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GEOLOGICAL SURVEY OF CANADA

A. P. LOW, DEPUTY HEAD AND DIRECTOR

THE TELKWA RIVER AND VICINITY

B. C.

BY

W. W. LEACH



OTTAWA
GOVERNMENT PRINTING BUREAU
1907

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ERRATA.

(1). Page 9, fifteenth line from top, after "canoes," insert a comma, and after "horses" add ": made to swim."

(2). Page 12, fourteenth line from bottom, for "Gleichemia" read "Gleichenia."

(3). Page 14, eleventh line from bottom, for "southwest" read "southeast."

(4). Page 19, tenth line from bottom, after "extent of" add "the."

(5). Page 21, nineteenth line from bottom, for "intermediate" read "immediate."

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A. P. Low, Esq.,
Deputy Head and Director,
Geological Survey of Canada.

SIR,—Herewith I have the honour to submit the enclosed report on my explorations on the Telkwa river, Skeena Mining division, British Columbia. The report is accompanied by a geological and topographical map of the district.

I have the honour to be, sir,
Your obedient servant,
W. W. LEACH.

OTTAWA, April 25, 1907.

THE TELKWA RIVER AND VICINITY

BY

W. W. LEACH.

It is only within the past few years that much attention has been paid to prospecting in this region, at least in regard to quartz and coal, as much of this country has previously been run over by prospectors in search of placer gold. The commencement of construction of the Grand Trunk Pacific railway has, however, awakened much interest in this district with the result that a great part of the country has been roughly prospected, many mineral claims have been staked and much of the available arable land and timber has been taken up.

As it seems now fairly definitely settled that the railway will follow down the Bulkley valley, from its head to its junction with the Skeena, much interest has been aroused in the natural resources of the district through which it will pass, and, at many widely separated localities in and adjacent to the Bulkley valley, evidences of the presence of minerals of economic value have been found, notably on the Telkwa river, the headwaters of the Zymoetz or Copper river, and in the Babine range between the Bulkley valley and Babine lake to the east. Of these localities, the Telkwa river is probably the best known, and, during the past season, the attention of the writer was confined to its watershed and immediate vicinity, as shown on the map accompanying this report.

TOPOGRAPHY.

The Telkwa river is one of the most important tributaries of the Bulkley and rises in the Coast range; thence following an easterly course for about forty miles it joins the Bulkley about fifty-five miles above Hazelton, at the junction of the latter stream and the Skeena river.

At the junction of the Bulkley and the Telkwa rivers the former occupies a wide valley, the river itself being confined to a narrow

secondary valley cut through gravel terraces to a depth of from 100 to 150 feet.

The valley of the Telkwa itself is also terraced for a distance of about twenty miles, when the floor of the valley rises above the level of the terraces.

The Telkwa is a typical mountain stream, swift and cold, and subject to frequent and sudden fluctuations due to the presence of many large snowfields and glaciers at its head. At low water it is readily forded, but when in flood is quite impassable.

Apart from the comparatively small area of terraced country near its mouth the whole watershed of the Telkwa may be said to be mountainous. The Coast range in which it takes its rise is an exceedingly rugged and alpine chain of mountains, presenting an unusually unbroken front, stretching in a continuous array of sharp and jagged peaks as far as the eye can see in a northwesterly and southeasterly direction, while numerous glaciers and snowfields are constantly in view along its eastern slopes. The highest peak shown on the map reaches an elevation of 9,300 feet, while many are over 8,000 feet high.

Flanking the eastern slopes of the range a series of lower ridges occur, which extend to the Bulkley valley; these ridges, while by no means as rugged as the main range, still reach in places an elevation of over 7,000 feet, while the area above the 6,000 foot contour is quite extensive. They give the general impression of a dissected plateau, usually with gentle slopes towards the south and west, and showing precipitous faces towards the north and east. A few small glaciers are to be seen on the northern slopes of the highest ridges.

The topography generally, away from the main range, is quite irregular, the larger streams, as a rule, heading in comparatively low, marshy passes and following erratic courses to the main valleys, leaving, in many cases, isolated areas of more or less flat-topped mountains. This feature is well shown on the map; the valley occupied by the south fork of the Telkwa and a branch of the Morice river separating the block of mountains at the head of Goat, Glacier and Sunset creeks from that at the head of Scallon and Howson creeks.

Pine creek and the north fork of the Telkwa both take their rise in comparatively low passes with tributaries of the Zymoetz river, while the main branch of the Telkwa and a small stream entering Burnie lake head together. Burnie lake is reported to empty into a stream which eventually reaches the Kitnayakwa.

In nearly all cases the glaciers of these mountains appear to be regularly retreating, and in several instances, notably at the

head of Scallon creek, small glaciers have entirely disappeared within recent years.

TRANSPORTATION.

At present the only means of communication with the outside world is by pack train, either to Quesnel, on the Cariboo road, 300 miles to the south, or to Hazelton, fifty-five miles to the north, and thence down the Skeena by river steamer to Port Essington on salt water. Navigation on the Skeena, however, is a very uncertain quantity, as it can be ascended at moderate stages of water only, so that this route can not always be depended on.

At Aldermere, a new town situated on the Bulkley river opposite the mouth of the Telkwa, all ordinary supplies can be obtained and hotel accommodation secured.

To reach the Telkwa district from Aldermere the Bulkley has to be crossed by canoes and horses; the lack of a bridge or adequate ferry is of great inconvenience to travellers, as at high water the crossing is by no means easy.

Up the Telkwa there are a number of trails giving access to the various camps, on most of which the grades are sufficiently light to permit of the construction of wagon roads without much change of route, while Howson camp, near Moose-skin lake, which may be considered as near the centre of the chief mineral-bearing areas, could be reached by a railway from Aldermere without excessively heavy grades, should the ore deposits in that neighbourhood prove of sufficient value to warrant its construction.

As the timber line is reached at an elevation of about 5,000 feet above sea level there is a large area above it where travelling is comparatively easy during the summer months; the geological features also can be more readily examined there than in the valleys, so that the attention of prospectors has been mostly concentrated on these higher levels, and the majority of claims are staked above timber line.

TIMBER.

A great part of this district has been burned over and the original forest replaced by poplar and jackpine, but, in some of the larger valleys, such as that of the Telkwa itself, above Pine creek, and the North and South Fork valleys, much fair timber

remains, consisting chiefly of spruce and balsam, with a little hemlock and jackpine. There should be an ample quantity remaining to supply any local demand for building and mining purposes for a long time to come.

MAP.

The information for the compilation of the accompanying map was obtained chiefly by triangulation with panoramic sketches, supplemented by paced surveys of the main trails; the triangulation being based on township surveys by the British Columbia Government.

The elevation of the mouth of the Telkwa, upon which all other elevations given depend, was assumed to be 1,750 feet above sea level. This figure was arrived at from the results of a number of aneroid barometer observations between this point and Hazelton, and must be considered as only approximate. Other elevations are calculated from vertical angles checked by the aneroid.

GEOLOGY.

The rocks of the Telkwa valley may be roughly subdivided into four main divisions, consisting of, in ascending order: 1st. The Crystalline rocks of the Coast range. 2nd. The Porphyrite group. 3rd. The Coal-bearing beds. 4th. A series of eruptives, more recent than any of the above mentioned.

COAST CRYSTALLINE ROCKS.

Of the first, little can be said; they constitute the backbone of the Coast range and, where seen, consist of gneisses, schists, granites, &c., but were in no case closely examined. Dr. Dawson has provisionally classed them as of Palæozoic age, probably Carboniferous (Report of Progress, 1879-80, p. 100 B), and has given them the general name of the Cascade Crystalline series.

PORPHYRITE GROUP.

Rocks of the Porphyrite group occupy by far the most extensive area in this map-sheet. They consist of a great series of volcanics, composed of tuffs, andesites, agglomerates, &c., more

often occurring in sheets as volcanic flows but frequently showing evidences of deposition under water, more particularly towards the top of the series, and are all more or less regularly bedded.

Dr. Dawson has given the name of the Porphyrite group to this series in its southern extension in the neighbourhood of Francois lake (Report of Progress, 1876-77), and has provisionally correlated it with the volcanics met with on the lower Skeena (Report of Progress, 1879-80, p. 129 B). From fossil evidence he has classed it as Lower Cretaceous, and, in the Francois Lake district, has estimated the thickness of these rocks to be over 10,000 feet. As no fossils were found in these beds during the past season no evidence of their age, beyond their lithological resemblance to those described by Dr. Dawson, is forthcoming. No attempt was made to ascertain their thickness in the Telkwa district, but it is probably not less than 5,000 feet.

The rocks of this group vary greatly in appearance in different parts of the field, in colour ranging from light greenish greys to dark purplish reds. Generally speaking it may be said that red colours predominate towards the top of the series, the beds consisting of reddish andesites, breccias and tuffs, in many cases amygdaloidal, with inclusions of calcite and zeolites. Green is the characteristic colour towards the base, the beds being composed largely of fine-grained greenish feldspathic rocks, often amygdaloidal and containing much calcite and epidote. A few specimens collected from the amygdaloidal rocks of Pine creek, from the upper beds of the series, were examined by Dr. Hoffmann, and the following secondary minerals were determined: calcite, epidote, prehnite, heulandite, mesolite and laumonite.

At the mouth of the Telkwa, on both sides of the Bulkley, there occur a number of exposures of light-coloured, altered, tufaceous rocks, much resembling sandstone in appearance; although no similar rocks were noted elsewhere in the district and it was impossible to trace their relationship to the other volcanics clearly, it seems probable that they occupy a position near the top of the Porphyrite group.

The rocks of the Porphyrite group are of great economic importance, inasmuch as practically all the mineral claims that have been staked in the district are located in them.

COAL-BEARING BEDS.

Immediately overlying these rocks, and possibly unconformable to them, although both have been subsequently folded and

faulted to such an extent that their immediate relationship to one another is somewhat doubtful, occurs a series of beds composed chiefly of clay shales and containing a number of important coal seams. The lower member of these beds consists of a coarse, loosely-cemented conglomerate, mainly composed of pebbles from the underlying volcanics, in places shading into a coarse grit and not more than sixty feet in thickness in any place seen, but, on account of its characteristic appearance and permanency throughout the field, affording a very valuable reference horizon when prospecting for coal. This is followed by some thin-bedded clay shales with a few soft, thin, crumbly beds of light-coloured sandstone, succeeded by more clay shales and coal, the shales being often carbonaceous and containing many beds carrying numerous yellow-weathering clay-ironstone nodules. These are the youngest sedimentary rocks represented in the district, and, although not of great thickness (in no case seen showing more than 300 feet in all), they are of considerable importance on account of the coal contained therein.

A few fossil plants were collected from the coal-bearing beds of Goat creek, which were submitted to Professor Penhallow for determination. The following notes by him concerning them may be of interest:—

“No. 1.—Fine specimen of a very promising stem, which will have to be sectioned and worked out. Until microscopical sections have been prepared and studied, no result can be given.

“No. 2.—Two other fragments of stems, both highly altered and pyritized and not determinable.

“No. 3.—A very fine specimen of a fern. This is *Gleichemia gilbert-thompsoni*, Fontaine.

“Along the International Boundary Line, on the Skagit river, Dr. R. A. Daly obtained the same species. With respect to the age indicated by this plant Ward has already indicated its probable relation to the Lower Cretaceous, and in my report to Dr. Daly, on his collection, a review of the evidence seemed to confirm this view with respect to the specimens from the Skagit river. We may, for the present at least, conclude that a similar horizon is indicated for the Skeena River specimen.”

These beds are overlain by a considerable thickness of glacial drift.

NEWER ERUPTIVES.

All the above rocks are cut by a series of eruptives consisting of coarsely-crystalline porphyritic rocks which have thrown out

dikes in all directions and have crumpled and dislocated the volcanic flows and coal-bearing strata in their vicinity to a very great extent. These intrusive rocks themselves are somewhat variable in appearance and composition, two distinct facies having been noted in the Telkwa district; the small area at the head of Glacier creek consisting of a coarse, light-coloured, biotite granite, shading off into a granite porphyry near its edges, while the larger area on Scallon creek is composed of a pinkish syenite porphyry. The dikes from them show a large number of types.

The boundaries of these areas, as shown on the map, must be regarded as only approximate, as the eruptives have shattered and metamorphosed the volcanics near their contacts, and have caught up and included in them many small patches of the latter, so that it is impossible to define the line of contact with any degree of exactness.

In the bed of Pine creek, near its mouth, numerous boulders of similar rocks to these were noted which must be derived from one or more corresponding areas on the watershed of that stream.

These rocks appear to have a marked influence on ore deposition in this region, as they apparently afforded a channel for the ascent of mineral-bearing solutions.

It may be said as a general rule that, although the greater part of this district is underlain by rocks of the Porphyrite group, no important discoveries of minerals have been made except in the immediate vicinity of these intrusive areas and the dikes from them; it would, therefore, appear conclusive that they were instrumental in the deposition of such ore as has so far been found.

Their influence on the coal has also been important, as it has been found that as the main eruptive areas are approached, with the resulting increased disturbance of the strata, the coal becomes much more anthracitic in character. The coal seams themselves have been cut by numerous dikes in many cases accompanied by faulting, a fact that will materially affect future mining operations.

There is a possibility that within this map sheet there may be included in the area coloured as being underlain by rocks of the Porphyrite group, small isolated patches of Tertiary andesitic or tufaceous rocks, very much alike in appearance to similar rocks referable to the Porphyrite group. Such conditions exist to the south in the vicinity of Francois lake, and Dr. Dawson has pointed out the difficulty of separating the Tertiary and Mesozoic volcanic products there. (Report of Progress, 1876-7, p. 92.) Certain fossils found in a tufaceous rock near the head of Goat creek would

seem to point to the existence of such an area in that neighbourhood. These fossils (shells) were examined by Dr. Ami, who was unable, owing to their bad preservation, to give any definite opinion regarding the age of the strata from which they were obtained.

COAL.

The problem of delimiting the coal areas in this district is one of extreme difficulty. The exceedingly soft nature of the coal-bearing rocks, and their consequent failure to resist erosion, has resulted in their removal everywhere from the higher ridges, only a few detached remnants remaining in the valleys. The total thickness of the coal formation being small, probably not in excess of 300 feet, and having been folded and faulted to a considerable extent, it is seen that even in the lower valleys the volcanic rocks occupy a large extent of the area, the coal-bearing beds having been removed by denudation except in the case of a few small basins where the seams at no time attain any great depth.

The only natural exposures are to be found in the creek bottoms, in the few places where the streams have cut through the heavy covering of drift of the wide, terraced valleys to the bedrock. Away from the creeks no rock exposures need be looked for until the higher ridges are reached, and these are in all cases composed of the volcanic rocks, the actual contact being almost invariably masked by drift covering. It will, therefore, require very close prospecting before the extent of the coal areas is proved.

The areas, as coloured on the map, must be considered as showing in a general way only the extent of the basins. The exposures are all in the streams so that the lateral boundaries are not definitely known. It will be seen that the coal is found in a series of shallow troughs with a general northwest and southwest trend, there also existing a number of minor undulations within these main synclines, and numerous small faults. The extent of the largest basin northward of the Telkwa river is uncertain, as no exposures are to be seen for four or five miles north of the river. The position of the small, isolated area on Mud creek, as shown on the map, is very doubtful; no exposures could be found on that part of the creek, but a certain amount of drift from the coal measures was seen in the stream bed about there. It is possible that this area is an extension of and continuous with the one on Cabin creek.

It is quite probable that other small coal basins exist which are not shown, perhaps at times being completely masked by drift-covering; for example, in the stretch of country from a short distance below the mouth of Goat creek to the Bulkley river no rock exposures are to be found, but it is within the range of probability that part of it is underlain by coal.

There are, at present, four companies holding coal locations in this district, all of which have done some prospecting of a desultory nature.

CASSIAR COAL COMPANY.

The Cassiar Coal Company, whose property lies in part on Goat creek, a large tributary of the Telkwa river from the southwest, have stripped several seams about six miles up that stream. The following section, in descending order, was measured by the writer in 1903 when the work had just been done. Since then the cuts have fallen in, to some extent.

	Ft.	Ins.
Clay shale.....		
Top seam—		
Coal with a few small clay partings.....	12	0
Clean coal.....	7	7
Clay.....	2	0
Grey sandy shale and covered, about	30	0
Middle seam—		
Coal.....	1	5
Clay shale.....	2	7
Coal with a few irregular clay partings.....	14	5
Shale with ironstone nodules.....	3	3
Coal.....	2	0
Grey clay shale with nodular ironstone bands, about.....	50	0
Bottom seam—		
Carbonaceous shale and coal.....	2	0
Coal.....	1	5
Shale.....	0	5
Coal with small irregular clay partings.....	9	0
Clay shale.....		

Analyses of the above coals gave the following results:—

	Moist.	Vol. Comb. Mat.	Fixed Carbon.	Ash.
1. Lower 7 feet of top seam.....	1.92	30.45	61.30	6.33
2. Lower 7 feet, middle bench, middle seam	4.70	30.40	60.80	4.10
3. Middle bench (14 ft. 5 ins.) middle seam.	6.60	29.00	56.90	7.50

No. 3 analysis is by the British Columbia Provincial assayer. (Report of Minister of Mines, B.C., 1905.) No. 1 gave a dense

and non-expansive coke, while Nos. 2 and 3 were non-coking. No. 3, the only one of these tested for sulphur, showed 0.52 per cent.

This coal should make an excellent fuel as it is fairly hard and well able to stand considerable handling without much loss in slack; it is, however, apparently not suited for the manufacture of coke. The strata here dip irregularly at low angles and show several small faults.

A short distance up Goat creek from these openings, in a high cut bank, what are probably the same beds are seen, but, in this case, it appears that the two upper seams have been burnt, leaving in their place thin beds of ash and slaggy material and colouring the neighbouring shales a brick red, thus forming a very noticeable feature in the landscape. A fourth seam, overlying the others, outcrops at the top of the cut bank; it shows about two feet of coal, but no regular roof was seen, the present overlying material being the gravel wash of the terrace. It does not seem probable that the burning extends over any large area here as there is no further sign of it higher up the creek, although a couple of miles down Goat creek a similar occurrence was noted.

These exposures give what is probably the best section of the coal measures in the district, about 200 feet of strata being uncovered between the creek bed and the top of the terrace, but it is by no means complete.

Several other coal exposures were seen on the property of this company farther down Goat creek, but no other work of any extent has been done. About a mile down Goat creek from the above mentioned cuts a seam of impure coal is to be seen cut by a small dike, and both dike and coal are slightly faulted.

This company has sunk two diamond-drill bore holes in search of coal, one at the mouth of the Telkwa and the other near the mouth of a small creek entering the Telkwa about two miles above Goat creek. The first of these, said to be about 300 feet deep, was sunk in the fine-grained, sandstone-like volcanic rock described on a previous page and supposed to be of a lower horizon than the coal beds. The second was started in the conglomerate, representing the lowest member of the coal-bearing beds, and driven through to the underlying volcanics.

To the north and west of this property a number of locations are held by the Kitimat Development Syndicate. No work has been done beyond mere surface stripping at various places. On Mud creek, a branch of Goat creek from the southwest, near its mouth, and on the Telkwa river a few miles above the mouth of Goat creek, the coal has been exposed by the action of the stream;

several good seams are uncovered of a nature very similar to those of the Cassiar Company on the north side of the Telkwa, one seam showing twelve feet of coal with the floor below water level, but in all cases the strata are subject to faulting as elsewhere in the field.

TRANSCONTINENTAL EXPLORATION SYNDICATE.

The coal lands of the Transcontinental Syndicate are situated on Goat creek, above those of the Cassiar Coal Company, and separated from the latter by rocks of the Porphyrite group, here exposed along the axis of an anticline. During the past season two prospecting tunnels have been driven, and a shaft sunk, with the intention of proving the number, size and condition of the seams at this point. At the close of last season No. 1 tunnel had been driven a distance of one hundred and forty-six feet across the strike of the measures, the strata here dipping at about thirty degrees. Five seams had been cut in ascending order, three feet six inches, two feet eight inches, four feet nine inches, three feet and one foot, respectively, in thickness.

No. 2 tunnel, fifty-five feet in length, also cross-cutting, had passed through two seams, the lower six feet six inches, and the upper two feet eight inches, thick. The roof of the larger seam is missing, a fault having cut through the seam here, but it is probable that this is the same bed that is shown in a natural exposure a short distance down the creek, where about ten feet of coal is in sight.

No. 2 tunnel cuts the strata at a slightly higher horizon than No. 1, and it is probable that the two upper seams in No. 1 tunnel are the same as the large lower seam in No. 2.

Near the entry to No. 1 tunnel a shaft had been sunk to a depth of thirty-seven feet to prospect the strata at a lower horizon than could be reached by the tunnels, but no coal was found.

An attempt to combine the sections afforded by these three openings shows the following results, in descending order:—

	Ft.	Ins.	
Shale.....	
Coal.....	2	8	
Shale.....	12	0	This thickness uncertain as a fault intervenes.
Coal.....	6	6	This seam split in No. 1 tunnel.
Shale.....	13	0	
Coal.....	4	9	
Shale.....	19	6	
Coal.....	2	8	
Shale.....	3	0	
Coal.....	3	6	
Shale.....	52	0	
Total.....	119	7	
Coal.....	20	1	

The coal measures at this point, being nearer to the later eruptive areas, are more highly flexed than those farther down Goat creek and evidences of faulting are abundant. Although, in all probability, the same seams are represented here as those mentioned before on the Cassiar Coal Company's land, the character of the coal is entirely different, as the following analyses show:—

	Moist.	Vol. Com. Mat.	Fixed Carbon.	Ash.
No. 1. Seam 2 ft. 4 ins., 200 ft. down creek from No. 1 Tunnel (non-coking).....	0.80	8.20	81.60	9.40
No. 2. Six foot seam of No. 2 Tunnel (non-coking).....	0.90	9.90	75.80	13.40

No. 1. Analysis by British Columbia Provincial Assayer. (Report of Minister of Mines, B.C., 1905.)

This coal is firm and bright, and may be classed as a semi-anthracite, and should make a most excellent fuel of its kind.

As has already been mentioned, on the nearer approach to the newer eruptive areas the older rocks, including the coal beds, have been highly disturbed and the resultant heat and pressure have had a marked effect on the coal, altering it from a bituminous to a semi-anthracite; it must be expected, however, that more difficulties will be met with in mining, due to the probable greater frequency of faulting and increased intensity of the folding.

TELKWA M., M. AND D. CO.

Similar conditions, if anything intensified, prevail at the property of the Telkwa Mining, Milling and Development Company, situated on Coal creek, a small stream running into Goldstream one of the headwaters of the Morice river, and not far from the head of the south fork of the Telkwa river; here a number of seams of good coal have been opened up. The disconnected nature of the work done, with the disturbed condition of the strata, renders it almost impossible to be sure of the relative positions of the seams, and whether several of the openings are on the same or different seams. It is fairly certain, however, that at least four different workable seams have been uncovered. In descending order these have the following respective thicknesses:—Four feet two inches, four and one half feet, four feet, and seven

feet three inches. Analyses of the second, third and fourth of these seams resulted as follows:—

	Moist.	Vol. Com. Mat.	Fixed Carbon.	Ash.
No. 1.—4½ foot seam.....	1.36	10.87	80.82	6.95
No. 2.—4 foot seam.....	0.58	10.82	82.70	5.90
No. 3.—7 ft. 3 ins. seam.	0.80	11.10	78.90	9.20

All of the above coals are non-coking and, like those from the Transcontinental Syndicate's property, can be classed as semi-anthracite. They are all strong, bright and lustrous.

Where these seams have been uncovered the area of coal-bearing rocks is very narrow, probably not more than a few hundred feet in width. It appears to lie on the line of, and on the downthrow side of, a fault which is parallel to, and near the axis of, a sharp syncline, and represents a small remnant of a once much larger coal-field now mostly removed by erosion. The southern boundary of this coal area was not determined and it is probable that to the south and west, in the main valley of Goldstream, a much wider belt of coal land will be found to exist.

GENERAL CONCLUSION.

With regard to this field as a whole, it may be said that wherever the coal formation has been exposed faults were seen, not, as a rule, of any great size, but in such numbers as to be a matter of serious importance to future mining operations. The coal has also been cut by numerous dikes, and nearly everywhere is somewhat severely flexed. These facts, taken in connexion with the uncertain extent of several areas, seem to render it imperative that systematic and careful prospecting should be undertaken well in advance of regular mining. Some method of boring could possibly be utilized to determine the position and the nature of the strata underlying the great gravel deposits of the terraces; until something of this sort is done it will be impossible to define the limits of the several coal areas with any degree of accuracy. It is possible that in certain cases mining could be successfully carried on by stripping the overlying gravel and shales from the coal, when not of too great depth, a method that was formerly

somewhat extensively utilized in the anthracite fields of Pennsylvania.

Coal has been reported as occurring in the bed of a small creek entering Burnie lake from the east, and also in a small tributary of Pine creek, and it is quite possible that other small basins will be found when the country has been more thoroughly prospected.

Nearly all the faults noted, especially in the coal areas on Goat and Mud creeks, were normal ones with downthrows to the south and west.

MINERAL CLAIMS.

Hunter basin, situated at the head of Cabin or Four-mile creek, a tributary of Goat creek, was the first locality visited. The country rock here consists of bedded volcanic rocks, red and greenish andesites, agglomerates, &c., tilted at comparatively low angles, but occasionally showing locally more severe crumpling, often accompanied by faulting. Across the ridge to the south, at the head of Glacier and Webster creeks, an intrusive area of coarsely-crystalline granitic rocks is found which seems to have had an important relationship to the mineralization of the district, as it is along the borders of this area that many claims have been staked, notably in Hunter basin, Hankin basin, Dominion basin (at the head of Goldstream), and various locations on the heads of Sunrise and Glacier creeks. The eruptive mass is itself in places impregnated with iron pyrites, which has resulted in the weathering of the rocks to a bright rusty yellow, giving a characteristic colouring to the mountains.

In Hunter basin the veins are, as a rule, small, and appear either in narrow irregular fissures or as replacements along lines of crushing. The 'King' and 'Rainbow' claims are good examples of the former. On the 'King' a shaft had been sunk, said to be fifty feet in depth, but full of water when seen. The vein, at this point, is about two and one-half feet wide and is in places well mineralized with bornite and chalcopyrite, the ore occurring in irregular lenses or pockets; it is reported to carry good values in silver and copper.

On the 'Rainbow' ore of a different class is found, consisting chiefly of highly micaceous specular iron with some iron pyrites, bornite, chalcopyrite and copper carbonates. There appear to be two or more small irregular veins, more or less parallel. Where the most work had been done on one vein it varied from one to ten inches in width, practically all ore.

On the 'Waresco' claim the ore seems to occur along a crushed zone from four and a half to five feet in width, the country rock having been decomposed and replaced in part by minerals consisting of copper carbonates, copper glance, chalcopyrite and bornite.

Numerous other claims of a similar nature are to be found in this neighbourhood, but very little work has as yet been done in proving them.

Dominion basin at the head of Goldstream is near the opposite border of the Glacier Creek granite area. The country rock here is composed of grey and greenish volcanics not so much disturbed as at Hunter basin, but with generally regular light dips to the southwest. These rocks are cut by a fine-grained, brownish-coloured dike, about forty-five feet in width, which can be plainly seen on both sides of the valley which it crosses about at right angles. It is along the edges of this dike that various mineral claims have been staked, the Dominion and the Black Jack being the most important. It would appear that this dike has afforded a channel for the ascent of the mineral-bearing solutions which have penetrated laterally along the bedding planes of the volcanics, where most readily attacked, decomposing and replacing the country rock in part with secondary minerals and ore. It seems reasonable to suppose, therefore, that the ore bodies will be found to occur in a succession of steps, where the more readily decomposed strata of the volcanics are met with, and will reach their maximum thickness in the intermediate neighbourhood of the dike, gradually disappearing at increased distances from it. The ore consists chiefly of micaceous specular iron, chalcopyrite, copper glance and copper carbonates with a gangue of altered country rock, quartz, calcite and epidote.

Another and larger area of intrusive rocks occurs near the head of Scallon creek, an important tributary to the south fork of the Telkwa from the west, extending across the divide to the headwaters of the Morice and main branch of the Telkwa. This rock has sent out numerous dikes in all directions into the surrounding volcanics, and has also caught up and included in it many patches of the latter. Near the contact of these two formations, and along the dikes from the former, a large number of mineral locations have been made including the Duchess, the Anna-Eva and the Evenings groups on Howson creek, the Starr group on Starr creek and numerous other claims.

The Duchess group owned by the Telkwa Mines, Limited, is situated on the north side of Howson creek near its head. This property has been opened up by a short tunnel about twelve feet

long, all in ore. The ground in the vicinity is rather heavily drift-covered and, as yet, but little work has been done, so that it is very difficult to gain an idea of the nature of the deposit. It appears probable, however, that the ore occurs in a large dike from the neighbouring eruptive rocks at or near its contact with the volcanic country rock, the volcanics themselves, near the dike, being largely decomposed and in places mineralized and with much epidote developed. The extent of the ore body is not yet shown, but at the entrance to the tunnel it is at least twelve feet wide and can be traced longitudinally for several hundred feet, the whole mass being more or less highly mineralized with pyrites, chalcopyrite and hematite, weathering to a well-defined iron-cap on the surface. The gangue consists largely of the decomposed and highly altered dike rock with many small quartz stringers parallel to the dike walls.

A short distance down the creek, on the same side, the Evening group is situated, the property of the Telkwa Mining, Milling and Development Company. This appears to be of a very similar nature to the Duchess, but the hillside here being less heavily drift-covered the ore can be traced more readily. The mineral apparently is contained in a dike from twenty-five to thirty feet in width, cutting at a narrow angle the bedded volcanics, which are here tilted at high angles and in places much altered; the whole width is more or less mineralized with irregularly distributed lenses and bands of higher grade ore, as in the Duchess, consisting of chalcopyrite, pyrite and hematite with a large quantity of quartz and remnants of the original dike rock. This deposit has been opened up by cuts at irregular intervals for a distance of about 1,500 feet, in all of which ore is shown.

On the ridge on the opposite side of Howson creek, and consequently farther away from the eruptive rocks, a number of claims have been staked including the Anna-Eva group, the Iron-Horse group, the War Eagle, Granville, Strathcona, Homestake, Walter and many others. All of these show a somewhat similar condition of affairs to that noted at the Duchess and Evening; the mineral occurring in dikes, in streaks parallel to, and generally richer near, the walls, and usually associated with quartz, serpentine, calcite, epidote and other secondary minerals. In places the volcanic country rock is likewise decomposed and mineralized alongside of the dikes. None of these claims appear to be so heavily mineralized as are those across the creek.

Across the ridge, at the head and to the west of Howson and Scallon creeks, in Starr basin, a number of claims are located. The ore here is usually found at the contact of the eruptive and

volcanic rocks. This contact is very irregular in outline as the volcanics have been much shattered, and many patches of varying size have been caught up in the intrusive rocks; these small areas are usually highly altered and often somewhat mineralized.

At the Starr group the ore seems to be developed along two parallel crushed zones in the volcanic near the contact, about two and three feet in width, respectively. The mineral, which is irregularly distributed, consists of pyrite, chalcopyrite and copper carbonates, in a gangue of quartz, calcite and altered country rock.

At the time of the writer's visit practically no work had been done on any of the Telkwa River properties beyond mere surface prospecting, and that to a very limited degree only. In some of the small fissures high grade ore is found, with values chiefly in silver and copper, the gold contents being as a rule small throughout the district. It is, however, mainly in the larger and lower grade properties that the future of this country depends, but, until much more work has been done little idea of the extent of the deposits and their ultimate value can be gained. As none but smelting ores have so far been discovered, and as they are not of sufficiently high grade to stand transportation in existing circumstances, no great development need be looked for until the advent of the railway.

Although time was not available to visit the headwaters of the Zymoetz river or the Babine mountains, where many claims have been located, it may be of interest to note here that many promising specimens of galena ore, said to be from those localities, were seen by the writer.

ADDENDA

Since the foregoing was written, the writer has spent another season in the Telkwa district, and obtained some additional information, the chief points of which are embodied in the following notes.

TOPOGRAPHY.

The Telkwa, above the south fork, occupies a wide flat valley, the river meandering through swampy meadows, following a course approximately northeast and southwest. About twelve miles from the south fork, near Milk creek, the valley turns sharply to the south, and, at the bend, an unexpected, low pass leads off westward to Summit creek, a branch of the Zymoetz. This pass has an elevation of about 1,300 feet above the mouth of the Telkwa, and may prove of great importance; as the Grand Trunk Pacific have found a feasible railway route through it, which, if used, will shorten considerably the distance from the mouth of the Telkwa to the coast.

Milk creek rises in a high and rugged range of mountains, forming the divide between the Zymoetz, and Telkwa rivers. This range rapidly decreases in height to the east, forming a plateau-like country, where the highest point reaches an elevation of only 6,600 feet, finally dropping down to a low pass, in which Pass creek rises and separates it from the Hudson Bay mountains.

The last named range, though quite rugged—the highest points reaching at least 8,000 feet—is cut off on all sides by low country, and forms a very conspicuous feature of the district.

In most cases the headwaters of the Zymoetz occupy wide, flat valleys, interspersed with many small lakes, and much meadow land.

TRANSPORTATION.

Last summer, a good cable ferry was put in across the Bulkley river, above the mouth of the Telkwa, and a commencement made on the construction of a bridge nearby; while the Provincial Government have built a sleigh road from Hazelton to Aldermere, thus greatly improving the means of access to this district.

MINERAL CLAIMS.

Comparatively few new claims were staked last season, and chiefly assessment work done on those already located, hence

little can be added to what has already been said. There are, however, a few claims that were not visited before, also some new points of interest on those already described, which may be mentioned here.

At Hankin's camp, near the head of Goat creek, is situated a group of claims belonging to Messrs. Loring, Forrest, and the Hankin Brothers. These are among the oldest mineral locations in the district, and are partially prospected by open cuts and several short tunnels.

The country rock consists of typical beds of volcanics, tuffs, agglomerates, andesites, &c., belonging to the Porphyrite group and here lying nearly horizontal and well exposed at many places on both sides of the rather deep, narrow valley. These beds are cut by a number of roughly parallel, light-coloured quartzose dikes with a nearly vertical dip, and crossing the valley approximately at right angles.

The mineral deposits occur in nearly horizontal beds following the bedding planes of the volcanics, and show decided enrichment in the immediate vicinity of the dikes; the mineral-bearing solutions having apparently ascended along the walls of the dikes, and thence following the bedding planes, have decomposed the more readily attacked volcanic beds.

On the "Eldorado," "Naiad" and "Telkwa" claims, the best showings of mineral are to be met with; here at least three beds of ore, each about five feet in thickness, may be seen, consisting of iron pyrites, copper pyrites, a little pyrrhotite, hematite and magnetite, in a gangue of altered country rock, calcite, epidote, garnets, quartz, &c. The percentage of copper is small, but, according to the owners, fair values in gold are to be found. The ore bodies are very much thicker in places, more particularly alongside of the dikes.

On Howson creek, at the "Evening" claim, a cross-cut of seventy feet has been run in low grade ore, the main body, exposed by cuts on the surface, not having yet been reached.

On the "Duchess," a tunnel has been driven for sixty feet, starting at a very good exposure of copper ore and following the foot-wall of the ore-bearing dike. The ore is continuous for the length of the tunnel. Several open cuts have been made up the hill on what is supposed to be the "Duchess" dike; one of these shows six feet of good ore, the others very little, but the dike is much decomposed and iron-stained.

There are a number of parallel dikes here, some of them ore-bearing, which have a general north and south strike, about at right angles to the direction of the valley. As the ground is mostly drift-covered, and the dikes are often quite close to one another, it is a difficult problem to ascertain, for any distance, which dike one is following.

The "Countess" claim, owned by the same company as the "Duchess", (The Telkwa Mines, Limited) is situated near the top of the ridge on what is probably a similar and parallel dike. An open cut has been made here, but not much ore is in sight; a small cut, however, on the same dike at the top of the ridge.

has a much better appearance, the ore there being similar to that at the "Duchess."

Across the ridge, to the north, in a small basin in which rises a branch of Howson creek, a number of claims have been staked. Among these the "Standard," "Princess," and "Contention," are also owned by the Telkwa Mines, Limited; on only one of these, the "Standard," was any work seen. It consisted of a small open cut showing from eighteen to twenty inches of good ore, composed of chalcopryite and specular iron with a little quartz. The ore occurs in a dike along the hanging wall.

In this basin, as at the "Evening" and "Duchess," a number of parallel dikes occur, with approximate north and south strikes cutting the bedded volcanics. The ore found in the dikes is usually near the walls, and at times extends into the country rock.

The Telkwa Mining, Milling and Development Company have also a number of claims here, among others the "Whispering Wind" and "Silver Heels." On the latter, a large dike from fifty to sixty feet wide exists, striking north and south, and dipping 75 to 80 degrees east. On the easterly or hanging wall, about four feet of chalcopryite and specular iron ore was seen, but no work has been done. On the westerly wall, however, a large open cut shows fifteen feet of good ore, consisting of chalcopryite, specular iron, and a little iron pyrites with a gangue of quartz and altered country rock.

COAL.

On the coal properties mentioned in the earlier part of this report nothing has been done, practically, since our previous description was written, the owners awaiting the advent of the proposed railway before resuming operations.

On Goldstream, however, a little below its junction with Coal creek, and separated from the property of the Telkwa Mining, Milling and Development Company by a short distance only, a new coal area was discovered last year.

This area, about two, by two miles and one-half, at its greatest diameters, is in the form of a basin, the coal outcropping on both sides, at from 400 to 500 feet above the floor of the valley. The coal dips towards the creek from both sides, with a slope rather greater than that of the hills, so that it underlies the bed of the stream, although at no great depth.

Up Goldstream this area is separated from that of Coal creek, probably by an anticline, the coal measures having been removed from its axis by denudation. At the lower end, the limits of the coal-bearing strata are not so closely defined, but, in all probability, the creek has there cut through the coal measures to the underlying volcanics, this cutting being accentuated by another anticlinal fold.

The coal has been opened up at only one place, where two seams have been uncovered, the upper one showing five and

one-half feet of clean coal, overlain by about one and one-half feet of soft, impure coaly material, the cut not having been extended far enough to locate the roof clearly. The lower seam shows three and one-half feet of clean, bright coal. No analyses have as yet been made of these coals, but in appearance they closely resemble the coal from Coal creek. At several other points across the basin the coal outcrop was noted, but no time was available to open up the seams.

No evidences of local disturbances or faulting of any great extent were noted.

Another and smaller area was seen about two miles farther down Goldstream, but has not been opened up.

Other areas of the coal-bearing rocks were noted at Driftwood creek, Moricetown, at the head of the Zymoetz river, and on Hudson Bay mountain, but at none of these localities has any workable seam been yet found, and it seems probable that the seams reach their maximum thickness in the Telkwa-Morice River district, and thin out rapidly, at least towards the north.

It is now fairly certain that no great coal field exists in the Bulkley Valley district, from Hazelton to the headwaters of the Morice, but many comparatively small, isolated areas are known, in which the coal varies from a lignitic to a semi-anthracite. In some of these areas the strata are greatly disturbed, much faulting and folding being in evidence.

The quality of the coal seems to depend on the proximity of the measures to the newer eruptive rocks, which are younger than the coal, and in places have sent out dikes cutting the seams.

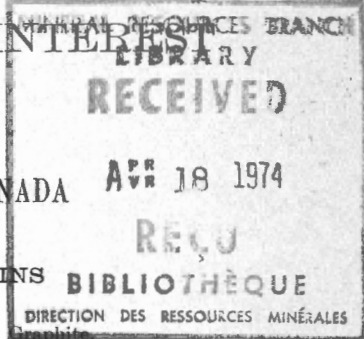
A number of fossils were collected from the coal measures and adjacent beds; although none of these have as yet been determined, there is sufficient evidence to state that these rocks are probably Lower Cretaceous, though possibly Jurassic.

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