baked for a few feet, and veinlets of white calcite occur both in the quartzites and the gabbro.

A quarter of a mile south of the Cream Pot mine, at the junction of the olive-green slates and the black, banded slates, the strata are in rolls and form a few small sharp crumples, generally less than a foot in depth and plunging southwesterly at 20 degrees, in which are interbedded small corrugated veins of quartz carrying a little feldspar. About 700 feet farther south, a few beds of grey quartzite are interstratified with the banded slates, and the strata are tilted vertically, probably by a fault following the stratification, beyond which the rocks are concealed as far south as Foote cove.

From Foote cove to Chegoggin point the rocks are much metamorphosed into crystalline schists and knotted slates of different varieties, and white quartzites. The predominating schists are coarse, micaceous, siliceous, and hornblendic, and some also carry garnet, actinolite, chlorite, staurolite, sericite, sillimanite, and iron pyrites. Some of the belts are composed of an intimate mixture of garnet and hornblende, whereas others are largely made up of garnet crystals developed in fine mica schist with crystals of biotite and iron pyrites. One belt of this garnet-bearing schist has a thickness of 36 feet and is mentioned further as a possible source of abrasive. Other belts consist of almost pure hornblende rock, or hornblendite; and at some points the softer mica schists have their bedding planes curving around the hornblendic masses, as though these were included boulders, but evidently the deposits are intrusive and possibly derived from the alteration of pyroxene, one such mass being about 10 by 20 feet. At many points also, the strata are traversed by irregular, lenticular veins of quartz which commonly follow, but also slightly cut, the bedding plane. Some of the veins are over 5 to 8 feet wide, but generally of little length. The quartz is for the most part crystalline and carries small scales of silvery white mica and plagioclase feldspar partly kaolinized. These veins should be considered as pegmatitic intrusions derived probably from the granite magma, although the nearest granite is over 10 miles away, to the southeast of the town of Yarmouth. Adjoining some of these veins are a few small interbedded veins said to be auriferous, apparently different from the pegmatitic dykes.

The strata in this part of the section are much disturbed and sheared, but no fault of any magnitude has been observed. On the shore the strike of the rocks is north 37 degrees east magnetic, whereas inland a little farther to the northeast, between the shore and Jenkins road, the general strike is north 50 degrees east, causing a marked banding of the strata and dislocations that would be favourable to the formation of fractures and the intrusion of pegmatitic dykes, and auriferous quartz veins.

Near the southern extremity of Chegoggin point, the grey mica schists are overlain by a belt of quartzose schist, about 20 feet thick, heavily charged with iron pyrites partly crystallized. This is followed to the south by a small belt of grey mica schist, and still farther south by the wide belt of white quartzites which is finally overlain by black, siliceous, hornblendic, micaceous schists that are the highest beds exposed and terminate the section.

The belt of white quartzite outcrops prominently on the seashore between high and low tides for a length of about 800 feet. Its thickness is 350 feet and it consists of thick, massive beds of white, pinkish-white, and yellowish-white, semi-transparent

and vitreous quartz rock. Some beds consist apparently of pure silica rock, others are slightly coloured with iron oxide, or have a banded structure, with developments of sericite and silvery white mica along the bedding plane. Under the microscope grains of quartz sand are visible. The deposit is a highly metamorphosed quartzose sandstone of sedimentary origin conformably interstratified with the schists and should not be considered as immense auriferous quartz veins of later origin, as it was reported to be. A ten-stamp mill was erected on it, but the deposit was proved to be barren. The belts of white quartzites and garnet-bearing schist have been traced by a few test-pits from the shore 3 miles inland to Jenkins road, and they undoubtedly extend northeasterly along the strike beyond Brazil lake, where they have been reported to outcrop, and probably extend as far as the main granite batholith some 32 miles inland.

A comparison of this section with those exhibited on Black and Gaspereau rivers in Kings county shows that the succession of the strata is generally similar, although much more metamorphosed in Yarmouth county. The total thickness of the Halifax formation, measured up to the base of the white quartzite, in Yarmouth county is 5,636 feet, and that in Kings county was estimated at 11,700 feet[1]. The belt of white quartzite at Chegoggin point is 350 feet in thickness, and that at Whiterock, Kings county, is 375 feet; but to the west of Whiterock it divides into two distinct belts, and 2 miles west, on the south side of Gaspereau river, the two belts are separated by 200 feet of slate and their total thickness is reduced to 50 feet. The rock changes in character also from a pinkish-white, vitreous, massive, quartzite to a grey, partly altered, banded quartzose sandstone, in which the original grains of quartz sand are quite distinct.

Economic Geology.

The economic minerals so far discovered in the rocks of the section are gold, garnet, quartz, and iron pyrites.

Gold. A gold-bearing vein has been worked successfully for a number of years at the Cream Pot mine, which is reported on hereafter at some length.

The occurrence at Chegoggin point near the belt of garnet-bearing schist of a few interbedded veins of quartz said to be auriferous, possibly induced, in 1890, J. D. Huntington to build a ten-stamp mill and trench across the big belt of white quartzite lying a little farther south to test it for gold. It is said that no gold was found in the quartzite, and the quartz veins were apparently of little value, for the operations were soon discontinued.

The sand along the seashore, especially at Foote cove, contains some fine gold, probably derived from the cropping of the Cream Pot vein which is seen in calm weather under the sea, but attempts to amalgamate the gold in the stamp-mill were unsuccessful.

Garnet. At Chegoggin point, a belt of garnet-bearing schist has been tested, and may yet prove valuable for the production of abrasive. The belt, 36 feet thick, and well exposed on the shore at low tide for a length of 450 feet, has been proved continuous for a distance of 3 miles to the northeast by a few openings along its course and no doubt extends much farther. One of the openings 500 feet from the shore is an open-cut 20 feet across the belt, by 15 feet along its course, and 18 feet in depth. The farthest opening is a shallow prospect hole, 3 miles away from the shore. The belt is composed of different beds of mica schists, from a foot to 5 feet in width, holding in crystal form and in variable proportion almandite garnet, hornblende, biotite mica, a little quartz, and specks of iron pyrites. Some beds may contain from 35 to 70 per cent garnet. About the year 1892, J. D. Huntington investigated the

[1]Geol. Surv., Can., Sum. Rept., 1908, pp. 150-153.

belt as a source of abrasive and did some development work along its course. Some of the material from the pit near the shore was crushed in the stamp-mill erected previously to crush the quartzite. A crude attempt is said to have been made to concentrate the crushed material. The remains of a kiln near the site of the crusher seem to show that the material was roasted before crushing, the powder being dried after concentration. One local informant says that 100 barrels of the powdered material were shipped away; another says that 10 bags of garnet concentrates were sent to the United States, and that emery wheels and stones, some of which were seen by local people and proved to be excellent, were made out of this material.

Quartz (Silica). The big belt of white quartzite already described may be of economic value as a source of silica for certain purposes, and, as the belt is 350 feet thick and extends for many miles to the northeast an unlimited supply is available. It is also favourably situated for shipment at low cost.

High grade silica rock is used in the manufacture of glass, ferro-silicon, carborundum, abrasives, silica-brick, and tube mill liners and pebbles. The rock used is in large part dependent upon its composition and structure. To ascertain for which industries the quartzites of Chegoggin point and Whiterock may be used, the different beds must be studied in detail in the field, and samples should be submitted for investigation in the laboratory and under the microscope.

Iron Pyrites. The deposits of iron pyrites are apparently not rich enough nor sufficiently extensive to be of economic value.

Cream Pot Gold Mine.

Location. The mine known as the Cream Pot is situated in Cranberry Head gold district, 6 miles north of the town of Yarmouth, on a bluff of rock about 75 feet high facing westerly toward the sea, at the entrance to the bay of Fundy. The washing of the waves against the bluff wears away the softer beds of rock and forms indentations in which the salt water is churned, producing a white foam; hence the name of the mine. Lyman Harris, an experienced local miner and mill-amalgamator, acted as guide in this survey.

Character of the Deposit. One vein only has been worked, and no others have been discovered in the immediate vicinity of the mine, except a few small, interbedded, corrugated veins outcropping on the shore several hundred feet to the southwest in crumpled up strata. At the time of the survey no mining operations were being carried on and the workings were inaccessible; the Cream Pot vein could, therefore, be observed only on the shore, where it outcrops at low tide.

The vein occurs in the olive-green slates, 400 feet above the base of the Halifax slate formation, and at a distance of one-third of a mile to the southeast of the anticline in the Goldenville quartzite formation, measured at right angles to the strike of the strata.

The strike of the strata is north 44 degrees east magnetic and the dip is southerly at 80 degrees; the general strike of the vein is north 50 degrees east, and the dip is also southerly at an angle of 59 degrees. The vein, therefore, crosses the stratification at an angle of 6 degrees easterly, and the line of intersection of the vein with the strata would plunge southwesterly at an angle of 18 degrees.

The vein occurs in the form of lenses or kidneys, which generally vary from 4 to 8 inches in thickness and from 1 to 3 feet in length and follow one another in close succession, and the pinches between the lenses range from nothing to one inch in thickness. Some lenses, however, were larger. One mined by L. Harris at the bottom of the middle shaft was 15 inches thick, 7 feet long, and 2 feet in breadth, plunged easterly at a low angle, and gave 83 pennyweights of gold to the ton.

The vein-filling is quartz with a considerable proportion of arsenical pyrites and a little galena associated with free gold, occurring always in the same regular order

from the north or foot-wall, which is well-defined, toward the south where there is no regular hanging-wall. Adjoining the foot-wall is a band of talcose rock heavily charged with arsenical pyrites in small crystals uniformly distributed through the mass. The usual white quartz carrying free gold associated with galena forms the central part of the vein and on the south side the rock is intersected with stringers of quartz joining the main vein.

The vein has all the important characteristics of a persistent fissure vein. It has been opened at the surface for 1,235 feet and worked for a length of 358 feet and to a depth of 220 feet, with apparently no change in its character, strike, or dip. A few small faults have been encountered in the workings, but they are not important, the largest being 15 inches.

Certain lenses in the vein were richer than others, but no reliable information could be obtained regarding the location and general trend of the zone of special enrichment or pay-ore. The richest ore was found at very low tide 300 feet west of the west shaft, just east of a small fault of 15 inches. L. Harris, who milled the ore taken out for a test, said, as already mentioned, that it gave 83 pennyweights of gold to the ton, or about the same yield as the large lens, plunging easterly, mined by him at the bottom of the middle shaft, where the vein is still averaging 6 inches in width and showing good pay ore. These two occurrences of rich ore on the vein have led some people to conclude that they form part of an ore-shoot plunging easterly at an angle of 30 degrees. This is indicated on a plan and section of the mine, dated 1897, a copy of which is filed in the mine-office, by a line drawn between the two rich occurrences. The conclusion is, perhaps, based more on expectation than on the knowledge of existing conditions, as the two rich occurrences are separated by 500 feet of undeveloped ground; still the small lenses of ore that constitute the vein are said to be dipping easterly at low angle, and possibly the zone of pay-ore may have the same orientation.

As a general rule, however, in the gold fields of Nova Scotia, the ore-shoots in fissure veins occur at their intersection with interbedded veins, or with certain strata of soft mineralized rock which are more favourable to fracturing and the infiltration and deposition of gold. Such was the case with the celebrated ore-shoot in the Libbey fissure vein at Brookfield and with that in the Lake lode at Caribou, both worked for lengths of nearly 2,000 feet and to depths of 1,000 feet.[1] If this rule applies to the Cream Pot mine, the ore-body or ore-shoot will plunge southwesterly at an angle of 18 degrees, which is, as above given, the direction of the line of intersection of the vein with the strata.

No reliable information could be obtained regarding the production of the mine, or the average value of the ore. The following notes appear on the plan and section of the mine already mentioned. The mine has produced $30,000 worth of gold; the ore averaged from 10 pennyweights to 3 ounces of gold per ton and yielded a large proportion of concentrates, some of which were tested giving an average of 6 ounces of gold to the ton.

Development. The mine workings consist of three shafts, the west or Bank shaft 160 feet deep, then 90 feet easterly the Middle shaft 200 feet deep, and 50 feet farther the east or Pump shaft 220 feet deep. The ore between the three shafts has been all mined from the surface to the bottom; from the west shaft stopes extend westerly 118 feet, and from the east shaft, between 60 and 100 feet in depth, stopes extend easterly for about 100 feet. The development work along the vein from the east shaft easterly is: at 295 feet the Huntington shaft 90 feet deep with short drifts east and west; 100 feet farther the Ryerson shaft 30 feet deep; 200 feet farther a prospect pit; 200 feet still farther another pit; and about 300 feet farther a pit in the swamp did not reach the vein. To the west of the west shaft the vein outcrops on the seashore at low tide.

[1]Mem. 20, pp. 121 and 124.

History. A discovery of gold at Cranberry head was reported in 1868. Isaac Foote found rich quartz at low tide, and the first mining areas were taken by Bingay of Yarmouth who sunk a pit on the shore, In 1869, an open-cut 600 feet long and 20 feet deep was made and two shafts were sunk. In 1870, Samuel Ryerson built a 10-stamp mill on Chegoggin river; 130 ounces of gold were recovered from 184 tons of quartz, but much fine gold was lost in the tailings; shafts were sunk, and stoping was done. In 1871, little was done and operations must have ceased, for it is known that in 1874[1] the mine was reopened by Capt. Cocksetter who leased the property from Ryerson and worked it for two years, spending much money in the erection of buildings. The east shaft then had attained a depth of 190 feet and the west one a depth of 145 feet, and two others farther east on the vein had a depth of 80 feet and 30 feet respectively; the ground between the first and second shaft had been stoped to within 50 feet of the surface. During the winter of 1874-5, 38 tons of quartz was crushed, yielding 29 ounces, and operations ceased in July, 1875. Later, Ryerson let the lease run out and the property was taken up by S. A. Haywood and others of St. John, N.B., and work was resumed in May, 1880, with John Lockwood as manager. The ten-stamp mill was removed from Gegoggin river to the present site at the mine, and five stamps were added; work was discontinued in the autumn, but was resumed in June, 1881, and continued until December; the shafts were deepened to the present depths, the east shaft to 220 feet, the middle shaft to 200 feet, and the west shaft to 160 feet; all the ground left between the three shafts was stoped, and a tunnel was driven under the sea westerly 118 feet from the west shaft; more ore was crushed than had been previously treated, and a considerable part is said to have yielded from 1 to 3 ounces of gold to the ton. Later, the lease expired and the areas were taken up by Oaks of St. John, N.B., who did a little work, but again the lease lapsed, and the areas were taken up in 1897 by J. D. Huntington, who formed The Gold Fissure Mining Company, Ltd. The mine was reopened and worked desultorily for a few years; stoping was done mostly east of the east shaft, short tunnels were driven both ways from the 80-foot shaft, a 2-stamp Tremain steam mill was installed, and 200 tons of ore yielded about 150 ounces of gold. The machinery was too small for the work and the mine was closed in 1903 and since has been idle.

INVESTIGATIONS IN NOVA SCOTIA AND NEW BRUNSWICK.

By Albert O. Hayes.

During a field season of five months, attention was given mainly to the geology of certain salt and coal deposits in Nova Scotia and a short period of time was devoted to a continuation of the revision of the stratigraphy of eastern New Brunswick.

H. W. McKeil and D. D. Foster were appointed assistants and carried on their work most satisfactorily.

The geology of the Malagash salt deposits, Cumberland county, Nova Scotia, was studied in June and July and a general geological map of the Malagash peninsula and a detailed topographical-geological map of the area known to be underlain by salt will be published with the memoir on the Malagash salt deposits, now in press.

Three visits were paid to Dunmaglass, Antigonish county, to advise the Maple Mountain Salt Mining Company where to place a drill to prospect for salt. A hole 620 feet deep was sunk without success.

Field work for a map of the structural geology of the southeastern part of the Sydney coal field was completed during August and September.

One week was given to a special study of a district west of the map-area lying between Sydney river and the Caribou Marsh road in Cape Breton county, and advice

[1] Rept. Dept. of Mines, Nova Scotia, 1874, p. 48.

given to lease-holders regarding the best method for prospecting for coal by borings. Three trips to the St. Rose and Chimney Corner coal fields, Inverness county, were made to supervise prospecting for coal by boring operations. One seam 3 feet 6 inches, another 8 feet 3 inches thick, and several thinner seams were cut in a calyx-drill boring situated 175 feet west of a culvert on the main road, and 1,550 feet northeast along the main road from McLeod's store on McLeod brook[1]. A summary of the drill record to November 12, 1919, is as follows:

	Ft.	In.	Total Ft.	Total In.
Boulder clay	58	..	58	
Sandstone and shale	47	..	105	
Carbonaceous shale	3	..	108	
Sandstone and shale	2	6	110	6
Carbonaceous shale	3	9	114	3
Sandstone and shale	45	3	159	6
Coal	..	2	159	8
Sandstone and shale	38	..	197	8
Coal	3	6	201	2
Sandstone and shale	118	2	319	
Coal	1	3	320	3
Sandstone and shale	45	..	365	3
Coal	8	3	373	6
Sandstone and shale	35	9	409	3
Coal	2	..	411	3

An analysis of an average sample from the core of the seam 8 feet 3 inches thick was made by E. Stansfield, Mines Branch, who reports as follows:

Sample of coal from Simpson's boring at St. Rose, Inverness area, Nova Scotia. Sent in by A. O. Hayes, Geological Survey, Ottawa.

Sample mark		3	
Laboratory sample No.		1649	
Moisture condition of sample (see note).		R	D
Proximate analysis—			
Moisture	%	4·4	
Ash	%	12·7	13·3
Volatile matter	%	36·6	38·3
Fixed carbon	%	46·3	48·4
Ultimate analysis—			
Sulphur	%	7·2	7·5
Fuel ratio, fixed carbon, volatile matter		1·25	1·25
Coking properties		Forms poor coke.	

Remarks: Sample of 8-foot seam at a depth of 365 feet.

Note: Figures in column "R" refer to fuel as received, and in column "D" refer to fuel dried at 105 degrees C. The analyses were made on the fuel as received and other results calculated therefrom.

On the lowest seam—which outcrops both on the shore and about a quarter of a mile south of the loading pier at Chimney Corner cove—a new slope has been sunk by the Chimney Corner Coal Company. A haulage tramway has been built to connect the slope and pier, where small schooners may be loaded. Coal is supplied also to the local trade. The seam, No. 7 of a section given in a previous report[2], dips north 55 degrees west magnetic at an angle of 35 degrees; the slope has been sunk north 81 degrees west at an angle of 24 degrees for a distance of 135 feet. A section through the seam is as follows:

	Ft.	In.
Roof of grey shale (holding fossils, anthracomya, ostracods, etc.).		
Coal	3	0
Clay parting	..	½
Coal, hard, splintery	..	6
Pavement of hard shale (soil bed).		

Two samples were taken from the face of the levels and analysed by E. Stansfield, Mines Branch: No. 1, Report No. 453, from 125 feet northeast and No. 2, Report No. 454, 123 feet southwest of the main slope. The underlying parting and splintery

[1] See map in Sum. Rept., Geol. Surv., Can., 1918, pt. F, p. 9F.
[2] Geol. Surv., Can., Sum. Rept., 1918, pt. F, p. 10.

coal was included in No. 1 sample and omitted in No. 2 with a noticeable effect in the amount of ash contained.

Report No. 453. Sample of coal from S. J. Doucet's mine, Chimney Corner, Inverness area, N.S. Sent in by A. O. Hayes, Geological Survey, Ottawa.

Sample mark	1	
Laboratory sample No.	1647	
Moisture condition of sample (see note).	R	D
Proximate analysis—		
Moisture...%	8·7	
Ash...%	20·0	21·9
Volatile matter...%	29·6	32·5
Fixed carbon (by difference)...%	41·7	45·6
Ultimate analysis—		
Sulphur...%	6·3	6·9
Fuel ratio, fixed carbon, volatile matter	1·40	1·40
Coking properties	Agglomerates.	

Remarks: Sample includes the following: solid coal 3 feet; clay partings ½ inch; coal with some splint 5 to 6 inches.

Note: Figures in column "R" refer to fuel as received, in column "D" to fuel dried at 105 degrees C. The analyses were made on the fuel as received and other results calculated therefrom.

Report No. 454. Sample of coal from Chimney Corner, Inverness area, N.S. From a point 250 feet southeast of location of sample No. 1647. Sent in by A. O. Hayes, Geological Survey, Ottawa.

Sample mark	2	
Laboratory sample No.	1648	
Moisture condition of sample (see note).	R	D
Proximate analysis—		
Moisture...%	8·9	
Ash...%	8·2	9·0
Volatile matter...%	34·2	37·5
Fixed carbon...%	48·7	53·5
Ultimate analysis—		
Sulphur...%	4·7	5·2
Fuel ratio, fixed carbon—		
Volatile matter	1·45	1·45
Coking properties	Forms very poor coke.	

Remarks: Sample includes upper 3 feet of coal, without leaner 6 inches below.

Note: Figures in column "R" refer to fuel as received, in column "D" to fuel dried at 105 degrees C. The analyses were made on the fuel as received and other results calculated therefrom.

Three weeks were spent in a preliminary study of the stratigraphy of the Carboniferous rocks of New Brunswick. The distribution of the Albert series in which oil and gas occur, and of the Windsor series in which salt and gypsum are found has not yet been fully worked out.

Three trips were made, two in company with W. J. Wright and one with Dr. G. F. Matthew. As a result of a reconnaissance of the district from Hillsborough to Hampton lying between the Kennebecasis and Hammond rivers, the conclusion was arrived at that the Windsor series is much more extensively distributed than heretofore supposed, and that the Carboniferous rocks between Elgin and St. John probably overlie the Albert series with which they have been correlated.

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