CANADA

DEPARTMENT OF MINES AND RESOURCES

MINES AND GEOLOGY BRANCH

GEOLOGICAL SURVEY

PAPER 44-7

GEOLOGY AND COAL DEPOSITS OF HASLER CREEK AREA, BRITISH COLUMBIA

(Report and Map)

BY

J. Spivak

OTTAWA

1944

CANADA
DEPARTMENT OF MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

GEOLOGICAL SURVEY
Paper 44-7

GEOLOGY AND COAL DEPOSITS OF HASLER CREEK AREA, BRITISH COLUMBIA
(Summary Account)

By

J. Spivak

OTTAWA, 1944

CONTENTS

Illustrations

Geology and Coal Deposits of Hasler Creek Area, British Columbia

INTRODUCTION

Hasler Creek area lies between latitudes 55°30' and 55°40' and longitudes 122° and 122°15', about 87 miles west of Dawson Creek, British Columbia. It is accessible by a motor road that reaches Pine River about 2 miles below the mouth of Hasler Creek. Pack trails extend westward along Pine River and southward up Hasler Creek from the road terminus. Geological mapping in 1943 was confined to a belt 2 to 4 miles wide and about 15 miles long in which the coal-bearing formation is exposed.

The writer wishes to acknowledge the assistance given by the Hasler Creek Coal Company in prospecting and opening some of the pits. D.W. Axford gave efficient help as student assistant.

GENERAL CHARACTER OF THE AREA

The area lies within the Foothills belt of east-central British Columbia. Elevations range from 2,000 feet, in Pine River Valley, to 4,700 feet on the highest ridges. Topographic features express the character of the underlying bedrock, the high ridges being underlain by coarse sandstones and conglomerates and the valleys by shales or the softer sandstones and siltstones.

Evidence of glaciation is widespread in the area. Pine River has a broad U-shaped valley filled to a considerable depth by gravels and glacial deposits. Pine River No.1 well, near the mouth of Commotion Creek, drilled through 1,080 feet of unconsolidated material before reaching bedrock. Hasler Creek has a wide, drift-filled valley, with a distinct terrace about 200 feet above present creek level. Glacial striae and gouges on Falls Mountain indicate the direction of ice movement as south 70 to 80 degrees east. No granite or gneissic boulders of the types associated with Keewatin glaciation were observed.

The smaller tributary creeks and lower hills are mantled by drift of variable thickness. The area is covered by dense growths of small spruce, pine, balsam, and poplar.

STRATIGRAPHY

Strata exposed within the area mapped are of Lower Cretaceous age. They include parts of the Bullhead and Fort St. John groups (Wickenden and Shaw,1943)[1], as shown in the following table:

[1] A list of references is given at the end of this report.

Table of Formations

Group	Formation	Lithology	Thickness Feet
Fort St. John	Commotion	Conglomerate near top, sandstone and shale members below: marine and non-marine.	1,100+

Table of Formations (Cont'd)

Group	Formation	Lithology	Thickness Feet
	Moosebar	Dark grey marine shales; calcareous sandstone members in upper part.	1,350
Bullhead	Gething	Sandstone, siltstone, shales, coal; non-marine.	1,075 +

Gething Formation

The name "Gething" was given by McLearn (1922) to the upper member of the Bullhead Mountain formation (now Bullhead group) in Peace River Canyon. It is a coal-bearing series of sandstones and shales of non-marine origin, overlain by marine shales of the Moosebar formation and underlain by a series of coarse sandstones, conglomerates, and quartzitic sandstones. The contact between the Gething and the lower Bullhead member is drawn arbitrarily where conglomerates and grits give place to overlying medium to fine sandstone, shale, clay ironstone, and coal beds. The thickness of the Gething in Peace River Canyon is about 1,400 feet.

Strata correlative with the Gething formation are exposed along Hasler Creek near the coal mine and in the Willow Creek drainage basin near Pine River. Outcrops are scarce and discontinuous and usually comprise less than 50 feet of beds. The thickest section is exposed on Hasler Creek, near the coal mine. It comprises the following:

Overlying beds - Moosebar formation

	Thickness Feet	Inches
Sandstone, grey to cream, dense, scattered pebbles	6	5
Siltstone, sandy, laminated, dark grey, buff weathering	38	0
Sandstone, buff weathering	1	6
Siltstone, arenaceous, dark grey, sub-conchoidal fracture	36	6
Shale, black, somewhat fissile, a few concretionary bands	5	3
Siltstone, arenaceous, buff to brown weathering.	8	6
Shale, black, somewhat fissile, concretionary bands and irregular nodules	7	0
Coal, schisted, prostrate compressed tree trunks	1	4
Shale, plant fragments, some irregular coal seamlets	3	7
Siltstone, sandy, fairly massive, buff weathering	8	3
Shale, with thin concretionary bands	3	8
Coal, bright	1	0
Shale, brown weathering, thin concretionary bands; some coal fragments near top	3	0
Sandstone, medium-grained, fine bedding, micaceous	1	11
Shale, grey to black, buff weathering	1	10
Sandstone, massive, buff weathering	7	8
Shale, sandy, sub-conchoidal fracture	2	8

	Thickness Feet	Inches
Shale, hackly, grey-black	4	2
Sandstone, grey, some shale, buff weathering, ripple-marked	12	0
Siltstone	1	6
Sandstone, massive, buff weathering	0	10
Siltstone, grey, buff to white weathering	2	6
Coal, hard, bright--Discovery seam	7	4
Coal, sheared and foliated, crumbles readily	1	4
Shale, carbonaceous, brown weathering, coal seamlets	4	2
Coal, sheared, with ½-inch shale partings	5	2
Shale, carbonaceous, brown weathering, coal seamlets, clay seams	3	7
Coal, sheared	0	8
Shale, carbonaceous, containing coal seamlets	1	8
Shale, irregular clay ironstone bands, prostrate plant remains	11	0
Coal	0	6
Shale, arenaceous	0	2
Coal	0	6
Sandstone, somewhat micaceous	0	4
Coal, schisted	2	6
Shale, fissile, contains coal seamlets and plant remains	2	0
Sandstone, micaceous, plant remains	0	5
Shale, carbonaceous, some clay ironstone nodules	7	10
Clay ironstone	1	6
Shale, fissile	1	6
Siltstone, some ironstone concretions	1	4
Shale, carbonaceous, plant remains, concretions	2	6
Clay ironstone	1	6
Shale, fissile	5	0
Siltstone, greyish brown, arenaceous	2	6
Shale, carbonaceous, partly concealed	11	0
Sandstone, fine-grained, partly concealed	17	0
Sandstones with interbedded shale and a few coal seams, poorly exposed	148	0
Sandstone, black, fine-grained, thin bedded	8	0
Shale, fissile, carbonaceous	3	0
Sandstone, argillaceous, grey-black, plant remains	20	0
Shale, carbonaceous	0	6
Shale, plant fragments, a few concretions	1	3
Coal, schistose	1	10
Sandstone, grey-black, plant remains	1	6
Shale, fissile, coal seamlets	1	8
Coal, bright, somewhat schistose	2	7
Shale, carbonaceous, coal seamlets	1	6
Coal, bright	2	6
Shale, fissile	0	8
Coal, bright	0	6
Shale, grey, hackly	1	0
Sandstone, argillaceous, plant fragments	1	6
Shale, carbonaceous, hackly, some concretions	11	6
Sandstone, massive, some plant remains	18	6
Shale, carbonaceous	1	0
Sandstone, buff weathering, thin bedded	3	8
Shale, some interbedded sandstone, plant remains	4	0
Sandstone, argillaceous, with thin shale beds, fossil wood	11	0
Shale, brown weathering, some concretionary layers	2	0
Clay ironstone concretionary band	0	9
Shale, grey-black	4	10
Coal	0	2

Point seam

	Thickness Feet	Inches
Shale, carbonaceous	1	0
Coal, bright, impure	2	4
Shale, carbonaceous, hackly	0	10
Coal, dull, impure	1	6
Shale	0	6
Coal, containing thin clay seams	0	10
Shales, dark grey, fissile	6	6
Clay ironstone	1	0
Shale, grey, hackly, some concretions	16	0
Shale, carbonaceous, with seamlets of coal	5	6
Sandstone, fine-grained, buff, poorly exposed	12	0
Total	553	6

The above section is underlain by an additional 490 feet of poorly exposed beds. These include brown weathering sandstones and shales and, in turn, are underlain by about 30 feet of light grey, hard, medium-grained sandstones that are coarser and more massive than those in the upper part of the formation. These sandstones may represent basal beds of the Gething formation. The total thickness of the Gething, as derived from these measurements, is 1,074 feet, and this is probably a minimum figure as the base of the formation is not known definitely. The measurements were made across the steeply dipping east limb of an anticline where there is likely to be appreciable thinning in the beds.

A 30-foot bed of coarse-grained, light grey sandstone, with chert-pebble conglomerate lenses, is exposed on Willow Creek and may underlie the Gething. It is overlain, above the falls, by 100 feet of beds that include fine-grained sandstone, siltstone, shales, and coal. The coal is represented by three seams varying from 2 to 3 feet in thickness and three others between 3 and 11 inches thick. In tracing beds along their strike an appreciable variation was noted in the thickness of concretionary bands in the shales and of partings in the coal seams.

Plant remains occur at several horizons in the Gething formation and are useful in distinguishing it from overlying formations. The following species have been identified by W.A. Bell of the Geological Survey:

Pterophyllum concinnum (Heer)
Stenorachis n.sp.
Elatides dicksoniana (Heer)
Pityophyllum nordenskioldi (Heer)
Ptilophyllum arcticum (Heer)
Podozamites lanceolatus (Lindley and Hutton)

The collections indicate a flora of Aptian (Lower Cretaceous) age.

Moosebar Formation

The type section of the Moosebar formation was described by McLearn (1922) from a locality near Contact Point in Peace River Canyon. Strata that are in part correlative with the Moosebar underlie a large part of the present area. Fairly continuous exposures occur on Grizzly Creek; on the west fork of Johnson Creek; on Falling Creek; and on the north fork of Falling Creek. Outcrops are not abundant elsewhere and sections exposed are generally less than 50 feet thick.

Fossils representative of several genera of marine pelecypods may be found throughout the sandstone and shale members of the Moosebar formation. Though of no diagnostic value, they are useful in establishing the correlation of isolated exposures as

Moosebar. The fossils include Yoldia cf. kissoumi and several species of the following genera (identified by F.H. McLearn of the Geological Survey):
Pecten (Entolium), Corbula, Goniomya, Modiolus ?, Protocardium ?, Psilomya, and Lima.

A section in the lower part of the Moosebar was measured on Grizzly Creek, east of the Hasler coal mine, and is as follows:

	Thickness Feet
Sandstone, argillaceous, cream to light grey, fine-grained	23
Shale, dark grey with narrow concretionary bands .	76
Sandstone, argillaceous, light grey, cream weathering	4
Shale, dark grey, calcareous; concretionary zones, 6 inches to 1 foot thick, occur 2 to 6 feet apart throughout this section	221

Underlying beds--Gething formation.

The north branch of Falling Creek exposes a continuous section of marine shales which lies near the top of the formation. It consists of the following:

Overlying beds - Commotion formation

	Thickness Feet
Sandstone, argillaceous, with interbedded shale; beds 1 to 3 feet thick	120
Shales with interbedded sandstones, light to dark grey, a few concretionary bands near base . .	500

Outcrops in other localities reveal lithologic characteristics not observed in the measured sections. South of Pine River is a 1½-foot bed of chert-pebble conglomerate with a shale matrix, in the lower part of the formation. Bentonite beds, one-tenth to one-quarter inch thick, occur in the lower shales on Johnson Creek and on Falling Creek. On the west fork of Johnson Creek some of the sandstones have ripple-marked surfaces.

Traverses on the west branch of Johnson Creek indicate a thickness of about 1,350 feet for the Moosebar formation. This figure is confirmed by the calculated thickness at places where the contacts of the overlying and underlying formations were observed. Pine River No. 1 well penetrated dark grey shales with sandstone members between depths of 1,080 and 2,410 feet. The lithology of the drill samples is similar to that of exposed Moosebar strata. Uppermost Moosebar beds are, however, not represented as they have been eroded from the well site.

Commotion Formation

The type section of the Commotion formation has been described by Wickenden and Shaw (1943) from Commotion Creek in Pine River region. The strata form the northwesterly trending ridges in the northern part of the present area. Lower beds of the formation are exposed also on Slump Mountain and on Falls Mountain near the southern limit of the area.

The lithology of the lower part of the Commotion formation is somewhat similar to that of the Moosebar. Sandstone members are, however, thicker, somewhat coarser, and more massively

crossbedded. Contact between the two formations was placed tentatively at the base of the lowest crossbedded grey-green sandstone member overlying more thinly interbedded sandstones and shales typical of the Moosebar.

The lower part of the Commotion formation consists of a succession of sandstone beds, from 2 to 20 feet thick, aggregating more than 400 feet in thickness. The sandstones are fine-to coarse-grained and greenish grey to buff. The fine-grained beds are interstratified with thin, sandy shales, and some of them contain paper-thin layers of carbonaceous material. The coarser grained sandstones show massive crossbedding and locally contain thin conglomerate lenses. Near the top of the section, on Falls Mountain, a 10-inch fossil bed carries a species of Dosinia (?).

On Hasler Creek the sandstone section is overlain by more than 700 feet of shales, thin sandstones, and a thick conglomerate zone. This upper part of the Commotion formation was not studied in detail.

A traverse on Johnson Creek indicated a thickness of at least 1,150 feet for the Commotion formation. Wickenden and Shaw (1943) state that the formation is between 1,300 and 1,500 feet thick.

STRUCTURE

The predominant structural feature of the area is a zone of anticlinal folding that extends from the vicinity of Hasler Creek through the Willow Creek drainage basin and to the northwest of Pine River. The zone exposes Bullhead strata near Hasler and Willow Creeks, but in an intervening area, 4½ miles long, Moosebar beds occupy the crestal area.

On Hasler Creek the east limb of the anticlinal structure exposes almost the entire Gething formation. The structure is apparently asymmetrical, as dips on the east limb are steeper in general than those observed on the west limb. Northwest of Hasler Creek, flat-lying beds of the Moosebar formation occupy the crest of the fold at an elevation of 3,450 feet; this suggests that the fold plunges northwesterly. To the southeast, the axial trace of the fold has been mapped for almost 2 miles, and in this direction the exposed Gething beds are higher stratigraphically than those observed near the crest of the anticline at Hasler Creek. Insufficient data is available to determine whether this implies a southeasterly plunge or is merely due to differences in elevation. Moosebar shales on the east limb of the structure are folded into a number of minor anticlines and synclines and are broken by faults of slight displacement.

As developed along Willow Creek the anticlinal structure is the southeasterly continuation of the Pine River anticline, described by E.M. Spieker (1920). It exposes the Gething formation and about 50 feet of underlying Bullhead beds. Between the headwaters of Willow Creek and Pine River the outcrop area of Bullhead becomes noticeably wider, indicating that the fold has a southeasterly plunge. The crestal area in the Willow Creek region, shows several subsidiary anticlines and synclines, with intervening minor faults. Structural details of individual folds could not be determined because of lack of good exposures.

Southwest of the anticlinal zone, the predominant structure is synclinal. This is indicated by the symmetrical syncline in the Commotion formation on Slump Mountain and by the synclinal beds on Falls Mountain. In the area between these mountains, the

underlying Moosebar formation exhibits subsidiary folding in a series of closely spaced anticlines and synclines.

COAL DEPOSITS

Hasler Creek Coal Deposits

The Hasler Creek Coal Company was incorporated in British Columbia in December 1943 to develop the Discovery seam on Hasler Creek. This seam was discovered in 1934 by Mr. G. Goodrich, after unusually high water had removed the overburden along the east bank of Hasler Creek near the coal outcrop. No work was undertaken until the winter of 1940-41, when the seam was opened up by an adit about 15 feet above creek level and extending into the coal for 56 feet. In addition, coal was mined, by means of open-cut benches, to a height of about 50 feet above the adit. Six hundred tons were delivered to the drilling contractors at Pine River Well No. 1 at Commotion Creek. During the winter of 1942 the adit was cleaned out in preparation for mining underground, but no production was attempted. In December 1943 a tipple and camp buildings were erected and a daily production of 35 tons was reached.

The Discovery seam lies about 200 feet south of the Moosebar-Gething contact, on the east side of Hasler Creek. It is 159 feet, stratigraphically, below the top of the Gething formation at this locality. The coal section includes:

	Thickness Feet	Inches
Coal, Discovery seam, hard, bright with 2-inch sandstone parting near base	7	4
Coal, sheared and foliated	1	4
Shale, carbonaceous, brown weathering, contains ¼-inch coal seamlets	4	2
Coal, sheared, with ½-inch shale partings	5	2
Total thickness of coal with shale partings . . .	18	0

About 300 feet south of the adit, or 261 feet stratigraphically below the Discovery seam, a coal section, designated as the Point seam, includes the following beds:

		Thickness Feet	Inches
Point Seam	(Coal, somewhat sheared	2	7
	(Shale, carbonaceous, with thin coal seamlets	1	6
	(Coal, bright	2	6
	Total thickness of coal and shale parting	6	7

Between the two sections there are at least five individual seams varying from 6 inches to 2½ feet in thickness. None of these is considered thick enough to warrant development work under existing conditions.

The coal consists of alternating bright and dull bands, is black, and has a black streak. The bright bands are commonly lenticular, and vary from one-eighth to one-quarter inch in thickness. Dull bands are of similar thickness and usually predominate over the bright bands. Analyses of five samples from the Discovery and Point seams are given below:

Coal Analyses, Hasler Creek, B. C.

Analyses by Bureau of Mines, Ottawa.

Number and form of analyses	Moisture	Vol. matter	Fixed Carbon	Ash	Sul-phur	Heating value B.T.U.	Cok-ing prop-erties	Ash soft-ening temp.
1 - A[1]	5.1	18.7	72.1	4.1	0.7	14120	Good	2780
- B[2]		19.7	76.0	4.3	0.7	14880	Good	2780
2 - A	5.1	18.9	70.1	5.9	0.7	13880	Good	2530
- B		19.9	73.9	6.2	0.7	14620	Good	2530
3 - A	4.4	15.2	44.5	35.9	0.3	8970	Fair to good	2250
- B		15.9	46.5	37.6	0.3	9380		2250
4 - B	9.5	17.1	47.7	35.2	0.5	8590	Non agg-lom-erate	2800
5 - B	13.7	21.3	59.8	18.9	0.5	10630	"	2850

[1]A - As received [2]B - Air dried

Lab. No.	Location of samples
1. 25301	Discovery seam, from adit face - 7 feet 4 inches.
2. 25303	Discovery seam, duplicate sample taken one foot above 25301.
3. 25302	Bench below Discovery seam, in adit face and cross-cut - 6 feet 2 inches.
4. 24164	Point seam, upper bench, 2 feet 7 inches.
5. 24165	Point seam, lower bench, 2 feet 6 inches.

Coal from the Discovery seam is of low volatile, bituminous rank. The ash content is low and coking properties are good. The section underlying the Discovery seam was sampled to determine whether it could be included in the commercial coal, but the analyses indicated a low calorific value and high ash content.

The Point seam is inferior in rank, grade, and thickness to the Discovery seam. The samples are from two benches separated by 15 inches of carbonaceous shale. The coal is weathered and it is probable that the analyses given above are not indicative of the true grade and rank. The Point seam may, however, furnish additional tonnage if a mining plant is installed to work the Discovery seam.

The map shows the detail of the southeasterly part of the area near Hasler Creek. The contact between Moosebar and Gething formations was used as an horizon marker in prospecting and trenching for coal exposures.

Two localities were found in which comparatively shallow trenches revealed coal; one is about 3,250 feet southeast of the adit and 700 feet above creek level; the other is 7,500 feet southeast and about 900 feet above Hasler Creek. At the first locality, seven pits and test holes revealed coal. The coal in Pit No.1 is about 18 feet thick and apparently occurs at the crest of an anticline. Overlying beds strike south 45 degrees east and dip 32 degrees southwest; about 30 feet below the pit, and apparently underlying the coal, sandstones and shale strike south 60 degrees east and dip 20 degrees northeast. Overlying beds near the ridge top, south of Pit No. 1, dip about 32 degrees southwest. A section of sandstone and shale in Pit No. 7 strikes south 45 degrees east and dips 61 degrees northeast. The

overburden was too thick to permit determination of the thickness of the coal seams in the other pits. The thickness of the coal in Pit No. 1, its stratigraphic position, and the structural data, indicate that the coal probably represents the Discovery seam. At the second locality, a 15-foot seam of sheared coal occurs about 500 feet south of the Moosebar-Gething contact. The strata between the contact and the coal outcrop dip steeply and exhibit isoclinal folding with minor faulting. Additional prospecting and trenching along the creek section are necessary before it is possible to determine whether this coal section is the continuation of the Discovery seam.

Insufficient development work has as yet been done to permit definite correlation of coal seams and the calculation of tonnages throughout the area. Local faults and changes in physical character of the coal in the folded zone might reduce estimates of mineable coal considerably. An approximation of the tonnage of coal in the Discovery seam on the east limb of the anticlinal structure has been made, assuming continuity between the adit and Pit No. 1. This region contains 400,000 tons of coal above Hasler Creek level, using a 7-foot mineable section as the average thickness. If the Discovery seam is continuous to the second locality on Grizzly Creek, the available tonnage on the east limb would be 1,200,000 tons. Further prospecting should reveal the Discovery seam on the west limb of the anticline, from which additional tonnage would be available.

Other Coal Occurrences

Coal outcrops were observed at several localities in the Willow Creek area. The overburden there is too thick to permit tracing seams for any distance, and in most instances insufficient data are available to determine the stratigraphic position of the seams. On a westerly branch of Johnson Creek, a coal outcrop over 7 feet thick occurs near the top of the Gething formation. Several 2- to 3-foot seams outcrop on Willow Creek, above the first falls, near the base of the Gething. South of Pine River a 3-foot seam and a 5-foot seam occur in the upper part of the formation, but their exact stratigraphic position could not be determined. Coal outcrops and thicknesses of individual seams are indicated on the accompanying geological map.

Prospecting for coal in this area should be confined mainly to a relatively narrow beltnear the contact between the Gething and Moosebar formations. This is the stratigraphic horizon in which the thickest coal seam is known to occur on Hasler and Johnson Creeks. The most accessible region for prospecting and development is east of Willow Creek on the south side of Pine River and just west of Crassier Creek on the north side of the river.

Oil and Gas Possibilities

Exploration for oil and gas in the map-area would be confined to drilling tests of strata below the Gething formation. No detailed stratigraphic studies of the underlying formations have been made in the Pine River region, and there is no information regarding the presence of porous and permeable reservoir beds. The Hasler and Willow Creek folds extend beyond the limits of the area mapped so that it was not possible to determine the closure on the structures. Further information on this and other factors is necessary before the merits of the structures can be appraised.

REFERENCES

Wickenden, R.T.D., and Shaw, G.: Geol. Surv., Canada, paper 43-13 (1943).

McLearn, F.H.: Geol. Surv., Canada, Sum. Rept.1922, pt.B.

Spieker, E.M.: Report of Oil Surveys in the Peace River District,1920; B.C. Department of Lands, 1921.