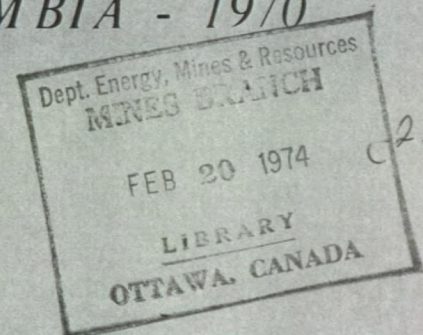


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DEPARTMENT OF
ENERGY, MINES AND RESOURCES
MINES BRANCH
OTTAWA

*EVALUATION OF CANADIAN COMMERCIAL
COALS: ALBERTA AND
BRITISH COLUMBIA - 1970*



T. E. TIBBETTS AND W. J. MONTGOMERY

FUELS RESEARCH CENTRE

MAY 1971

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EVALUATION OF CANADIAN COMMERCIAL COALS:
ALBERTA AND BRITISH COLUMBIA - 1970

by

T.E. Tibbetts* and W.J. Montgomery**

ABSTRACT

The physical and chemical analyses of thirty-four coal samples are reported. In addition, the chemical analyses of ash of most of the same coals are reported in a separate section.

The samples were taken and analyzed by the Mines Branch during the year 1970. They represent the production on a specified day of the coals as commercially prepared at the mine or, referring to the channel samples, the coal seam where mining was in progress or planned.

Coals from thirteen mining operations in two of the three coal mining provinces of western Canada, Alberta and British Columbia, are represented; they include subbituminous and bituminous coals.

*Head, Coal and Peat Resources Evaluation Section and **Head, Solid Fuels Laboratory, Fuels Research Centre, Mines Branch, Department of Energy, Mines and Resources, Ottawa, Canada.

Direction des mines
Circulaire d'information IC 270
EVALUATION DES HOUILLES COMMERCIALES CANADIENNES:
ALBERTA ET COLOMBIE-BRITANNIQUE - 1970

par

T.E. Tibbetts* et W.J. Montgomery**

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RESUME

Les auteurs décrivent les résultats d'analyses physiques et chimiques de 34 échantillons de houille. Ils donnent de plus les résultats de l'analyse chimique de la cendre de la plupart de ces charbons dans une section séparée.

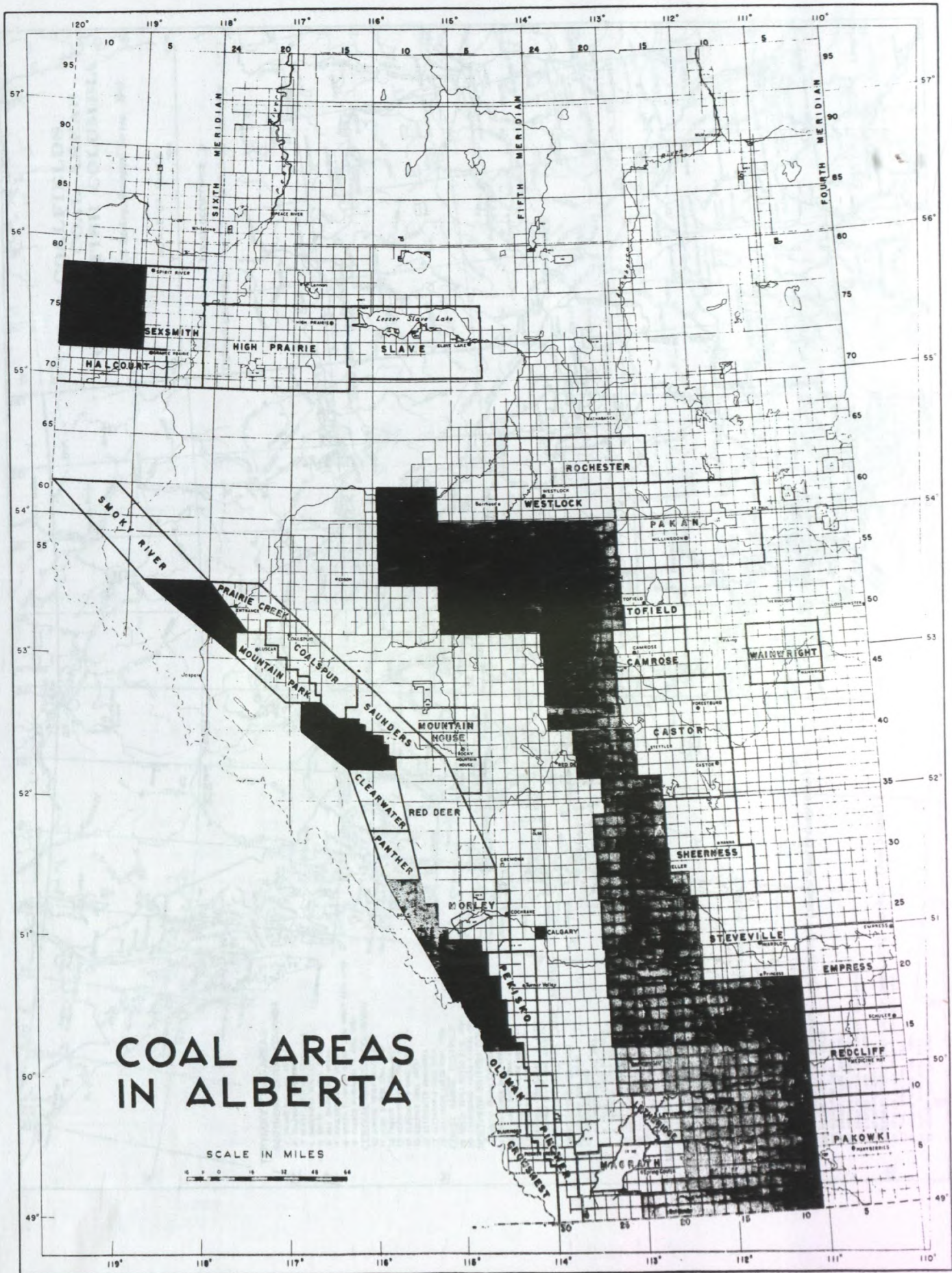
Les échantillons ont été prélevés et analysés en 1970 par la Direction des mines. Ils sont représentatifs de la production journalière de la houille préparée commercialement à la mine, ou, dans le cas des échantillons de veines, de la couche de houille où l'extraction était en cours ou projetée.

Les échantillons proviennent de 13 charbonnages dans deux provinces de l'Ouest, soit l'Alberta et la Colombie-Britannique; ils comprennent de la houille maigre et de la houille grasse.

*Chef, Section de l'évaluation des ressources en houille et en tourbe, et
**Chef, du Laboratoire des combustibles solides, Direction des mines,
ministère de l'Energie, des Mines et des Ressources, Ottawa, Canada.

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COALFIELDS AND COAL AREAS OF BRITISH COLUMBIA

Prepared by B. R. Mackay, Geological Survey, 1946.

SCALE OF MILES
0 100 200

Local occurrence o

Defined boundary — Undefined boundary - - -



TERTIARY COAL AREAS

SOUTHERN BRITISH COLUMBIA

- 1 PRINCETON COAL AREA
- 2 TOLAMEN COAL AREA
- 3 MERRITT-NICOLA COAL AREA
- 4 QUILCHENA COAL AREA
- 5 WHITE LAKE COAL AREA
- 6 HAT CREEK COAL AREAS
- 7 KAMLOOPS COAL AREAS
- 8 NORTH THOMPSON RIVER (CHU CHUA) COAL AREA
- 9 FRASER RIVER DELTA COAL AREA

CENTRAL BRITISH COLUMBIA

- 10 HORNBY RIVER COAL AREA
- 11 FORT GEORGE COAL AREA
- 12 FRASER LAKE COAL AREA
- 13 NECHAKO RIVER COAL AREA
- 14 BLACKWATER COAL AREA
- 15 QUESNEL COAL AREA
- 16 COTTONWOOD COAL AREA
- 17 ALEXANDRIA COAL AREA
- 18 DRIFTWOOD CREEK COAL AREA

COAST RANGE DISTRICT

- 19 BELLA COOLA RIVER COAL AREA
- 20 KHASAGAN (DEAN RIVER) COAL AREA

NORTHERN BRITISH COLUMBIA

(Liard River Drainage Basin)

- 21 COAL RIVER COAL AREA
 - 22 WYLAND RIVER COAL AREA
 - 23 DEASE RIVER COAL AREA
 - 24 RAPID RIVER COAL AREA
- GRAHAM ISLAND
- 25 SIGNUM POINT COAL AREA

UPPER CRETACEOUS COAL AREAS

- VANCOUVER ISLAND
- 26 SNOUASH COAL AREAS
 - 27 GOMIX COAL AREA
 - a CUMBERLAND COAL AREA
 - b TSABLE RIVER COAL AREA
 - c CAMPBELL RIVER COAL AREA
 - 28 NANAIMO COAL AREAS
 - 29 COWICHAN COAL AREA
 - 30 ALBERNI COAL AREA
- GRAHAM ISLAND

LOWER CRETACEOUS COAL AREAS

SOUTHEASTERN BRITISH COLUMBIA COAL DISTRICT

- 32 GROSSEST COAL AREAS
- a FERRIE BASIN COAL AREA
- b CORBIN BASIN COAL AREA
- c TENT AND TAYLOR MOUNTAIN COAL AREA
- 33 FLATHEAD RIVER COAL AREAS
- 34 UPPER ELK RIVER COAL AREA

NORTHEASTERN BRITISH COLUMBIA COAL DISTRICT

- 35 PEACE RIVER CANYON COAL AREA
- 36 BUTLER RIDGE COAL AREAS
- 37 CARBON RIVER COAL AREA
- 38 FALLS CREEK COAL AREA
- 39 HASLER CREEK COAL AREA
- 40 HALFNAY-SIKANNI CHIEF RIVERS COAL AREAS
- 41 MINAKER RIVER COAL AREA

CENTRAL BRITISH COLUMBIA COAL DISTRICT (Skeena River Drainage Basin)

- 42 TELKWA RIVER COAL AREAS
- 43 CLARK-FORM COAL AREAS
- 44 CHISHOLM LAKE COAL AREA
- 45 KATHLYN LAKE COAL AREA
- 46 ZYMOLTZ RIVER (COAL CREEK) COAL AREAS
- 47 XISPIDZ RIVER COAL AREA
- 48 BROWNDOG COAL AREA

NORTHWESTERN BRITISH COLUMBIA COAL DISTRICT (Alain District)

- 49 STIRINE RIVER (TUYA RIVER) COAL AREA
- 50 TAKU RIVER COAL AREA
- 51 INKLIN RIVER COAL AREA
- 52 SLOKO RIVER COAL AREA
- 53 GRAHAM INLET COAL AREA

COAL AREAS AND PRINCIPAL MINES
(with approximate production in 1970 in thousands of short tons)

ALBERTA

1. Subbituminous

Ardley Area

Sisson's Mine (No. 809) 21

Castor Area

Alberta Coal Ltd. (No. 1046) 370

Forestburg Collieries Ltd. (No. 1578) 700

Drumheller Area

Century Coals Limited (No. 1742) 85

Edmonton Area

Star-Key Mines Ltd. (No. 1626) 25

Pembina Area

Alberta Coal Ltd. (No. 1757) 2,400

Calgary Power Ltd. (No. 1769) 240

Sheerness Area

Alberta Coal Ltd. (No. 443) 100

2. Bituminous

Cascade Area

The Canmore Mines Ltd. (No. 2) 330

Crowsnest Area

Coleman Collieries Ltd. (Nos. 1695, 1747, 1764) 1,000

Mountain Park Area

Cardinal River Coals Ltd. (No. 1768) 550

Smokey River Area

McIntyre Coal Mines Ltd. (No. 1765) 1,000

BRITISH COLUMBIA

Southeastern Coal District

Kaiser Resources Limited 3,480 .
(Michel Preparation Plant)

INTRODUCTION

In order to keep in close touch with any change in coal quality, and to ensure that such changes are significant and not due to improper sampling techniques, the Fuels Research Centre has had members of the staff collecting samples of commercially prepared coals at the mines in eastern and western Canadian coalfields on a more or less continuing basis since 1954. The project (No. 2-2-9), "Survey of Canadian Commercial Coals", is conducted under the direction of the Coal and Peat Resources Evaluation Section and forms the basis of information on Canadian coals published periodically in the "Analysis Directory of Canadian Coals".

Under this project all samples are collected in accordance with recognized reliable specifications and for the most part are representative of the production for one day at the mines. Normal production and preparation procedures are followed at the mine during the sampling periods, allowing the samples to be truly representative of the commercially prepared products.

Production at mines in western Canada was sampled by C.F.J. Rozenhart of the Western Regional Laboratory, Metals Reduction and Energy Centre, with assistance from the mine operators. In some instances where the mine was not in commercial production, channel samples were taken to permit some assessment of the potential quality of the commercial coal. This fact is noted where applicable.

The gross samples were crushed and reduced in volume in the field prior to being shipped to Ottawa for analysis. The Western Regional Laboratory has a specially equipped sampling vehicle for this purpose.

This report contains the analyses of commercial coal samples and, for some mines, channel samples collected under this project in Alberta and British Columbia during the year 1970. In addition to the analyses of the coals, the chemical analysis of the ash is given for most of the samples. All analyses were conducted by the Fuels Research Centre, substantially by the Solid Fuels Laboratory.

The general analyses of subbituminous coals from Alberta are reported in Section I on the equilibrium ("in situ") moisture basis. Section II contains the general analyses on the as-received moisture basis of bituminous coals from Alberta and British Columbia. The ultimate analyses on the as-received moisture basis and the chemical analyses of ash are reported for selected samples in Section III.

Registered trade names of coals, when known, are shown in quotations.

GLOSSARY OF ABBREVIATED TERMS

sq	-	square-hole screen
rd	-	round-hole screen
-	-	not determined
ASTM	-	American Society for Testing and Materials

SECTION 1

GENERAL ANALYSES OF SUBBITUMINOUS COALS FROM ALBERTA

(Analyses are reported on Equilibrium Moisture Basis)

Mine OperatorALBERTA COAL LIMITED - No. 1046
 Mine LocationHalkirk, Castor Area, Alberta
 Name of Mine or Coal "Cortel", "Vesta", "Sterling" "Victory", "Blue Flame"

Date Sampled	14-10-70	14-10-70	14-10-70
Weight Sampled (approx.) tons	2040	25	20
Size: Mine Designation	Lump	Egg	Nut
Screen Opening, in.	Plus 4 1/2 sq	4 1/2 to 2 sq	2 to 1 1/4 sq
FRC Laboratory No.	3340-70	3341-70	3342-70
Proximate Analysis			
Moisture %	25.8	24.2	24.2
Ash %	6.1	7.3	7.0
Volatile Matter %	30.2	30.8	29.1
Fixed Carbon %	37.9	37.6	39.7
Sulphur %	0.4	0.4	0.4
Calorific Value Btu/lb.	8670	8690	8660
Ash Fusibility			
Initial Temp.°F	2050	1980	1840
Softening Temp:(a) Spherical°F	2110	2060	2030
(b) Hemispherical.°F	2200	2240	2200
Fluid Temp.°F	2450	2450	2440
Grindability Index (Hardgrove)	-	-	-
Free Swelling Index (ASTM)	-	-	-
Classification by Rank (ASTM)	Subbituminous C		

Mine OperatorALBERTA COAL LIMITED - No. 1046
 Mine LocationHalkirk, Castor Area, Alberta
 Name of Mine or Coal "Cortel," "Vesta", "Sterling", "Victory," "Blue Flame"

Date Sampled	14-10-70	14-10-70
Weight Sampled (approx.) tons	20	40
Size: Mine Designation	Stoker	Slack
Screen Opening in.	1 1/4 to 5/8 sq	Minus 5/8 sq
FRC Laboratory No.	3343-70	3344-70
Proximate Analysis		
Moisture %	25.4	26.0
Ash %	7.1	8.2
Volatile Matter %	32.2	29.5
Fixed Carbon %	35.3	36.3
Sulphur %	0.3	0.5
Calorific Value Btu/lb.	8550	8270
Ash Fusibility		
Initial Temp.°F	1960	1950
Softening Temp:(a) Spherical°F	2060	2050
(b) Hemispherical.°F	2230	2260
Fluid Temp.°F	2620	2630
Grindability Index (Hardgrove)	29	33
Free Swelling Index (ASTM)	-	-
Classification by Rank (ASTM)	Subbituminous C	

Mine OperatorALBERTA COAL LIMITED - No. 1757
Mine LocationWabumun, Pembina Area, Alberta
Name of Mine or Coal "Whitewood"

Date Sampled	3-11-70
Weight Sampled (approx.) tons	-
Size: Mine Designation	Not Specified
Screen Opening in.	(From Stock Pile)
FRC Laboratory No.	3434-70
Proximate Analysis	
Moisture %	19.5
Ash %	13.5
Volatile Matter %	27.3
Fixed Carbon %	29.7
Sulphur %	0.4
Calorific Value Btu/lb.	8200
Ash Fusibility	
Initial Temp.°F	2200
Softening Temp:(a) Spherical°F	2360
(b) Hemispherical.°F	2540
Fluid Temp.°F	2670
Grindability Index (Hardgrove)	-
Free Swelling Index (ASTM)	-
Classification by Rank (ASTM)	Subbituminous 'B

Mine Operator ALBERTA COAL LIMITED - No. 443

Mine Location Sheerness, Sheerness Area, Alberta

Name of Mine or Coal "Roselyn", "Berry Creek", "Volcano"

Date Sampled	28-10-70	28-10-70	28-10-70	28-10-70
Weight Sampled (approx.) tons	20	20	40	20
Size: Mine Designation	Egg	Nut	Stoker	Slack
Screen Opening in.	4 1/2 to 2 rd	2 rd to 1 1/4 sq	1 1/4 to 5/8 sq	Minus 5/8 sq
FRC Laboratory No.	3404-70	3405-70	3406-70	3407-70
Proximate Analysis				
Moisture %	27.0	26.8	27.6	27.6
Ash %	5.8	6.7	6.2	8.0
Volatile Matter %	28.9	29.6	32.6	28.4
Fixed Carbon %	38.3	36.9	33.6	36.0
Sulphur %	0.4	0.4	0.4	0.4
Calorific Value Btu/lb.	8120	8250	8150	7920
Ash Fusibility				
Initial Temp.°F	1900	1900	1910	1930
Softening Temp:(a) Spherical....°F	1980	1970	1990	1990
(b) Hemispherical.°F	2040	2050	2060	2130
Fluid Temp.°F	2260	2250	2300	2300
Grindability Index (Hardgrove)	-	-	32	33
Free Swelling Index (ASTM)	-	-	-	-
Classification by Rank (ASTM)	Subbituminous C			

Mine Operator CALGARY POWER LIMITED - No. 1769
Mine Location Seba Beach, Pembina Area, Alberta
Name of Mine or Coal "Highvale"

Date Sampled	3-11-70
Weight Sampled (approx.) tons	-
Size: Mine Designation	Not Specified
Screen Opening in.	Minus 1
FRC Laboratory No.	3435-70
Proximate Analysis	
Moisture %	19.8
Ash %	14.5
Volatile Matter %	25.8
Fixed Carbon %	39.9
Sulphur %	0.3
Calorific Value Btu/lb.	8170
Ash Fusibility	
Initial Temp.°F	2310
Softening Temp:(a) Spherical°F	2430
(b) Hemispherical.°F	2580
Fluid Temp.°F	2700+
Grindability Index (Hardgrove)	48
Free Swelling Index (ASTM)	-
Classification by Rank (ASTM)	Subbituminous B

Mine OperatorCENTURY COALS LIMITED - No. 1742

Mine Location East Coulee, Drumheller Area, Alberta

Name of Mine or Coal "Atlas", "Commander", "New Wild Fire", "New Murray",
"Western Gem", "Hy-Grade", "Purity Hard".

Date Sampled	29-10-70	29-10-70	29-10-70
Weight Sampled (approx.) tons	40	20	20
Size: Mine Designation	Lump	Egg	Nut
Screen Opening in.	Plus 4 1/2 rd	4 1/2 to 2 rd	2 to 1 1/4 rd
FRC Laboratory No.	3408-70	3409-70	3410-70
Proximate Analysis			
Moisture %	20.1	18.5	19.3
Ash %	5.6	7.8	7.6
Volatile Matter %	29.9	32.1	31.1
Fixed Carbon %	44.4	41.6	42.0
Sulphur %	0.4	0.4	0.4
Calorific Value Btu/lb.	9420	9410	9400
Ash Fusibility			
Initial Temp.°F	1990	2000	2030
Softening Temp:(a) Spherical°F	2060	2210	2220
(b) Hemispherical.°F	2170	2360	2350
Fluid Temp.°F	2580	2600	2590
Grindability Index (Hardgrove)	-	-	-
Free Swelling Index (ASTM)	-	-	-
Classification by Rank (ASTM)	Subbituminous B		

Mine Operator CENTURY COALS LIMITED - No. 1742

Mine Location East Coulee, Drumheller Area, Alberta

Name of Mine or Coal "Atlas", "Commander", "New Wild Fire", "New Murray",
"Western Gem", "Hy-Grade", "Purity Hard".

Date Sampled	29-10-70	29-10-70
Weight Sampled (approx.) tons	60	20
Size: Mine Designation	Stoker	Slack
Screen Opening in.	1 1/4 to 5/8 rd	Minus 5/8 rd
FRC Laboratory No.	3411-70	3412-70
Proximate Analysis		
Moisture %	19.4	19.1
Ash %	10.5	10.3
Volatile Matter %	30.2	30.1
Fixed Carbon %	39.9	40.5
Sulphur %	0.5	0.5
Calorific Value Btu/lb.	8930	8920
Ash Fusibility		
Initial Temp.°F	2030	2060
Softening Temp:(a) Spherical°F	2220	2280
(b) Hemispherical.°F	2400	2420
Fluid Temp.°F	2590	2610
Grindability Index (Hardgrove)	33	34
Free Swelling Index (ASTM)	-	-
Classification by Rank (ASTM)	Subbituminous B	

Mine OperatorFORESTBURG COLLIERIES LIMITED-No. 1578

Mine LocationForestburg, Castor Area, Alberta

Name of Mine or Coal "Diplomat", "Ambassador"

Date Sampled	15-10-70	15-10-70	15-10-70
Weight Sampled (approx.) tons	40	20	25
Size: Mine Designation	Lump	Egg	Nut
Screen Opening in.	Plus 4 1/2 sq	4 1/2 to 2 sq	2 to 1 sq
FRC Laboratory No.	3345-70	3346-70	3347-70
Proximate Analysis			
Moisture %	25.5	26.0	25.2
Ash %	4.8	5.0	6.5
Volatile Matter %	33.5	30.4	32.0
Fixed Carbon %	36.2	38.6	36.3
Sulphur %	0.4	0.5	0.5
Calorific Value Btu/lb.	8820	8670	8600
Ash Fusibility			
Initial Temp.°F	2010	1990	2170
Softening Temp:(a) Spherical°F	2070	2060	2280
(b) Hemispherical.°F	2140	2140	2360
Fluid Temp.°F	2400	2400	2600
Grindability Index (Hardgrove)	-	-	-
Free Swelling Index (ASTM)	-	-	-
Classification by Rank (ASTM)	Subbituminous C		

Mine Operator FORESTBURG COLLIERIES LIMITED - No. 1578

Mine Location Forestburg, Castor Area, Alberta

Name of Mine or Coal "Diplomat", "Ambassador"

Date Sampled	15-10-70	15-10-70
Weight Sampled (approx.) tons	25	40
Size: Mine Designation	Stoker	Slack
Screen Opening in.	1 to 1/2 sq	Minus 1/2 sq
FRC Laboratory No.	3348-70	3349-70
Proximate Analysis		
Moisture %	25.8	25.4
Ash %	6.2	7.8
Volatile Matter %	29.6	29.1
Fixed Carbon %	38.4	37.7
Sulphur %	0.4	0.5
Calorific Value Btu/lb.	8640	8460
Ash Fusibility		
Initial Temp.°F	2150	2190
Softening Temp: (a) Spherical°F	2260	2310
(b) Hemispherical.°F	2360	2400
Fluid Temp.°F	2540	2510
Grindability Index (Hardgrove)	31	32
Free Swelling Index (ASTM)	-	-
Classification by Rank (ASTM)	Subbituminous C	

Mine OperatorSISSON'S MINE - No. 809

Mine LocationAlix, Ardley Area, Alberta

Name of Mine or Coal "Sisson's"

Date Sampled	30-10-70	30-10-70
Weight Sampled (approx.) tons	-	-
Size: Mine Designation	Channel Sample from Crusher Pit	Channel Sample from Main Pit
FRC Laboratory No.	3401-70	3402-70
Proximate Analysis		
Moisture %	18.4	19.6
Ash %	9.4	7.9
Volatile Matter %	28.6	28.7
Fixed Carbon %	43.6	43.8
Sulphur %	0.2	0.3
Calorific Value Btu/lb.	9100	9130
Ash Fusibility		
Initial Temp.°F	2220	2170
Softening Temp:(a) Spherical°F	2240	2220
(b) Hemispherical.°F	2370	2280
Fluid Temp.°F	2480	2460
Grindability Index (Hardgrove)	-	44
Free Swelling Index (ASTM)	-	-
Classification by Rank (ASTM)	Subbituminous B	

Mine Operator STAR-KEY MINES LIMITED - No. 1626

Mine Location St. Albert, Edmonton Area, Alberta

Name of Mine or Coal "Star-Key"

Date Sampled	4-11-70	4-11-70	4-11-70
Weight Sampled (approx.) tons	20	20	15
Size: Mine Designation	Lump	Egg	Nut
Screen Opening in.	Plus 4 1/2 rd	4 1/2 rd to 1 3/4 sq	1 3/4 to 1 1/4 sq
FRC Laboratory No.	3429-70	3430-70	3431-70
Proximate Analysis			
Moisture %	23.1	23.6	24.1
Ash %	9.1	8.0	8.5
Volatile Matter %	29.5	28.2	26.9
Fixed Carbon %	38.3	40.2	40.5
Sulphur %	0.2	0.3	0.2
Calorific Value Btu/lb.	8510	8580	8460
Ash Fusibility			
Initial Temp.°F	2300	2260	2250
Softening Temp:(a) Spherical°F	2370	2300	2350
(b) Hemispherical.°F	2510	2430	2500
Fluid Temp.°F	2700+	2680	2700+
Grindability Index (Hardgrove)	-	-	-
Free Swelling Index (ASTM)	-	-	-
Classification by Rank (ASTM)	Subbituminous C		

Mine Operator STAR-KEY MINES LIMITED - No. 1626
 Mine Location St. Alberta, Edmonton Area, Alberta
 Name of Mine or Coal "Star-Key"

Date Sampled	4-11-70	4-11-70
Weight Sampled (approx.) tons	15	15
Size: Mine Designation	Stoker	Slack
Screen Opening in.	1 1/4 to 7/16 sq	Minus 7/16 sq
FRC Laboratory No.	3432-70	3433-70
Proximate Analysis		
Moisture %	23.6	23.2
Ash %	8.6	12.1
Volatile Matter %	28.3	27.3
Fixed Carbon %	39.5	37.4
Sulphur %	0.2	0.2
Calorific Value Btu/lb.	8520	8020
Ash Fusibility		
Initial Temp. °F	2330	2320
Softening Temp: (a) Spherical °F	2360	2430
(b) Hemispherical. °F	2540	2560
Fluid Temp. °F	2700	2680
Grindability Index (Hardgrove)	32	31
Free Swelling Index (ASTM)	-	-
Classification by Rank (ASTM)	Subbituminous C	

SECTION II

GENERAL ANALYSES OF BITUMINOUS COALS
FROM ALBERTA AND BRITISH COLUMBIA

(Analyses are reported on As-Received Moisture Basis)

Mine Operator THE CANMORE MINES LIMITED - No. 2

Mine Location Canmore, Cascade Area, Alberta

Name of Mine or Coal "Canmore Smokeless".

Date Sampled	22-10-70	22-10-70
Weight Sampled (approx.) tons	30	70
Size: Mine Designation	Stoker	Slack
Screen Opening in.	1 1/4 to 5/16 tyrod	Minus 5/16 tyrod
FRC Laboratory No.	3447-70	3448-70
Proximate Analysis		
Moisture %	6.8	7.9
Ash %	8.0	7.7
Volatile Matter %	11.3	11.6
Fixed Carbon %	73.9	72.8
Sulphur %	0.7	0.7
Calorific Value Btu/lb.	13,240	13,110
Ash Fusibility		
Initial Temp.°F	2680	2680
Softening Temp:(a) Spherical°F	2750+	2750+
(b) Hemispherical.°F	2750+	2750+
Fluid Temp.°F	2750+	2750+
Grindability Index (Hardgrove)	61	65
Free Swelling Index (ASTM)	Non-Agglomerate	-
Classification by Rank (ASTM)	Semianthracite	

Mine Operator CARDINAL RIVER COALS LIMITED - No. 1768

Mine Location Hinton, Mountain Park Area, Alberta

Name of Mine or Coal "Cardinal"

Date Sampled	7-10-70
Weight Sampled (approx.) tons	5100*
Size: Mine Designation	Not Designated
Screen Opening in.	Minus 1 3/4
FRC Laboratory No.	3338-70
Proximate Analysis	
Moisture %	1.2
Ash %	9.3
Volatile Matter %	21.6
Fixed Carbon %	67.9
Sulphur %	0.2
Calorific Value Btu/lb.	13,880
Ash Fusibility	
Initial Temp.°F	2110
Softening Temp:(a) Spherical°F	2410
(b) Hemispherical.°F	2550
Fluid Temp.°F	2600
Grindability Index (Hardgrove)	32
Free Swelling Index (ASTM)	4
Classification by Rank (ASTM)	Medium-Volatile Bituminous

* Automatic Sampler

Mine Operator COLEMAN COLLIERIES LIMITED *

Mine Location Coleman, Crowsnest Area, Alberta

Name of Mine or Coal "Coleman", "Vicary Creek"

Date Sampled	21-10-70
Weight Sampled (approx.) tons	800
Size: Mine Designation	"Export" Coal
Screen Opening in.	Minus 2 rd
FRC Laboratory No.	3450-70
Proximate Analysis	
Moisture	4.0
Ash	9.8
Volatile Matter	22.2
Fixed Carbon	64.0
Sulphur	0.6
Calorific Value	13,330
Ash Fusibility	
Initial Temp.°F	2750+
Softening Temp:(a) Spherical°F	2750+
(b) Hemispherical.°F	2750+
Fluid Temp.°F	2750+
Grindability Index (Hardgrove)	75
Free Swelling Index (ASTM)	5+
Classification by Rank (ASTM) .s.....	Medium-Volatile Bituminous

* Coleman Collieries Ltd. operate three mines - nos. 1695, 1747 and 1764.
The origin of this coal was not designated.

Mine OperatorKAISER RESOURCES LIMITED
Mine LocationMichel Preparation Plant, Michel, British Columbia
Name of Mine or CoalVarious Mines

Date Sampled	21-10-70
Weight Sampled (approx.) tons	40
Size: Mine Designation	Not Designated
Screen Opening in.	Minus 2 sq
FRC Laboratory No.	3449-70
Proximate Analysis	
Moisture %	3.4
Ash %	8.8
Volatile Matter %	24.7
Fixed Carbon %	63.1
Sulphur %	0.5
Calorific Value Btu/lb.	13,510
Ash Fusibility	
Initial Temp.°F	2750+
Softening Temp:(a) Spherical°F	2750+
(b) Hemispherical.°F	2750+
Fluid Temp.°F	2750+
Grindability Index (Hardgrove)	86
Free Swelling Index (ASTM)	8
Classification by Rank (ASTM)	Medium-Volatile Bituminous

Mine OperatorMCINTYRE COAL MINES LIMITED - No. 1765
 Mine LocationGrande Cache, Smokey River Area, Alberta
 Name of Mine or CoalMcIntyre

Date Sampled	6-10-70
Weight Sampled (approx.) tons	3000*
Size: Mine Designation	Not Designated
Screen Opening in.	Minus 1 1/2 sq
FRC Laboratory No.	3339-70
Proximate Analysis	
Moisture %	2.5
Ash %	6.1
Volatile Matter %	19.4
Fixed Carbon %	72.0
Sulphur %	0.4
Calorific Value Btu/lb.	14,270
Ash Fusibility	
Initial Temp.°F	2260
Softening Temp:(a) Spherical°F	2380
(b) Hemispherical.°F	2460
Fluid Temp.°F	2510
Grindability Index (Hardgrove)	-
Free Swelling Index (ASTM)	9
Classification by Rank (ASTM)	Low-Volatile Bituminous

* Automatic Sampler

SECTION III
ULTIMATE ANALYSES
AND
ANALYSES OF ASH
OF COALS
FROM
ALBERTA AND BRITISH COLUMBIA

(Ultimate Analyses on As-Received Moisture Basis)

Mine OperatorALBERTA COAL LIMITED - No. 1046
 Mine LocationHalkirk, Castor Area, Alberta
 Name of Mine or Coal!"Cordel", "Vesta", "Sterling", "Victory", "Blue Flame"

Date Sampled	14-10-70	14-10-70
Weight Sampled (approx)tons.	20	40
Size: Mine Designation	Stoker	Slack
Screen Openingin.	1 1/4 to 5/8 sq	Minus 5/8 sq
FRC Laboratory No.	3343-70	3344-70

Ultimate Analysis

Carbon	50.9	49.3
Hydrogen	3.4	3.2
Sulphur	0.3	0.5
Nitrogen	1.0	1.0
Ash	7.2	8.3
Oxygen (by difference)	12.7	12.5

Ash Analysis

SiO ₂	39.2	40.9
Al ₂ O ₃	23.3	23.0
Fe ₂ O ₃	4.9	4.8
TiO ₂	0.2	0.3
P ₂ O ₅	1.2	1.0
CaO	13.2	13.8
MgO	1.3	1.7
SO ₃	6.3	7.6
Na ₂ O	10.8	8.5
K ₂ O	0.3	0.3

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Mine Operator ALBERTA COAL LIMITED - No. 443
 Mine Location Sheerness, Sheerness Area, Alberta
 Name of Mine or Coal "Roselyn", "Berry Creek", "Volcano"

Date Sampled	28-10-70	28-10-70
Weight Sampled (approx) tons.	40	20
Size: Mine Designation	Stoker	Slack
Screen Opening in.	1 1/4 to 5/8 sq	Minus 5/8 sq
FRC Laboratory No.	3406-70	3407-70

Ultimate Analysis

Carbon	%	48.1	48.3
Hydrogen	%	3.2	3.1
Sulphur	%	0.4	0.4
Nitrogen	%	1.0	1.0
Ash	%	6.3	8.1
Oxygen (by difference)	%	14.4	12.4

Ash Analysis

SiO ₂	%	26.6	30.8
Al ₂ O ₃	%	18.2	18.1
Fe ₂ O ₃	%	20.8	18.8
TiO ₂	%	0.3	0.2
P ₂ O ₅	%	0.5	0.4
CaO	%	16.5	16.3
MgO	%	2.5	0.2
SO ₃	%	10.0	9.8
Na ₂ O	%	2.7	2.3
K ₂ O	%	0.4	0.7

Mine Operator THE CANMORE MINES LIMITED - No. 2
 Mine Location Canmore, Cascade Area, Alberta
 Name of Mine or Coal "Canmore Smokeless"

Date Sampled	22-10-70	22-10-70
Weight Sampled (approx)tons.	30	70
Size: Mine Designation	Stoker	Slack
Screen Openingin.	1 1/4 to 5/16 tyrod	Minus 5/16 tyrod
FRC Laboratory No.	3447-70	3448-70

Ultimate Analysis

Carbon	%	77.9	77.0
Hydrogen	%	3.5	3.5
Sulphur	%	0.7	0.7
Nitrogen	%	1.3	1.3
Ash	%	8.0	7.7
Oxygen (by difference)	%	1.7	1.9

Ash Analysis

SiO ₂	%	58.9	59.7
Al ₂ O ₃	%	31.8	30.8
Fe ₂ O ₃	%	4.6	3.9
TiO ₂	%	0.7	0.9
P ₂ O ₅	%	0.6	0.7
CaO	%	0.7	0.8
MgO	%	0.9	1.0
SO ₃	%	0.1	0.4
Na ₂ O	%	0.4	0.4
K ₂ O	%	1.2	1.6

Mine OperatorCALGARY POWER LIMITED - No. 1769
 Mine LocationSeba Beach, Pembina Area, Alberta
 Name of Mine or Coal "Highvale"

Date Sampled	3-11-70
Weight Sampled (approx)tons.	-
Size: Mine Designation	Not Specified
Screen Openingin.	Minus 1
FRC Laboratory No.	3435-70

Ultimate Analysis

Carbon	%	48.5
Hydrogen	%	3.8
Sulphur	%	0.3
Nitrogen	%	0.8
Ash	%	14.2
Oxygen (by difference)	%	11.1

Ash Analysis

SiO ₂	%	50.7
Al ₂ O ₃	%	25.5
Fe ₂ O ₃	%	5.1
TiO ₂	%	0.6
P ₂ O ₅	%	0.1
CaO	%	12.5
MgO	%	2.0
SO ₃	%	3.4
Na ₂ O	%	0.3
K ₂ O	%	0.7

Mine Operator "CARDINAL RIVER COALS LIMITED - No. 1768"
 Mine Location "Hinton, Mountain Park Area, Alberta"
 Name of Mine or Coal "Cardinal"

Date Sampled 7-10-70
 Weight Sampled (approx) tons. 5100

Size: Mine Designation Not Designated
 Screen Opening in. Minus 1 3/4

FRC Laboratory No. 3338-70

Ultimate Analysis

Carbon % 80.6
 Hydrogen % 4.3
 Sulphur % 0.2
 Nitrogen % 1.0
 Ash % 9.3
 Oxygen (by difference) % 3.4

Ash Analysis

SiO₂ % 49.6
 Al₂O₃ % 30.2
 Fe₂O₃ % 7.7
 TiO₂ % 1.0
 P₂O₅ % 2.3
 CaO % 5.3
 MgO % 1.2
 SO₃ % 1.9
 Na₂O % 1.6
 K₂O % 0.6

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Mine Operator CENTURY COALS LIMITED - No. 1742
 Mine Location East Coulee, Drumheller Area, Alberta
 Name of Mine or Coal "Atlas", "Commander", "New Wild Fire", "New Murray", "Western Gem", "Hy-Grade", "Purity Hard"

Date Sampled	29-10-70	29-10-70
Weight Sampled (approx) tons.	60	20
Preparation: Mine Designation	Stoker	Slack
Screen Opening in.	1 1/4 to 5/8 rd	Minus 5/8 rd

QC Laboratory No.	3411-70	3412-70
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<u>Ultimate Analysis</u>		
Carbon	53.0	52.8
Hydrogen	3.6	3.5
Sulphur	0.5	0.5
Nitrogen	1.2	1.2
Ash	10.6	10.3
Oxygen (by difference)	12.6	12.7

<u>Proximate Analysis</u>		
SiO ₂	48.5	48.2
Al ₂ O ₃	28.2	27.0
Fe ₂ O ₃	4.5	4.4
TiO ₂	0.4	0.4
P ₂ O ₅	0.7	0.6
CaO	6.7	7.6
MgO	1.3	1.4
SO ₃	3.7	5.8
Na ₂ O	4.5	4.6
K ₂ O	0.9	1.0

Mine OperatorCOLEMAN COLLIERIES LIMITED
Mine LocationColeman, Crowsnest Area, Alberta
Name of Mine or Coal "Coleman", "Vicary Creek"

Date Sampled	21-10-70
Weight Sampled (approx)tons.	800

Size: Mine Designation	"Export" Coal
Screen Openingin.	Minus 2 rd

FRC Laboratory No.	3450-70
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Ultimate Analysis

Carbon	%	76.9
Hydrogen	%	4.5
Sulphur	%	0.6
Nitrogen	%	1.1
Ash	%	9.8
Oxygen (by difference)	%	3.1

Ash Analysis

SiO ₂	%	49.4
Al ₂ O ₃	%	36.7
Fe ₂ O ₃	%	4.7
TiO ₂	%	1.7
P ₂ O ₅	%	1.8
CaO	%	2.7
MgO	%	0.3
SO ₃	%	0.9
Na ₂ O	%	0.5
K ₂ O	%	0.4

Mine Operator FORESTBURG COLLIERIES LIMITED - No. 1578
 Mine Location Forestburg, Castor Area, Alberta
 Name of Mine or Coal "Diplomat", "Ambassador"

Date Sampled	15-10-70	15-10-70
Weight Sampled (approx)tons.	25	40
Size: Mine Designation	Stoker	Slack
Screen Openingin.	1 to 1/2 sq	Minus 1/2 sq
FRC Laboratory No.	3348-70	3349-70

Ultimate Analysis

Carbon	%	52.3	50.5
Hydrogen	%	3.5	3.2
Sulphur	%	0.4	0.5
Nitrogen	%	1.0	1.0
Ash	%	6.3	8.0
Oxygen (by difference)	%	11.8	12.9

Ash Analysis

SiO ₂	%	39.3	42.1
Al ₂ O ₃	%	25.3	26.4
Fe ₂ O ₃	%	5.5	4.9
TiO ₂	%	0.4	0.4
P ₂ O ₅	%	0.8	0.8
CaO	%	17.2	13.0
MgO	%	2.1	2.1
SO ₃	%	8.9	8.0
Na ₂ O	%	1.8	1.6
K ₂ O	%	0.4	0.4

Mine Operator MCINTYRE COAL MINES LIMITED - No. 1765
 Mine Location Grande Cache, Smokey River Area, Alberta
 Name of Mine or Coal McIntyre

Date Sampled	6-10-70
Weight Sampled (approx) tons.	3000
Size: Mine Designation	Not Designated
Screen Opening in.	Minus 1 1/2 sq
FRC Laboratory No.	3339-70

Ultimate Analysis

Carbon	%	82.0
Hydrogen	%	4.4
Sulphur	%	0.4
Nitrogen	%	1.2
Ash	%	6.1
Oxygen (by difference)	%	3.4

Ash Analysis

SiO ₂	%	48.7
Al ₂ O ₃	%	29.1
Fe ₂ O ₃	%	7.2
TiO ₂	%	0.8
P ₂ O ₅	%	2.5
CaO	%	5.0
MgO	%	1.5
SO ₃	%	3.0
Na ₂ O	%	3.2
K ₂ O	%	0.7

Mine Operator SISSON'S MINE - No. 809
 Mine Location Alix, Ardley Area, Alberta
 Name of Mine or Coal "Sisson's"

Date Sampled 30-10-70
 Weight Sampled (approx) tons. -

Size: Mine Designation Channel Sample
 from
 Main Pit

FRC Laboratory No. 3402-70

Ultimate Analysis

Carbon % 53.6
 Hydrogen % 3.2
 Sulphur % 0.3
 Nitrogen % 0.8
 Ash % 7.8
 Oxygen (by difference) % 13.2

Ash Analysis

SiO₂ % 42.5
 Al₂O₃ % 19.7
 Fe₂O₃ % 3.5
 TiO₂ % 0.2
 P₂O₅ % 4.2
 CaO % 22.1
 MgO % 2.3
 SO₃ % 5.6
 Na₂O % 0.3
 K₂O % 0.2

Mine Operator STAR-KEY MINES LIMITED - No. 1626
 Mine Location St. Albert, Edmonton Area, Alberta
 Name of Mine or Coal "Star-Key"

Date Sampled	4-11-70	4-11-70
Weight Sampled (approx)tons.	15	15
Size: Mine Designation	Stoker	Slack
Screen Openingin.	1 1/4 to 7/16 sq	Minus 7/16 sq
FRC Laboratory No.	3432-70	3433-70
<u>Ultimate Analysis</u>		
Carbon	50.6	46.8
Hydrogen	3.2	2.9
Sulphur	0.2	0.2
Nitrogen	0.9	0.9
Ash	8.6	11.8
Oxygen (by difference)	12.5	12.0
<u>Ash Analysis</u>		
SiO ₂	47.8	49.4
Al ₂ O ₃	29.0	30.1
Fe ₂ O ₃	4.1	3.5
TiO ₂	0.5	0.5
P ₂ O ₅	0.6	0.5
CaO	11.1	9.6
MgO	2.2	1.2
SO ₃	0.2	1.7
Na ₂ O	4.8	3.9
K ₂ O	0.5	0.6

Mine Operator KAISER RESOURCES LIMITED
 Mine Location Michel Preparation Plant, Michel, British Columbia
 Name of Mine or Coal Various Mines

Date Sampled 21-10-70
 Weight Sampled (approx) tons. 40

Size: Mine Designation Not Designated
 Screen Opening in. Minus 2 sq

FRC Laboratory No. 3449-70

Ultimate Analysis

Carbon % 77.6
 Hydrogen % 4.7
 Sulphur % 0.5
 Nitrogen % 1.3
 Ash % 8.8
 Oxygen (by difference) % 3.7

Ash Analysis

SiO₂ % 59.1
 Al₂O₃ % 34.5
 Fe₂O₃ % 2.2
 TiO₂ % 1.8
 P₂O₅ % 1.7
 CaO % 2.3
 MgO % 0.4
 SO₃ % 0.7
 Na₂O % 0.5
 K₂O % 0.9

Name of Mine or Plant
Mine Location
Name Operator

21-10-78	Date Sampled
40	Weight Sampled (approx)
Not Designated	Mine Designation
Mine 2 ad	Section/Opening
2-11-78	Lab. Laboratory No.

Ultimate Analysis	
77.6	Carbon
4.3	Hydrogen
0.3	Sulfur
1.3	Nitrogen
8.8	Ash
3.7	Oxygen (by difference)
Ash Analysis	
58.1	SiO ₂
24.3	Al ₂ O ₃
3.1	Fe ₂ O ₃
1.8	MgO
1.3	CaO
2.1	Na ₂ O
0.4	K ₂ O
0.7	SO ₃
0.3	H ₂ O
0.3	Loss