

COAL DATA SOURCES

PROVINCE OF BRITISH COLUMBIA MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

GEOLOGICAL SURVEY BRANCH

COAL UNIT

(Coal quality and geology information)

553 Superior Street

Victoria, B.C. V8V 1X4 Canada

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Dave Grieve Southeast B.C./Coal Quality
Barry Ryan Northwest B.C./Coalbed Methane
Alex Matheson Central and South Central B.C.,
Vancouver Island
Maria Holuszko Coal Quality

MINERAL POLICY BRANCH

(Policy, statistics, economics and land use)

525 Superior Street, Room 26

Victoria, B.C. V8V 1X4

Phone: (604) 387-3787 Fax: (604) 387-5713

MINERAL TITLES BRANCH

(Coal rights tenure)

525 Superior Street, Room 17

Victoria, B.C. V8V 1X4

Phone: (604) 387-4417 Fax: (604) 387-3594

RESOURCE MANAGEMENT BRANCH

(Coal exploration and production permitting and regulation;
reclamation)

525 Superior Street, Room 105

Victoria, B.C. V8V 1X4

Phone: (604) 387-3781 Fax: (604) 387-5985

PETROLEUM TITLES BRANCH

(Oil and natural gas tenure, including coalbed methane)

617 Government Street, 4th Floor

Victoria, B.C. V8V 1X4

Phone: (604) 387-1908 Fax: (604) 356-0160

*Coal quality and/or production data are also generally
available from the following:*

ENERGY, MINES AND RESOURCES CANADA

CANMET

Coal Research Laboratories

P.O. Bag 1280

Devon, Alberta T0C 1E0

CANMET

Energy Research Laboratories

555 Booth Street

Ottawa, Ontario K1A 0G1

Geological Survey of Canada

The Institute of Sedimentary and Petroleum Geology

3303-33rd Street N.W.

Calgary, Alberta T2L 2A7

Mineral Policy Sector

460 O'Connor Street

Ottawa, Ontario K1A 0E4

THE COAL ASSOCIATION OF CANADA

502, 205-9th Avenue S.E.

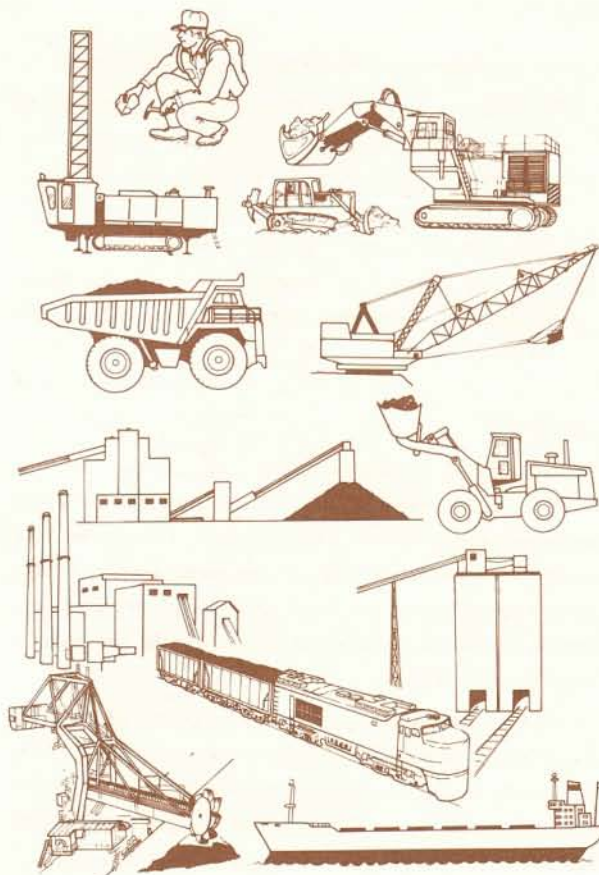
Calgary, Alberta T2G 0R3



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British Columbia Coals Quality & Resources



PROVINCE OF BRITISH COLUMBIA
MINISTRY OF ENERGY, MINES AND
PETROLEUM RESOURCES
GEOLOGICAL SURVEY BRANCH



INFORMATION CIRCULAR 1992-18

INTRODUCTION

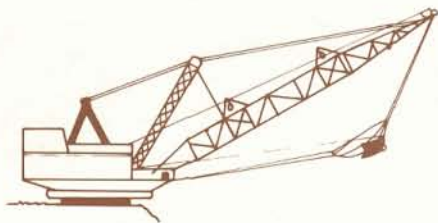
The province of British Columbia is richly endowed with more than 19 billion tonnes of coal resources which range from lignite to anthracite in rank. This brochure summarizes available information concerning the major coalfields and provides generalized coal-quality data for each. Averages of quality parameters are generally cited without reference to the range of values.

Several information sources have been used; including:

- Published reports of the British Columbia Ministry of Energy, Mines and Petroleum Resources; CANMET; the Geological Survey of Canada; and, the technical articles written by staff of coal mining and exploration companies.
- Unpublished, assessment reports submitted to the British Columbia Ministry of Energy, Mines and Petroleum Resources by exploration companies in compliance with the B.C. *Coal Act*.
- Trade publications, including the TEX Report's "Coal Manual".

Caution is advised in using data contained in this brochure. Quality variations within individual coalfields and/or basins are often pronounced and the values presented may not be representative of the range of coal quality present. Where product specifications are listed, these values represent the current range of market demand, rather than the full range of available coal quality.

An efficient and intricate infrastructure is in place within the province, including rail and road transportation routes, power networks, community services, deep-water seaports and communications systems. This ensures that British Columbia coal resources are among the most competitive in the world.



PRODUCING COMPANIES

ESSO RESOURCES CANADA LIMITED

237 - 4th Avenue S.W.
Calgary, Alberta
T2P 0H6
Phone: (403) 237-3737
FAX: (403) 237-3037

FORDING COAL LIMITED

1000, 205 - 9th Avenue S.E.
Calgary, Alberta
T2G 0R4
Phone: (403) 264-1063
FAX: (403) 264-7339

HILLSBOROUGH RESOURCES LIMITED

c/o 1280 - 1055 West Hastings Street
Vancouver, British Columbia
V6E 2E9
Phone: (604) 684-9288
FAX: (604) 684-3178

MANALTA COAL LTD.

734 - 7th Avenue S.W.
P.O. Box 2880
Calgary, Alberta
T2P 2M7
Phone: (403) 294-5311
FAX: (403) 269-8075

QUINTETTE COAL LIMITED

200 Burrard Street
Vancouver, British Columbia
V6C 3L9
Phone: (604) 687-1117
FAX: (604) 687-6100

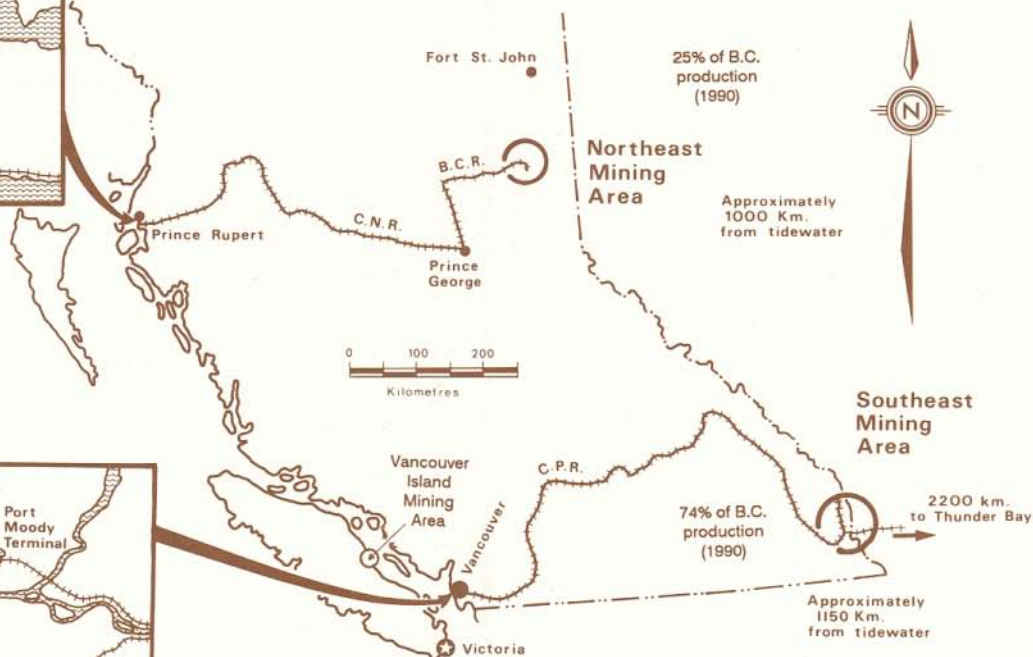
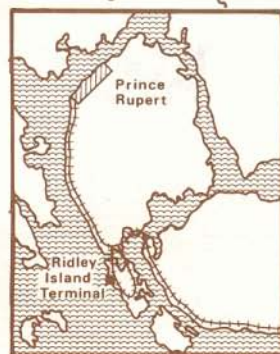
TECK CORPORATION

200 Burrard Street
Vancouver, British Columbia
V6C 3L9
Phone: (604) 687-1117
FAX: (604) 687-6100

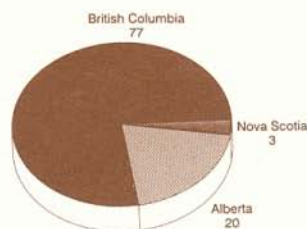
WESTAR MINING LTD.

1176 West Georgia Street
Vancouver, British Columbia
V6E 4B8
Phone: (604) 681-8222
FAX: (604) 681-9537

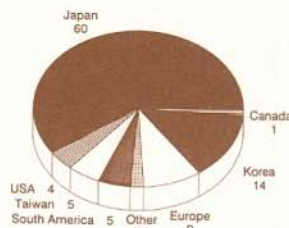
PRODUCTION AND MARKETING



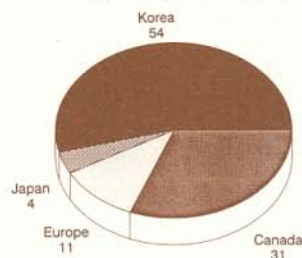
PRODUCTION OF COKING COAL IN CANADA, 1989*



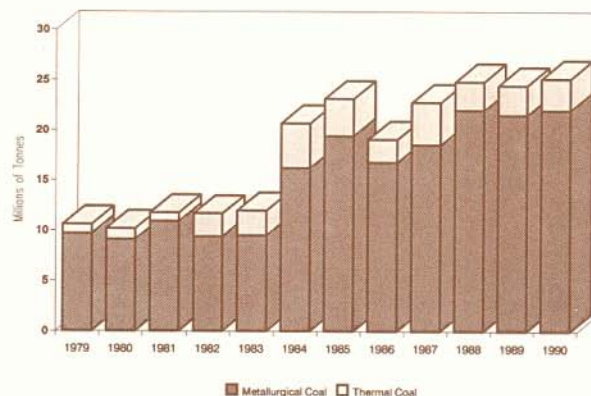
% SALES VOLUME BY MARKET 1989 METALLURGICAL COAL SHIPMENTS⁺



% SALES VOLUME BY MARKET 1989 THERMAL COAL SHIPMENTS⁺



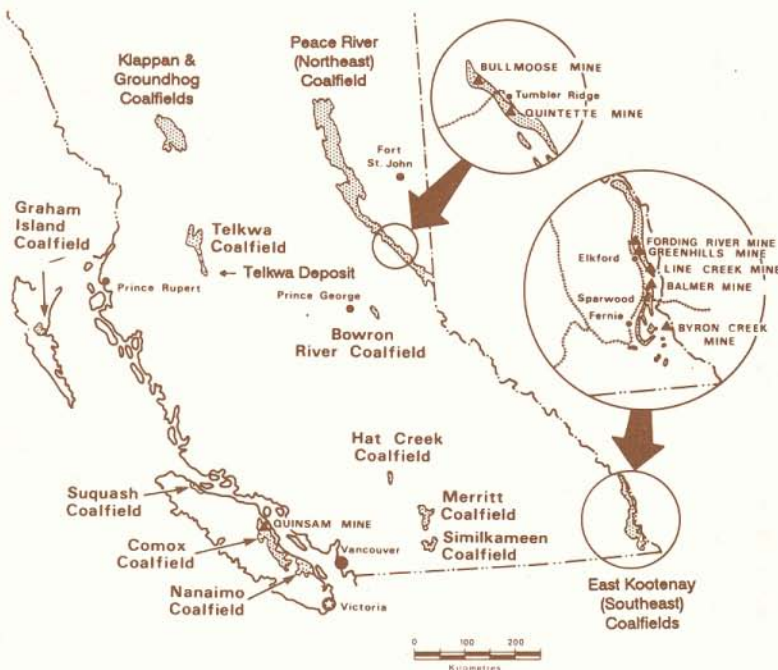
PRODUCTION OF COKING AND THERMAL COAL 1979 - 1990



RESOURCES

COALFIELD	A.S.T.M. COAL RANK	POTENTIAL UTILIZATION	MEASURED RESERVES (millions of tonnes)	TOTAL RESOURCES OF IMMEDIATE INTEREST*
Peace River	Low to High Volatile Bituminous	Metallurgical and Thermal	1015	9270
East Kootenay	Low to High Volatile Bituminous	Metallurgical and Thermal	1370	6670
Klappan and Groundhog	Low Volatile Bituminous to Anthracite	Thermal	100	1600
Telkwa Deposit	High Volatile A Bituminous	Thermal	30	180
Hat Creek	Lignite to Subbituminous B	Thermal	440	940
Similkameen	Lignite to High Volatile B Bituminous	Thermal	20	350
Merritt	High Volatile B to A Bituminous	Thermal	10	80
Comox	High Volatile A & B Bituminous	Thermal	35	265
Nanaimo	High Volatile A & B Bituminous	Thermal	0	10
Suquash	High Volatile C & B Bituminous	Thermal	0	40
Bowron River	High Volatile B & C Bituminous	Thermal	10	70
TOTAL			3030	19 475

*Source: Smith G.G. (1989): Coal Resources of Canada, Geological Survey of Canada, Paper 1989-4.



COALFIELDS AND RESOURCES

MINES

OWNER	MINE	MINING METHOD	1990 CLEAN COAL PRODUCTION* (millions of tonnes)	UTILIZATION
NORTHEAST				
Teck Corporation	Bullmoose	Open Pit	1.6	Mainly Metallurgical
Quintette Coal Limited	Quintette	Open Pit	4.6	Metallurgical
SOUTHEAST				
Fording Coal Limited	Fording River	Open Pit	6.3	Metallurgical and Thermal
Westar Mining Ltd.	Greenhills	Open Pit	3.0	Metallurgical and Thermal
	Balmer	Open Pit	5.6	Metallurgical and Thermal
Manalta Coal Ltd.	Line Creek	Open Pit	2.1	Metallurgical and Thermal
Eso Resources Canada Limited	Byron Creek	Open Pit	1.5	Thermal and Weak Coking
VANCOUVER ISLAND				
Hillsborough Resources Limited	Quinsam	Open Pit and Underground	0.3	Thermal
TOTAL			25.0	

*From the Coal Association of Canada, 1991 directory.

NORTHEAST

AGE Early Cretaceous

TOTAL RESOURCES
OF IMMEDIATE
INTEREST 9270 million tonnes

MEASURED
RESERVES 1015 million tonnes

	'RUN-OF-MINE' COAL	METALLURGICAL PRODUCTS*	THERMAL PRODUCTS*
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PROXIMATE ANALYSIS, %

(as received)		air dried	air dried
Moisture	5.0	1.0-2.0	2.0-2.5
Ash	15.0 (4.5-21.5)	9.5	10.0
Volatile Matter	22.5	20-26	21-23
Fixed Carbon	57.5	63-69	60.0-66.5

SULPHUR, %	0.5	0.5	0.5
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HEATING VALUE

MJ/kg	29.1	30.2	29.3-31.4
BTU/lb	12 500	13 000	12 600-13 500
kcal/kg	7 000	7 222	7000-7500

A.S.T.M. RANK High to Low Volatile Bituminous

ULTIMATE ANALYSIS, %

(dry, ash-free basis)	
Carbon	88.0
Hydrogen	5.0
Oxygen	5.4
Nitrogen	1.4
Sulphur	0.2
	100.0

HARDGROVE
GRINDABILITY INDEX 72.82

ASH CHEMISTRY, %

Na ₂ O	<2.3
K ₂ O	<2.7
P ₂ O ₅	<1.6

INITIAL DEFORMATION

TEMPERATURE °C 1200-1500, oxidizing

FREE SWELLING INDEX, 1-7 5-7

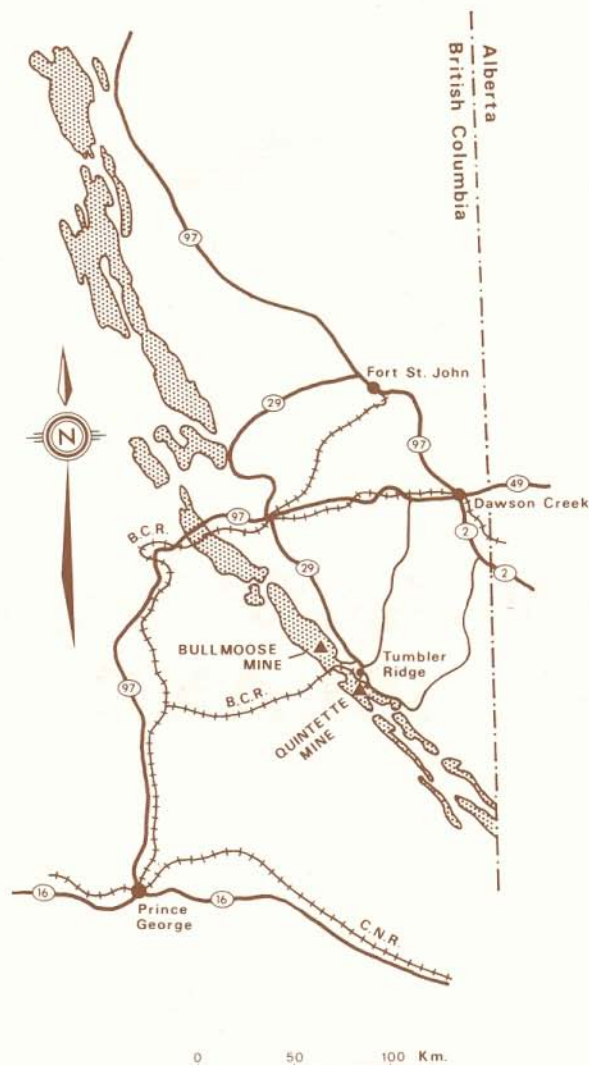
\bar{R}_Q max 1.2 (0.8-1.7)

FLUIDITY, d.d.p.m. 90

SIZE, mm 38 x 0, 50 x 0

SULPHUR FORMS, %

Pyritic	<0.2
Sulphate	0.0
Organic	<0.4
	<0.6



*Ranges derived from the 1988 TEX Report Coal Manual. These ranges represent current contract specifications with Japanese importers - they do not represent the limits of quality specifications of northeast B.C. coals.

SOUTHEAST

AGE Late Jurassic
Early Cretaceous

TOTAL RESOURCES
OF IMMEDIATE
INTEREST 6670

MEASURED RESERVES 1370

	'RUN-OF-MINE' COAL	METALLURGICAL PRODUCTS	THERMAL PRODUCTS	SEMI-COKING PRODUCTS
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PROXIMATE ANALYSIS, %

(air-dried basis)				
Moisture	2.0	1.0-1.5	1.0-1.5	
Ash	17.0	6.5-9.5	9-15	8.5-10.5
Volatile Matter	23.0	19.33	19.5-31	21-28
Fixed Carbon	58.0	59-69	60-66	
	100.0			

SULPHUR, % 0.4 0.4-0.5 max 0.3-0.6 0.3-0.6

HEATING VALUE

BTU/lb	12 250	13 680-14 040	11 520-13 320	
MJ/kg	28.5	31.3-32.7	26.8-31.0	
kcal/kg	6820	7600-7800	6400-7400	

A.S.T.M. RANK Low to High Volatile Bituminous

ULTIMATE ANALYSIS, %

(dry, ash-free basis)	
Carbon	87.5
Hydrogen	5.0
Oxygen	5.5
Nitrogen	1.6
Sulphur	0.4
	100.0

HARDGROVE

GRINDABILITY INDEX 84 (65->100)

ASH CHEMISTRY, %

Na ₂ O	0.1
K ₂ O	1.0
P ₂ O ₅	1.3

INITIAL DEFORMATION

TEMPERATURE °C 1450 (1250-1482+)
oxidizing

FREE SWELLING INDEX 4.0 (2-7.5) 6-8 1-5.5 3-6

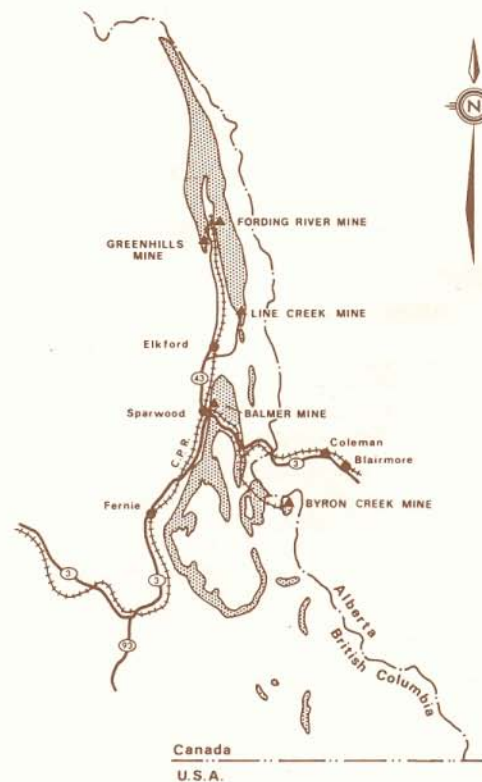
$\bar{R}_0\text{max}^+$ 1.3 (0.8-1.6)

FLUIDITY, d.d.p.m. <100

SIZE, mm 38 x 0

SULPHUR FORMS, %

Pyritic	0.1
Sulphate	0.0
Organic	0.3
	0.4



* Ranges derived from the 1988 TEX Report Coal Manual. These ranges represent current contract specifications with Japanese importers - they do not represent the limits of quality specifications of southeast B.C. coals.

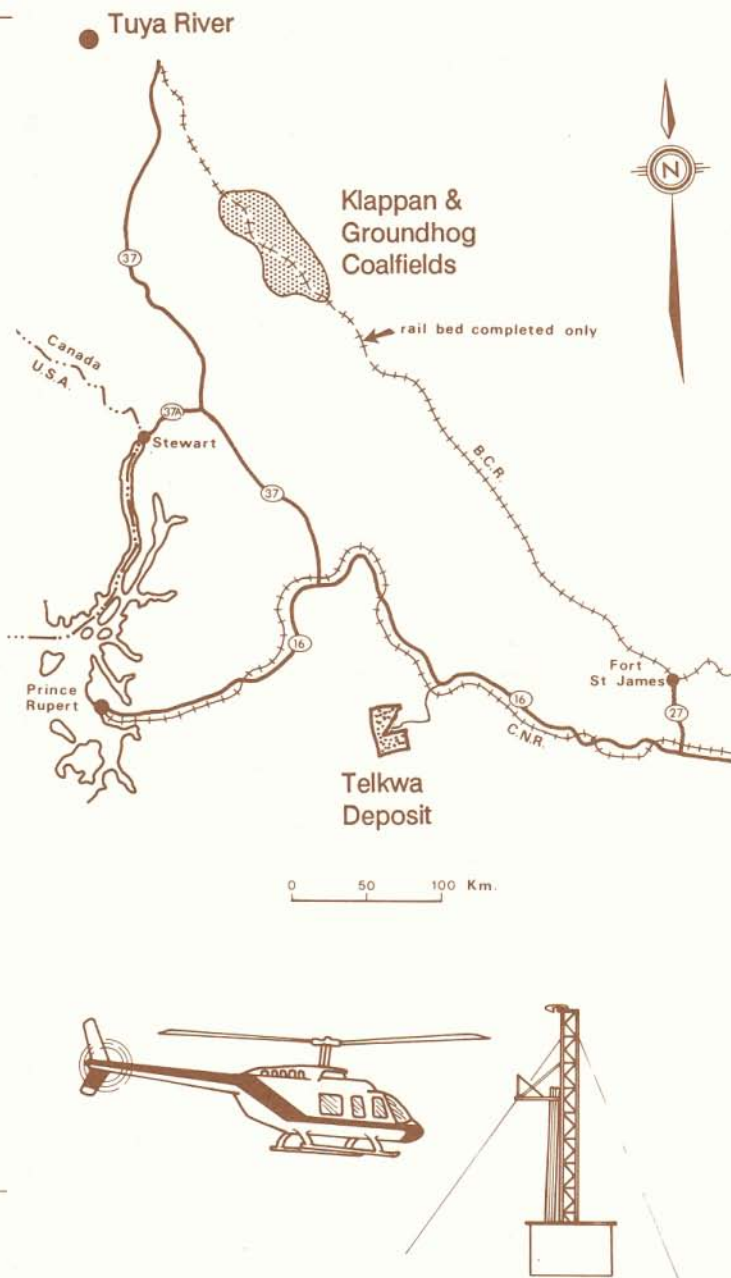
+ Source: B.C. Geological Survey.

NORTHWEST

	TELKWA	KLAPPAN and GROUNDHOG	TUYA RIVER
AGE	Early Cretaceous	Late Jurassic	Early Tertiary
UTILIZATION	Thermal	Thermal	Thermal
TOTAL RESOURCES OF IMMEDIATE INTEREST	180 million tonnes	1600 million tonnes	-
MEASURED RESERVES	30 million tonnes	100 million tonnes	-
PROXIMATE ANALYSIS, % (as received)		Beneficiated	
Moisture	4.0	2.0	11.1
Ash	21.0	36.0	24.3
Volatile Matter	25.5	8.0	29.1
Fixed Carbon	49.5	54.0	34.3
	100.0	100.0	98.8
SULPHUR, %	1.8	0.5	0.5
HEATING VALUE			
MJ/kg	25.5	20.5	18.3
BTU/lb	10 950	8 800	7 880
kcal/kg	6 080	4 890	4 380
A.S.T.M. RANK	High Volatile A Bituminous	Low Volatile Bituminous to Anthracite	High Volatile C to B Bituminous
ULTIMATE ANALYSIS, % (dry, ash-free basis)			
Carbon	80.0	90.2	
Hydrogen	5.0	3.0	
Oxygen	13.0	5.0	
Nitrogen	0.8	1.0	
Sulphur	1.2	0.8	
	100.0	100.0	
HARDGROVE GRINDABILITY INDEX	60	48	53
ASH CHEMISTRY, %			
Na ₂ O	0.8	1.0	
K ₂ O	0.3	1.0	
P ₂ O ₅	0.6	1.0	
INITIAL DEFORMATION TEMPERATURE °C	1450	1250	
FREE SWELLING INDEX	Up to 5.5		
\bar{R}_0 max	0.87*	3.2 to 3.8 ⁺	0.73*

*Source: B.C. Geological Survey.

⁺Source: Gulf Canada.



CENTRAL

AGE Tertiary

TOTAL RESOURCES
OF IMMEDIATE
INTEREST 70 million tonnes

MEASURED RESERVES 10 million tonnes

UTILIZATION Thermal

PROXIMATE ANALYSIS, %

(as received basis)

Moisture	4.0
Ash	35.7
Volatile Matter	26.4
Fixed Carbon	33.9
Total	100.0

SULPHUR, % 1.25

HEATING VALUE

(as received)

MJ/kg	18.6
BTU/lb	8 000
kcal/kg	4 500

A.S.T.M. Rank High Volatile C and
B Bituminous

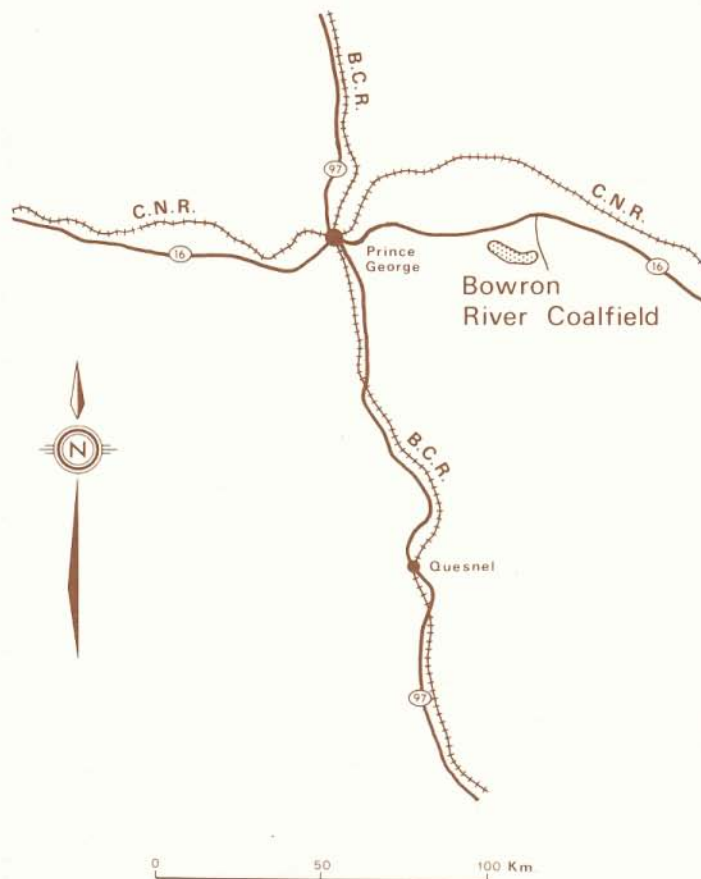
ULTIMATE ANALYSIS, %

(dry, ash-free basis)

Carbon	75.8
Hydrogen	5.8
Oxygen	15.2
Nitrogen	1.6
Sulphur	1.6
Total	100.0

HARDGROVE
GRINDABILITY INDEX 53

PETROGRAPHY $\bar{R}_{\text{omax}} = 0.65$
0-2% Resinite

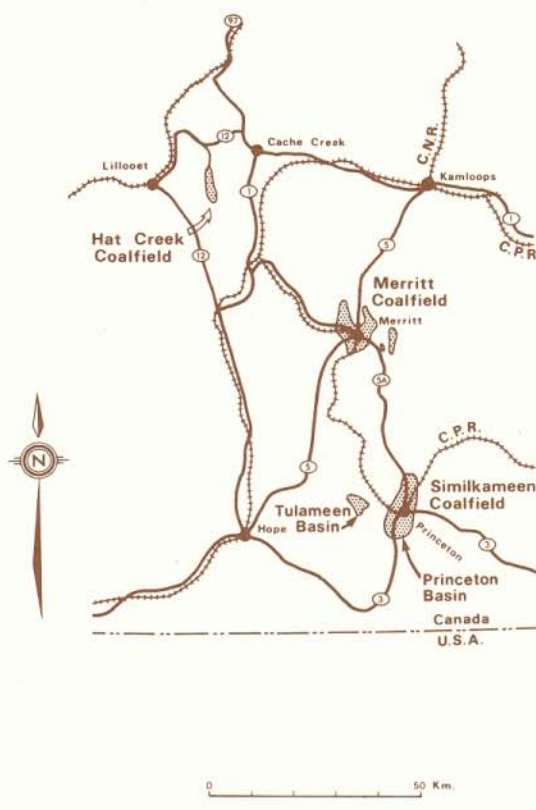


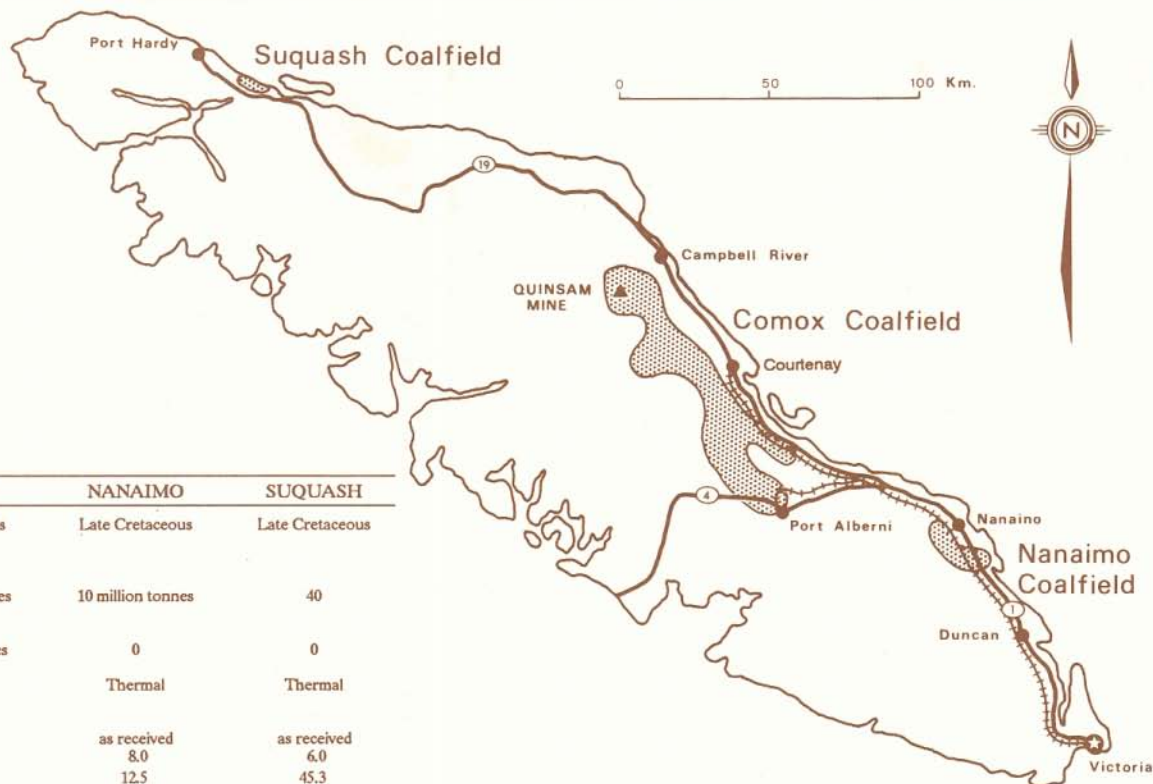
SOUTH CENTRAL

	HAT CREEK	MERRITT	SIMILKAMEEN	
			Tulameen Basin	Princeton Basin*
AGE	Tertiary Eocene	Tertiary Eocene	Tertiary Eocene	
TOTAL RESOURCES OF IMMEDIATE INTEREST	940 million tonnes	89 million tonnes	240 million tonnes	110 million tonnes
MEASURED RESERVES	440 million tonnes	10 million tonnes	20 million tonnes	0
UTILIZATION	Thermal	Thermal	Thermal	
PROXIMATE ANALYSIS, % (as received)				
Moisture	23.5	5.0	5.5	16.2
Ash	26.6	9.0	8.8	7.0
Volatile Matter	24.8	34.0	29.0	30.8
Fixed Carbon	25.1	52.0	56.7	46.2
	100.0	100.0	100.0	100.2
SULPHUR, %	0.4	0.6	0.6	0.45
HEATING VALUE (as received)				
MJ/kg	13.5	29.1	27.2	23.5
BTU/lb	5800	12 500	11 700	10 100
kcal/kg	3 200	6 950	6 500	5 600
A.S.T.M. RANK	Lignite to Subbituminous B	High Volatile B to A Bituminous	High Volatile C to B Bituminous	Lignite to High Volatile B Bituminous
ULTIMATE ANALYSIS, % (dry, ash-free basis)				
Hydrogen	72.9			
Oxygen	4.8			
Nitrogen	20.3			
Sulphur	1.5			
	0.5			
HARDGROVE GRINDABILITY INDEX		57	51	
ASH CHEMISTRY, %				
Na ₂ O	1		0.67	
K ₂ O	0.5		0.64	
P ₂ O ₅	0.2		0.17	
INITIAL DEFORMATION TEMPERATURE °C	1400-1500 ash fusion oxidizing atm.	1550 softening	1400 oxidizing atm.	
R _o max [†]	0.4	0.75	.57-.79	

*Princeton seam only Mine data.

†Source: B.C. Geological Survey.





	COMOX*	NANAIMO	SUQUASH
AGE	Late Cretaceous	Late Cretaceous	Late Cretaceous
TOTAL RESOURCES OF IMMEDIATE INTEREST	265 million tonnes	10 million tonnes	40
MEASURED RESERVES	35 million tonnes	0	0
UTILIZATION	Thermal	Thermal	Thermal
PROXIMATE ANALYSIS, %			
Moisture	air-dried	as received	as received
Ash	3.5	8.0	6.0
Volatile Matter	<13.5	12.5	45.3
Fixed Carbon	48.0	35.7	23.3
	36.5	43.8	25.4
		100.0	100.0
SULPHUR, %	0.6	0.6	2.2
HEATING VALUE			
MJ/kg	27.2	27.0	13.9
BTU/lb	11 700	11 600	5 969
kcal/kg	6 500	6 450	3 316
A.S.T.M. RANK	High Volatile A+B Bituminous	High Volatile A+B Bituminous	High Volatile C+B Bituminous
ULTIMATE ANALYSIS, % (dry, ash-free basis)			
Carbon	80.9	82.0	
Hydrogen	5.3	6.1	
Oxygen	12.1	9.6	
Nitrogen	1.0	1.6	
Sulphur	0.7	0.7	
	100.0	100.0	
HARDGROVE GRINDABILITY INDEX	45 minimum	53-85	43
ASH CHEMISTRY, %			
Na ₂ O	0.2	0.5	
K ₂ O	0.2	0.9	
P ₂ O ₅	0.7	0.4	
INITIAL DEFORMATION TEMPERATURE °C	>1275 oxidizing atm.	1280 oxidizing atm.	
FREE SWELLING INDEX	1.5 to 2.5	up to 4.5	1.5
R _Q max ⁺	0.6-0.85	0.64-0.72	0.63-0.81

VANCOUVER ISLAND



* Product specifications, Quinsam mine, 1988.

⁺ Source: B.C. Geological Survey Branch.