

**ANALYSIS DIRECTORY OF CANADIAN
COMMERCIAL COALS:
SUPPLEMENT NO. 6**

G.W. BONNELL and L.C. JANKE

**ENERGY RESEARCH PROGRAM
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ANALYSIS DIRECTORY OF CANADIAN COMMERCIAL COALS -
SUPPLEMENT NO. 6

by

G.W. Bonnell* and L.C. Janke**

SUMMARY

The assessment of Canadian commercial coals was undertaken by independently sampling run-of-mine and cleaned coals at operating mines, preparation plants and coal burning generating stations. Samples were taken by Coal Research Laboratories staff in Calgary, Alberta and Sydney, Nova Scotia during 1984, with the full cooperation of coal operators and users. Sample preparation and analyses were performed at the Energy Research Laboratories in Ottawa and Coal Research Laboratories in Sydney.

Generally, the samples represent production on a specific day, thus the results are broadly indicative, at least, for comparative and screening purposes, of the quality of Canadian commercial coals produced at the time of sampling.

Coals are identified by operator (not necessarily the lease owner), name of mine, seam, coalfield and location. Information is arranged by province and is intended to provide a ready indication of the quality of commercially available coals and to complement coal industry statistics available in other federal and provincial reports. If a more continuous profile of the quality of a specific coal is needed for commercial purposes, then the mine operator should, of course, be contacted.

Most major coal mines, coal preparation plants and coal burning generating stations in Canada were sampled.

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RÉPERTOIRE DES ANALYSES DES CHARBONS COMMERCIAUX CANADIENS
SUPPLÉMENT N° 6

par

G.W. Bonnell* et L. C. Janke**

SOMMAIRE

L'évaluation des charbons commerciaux canadiens a débuté par l'échantillonnage indépendant de charbons tout-venants et de charbons épurés provenant de mines en exploitation, d'installations de préparation et de centrales génératrices alimentées au charbon. En 1984, des échantillons ont été prélevés par les employés des Laboratoires de recherche sur le charbon à Calgary (Alberta) et Sydney (Nouvelle-Écosse) en coopération avec les exploitants et utilisateurs de charbon. La préparation et l'analyse des échantillons a été effectuées aux Laboratoires de recherche sur l'énergie à Ottawa et aux Laboratoires de recherche sur le charbon à Sydney.

En général, les échantillons sont représentatifs de la production d'une seule journée: par conséquent, les résultats sont en grande partie indicatifs, du moins à des fins de comparaison et de classement, de la qualité des charbons commerciaux canadiens produits au moment de l'échantillonnage.

Les charbons sont identifiés par exploitant (lequel n'est pas nécessairement propriétaire de la concession), par la mine, le gîte, la houillère et l'emplacement. Les renseignements sont classés par province et ont pour objet de fournir une indication immédiate de la qualité des charbons commerciaux canadiens disponibles et de compléter les statistiques sur l'industrie du charbon présentées dans d'autres rapports fédéraux et provinciaux. Pour obtenir des renseignements plus complets sur la qualité d'un charbon particulier, s'adresser à l'exploitant de la mine en question.

La plupart des principales houillères, installations de préparation de charbon et centrales génératrices alimentées au charbon au Canada ont été échantillonnées.

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INTRODUCTION

CANMET has a national responsibility for assessing the quality and quantity of Canada's commercial coals. Files with chemical and physical data on coal date back to 1910. As well, CANMET (the former Mines Branch) has historically represented Canada's interest in national and international standards work in the subject area of coal and coke quality assessment. As a result there is a steady demand within Canada and from abroad for data and information on the quality of Canadian coals. These enquiries come mostly from potential users of Canadian coals and from various government departments requiring commercial coal quality information for inventory and regulatory purposes.

To meet these needs a series of CANMET reports are published as supplements to the "Analysis Directory of Canadian Commercial Coals". These reports have been published at various intervals since the original issue in 1948 (1,2,3,4,5,6). This supplement covers analyses of coals sampled by CANMET staff in Nova Scotia, New Brunswick, Saskatchewan, Alberta and British Columbia in 1984. All major coal producing sites were sampled, although not all saleable products could be sampled.

Individual data sheets for each sample provide a selection of chemical and physical characteristics and identify the samples with regard to their relevant coalfields, seams and mining districts. The information provides a better understanding of variations in coal quality within and between coalfields. The selected format makes it possible to relate this information to the statistical data and summaries of coal industry developments which appear in various publications and in certain federal and provincial coal reports dealing with production statistics and resource and reserve assessment (7,8,9,10).

Future presentations of analytical data on commercial coal may involve further changes in format that will provide more information consistent with developing concepts and establishing a national coal inventory for Canada. As well, more specific sample location data will be incorporated in future reports.

Sample collection was conducted by staff of the regional laboratories of CANMET's Coal Research Laboratories in Sydney, Nova Scotia and Calgary, Alberta with the cooperation and assistance of mine operators and

consumers. Normal mining and preparation plant sampling procedures were followed so that analytical results would be reasonably representative of production at the time of sampling.

Sample preparation facilities of the New Brunswick Electric Power Commission were used for partial preparation of samples from the Minto Coalfield in New Brunswick. Elsewhere, mobile and base facilities of the regional laboratories were used.

Sample preparation and analyses were conducted by qualified, experienced personnel at the Sydney and Ottawa laboratories using standard procedures of the American Society for Testing and Materials (ASTM). Although sampling procedures and analytical results of individual samples must be accorded a high degree of confidence, the frequency and timing of sampling and selection of samples from a variety of sources - seams, conveyors, mine sites, preparation plants and delivery points - mean that the data may only be subjected to statistical analyses with some reservations. It must be understood that individual sample results are not necessarily typical or representative of production over long periods and certainly should not be related to specific contract specification requirements. It is hoped that the chemical and physical information will be useful for purposes such as: considering quality aspects of contract specifications, classifying coal by rank, considering environmental hazards, selecting combustion or conversion processes and, to a limited extent, evaluating coal suitability for metallurgical use. The specific data and their usefulness are discussed briefly below.

The proximate analysis includes mass per cent of moisture, ash, volatile matter and fixed carbon. For low-, medium- and high-volatile A bituminous coals these determinations together with sulphur content and calorific value are presented on the basis of as-received moisture which is characteristically low. However, for high-volatile B and C bituminous, subbituminous and lignite coals, the proximate analysis, sulphur content and calorific value are presented on the basis of equilibrium moisture content.

The as-received moisture is the total of the moisture loss determined on air drying under standard conditions (adherent or surface moisture) and the residual moisture determined as part of the proximate analysis (inherent or oven dried moisture). On the other hand, the equilibrium

moisture provides a means of estimating the natural bed moisture exclusive of surface moisture and is essential for classifying low-rank coals.

Data on proximate analysis, sulphur content and calorific value are essential for establishing contract specifications and prices and for quality control of coal deliveries. The moisture, ash and sulphur contents and the calorific value are subject to improvement by appropriate coal preparation techniques used to upgrade the coal. The fixed carbon and volatile matter contents on a dry, mineral-matter-free basis, the heating values on a moisture, mineral-matter-free basis and along with the agglomerating characteristics are used for classifying coals by rank according to ASTM standards (Table 1).

The rank of the coal indicates the degree to which the original organic matter has been metamorphosed by temperature and pressure over time to form lignitic, subbituminous, bituminous or anthracitic coals. Rank is important commercially because, within wide limits, it signifies the potential use of the coal, subject to considerations related to quality factors such as moisture, ash, sulphur and trace element content.

The ultimate analysis presented on a dry basis includes mass per cent of carbon, hydrogen, sulphur, nitrogen, ash and oxygen, the latter obtained by difference from 100%. This elemental analysis is basic to the evaluations of coal for conversion and combustion uses.

The sulphur and trace element contents are important considerations related to power plant emissions and regional or national environmental pollution regulations. As well, sulphur is an unwanted constituent in the manufacture of coke for the metallurgical industry.

The values reported for the trace element analyses represent the total trace element concentration in raw coal as determined using the most recent version of the appropriate standard test method from volume 5.05 of the Annual Book of ASTM Standards. The range of concentration which these procedures cover and the expected variability in analytical results are described in the section on Precision and Bias in each test method. It should be cautioned that no attempt to predict the pathway of these elements in a combustion or conversion process from the bulk analytical results should be made.

Methods for determining arsenic and selenium in coal will soon be incorporated into the ASTM Book of Standards and subsequently can also be

incorporated into the Analysis Directory. ASTM standard methods for determining further trace elements are under development.

Sulphur forms reported in this publication are subdivided into three groups: pyritic sulphur, sulfate sulphur and organic sulphur. Sulphur forms are important considerations in coal washability and liquefaction.

Ash fusibility temperatures may be determined in a reducing or oxidizing atmosphere and are considered with selecting combustion equipment to avoid or reduce clinkering and slagging problems.

The mineral content of ash is important in furnace design as well as in the design of electrostatic precipitators. Mineral analysis of coal ash together with ash fusibility temperatures allow the prediction of slag viscosity. Mineral analysis of coal ash can also be used to predict the nature of fireside deposits formed in the boiler and characteristics of the fly ash such as electrical resistivity.

The Hardground Grindability Index is an indicator of the energy required to grind a coal to the desired fineness; the lower the index, the more energy required.

The ASTM Free Swelling Index (FSI) is an indicator of the swelling and caking characteristics of coal and is particularly relevant to selecting metallurgical coals.

The coal analyses are arranged by province. Each page contains a three-line heading stating where possible: -name of mine operator (not necessarily the lease owner), -name of mine, seam and coalfield, -mine location by place name, county or district as appropriate and province.

For coal mines in the plains of Saskatchewan and Alberta, locations are often identified in the surveyed municipal land location system by section, township, range and meridian. Mines in Alberta are also identified by numbers assigned by Alberta's Energy Resources Conservation Board.

The approximate annual coal production of the major mines in Canada, in thousands of tonnes, is shown in Table 2 for 1985. Statistics are arranged by province, coalfield and company.

UNITS OF MEASUREMENT

Units of measurement in this report are in the International System of Units (SI) as approved for official use by the Canadian Standards Association and Metric Commission Canada. These units have been adopted by the Mining Association of Canada and the Coal Association of Canada. To assist with the shift to metric units these two associations have published "Metric Practice Guide for the Canadian Mining and Metallurgical Industries", 1978. Listed below are some useful conversion factors along with SI prefixes.

<u>Multiply this</u>		<u>by this</u>	<u>to obtain</u>	
British thermal unit	(Btu)	1055.06	joule	J
Btu per pound		2.326	kilojoule per kilogram	kJ/kg
cubic yard	cu yd	0.764 555	cubic metre	m ³
cubic yards per ton		0.842 78	cubic metres per tonne	m ³ /t
degrees Celcius	°C	(°C x 9/5) + 32	degrees Fahrenheit	°F
degrees Fahrenheit	°F	(°F - 32) x 5/9	degrees Celcius	°C
foot	ft	0.3048	metre	m
joule	J	0.000 947 8	Btu	
kilogram	kg	2.204 622 6	pound	lb
kilojoule per kilogram	kJ/kg	0.429 923	Btu per pound	
kilometre	km	0.621 371	mile	
litre per second	L/s	13.1982	gallon per minute	gpm
megajoule per kilogram	MJ/kg	429.923	Btu per pound	
metre	m	3.280 84	foot	ft
mile		1.609 344	kilometre	km
pound	lb	0.453 592 3	kilogram	kg
short ton per acre foot		7.354 67	tonne per hectare metre	t/ham
long ton		1.016 046 908 8	tonne	t
short ton		0.907 184 74	tonne	t
tonne	t	0.984 206 5	long ton	
tonne	t	1.102 311	short ton	

COAL ANALYSES – NOVA SCOTIA

EVANS COAL MINES LIMITED
St. Rose Mine; No.5 Seam; Inverness Coalfield
St. Rose, Inverness County, Nova Scotia

Sampling date 4-05-84
Sampling location Mine (u/g)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3181-84

Rank of coal High-volatile B bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	5.58		
Ash %	11.38	12.05	
Volatile %	34.43	36.47	41.46
Fixed carbon %	48.61	51.48	58.54

Ultimate:			
Carbon %	64.11	67.90	77.20
Hydrogen %	4.10	4.34	4.93
Sulphur (Pyritic) %	(3.18)	(3.36)	-
(Sulphate) %	(0.20)	(0.21)	-
(Organic) %	(3.18)	(3.36)	(3.82)
Total %	6.54	6.93	-
Nitrogen %	1.28	1.36	1.55
Ash %	11.38	12.05	-
Oxygen, by difference %	7.01	7.42	8.44

Heating value:			
	MJ/kg	27.87	29.51
	kcal/kg	6656	7049
	Btu/lb	11981	12689

Hardgrove grindability index 54

Free swelling index (FSI) 2.5

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	979	1321
Spherical °C	999	1382
Hemispherical °C	1052	1399
Fluid °C	1066	1438

Notes:

EVANS COAL MINES LIMITED
 St. Rose Mine; No.5 Seam; Inverness Coalfield
 St. Rose, Inverness County, Nova Scotia

Sampling date 4-05-84
 Sampling location Mine (u/g)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3181-84

Ash analysis, per cent:

SiO ₂	23.92
Al ₂ O ₃	10.80
Fe ₂ O ₃	41.22
Mn ₃ O ₄	-
TiO ₂	0.49
P ₂ O ₅	0.49
CaO	7.12
MgO	1.08
SO ₃	9.41
Na ₂ O	1.96
K ₂ O	1.05
SrO	-
BaO	0.06
Loss on fusion (LOF)	0.59

Volatile trace element analysis ug/g (ppm)

Hg	0.13
Cl	3300
F	54.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

EVANS COAL MINES LIMITED
St. Rose Mine; No.5 Seam; Inverness Coalfield
St. Rose, Inverness County, Nova Scotia

Sampling date 4-05-84
Sampling location Mine Dry Screening Plant

Product name Medium Lump
Screen opening ,mm 152 x 83 ,sq
(Screen opening ,in) 6 x 3 1/4 ,sq

ERL number 3182-84

Rank of coal High-volatile B bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	6.54		
Ash %	11.07	11.84	
Volatile %	32.73	35.02	39.72
Fixed carbon %	49.67	53.14	60.28

Ultimate:			
Carbon %	63.74	68.20	77.36
Hydrogen %	4.03	4.31	4.89
Sulphur (Pyritic) %	(3.60)	(3.85)	-
(Sulphate) %	(0.41)	(0.44)	-
(Organic) %	(2.86)	(3.06)	(3.47)
Total %	6.87	7.35	-
Nitrogen %	1.30	1.39	1.58
Ash %	11.07	11.84	-
Oxygen, by difference %	6.46	6.91	7.84

Heating value:			
	MJ/kg	27.71	29.65
	kcal/kg	6618	7081
	Btu/lb	11912	12746

Hardgrove grindability index 53

Free swelling index (FSI) 2.5

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1004	1385
Spherical °C	1007	1435
Hemispherical °C	1013	1441
Fluid °C	1199	1454

Notes: Equilibrium moisture was calculated from the average of the following samples: 3183-84, 3184-84, 3185-84 & 3186-84

EVANS COAL MINES LIMITED
 St. Rose Mine; No.5 Seam; Inverness Coalfield
 St. Rose, Inverness County, Nova Scotia

Sampling date 4-05-84
 Sampling location Mine Dry Screening Plant

Product name Medium Lump
 Screen opening ,mm 152 x 83 ,sq
 (Screen opening ,in) 6 x 3 1/4 ,sq

ERL number 3182-84

Ash analysis, per cent:

SiO ₂	23.30
Al ₂ O ₃	8.86
Fe ₂ O ₃	49.91
Mn ₃ O ₄	-
TiO ₂	0.44
P ₂ O ₅	0.70
CaO	5.12
MgO	0.79
SO ₃	6.82
Na ₂ O	1.66
K ₂ O	0.64
SrO	-
BaO	-
Loss on fusion (LOF)	0.97

Volatile trace element analysis ug/g (ppm)

Hg	0.16
Cl	2830
F	60.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

EVANS COAL MINES LIMITED
St. Rose Mine; No.5 Seam; Inverness Coalfield
St. Rose, Inverness County, Nova Scotia

Sampling date 4-05-84
Sampling location Mine Dry Screening Plant

Product name Egg
Screen opening ,mm 83 x 51 ,sq
(Screen opening ,in) 3 1/4 x 2 ,sq

ERL number 3183-84

Rank of coal High-volatile B bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	6.54		
Ash %	9.21	9.85	
Volatile %	33.01	35.32	39.17
Fixed carbon %	51.25	54.83	60.83

Ultimate:			
Carbon %	65.69	70.29	77.97
Hydrogen %	4.18	4.47	4.96
Sulphur (Pyritic) %	(2.87)	(3.07)	-
(Sulphate) %	(0.24)	(0.26)	-
(Organic) %	(2.81)	(3.00)	(3.33)
Total %	5.92	6.33	-
Nitrogen %	1.29	1.38	1.53
Ash %	9.21	9.85	-
Oxygen, by difference %	7.18	7.68	8.52

Heating value:			
	MJ/kg	28.28	30.26
	kcal/kg	6755	7228
	Btu/lb	12159	13010
			14432

Hardgrove grindability index 55

Free swelling index (FSI) 3.5

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1018	1377
Spherical °C		1021	1438
Hemispherical °C		1032	1441
Fluid °C		1216	1454

Notes:

EVANS COAL MINES LIMITED
St. Rose Mine; No.5 Seam; Inverness Coalfield
St. Rose, Inverness County, Nova Scotia

Sampling date 4-05-84
Sampling location Mine Dry Screening Plant

Product name Egg
Screen opening ,mm 83 x 51 ,sq
(Screen opening ,in) 3 1/4 x 2 ,sq

ERL number 3183-84

Ash analysis, per cent:

SiO ₂	26.45
Al ₂ O ₃	10.79
Fe ₂ O ₃	45.18
Mn ₃ O ₄	-
TiO ₂	0.58
P ₂ O ₅	0.77
CaO	4.57
MgO	0.71
SO ₃	6.02
Na ₂ O	1.83
K ₂ O	0.87
SrO	-
BaO	0.03
Loss on fusion (LOF)	1.45

Volatile trace element analysis ug/g (ppm)

Hg	0.10
Cl	3040
F	57.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

EVANS COAL MINES LIMITED
St. Rose Mine; No.5 Seam; Inverness Coalfield
St. Rose, Inverness County, Nova Scotia

Sampling date 4-05-84
Sampling location Mine Dry Screening Plant

Product name Nut
Screen opening ,mm 51 x 19 ,sq
(Screen opening ,in) 2 x 3/4 ,sq

ERL number 3184-84

Rank of coal High-volatile B bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	6.17		
Ash %	10.24	10.91	
Volatile %	32.90	35.06	39.35
Fixed carbon %	50.70	54.03	60.65

Ultimate:			
Carbon %	64.74	69.00	77.45
Hydrogen %	4.24	4.52	5.07
Sulphur (Pyritic) %	(3.63)	(3.87)	-
(Sulphate) %	(0.24)	(0.26)	-
(Organic) %	(2.77)	(2.95)	(3.31)
Total %	6.64	7.08	-
Nitrogen %	1.31	1.40	1.57
Ash %	10.24	10.91	-
Oxygen, by difference %	6.65	7.09	7.96

Heating value:			
	MJ/kg	28.09	29.94
	kcal/kg	6710	7151
	Btu/lb	12077	12871
			14447

Hardgrove grindability index 54

Free swelling index (FSI) 2.5

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1029	1441
Spherical °C		1041	1446
Hemispherical °C		1052	1449
Fluid °C		1218	1452

Notes:

EVANS COAL MINES LIMITED
 St. Rose Mine; No.5 Seam; Inverness Coalfield
 St. Rose, Inverness County, Nova Scotia

Sampling date	4-05-84
Sampling location	Mine Dry Screening Plant

Product name	Nut
Screen opening ,mm	51 x 19 ,sq
(Screen opening ,in)	2 x 3/4 ,sq

ERL number	3184-84
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Ash analysis, per cent:

SiO ₂	25.09
Al ₂ O ₃	9.95
Fe ₂ O ₃	51.61
Mn ₃ O ₄	-
TiO ₂	0.54
P ₂ O ₅	0.54
CaO	3.31
MgO	0.52
SO ₃	4.00
Na ₂ O	1.70
K ₂ O	0.84
SrO	-
BaO	0.13
Loss on fusion (LOF)	0.55

Volatile trace element analysis ug/g (ppm)

Hg	0.16
Cl	3020
F	51.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

EVANS COAL MINES LIMITED
St. Rose Mine; No.5 Seam; Inverness Coalfield
St. Rose, Inverness County, Nova Scotia

Sampling date 4-05-84
Sampling location Mine Dry Screening Plant

Product name Stoker Pea
Screen opening ,mm 19 x 6.4 ,sq
(Screen opening ,in) 3/4 x 1/4 ,sq

ERL number 3185-84

Rank of coal High-volatile B bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	%	6.87	
Ash	%	11.38	12.22
Volatile	%	32.85	35.28 40.19
Fixed carbon	%	48.90	52.50 59.81

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon	%	63.53	68.22 77.72
Hydrogen	%	4.07	4.37 4.98
Sulphur (Pyritic)	%	(3.37)	(3.62) -
(Sulphate)	%	(0.23)	(0.25) -
(Organic)	%	(2.52)	(2.70) (3.08)
Total	%	6.12	6.57 -
Nitrogen	%	1.29	1.38 1.57
Ash	%	11.38	12.22 -
Oxygen, by difference	%	6.74	7.24 8.25

Heating value:	MJ/kg	27.58	29.61	33.73
	kcal/kg	6587	7073	8057
	Btu/lb	11856	12731	14503

Hardgrove grindability index 54

Free swelling index (FSI) 3.0

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C	1021 1368
Spherical	°C	1032 1429
Hemispherical	°C	1163 1435
Fluid	°C	1202 1446

Notes:

EVANS COAL MINES LIMITED
 St. Rose Mine; No.5 Seam; Inverness Coalfield
 St. Rose, Inverness County, Nova Scotia

Sampling date 4-05-84
 Sampling location Mine Dry Screening Plant

Product name Stoker Pea
 Screen opening ,mm 19 x 6.4 ,sq
 (Screen opening ,in) 3/4 x 1/4 ,sq

ERL number 3185-84

Ash analysis, per cent:

SiO ₂	29.10
Al ₂ O ₃	12.58
Fe ₂ O ₃	43.41
Mn ₃ O ₄	-
TiO ₂	0.57
P ₂ O ₅	0.50
CaO	4.04
MgO	0.58
SO ₃	4.15
Na ₂ O	1.43
K ₂ O	1.45
SrO	-
BaO	0.03
Loss on fusion (LOF)	0.27

Volatile trace element analysis ug/g (ppm)

Hg	0.13
Cl	2960
F	56.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

EVANS COAL MINES LIMITED
St. Rose Mine; No.5 Seam; Inverness Coalfield
St. Rose, Inverness County, Nova Scotia

Sampling date 4-05-84
Sampling location Mine Dry Screening Plant

Product name Fines
Screen opening ,mm Minus 6.4 ,sq
(Screen opening ,in) Minus 1/4 ,sq

ERL number 3186-84

Rank of coal High-volatile B bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	6.58		
Ash %	12.80	13.70	
Volatile %	32.65	34.95	40.50
Fixed carbon %	47.97	51.35	59.50

Ultimate:			
Carbon %	62.73	67.15	77.81
Hydrogen %	4.04	4.32	5.01
Sulphur (Pyritic) %	(2.91)	(3.11)	-
(Sulphate) %	(0.20)	(0.22)	-
(Organic) %	(2.53)	(2.71)	(3.14)
Total %	5.64	6.04	-
Nitrogen %	1.22	1.31	1.52
Ash %	12.80	13.70	-
Oxygen, by difference %	6.99	7.48	8.67

Heating value:			
	MJ/kg	26.88	28.78
	kcal/kg	6421	6873
	Btu/lb	11558	12372
			33.35
			7964
			14336

Hardgrove grindability index 54

Free swelling index (FSI) 2.5

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1035	1299
Spherical °C		1046	1382
Hemispherical °C		1188	1393
Fluid °C		1218	1404

Notes:

EVANS COAL MINES LIMITED
 St. Rose Mine; No.5 Seam; Inverness Coalfield
 St. Rose, Inverness County, Nova Scotia

Sampling date 4-05-84
 Sampling location Mine Dry Screening Plant

Product name Fines
 Screen opening ,mm Minus 6.4 ,sq
 (Screen opening ,in) Minus 1/4 ,sq

ERL number 3186-84

Ash analysis, per cent:

SiO ₂	31.80
Al ₂ O ₃	14.40
Fe ₂ O ₃	33.69
Mn ₃ O ₄	-
TiO ₂	0.58
P ₂ O ₅	0.44
CaO	5.02
MgO	1.06
SO ₃	6.49
Na ₂ O	1.42
K ₂ O	2.00
SrO	0.01
BaO	-
Loss on fusion (LOF)	0.75

Volatile trace element analysis ug/g (ppm)

Hg	0.10
Cl	4430
F	68.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

EVANS COAL MINES LIMITED
St. Rose Mine; No.5 Seam; Inverness Coalfield
St. Rose, Inverness County, Nova Scotia

Sampling date 3-05-84
Sampling location Trenton Power Station (NSPC)

Product name Mine run
Screen opening ,mm
(Screen opening ,in)

ERL number 3179-84

Rank of coal High-volatile B bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	6.35		
Ash %	11.10	11.85	
Volatile %	32.71	34.93	39.62
Fixed carbon %	49.84	53.22	60.38

Ultimate:			
Carbon %	63.82	68.15	77.31
Hydrogen %	4.01	4.28	4.86
Sulphur (Pyritic) %	(3.09)	(3.29)	-
(Sulphate) %	(0.19)	(0.21)	-
(Organic) %	(2.93)	(3.13)	(3.55)
Total %	6.21	6.63	-
Nitrogen %	1.22	1.30	1.47
Ash %	11.10	11.85	-
Oxygen, by difference %	7.30	7.79	8.84

Heating value:			
	MJ/kg	27.65	29.52
	kcal/kg	6604	7052
	Btu/lb	11887	12693

Hardgrove grindability index 54

Free swelling index (FSI) 3.0

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1021	1332
Spherical °C		1032	1407
Hemispherical °C		1049	1424
Fluid °C		1210	1463

Notes: Equilibrium moisture was calculated from the average of the following samples: 3181-84, 3183-84, 3184-84, 3185-84 & 3186-84

EVANS COAL MINES LIMITED
 St. Rose Mine; No.5 Seam; Inverness Coalfield
 St. Rose, Inverness County, Nova Scotia

Sampling date 3-05-84
 Sampling location Trenton Power Station (NSFC)

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3179-84

Ash analysis, per cent:

SiO ₂	28.08
Al ₂ O ₃	11.87
Fe ₂ O ₃	40.81
Mn ₃ O ₄	-
TiO ₂	0.49
P ₂ O ₅	0.41
CaO	5.48
MgO	1.07
SO ₃	6.34
Na ₂ O	2.53
K ₂ O	1.42
SrO	-
BaO	0.11
Loss on fusion (LOF)	1.10

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	2980
F	62.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

PIONEER COAL CO. LTD.
Drummond Colliery; No.1 (Scott) Seam; Pictou Coalfield
Westville, Pictou County, Nova Scotia

Sampling date 3-05-84
Sampling location Mine (u/g)
South side of main slope

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3175-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.59		
Ash %	19.66	20.18	
Volatile %	24.45	25.10	31.44
Fixed carbon %	53.30	54.72	68.56

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	65.88	67.63	84.73
Hydrogen %	3.99	4.10	5.14
Sulphur (Pyritic) %	(0.69)	(0.71)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.70)	(0.72)	(0.91)
Total %	1.41	1.45	-
Nitrogen %	1.88	1.93	2.42
Ash %	19.66	20.18	-
Oxygen, by difference %	4.59	4.71	5.90

Heating value:	MJ/kg	kcal/kg	Btu/lb
	27.25	6509	11716
	27.98	6682	12028
	35.05	8371	15068

Hardgrove grindability index 60

Free swelling index (FSI) 2.5

Moisture (as rec'd)

Inherent %	1.72
Adherent %	0.87

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1296	1435
Spherical °C	1418	1482+
Hemispherical °C	1432	1482+
Fluid °C	1482+	1482+

Notes: Drummond Colliery was formerly owned and run by Drummond Coal Company Ltd.

PIONEER COAL CO. LTD.
 Drummond Colliery; No.1 (Scott) Seam; Pictou Coalfield
 Westville, Pictou County, Nova Scotia

Sampling date 3-05-84
 Sampling location Mine (u/g)
 South side of main slope

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3175-84

Ash analysis, per cent:

SiO ₂	59.29
Al ₂ O ₃	23.39
Fe ₂ O ₃	6.31
Mn ₃ O ₄	-
TiO ₂	0.74
P ₂ O ₅	0.46
CaO	2.04
MgO	1.00
SO ₃	1.81
Na ₂ O	0.66
K ₂ O	1.91
SrO	0.05
BaO	-
Loss on fusion (LOF)	1.23

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	1760
F	124.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

PIONEER COAL CO. LTD.
Drummond Colliery; No.1 (Scott) Seam; Pictou Coalfield
Westville, Pictou County, Nova Scotia

Sampling date 3-05-84
Sampling location Mine (u/g)
Sampled from coal cars

Product name Mine run
Screen opening ,mm
(Screen opening ,in)

ERL number 3176-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	3.10		
Ash %	19.92	20.56	
Volatile %	23.92	24.68	31.07
Fixed carbon %	53.06	54.76	68.93

Ultimate:			
Carbon %	64.94	67.02	84.37
Hydrogen %	3.87	3.99	5.02
Sulphur (Pyritic) %	(0.91)	(0.94)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.67)	(0.69)	(0.87)
Total %	1.58	1.63	-
Nitrogen %	1.94	2.00	2.52
Ash %	19.92	20.56	-
Oxygen, by difference %	4.65	4.80	6.04

Heating value:			
	MJ/kg	26.77	27.63
	kcal/kg	6394	6598
	Btu/lb	11509	11877
			34.78
			8306
			14951

Hardgrove grindability index 58

Free swelling index (FSI) 1.5

Moisture (as rec'd)

Inherent %	1.83
Adherent %	1.27

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1327	1424
Spherical °C		1399	1471
Hemispherical °C		1482	1482+
Fluid °C		1482+	1482+

Notes: Drummond Colliery was formerly owned and run by Drummond Coal Company Ltd.

PIONEER COAL CO. LTD.
 Drummond Colliery; No.1 (Scott) Seam; Pictou Coalfield
 Westville, Pictou County, Nova Scotia

Sampling date 3-05-84
 Sampling location Mine (u/g)
 Sampled from coal cars

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3176-84

Ash analysis, per cent:

SiO ₂	57.14
Al ₂ O ₃	23.54
Fe ₂ O ₃	9.63
Mn ₃ O ₄	-
TiO ₂	0.75
P ₂ O ₅	0.54
CaO	2.15
MgO	0.88
SO ₃	1.56
Na ₂ O	0.44
K ₂ O	1.68
SrO	0.05
BaO	-
Loss on fusion (LOF)	0.96

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	1720
F	135.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

PIONEER COAL CO. LTD.
Drummond Colliery; No.1 (Scott) Seam; Pictou Coalfield
Westville, Pictou County, Nova Scotia

Sampling date 3-05-84
Sampling location Trenton Power Station (NSPC)

Product name Mine run
Screen opening ,mm
(Screen opening ,in)

ERL number 3177-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.68		
Ash %	21.69	22.29	
Volatile %	24.58	25.26	32.50
Fixed carbon %	51.05	52.45	67.50

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	63.46	65.21	83.91
Hydrogen %	3.81	3.91	5.03
Sulphur (Pyritic) %	(1.88)	(1.93)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.63)	(0.65)	(0.84)
Total %	2.51	2.58	-
Nitrogen %	1.86	1.91	2.46
Ash %	21.69	22.29	-
Oxygen, by difference %	3.99	4.10	5.28

Heating value:	MJ/kg	kcal/kg	Btu/lb
	26.37	6297	11335
	27.09	6471	11648
	34.86	8327	14988

Hardgrove grindability index 58

Free swelling index (FSI) 1.5

Moisture (as rec'd)
Inherent % 1.72
Adherent % 0.96

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1132	1285
Spherical °C	1210	1352
Hemispherical °C	1293	1371
Fluid °C	1316	1454

Notes: Drummond Colliery was formerly owned and run by Drummond Coal Company Ltd.

PIONEER COAL CO. LTD.
 Drummond Colliery; No.1 (Scott) Seam; Pictou Coalfield
 Westville, Pictou County, Nova Scotia

Sampling date 3-05-84
 Sampling location Trenton Power Station (NSPC)

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3177-84

Ash analysis, per cent:

SiO ₂	49.08
Al ₂ O ₃	21.44
Fe ₂ O ₃	14.78
Mn ₃ O ₄	-
TiO ₂	0.67
P ₂ O ₅	0.67
CaO	4.61
MgO	1.48
SO ₃	3.82
Na ₂ O	0.45
K ₂ O	1.64
SrO	0.05
BaO	-
Loss on fusion (LOF)	1.37

Volatile trace element analysis ug/g (ppm)

Hg	0.10
Cl	1770
F	143.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

PIONEER COAL CO. LTD.
 Drummond Colliery; No.1 (Scott) Seam; Pictou Coalfield
 Westville, Pictou County, Nova Scotia

Sampling date 3-05-84
 Sampling location Trenton Power Station (NSPC)

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3178-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.65		
Ash %	20.96	21.53	
Volatile %	24.34	25.01	31.87
Fixed carbon %	52.05	53.46	68.13

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	64.41	66.17	84.33
Hydrogen %	3.86	3.97	5.06
Sulphur (Pyritic) %	(0.85)	(0.88)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.57)	(0.59)	(0.75)
Total %	1.43	1.47	-
Nitrogen %	1.78	1.83	2.33
Ash %	20.96	21.53	-
Oxygen, by difference %	4.90	5.03	6.41

Heating value:	As Rec'd	Dry	Dry Ash Free	
	MJ/kg	26.61	27.34	34.84
	kcal/kg	6357	6530	8322
	Btu/lb	11442	11754	14979

Hardgrove grindability index 59

Free swelling index (FSI) 2.5

Moisture (as rec'd)

Inherent %	1.77
Adherent %	0.88

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1310	1399
Spherical °C	1421	1471
Hemispherical °C	1454	1474
Fluid °C	1482+	1482+

Notes: Drummond Colliery was formerly owned and run by Drummond Coal Company Ltd.

PIONEER COAL CO. LTD.
 Drummond Colliery; No.1 (Scott) Seam; Pictou Coalfield
 Westville, Pictou County, Nova Scotia

Sampling date 3-05-84
 Sampling location Trenton Power Station (NSFC)

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3178-84

Ash analysis, per cent:

SiO ₂	56.66
Al ₂ O ₃	24.24
Fe ₂ O ₃	7.80
Mn ₃ O ₄	-
TiO ₂	0.70
P ₂ O ₅	0.48
CaO	2.42
MgO	0.88
SO ₃	2.20
Na ₂ O	0.52
K ₂ O	1.83
SrO	0.05
BaO	-
Loss on fusion (LOF)	1.29

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	1690
F	149.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

PIONEER COAL CO. LTD.
Drummond Mine; Acadia Seam; Pictou Coalfield
Westville, Pictou County, Nova Scotia

Sampling date 25-06-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3363-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	4.19		
Ash %	15.38	16.05	
Volatile %	26.24	27.39	32.63
Fixed carbon %	54.19	56.56	67.37

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	67.97	70.94	84.50
Hydrogen %	4.45	4.64	5.53
Sulphur (Pyritic) %	(0.96)	(1.01)	-
(Sulphate) %	(0.08)	(0.08)	-
(Organic) %	(0.86)	(0.89)	(1.06)
Total %	1.90	1.98	-
Nitrogen %	1.48	1.54	1.83
Ash %	15.38	16.05	-
Oxygen, by difference %	4.65	4.85	5.78

Heating value:	MJ/kg	As Rec'd	Dry	Dry Ash Free
	27.82		29.03	34.58
	kcal/kg	6644	6934	8260
	Btu/lb	11959	12482	14868

Hardgrove grindability index 62

Free swelling index (FSI) 6.0

Moisture (as rec'd)

Inherent %	2.60
Adherent %	1.59

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1296	1416
Spherical °C	1396	1457
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes:

PIONEER COAL CO. LTD.
 Drummond Mine; Acadia Seam; Pictou Coalfield
 Westville, Pictou County, Nova Scotia

Sampling date	25-06-84
Sampling location	Mine (surface)

Product name	Channel Sample
Screen opening ,mm (Screen opening ,in)	

ERL number	3363-84
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Ash analysis, per cent:

SiO ₂	67.00
Al ₂ O ₃	17.67
Fe ₂ O ₃	9.27
Mn ₃ O ₄	-
TiO ₂	0.97
P ₂ O ₅	-
CaO	0.18
MgO	0.14
SO ₃	0.39
Na ₂ O	0.32
K ₂ O	1.60
SrO	0.02
BaO	0.01
Loss on fusion (LOF)	0.47

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	390
F	60.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

PIONEER COAL CO. LTD.
Drummond Mine; Scott Seam; Pictou Coalfield
Westville, Pictou County, Nova Scotia

Sampling date 5-07-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3492-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	4.70		
Ash	46.98	49.30	
Volatile	19.85	20.83	41.08
Fixed carbon	28.47	29.87	58.92

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon	36.07	37.85	74.65
Hydrogen	2.51	2.63	5.19
Sulphur (Pyritic)	(4.28)	(4.49)	-
(Sulphate)	(0.33)	(0.35)	-
(Organic)	(0.51)	(0.53)	(1.05)
Total	5.13	5.38	-
Nitrogen	0.87	0.91	1.79
Ash	46.98	49.30	-
Oxygen, by difference	3.75	3.93	7.75

Heating value:	MJ/kg	kcal/kg	Btu/lb
	15.28	16.04	31.63
	3650	3830	7554
	6570	6894	13598

Hardgrove grindability index 62

Free swelling index (FSI) 0.5

Moisture (as rec'd)

Inherent	%	2.27
Adherent	%	2.43

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C	1202
Spherical	°C	1371
Hemispherical	°C	1457
Fluid	°C	1482
		1388
		1452
		1482+
		1482+

Notes:

PIONEER COAL CO. LTD.
 Drummond Mine; Scott Seam; Pictou Coalfield
 Westville, Pictou County, Nova Scotia

Sampling date 5-07-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3492-84

Ash analysis, per cent:

SiO ₂	51.21
Al ₂ O ₃	24.90
Fe ₂ O ₃	15.61
Mn ₃ O ₄	-
TiO ₂	0.81
P ₂ O ₅	0.08
CaO	0.40
MgO	1.24
SO ₃	0.66
Na ₂ O	0.26
K ₂ O	3.32
SrO	0.03
BaO	-
Loss on fusion (LOF)	0.31

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	130
F	394.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
Lingan Mine; Harbour Seam; Sydney Coalfield
Lingan, Cape Breton County, Nova Scotia

Sampling date 8-05-84
Sampling location Seaboard Power Station (NSPC)

Product name 23 Thermal Coal (Fines)
Screen opening ,mm Minus 24 mesh
(Screen opening ,in)

ERL number 3196-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	8.19		
Ash %	3.89	4.24	
Volatile %	33.21	36.17	37.78
Fixed carbon %	54.70	59.59	62.22

Ultimate:			
Carbon %	74.74	81.41	85.01
Hydrogen %	4.82	5.25	5.48
Sulphur (Pyritic) %	(1.03)	(1.12)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.54)	(0.59)	(0.61)
Total %	1.58	1.72	-
Nitrogen %	1.73	1.88	1.96
Ash %	3.89	4.24	-
Oxygen, by difference %	5.05	5.50	5.74

Heating value:			
	MJ/kg	31.76	34.59
	kcal/kg	7586	8263
	Btu/lb	13655	14873
			15532

Hardgrove grindability index 59

Free swelling index (FSI) 8.0

Moisture (as rec'd)
Inherent % 1.16
Adherent % 7.03

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1071	1371
Spherical °C	1102	1402
Hemispherical °C	1129	1404
Fluid °C	1354	1416

Notes: Thermal Fines Product is from CBDC's Victoria Junction Coal Preparation Plant

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Lingan Mine; Harbour Seam; Sydney Coalfield
 Lingan, Cape Breton County, Nova Scotia

Sampling date 8-05-84
 Sampling location Seaboard Power Station (NSPC)

Product name 23 Thermal Coal (Fines)
 Screen opening ,mm Minus 24 mesh
 (Screen opening ,in)

ERL number 3196-84

Ash analysis, per cent:

SiO ₂	29.40
Al ₂ O ₃	16.91
Fe ₂ O ₃	43.89
Mn ₃ O ₄	-
TiO ₂	0.90
P ₂ O ₅	0.27
CaO	1.75
MgO	0.94
SO ₃	1.38
Na ₂ O	0.66
K ₂ O	1.18
SrO	0.01
BaO	0.13
Loss on fusion (LOF)	0.93

Volatile trace element analysis ug/g (ppm)

Hg	0.16
Cl	810
F	28.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
Lingan Mine; Harbour Seam; Sydney Coalfield
Lingan, Cape Breton County, Nova Scotia

Sampling date 9-05-84
Sampling location Mine (u/g)
5 West Wall

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3197-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.79		
Ash %	3.26	3.32	
Volatile %	35.71	36.37	37.62
Fixed carbon %	59.23	60.31	62.38

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	80.96	82.44	85.27
Hydrogen %	5.24	5.34	5.52
Sulphur (Pyritic) %	(0.67)	(0.68)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.58)	(0.59)	(0.61)
Total %	1.25	1.27	-
Nitrogen %	1.97	2.01	2.08
Ash %	3.26	3.32	-
Oxygen, by difference %	5.52	5.62	5.81

Heating value:	MJ/kg	As Rec'd	Dry	Dry Ash Free
	34.40	35.03	36.23	
	kcal/kg	8216	8366	8653
	Btu/lb	14789	15059	15576

Hardgrove grindability index 57

Free swelling index (FSI) 7.5

Moisture (as rec'd)
Inherent % 1.37
Adherent % 0.42

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1054	1354
Spherical °C	1068	1391
Hemispherical °C	1079	1402
Fluid °C	1327	1410

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Lingan Mine; Harbour Seam; Sydney Coalfield
 Lingan, Cape Breton County, Nova Scotia

Sampling date	9-05-84
Sampling location	Mine (u/g) S West Wall
Product name	Channel Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	3197-84

Ash analysis, per cent:

SiO ₂	31.83
Al ₂ O ₃	19.38
Fe ₂ O ₃	37.97
Mn ₃ O ₄	-
TiO ₂	0.86
P ₂ O ₅	0.20
CaO	1.97
MgO	1.12
SO ₃	1.79
Na ₂ O	0.77
K ₂ O	1.18
SrO	0.01
BaO	-
Loss on fusion (LOF)	0.90

Volatile trace element analysis ug/g (ppm)

Hg	0.09
Cl	670
F	19.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
Lingan Mine; Harbour Seam; Sydney Coalfield
Lingan, Cape Breton County, Nova Scotia

Sampling date 9-05-84
Sampling location Mine (u/g)

Product name Slack
Screen opening ,mm Minus 51 ,sq
(Screen opening ,in) Minus 2 ,sq

ERL number 3198-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	6.32		
Ash %	25.22	26.92	
Volatile %	27.26	29.10	39.82
Fixed carbon %	41.20	43.98	60.18

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	57.35	61.22	83.77
Hydrogen %	3.85	4.11	5.62
Sulphur (Pyritic) %	(1.13)	(1.20)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.27)	(0.28)	(0.39)
Total %	1.40	1.49	-
Nitrogen %	1.37	1.46	2.00
Ash %	25.22	26.92	-
Oxygen, by difference %	4.50	4.80	6.57

Heating value:	MJ/kg	24.09	25.71	35.18
	kcal/kg	5753	6141	8403
	Btu/lb	10355	11053	15125

Hardgrove grindability index 59

Free swelling index (FSI) 6.5

Moisture (as rec'd)
Inherent % 1.16
Adherent % 5.16

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1216	1404
Spherical °C	1332	1457
Hemispherical °C	1416	1460
Fluid °C	1482+	1482

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Lingan Mine; Harbour Seam; Sydney Coalfield
 Lingan, Cape Breton County, Nova Scotia

Sampling date 9-05-84
 Sampling location Mine (u/g)

Product name Slack
 Screen opening ,mm Minus 51 ,sq
 (Screen opening ,in) Minus 2 ,sq

ERL number 3198-84

Ash analysis, per cent:

SiO ₂	53.78
Al ₂ O ₃	24.60
Fe ₂ O ₃	10.19
Mn ₃ O ₄	-
TiO ₂	0.96
P ₂ O ₅	0.06
CaO	1.02
MgO	1.60
SO ₃	1.23
Na ₂ O	0.70
K ₂ O	3.73
SrO	0.04
BaO	0.03
Loss on fusion (LOF)	0.80

Volatile trace element analysis ug/g (ppm)

Hg	0.12
Cl	780
F	140.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
Lingan Mine; Harbour Seam; Sydney Coalfield
Lingan, Cape Breton County, Nova Scotia

Sampling date 10-05-84
Sampling location Coal Preparation Plant
Victoria Junction

Product name Raw feed
Screen opening ,mm Minus 38 ,sq
(Screen opening ,in) Minus 1 1/2 ,sq

ERL number 3200-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	8.08		
Ash %	21.45	23.34	
Volatile %	27.34	29.74	38.79
Fixed carbon %	43.13	46.92	61.21

Ultimate:			
Carbon %	58.91	64.09	83.60
Hydrogen %	3.95	4.30	5.61
Sulphur (Pyritic) %	(1.45)	(1.58)	-
(Sulphate) %	(0.04)	(0.04)	-
(Organic) %	(0.28)	(0.30)	(0.40)
Total %	1.77	1.93	-
Nitrogen %	1.37	1.49	1.94
Ash %	21.45	23.34	-
Oxygen, by difference %	4.46	4.85	6.33

Heating value:			
	MJ/kg	24.44	26.58
	kcal/kg	5836	6349
	Btu/lb	10505	11428

Hardgrove grindability index 59

Free swelling index (FSI) 7.0

Moisture (as rec'd)
Inherent % 1.27
Adherent % 6.81

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1182	1357
Spherical °C		1252	1427
Hemispherical °C		1399	1454
Fluid °C		1432	1460

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Lingan Mine; Harbour Seam; Sydney Coalfield
 Lingan, Cape Breton County, Nova Scotia

Sampling date	10-05-84
Sampling location	Coal Preparation Plant Victoria Junction
Product name	Raw feed
Screen opening ,mm (Screen opening ,in)	Minus 38 ,sq Minus 1 1/2 ,sq
ERL number	3200-84

Ash analysis, per cent:

SiO ₂	53.00
Al ₂ O ₃	23.14
Fe ₂ O ₃	13.59
Mn ₃ O ₄	-
TiO ₂	0.98
P ₂ O ₅	-
CaO	0.56
MgO	1.58
SO ₃	0.77
Na ₂ O	0.64
K ₂ O	3.53
SrO	0.02
BaO	0.08
Loss on fusion (LOF)	0.68

Volatile trace element analysis ug/g (ppm)

Hg	0.14
Cl	790
F	123.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
Lingan Mine; Harbour Seam; Sydney Coalfield
Lingan, Cape Breton County, Nova Scotia

Sampling date 10-05-84
Sampling location Coal Preparation Plant
Victoria Junction

Product name Thermal Coal
Screen opening ,mm Minus 38 ,sq
(Screen opening ,in) Minus 1 1/2 ,sq

ERL number 3201-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	5.40		
Ash %	2.85	3.01	
Volatile %	34.50	36.47	37.60
Fixed carbon %	57.25	60.52	62.40

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	77.92	82.36	84.92
Hydrogen %	4.98	5.26	5.42
Sulphur (Pyritic) %	(0.86)	(0.91)	-
(Sulphate) %	(0.02)	(0.02)	-
(Organic) %	(0.53)	(0.56)	(0.57)
Total %	1.41	1.49	-
Nitrogen %	1.84	1.95	2.01
Ash %	2.85	3.01	-
Oxygen, by difference %	5.61	5.93	6.11

Heating value:	MJ/kg	Dry	Dry Ash Free
	33.29	35.19	36.28
	kcal/kg 7951	8405	8666
	Btu/lb 14313	15129	15598

Hardgrove grindability index 60

Free swelling index (FSI) 8.0

Moisture (as rec'd)
Inherent % 1.25
Adherent % 4.15

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1071	1382
Spherical °C	1082	1410
Hemispherical °C	1096	1416
Fluid °C	1316	1438

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Lingan Mine; Harbour Seam; Sydney Coalfield
 Lingan, Cape Breton County, Nova Scotia

Sampling date	10-05-84
Sampling location	Coal Preparation Plant Victoria Junction
Product name	Thermal Coal
Screen opening ,mm (Screen opening ,in)	Minus 38 ,sq Minus 1 1/2 ,sq
ERL number	3201-84

Ash analysis, per cent:

SiO ₂	26.40
Al ₂ O ₃	16.79
Fe ₂ O ₃	49.51
Mn ₃ O ₄	-
TiO ₂	0.89
P ₂ O ₅	0.28
CaO	1.24
MgO	0.79
SO ₃	0.81
Na ₂ O	0.64
K ₂ O	0.86
SrO	0.01
BaO	-
Loss on fusion (LOF)	0.67

Volatile trace element analysis ug/g (ppm)

Hg	0.15
Cl	410
F	21.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
Lingan Mine; Harbour Seam; Sydney Coalfield
Lingan, Cape Breton County, Nova Scotia

Sampling date 10-05-84
Sampling location Coal Preparation Plant
Victoria Junction

Product name Coarse Product
Screen opening ,mm 38 x 24 mesh ,sq
(Screen opening ,in) 1 1/2 x 24 mesh ,sq

ERL number 3202-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	5.36		
Ash %	2.73	2.88	
Volatile %	35.87	37.90	39.03
Fixed carbon %	56.05	59.22	60.97

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	78.23	82.66	85.11
Hydrogen %	5.14	5.43	5.59
Sulphur (Pyritic) %	(0.94)	(0.99)	-
(Sulphate) %	(0.02)	(0.02)	-
(Organic) %	(0.58)	(0.62)	(0.64)
Total %	1.54	1.63	-
Nitrogen %	1.79	1.89	1.95
Ash %	2.73	2.88	-
Oxygen, by difference %	5.21	5.51	5.67

Heating value:	MJ/kg	Dry	Dry Ash Free
	33.13	35.01	36.04
	kcal/kg 7913	8361	8609
	Btu/lb 14243	15050	15496

Hardgrove grindability index 60

Free swelling index (FSI) 8.0

Moisture (as rec'd)
Inherent % 1.25
Adherent % 4.11

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1096	1421
Spherical °C	1107	1424
Hemispherical °C	1132	1427
Fluid °C	1304	1435

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Lingan Mine; Harbour Seam; Sydney Coalfield
 Lingan, Cape Breton County, Nova Scotia

Sampling date	10-05-84
Sampling location	Coal Preparation Plant Victoria Junction
Product name	Coarse Product
Screen opening ,mm (Screen opening ,in)	38 x 24 mesh ,sq 1 1/2 x 24 mesh ,sq
ERL number	3202-84

Ash analysis, per cent:

SiO ₂	22.36
Al ₂ O ₃	14.64
Fe ₂ O ₃	55.40
Mn ₃ O ₄	-
TiO ₂	0.87
P ₂ O ₅	0.25
CaO	1.22
MgO	0.68
SO ₃	0.77
Na ₂ O	0.62
K ₂ O	0.68
SrO	-
BaO	-
Loss on fusion (LOF)	0.62

Volatile trace element analysis ug/g (ppm)

Hg	0.13
Cl	460
F	15.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
Lingan Mines; Harbour Seam; Sydney Coalfield
Lingan, Cape Breton County, Nova Scotia

Sampling date 10-05-84
Sampling location Coal Preparation Plant
Victoria Junction

Product name Thermal Fines Product
Screen opening ,mm Minus 24 mesh
(Screen opening ,in)

ERL number 2332-85

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture..... %	15.15		
Ash..... %	9.67	11.40	
Volatile..... %	28.64	33.76	38.10
Fixed carbon..... %	46.53	54.84	61.90

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon..... %	63.76	75.15	84.82
Hydrogen..... %	4.12	4.86	5.49
Sulphur (Pyritic)..... %	(1.90)	(2.24)	-
(Sulphate)..... %	(0.03)	(0.03)	-
(Organic)..... %	(0.50)	(0.59)	(0.66)
Total..... %	2.43	2.86	-
Nitrogen..... %	1.44	1.70	1.92
Ash..... %	9.67	11.40	-
Oxygen, by difference..... %	3.42	4.03	4.55

Heating value:	MJ/kg	As Rec'd	Dry	Dry Ash Free
		27.65	32.59	36.78
	kcal/kg	6604	7784	8785
	Btu/lb	11887	14010	15813

Hardgrove grindability index

Free swelling index (FSI) 8.0

Moisture (as rec'd)

Inherent..... %	1.13
Adherent..... %	14.02

Ash Fusibility temperature

	Reducing	Oxidizing
Initial..... °C	1074	1366
Spherical..... °C	1107	1402
Hemispherical..... °C	1279	1416
Fluid..... °C	1421	1446

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Lingan Mine; Harbour Seam; Sydney Coalfield
 Lingan, Cape Breton County, Nova Scotia

Sampling date	10-05-84
Sampling location	Coal Preparation Plant Victoria Junction
Product name	Thermal Fines Product
Screen opening ,mm (Screen opening ,in)	Minus 24 mesh
ERL number	2332-85

Ash analysis, per cent:

SiO ₂	39.27
Al ₂ O ₃	20.39
Fe ₂ O ₃	31.77
Mn ₃ O ₄	-
TiO ₂	1.01
P ₂ O ₅	0.14
CaO	1.21
MgO	0.81
SO ₃	0.88
Na ₂ O	0.64
K ₂ O	1.62
SrO	0.02
BaO	-
Loss on fusion (LOF)	0.45

Volatile trace element analysis ug/g (ppm)

Hg	0.18
Cl	680
F	63.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 No. 26 Colliery; Harbour Seam; Sydney Coalfield
 Glace Bay, Cape Breton County, Nova Scotia

 Sampling date 7-06-84
 Sampling location Coal Preparation Plant
 Victoria Junc (stockpile)

Product name Slack
 Screen opening ,mm Minus 51 ,sq
 (Screen opening ,in) Minus 2 ,sq

ERL number 3361-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	5.57		
Ash %	19.33	20.47	
Volatile %	27.15	28.75	36.15
Fixed carbon %	47.95	50.78	63.85

Ultimate:			
Carbon %	64.85	68.67	86.34
Hydrogen %	4.10	4.34	5.46
Sulphur (Pyritic) %	(0.50)	(0.53)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.34)	(0.36)	(0.46)
Total %	0.84	0.89	-
Nitrogen %	1.56	1.65	2.07
Ash %	19.33	20.47	-
Oxygen, by difference %	3.76	3.98	5.00

Heating value:			
	MJ/kg	26.52	28.09
	kcal/kg	6335	6708
	Btu/lb	11402	12075
			15182

 Hardgrove grindability index 70

Free swelling index (FSI) 7.5

Moisture (as rec'd)
 Inherent % 1.13
 Adherent % 4.44

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1129	1321
Spherical °C	1177	1382
Hemispherical °C	1282	1399
Fluid °C	1341	1438

Notes: On April 5, 1984 No. 26 Colliery was closed due to a fire in the main deeps.

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 No. 26 Colliery; Harbour Seam; Sydney Coalfield
 Glace Bay, Cape Breton County, Nova Scotia

Sampling date	7-06-84
Sampling location	Coal Preparation Plant Victoria Junc (stockpile)
Product name	Slack
Screen opening ,mm (Screen opening ,in)	Minus 51 ,sq Minus 2 ,sq
ERL number	3361-84

Ash analysis, per cent:

SiO ₂	53.24
Al ₂ O ₃	19.08
Fe ₂ O ₃	16.26
Mn ₃ O ₄	-
TiO ₂	0.92
P ₂ O ₅	0.08
CaO	1.09
MgO	1.28
SO ₃	1.64
Na ₂ O	0.44
K ₂ O	2.81
SrO	0.02
BaO	0.11
Loss on fusion (LOF)	0.69

Volatile trace element analysis ug/g (ppm)

Hg	0.11
Cl	660
F	94.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Prince Mine; Hub Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

 Sampling date 8-05-84
 Sampling location Mine (u/g)
 No. 4 Deep

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3194-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	8.67		
Ash %	6.60	7.23	
Volatile %	32.37	35.44	38.20
Fixed carbon %	52.36	57.33	61.80

Ultimate:			
Carbon %	69.00	75.55	81.44
Hydrogen %	4.41	4.83	5.21
Sulphur (Pyritic) %	(1.61)	(1.77)	-
(Sulphate) %	(0.05)	(0.05)	-
(Organic) %	(0.97)	(1.06)	(1.14)
Total %	2.63	2.88	-
Nitrogen %	1.47	1.61	1.74
Ash %	6.60	7.23	-
Oxygen, by difference %	7.22	7.90	8.52

Heating value:			
	MJ/kg	29.65	32.46
	kcal/kg	7082	7754
	Btu/lb	12747	13957

 Hardgrove grindability index 60

Free swelling index (FSI) 7.0

Moisture (as rec'd)	
Inherent %	3.57
Adherent %	5.10

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1057	1366
Spherical °C	1082	1393
Hemispherical °C	1107	1413
Fluid °C	1279	1416

 Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Prince Mine; Hub Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

Sampling date	8-05-84
Sampling location	Mine (u/g) No. 4 Deep
Product name	Channel Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	3194-84

Ash analysis, per cent:

SiO ₂	38.44
Al ₂ O ₃	16.45
Fe ₂ O ₃	36.79
Mn ₃ O ₄	-
TiO ₂	0.84
P ₂ O ₅	0.16
CaO	1.57
MgO	0.74
SO ₃	1.16
Na ₂ O	0.87
K ₂ O	1.11
SrO	-
BaO	0.01
Loss on fusion (LOF)	0.91

Volatile trace element analysis ug/g (ppm)

Hg	0.15
Cl	3440
F	26.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Prince Mine; Hub Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

 Sampling date 8-05-84
 Sampling location Mine (u/g)

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3195-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	7.81		
Ash %	17.86	19.37	
Volatile %	29.77	32.30	40.06
Fixed carbon %	44.56	48.33	59.94

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	59.10	64.11	79.51
Hydrogen %	3.94	4.27	5.30
Sulphur (Pyritic) %	(3.04)	(3.29)	-
(Sulphate) %	(0.10)	(0.11)	-
(Organic) %	(1.22)	(1.32)	(1.64)
Total %	4.36	4.73	-
Nitrogen %	1.30	1.41	1.75
Ash %	17.86	19.37	-
Oxygen, by difference %	5.63	6.11	7.58

Heating value:	MJ/kg	As Rec'd	Dry	Dry Ash Free
	25.12	27.25	33.79	
	kcal/kg	6000	6508	8071
	Btu/lb	10799	11714	14529

 Hardgrove grindability index 57

Free swelling index (FSI) 6.0

Moisture (as rec'd)
 Inherent % 2.40
 Adherent % 5.41

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1088	1382
Spherical °C	1263	1413
Hemispherical °C	1346	1416
Fluid °C	1371	1418

 Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Prince Mine; Hub Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

Sampling date 8-05-84
 Sampling location Mine (u/g)

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3195-84

Ash analysis, per cent:

SiO ₂	38.92
Al ₂ O ₃	23.43
Fe ₂ O ₃	26.50
Mn ₃ O ₄	-
TiO ₂	0.85
P ₂ O ₅	0.40
CaO	1.69
MgO	0.85
SO ₃	1.40
Na ₂ O	0.65
K ₂ O	1.89
SrO	-
BaO	0.10
Loss on fusion (LOF)	1.10

Volatile trace element analysis ug/g (ppm)

Hg	0.18
Cl	2770
F	79.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Prince Mine; Hub Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

 Sampling date 3-05-84
 Sampling location Trenton Power Station (NSPC)

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3180-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	6.68		
Ash %	20.18	21.62	
Volatile %	28.93	31.00	39.56
Fixed carbon %	44.21	47.38	60.44

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	57.60	61.72	78.74
Hydrogen %	3.85	4.13	5.27
Sulphur (Pyritic) %	(3.64)	(3.90)	-
(Sulphate) %	(0.18)	(0.20)	-
(Organic) %	(1.14)	(1.22)	(1.56)
Total %	4.96	5.32	-
Nitrogen %	1.22	1.31	1.67
Ash %	20.18	21.62	-
Oxygen, by difference %	5.51	5.90	7.53

Heating value:	MJ/kg	Dry	Dry Ash Free
	24.82	26.59	33.93
	kcal/kg 5928	6352	8104
	Btu/lb 10670	11433	14586

 Hardgrove grindability index 58

Free swelling index (FSI) 6.0

Moisture (as rec'd)
 Inherent % 3.53
 Adherent % 3.15

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1079	1366
Spherical °C	1196	1388
Hemispherical °C	1291	1393
Fluid °C	1304	1399

 Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Prince Mine; Hub Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

Sampling date 3-05-84
 Sampling location Trenton Power Station (NSPC)

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3180-84

Ash analysis, per cent:

SiO ₂	41.23
Al ₂ O ₃	20.24
Fe ₂ O ₃	28.13
Mn ₃ O ₄	-
TiO ₂	0.79
P ₂ O ₅	0.42
CaO	1.79
MgO	0.79
SO ₃	1.34
Na ₂ O	0.60
K ₂ O	1.86
SrO	0.05
BaO	-
Loss on fusion (LOF)	0.30

Volatile trace element analysis ug/g (ppm)

Hg	0.16
Cl	2860
F	99.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Prince Mine; Hub Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

 Sampling date 9-05-84
 Sampling location Lingan Power Station (NSPC)

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3199-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture..... %	9.90		
Ash..... %	14.70	16.32	
Volatile..... %	30.85	34.24	40.92
Fixed carbon..... %	44.54	49.44	59.08

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon..... %	59.23	65.74	78.56
Hydrogen..... %	4.00	4.44	5.31
Sulphur (Pyritic)..... %	(3.59)	(3.98)	-
(Sulphate)..... %	(0.16)	(0.18)	-
(Organic)..... %	(1.03)	(1.14)	(1.36)
Total..... %	4.78	5.30	-
Nitrogen..... %	1.32	1.46	1.74
Ash..... %	14.70	16.32	-
Oxygen, by difference..... %	6.07	6.74	8.05

Heating value:	MJ/kg	Dry	Dry Ash Free
	25.64	28.46	34.01
	kcal/kg 6124	6797	8123
	Btu/lb 11023	12234	14621

 Hardgrove grindability index 55

Free swelling index (FSI) 5.0

Moisture (as rec'd)
 Inherent..... % 3.38
 Adherent..... % 6.52

Ash Fusibility temperature	Reducing	Oxidizing
Initial..... °C	1060	1377
Spherical..... °C	1093	1404
Hemispherical..... °C	1121	1407
Fluid..... °C	1313	1413

 Notes:

CAPE BRETON DEVELOPMENT CORPORATION (CBDC)
 Prince Mine; Hub Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

Sampling date 9-05-84
 Sampling location Lingan Power Station (NSPC)

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3199-84

Ash analysis, per cent:

SiO ₂	34.78
Al ₂ O ₃	18.75
Fe ₂ O ₃	36.94
Mn ₃ O ₄	-
TiO ₂	0.69
P ₂ O ₅	0.20
CaO	1.22
MgO	0.84
SO ₃	1.33
Na ₂ O	0.42
K ₂ O	2.17
SrO	0.01
BaO	-
Loss on fusion (LOF)	1.03

Volatile trace element analysis ug/g (ppm)

Hg	0.18
Cl	1670
F	64.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

THOMAS BROGAN AND SONS CONSTRUCTION LTD.
Brogans Mine; Upper Bonar (Lloyd Cove) Seam; Sydney Coalfield
Point Aconi, Cape Breton County, Nova Scotia

Sampling date 25-06-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3362-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	11.15		
Ash %	6.02	6.77	
Volatile %	32.31	36.36	39.00
Fixed carbon %	50.53	56.87	61.00

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	65.33	73.52	78.86
Hydrogen %	3.53	3.97	4.26
Sulphur (Pyritic) %	(2.95)	(3.32)	-
(Sulphate) %	(0.25)	(0.28)	-
(Organic) %	(1.00)	(1.13)	(1.21)
Total %	4.20	4.73	-
Nitrogen %	1.93	2.17	2.33
Ash %	6.02	6.77	-
Oxygen, by difference %	7.85	8.84	9.48

Heating value:	MJ/kg	kcal/kg	Btu/lb
	28.11	6714	12085
		7556	13601
			14588

Hardgrove grindability index 54

Free swelling index (FSI) 5.0

Moisture (as rec'd)

Inherent %	6.64
Adherent %	4.51

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1096	1449
Spherical °C	1107	1460
Hemispherical °C	1110	1466
Fluid °C	1121	1468

Notes:

THOMAS BROGAN AND SONS CONSTRUCTION LTD.
 Brogans Mine; Upper Bonar (Lloyd Cove) Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

Sampling date 25-06-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3362-84

Ash analysis, per cent:

SiO ₂	17.09
Al ₂ O ₃	8.06
Fe ₂ O ₃	68.67
Mn ₃ O ₄	-
TiO ₂	0.27
P ₂ O ₅	-
CaO	0.94
MgO	0.60
SO ₃	1.37
Na ₂ O	0.13
K ₂ O	0.81
SrO	-
BaO	-
Loss on fusion (LOF)	0.66

Volatile trace element analysis ug/g (ppm)

Hg	0.10
Cl	190
F	23.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

THOMAS BROGAN AND SONS CONSTRUCTION LTD.
 Brogans Mine; Lower Bonar (Lloyd Cove) Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

 Sampling date 7-05-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3187-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	9.33		
Ash %	6.92	7.63	
Volatile %	32.34	35.67	38.61
Fixed carbon %	51.42	56.70	61.39

Ultimate:			
Carbon %	66.85	73.73	79.82
Hydrogen %	4.37	4.82	5.22
Sulphur (Pyritic) %	(2.43)	(2.68)	-
(Sulphate) %	(0.11)	(0.13)	-
(Organic) %	(1.68)	(1.85)	(2.00)
Total %	4.23	4.66	-
Nitrogen %	1.37	1.51	1.63
Ash %	6.92	7.63	-
Oxygen, by difference %	6.94	7.65	8.28

Heating value:			
	MJ/kg	28.69	31.65
	kcal/kg	6854	7559
	Btu/lb	12337	13605
			14729

 Hardgrove grindability index 55

Free swelling index (FSI) 6.5

Moisture (as rec'd)
 Inherent % 4.00
 Adherent % 5.33

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1049	1404
Spherical °C		1057	1413
Hemispherical °C		1107	1416
Fluid °C		1185	1418

 Notes:

THOMAS BROGAN AND SONS CONSTRUCTION LTD.
 Brogans Mine; Lower Bonar (Lloyd Cove) Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

Sampling date 7-05-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3187-84

Ash analysis, per cent:

SiO ₂	27.86
Al ₂ O ₃	11.94
Fe ₂ O ₃	51.18
Mn ₃ O ₄	-
TiO ₂	0.58
P ₂ O ₅	1.04
CaO	2.55
MgO	0.71
SO ₃	1.23
Na ₂ O	0.36
K ₂ O	1.12
SrO	-
BaO	0.04
Loss on fusion (LOF)	0.13

Volatile trace element analysis ug/g (ppm)

Hg	0.14
Cl	1580
F	76.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

THOMAS BROGAN AND SONS CONSTRUCTION LTD.

Brogans Mine; Lower Bonar (Lloyd Cove) Seam; Sydney Coalfield
Point Aconi, Cape Breton County, Nova Scotia

Sampling date 7-05-84
Sampling location Mine (surface)

Product name Nut
Screen opening ,mm 51 x 6.4 ,sq
(Screen opening ,in) 2 x 1/4 ,sq

ERL number 3188-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	9.65		
Ash %	10.67	11.81	
Volatile %	31.08	34.40	39.00
Fixed carbon %	48.60	53.79	61.00

Ultimate:			
Carbon %	62.51	69.19	78.46
Hydrogen %	4.12	4.56	5.17
Sulphur (Pyritic) %	(3.02)	(3.35)	-
(Sulphate) %	(0.19)	(0.21)	-
(Organic) %	(1.86)	(2.06)	(2.34)
Total %	5.08	5.62	-
Nitrogen %	1.24	1.37	1.55
Ash %	10.67	11.81	-
Oxygen, by difference %	6.73	7.45	8.45

Heating value:			
	MJ/kg	27.06	29.95
	kcal/kg	6462	7152
	Btu/lb	11632	12874
			14599

Hardgrove grindability index 56

Free swelling index (FSI) 6.0

Moisture (as rec'd)
Inherent % 4.17
Adherent % 5.48

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1060	1377
Spherical °C	1071	1404
Hemispherical °C	1085	1407
Fluid °C	1207	1416

Notes:

THOMAS BROGAN AND SONS CONSTRUCTION LTD.
 Brogans Mine; Lower Bonar (Lloyd Cove) Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

Sampling date 7-05-84
 Sampling location Mine (surface)

Product name Nut
 Screen opening ,mm 51 x 6.4 ,sq
 (Screen opening ,in) 2 x 1/4 ,sq

ERL number 3188-84

Ash analysis, per cent:

SiO ₂	34.43
Al ₂ O ₃	13.19
Fe ₂ O ₃	42.67
Mn ₃ O ₄	-
TiO ₂	0.61
P ₂ O ₅	0.76
CaO	1.61
MgO	0.99
SO ₃	1.06
Na ₂ O	0.34
K ₂ O	1.79
SrO	-
BaO	0.09
Loss on fusion (LOF)	0.79

Volatile trace element analysis ug/g (ppm)

Hg	0.13
Cl	270
F	80.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

THOMAS BROGAN AND SONS CONSTRUCTION LTD.
Brogans Mine; Lower Bonar (Lloyd Cove) Seam; Sydney Coalfield
Point Aconi, Cape Breton County, Nova Scotia

Sampling date 7-05-84
Sampling location Mine (surface)

Product name Fines
Screen opening ,mm Minus 6.4 ,sq
(Screen opening ,in) Minus 1/4 ,sq

ERL number 3189-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	13.57		
Ash %	15.93	18.43	
Volatile %	27.26	31.54	38.67
Fixed carbon %	43.24	50.03	61.33

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	54.87	63.48	77.82
Hydrogen %	3.57	4.13	5.06
Sulphur (Pyritic) %	(3.26)	(3.77)	-
(Sulphate) %	(0.23)	(0.27)	-
(Organic) %	(1.78)	(2.06)	(2.53)
Total %	5.27	6.10	-
Nitrogen %	1.05	1.21	1.48
Ash %	15.93	18.43	-
Oxygen, by difference %	5.75	6.65	8.15

Heating value:	MJ/kg	Dry	Dry Ash Free
	23.77	27.50	33.71
	kcal/kg 5677	6568	8052
	Btu/lb 10218	11822	14493

Hardgrove grindability index 61

Free swelling index (FSI) 5.0

Moisture (as rec'd)

Inherent %	3.13
Adherent %	10.44

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1054	1338
Spherical °C	1096	1385
Hemispherical °C	1210	1399
Fluid °C	1224	1410

Notes:

THOMAS BROGAN AND SONS CONSTRUCTION LTD.
 Brogans Mine; Lower Bonar (Lloyd Cove) Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

Sampling date 7-05-84
 Sampling location Mine (surface)

Product name Fines
 Screen opening ,mm Minus 6.4 ,sq
 (Screen opening ,in) Minus 1/4 ,sq

ERL number 3189-84

Ash analysis, per cent:

SiO ₂	42.48
Al ₂ O ₃	15.22
Fe ₂ O ₃	32.97
Mn ₃ O ₄	-
TiO ₂	0.65
P ₂ O ₅	0.53
CaO	1.11
MgO	0.89
SO ₃	0.58
Na ₂ O	0.39
K ₂ O	2.41
SrO	-
BaO	0.11
Loss on fusion (LOF)	0.39

Volatile trace element analysis ug/g (ppm)

Hg	0.11
Cl	220
F	112.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

SELMINCO INC.
Coal Reclamation Project; Princess Dump; Sydney Coalfield
Sydney Mines, Cape Breton County, Nova Scotia

Sampling date 7-05-84
Sampling location Stockpile

Product name Slack
Screen opening ,mm 38 x 28 mesh ,sq
(Screen opening ,in) 1 1/2 x 28 mesh ,sq

ERL number 3192-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	6.02		
Ash %	5.73	6.10	
Volatile %	34.14	36.32	38.68
Fixed carbon %	54.11	57.58	61.32

Ultimate:			
Carbon %	73.93	78.67	83.78
Hydrogen %	4.95	5.27	5.61
Sulphur (Pyritic) %	(1.08)	(1.15)	-
(Sulphate) %	(0.04)	(0.04)	-
(Organic) %	(0.77)	(0.82)	(0.88)
Total %	1.89	2.01	-
Nitrogen %	1.73	1.84	1.96
Ash %	5.73	6.10	-
Oxygen, by difference %	5.74	6.11	6.51

Heating value:			
	MJ/kg	31.45	33.47
	kcal/kg	7512	7993
	Btu/lb	13522	14388

Hardgrove grindability index 57

Free swelling index (FSI) 8.0

Moisture (as rec'd)

Inherent %	1.50
Adherent %	4.52

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1057	1371
Spherical °C	1152	1399
Hemispherical °C	1268	1404
Fluid °C	1318	1413

Notes:

SELMINCO INC.
Coal Reclamation Project; Princess Dump; Sydney Coalfield
Sydney Mines, Cape Breton County, Nova Scotia

Sampling date	7-05-84
Sampling location	Stockpile

Product name	Slack
Screen opening ,mm (Screen opening ,in)	38 x 28 mesh ,sq 1 1/2 x 28 mesh ,sq

ERL number	3192-84
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Ash analysis, per cent:

SiO ₂	37.06
Al ₂ O ₃	19.02
Fe ₂ O ₃	34.74
Mn ₃ O ₄	-
TiO ₂	1.14
P ₂ O ₅	0.41
CaO	1.19
MgO	0.83
SO ₃	0.97
Na ₂ O	0.45
K ₂ O	1.41
SrO	0.02
BaO	0.17
Loss on fusion (LOF)	1.25

Volatile trace element analysis ug/g (ppm)

Hg	0.23
Cl	1270
F	33.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

SELMINCO INC.
Coal Reclamation Project; Summit Dump; Sydney Coalfield
New Waterford, Cape Breton County, Nova Scotia

Sampling date 7-05-84
Sampling location Stockpile

Product name Slack
Screen opening ,mm 38 x 28 mesh ,sq
(Screen opening ,in) 1 1/2 x 28 mesh ,sq

ERL number 3193-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	7.40		
Ash %	4.96	5.36	
Volatile %	31.93	34.48	36.44
Fixed carbon %	55.71	60.16	63.56

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	73.27	79.12	83.60
Hydrogen %	5.07	5.48	5.79
Sulphur (Fyritic) %	(0.59)	(0.64)	-
(Sulphate) %	(0.05)	(0.05)	-
(Organic) %	(0.82)	(0.89)	(0.94)
Total %	1.46	1.58	-
Nitrogen %	1.64	1.77	1.87
Ash %	4.96	5.36	-
Oxygen, by difference %	6.20	6.69	7.07

Heating value:	MJ/kg	As Rec'd	Dry	Dry Ash Free
	kcal/kg	31.06	33.54	35.44
	Btu/lb	7418	8010	8464
		13352	14418	15235

Hardgrove grindability index 63

Free swelling index (FSI) 7.5

Moisture (as rec'd)

Inherent %	1.72
Adherent %	5.68

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1066	1379
Spherical °C	1141	1407
Hemispherical °C	1304	1410
Fluid °C	1321	1418

Notes:

SELMINCO INC.
Coal Reclamation Project; Summit Dump; Sydney Coalfield
New Waterford, Cape Breton County, Nova Scotia

Sampling date 7-05-84
Sampling location Stockpile

Product name Slack
Screen opening ,mm 38 x 28 mesh ,sq
(Screen opening ,in) 1 1/2 x 28 mesh ,sq

ERL number 3193-84

Ash analysis, per cent:

SiO ₂	43.39
Al ₂ O ₃	20.52
Fe ₂ O ₃	25.48
Mn ₃ O ₄	-
TiO ₂	1.12
P ₂ O ₅	0.42
CaO	1.55
MgO	0.66
SO ₃	1.11
Na ₂ O	0.54
K ₂ O	2.01
SrO	0.05
BaO	0.06
Loss on fusion (LOF)	1.04

Volatile trace element analysis ug/g (ppm)

Hg	0.15
Cl	3010
F	51.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

PIONEER COAL CO. LTD.

Novaco Mine; Upper Sydney Main (Harbour) Seam; Sydney Coalfield
Point Aconi, Cape Breton County, Nova Scotia

Sampling date	7-05-84		
Sampling location	Mine (surface)		
Product name	Channel Sample		
Screen opening ,mm (Screen opening ,in)			
ERL number	3190-84		
Rank of coal	High-volatile A bituminous		
Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	% 6.47		
Ash	% 8.67	9.27	
Volatile	% 34.46	36.84	40.61
Fixed carbon	% 50.40	53.89	59.39
Ultimate:			
Carbon	% 66.06	70.63	77.85
Hydrogen	% 4.44	4.75	5.24
Sulphur (Pyritic)	% (4.43)	(4.74)	-
(Sulphate)	% (0.17)	(0.18)	-
(Organic)	% (1.14)	(1.22)	(1.35)
Total	% 5.74	6.14	-
Nitrogen	% 1.49	1.59	1.75
Ash	% 8.67	9.27	-
Oxygen, by difference	% 7.13	7.62	8.40
Heating values:			
	MJ/kg	29.23	31.26
	kcal/kg	6983	7466
	Btu/lb	12569	13438
Hardgrove grindability index	56		
Free swelling index (FSI)	5.5		
Moisture (as rec'd)			
Inherent	% 4.06		
Adherent	% 2.41		
Ash Fusibility temperature	Reducing	Oxidizing	
Initial	°C 1135	1457	
Spherical	°C 1157	1466	
Hemispherical	°C 1196	1468	
Fluid	°C 1235	1474	

Notes: Novaco Mine is owned by Novaco (a wholly owned Provincial Crown Corp.) and operated by Pioneer Coal Co. Ltd.

PIONEER COAL CO. LTD.
 Novaco Mine; Upper Sydney Main (Harbour) Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

Sampling date 7-05-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3190-84

Ash analysis, per cent:

SiO ₂	13.13
Al ₂ O ₃	9.03
Fe ₂ O ₃	74.35
Mn ₃ O ₄	-
TiO ₂	0.25
P ₂ O ₅	0.16
CaO	1.20
MgO	0.34
SO ₃	0.82
Na ₂ O	0.33
K ₂ O	0.40
SrO	-
BaO	0.06
Loss on fusion (LOF)	0.75

Volatile trace element analysis ug/g (ppm)

Hg	0.28
Cl	2610
F	30.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

PIONEER COAL CO. LTD.

Novaco Mine; Upper Sydney Main (Harbour) Seam; Sydney Coalfield
Point Aconi, Cape Breton County, Nova Scotia

 Sampling date 7-05-84
 Sampling location Mine (surface)
 Sampled from stockpile

Product name Slack
 Screen opening ,mm Minus 51 ,rd
 (Screen opening ,in) Minus 2 ,rd

ERL number 3191-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	8.38		
Ash %	12.50	13.64	
Volatile %	32.88	35.89	41.56
Fixed carbon %	46.24	50.47	58.44

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	61.44	67.06	77.65
Hydrogen %	4.20	4.58	5.30
Sulphur (Pyritic) %	(4.34)	(4.74)	-
(Sulphate) %	(0.16)	(0.18)	-
(Organic) %	(1.09)	(1.19)	(1.37)
Total %	5.59	6.10	-
Nitrogen %	1.43	1.56	1.81
Ash %	12.50	13.64	-
Oxygen, by difference %	6.47	7.06	8.18

Heating value:	MJ/kg	27.14	29.63	34.30
	kcal/kg	6483	7076	8193
	Btu/lb	11669	12737	14748

 Hardgrove grindability index 53

Free swelling index (FSI) 5.0

Moisture (as rec'd)
 Inherent % 3.75
 Adherent % 4.63

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1099	1421
Spherical °C	1116	1435
Hemispherical °C	1132	1438
Fluid °C	1282	1449

 Notes: Novaco Mine is owned by Novaco (a wholly owned Provincial Crown Corp.) and operated by Pioneer Coal Co. Ltd.

PIONEER COAL CO. LTD.
 Novaco Mine; Upper Sydney Main (Harbour) Seam; Sydney Coalfield
 Point Aconi, Cape Breton County, Nova Scotia

Sampling date	7-05-84
Sampling location	Mine (surface) Sampled from stockpile
Product name	Slack
Screen opening ,mm (Screen opening ,in)	Minus 51 ,rd Minus 2 ,rd
ERL number	3191-84

Ash analysis, per cent:

SiO ₂	25.90
Al ₂ O ₃	15.70
Fe ₂ O ₃	52.46
Mn ₃ O ₄	-
TiO ₂	0.49
P ₂ O ₅	0.15
CaO	0.87
MgO	0.71
SO ₃	0.58
Na ₂ O	0.31
K ₂ O	1.73
SrO	-
BaO	0.05
Loss on fusion (LOF)	0.56

Volatile trace element analysis ug/g (ppm)

Hg	0.29
Cl	1810
F	48.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

PIONEER COAL CO. LTD.

Novaco Mine; Lower Sydney Main (Harbour) Seam; Sydney Coalfield
Point Aconi, Cape Breton County, Nova Scotia

 Sampling date 5-06-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3360-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	7.99		
Ash %	9.80	10.65	
Volatile %	32.86	35.71	39.97
Fixed carbon %	49.35	53.64	60.03

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	67.00	72.82	81.50
Hydrogen %	4.53	4.92	5.51
Sulphur (Pyritic) %	(1.97)	(2.14)	-
(Sulphate) %	(0.09)	(0.09)	-
(Organic) %	(0.87)	(0.94)	(1.06)
Total %	2.92	3.17	-
Nitrogen %	1.54	1.67	1.87
Ash %	9.80	10.65	-
Oxygen, by difference %	6.23	6.77	7.58

Heating value:	MJ/kg	30.36	33.98
	27.94		
	6673	7252	8116
	12011	13053	14609

Hardgrove grindability index 50

Free swelling index (FSI) 5.0

Moisture (as rec'd)	%
Inherent %	4.38
Adherent %	3.61

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1068	1385
Spherical °C	1177	1402
Hemispherical °C	1338	1404
Fluid °C	1368	1421

Notes: Novaco Mine is owned by Novaco (a wholly owned Provincial Crown Corp.) and operated by Pioneer Coal Co. Ltd.

PIONEER COAL CO. LTD.

Novaco Mine; Lower Sydney Main (Harbour) Seam; Sydney Coalfield
Point Aconi, Cape Breton County, Nova Scotia

Sampling date 5-06-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3360-84

Ash analysis, per cent:

SiO ₂	37.27
Al ₂ O ₃	22.08
Fe ₂ O ₃	30.32
Mn ₃ O ₄	-
TiO ₂	0.79
P ₂ O ₅	-
CaO	1.06
MgO	1.23
SO ₃	1.43
Na ₂ O	0.43
K ₂ O	2.45
SrO	0.01
BaO	-
Loss on fusion (LOF)	0.86

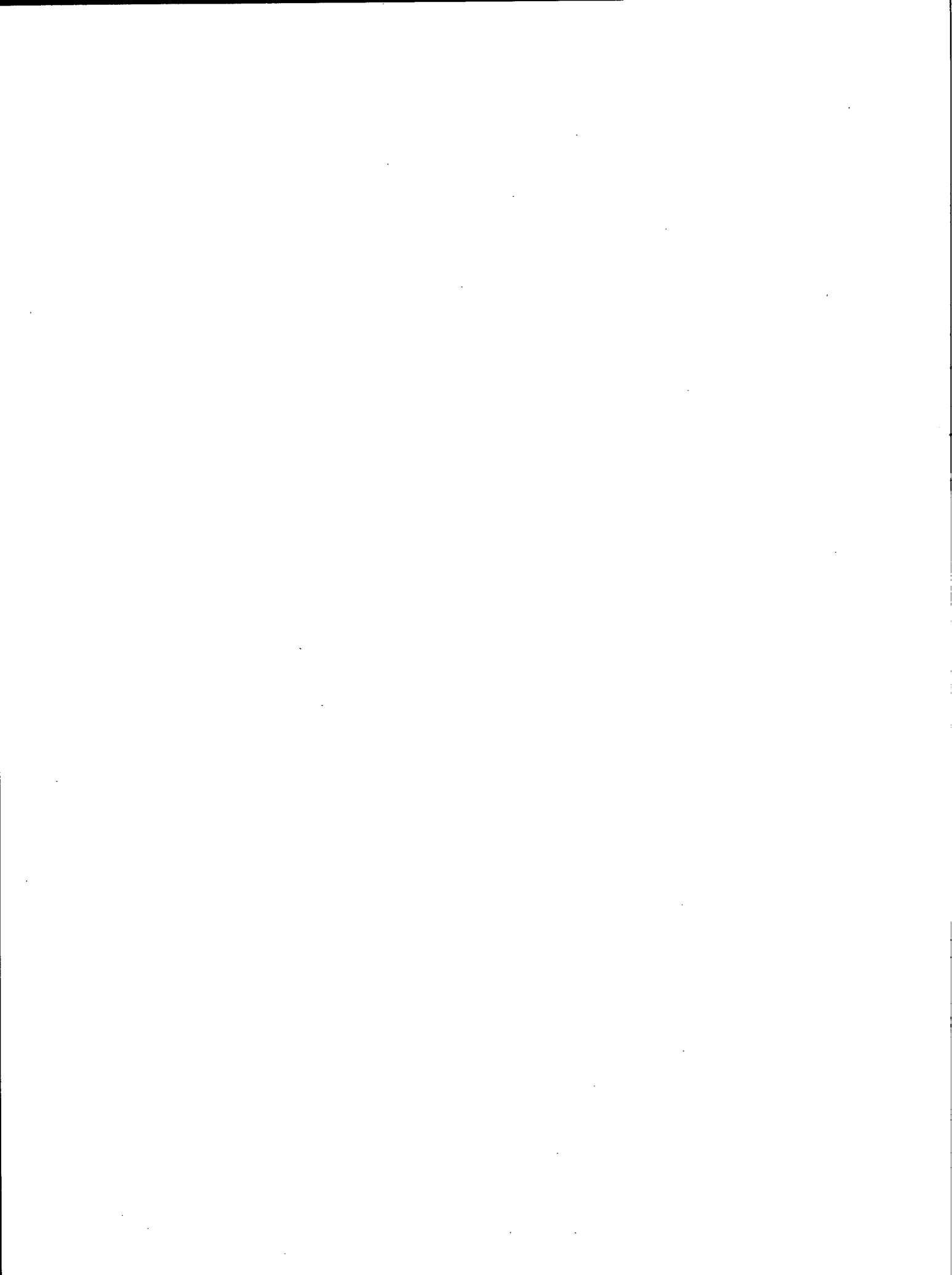
Volatile trace element analysis ug/g (ppm)

Hg	0.16
Cl	1850
F	49.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:



COAL ANALYSES – NEW BRUNSWICK

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	5-04-84
Sampling location	Dragline 9W

Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	

ERL number	2799-84
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Rank of coal	High-volatile A bituminous
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Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	%		
Moisture	2.92		
Ash	%	25.04	
Ash	24.31		
Volatile	%	29.92	39.92
Volatile	29.05		
Fixed carbon	%	45.04	60.08
Fixed carbon	43.72		

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon	%	59.89	79.90
Carbon	58.14		
Hydrogen	%	3.79	5.06
Hydrogen	3.68		
Sulphur (Pyritic)	%	(7.49)	-
Sulphur (Pyritic)	(7.27)		
(Sulphate)	%	(0.00)	-
(Sulphate)	(0.00)		
(Organic)	%	(1.21)	(1.61)
(Organic)	(1.17)		
Total	%	8.70	-
Total	8.45		
Nitrogen	%	0.83	1.11
Nitrogen	0.81		
Ash	%	25.04	-
Ash	24.31		
Oxygen, by difference	%	1.75	2.33
Oxygen, by difference	1.70		

Heating values:	MJ/kg	kcal/kg	Btu/lb
	25.31	6046	10883
	26.08	6228	11211
	34.79	8309	14956

Hardgrove grindability index	58
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Free swelling index (FSI)	6.5
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Moisture (as rec'd)	%
Inherent	0.68
Adherent	2.24

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C	1332
Initial	1027	
Spherical	°C	1382
Spherical	1029	
Hemispherical	°C	1393
Hemispherical	1071	
Fluid	°C	1399
Fluid	1127	

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	5-04-84
Sampling location	Dragline 9W
Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	2799-84

Ash analysis, per cent:

SiO ₂	36.89
Al ₂ O ₃	11.53
Fe ₂ O ₃	39.43
Mn ₃ O ₄	-
TiO ₂	0.64
P ₂ O ₅	1.37
CaO	3.18
MgO	-
SO ₃	2.44
Na ₂ O	0.19
K ₂ O	1.29
SrO	-
BaO	0.12
Loss on fusion (LOF)	0.49

Volatile trace element analysis ug/g (ppm)

Hg	0.92
Cl	230
F	239.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	4-04-84
Sampling location	Dragline 500
Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	2800-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	0.83		
Ash %	15.16	15.29	
Volatile %	32.69	32.96	38.91
Fixed carbon %	51.32	51.75	61.09

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	68.17	68.74	81.15
Hydrogen %	4.24	4.28	5.05
Sulphur (Pyritic) %	(8.99)	(9.06)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.91)	(0.91)	(1.08)
Total %	9.89	9.97	-
Nitrogen %	0.81	0.82	0.97
Ash %	15.16	15.29	-
Oxygen, by difference %	0.89	0.90	1.06

Heating value:	MJ/kg	kcal/kg	Btu/lb
	29.83	7124	12823
	30.08	7183	12930
	35.50	8480	15264

Hardgrove grindability index 63

Free swelling index (FSI) 7.0

Moisture (as rec'd)	%
Inherent %	0.45
Adherent %	0.38

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1082	1441
Spherical °C	1091	1441
Hemispherical °C	1096	1442
Fluid °C	1141	1442

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	4-04-84
Sampling location	Dragline 500
Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	2800-84

Ash analysis, per cent:

SiO ₂	15.60
Al ₂ O ₃	6.00
Fe ₂ O ₃	72.09
Mn ₃ O ₄	-
TiO ₂	0.29
P ₂ O ₅	0.59
CaO	1.51
MgO	-
SO ₃	1.42
Na ₂ O	0.05
K ₂ O	0.42
SrO	-
BaO	0.04
Loss on fusion (LOF)	0.80

Volatile trace element analysis ug/g (ppm)

Hg	0.70
Cl	210
F	61.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

 Sampling date 4-04-84
 Sampling location Grand Lake Power Station (NBEPC)
 Dragline 500

Product name Mine Run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2801-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.21		
Ash %	24.67	25.23	
Volatile %	29.07	29.73	39.76
Fixed carbon %	44.04	45.04	60.24

Ultimate:			
Carbon %	57.79	59.10	79.04
Hydrogen %	3.64	3.72	4.98
Sulphur (Pyritic) %	(9.72)	(9.94)	-
(Sulphate) %	(0.02)	(0.02)	-
(Organic) %	(0.68)	(0.69)	(0.93)
Total %	10.41	10.65	-
Nitrogen %	0.59	0.60	0.80
Ash %	24.67	25.23	-
Oxygen, by difference %	0.68	0.70	0.94

Heating value:			
	MJ/kg	25.39	25.96
	kcal/kg	6063	6201
	Btu/lb	10914	11161
			34.72
			8293
			14927

Hardgrove grindability index 63

Free swelling index (FSI) 7.0

Moisture (as rec'd)
 Inherent % 0.48
 Adherent % 1.73

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1082	1416
Spherical °C	1093	1418
Hemispherical °C	1152	1421
Fluid °C	1210	1427

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date 4-04-84
 Sampling location Grand Lake Power Station (NBEPC)
 Dragline 500

Product name Mine Run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2801-84

Ash analysis, per cent:

SiO ₂	29.70
Al ₂ O ₃	11.59
Fe ₂ O ₃	50.09
Mn ₃ O ₄	-
TiO ₂	0.54
P ₂ O ₅	0.77
CaO	1.61
MgO	1.04
SO ₃	1.27
Na ₂ O	0.13
K ₂ O	1.78
SrO	-
BaO	0.16
Loss on fusion (LOF)	0.36

Volatile trace element analysis ug/g (ppm)

Hg	0.89
Cl	210
F	156.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date 5-04-84
 Sampling location Dragline
 7200

Product name Seam Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2802-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	3.64		
Ash %	20.03	20.79	
Volatile %	29.30	30.40	38.38
Fixed carbon %	47.03	48.81	61.62

Ultimate:			
Carbon %	60.85	63.15	79.72
Hydrogen %	3.74	3.88	4.90
Sulphur (Pyritic) %	(8.57)	(8.90)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(1.31)	(1.36)	(1.72)
Total %	9.90	10.27	-
Nitrogen %	0.67	0.70	0.88
Ash %	20.03	20.79	-
Oxygen, by difference %	1.17	1.21	1.53

Heating value:			
	MJ/kg	26.51	27.52
	kcal/kg	6333	6572
	Btu/lb	11399	11830

Hardgrove grindability index 61

Free swelling index (FSI) 6.5

Moisture (as rec'd)

Inherent %	0.64
Adherent %	3.00

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1057	1404
Spherical °C	1074	1416
Hemispherical °C	1077	1418
Fluid °C	1185	1438

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	5-04-84
Sampling location	Dragline 7200
Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	2802-84

Ash analysis, per cent:

SiO ₂	24.72
Al ₂ O ₃	9.20
Fe ₂ O ₃	56.07
Mn ₃ O ₄	-
TiO ₂	0.47
P ₂ O ₅	1.10
CaO	2.79
MgO	-
SO ₃	2.76
Na ₂ O	0.15
K ₂ O	0.78
SrO	-
BaO	0.04
Loss on fusion (LOF)	0.52

Volatile trace element analysis ug/g (ppm)

Hg	0.59
Cl	270
F	175.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date 4-04-84
 Sampling location Grand Lake Power Station (NBEFC)
 Dragline 7200

Product name Mine Run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2803-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.70		
Ash %	23.35	24.00	
Volatile %	29.17	29.98	39.45
Fixed carbon %	44.78	46.02	60.55

Ultimate:			
Carbon %	58.37	59.99	78.93
Hydrogen %	3.60	3.70	4.87
Sulphur (Pyritic) %	(9.27)	(9.52)	-
(Sulphate) %	(0.02)	(0.02)	-
(Organic) %	(1.49)	(1.53)	(2.01)
Total %	10.77	11.07	-
Nitrogen %	0.65	0.67	0.88
Ash %	23.35	24.00	-
Oxygen, by difference %	0.55	0.57	0.75

Heating value:			
	MJ/kg	25.54	26.25
	kcal/kg	6101	6270
	Btu/lb	10982	11286
			14850

Hardgrove grindability index 60

Free swelling index (FSI) 6.5

Moisture (as rec'd)

Inherent %	0.64
Adherent %	2.06

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1060	1388
Spherical °C	1068	1404
Hemispherical °C	1077	1407
Fluid °C	1229	1413

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date 4-04-84
 Sampling location Grand Lake Power Station (NBEPC)
 Dragline 7200

Product name Mine Run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2803-84

Ash analysis, per cent:

SiO ₂	28.31
Al ₂ O ₃	9.71
Fe ₂ O ₃	53.21
Mn ₃ O ₄	-
TiO ₂	0.52
P ₂ O ₅	0.68
CaO	1.93
MgO	0.80
SO ₃	2.03
Na ₂ O	0.18
K ₂ O	0.91
SrO	-
BaO	0.04
Loss on fusion (LOF)	0.43

Volatile trace element analysis ug/g (ppm)

Hg	0.56
Cl	270
F	135.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	4-04-84
Sampling location	Dragline 8200
Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	2804-84

Rank of coal	High-volatile A bituminous
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Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	%	1.59	
Ash	%	14.78	15.02
Volatile	%	32.03	32.54 38.30
Fixed carbon	%	51.60	52.44 61.70

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon	%	69.34	70.46 82.91
Hydrogen	%	4.21	4.28 5.04
Sulphur (Pyritic)	%	(4.32)	(4.39) -
(Sulphate)	%	(0.01)	(0.01) -
(Organic)	%	(1.42)	(1.44) (1.69)
Total	%	5.75	5.84 -
Nitrogen	%	0.87	0.88 1.04
Ash	%	14.78	15.02 -
Oxygen, by difference	%	3.46	3.52 4.14

Heating value:	MJ/kg	29.56	30.04	35.35
	kcal/kg	7061	7175	8443
	Btu/lb	12709	12915	15198

Hardgrove grindability index	60
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Free swelling index (FSI)	7.0
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Moisture (as rec'd)	
Inherent	%
Adherent	%

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C	1016 1293
Spherical	°C	1018 1371
Hemispherical	°C	1068 1382
Fluid	°C	1113 1393

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	4-04-84
Sampling location	Dragline 8200
Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	2804-84

Ash analysis, per cent:

SiO ₂	35.07
Al ₂ O ₃	10.80
Fe ₂ O ₃	37.61
Mn ₃ O ₄	-
TiO ₂	0.61
P ₂ O ₅	2.19
CaO	5.44
MgO	-
SO ₃	3.95
Na ₂ O	0.23
K ₂ O	0.79
SrO	-
BaO	0.10
Loss on fusion (LOF)	0.91

Volatile trace element analysis ug/g (ppm)

Hg	0.29
Cl	260
F	213.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

 Sampling date 4-04-84
 Sampling location Grand Lake Power Station (NBEPC)
 Dragline 8200

Product name Mine Run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2805-84

 Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.21		
Ash %	18.19	18.60	
Volatile %	30.79	31.48	38.68
Fixed carbon %	48.81	49.92	61.32

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	64.93	66.40	81.57
Hydrogen %	4.02	4.11	5.05
Sulphur (Pyritic) %	(5.66)	(5.79)	-
(Sulphate) %	(0.02)	(0.02)	-
(Organic) %	(1.19)	(1.22)	(1.50)
Total %	6.87	7.03	-
Nitrogen %	0.78	0.80	0.98
Ash %	18.19	18.60	-
Oxygen, by difference %	2.99	3.06	3.76

Heating value:	MJ/kg	27.93	28.56	35.08
	kcal/kg	6670	6821	8379
	Btu/lb	12006	12277	15082

 Hardgrove grindability index 60

Free swelling index (FSI) 7.0

Moisture (as rec'd)
 Inherent % 0.64
 Adherent % 1.57

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1032	1329
Spherical °C	1038	1393
Hemispherical °C	1043	1399
Fluid °C	1135	1410

 Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date 4-04-84
 Sampling location Grand Lake Power Station (NBEPC)
 Dragline 8200

Product name Mine Run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2805-84

Ash analysis, per cent:

SiO ₂	35.61
Al ₂ O ₃	11.65
Fe ₂ O ₃	39.82
Mn ₃ O ₄	-
TiO ₂	0.59
P ₂ O ₅	1.23
CaO	3.54
MgO	-
SO ₃	3.23
Na ₂ O	0.22
K ₂ O	1.30
SrO	-
BaO	0.20
Loss on fusion (LOF)	0.34

Volatile trace element analysis ug/g (ppm)

Hg	0.43
Cl	240
F	149.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	2-05-84
Sampling location	Dragline 7400
Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	3173-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	4.91		
Ash %	9.73	10.23	
Volatile %	33.54	35.27	39.29
Fixed carbon %	51.82	54.50	60.71

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	72.59	76.34	85.04
Hydrogen %	4.77	5.02	5.59
Sulphur (Pyritic) %	(3.45)	(3.62)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(1.12)	(1.18)	(1.32)
Total %	4.58	4.82	-
Nitrogen %	1.02	1.07	1.19
Ash %	9.73	10.23	-
Oxygen, by difference %	2.40	2.52	2.81

Heating value:	MJ/kg	kcal/kg	Btu/lb
	31.31	7477	13459
	32.92	7863	14154
	36.67	8760	15767

Hardgrove grindability index 63

Free swelling index (FSI) 7.0

Moisture (as rec'd)	
Inherent %	0.92
Adherent %	3.99

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1088	1432
Spherical °C	1102	1435
Hemispherical °C	1152	1438
Fluid °C	1221	1446

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	2-05-84
Sampling location	Dragline 7400
Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	3173-84

Ash analysis, per cent:

SiO ₂	29.74
Al ₂ O ₃	11.96
Fe ₂ O ₃	49.09
Mn ₃ O ₄	-
TiO ₂	0.50
P ₂ O ₅	0.24
CaO	1.34
MgO	0.83
SO ₃	0.81
Na ₂ O	0.14
K ₂ O	2.64
SrO	-
BaO	-
Loss on fusion (LOF)	0.63

Volatile trace element analysis ug/g (ppm)

Hg	0.23
Cl	150
F	80.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	2-05-84		
Sampling location	Grand Lake Power Station (NBEPC) Dragline 7400		
Product name	Mine Run		
Screen opening ,mm (Screen opening ,in)			
ERL number	3174-84		
Rank of coal	High-volatile A bituminous		
Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture..... %	6.94		
Ash..... %	13.36	14.36	
Volatile..... %	31.25	33.58	39.21
Fixed carbon..... %	48.45	52.06	60.79
Ultimate:			
Carbon..... %	67.65	72.69	84.88
Hydrogen..... %	4.41	4.74	5.53
Sulphur (Pyritic)..... %	(3.37)	(3.62)	-
(Sulphate)..... %	(0.01)	(0.01)	-
(Organic)..... %	(0.99)	(1.06)	(1.24)
Total..... %	4.36	4.69	-
Nitrogen..... %	1.01	1.09	1.27
Ash..... %	13.36	14.36	-
Oxygen, by difference..... %	2.26	2.43	2.84
Heating value:			
	MJ/kg	28.99	31.15
	kcal/kg	6925	7441
	Btu/lb	12465	13394
Hardgrove grindability index	62		
Free swelling index (FSI)	6.5		
Moisture (as rec'd)			
Inherent..... %	0.99		
Adherent..... %	5.95		
Ash Fusibility temperature	Reducing	Oxidizing	
Initial..... °C	1074	1343	
Spherical..... °C	1143	1404	
Hemispherical..... °C	1179	1416	
Fluid..... °C	1182	1424	

Notes:

N.B. COAL LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date 2-05-84
 Sampling location Grand Lake Power Station (NBEPC)
 Dragline 7400

Product name Mine Run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3174-84

Ash analysis, per cent:

SiO ₂	43.86
Al ₂ O ₃	13.18
Fe ₂ O ₃	34.64
Mn ₃ O ₄	-
TiO ₂	0.46
P ₂ O ₅	0.13
CaO	0.96
MgO	0.95
SO ₃	0.71
Na ₂ O	0.21
K ₂ O	3.01
SrO	-
BaO	-
Loss on fusion (LOF)	0.60

Volatile trace element analysis ug/g (ppm)

Hg	0.16
Cl	50
F	98.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

KNOX CONSTRUCTION LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

 Sampling date 3-04-84
 Sampling location Dragline
 2400

Product name Seam Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2806-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.49		
Ash %	14.54	14.76	
Volatile %	34.15	34.67	40.68
Fixed carbon %	49.81	50.57	59.32

Ultimate:			
Carbon %	68.72	69.76	81.84
Hydrogen %	4.35	4.42	5.19
Sulphur (Pyritic) %	(5.80)	(5.89)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(1.41)	(1.43)	(1.68)
Total %	7.21	7.32	-
Nitrogen %	0.81	0.82	0.96
Ash %	14.54	14.76	-
Oxygen, by difference %	2.88	2.92	3.43

Heating value:			
	MJ/kg	29.69	30.14
	kcal/kg	7091	7199
	Btu/lb	12764	12958
			15202

 Hardgrove grindability index 57

Free swelling index (FSI) 7.0

Moisture (as rec'd)
 Inherent % 0.63
 Adherent % 0.86

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1041	1391
Spherical °C	1046	1407
Hemispherical °C	1049	1410
Fluid °C	1182	1416

 Notes:

KNOX CONSTRUCTION LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	3-04-84
Sampling location	Dragline 2400
Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	2806-84

Ash analysis, per cent:

SiO ₂	27.14
Al ₂ O ₃	9.39
Fe ₂ O ₃	51.94
Mn ₃ O ₄	-
TiO ₂	0.57
P ₂ O ₅	1.52
CaO	3.29
MgO	-
SO ₃	2.52
Na ₂ O	0.11
K ₂ O	0.88
SrO	-
BaO	0.06
Loss on fusion (LOF)	0.70

Volatile trace element analysis ug/g (ppm)

Hg	0.29
Cl	100
F	142.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

KNOX CONSTRUCTION LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date 4-04-84
 Sampling location Grand Lake Power Station (NBEPC)
 Dragline 2400

Product name Mine Run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2807-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	4.33		
Ash %	23.41	24.47	
Volatile %	29.14	30.46	40.33
Fixed carbon %	43.12	45.07	59.67

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	57.73	60.34	79.89
Hydrogen %	3.65	3.82	5.06
Sulphur (Pyritic) %	(7.81)	(8.17)	-
(Sulphate) %	(0.03)	(0.03)	-
(Organic) %	(0.97)	(1.02)	(1.35)
Total %	8.81	9.21	-
Nitrogen %	0.66	0.69	0.91
Ash %	23.41	24.47	-
Oxygen, by difference %	1.41	1.47	1.95

Heating value:	MJ/kg	kcal/kg	Btu/lb
	25.18	6015	10827
	26.32	6287	11316
	34.85	8323	14982

Hardgrove grindability index

Free swelling index (FSI) 6.5

Moisture (as rec'd)

Inherent %	0.66
Adherent %	3.67

Ash Fusibility temperature

	Reducing	Oxidizing
Initial °C	1046	1371
Spherical °C	1052	1407
Hemispherical °C	1054	1410
Fluid °C	1113	1413

Notes:

KNOX CONSTRUCTION LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date 4-04-84
 Sampling location Grand Lake Power Station (NBEPC)
 Dragline 2400

Product name Mine Run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2807-84

Ash analysis, per cent:

SiO ₂	32.41
Al ₂ O ₃	10.52
Fe ₂ O ₃	43.65
Mn ₃ O ₄	-
TiO ₂	0.50
P ₂ O ₅	0.63
CaO	3.36
MgO	0.82
SO ₃	4.38
Na ₂ O	0.12
K ₂ O	1.81
SrO	-
BaO	0.02
Loss on fusion (LOF)	0.65

Volatile trace element analysis ug/g (ppm)

Hg	0.33
Cl	100
F	102.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

KNOX CONSTRUCTION LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	3-04-84
Sampling location	Dragline 200
Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	2808-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.82		
Ash %	15.25	15.53	
Volatile %	32.58	33.19	39.29
Fixed carbon %	50.35	51.28	60.71

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	67.33	68.58	81.19
Hydrogen %	4.20	4.28	5.07
Sulphur (Pyritic) %	(7.14)	(7.28)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.94)	(0.96)	(1.13)
Total %	8.08	8.23	-
Nitrogen %	0.80	0.81	0.96
Ash %	15.25	15.53	-
Oxygen, by difference %	2.52	2.57	3.04

Heating value:	MJ/kg	kcal/kg	Btu/lb
	29.25	29.79	35.27
	6986	7116	8424
	12575	12808	15163

Hardgrove grindability index 61

Free swelling index (FSI) 7.0

Moisture (as rec'd)	%
Inherent %	0.62
Adherent %	1.20

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1035	1377
Spherical °C	1038	1418
Hemispherical °C	1043	1427
Fluid °C	1138	1432

Notes:

KNOX CONSTRUCTION LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	3-04-84
Sampling location	Dragline 200
Product name	Seam Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	2808-84

Ash analysis, per cent:

SiO ₂	19.90
Al ₂ O ₃	6.71
Fe ₂ O ₃	57.13
Mn ₃ O ₄	-
TiO ₂	0.33
F ₂ O ₅	2.33
CaO	5.97
MgO	-
SO ₃	4.67
Na ₂ O	0.12
K ₂ O	0.37
SrO	-
BaO	0.01
Loss on fusion (LOF)	0.74

Volatile trace element analysis ug/g (ppm)

Hg	0.27
Cl	300
F	275.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

KNOX CONSTRUCTION LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	4-04-84		
Sampling location	Grand Lake Power Station (NBEPC) Dragline 200		
Product name	Mine Run		
Screen opening ,mm (Screen opening ,in)			
ERL number	2809-84		
Rank of coal	High-volatile A bituminous		
Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	% 4.19		
Ash	% 26.03	27.17	
Volatile	% 27.85	29.07	39.91
Fixed carbon	% 41.93	43.76	60.09
Ultimate:			
Carbon	% 55.26	57.67	79.18
Hydrogen	% 3.49	3.64	5.00
Sulphur (Pyritic)	% (8.59)	(8.97)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.46)	(0.48)	(0.66)
Total	% 9.05	9.45	-
Nitrogen	% 0.67	0.70	0.96
Ash	% 26.03	27.17	-
Oxygen, by difference	% 1.31	1.37	1.88
Heating value:			
	MJ/kg	24.12	25.17
	kcal/kg	5760	6012
	Btu/lb	10368	10821
Hardgrove grindability index	60		
Free swelling index (FSI)	6.0		
Moisture (as rec'd)			
Inherent	% 0.62		
Adherent	% 3.57		
Ash Fusibility temperature	Reducing		Oxidizing
Initial	°C 1049		1341
Spherical	°C 1052		1399
Hemispherical	°C 1121		1402
Fluid	°C 1199		1410

Notes:

KNOX CONSTRUCTION LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date	4-04-84
Sampling location	Grand Lake Power Station (NBEPC) Dragline 200
Product name	Mine Run
Screen opening ,mm (Screen opening ,in)	
ERL number	2809-84

Ash analysis, per cent:

SiO ₂	33.06
Al ₂ O ₃	12.42
Fe ₂ O ₃	40.88
Mn ₃ O ₄	-
TiO ₂	0.55
P ₂ O ₅	0.65
CaO	3.26
MgO	0.90
SO ₃	4.11
Na ₂ O	0.22
K ₂ O	1.83
SrO	-
BaO	0.01
Loss on fusion (LOF)	0.64

Volatile trace element analysis ug/g (ppm)

Hg	0.40
Cl	250
F	159.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

KNOX CONSTRUCTION LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

 Sampling date 2-05-84
 Sampling location Dragline
 4500

Product name Seam Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3172-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	4.74		
Ash %	19.66	20.64	
Volatile %	29.58	31.05	39.12
Fixed carbon %	46.02	48.31	60.88

Ultimate:			
Carbon %	61.16	64.21	80.91
Hydrogen %	4.11	4.31	5.43
Sulphur (Pyritic) %	(5.24)	(5.50)	-
(Sulphate) %	(0.05)	(0.05)	-
(Organic) %	(3.46)	(3.64)	(4.58)
Total %	8.75	9.19	-
Nitrogen %	0.89	0.93	1.17
Ash %	19.66	20.64	-
Oxygen, by difference %	0.69	0.72	0.91

Heating value:			
	MJ/kg	26.88	28.22
	kcal/kg	6420	6739
	Btu/lb	11556	12131
			35.56
			8492
			15286

 Hardgrove grindability index 59

Free swelling index (FSI) 6.0

Moisture (as rec'd)
 Inherent % 0.95
 Adherent % 3.79

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1035	1374
Spherical °C	1041	1399
Hemispherical °C	1043	1410
Fluid °C	1138	1418

 Notes:

KNOX CONSTRUCTION LIMITED
 Dragline Operations; Minto/Chipman Area; Minto Coalfield
 Minto, Sunbury/Queens Counties, New Brunswick

Sampling date 2-05-84
 Sampling location Dragline
 4500

Product name Seam Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3172-84

Ash analysis, per cent:

SiO ₂	29.38
Al ₂ O ₃	9.83
Fe ₂ O ₃	49.73
Mn ₃ O ₄	-
TiO ₂	0.55
P ₂ O ₅	0.97
CaO	3.69
MgO	0.53
SO ₃	2.27
Na ₂ O	0.10
K ₂ O	0.58
SrO	-
BaO	-
Loss on fusion (LOF)	0.59

Volatile trace element analysis ug/g (ppm)

Hg	0.44
Cl	180
F	151.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

R. MILLS COAL COMPANY
Coal Reclamation Project; Waste Dumps; Minto Coalfield
Midlands, Sunbury/Queens Counties, New Brunswick

Sampling date 6-04-84
Sampling location Pilot Recovery Plant
(stockpile)

Product name Fines
Screen opening ,mm Minus 6.4 ,sq
(Screen opening ,in) Minus 1/4 ,sq

ERL number 2810-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	13.35		
Ash %	24.89	28.72	
Volatile %	23.48	27.09	38.01
Fixed carbon %	38.29	44.19	61.99

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	49.97	57.67	80.91
Hydrogen %	3.13	3.61	5.06
Sulphur (Pyritic) %	(4.33)	(4.99)	-
(Sulphate) %	(0.08)	(0.09)	-
(Organic) %	(0.43)	(0.50)	(0.69)
Total %	4.84	5.58	-
Nitrogen %	0.57	0.66	0.93
Ash %	24.89	28.72	-
Oxygen, by difference %	3.26	3.76	5.27

Heating value:	MJ/kg	21.22	24.49	34.35
	kcal/kg	5068	5848	8205
	Btu/lb	9122	10527	14769

Hardgrove grindability index

Free swelling index (FSI) 6.0

Moisture (as rec'd)

Inherent %	0.92
Adherent %	12.43

Ash Fusibility temperature

	Reducing	Oxidizing
Initial °C	1088	1316
Spherical °C	1160	1382
Hemispherical °C	1271	1404
Fluid °C	1282	1438

Notes:

R. MILLS COAL COMPANY
Coal Reclamation Project; Waste Dumps; Minto Coalfield
Midlands, Sunbury/Queens Counties, New Brunswick

Sampling date	6-04-84
Sampling location	Pilot Recovery Plant (stockpile)
Product name	Fines
Screen opening ,mm (Screen opening ,in)	Minus 6.4 ,sq Minus 1/4 ,sq
ERL number	2810-84

Ash analysis, per cent:

SiO ₂	49.38
Al ₂ O ₃	18.01
Fe ₂ O ₃	22.59
Mn ₃ O ₄	-
TiO ₂	0.87
P ₂ O ₅	0.45
CaO	1.01
MgO	0.95
SO ₃	1.20
Na ₂ O	0.23
K ₂ O	2.66
SrO	-
BaO	0.04
Loss on fusion (LOF)	0.97

Volatile trace element analysis ug/g (ppm)

Hg	0.36
Cl	160
F	175.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

R. MILLS COAL COMPANY
Coal Reclamation Project; Waste Dumps; Minto Coalfield
Midlands, Sunbury/Queens Counties, New Brunswick

Sampling date 4-04-84
Sampling location Grand Lake Power Station (NBEPC)

Product name Fines
Screen opening ,mm Minus 6.4 ,sq
(Screen opening ,in) Minus 1/4 ,sq

ERL number 2811-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	15.04		
Ash %	24.29	28.59	
Volatile %	23.60	27.77	38.89
Fixed carbon %	37.07	43.64	61.11

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	49.09	57.78	80.91
Hydrogen %	3.08	3.62	5.07
Sulphur (Pyritic) %	(4.26)	(5.02)	-
(Sulphate) %	(0.08)	(0.09)	-
(Organic) %	(0.45)	(0.54)	(0.75)
Total %	4.80	5.65	-
Nitrogen %	0.53	0.62	0.87
Ash %	24.29	28.59	-
Oxygen, by difference %	3.18	3.74	5.24

Heating value:	MJ/kg	Dry	Dry Ash Free
	20.87	24.56	34.40
	kcal/kg 4985	5867	8216
	Btu/lb 8973	10561	14789

Hardgrove grindability index

Free swelling index (FSI) 6.0

Moisture (as rec'd)

Inherent %	0.85
Adherent %	14.19

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1077	1310
Spherical °C	1146	1385
Hemispherical °C	1252	1399
Fluid °C	1274	1429

Notes:

R. MILLS COAL COMPANY
Coal Reclamation Project; Waste Dumps; Minto Coalfield
Midlands, Sunbury/Queens Counties, New Brunswick

Sampling date 4-04-84
Sampling location Grand Lake Power Station (NBEPD)

Product name Fines
Screen opening ,mm Minus 6.4 ,sq
(Screen opening ,in) Minus 1/4 ,sq

ERL number 2811-84

Ash analysis, per cent:

SiO ₂	49.19
Al ₂ O ₃	17.70
Fe ₂ O ₃	22.70
Mn ₃ O ₄	-
TiO ₂	0.86
P ₂ O ₅	0.50
CaO	1.01
MgO	1.03
SO ₃	1.19
Na ₂ O	0.24
K ₂ O	2.64
SrO	-
BaO	0.21
Loss on fusion (LOF)	0.51

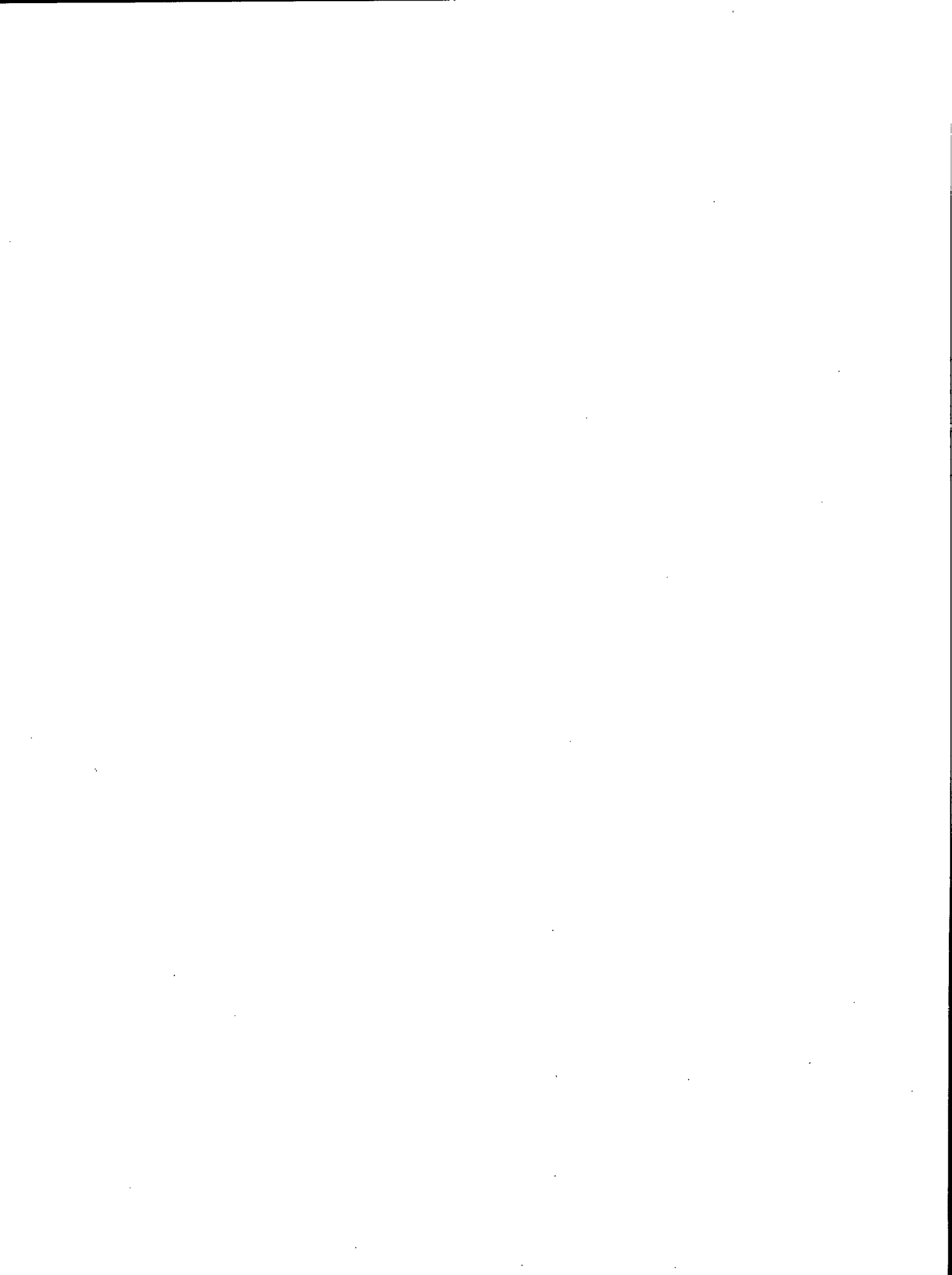
Volatile trace element analysis ug/g (ppm)

Hg	0.34
Cl	140
F	179.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:



COAL ANALYSES – SASKATCHEWAN

BIENFAIT COAL CO. LTD.
 Bienfait Mine; Top Main Seam; Estevan Coalfield
 Bienfait, Saskatchewan

Sampling date	2-08-84		
Sampling location	Mine (surface) Cut 33		
Product name	Channel Sample		
Screen opening ,mm (Screen opening ,in)			
ERL number	3897-84		
Rank of coal	Lignite A		
Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	32.27		
Ash %	8.78	12.97	
Volatile %	27.40	40.46	46.49
Fixed carbon %	31.54	46.57	53.51
Ultimate:			
Carbon %	42.30	62.45	71.76
Hydrogen %	2.87	4.24	4.87
Sulphur (Pyritic) %	(0.03)	(0.04)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.31)	(0.46)	(0.53)
Total %	0.34	0.50	-
Nitrogen %	0.70	1.03	1.18
Ash %	8.78	12.97	-
Oxygen, by difference %	12.74	18.81	21.61
Heating value:			
	MJ/kg	16.25	23.99
	kcal/kg	3881	5730
	Btu/lb	6986	10314
Hardgrove grindability index	55		
Free swelling index (FSI)	N/A		
Moisture (as rec'd)			
Inherent %			
Adherent %			
Ash Fusibility temperature	Reducing	Oxidizing	
Initial °C	1088	1238	
Spherical °C	1099	1329	
Hemispherical °C	1174	1341	
Fluid °C	1285	1457	

Notes: Bienfait Coal Co. Ltd. is a subsidiary of Luscar Ltd.

BIENFAIT COAL CO. LTD.
 Bienfait Mine; Top Main Seam; Estevan Coalfield
 Bienfait, Saskatchewan

Sampling date	2-08-84
Sampling location	Mine (surface) Cut 33
Product name	Channel Sample
Screen opening ,mm (Screen opening ,in)	
ERL number	3897-84

Ash analysis, per cent:

SiO ₂	40.66
Al ₂ O ₃	17.03
Fe ₂ O ₃	4.11
Mn ₃ O ₄	-
TiO ₂	1.12
P ₂ O ₅	0.22
CaO	14.73
MgO	2.98
SO ₃	8.03
Na ₂ O	8.31
K ₂ O	0.60
SrO	0.47
BaO	1.21
Loss on fusion (LOF)	0.61

Volatile trace element analysis ug/g (ppm)

Hg	0.08
Cl	60
F	48.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

BIENFAIT COAL CO. LTD.
 Bienfait Mine; Top Seam; Estevan Coalfield
 Bienfait, Saskatchewan

Sampling date 2-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3898-84

Rank of coal Lignite A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	31.70		
Ash %	8.84	12.95	
Volatile %	28.33	41.48	47.65
Fixed carbon %	31.12	45.57	52.35

Ultimate:			
Carbon %	42.52	62.26	71.52
Hydrogen %	3.02	4.42	5.08
Sulphur (Pyritic) %	(0.32)	(0.47)	-
(Sulphate) %	(0.09)	(0.13)	-
(Organic) %	(0.84)	(1.23)	(1.41)
Total %	1.24	1.82	-
Nitrogen %	0.64	0.93	1.07
Ash %	8.84	12.95	-
Oxygen, by difference %	12.03	17.62	20.24

Heating value:			
	MJ/kg	16.68	24.42
	kcal/kg	3983	5832
	Btu/lb	7169	10497

Hardgrove grindability index 54

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1013	1135
Spherical °C	1104	1163
Hemispherical °C	1121	1166
Fluid °C	1160	1204

Notes: Bienfait Coal Co. Ltd. is a subsidiary of Luscar Ltd.

BIENFAIT COAL CO. LTD.
 Bienfait Mine; Top Seam; Estevan Coalfield
 Bienfait, Saskatchewan

Sampling date 2-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3898-84

Ash analysis, per cent:

SiO ₂	37.49
Al ₂ O ₃	10.57
Fe ₂ O ₃	8.54
Mn ₃ O ₄	-
TiO ₂	0.83
P ₂ O ₅	-
CaO	12.39
MgO	2.28
SO ₃	17.76
Na ₂ O	7.89
K ₂ O	0.62
SrO	0.33
BaO	0.61
Loss on fusion (LOF)	2.22

Volatile trace element analysis ug/g (ppm)

Hg	0.16
Cl	40
F	31.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

BIENFAIT COAL CO. LTD.
 Bienfait Mine; Lower Main Seam; Estevan Coalfield
 Bienfait, Saskatchewan

Sampling date 2-08-84
 Sampling location Mine (surface)
 Cut 33, Stn# 9

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3899-84

Rank of coal Lignite A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	32.18		
Ash %	6.93	10.22	
Volatile %	27.20	40.11	44.68
Fixed carbon %	33.69	49.67	55.32

Ultimate:			
Carbon %	43.15	63.63	70.87
Hydrogen %	2.94	4.34	4.83
Sulphur (Pyritic) %	(0.02)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.27)	(0.39)	(0.44)
Total %	0.28	0.42	-
Nitrogen %	0.65	0.96	1.07
Ash %	6.93	10.22	-
Oxygen, by difference %	13.86	20.43	22.76

Heating value:			
	MJ/kg	16.73	24.67
	kcal/kg	3996	5893
	Btu/lb	7194	10607

Hardgrove grindability index 58

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1124	1299
Spherical °C	1166	1393
Hemispherical °C	1182	1399
Fluid °C	1229	1413

Notes: Bienfait Coal Co. Ltd. is a subsidiary of Luscar Ltd.

BIENFAIT COAL CO. LTD.
 Bienfait Mine; Lower Main Seam; Estevan Coalfield
 Bienfait, Saskatchewan

Sampling date 2-08-84
 Sampling location Mine (surface)
 Cut 33, Stn# 9

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3899-84

Ash analysis, per cent:

SiO ₂	25.61
Al ₂ O ₃	19.89
Fe ₂ O ₃	5.34
Mn ₃ O ₄	-
TiO ₂	1.16
P ₂ O ₅	2.57
CaO	18.56
MgO	3.39
SO ₃	8.83
Na ₂ O	10.30
K ₂ O	0.15
SrO	0.79
BaO	1.53
Loss on fusion (LOF)	1.50

Volatile trace element analysis ug/g (ppm)

Hg	0.09
Cl	50
F	39.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

BIENFAIT COAL CO. LTD.
 Bienfait Mine; Estevan Coal Zone; Estevan Coalfield
 Bienfait, Saskatchewan

Sampling date	2-08-84		
Sampling location	Mine (surface)		
Product name	Mine run (crushed)		
Screen opening ,mm (Screen opening ,in)			
ERL number	3900-84		
Rank of coal	Lignite A		
Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 30.86		
Ash	% 12.24	17.70	
Volatile	% 26.94	38.96	47.34
Fixed carbon	% 29.97	43.34	52.66
Ultimate:			
Carbon	% 40.62	58.75	71.39
Hydrogen	% 2.77	4.01	4.87
Sulphur (Pyritic)	% (0.09)	(0.13)	-
(Sulphate)	% (0.02)	(0.03)	-
(Organic)	% (0.37)	(0.53)	(0.65)
Total	% 0.48	0.69	-
Nitrogen	% 0.67	0.97	1.18
Ash	% 12.24	17.70	-
Oxygen, by difference	% 12.36	17.88	21.73
Heating value:			
	MJ/kg	15.72	22.74
	kcal/kg	3755	5431
	Btu/lb	6759	9776
Hardgrove grindability index	59		
Free swelling index (FSI)	N/A		
Moisture (as rec'd)			
Inherent	%		
Adherent	%		
Ash Fusibility temperature	Reducing	Oxidizing	
Initial	°C 1093	1146	
Spherical	°C 1135	1177	
Hemispherical	°C 1263	1277	
Fluid	°C 1416	1429	

Notes: Bienfait Coal Co. Ltd. is a subsidiary of Luscar Ltd.

BIENFAIT COAL CO. LTD.
 Bienfait Mine; Estevan Coal Zone; Estevan Coalfield
 Bienfait, Saskatchewan

Sampling date 2-08-84
 Sampling location Mine (surface)

Product name Mine run (crushed)
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3900-84

Ash analysis, per cent:

SiO ₂	48.03
Al ₂ O ₃	18.14
Fe ₂ O ₃	4.32
Mn ₃ O ₄	-
TiO ₂	1.20
F ₂ O ₅	0.25
CaO	10.74
MgO	2.40
SO ₃	6.11
Na ₂ O	6.44
K ₂ O	1.06
SrO	0.37
BaO	0.81
Loss on fusion (LOF)	0.42

Volatile trace element analysis ug/g (ppm)

Hg	0.12
Cl	50
F	68.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

MANITOBA AND SASKATCHEWAN COAL COMPANY LIMITED
Boundary Dam Mine; Estevan Seam; Estevan Coalfield
Estevan, Saskatchewan
Sec. 35, Twp. 1; R8, W2

Sampling date 3-08-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3902-84

Rank of coal Lignite A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	31.15		
Ash %	11.50	16.71	
Volatile %	26.95	39.15	47.00
Fixed carbon %	30.39	44.14	53.00

Ultimate:			
Carbon %	40.46	58.77	70.56
Hydrogen %	2.72	3.95	4.74
Sulphur (Pyritic) %	(0.05)	(0.07)	-
(Sulphate) %	(0.02)	(0.03)	-
(Organic) %	(0.28)	(0.41)	(0.49)
Total %	0.35	0.51	-
Nitrogen %	0.78	1.13	1.36
Ash %	11.50	16.71	-
Oxygen, by difference %	13.03	18.93	22.73

Heating value:			
	MJ/kg	15.53	22.56
	kcal/kg	3710	5389
	Btu/lb	6678	9700
			27.09
			6470
			11646

Hardgrove grindability index 60

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1113	1174
Spherical °C	1127	1332
Hemispherical °C	1299	1366
Fluid °C	1343	1371

Notes: Manitoba and Saskatchewan Coal Co. Ltd. is a subsidiary of Luscar Ltd.

MANITOBA AND SASKATCHEWAN COAL COMPANY LIMITED
 Boundary Dam Mine; Estevan Seam; Estevan Coalfield
 Estevan, Saskatchewan
 Sec. 35, Twp. 1; R8, W2

Sampling date 3-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3902-84

Ash analysis, per cent:

SiO ₂	40.34
Al ₂ O ₃	21.44
Fe ₂ O ₃	3.54
Mn ₃ O ₄	-
TiO ₂	1.01
F ₂ O ₅	0.58
CaO	12.50
MgO	3.01
SO ₃	7.32
Na ₂ O	7.44
K ₂ O	0.62
SrO	0.47
BaO	1.01
Loss on fusion (LOF)	0.79

Volatile trace element analysis ug/g (ppm)

Hg	0.09
Cl	50
F	63.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

MANALTA COAL LIMITED
 Costello Mine; Estevan Seam; Estevan Coalfield
 Estevan, Saskatchewan

Sampling date 7-08-84
 Sampling location Mine (surface)
 Sampled from Railcars

Product name Slack
 Screen opening ,mm Minus 32
 (Screen opening ,in) Minus 1 1/4

ERL number 3903-84

Rank of coal Lignite A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	31.55		
Ash %	6.88	10.05	
Volatile %	28.86	42.16	46.87
Fixed carbon %	32.71	47.79	53.13

Ultimate:			
Carbon %	44.69	65.29	72.58
Hydrogen %	3.00	4.38	4.87
Sulphur (Pyritic) %	(0.22)	(0.32)	-
(Sulphate) %	(0.05)	(0.08)	-
(Organic) %	(0.38)	(0.56)	(0.62)
Total %	0.66	0.96	-
Nitrogen %	0.77	1.12	1.25
Ash %	6.88	10.05	-
Oxygen, by difference %	12.46	18.20	20.23

Heating value:			
	MJ/kg	17.25	25.20
	kcal/kg	4120	6019
	Btu/lb	7416	10834

Hardgrove grindability index 51

Free swelling index (FSI) N/A

Moisture (as rec'd)

Inherent %	
Adherent %	

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1132	1249
Spherical °C		1179	1316
Hemispherical °C		1193	1327
Fluid °C		1210	1341

Notes: Costello Mine was formerly named Klimax Mine

MANALTA COAL LIMITED
 Costello Mine; Estevan Seam; Estevan Coalfield
 Estevan, Saskatchewan

Sampling date	7-08-84
Sampling location	Mine (surface) Sampled from Railcars
Product name	Slack
Screen opening ,mm (Screen opening ,in)	Minus 32 Minus 1 1/4
ERL number	3903-84

Ash analysis, per cent:

SiO ₂	23.72
Al ₂ O ₃	12.63
Fe ₂ O ₃	6.28
Mn ₃ O ₄	-
TiO ₂	0.91
P ₂ O ₅	0.42
CaO	20.50
MgO	4.08
SO ₃	18.01
Na ₂ O	10.70
K ₂ O	0.17
SrO	0.60
BaO	0.56
Loss on fusion (LOF)	1.79

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	70
F	22.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

MANALTA COAL LIMITED
 Costello Mine; Estevan Seam; Estevan Coalfield
 Estevan, Saskatchewan

 Sampling date 7-08-84
 Sampling location Mine (surface) Pit cut 13-9-00
 W 660 m, S 890 m

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3904-84

Rank of coal Lignite A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	30.92		
Ash %	8.19	11.86	
Volatile %	28.49	41.24	46.79
Fixed carbon %	32.40	46.90	53.21

Ultimate:			
Carbon %	44.27	64.08	72.70
Hydrogen %	2.98	4.32	4.90
Sulphur (Fyritic) %	(0.21)	(0.31)	-
(Sulphate) %	(0.04)	(0.06)	-
(Organic) %	(0.38)	(0.55)	(0.63)
Total %	0.64	0.92	-
Nitrogen %	0.84	1.21	1.37
Ash %	8.19	11.86	-
Oxygen, by difference %	12.16	17.61	19.98

Heating value:			
	MJ/kg	17.07	24.71
	kcal/kg	4077	5902
	Btu/lb	7339	10624

 Hardgrove grindability index 56

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1088	1218
Spherical °C	1174	1282
Hemispherical °C	1177	1296
Fluid °C	1191	1307

 Notes: Costello Mine was formerly named Klimax Mine

MANALTA COAL LIMITED
 Costello Mine; Estevan Seam; Estevan Coalfield
 Estevan, Saskatchewan

Sampling date 7-08-84
 Sampling location Mine (surface) Pit cut 13-9-00
 W 660 m, S 890 m

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3904-84

Ash analysis, per cent:

SiO ₂	31.08
Al ₂ O ₃	13.20
Fe ₂ O ₃	4.89
Mn ₃ O ₄	-
TiO ₂	1.16
P ₂ O ₅	0.61
CaO	18.29
MgO	4.00
SO ₃	15.42
Na ₂ O	10.10
K ₂ O	0.14
SrO	0.57
BaO	1.17
Loss on fusion (LOF)	0.64

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	50
F	24.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 546 m

MANALTA COAL LIMITED
Costello Mine; Estevan Seam; Estevan Coalfield
Estevan, Saskatchewan

Sampling date 7-08-84
Sampling location Mine (surface)
Sampled from Railcars

Product name Slack
Screen opening ,mm Minus 38
(Screen opening ,in) Minus 1 1/2

ERL number 3905-84

Rank of coal Lignite A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	31.65		
Ash %	7.63	11.17	
Volatile %	27.44	40.14	45.19
Fixed carbon %	33.28	48.69	54.81

Ultimate:			
Carbon %	44.37	64.91	73.07
Hydrogen %	2.90	4.25	4.78
Sulphur (Pyritic) %	(0.34)	(0.49)	-
(Sulphate) %	(0.07)	(0.10)	-
(Organic) %	(0.34)	(0.49)	(0.55)
Total %	0.74	1.08	-
Nitrogen %	0.77	1.13	1.27
Ash %	7.63	11.17	-
Oxygen, by difference %	11.93	17.46	19.66

Heating value:			
	MJ/kg	17.07	24.97
	kcal/kg	4076	5964
	Btu/lb	7337	10735

Hardgrove grindability index 62

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1129	1243
Spherical °C	1202	1288
Hemispherical °C	1207	1296
Fluid °C	1216	1318

Notes: Costello Mine was formerly named Klimax Mine

MANALTA COAL LIMITED
 Costello Mine; Estevan Seam; Estevan Coalfield
 Estevan, Saskatchewan

Sampling date	7-08-84
Sampling location	Mine (surface) Sampled from Railcars
Product name	Slack
Screen opening ,mm (Screen opening ,in)	Minus 38 Minus 1 1/2
ERL number	3905-84

Ash analysis, per cent:

SiO ₂	23.65
Al ₂ O ₃	12.24
Fe ₂ O ₃	7.27
Mn ₃ O ₄	-
TiO ₂	1.29
P ₂ O ₅	0.11
CaO	19.30
MgO	4.33
SO ₃	20.25
Na ₂ O	10.40
K ₂ O	0.15
SrO	0.54
BaO	1.85
Loss on fusion (LOF)	0.97

Volatile trace element analysis ug/g (ppm)

Hg	0.08
Cl	40
F	17.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

MANALTA COAL LIMITED
Utility Mine; Estevan Seam; Estevan Coalfield
Estevan, Saskatchewan
N.W.Qtr. Sec. 29, Twp.1; R8, 22 meridian

Sampling date 8-08-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3906-84

Rank of coal Lignite A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	32.38		
Ash %	6.95	10.28	
Volatile %	27.95	41.34	46.08
Fixed carbon %	32.71	48.38	53.92

Ultimate:			
Carbon %	43.42	64.21	71.57
Hydrogen %	3.04	4.50	5.02
Sulphur (Pyritic) %	(0.02)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.25)	(0.37)	(0.42)
Total %	0.27	0.40	-
Nitrogen %	0.67	0.99	1.10
Ash %	6.95	10.28	-
Oxygen, by difference %	13.27	19.62	21.87

Heating value:			
	MJ/kg	16.56	24.49
	kcal/kg	3955	5848
	Btu/lb	7118	10527
			11733

Hardgrove grindability index 60

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1116	1285
Spherical °C	1160	1374
Hemispherical °C	1166	1379
Fluid °C	1179	1388

Notes: Utility Mine is owned by Sask. Power Corp. and is operated by
Manalta Coal Ltd.

MANALTA COAL LIMITED
 Utility Mine; Estevan Seam; Estevan Coalfield
 Estevan, Saskatchewan
 N.W.Qtr. Sec. 29, Twp.1; R8, 22 meridian

Sampling date 8-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3906-84

Ash analysis, per cent:

SiO ₂	27.36
Al ₂ O ₃	18.86
Fe ₂ O ₃	4.00
Mn ₃ O ₄	-
TiO ₂	1.44
P ₂ O ₅	1.51
CaO	19.15
MgO	3.82
SO ₃	9.13
Na ₂ O	11.60
K ₂ O	0.14
SrO	0.69
BaO	1.69
Loss on fusion (LOF)	0.54

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	50
F	33.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

MANALTA COAL LIMITED
Utility Mine; Estevan Seam; Estevan Coalfield
Estevan, Saskatchewan

Sampling date	2-08-84
Sampling location	Boundary Dam Power Stn. (Sask. Power Corp.) Feed Belt
Product name	Slack
Screen opening ,mm (Screen opening ,in)	Minus 19 Minus 3/4
ERL number	3901-84

Rank of coal Lignite A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	30.86		
Ash %	9.63	13.93	
Volatile %	27.50	39.77	46.21
Fixed carbon %	32.01	46.30	53.79

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	42.15	60.97	70.84
Hydrogen %	2.81	4.06	4.72
Sulphur (Pyritic) %	(0.04)	(0.06)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.21)	(0.30)	(0.35)
Total %	0.26	0.37	-
Nitrogen %	0.72	1.04	1.21
Ash %	9.63	13.93	-
Oxygen, by difference %	13.57	19.63	22.81

Heating value:	MJ/kg	kcal/kg	Btu/lb	As Rec'd	Dry	Dry Ash Free
	16.25	3881	6985	16.25	23.50	27.30
					5613	6521
					10103	11738

Hardgrove grindability index 54

Free swelling index (FSI) N/A

Moisture (as rec'd)

Inherent %	
Adherent %	

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1116	1235
Spherical °C	1121	1349
Hemispherical °C	1204	1357
Fluid °C	1441	1368

Notes: Utility Mine is owned by Sask. Power Corp. and is operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
Utility Mine; Estevan Seam; Estevan Coalfield
Estevan, Saskatchewan

Sampling date	2-08-84
Sampling location	Boundary Dam Power Stn. (Sask. Power Corp.) Feed Belt
Product name	Slack
Screen opening ,mm (Screen opening ,in)	Minus 19 Minus 3/4
ERL number	3901-84

Ash analysis, per cent:

SiO ₂	40.77
Al ₂ O ₃	20.59
Fe ₂ O ₃	3.96
Mn ₃ O ₄	-
TiO ₂	1.34
P ₂ O ₅	0.21
CaO	14.14
MgO	2.97
SO ₃	5.19
Na ₂ O	8.62
K ₂ O	0.65
SrO	0.42
BaO	1.37
Loss on fusion (LOF)	0.58

Volatile trace element analysis ug/g (ppm)

Hg	0.08
Cl	70
F	51.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

SASKATCHEWAN POWER CORPORATION
 Poplar River Mine; Hart Seam; Willow Bunch Coalfield
 Estevan, Saskatchewan

Sampling date 1-08-84
 Sampling location Mine (surface)
 N 6305 W 145.70

Product name Medium Lump
 Screen opening ,mm Minus 152
 (Screen opening ,in) Minus 6

ERL number 3895-84

Rank of coal Lignite A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	32.36		
Ash %	17.31	25.59	
Volatile %	24.40	36.08	48.49
Fixed carbon %	25.93	38.33	51.51

Ultimate:			
Carbon %	35.16	51.98	69.86
Hydrogen %	2.33	3.44	4.62
Sulphur (Pyritic) %	(0.17)	(0.25)	-
(Sulphate) %	(0.10)	(0.15)	-
(Organic) %	(0.34)	(0.51)	(0.68)
Total %	0.62	0.91	-
Nitrogen %	0.42	0.62	0.83
Ash %	17.31	25.59	-
Oxygen, by difference %	11.81	17.46	23.46

Heating value:			
	MJ/kg	12.86	19.01
	kcal/kg	3071	4541
	Btu/lb	5528	8173
			25.55
			6102
			10984

Hardgrove grindability index 69

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1193	1229
Spherical °C		1224	1279
Hemispherical °C		1391	1346
Fluid °C		1424	1382

Notes:

SASKATCHEWAN POWER CORPORATION
 Poplar River Mine; Hart Seam; Willow Bunch Coalfield
 Estevan, Saskatchewan

Sampling date	1-08-84
Sampling location	Mine (surface) N 6305 W 145.70
Product name	Medium Lump
Screen opening ,mm (Screen opening ,in)	Minus 152 Minus 6
ERL number	3895-84

Ash analysis, per cent:

SiO ₂	47.95
Al ₂ O ₃	20.74
Fe ₂ O ₃	4.58
Mn ₃ O ₄	-
TiO ₂	0.89
P ₂ O ₅	-
CaO	10.07
MgO	3.29
SO ₃	7.22
Na ₂ O	0.81
K ₂ O	1.86
SrO	0.15
BaO	0.35
Loss on fusion (LOF)	2.47

Volatile trace element analysis ug/g (ppm)

Hg	0.09
Cl	60
F	120.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 772 m

SASKATCHEWAN POWER CORPORATION
 Poplar River Mine; Hart Seam; Willow Bunch Coalfield
 Estevan, Saskatchewan

Sampling date 1-08-84
 Sampling location Mine (surface)
 N 6305 W 145.70

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3896-84

Rank of coal Lignite A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	33.10		
Ash %	10.74	16.06	
Volatile %	27.57	41.21	49.09
Fixed carbon %	28.59	42.73	50.91

Ultimate:			
Carbon %	38.81	58.01	69.11
Hydrogen %	2.59	3.87	4.61
Sulphur (Pyritic) %	(0.27)	(0.40)	-
(Sulphate) %	(0.10)	(0.14)	-
(Organic) %	(0.35)	(0.53)	(0.63)
Total %	0.72	1.08	-
Nitrogen %	0.45	0.68	0.81
Ash %	10.74	16.06	-
Oxygen, by difference %	13.58	20.30	24.18

Heating value:			
	MJ/kg	14.37	21.47
	kcal/kg	3431	5129
	Btu/lb	6176	9232
			25.58
			6110
			10998

Hardgrove grindability index 69

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1146	1238
Spherical °C		1163	1246
Hemispherical °C		1171	1254
Fluid °C		1327	1418

Notes:

SASKATCHEWAN POWER CORPORATION
 Poplar River Mine; Hart Seam; Willow Bunch Coalfield
 Estevan, Saskatchewan

Sampling date 1-08-84
 Sampling location Mine (surface)
 N 6305 W 145.70

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3896-84

Ash analysis, per cent:

SiO ₂	29.02
Al ₂ O ₃	20.34
Fe ₂ O ₃	7.51
Mn ₃ O ₄	-
TiO ₂	0.73
P ₂ O ₅	0.24
CaO	17.93
MgO	5.32
SO ₃	13.71
Na ₂ O	0.49
K ₂ O	0.73
SrO	0.27
BaO	0.29
Loss on fusion (LOF)	2.28

Volatile trace element analysis ug/g (ppm)

Hg	0.08
Cl	40
F	51.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 772 m



COAL ANALYSES – ALBERTA (PLAINS REGION)

FORESTBURG COLLIERIES LIMITED

Diplomat Mine (Mine No. 1578); No. 1 Seam; Battle River Coalfield
 Forestburg, Plains Region, Alberta
 Sec. 2, Twp. 41; R16, W4

Sampling date 25-09-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2070-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	23.18		
Ash %	4.84	6.30	
Volatile %	30.83	40.13	42.83
Fixed carbon %	41.15	53.57	57.17

Ultimate:			
Carbon %	52.77	68.69	73.31
Hydrogen %	3.43	4.47	4.77
Sulphur (Pyritic) %	(0.04)	(0.05)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.31)	(0.41)	(0.44)
Total %	0.36	0.47	-
Nitrogen %	1.18	1.54	1.64
Ash %	4.84	6.30	-
Oxygen, by difference %	14.23	18.53	19.78

Heating value:			
	MJ/kg	20.32	26.45
	kcal/kg	4853	6317
	Btu/lb	8735	11371
			28.23
			6742
			12136

Hardgrove grindability index 34

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1027	1174
Spherical °C	1154	1188
Hemispherical °C	1177	1241
Fluid °C	1182	1274

Notes: Forestburg Collieries Ltd. is a subsidiary of Luscar Ltd.

FORESTBURG COLLIERIES LIMITED

Diplomat Mine (Mine No. 1578); No. 1 Seam; Battle River Coalfield
 Forestburg, Plains Region, Alberta
 Sec. 2, Twp. 41; R16, W4

Sampling date 25-09-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2070-85

Ash analysis, per cent:

SiO ₂	36.05
Al ₂ O ₃	14.22
Fe ₂ O ₃	9.95
Mn ₃ O ₄	--
TiO ₂	0.56
P ₂ O ₅	0.05
CaO	18.78
MgO	3.21
SO ₃	9.81
Na ₂ O	0.48
K ₂ O	0.08
SrO	0.10
BaO	0.27
Loss on fusion (LOF)	4.07

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	--
F	--
Br	--
As	--
Se	--

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

FORESTBURG COLLIERIES LIMITED
Diplomat Mine (Mine No. 1578); No. 1 Seam; Battle River Coalfield
Forestburg, Plains Region, Alberta

Sampling date 25-09-84
Sampling location Mine (surface)

Product name Egg
Screen opening ,mm 152 x 51
(Screen opening ,in) 6 x 2

ERL number 2069-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	%	22.83	
Ash	%	11.60	15.03
Volatile	%	28.22	36.57
Fixed carbon	%	37.35	48.40
			56.96

Ultimate:	%	As Rec'd	Dry	Dry Ash Free
Carbon	%	47.93	62.11	73.10
Hydrogen	%	3.29	4.26	5.01
Sulphur (Pyritic)	%	(0.06)	(0.08)	-
(Sulphate)	%	(0.00)	(0.00)	-
(Organic)	%	(0.28)	(0.37)	(0.43)
Total	%	0.34	0.44	-
Nitrogen	%	1.00	1.29	1.52
Ash	%	11.60	15.03	-
Oxygen, by difference	%	13.02	16.87	19.85

Heating value:	MJ/kg	18.56	24.06	28.31
	kcal/kg	4434	5746	6762
	Btu/lb	7981	10342	12171

Hardgrove grindability index 33

Free swelling index (FSI) N/A

Moisture (as rec'd)

Inherent	%	
Adherent	%	

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C	1132
Spherical	°C	1268
Hemispherical	°C	1324
Fluid	°C	1327
		1388

Notes: Forestburg Collieries Ltd. is a subsidiary of Luscar Ltd.

FORESTBURG COLLIERIES LIMITED
 Diplomat Mine (Mine No. 1578); No. 1 Seam; Battle River Coalfield
 Forestburg, Plains Region, Alberta

Sampling date	25-09-84
Sampling location	Mine (surface)

Product name	Egg
Screen opening ,mm (Screen opening ,in)	152 x 51 6 x 2

ERL number	2069-85
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Ash analysis, per cent:

SiO ₂	50.23
Al ₂ O ₃	18.01
Fe ₂ O ₃	10.45
Mn ₃ O ₄	-
TiO ₂	0.58
P ₂ O ₅	0.09
CaO	7.76
MgO	1.68
SO ₃	5.54
Na ₂ O	0.51
K ₂ O	0.95
SrO	0.04
BaO	0.29
Loss on fusion (LOF)	1.88

Volatile trace element analysis ug/g (ppm)

Hg	0.03
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

FORESTBURG COLLIERIES LIMITED

Diplomat Mine (Mine No. 1578); No. 1 Seam; Battle River Coalfield
Forestburg, Plains Region, Alberta

Sampling date	25-09-84		
Sampling location	Mine (surface)		
Product name	Nut		
Screen opening ,mm (Screen opening ,in)	51 x 25 2 x 1		
ERL number	2071-85		
Rank of coal	Subbituminous C		
Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 24.73		
Ash	% 7.50	9.96	
Volatile	% 29.52	39.22	43.56
Fixed carbon	% 38.25	50.82	56.44
Ultimate:			
Carbon	% 49.69	66.02	73.32
Hydrogen	% 3.31	4.40	4.89
Sulphur (Pyritic)	% (0.04)	(0.05)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.30)	(0.40)	(0.45)
Total	% 0.35	0.46	-
Nitrogen	% 1.11	1.47	1.63
Ash	% 7.50	9.96	-
Oxygen, by difference	% 13.32	17.69	19.65
Heating value:			
	MJ/kg 19.02	25.27	28.06
	kcal/kg 4542	6034	6702
	Btu/lb 8176	10862	12064
Hardgrove grindability index	33		
Free swelling index (FSI)	N/A		
Moisture (as rec'd)			
Inherent	%		
Adherent	%		
Ash Fusibility temperature	Reducing	Oxidizing	
Initial	°C 1129	1204	
Spherical	°C 1216	1241	
Hemispherical	°C 1285	1293	
Fluid	°C 1316	1443	

Notes: Forestburg Collieries Ltd. is a subsidiary of Luscar Ltd.

FORESTBURG COLLIERIES LIMITED
Diplomat Mine (Mine No. 1578); No. 1 Seam; Battle River Coalfield
Forestburg, Plains Region, Alberta

Sampling date	25-09-84
Sampling location	Mine (surface)

Product name	Nut
Screen opening ,mm	51 x 25
(Screen opening ,in)	2 x 1

ERL number	2071-85
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Ash analysis, per cent:

SiO ₂	45.67
Al ₂ O ₃	16.31
Fe ₂ O ₃	10.00
Mn ₃ O ₄	-
TiO ₂	0.58
P ₂ O ₅	0.12
CaO	11.68
MgO	2.23
SO ₃	7.54
Na ₂ O	0.50
K ₂ O	0.41
SrO	0.07
BaO	0.40
Loss on fusion (LOF)	2.67

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

FORESTBURG COLLIERIES LIMITED

Diplomat Mine (Mine No. 1578); No. 1 Seam; Battle River Coalfield
Forestburg, Plains Region, Alberta

Sampling date 25-09-84
Sampling location Mine (surface)

Product name Stoker
Screen opening ,mm 25 x 13
(Screen opening ,in) 1 x 1/2

ERL number 2072-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 24.39		
Ash	% 5.73	7.58	
Volatile	% 30.31	40.09	43.38
Fixed carbon	% 39.57	52.33	56.62

Ultimate:			
Carbon	% 51.10	67.58	73.12
Hydrogen	% 3.41	4.51	4.88
Sulphur (Pyritic)	% (0.04)	(0.05)	-
(Sulphate)	% (0.02)	(0.03)	-
(Organic)	% (0.32)	(0.42)	(0.46)
Total	% 0.38	0.50	-
Nitrogen	% 1.15	1.52	1.64
Ash	% 5.73	7.58	-
Oxygen, by difference	% 13.84	18.31	19.81

Heating value:	MJ/kg		
	19.61	25.94	28.07
	kcal/kg 4684	6196	6704
	Btu/lb 8432	11152	12067

Hardgrove grindability index 34

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C 1135	1166
Spherical	°C 1152	1185
Hemispherical	°C 1277	1241
Fluid	°C 1291	1316

Notes: Forestburg Collieries Ltd. is a subsidiary of Luscar Ltd.

FORESTBURG COLLIERIES LIMITED
 Diplomat Mine (Mine No. 1578); No. 1 Seam; Battle River Coalfield
 Forestburg, Plains Region, Alberta

Sampling date	25-09-84
Sampling location	Mine (surface)

Product name	Stoker
Screen opening ,mm	25 x 13
(Screen opening ,in)	1 x 1/2

ERL number	2072-85
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Ash analysis, per cent:

SiO ₂	40.80
Al ₂ O ₃	14.49
Fe ₂ O ₃	8.48
Mn ₃ O ₄	-
TiO ₂	0.64
P ₂ O ₅	0.16
CaO	15.85
MgO	2.55
SO ₃	9.58
Na ₂ O	0.55
K ₂ O	0.11
SrO	0.11
BaO	0.28
Loss on fusion (LOF)	4.04

Volatile trace element analysis ug/g (ppm)

Hg	0.01
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

FORESTBURG COLLIERIES LIMITED

Diplomat Mine (Mine No. 1578); No. 1 Seam; Battle River Coalfield
Forestburg, Plains Region, Alberta

Sampling date	25-09-84		
Sampling location	Battle River Power Station Feed Belt		
Product name	Raw Coal		
Screen opening ,mm (Screen opening ,in)			
ERL number	2073-85		
Rank of coal	Subbituminous C		
Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 23.49		
Ash	% 10.34	13.51	
Volatile	% 29.61	38.70	44.75
Fixed carbon	% 36.56	47.79	55.25
Ultimates:			
Carbon	% 48.19	62.99	72.83
Hydrogen	% 3.31	4.32	4.99
Sulphur (Pyritic)	% (0.06)	(0.08)	-
(Sulphate)	% (0.02)	(0.03)	-
(Organic)	% (0.34)	(0.45)	(0.52)
Total	% 0.43	0.56	-
Nitrogen	% 1.10	1.44	1.66
Ash	% 10.34	13.51	-
Oxygen, by difference	% 13.14	17.18	19.86
Heating value:			
	MJ/kg	18.71	24.45
	kcal/kg	4468	5839
	Btu/lb	8042	10511
Hardgrove grindability index	36		
Free swelling index (FSI)	N/A		
Moisture (as rec'd)			
Inherent	%		
Adherent	%		
Ash Fusibility temperature	Reducing	Oxidizing	
Initial	°C 1143	1238	
Spherical	°C 1324	1279	
Hemispherical	°C 1354	1316	
Fluid	°C 1404	1471	

Notes: Forestburg Collieries Ltd. is a subsidiary of Luscar Ltd.

FORESTBURG COLLIERIES LIMITED
 Diplomat Mine (Mine No. 1578); No. 1 Seam; Battle River Coalfield
 Forestburg, Plains Region, Alberta

Sampling date 25-09-84
 Sampling location Battle River Power Station
 Feed Belt

Product name Raw Coal
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2073-85

Ash analysis, per cent:

SiO ₂	46.19
Al ₂ O ₃	18.35
Fe ₂ O ₃	4.28
Mn ₃ O ₄	-
TiO ₂	0.59
P ₂ O ₅	0.35
CaO	8.94
MgO	1.43
SO ₃	0.76
Na ₂ O	4.21
K ₂ O	0.51
SrO	0.21
BaO	0.33
Loss on fusion (LOF)	12.52

Volatile trace element analysis ug/g (ppm)

Hg	0.03
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

FORESTBURG COLLIERIES LIMITED
 Paintearth Mine (No. 1781); No. 1 Seam; Battle River Coalfield
 Forestburg, Plains Region, Alberta
 LSD. 9, Sec. 12, Twp. 40; R16, W4

 Sampling date 25-09-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2068-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	26.10		
Ash %	5.34	7.23	
Volatile %	29.69	40.18	43.31
Fixed carbon %	38.86	52.59	56.69

Ultimate:			
Carbon %	49.85	67.46	72.72
Hydrogen %	3.37	4.56	4.92
Sulphur (Pyritic) %	(0.02)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.42)	(0.56)	(0.61)
Total %	0.44	0.59	-
Nitrogen %	1.01	1.36	1.47
Ash %	5.34	7.23	-
Oxygen, by difference %	13.89	18.80	20.27

Heating value:			
	MJ/kg	19.30	26.11
	kcal/kg	4609	6237
	Btu/lb	8296	11226
			28.15
			6723
			12101

 Hardgrove grindability index 35

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1029	1316
Spherical °C	1138	1352
Hemispherical °C	1143	1354
Fluid °C	1171	1363

 Notes: Forestburg Collieries Ltd. is a subsidiary of Luscar Ltd.

FORESTBURG COLLIERIES LIMITED
 Paintearth Mine (No. 1781); No. 1 Seam; Battle River Coalfield
 Forestburg, Plains Region, Alberta
 LSD. 9, Sec. 12, Twp. 40; R16, W4

Sampling date 25-09-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2068-85

Ash analysis, per cent:

SiO ₂	31.00
Al ₂ O ₃	15.25
Fe ₂ O ₃	6.50
Mn ₃ O ₄	-
TiO ₂	0.72
P ₂ O ₅	1.06
CaO	17.82
MgO	1.08
SO ₃	12.44
Na ₂ O	8.24
K ₂ O	0.19
SrO	0.41
BaO	0.91
Loss on fusion (LOF)	2.61

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

FORESTBURG COLLIERIES LIMITED
 Paintearth Mine (No. 1781); No. 3 Seam; Battle River Coalfield
 Forestburg, Plains Region, Alberta
 LSD. 12, Twp. 40; R15, W4

Sampling date 25-09-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2066-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	%		
Ash	%	11.66	
Volatile	%	37.94	42.95
Fixed carbon	%	50.40	57.05

Ultimate:	%	As Rec'd	Dry	Dry Ash Free
Carbon	%	48.27	64.34	72.83
Hydrogen	%	3.38	4.50	5.09
Sulphur (Pyritic)	%	(0.05)	(0.07)	-
(Sulphate)	%	(0.02)	(0.03)	-
(Organic)	%	(0.40)	(0.53)	(0.60)
Total	%	0.47	0.62	-
Nitrogen	%	1.08	1.44	1.63
Ash	%	8.75	11.66	-
Oxygen, by difference	%	13.09	17.44	19.74

Heating value:	MJ/kg	19.32	25.76	29.16
	kcal/kg	4616	6152	6964
	Btu/lb	8308	11073	12535

Hardgrove grindability index 36

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent
 % |

Adherent
 % |

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C	1121
Spherical	°C	1229
Hemispherical	°C	1393
Fluid	°C	1396
		1482+

Notes: Forestburg Collieries Ltd. is a subsidiary of Luscar Ltd.

FORESTBURG COLLIERIES LIMITED
 Paintearth Mine (No. 1781); No. 3 Seam; Battle River Coalfield
 Forestburg, Plains Region, Alberta
 LSD. 12, Twp. 40; R15, W4

Sampling date 25-09-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2066-85

Ash analysis, per cent:

SiO ₂	49.25
Al ₂ O ₃	17.21
Fe ₂ O ₃	4.28
Mn ₃ O ₄	-
TiO ₂	0.56
P ₂ O ₅	0.27
CaO	10.44
MgO	1.46
SO ₃	6.67
Na ₂ O	4.23
K ₂ O	0.39
SrO	0.19
BaO	0.31
Loss on fusion (LOF)	2.90

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	80
F	34.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

FORESTBURG COLLIERIES LIMITED
 Paintearth Mine (No. 1781); No. 4 Seam; Battle River Coalfield
 Forestburg, Plains Region, Alberta
 LSD. 13, Sec. 7, Twp. 40; R15, W4

Sampling date 25-09-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening, mm
 (Screen opening, in)

ERL number 2067-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	25.14		
Ash %	5.55	7.41	
Volatile %	28.96	38.69	41.79
Fixed carbon %	40.35	53.90	58.21

Ultimate:			
Carbon %	50.23	67.10	72.47
Hydrogen %	3.37	4.50	4.86
Sulphur (Pyritic) %	(0.02)	(0.03)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.33)	(0.45)	(0.48)
Total %	0.37	0.49	-
Nitrogen %	1.00	1.33	1.44
Ash %	5.55	7.41	-
Oxygen, by difference %	14.35	19.17	20.70

Heating values:			
	MJ/kg	19.37	25.87
	kcal/kg	4626	6179
	Btu/lb	8326	11122

Hardgrove grindability index 34

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1068	1143
Spherical °C	1116	1171
Hemispherical °C	1304	1229
Fluid °C	1307	1316

Notes: Forestburg Collieries Ltd. is a subsidiary of Luscar Ltd.

FORESTBURG COLLIERIES LIMITED
 Paintearth Mine (No. 1781); No. 4 Seam; Battle River Coalfield
 Forestburg, Plains Region, Alberta
 LSD. 13, Sec. 7, Twp. 40; R15, W4

Sampling date 25-09-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2067-85

Ash analysis, per cent:

SiO ₂	41.79
Al ₂ O ₃	15.38
Fe ₂ O ₃	5.23
Mn ₃ O ₄	-
TiO ₂	0.73
P ₂ O ₅	1.50
CaO	15.10
MgO	1.07
SO ₃	8.43
Na ₂ O	4.30
K ₂ O	0.43
SrO	0.41
BaO	0.71
Loss on fusion (LOF)	3.25

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	80
F	28.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

MANALTA COAL LIMITED

Vesta Mine (Mine No. 1046); No. 1 Seam; Battle River Coalfield
Halkirk, Plains Region, Alberta

 Sampling date 21-09-84
 Sampling location Mine (surface)
 5811700 N 422180 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2063-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 25.28		
Ash	% 10.23	13.69	
Volatile	% 28.60	38.28	44.35
Fixed carbon	% 35.89	48.03	55.65

Ultimate:			
Carbon	% 46.22	61.86	71.67
Hydrogen	% 3.12	4.17	4.83
Sulphur (Pyritic)	% (0.03)	(0.04)	-
(Sulphate)	% (0.01)	(0.01)	-
(Organic)	% (0.31)	(0.42)	(0.49)
Total	% 0.36	0.48	-
Nitrogen	% 0.99	1.33	1.54
Ash	% 10.23	13.69	-
Oxygen, by difference	% 13.80	18.47	21.40

Heating value:			
	MJ/kg	17.73	23.73
	kcal/kg	4235	5667
	Btu/lb	7622	10201
			11819

 Hardgrove grindability index 42

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent

Adherent

Ash Fusibility temperature		Reducing	Oxidizing
Initial	°C	1124	1143
Spherical	°C	1160	1182
Hemispherical	°C	1282	1274
Fluid	°C	1329	1452

 Notes:

MANALTA COAL LIMITED
 Vesta Mine (Mine No. 1046); No. 1 Seam; Battle River Coalfield
 Halkirk, Plains Region, Alberta

Sampling date 21-09-84
 Sampling location Mine (surface)
 5811700 N 422180 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2063-85

Ash analysis, per cent:

SiO ₂	55.80
Al ₂ O ₃	12.23
Fe ₂ O ₃	3.96
Mn ₃ O ₄	-
TiO ₂	0.65
P ₂ O ₅	0.28
CaO	10.87
MgO	2.13
SO ₃	5.63
Na ₂ O	2.47
K ₂ O	1.17
SrO	0.14
BaO	0.34
Loss on fusion (LOF)	2.37

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	80
F	53.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 745.6 m

MANALTA COAL LIMITED

Vesta Mine (Mine No. 1046); No. 2 Seam; Battle River Coalfield
Halkirk, Plains Region, Alberta

 Sampling date 21-09-84
 Sampling location Mine (surface)
 5811700 N 422110 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2064-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 22.92		
Ash	% 10.81	14.03	
Volatile	% 28.70	37.24	43.32
Fixed carbon	% 37.56	48.73	56.68

Ultimate:			
Carbon	% 48.21	62.54	72.75
Hydrogen	% 3.39	4.40	5.12
Sulphur (Pyritic)	% (0.06)	(0.08)	-
(Sulphate)	% (0.02)	(0.03)	-
(Organic)	% (0.30)	(0.39)	(0.45)
Total	% 0.39	0.50	-
Nitrogen	% 1.12	1.45	1.69
Ash	% 10.81	14.03	-
Oxygen, by difference	% 13.17	17.08	19.87

Heating value:			
	MJ/kg	18.73	24.30
	kcal/kg	4473	5803
	Btu/lb	8051	10445
			12150

 Hardgrove grindability index 36

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C 1154	1246
Spherical	°C 1374	1304
Hemispherical	°C 1391	1335
Fluid	°C 1482+	1393

 Notes:

MANALTA COAL LIMITED
 Vesta Mine (Mine No. 1046); No. 2 Seam; Battle River Coalfield
 Halkirk, Plains Region, Alberta

Sampling date 21-09-84
 Sampling location Mine (surface)
 5811700 N 422110 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2064-85

Ash analysis, per cent:

SiO ₂	48.11
Al ₂ O ₃	21.04
Fe ₂ O ₃	4.04
Mn ₃ O ₄	-
TiO ₂	0.69
P ₂ O ₅	0.33
CaO	9.08
MgO	1.31
SO ₃	4.82
Na ₂ O	5.58
K ₂ O	0.43
SrO	0.20
BaO	0.60
Loss on fusion (LOF)	2.37

Volatile trace element analysis ug/g (ppm)

Hg	0.03
Cl	70
F	45.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 743.4 m

MANALTA COAL LIMITED

Vesta Mine (Mine No. 1046); No. 3 Seam; Battle River Coalfield
Halkirk, Plains Region, Alberta

 Sampling date 21-09-84
 Sampling location Mine (surface)
 5811735 N 421075 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2065-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 20.47		
Ash	% 14.44	18.16	
Volatile	% 28.73	36.13	44.15
Fixed carbon	% 36.35	45.71	55.85

Ultimate:			
Carbon	% 46.89	58.96	72.04
Hydrogen	% 3.28	4.13	5.05
Sulphur (Pyritic)	% (0.07)	(0.08)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.28)	(0.36)	(0.43)
Total	% 0.35	0.44	-
Nitrogen	% 1.21	1.52	1.86
Ash	% 14.44	18.16	-
Oxygen, by difference	% 13.35	16.79	20.52

Heating value:			
	MJ/kg	18.12	22.78
	kcal/kg	4327	5441
	Btu/lb	7788	9793
			11966

 Hardgrove grindability index 40

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C 1204	1268
Spherical	°C 1288	1335
Hemispherical	°C 1393	1429
Fluid	°C 1482+	1482+

 Notes:

MANALTA COAL LIMITED

Vesta Mine (Mine No. 1046); No. 3 Seam; Battle River Coalfield
Halkirk, Plains Region, Alberta

Sampling date 21-09-84
Sampling location Mine (surface)
5811735 N 421075 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2065-85

Ash analysis, per cent:

SiO ₂	54.75
Al ₂ O ₃	20.66
Fe ₂ O ₃	3.34
Mn ₃ O ₄	-
TiO ₂	0.73
P ₂ O ₅	0.12
CaO	6.94
MgO	0.72
SO ₃	3.60
Na ₂ O	4.27
K ₂ O	1.06
SrO	0.17
BaO	0.76
Loss on fusion (LOF)	1.80

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	80
F	43.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 712.6 m

MANALTA COAL LIMITED

Montgomery Mine (Mine No. 443); No. 1 Seam; Sheerness Coalfield
Hanna, Plains Region, Alberta

 Sampling date 21-09-84
 Sampling location Mine (surface)
 5704087 N 49642 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2062-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	26.11		
Ash %	6.13	8.30	
Volatile %	29.28	39.63	43.22
Fixed carbon %	38.47	52.07	56.78

Ultimate:			
Carbon %	48.43	65.54	71.47
Hydrogen %	3.25	4.40	4.80
Sulphur (Pyritic) %	(0.05)	(0.06)	-
(Sulphate) %	(0.04)	(0.05)	-
(Organic) %	(0.37)	(0.51)	(0.55)
Total %	0.46	0.62	-
Nitrogen %	1.14	1.54	1.68
Ash %	6.13	8.30	-
Oxygen, by difference %	14.48	19.60	21.37

Heating value:			
	MJ/kg	18.67	25.27
	kcal/kg	4459	6034
	Btu/lb	8026	10862
			11845

 Hardgrove grindability index 39

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1116	1199
Spherical °C		1179	1210
Hemispherical °C		1293	1266
Fluid °C		1363	1346

 Notes: Montgomery Mine was formerly named Roselyn Mine

MANALTA COAL LIMITED
 Montgomery Mine (Mine No. 443); No. 1 Seam; Sheerness Coalfield
 Hanna, Plains Region, Alberta

Sampling date 21-09-84
 Sampling location Mine (surface)
 5704087 N 49642 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2062-85

Ash analysis, per cent:

SiO ₂	33.09
Al ₂ O ₃	19.31
Fe ₂ O ₃	6.34
Mn ₃ O ₄	-
TiO ₂	0.94
P ₂ O ₅	0.22
CaO	18.39
MgO	2.59
SO ₃	11.32
Na ₂ O	1.45
K ₂ O	0.32
SrO	0.24
BaO	0.58
Loss on fusion (LOF)	3.01

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	80
F	26.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 826.7 m

MANALTA COAL LIMITED

Highvale Mine (Mine No. 1769); Seam No. 1; Wabamun Coalfield
 Seba Beach, Plains Region, Alberta
 N.E Qtr. Sec. 32, Twp. 52; R5, W5M

Sampling date 11-12-84
 Sampling location Mine (surface)
 Pit 04

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2363-85

Rank of coal Subbituminous B

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	18.84		
Ash %	13.13	16.18	
Volatile %	28.00	34.50	41.16
Fixed carbon %	40.03	49.32	58.84

Ultimate:			
Carbon %	50.08	61.70	73.61
Hydrogen %	3.13	3.86	4.61
Sulphur (Pyritic) %	(0.04)	(0.05)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.14)	(0.17)	(0.20)
Total %	0.18	0.22	-
Nitrogen %	0.71	0.87	1.04
Ash %	13.13	16.18	-
Oxygen, by difference %	13.94	17.17	20.48

Heating value:			
	MJ/kg	19.05	23.47
	kcal/kg	4549	5605
	Btu/lb	8188	10089

Hardgrove grindability index 46

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1282	1360
Spherical °C	1368	1399
Hemispherical °C	1388	1421
Fluid °C	1482+	1482+

Notes: Highvale Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED

Highvale Mine (Mine No. 1769); Seam No. 1; Wabamun Coalfield
 Seba Beach, Plains Region, Alberta
 N.E Qtr. Sec. 32, Twp. 52; R5, W5M

Sampling date 11-12-84
 Sampling location Mine (surface)
 Pit 04

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2363-85

Ash analysis, per cent:

SiO ₂	48.94
Al ₂ O ₃	25.20
Fe ₂ O ₃	3.44
Mn ₃ O ₄	-
TiO ₂	0.71
P ₂ O ₅	0.10
CaO	12.37
MgO	0.84
SO ₃	3.41
Na ₂ O	2.89
K ₂ O	0.25
SrO	0.11
BaO	0.21
Loss on fusion (LOF)	0.62

Volatile trace element analysis ug/g (ppm)

Hg	0.11
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 715 m

MANALTA COAL LIMITED

Highvale Mine (Mine No. 1769); Seam No. 2; Wabamun Coalfield
 Seba Beach, Plains Region, Alberta
 N.E. Qtr. Sec. 32, Twp. 52; R5, W5M

Sampling date 11-12-84
 Sampling location Mine (surface)
 Pit 04

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2364-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 19.41		
Ash	% 13.56	16.82	
Volatile	% 27.59	34.24	41.16
Fixed carbon	% 39.44	48.94	58.84

Ultimate:			
Carbon	% 48.89	60.66	72.93
Hydrogen	% 3.06	3.80	4.57
Sulphur (Pyritic)	% (0.05)	(0.06)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.08)	(0.10)	(0.12)
Total	% 0.13	0.16	-
Nitrogen	% 0.64	0.80	0.96
Ash	% 13.56	16.82	-
Oxygen, by difference	% 14.31	17.76	21.35

Heating value:			
	MJ/kg	18.53	22.99
	kcal/kg	4425	5491
	Btu/lb	7965	9883

Hardgrove grindability index 43

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C 1210	1302
Spherical	°C 1296	1354
Hemispherical	°C 1360	1371
Fluid	°C 1379	1449

Notes: Highvale Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
 Highvale Mine (Mine No. 1769); Seam No. 2; Wabamun Coalfield
 Seba Beach, Plains Region, Alberta
 N.E. Qtr. Sec. 32, Twp. 52; R5, W5M

Sampling date 11-12-84
 Sampling location Mine (surface)
 Pit 04

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2364-85

Ash analysis, per cent:

SiO ₂	46.66
Al ₂ O ₃	22.63
Fe ₂ O ₃	5.73
Mn ₃ O ₄	-
TiO ₂	0.76
P ₂ O ₅	0.17
CaO	13.00
MgO	1.06
SO ₃	2.88
Na ₂ O	0.07
K ₂ O	0.27
SrO	-
BaO	0.11
Loss on fusion (LOF)	1.49

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 705 m

MANALTA COAL LIMITED

Highvale Mine (Mine No. 1769); Seam No. 3; Wabamun Coalfield
 Seba Beach, Plains Region, Alberta
 N.W. Qtr. Pit 4, Twp. 52; R4, W5M

 Sampling date 11-12-84
 Sampling location Mine (surface)
 Pit 02 South

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2365-85

Rank of coal Subbituminous B

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 19.33		
Ash	% 8.74	10.84	
Volatile	% 28.41	35.22	39.50
Fixed carbon	% 43.51	53.94	60.50

Ultimate:			
Carbon	% 53.19	65.93	73.95
Hydrogen	% 3.23	4.01	4.50
Sulphur (Pyritic)	% (0.04)	(0.05)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.26)	(0.32)	(0.36)
Total	% 0.30	0.37	-
Nitrogen	% 0.74	0.92	1.03
Ash	% 8.74	10.84	-
Oxygen, by difference	% 14.46	17.93	20.11

Heating value:			
	MJ/kg	20.35	25.22
	kcal/kg	4860	6024
	Btu/lb	8748	10844
			12162

 Hardgrove grindability index 45

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C 1091	1132
Spherical	°C 1160	1216
Hemispherical	°C 1274	1243
Fluid	°C 1391	1432

Notes: Highvale Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
 Highvale Mine (Mine No. 1769); Seam No. 3; Wabamun Coalfield
 Seba Beach, Plains Region, Alberta
 N.W. Qtr. Pit 4, Twp. 52; R4, W5M

Sampling date 11-12-84
 Sampling location Mine (surface)
 Pit 02 South

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2365-85

Ash analysis, per cent:

SiO ₂	49.54
Al ₂ O ₃	16.10
Fe ₂ O ₃	4.20
Mn ₃ O ₄	-
TiO ₂	0.56
P ₂ O ₅	0.19
CaO	14.77
MgO	1.00
SO ₃	6.62
Na ₂ O	4.59
K ₂ O	0.31
SrO	0.15
BaO	0.24
Loss on fusion (LOF)	0.75

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 700 m

MANALTA COAL LIMITED

Highvale Mine (Mine No. 1769); Seam No. 4; Wabamun Coalfield
 Seba Beach, Plains Region, Alberta
 N.W. Qtr. Pit 4, Twp. 52; R4, W5M

Sampling date 11-12-84
 Sampling location Mine (surface)
 Pit 02 South

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2366-85

Rank of coal Subbituminous B

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	17.38		
Ash %	19.78	23.94	
Volatile %	27.67	33.49	44.03
Fixed carbon %	35.17	42.57	55.97

Ultimate:			
Carbon %	46.26	55.99	73.61
Hydrogen %	2.80	3.39	4.46
Sulphur (Pyritic) %	(0.03)	(0.04)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.32)	(0.39)	(0.51)
Total %	0.36	0.43	-
Nitrogen %	0.65	0.79	1.04
Ash %	19.78	23.94	-
Oxygen, by difference %	12.77	15.46	20.33

Heating value:			
	MJ/kg	18.16	21.98
	kcal/kg	4337	5249
	Btu/lb	7807	9449
			12423

Hardgrove grindability index 49

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1182	1191
Spherical °C	1304	1282
Hemispherical °C	1416	1374
Fluid °C	1471	1482+

Notes: Highvale Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
 Highvale Mine (Mine No. 1769); Seam No. 4; Wabamun Coalfield
 Seba Beach, Plains Region, Alberta
 N.W. Qtr. Pit 4, Twp. 52; R4, W5M

Sampling date 11-12-84
 Sampling location Mine (surface)
 Pit 02 South

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2366-85

Ash analysis, per cent:

SiO ₂	64.71
Al ₂ O ₃	13.28
Fe ₂ O ₃	1.23
Mn ₃ O ₄	-
TiO ₂	0.49
P ₂ O ₅	0.28
CaO	9.75
MgO	0.71
SO ₃	3.29
Na ₂ O	2.16
K ₂ O	0.03
SrO	0.08
BaO	0.16
Loss on fusion (LOF)	1.88

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 690 m

MANALTA COAL LIMITED

Highvale Mine (Mine No. 1769); Seam No. 6; Wabamun Coalfield
 Seba Beach, Plains Region, Alberta
 N.W. Qtr. Pit 4, Twp. 52; R4, W5M

Sampling date 11-12-84
 Sampling location Mine (surface)
 Pit 02 South

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2367-85

Rank of coal Subbituminous B

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	19.70		
Ash %	12.03	14.98	
Volatile %	28.23	35.16	41.35
Fixed carbon %	40.04	49.86	58.65

Ultimate:			
Carbon %	49.87	62.11	73.05
Hydrogen %	3.28	4.09	4.81
Sulphur (Pyritic) %	(0.06)	(0.07)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.29)	(0.36)	(0.42)
Total %	0.35	0.43	-
Nitrogen %	0.90	1.12	1.32
Ash %	12.03	14.98	-
Oxygen, by difference %	13.87	17.27	20.31

Heating value:			
	MJ/kg	19.29	24.03
	kcal/kg	4608	5738
	Btu/lb	8294	10329

Hardgrove grindability index 39

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1141	1271
Spherical °C	1279	1329
Hemispherical °C	1374	1368
Fluid °C	1391	1446

Notes: Highvale Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED

Highvale Mine (Mine No. 1769); Seam No. 6; Wabamun Coalfield
 Seba Beach, Plains Region, Alberta
 N.W. Qtr. Pit 4, Twp. 52; R4, W5M

Sampling date 11-12-84
 Sampling location Mine (surface)
 Pit 02 South

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2367-85

Ash analysis, per cent:

SiO ₂	50.73
Al ₂ O ₃	20.22
Fe ₂ O ₃	3.39
Mn ₃ O ₄	-
TiO ₂	0.85
P ₂ O ₅	0.05
CaO	10.65
MgO	1.32
SO ₃	4.32
Na ₂ O	4.23
K ₂ O	0.21
SrO	0.14
BaO	0.60
Loss on fusion (LOF)	1.75

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 685 m

MANALTA COAL LIMITED
Highvale Mine (Mine No. 1769); Wabamun Coalfield
Seba Beach, Plains Region, Alberta

Sampling date	11-12-84		
Sampling location	Keephills Power Generating Station Feed Belt		
Product name	Plant Feed		
Screen opening ,mm (Screen opening ,in)			
ERL number	2368-85		
Rank of coal	Subbituminous C		
Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 19.62		
Ash	% 9.48	11.80	
Volatile	% 28.74	35.76	40.54
Fixed carbon	% 42.15	52.44	59.46
Ultimate:			
Carbon	% 51.72	64.35	72.96
Hydrogen	% 3.24	4.03	4.57
Sulphur (Pyritic)	% (0.04)	(0.05)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.14)	(0.17)	(0.20)
Total	% 0.18	0.22	-
Nitrogen	% 0.73	0.91	1.03
Ash	% 9.48	11.80	-
Oxygen, by difference	% 15.02	18.69	21.19
Heating value:			
	MJ/kg	19.77	24.59
	kcal/kg	4721	5874
	Btu/lb	8499	10573
Hardgrove grindability index	42		
Free swelling index (FSI)	N/A		
Moisture (as rec'd)			
Inherent	%		
Adherent	%		
Ash Fusibility temperature	Reducing	Oxidizing	
Initial	°C 1213	1282	
Spherical	°C 1274	1332	
Hemispherical	°C 1291	1363	
Fluid	°C 1399	1438	

Notes: Highvale Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
 Highvale Mine (Mine No. 1769); Wabamun Coalfield
 Seba Beach, Plains Region, Alberta

Sampling date	11-12-84
Sampling location	Keephills Power Generating Station Feed Belt

Product name	Plant Feed
Screen opening ,mm (Screen opening ,in)	

ERL number	2368-85
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Ash analysis, per cent:

SiO ₂	44.10
Al ₂ O ₃	23.27
Fe ₂ O ₃	4.66
Mn ₃ O ₄	-
TiO ₂	0.94
P ₂ O ₅	0.12
CaO	14.74
MgO	1.00
SO ₃	4.41
Na ₂ O	3.62
K ₂ O	0.42
SrO	0.15
BaO	0.78
Loss on fusion (LOF)	0.63

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	70
F	123.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba	
Sr	
V	
Mn	
Cr	

Notes:

MANALTA COAL LIMITED
 Highvale Mine (Mine No. 1769); Wabamun Coalfield
 Seba Beach, Plains Region, Alberta

Sampling date 11-12-84
 Sampling location Sundance Power Generating Station

Product name Plant Feed
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2369-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	19.18		
Ash %	15.95	19.74	
Volatile %	26.70	33.04	41.17
Fixed carbon %	38.16	47.22	58.83

Ultimate:			
Carbon %	47.59	58.89	73.37
Hydrogen %	2.97	3.67	4.57
Sulphur (Pyritic) %	(0.06)	(0.07)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.17)	(0.20)	(0.26)
Total %	0.23	0.29	-
Nitrogen %	0.71	0.88	1.10
Ash %	15.95	19.74	-
Oxygen, by difference %	13.36	16.53	20.60

Heating value:			
	MJ/kg	18.08	22.37
	kcal/kg	4318	5342
	Btu/lb	7772	9616
			11981

Hardgrove grindability index 48

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1193	1221
Spherical °C	1291	1313
Hemispherical °C	1410	1366
Fluid °C	1466	1482+

Notes: Highvale Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
 Highvale Mine (Mine No. 1769); Wabamun Coalfield
 Seba Beach, Plains Region, Alberta

Sampling date 11-12-84
 Sampling location Sundance Power Generating Station

Product name Plant Feed
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2369-85

Ash analysis, per cent:

SiO ₂	56.86
Al ₂ O ₃	18.15
Fe ₂ O ₃	2.96
Mn ₃ O ₄	-
TiO ₂	0.67
P ₂ O ₅	0.14
CaO	10.25
MgO	1.04
SO ₃	3.51
Na ₂ O	2.74
K ₂ O	0.25
SrO	0.11
BaO	0.66
Loss on fusion (LOF)	0.76

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

MANALTA COAL LIMITED

Whitewood Mine (Mine No. 1757); Seam No. 1; Wabamun Coalfield
Wabamun, Plains Region, Alberta
S.E. Qtr. Sec. 21, Twp. 53; R4, W5M

Sampling date 12-12-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2356-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 20.54		
Ash	% 9.22	11.60	
Volatile	% 28.21	35.50	40.16
Fixed carbon	% 42.03	52.90	59.84

Ultimate:			
Carbon	% 51.54	64.86	73.37
Hydrogen	% 3.10	3.90	4.41
Sulphur (Pyritic)	% (0.04)	(0.05)	-
(Sulphate)	% (0.01)	(0.01)	-
(Organic)	% (0.14)	(0.17)	(0.20)
Total	% 0.19	0.24	-
Nitrogen	% 0.77	0.97	1.10
Ash	% 9.22	11.60	-
Oxygen, by difference	% 14.64	18.43	20.85

Heating value:			
	MJ/kg	19.42	24.44
	kcal/kg	4639	5838
	Btu/lb	8350	10509
			11888

Hardgrove grindability index 43

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C 1171	1199
Spherical	°C 1196	1249
Hemispherical	°C 1202	1307
Fluid	°C 1271	1371

Notes: Whitewood Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
 Whitewood Mine (Mine No. 1757); Seam No. 1; Wabamun Coalfield
 Wabamun, Plains Region, Alberta
 S.E. Qtr. Sec. 21, Twp. 53; R4, W5M

Sampling date 12-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2356-85

Ash analysis, per cent:

SiO ₂	46.79
Al ₂ O ₃	17.74
Fe ₂ O ₃	3.91
Mn ₃ O ₄	-
TiO ₂	0.53
P ₂ O ₅	0.05
CaO	18.63
MgO	3.25
SO ₃	3.82
Na ₂ O	0.13
K ₂ O	0.29
SrO	0.10
BaO	0.47
Loss on fusion (LOF)	2.40

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 630 m

MANALTA COAL LIMITED

Whitewood Mine (Mine No. 1757); Seam No. 2; Wabamun Coalfield
 Wabamun, Plains Region, Alberta
 N.E. Qtr. Sec. 21, Twp. 53; R4, W5M

 Sampling date 12-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2357-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	19.21		
Ash %	13.10	16.22	
Volatile %	28.79	35.64	42.54
Fixed carbon %	38.89	48.14	57.46

Ultimate:			
Carbon %	49.23	60.94	72.74
Hydrogen %	3.16	3.91	4.67
Sulphur (Pyritic) %	(0.05)	(0.06)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.23)	(0.28)	(0.34)
Total %	0.28	0.35	-
Nitrogen %	0.70	0.87	1.04
Ash %	13.10	16.22	-
Oxygen, by difference %	14.31	17.71	21.14

Heating value:			
	MJ/kg	18.79	23.26
	kcal/kg	4488	5556
	Btu/lb	8079	10000
			27.76
			6631
			11936

 Hardgrove grindability index 40

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1168	1210
Spherical °C		1227	1374
Hemispherical °C		1360	1452
Fluid °C		1416	1482+

Notes: Whitewood Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
 Whitewood Mine (Mine No. 1757); Seam No. 2; Wabamun Coalfield
 Wabamun, Plains Region, Alberta
 N.E. Qtr. Sec. 21, Twp. 53; R4, W5M

Sampling date 12-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2357-85

Ash analysis, per cent:

SiO ₂	67.16
Al ₂ O ₃	9.98
Fe ₂ O ₃	3.02
Mn ₃ O ₄	-
TiO ₂	0.31
P ₂ O ₅	0.02
CaO	10.92
MgO	1.30
SO ₃	4.60
Na ₂ O	0.11
K ₂ O	0.07
SrO	0.08
BaO	0.30
Loss on fusion (LOF)	1.17

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 625 m

MANALTA COAL LIMITED

Whitewood Mine (Mine No. 1757); Seam No. 3; Wabamun Coalfield
Wabamun, Plains Region, Alberta
N.E. Qtr. Sec. 21, Twp. 53; R4, W5M

Sampling date 12-12-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2358-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	20.88		
Ash %	9.27	11.72	
Volatile %	29.50	37.28	42.23
Fixed carbon %	40.35	51.00	57.77

Ultimate:			
Carbon %	50.98	64.43	72.98
Hydrogen %	3.05	3.85	4.36
Sulphur (Pyritic) %	(0.04)	(0.05)	-
(Sulphate) %	(0.03)	(0.04)	-
(Organic) %	(0.13)	(0.16)	(0.19)
Total %	0.20	0.25	-
Nitrogen %	0.72	0.91	1.03
Ash %	9.27	11.72	-
Oxygen, by difference %	14.91	18.84	21.34

Heating value:			
	MJ/kg	19.30	24.39
	kcal/kg	4609	5825
	Btu/lb	8296	10485

Hardgrove grindability index 43

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1282	1374
Spherical °C	1354	1404
Hemispherical °C	1360	1424
Fluid °C	1424	1463

Notes: Whitewood Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
 Whitewood Mine (Mine No. 1757); Seam No. 3; Wabamun Coalfield
 Wabamun, Plains Region, Alberta
 N.E. Qtr. Sec. 21, Twp. 53; R4, W5M

Sampling date 12-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2358-85

Ash analysis, per cent:

SiO ₂	40.39
Al ₂ O ₃	24.58
Fe ₂ O ₃	6.70
Mn ₃ O ₄	-
TiO ₂	0.91
P ₂ O ₅	0.14
CaO	17.06
MgO	1.53
SO ₃	5.35
Na ₂ O	0.19
K ₂ O	0.12
SrO	0.07
BaO	0.47
Loss on fusion (LOF)	1.08

Volatile trace element analysis ug/g (ppm)

Hg	0.03
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 624 m

MANALTA COAL LIMITED

Whitewood Mine (Mine No. 1757); Seam No. 4; Wabamun Coalfield
Wabamun, Plains Region, Alberta
N.E. Qtr. Sec. 21, Twp. 53; R4, W5M

Sampling date 12-12-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2359-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	20.06		
Ash %	13.00	16.26	
Volatile %	26.74	33.45	39.95
Fixed carbon %	40.20	50.29	60.05

Ultimate:			
Carbon %	50.00	62.55	74.70
Hydrogen %	2.76	3.45	4.12
Sulphur (Pyritic) %	(0.03)	(0.04)	-
(Sulphate) %	(0.02)	(0.02)	-
(Organic) %	(0.25)	(0.31)	(0.37)
Total %	0.30	0.37	-
Nitrogen %	0.68	0.85	1.02
Ash %	13.00	16.26	-
Oxygen, by difference %	13.21	16.52	19.73

Heating value:			
	MJ/kg	18.68	23.36
	kcal/kg	4461	5580
	Btu/lb	8029	10044

Hardgrove grindability index 51

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1171	1168
Spherical °C	1232	1332
Hemispherical °C	1352	1402
Fluid °C	1413	1477

Notes: Whitewood Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
 Whitewood Mine (Mine No. 1757); Seam No. 4; Wabamun Coalfield
 Wabamun, Plains Region, Alberta
 N.E. Qtr. Sec. 21, Twp. 53; R4, W5M

Sampling date 12-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2359-85

Ash analysis, per cent:

SiO ₂	61.32
Al ₂ O ₃	12.20
Fe ₂ O ₃	2.39
Mn ₃ O ₄	-
TiO ₂	0.38
P ₂ O ₅	0.06
CaO	14.29
MgO	1.37
SO ₃	3.67
Na ₂ O	0.20
K ₂ O	-
SrO	0.11
BaO	0.46
Loss on fusion (LOF)	1.36

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 619 m

MANALTA COAL LIMITED

Whitewood Mine (Mine No. 1757); Seam No. 5; Wabamun Coalfield
 Wabamun, Plains Region, Alberta
 N.E. Qtr. Sec. 21, Twp. 53; R4, W5M

Sampling date 12-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2360-85

Rank of coal Subbituminous C

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	13.13		
Ash %	53.37	61.44	
Volatile %	17.31	19.93	51.69
Fixed carbon %	16.18	18.63	48.31

Ultimate:			
Carbon %	22.21	25.57	66.31
Hydrogen %	1.97	2.27	5.89
Sulphur (Pyritic) %	(0.08)	(0.09)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.18)	(0.20)	(0.53)
Total %	0.27	0.31	-
Nitrogen %	0.34	0.39	1.01
Ash %	53.37	61.44	-
Oxygen, by difference %	8.70	10.02	25.99

Heating value:			
	MJ/kg	3.89	4.48
	kcal/kg	930	1070
	Btu/lb	1673	1926
			11.62
			2775
			4995

Hardgrove grindability index 51

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1482+	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes: Whitewood Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED

Whitewood Mine (Mine No. 1757); Seam No. 5; Wabamun Coalfield
 Wabamun, Plains Region, Alberta
 N.E. Qtr. Sec. 21, Twp. 53; R4, W5M

Sampling date 12-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2360-85

Ash analysis, per cent:

SiO ₂	69.64
Al ₂ O ₃	20.63
Fe ₂ O ₃	0.74
Mn ₃ O ₄	-
TiO ₂	1.13
P ₂ O ₅	0.09
CaO	2.15
MgO	0.48
SO ₃	0.94
Na ₂ O	0.39
K ₂ O	0.49
SrO	0.03
BaO	0.38
Loss on fusion (LOF)	0.75

Volatile trace element analysis ug/g (ppm)

Hg	0.32
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 618 m

MANALTA COAL LIMITED

Whitewood Mine (Mine No. 1757); Seam No. 6; Wabamun Coalfield
Wabamun, Plains Region, Alberta
N.E. Qtr. Sec. 21, Twp. 53; R4, W5M

Sampling date 12-12-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2361-85

Rank of coal Subbituminous B

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 20.12		
Ash	% 7.48	9.37	
Volatile	% 31.30	39.18	43.23
Fixed carbon	% 41.10	51.45	56.77

Ultimate:			
Carbon	% 53.03	66.39	73.25
Hydrogen	% 3.52	4.41	4.87
Sulphur (Pyritic)	% (0.05)	(0.06)	-
(Sulphate)	% (0.01)	(0.01)	-
(Organic)	% (0.32)	(0.40)	(0.44)
Total	% 0.38	0.47	-
Nitrogen	% 0.96	1.20	1.32
Ash	% 7.48	9.37	-
Oxygen, by difference	% 14.51	18.16	20.04

Heating value:			
	MJ/kg	20.60	25.78
	kcal/kg	4919	6158
	Btu/lb	8855	11085
			12231

Hardgrove grindability index 36

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent

Adherent

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C 1166	1191
Spherical	°C 1185	1207
Hemispherical	°C 1221	1227
Fluid	°C 1285	1349

Notes: Whitewood Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
 Whitewood Mine (Mine No. 1757); Seam No. 6; Wabamun Coalfield
 Wabamun, Plains Region, Alberta
 N.E. Qtr. Sec. 21, Twp. 53; R4, W5M

Sampling date 12-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2361-85

Ash analysis, per cent:

SiO ₂	41.24
Al ₂ O ₃	16.61
Fe ₂ O ₃	3.95
Mn ₃ O ₄	-
TiO ₂	0.67
P ₂ O ₅	0.07
CaO	20.06
MgO	2.00
SO ₃	8.19
Na ₂ O	1.11
K ₂ O	0.10
SrO	0.15
BaO	0.68
Loss on fusion (LOF)	3.36

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 616 m

MANALTA COAL LIMITED
Whitewood Mine (Mine No. 1757); Wabamun Coalfield
Wabamun, Plains Region, Alberta

Sampling date	12-12-84
Sampling location	Wabamun Generating Station Feed Belt

Product name	Mine Run
Screen opening ,mm (Screen opening ,in)	

ERL number	2362-85
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Rank of coal	Subbituminous C
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Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	%		
Ash	%	19.16	
Volatile	%	34.41	42.57
Fixed carbon	%	46.43	57.43

Ultimate:	%	As Rec'd	Dry	Dry Ash Free
Carbon	%	46.90	58.88	72.84
Hydrogen	%	2.99	3.75	4.64
Sulphur (Pyritic)	%	(0.08)	(0.10)	-
(Sulphate)	%	(0.02)	(0.02)	-
(Organic)	%	(0.20)	(0.24)	(0.30)
Total	%	0.29	0.37	-
Nitrogen	%	0.71	0.89	1.10
Ash	%	15.26	19.16	-
Oxygen, by difference	%	13.50	16.95	20.97

Heating value:	MJ/kg	As Rec'd	Dry	Dry Ash Free
	kcal/kg	17.86	22.42	27.74
	Btu/lb	4267	5356	6626
		7680	9641	11926

Hardgrove grindability index	45
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Free swelling index (FSI)	N/A
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Moisture (as rec'd)	
Inherent	%
Adherent	%

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C	1174
Spherical	°C	1274
Hemispherical	°C	1379
Fluid	°C	1454
		1249
		1332
		1360
		1482+

Notes: Whitewood Mine is owned by TransAlta Utilities Corp. and operated by Manalta Coal Ltd.

MANALTA COAL LIMITED
Whitewood Mine (Mine No. 1757); Wabamun Coalfield
Wabamun, Plains Region, Alberta

Sampling date	12-12-84
Sampling location	Wabamun Generating Station Feed Belt
Product name	Mine Run
Screen opening ,mm (Screen opening ,in)	
ERL number	2362-85

Ash analysis, per cent:

SiO ₂	57.05
Al ₂ O ₃	17.85
Fe ₂ O ₃	4.37
Mn ₃ O ₄	-
TiO ₂	0.67
P ₂ O ₅	0.13
CaO	10.53
MgO	1.61
SO ₃	4.37
Na ₂ O	0.34
K ₂ O	0.51
SrO	0.06
BaO	0.38
Loss on fusion (LOF)	0.75

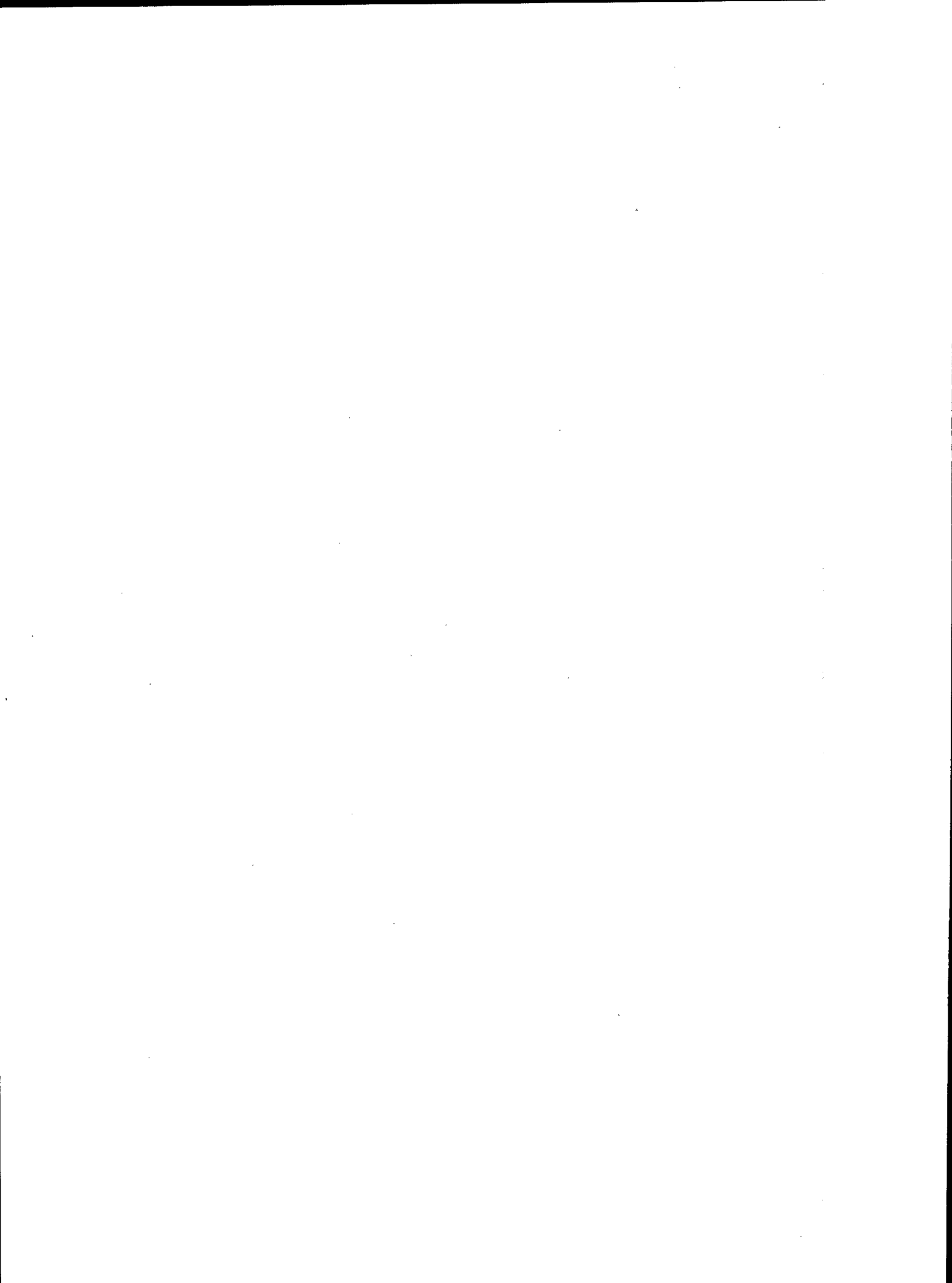
Volatile trace element analysis ug/g (ppm)

Hg	0.09
Cl	70
F	83.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba	
Sr	
V	
Mn	
Cr	

Notes:



**COAL ANALYSES – ALBERTA
(FOOTHILLS AND MOUNTAIN REGIONS)**

LUSCAR LIMITED

Coal Valley Mine (Mine No. 1778); Val D'Or Seam; Coalspur Coalfield
Edson, Foothills Region, Alberta
N.E. Qtr. SEC. 4, TWP. 47; R19, W5M

Sampling date 2-11-84
Sampling location Mine (sfce) Pit 24 (1050 S 550 W)
37800 N 104850 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2341-85

Rank of coal High-volatile C bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 9.03		
Ash	% 13.96	15.35	
Volatile	% 30.19	33.19	39.21
Fixed carbon	% 46.81	51.46	60.79

Ultimate:			
Carbon	% 60.07	66.03	78.00
Hydrogen	% 3.85	4.23	5.00
Sulphur (Pyritic)	% (0.12)	(0.13)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.14)	(0.15)	(0.18)
Total	% 0.25	0.28	-
Nitrogen	% 0.93	1.02	1.20
Ash	% 13.96	15.35	-
Oxygen, by difference	% 11.91	13.09	15.46

Heating value:			
	MJ/kg	23.58	25.92
	kcal/kg	5632	6191
	Btu/lb	10138	11144
			13165

Hardgrove grindability index 45

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent

Adherent

Ash Fusibility temperature		Reducing	Oxidizing
Initial	°C	1168	1196
Spherical	°C	1210	1246
Hemispherical	°C	1307	1282
Fluid	°C	1368	1479

Notes:

LUSCAR LIMITED

Coal Valley Mine (Mine No. 1778); Val D'Or Seam; Coalspur Coalfield
Edson, Foothills Region, Alberta
N.E. Qtr. SEC. 4, TWP. 47; R19, W5M

Sampling date 2-11-84
Sampling location Mine (sfce) Pit 24 (1050 S 550 W)
37800 N 104850 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2341-85

Ash analysis, per cent:

SiO ₂	53.30
Al ₂ O ₃	16.45
Fe ₂ O ₃	4.56
Mn ₃ O ₄	-
TiO ₂	0.58
P ₂ O ₅	0.01
CaO	11.11
MgO	1.58
SO ₃	2.78
Na ₂ O	2.27
K ₂ O	0.57
SrO	0.18
BaO	0.47
Loss on fusion (LOF)	4.25

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1365.5 m

LUSCAR LIMITED

Coal Valley Mine (Mine No. 1778); Silkstone (Wee) Seam; Coalspur Coalfield
Edson, Foothills Region, Alberta
N.W. Qtr. Sec. 9, Twp. 47; R19, W5M

Sampling date 2-11-84
Sampling location Mine (sfce) Pit 31 E (150 S 400 W)
40500 N 98800 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2342-85

Rank of coal High-volatile C bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	9.28		
Ash %	12.37	13.63	
Volatile %	29.29	32.29	37.39
Fixed carbon %	49.06	54.08	62.61

Ultimate:			
Carbon %	62.04	68.39	79.18
Hydrogen %	3.76	4.15	4.80
Sulphur (Pyritic) %	(0.12)	(0.13)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.03)	(0.03)	(0.04)
Total %	0.15	0.17	-
Nitrogen %	1.09	1.20	1.39
Ash %	12.37	13.63	-
Oxygen, by difference %	11.30	12.46	14.43

Heating value:			
	MJ/kg	24.07	26.53
	kcal/kg	5749	6337
	Btu/lb	10348	11407

Hardgrove grindability index 62

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1157	1257
Spherical °C	1285	1329
Hemispherical °C	1307	1377
Fluid °C	1379	1482+

Notes:

LUSCAR LIMITED

Coal Valley Mine (Mine No. 1778); Silkstone (Wee) Seam; Coalspur Coalfield
Edson, Foothills Region, Alberta
N.W. Qtr. Sec. 9, Twp. 47; R19, W5M

Sampling date 2-11-84
Sampling location Mine (sfce) Pit 31 E (150 S 400 W)
40500 N 98800 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2342-85

Ash analysis, per cent:

SiO ₂	50.61
Al ₂ O ₃	19.15
Fe ₂ O ₃	4.41
Mn ₃ O ₄	-
TiO ₂	0.50
P ₂ O ₅	0.04
CaO	14.17
MgO	1.02
SO ₃	2.01
Na ₂ O	0.14
K ₂ O	0.55
SrO	0.08
BaO	0.34
Loss on fusion (LOF)	5.12

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1353.3 m

LUSCAR LIMITED

Coal Valley Mine (Mine No. 1778); Mynheer A Seam; Coalspur Coalfield
Edson, Foothills Region, Alberta
N.E. Qtr. Sec. 25, Twp. 47; R20, W5M

Sampling date 2-11-84
Sampling location Mine (sfce) Pit 12 (1250 S 1150 W)
39450 N 78250 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2344-85

Rank of coal High-volatile C bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	8.50		
Ash %	13.06	14.27	
Volatile %	29.49	32.23	37.59
Fixed carbon %	48.95	53.50	62.41

Ultimate:			
Carbon %	61.43	67.14	78.32
Hydrogen %	3.90	4.26	4.97
Sulphur (Pyritic) %	(0.05)	(0.05)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.15)	(0.16)	(0.19)
Total %	0.20	0.22	-
Nitrogen %	0.99	1.08	1.26
Ash %	13.06	14.27	-
Oxygen, by difference %	11.92	13.03	15.20

Heating value:			
	MJ/kg	24.02	26.25
	kcal/kg	5737	6270
	Btu/lb	10327	11286

Hardgrove grindability index 52

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1177	1224
Spherical °C		1268	1296
Hemispherical °C		1349	1360
Fluid °C		1424	1471

Notes:

LUSCAR LIMITED

Coal Valley Mine (Mine No. 1778); Mynheer A Seam; Coalspur Coalfield
Edson, Foothills Region, Alberta
N.E. Qtr. Sec. 25, Twp. 47; R20, W5M

Sampling date 2-11-84
Sampling location Mine (sfce) Pit 12 (1250 S 1150 W)
39450 N 78250 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2344-85

Ash analysis, per cent:

SiO ₂	52.04
Al ₂ O ₃	18.05
Fe ₂ O ₃	3.94
Mn ₃ O ₄	-
TiO ₂	0.68
P ₂ O ₅	0.38
CaO	13.20
MgO	1.71
SO ₃	2.63
Na ₂ O	0.44
K ₂ O	0.18
SrO	0.08
BaO	0.36
Loss on fusion (LOF)	4.76

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1379.2 m

LUSCAR LIMITED

Coal Valley Mine (Mine No. 1778); Mynheer B Seam; Coalspur Coalfield
Edson, Foothills Region, Alberta
S.E. Qtr. Sec. 16, Twp. 47; R19, W5M

Sampling date 2-11-84
Sampling location Mine (sfce) Pit 42 (950 S 1100 W)
39450 N 78250 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2339-85

Rank of coal High-volatile C bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	9.17		
Ash %	16.79	18.49	
Volatile %	27.68	30.47	37.38
Fixed carbon %	46.36	51.04	62.62

Ultimate:			
Carbon %	58.20	64.08	78.62
Hydrogen %	3.72	4.10	5.03
Sulphur (Pyritic) %	(0.11)	(0.12)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.18)	(0.20)	(0.24)
Total %	0.30	0.33	-
Nitrogen %	0.90	0.99	1.21
Ash %	16.79	18.49	-
Oxygen, by difference %	10.91	12.01	14.73

Heating value:			
	MJ/kg	22.71	25.00
	kcal/kg	5424	5971
	Btu/lb	9762	10748
			30.67
			7326
			13186

Hardgrove grindability index 45

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1149	1274
Spherical °C	1293	1332
Hemispherical °C	1396	1385
Fluid °C	1421	1482+

Notes:

LUSCAR LIMITED

Coal Valley Mine (Mine No. 1778); Mynheer B Seam; Coalspur Coalfield
Edson, Foothills Region, Alberta
S.E. Qtr. Sec. 16, Twp. 47; R19, W5M

Sampling date 2-11-84
Sampling location Mine (sfce) Pit 42 (950 S 1100 W)
39450 N 78250 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2339-85

Ash analysis, per cent:

SiO ₂	51.43
Al ₂ O ₃	20.26
Fe ₂ O ₃	3.16
Mn ₃ O ₄	-
TiO ₂	0.73
P ₂ O ₅	0.07
CaO	11.46
MgO	1.16
SO ₃	2.49
Na ₂ O	1.20
K ₂ O	0.36
SrO	0.06
BaO	0.27
Loss on fusion (LOF)	4.97

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1348.7 m

LUSCAR LIMITED
Coal Valley Mine (Mine No. 1778); Coalspur Coalfield
Edson, Foothills Region, Alberta

Sampling date 2-11-84
Sampling location Preparation Plant
Feed Belt

Product name Raw Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 2343-85

Rank of coal High-volatile C bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	10.16		
Ash %	25.74	28.65	
Volatile %	25.69	28.59	40.07
Fixed carbon %	38.42	42.76	59.93

Ultimates:	As Rec'd	Dry	Dry Ash Free
Carbon %	49.94	55.59	77.91
Hydrogen %	3.21	3.57	5.00
Sulphur (Pyritic) %	(0.11)	(0.12)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.09)	(0.10)	(0.14)
Total %	0.20	0.22	-
Nitrogen %	0.95	1.06	1.49
Ash %	25.74	28.65	-
Oxygen, by difference %	9.80	10.91	15.29

Heating value:	MJ/kg	kcal/kg	Btu/lb
	19.32	4615	8307
		21.51	5137
			9246
		30.14	7199
			12959

Hardgrove grindability index 56

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1243	1293
Spherical °C	1313	1360
Hemispherical °C	1410	1418
Fluid °C	1446	1482+

Notes:

LUSCAR LIMITED
 Coal Valley Mine (Mine No. 1778); Coalspur Coalfield
 Edson, Foothills Region, Alberta

Sampling date 2-11-84
 Sampling location Preparation Plant
 Feed Belt

Product name Raw Feed
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2343-85

Ash analysis, per cent:

SiO ₂	60.16
Al ₂ O ₃	20.11
Fe ₂ O ₃	2.94
Mn ₃ O ₄	-
TiO ₂	0.70
P ₂ O ₅	0.18
CaO	7.33
MgO	1.20
SO ₃	1.01
Na ₂ O	0.92
K ₂ O	0.60
SrO	0.06
BaO	0.26
Loss on fusion (LOF)	3.12

Volatile trace element analysis ug/g (ppm)

Hg	0.08
Cl	60
F	211.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

LUSCAR LIMITED
Coal Valley Mine (Mine No. 1778); Coalspur Coalfield
Edson, Foothills Region, Alberta

Sampling date 2-11-84
Sampling location Preparation Plant

Product name Clean Coal
Screen opening ,mm
(Screen opening ,in)

ERL number 2340-85

Rank of coal High-volatile C bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	9.23		
Ash %	10.28	11.32	
Volatile %	30.04	33.09	37.31
Fixed carbon %	50.46	55.59	62.69
 Ultimate:			
Carbon %	63.58	70.05	78.99
Hydrogen %	4.07	4.48	5.05
Sulphur (Pyritic) %	(0.09)	(0.10)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.17)	(0.18)	(0.21)
Total %	0.25	0.28	-
 Nitrogen %	 1.00	 1.10	 1.24
Ash %	10.28	11.32	-
Oxygen, by difference %	11.59	12.77	14.40
 Heating value:			
	MJ/kg	25.22	27.78
	kcal/kg	6023	6636
	Btu/lb	10842	11944

Hardgrove grindability index 44

Free swelling index (FSI) N/A

Moisture (as rec'd)

Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1229	1254
Spherical °C	1282	1327
Hemispherical °C	1393	1366
Fluid °C	1441	1479

Notes:

LUSCAR LIMITED
 Coal Valley Mine (Mine No. 1778); Coalspur Coalfield
 Edson, Foothills Region, Alberta

Sampling date 2-11-84
 Sampling location Preparation Plant

Product name Clean Coal
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2340-85

Ash analysis, per cent:

SiO ₂	58.28
Al ₂ O ₃	18.73
Fe ₂ O ₃	3.92
Mn ₃ O ₄	-
TiO ₂	0.86
P ₂ O ₅	0.37
CaO	6.63
MgO	1.51
SO ₃	3.24
Na ₂ O	1.28
K ₂ O	0.25
SrO	0.11
BaO	0.27
Loss on fusion (LOF)	2.87

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

CARDINAL RIVER COALS LTD.
 Luscar Mine (Mine No. 1768); Jewel Seam; Cadomin-Luscar Coalfield
 Hinton, Mountain Region, Alberta
 Sec. 13, Twp. 47; R24, W5M

Sampling date 5-11-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2345-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.45		
Ash %	15.81	16.04	
Volatile %	20.90	21.21	25.26
Fixed carbon %	61.84	62.75	74.74

Ultimate:			
Carbon %	74.63	75.72	90.19
Hydrogen %	4.09	4.15	4.94
Sulphur (Pyritic) %	(0.04)	(0.04)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.11)	(0.11)	(0.13)
Total %	0.15	0.15	-
Nitrogen %	1.15	1.17	1.39
Ash %	15.81	16.04	-
Oxygen, by difference %	2.73	2.77	3.30

Heating value:			
	MJ/kg	29.72	30.15
	kcal/kg	7098	7202
	Btu/lb	12777	12964
			15441

Hardgrove grindability index 78

Free swelling index (FSI) 4.0

Moisture (as rec'd)
 Inherent % 1.02
 Adherent % 0.43

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1338	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes: Luscar Mine is owned by Luscar Ltd. and operated by Cardinal River Coals Ltd.

CARDINAL RIVER COALS LTD.
 Luscar Mine (Mine No. 1768); Jewel Seam; Cadomin-Luscar Coalfield
 Hinton, Mountain Region, Alberta
 Sec. 13, Twp. 47; R24, W5M

Sampling date 5-11-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2345-85

Ash analysis, per cent:

SiO ₂	53.83
Al ₂ O ₃	27.50
Fe ₂ O ₃	3.22
Mn ₃ O ₄	-
TiO ₂	1.02
P ₂ O ₅	0.27
CaO	4.14
MgO	1.11
SO ₃	1.93
Na ₂ O	1.36
K ₂ O	0.54
SrO	0.15
BaO	0.43
Loss on fusion (LOF)	2.30

Volatile trace element analysis ug/g (ppm)

Hg	0.08
Cl	90
F	78.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1524 m

CARDINAL RIVER COALS LTD.
Luscar Mine (Mine No. 1768); Jewel Seam; Cadomin-Luscar Coalfield
Hinton, Mountain Region, Alberta

Sampling date	5-11-84
Sampling location	Preparation Plant Stockpile

Product name	Raw Coal (oxidized)
Screen opening ,mm (Screen opening ,in)	

ERL number	2347-85
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Rank of coal	Medium-volatile bituminous
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Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	%	4.37	
Ash	%	18.03	18.86
Volatile	%	18.95	19.82
Fixed carbon	%	58.64	61.32
			24.43
			75.57

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon	%	69.83	73.02
Hydrogen	%	3.81	3.98
Sulphur (Pyritic)	%	(0.13)	(0.13)
(Sulphate)	%	(0.01)	(0.01)
(Organic)	%	(0.22)	(0.23)
Total	%	0.36	0.38
			(0.29)
Nitrogen	%	1.26	1.32
Ash	%	18.03	18.86
Oxygen, by difference	%	2.33	2.44
			3.01

Heating value:	MJ/kg	kcal/kg	Btu/lb
	27.88	6659	11986
	29.15	6963	12534
	35.93	8582	15447

Hardgrove grindability index	92
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Free swelling index (FSI)	3.0
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Moisture (as rec'd)	%
Inherent	1.01
Adherent	3.36

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C	1246
Spherical	°C	1360
Hemispherical	°C	1460
Fluid	°C	1482+
		1310
		1441
		1479
		1482+

Notes: Luscar Mine is owned by Luscar Ltd. and operated by Cardinal River Coals Ltd.

CARDINAL RIVER COALS LTD.

Luscar Mine (Mine No. 1768); Jewel Seam; Cadomin-Luscar Coalfield
Hinton, Mountain Region, Alberta

Sampling date 5-11-84
Sampling location Preparation Plant
Stockpile

Product name Raw Coal (oxidized)
Screen opening ,mm
(Screen opening ,in)

ERL number 2347-85

Ash analysis, per cent:

SiO ₂	58.51
Al ₂ O ₃	21.46
Fe ₂ O ₃	4.17
Mn ₃ O ₄	-
TiO ₂	1.02
P ₂ O ₅	0.38
CaO	4.10
MgO	0.95
SO ₃	2.67
Na ₂ O	1.39
K ₂ O	0.64
SrO	0.08
BaO	0.47
Loss on fusion (LOF)	1.87

Volatile trace element analysis ug/g (ppm)

Hg	0.28
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

CARDINAL RIVER COALS LTD.

Luscar Mine (Mine No. 1768); Jewel Seam; Cadomin-Luscar Coalfield
Hinton, Mountain Region, Alberta

Sampling date 5-11-84
Sampling location Preparation Plant
Feed Belt

Product name Raw Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 2348-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	% 1.25		
Ash	% 18.22	18.45	
Volatile	% 21.40	21.67	26.57
Fixed carbon	% 59.13	59.88	73.43

Ultimate:			
Carbon	% 71.67	72.57	88.99
Hydrogen	% 3.93	3.98	4.88
Sulphur (Pyritic)	% (0.06)	(0.06)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.10)	(0.10)	(0.12)
Total	% 0.16	0.16	-
Nitrogen	% 1.21	1.23	1.51
Ash	% 18.22	18.45	-
Oxygen, by difference	% 3.56	3.61	4.43

Heating value:			
	MJ/kg	28.51	28.87
	kcal/kg	6809	6895
	Btu/lb	12256	12411
			35.40
			8455
			15219

Hardgrove grindability index 80

Free swelling index (FSI) 4.5

Moisture (as rec'd)
Inherent

Adherent

Inherent

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C 1277	1304
Spherical	°C 1313	1354
Hemispherical	°C 1332	1382
Fluid	°C 1410	1482+

Notes: Luscar Mine is owned by Luscar Ltd. and operated by Cardinal
River Coals Ltd.

CARDINAL RIVER COALS LTD.
Luscar Mine (Mine No. 1768); Jewel Seam; Cadomin-Luscar Coalfield
Hinton, Mountain Region, Alberta

Sampling date 5-11-84
Sampling location Preparation Plant
Feed Belt

Product name Raw Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 2348-85

Ash analysis, per cent:

SiO ₂	52.80
Al ₂ O ₃	24.51
Fe ₂ O ₃	3.84
Mn ₃ O ₄	-
TiO ₂	0.96
P ₂ O ₅	0.33
CaO	8.20
MgO	1.89
SO ₃	1.87
Na ₂ O	1.05
K ₂ O	0.79
SrO	0.20
BaO	0.45
Loss on fusion (LOF)	1.32

Volatile trace element analysis ug/g (ppm)

Hg	0.12
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

CARDINAL RIVER COALS LTD.
Luscar Mine (Mine No. 1768); Jewel Seam; Cadomin-Luscar Coalfield
Hinton, Mountain Region, Alberta

Sampling date 5-11-84
Sampling location Preparation Plant
Sampled from stockpile

Product name Clean Coal
Screen opening ,mm
(Screen opening ,in)

ERL number 2346-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	%	7.22	
Ash	%	9.07	9.78
Volatile	%	20.48	22.07
Fixed carbon	%	63.23	68.15
			75.54

Ultimate:	%	As Rec'd	Dry	Dry Ash Free
Carbon	%	75.79	81.69	90.55
Hydrogen	%	4.06	4.38	4.85
Sulphur (Pyritic)	%	(0.03)	(0.03)	-
(Sulphate)	%	(0.00)	(0.00)	-
(Organic)	%	(0.16)	(0.17)	(0.19)
Total	%	0.19	0.20	-
Nitrogen	%	1.29	1.39	1.54
Ash	%	9.07	9.78	-
Oxygen, by difference	%	2.38	2.56	2.84

Heating value:	MJ/kg	30.29	32.65	36.19
	kcal/kg	7235	7798	8643
	Btu/lb	13022	14036	15558

Hardgrove grindability index 80

Free swelling index (FSI) 6.5

Moisture (as rec'd)

Inherent	%	0.87
Adherent	%	6.35

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C	1207
Spherical	°C	1316
Hemispherical	°C	1379
Fluid	°C	1421
		1313
		1360
		1379
		1482+

Notes: Luscar Mine is owned by Luscar Ltd. and operated by Cardinal River Coals Ltd.

CARDINAL RIVER COALS LTD.
Luscar Mine (Mine No. 1768); Jewel Seam; Cadomin-Luscar Coalfield
Hinton, Mountain Region, Alberta

Sampling date 5-11-84
Sampling location Preparation Plant
Sampled from stockpile

Product name Clean Coal
Screen opening ,mm
(Screen opening ,in)

ERL number 2346-85

Ash analysis, per cent:

SiO ₂	48.48
Al ₂ O ₃	24.77
Fe ₂ O ₃	4.13
Mn ₃ O ₄	-
TiO ₂	1.20
P ₂ O ₅	0.67
CaO	7.68
MgO	1.76
SO ₃	3.39
Na ₂ O	1.47
K ₂ O	0.31
SrO	0.23
BaO	0.46
Loss on fusion (LOF)	3.20

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

GREGG RIVER RESOURCES LTD.
 Gregg River Mine ;Jewel Seam; Cadomin-Luscar Coalfield
 Hinton, Mountain Region, Alberta
 LSD. 10, Sec. 28, Twp. 47; R24, W5

Sampling date 4-12-84
 Sampling location Mine (surface)
 CD 1 Pit

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2349-85

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.20		
Ash %	15.04	15.22	
Volatile %	19.17	19.40	22.88
Fixed carbon %	64.60	65.38	77.12

Ultimate:

Carbon %	75.58	76.50	90.23
Hydrogen %	4.00	4.05	4.78
Sulphur (Pyritic) %	(0.08)	(0.08)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.23)	(0.23)	(0.27)
Total %	0.31	0.31	-
Nitrogen %	1.31	1.33	1.57
Ash %	15.04	15.22	-
Oxygen, by difference %	2.56	2.59	3.05

Heating value:

MJ/kg	30.22	30.59	36.08
kcal/kg	7218	7306	8617
Btu/lb	12993	13150	15511

Hardgrove grindability index 91

Free swelling index (FSI) 3.5

Moisture (as rec'd)

Inherent %	0.80
Adherent %	0.40

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1152	1446
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes: Gregg River Mine is owned by Manalta Coal Ltd. and operated by Gregg River Resources Ltd.

GREGG RIVER RESOURCES LTD.
 Gregg River Mine ;Jewel Seam; Cadomin-Luscar Coalfield
 Hinton, Mountain Region, Alberta
 LSD. 10, Sec. 28, Twp. 47; R24, W5

Sampling date 4-12-84
 Sampling location Mine (surface)
 CD 1 Pit

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2349-85

Ash analysis, per cent:

SiO ₂	60.29
Al ₂ O ₃	24.77
Fe ₂ O ₃	4.23
Mn ₃ O ₄	-
TiO ₂	1.12
P ₂ O ₅	0.33
CaO	2.47
MgO	0.76
SO ₃	0.91
Na ₂ O	1.29
K ₂ O	0.80
SrO	0.07
BaO	0.48
Loss on fusion (LOF)	0.38

Volatile trace element analysis ug/g (ppm)

Hg	0.09
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1635 m

GREGG RIVER RESOURCES LTD.
 Gregg River Mine ;Jewel Seam; Cadomin-Luscar Coalfield
 Hinton, Mountain Region, Alberta
 LSD. 6, Sec. 21, Twp. 47; R24, W5

Sampling date 4-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2350-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.08		
Ash %	10.42	10.64	
Volatile %	23.21	23.70	26.52
Fixed carbon %	64.29	65.66	73.48

Ultimate:			
Carbon %	78.32	79.98	89.50
Hydrogen %	4.37	4.46	4.99
Sulphur (Pyritic) %	(0.03)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.16)	(0.16)	(0.18)
Total %	0.19	0.19	-
Nitrogen %	1.31	1.34	1.50
Ash %	10.42	10.64	-
Oxygen, by difference %	3.32	3.39	3.79

Heating value:			
	MJ/kg	31.51	32.18
	kcal/kg	7527	7687
	Btu/lb	13548	13836
			36.01
			8602
			15483

Hardgrove grindability index 89

Free swelling index (FSI) 7.5

Moisture (as rec'd)
 Inherent % 0.92
 Adherent % 1.16

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1146	1271
Spherical °C		1246	1316
Hemispherical °C		1271	1338
Fluid °C		1374	1460

Notes: Gregg River Mine is owned by Manalta Coal Ltd. and operated by Gregg River Resources Ltd.

GREGG RIVER RESOURCES LTD.
 Gregg River Mine ;Jewel Seam; Cadomin-Luscar Coalfield
 Hinton, Mountain Region, Alberta
 LSD. 6, Sec. 21, Twp. 47; R24, W5

Sampling date 4-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2350-85

Ash analysis, per cent:

SiO ₂	50.27
Al ₂ O ₃	20.20
Fe ₂ O ₃	4.96
Mn ₃ O ₄	-
TiO ₂	1.41
P ₂ O ₅	1.42
CaO	10.50
MgO	1.97
SO ₃	3.63
Na ₂ O	1.38
K ₂ O	0.17
SrO	0.18
BaO	0.71
Loss on fusion (LOF)	1.99

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1650 m

GREGG RIVER RESOURCES LTD.
 Gregg River Mine ;Jewel Seam; Cadomin-Luscar Coalfield
 Hinton, Mountain Region, Alberta

Sampling date 4-12-85
 Sampling location Preparation Plant
 Sampled From Stockpile

Product name Clean Coal
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2351-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture..... %	5.90		
Ash..... %	9.36	9.95	
Volatile..... %	19.89	21.14	23.48
Fixed carbon..... %	64.84	68.91	76.52

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon..... %	76.75	81.56	90.57
Hydrogen..... %	4.13	4.39	4.88
Sulphur (Pyritic)..... %	(0.06)	(0.06)	-
(Sulphate)..... %	(0.00)	(0.00)	-
(Organic)..... %	(0.23)	(0.24)	(0.27)
Total..... %	0.29	0.31	-
Nitrogen..... %	1.31	1.39	1.54
Ash..... %	9.36	9.95	-
Oxygen, by difference..... %	2.26	2.40	2.67

Heating values:	MJ/kg	30.78	32.71	36.33
	kcal/kg	7352	7813	8677
	Btu/lb	13234	14064	15618

Hardgrove grindability index 85

Free swelling index (FSI) 5.0

Moisture (as rec'd)
 Inherent..... % 0.94
 Adherent..... % 4.96

Ash Fusibility temperature	Reducing	Oxidizing
Initial..... °C	1310	1404
Spherical..... °C	1460	1482+
Hemispherical..... °C	1482+	1482+
Fluid..... °C	1482+	1482+

Notes: Gregg River Mine is owned by Manalta Coal Ltd. and operated by Gregg River Resources Ltd.

GREGG RIVER RESOURCES LTD.
 Gregg River Mine ;Jewel Seam; Cadomin-Luscar Coalfield
 Hinton, Mountain Region, Alberta

Sampling date 4-12-85
 Sampling location Preparation Plant
 Sampled From Stockpile

Product name Clean Coal
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2351-85

Ash analysis, per cent:

SiO ₂	54.71
Al ₂ O ₃	25.32
Fe ₂ O ₃	4.55
Mn ₃ O ₄	-
TiO ₂	1.31
P ₂ O ₅	0.57
CaO	4.34
MgO	1.14
SO ₃	2.75
Na ₂ O	1.30
K ₂ O	0.43
SrO	0.13
BaO	0.70
Loss on fusion (LOF)	1.19

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	100
F	84.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

SMOKY RIVER COAL LTD.

No. 9 Mine (Mine No. 1774); No. 4 Seam; Smoky River Coalfield
Grand Cache, Mountain Region, Alberta

Sampling date 5-11-84
Sampling location Mine (Surface)
44181.4 N 93912 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2335-85

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.29		
Ash %	19.83	20.09	
Volatile %	16.27	16.48	20.62
Fixed carbon %	62.61	63.43	79.38

Ultimate:			
Carbon %	71.76	72.70	90.98
Hydrogen %	3.69	3.74	4.68
Sulphur (Pyritic) %	(0.30)	(0.30)	-
(Sulphate) %	(0.02)	(0.02)	-
(Organic) %	(0.25)	(0.25)	(0.32)
Total %	0.57	0.58	-
Nitrogen %	1.32	1.34	1.68
Ash %	19.83	20.09	-
Oxygen, by difference %	1.53	1.55	1.94

Heating value:			
	MJ/kg	28.45	28.82
	kcal/kg	6795	6884
	Btu/lb	12232	12391
			36.07
			8615
			15506

Hardgrove grindability index 111

Free swelling index (FSI) 3.0

Moisture (as rec'd)
Inherent % 0.89
Adherent % 0.40

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1291	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes: Smoky River Coal Ltd. is a subsidiary of McIntyre Mines Ltd.

SMOKY RIVER COAL LTD.
 No. 9 Mine (Mine No. 1774); No. 4 Seam; Smoky River Coalfield
 Grand Cache, Mountain Region, Alberta

Sampling date 5-11-84
 Sampling location Mine (Surface)
 44181.4 N 93912 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2335-85

Ash analysis, per cent:

SiO ₂	57.22
Al ₂ O ₃	24.89
Fe ₂ O ₃	4.58
Mn ₃ O ₄	-
TiO ₂	1.08
P ₂ O ₅	0.37
CaO	2.42
MgO	0.76
SO ₃	2.09
Na ₂ O	0.76
K ₂ O	1.87
SrO	0.09
BaO	0.31
Loss on fusion (LOF)	1.63

Volatile trace element analysis ug/g (ppm)

Hg	0.16
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1413 m

SMOKY RIVER COAL LTD.

No. 9 Mine (Mine No., 1774); No. 4 Seam; Smoky River Coalfield
Grand Cache, Mountain Region, Alberta

Sampling date 1-11-84
Sampling location Upper E Mine (Surface)
51950 N 100950 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2334-85

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	% 1.62		
Ash	% 24.55	24.96	
Volatile	% 15.19	15.44	20.58
Fixed carbon	% 58.63	59.60	79.42

Ultimate:			
Carbon	% 67.06	68.17	90.84
Hydrogen	% 3.51	3.57	4.76
Sulphur (Pyritic)	% (0.28)	(0.28)	-
(Sulphate)	% (0.02)	(0.02)	-
(Organic)	% (0.26)	(0.26)	(0.35)
Total	% 0.56	0.57	-
Nitrogen	% 1.22	1.24	1.65
Ash	% 24.55	24.96	-
Oxygen, by difference	% 1.47	1.49	1.99

Heating value:			
	MJ/kg	26.48	26.92
	kcal/kg	6325	6429
	Btu/lb	11384	11572
			35.87
			8567
			15421

Hardgrove grindability index 93

Free swelling index (FSI) 2.5

Moisture (as rec'd)	
Inherent	% 0.98
Adherent	% 0.64

Ash Fusibility temperature		Reducing	Oxidizing
Initial	°C	1366	1482+
Spherical	°C	1482+	1482+
Hemispherical	°C	1482+	1482+
Fluid	°C	1482+	1482+

Notes: Smoky River Coal Ltd. is a subsidiary of McIntyre Mines Ltd.

SMOKY RIVER COAL LTD.
 No. 9 Mine (Mine No. 1774); No. 4 Seam; Smoky River Coalfield
 Grand Cache, Mountain Region, Alberta

Sampling date 1-11-84
 Sampling location Upper E Mine (Surface)
 51950 N 100950 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2334-85

Ash analysis, per cent:

SiO ₂	63.00
Al ₂ O ₃	25.18
Fe ₂ O ₃	2.37
Mn ₃ O ₄	-
TiO ₂	1.02
P ₂ O ₅	0.28
CaO	1.16
MgO	0.64
SO ₃	0.53
Na ₂ O	0.65
K ₂ O	2.30
SrO	0.07
BaO	0.31
Loss on fusion (LOF)	1.18

Volatile trace element analysis ug/g (ppm)

Hg	0.15
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1376.2 m

SMOKY RIVER COAL LTD.

No. 9 Mine (Mine No. 1774); No. 10 Seam; Smoky River Coalfield;
Grand Cache, Mountain Region, Alberta

Sampling date 5-11-84
Sampling location Mine W Extension (Surface)
52125.8 N 99639.2 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2336-85

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	% 0.84		
Ash	% 20.52	20.69	
Volatile	% 17.89	18.04	22.75
Fixed carbon	% 60.76	61.27	77.25

Ultimate:			
Carbon	% 70.98	71.58	90.25
Hydrogen	% 3.77	3.80	4.79
Sulphur (Pyritic)	% (0.07)	(0.07)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.25)	(0.25)	(0.32)
Total	% 0.32	0.32	-
Nitrogen	% 1.16	1.17	1.48
Ash	% 20.52	20.69	-
Oxygen, by difference	% 2.42	2.44	3.08

Heating value:			
	MJ/kg	28.10	28.34
	kcal/kg	6712	6769
	Btu/lb	12082	12184
			35.73
			8535
			15363

Hardgrove grindability index 88

Free swelling index (FSI) 4.5

Moisture (as rec'd)
Inherent

Inherent	% 0.84
Adherent	%

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C 1482+	1482+
Spherical	°C 1482+	1482+
Hemispherical	°C 1482+	1482+
Fluid	°C 1482+	1482+

Notes: Smoky River Coal Ltd. is a subsidiary of McIntyre Mines Ltd.

SMOKY RIVER COAL LTD.
 No. 9 Mine (Mine No. 1774); No. 10 Seam; Smoky River Coalfield
 Grand Cache, Mountain Region, Alberta

Sampling date 5-11-84
 Sampling location Mine W Extension (Surface)
 52125.8 N 99639.2 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2336-85

Ash analysis, per cent:

SiO ₂	56.87
Al ₂ O ₃	26.94
Fe ₂ O ₃	5.56
Mn ₃ O ₄	-
TiO ₂	1.42
P ₂ O ₅	0.45
CaO	1.94
MgO	0.69
SO ₃	1.07
Na ₂ O	0.77
K ₂ O	0.51
SrO	0.07
BaO	0.21
Loss on fusion (LOF)	1.22

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1418.5 m

SMOKY RIVER COAL LTD.

Mine No. 1765/09/B; No. 4 Seam (SW Section); Smoky River Coalfield
Grand Cache, Mountain Region, Alberta

Sampling date 1-11-84
Sampling location Mine (u/g)
50290 N 89600 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2333-85

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.21		
Ash %	7.85	7.95	
Volatile %	17.00	17.21	18.70
Fixed carbon %	73.94	74.84	81.30

Ultimate:			
Carbon %	83.48	84.50	91.80
Hydrogen %	4.20	4.25	4.62
Sulphur (Pyritic) %	(0.03)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.28)	(0.28)	(0.31)
Total %	0.31	0.31	-
Nitrogen %	1.34	1.36	1.48
Ash %	7.85	7.95	-
Oxygen, by difference %	1.61	1.63	1.77

Heating value:			
	MJ/kg	33.10	33.51
	kcal/kg	7906	8003
	Btu/lb	14231	14405
			36.40
			8694
			15649

Hardgrove grindability index 106

Free swelling index (FSI) 4.0

Moisture (as rec'd)
Inherent % 0.85
Adherent % 0.36

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1385	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes: Smoky River Coal Ltd. is a subsidiary of McIntyre Mines Ltd.

SMOKY RIVER COAL LTD.

Mine No. 1765/09/B; No. 4 Seam (SW Section); Smoky River Coalfield
Grand Cache, Mountain Region, Alberta

 Sampling date 1-11-84
 Sampling location Mine (u/g)
 50290 N 89600 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2333-85

Ash analysis, per cent:

SiO ₂	52.02
Al ₂ O ₃	29.35
Fe ₂ O ₃	1.98
Mn ₃ O ₄	-
TiO ₂	1.37
P ₂ O ₅	0.87
CaO	5.28
MgO	-
SO ₃	3.18
Na ₂ O	1.32
K ₂ O	0.33
SrO	0.17
BaO	0.58
Loss on fusion (LOF)	2.05

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

 Notes:

SMOKY RIVER COAL LTD.

Underground & Surface Mines; Various Seams; Smoky River Coalfield
Grand Cache, Mountain Region, Alberta

Sampling date 5-11-84
Sampling location Preparation Plant

Product name Raw Coal
Screen opening ,mm
(Screen opening ,in)

ERL number 2337-85

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.15		
Ash %	19.41	19.84	
Volatile %	16.26	16.62	20.73
Fixed carbon %	62.17	63.54	79.27

Ultimate:			
Carbon %	71.61	73.18	91.29
Hydrogen %	3.68	3.76	4.69
Sulphur (Pyritic) %	(0.20)	(0.20)	-
(Sulphate) %	(0.02)	(0.02)	-
(Organic) %	(0.24)	(0.24)	(0.30)
Total %	0.45	0.46	-
Nitrogen %	1.22	1.25	1.56
Ash %	19.41	19.84	-
Oxygen, by difference %	1.48	1.51	1.88

Heating value:			
	MJ/kg	28.13	28.75
	kcal/kg	6719	6867
	Btu/lb	12094	12360
			35.86
			8566
			15419

Hardgrove grindability index 96

Free swelling index (FSI) 2.5

Moisture (as rec'd)
Inherent % 0.87
Adherent % 1.28

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1224	1277
Spherical °C	1307	1388
Hemispherical °C	1429	1463
Fluid °C	1482+	1482+

Notes: Smoky River Coal Ltd. is a subsidiary of McIntyre Mines Ltd.

SMOKY RIVER COAL LTD.
Underground & Surface Mines; Various Seams; Smoky River Coalfield
Grand Cache, Mountain Region, Alberta

Sampling date 5-11-84
Sampling location Preparation Plant

Product name Raw Coal
Screen opening ,mm
(Screen opening ,in)

ERL number 2337-85

Ash analysis, per cent:

SiO ₂	56.67
Al ₂ O ₃	22.54
Fe ₂ O ₃	3.19
Mn ₃ O ₄	-
TiO ₂	1.12
P ₂ O ₅	0.45
CaO	5.42
MgO	1.63
SO ₃	3.66
Na ₂ O	0.70
K ₂ O	2.02
SrO	0.10
BaO	0.07
Loss on fusion (LOF)	1.90

Volatile trace element analysis ug/g (ppm)

Hg	0.19
Cl	150
F	109.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

SMOKY RIVER COAL LTD.

Underground & Surface Mines; Various Seams; Smoky River Coalfield
Grand Cache, Mountain Region, Alberta

Sampling date 5-11-84
Sampling location Preparation Plant

Product name Clean Coal
Screen opening ,mm
(Screen opening ,in)

ERL number 2338-85

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	3.03		
Ash %	6.90	7.12	
Volatile %	16.93	17.46	18.80
Fixed carbon %	73.13	75.42	81.20

Ultimate:			
Carbon %	82.40	84.98	91.49
Hydrogen %	4.15	4.28	4.61
Sulphur (Pyritic) %	(0.10)	(0.10)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.34)	(0.35)	(0.38)
Total %	0.44	0.45	-
Nitrogen %	1.40	1.44	1.55
Ash %	6.90	7.12	-
Oxygen, by difference %	1.68	1.73	1.86

Heating value:	MJ/kg		
	32.80	33.83	36.42
	kcal/kg 7835	8080	8699
	Btu/lb 14103	14544	15659

Hardgrove grindability index 94

Free swelling index (FSI) 4.5

Moisture (as rec'd)
Inherent % 0.71
Adherent % 2.32

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1327	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes: Smoky River Coal Ltd. is a subsidiary of McIntyre Mines Ltd.

SMOKY RIVER COAL LTD.
Underground & Surface Mines; Various Seams; Smoky River Coalfield
Grand Cache, Mountain Region, Alberta

Sampling date 5-11-84
Sampling location Preparation Plant

Product name Clean Coal
Screen opening ,mm
(Screen opening ,in)

ERL number 2338-85

Ash analysis, per cent:

SiO ₂	53.31
Al ₂ O ₃	28.08
Fe ₂ O ₃	3.10
Mn ₃ O ₄	-
TiO ₂	1.58
P ₂ O ₅	1.15
CaO	3.99
MgO	0.49
SO ₃	2.19
Na ₂ O	1.32
K ₂ O	0.58
SrO	0.27
BaO	0.57
Loss on fusion (LOF)	2.72

Volatile trace element analysis ug/g (ppm)

Hg	0.17
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

OBED MOUNTAIN COAL CO.
 Obed-Marsh Project; No. 1 Seam; Obed Marsh Coalfield
 Hinton, Foothills Region, Alberta
 LSD. 18, Sec. 27, Twp. 53; R24, W5M

Sampling date 5-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2352-85

Rank of coal Subbituminous A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	13.61		
Ash %	17.48	20.23	
Volatile %	33.63	38.93	48.80
Fixed carbon %	35.28	40.84	51.20

Ultimate:			
Carbon %	52.69	60.99	76.46
Hydrogen %	3.65	4.23	5.30
Sulphur (Pyritic) %	(0.11)	(0.13)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.18)	(0.20)	(0.26)
Total %	0.29	0.33	-
Nitrogen %	1.24	1.43	1.79
Ash %	17.48	20.23	-
Oxygen, by difference %	11.05	12.79	16.03

Heating value:			
	MJ/kg	20.87	24.16
	kcal/kg	4985	5770
	Btu/lb	8972	10386
			13020

Hardgrove grindability index 44

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1268	1277
Spherical °C		1318	1416
Hemispherical °C		1463	1441
Fluid °C		1482+	1482+

Notes: Obed Mountain Coal Co. is owned by Union Oil Co. of Canada Ltd.

OBED MOUNTAIN COAL CO.
 Obed-Marsh Project; No. 1 Seam; Obed Marsh Coalfield
 Hinton, Foothills Region, Alberta
 LSD. 18, Sec. 27, Twp. 53; R24, W5M

Sampling date 5-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2352-85

Ash analysis, per cent:

SiO ₂	66.02
Al ₂ O ₃	16.24
Fe ₂ O ₃	2.40
Mn ₃ O ₄	—
TiO ₂	0.46
P ₂ O ₅	0.06
CaO	5.36
MgO	1.53
SO ₃	1.70
Na ₂ O	0.31
K ₂ O	0.35
SrO	0.11
BaO	0.40
Loss on fusion (LOF)	2.71

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	—
F	—
Br	—
As	—
Se	—

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

OBED MOUNTAIN COAL CO.
 Obed-Marsh Project; No. 2 Seam; Obed Marsh Coalfield
 Hinton, Foothills Region, Alberta
 LSD. 18, Sec. 27, Twp. 53; R24, W5M

Sampling date 5-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2353-85

Rank of coal Subbituminous A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	12.66		
Ash %	16.94	19.40	
Volatile %	36.48	41.77	51.82
Fixed carbon %	33.91	38.83	48.18

Ultimate:			
Carbon %	53.55	61.31	76.07
Hydrogen %	3.84	4.40	5.46
Sulphur (Pyritic) %	(0.30)	(0.35)	-
(Sulphate) %	(0.08)	(0.09)	-
(Organic) %	(0.41)	(0.47)	(0.59)
Total %	0.79	0.91	-
Nitrogen %	1.29	1.48	1.84
Ash %	16.94	19.40	-
Oxygen, by difference %	10.92	12.50	15.51

Heating value:			
	MJ/kg	21.43	24.54
	kcal/kg	5120	5862
	Btu/lb	9215	10551
			30.45
			7273
			13091

Hardgrove grindability index 42

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1218	1263
Spherical °C	1271	1349
Hemispherical °C	1421	1441
Fluid °C	1482+	1482+

Notes: Obed Mountain Coal Co. is owned by Union Oil Co. of Canada Ltd.

OBED MOUNTAIN COAL CO.
 Obed-Marsh Project; No. 2 Seam; Obed Marsh Coalfield
 Hinton, Foothills Region, Alberta
 LSD. 18, Sec. 27, Twp. 53; R24, W5M

Sampling date 5-12-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2353-85

Ash analysis, per cent:

SiO ₂	59.15
Al ₂ O ₃	17.55
Fe ₂ O ₃	4.90
Mn ₃ O ₄	-
TiO ₂	0.88
P ₂ O ₅	0.33
CaO	6.00
MgO	1.75
SO ₃	3.56
Na ₂ O	0.25
K ₂ O	0.36
SrO	0.11
BaO	0.56
Loss on fusion (LOF)	2.77

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

OBED MOUNTAIN COAL CO.
 Obed-Marsh Project; No. 1 & 2 Seams; Obed Marsh Coalfield
 Hinton, Foothills Region, Alberta

Sampling date 5-12-84
 Sampling location Preparation Plant
 Sampled from stockpile

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2355-85

Rank of coal Subbituminous A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	14.70		
Ash %	15.71	18.42	
Volatile %	36.93	43.30	53.08
Fixed carbon %	32.65	38.28	46.92

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	52.89	62.00	76.00
Hydrogen %	3.69	4.33	5.31
Sulphur (Pyritic) %	(0.11)	(0.13)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.17)	(0.20)	(0.24)
Total %	0.28	0.33	-
Nitrogen %	1.31	1.53	1.88
Ash %	15.71	18.42	-
Oxygen, by difference %	11.42	13.39	16.41

Heating value:	MJ/kg	21.00	24.62	30.18
	kcal/kg	5016	5880	7208
	Btu/lb	9028	10584	12974

Hardgrove grindability index 42

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1257	1279
Spherical °C	1307	1343
Hemispherical °C	1341	1449
Fluid °C	1482+	1482+

Notes: Obed Mountain Coal Co. is owned by Union Oil Co. of Canada Ltd.

OBED MOUNTAIN COAL CO.
 Obed-Marsh Project; No. 1 & 2 Seams; Obed Marsh Coalfield
 Hinton, Foothills Region, Alberta

Sampling date 5-12-84
 Sampling location Preparation Plant
 Sampled from stockpile

Product name Mine run
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2355-85

Ash analysis, per cent:

SiO ₂	63.12
Al ₂ O ₃	18.49
Fe ₂ O ₃	2.46
Mn ₃ O ₄	-
TiO ₂	0.63
P ₂ O ₅	0.06
CaO	6.22
MgO	1.65
SO ₃	2.48
Na ₂ O	0.27
K ₂ O	0.41
SrO	0.08
BaO	0.48
Loss on fusion (LOF)	2.26

Volatile trace element analysis ug/g (ppm)

Hg	0.10
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

OBED MOUNTAIN COAL CO.
Obed-Marsh Project; No. 1 & 2 Seams; Obed Marsh Coalfield
Hinton, Foothills Region, Alberta

Sampling date	5-12-84		
Sampling location	Preparation Plant		
Product name	Clean Coal		
Screen opening ,mm (Screen opening ,in)			
ERL number	2354-85		
Rank of coal	Subbituminous A		
Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture	% 12.28		
Ash	% 10.85	12.37	
Volatile	% 37.75	43.03	49.10
Fixed carbon	% 39.12	44.60	50.90
Ultimate:			
Carbon	% 59.20	67.49	77.02
Hydrogen	% 4.14	4.72	5.39
Sulphur (Pyritic)	% (0.10)	(0.11)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.26)	(0.29)	(0.33)
Total	% 0.36	0.41	-
Nitrogen	% 1.45	1.65	1.88
Ash	% 10.85	12.37	-
Oxygen, by difference	% 11.72	13.36	15.25
Heating value:			
	MJ/kg 23.58	26.88	30.68
	kcal/kg 5633	6421	7328
	Btu/lb 10139	11558	13190
Hardgrove grindability index	41		
Free swelling index (FSI)	N/A		
Moisture (as rec'd)			
Inherent	%		
Adherent	%		
Ash Fusibility temperature	Reducing	Oxidizing	
Initial	°C 1277	1293	
Spherical	°C 1313	1360	
Hemispherical	°C 1396	1471	
Fluid	°C 1474	1482+	

Notes: Obed Mountain Coal Co. is owned by Union Oil Co. of Canada Ltd.

OBED MOUNTAIN COAL CO.
 Obed-Marsh Project; No. 1 & 2 Seams; Obed Marsh Coalfield
 Hinton, Foothills Region, Alberta

Sampling date 5-12-84
 Sampling location Preparation Plant

Product name Clean Coal
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2354-85

Ash analysis, per cent:

SiO ₂	60.51
Al ₂ O ₃	18.31
Fe ₂ O ₃	2.75
Mn ₃ O ₄	-
TiO ₂	0.74
P ₂ O ₅	0.16
CaO	6.73
MgO	0.90
SO ₃	3.72
Na ₂ O	0.29
K ₂ O	0.44
SrO	0.16
BaO	0.69
Loss on fusion (LOF)	2.25

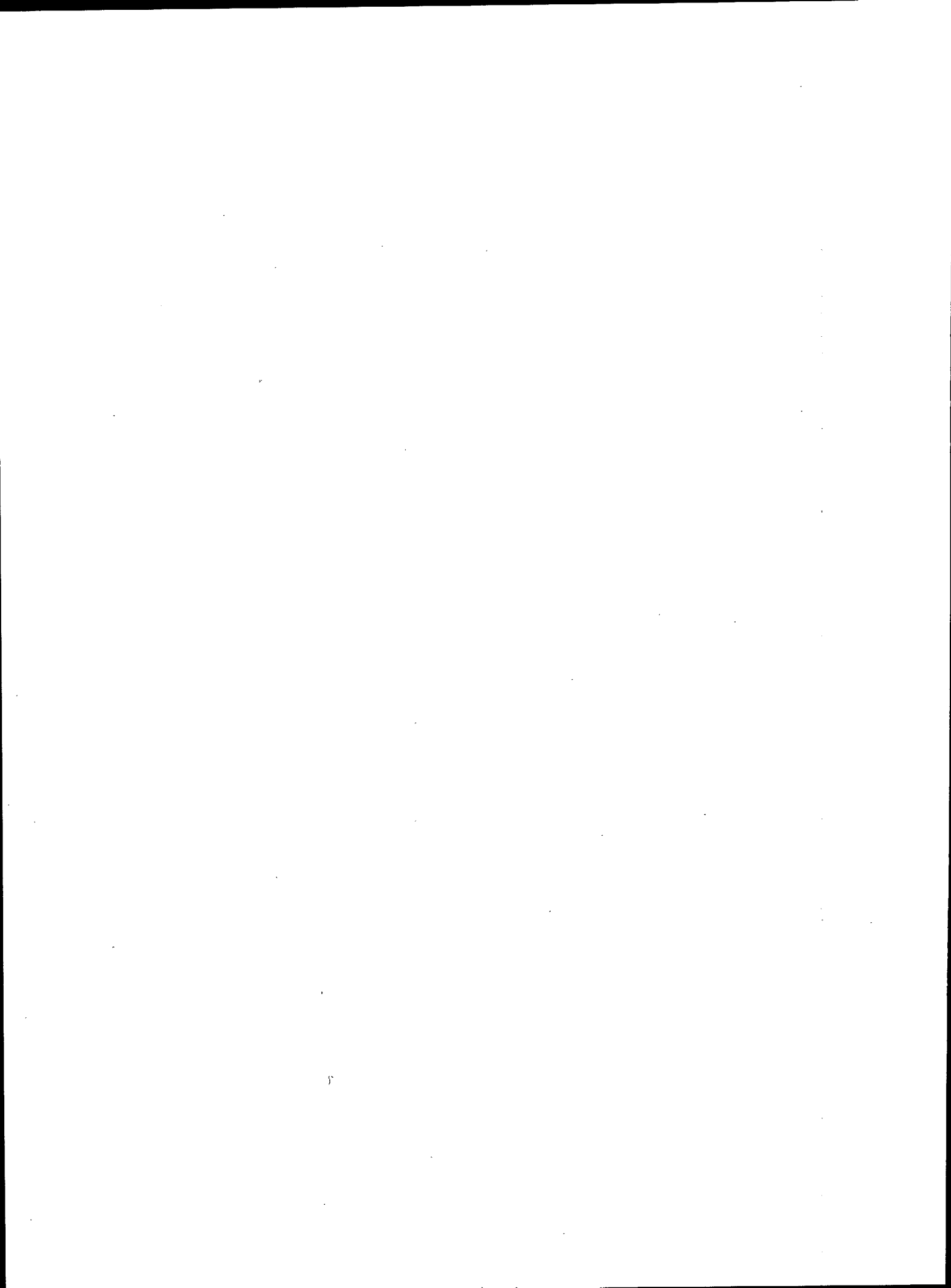
Volatile trace element analysis ug/g (ppm)

Hg	0.03
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:



COAL ANALYSES – BRITISH COLUMBIA

BYRON CREEK COLLIERIES LIMITED
Coal Mountain Mine; No. 1 Seam (Top Section); Crownsnest Coalfield
Sparwood, British Columbia

Sampling date 17-08-84
Sampling location Mine (surface)
3517 N 5730 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3937-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.12		
Ash %	22.28	22.76	
Volatile %	22.04	22.52	29.16
Fixed carbon %	53.56	54.72	70.84

Ultimate:			
Carbon %	64.17	65.56	84.88
Hydrogen %	3.61	3.69	4.78
Sulphur (Pyritic) %	(0.03)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.15)	(0.15)	(0.20)
Total %	0.18	0.18	-
Nitrogen %	1.10	1.12	1.45
Ash %	22.28	22.76	-
Oxygen, by difference %	6.55	6.69	8.66

Heating value:			
	MJ/kg	25.59	26.15
	kcal/kg	6113	6246
	Btu/lb	11004	11242
			14555

Hardgrove grindability index 94

Free swelling index (FSI) 1.0

Moisture (as rec'd)
Inherent % 0.96
Adherent % 1.16

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1482+	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes: 1 Byron Creek Coll. is a subsidiary of Esso Minerals Can. Ltd.
2 Coal Mountain Mine was formerly named Corbin Mine

BYRON CREEK COLLIERIES LIMITED
 Coal Mountain Mine; No. 1 Seam (Top Section); Crowsnest Coalfield
 Sparwood, British Columbia

Sampling date 17-08-84
 Sampling location Mine (surface)
 3517 N 5730 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3937-84

Ash analysis, per cent:

SiO ₂	52.57
Al ₂ O ₃	36.05
Fe ₂ O ₃	1.63
Mn ₃ O ₄	-
TiO ₂	1.78
P ₂ O ₅	0.23
CaO	1.53
MgO	0.60
SO ₃	1.37
Na ₂ O	0.34
K ₂ O	0.26
SrO	0.09
BaO	0.26
Loss on fusion (LOF)	1.75

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	70
F	97.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1895 m

BYRON CREEK COLLIERIES LIMITED
Coal Mountain Mine; No. 1 Seam (Middle Section); Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 17-08-84
Sampling location Mine (surface)
3517 N 5730 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3938-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.86		/
Ash %	10.74	10.94	
Volatile %	24.47	24.93	27.99
Fixed carbon %	62.94	64.13	72.01

Ultimate:			
Carbon %	76.30	77.75	87.30
Hydrogen %	4.03	4.11	4.61
Sulphur (Pyritic) %	(0.02)	(0.02)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.12)	(0.12)	(0.14)
Total %	0.14	0.14	-
Nitrogen %	1.32	1.35	1.52
Ash %	10.74	10.94	-
Oxygen, by difference %	5.60	5.71	6.41

Heating value:			
	MJ/kg	30.21	30.79
	kcal/kg	7216	7353
	Btu/lb	12990	13236

Hardgrove grindability index 77

Free swelling index (FSI) 1.5

Moisture (as rec'd)
Inherent % 0.99
Adherent % 0.87

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1335	1346
Spherical °C		1357	1379
Hemispherical °C		1404	1388
Fluid °C		1446	1454

Notes: 1 Byron Creek Coll. is a subsidiary of Esso Minerals Can. Ltd.
2 Coal Mountain Mine was formerly named Corbin Mine

BYRON CREEK COLLIERIES LIMITED

Coal Mountain Mine; No. 1 Seam (Middle Section); Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 17-08-84
Sampling location Mine (surface)
3517 N 5730 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3938-84

Ash analysis, per cent:

SiO ₂	39.25
Al ₂ O ₃	27.11
Fe ₂ O ₃	3.78
Mn ₃ O ₄	-
TiO ₂	1.93
P ₂ O ₅	0.16
CaO	15.92
MgO	3.70
SO ₃	4.61
Na ₂ O	1.03
K ₂ O	0.09
SrO	0.17
BaO	0.77
Loss on fusion (LOF)	1.17

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	50
F	26.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1895 m

BYRON CREEK COLLIERIES LIMITED

Coal Mountain Mine; No. 1 Seam (Bottom Section); Crowsnest Coalfield
Sparwood, British Columbia

 Sampling date 17-08-84
 Sampling location Mine (surface)
 3473 N 5740 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3934-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.22		
Ash %	10.83	11.08	
Volatile %	23.69	24.23	27.25
Fixed carbon %	63.26	64.69	72.75

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	75.77	77.49	87.15
Hydrogen %	3.91	4.00	4.50
Sulphur (Pyritic) %	(0.02)	(0.02)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.14)	(0.14)	(0.16)
Total %	0.16	0.16	-
Nitrogen %	1.30	1.33	1.50
Ash %	10.83	11.08	-
Oxygen, by difference %	5.81	5.94	6.68

Heating value:	MJ/kg	As Rec'd	Dry	Dry Ash Free
		30.10	30.78	34.62
	kcal/kg	7189	7352	8268
	Btu/lb	12940	13233	14882

 Hardgrove grindability index 85

Free swelling index (FSI) 1.0

Moisture (as rec'd)	%
Inherent	1.00
Adherent	1.22

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1388	1418
Spherical °C	1407	1424
Hemispherical °C	1410	1446
Fluid °C	1468	1482+

Notes: 1 Byron Creek Coll. is a subsidiary of Esso Minerals Can. Ltd.
 2 Coal Mountain Mine was formerly named Corbin Mine

BYRON CREEK COLLIERIES LIMITED
 Coal Mountain Mine; No. 1 Seam (Bottom Section); Crowneast Coalfield
 Sparwood, British Columbia

Sampling date	17-08-84
Sampling location	Mine (surface) 3473 N 5740 E

Product name	Channel Sample
Screen opening ,mm (Screen opening ,in)	

ERL number	3934-84
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Ash analysis, per cent:

SiO ₂	42.02
Al ₂ O ₃	28.98
Fe ₂ O ₃	3.04
Mn ₃ O ₄	-
TiO ₂	1.90
P ₂ O ₅	0.25
CaO	13.89
MgO	2.44
SO ₃	4.44
Na ₂ O	1.04
K ₂ O	0.13
SrO	0.26
BaO	0.80
Loss on fusion (LOF)	1.49

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	70
F	42.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1895 m

BYRON CREEK COLLIERIES LIMITED
Coal Mountain Mine; No.1 Seam; Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 17-08-84
Sampling location Preparation Plant

Product name Raw Coal Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 3935-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	3.09		
Ash %	14.37	14.83	
Volatile %	23.00	23.73	27.86
Fixed carbon %	59.54	61.44	72.14

Ultimate:			
Carbon %	71.78	74.07	86.97
Hydrogen %	3.80	3.92	4.60
Sulphur (Pyritic) %	(0.04)	(0.04)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.14)	(0.14)	(0.17)
Total %	0.19	0.20	-
Nitrogen %	1.35	1.39	1.63
Ash %	14.37	14.83	-
Oxygen, by difference %	5.42	5.59	6.56

Heating value:			
	MJ/kg	28.59	29.50
	kcal/kg	6829	7046
	Btu/lb	12291	12683

Hardgrove grindability index 76

Free swelling index (FSI) 1.5

Moisture (as rec'd)

Inherent %	1.20
Adherent %	1.89

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1263	1296
Spherical °C	1296	1318
Hemispherical °C	1377	1363
Fluid °C	1429	1477

Notes: 1 Byron Creek Coll. is a subsidiary of Esso Minerals Can. Ltd.
2 Coal Mountain Mine was formerly named Corbin Mine

BYRON CREEK COLLIERIES LIMITED
 Coal Mountain Mine; No.1 Seam; Crowsnest Coalfield
 Sparwood, British Columbia

Sampling date 17-08-84
 Sampling location Preparation Plant

Product name Raw Coal Feed
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3935-84

Ash analysis, per cent:

SiO ₂	48.40
Al ₂ O ₃	25.01
Fe ₂ O ₃	3.44
Mn ₃ O ₄	-
TiO ₂	1.94
P ₂ O ₅	0.69
CaO	9.95
MgO	3.17
SO ₃	4.22
Na ₂ O	1.01
K ₂ O	0.18
SrO	0.25
BaO	0.85
Loss on fusion (LOF)	0.91

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	60
F	114.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

BYRON CREEK COLLIERIES LIMITED
Coal Mountain Mine; No. 1 Seam; Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 17-08-84
Sampling location Preparation Plant

Product name Clean Coal
Screen opening ,mm
(Screen opening ,in)

ERL number 3936-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	% 3.88		
Ash	% 11.99	12.47	
Volatile	% 22.08	22.97	26.24
Fixed carbon	% 62.05	64.56	73.76

Ultimate:			
Carbon	% 72.84	75.78	86.58
Hydrogen	% 3.75	3.90	4.46
Sulphur (Pyritic)	% (0.03)	(0.03)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.17)	(0.17)	(0.20)
Total	% 0.20	0.21	-
Nitrogen	% 1.24	1.29	1.47
Ash	% 11.99	12.47	-
Oxygen, by difference	% 6.10	6.35	7.25

Heating value:			
	MJ/kg	28.98	30.15
	kcal/kg	6921	7201
	Btu/lb	12458	12961
			34.44
			8226
			14807

Hardgrove grindability index 70

Free swelling index (FSI) 1.0

Moisture (as rec'd)
Inherent

Inherent

Adherent

Ash Fusibility temperature		Reducing	Oxidizing
Initial	°C	1360	1352
Spherical	°C	1468	1482+
Hemispherical	°C	1482+	1482+
Fluid	°C	1482+	1482+

Notes: 1 Byron Creek Coll. is a subsidiary of Esso Minerals Can. Ltd.
2 Coal Mountain Mine was formerly named Corbin Mine

BYRON CREEK COLLIERIES LIMITED
 Coal Mountain Mine; No. 1 Seam; Crownsnest Coalfield
 Sparwood, British Columbia

Sampling date 17-08-84
 Sampling location Preparation Plant

Product name Clean Coal
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3936-84

Ash analysis, per cent:

SiO ₂	49.18
Al ₂ O ₃	28.57
Fe ₂ O ₃	2.55
Mn ₃ O ₄	-
TiO ₂	1.91
P ₂ O ₅	0.74
CaO	6.19
MgO	1.72
SO ₃	3.11
Na ₂ O	1.04
K ₂ O	0.22
SrO	0.25
BaO	0.68
Loss on fusion (LOF)	1.92

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	50
F	73.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

WESTAR MINING LTD.

Michel Underground Mine; No. 10 Seam (Top Sect.); Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 27-09-84
Sampling location (Hydraulic) Mine (u/g)
5331.66 S 2605.51 W

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2076-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.75		
Ash %	8.12	8.35	
Volatile %	20.67	21.26	23.20
Fixed carbon %	68.45	70.39	76.80

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	80.32	82.60	90.13
Hydrogen %	4.46	4.59	5.01
Sulphur (Pyritic) %	(0.04)	(0.04)	-
(Sulphate) %	(0.05)	(0.05)	-
(Organic) %	(0.24)	(0.24)	(0.26)
Total %	0.32	0.33	-
Nitrogen %	1.41	1.45	1.58
Ash %	8.12	8.35	-
Oxygen, by difference %	2.61	2.68	2.92

Heating value:	MJ/kg	Dry	Dry Ash Free
	32.28	33.19	36.22
	kcal/kg 7709	7928	8650
	Btu/lb 13877	14270	15570

Hardgrove grindability index 95

Free swelling index (FSI) 8.0

Moisture (as rec'd)	
Inherent %	0.77
Adherent %	1.98

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1482+	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes: 1 Westar Mining Ltd. was formerly named B.C. Coal Ltd.
2 10 Seam has been referred to as Balmer Seam in some reports

WESTAR MINING LTD.

Michel Underground Mine; No. 10 Seam (Top Sect.); Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 27-09-84
Sampling location (Hydraulic) Mine (u/g)
5331.66 S 2605.51 W

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2076-85

Ash analysis, per cent:

SiO ₂	53.52
Al ₂ O ₃	34.20
Fe ₂ O ₃	2.23
Mn ₃ O ₄	-
TiO ₂	1.95
P ₂ O ₅	0.21
CaO	1.82
MgO	0.69
SO ₃	2.02
Na ₂ O	0.25
K ₂ O	0.14
SrO	0.03
BaO	0.14
Loss on fusion (LOF)	1.51

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1373.8 m

WESTAR MINING LTD.

Michel Underground Mine; No. 10 Seam (Bot. Sect.); Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 27-09-84
Sampling location (Hydraulic) Mine (u/g)
4711.79 S 1077.73 W

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2078-85

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.30		
Ash %	15.37	15.73	
Volatile %	18.52	18.96	22.50
Fixed carbon %	63.81	65.31	77.50

Ultimate:			
Carbon %	74.43	76.18	90.40
Hydrogen %	4.07	4.17	4.95
Sulphur (Pyritic) %	(0.03)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.15)	(0.15)	(0.18)
Total %	0.18	0.18	-
Nitrogen %	1.21	1.24	1.47
Ash %	15.37	15.73	-
Oxygen, by difference %	2.44	2.50	2.97

Heating value:			
	MJ/kg	29.35	30.04
	kcal/kg	7011	7176
	Btu/lb	12620	12917
			35.65
			8516
			15328

Hardgrove grindability index 91

Free swelling index (FSI) 5.0

Moisture (as rec'd)	
Inherent %	0.73
Adherent %	1.57

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1482+	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes: 1 Westar Mining Ltd. was formerly named B.C. Coal Ltd.
2 10 Seam has been referred to as Balmer Seam in some reports

WESTAR MINING LTD.

Michel Underground Mine; No. 10 Seam (Bot. Sect.); Crowsnest Coalfield
Sparwood, British Columbia

 Sampling date 27-09-84
 Sampling location (Hydraulic) Mine (u/g)
 4711.79 S 1077.73 W

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2078-85

Ash analysis, per cent:

SiO ₂	56.57
Al ₂ O ₃	34.60
Fe ₂ O ₃	1.03
Mn ₃ O ₄	-
TiO ₂	1.36
P ₂ O ₅	0.20
CaO	1.51
MgO	0.34
SO ₃	1.21
Na ₂ O	0.16
K ₂ O	0.11
SrO	0.01
BaO	0.25
Loss on fusion (LOF)	1.11

Volatile trace element analysis ug/g (ppm)

Hg	0.11
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

 Notes: Sample Elevation = 1373.8 m

WESTAR MINING LTD.
Michel Underground Mine; No. 10 Seam; Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 27-09-84
Sampling location Preparation Plant

Product name Raw Coal Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 2074-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.77		
Ash %	24.41	24.85	
Volatile %	19.34	19.69	26.20
Fixed carbon %	54.48	55.46	73.80

Ultimate:			
Carbon %	64.51	65.67	87.39
Hydrogen %	3.63	3.70	4.92
Sulphur (Pyritic) %	(0.13)	(0.13)	-
(Sulphate) %	(0.02)	(0.02)	-
(Organic) %	(0.19)	(0.19)	(0.26)
Total %	0.34	0.35	-
Nitrogen %	1.02	1.04	1.38
Ash %	24.41	24.85	-
Oxygen, by difference %	4.31	4.39	5.84

Heating value:			
	MJ/kg	25.35	25.81
	kcal/kg	6056	6165
	Btu/lb	10900	11097
			34.35
			8204
			14766

Hardgrove grindability index 72

Free swelling index (FSI) 2.5

Moisture (as rec'd)

Inherent %	0.86
Adherent %	0.91

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1482+	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes: 1 Westar Mining Ltd. was formerly named B.C. Coal Ltd.
2 10 Seam has been referred to as Balmer Seam in some reports

WESTAR MINING LTD.
Michel Underground Mine; No. 10 Seam; Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 27-09-84
Sampling location Preparation Plant

Product name Raw Coal Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 2074-85

Ash analysis, per cent:

SiO ₂	63.50
Al ₂ O ₃	25.23
Fe ₂ O ₃	2.77
Mn ₃ O ₄	-
TiO ₂	1.29
P ₂ O ₅	0.34
CaO	1.30
MgO	0.52
SO ₃	1.10
Na ₂ O	0.08
K ₂ O	1.44
SrO	0.02
BaO	0.26
Loss on fusion (LOF)	0.88

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

WESTAR MINING LTD.
Michel Underground Mine; No. 10 Seam; Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 27-09-84
Sampling location Preparation Plant

Product name Clean Coal
Screen opening ,mm Minus 51
(Screen opening ,in) Minus 2

ERL number 2079-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	% 4.47		
Ash	% 9.51	9.95	
Volatile	% 20.19	21.13	23.46
Fixed carbon	% 65.84	68.92	76.54

Ultimate:			
Carbon	% 78.08	81.73	90.76
Hydrogen	% 4.24	4.44	4.93
Sulphur (Pyritic)	% (0.04)	(0.04)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.22)	(0.23)	(0.26)
Total	% 0.26	0.27	-
Nitrogen	% 1.32	1.38	1.53
Ash	% 9.51	9.95	-
Oxygen, by difference	% 2.13	2.23	2.48

Heating value:			
	MJ/kg	30.98	32.43
	kcal/kg	7400	7747
	Btu/lb	13321	13944
			15485

Hardgrove grindability index 86

Free swelling index (FSI) 6.0

Moisture (as rec'd)

Inherent	% 0.80
Adherent	% 3.67

Ash Fusibility temperature		Reducing	Oxidizing
Initial	°C	1482+	1482+
Spherical	°C	1482+	1482+
Hemispherical	°C	1482+	1482+
Fluid	°C	1482+	1482+

Notes: 1 Westar Mining Ltd. was formerly named B.C. Coal Ltd.
2 10 Seam has been referred to as Balmer Seam in some reports

WESTAR MINING LTD.
 Michel Underground Mine; No. 10 Seam; Crowsnest Coalfield
 Sparwood, British Columbia

Sampling date	27-09-84
Sampling location	Preparation Plant

Product name	Clean Coal
Screen opening ,mm	Minus 51
(Screen opening ,in)	Minus 2

ERL number	2079-85
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Ash analysis, per cent:

SiO ₂	60.41
Al ₂ O ₃	27.69
Fe ₂ O ₃	2.70
Mn ₃ O ₄	-
TiO ₂	1.58
P ₂ O ₅	0.53
CaO	1.89
MgO	0.43
SO ₃	1.01
Na ₂ O	0.12
K ₂ O	0.29
SrO	0.03
BaO	0.25
Loss on fusion (LOF)	1.10

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

WESTAR MINING LTD.
Harmer Surface Mine; No. 8 Seam; Crownsnest Coalfield
Sparwood, British Columbia

Sampling date 28-09-84
Sampling location Mine (surface)
Sampled from stockpile

Product name Mine run
Screen opening ,mm
(Screen opening ,in)

ERL number 2077-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.48		
Ash %	39.98	41.00	
Volatile %	18.73	19.21	32.56
Fixed carbon %	38.80	39.79	67.44

Ultimate:			
Carbon %	49.39	50.64	85.83
Hydrogen %	3.28	3.36	5.69
Sulphur (Pyritic) %	(0.19)	(0.19)	-
(Sulphate) %	(0.03)	(0.03)	-
(Organic) %	(0.18)	(0.18)	(0.31)
Total %	0.39	0.40	-
Nitrogen %	0.96	0.98	1.66
Ash %	39.98	41.00	-
Oxygen, by difference %	3.53	3.62	6.14

Heating value:	MJ/kg	19.45	19.94	33.80
	kcal/kg	4645	4763	8073
	Btu/lb	8361	8573	14531

Hardgrove grindability index 62

Free swelling index (FSI) 1.0

Moisture (as rec'd)

Inherent %	0.89
Adherent %	1.59

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1482+	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes: Westar Mining Ltd. was formerly named B.C. Coal Ltd.

WESTAR MINING LTD.
Harmer Surface Mine; No. 8 Seam; Crownsnest Coalfield
Sparwood, British Columbia

Sampling date 28-09-84
Sampling location Mine (surface)
Sampled from stockpile

Product name Mine run
Screen opening ,mm
(Screen opening ,in)

ERL number 2077-85

Ash analysis, per cent:

SiO ₂	65.43
Al ₂ O ₃	24.85
Fe ₂ O ₃	1.71
Mn ₃ O ₄	-
TiO ₂	1.25
P ₂ O ₅	0.26
CaO	0.64
MgO	0.72
SO ₃	0.54
Na ₂ O	0.06
K ₂ O	1.94
SrO	0.03
BaO	-
Loss on fusion (LOF)	1.03

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	-
F	-
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1804.4 m

WESTAR MINING LTD.
Harmer Surface Mine; No. 10 Seam; Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 28-09-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2075-85

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture..... %	5.37		
Ash..... %	13.21	13.96	
Volatile..... %	18.63	19.69	22.88
Fixed carbon..... %	62.78	66.35	77.12

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon..... %	72.96	77.10	89.61
Hydrogen..... %	3.88	4.10	4.77
Sulphur (Pyritic)..... %	(0.03)	(0.03)	-
(Sulphate)..... %	(0.00)	(0.00)	-
(Organic)..... %	(0.17)	(0.18)	(0.21)
Total..... %	0.20	0.21	-
Nitrogen..... %	1.22	1.29	1.50
Ash..... %	13.21	13.96	-
Oxygen, by difference..... %	3.16	3.34	3.88

Heating value:	MJ/kg	kcal/kg	Btu/lb
	28.99	30.64	35.61
	6925	7318	8506
	12465	13173	15310

Hardgrove grindability index 112

Free swelling index (FSI) 2.0

Moisture (as rec'd)

Inherent..... %	0.76
Adherent..... %	4.61

Ash Fusibility temperature	Reducing	Oxidizing
Initial..... °C	1482+	1482+
Spherical..... °C	1482+	1482+
Hemispherical..... °C	1482+	1482+
Fluid..... °C	1482+	1482+

Notes: Westar Mining Ltd. was formerly named B.C. Coal Ltd.

WESTAR MINING LTD.
Harmer Surface Mine; No. 10 Seam; Crowsnest Coalfield
Sparwood, British Columbia

Sampling date 28-09-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2075-85

Ash analysis, per cent:

SiO ₂	57.46
Al ₂ O ₃	32.90
Fe ₂ O ₃	0.92
Mn ₃ O ₄	-
TiO ₂	1.95
P ₂ O ₅	0.09
CaO	0.77
MgO	0.38
SO ₃	0.43
Na ₂ O	0.04
K ₂ O	0.15
SrO	0.02
BaO	0.09
Loss on fusion (LOF)	4.20

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	70
F	63.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1636.8 m

WESTAR MINING LTD.
Greenhills Mine; No. 26 Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 16-08-84
Sampling location Mine (surface)
5553912 N 651900 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3929-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.09		
Ash %	4.88	4.98	
Volatile %	31.07	31.73	33.39
Fixed carbon %	61.97	63.29	66.61

Ultimate:			
Carbon %	79.36	81.05	85.30
Hydrogen %	4.93	5.04	5.30
Sulphur (Pyritic) %	(0.02)	(0.02)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.38)	(0.38)	(0.40)
Total %	0.40	0.41	-
Nitrogen %	1.67	1.71	1.80
Ash %	4.88	4.98	-
Oxygen, by difference %	6.67	6.81	7.17

Heating value:			
	MJ/kg	32.57	33.27
	kcal/kg	7780	7946
	Btu/lb	14004	14303
			15053

Hardgrove grindability index 63

Free swelling index (FSI) 6.5

Moisture (as rec'd)

Inherent %	1.14
Adherent %	0.95

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1352	1432
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes: Westar Mining Ltd. was formerly named B.C. Coal Ltd.

WESTAR MINING LTD.
Greenhills Mine; No. 26 Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 16-08-84
Sampling location Mine (surface)
5553912 N 651900 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3929-84

Ash analysis, per cent:

SiO ₂	51.85
Al ₂ O ₃	30.16
Fe ₂ O ₃	3.62
Mn ₃ O ₄	-
TiO ₂	1.41
P ₂ O ₅	4.05
CaO	2.57
MgO	-
SO ₃	1.11
Na ₂ O	0.06
K ₂ O	0.40
SrO	1.31
BaO	1.24
Loss on fusion (LOF)	0.84

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	30
F	181.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

WESTAR MINING LTD.
Greenhills Mine; No. 16 (Cougar) Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 16-08-84
Sampling location Mine (surface)
5553480 N 651760 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3930-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.80		
Ash %	8.84	9.00	
Volatile %	26.83	27.32	30.02
Fixed carbon %	62.53	63.68	69.98

Ultimate:			
Carbon %	77.36	78.78	86.57
Hydrogen %	4.51	4.59	5.04
Sulphur (Pyritic) %	(0.04)	(0.04)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.42)	(0.42)	(0.47)
Total %	0.47	0.48	-
Nitrogen %	1.49	1.52	1.67
Ash %	8.84	9.00	-
Oxygen, by difference %	5.53	5.63	6.19

Heating value:			
	MJ/kg	31.20	31.77
	kcal/kg	7452	7589
	Btu/lb	13414	13660

Hardgrove grindability index 70

Free swelling index (FSI) 5.5

Moisture (as rec'd)
Inherent % 1.06
Adherent % 0.74

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1482+	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes: Westar Mining Ltd. was formerly named B.C. Coal Ltd.

WESTAR MINING LTD.
Greenhills Mine; No. 16 (Cougar) Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date	16-08-84
Sampling location	Mine (surface) 5553680 N 651760 E

Product name	Channel Sample
Screen opening ,mm (Screen opening ,in)	

ERL number	3930-84
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Ash analysis, per cent:

SiO ₂	63.98
Al ₂ O ₃	26.17
Fe ₂ O ₃	1.17
Mn ₃ O ₄	-
TiO ₂	1.23
P ₂ O ₅	0.80
CaO	0.75
MgO	0.46
SO ₃	0.03
Na ₂ O	0.09
K ₂ O	1.44
SrO	0.20
BaO	0.38
Loss on fusion (LOF)	0.80

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	40
F	95.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 2181.0

WESTAR MINING LTD.
Greenhills Mine; No. 1 (CTR) Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 16-08-84
Sampling location Mine (surface)
5551225 N 652875 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3931-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture..... %	1.87		
Ash..... %	13.18	13.43	
Volatile..... %	22.76	23.19	26.79
Fixed carbon..... %	62.19	63.38	73.21

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon..... %	75.20	76.64	88.53
Hydrogen..... %	4.24	4.32	4.99
Sulphur (Pyritic)..... %	(0.04)	(0.04)	-
(Sulphate)..... %	(0.00)	(0.00)	-
(Organic)..... %	(0.16)	(0.16)	(0.19)
Total..... %	0.20	0.20	-
Nitrogen..... %	1.27	1.29	1.49
Ash..... %	13.18	13.43	-
Oxygen, by difference..... %	4.04	4.12	4.76

Heating value:	MJ/kg	30.10	30.67	35.43
	kcal/kg	7188	7326	8462
	Btu/lb	12939	13186	15232

Hardgrove grindability index 121

Free swelling index (FSI) 6.0

Moisture (as rec'd)

Inherent..... %	0.53
Adherent..... %	1.34

Ash Fusibility temperature	Reducing	Oxidizing
Initial..... °C	1482+	1482+
Spherical..... °C	1482+	1482+
Hemispherical..... °C	1482+	1482+
Fluid..... °C	1482+	1482+

Notes: Westar Mining Ltd. was formerly named B.C. Coal Ltd.

WESTAR MINING LTD.
Greenhills Mine; No. 1 (CTR) Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 16-08-84
Sampling location Mine (surface)
5551225 N 652875 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3931-84

Ash analysis, per cent:

SiO ₂	53.31
Al ₂ O ₃	38.05
Fe ₂ O ₃	1.81
Mn ₃ O ₄	-
TiO ₂	1.95
P ₂ O ₅	0.85
CaO	1.49
MgO	-
SO ₃	0.41
Na ₂ O	0.05
K ₂ O	0.09
SrO	0.02
BaO	-
Loss on fusion (LOF)	0.37

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	30
F	127.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

WESTAR MINING LTD.
Greenhills Mine; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 16-08-84
Sampling location Preparation Plant

Product name Raw Coal Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 3932-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	%	3.08	
Ash	%	17.43	17.98
Volatile	%	24.13	24.90
Fixed carbon	%	55.36	57.12
			30.36
			69.64

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon	%	68.96	71.15
Hydrogen	%	4.05	4.18
Sulphur (Pyritic)	%	(0.12)	(0.12)
(Sulphate)	%	(0.00)	(0.00)
(Organic)	%	(0.32)	(0.33)
Total	%	0.45	0.46
			86.75
			5.10
			-
			-
			(0.41)
			-
Nitrogen	%	1.40	1.44
Ash	%	17.43	17.98
Oxygen, by difference	%	4.64	4.79
			1.76
			-
			5.84

Heating value:	MJ/kg	27.84	28.73	35.03
	kcal/kg	6650	6862	8366
	Btu/lb	11971	12351	15059

Hardgrove grindability index 88

Free swelling index (FSI) 6.0

Moisture (as rec'd)

Inherent	%	1.10
Adherent	%	1.98

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C	1357
Spherical	°C	1482+
Hemispherical	°C	1482+
Fluid	°C	1482+
		1416
		1482+
		1482+
		1482+

Notes: Westar Mining Ltd. was formerly named B.C. Coal Ltd.

WESTAR MINING LTD.
Greenhills Mine; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 16-08-84
Sampling location Preparation Plant

Product name Raw Coal Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 3932-84

Ash analysis, per cent:

SiO ₂	61.55
Al ₂ O ₃	25.10
Fe ₂ O ₃	4.28
Mn ₃ O ₄	-
TiO ₂	1.23
P ₂ O ₅	1.28
CaO	1.72
MgO	1.14
SO ₃	1.10
Na ₂ O	0.09
K ₂ O	2.03
SrO	0.10
BaO	0.50
Loss on fusion (LOF)	0.78

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	30
F	222.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

WESTAR MINING LTD.
Greenhills Mine; Elk Valley Coalfield
Elkford, British Columbia

 Sampling date 16-08-84
 Sampling location Preparation Plant

Product name Clean Coal
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3933-84

 Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	3.38		
Ash %	6.21	6.43	
Volatile %	26.46	27.39	29.27
Fixed carbon %	63.94	66.18	70.73

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	78.88	81.64	87.25
Hydrogen %	4.52	4.68	5.00
Sulphur (Pyritic) %	(0.04)	(0.04)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.41)	(0.42)	(0.45)
Total %	0.45	0.47	-
Nitrogen %	1.57	1.62	1.73
Ash %	6.21	6.43	-
Oxygen, by difference %	4.99	5.16	5.51

Heating value:	MJ/kg	32.10	33.23	35.51
	kcal/kg	7668	7937	8482
	Btu/lb	13802	14286	15268

 Hardgrove grindability index 92

Free swelling index (FSI) 7.0

Moisture (as rec'd)
 Inherent % 1.06
 Adherent % 2.32

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1482+	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

 Notes: Westar Mining Ltd. was formerly named B.C. Coal Ltd.

WESTAR MINING LTD.
Greenhills Mine; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 16-08-84
Sampling location Preparation Plant

Product name Clean Coal
Screen opening ,mm
(Screen opening ,in)

ERL number 3933-84

Ash analysis, per cent:

SiO ₂	52.97
Al ₂ O ₃	29.40
Fe ₂ O ₃	4.89
Mn ₃ O ₄	-
TiO ₂	1.84
P ₂ O ₅	2.81
CaO	3.05
MgO	0.64
SO ₃	0.93
Na ₂ O	0.09
K ₂ O	0.74
SrO	0.23
BaO	0.54
Loss on fusion (LOF)	0.81

Volatile trace element analysis ug/g (ppm)

Hg	0.03
Cl	60
F	141.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

FORDING COAL LTD.
Fording River Mine; G Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 14-08-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3907-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture..... %	1.38		
Ash..... %	13.72	13.91	
Volatile..... %	22.63	22.95	26.66
Fixed carbon..... %	62.27	63.14	73.34

Ultimate:			
Carbon..... %	73.49	74.52	86.56
Hydrogen..... %	4.41	4.47	5.19
Sulphur (Pyritic)..... %	(0.08)	(0.08)	-
(Sulphate)..... %	(0.01)	(0.01)	-
(Organic)..... %	(0.52)	(0.53)	(0.61)
Total..... %	0.61	0.62	-
Nitrogen..... %	1.58	1.60	1.86
Ash..... %	13.72	13.91	-
Oxygen, by difference..... %	4.81	4.88	5.67

Heating value:			
	MJ/kg	30.03	30.45
	kcal/kg	7172	7272
	Btu/lb	12910	13090
			15205

Hardgrove grindability index 106

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent..... % 0.96
Adherent..... % 0.42

Ash Fusibility temperature	Reducing	Oxidizing
Initial..... °C	1229	1379
Spherical..... °C	1435	1482+
Hemispherical..... °C	1466	1482+
Fluid..... °C	1482+	1482+

Notes:

FORDING COAL LTD.
 Fording River Mine; G Seam; Elk Valley Coalfield
 Elkford, British Columbia

Sampling date	14-08-84
Sampling location	Mine (surface)

Product name	Channel Sample
Screen opening ,mm (Screen opening ,in)	

ERL number	3907-84
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Ash analysis, per cent:

SiO ₂	64.51
Al ₂ O ₃	23.03
Fe ₂ O ₃	5.74
Mn ₃ O ₄	-
TiO ₂	1.33
P ₂ O ₅	1.36
CaO	1.71
MgO	0.43
SO ₃	-
Na ₂ O	0.09
K ₂ O	1.20
SrO	0.13
BaO	0.28
Loss on fusion (LOF)	0.32

Volatile trace element analysis ug/g (ppm)

Hg	0.03
Cl	40
F	201.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

FORDING COAL LTD.
Fording River Mine; K (No.15) Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 14-08-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3908-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.06		
Ash %	7.17	7.25	
Volatile %	33.04	33.39	36.00
Fixed carbon %	58.73	59.36	64.00

Ultimate:			
Carbon %	78.29	79.13	85.32
Hydrogen %	5.11	5.16	5.56
Sulphur (Pyritic) %	(0.09)	(0.09)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.26)	(0.26)	(0.28)
Total %	0.36	0.36	-
Nitrogen %	1.81	1.83	1.97
Ash %	7.17	7.25	-
Oxygen, by difference %	6.20	6.27	6.76

Heating value:			
	MJ/kg	32.28	32.62
	kcal/kg	7709	7792
	Btu/lb	13877	14025
			35.17
			8401
			15121

Hardgrove grindability index 62

Free swelling index (FSI) 7.5

Moisture (as rec'd)
Inherent % 0.81
Adherent % 0.25

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1132	1327
Spherical °C		1349	1404
Hemispherical °C		1377	1427
Fluid °C		1379	1482+

Notes:

FORDING COAL LTD.
 Fording River Mine; K (No.15) Seam; Elk Valley Coalfield
 Elkford, British Columbia

Sampling date 14-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3908-84

Ash analysis, per cent:

SiO ₂	51.70
Al ₂ O ₃	21.99
Fe ₂ O ₃	16.41
Mn ₃ O ₄	-
TiO ₂	0.98
P ₂ O ₅	0.21
CaO	2.02
MgO	1.65
SO ₃	0.64
Na ₂ O	0.22
K ₂ O	1.43
SrO	0.04
BaO	0.39
Loss on fusion (LOF)	0.59

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	50
F	48.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

FORDING COAL LTD.
Fording River Mine; No. 8 Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 14-08-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3909-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	0.79		
Ash %	30.63	30.87	
Volatile %	19.05	19.20	27.77
Fixed carbon %	49.54	49.93	72.23

Ultimate:			
Carbon %	59.12	59.59	86.20
Hydrogen %	3.51	3.54	5.12
Sulphur (Pyritic) %	(0.07)	(0.07)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.42)	(0.42)	(0.61)
Total %	0.49	0.49	-
Nitrogen %	0.88	0.89	1.29
Ash %	30.63	30.87	-
Oxygen, by difference %	4.58	4.62	6.68

Heating value:			
	MJ/kg	23.55	23.74
	kcal/kg	5626	5671
	Btu/lb	10127	10207
			34.34
			8203
			14765

Hardgrove grindability index 73

Free swelling index (FSI) 2.0

Moisture (as rec'd)

Inherent %	0.50
Adherent %	0.29

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1482+	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes: Analysis results were obtained by averaging the results from the top and bottom portions of the seam.

FORDING COAL LTD.
 Fording River Mine; No. 8 Seam; Elk Valley Coalfield
 Elkford, British Columbia

Sampling date 14-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3909-84

Ash analysis, per cent:

SiO ₂	59.78
Al ₂ O ₃	33.61
Fe ₂ O ₃	1.50
Mn ₃ O ₄	-
TiO ₂	1.47
P ₂ O ₅	0.11
CaO	0.16
MgO	-
SO ₃	-
Na ₂ O	0.06
K ₂ O	1.08
SrO	0.05
BaO	0.23
Loss on fusion (LOF)	0.83

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	40
F	148.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

FORDING COAL LTD.
Fording River Mine; E Seam (No. 3 Pit); Elk Valley Coalfield
Elkford, British Columbia

Sampling date 14-08-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3910-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	0.97		
Ash %	18.77	18.95	
Volatile %	23.45	23.68	29.22
Fixed carbon %	56.81	57.37	70.78

Ultimate:			
Carbon %	70.55	71.24	87.90
Hydrogen %	4.22	4.26	5.26
Sulphur (Pyritic) %	(0.06)	(0.06)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.31)	(0.31)	(0.38)
Total %	0.37	0.37	-
Nitrogen %	1.26	1.27	1.57
Ash %	18.77	18.95	-
Oxygen, by difference %	3.87	3.91	4.82

Heating value:			
	MJ/kg	28.64	28.92
	kcal/kg	6841	6908
	Btu/lb	12315	12435
			35.69
			8524
			15342

Hardgrove grindability index 100

Free swelling index (FSI) 7.5

Moisture (as rec'd)
Inherent % 0.43
Adherent % 0.54

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1482+	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes:

FORDING COAL LTD.
 Fording River Mine; E Seam (No. 3 Pit); Elk Valley Coalfield
 Elkford, British Columbia

Sampling date 14-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3910-84

Ash analysis, per cent:

SiO ₂	61.10
Al ₂ O ₃	31.34
Fe ₂ O ₃	0.73
Mn ₃ O ₄	-
TiO ₂	1.65
P ₂ O ₅	0.25
CaO	0.46
MgO	0.36
SO ₃	0.18
Na ₂ O	0.07
K ₂ O	0.94
SrO	0.07
BaO	-
Loss on fusion (LOF)	0.88

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	30
F	133.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

FORDING COAL LTD.
Fording River Mine; F (No. 9) Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 14-08-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3911-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.43		
Ash %	12.05	12.23	
Volatile %	23.01	23.34	26.59
Fixed carbon %	63.51	64.43	73.41

Ultimate:			
Carbon %	76.14	77.25	88.01
Hydrogen %	4.23	4.29	4.89
Sulphur (Pyritic) %	(0.06)	(0.06)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.35)	(0.35)	(0.40)
Total %	0.40	0.41	-
Nitrogen %	1.36	1.38	1.57
Ash %	12.05	12.23	-
Oxygen, by difference %	4.38	4.44	5.06

Heating value:			
	MJ/kg	30.45	30.89
	kcal/kg	7272	7378
	Btu/lb	13090	13281

Hardgrove grindability index 85

Free swelling index (FSI) 4.0

Moisture (as rec'd)

Inherent %	0.58
Adherent %	0.85

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1224	1299
Spherical °C	1357	1421
Hemispherical °C	1432	1435
Fluid °C	1479	1468

Notes:

FORDING COAL LTD.
 Fording River Mine; F (No. 9) Seam; Elk Valley Coalfield
 Elkford, British Columbia

Sampling date 14-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3911-84

Ash analysis, per cent:

SiO ₂	48.40
Al ₂ O ₃	25.81
Fe ₂ O ₃	13.26
Mn ₃ O ₄	-
TiO ₂	1.20
P ₂ O ₅	2.45
CaO	3.79
MgO	0.64
SO ₃	0.61
Na ₂ O	0.09
K ₂ O	0.49
SrO	0.08
BaO	0.49
Loss on fusion (LOF)	0.87

Volatile trace element analysis ug/g (ppm)

Hg	0.03
Cl	30
F	282.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

FORDING COAL LTD.
Fording River Mine; B (No. 4) Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 14-08-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3912-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	0.91		
Ash %	7.22	7.29	
Volatile %	21.64	21.84	23.56
Fixed carbon %	70.23	70.87	76.44

Ultimate:			
Carbon %	82.08	82.83	89.34
Hydrogen %	4.40	4.44	4.79
Sulphur (Pyritic) %	(0.04)	(0.04)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.18)	(0.18)	(0.20)
Total %	0.22	0.22	-
Nitrogen %	1.43	1.44	1.55
Ash %	7.22	7.29	-
Oxygen, by difference %	3.75	3.78	4.08

Heating value:			
	MJ/kg	32.94	33.24
	kcal/kg	7867	7939
	Btu/lb	14160	14290
			35.85
			8563
			15414

Hardgrove grindability index 94

Free swelling index (FSI) 5.5

Moisture (as rec'd)
Inherent % 0.46
Adherent % 0.45

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1318	1454
Spherical °C		1471	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes:

FORDING COAL LTD.
 Fording River Mine; B (No. 4) Seam; Elk Valley Coalfield
 Elkford, British Columbia

Sampling date	14-08-84
Sampling location	Mine (surface)

Product name	Channel Sample
Screen opening ,mm (Screen opening ,in)	

ERL number	3912-84
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Ash analysis, per cent:

SiO ₂	46.33
Al ₂ O ₃	31.88
Fe ₂ O ₃	12.33
Mn ₃ O ₄	-
TiO ₂	1.79
P ₂ O ₅	0.78
CaO	2.18
MgO	1.20
SO ₃	0.73
Na ₂ O	0.13
K ₂ O	0.23
SrO	0.01
BaO	-
Loss on fusion (LOF)	0.49

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	30
F	72.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

FORDING COAL LTD.
Fording River Mine; No. 7 Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 14-08-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3913-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	0.82		
Ash %	30.13	30.38	
Volatile %	18.32	18.47	26.53
Fixed carbon %	50.73	51.15	73.47

Ultimate:			
Carbon %	61.16	61.66	88.57
Hydrogen %	3.45	3.48	5.00
Sulphur (Pyritic) %	(0.14)	(0.14)	-
(Sulphate) %	(0.02)	(0.02)	-
(Organic) %	(0.24)	(0.24)	(0.35)
Total %	0.40	0.40	-
Nitrogen %	1.06	1.07	1.54
Ash %	30.13	30.38	-
Oxygen, by difference %	2.99	3.01	4.32

Heating value:			
	MJ/kg	24.33	24.53
	kcal/kg	5811	5859
	Btu/lb	10461	10547
			35.24
			8416
			15149

Hardgrove grindability index 69

Free swelling index (FSI) 2.0

Moisture (as rec'd)
Inherent % 0.51
Adherent % 0.31

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1482+	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes:

FORDING COAL LTD.
 Fording River Mine; No. 7 Seam; Elk Valley Coalfield
 Elkford, British Columbia

Sampling date 14-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3913-84

Ash analysis, per cent:

SiO ₂	68.05
Al ₂ O ₃	23.98
Fe ₂ O ₃	1.36
Mn ₃ O ₄	-
TiO ₂	1.07
P ₂ O ₅	0.04
CaO	0.07
MgO	0.81
SO ₃	0.51
Na ₂ O	0.09
K ₂ O	2.51
SrO	0.07
BaO	0.23
Loss on fusion (LOF)	0.49

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	30
F	207.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

FORDING COAL LTD.
Fording River Mine; No. 13 Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 14-08-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3914-84

Rank of coal Subbituminous A

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	16.53		
Ash %	9.92	11.88	
Volatile %	26.17	31.35	35.58
Fixed carbon %	47.39	56.77	64.42

Ultimate:			
Carbon %	57.54	68.93	78.22
Hydrogen %	3.13	3.75	4.26
Sulphur (Pyritic) %	(0.06)	(0.07)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.36)	(0.43)	(0.49)
Total %	0.43	0.52	-
Nitrogen %	1.27	1.52	1.72
Ash %	9.92	11.88	-
Oxygen, by difference %	11.18	13.40	15.21

Heating value:			
	MJ/kg	21.89	26.23
	kcal/kg	5228	6264
	Btu/lb	9411	11275

Hardgrove grindability index 121

Free swelling index (FSI) N/A

Moisture (as rec'd)
Inherent %
Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1235	1288
Spherical °C	1307	1313
Hemispherical °C	1371	1360
Fluid °C	1477	1418

Notes:

FORDING COAL LTD.
 Fording River Mine; No. 13 Seam; Elk Valley Coalfield
 Elkford, British Columbia

Sampling date 14-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3914-84

Ash analysis, per cent:

SiO ₂	35.53
Al ₂ O ₃	20.11
Fe ₂ O ₃	2.79
Mn ₃ O ₄	-
TiO ₂	1.14
P ₂ O ₅	0.84
CaO	18.91
MgO	2.56
SO ₃	15.68
Na ₂ O	0.06
K ₂ O	0.83
SrO	0.18
BaO	0.77
Loss on fusion (LOF)	1.99

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	40
F	98.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

FORDING COAL LTD.
Fording River Mine; "H" Seam; Elk Valley Coalfield
Elkford, British Columbia

Sampling date 14-08-84
Sampling location Mine (surface)

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3915-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	% 1.63		
Ash	% 10.35	10.52	
Volatile	% 27.80	28.26	31.58
Fixed carbon	% 60.22	61.22	68.42

Ultimate:			
Carbon	% 75.74	77.00	86.05
Hydrogen	% 4.64	4.72	5.27
Sulphur (Pyritic)	% (0.05)	(0.05)	-
(Sulphate)	% (0.01)	(0.01)	-
(Organic)	% (0.42)	(0.42)	(0.47)
Total	% 0.47	0.48	-
Nitrogen	% 1.68	1.71	1.91
Ash	% 10.35	10.52	-
Oxygen, by difference	% 5.48	5.57	6.22

Heating value:			
	MJ/kg	30.81	31.32
	kcal/kg	7358	7481
	Btu/lb	13245	13465
			15048

Hardgrove grindability index 75

Free swelling index (FSI) 7.5

Moisture (as rec'd)

Inherent	% 0.98
Adherent	% 0.65

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C 1482+	1482+
Spherical	°C 1482+	1482+
Hemispherical	°C 1482+	1482+
Fluid	°C 1482+	1482+

Notes:

FORDING COAL LTD.
 Fording River Mine; "H" Seam; Elk Valley Coalfield
 Elkford, British Columbia

Sampling date 14-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3915-84

Ash analysis, per cent:

SiO ₂	57.70
Al ₂ O ₃	35.07
Fe ₂ O ₃	0.82
Mn ₃ O ₄	-
TiO ₂	1.09
P ₂ O ₅	0.54
CaO	0.85
MgO	0.48
SO ₃	0.98
Na ₂ O	0.03
K ₂ O	0.67
SrO	0.19
BaO	0.18
Loss on fusion (LOF)	0.78

Volatile trace element analysis ug/g (ppm)

Hg	0.03
Cl	30
F	96.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

FORDING COAL LTD.
Fording River Mine; "I" Seam; Elk Valley Coalfield
Elkford, British Columbia

 Sampling date 14-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3916-84

Rank of coal High-volatile A bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	3.32		
Ash %	6.05	6.26	
Volatile %	29.17	30.17	32.18
Fixed carbon %	61.46	63.57	67.82

Ultimate:			
Carbon %	77.90	80.58	85.96
Hydrogen %	4.68	4.84	5.16
Sulphur (Pyritic) %	(0.05)	(0.05)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.52)	(0.54)	(0.57)
Total %	0.58	0.60	-
Nitrogen %	1.83	1.89	2.02
Ash %	6.05	6.26	-
Oxygen, by difference %	5.64	5.83	6.22

Heating value:			
	MJ/kg	32.01	33.11
	kcal/kg	7644	7907
	Btu/lb	13760	14233

 Hardgrove grindability index 92

Free swelling index (FSI) 7.5

Moisture (as rec'd)
 Inherent % 1.16
 Adherent % 2.16

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1335	1427
Spherical °C		1477	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

 Notes:

FORDING COAL LTD.
 Fording River Mine; "I" Seam; Elk Valley Coalfield
 Elkford, British Columbia

Sampling date 14-08-84
 Sampling location Mine (surface)

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3916-84

Ash analysis, per cent:

SiO ₂	52.16
Al ₂ O ₃	27.61
Fe ₂ O ₃	6.85
Mn ₃ O ₄	-
TiO ₂	1.46
P ₂ O ₅	2.55
CaO	3.31
MgO	0.83
SO ₃	2.00
Na ₂ O	0.07
K ₂ O	0.66
SrO	0.43
BaO	0.56
Loss on fusion (LOF)	0.15

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	20
F	137.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

CROWS NEST RESOURCES LTD.

Line Creek Mine; No. 4 Seam (thermal) 1852 bench; Elk Valley Coalfield
Sparwood, British Columbia

 Sampling date 15-08-84
 Sampling location Mine (surface)
 5534000 N 659800 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3917-84

Rank of coal Subbituminous B

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Equilibrium moisture %	16.19		
Ash %	6.25	7.46	
Volatile %	27.67	33.01	35.67
Fixed carbon %	49.89	59.53	64.33

Ultimate:			
Carbon %	58.78	70.14	75.79
Hydrogen %	2.71	3.23	3.49
Sulphur (Pyritic) %	(0.07)	(0.08)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.39)	(0.47)	(0.51)
Total %	0.46	0.55	-
Nitrogen %	1.16	1.38	1.49
Ash %	6.25	7.46	-
Oxygen, by difference %	14.45	17.24	18.63

Heating value:			
	MJ/kg	21.86	26.09
	kcal/kg	5222	6231
	Btu/lb	9399	11215

 Hardgrove grindability index 135

Free swelling index (FSI) N/A

Moisture (as rec'd)
 Inherent %
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1371	1402
Spherical °C	1457	1482+
Hemispherical °C	1477	1482+
Fluid °C	1482+	1482+

 Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.

Line Creek Mine; No. 4 Seam (thermal) 1852 bench; Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Mine (surface)
5534000 N 659800 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3917-84

Ash analysis, per cent:

SiO ₂	47.68
Al ₂ O ₃	30.38
Fe ₂ O ₃	3.85
Mn ₃ O ₄	-
TiO ₂	1.43
P ₂ O ₅	0.71
CaO	7.60
MgO	1.51
S ₂ O ₃	4.90
Na ₂ O	0.06
K ₂ O	0.22
SrO	0.21
BaO	0.38
Loss on fusion (LOF)	0.75

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	20
F	93.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1846 m

CROWS NEST RESOURCES LTD.

Line Creek Mine; No. 7 Seam (met) 1846 bench; Elk Valley Coalfield
Sparwood, British Columbia

 Sampling date 15-08-84
 Sampling location Mine (surface)
 5534000N 659600 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3918-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.24		
Ash %	23.49	23.78	
Volatile %	20.10	20.35	26.70
Fixed carbon %	55.18	55.87	73.30

Ultimate:			
Carbon %	65.54	66.36	87.06
Hydrogen %	3.78	3.83	5.02
Sulphur (Pyritic) %	(0.08)	(0.08)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.36)	(0.36)	(0.48)
Total %	0.43	0.44	-
Nitrogen %	1.25	1.27	1.67
Ash %	23.49	23.78	-
Oxygen, by difference %	4.27	4.32	5.67

Heating values:			
	MJ/kg	26.01	26.33
	kcal/kg	6212	6289
	Btu/lb	11181	11321
			34.55
			8252
			14853

Hardgrove grindability index 79

Free swelling index (FSI) 2.0

Moisture (as rec'd)
 Inherent % 0.88
 Adherent % 0.36

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1482+	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.

Line Creek Mine; No. 7 Seam (met) 1846 bench; Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Mine (surface)
5534000N 659600 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3918-84

Ash analysis, per cent:

SiO ₂	61.20
Al ₂ O ₃	27.55
Fe ₂ O ₃	3.03
Mn ₃ O ₄	--
TiO ₂	1.61
P ₂ O ₅	1.50
CaO	1.81
MgO	0.59
SO ₃	0.46
Na ₂ O	0.07
K ₂ O	1.20
SrO	0.08
BaO	0.40
Loss on fusion (LOF)	0.07

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	40
F	343.
Br	--
As	--
Se	--

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1845 m

CROWS NEST RESOURCES LTD.
Line Creek Mine; No. 9 Seam (thermal); Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Mine (surface)
5533800 N 659500 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3920-84

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.94		
Ash %	29.01	29.59	
Volatile %	16.42	16.75	23.79
Fixed carbon %	52.62	53.66	76.21

Ultimate:			
Carbon %	60.80	62.00	88.06
Hydrogen %	3.33	3.40	4.83
Sulphur (Pyritic) %	(0.05)	(0.05)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.27)	(0.27)	(0.39)
Total %	0.31	0.32	-
Nitrogen %	0.87	0.89	1.26
Ash %	29.01	29.59	-
Oxygen, by difference %	3.73	3.80	5.40

Heating value:			
	MJ/kg	24.21	24.69
	kcal/kg	5782	5897
	Btu/lb	10408	10614
			35.06
			8375
			15075

Hardgrove grindability index 71

Free swelling index (FSI) 1.5

Moisture (as rec'd)

Inherent %	0.44
Adherent %	1.50

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1482+	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.
Line Creek Mine; No. 9 Seam (thermal); Elk Valley Coalfield
Sparwood, British Columbia

Sampling date	15-08-84
Sampling location	Mine (surface) 5533800 N 659500 E

Product name	Channel Sample
Screen opening ,mm (Screen opening ,in)	

ERL number	3920-84
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Ash analysis, per cent:

SiO ₂	72.88
Al ₂ O ₃	23.41
Fe ₂ O ₃	0.61
Mn ₃ O ₄	-
TiO ₂	1.47
P ₂ O ₅	-
CaO	0.03
MgO	0.58
SO ₃	0.40
Na ₂ O	0.05
K ₂ O	0.55
SrO	0.01
BaO	0.16
Loss on fusion (LOF)	0.12

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	40
F	79.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1846 m

CROWS NEST RESOURCES LTD.

Line Creek Mine; No. 10A Seam (met) 1846 bench; Elk Valley Coalfield
Sparwood, British Columbia

 Sampling date 15-08-84
 Sampling location Mine (surface)
 5533900 N 659400 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3921-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	0.75		
Ash %	22.71	22.88	
Volatile %	19.94	20.09	26.05
Fixed carbon %	56.60	57.03	73.95

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	67.66	68.17	88.39
Hydrogen %	3.97	4.00	5.19
Sulphur (Pyritic) %	(0.09)	(0.09)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.15)	(0.15)	(0.20)
Total %	0.24	0.24	-
Nitrogen %	1.17	1.18	1.53
Ash %	22.71	22.88	-
Oxygen, by difference %	3.50	3.53	4.58

Heating value:	MJ/kg	Dry	Dry Ash Free
	27.03	27.24	35.32
	kcal/kg 6457	6506	8436
	Btu/lb 11622	11710	15184

 Hardgrove grindability index 76

Free swelling index (FSI) 5.0

Moisture (as rec'd)
 Inherent % 0.47
 Adherent % 0.28

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1482+	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

 Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.

Line Creek Mine; No. 10A Seam (met) 1846 bench; Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Mine (surface)
5533900 N 659400 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3921-84

Ash analysis, per cent:

SiO ₂	60.87
Al ₂ O ₃	31.57
Fe ₂ O ₃	1.20
Mn ₃ O ₄	-
TiO ₂	1.48
P ₂ O ₅	-
CaO	0.15
MgO	0.73
SO ₃	0.58
Na ₂ O	0.08
K ₂ O	1.68
SrO	0.04
BaO	-
Loss on fusion (LOF)	0.24

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	30
F	147.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1846 m

CROWS NEST RESOURCES LTD.

Line Creek Mine; No. 6 Seam (met) 1846 bench; Elk Valley Coalfield
Sparwood, British Columbia

 Sampling date 15-08-84
 Sampling location Mine (surface)
 5534300 N 659700 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3922-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	% 0.80		
Ash	% 15.67	15.80	
Volatile	% 22.19	22.37	26.57
Fixed carbon	% 61.34	61.83	73.43

Ultimate:			
Carbon	% 73.37	73.96	87.84
Hydrogen	% 4.01	4.04	4.80
Sulphur (Pyritic)	% (0.18)	(0.18)	-
(Sulphate)	% (0.00)	(0.00)	-
(Organic)	% (0.47)	(0.47)	(0.56)
Total	% 0.64	0.65	-
Nitrogen	% 1.30	1.31	1.56
Ash	% 15.67	15.80	-
Oxygen, by difference	% 4.21	4.24	5.04

Heating value:			
	MJ/kg	29.33	29.56
	kcal/kg	7005	7061
	Btu/lb	12608	12710
			35.11
			8386
			15095

Hardgrove grindability index 83

Free swelling index (FSI) 2.5

Moisture (as rec'd)
 Inherent

Adherent	% 0.54
	% 0.26

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C 1091	1249
Spherical	°C 1271	1366
Hemispherical	°C 1343	1382
Fluid	°C 1371	1427

Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.

Line Creek Mine; No. 6 Seam (met) 1846 bench; Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Mine (surface)
5534300 N 659700 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3922-84

Ash analysis, per cent:

SiO ₂	49.65
Al ₂ O ₃	19.30
Fe ₂ O ₃	16.73
Mn ₃ O ₄	-
TiO ₂	1.07
P ₂ O ₅	2.51
CaO	3.69
MgO	0.67
SO ₃	1.88
Na ₂ O	0.09
K ₂ O	0.95
SrO	0.04
BaO	0.25
Loss on fusion (LOF)	0.69

Volatile trace element analysis ug/g (ppm)

Hg	0.03
Cl	40
F	277.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1846 m

CROWS NEST RESOURCES LTD.
Line Creek Mine; No. 10B Seam (met); Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Mine (surface)
5533800 N 659500 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3923-84

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	0.41		
Ash %	18.26	18.34	
Volatile %	18.76	18.84	23.07
Fixed carbon %	62.56	62.82	76.93

Ultimate:			
Carbon %	72.76	73.06	89.47
Hydrogen %	3.89	3.91	4.79
Sulphur (Pyritic) %	(0.04)	(0.04)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.40)	(0.40)	(0.49)
Total %	0.44	0.44	-
Nitrogen %	1.03	1.03	1.26
Ash %	18.26	18.34	-
Oxygen, by difference %	3.21	3.22	3.94

Heating value:			
	MJ/kg	29.03	29.14
	kcal/kg	6933	6961
	Btu/lb	12479	12530
			35.69
			8525
			15344

Hardgrove grindability index 74

Free swelling index (FSI) 3.0

Moisture (as rec'd)
Inherent % 0.36
Adherent % 0.05

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1482+	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.
 Line Creek Mine; No. 10B Seam (met); Elk Valley Coalfield
 Sparwood, British Columbia

Sampling date 15-08-84
 Sampling location Mine (surface)
 5533800 N 659500 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3923-84

Ash analysis, per cent:

SiO ₂	65.94
Al ₂ O ₃	29.53
Fe ₂ O ₃	0.63
Mn ₃ O ₄	-
TiO ₂	1.63
P ₂ O ₅	0.27
CaO	0.41
MgO	0.10
SO ₃	-
Na ₂ O	0.02
K ₂ O	0.31
SrO	0.03
BaO	0.30
Loss on fusion (LOF)	1.05

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	40
F	78.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1846 m

CROWS NEST RESOURCES LTD.
Line Creek Mine; No. 8 Seam (met); Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Mine (surface)
5534200 N 659400 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3924-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture	%	0.89	
Ash	%	26.56	26.80
Volatile	%	18.90	19.07
Fixed carbon	%	53.65	54.13
			73.95

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon	%	63.76	64.33
Hydrogen	%	3.53	3.56
Sulphur (Pyritic)	%	(0.09)	(0.09)
(Sulphate)	%	(0.00)	(0.00)
(Organic)	%	(0.30)	(0.30)
Total	%	0.39	0.39
			(0.41)
			-
Nitrogen	%	1.09	1.10
Ash	%	26.56	26.80
Oxygen, by difference	%	3.79	3.82
			5.22

Heating value:	MJ/kg	25.45	25.68	35.08
	kcal/kg	6078	6133	8378
	Btu/lb	10941	11039	15081

Hardgrove grindability index 82

Free swelling index (FSI) 2.0

Moisture (as rec'd)

Inherent	%	0.68
Adherent	%	0.21

Ash Fusibility temperature	Reducing	Oxidizing
Initial	°C	1402
Spherical	°C	1482+
Hemispherical	°C	1482+
Fluid	°C	1482+
		1468
		1482+
		1482+
		1482+

Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.
Line Creek Mine; No. 8 Seam (met); Elk Valley Coalfield
Sparwood, British Columbia

Sampling date	15-08-84
Sampling location	Mine (surface) 5534200 N 659400 E

Product name	Channel Sample
Screen opening ,mm (Screen opening ,in)	

ERL number	3924-84
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Ash analysis, per cent:

SiO ₂	62.37
Al ₂ O ₃	25.12
Fe ₂ O ₃	0.91
Mn ₃ O ₄	-
TiO ₂	1.37
P ₂ O ₅	2.08
CaO	2.98
MgO	0.38
SO ₃	-
Na ₂ O	0.09
K ₂ O	1.79
SrO	0.04
BaO	0.19
Loss on fusion (LOF)	0.53

Volatile trace element analysis ug/g (ppm)

Hg	0.11
Cl	40
F	501.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1834 m

CROWS NEST RESOURCES LTD.
Line Creek Mine; No. 9 Seam (met); Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Mine (surface)
5534200 N 659400 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3925-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	0.59		
Ash %	17.80	17.91	
Volatile %	20.06	20.18	24.58
Fixed carbon %	61.55	61.91	75.42

Ultimate:			
Carbon %	71.92	72.35	88.13
Hydrogen %	3.96	3.98	4.85
Sulphur (Pyritic) %	(0.03)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.34)	(0.34)	(0.42)
Total %	0.37	0.37	-
Nitrogen %	1.11	1.12	1.36
Ash %	17.80	17.91	-
Oxygen, by difference %	4.24	4.27	5.20

Heating value:			
	MJ/kg	28.88	29.05
	kcal/kg	6898	6939
	Btu/lb	12416	12490

Hardgrove grindability index 82

Free swelling index (FSI) 5.0

Moisture (as rec'd)
Inherent % 0.46
Adherent % 0.13

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1482+	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.
 Line Creek Mine; No. 9 Seam (met); Elk Valley Coalfield
 Sparwood, British Columbia

Sampling date 15-08-84
 Sampling location Mine (surface)
 5534200 N 659400 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3925-84

Ash analysis, per cent:

SiO ₂	60.80
Al ₂ O ₃	34.59
Fe ₂ O ₃	0.57
Mn ₃ O ₄	-
TiO ₂	1.70
P ₂ O ₅	0.40
CaO	0.42
MgO	-
SO ₃	-
Na ₂ O	0.05
K ₂ O	0.17
SrO	0.07
BaO	0.23
Loss on fusion (LOF)	0.43

Volatile trace element analysis ug/g (ppm)

Hg	0.07
Cl	50
F	97.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

CROWS NEST RESOURCES LTD.

Line Creek Mine; No. 10A Seam (thermal) 1858 bench; Elk Valley Coalfield
Sparwood, British Columbia

 Sampling date 15-08-84
 Sampling location Mine (surface)
 5533700 N 659500 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 3926-84

Rank of coal Low-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	0.32		
Ash %	24.41	24.49	
Volatile %	17.74	17.80	23.57
Fixed carbon %	57.53	57.71	76.43

Ultimate:			
Carbon %	66.70	66.91	88.61
Hydrogen %	3.52	3.53	4.67
Sulphur (Pyritic) %	(0.05)	(0.05)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.34)	(0.34)	(0.45)
Total %	0.39	0.39	-
Nitrogen %	0.87	0.87	1.15
Ash %	24.41	24.49	-
Oxygen, by difference %	3.80	3.81	5.05

Heating value:			
	MJ/kg	26.53	26.62
	kcal/kg	6337	6358
	Btu/lb	11407	11444

 Hardgrove grindability index 71

Free swelling index (FSI) 1.0

Moisture (as rec'd)
 Inherent % 0.32
 Adherent %

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1482+	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

 Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.

Line Creek Mine; No. 10A Seam (thermal) 1858 bench; Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Mine (surface)
5533700 N 659500 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 3926-84

Ash analysis, per cent:

SiO ₂	68.27
Al ₂ O ₃	25.68
Fe ₂ O ₃	0.55
Mn ₃ O ₄	-
TiO ₂	1.51
P ₂ O ₅	0.23
CaO	0.24
MgO	0.12
SO ₃	-
Na ₂ O	0.02
K ₂ O	0.38
SrO	0.04
BaO	0.30
Loss on fusion (LOF)	3.15

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	40
F	79.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1858 m

CROWS NEST RESOURCES LTD.
Line Creek Mine; Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Preparation Plant

Product name Raw (thermal) Coal Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 3928-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.65		
Ash %	18.54	19.05	
Volatile %	19.07	19.59	24.20
Fixed carbon %	59.73	61.36	75.80

Ultimate:			
Carbon %	68.60	70.47	87.05
Hydrogen %	3.58	3.68	4.55
Sulphur (Pyritic) %	(0.07)	(0.07)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.17)	(0.17)	(0.21)
Total %	0.23	0.24	-
Nitrogen %	1.03	1.06	1.31
Ash %	18.54	19.05	-
Oxygen, by difference %	5.35	5.50	6.79

Heating value:			
	MJ/kg	27.03	27.77
	kcal/kg	6456	6632
	Btu/lb	11620	11937

Hardgrove grindability index 75

Free swelling index (FSI) 1.5

Moisture (as rec'd)

Inherent %	1.12
Adherent %	1.53

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1482+	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.
Line Creek Mine; Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Preparation Plant

Product name Raw (thermal) Coal Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 3928-84

Ash analysis, per cent:

SiO ₂	57.58
Al ₂ O ₃	31.81
Fe ₂ O ₃	3.48
Mn ₃ O ₄	-
TiO ₂	1.52
P ₂ O ₅	0.68
CaO	1.01
MgO	0.43
SO ₃	0.15
Na ₂ O	0.11
K ₂ O	0.93
SrO	0.04
BaO	0.24
Loss on fusion (LOF)	0.62

Volatile trace element analysis ug/g (ppm)

Hg	0.09
Cl	30
F	169.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

CROWS NEST RESOURCES LTD.
Line Creek Mine; Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Preparation Plant
Sampled from stockpile

Product name Clean Coal (thermal)
Screen opening ,mm
(Screen opening ,in)

ERL number 3919-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.59		
Ash %	16.87	17.32	
Volatile %	20.09	20.62	24.94
Fixed carbon %	60.45	62.06	75.06

Ultimate:			
Carbon %	69.35	71.20	86.12
Hydrogen %	3.68	3.78	4.57
Sulphur (Pyritic) %	(0.07)	(0.07)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.30)	(0.30)	(0.37)
Total %	0.36	0.37	-
Nitrogen %	1.05	1.08	1.31
Ash %	16.87	17.32	-
Oxygen, by difference %	6.09	6.25	7.56

Heating value:			
	MJ/kg	27.62	28.35
	kcal/kg	6596	6772
	Btu/lb	11873	12189
			34.29
			8190
			14742

Hardgrove grindability index 77

Free swelling index (FSI) 1.5

Moisture (as rec'd)
Inherent % 1.32
Adherent % 1.27

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1482+	1482+
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.
Line Creek Mine; Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Preparation Plant
Sampled from stockpile

Product name Clean Coal (thermal)
Screen opening ,mm
(Screen opening ,in)

ERL number 3919-84

Ash analysis, per cent:

SiO ₂	60.02
Al ₂ O ₃	30.12
Fe ₂ O ₃	2.86
Mn ₃ O ₄	-
TiO ₂	1.57
P ₂ O ₅	0.46
CaO	0.90
MgO	0.67
SO ₃	0.81
Na ₂ O	0.08
K ₂ O	0.88
SrO	0.05
BaO	0.17
Loss on fusion (LOF)	0.28

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	40
F	145.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

CROWS NEST RESOURCES LTD.
Line Creek Mine; Elk Valley Coalfield
Sparwood, British Columbia

Sampling date 15-08-84
Sampling location Preparation Plant
Sampled from stockpile

Product name Clean Coal (met.)
Screen opening ,mm Minus 25
(Screen opening ,in) Minus 1

ERL number 3927-84

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.84		
Ash %	8.71	8.87	
Volatile %	22.39	22.81	25.03
Fixed carbon %	67.06	68.32	74.97

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	78.67	80.15	87.95
Hydrogen %	4.33	4.41	4.84
Sulphur (Pyritic) %	(0.03)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.43)	(0.44)	(0.49)
Total %	0.46	0.47	-
Nitrogen %	1.44	1.47	1.61
Ash %	8.71	8.87	-
Oxygen, by difference %	4.54	4.63	5.08

Heating value:	MJ/kg	31.86	32.46	35.62
	kcal/kg	7609	7752	8507
	Btu/lb	13697	13954	15312

Hardgrove grindability index 83

Free swelling index (FSI) 5.5

Moisture (as rec'd)

Inherent %	0.70
Adherent %	1.14

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1482+	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes: Crows Nest Res. Ltd. is a subsidiary of Shell Can. Resources

CROWS NEST RESOURCES LTD.
Line Creek Mine; Elk Valley Coalfield
Sparwood, British Columbia

Sampling date	15-08-84
Sampling location	Preparation Plant Sampled from stockpile
Product name	Clean Coal (met.)
Screen opening ,mm (Screen opening ,in)	Minus 25 Minus 1
ERL number	3927-84

Ash analysis, per cent:

SiO ₂	58.64
Al ₂ O ₃	29.76
Fe ₂ O ₃	1.97
Mn ₃ O ₄	-
TiO ₂	1.93
P ₂ O ₅	1.37
CaO	1.61
MgO	0.42
SO ₃	0.25
Na ₂ O	0.09
K ₂ O	0.61
SrO	0.16
BaO	0.38
Loss on fusion (LOF)	0.48

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	30
F	112.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

TECK CORPORATION
Bullmoose Mine; A-2 (met) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Mine (surface)
109+360 N 595+860 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2047-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.32		
Ash %	13.05	13.36	
Volatile %	21.95	22.47	25.93
Fixed carbon %	62.68	64.17	74.07

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	75.46	77.25	89.16
Hydrogen %	3.98	4.07	4.70
Sulphur (Pyritic) %	(0.07)	(0.07)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.34)	(0.35)	(0.41)
Total %	0.41	0.42	-
Nitrogen %	1.10	1.13	1.30
Ash %	13.05	13.36	-
Oxygen, by difference %	3.68	3.77	4.35

Heating value:	MJ/kg	30.27	30.99	35.77
	kcal/kg	7229	7401	8542
	Btu/lb	13013	13322	15376

Hardgrove grindability index 77

Free swelling index (FSI) 5.0

Moisture (as rec'd)
Inherent % 0.63
Adherent % 1.69

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1154	1246
Spherical °C	1229	1357
Hemispherical °C	1393	1371
Fluid °C	1482+	1479

Notes:

TECK CORPORATION
Bullmoose Mine; A-2 (met) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date	13-09-84
Sampling location	Mine (surface) 109+360 N 595+860 E

Product name	Channel Sample
Screen opening ,mm (Screen opening ,in)	

ERL number	2047-85
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Ash analysis, per cent:

SiO ₂	59.53
Al ₂ O ₃	16.64
Fe ₂ O ₃	9.16
Mn ₃ O ₄	-
TiO ₂	1.45
P ₂ O ₅	0.10
CaO	3.29
MgO	1.70
SO ₃	2.90
Na ₂ O	0.49
K ₂ O	1.20
SrO	0.05
BaO	0.98
Loss on fusion (LOF)	0.80

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	160
F	55.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1337 m

TECK CORPORATION
Bullmoose Mine; No. 6, (met) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Mine (surface)
108+910 N 596+215 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2048-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	5.38		
Ash %	20.98	22.17	
Volatile %	20.76	21.94	28.19
Fixed carbon %	52.88	55.89	71.81

Ultimate:			
Carbon %	64.52	68.19	87.61
Hydrogen %	3.58	3.78	4.86
Sulphur (Pyritic) %	(0.09)	(0.09)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.31)	(0.32)	(0.41)
Total %	0.39	0.41	-
Nitrogen %	1.07	1.13	1.45
Ash %	20.98	22.17	-
Oxygen, by difference %	4.09	4.32	5.55

Heating value:			
	MJ/kg	26.01	27.49
	kcal/kg	6213	6566
	Btu/lb	11183	11819
			15186

Hardgrove grindability index 77

Free swelling index (FSI) 5.0

Moisture (as rec'd)
Inherent % 0.72
Adherent % 4.66

Ash Fusibility temperature		Reducing	Oxidizing
Initial °C		1318	1338
Spherical °C		1482+	1482+
Hemispherical °C		1482+	1482+
Fluid °C		1482+	1482+

Notes:

TECK CORPORATION
Bullmoose Mine; No. 6 (met) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Mine (surface)
108+910 N 596+215 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2048-85

Ash analysis, per cent:

SiO ₂	60.71
Al ₂ O ₃	22.71
Fe ₂ O ₃	1.91
Mn ₃ O ₄	-
TiO ₂	1.76
P ₂ O ₅	1.59
CaO	2.60
MgO	1.20
SO ₃	1.14
Na ₂ O	0.40
K ₂ O	1.76
SrO	0.22
BaO	1.11
Loss on fusion (LOF)	0.58

Volatile trace element analysis ug/g (ppm)

Hg	0.10
Cl	110
F	200.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1411 m

TECK CORPORATION
Bullmoose Mine; B (thermal) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Mine (surface)
109+400 N 595+860 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2050-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	4.02		
Ash %	4.36	4.54	
Volatile %	25.06	26.11	27.35
Fixed carbon %	66.56	69.35	72.65

Ultimate:			
Carbon %	79.76	83.10	87.05
Hydrogen %	4.38	4.56	4.78
Sulphur (Pyritic) %	(0.03)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.17)	(0.17)	(0.18)
Total %	0.20	0.21	-
Nitrogen %	1.26	1.31	1.37
Ash %	4.36	4.54	-
Oxygen, by difference %	6.03	6.28	6.58

Heating value:			
	MJ/kg	31.89	33.23
	kcal/kg	7617	7936
	Btu/lb	13711	14285

Hardgrove grindability index 82

Free swelling index (FSI) 1.0

Moisture (as rec'd)	
Inherent %	2.42
Adherent %	1.60

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1232	1274
Spherical °C	1282	1357
Hemispherical °C	1343	1421
Fluid °C	1377	1463

Notes:

TECK CORPORATION
Bullmoose Mine; B (thermal) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Mine (surface)
109+400 N 595+860 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2050-85

Ash analysis, per cent:

SiO ₂	41.61
Al ₂ O ₃	26.86
Fe ₂ O ₃	8.63
Mn ₃ O ₄	-
TiO ₂	2.61
F ₂ O ₅	0.59
CaO	7.78
MgO	1.37
SO ₃	2.87
Na ₂ O	2.30
K ₂ O	0.48
SrO	0.16
BaO	3.27
Loss on fusion (LOF)	0.74

Volatile trace element analysis ug/g (ppm)

Hg	0.05
Cl	150
F	24.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes: Sample Elevation = 1437 m

TECK CORPORATION
Bullmoose Mine; E (met) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

 Sampling date 13-09-84
 Sampling location Mine (surface)
 108+425 N 595+970 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2052-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	5.93		
Ash %	18.31	19.46	
Volatile %	24.67	26.23	32.57
Fixed carbon %	51.09	54.31	67.43

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	65.87	70.02	86.94
Hydrogen %	3.88	4.12	5.12
Sulphur (Pyritic) %	(0.16)	(0.17)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.32)	(0.34)	(0.43)
Total %	0.49	0.52	-
Nitrogen %	1.09	1.16	1.44
Ash %	18.31	19.46	-
Oxygen, by difference %	4.44	4.72	5.86

Heating value:	MJ/kg	26.69	28.38	35.23
	kcal/kg	6376	6778	8415
	Btu/lb	11476	12200	15148

 Hardgrove grindability index 72

Free swelling index (FSI) 7.0

Moisture (as rec'd)
 Inherent % 0.93
 Adherent % 5.00

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1285	1368
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

 Notes:

TECK CORPORATION
 Bullmoose Mine; E (met) Seam; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 13-09-84
 Sampling location Mine (surface)
 108+425 N 595+970 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2052-85

Ash analysis, per cent:

SiO ₂	58.70
Al ₂ O ₃	23.34
Fe ₂ O ₃	2.74
Mn ₃ O ₄	-
TiO ₂	1.13
P ₂ O ₅	0.77
CaO	2.31
MgO	1.70
SO ₃	2.19
Na ₂ O	0.30
K ₂ O	2.68
SrO	0.14
BaO	0.71
Loss on fusion (LOF)	1.72

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	90
F	191.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1499 m

TECK CORPORATION
Bullmoose Mine; A-1 (met) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Mine (surface)
109+295 N 596+110 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2053-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	2.50		
Ash %	6.52	6.69	
Volatile %	22.78	23.36	25.03
Fixed carbon %	68.20	69.95	74.97

Ultimate:			
Carbon %	81.34	83.42	89.40
Hydrogen %	4.32	4.43	4.75
Sulphur (Pyritic) %	(0.03)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.28)	(0.29)	(0.31)
Total %	0.31	0.32	-
Nitrogen %	1.19	1.22	1.31
Ash %	6.52	6.69	-
Oxygen, by difference %	3.82	3.92	4.20

Heating value:	MJ/kg		
	32.90	33.74	36.16
	kcal/kg 7858	8059	8637
	Btu/lb 14144	14506	15546

Hardgrove grindability index 76

Free swelling index (FSI) 5.0

Moisture (as rec'd)
Inherent % 0.66
Adherent % 1.84

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1179	1232
Spherical °C	1282	1321
Hemispherical °C	1404	1402
Fluid °C	1482+	1482+

Notes:

TECK CORPORATION
 Bullmoose Mine; A-1 (met) Seam; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 13-09-84
 Sampling location Mine (surface)
 109+295 N 596+110 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2053-85

Ash analysis, per cent:

SiO ₂	58.34
Al ₂ O ₃	16.38
Fe ₂ O ₃	6.19
Mn ₃ O ₄	-
TiO ₂	1.79
P ₂ O ₅	0.10
CaO	4.42
MgO	2.15
SO ₃	4.53
Na ₂ O	0.94
K ₂ O	0.35
SrO	0.11
BaO	1.22
Loss on fusion (LOF)	1.83

Volatile trace element analysis ug/g (ppm)

Hg	0.03
Cl	160
F	24.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1338 m

TECK CORPORATION
Bullmoose Mine; A-1 (thermal) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Mine (surface)
109+375 N 595+960 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2054-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.17		
Ash %	5.47	5.53	
Volatile %	23.26	23.53	24.91
Fixed carbon %	70.11	70.94	75.09

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	82.83	83.81	88.72
Hydrogen %	4.39	4.44	4.70
Sulphur (Pyritic) %	(0.02)	(0.02)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.28)	(0.28)	(0.30)
Total %	0.30	0.30	-
Nitrogen %	1.24	1.25	1.32
Ash %	5.47	5.53	-
Oxygen, by difference %	4.62	4.67	4.94

Heating values:	MJ/kg	33.49	33.88	35.87
	kcal/kg	7998	8093	8567
	Btu/lb	14397	14567	15420

Hardgrove grindability index 72

Free swelling index (FSI) 2.5

Moisture (as rec'd)

Inherent %	0.95
Adherent %	0.22

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1218	1246
Spherical °C	1416	1443
Hemispherical °C	1482+	1471
Fluid °C	1482+	1482+

Notes:

TECK CORPORATION
 Bullmoose Mine; A-1 (thermal) Seam; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 13-09-84
 Sampling location Mine (surface)
 109+375 N 595+960 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2054-85

Ash analysis, per cent:

SiO ₂	65.58
Al ₂ O ₃	15.52
Fe ₂ O ₃	3.87
Mn ₃ O ₄	-
TiO ₂	1.61
P ₂ O ₅	0.03
CaO	2.78
MgO	1.12
SO ₃	3.21
Na ₂ O	1.02
K ₂ O	0.02
SrO	0.11
BaO	1.28
Loss on fusion (LOF)	1.83

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	310
F	15.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1334 m

TECK CORPORATION
Bullmoose Mine; B (met) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Mine (surface)
109+190 N 596+210 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2055-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.81		
Ash %	7.35	7.49	
Volatile %	25.82	26.30	28.43
Fixed carbon %	65.01	66.21	71.57

Ultimate:			
Carbon %	80.13	81.61	88.22
Hydrogen %	4.41	4.49	4.85
Sulphur (Pyritic) %	(0.03)	(0.03)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.13)	(0.13)	(0.14)
Total %	0.16	0.16	-
Nitrogen %	1.25	1.27	1.37
Ash %	7.35	7.49	-
Oxygen, by difference %	4.89	4.98	5.38

Heating value:			
	MJ/kg	32.12	32.71
	kcal/kg	7672	7813
	Btu/lb	13809	14064
			15203

Hardgrove grindability index 81

Free swelling index (FSI) 6.5

Moisture (as rec'd)
Inherent % 0.74
Adherent % 1.07

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1185	1213
Spherical °C	1238	1241
Hemispherical °C	1252	1246
Fluid °C	1310	1293

Notes:

TECK CORPORATION
Bullmoose Mine; E (met) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Mine (surface)
109+190 N 596+210 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2055-85

Ash analysis, per cent:

SiO ₂	30.10
Al ₂ O ₃	15.21
Fe ₂ O ₃	5.27
Mn ₃ O ₄	-
TiO ₂	1.80
P ₂ O ₅	0.28
CaO	25.61
MgO	3.61
SO ₃	5.04
Na ₂ O	2.28
K ₂ O	0.16
SrO	0.26
BaO	2.68
Loss on fusion (LOF)	7.36

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	230
F	20.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

TECK CORPORATION
Bullmoose Mine; A-2 (thermal) Seam; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Mine (surface)
109+375 N 595+960 E

Product name Channel Sample
Screen opening ,mm
(Screen opening ,in)

ERL number 2056-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.26		
Ash %	9.92	10.05	
Volatile %	23.64	23.94	26.61
Fixed carbon %	65.18	66.01	73.39

Ultimate:			
Carbon %	79.13	80.14	89.09
Hydrogen %	4.37	4.43	4.92
Sulphur (Pyritic) %	(0.04)	(0.04)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.36)	(0.36)	(0.40)
Total %	0.40	0.41	-
Nitrogen %	1.10	1.11	1.23
Ash %	9.92	10.05	-
Oxygen, by difference %	3.81	3.86	4.29

Heating value:			
	MJ/kg	31.84	32.25
	kcal/kg	7605	7702
	Btu/lb	13689	13863
			35.85
			8562
			15412

Hardgrove grindability index 77

Free swelling index (FSI) 6.5

Moisture (as rec'd)		
Inherent %	0.72	
Adherent %	0.54	

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1299	1399
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes:

TECK CORPORATION
 Bullmoose Mine; A-2 (thermal) Seam; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 13-09-84
 Sampling location Mine (surface)
 109+375 N 595+960 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2056-85

Ash analysis, per cent:

SiO ₂	60.37
Al ₂ O ₃	23.47
Fe ₂ O ₃	3.03
Mn ₃ O ₄	-
TiO ₂	1.46
P ₂ O ₅	0.28
CaO	2.75
MgO	1.21
SO ₃	2.43
Na ₂ O	0.61
K ₂ O	0.48
SrO	0.12
BaO	1.19
Loss on fusion (LOF)	1.19

Volatile trace element analysis ug/g (ppm)

Hg	0.04
Cl	250
F	41.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1334 m

TECK CORPORATION
Bullmoose Mine; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Preparation Plant

Product name Raw Coal Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 2049-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	5.55		
Ash %	25.98	27.51	
Volatile %	20.79	22.01	30.36
Fixed carbon %	47.68	50.48	69.64

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	59.33	62.82	86.66
Hydrogen %	3.44	3.64	5.02
Sulphur (Pyritic) %	(0.13)	(0.14)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.16)	(0.17)	(0.24)
Total %	0.30	0.32	-
Nitrogen %	0.92	0.97	1.34
Ash %	25.98	27.51	-
Oxygen, by difference %	4.48	4.74	6.54

Heating value:	MJ/kg	Dry	Dry Ash Free
	23.80	25.20	34.76
	kcal/kg 5685	6019	8303
	Btu/lb 10233	10834	14946

Hardgrove grindability index 75

Free swelling index (FSI) 5.5

Moisture (as rec'd)	%
Inherent	0.76
Adherent	4.79

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1332	1343
Spherical	1482+	1482+
Hemispherical	1482+	1482+
Fluid	1482+	1482+

Notes:

TECK CORPORATION
Bullmoose Mine; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Preparation Plant

Product name Raw Coal Feed
Screen opening ,mm
(Screen opening ,in)

ERL number 2049-85

Ash analysis, per cent:

SiO ₂	60.39
Al ₂ O ₃	22.85
Fe ₂ O ₃	2.21
Mn ₃ O ₄	-
TiO ₂	1.30
P ₂ O ₅	0.43
CaO	3.08
MgO	1.45
SO ₃	2.19
Na ₂ O	0.46
K ₂ O	1.72
SrO	0.08
BaO	0.72
Loss on fusion (LOF)	0.91

Volatile trace element analysis ug/g (ppm)

Hg	0.09
Cl	100
F	197.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

TECK CORPORATION
Bullmoose Mine; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Preparation Plant

Product name Clean Coal
Screen opening ,mm Minus 51
(Screen opening ,in) Minus 2

ERL number 2051-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	5.25		
Ash %	9.25	9.76	
Volatile %	24.40	25.75	28.54
Fixed carbon %	61.11	64.49	71.46

Ultimate:			
Carbon %	75.63	79.82	88.45
Hydrogen %	4.21	4.44	4.92
Sulphur (Pyritic) %	(0.05)	(0.05)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.32)	(0.33)	(0.37)
Total %	0.36	0.38	-
Nitrogen %	1.20	1.27	1.41
Ash %	9.25	9.76	-
Oxygen, by difference %	4.10	4.33	4.80

Heating value:			
	MJ/kg	30.55	32.24
	kcal/kg	7296	7699
	Btu/lb	13132	13859

Hardgrove grindability index 79

Free swelling index (FSI) 7.0

Moisture (as rec'd)

Inherent %	0.74
Adherent %	4.51

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1207	1254
Spherical °C	1277	1346
Hemispherical °C	1379	1391
Fluid °C	1454	1452

Notes:

TECK CORPORATION
Bullmoose Mine; Peace River Coalfield
Tumbler Ridge, British Columbia

Sampling date 13-09-84
Sampling location Preparation Plant

Product name Clean Coal
Screen opening ,mm Minus 51
(Screen opening ,in) Minus 2

ERL number 2051-85

Ash analysis, per cent:

SiO ₂	51.97
Al ₂ O ₃	21.43
Fe ₂ O ₃	4.51
Mn ₃ O ₄	-
TiO ₂	2.11
P ₂ O ₅	1.00
CaO	6.27
MgO	2.23
SO ₃	3.79
Na ₂ O	1.04
K ₂ O	0.69
SrO	0.17
BaO	1.49
Loss on fusion (LOF)	1.25

Volatile trace element analysis ug/g (ppm)

Hg	0.06
Cl	120
F	53.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
Sr
V
Mn
Cr

Notes:

DENISON MINES LTD.
 Quintette Mine; E (met) Seam; Peace River Coalfield
 Tumbler Ridge, British Columbia

 Sampling date 14-09-84
 Sampling location Mine (surface)
 6099105 N 615370 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2058-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.96		
Ash %	17.91	18.27	
Volatile %	22.65	23.10	28.26
Fixed carbon %	57.48	58.63	71.74

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	71.28	72.71	88.96
Hydrogen %	4.02	4.10	5.02
Sulphur (Pyritic) %	(0.10)	(0.10)	-
(Sulphate) %	(0.00)	(0.00)	-
(Organic) %	(0.21)	(0.21)	(0.26)
Total %	0.31	0.32	-
Nitrogen %	0.99	1.01	1.24
Ash %	17.91	18.27	-
Oxygen, by difference %	3.52	3.59	4.39

Heating value:	MJ/kg	28.66	29.24	35.77
	kcal/kg	6846	6983	8544
	Btu/lb	12323	12570	15380

 Hardgrove grindability index 77

Free swelling index (FSI) 7.0

Moisture (as rec'd)
 Inherent % 0.68
 Adherent % 1.28

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1310	1263
Spherical °C	1482+	1413
Hemispherical °C	1482+	1463
Fluid °C	1482+	1482+

 Notes: Top 2/3 of "E" Seam sampled (without parting)

DENISON MINES LTD.
 Quintette Mine; E (met) Seam; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 14-09-84
 Sampling location Mine (surface)
 6099105 N 615370 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2058-85

Ash analysis, per cent:

SiO ₂	59.85
Al ₂ O ₃	23.04
Fe ₂ O ₃	2.47
Mn ₃ O ₄	-
TiO ₂	1.13
P ₂ O ₅	0.25
CaO	3.69
MgO	1.28
SO ₃	2.70
Na ₂ O	0.62
K ₂ O	1.76
SrO	0.07
BaO	0.50
Loss on fusion (LOF)	1.05

Volatile trace element analysis ug/g (ppm)

Hg	0.02
Cl	110
F	175.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1676 m

DENISON MINES LTD.
 Quintette Mine; J (met) Seam; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 14-09-84
 Sampling location Mine (surface)
 6099050 N 615225 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2061-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	1.77		
Ash %	14.56	14.82	
Volatile %	22.85	23.26	27.31
Fixed carbon %	60.82	61.92	72.69

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	74.00	75.34	88.45
Hydrogen %	4.15	4.22	4.95
Sulphur (Pyritic) %	(0.05)	(0.05)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.21)	(0.21)	(0.25)
Total %	0.27	0.27	-
Nitrogen %	1.05	1.07	1.26
Ash %	14.56	14.82	-
Oxygen, by difference %	4.20	4.28	5.02

Heating value:	MJ/kg	Dry	Dry Ash Free
	29.74	30.28	35.55
	kcal/kg 7104	7232	8491
	Btu/lb 12787	13018	15283

Hardgrove grindability index 81

Free swelling index (FSI) 7.0

Moisture (as rec'd)
 Inherent % 0.66
 Adherent % 1.11

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1482+	1482+
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes:

DENISON MINES LTD.
 Quintette Mine; J (met) Seam; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 14-09-84
 Sampling location Mine (surface)
 6099050 N 615225 E

Product name Channel Sample
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2061-85

Ash analysis, per cent:

SiO ₂	50.85
Al ₂ O ₃	31.51
Fe ₂ O ₃	2.22
Mn ₃ O ₄	-
TiO ₂	1.37
P ₂ O ₅	0.18
CaO	4.00
MgO	1.38
SO ₃	3.29
Na ₂ O	0.54
K ₂ O	0.17
SrO	0.08
BaO	0.52
Loss on fusion (LOF)	1.51

Volatile trace element analysis ug/g (ppm)

Hg	0.13
Cl	70
F	51.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes: Sample Elevation = 1690 m

DENISON MINES LTD.
 Quintette Mine; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 14-09-84
 Sampling location Preparation Plant

Product name Raw Coal Feed (met)
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2057-85

Rank of coal Medium-volatile bituminous

Proximate analysis:		As Rec'd	Dry	Dry Ash Free
Moisture	%	4.82		
Ash	%	32.80	34.46	
Volatile	%	18.29	19.22	29.33
Fixed carbon	%	44.09	46.32	70.67

Ultimate:				
Carbon	%	54.93	57.71	88.05
Hydrogen	%	3.08	3.24	4.94
Sulphur (Pyritic)	%	(0.20)	(0.21)	-
(Sulphate)	%	(0.01)	(0.01)	-
(Organic)	%	(0.08)	(0.08)	(0.12)
Total	%	0.29	0.30	-
Nitrogen	%	0.72	0.76	1.16
Ash	%	32.80	34.46	-
Oxygen, by difference	%	3.36	3.53	5.39

Heating value:				
	MJ/kg	21.69	22.78	34.76
	kcal/kg	5179	5442	8303
	Btu/lb	9323	9795	14945

Hardgrove grindability index 77

Free swelling index (FSI) 3.0

Moisture (as rec'd)
 Inherent % 0.74
 Adherent % 4.08

Ash Fusibility temperature		Reducing	Oxidizing
Initial	°C	1252	1299
Spherical	°C	1416	1482+
Hemispherical	°C	1479	1482+
Fluid	°C	1482+	1482+

Notes:

DENISON MINES LTD.
 Quintette Mine; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 14-09-84
 Sampling location Preparation Plant

Product name Raw Coal Feed (met)
 Screen opening ,mm
 (Screen opening ,in)

ERL number 2057-85

Ash analysis, per cent:

SiO ₂	64.52
Al ₂ O ₃	18.53
Fe ₂ O ₃	2.70
Mn ₃ O ₄	-
TiO ₂	0.92
P ₂ O ₅	0.11
CaO	3.48
MgO	1.66
SO ₃	1.88
Na ₂ O	0.45
K ₂ O	2.69
SrO	0.04
BaO	0.34
Loss on fusion (LOF)	1.11

Volatile trace element analysis ug/g (ppm)

Hg	0.10
Cl	80
F	252.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

DENISON MINES LTD.
 Quintette Mine; Peace River Coalfield
 Tumbler Ridge, British Columbia

 Sampling date 14-09-84
 Sampling location Preparation Plant

Product name Clean Coal (thermal)
 Screen opening ,mm Minus 51
 (Screen opening ,in) Minus 2

ERL number 2059-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	6.80		
Ash %	11.88	12.75	
Volatile %	21.52	23.09	26.46
Fixed carbon %	59.79	64.16	73.54

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	70.66	75.82	86.90
Hydrogen %	3.77	4.05	4.64
Sulphur (Pyritic) %	(0.06)	(0.06)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.27)	(0.29)	(0.34)
Total %	0.34	0.37	-
Nitrogen %	0.97	1.04	1.19
Ash %	11.88	12.75	-
Oxygen, by difference %	5.56	5.97	6.84

Heating value:	MJ/kg	As Rec'd	Dry	Dry Ash Free
		28.17	30.23	34.64
	kcal/kg	6728	7219	8274
	Btu/lb	12111	12995	14894

 Hardgrove grindability index 78

Free swelling index (FSI) 1.0

Moisture (as rec'd)
 Inherent % 1.30
 Adherent % 5.50

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1274	1307
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

 Notes:

DENISON MINES LTD.
 Quintette Mine; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 14-09-84
 Sampling location Preparation Plant

Product name Clean Coal (thermal)
 Screen opening ,mm Minus 51
 (Screen opening ,in) Minus 2

ERL number 2059-85

Ash analysis, per cent:

SiO ₂	60.05
Al ₂ O ₃	22.29
Fe ₂ O ₃	3.27
Mn ₃ O ₄	-
TiO ₂	1.31
P ₂ O ₅	0.49
CaO	3.80
MgO	1.20
SO ₃	2.15
Na ₂ O	0.58
K ₂ O	1.38
SrO	0.14
BaO	0.64
Loss on fusion (LOF)	0.76

Volatile trace element analysis ug/g (ppm)

Hg	0.11
Cl	80
F	98.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

DENISON MINES LTD.
 Quintette Mine; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 14-09-84
 Sampling location Preparation Plant

Product name Clean Coal (met)
 Screen opening ,mm Minus 51
 (Screen opening ,in) Minus 2

ERL number 2060-85

Rank of coal Medium-volatile bituminous

Proximate analysis:	As Rec'd	Dry	Dry Ash Free
Moisture %	7.99		
Ash %	10.26	11.15	
Volatile %	21.58	23.45	26.39
Fixed carbon %	60.18	65.40	73.61

Ultimate:	As Rec'd	Dry	Dry Ash Free
Carbon %	72.45	78.74	88.62
Hydrogen %	3.96	4.30	4.84
Sulphur (Pyritic) %	(0.07)	(0.08)	-
(Sulphate) %	(0.01)	(0.01)	-
(Organic) %	(0.27)	(0.29)	(0.33)
Total %	0.35	0.38	-
Nitrogen %	1.02	1.11	1.25
Ash %	10.26	11.15	-
Oxygen, by difference %	3.97	4.32	4.86

Heating value:	MJ/kg	Dry	Dry Ash Free
	29.12	31.65	35.62
	kcal/kg 6955	7559	8507
	Btu/lb 12519	13606	15313

Hardgrove grindability index 80

Free swelling index (FSI) 5.0

Moisture (as rec'd)
 Inherent % 0.94
 Adherent % 7.05

Ash Fusibility temperature	Reducing	Oxidizing
Initial °C	1257	1321
Spherical °C	1482+	1482+
Hemispherical °C	1482+	1482+
Fluid °C	1482+	1482+

Notes:

DENISON MINES LTD.
 Quintette Mine; Peace River Coalfield
 Tumbler Ridge, British Columbia

Sampling date 14-09-84
 Sampling location Preparation Plant

Product name Clean Coal (met)
 Screen opening ,mm Minus 51
 (Screen opening ,in) Minus 2

ERL number 2060-85

Ash analysis, per cent:

SiO ₂	57.44
Al ₂ O ₃	23.13
Fe ₂ O ₃	4.11
Mn ₃ O ₄	-
TiO ₂	1.39
P ₂ O ₅	0.39
CaO	3.78
MgO	1.46
SO ₃	2.48
Na ₂ O	0.66
K ₂ O	1.40
SrO	0.10
BaO	0.67
Loss on fusion (LOF)	1.01

Volatile trace element analysis ug/g (ppm)

Hg	0.09
Cl	100
F	103.
Br	-
As	-
Se	-

Non-volatile trace element analysis ug/g (ppm)

Ba
 Sr
 V
 Mn
 Cr

Notes:

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Sample preparation for the western coals were performed by T.A. Lloyd and K. Graham. Sample preparation for the eastern coals was conducted by G. Corbett, D. Young and G. Bonnell.

Sample analyses for the eastern coals were performed in both the Cape Breton Coal Research Laboratory in Sydney and the Energy Research Laboratories in Ottawa. (In the Sydney Laboratory the following analyses were done by G. Corbett, D. Young and G. Bonnell: proximates, total sulphurs, heating values and FSI's.) All the remaining analyses for the eastern coals were done in the Ottawa Laboratory. Analyses for the western coals were done entirely at the Energy Research Laboratories in Ottawa. Proximate analyses and FSI's were done by E. Bonvie. Ultimate analyses and equilibrium moistures were done by D. Rioux. Total sulphurs and sulphur forms were done by T. Psuika and J. Glasa. Heating values were done by J. Glasa. Hardgrove grindability indexes were done by K. Graham and T.A. Lloyd. F.P.A.'s and trace mercuries were done by H. Koethe. Ash analyses were done by T. Moher and P. Zourdos. Trace chlorine and fluorine analyses were done by J. Skulski.

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Table 1 - Summary classification of coal by rank

VM*	FC*	Class	Group (rank)	Calorific value**	
				Btu/lb	MJ/kg
2	98 -		Meta - Anthracite		
8	92 -	Anthracitic ¹	Anthracite		
14	86		Semianthracite		
			Low-volatile bituminous		
22	78 -		Medium-volatile bituminous		
31	69 -	Bituminous ²	High-volatile A bituminous	14 000	32.6
			High-volatile B bituminous	13 000	30.2
			High-volatile C bituminous	11 500	26.7
			Subbituminous A ³	10 500	24.4
			Subbituminous ⁴ B	9 500	22.1
			Subbituminous C	8 300	19.3
			Lignite A	6 300	14.7
		Lignite ⁴ B			

*Dry, mineral-matter-free basis; VM = Volatile matter; FC = Fixed carbon.

**Moist, mineral-matter-free basis.

¹Nonagglomerating; if agglomerating, classified as low-volatile bituminous.

²Commonly agglomerating.

³If agglomerating, classified as high-volatile C bituminous.

⁴Nonagglomerating.

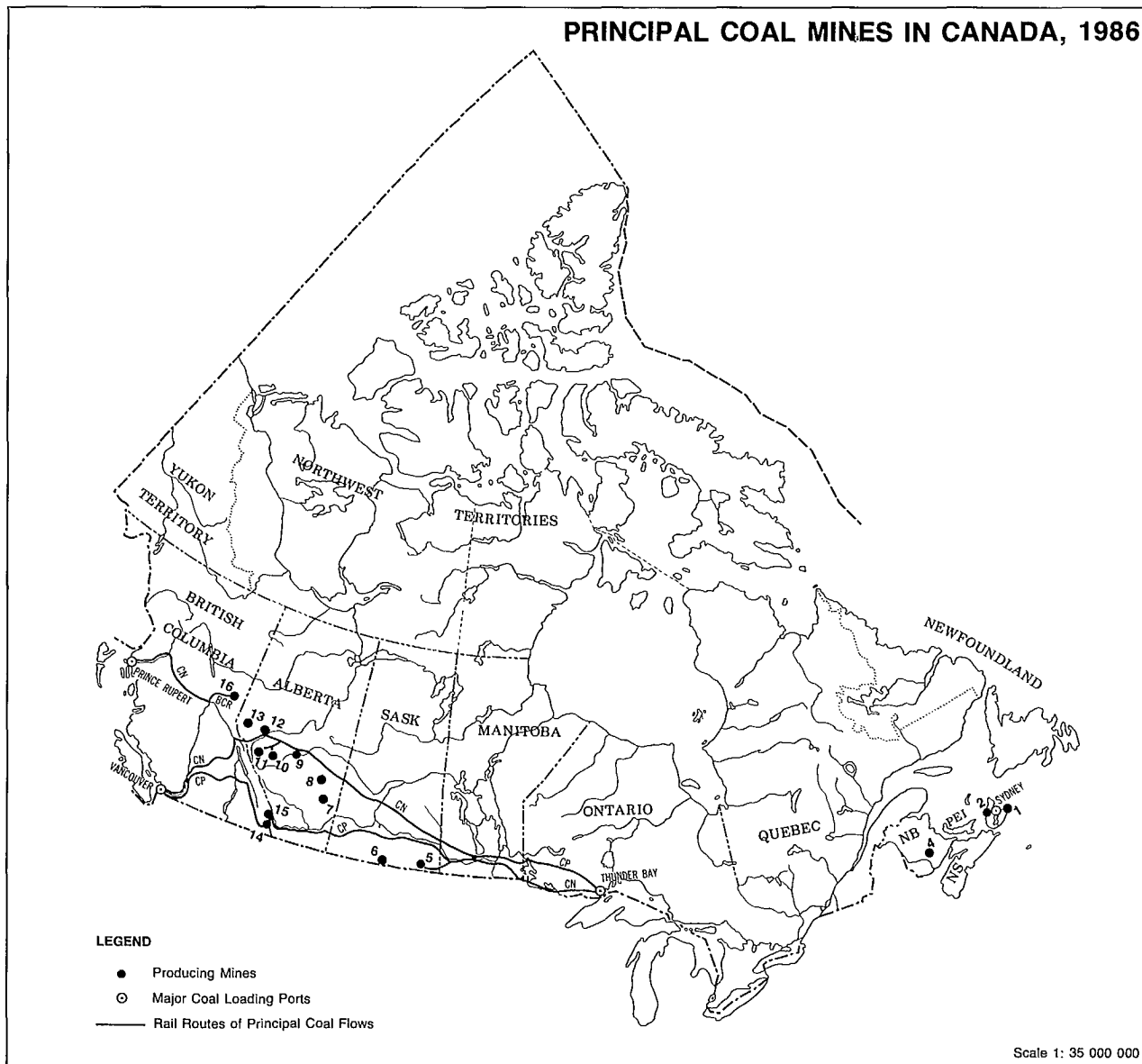
Table 2 - Some of the mines sampled and their approximate raw coal production for 1985 (in thousands of tonnes)

	<u>(x 10³ tonnes)</u>
NOVA SCOTIA	
Inverness Coalfield	
St. Rose Mine (Evans Coal Mines Ltd.)	29
Pictou Coalfield	
Pioneer Coal Company Limited (u/g & sfce)	n/a
Sydney Coalfield	
Lingan Mine (Cape Breton Development Corp.)	1,906
Prince Mine (Cape Breton Development Corp.)	994
Brogans Mine (Thomas Brogan & Sons Const. Ltd.)	33
Selminco (Coal Reclamation, Sydney Mines)	50
Selminco (Coal Reclamation, New Waterford)	108
NEW BRUNSWICK	
Minto Coalfield	
Minto/Chipman Area Pits (N.B. Coal Ltd.)	560
SASKATCHEWAN	
Estevan Coalfield	
Bienfait Mine (Bienfait Coal Co. Ltd.)	1,386
Boundary Dam Mine (M & S Coal Co. Ltd.)	2,087
Costello Mine (Manalta Coal Ltd.)	294
Utility Mine (Manalta Coal Ltd.)	2,404
Willow Bunch Coalfield	
Poplar River Mine (Manalta Coal Ltd.)	3,800
ALBERTA (PLAINS REGION)	
Battle River Coalfield	
Diplomat Mine (Forestburg Collieries Ltd.)	62
Paintearth Mine (Forestburg Collieries Ltd.)	1,539
Vesta Mine (Manalta Coal Ltd.)	1,143
Sheerness Coalfield	
Montgomery Mine (Manalta Coal Ltd.)	296
Wabamun Coalfield	
Highvale Mine (Manalta Coal Ltd.)	11,842
Whitewood Mine (Manalta Coal Ltd.)	1,950

Table 2 - Some of the mines sampled and their approximate raw coal production for 1985 (in thousands of tonnes)(cont'd)

	<u>(x 10³ tonnes)</u>
ALBERTA (FOOTHILLS AND MOUNTAIN REGIONS)	
Coalspur Coalfield	
Coal Valley Mine (Luscar Ltd.)	3,300
Cadomin-Luscar Coalfield	
Luscar Mine (Cardinal River Coals Ltd.)	2,390
Gregg River Mine (Gregg River Res. Ltd.)	2,837
Smoky River Coalfield	
Mine 1774 (Smoky River Coal Ltd.) (sfce)	897
Mines 1765/09/A,B,G (Smoky River Coals Ltd.) (u/g)	494
Obed Marsh Coalfield	
Obed-Marsh Mine (Obed Mountain Coal Co.)	1,356
BRITISH COLUMBIA	
Crowsnest Coalfield	
Coal Mountain Mine (Byron Creek Collieries Ltd.)	1,173
Michel Underground Mine (Westar Mining Ltd.)	190
Harmer Surface Mine (Westar Mining Ltd.)	9,020
Elk Valley Coalfield	
Greenhills Mine (Westar Mining Ltd.)	3,089
Fording River Mine (Fording Coal Ltd.)	6,480
Line Creek Mine (Crows Nest Resources Ltd.)	2,780
Peace River Coalfield	
Bullmoose Mine (Teck Corp.)	2,857
Quintette Mine (Denison Mines Ltd.)	10,095

PRINCIPAL COAL MINES IN CANADA, 1986



Produced by the Surveys and Mapping Branch, Energy, Mines and Resources Canada.

INDEX FOR MAP

Nova Scotia (bituminous coal)

1. Lingan Mine (Cape Breton Development Corporation)
- Prince Mine (Cape Breton Development Corporation)
- Point Aconi Pit (Novaco Ltd.)
2. St. Rose Mine (Evans Coal Mines Ltd.)

New Brunswick (bituminous coal)

4. (Minto / Chipman Area Pits (N. B. Coal Ltd.))

Saskatchewan (lignite coal)

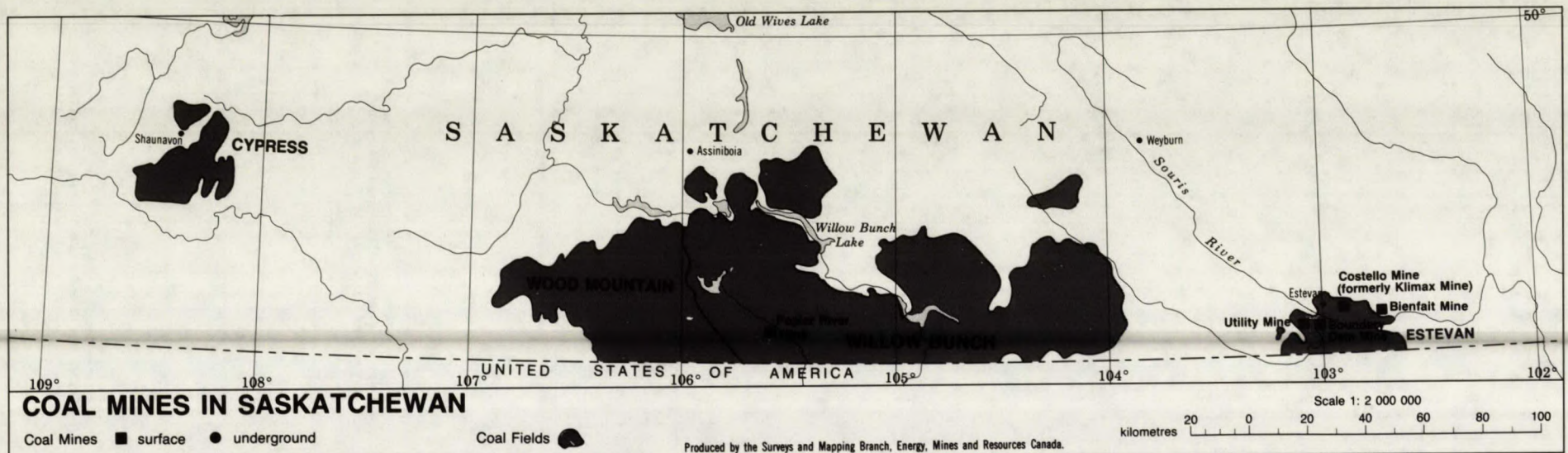
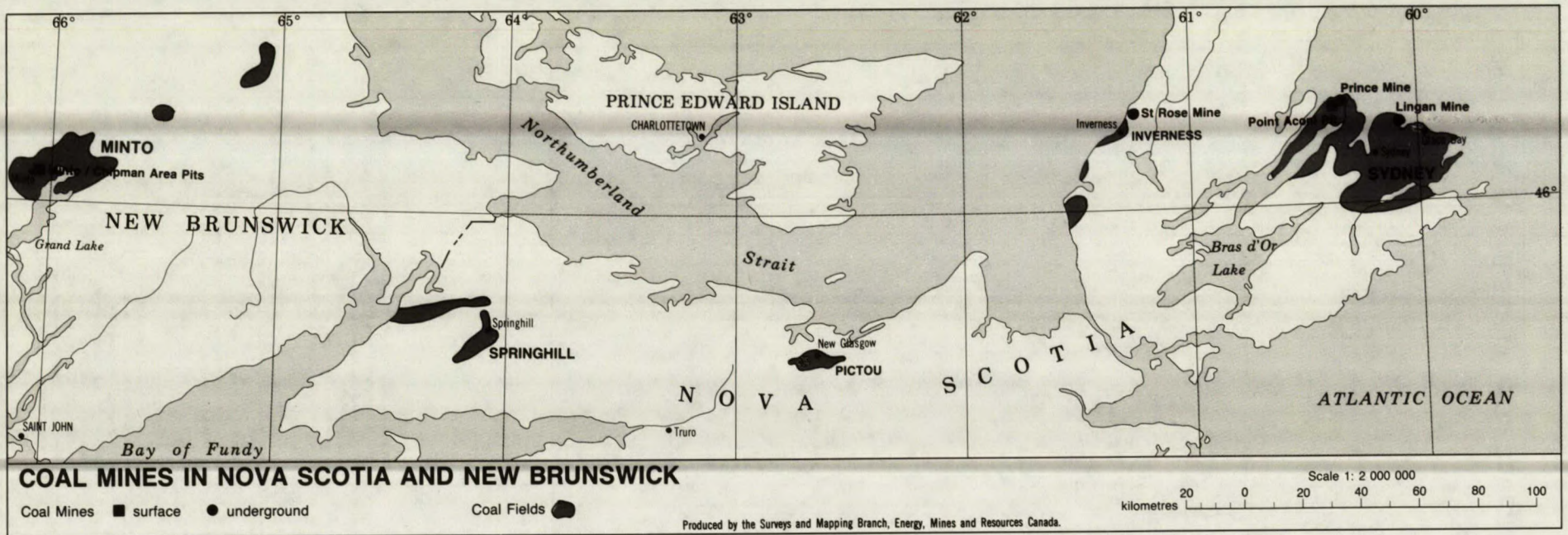
5. Bienfait Mine (Bienfait Coal Co.)
- Boundary Dam Mine (M & S Coal Co.)
- Costello Mine (formerly Klimax Mine) (Manalta Coal Ltd.)
- Utility Mine (Saskatchewan Power Corporation, with Manalta as operator)
6. Poplar River Mine (Manalta Coal Ltd.)

Alberta (subbituminous coal)

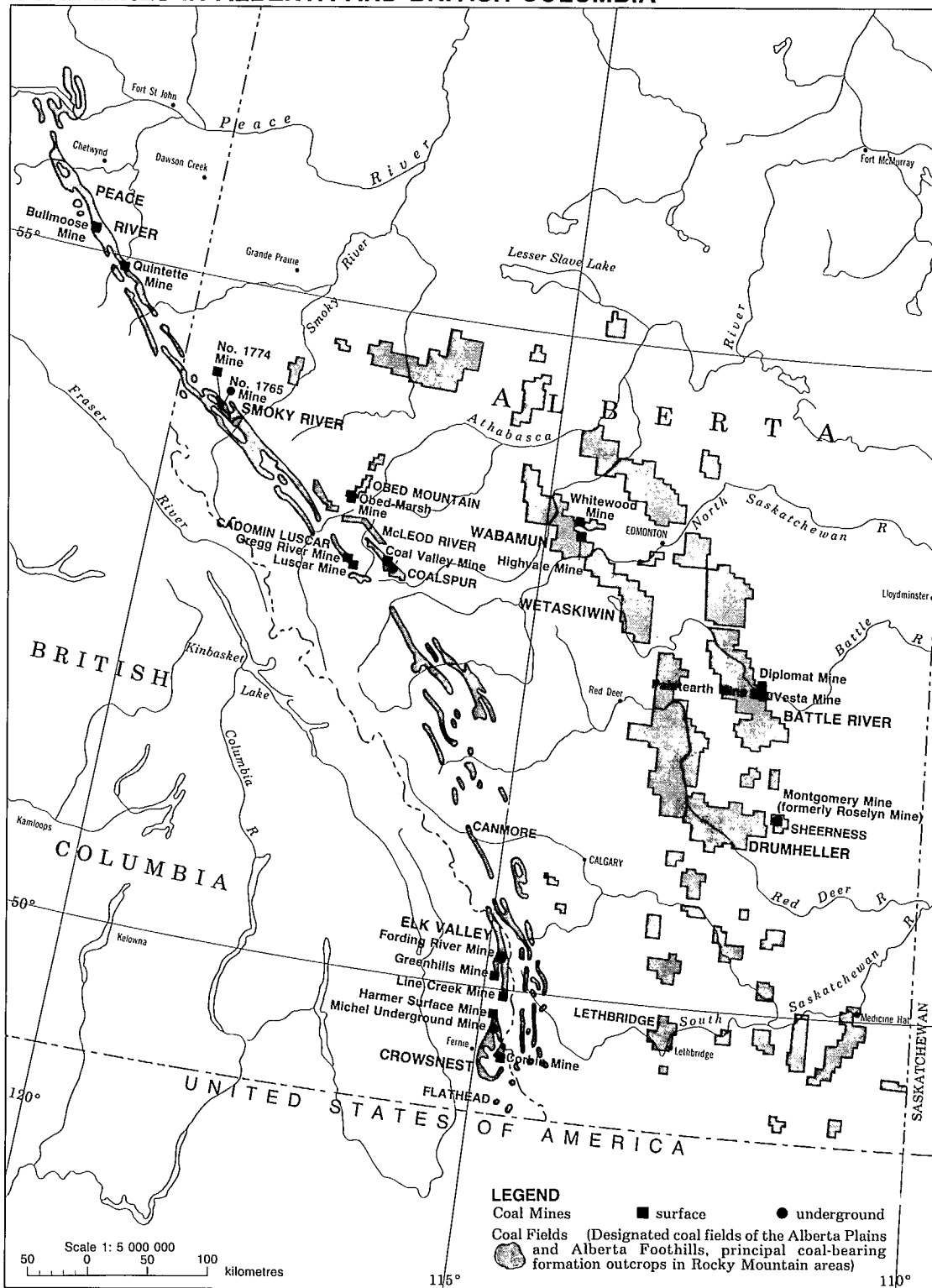
7. Montgomery Mine (formerly Roselyn Mine) (Manalta Coal Ltd.)
 8. Vesta Mine (Alberta Power Limited, with Manalta as operator)
 - Diplomat Mine (Forestburg Collieries Ltd.)
 - Paintearth Mine (Forestburg Collieries Ltd.)
 9. Highvale Mine (TransAlta Utilities Corporation, with Manalta as operator)
 - Whitewood Mine (TransAlta Utilities Corporation, with Manalta as operator)
- (bituminous coal)
10. Coal Valley Mine (Luscar Sterco Ltd.)
 11. Luscar Mine (Cardinal River Coals Ltd.)
 - Gregg River Mine (Manalta Coal Ltd.)
 12. Obed-Marsh Mine (Union Oil Company of Canada Limited)
 13. No. 1765 Mine (underground) (Smoky River Coals Ltd.)
 - No. 1774 Mine (surface) (Smoky River Coals Ltd.)

British Columbia (bituminous coal)

14. Corbin Mine (Byron Creek Collieries Limited)
- Harmer Surface Mine (Westar Mining Ltd.)
- Michel Underground Mine (Westar Mining Ltd.)
15. Line Creek Mine (Crows Nest Resources Limited)
- Fording River Mine (Fording Coal Ltd.)
- Greenhills Mine (Westar Mining Ltd.)
16. Quintette Mine (Denison Mines Limited and others)
- Bullmoose Mine (Teck Corporation and others)



COAL MINES IN ALBERTA AND BRITISH COLUMBIA



LEGEND
 Coal Mines ■ surface ● underground
 Coal Fields (Designated coal fields of the Alberta Plains and Alberta Foothills, principal coal-bearing formation outcrops in Rocky Mountain areas)

Scale 1: 5 000 000
 50 0 50 100 kilometres

Produced by the Surveys and Mapping Branch, Energy, Mines and Resources Canada.