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SOME COAL DEPOSITS
OF THE PEACE RIVER FOOTHILLS,
BRITISH COLUMBIA

By
F. H. McLearn and E. J. W. Irish



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GEOLOGICAL SURVEY

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SOME COAL DEPOSITS OF THE PEACE RIVER FOOTHILLS,
BRITISH COLUMBIA

INTRODUCTION

The Peace River Foothills are in eastern British Columbia west of the Peace River Block, at 56 degrees north latitude, and between 122° 05' and 123° 10' west longitude.

Hudson Hope, on the north bank of Peace River about 7 miles east of the Foothills, is the nearest settlement. It lies 65 miles from Fort St. John on the Alaska Highway, with which it is joined by a dirt road. From Hudson Hope a dirt road 14 miles long, known as the Portage, extends westward through the wind gap north of Portage Mountain to the head of Peace River Canyon and into the Peace River Foothills. From the head of the canyon a narrow dirt road extends 20 miles up the north side of the river to the Beattie ranch at the mouth of Ayland Creek. The King Gething mine, on the east slope of Portage Mountain, is reached by a branch from the Portage road. The Packwood mine, west of Cust Creek in the Foothills, is reached by a branch road from the river road about 8 miles above the head of the canyon. All of these roads can be used by heavy trucks in dry weather and in the winter, but are impassable after heavy or continued rain.

Field work was undertaken in the summer of 1943 to locate workable coal seams easily accessible to the existing means of transportation--that is to the Portage road and its extension up the north side of Peace River to the Beattie ranch. The coal is required for towns and camps along the Alaska Highway.

Three areas were examined. One is on the east slope of Portage Mountain in the vicinity of King Gething mine. Another is in the upper part of Peace River Canyon on the west slope of Portage Mountain. The third lies north of the river road between Dunlevy and Cust Creeks.

Able assistance was given in the field by R. J. Heron and A. C. Knight. The writers are indebted to Messrs. J. W. Beattie, King Gething, Neil Gething, and George Packwood for co-operation and numerous courtesies.

All coal samples were collected by the writers during the field season; analyses were made by the Bureau of Mines, Department of Mines and Resources, Ottawa.

The coal deposits had been previously investigated by C. F. J. Galloway¹, M. Y. Williams², and F. H. McLearn³.

¹Galloway, C. F. J.: Ann. Rept., Minister of Mines, B. C., 1912, pp. 118-136.

²Williams, M. Y.: Trans. Can. Inst. Min. Met., vol. XXXVII, pp. 352-353 (1934).

³McLearn, F. H.: Geol. Surv., Canada, Sum. Rept., 1917, pt. C, pp. 20-21; Sum. Rept. 1923, pt. B, pp. 1-46.

DESCRIPTION OF COUNTRY

The Foothills along Peace River are high, rugged, and deeply dissected. Maximum relief on the upland is between 1,500 and 2,500 feet. A few high ridges rise to an elevation of 6,000 feet above sea-level. The valley of the Peace has wide river flats at an elevation of about 1,800 feet and is bordered by long, high terraces. At the eastern border of the Foothills is the wind gap between the southern end of Butler Mountain and Portage Mountain. It is now partly filled with terminal moraine deposits, but in pre-glacial time was occupied by Peace River on its course to the western border of the plains. The present stream flows around the south side of Portage Mountain, where it has excavated the deep Peace River Canyon.

Within the Foothills bedrock is best exposed on the high ridges above the terraces, or in tributary stream valleys cut through the terraces. Bedrock is almost continuously exposed in the steep walls of Peace River Canyon at the eastern border of the Foothills.

BULLHEAD GROUP

The Bullhead group includes two formations, the Dunlevy below, and the Gething above. Most of the coal is in the Gething, but a few thin seams occur in the uppermost part of the Dunlevy. The basal beds of the Dunlevy are marine and possibly of late Jurassic age, but most of the group is probably non-marine and of Lower Cretaceous age.

The name "Dunlevy" is applied to what was formerly called the Lower member of the Bullhead (McLearn, 1922); that is, to the beds that lie between the Jurassic dark shales below and the Gething formation above. The lower and greater part of the formation consists of massive, coarse, hard sandstone with some finer sandstone and shale. At the top are conglomerates and sandstones with thin zones of fine sandstone, siltstone, dark shale, and thin coal seams. Some of the fine sandstones and siltstones in this upper part are ripple-marked, and carry fossil wood fragments and fine plant debris. The true thickness of the Dunlevy formation is not exactly known, but may be as much as 3,000 feet.

The Gething formation overlies the Dunlevy conformably, and the contact is drawn arbitrarily where the conglomerates and coarse sandstones disappear or become rare, and fine sandstone, siltstone, shale, and coal seams become more common. The formation consists of interbedded, fine- to medium-grained sandstone, siltstone, clay ironstone, shale, and coal beds. Conglomerate and coarse sandstone are rare. The sandstone beds are massive to layered or flaggy, and white or cream to light grey or brownish. Crossbedded and ripple-marked sandstones and siltstones are present in places. A few of the sandstone members are massive, thick, and persistent. These have been named and are shown on Figure 3. Shales are grey to black and vary in thickness from 2 inches to 10 feet. Clay ironstone forms thin and thick beds and occurs as concretions in several coal seams. Well-preserved plant remains are not common, but are present in some shales, siltstones and clay ironstones. The flora is correlated with that of the Lower Cretaceous, Luscar formation and with that of the the lower part of the Blairmore group of southern Alberta.

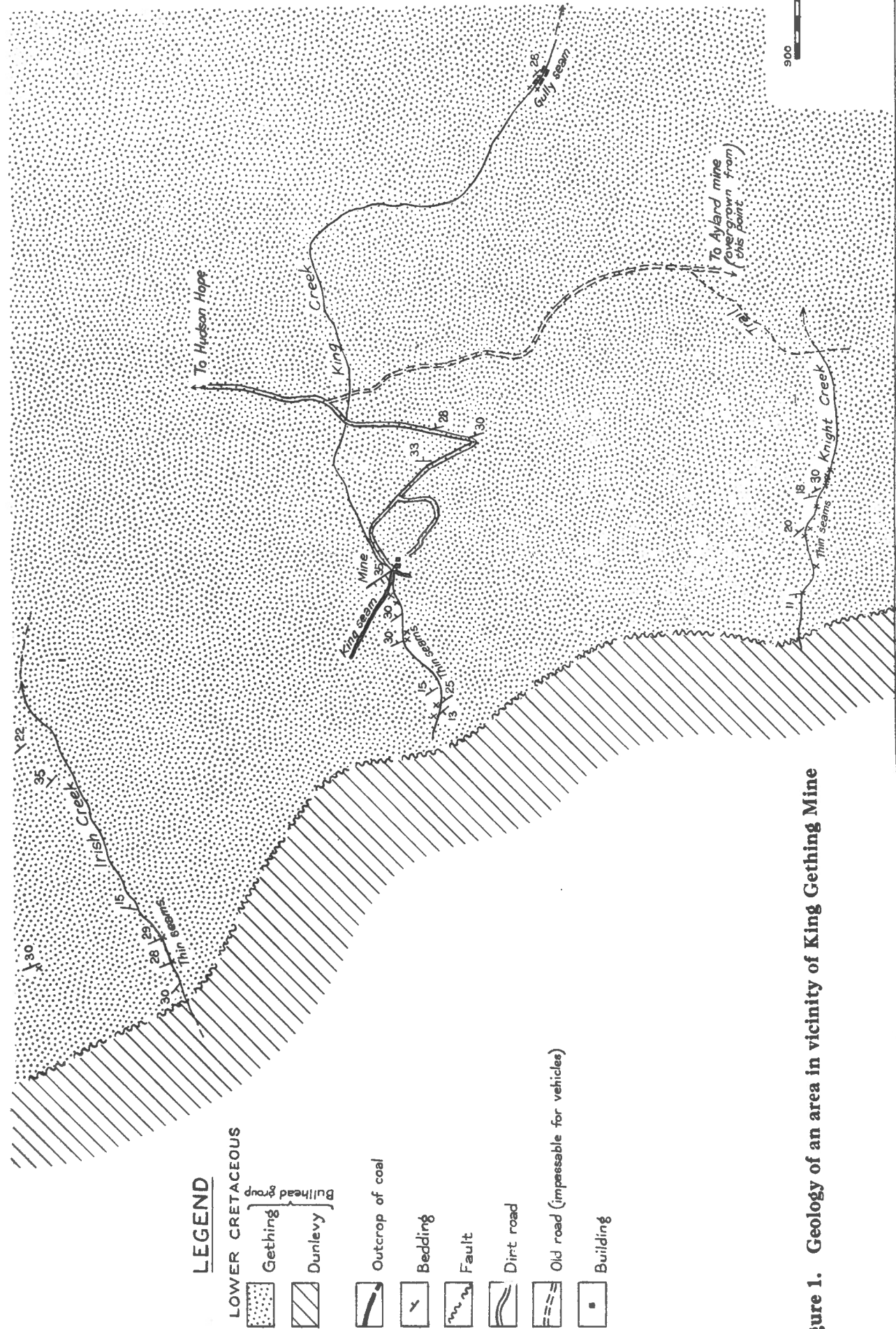


Figure 1. Geology of an area in vicinity of King Gething Mine

KING GETHING MINE AND VICINITY

Geology

An area in the vicinity of the King Gething mine, on the east slope of Portage Mountain, north of the canyon 10 miles west of Hudson Hope, was examined (Figure 1). It is drained by Knight, King, and Irish Creeks. In its western part, bedrock outcrops in cliffs and sloping rocky ledges and is exposed at the headwaters of the three creeks. Eastward, however, bedrock is deeply drift covered in what was probably a pre-glacial valley. Only at one place, in the lower part of King Creek, has excavation been deep enough to penetrate this cover. For this reason the investigation of the coal-bearing strata was greatly hampered.

The coal-bearing beds in this area lie on the east limb of a south-pitching, faulted, anticlinal structure. The average trend is north-south, and dips vary from 18 to 30 degrees to the east. Near the crest of the anticline, on the west border of the area, a fault has thrust Dunlevy beds over the Gething formation. A small anticlinal fold shows in the Gething strata just east of the fault. The lower part of the Gething, although not the actual base, is exposed east of the fault in the upper reaches of Knight, King, and Irish Creeks. Beds in the middle of the formation are concealed in the central part of the map-area, but a few exposures of beds high in the formation were observed near the mouth of King Creek, and also east of King Creek, on the north side of the canyon beyond the map-area.

Coal Seams

The "King" is the thickest seam known in the area. It is in the lower part of the Gething formation, although the exact distance above the base is not known. The seam is exposed in the upper part of King Creek and is worked in the King Gething mine. The seam can be traced northwest up the hill about 600 feet from the mine by means of a ledge of siltstone that immediately overlies the coal. It could not, however, be further traced toward Irish Creek without digging deep trenches. It was not located on Irish Creek, but is probably present somewhere between the group of exposures near the head of the creek and another group farther downstream. It could not be traced south from the mine, in which direction bedrock is heavily drift covered, nor is it exposed on Knight Creek, though it probably lies east of the exposures on this creek.

Where measured at the King Gething mine, the King seam is 5.2 feet thick, including a 0.3-foot shale parting. The section there from top to bottom is as follows:

	Feet
Dull coal-----	0.7
Dull and bright coal-----	1.6
Shale-----	0.3
Bright and dull coal-----	2.0
Bright coal-----	<u>0.6</u>
Total	5.2

In the upper part of the seam are large lenses of clay ironstone. Where present, they do not replace the coal, which maintains its thickness. Analyses, by benches, are given in a table that follows. In all benches the coal is of medium volatile bituminous rank. In the basal, 0.6-foot bench the coal has good caking properties.

On King Creek several thin seams lie stratigraphically below the King seam. One has a thickness of 2 feet, including 0.2 foot of shale. Below this, and farther west upstream on the crest of an anticline, is a coal seam 0.9 foot thick. Other seams exposed by trenching measured 3 inches or less.

Seams are also present below the horizon of the King seam on Knight Creek. They vary from 0.3 to 0.8 feet in thickness.

Other seams, probably below the King seam, occur at the headwaters of Irish Creek. On the crest of the anticline, just east of the fault, is a seam 1.2 feet thick. Adjacent seams vary from 2 to 8 inches in thickness.

A seam above the King is exposed in a small trench northwest of the King Gething mine. It is 2.6 feet thick.

Analyses of Coal Samples from King Seam, King Gething mine

	Dull, detrital coal		Dull and bright coal		Bright and dull coal		Bright coal	
	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry	As rec'd	Dry
Moisture condition								
Proximate analysis								
Moisture %	3.8		5.9		5.7		4.5	
Ash %	10.5	10.9	16.1	17.1	3.3	3.4	1.3	1.4
Volatile matter %	22.1	23.0	26.8	28.5	21.4	22.7	26.2	27.4
Fixed carbon (by difference) %	63.6	66.1	51.2	54.4	69.1	73.9	68.0	71.2
Ultimate analysis								
Sulphur %	1.8	1.8	0.8	0.9	0.8	0.9	0.9	0.9
Nitrogen %								
Calorific value								
B.T.U. per lb. gross	12,900	13,420	11,080	11,770	13,840	14,680	14,480	15,170
Caking properties	Agglomerates		Agglomerates		Agglomerates		Good	
Softening temperature of ash	2,050		2,300		2,710		2,680	
Colour of ash	Light mauve		Light brown		Very light pink		Light salmon-pink	

Still higher stratigraphically, and about 320 feet above the King seam, is the Quentin seam. It is 2.3 feet thick where measured on King Creek, and 2.7 feet thick where measured beside the mine road. It consists of bright and dull coal, and, where sampled on the road, gave the following analysis:

		As received	Dry
Moisture condition			
Proximate analysis			
Moisture	%	24.1	-
Ash	%	12.9	17.0
Volatile matter	%	23.0	30.3
Fixed carbon (by difference)	%	40.0	52.7
Ultimate analysis			
Sulphur	%	0.6	0.7
Calorific value			
B.T.U. per lb. gross.		7,720	10,180
Caking properties		Non-agglomerating	
Colour of ash		Pinkish white	

This sample was too weathered to permit a proper classification as to rank.

Very high in the Gething formation is the Gully seam. It is exposed in the bottom of King Creek about a mile below the mine. Its total thickness including 0.1- and 0.05-foot shale partings, and some clay ironstone concretions near the base, is about 2.9 feet.

Other possibly good seams may occur in the upper part of the formation above the Gully seam, but, if present, are deeply buried beneath superficial deposits.

King Gething Mine

The Gething property is on the east slope of Portage Mountain, 12 miles by road west of Hudson Hope. The mine is on King Creek at an elevation of 2,750 feet, and is 1,200 feet above river level. At this point the stream flows in a deep gully, into the east bank of which the entries have been driven (Figure 2).

At the end of June 1943, underground workings consisted of two entries along the strike of the seam and connected by two raises at 70 and 110 feet, respectively, from the portal. The lower, or main, entry was 200 feet long. No. 1 raise, nearest the portal, extended 70 feet up the dip and joined the upper entry. No. 2 raise had been driven 60 feet up the dip and a small room opened at the upper end. No. 3 raise, 150 feet from the portal, had been driven up about 30 feet.

The upper entry, 18 feet higher than the main entry, was 120 feet long and did not connect with No. 3 raise.

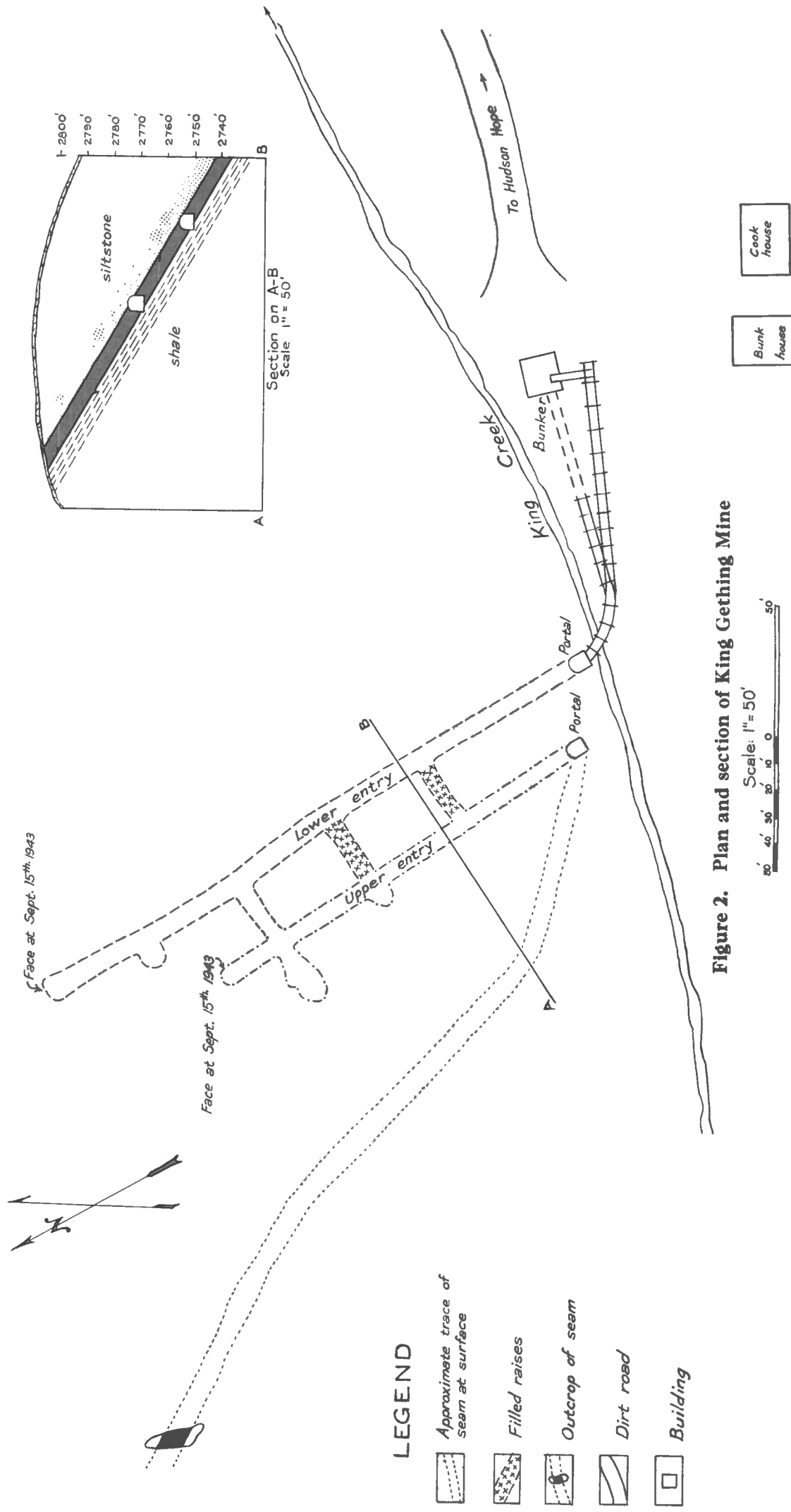


Figure 2. Plan and section of King Gething Mine

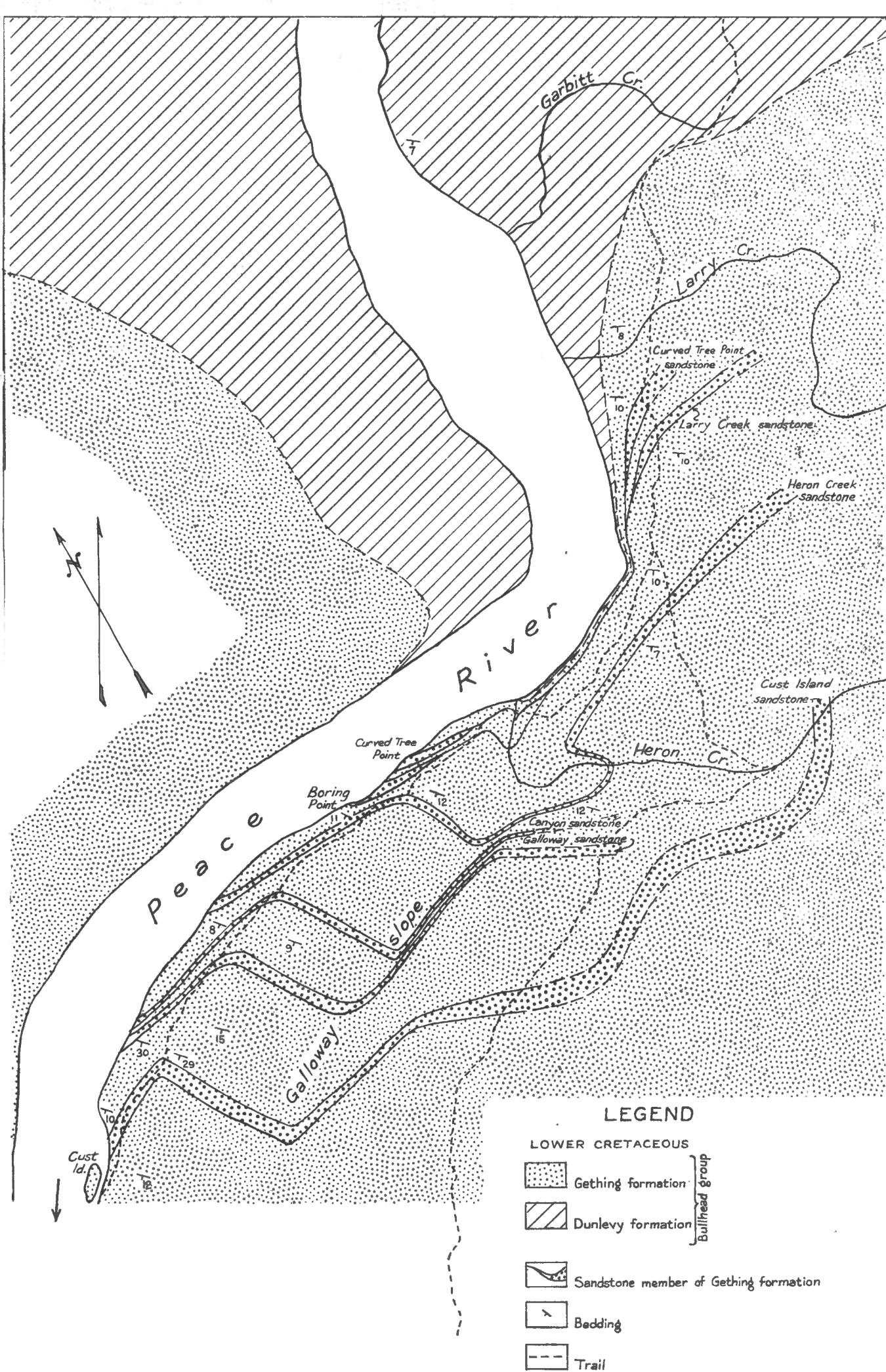


Figure 3. Upper Canyon Area

Scale: 1" = 800'

800' 400' 0 800'

On September 13, when the junior author again visited the mine, the main entry had been driven an additional 30 feet, the face then being 230 feet from the portal. Work was in progress on the upper entry, which was then 190 feet long. No. 1 and No. 2 raises had been filled in, and a room was being opened from No. 3 raise.

It is planned this winter to drive each entry to a length of 310 feet. Two new raises are expected to be worked at 230 feet and 310 feet, respectively, from the main portal.

Both shale partings and ironstone concretions cause difficulties in mining the King seam. The shale must be cleaned from the coal, and the large concretions are hard to remove without shattering the coal. Further, the 30-degree dip of the seam is not steep enough for the coal to slide down the chutes, and is too great to allow the cars to be pushed up to the face. It is necessary, therefore, to shovel the coal from the chutes into the cars. All drilling is done with a coal auger.

Production in the past has been on an extremely small scale and very irregular. Recent government assistance has, however, been very helpful and it is expected that production this winter will be between 12 and 20 tons a day.

The main problem, common to the district, is the long haul by truck to the Alaska Highway and Fort St. John. Production depends to a considerable extent on the condition of this road, which at times is impassable for trucks.

UPPER CANYON AREA

Geology

The area examined consists of a strip about a mile wide along the east side of Peace River Canyon from its head down to Cust Island, which is close to the east bank, a little above and opposite Gething Creek. This area is served by an old trail that at one time was open as far as Grant flat in the middle of the canyon. A branch leaves the main trail between Larry and Heron Creeks and follows close to the canyon cliff as far as Cust Island (Figure 3).

The area is on the western and outer gentle slope of Portage Mountain, which will be referred to as the upland surface. This surface comprises a high level bench south of the escarpment, made by the outcrop of the Heron Creek sandstone, and a smaller and somewhat lower bench north and northwest of this escarpment. It is delimited on the west by a steep slope or cliff. Where the trail crosses Garbitt Creek this cliff is about 500 yards east of the river. It continues to the mouth of Larry Creek where it merges with the precipitous wall of the canyon. Between Larry and Heron Creeks this merged cliff rises as a shear wall, at one place nearly 800 feet above the river. South of Heron Creek the upper part of the cliff continues as a high, steep slope, designated the "Galloway slope" on the map (Figure 3). Southwest of Heron Creek the lower part of the high canyon wall continues as a precipitous cliff at the edge of the river. Between the base of the Galloway slope and the cliff at the edge of the river,

is a high, nearly flat surface of an old back channel or site of the canyon at an early stage in its development. The entire area is traversed by Garbitt, Larry, and Heron Creeks, flowing westward into the canyon.

The walls of the canyon provide almost continuous rock exposures, though some are inaccessible. Exposures are also present in the creek bottoms, and some of the more resistant sandstones form protruding ledges on the upland surface.

The area is underlain by the upper part of the Dunlevy formation and lower part of the Gething. The Dunlevy-Gething contact is high in the cliff at the mouth of Larry Creek, but southward gradually descends with the dip, and, finally, disappears below river level at the mouth of Heron Creek. The Gething formation underlies all of the southern part of this upper canyon coal area. It consists of moderately thick, massive sandstones separated by thick zones of finer sandstones, siltstones, dark shales, and coal seams. The massive sandstone members are important as they are relatively well exposed and thereby aid in tracing the intervening coal seams. Six of these sandstone members are mapped (Figure 3). Their exposures trace a peculiar zig-zag pattern due to the attitude of the beds and the local topography. Where the sandstones rise in the river cliff or on the Galloway slope they follow an approximate easterly direction; where they cross the gently sloping or flat surfaces such as the upland and the old back channel, they follow a course approximately that of the strike of the beds. The Curved Tree Point sandstone is about 20 feet thick and about 90 feet above the base of the Gething formation. Thirty feet higher is the Larry sandstone, which is 20 feet thick. The Heron Creek sandstone, about 15 feet thick, lies about 160 feet above the Larry sandstone. North of the trail it becomes coarser and includes considerable fine conglomerate. The Canyon sandstone member is approximately 20 feet thick and lies 80 feet above the Heron Creek member. To the south it loses its identity, passing into fine sandstone and siltstone before reaching the shore of the river. The Galloway sandstone is about 15 feet thick and occurs 80 feet above the Canyon sandstone. The highest sandstone member, the Cust Island sandstone, is 120 feet above the Galloway. It is 25 feet thick and near the base contains beds of conglomerate with pebbles as much as 2 inches long.

From the head of the canyon to some 800 yards above Cust Island, the average strike is north 45 degrees west, and dips vary from 8 to 12 degrees southwest. There the dip increases abruptly to 25 or 30 degrees, forming a local monoclinical structure. Farther south the dip decreases and the beds resume their original attitude at Cust Island.

Coal Seams

Although several fairly thick black shale beds are present between the base of the Gething formation and the Curved Tree Point sandstone, only one coal seam was found. It occurs in a thick, black shale zone about 30 feet below the Curved Tree Point sandstone. This is the Murray seam, and was uncovered in a trench excavated at the top of the cliff a short distance west of where the Curved Tree Point sandstone

crosses the trail south of Larry Creek. The seam is 5 feet thick, including, at the middle, a 0.5-foot bed of clay ironstone.

The coal, as exposed, is considerably weathered, and the following analysis of a sample taken cannot be regarded as representative of its quality. The rank indicated by the analysis is medium volatile bituminous.

Moisture condition		As received	Dry
Proximate analysis			
Moisture	%	13.1	
Ash	%	13.7	15.8
Volatile matter	%	22.0	25.3
Fixed carbon (by difference)	%	51.2	58.9
Ultimate analysis			
Sulphur	%	0.4	0.4
Calorific value			
B.T.U. per lb. gross		9,750	11,210
Caking properties		Non-agglomerating	
Softening temperature of ash		2,050° F.	
Colour of ash		Light rose	

Downstream this seam is inaccessible in the high canyon wall. It appears to pass below river level a little southwest of the mouth of Heron Creek. It is possible that this is the seam mined by Neil Gething on the opposite bank of the river some years ago.

The beds between the Curved Tree Point and Larry sandstone members are exposed in the wall of the canyon, but are concealed on the trail south of Larry Creek and in the lower part of Heron Creek. They disappear below river level between Curved Tree Point and Boring Point. Viewed from the top of the canyon wall they include four zones of dark shale and coal. The two lowest zones contain several very thin seams of coal, the third carries a coal seam about 1 foot thick, and the top or fourth zone a seam from 6 to 8 inches thick.

The section between the Larry and Cust Island sandstone members is accessible and can be examined in the shore section at the base of the cliff between Boring Point and Cust Island.

Several thin seams of coal, from 0.2 to 0.6 foot thick, directly overlie the Larry sandstone at Boring Point. About 12 feet above this is the Boring seam, comprising, from top to bottom, 1.5 feet of canneloid coal, 0.2 foot of shiny and dull coal, 0.8 foot of black shale, and 1.0 foot of shiny coal. Analyses of the coal in the two benches follow:

Canneloid coal (1 foot)			Lower bench (1 foot)	
Moisture condition	As rec'd	Dry	As rec'd	Dry
Proximate analysis				
Moisture %	2.2		4.3	
Ash %	11.5	11.7	5.2	5.5
Volatile matter %	19.5	20.0	21.6	22.5
Fixed carbon (by difference) %	66.8	68.3	68.9	72.0
Ultimate analysis				
Sulphur %	0.7	0.7	0.8	0.9
Calorific value				
B.T.U. per lb. gross	13,060	13,360	14,070	14,690
Caking properties	Agglomerates		Good	
Colour of ash	Pinkish white		Very light pink	

About 9 feet above the Boring seam is a 0.4-foot seam of coal, and 20 feet higher is a seam 1.5 feet thick. Four feet above this is a seam 0.4-foot thick and 7 feet higher a 1.1-foot seam with a 0.1-foot shale parting. All these seams between the Larry and Heron sandstones pass below river level southwest of Boring Point. Northeast from the same point they rise on the canyon wall and are then concealed in the lower part of the valley of Heron Creek. The lower ones pass into the top of the high canyon wall northeast of the mouth of Heron Creek and the upper ones can be excavated on the steep slope between the canyon wall and the trail. However, these seams are too thin to warrant prospecting.

Some coal is present between the Heron Creek and Canyon sandstone members. In the shore section, at the top or just above the Heron Creek sandstone, is the lower of the Twin seams, 2.3 feet thick. Seven feet higher is the upper of the Twin seams, 2 feet thick. They are separated by siltstone, dark shale, and a very little coal. Both seams contain coal of fair grade and of low volatile bituminous rank. Analyses follow:

	Lower Seam		Upper Seam	
	As rec'd	Dry	As rec'd	Dry
Moisture condition				
Proximate analysis				
Moisture %	3.5		2.3	
Ash %	5.8	6.0	8.2	8.4
Volatile matter %	20.3	21.1	20.5	21.0
Fixed carbon (by difference) %	70.4	72.9	69.0	70.6
Ultimate analysis				
Sulphur %	0.6	0.7	0.8	0.8
Calorific value				
B.T.U. per lb. gross	13,810	14,310	13,510	13,830
Caking properties	Agglomerates		Agglomerates	
Softening temperature of ash	Above 2,850°F.			
Colour of ash	Light mauvey white		Light pinkish white	

The Twin seams pass below river level not far southwest of their exposure on the shore of the river. Northwestward they rise on the canyon cliff and reach the top near Boring Point. It is inferred that they extend across to the Galloway slope, up that slope and into the sides of Heron Creek Valley at the top, or just above, the Heron Creek sandstone member.

Stratigraphically above the Twin seams in the shore section is a barren zone about 65 feet thick, at the top of which is a 0.8-foot coal seam. Overlying beds up to the Canyon sandstone member contain no coal.

Several small coal seams occur between the Canyon sandstone and Galloway sandstone members. Lying on the Canyon sandstone, or equivalent beds, is the Knight seam. Its outcrop is indicated on the map by the line at the top of the Canyon sandstone, which has been traced from the shore section up the canyon wall, across the back channel, and up the Galloway slope. The Knight seam was located in a trench on the top of this sandstone near the west end of the Galloway slope and south of Heron Creek. It is 3 feet thick where exposed on the shore of the canyon, and 3.9 feet thick where opened up near the top of the Galloway slope.

The analysis of a sample taken at the bottom of the canyon is as follows:

		As received	Dry
Moisture condition			
Proximate analysis			
Moisture	%	2.6	
Ash	%	9.1	9.4
Volatile matter	%	20.7	21.2
Fixed carbon (by difference)	%	67.6	69.4
Ultimate analysis			
Sulphur	%	0.8	0.8
Calorific value			
B.T.U. per lb gross		13,510	13,870
Caking properties		Poor	
Softening temperature of ash		2,290°F.	
Colour of ash		Light rose	

This is apparently a rather low grade coal of medium volatile bituminous rank. The sample, however, was considerably weathered and the analysis is, therefore, not truly representative.

The following are analyses of two samples from the seam in the pit on the Calloway slope:

		Entire seam		Lower 1.5 feet	
Moisture condition		As rec'd	Dry	As rec'd	Dry
Proximate analysis					
Moisture	%	11.0		11.0	
Ash	%	14.9	16.8	9.3	10.4
Volatile matter	%	21.7	24.4	22.2	25.0
Fixed carbon (by difference)	%	52.4	58.8	57.5	64.6
Ultimate analysis					
Sulphur	%	0.6	0.7	0.7	0.8
Calorific value					
B.T.U. per lb gross		9,980	11,210	11,870	12,780
Caking properties		Both non-agglomerating			
Softening temperature of ash		2,140°F.		2,140°F.	
Colour of ash		Light pink		Mauve	

The best coal is in the lower part of the seam. Its rank is medium volatile bituminous.

Six feet above the Knight seam is a 1.2-foot seam. Eleven feet higher is 0.4 foot of coal overlain by 0.4 foot of shale and 0.4 foot of coal. Twelve feet higher still is a 1.2-foot seam. No others were noted between this seam and the Galloway sandstone. Some beds, however, are concealed in the shore section.

The beds between the Galloway and Cust Island sandstones contain very little coal. About 0.3-foot of coal is found 10 feet above the Galloway sandstone and a small variable seam, a little less than 1 foot thick, occurs immediately below the Cust Island sandstone.

DUNLEVY CREEK-CUST CREEK AREA

Geology

Only a reconnaissance examination was made of the territory between Dunlevy and Cust Creeks. Large seams have been reported, but none was found within a few miles of the road.

Topographically the area includes the west side of Butler Ridge and the southern parts of the valleys of Dunlevy, Gravel Hill, and Cust Creeks.

Butler Ridge is underlain by the Dunlevy formation, and the lower parts of Dunlevy and Gravel Hill Valleys by the Gething formation. Both formations are exposed in Cust Valley. The structure includes the steep west limb of a flat-topped anticline on the west side of Butler Ridge, and the more gentle slopes of the same limb in Dunlevy and Gravel Hill Valleys. Dips on Butler Ridge are from 40 to 70 degrees southwest, and in Dunlevy Valley from 2 to 5 degrees southwest. The structure on Cust Creek is faulted and dips are less regular.

Coal Seams

No seams thick enough to mine are exposed in the canyon of Dunlevy Creek, or in the canyon or upper reaches of the east fork of Dunlevy Creek and its tributaries. Only thin seams were found on Gravel Hill and Cust Creeks.

At and near the Packwood mine, at the south end of a spur from Butler Ridge, two thin seams occur in the upper conglomerate-bearing part of the Dunlevy formation.

The No. 1 seam, worked in the mine, has an average thickness of 30 inches in the upper level and 20 inches in the lower level. The lower 10 inches of the seam is finely crushed, and movement is also indicated by slickensides on both walls. The foot-wall rock is silty shale and the hanging-wall consists of hard, massive sandstone. The seam was sampled at the face in both levels. Analyses are as follows:

	Upper level		Lower level	
	As rec'd	Dry	As rec'd	Dry
Moisture condition				
Proximate analysis				
Moisture %	5.0		4.5	
Ash %	6.1	6.4	4.7	4.9
Volatile matter %	18.9	19.9	19.1	20.0
Fixed carbon (by difference) %	70.0	73.7	71.7	75.1
Ultimate analysis				
Sulphur %	0.6	0.6	0.6	0.6
Calorific value				
B.T.U. per lb gross	13,220	13,920	13,580	14,230
Caking properties	Agglomerates		Agglomerates	
Colour of ash	Very light pink		Very light pink	

This is a low volatile bituminous coal.

The No. 2 seam is 15.5 feet above the No. 1 seam and is 30 inches thick where exposed in a pit. It is underlain by 3.5 feet of fine siltstone that grades downward into the hard, coarse sandstone that forms the hanging-wall of No. 1 seam.

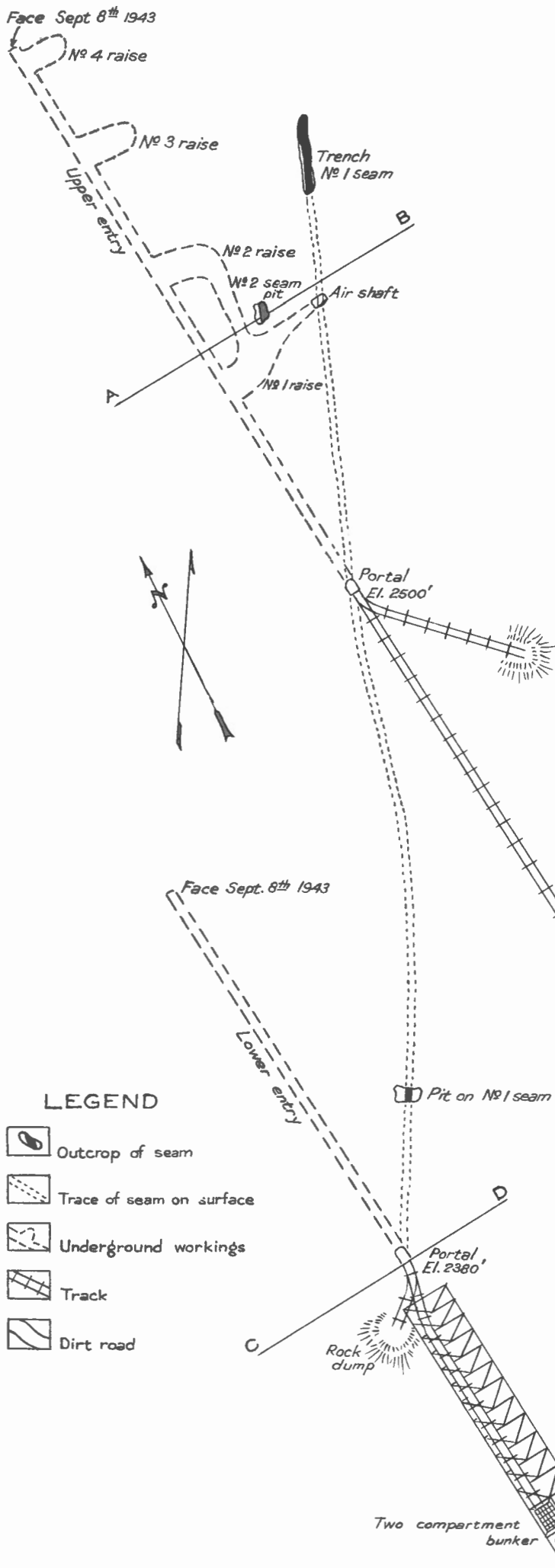
Packwood Mine

Packwood coal mine (Figure 4) is 22 miles west of Hudson Hope. It is situated on the steep, southern end of a south-trending spur of Butler Ridge, 1 mile north of the river by road and about 480 feet above river level.

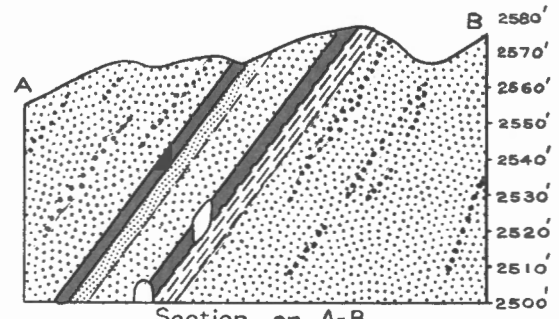
The property was acquired by Mr. George Packwood in 1940. During the same year the mine was opened and 125 tons of coal taken out. There was no production in 1941, but during the following winter the mine was reopened and approximately 104 tons of coal were trucked to Fort St. John. Hauling was stopped in the spring of 1943 due to the bad condition of the road, although 100 tons of coal remained to be transported. During the summer of 1943 the remaining 100 tons were removed.

Underground workings consist of two entries along the strike of the seam; one at an elevation of 2,500 feet, and the other at an elevation of 2,380 feet. Prior to February 1943, only the upper entry existed, but work is now confined to the new, lower entry.

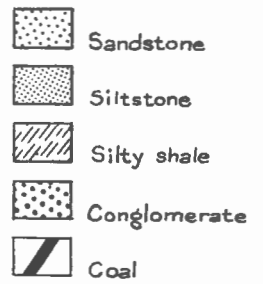
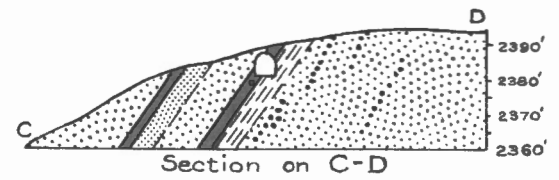
The upper entry is 230.6 feet long, in which distance four raises, each about 30 feet high, have been put up.



SECTIONS



Scale 1" = 50'



LEGEND

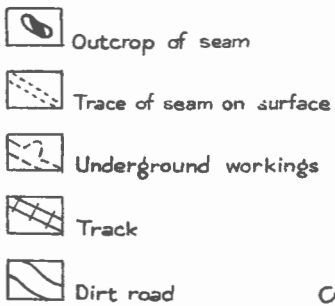
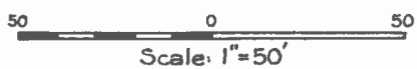


Figure 4. Plan and sections of Packwood Mine



No. 1 raise is connected by a crosscut to No. 2 raise, and extends to the surface as an air shaft. The seam on this level is 3.1 feet thick at the portal, but thins to 2.6 feet at the face. It contains no partings or concretionary bodies, and consists mainly of bright coal.

By September 7, 1943, the lower entry had been driven 150 feet. On this level the seam measures 2 feet at the portal and 1.6 feet at the face. A large, lens-like projection of sandstone from the hanging-wall starts 66 feet from the portal and persists for 30 feet. This 'cut-out' locally pinches the seam to less than 1.8 inches.

Coal removed from the upper entry had to be lowered by cable down a steeply inclined track to an old bunker at the foot of the hill, a vertical distance of nearly 200 feet. This required a hoist at the portal. The new entry is 120 feet lower, and coal is now trammed a short distance on a trestle and emptied into a newly constructed, 2-compartment bunker having a capacity of 2,400 cubic feet, or about 65 tons. This bunker is provided with a screen that separates most of the slack.

Work planned for this winter (1943-44) included completing the lower entry as far in as the present face of the upper entry, and then driving raises between the two entries. No large amount of coal will be removed until work in the lower entry is complete.

Removal of coal from the raises is facilitated by the high dip of the seam, which is 54 degrees to the southwest. This allows the coal to slide into the cars from the chutes. Mining is hampered by the necessity of removing considerable rock with the coal. For this reason a compressed air drill is used in the drift, whereas coal augers are used in the raises.

No partings are present in the seam, but some wall-rock must be removed.

The coal is hauled by truck to Fort St. John over a poor road, a distance of about 83 miles.