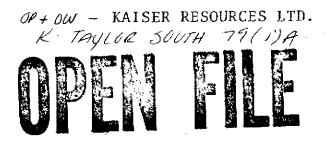
TAYLOR SOUTH LICENCES (CL4185, CL4186, CL4187) G.L. Taylor, M.T. Zral Oct. 9, 1979

> NTS Map 82 G/7 Edition 2 MCE Series A721



GEOLOGICAL BRANCH ASSESSMENT REPORT

12-11-1

G.L. Taylor, Principal Geologist

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SUMMARY

The coal-bearing member of the Kootenay Formation contains four coal seams in or adjacent to the Taylor South coal licence area. Coal reserves were calculated for the two upper seams, 9 and 8, which are projected under cover on the eastern part of coal licence 4185. M- and 10-seam are very lenticular in nature and reserves were not estimated for these seams in the coal licence area.

Partially explored, in-place coal reserves are as follows:

9-seam	1,066,400	short tons
8-seam	140,700	short tons
TOTAL	1,207,100	short tons

The possibility of projecting reserves down dip to the west under cover of the Blairmore Group is made difficult by the lenticular nature of all the seams toward the south and west.

Future coal production from these licences would seem unlikely because of low tonnage, unpredictability of seam extent and remoteness of the licence locations.

INTRODUCTION

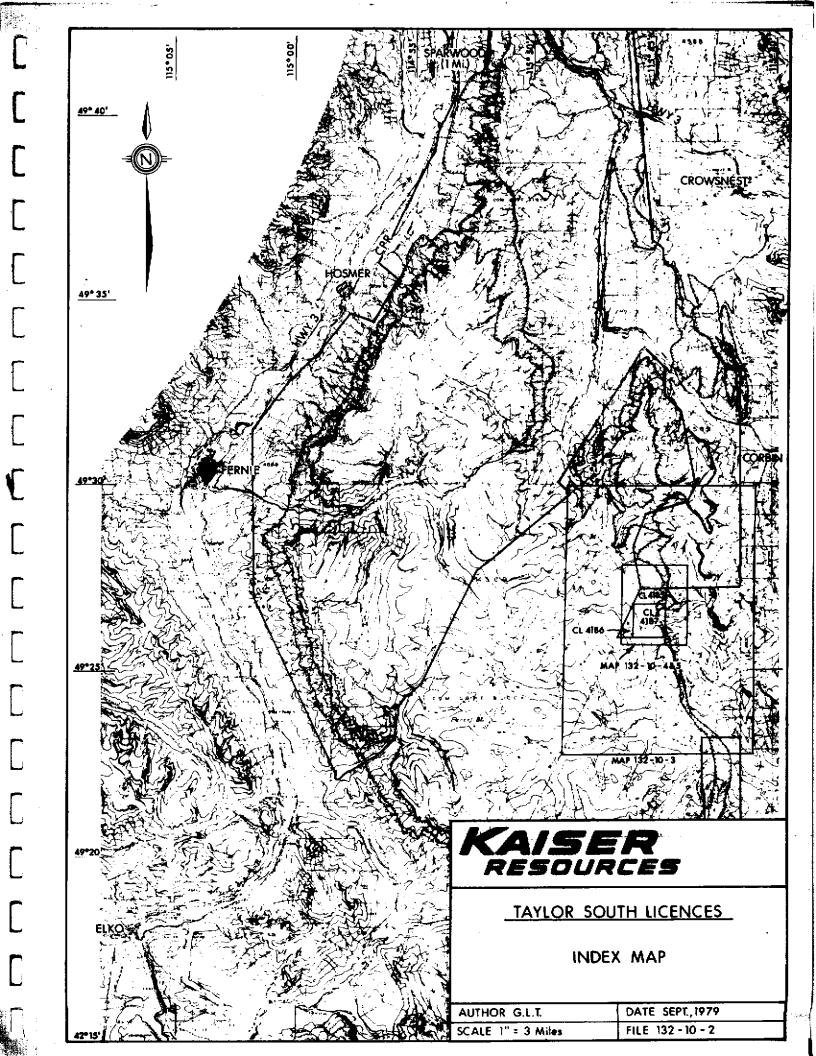
Location

The Taylor South group of coal licences is centered roughly over the intersection of 114°25' longitude and 49°26' latitude as shown on the index map (132-10-2). Coal licence 4185 adjoins the southern boundary of Kaiser Resources' Taylor Mountain South area. Coal licence 4187 is located directly south of 4185 and the triangular shaped coal licence, 4186, lies to the west of 4187. The licences are situated 14.5 miles (23.3 km) east-south-east of Fernie and 6.5 miles (10.5 km) south-west of Corbin townsite.

Topography and Climate

The Taylor South coal licences are situated on the westfacing slopes of a series of southerly trending ridges. The ridges along the eastern border of the licences attain altitudes up to 7200 feet above sea level. The westerly ridge slopes are capped and protected from erosion by resistant conglomerate beds in dip-slope repose. Part of the drainage off the licences is to the west to Leach Creek which eventually runs into Michel Creek and thence to the Elk River. A westerly flowing tributary of McEvoy Creek flows into the Flathead River which flows southerly to Montana, U.S.A..

The upper parts of the ridges are classed environmentally as high elevation rocky peaks. The lower reaches of the ridges are in the dense willow, alder, lodgepole pine fire succession stage.



Summer and early fall days are characterized by a warm pleasant climate although strong winds are not uncommon at the higher elevations. Fresh snow appears above the 7000 foot level by early October and is present until early June.

Access

The Taylor South licences can be reached by vehicle via the Corbin Road which leaves B.C. Highway 3 three and seventenths miles (6 km) east of Michel. Licence access branches off the Corbin road seven and six-tenths miles (12.2 km) south of B.C. Highway 3 (Coal Creek pass road). The pipeline access, three and six-tenths miles (5.8 km) from the Corbin Road, leads up Leach Creek from the Coal Creek pass road five and four-tenths miles (8.7 km) to the newly constructed licence access road. Coal licences 4185 and 4187 can be reached by the new road. Coal licence 4186 can be reached by proceeding southerly a further two miles (3.2 km) past the new road turnoff along the pipeline and down the McEvoy Creek road.

Land Description and Ownership

The three coal licences 4185, 4186 and 4187 are held by Kaiser Resources Ltd., Sparwood, B.C.. The coal licence boundaries are described in the following sections.

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<u>Coal Licence No. 4185 (Kootenay Land District)</u>. The boundary commences at corner post 18 of Parcel 82 of L4589 (as shown on Plan No. 9789 (x-27), on file at the Nelson L.R.O.); extends east 61 chains; thence south 40 chains; thence west 80 chains, more or less, to the easterly boundary of said parcel 82 and thence northeasterly on said easterly boundary to the point of commencement as shown on the regional geological compilation map (132-10-3) and the geological plan map (132-10-4).

<u>Coal Licence No. 4186 (Kootenay Land District)</u>. The boundary commences at a point on the easterly boundary of Parcel 82 of L 4589 which is 19 chains west (more or less) and 40 chains south of corner post 18 (as shown on Plan No. 9789 (x-27), on file at the Nelson L.R.O.); extends south 80 chains; thence west 38.7 chains, more or less, to the easterly boundary of said Parcel 82 and thence northeasterly on said easterly boundary to the point of commencement as shown on the regional geological compilation map (132-10-3) and the geological plan map (132-10-4).

Coal Licence No. 4187 (Kootenay Land District). The boundary commences at a point 40 chains south and 19.4 chains west of corner post 18 of Parcel 82 of L4589 (as shown on Plan No. 9789 (x-27), on file at the Nelson L.R.O.); extends east 80 chains; thence south 80 chains; thence west 80 chains and thence north 80 chains to the point of commencement as shown on the regional geological compilation map (132-10-3) and the geological plan map (132-10-4).

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EXPLORATION WORK

The on-property work on coal licences 4185, 4186, and 4187 was done between June 17 and July 11, 1979. The office work concerning report preparation was performed between September 25 and October 12, 1979.

On Property

On licence work consisted of geological outcrop mapping, road construction, surveying and reclamation work. People, time, equipment and consumables required to complete the study are listed in Table I.

<u>Geological</u>. The geological mapping was undertaken by one geologist and four student geologists. Outcrops were located by compass and string chain traverses tied to transit survey stations. The geologist and helpers also planned and flagged the road course prior to construction. Two four-wheel drive pick-up trucks were used for transportation.

<u>Road Construction</u>. A single D-7 cat was used for new road construction. A total of 13,700 feet of new road was constructed and an additional 1000 feet of old road upgraded in nine working days. The upgraded portion and 1300 feet of new road provide offproperty access to the north-west of corner post 18, L4589 (geological map 132-10-4). The remaining 12,400 feet of access traverses KRL's Taylor Mountain South freehold land (2600 feet) and licences 4185 and 4187 (9800 feet). Culverts were installed in active drainage courses.

TABLE I. Exploration work on Taylor South licences during 1979

Type of Work	People	Equipment, Consumables	On Property Days	Off Property Days
Geological	Geologist Geology Student Geology Student Geology Student Geology Student Geol. Technician Draftsman	P/U Truck P/U Truck	4 - 17 10 14 5 5 0 0 20 5	8 3 2 0 2 1 1 3
Surveying	Surveyor Surveyor Helper Helper	P/U Truck P/U Truck	2 10 10 1 2 10	
Construction	Cat Operator	Cat (D~7) P/U Truck Culverts (2-12" Ø x 20')	9 9 9	
Reclamation Slashing	4 Workers	Skidder P/U Truck	4 4 4	
Seeding	5 Workers	P/U Truck 424 1b. seed 1698 1b. fertilizer	1.5 1.5	

<u>Surveying</u>. The newly constructed road was surveyed by transit and stadia method. The survey notes were reduced and plotted by computer methods. The survey traverse map (132-10-5) shows all station and shot locations. Station 27801 and 27802 were located by Geodimeter from station U7339 near the northeast corner of coal licence 4185.

The contoured base map was photogrammetically compiled in June, 1979 by McElhanney Surveying and Engineering Ltd., Vancouver, B.C. from aerial photography flown in July, 1979. KRL's Mine grid, for which the northerly lines are located 23⁰39' east of true north, is the reference grid displayed on the survey traverse map (132-10-5) and on the geological plan map (132-10-4).

<u>Reclamation</u>. Road slashing was carried out be a contractor who employed four workers and a skidder. The contract was based on road footage cleared.

Seeding and fertilizing all disturbed areas was completed in a day and a half by five workers from KRL's ENvironmental Services department.

Office

Geological note reduction and plotting was done in the office by the geologists and four assistants. Two geologists prepared the interpretation, maps, cross-section, chart and report.

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The survey notes were reduced and plotted by a geological technician using a computer and plotter. One draftsman completed work on the maps, cross-sections and chart.

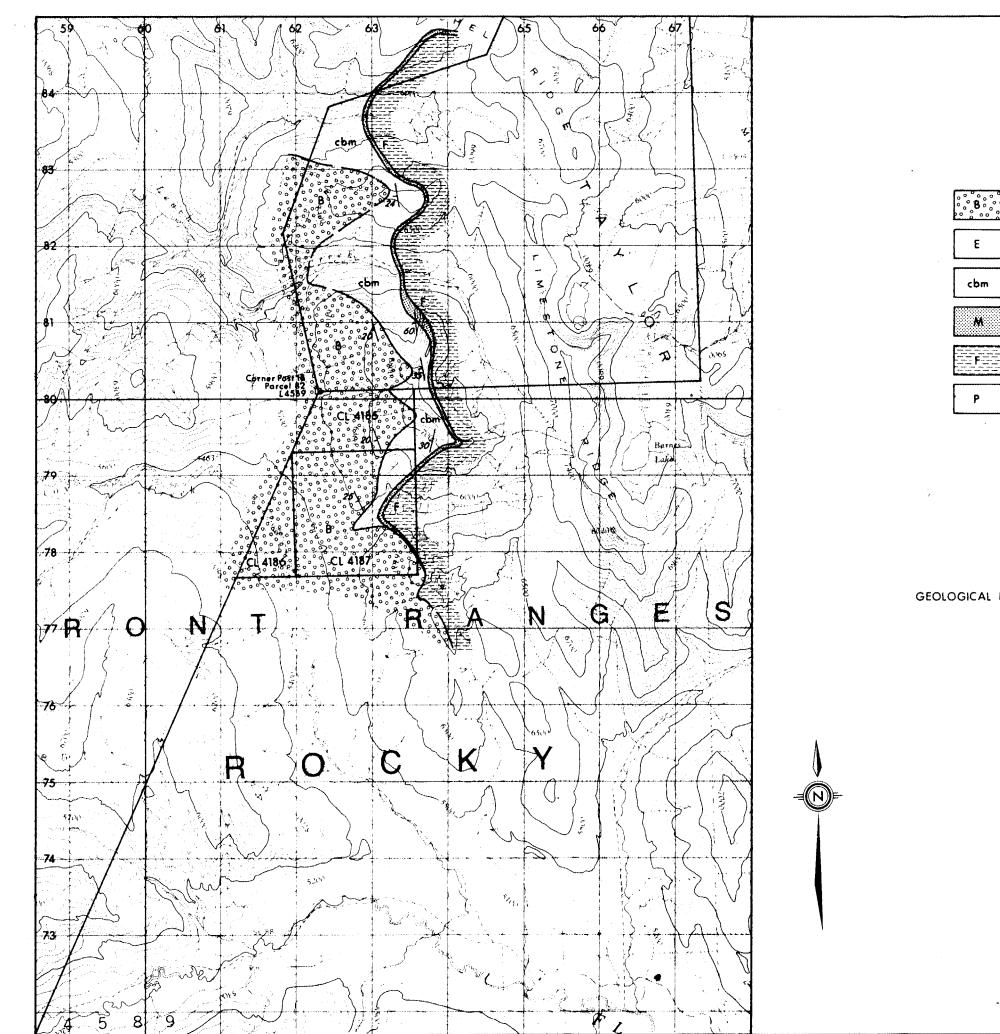
GENERAL GEOLOGY

The Kootenay Formation, which contains the coal seams in the area, strikes in a northerly direction and underlies the licences except for a small eastern portion of coal licence 4187 (regional geological compilation map 132-10-3). The beds dip westerly between 15 and 35 degrees at nearly dip-slope conditions on coal licence 4185 and the northern part of coal licence 4187. The westerly facing slopes are capped and protected from erosion by coarse sediments of the Blairmore Group, which are believed to lie unconformably on the Kootenay Formation. The Fernie Formation underlies the basal sandstone unit of the Kootenay Formation. Paleozoic rocks underlie the Fernie and Spray River Formations and occur to the east on Limestone Ridge (map 132-10-3).

Stratigraphy

<u>Paleozoic</u>. Paleozoic limestones and quartzites, the oldest rocks in the area, are exposed to the east on Limestone Ridge. No paleozoic rocks were mapped in the coal licence area.

<u>Triassic and Jurassic</u>. Shaley quartzites, sandy shales and argillaceous dolomites of the Spray River Formation overlie the Paleozoic rocks of the area. The Spray River Formation is overlain by calcareous shales and sandy beds of the Fernie Formation.



Ε Elk Member cbm Coal bearing mbr - Kootenay Formation Moose Mtn. Mbr. ₩ (Undifferentiated) — Fernie Formation Spray River Formation (Undifferentiated) - Paleozoic Rocks

BEDDI

GEOLOGICAL BOUND

LEGEND

Blairmore Group

ING	strike and dip of strata -20
	anticline — 🕂 synchine — 🖡 —
ARY	established inferred

RESOUR					
TAYLOR SOU	TH LICENCES				
REGIONAL GEOLOGICAL COMPILATION MAP					
AUTHOR G.L.T.	DATE SEPT., 1979				
SCALE 1: 50,000	FILE 132-10-3				

These formations were not mapped in the coal licence area, although round concretions from the Fernie Formation occur on coal licence 4187 in areas under the basal sandstone unit of the Kootenay Formation (map 132-10-3).

<u>Cretaceous-Kootenay Formation</u>. The nomenclature of Jansa (1972), based on regional sedimentological studies, is used herein to designate the members of the Kootenay Formation. The lowermost unit, the Moose Mountain Member, is a coarse-grained basal sandstone unit. The middle unit, informally called the coal-bearing member by Jansa (1972), is up to 600 feet thick in the coal licence area. The uppermost unit, the Elk Member, is absent in the licence area.

Gibson (1977) proposed tentatively to change the Moose Mountain Member to the Basal Sandstone member. The other two members would be called informally the Coal-Bearing member and the Elk member.

The Moose Mountain Member is approximately 80 feet thick in the licence area. Outcrops of the light-grey, coarse-grained, sandstone unit were mapped for reference to the east of coal licence 4185 and 4187 and in the south-east quadrant of coal licence 4187.

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The coal-bearing member consists of a thick succession of interbedded sandstone, siltstone, mudstone, carbonaceous mudstone and coal in the licence area. To the north of the coalbearing member is up to 600 feet thick but an erosional unconformity has eliminated this member to the south and basal conglomerates of the overlying Blairmore Group rest directly on the Moose Mountain Member (geological plan map 132-10-4). The effect of this erosion on the coal-bearing member to the west under the Blairmore Group is speculated upon by down-dip projections shown in cross sections OS to 6000S (132-10-10, -11, -12, -13 and -14). The four coal seams contained in the coal-bearing member appear to be limited in extent by the erosional unconformity and abrupt facies changes.

The Elk Member, the uppermost unit of the Kootenay Formation, has been completely eliminated by erosion prior to deposition of the Blairmore Group.

<u>Cretaceous - Blairmore Group</u>. The Blairmore Group, which consists of conglomerates, sandstones and vari-colored mudstones, overlies the Kootenay Formation on the west-facing slopes of the coal licences. Outcrops of the basal sandstone-conglomerate unit were mapped on coal licences 4185 and 4187 (geological plan map 132-10-4). The diagnostic vari-colored mudstones of the Blairmore Group are prominent above the basal sandstone - conglomerate unit on coal licence 4187.

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and the state was not

Erosion prior to deposition of the basal sandstoneconglomerate of the Blairmore group appears to best explain the gradual thinning and eventual elimination of the coalbearing member to the south. No extreme faulting, jointing or folding of the rocks occur in the vicinity of the contact where it was cut by the road on coal licence 4187. A fault explanation would require movement in the order of 5000 to 8000 feet to eliminate the Elk Member and the upper part of the coal-bearing member of the Kootenay Formation. Once again, outcrops in the vicinity of the contact along the road cut reveal no disturbances which one could associate with such a fault. To the south, the contact between the conglomerate of the Blairmore group and the Moose Mountain Member of the Kootenay Formation shows no indication of faulting.

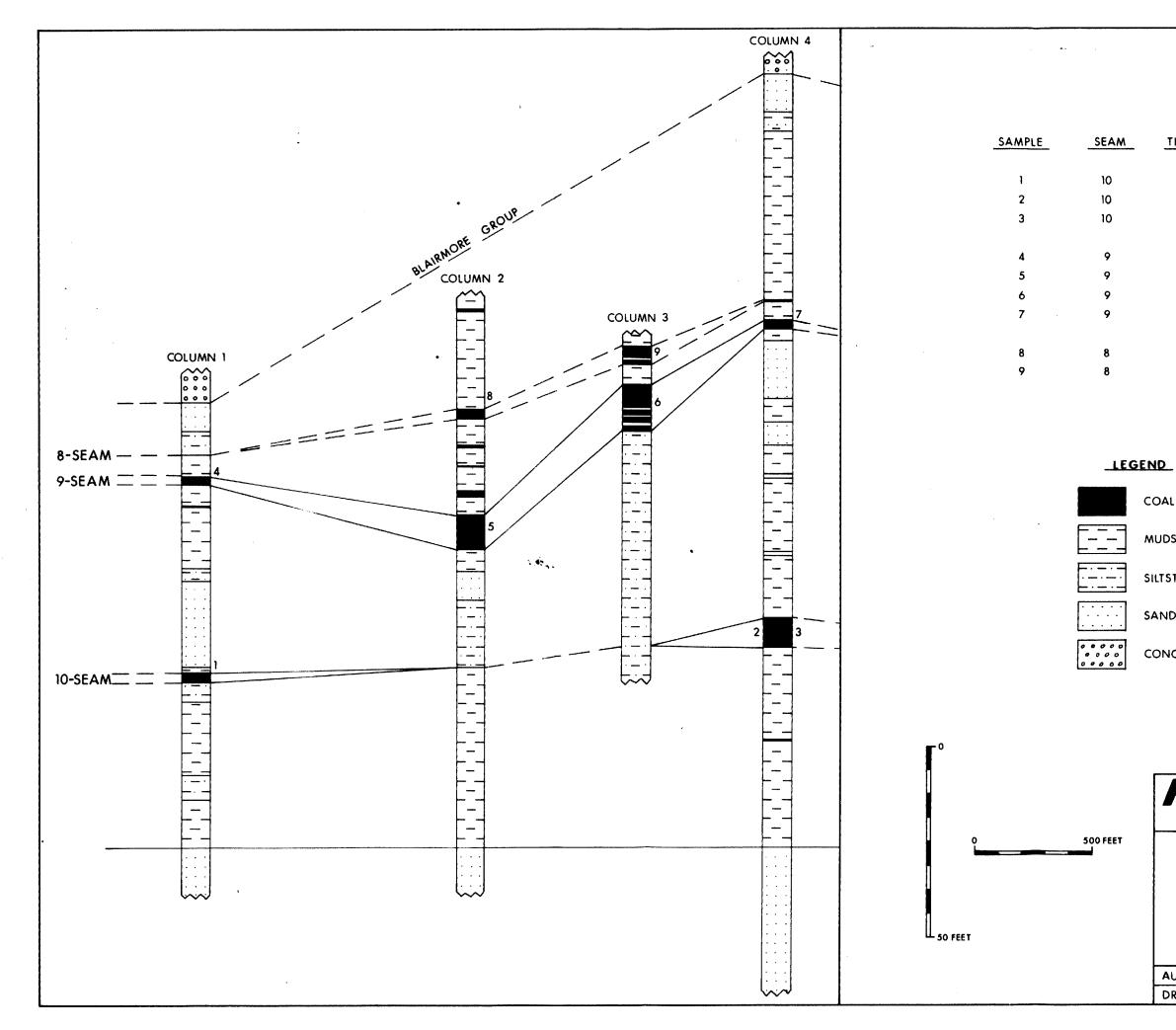
ECONOMIC GEOLOGY

Coal Seams and Quality

The coal-bearing member of the Kootenay Formation contains four coal seams. The lowermost, M-seam, lies directly on the Moose Mountain sandstone. The other three seams, arbitrarily named 10, 9 and 8 in ascending order, occur within a 130 to 180 foot section 330 to 500 feet above the Moose Mountain Member (geological cross-sections 132-10, -11, -12, -13 and -14). The best exposures of all seams occur at the top of the ridge to the east of coal licence 4185. Columns from these exposures were measured in 1973 and used here as a guide to coal location and thickness (correlation chart 132-10-6). No direct correlation could be made with coaly areas along the road in the coal-bearing member on coal licence 4187. The off-licence thicknesses were used to construct rough true thickness contour maps for 10-, 9- and 8seam (132-10-7, -8 and -9). M-seam was not considered for reserves because of its lenticular nature and 10-seam did not reach economic thickness within the licence area (isopach map 132-10-7).

Representative samples of oxidized coal were taken at the location incidated on the correlation chart (132-10-6). The columns shown in the correlation chart are keyed to the geological plan map (132-10-4). An ash content only is reported for these locations since the true volatile matter content cannot be obtained by analyzing oxidized outcrop samples.

No petrographic work was done on licence area coal during 1979.



THICKNESS	ASH (dry)
5.6	32.6
13.2	16.7
15.5 🤇	16.7
4.8	34.5
18.3	50.8
22.9	31.9
5.1	27.5
5.2	32.0
8.7	45.5

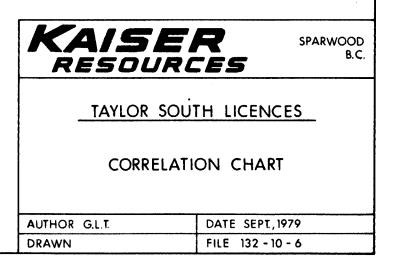
COAL

MUDSTONE

SILTSTONE

SANDSTONE

CONGLOMERATE



<u>M-Seam</u>. M-seam is present at several sites at the upper contact of the Moose Mountain Member immediately east of coal licences 4185 and 4187 (geological plan map 132-10-4). Visual examinations of the outcrop expression of M-seam indicate a lenticular nature for the coal. In view of this the prediction of coal tonnages for M-seam in the licence area would be nearly impossible. No samples of M-seam coal were taken.

<u>10-Seam</u>. This seam, the lowermost of the main coal area, occurs about 330 to 400 feet above the Moose Mountain Member. The seam is very lenticular in nature along the outcrop to the east of coal licence 4185 where it ranges between 0.0 and 15.5 feet thick (correlation chart 132-10-6). A 0.0 thickness was assumed for the outcrop along the new road on coal licence 4187 and true thickness isopach lines (132-10-7) indicate that the seam is probably less than two feet along the eastern portion of coal licence 4185 and 4187. To the west, under cover, lenticular patterns and reserves are unpredictable.

Representative outcrop samples of oxidized coal were taken from the area to the east of licence 4185 in 1973 and analyzed for ash content only. The results are shown on the correlation chart (132-10-6).

<u>9-Seam</u>. This seam is the thickest and most consistent of the four seams occuring in the coal licence area. Coal thicknesses ranges from 4.8 to 22.9 feet in exposures at the top of the ridge to the east of coal licence 4185. (correlation chart 132-10-6 and geological plan map 132-10-4). This seam is correlated to a 1.0

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foot thick coal zone on the access road through the coalbearing member on coal licence 4187. The true thickness isopach lines indicate that the coal pinches to less than 2.0 feet thick in the western portion of coal licence 4185. (isopach map 132-10-8). As in the case of 10-seam, any coal reserve to the west is unpredictable due to thickness variations, lenticular patterns and elimination by pre-Blairmore Group erosion.

Raw ash contents of 9-seam outcrop coal samples taken in 1973 from the area adjacent to the eastern boundary of licence 4185 and keyed to the correlation chart (132-10-6).

A reflectance (Ro) of 1.62 is reported by Gigliotti and Pearson (1979) for a 9-seam exposure near the north-east corner of coal licenct 4185 (sample 6, correlation chart 132-10 -6). This indicates a low volatile bituminous rank for the coal.

<u>8-Seam</u>. This seam is only exposed on the ridge to the east of coal licence 4185 where it ranges between 1.0 and 8.7 feet thick. The seam is tentatively correlated to a zone of coaly bands along the road through the coal-bearing member on coal licence 4187. A thickness of 0.0 feet is used for this coaly zone for isopach construction (132-10-9).

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Two outcrop samples of 8-seam coal were taken in 1973 from the area to the east of licence 4185 and analyzed for raw ash. The results are indicated on the correlation chart (132-10-6).

Coal Reserves

In place coal reserves for Kaiser Resources Ltd. properties are designated as proven, partially explored or projected depending upon the nature and proximity of geological data points.

Proven reserves constitute tons of coal in place (1.15 n.t./cu. yd.) computed from observations (drill holes, adits, mine workings, etc.) spaced at intervals of 0.5 miles or less in areas of good geological continuity. Seams should be greater than 2 feet in thickness and under less than 2500 feet of cover.

Partially explored reserves consist of tons of coal in place (1.15 n.t./cu. yd.) computed partially from observations spaced at intervals from 0.5 to 1.5 miles apart and partially from reasonable geological projections. Seams should be greater than 2 feet in thickness and under less than 2500 feet of cover.

Projected reserves are made up of tons of coal in place (1.15 n.t./cu. yd.) where little direct evidence is available but where geological studies have indicated continuity of the coal measures. Coal seams and thicknesses are projected from adjacent areas.

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Taylor South licence coal reserves are situated under less than 2500 feet of cover and are classified as partially explored. Coal volumes and tonnages were calculated by the average end area method using geological cross-sections spaced 1000 feet apart (cross-sections 132-10-10 to -14). Coal thicknesses were obtained from the true thickness isopach maps (132-10-7, -8 and -9).

In place partially explored reserves in short tons for the Taylor South coal licences are as follows:

M-seam 10-seam	-			calculated calculated
9-seam 8-seam	+	1,066,400 140,700	tons tons	•••••••
Total		1,207,100	tons	

Reserves for 8- and 9-seam are under less than 400 feet of cover. The calculations are shown in Table II. Projected reserves of all seams may exist to the west under deeper cover but reserve calculations would prove difficult because of discontinuity of the coal due to pre-Blairmore Group erosion and the lenticular nature of the seams.

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Section	Seam Thickness (feet)	Length of Seam (feet)	Area of Seam (feet) ²	Average End Area of Seam (feet)	Dist. Between Cross-Sections (feet)	Volume Coal (yards) ³	Short Tons Coal
<u>9-SEAM</u>							
05	6.0	1670	9.980	11 808	1000	437 330	502 900
1000S	7.7	1765	13 635	10 680	1000	395 560	454 900
2000S	4.7	1640	7 725	3 863	660	94 430	108 600
2660	2.0	0	0				
Total	6.1						1 066 400
8-SEAM				<u> </u>			
05	3.9	1320	1 240	1 775	1000	65 740	75 600
10005	3.7	620	2 310	1 495	1000	55 370	63 700
20005	2.0	340	680	340	100	1 260	1 400
21005	2.0	0	0				
Total	2.8						140 700

TABLE II. Coal reserve calculations for 9- and 8-seam.

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CONCLUSIONS

Low tonnages of partially explored coal reserves are indicated for the Taylor South licence area. These reserves underlie only the north-east corner of the licence group. Any existing projected coal reserves down dip to the west and south would be difficult to outline due to unpredictable seam extent. It would appear that future coal production from these licences seems unlikely because of the low tonnage and remoteness of the licence locations.

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STATEMENT OF QUALIFICATIONS

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