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Hon. Jack Davis, Minister

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FOREWORD

This is the first edition of the British Columbia Coal Quality Catalog. It outlines the range of coal qualities available in British Columbia on a seam-by-seam basis from currently producing coal mines and coal properties which are considered to have potential for economic development in the future. It is intended to be used in conjunction with Paper 1986-3, Coal in British Columbia. We intend to revise the catalog every two years, in order to keep it as up-to-date as possible.

The British Columbia Coal Quality Catalog has been assembled by staff of the Coal Resources Subsection of the British Columbia Geological Survey Branch of the Ministry of Energy, Mines and Petroleum Resources. Your comments on the style and content of the catalog would be most welcome.

INTRODUCTION

Coal in British Columbia ranges in rank from lignite to anthracite, with the majority of production and reserves currently from the bituminous categories. British Columbia coals are used primarily for coke production and thermal power generation. Their quality diversity makes them attractive to almost all users of coking and thermal coal, as well as for other applications.

Coal production in British Columbia is currently greater than 22 million tonnes per year, and comes from eight different mines. Five of these mines are in southeastern British Columbia (Figure 4): the Westar Mining Ltd. Balmer and Greenhills operations; the Crows Nest Resources Line Creek mine; Byron Creek Collieries; and the Fording Coal Ltd. Fording River operations. Another two are in northeastern British Columbia (Figure 2): the Quintette operations of Quintette Coal Ltd. and Teck Corporation's Bullmoose operations. The remaining British Columbia coal mine, Quinsam, is on Vancouver Island (Figure 7), and is operated by Brinco Coal Corporation.

This catalog is intended to be used as a guide to the quality of British Columbia coals on a seam-by-seam basis. However, the data it contains can be considered only an approximation of coal quality for any particular seam or property. This is primarily because of variations in sampling and analytical techniques, variations in bases of reporting data, and variations between *in situ* coal quality and potential specifications of product coals and coal blends. Caution should be used in making decisions based on the contents of this catalog; users are advised to check with original sources, including marketing departments of mining companies, for verification of data.

The format of the catalog has been kept as consistent as possible, but it was necessary to vary the presentation in some instances. The most notable variations are the bases in which data are reported. The amount of information provided for each entry also varies, depending on the source.

There are two major sources of the data included in this volume. The first is the ministry's vast collection of coal company reports, representing technical submissions required to document both exploration programs (assessment reports) and proposed mine developments (Stage I and II reports). The second source includes reports and papers published by government research agencies, including CANMET, the Geological Survey of Canada, and the British Columbia Ministry of Energy, Mines and Petroleum Resources, and those published by mining companies. More detail concerning sources of coal geology and quality information can be found in a snbsequent section and specific sources are listed with the data.

We may appear to have been somewhat arbitrary in selecting properties and seams to include in the catalog. In some cases this has been forced upon us by the non-availability of data, and in other cases we have simply made a decision based on our perception of priorities. We have tried to restrict ourselves to properties which have measured reserves, but not necessarily to those which we believe have a good chance of going into production in the short term. Furthermore, in some cases we have included properties to provide geographic or stratigraphic representation. In the case of coal seams included in the catalog, we have tried to choose those most representative of each property, but readily acknowledge that we have fallen short of this goal in a number of instances. Hopefully these problems can be addressed in future revisions.

COAL ANALYSIS

The following is intended as only a brief overview of coal analysis principles. For further information the reader is referred to Ward (1984), which was used as source material for this section.

REPORTING OF COAL ANALYSIS

Coal analytical data can be presented in several ways, depending on the end use of the data. These are summarized in Figure 1. Data presented on an as-received (a.r.) basis reflect the entire coal prior to any drying treatment. The air-dried (a.d.) basis represents all the coal minus the surface moisture which is lost during drying. Dry coal refers to calculated values on theoretical coal with no moisture. Dry, ash-free coal (d.a.f.) is calculated as though the coal contains no moisture or ash. Finally, dry, mineral-matter-free coal (d.m.m.f.) is considered to contain no moisture or mineral matter.

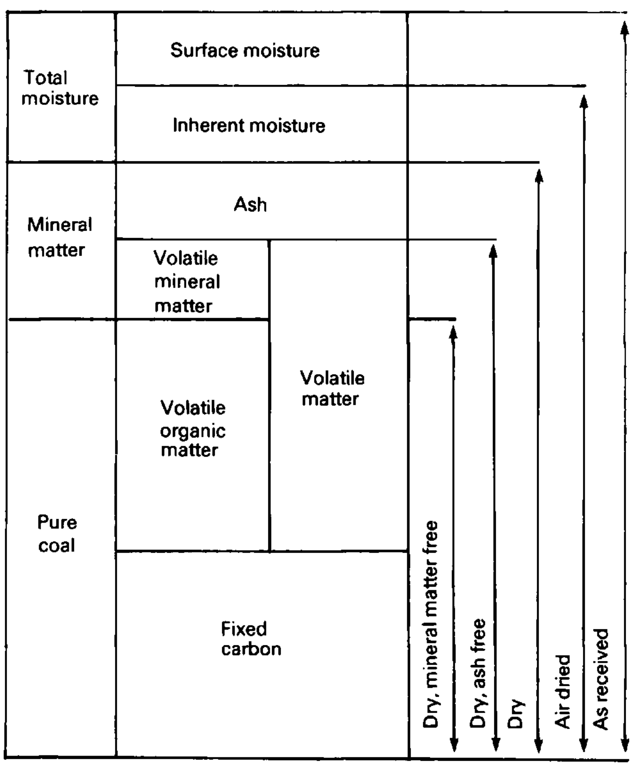

Figure 1: Components of a coal included when reporting analyses to different bases (from Ward, 1984).

Coal analyses are commonly reported in terms of a classification category. In this catalog, all entries are referred to the A.S.T.M. classification (Table 1).

PROXIMATE ANALYSIS

Proximate analysis consists of a series of tests which measure the relative amounts of moisture, volatile and non-volatile organic compounds, and ash in a coal.

MOISTURE

Moisture can be measured on either the sample as received or after air drying (Figure 1). In the former case, the value obtained represents total moisture, while in the latter case the surface moisture has been removed and what remains is usually referred to as inherent moisture (Ward, 1984).

VOLATILE MATTER

Volatile matter consists of "the components of the coal, except for the moisture content, that are liberated at high temperature in the absence of air" (Ward, 1984). This usually consists mainly of organic material, but contains some amount of volatile material liberated from the mineral matter during the analysis.

TABLE 1: A.S.T.M. Classification of Coals.

CLASS	GROUP	Limits of F.C. dmmf %	Limits of V.M. dmmf %	Limits of C.V. mmmf BTU/lb*
I Anthracite	1. Meta-anthracite	98	2	-
	2. Anthracite	92-98	2-8	-
	3. Semi-anthracite	86-92	8-14	-
II Bituminous	1. Low volatile	78-86	14-22	-
	2. Medium volatile	69-78	22-31	-
	3. High volatile - A	69	31	14000
	4. High volatile - B	-	-	13000-14000
	5. High volatile - C	-	-	10500-13000
III Sub - bituminous	1. Sub-bit. A	-	-	10500-11500
	2. Sub-bit. B	-	-	9500-10500
	3. Sub-bit. C	-	-	8300-9500
IV Lignitic	1. Lignite A	-	-	6300-8300
	2. Lignite B	-	-	6300

* 1 Btu/lb = 1.8 kcal/kg

ASH

Ash is "the non-combustible inorganic residue that remains when coal is burned" (Ward, 1984). It represents most of the mineral matter, the remainder being driven off during determination of volatile matter.

FIXED CARBON

The fixed carbon content of a coal is "the carbon found in the material that remains after the volatile matter has been expelled" (Ward, 1984). It is not determined directly, but is simply the difference between 100% and the sum of the moisture, volatile matter and ash.

ULTIMATE ANALYSIS

Ultimate analysis involves the determination of the percentages of carbon, hydrogen, nitrogen, oxygen and sulphur.

CALORIFIC VALUE

The energy liberated from a coal under controlled conditions in a laboratory is referred to as calorific value or specific energy. It gives a good indication of the available energy in actual utilization.

ASH ANALYSIS

A chemical analysis can be performed on the inorganic residue after combustion, to provide an indication of the nature of the mineral matter in the coal and the potential for problems during combustion such as slagging and fouling.

ASH FUSION TEMPERATURES

The temperatures at which coal ash deforms and fuses are important data when selecting a coal for burning in a particular style of furnace, as the behaviour at high temperatures influences the manner in which ash is handled. Temperatures recorded during this procedure represent specific stages in the deformation and ultimate fusion of a cone-shaped, moulded sample of ash. The commonly recorded temperatures include the point of *initial* deformation of the mould, the temperature at which the top of the mould takes on a *spherical* shape, the point at which the entire mould takes on a *hemispherical* shape, and the temperature at which the ash becomes *fluid*.

HARDGROVE GRINDABILITY INDEX

Operation of most current coal-burning equipment requires that coal be pulverized prior to injection into combustion chambers.

The Hardgrove Grindability Index (HGI) is a measure of the ease with which a coal may be ground into a powder. It is calculated from the mass of material which passes through a screen after standardized milling. Low values (less than 50) represent hard coals(Ward, 1984).

FREE SWELLING INDEX (FSI)

The free swelling index of a coal is a measure of its so-called caking capacity, an important indication of its potential for coke making. Values range from 0 (non-caking) to 9. The ideal range is 4 to 6 (Ward, 1984) although as a rule different coals are blended together to provide the optimum swelling properties.

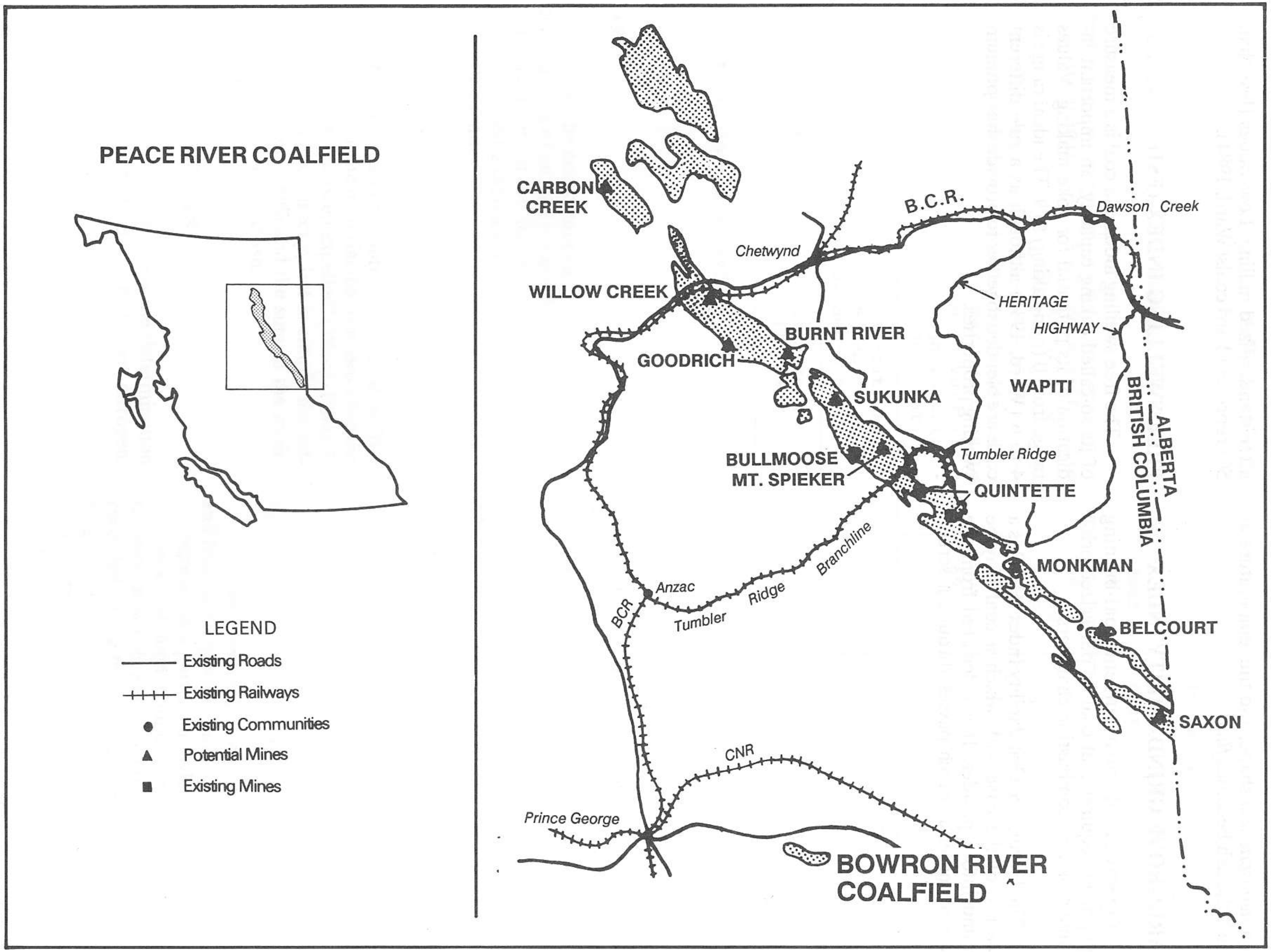

Figure 2: Location of properties in the Peace River coalfield.

GEOLOGICAL SETTING OF BRITISH COLUMBIA COALS

Details concerning the geology of the coalfields and individual coal properties in British Columbia are contained in Paper 1986-3, Coal in British Columbia, as well as in numerous other technical publications. This section is intended to provide a general overview only, and the reader is referred to these other sources for more detailed information.

British Columbia coal deposits range from Late Jurassic to Tertiary in age, and occur in three of the five major tectonic belts. The Insular Belt includes the Upper Cretaceous Vancouver Island coals. The Intermontane Belt includes Jurassic and Cretaceous coals of northwestern British Columbia, and Tertiary coals of south central British Columbia. The Rocky Mountain Fold and Thrust Belt includes Lower and Upper Cretaceous coal deposits of northeast British Columbia, known as the Peace River coalfield, and Jurassic–Cretaceous coal deposits of southeast British Columbia, known as the East Kootenay coalfields.

PEACE RIVER COALFIELD

Coal deposit locations in the Peace River coalfield are illustrated in Figure 2. These coals occupy a stratigraphic interval of over 3000 metres and are found in four different formations. Lower Cretaceous Gething and Gates formations contain the major coal measures of the region (Figure 3). Minor coal occurrences have also been investigated by exploration companies in the Jurassic-Cretaceous Minnes Group and in the Upper Cretaceous Wapiti Formation. The Peace River coalfield proper occurs in the inner Foothills of the Rocky Mountains from north of the Peace River south to the Alberta–British Columbia border. Coals of the Wapiti Formation are not in what has been traditionally known as the Peace River coalfield, but occur in the closely associated outer Foothills and Alberta Syncline structural zone. All major coals in the coalfield are closely associated with marine shorelines and within any formation the marine influence on coal seams may vary with stratigraphic or lateral position.

Current coal production in the coalfield is from the Gates Formation. Coals of this interval are usually thick and continuous. They form the major coal resource of the coalfield from the Bullmoose area south to the Alberta border. Formation thickness decreases from about 350 metres at the Alberta border to about 60 metres at Peace River. Important coal seams are present in the formation from the south to just north of the Bullmoose mine where they thin and the formation becomes mainly marine in origin and non-coal-bearing.

Gething Formation coals form a significant portion of the resource base of the coalfield. Minor past production has occurred from this formation but at present it is not a producer. Formational thickness varies significantly from about 100 metres in the south at the Alberta–British Columbia border to over 1000 metres in the north at Carbon Creek. In the Sukunka to Quintette region an upper member of the Gething Formation contains several major coal seams. This member pinches out just north of the Sukunka deposit. North of Sukunka the coals are located in the major body of the Gething Formation with the major coal development being near the top of this unit. At Carbon Creek more than 100 coal seams have been identified with 10 seams being over 1 metre in thickness.

Minnes Group coals are present throughout the coalfield but have not proved as economically interesting as those in the Gates and Gething formations. Wapiti Formation coal occurs principally at the base of the formation where seam thickness may reach 2 metres.

The coalfield is in the inner Foothills of the Rocky Mountain Fold and Thrust Belt. Folding

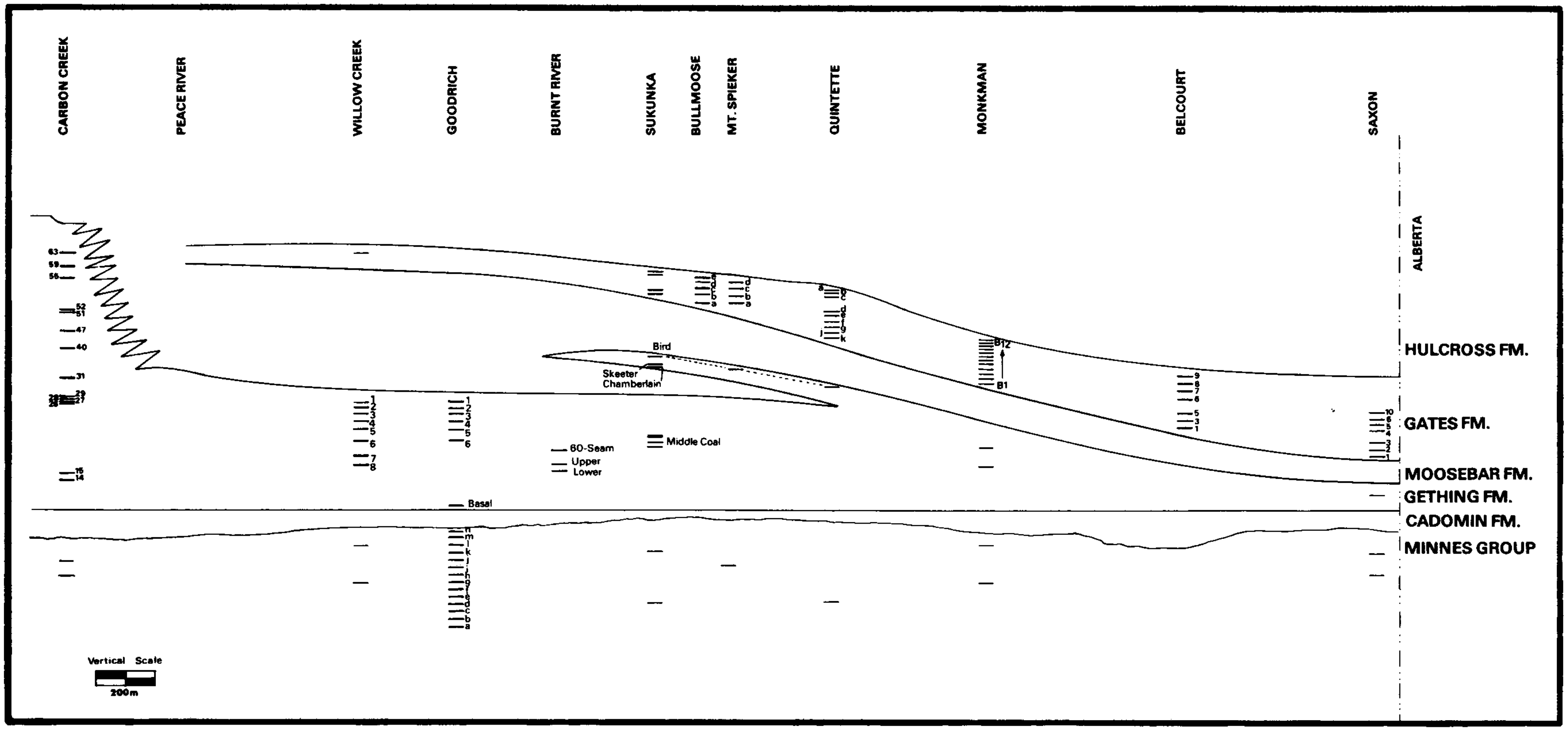

Figure 3: Schematic cross section of the Peace River coalfield showing stratigraphic relationships and relative coal seam positions. The Wapiti Formation is approximately 2000 metres above the top of the Gates Formation.

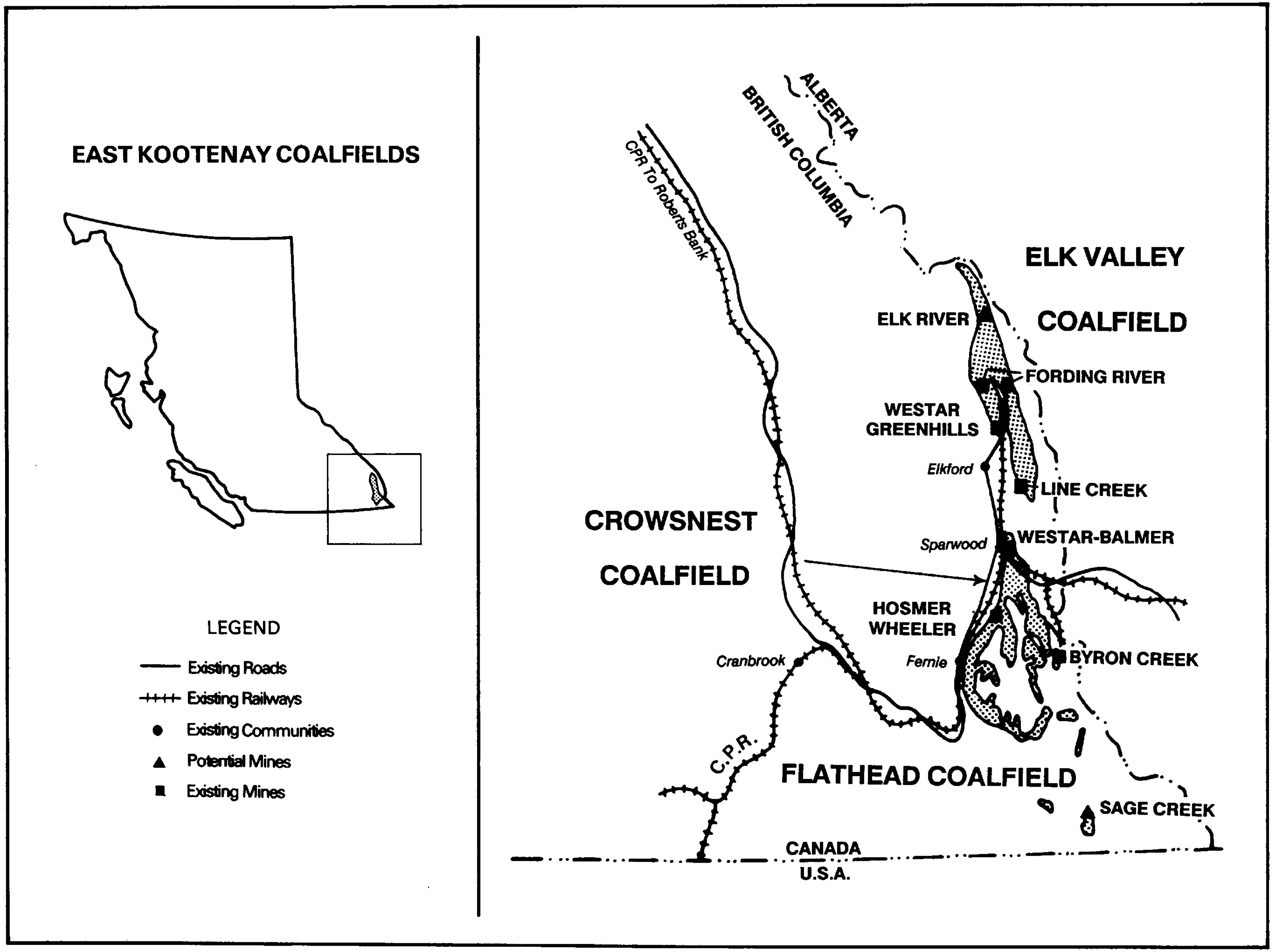

Figure 4: Location of properties in the East Kootenay coalfields. See Figure 3 for property locations.

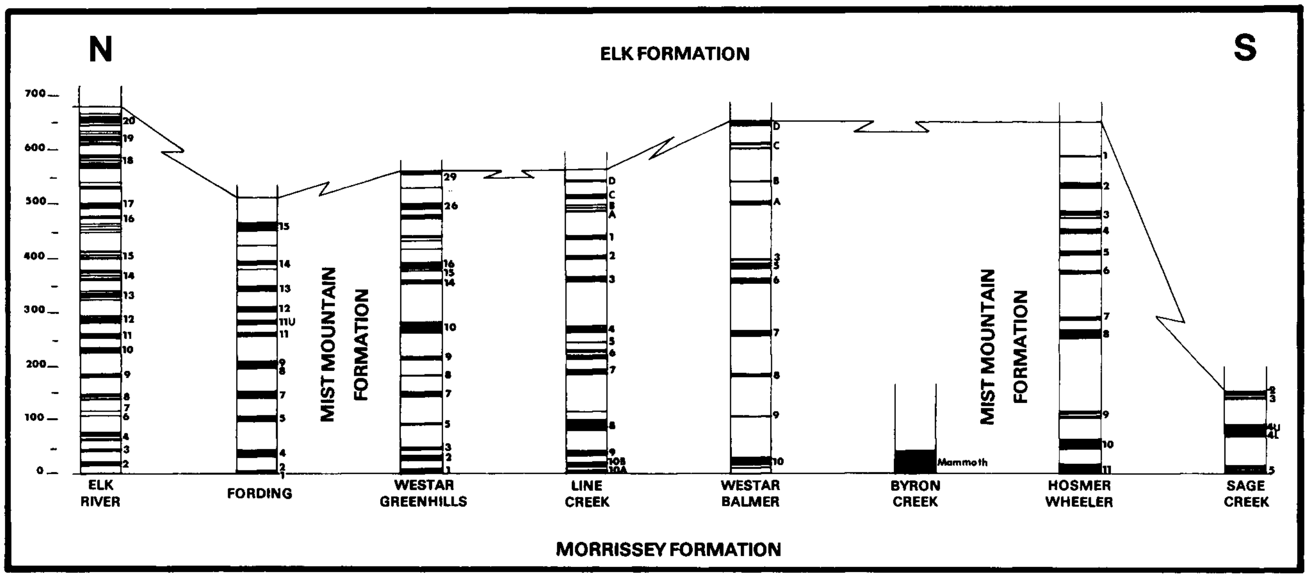

Figure 5: Schematic stratigraphic sections of the Mist Mountain Formation in southeastern British Columbia, showing relative coal seam positions and thicknesses.

and faulting are common within the coal deposits of the belt. Structural complications within deposits may range from simple to extreme, depending on the situation. In some locations multiple fault repeats have substantially increased seam thickness. Coals in the Wapiti Formation are relatively unaffected by structural complications and are generally flat laying.

EAST KOOTENAY COALFIELDS

The distribution of coal deposits in the East Kootenay coalfields of southeastern British Columbia is shown in Figure 4. Three structurally separate coalfields are recognized: the Elk Valley, Crowsnest and Flathead coalfields. A summary of the geology of the region's coal resources is provided in Grieve (1985).

The Mist Mountain Formation of the Jurassic –Cretaceous Kootenay Group contains essentially all the economic coals in this region. Figure 5 shows generalized sections of the Mist Mountain Formation at selected locations. The formation averages 500 metres in thickness in southeastern British Columbia, with a range from less than 200 to greater than 600 metres. Individual seams range from less than 1 to greater than 13 metres in thickness, and cumulatively they comprise between 8 and 12 per cent of the total stratigraphic thickness of the formation. The seam numbers and names included in Figure 5 apply only to the sections where they are plotted. As a rule, correlation of individual coal seams on a regional basis in the East Kootenay coalfields is not possible. A potential exception to this rule is the significant coal zone which occurs at or near the base of the formation at most locations throughout southeast British Columbia. Examples of this include 5-seam at Sage Creek, the Mammoth seam at Byron Creek Collieries, and 10A and 10B seams at Line Creek. Marine influence is generally not evident within the Mist Mountain Formation.

The East Kootenay coalfields are within the Front Ranges of the Rocky Mountains, a structural province characterized by thrust faults and folds. The distribution and shape of the coalfields (Figure 4) are controlled by these features, with large synclines forming the major structures in the Crowsnest and Elk Valley coalfields. Because of the structural setting, most properties contain strata which are moderately to steeply dipping, and which are affected by faulting. These deformational features are important factors in mine planning, but are usually not insurmountable, and are often advantageous, especially in instances where coal seams are tectonically thickened. An example is the Mammoth seam at Byron Creek Collieries, which has been thickened by thrust faulting.

HAT CREEK COALFIELD

The two structurally separate coal deposits which comprise the Hat Creek coalfield (Figure 6) occur in the Eocene Hat Creek Coal Formation of the Kamloops Group. We are concerned here with the more northerly No. 1 deposit, which was extensively explored during the 1970s by B.C. Hydro. The coal measures in the No. 1 deposit are ap-

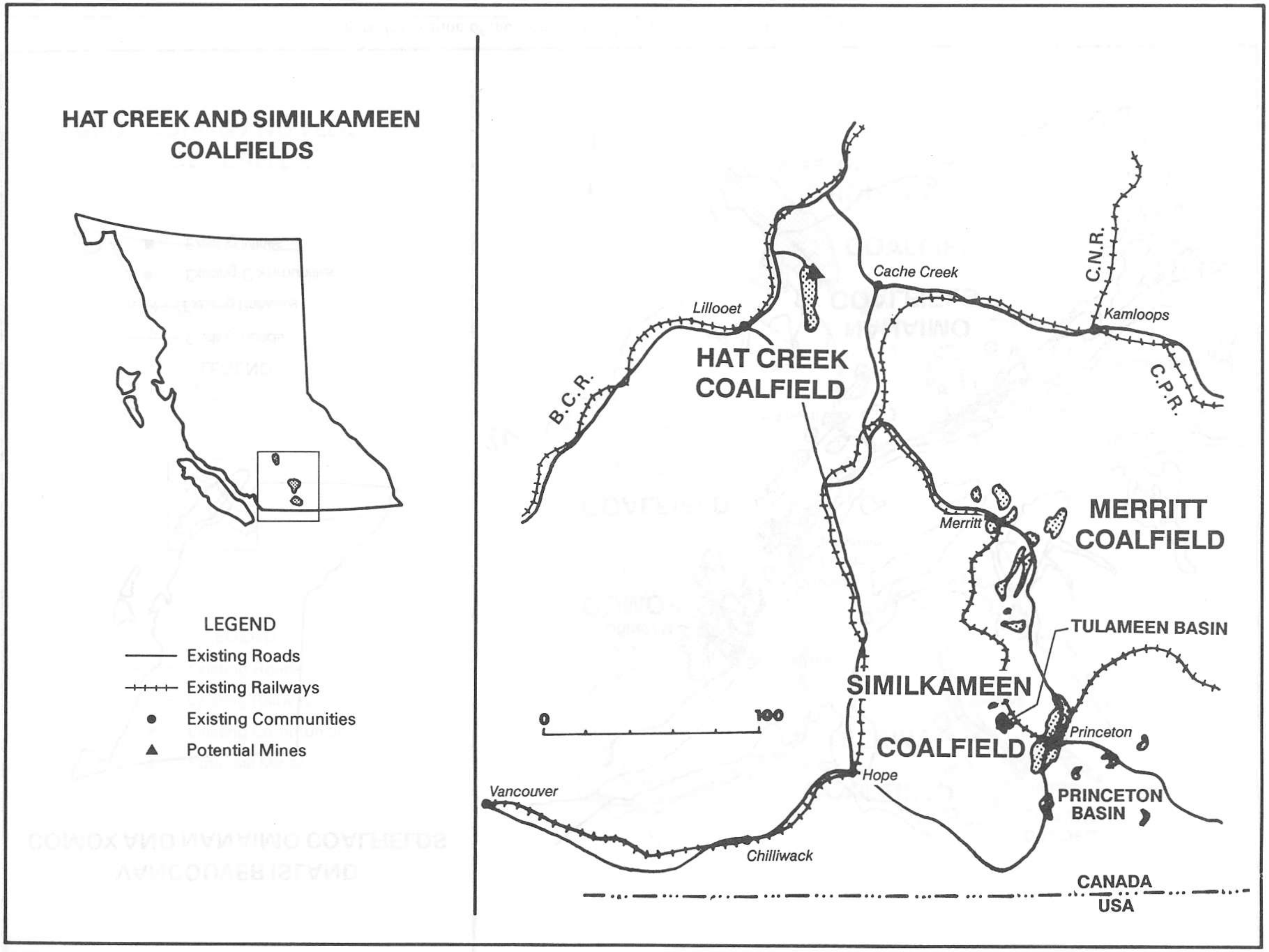

Figure 6: Location of Tertiary coal deposits in the southern Interior region of British Columbia.

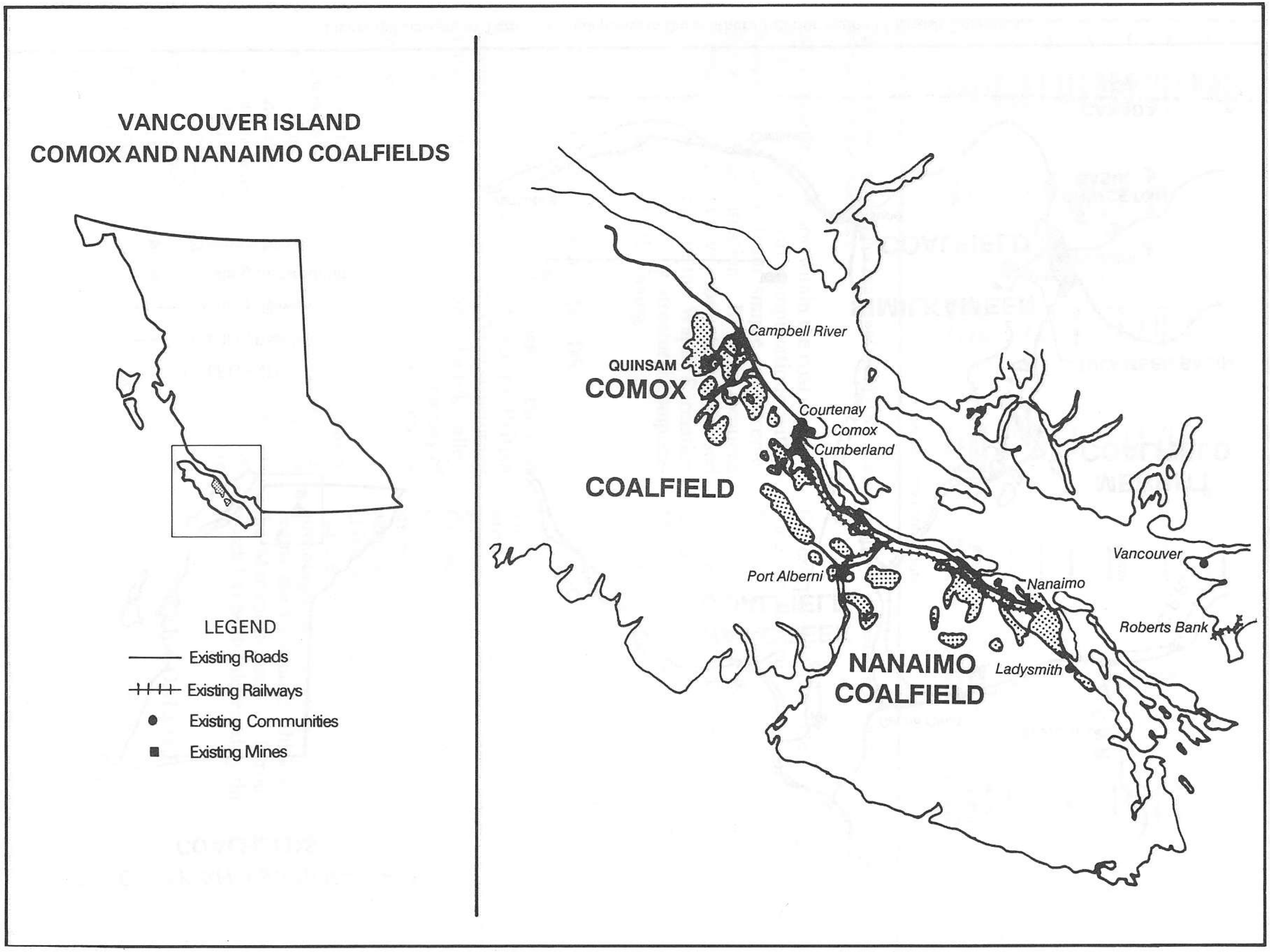

Figure 7: Location of the Comox and Nanaimo coalfields on Vancouver Island.

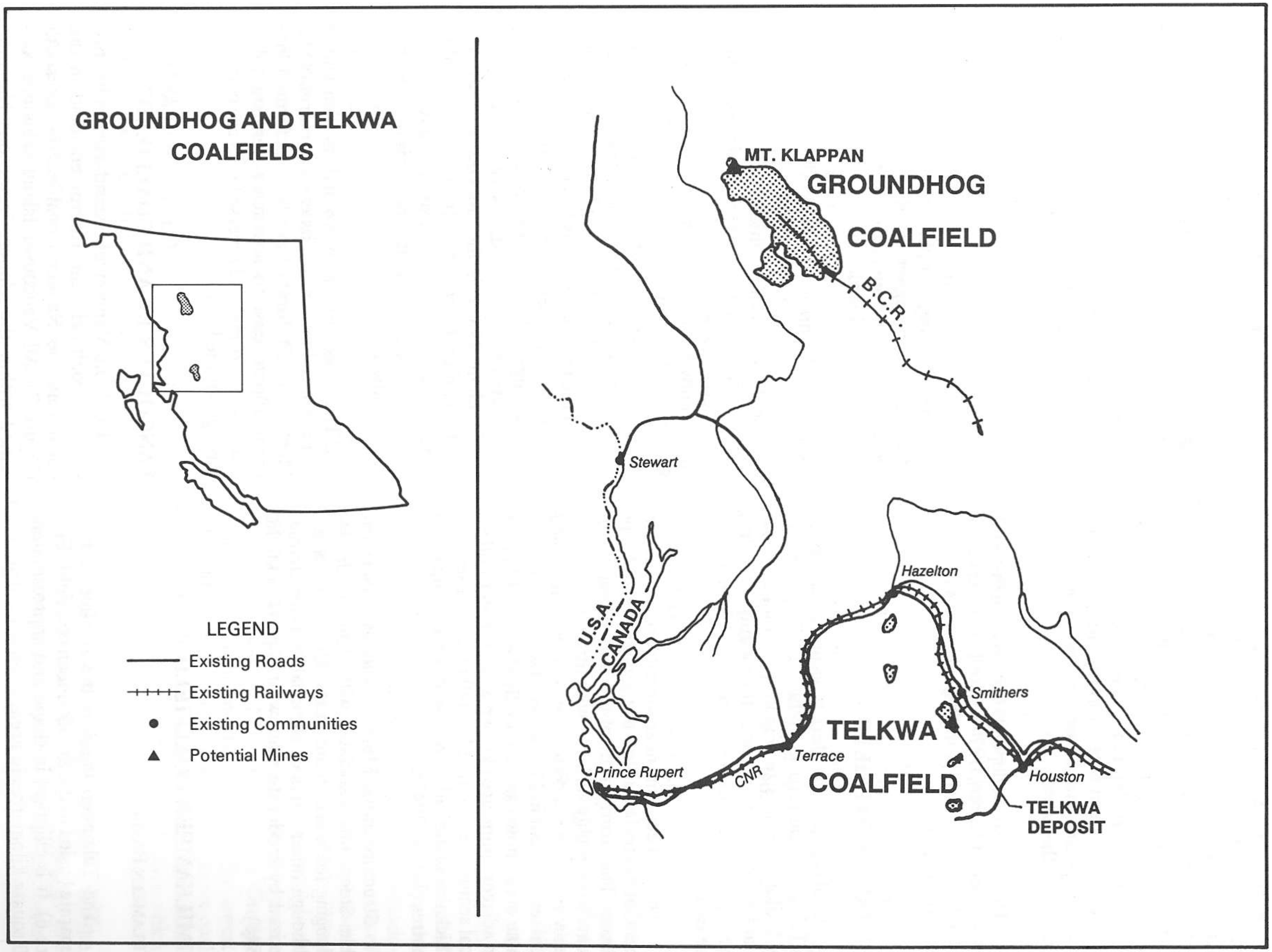

Figure 8: Location of the Telkwa and Groundhog coalfields.

proximately 350 to 560 metres thick, and have been subdivided into four coal zones and two rock zones (Kim, 1985). Only one of the coal zones, however, the D zone, is devoid of rock partings, and so the bulk of the deposit is composed of thinly interbedded coal and rock. This is reflected in the high ash content of Hat Creek coal, which will be covered in the next section. Nonetheless, the Hat Creek deposits contain one of the thickest coal sections in the world.

The Hat Creek deposits occupy a north-trending graben (Church, 1977). The No. 1 deposit is folded about a south-plunging axis and is affected by normal faults.

MERRITT COALFIELD

Coal measures at Merritt occupy a depression in Triassic volcanic rocks (White, 1947), roughly 11 by 5 kilometres in size (Figure 6). Other separate coal-bearing basins occur in the vicinity, including the deposits on Quilchena Creek, 20 kilometres to the east.

The coal deposits near Merritt are assigned to the Coldwater beds of the Eocene Kamloops Group. The stratigraphy of the coal measures appears to be highly variable, with little or no consistency over the coalfield. Between five and eight coal seams occur in 230 metres of strata at a former mine area known as Coal Gully (White, 1947). At an adjacent mine area known as Coldwater Hill six coal seams are contained in 140 metres of section. Thickness of individual coal seams ranges up to 4.5 metres (White, 1947).

Structure of the Merritt coalfield is also variable. Steep dips associated with tight, southeast-plunging folds are found in the Coal Gully area, although other parts of the coalfield are characterized by moderate southwest dips (Cockfield, 1948).

SIMILKAMEEN COALFIELD

TULAMEEN BASIN

The Tulameen basin is the smaller of two separate basins in the Similkameen coalfield (Figure 6). It is elliptical in shape and approximately 20 square kilometres in area.

The coal in the Tulameen basin is contained in the 130-metre-thick middle member of the Allenby Formation of the Eocene Princeton Group. Only two coal seams of significant thickness are found in the basin, and even these are well developed only along the western edge of the basin and are observed to shale out within it. Where developed, the lower seam averages about 7 metres in thickness, while the upper or main seam is 15 to 20 metres thick (Williams and Ross, 1979). They are separated by 20 to 25 metres of mudstone.

The major structure of the Tulameen basin is a southeast- plunging open syncline. The basin is affected by high-angle normal faults, and in some locations the coal appears to be affected by thrust faulting (Evans, 1985).

PRINCETON BASIN

Coal of workable thickness occurs in the southern half of the Princeton basin only, and is contained in the so-called coal-bearing member of the Allenby Formation of the Eocene Princeton Group (McMechan, 1983). A total of eight coal seams or zones have been documented in the member, although no more than five or six occur at any one location. The overall stratigraphic thickness of the member exceeds 1000 metres. Correlation of seams is extremely difficult because of facies changes. The basal coal zone of the member, known as the Princeton-Black-Blue Flame zone (McMechan, 1983), is the thickest and was the most significant producer. It is highly variable, ranging from 2 to 15 metres in thickness; the number of rock partings it contains is fairly high at most locations.

The Princeton basin is a half graben with a major normal fault along its eastern margin (McMechan, 1983). Strata have been deformed into broad, open, east to southeast-trending folds. Small-scale normal and reverse faults are common throughout the basin.

VANCOUVER ISLAND COALFIELDS

Coal on Vancouver Island occurs in two separate coalfields, the Comox coalfield in the north, and the Nanaimo coalfield in the south (Figure 7). All Vancouver Island coals are contained within the Upper Cretaceous Nanaimo Group, although the coals in the Nanaimo coalfield are younger than those of the Comox coalfield.

The structure of the Vancouver Island coalfields is characterized by gently warped and tilted fault blocks (Muller and Atchison, 1971). Most fault blocks are tilted and downthrown to the northeast along northwest-trending faults. Faults in the Nanaimo coalfield are more closely spaced and have greater displacement than those in the Comox coalfield.

Comox Coalfield

The Cumberland and Dunsmuir members of the Comox Formation host the coals of the Comox coalfield (Bickford and Kenyon, 1988). Past and current production is from the Cumberland member only. Its characteristics are quite variable, although it generally contains from one to four coal seams or zones, with the thickest individual seam being about 3.5 metres thick. At the operating Quinsam Coal mine, west of Campbell River (Figure 7), mining is in the No. 1 coal bed, 2.4 to 4.0 metres thick, in the basal Cumberland. Coals of the Dunsmuir member tend to be thin.

Nanaimo Coalfield

In the Nanaimo coalfield coals are found in the Northfield member of the Extension Formation, the Newcastle member of the Pender Formation, and in the Reserve member of the Protection Formation (Bickford and Kenyon, 1988). The Extension Formation hosts the Wellington and the Little Wellington (No. 2) coal beds, which have average respective thicknesses of 2.5 and 0.5 metres. Both have contributed to coal production in the Nanaimo area. The Pender Formation hosts the formerly productive Newcastle and Douglas coal beds. Their average thicknesses are 1.0 and 3.0 metres, respectively. There has been no production of coals from the Protection Formation.

TELKWA COALFIELD

The Telkwa coalfield is part of the Bowser Basin of northwestern British Columbia. The deposits are hosted by the lower part of the Lower Cretaceous Skeena Group. Discussion here will focus on the Telkwa deposit (Figure 8).

The 400-metre-thick Telkwa coal measures contain coal in two distinct sequences (Schroeter *et al.*, 1986). The lower sequence includes up to four coal seams with an aggregate thickness of 2 to 12 metres and which range from 1 to 6 metres in thickness. Its overall thickness ranges from 2 to 40 metres. The upper sequence contains up to 15 coal seams, with individual thicknesses ranging between 1 and 5 metres and having an aggregate thickness of up to 26 metres. Its overall thickness varies from 20 to 170 metres. Quality reported in this catalog represents coals in the proposed Crows Nest Resources mine plan, which are part of the upper coal sequence.

Telkwa coal measures are characterized by high-angle faulting (Schroeter *et al.*, 1986). Faults are steeply dipping, trend predominantly northwesterly, and are of both normal and reverse types. The coal measures are generally preserved in graben structures formed by these faults. The deposit is characterized by broad, open folding and shallow northeast or southwest dips.

GROUNDHOG COALFIELD

The Groundhog coalfield is also part of the Bowser Basin of northwestern British Columbia, with the host rocks in this case being the Middle to Upper Jurassic Bowser Lake Group, and the Cretaceous Skeena Group. Discussion here will focus on the Mount Klappan deposit, at the north end of the coalfield (Figure 8).

Coal at Mount Klappan occurs in the so-called Unit 2 (Schroeter *et al.*, 1986), which spans the Bowser Lake-Skeena contact and the Jurassic-Cretaceous boundary, and which includes strata of both marine (Bowser Lake) and nonmarine (Skeena) origin. It ranges in thickness from 350 to 420 metres. Three members of Unit 2 have been defined (Schroeter *et al.*, 1986), with the contact between the Bowser Lake and Skeena Groups occurring within the middle member. The lowest and middle members each contains up to six coal seams, with individual seams up to 5 metres thick. The upper member contains four coal seams which range in thickness up to 8 metres.

Two phases of deformation have affected the strata of the Mount Klappan area (Moffat and Bustin, 1984). The first phase involved northwest-trending folds and minor thrust faults. These structures were later deformed by broad, open, northeast-trending folds and flat-lying thrust faults.

BOWRON RIVER COALFIELD

Bowron River coalfield occupies a northwesterly-trending elongate basin about 25 kilometres in length which lies 45 kilometres east of Prince George (Figure 2). Coal deposits occur in the lower portion of an unnamed Tertiary (late Paleocene or younger) sequence, that may be up to 700 metres thick (Smith, 1989). The coal zone, which is up to 35 metres in thickness, contains an aggregate of 12 metres of coal, in lenticular seams which attain thicknesses of 1.5 to 3.5 metres.

The structure of the coalfield is an asymetric graben; strata dip moderately to the northeast (Smith, 1988). There is significant folding and faulting of the coal measures within the basin.

QUALITY OF BRITISH COLUMBIA COALS

Quality parameters of individual coal seams from the main coalfields and basins in British Columbia are listed in the Appendix. These data are summarized in this section.

PEACE RIVER COALFIELD

Coal quality and rank in the Peace River coalfield spans a significant range of values due to varied stratigraphic position and thermal maturation history. Rank of coals in the coalfield ranges from low volatile bituminous to high volatile bituminous B. Within the disturbed belt, coal ranks generally tend to decrease towards the mountains due to the initiation sequence of thrusting, which was from west to east (Kalkreuth and McMechan, 1988). As the strata being displaced by thrusting were raised, coalification slowed or ceased relative to equivalent unfaulted strata. Quality parameters such as sulphur and ash content, ash and coal chemistry and maceral composition are dictated largely by the sedimentary environment in which the individual coal seams were deposited. Marine influence during or immediately after deposition is the major quality controlling factor in this respect. Strong marine association tends to increase the sulphur content, decrease the ash fusion temperature, increase the ash base/acid ratio and increase the reactivity of a coal.

Minnes Group coal seams range in rank from high to low volatile bituminous.

Gething Formation coals are of economic interest primarily from the Peace River to the Sukunka River. At Carbon Creek the seams in the lower half of the formation tend to be lower in sulphur (<1.0%) than those in the upper half of the formation. Sulphur distribution is due to the stronger marine influence in the upper part of the section. The rank is medium volatile bituminous for all of the seams. Further south, at Willow Creek, the sulphur content of the seams is generally low (about 0.5%). The rank varies with stratigraphic position and is from low volatile bituminous to medium volatile bituminous. At the Goodrich deposit coals of the same stratigraphic interval as Willow Creek are of interest. Their rank is slightly lower due to their earlier involvement in deformation. Further south at Burnt River, Gething Formation coals are all low volatile bituminous in rank due to their relatively late deformation. They are low in sulphur and are well suited to thermal applications. Coals in the upper member of the Gething Formation have excellent free swelling characteristics and are medium volatile bituminous in rank. The upper seam in this interval, the Bird seam, is high in sulphur due to close proximity of overlaying marine Moosebar Formation strata (often overlying by less than 1 metre).

Gates Formation coals are presently being produced from the Bullmoose and Quintette deposits. These coals produce an excellent metallurgical product, are low in sulphur, have high grindabilities and moderate to high swelling properties (Appendix). Oxidized portions of these seams are produced for thermal products. The coals all tend to be medium volatile bituminous in the major deposits (Appendix), but high volatile bituminous ranks may be present near the western limit of the coalfield in seams stratigraphically high in the Gates Formation.

Wapiti Formation coals investigated to date occur at one stratigraphic horizon, within a few metres of the formation base. On the basis of vitrinite reflectance the rank of this coal is high volatile bituminous A to B.

In summary the coals of this coalfield range in rank from low volatile bituminous to high volatile bituminous B. Sulphur content is generally less than 0.5 per cent but locally seams in close association with marine strata may reach 2.0 per cent.

Coals suitable for both metallurgical and thermal applications are being produced from this coalfield.

EAST KOOTENAY COALFIELDS

The East Kootenay coalfields of southeastern British Columbia contain coals which range in rank from high volatile A to low volatile bituminous. Rank of any given seam is dependent on both stratigraphic position and geographic location. Stratigraphic position influences rank through the effect of up-section rank decrease (Hilt's Rule). This effect is compounded, when classifying rank of coals by volatile matter content, by a general up-section increase in reactive maceral contents (Cameron, 1972). Geographic position influences rank through the effect of regional rank gradients (Pearson and Grieve, 1985). This is exemplified by comparing the rank of the basal coal seam of the Mist Mountain Formation at various locations. On the Elk River property, 2-seam is low volatile bituminous, with a dry, ash-free (d.a.f.) volatile matter content of 20.1 per cent. In contrast, at Byron Creek Collieries the Mammoth seam is medium volatile and has a volatile matter content (d.a.f.) of 27.8 per cent, while at Sage Creek the 5-seam is also medium volatile and has a value of 29.0 per cent (based on values in this catalog only). Of the properties listed in the Appendix, the Elk River property has the greatest proportion of low-volatile coals, while Greenhills mine and the Hosmer-Wheeler property have the greatest proportion of high-volatile coals.

Other quality attributes of coals of the East Kootenay coalfields include low sulphur contents (generally <0.5%), high ash fusion temperatures, and high Hardgrove indices. Their coking properties (not covered here) make them attractive metallurgical coals, and their high heat contents are desirable for thermal applications. Coals of semicoking variety have found markets within the last few years. Major markets for coking, semicoking, and thermal coals are eastern Asian countries, principally Japan and Korea. Ranges of contract specifications on an air-dried basis are as follows (Horie, 1987):

Metallurgical Coal: moisture, 1.0–1.5 per cent; ash, 6.5–9.5 per cent; volatile matter, 19–33 per cent; fixed carbon, 59–69 per cent; calorific value, 7600–7800 kcal/kg; FSI, 6–8.

Semi-coking coal: ash, 8.5–10.5 per cent; volatile matter, 21–28 per cent; sulphur, 0.3–0.6 per cent; FSI, 3–6.

Thermal coal: moisture, 1.0–1.5 per cent; ash: 9–15 per cent, volatile matter, 19.5–31.0 per cent; fixed carbon, 60–66 per cent; calorific value, 6400–7400 kcal/k; FSI, 1–5.5.

HAT CREEK COALFIELD

Rank of coals in Hat Creek coalfield ranges from lignite to sub-bituminous A (Smith, 1989), with the No. 1 deposit containing coals ranging in rank from lignite to sub-bituminous C (Goodarzi, 1985). Average volatile matter content (d.a.f.) is 51 per cent (Smith, 1989). Moisture and ash contents are generally high, while sulphur content and calorific value are low. For example, the No. 1 deposit is characterized by coal with an average 34.82 per cent ash, 24 per cent moisture, and a calorific value of 4222 kcal/kg (Kim, 1985). Sulphur content of the sample cited in the Appendix is 0.5 per cent.

MERRITT COALFIELD

Rank of coals in the Merritt coalfield ranges from high volatile A to high volatile C bituminous (Smith, 1989). The two seams cited in the Appendix, representing formerly active mines at Middlesboro colliery (Dickson, 1941) are both high volatile B. Coal quality is variable between different seams and deposits in the coalfield. Typical values are (all as received): moisture, 5.0 per cent; ash, 9.0 per cent; volatile matter, 34.0 per cent; fixed carbon, 52.0 per cent, calorific value, 6500 kcal/kg; and sulphur, 0.6 per cent.

SIMILKAMEEN COALFIELD

TULAMEEN BASIN

Rank of coals in the Tulameen basin ranges from high volatile C to high volatile A bituminous. Average quality parameters for the main seam in two separate mines (Dickson, 1941) are (all as received): moisture, 5.5 per cent; ash, 8.8 per cent; volatile matter, 29.0 per cent; fixed carbon, 56.7 per cent; calorific value, 6500 kcal/kg; and sulphur, 0.7 per cent.

PRINCETON BASIN

Coal rank in the Princeton basin ranges from lignite to high volatile A bituminous, with most of the former production from the sub-bituminous A to high volatile C bituminous category (Smith, 1989). The example cited in the Appendix represents the major Princeton seam from one former mine location only. Average quality characteristics of five former mines in the Princeton seam cited by McMechan (1983) are as follows (all as received): moisture, 16.2 per cent; ash, 7.0 per cent; volatile matter, 30.8 per cent; fixed carbon, 46.2 per cent; sulphur, 0.45 per cent; calorific value, 5600 kcal/kg.

VANCOUVER ISLAND COALFIELDS

COMOX COALFIELD

The Comox coalfield contains mainly coals of high volatile A and B bituminous rank. Typical coal quality characteristics are as follows (Smith, 1989): moisture (a.r.), 4 per cent; ash (dry), 14 per cent; volatile matter (d.a.f.), 38 per cent; fixed carbon (d.a.f.), 62 per cent; calorific value, 8240 kcal/kg; sulphur, 1.5 per cent. Specifications of the Quinsam mine's thermal coal product include (all air-dried): calorific value, 6500 kcal/kg; moisture, 3.5 per cent; ash, < 13.5 per cent; volatile matter, 36.5 per cent; and sulphur, < 1 per cent. This represents a lower rank bituminous coal.

NANAIMO COALFIELD

Coals of the Nanaimo coalfield are mainly high volatile B bituminous in rank. Typical coal quality characteristics are as follows (Smith, 1989): moisture (a.r.), 5 per cent; ash (dry), 14 per cent; volatile matter (d.a.f.), 41 per cent; fixed carbon (d.a.f.), 59 per cent; calorific value, 8240 kcal/kg; sulphur, 0.5 per cent. Values cited in the Appendix represent four former mines in each of four separate coal seams. Calorific values (a.r.) vary from 6300 to 6733 kcal/kg, and sulphur contents range from 0.36 to 1.12 per cent.

TELKWA COALFIELD

Most coals of the Telkwa coalfield range from high to medium volatile bituminous, with local occurrences of higher rank (Smith, 1989). Typical coal quality characteristics are as follows (Smith, 1989): moisture (a.r.), 4 per cent; ash (dry), 10 per cent; volatile matter (d.a.f.), 30 per cent; fixed carbon (d.a.f.), 70 per cent; sulphur, 1.1 per cent; and calorific value (d.a.f.), 8240 kcal/kg. The Telkwa deposit, which is the only deposit in the coalfield being considered here, is high volatile A bituminous in rank. Values from the Telkwa deposit cited in the Appendix represent averages (air dried) of washed coal from each of seams 1 to 10. Average volatile matter contents range from 26.1 to 31.9 per cent, moisture ranges from 1.23 to 2.17 per cent, calorific values range from 7005 to 7368 kcal/kg, and sulphur contents range from 0.66 to 2.11 per cent.

GROUNDHOG COALFIELD

Coals in Groundhog coalfield range from low volatile bituminous to meta-anthracite (Smith, 1989). Typical coal quality characteristics of the coalfield are as follows (Smith, 1989): moisture (a.r.), 4 per cent; ash (dry), 24 per cent; volatile matter (d.a.f.), 10 per cent; fixed carbon (d.a.f.), 90 per cent; sulphur, 0.8 per cent; calorific value (d.a.f.), 8360 kcal/kg. The Mount Klappan deposit, which is the only deposit in the coalfield being considered here, contains coals of anthracitic rank. Values in the appendix represent composites of coal seams in two different areas on the property: the Lost-Fox area and the Hobbit-Broatch area. Air-dried volatile matter contents for these two areas are 7.9 and 8.3 per cent, respeetively.

BOWRON RIVER COALFIELD

Rank of Bowron River coals is in the high-volatile C and B bituminous range. Typical coal quality characteristics, on an as-received basis, are: moisture, 4.0 per cent; ash, 35.7 per cent; volatile matter, 26.4 per cent; fixed carbon, 33.9 per cent; sulphur, 1.25 per cent; and calorific value, 4500 kcal/kg. No other values have been included in the Appendix.

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Appendix

QUALITY OF BRITISH COLUMBIA COAL SEAMS

List of Abbreviations:

HGI	Hardgrove Index
FSI	Free Swelling Index
ROM	Run of Mine
AD	Air Dried
AR	As Received
HVA,B,C	High Volatile A, B, or C
MV	Medium Volatile
LV	Low Volatile
BIT	Bituminous
SUBBIT	Subbituminous
ANTH	Anthracite
ASH FUS. TEMPS.	Ash Fusibility Temperatures
SPHER.	Spherical
HEMISPH.	Hemispherical
CHAM.	Chamberlain seam

PEACE RIVER COALFIELD

CARBON CREEK PROPERTY SOURCE: COMPANY REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
14	MV BIT		AR	1.08	19.71	14.35	64.86	7240				0.65				4
15	MV BIT		AR	1.28	20.96	5.21	72.55	7963				0.71				2
31	MV BIT		AR	1.43	21.37	31.20	45.81	5528				0.81				5.5
40	MV BIT		AR	2.08	27.41	11.87	58.63	7110				1.23				7
46	MV BIT		AR	2.34	28.13	4.76	64.75	7665				0.96				4
47	MV BIT		AR	2.64	23.72	12.61	60.19	6725				1.00				2
51	MV BIT		AR	2.55	25.30	5.22	66.93	7579				0.80				2
51A	MV BIT		AR	2.89	28.68	6.33	62.10	7512				0.86				2.5
52	MV BIT		AR	2.12	26.77	23.10	48.01	6078				1.83				4
54	MV BIT		AR	2.80	26.72	7.98	62.51	7292				0.89				1.5
55	MV BIT		AR	2.76	27.06	12.03	58.15	6984				0.60				2.5
58	MV BIT		AR	2.44	26.73	17.03	53.80	6434				0.93				2.5
59	MV BIT		AR	2.24	19.69	44.89	33.18	4148				0.59				1

WILLOW CREEK PROPERTY SOURCE: STAGE 1 REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
8	LV BIT	CORE&TREN	DRY	-	18.75	14.98	66.38	7267				0.66				3.5
7	LV BIT	CORE&TREN	DRY	-	15.63	7.97	76.58	7950				0.60				1
6	LV BIT	CORE&TREN	DRY	-	16.29	7.28	76.42	7949				0.62				1
5	LV BIT	CORE&TREN	DRY	-	16.91	8.31	74.79	7890				0.70				1
4	MV BIT	CORE&TREN	DRY	-	19.96	10.10	70.10	7681				0.48				3
3	MV BIT	CORE&TREN	DRY	-	21.08	8.71	70.21	7721				0.43				2
2	MV BIT	CORE&TREN	DRY	-	22.99	14.49	62.47	7327				0.59				6
1	MV BIT	CORE&TREN	DRY	-	23.72	7.90	68.32	7862				0.50				4.5

GOODRICH PROPERTY SOURCE: ASSESSMENT REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
1	MV BIT	CORE	AD	0.54	25.42	11.88	62.18	7328				0.26				4
2	MV BIT	CORE	AD	0.67	23.53	12.45	63.35	7270				0.47				3
3	MV BIT	CORE	AD	0.48	20.52	10.62	68.38	7660				1.08				7
4	MV BIT	CORE	AD	1.01	27.69	4.34	66.97	8073				0.43				5.5
5	MV BIT	CORE	AD	0.47	22.03	5.45	72.05	8013				0.58				3.5
6	MV BIT	CORE	AD	0.36	24.48	5.30	69.86	8106				0.92				7

BURNT RIVER PROPERTY   SOURCE: STAGE 1 REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
LOWER	LV BIT	CORE(AVG)	AD	0.90	13.50	6.30	78.80	8020				0.40			65	
UPPER	LV BIT	CORE(AVG)	AD	0.80	13.80	7.10	77.90	7885				0.41			57	
60	LV BIT	CORE(AVG)	AD	0.80	16.20	10.60	72.10	7640				0.32			79	

SUKUNKA PROPERTY   SOURCE: COMPANY REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
BIRD	MV BIT	CLEANCORE	AD	0.50	26.80	8.10	64.60	7995				2.09		70	109	8.5
SKEETER	MV BIT		AD	0.97	19.75	12.57	66.71	7427				0.61				7
CHAM.	MV BIT		AD	1.48	24.13	6.85	69.65	8261				0.47				6.5

BULLMOOSE MINE   SOURCE: BONNELL AND JANKE (1986); ASSESSMENT REPORT (C-SEAM) SEE BELOW FOR ASH ANALYSES

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
6 MET	MV BIT	CHANNEL	AR	5.40	20.75	21.00	64.39	6203	64.51	3.62	1.07	0.39	4.10	110	77	5
A2 MET	MV BIT	CHANNEL	AR	2.30	22.01	13.03	62.65	7230	75.45	3.82	1.10	0.41	3.70	160	77	5
A2 THML	MV BIT	CHANNEL	AR	1.25	23.70	9.23	65.01	7593	78.97	4.37	1.10	0.40	3.81	250	77	6.5
B MET	MV BIT	CHANNEL	AR	1.80	25.85	7.66	64.84	7659	80.02	4.40	1.25	0.16	4.89	230	81	6.5
B THML	MV BIT	CHANNEL	AR	4.02	24.93	24.51	65.92	7599	79.75	4.40	1.25	0.20	6.03	150	82	1
C	MV BIT	BULK	AD	0.50	22.60	24.60	52.30	6446				0.70			72	5
E MET	MV BIT	CHANNEL	AR	5.90	24.70	18.30	51.01	6375	65.85	3.88	1.10	0.49	4.44	90	72	7
A1 MET	MV BIT	CHANNEL	AR	2.50	22.76	6.61	68.10	7851	81.26	4.32	1.21	0.31	3.81	160	76	5
A1 THML	MV BIT	CHANNEL	AR	1.20	23.25	5.50	70.16	7986	82.85	4.39	1.25	0.30	4.62	310	72	2.5

SEAM	ASH FUS. TEMPS., REDUCING (DEGREES C)				ASH ANALYSIS (%)										
	INITIAL	SPHER.	HEMISPH.	FLUID	SiO2	Al2O3	Fe2O3	Mn3O4	TiO2	P2O5	CaO	MgO	SO3	Na2O	K2O
6 MET	1318	>1482	>1482	>1482	65.58	15.52	3.87		1.61	0.03	2.78	1.12	3.21	1.02	0.02
A2 MET	1154	1229	1393	>1482	59.54	16.64	9.16		1.45	0.10	3.30	1.70	2.90	0.49	1.20
A2 THML	1299	>1482	>1482	>1482	60.37	23.47	3.03		1.46	0.28	2.75	1.21	2.43	0.61	0.48
B MET	1185	1238	1252	1310	30.10	15.21	5.27		1.80	0.28	25.60	3.60	5.04	2.28	0.16
B THML	1232	1282	1343	1377	41.60	26.85	8.63		2.60	0.60	7.78	1.37	2.87	2.30	0.50
E MET	1285	>1482	>1482	>1482	58.70	23.34	2.74		1.13	0.77	2.31	1.70	2.20	0.30	2.68
A1 MET	1179	1282	1404	1482	58.34	16.38	6.19		1.79	0.10	4.42	2.15	4.53	0.94	0.35
A1 THML	1218	1416	>1482	>1482	65.58	15.52	3.87		1.61	0.03	2.78	1.12	3.21	1.02	0.02

MT. SPIEKER PROPERTY SOURCE: COMPANY REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
A	MV BIT		AR	2.60	21.50	15.30	62.80					0.48			77	6.5
B	MV BIT		AD	1.20	20.80	15.30	62.60					0.40			79	2
C	MV BIT		AD	1.30	18.30	30.30	50.40					0.42			75	1.5
D	MV BIT		AD	1.30	22.90	8.10	67.70					0.44			81	1.5
1	MV BIT		AD	1.00	22.30	27.80	49.50					0.53			76	4.5
2	MV BIT		AD	1.00	20.70	28.10	50.30					0.37			70	3.5
3	MV BIT		AD	0.90	22.73	26.12	50.66					0.55			71	6.5
4	MV BIT		AD	1.45	21.66	14.04	63.90					0.50			76	6

QUINTETTE MINE SOURCE: BONNELL AND JANKE (1986); STAGE 1 REPORT (SHIKANO); ASSESSMENT REPORTS SEE BELOW FOR ASH ANALYSES

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
K	MV BIT		AD	0.45	17.71	17.37	65.00					0.47				
J	MV BIT	CHANNEL	AR	1.75	22.73	13.11	61.53	7153	74.32	4.15	1.05	0.27	4.20	70	81	7
G	MV BIT		AD	0.57	14.29	39.70	45.00	5249				0.52			77	2
F	MV BIT		AD	0.50	19.41	19.33	60.00	7466				0.49			85	5
E	MV BIT	CHANNEL	AR	2.00	22.60	17.95	57.48	6841	71.28	4.02	1.00	0.31	3.52	110	77	7
D	MV BIT		AD	0.46	20.88	17.78	60.00					1.88				4
A	MV BIT		AD	0.82	22.97	10.45	65.76					1.11			88	4
SHIKANO																
K	MV BIT	CLEAN	AD		19	9.5						0.59				6.5
J	MV BIT	CLEAN	AD		19	9.5						0.35				6
G	MV BIT	CLEAN	AD		21	9.5						0.48				7.5
F	MV BIT	CLEAN	AD		21	9.5						0.53				8
E	MV BIT	CLEAN	AD		23	9.5						0.47				8
D	MV BIT	CLEAN	AD		23	9.5						0.69				6.5

SEAM	ASH FUS. TEMPS., REDUCING (DEGREES C)				ASH ANALYSIS (%)										
	INITIAL	SPHER.	HEMISPH.	FLUID	SiO2	Al2O3	Fe2O3	Mn3O4	TiO2	P2O5	CaO	MgO	SO3	Na2O	K2O
K	1313	1415	1433	1463	69.85	17.33	3.12		1.28	0.10	2.82	1.22	3.64	0.54	0.45
J	>1482	>1482	>1482	>1482	50.85	31.51	2.22		1.37	0.18	4.00	1.38	3.29	0.54	0.17
G	1400	>1500	>1500	>1500	63.03	26.62	1.94		1.19	0.77	2.68	0.73	1.17	0.19	0.61
F	1312	1405	1432	1472	52.86	27.00	3.41		1.28	3.03	5.80	1.08	2.85	0.35	0.89
E	1310	>1482	>1482	>1482	59.85	23.05	2.47		1.13	0.25	3.69	1.28	2.70	0.62	1.76
D	1470	>1500	>1500	>1500	53.90	31.60	3.21		1.08	2.68	5.51	0.72	2.59	0.19	0.27

MONKMAN PROPERTY SOURCE: COMPANY REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
HONEYMOON																
EAST																
B1	MV BIT		AD	0.85	24.26	6.40	68.61					0.54				7.5
B3	MV BIT		AD	0.80	23.25	8.75	67.25					0.35				7.5
B4	MV BIT		AD	0.56	23.47	11.89	64.09					0.21				7.5
B5	MV BIT		AD	0.69	19.12	29.43	50.76					0.52				3.5
HONEYMOON																
WEST																
B1	MV BIT		AD	0.68	23.72	6.75	68.75					0.50				8
B3	MV BIT		AD	0.56	20.06	16.72	62.66					0.49				8
B4	MV BIT		AD	0.47	22.41	16.56	60.62					0.24				7
DUCHESS																
B1	MV BIT		AD	0.80	18.44	27.86	52.90					0.30				3.5
B2	MV BIT		AD	0.79	20.37	17.44	61.40					0.34				5.5
B3	MV BIT		AD	0.85	18.15	29.48	51.52					0.52				3
B4	MV BIT		AD	0.64	21.19	21.24	56.93					0.25				5.5
B5	MV BIT		AD	0.94	17.75	33.27	48.04					0.58				2.5
B6	MV BIT		AD	1.05	25.41	4.34	69.20					0.75				8.5
B8	MV BIT		AD	0.97	18.11	34.13	46.79					0.39				3.5
B9	MV BIT		AD	1.04	21.43	20.21	57.32					0.29				2.5
B10	MV BIT		AD	0.94	24.56	10.88	63.62					1.07				6.5
B11	MV BIT		AD	1.00	24.33	14.62	60.05					0.82				5
DUKE																
B3	MV BIT		AD	1.00	17.39	25.66	54.91					0.33				4.5
B4	MV BIT		AD	0.67	22.66	14.53	62.23					0.21				7
B5	MV BIT		AD	1.00	20.65	15.25	63.10					0.38				4
BOOMERANG																
B3	MV BIT		AD	0.68	21.30	21.27	56.75					0.47				6.5
B4	MV BIT		AD	0.71	21.52	13.79	63.98					0.46				6.5

BELCOURT PROPERTY SOURCE: ASSESSMENT REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
RED DEER PIT (ALL CLEAN COAL)																
1	MV BIT	CORE&ADIT	AD	0.74	25.05	6.76	67.45					0.24				7
2	MV BIT	CORE&ADIT	AD	0.97	24.82	5.29	68.93					0.32				6
3	MV BIT	CORE&ADIT	AD	0.87	25.65	7.57	65.74					0.29				7
6	MV BIT	CORE&ADIT	AD	0.82	26.37	5.65	67.17					0.58				7.5
7	MV BIT	CORE&ADIT	AD	0.84	28.01	6.71	64.45					0.63				8
8	HV BIT	CORE&ADIT	AD	0.55	29.08	6.3	64.07					0.59				7
PTARMIGAN AND OMEGA PITS (CLEAN COAL)																
4	LV BIT	CORE&ADIT	AD	0.61	17.26	12.18	69.95					0.49				3.5
HOLTSLANDER PIT (CLEAN COAL)																
5	MV BIT	CORE&ADIT	AD	0.84	25.87	8.43	54.87					0.34				7

SAXON PROPERTY SOURCE: ASSESSMENT REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
1	MV BIT		AD	0.74	19.92	7.02	72.30					0.41				6.5
2	MV BIT		AD	0.85	20.50	6.95	71.69					0.42				6.5
3	MV BIT		AD	0.70	20.80	6.00	72.50					0.60				8
4	MV BIT		AD	0.92	21.44	6.30	71.34					0.37				6.5
5	MV BIT		AD	0.80	21.70	4.60	72.90					0.59				8.5

WAPITI PROPERTY SOURCE: ASSESSMENT REPORT SEE BELOW FOR ASH ANALYSIS

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
1	HVB BIT	CORE	AR	11.00	29.00	22.20	37.80	4980				0.38			62	

SEAM	ASH FUS. TEMPS., REDUCING (DEGREES C)				ASH ANALYSIS (%)										
	INITIAL	SPHER.	HEMISPH.	FLUID	SiO_2	Al_2O_3	Fe_2O_3	Mn_3O_4	TiO_2	P_2O_5	CaO	MgO	SO_3	Na_2O	K_2O
1	>1449				43.72	33.2	7.08		1.79	2.37	5.12	0.84	3.28	0.7	0.22

ELK VALLEY COALFIELD

ELK RIVER PROPERTY SOURCE: COMPANY REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
2	LV BIT		AD	0.13	16.56	17.54	65.57	7056				0.59				4
3	LV BIT		AD	0.13	12.97	37.59	49.31	6736				0.37				8
4	LV BIT		AD	0.56	18.06	12.38	69.00	7294				0.36				3.5
6	LV BIT		AD	0.59	18.35	14.27	66.78	7239				0.56				5.5
7	LV BIT		AD	0.57	18.81	20.72	59.90	6528				0.49				3
8	LV BIT		AD	0.68	18.79	12.69	67.84	7578				0.45				3.5
9	LV BIT		AD	0.72	19.30	16.65	63.33	6883				0.37				2
10	LV BIT		AD	0.68	20.88	10.11	68.33	7556				0.61				4.5
11	MV BIT		AD	0.35	17.22	34.89	47.54	5350				0.50				4.5
12	MV BIT		AD	0.33	18.02	17.64	64.01	7050				0.64				6.5
13	MV BIT		AD	0.73	22.43	11.39	65.45	7500				0.74				7.5
14	MV BIT		AD	0.36	20.80	25.58	53.50	6261				0.56				5
15	MV BIT		AD	0.32	21.66	14.49	63.53	7372				0.67				7
16	HV BIT		AD	0.45	23.54	9.40	66.61	7783				0.73				8
17	HV BIT		AD	0.23	25.73	16.74	57.30	7117				0.73				7.5
18	HV BIT		AD	0.31	22.46	31.55	45.68	5689				0.72				6.5
19	HV BIT		AD	0.35	26.37	6.44	66.84	7878				0.56				7
20	HV BIT		AD	0.53	29.45	12.93	57.09	7433				0.65				7

FORDING MINE SOURCE: BONNELL AND JANKE (1986); BONNELL et al. (1983) SEE BELOW FOR ASH ANALYSES

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
EAGLE MOUNTAIN																
4	MV BIT	CHANNEL	AR	0.91	21.64	7.22	70.23	7867	82.08	4.40	1.43	0.22	3.75	30	94	5.5
7	MV BIT	CHANNEL	AR	0.93	18.46	31.26	49.89	5766	60.44	3.40	1.10	0.40	3.00	30	69	2
8	MV BIT	CHANNEL	AR	0.80	19.05	30.63	49.55	5625	59.12	3.50	0.89	0.50	4.58	40	73	2
9	MV BIT	CHANNEL	AR	1.43	23.01	12.05	63.51	7272	76.14	4.23	1.36	0.40	4.38	30	85	4
11	MV BIT	ROM	AR	8.78	26.76	5.26	59.20	6621	69.53	4.00	1.75	0.77	9.91		87	
12	MV BIT	ROM	AR	7.17	15.41	42.86	34.56	3951	41.62	2.43	1.05	0.57	4.30		76	
13	HVA BIT	CHANNEL	AR	16.50	26.16	9.93	47.40	5225	57.54	3.13	1.30	0.43	11.17	40	121	
GREENHILLS																
B	MV BIT	ROM	AR	1.58	17.37	17.83	63.20	6824	71.83	3.57	1.27	0.28	3.64		79	
B	MV BIT	CHANNEL	AR	0.90	21.65	7.25	70.20	7860	82.10	4.40	1.45	0.20	3.75	30	94	5.5
D	MV BIT	ROM	AR	2.57	11.99	53.90	31.54	3485	38.84	2.15	0.90	0.19	1.45		67	
E	MV BIT	CHANNEL	AR	0.97	23.50	19.01	55.76	6766	69.67	4.20	1.25	0.37	3.85	30	100	7.5
F	MV BIT	CHANNEL	AR	1.43	23.03	12.10	63.35	7270	76.15	4.25	1.35	0.40	4.38		85	4
G	MV BIT	CHANNEL	AR	1.46	23.12	13.70	63.30	7170	73.50	4.40	1.60	0.60	4.80	40	106	
H	MV BIT	CHANNEL	AR	1.65	27.88	10.38	60.21	7347	75.77	4.65	1.68	0.48	5.48	30	75	7.5
I	HVA BIT	CHANNEL	AR	3.30	29.19	5.97	61.45	7645	77.90	4.65	1.81	0.61	5.65	20	92	7.5
K	HVA BIT	CHANNEL	AR	1.10	33.10	7.20	58.75	7710	78.30	5.10	1.80	0.35	6.25	50	62	7.5

FORDING MINE SOURCE: BONNELL AND JANKE (1986); BONNELL et al. (1983)

SEAM	ASH FUS. TEMPS., REDUCING (DEGREES C)				ASH ANALYSIS (%)										
	INITIAL	SPHER.	HEMISPH.	FLUID	SiO_2	Al_2O_3	Fe_2O_3	Mn_3O_4	TiO_2	P_2O_5	CaO	MgO	SO_3	Na_2O	K_2O
EAGLE MOUNTAIN															
4	1318	1471	>1482	>1482	46.33	31.88	12.33		1.79	0.78	2.18	1.20	0.73	0.13	0.23
7	>1482	>1482	>1482	>1482	68.05	23.98	1.36		1.07	0.05	0.06	0.80	0.50	0.10	2.50
8	>1482	>1482	>1482	>1482	59.78	33.61	1.50		1.50	0.10	0.16			0.06	1.08
11	1268	1318	1371	1429	49.18	21.05	1.56		1.22	0.70	9.16	1.29	12.19	0.13	1.19
12	1321	1471	>1482	>1482	68.75	18.47	3.47		0.87	0.40	1.41	0.68	1.13	0.04	3.17
13	1235	1307	1371	1477	35.50	20.11	2.80		1.15	0.85	18.91	2.55	15.68	0.06	0.83
GREENHILLS															
B	1246	1377	1429	1360	60.43	20.95	5.64		0.92	1.85	4.08	0.93	1.89	0.02	1.30
B	1318	1471	>1482	>1482	46.30	31.90	12.35		1.80	0.08	2.20	1.20	0.75	0.13	0.23
D	1427	>1482	>1482	>1482	71.40	19.56	1.91		0.98	0.10	0.49	0.95	0.29	0.07	2.85
E	>1482	>1482	>1482	>1482	60.09	31.35	0.75		1.65	0.25	0.45	0.36	0.18	0.07	0.94
F	1225	1356	1432	1477	48.50	25.86	13.26		1.20	2.45	3.80	0.64	0.61	0.10	0.50
G	1230	1435	1465	>1482	64.50	23.03	5.75		1.35	1.35	1.70	0.43		0.10	1.20
H	>1482	>1482	>1482	>1482	57.70	35.09	0.84		1.09	0.55	0.85	0.48	0.99	0.03	0.67
I	1335	1477	>1482	>1482	52.15	27.60	6.90		1.46	2.55	3.31	0.83	2.00	0.07	0.66
K	1133	1350	1377	1380	51.70	22.00	16.40		0.96	0.20	2.02	1.65	0.64	0.22	1.43

GREENHILLS MINE SOURCE: BONNELL AND JANKE (1986) SEE BELOW FOR ASH ANALYSES

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
1	MV BIT	CHANNEL	AR	1.87	22.76	13.18	62.19	7188	75.20	4.24	1.27	0.20	4.04	30	121	6
7	MV BIT	ROM	AR	8.06	21.41	12.63	57.90	6594	68.80	3.91	1.17	0.39	5.04		121	6
10	MV BIT	ROM	AR	8.68	16.98	48.86	25.48	2761	33.16	1.91	1.20	0.21	5.98		78	
16	MV BIT	CHANNEL	AR	1.80	26.83	8.84	62.53	7452	77.36	4.51	1.49	0.47	5.53	40	70	5.5
26	HVA BIT	CHANNEL	AR	2.09	31.07	4.88	61.97	7780	79.36	4.93	1.67	0.40	6.67	30	63	6.5

SEAM	ASH FUS. TEMPS., REDUCING (DEGREES C)				ASH ANALYSIS (%)										
	INITIAL	SPHER.	HEMISPH.	FLUID	SiO2	Al2O3	Fe2O3	Mn3O4	TiO2	P2O5	CaO	MgO	SO3	Na2O	K2O
1	>1482	>1482	>1482	>1482	53.31	38.05	1.81		1.95	0.85	1.49	1.65	0.41	0.05	0.09
7	>1482	>1482	>1482	>1482	56.60	37.85	0.67		2.32	0.05	0.75	0.09	0.63	0.02	0.28
10	1363	>1482	>1482	>1482	69.94	20.02	2.36		0.97	0.11	0.88	0.50	0.69	0.09	3.27
16	>1482	>1482	>1482	>1482	63.98	26.17	1.17		1.23	0.80	0.75	0.46	0.03	0.09	1.14
26	1352	>1482	>1482	>1482	51.85	30.16	3.62		1.41	4.05	2.57		1.11	0.06	0.40

LINE CREEK MINE SOURCE: ASSESSMENT REPORT; BONNELL AND JANKE (1986) (4-SEAM) SEE BELOW FOR ASH ANALYSES

10A	MV BIT	AR	1.10	20.20	9.60	69.10	7080	88.70	5.00	1.10	0.45	4.70		94	8.5
10B	MV BIT	AR	1.30	20.10	9.60	69.00	6910	89.32	4.80	1.22	0.50	4.16		106	7.5
9	MV BIT	AR	1.50	19.70	9.40	69.40	7600	89.10	4.70	1.20	0.33	4.70		86	2
8	MV BIT	AR	1.60	20.30	9.60	68.50	6610	86.40	4.60	1.20	0.40	7.40		89	3
7L	MV BIT	AR	1.40	22.90	9.40	66.30		88.80	5.00	1.40	0.53	4.20			
7U	MV BIT	AR	2.00	21.10	9.40	67.50		88.60	4.80	1.20	0.50	4.90			
6L	MV BIT	AR	1.40	22.80	9.40	66.40		88.60	4.90	2.00	0.56	3.90			
6U	MV BIT	AR	2.40	20.70	9.60	68.30		87.80	4.60	1.30	0.54	5.80			
4	HVA BIT	AR	16.19	27.67	6.25	49.89	5222	58.78	2.71	1.16	0.46	14.45	20	135	

SEAM	ASH FUS. TEMPS., REDUCING (DEGREES C)				ASH ANALYSIS (%)										
	INITIAL	SPHER.	HEMISPH.	FLUID	SiO_2	Al_2O_3	Fe_2O_3	Mn_3O_4	TiO_2	P_2O_5	CaO	MgO	SO_3	Na_2O	K_2O
10A					64.80	30.44	0.50				0.36	0.13	0.08	0.95	1.24
10B					64.70	30.70	0.99				0.34	0.21	0.06	0.43	0.88
9					58.50	33.73	0.62				3.04	0.29	0.66	0.45	0.33
8					55.80	34.88	0.90				2.99	0.42	0.60	0.38	0.56
4	1371	1457	1477	>1482	47.68	30.38	3.85		1.43	0.71	7.60	1.51	4.90	0.06	0.22

CROWSNEST COALFIELD

BALMER MINE   SOURCE: BONNELL AND JANKE (1986); UNPUBL. COMPANY DATA (A-SEAM)   SEE BELOW FOR ASH ANALYSES

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
BALMER	MV BIT	RAW FEED	AR	1.77	24.41	19.34	54.48	6056	64.51	3.63	1.02	0.34	4.31		72	2.5
BALMER	MV BIT	CHANNEL	AR	5.37	13.21	18.63	62.78	6925	72.96	3.88	1.22	0.20	3.16	70	112	2
8	MV BIT	STOCKPILE	AR	2.48	18.73	39.98	38.80	4645	49.39	3.28	0.96	0.39	3.53		62	1
A	MV BIT	BULK	DRY	-	25.90	20.50	53.60	6645				0.32				7

SEAM	ASH FUS. TEMPS., REDUCING (DEGREES C) INITIAL	SPHER.	HEMISPH.	FLUID	ASH ANALYSIS (%) SiO2	Al2O3	Fe2O3	Mn3O4	TiO2	P2O5	CaO	MgO	SO3	Na2O	K2O
BALMER	>1482	>1482	>1482	>1482	63.50	25.23	2.77		1.29	0.34	1.30	0.52	1.10	0.08	1.44
BALMER	>1482	>1482	>1482	>1482	57.46	32.90	0.92		1.95	0.09	0.77	0.38	0.43	0.04	0.15
8	>1482	>1482	>1482	>1482	65.43	24.85	1.71		1.25	0.26	0.64	0.72	0.54	0.06	1.94

BYRON CREEK COLLIERIES   SOURCE: BONNELL AND JANKE (1986)   SEE BELOW FOR ASH ANALYSES

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
MAMMOTH	MV BIT	RAW FEED	AR	3.09	23.00	14.37	59.54	6829	71.78	3.80	1.35	0.19	5.42	60	76	1.5

SEAM	ASH FUS. TEMPS., REDUCING (DEGREES C) INITIAL	SPHER.	HEMISPH.	FLUID	ASH ANALYSIS (%) SiO2	Al2O3	Fe2O3	Mn3O4	TiO2	P2O5	CaO	MgO	SO3	Na2O	K2O
MAMMOTH	1263	1296	1377	1429	48.40	25.01	3.44		1.94	0.69	9.95	3.17	4.22	1.01	0.18

HOSMER-WHEELER PROPERTY SOURCE: STAGE 2 REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
3	HVA BIT	COMPOSITE	DRY	-	30.30	7.90	61.80	7830								
4	HVA BIT	BULK	DRY	-	28.20	9.80	62.00	7422								
8	MV BIT	BULK	DRY	-	23.10	9.90	67.00	7812								
9	MV BIT	BULK	DRY	-	20.90	9.10	70.00	7758								
10	MV BIT	BULK	DRY	-	21.60	8.40	70.00	8020								
11	MV BIT	BULK	DRY	-	21.20	9.90	68.90	7833								

FLATHEAD COALFIELD

SAGE CREEK PROPERTY SOURCE: COMPANY REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
2	MV BIT	WASHED	AD	1.80	26.20	7.90	64.10	7886				0.34				7
4U	MV BIT	WASHED	AD	0.70	23.50	8.70	67.10	7756				0.43				6.5
4L	MV BIT	CORE&BULK	AD	1.40	22.80	19.70	56.50					0.48				2.5
5	MV BIT	WASHED	AD	0.80	24.10	8.70	67.10	7872				0.59				6.5

HAT CREEK COALFIELD

SOURCE: COMPANY REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
	SUBBIT C		AR	20.00	26.40	25.80	27.80	3550	72.9	4.8	1.5	0.5	20.3	>200		

MERRITT COALFIELD

MIDDLESBORO COLLIERY SOURCE: DICKSON (1941)

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
2	HVB BIT	ROM	AR	3.8	31.2	8.3	56.7	6889				0.55				
3	HVB BIT	ROM	AR	5.0	23.0	20.6	51.4	5661				0.93				

SIMILKAMEEN COALFIELD

TULAMEEN BASIN   SOURCE: ASSESSMENT REPORT   SEE BELOW FOR ASH ANALYSES

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
MAIN	HVC BIT	CLEANBULK	AD	5.66	31.82	13.65	48.87	5956	62.27	4.93	1.30	0.62	17.23			

SEAM	ASH FUS. TEMPS., REDUCING (DEGREES C)				ASH ANALYSIS (%)										
	INITIAL	SPHER.	HEMISPH.	FLUID	SiO_2	Al_2O_3	Fe_2O_3	Mn_3O_4	TiO_2	P_2O_5	CaO	MgO	SO_3	Na_2O	K_2O
MAIN	2260	2480	2580	2760	69.51	13.54	6.55		0.04	0.17	1.17	0.44	0.51	0.67	0.64

PRINCETON BASIN   SOURCE: MCMECHAN (1983)

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
PRINCETON	SUBBIT A	ROM	AR	14.9	29.5	8.0	47.6	5450				0.2				

NANAIMO COALFIELD

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
S. WELLINGTON NO. 10 MINE SOURCE: DICKSON (1941)																
DOUGLAS	HVB BIT	ROM	AR	1.0	25.3	19.3	54.4	6300				0.45				
NO. 1 MINE SOURCE: DICKSON (1941)																
NEWCASTLE	HVB BIT	DOMESTIC	AR	0.2	33.5	10.5	54.0	6544				1.12				
BEBAN AND LANTZVILLE MINES SOURCES: DICKSON (1941); BICKFORD AND KENYON (1988); KENYON (UNPUBL.)																
WELLINGTON	HVB BIT	ROM	AR	1.65	31.75	14.20	52.40	6486	66.28	4.70	1.27	0.36	10.95	0		
NORTHFIELD MINE SOURCE: DICKSON (1941)																
LITTLE WELLINGTON	HVB BIT	ROM	AR	0.8	34.3	13.0	51.9	6733				0.74				

COMOX COALFIELD

COMOX NOS. 5 AND 8 MINES SOURCE: DICKSON (1941) SEE BELOW FOR ASH ANALYSES

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
2	HVA BIT	ROM	AR	1.0	24.2	17.6	57.2	6861				2.15				

SEAM	ASH FUS. TEMPS., REDUCING (DEGREES C)				ASH ANALYSIS (%)										
	INITIAL	SPHER.	HEMISPH.	FLUID	SiO2	Al2O3	Fe2O3	Mn3O4	TiO2	P2O5	CaO	MgO	SO3	Na2O	K2O
2					10.40	12.80	22.50		0.80	2.88	22.70	3.90	23.10	Na2O+K2O=0.92	

QUINSAM MINE SOURCE: KENYON AND BICKFORD (1989)

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
1	HVA BIT	CHANNEL	AR	3.79	38.50	8.88	48.83	6717	72.42	5.13	0.97	0.92	11.21			

CHUTE CREEK PROPERTY SOURCE: KENYON (UNPUBL.)

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
A?	HVA BIT	CHANNEL	AR	3.26	36.83	10.36	49.55	6783	71.73	4.97	1.17	1.75	9.50	0		

TELKWA COALFIELD

TELKWA PROPERTY SOURCE: STAGE 2 REPORT

SEAM	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
1	HVA BIT	WASHED	AD	1.23	26.10	14.40	58.20	7005								
2	HVA BIT	WASHED	AD	1.98	27.10	12.30	57.90	7007								
3	HVA BIT	WASHED	AD	1.74	27.40	12.90	58.00	7057								
4	HVA BIT	WASHED	AD	1.87	28.00	10.40	59.80	7258								
5	HVA BIT	WASHED	AD	2.05	27.70	9.50	60.90	7319								
6	HVA BIT	WASHED	AD	2.03	28.40	9.70	53.90	7257								
7	HVA BIT	WASHED	AD	1.81	29.00	10.10	59.10	7262								
8	HVA BIT	WASHED	AD	2.17	28.40	9.20	60.20	7307								
9	HVA BIT	WASHED	AD	1.38	31.90	10.00	56.70	7368								
10	HVA BIT	WASHED	AD	1.38	30.80	10.70	57.10	7295								

GROUNDHOG COALFIELD

MT. KLAPPAN PROPERTY SOURCE: ASSESSMENT REPORT SEE BELOW FOR ASH ANALYSIS

AREA	ASTM RANK	SAMPLE TYPE	BASIS	MOISTURE (%)	VOLATILE MATTER (%)	ASH (%)	FIXED CARBON (%)	CALORIFIC VALUE (kcal/kg)	CARBON (%)	HYDROGEN (%)	NITROGEN (%)	SULPHUR (%)	OXYGEN (%)	CHLORINE (ppm)	HGI	FSI
HOBBIT-BROATCH	ANTH	COMBINED SEAMS	AD	1.30	8.30	28.40	62.00	5400	64.00	2.30	0.80	1.00	2.20	30	41	
LOST-FOX	ANTH	COMBINED SEAMS	AD	2.20	7.90	23.70	66.20	5900	69.00	2.10	0.80	0.40	1.80	50	50	

AREA	ASH FUS. TEMPS., OXIDIZING (DEGREES C)				ASH ANALYSIS (%)										
	INITIAL	SPHER.	HEMISPH.	FLUID	SiO_2	Al_2O_3	Fe_2O_3	Mn_3O_4	TiO_2	P_2O_5	CaO	MgO	SO_3	Na_2O	K_2O
HOBBIT-BROATCH	1240	1285	1310	1345	50.40	21.10	8.10		0.70	1.00	5.40	3.10	3.80	1.30	1.00
LOST-FOX	1235	1290	1320	1365	47.90	24.00	10.30		0.50	1.80	5.70	3.40	3.40	1.00	0.90

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