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REPORT ON THE SECOND SURVEY OF FERNIE COAL MINE, B. C., CANADA

APRIL, 1967

NITTETSU MINING CO., LTD.

TOYO MENKA KAISHA, LTD.

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I. INTRODUCTION

A survey team was dispatched to the Pacific Coal Limited claims in Canada and during the months September through December, 1965 collected samples for drum tests from Seams K-1 and K-5 by tunnelling. The results of the tests conducted at steel mills as previously reported led to the inference that the coal quality of both Seams K-1 and K-5 were not always consistently good because the carbonization of coal has advanced to a considerably high degree although these samples can be classified as low volatility coal.

With regard to Seam B (hitherto called Seam K-11. The reasons for a change of designation are given in later pages) which has been regarded as possessing the highest promise, samples could not be collected as the existence of outcrops has not been confirmed. Thus the survey of 1965 was not thoroughgoing enough to grasp the actual conditions in this respect.

Thereupon, another exploration plan was drawn up with the object of surveying Seam B and collecting samples for coal quality tests. The survey was carried out during three months beginning September, 1966. The report and the results of this latest investigation are submitted herewith. The exploration program initially gave priority to Seams B and K-5 as follows:

o Trenching (Bulldozing)

	Sites of Trenching	Sampling Tunnels
Seam B	6	2 - 3
Seam K-5	5	2 - 1
o Drilling	2	About 400 m (200 m/ each drill)
o Surveying	1	About 1.5 months

However, snowfall and other adverse weather conditions caused a delay in the identification of Seam B. Moreover, as the survey advanced, it became clear that Seam K-5 is not much of a coal-bed. On account of this, theinvestigation was centered on Seam B and Seam A which is located below the former.

Specifically speaking, trenching work was carried out at 6 spots by bulldozers and 3 spots by manpower along the outcrops of Seam B (the 8.5 kilometer distance between Morrissey Creek and Pipe Line Road) to directly confirm the continuity of the seam. At the same time, on No. 3 Ridge facing the Morrissey Creek to the west of the coal fields, sampling tunnels were driven for collecting samples for drum tests. In addition, three drill holes were made there so that coal quality could be examined by cores and the continuity of the seam could be ascertained in depth.

As to Seam A, which runs in parallel with Seam B and is located about 25-30 meters below the horizon of the latter, samples for drum tests were collected from tunnels excavated on No. 20 Ridge (near Pipe Line Road) in the east of the coal fields. In the meantime, trenching by bulldozers and manpower revealed the existance of outcrops of Seam A in the area about 2.5 - 3 kilometers west from this area.

In addition to the exploratory work mentioned above, on-the-spot measurements of coal seams were carried out.

Surveying on the south-western slope of Flathead Ridge was mostly completed.

Thus, the confirmation of Seam B, which was regarded from the beginning as the most promising source of coking coal, has been attained.

However, the planned excavation of four tunnels to collect samples for drum tests was hampered by bad weather. As a result, tunnelling work could be carried out only at two sites including one for Seam A.

It is to be regretted that the true value of the coal fields cannot be judged from the data obtained by the current survey. It is deemed necessary that this survey should be followed up with another thoroughgoing investigation.

April, 1967

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II SUMMARY

1) As was expected, it is most likely that Seam B will become the principal source of coking coal. As a supplementary object of the development project, Seam A can also be taken up for consideration, while the other coal-beds seems not worth immediate further prospecting because of the fact that it can not be regarded as the principal source of development project.

2) The extent of reserve in Seam A and Seam B is estimated at well over 34,000,000 tons clean coal basis. This figure is enough to justify the coal mining project on the scale envisaged i.e. 1 - 1.5 million tons per year in terms of clean coal output.

3) With regard to coal quality, tests conducted by steel mills here revealed that sample coal from Seam B is in the low volatility group (about 17 percent). At the same time, it was found poor in fluidity as well as in single abrasive strength, however, a good coking result was reported when it was mixed with other high fluidity coals. From these findings, it was made clear that coal from Seam B must have more test in order to prove as coking coal.

On the other hand, it was proved that coal from Seam A has a volatility of around 21 percent. Although its fluidity was rather low, it had fairly good coking characteristics similar to that of U.S. medium volatility coking coal in the strength tests, either single or blended.

4) As far as coal quality of Seam B is concerned, however, no definite conclusion could be drawn from the tests, for all the samples cannot be regarded as truly representative of Seam B. (Full particulars

are given on the following pages).

Judging from the test result of J-1 drill core and stratigraphical closeness to Seam A, it is presumed that coal quality of Seam B is somewhat similar to that of Seam A.

5) To sum up the quality of coal seams, it can be gathered that a medium volatile coking coal of around 20-22 percent volatile can be expected. As will be mentioned in the following paragraph, further investigations are necessary.

6) Fortunately, in the course of the current survey, stripping of overburden was carried out to expose Seam B in many places on the principal ridges, so that on the next occasion prospecting tunnels may be driven centered on the sites referred above. Specifically, a prospecting program could be drawn up on the following lines:

(1) Tunnels for sampling

Seam B 6 spots (Ridges No. 5, No. 7, No. 10, No. 14-15 and No. 20)

Seam A 1 spot (Ridges No. 14-15)

(2) Drilling

A minimum of eight drill holes, five (each 500-600 meters deep) aiming at Seams A and B at the proposed main haulage level, 1,160 meter above the sea and three holes (each 300 meters deep or so) at the middle level between the main haulage and outcrops, are required in order to ascertain the seam conditions as well as the quality changes in its deeper parts.

III LOCATION

The claims covered by our survey are located in the neighborhood of Fernie (Population: Approx. 3,500) on the southeast border of British Columbia, Canada. Situated in lat.49°21' N and long. 114°55'W and lying between 1,100 meters and 2,200 meters above the sea level, the mining fields are contained in the southernmost part of Crowsnest Coal Basin spreading to the border of the states of British Columbia and Alberta.

The area is one of the largest coal producing centers in Canada and includes Balmer (owned by Crows Nest Industries Ltd.) and Vicary (Coleman Collieries Ltd.). From these two mines, a total of about 900,000 tons of superior coking coal is being shipped to Japan annually. (Refer to Location map)

I V A C C E S S

The claims are at about 12 miles distance southeast from Fernie. Highway No. 3 and a railroad (C.P.R.) are running through the point 3/4 miles from the western extremity of the claims. (Fernie $\xrightarrow[20\ \text{minutes}]{\text{by car}}$ Claims).

Although there is no direct flight service between Vancouver and Fernie, regular air service is available daily between Vancouver and Cranbrook, and Vancouver and Calgary. Fernie can be reached after one-hour's drive from Cranbrook and three-hour's drive from Calgary. Anyway, the claims are easy of access.

V CLAIMS AND NEIGHBORING AREA

The land in the southern end of the Crowsnest Coal Basin has mostly been owned by Crows Nest Industries Ltd. for many years. Three other mining fields were owned by the Government and C.P.R. (a railway firm).

Pacific Coal Ltd., interested in the most favorably located, government-owned land, which spreads from Morrissey Creek to Michel Creek and which has a total area of 45,000 acres (about 5 x 20 miles), has long applied for leases of the most promising sections in the south-western part of the land. In July, 1966, the company won an exploration licence for an area of 18,421 acres. (Refer to Claim map)

V I H I S T O R Y

It has been reported that in the opening years of the 20th Century, mining activities were started by Crows Nest Industries Ltd. along Morrissey Creek and during the 1902-1909 period, a total of about 500,000 tons of coal was mined. Even today, remnants of its former glory are evident in the old pits and the ruins of coke ovens. According to some records, as many as 240 ovens were in operation and the output of coke amounted to 30,000 tons.

Crows Nest Industries Ltd. operations were carried out within its own coal fields lying north of Morrissey Creek. There are fair indications that small-scale exploitation as well as investigation has been conducted in the fields south of Morrissey Creek, which have now passed into the possession of Pacific Coal Ltd.

These Morrissey coal mines were shut down at the time of the 1909 bumps and outbursts of gas and the subsequent depression of the coal industry.

During the past years, many local geologists have investigated the area including the Pacific Coal Ltd. and have published their findings. However, these are mostly too general in contest.

In recent times, exploratory drillings and trenchings have been conducted by P.C.L. in a limited area along Morrissey Creek, with the result that the existence of more than 10 coal seams has been confirmed and among these Seams K-5,K-11, K-14 and K-15 were found worthy of further investigation.

Following this, Nittetsu Mining Consultants Co., in response

to the P.C.L.'s request, dispatched its survey team in 1965 who collected samples from Seams K-1 and K-5. Based on data gathered through this survey, the Proliminary Feasibility Report was made.

(For particulars, refer to the 1966 Report)

V I I T O P O G R A P H Y

The area is situated in the Rocky Mountains. The highest point in the claims is 2,300 meters and even Fernie is about 1,000 meters above the sea level.

In the southwestern part of the coal fields, Flathead Ridge runs from northwest to southeast in parallel with the strike of the strata. The southern side of the ridge forms rugged cliffs here and there while the northern side presents gentle slopes making a table land. The foothills are densely wooded but the forest area does not extend to the upper half of the mountains.

VIII GEOLOGY

In the area, a thick formation of sedimentary rocks belonging to Jurassic and Cretaceous periods is prevailing.

From ~~top to~~ bottom to top conformably, it consists of Fernie, Kootenay and Blaimore Formations.

The Kootenay Formation is a representative coal-bearing formation in Crowsnest Coal Basin composed chiefly of the alternation of sandstones and shales with coal seams of different thickness. Locally containing conglomerate beds, it is especially well developed along Flathead Ridge. It's thickness is about 600 meters here. The lower part of the formation shows a folding structure by a considerable degree together with the Fernie Formation at the bottom (Near No. 7 - No. 8 Ridges). The part above the middle horizon near Seam B which is the principal coal bed presents a gentle sloping structure with a 20 degree dip to the north and runs continuously in the direction of the strike without any noticeable fault. Furthermore, the strata feature the southeast wing of a large synclinal structure, of which northeast wing is cropping again about 15 kilometers away. In this respect, the coal field is truly continental.

IX DESCRIPTION OF THE SECOND EXPLORATION WORK (See Figure 21)

1. Trenching (Bulldozing)

Contractor:	Nohels Logging Co., Ltd. (Fernie, B.C.)
Work Period:	September 17 - November 1
Bulldozer:	D-6 30 days
	D-7 21 days
Blasting:	2 days (No. 7 ridge)
Trenched Places:	8 ridges
	(No. 3, No. 5, No. 7, No. 9, No. 11, No. 18
	No. 19 and No. 20)

2. Tunnelling and Sampling

Contractor:	R.F. Fry & Associates (Western) Ltd.
	(Vancouver, B.C.)
Work Period:	September 29 - November 29
	(Including 3 days for sampling)
Crew Members:	1 group 5 persons
	(Foreman 1, Hirebos 1, Miners 3)
Workday:	8 hours
Footage:	About 7 feet on average
Amount of Samples:	About 11 tons (a total for Seams A and B)
Methods:	From the outcrops of Seams A and B on No. 20 Ridge and No. 3 Ridge, respectively, slopes were driven along these seams for bulk sampling for drum tests.

Name of Drifts		Location	Above Sea-Level (M)	Inclination	Inclined Distance (Ft)	Level or Upward Cutting (Ft)	Downward Cutting (Ft)	Total Length (Ft)
Seam A	*Level Drift	Pipe Line Road	1925.00	0	54.5	-	-	54.5
	Slope	No. 20 Ridge	1930.00	(-)15°	91.0	22.0	0	113.00
Seam B	Slope	No. 3 Ridge	1500.00	(-)13°	63.5	37.11	19.0	119.61
Total					209.0	59.11	19.0	287.11

* Suspended half-way due to the instability of button index.

These tunnels were driven while checking the changes in weathering conditions by conducting button index measuring at intervals of 1-2 meters. From a point where the button index was practically stabilized, cross-cutting was performed to expose the seams. Thereupon, close survey of the seams was made with the unaided eye and again button index measurements were taken to decide the mineable range. At the same time, a large amount of samples were collected for drum tests. The following table shows the details of samplings.

Name of Seam	Position	Thickness (m)	Mark	Amount (Nos. of Drum)	Description For Steel Mills
Seam A	Top	2.18	PT	10	A
	Bottom	1.99	PB	10	
Seam B	Top	1.98	M_1	6	B_{top}
		1.99	M_2	6	
	Bottom	2.34	M_3	4	B_{bottom}
		1.85	M_4	4	

3. Drilling

Contractor:	Canadian Longyear Ltd. (Vancouver, B.C.)
Work period:	Sept. 28 - Oct. 31
Personnel:	A five-member gang consisting of a foremen and four labourers
Work system:	Round-the-clock work on two shifts
Cost:	About $10/Foot
Remarks:	Three drills, J-1, J-2 and J-3, were sunk toward the Morrissey Creek. Of the three, the drill J-2 developed trouble just above Seam B. Because of the weather, there was the possibility that the beginning of work on drill J-3 would become impossible if too much time were taken in fixing the drill. Consequently, the exploration into Seam B was called off.

Samples collected from the cores of the seams were brought to Japan, regardless of whether they represented thick or thin seams, and quality tests, mainly proximate analysis and C.B.I. measurement, were held on them.

In particular, samples from the Seam B core obtained through Bores J-1 and J-3 were sent to the Yawata Iron & Steel Co., Ltd. where coking tests were made excluding abrasive strength tests.

(Note) -- The "J" of the names of the bores represents Japan, indicating that they are drills sunk by Japan in 1966.

4. Road construction and repair and snow removal

Contractor:	Nohels Logging Co., Ltd. (Fernie B.C.)
Construction and repair:	D-6 5 days
	D-7 11.5 days
	D-8 8.5 days
Snow removal:	D-6 10 days

5. Surveying

Field work period:	Sept. 17 - Nov. 1 (40 actual work days)
Personnel:	Two on every work day and a running total of 79
Surveyed area:	A sloping tract of about 640 Ha facing the south west from the Morrissey Creek to Ridge No. 20
Control point:	B.C. Forest Service Road Bench Mark near the road at the mouth of the Morrissey Creek (Even = 3,275.23 Fts = 998.23 M)

Method: Traverse stations were established along a line leading from Bench Mark to Flathead Ridge via Morrissey Creek. A station was set up in every ridge under the stadia survey and survey lines were coordinated at the ends.

X COAL SEAMS

(See Fig. 1 Coal seam map, Fig. 2 C-C' Cross section and Fig. 3 J-J' Cross section)

In the Kootenay Formation, a number of seams have been confirmed to exist by trenching and several drillings. These seams have been named Seam K-1, Seam K-2 with the larger numerals representing higher horizons.

But, since information obtained through the previous drills is inadequate on many details, particularly on coal quality, this has made it difficult to correlate the current drilling results with those of preceeding years.

In addition, the surveys concentrated on Seam B which is located approximately in the center of the seams and considered to be a main seam. Active efforts could not be made to investigate seams other than those which were the subject of this survey.

Drill J-3 was sunk close to Drill B-1 for the purpose of determining the stratigraphical horizon of the seam which had been called Seam K-11. The drilling revealed that the seam is located lower than previously thought and that it is not proper to call it Seam K-11.

Since it might create confusion to continue to use the Seam K serial numbers in spite of the disclosure, it was decided to keep the names of the lowest five seams the same and give the upper seams alphabetical names from the bottom up. The name of what used to be Seam K-11 was changed to read Seam B.

(See Fig. 2 C-C' cross section and Fig. 18 Profile of correlated Drill Sections)

It seems that Seam B is located somewhere near Seam K-8 under the previous naming order and what used to be known as Sandstone K-10 is the layer between Seam E and Seam F.

Here is a thumb-nail sketch of the conditions of Seams A and B, which are regarded as worthy of further investigation and possibly actual mining.

1. Seam A

(See Fig. 4: Columnar Section of SeamA)

The stratigraphical horizon of Seam A is about 25 meters below Seam B in the neighborhood of Pipe Line Road.

Up to the present, the existence of Seam A has been confirmed only within the range of East 1/3 of the mining field by surface reconnaissance. It is not certain yet whether the coal bed continued further westward.

In the vicinity of Pipe Line Road, Seam A is found to be superior to that of Seam B. Moreover, investigation by the prospecting tunnels showed the thickness of the coal seam to be a little over 4 meters with an ash content of about 4 percent and a volatile matter around 21 percent. In terms of quality, coal possessing such good coking properties will surely meet the requirements of coking coal for steel mill use. (Refer to XI Coal Quality).

2. Seam B

(See Fig. 5: Columnar Section of Seam B)

The area between the Morrissey Creek and Pipe Line Road in the east has a well-developed coal seam. It is possible to track the outcrops continuously. Its thickness is well over 10 meters for distance of 3 kilometers between the Morrissey Creek and No. 5 Ridge. However,

generally, it is more or less 3-4 meters. Moreover, in the vicinity of No. 13 - No. 16 Ridges(Pipe Line), the seam shows a tendency to deterioration to some degree.

Examination of the samples collected from the prospecting tunnel on No. 3 Ridge revealed that the subject belongs to the so-called low volatile coal with the ash content of 10-12 percent and volatile matter around 17.5 percent. Although it appears very attractive, the results of button index measurement and single abrasive strength tests were not quite satisfactory, presenting a question as to its possible use as a coking material.

(For particulars, see XI Coal Quality)

Notwithstanding this, Seam B at J-1 drill hole, 2.3 kilometers toward the Morrissey Creek, was found to possess a similar quality to that of Seam A. On the basis of this fact, we can presume that carbonization of coal in the vicinity of the Morrissey Creek has been accelerated affected by the geological disturbance supposed to be along the Creek. being Therefore, from the results of the present investigation alone, it is not wise to draw any definite conclusion as to the coal quality of Seam B. Further investigation in the central part of the mining field between No. 5 Ridge and Pipe Line is essential for obtaining a real picture of coal quality of Seam B.

3. Seams above Seam B

The current surface investigation was carried out mainly to confirm the existence of Seam B by the aid of bulldozers. Cutting work was performed from the elevations to the lower-lying ground, so that before reaching Seam B, we discovered seams of different thickness and

different horizons. Some of these seams were found to be of mineable thickness, but as a target of the mining project they are inadequate at the present viewed from poor continuity of coal in the strike direction. It is not to say that these seams do not deserve further survey in a future development plan, but the stable large-scale formations like Seam B cannot be expected of these seams.

Description of coal seams according to ridge have been omitted from this report since accompanying charts show coal seam sections by outcrop. (See Fig. 6 - Fig. 12)

4. Coal seams in drilling

(See Fig. 13 - 14: Columnar section of coal seams in drilling)

(See Fig. 15 - 17: Columnar section of drill cores)

(See Fig. 18: Profile of correlated drill sections)

(Unit: m)

Drilling Number	Location		Drilling Length	Seam B (Total seam thickness Coal thickness)	Seam C (Total seam thickness Coal thickness)	Seam D (Total seam thickness Coal thickness)	Seam E (Total seam thickness Coal thickness)	Seam F (Total seam thickness Coal thickness)	Seam G (Total seam thickness Coal thickness)
	Distance from Morrisey Creek	Above Sea-Level							
J - 1	2,300	1,812	184.25	5.92 - 5.14	c. sh	8.77 - 7.29	c. sh	8.63-3.70 (1.90-1.02)	10.51-0.78
J - 2	1,300	1,602	152.40		0.52 - 0.42	7.59 - 8.31	c. sh.	6.41 - 0.74 (1.98-0.74)	soil
J - 3	400	1,361	248.41	17.77-17.11	c. sh.	7.32 - 3.97	0.28-0.13 0.51-0.14	soil	soil

XI COAL QUALITY

1. Samples taken from Tunnels

A total of 40 drums of samples collected from Seams A and B in the above-mentioned Ridges No. 3 and No. 20 were prepared to a certain extent of ash content at the laboratories of the Kobukuro Iron Works Co., Ltd. in Kyushu.

The prepared samples were forwarded to major steel firms where they received coking and other quality tests. On the basis of the results of these tests, the following paragraphs, tables and charts have been prepared to help judge whether the coalhas value in steel making, to assess the value of the coal field and to draw up a scheme of exploitation.

(1) Test results at Kobukuro

(A) Sieve Test

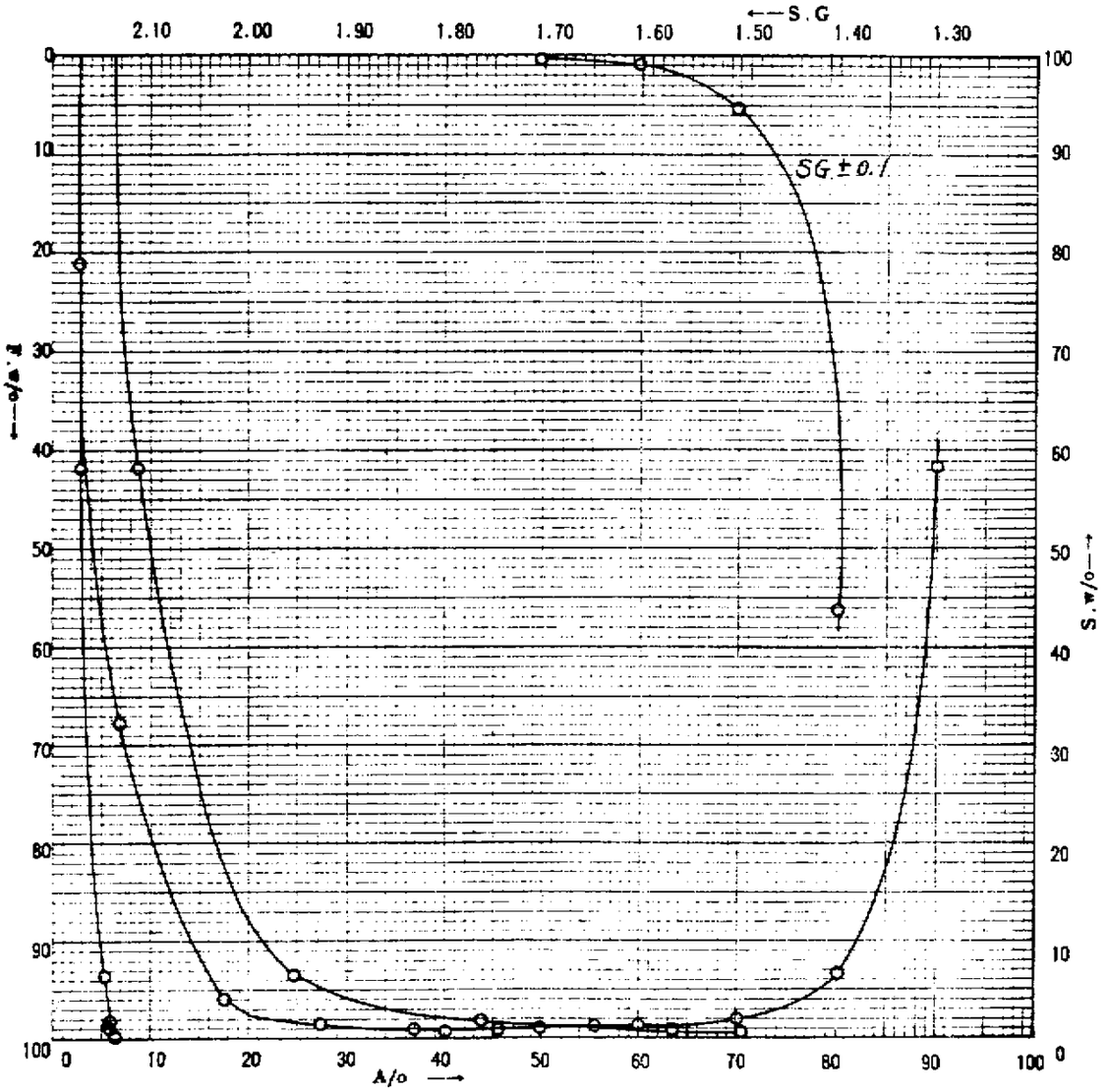
Brand / Size (mm)	PT		PB		M1		M2		M3		M4	
	Weight (%)	Ash (%)	Weight (%)	Ash (%)	Weight (%)	Ash (%)	Weight (%)	Ash (%)	Weight (%)	Ash (%)	Weight (%)	Ash (%)
20 - 10	22.7	2.7	22.4	7.6	7.8	16.7	6.5	20.2	7.0	17.8	12.2	24.3
10 - 5	17.5	3.2	15.9	6.7	9.1	13.4	14.6	17.3	10.6	12.3	11.5	21.5
5 - 2	23.1	2.7	22.5	5.5	21.7	11.0	24.4	13.7	24.1	9.5	21.9	15.1
2 - 1	8.6	2.9	11.7	4.5	8.1	11.5	14.6	11.1	16.1	7.5	13.8	10.8
1 - 0.5	6.5	2.5	7.1	5.9	14.3	9.2	5.6	8.0	6.6	6.1	6.5	9.5
- 0.5	21.6	2.8	20.4	6.1	39.0	7.0	34.3	10.2	35.6	4.8	34.1	8.1
Total	100	2.8	100	6.2	100	9.9	100	12.7	100	8.2	100	13.6

WASHABILITY CURVE

SEAM A Mark (P.B.)

S G	w/o	A/o	$\Sigma W_n - 1 + \frac{W_n}{2}$	W.A	$\Sigma WA_{(Af)}$	ΣW	$\frac{\Sigma WA}{\Sigma W}$	$\frac{(\Sigma Af - \Sigma WA)}{100 - \Sigma W}$
− 1.8	41.9	2.9	21.0	121.5	121.5	41.9	2.9	8.8
1.4	51.9	6.9	67.9	858.1	479.6	93.8	5.1	24.5
1.5	4.5	17.8	96.1	77.9	557.5	98.3	5.7	48.7
1.6	0.7	27.1	98.7	18.9	576.4	99.0	5.8	55.4
1.7	0.8	36.9	99.2	11.1	587.5	99.8	5.9	68.8
1.8	0.2	45.4	99.4	9.1	596.6	99.5	6.0	70.4
+1.8	0.5	70.4	99.8	35.3	631.8	100.0	6.3	
Σ	100.0	6.8						

	W/O	A/O
+0.5	79.6	6.8
−0.5	20.4	6.1
Σ	100.0	6.8

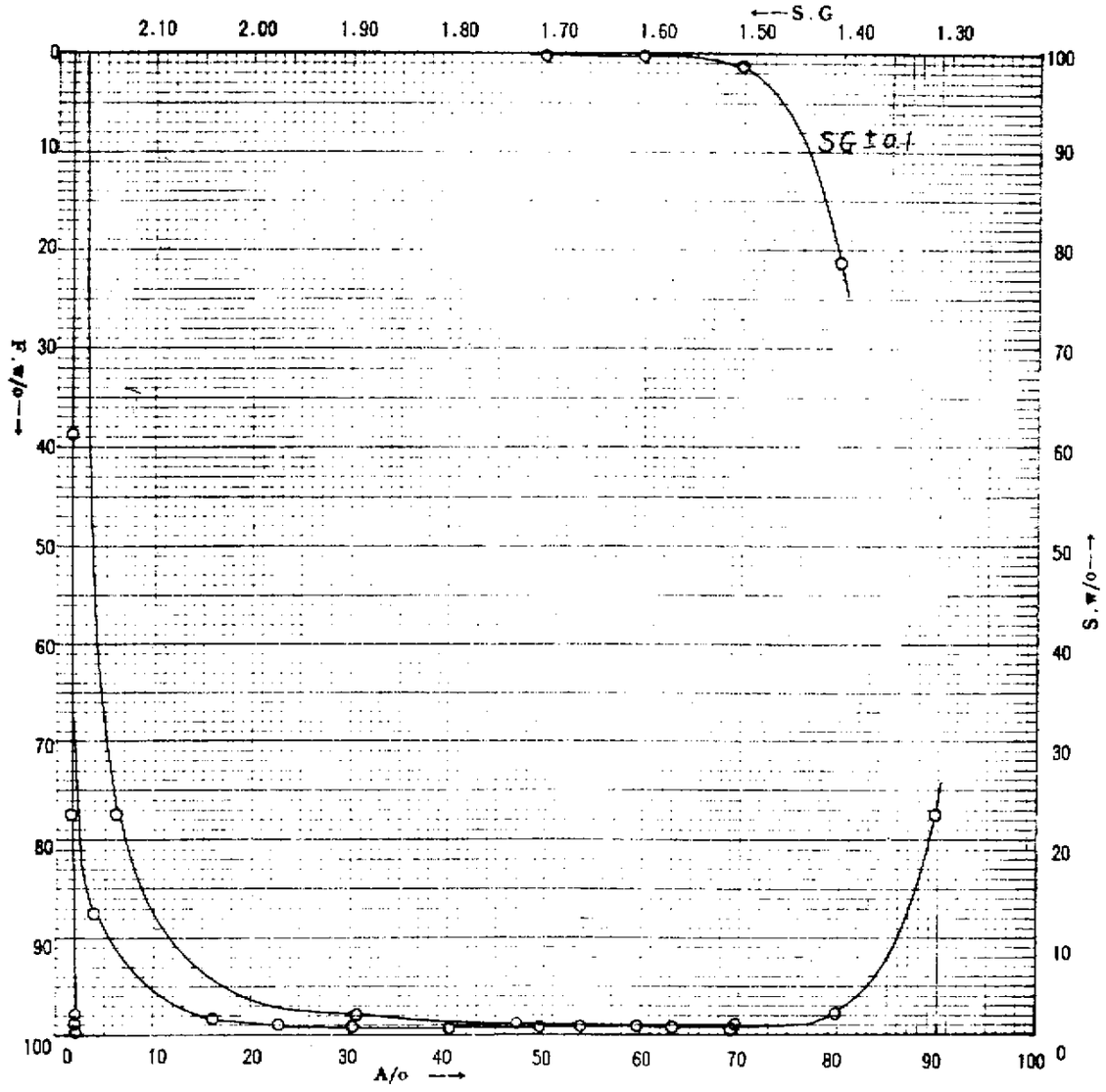


WASHABILITY CURVE

SEAM A Mark (P.T.)

S G	w/o	A/o	$\Sigma W_n - 1 + \frac{W_n}{2}$	W.A	ΣWA (Af)	ΣW	$\frac{\Sigma WA}{\Sigma W}$	$\frac{100A\text{-}\Sigma WA}{100-\Sigma W}$
− 1.3	77.7	1.9	88.9	147.63	147.63	77.7	1.9	6.6
1.4	20.4	4.8	87.9	87.72	235.35	98.1	2.4	31.1
1.5	1.0	16.5	98.6	16.50	251.85	99.1	2.5	47.3
1.6	0.2	23.2	99.2	4.64	256.49	99.3	2.6	54.2
1.7	0.2	30.6	99.4	6.12	262.61	99.5	2.6	63.6
1.8	0.1	40.5	99.6	4.05	266.66	99.6	2.7	69.4
+ 1.8	0.4	69.4	99.8	27.76	294.42	100.0	2.9	
Σ	100.0	2.9						

	W/O	A/O
+0.5mm	78.4	2.9
−0.5mm	21.6	2.8
Σ	100.0	2.9

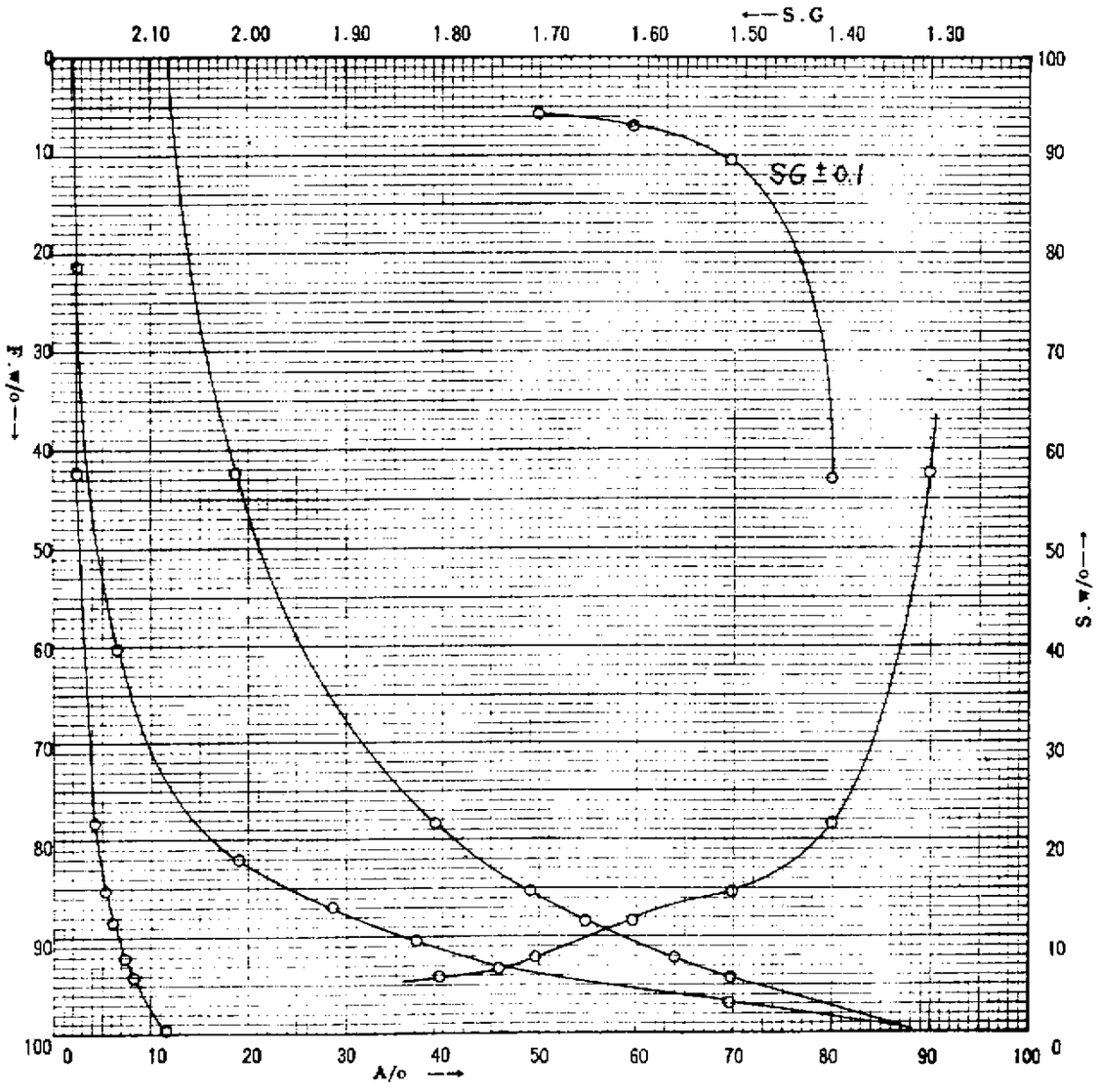


WASHABILITY CURVE

SEAM B Mark (M. 1)

S G	w/o	A/o	$\Sigma W_{n-1} + \frac{W_n}{2}$	W.A	ΣWA (Af)	ΣW	$\frac{\Sigma WA}{\Sigma W}$	$\frac{100Af-\Sigma WA}{100-\Sigma W}$
−1.3	42.5	2.4	21.2	102.00	102.00	42.5	2.4	18.9
1.4	36.0	6.7	60.5	241.20	343.20	78.5	4.4	39.3
1.5	7.1	19.1	82.1	185.61	478.81	85.6	5.6	49.3
1.6	8.2	28.9	87.2	92.48	571.29	88.8	6.4	55.0
1.7	3.8	37.3	90.7	141.74	713.03	92.6	7.7	64.1
1.8	1.8	45.9	98.5	82.62	795.65	94.4	8.4	69.9
+1.8	5.6	69.9	97.2	891.44	1187.09	100.0	11.9	
Σ	100.0	11.9						

	W/O	A/O
+0.5	61.0	11.9
−0.5	39.0	7.0
Σ	100.0	10.0

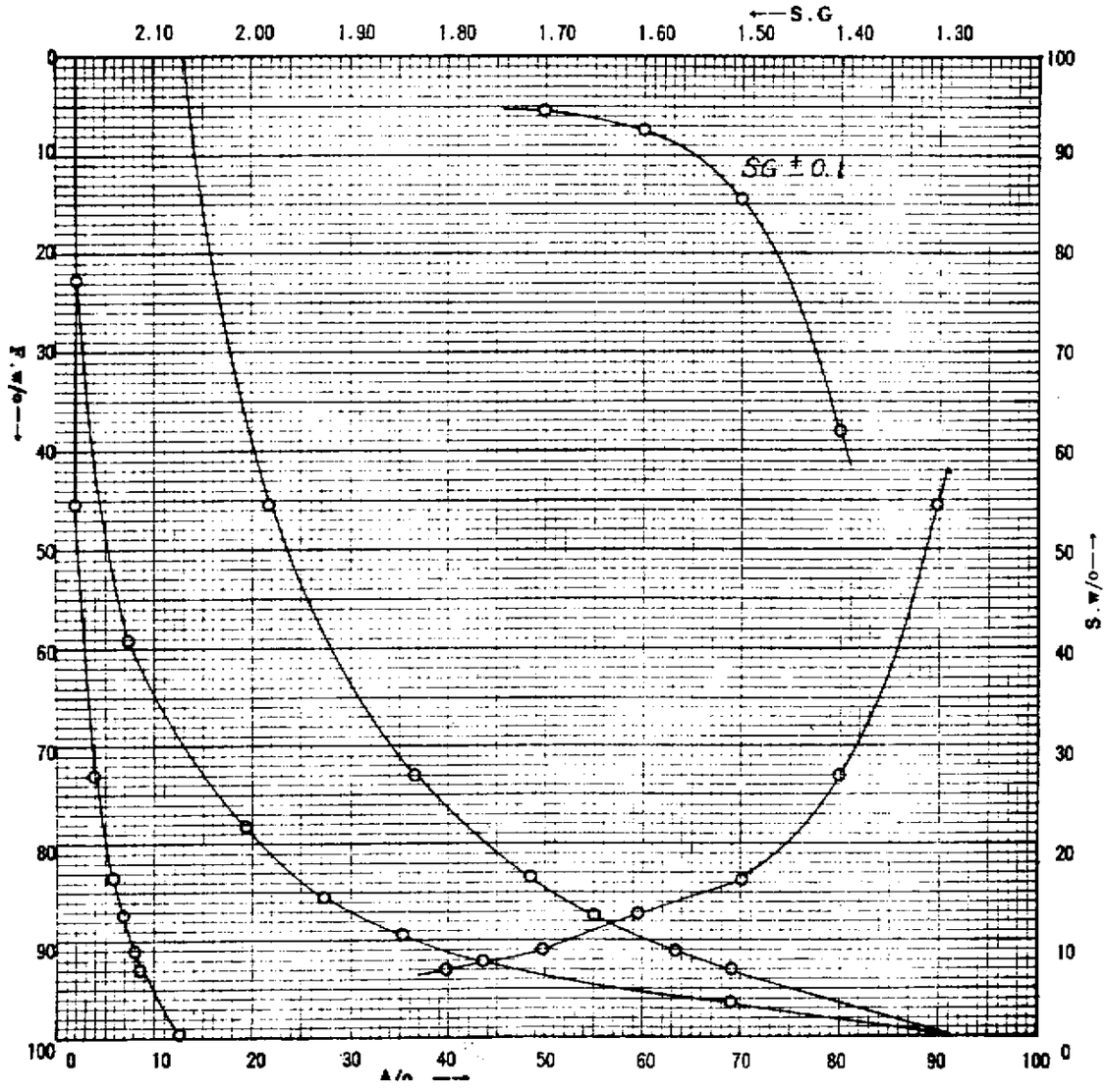


WASHABILITY CURVE

SEAM B **Mark (M. 2)**

S G	w/o	A/o	$\Sigma W_n - 1 + \frac{W_n}{2}$	W. A	ΣWA (Af)	ΣW	$\frac{\Sigma WA}{\Sigma W}$	$\frac{100Af - \Sigma WA}{100 - \Sigma W}$
− 1.3	45.7	2.3	22.9	100.54	100.54	45.7	2.3	22.0
1.4	37.5	7.5	59.5	306.25	306.79	75.2	4.3	56.9
1.5	10.7	19.5	78.6	208.65	515.44	85.9	6.1	48.5
1.6	3.9	27.3	85.9	106.47	621.91	87.8	7.1	55.2
1.7	3.6	35.3	89.6	127.08	748.99	91.4	8.2	63.6
1.8	1.9	43.7	92.4	85.05	833.02	93.3	8.9	69.2
+ 1.8	6.7	69.2	96.7	462.64	1295.66	100.0	13.0	
Σ	100.0	13.0						

	W/O	A/O
+0.5	65.7	13.0
−0.5	34.3	10.6
Σ	100.0	13.2

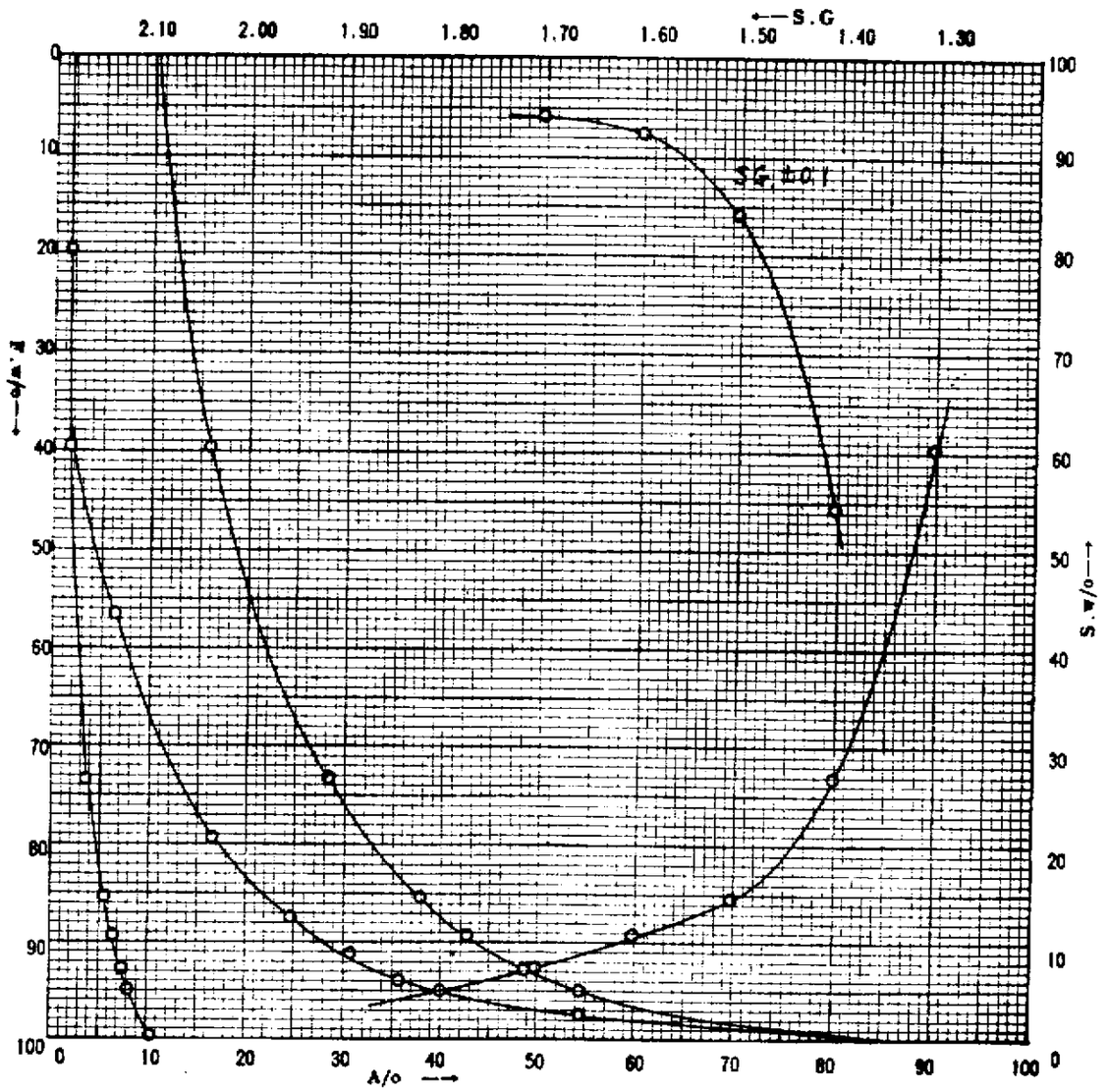


WASHABILITY CURVE

SEAM B Mark (M. 3)

	W/O	A/O
+ 0.5	64.6	10.4
− 0.5	35.6	4.8
Σ	100.0	8.4

S G	w/o	A/o	$\Sigma W_n - 1 + \frac{W_n}{2}$	W.A	ΣWA (Af)	ΣW	$\frac{\Sigma WA}{\Sigma W}$	$\frac{100Af - \Sigma WA}{100 - \Sigma W}$
− 1.3	39.7	1.7	19.9	67.5	67.5	39.7	1.7	16.1
1.4	33.7	6.6	56.6	253.4	259.9	73.4	3.9	38.3
1.5	12.3	16.7	79.5	208.8	498.7	85.6	5.8	38.0
1.6	8.7	24.7	87.5	91.3	585.0	89.3	6.6	42.6
1.7	3.7	30.8	91.3	114.0	699.0	93.0	7.5	46.8
1.8	2.1	35.7	94.1	105.0	774.0	95.1	8.1	54.4
+ 1.8	4.9	54.4	97.6	266.5	1040.5	100.0	10.4	
Σ	100.0	10.4						

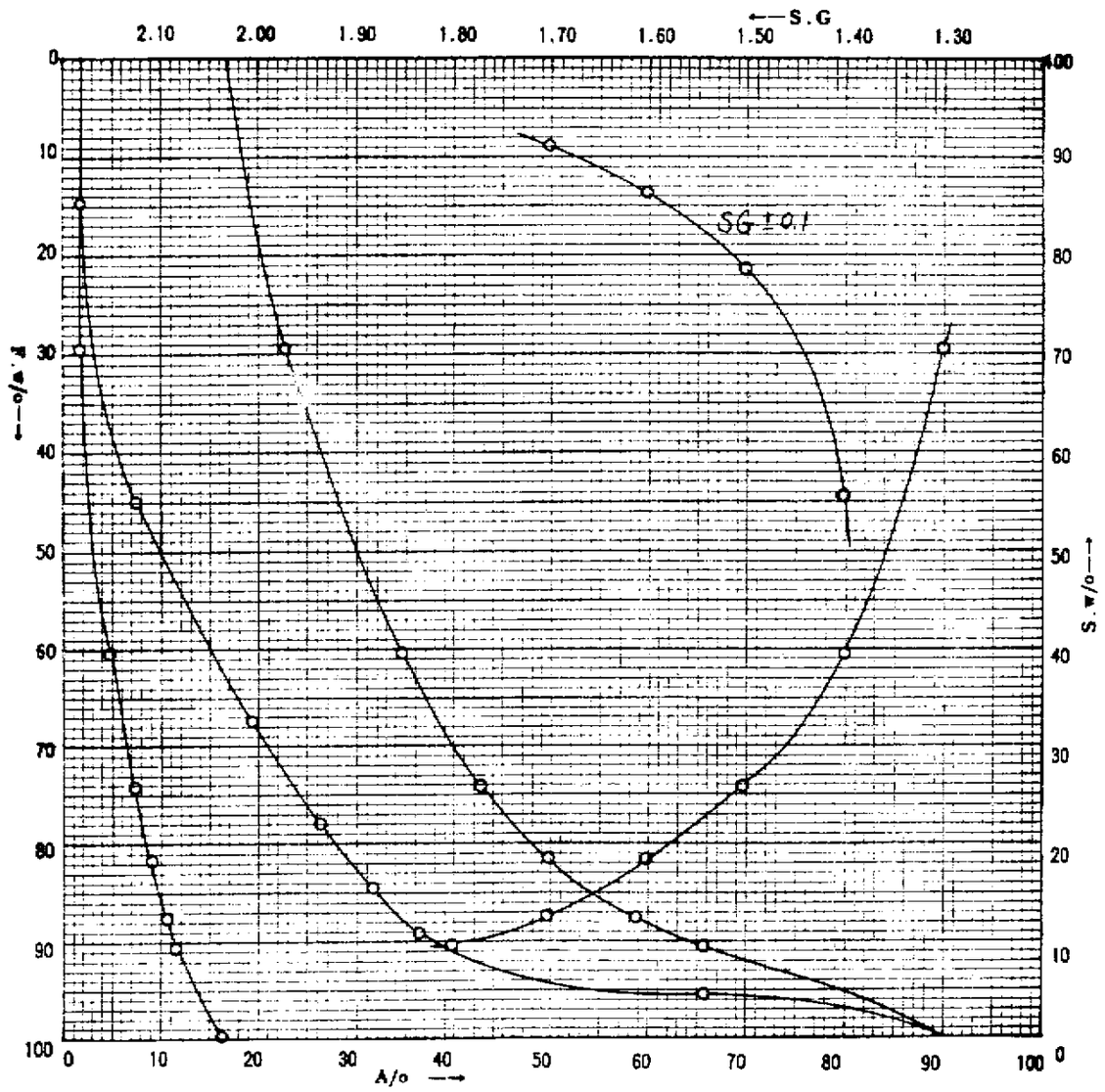


WASHABILITY CURVE

SEAM B Mark (M. 4)

S G	w/o	A/o	$\Sigma W_n - 1 + \frac{W_n}{2}$	W. A	ΣWA (Af)	ΣW	$\frac{\Sigma WA}{\Sigma W}$	$\frac{100Af - \Sigma WA}{100 - \Sigma W}$
− 1.8	29.5	2.0	14.8	59.0	59.0	29.5	2.0	22.9
1.4	31.0	7.8	45.0	285.6	294.6	60.5	4.7	34.9
1.5	13.6	19.5	67.8	265.3	559.8	74.1	7.6	45.0
1.6	7.7	26.3	78.0	202.5	762.3	81.8	9.3	50.1
1.7	6.0	31.3	84.8	190.8	953.1	87.8	10.9	59.0
1.8	2.9	36.7	89.3	106.4	1059.5	90.7	11.7	66.0
+ 1.8	9.3	66.0	95.4	618.3	1678.8	100.0	16.7	
Σ	100.0	16.7						

	W/O	A/O
+ 0.5	65.9	16.7
− 0.5	34.1	8.1
Σ	100.0	16.8



(C) Proximate analysis of Raw coal and Clean coal, Calorific value and Total sulphur

(Unit %)

Sample \ Item		Moisture	Ash	Volatile matter (V.M.)	Fixed carbon (F.C.)	Calorific Value (Kcal/kg)	Total Sul-phur
Raw coal	P T	1.8	2.7	22.8	72.7	8380	0.35
	P B	1.7	5.6	20.9	71.8	7990	0.31
	M 1	1.8	9.6	17.7	70.9	7700	0.40
	M 2	1.5	13.1	17.5	67.9	7350	0.22
	M 3	1.6	13.0	18.4	72.0	7810	0.24
	M 4	1.5	14.9	18.3	65.3	7120	0.21
Clean coal	P T	1.8	2.7	22.8	72.7	8380	0.35
	P B	1.7	5.6	20.9	71.8	7990	0.31
	M 1	1.7	5.5	18.2	74.6	8080	0.51
	M 2	1.7	7.3	17.6	73.4	7930	0.30
	M 3	1.7	6.5	18.7	73.1	8050	0.31
	M 4	1.7	6.5	18.0	73.8	8020	0.30

(Note) — Raw coal samples PT and PB were not washed and used as clean coal.

(D) C.B.I. of clean coal and melting point of ash

Item \ Sample	PT	PB	M1	M2	M3	M4
C. B. I.	$7\frac{1}{2}$	$6\frac{1}{2}$	5	3	4	4
Melting point of ash °C	+1,450	+1,450	+1,450	+1,450	+1,410	+1,450

(Note) — Since the maximum temperature of the test furnace was 1,450 degree centigrade, tests at higher temperatures could not be conducted.

(E) Quality of prepared samples

Sample	Proximate analysis (%)				Volatile matter (daf %)	C.B.I.	Total sulphur (%)	Yield (%)	Ash content in raw coal (%)
	Moisture	Ash	Volatile matter (V.M)	Fixed carbon (F.C)					
A	1.80	4.20	21.90	72.10	23.29	7	0.33	100.0	4.20
B top	1.70	6.40	17.90	74.00	18.71	4	0.40	85.3	12.50
B bottom	1.70	6.50	18.40	73.40	20.04	4	0.31	74.3	13.60

(F) Steel mills receiving the prepared samples

Receiver	Seam/Mark	Volume	Ash (%)	Date of forwarding
Higashida Coking plant of the Yawata Iron & SteelCo., Ltd.	Seam A (PB+PT)	400	4.6	Feb. 25
	Seam B (M1+M2)	180	6.7	Mar. 16
	Seam B (M3+M4)	200	6.4	
Kawasaki Plant of the Nippon Kokan K.K.	Seam A (PB+PT)	400	4.6	Feb. 25
	Seam B (M1+M2)	180	6.7	Mar. 16
	Seam B (M3+M4)	200	6.4	
Muroran Plant of the Fuji Iron & Steel Co., Ltd.	Seam A (PB+PT)	400	4.6	Mar. 3
	Seam B (M1+M2)	180	6.7	Mar. 16
	Seam B (M3+M4)	200	6.4	
Chiba Plant of the Kawasaki Steel Corporation	Seam A (PB+PT)	400	4.6	Mar. 3
	Seam B (M1+M2)	180	6.7	Mar. 16

Receiver	Seam/Mark	Volume	Ash (%)	Date of forwarding
Wakayama Plant of the Sumitomo Metal Industries,Ltd.	Seam A	400	4.6	Mar. 3
	Seam B (M1+M2)	180	6.7	Mar. 16
Amagasaki Coke Industry Co. (Kobe Steel, Ltd.)	Seam A	400	4.6	Mar. 3
Kurosaki Plant of the Mitsubishi Chemical Industries Ltd.	Seam A	100	4.6	Mar. 7

(Note) -- Ash content is the arithmetical average of each mark.

As samples from Seam A had a very low ash content of about 4% as raw coal, they were submitted to the steel makers without being washed.

As for those from Seam B, a target was set to obtain clean coal with an ash content of about 6.5% of through washing and floatation since the raw coal ash content was about 13 percent.

During the cleaning process, steps were not properly taken to recover fine coal of a size of less than 0.5 millimeters from a settling tank.

Consequently, there is a possibility that close to 30 percent of the fine coal was washed away, and it could have been giving the good coking property.

This is presumed to have been partly responsible for slightly dissatisfactory results in quality tests at the steel mills which will be explained in the following paragraphs.

(2) Test Results at Steel Mills

The results of quality tests on Fernie coal samples from Seams A and B which were provided in the above-mentioned methods were revealed by the six steel makers in a meeting of the Overseas Raw Materials Committee on April 27, 1967.

Opinions were expressed on the results from the standpoints of the respective firms, and discussions were held.

(Refer to Test Results at Six Steel Mills)

A summary of comments made at the meeting follows.

(A) Seam A

The opinions of six mills approximately concurred on samples from Seam A. Although slightly inferior in fluidity compared with Vicary coal, Fernie coal, from Seam A is excellent with the percentages of ash, volatile and sulphur contents standing at 4%, 1% and 0.1% respectively. The lower ash content has particular merit.

This coal showed an abrasive strength (drum index) of 90% to 94% as single of 90% to 93% as blended with other types of coal except at Yawata.

(Yawata Iron & Steel Co. uses Chikuho coal (Onoura coal) which has low fluidity as its base coal while the other makers depend on Hokkaido coal or Nishi-Sonogi coal (Takashima coal) with generally high fluidity).

These figures are no worse than other Canadian coking coal (Balmer coal and Vicary coal and so on).

Among other characteristics, Fernie coal has a slightly high phosphorous content compared with other Canadian coal of which the average contents are 1 to 1.6 percent.

But this is no drawback except in the case of manufacturing low-phosphorous coke.

With the decline in the output of low fluidity Chikuho coal in Kyushu, Japanese mills are being forced to switch over to high-fluidity Nishi-Kyushu, Miike and Hokkaido coals in future. In view of this trend in soft coking coal in Japan, considerable demand is expected to arise for Fernie coal for blending purposes.

(B) Seam B

Because of the amount of samples from Seam B, tests were held at five mills, excluding the Kobe Steel, Ltd. The five concerns differed slightly on the evaluation of the samples from the seam.

Generally speaking, while it is very interesting that the coal has low ash and sulphur contents and is a type with low volatile matter, its fluidity is lower than Seam A coal.

As a result, when it is used singly, the abrasive strength is quite low (there were major differences among test results at the five mills).

The Seam B coal did not show measurable degree in coking characteristics in Yawata and Nippon Kokan tests. But it showed a good compatibility with soft coking coal with high fluidity as in the case of Seam A coal. Its drum index was 90 to 93% (abrasive strength).

With the coal failed to show measurable coking character when used by itself, Nippon Kokan K.K. expressed it as not so much appropriate for steel making. Nevertheless, the other companies said that in view of its good compatibility with soft coking coal of high fluidity it is possible to use it in limited blending ratio.

The C.B.I. for Seam B coal was 3 to 4 in tests at the Kobukuro Iron Works and the steel mills, and the figures were pointed out to be slightly low by the mills.

Compared with the C.B.I. figures conducted at the time and sites the samples were collected, the indices obtained in Japan were at a considerably low level.

In the mine-site measurements, the coal was not cleaned, but

the over-all average indices are presumed to fall between 5 and 5½.

It had been anticipated before the test results at the steel companies were known that judging from the preceeding C.B.I. figures (5 - 5½) and the volatile matter of 17.5 percent the coking character of Seam B coal would be equal to that of Seam K-5 coal (volatile matter of 16.5 percent and a C.B.I. of 4½) or even better, although it would be no better than seam A coal of volatile matter of about 21 percent.

But, actually, the test results showed it falling short of the original expectations. As stated before, the miss-treatment of sample at the time of preparation process might possibly have had some bearing on the outcome of the tests.

The Seam B samples presented to the steel mills were not necessarily representing the inherent qualities of Fernie coal, and it is presumed that Seam B coal is to be close to Seam A coal in quality. (Including volatile matter)

As reasons for this presumption, it can be pointed out that the quality of the coal obtained from the Seam B core through the J-1 drill approximates that of Seam A coal and that because of the stratigraphical proximity of the Seams A and B much qualitative difference between the two kinds is inconceivable (See Diagram showing relation between volatile matter and C.B.I. on Seam A and B coal).

(Note) Some notable comments made at the meeting on the coal quality tests are as follows.

Mr. Sugamata, Manager of the Resources Research Office of the Yawata Iron & Steel Co.:

Since the Seam B samples presented were losing out some portion of fine coal, it is doubtful if the test results could be regarded as the true quality of the coal.

Spots where Seam A and B samples were collected were too far apart each other. Samples should be collected at many more places in order to find average coal qualities.

There are too much differences in test results between Seam A and Seam B coal. But are they intrinsically different?

The ash content of the prepared samples submitted for testing is low, particularly in the case of Seam A coal, but what would the ash content be in clean coal if and when actual mining is carried out in the area in future: Samples should be prepared to conform to the extent of ash content expected in the actual coal products and then tested.

And what is the estimated reserve of the coal deposits in the area?

Mr. Saito, Manager of the Resources Research Office of the Nippon Kokan K.K.:

Just as Mr. Sugamata pointed out, because of the error in sample preparation, it is inconceivable that the test results represent the true values of Fernie coal. Collection of samples should be made at as many spots as possible if they are to be representative.

At any rate, anything definite cannot be said of Fernie coal

Name of drill	Work period	Drill depth	Efficiency																Casing pipe (m)	Core recovery %		Remarks
			per day				per hour				per shift				per head							
			working		drilling		working		drilling		working		drilling		working		drilling					
			days	per day (m)	days	per day (m)	hours	per hour (m)	hours	per hour (m)	shift	per shift (m)	shift	per shift (m)	No. of workers	per head (m)	No. of workers	per head (m)		Average	Main seam	
J-1	9.28-10.8	184.25	11	16.75	6	30.70	174	1.05	120	1.53	16	11.51	10	18.42	36	5.11	20	9.21	5.18	95	88	There are days which were spent on felling trees for drilling scaffolds
J-2	10.9-10.16	152.40	8	19.05	4	38.10	129	1.18	36	4.23	12	12.70	8	19.05	32	4.76	16	9.52	7.01	94	-	
J-3	10.17-10.31	248.41	14	17.74	10	24.84	241	1.03	206	1.20	22	11.29	18	13.80	52	4.77	36	6.90	30.78	89	90	The work was suspended for a day due to a shortage of casings
Total/ average	9.28-10.31	585.26	33	17.72	20	29.25	544	1.07	362	1.61	50	11.70	36	16.25	120	4.87	72	8.12				

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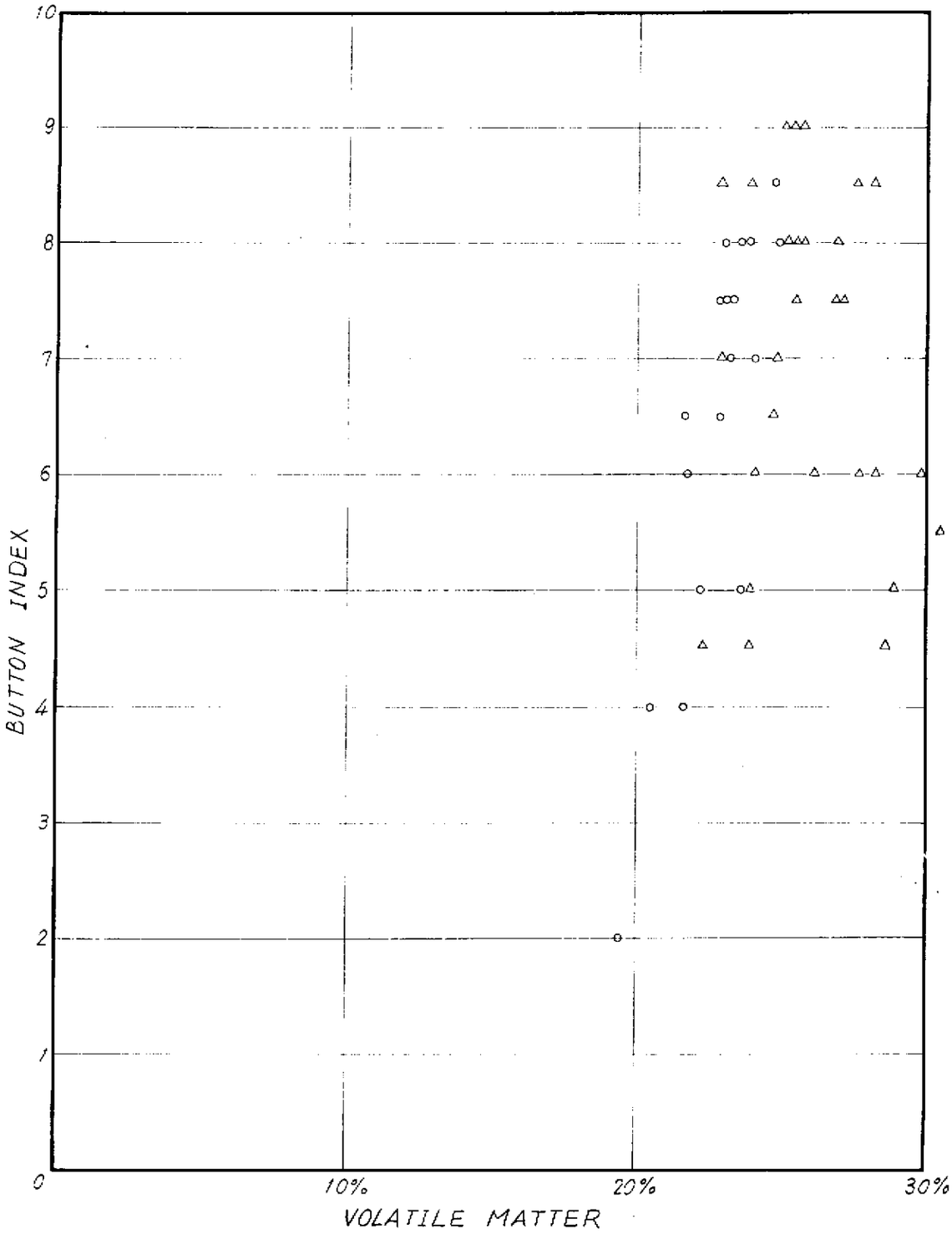
DIAGAM SHOWING RELATION BETWEEN VOLATILE MATTER AND BUTTON INDEX FOR A (TUNNEL) AND B (DRILL) SEAMS



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on the basis of the test results of this time. Another survey should be undertaken.

Mr. Miyake, Mining engineer of the Resources Research Office of the Fuji Iron & Steel Co.:

The C.B.I. was high for Seam B at the time of sampling but it was low after preparation. Further studies should be made on the point.

Opinions were expressed actively on the quality of Seam B coal and other matters by the various mills. Then, Mr. Sugamata of the Yawata Iron & Steel Co. said:

We admit that there is a sufficiently reserve of coal deposit. Assuming that the quality of Fernie coal to be commercially produced in future is close to that of Seam A coal, it has an advantage over Balmer coal as its ash content is lower than originally expected. Consequently, it would be very good if the coal is produced with the ash content held to a maximum of 7 percent.

Mr. Shimada, Acting chief of the Resources Research Office of the Yawata Iron & Steel Co. said:

Fernie coal has gone through sample tests twice, but the tests were sporadic with the samples taken from different seams.

As a result, next time it is necessary to sort out the results of the tests so far and to draft plans or the basis of future operation so that a comprehensive evaluation would be possible. The next surveying plans should be explained to steel makers beforehand.

2. Sample collected from Drill Cores

Samples taken from the Seam B core through drills J-1 and J-3

were prepared at the Mitaka Laboratories of the Nittetsu Mining Co., Ltd. and sent to the laboratories of the Yawata Iron & Steel Co., Ltd. for quality tests.

(1) Test results at Mitaka Laboratories

(A) Drill J-1

Result of Sink and Float Test

Specific gravity	Weight (%)	Ash (%)
-1.32	82.3	3.58
+1.32	17.7	19.17
Σ	100.0	6.34

On the basis of the sink and float test, the core samples were prepared. The quality of the samples which were sent to the Yawata Works is as follows.

(Unit: %)

Proximate analysis				Volatile matter (daf)	C.B.I.	Total sulphur	Yield
Moisture	Ash	Volatile matter	Fixed carbon				
0.79	6.22	21.40	71.59	23.01	7	0.40	98.1

(B) Drill J-3

The quality of samples presented to the Yawata Works

(Unit: %)

Mark	Proximate amlysis				Volatile matter (daf)	C.B.I.	Total sulphur	Theoretical yield	Ash content of raw coal
	Moisture	Ash	Volatile matter	Fixed carbon					
J-3 top	1.12	6.51	18.85	73.52	20.40	4	0.36	77.0	17.32
J-3 middle	1.19	7.48	17,75	73.58	19.43	$3\frac{1}{2}$	0.38	90.0	10.05
J-3 bottom	1.14	7.40	19.08	72.38	20.86	3	0.28	77.8	16.26

(2) Test results at Yawata

(A) Drill J-1

i) Samples

The tests were held on about one kilogram of coal samples collected from the Seam B core through drill J-1. The samples were prepared to an ash content of 6 percent at the Nittetsu Laboratories.

ii) Test results

a) Analysis

(Unit: %)

Item / Sample description	Moisture	Proximate analysis		Volatile matter (daf)	Fuel ratio	Cal/g (daf)	Elementary analysis (daf)				
		Ash	Volatile matter				C	H	N	S	O
J-1	1.81	5.95	20.98	22.31	3.48	8,678	88.59	3.85	1.37	0.21	4.98

b) Sulphur

Item / Sample	Total sulphur (%d)	Form of sulphur (%d)			Crusible Coke sulphur (%)
		Sulphate	Pyrite	Organic sulphur	
J - 1	0.39	0.00	0.04	0.35	0.39

c) Texture

Texture / Sample	Vitrinite	Degradinite	Exinite	Micrinite	Semifusinite	Fusinite	Mineral
J - 1	65.6	0.0	0.0	4.2	5.7	20.5	4.0

d) Coking quality

Item / Sample	CBI	Caking element index (%)	Gieseler Plastmeter					Dilatometer				
			Softening point (°C)	Max. fluidity (°C)	Max. fluidity log (Div/min)	Final Temp. (°C)	Range (°C)	Softening point (°C)	Maximum contraction (°C)	Maximum contraction Ratio (%)	Maximum dilatation (°C)	Maximum dilatation Ratio (%)
J - 1	8.0	90.6	408	468	2.38	489	45	410	455	26	488	-7

iii) General comments

Fernie coal from Seam B obtained through drill J-1 has a volatile matter of 22 percent pure coal basis which represents a considerably lesser carbonized quality compared with Fernie coal from K-1 and K-5 seams which were surveyed in 1965.

In addition, the former is higher in C.B.I., fluidity and dilatation. Judging from these characteristics, Fernie coal which came under the purview of the current survey has qualities similar to Balmer coal which is also mined in Canada, except that the fluidity and dilatation of the present samples are slightly lower.

Consequently, Fernie coal from Seam B recovered through drill J-1 can be presumed to have properties of strong coking coal and it can be concluded that it is sufficiently worthwhile to have more detailed tests on it.

When analytical results of core samples are compared comprehensively with those of samples collected from tunnels, it is noteworthy that the volatile matter of Seam B coal is at

a low level of about 18 percent in the case of samples from sites close to the Morrissey Creek at the western edge of the coal field (those from Drill J-3 and Ridge No. 3 tunnels), but it increases to 20 - 21 percent in the case of samples from Drill J-1 which is located a slight distance away towards the East.

Meanwhile, samples from Seam A tunnels in Ridge No. 20 near the eastern edge of the field where Seam A runs about 25 meters below Seam B have approximately the same volatile matter of about 21 percent.

When these are taken into account, it can be said that the "representative" volatile matter of Seam B coal is presumed about 21 percent. Further, it is conceivable that the characteristics of Seam B coal approximate to those of Seam A coal as far as fluidity and other points required in coal for steel production are concerned.

3. Samples from outcrops

The proximate analysis of samples collected from the various outcrops was conducted at Nittetsu's Mitaka laboratories.

These samples, being weathered to a considerable degree, are not appropriate as a material to infer the true quality of the coal, but it could be judged that coal is within a classification of coking coal.

4. Analytical data at Mitaka laboratories

(1) Samples from tunnels

(A) Samples from Seam A (Unit: %)

Sample No.	Proximate Analysis				Volatile matter (daf)	C.B.I.
	Moisture	Ash	Volatile matter	Fixed carbon		
20	1.30	3.52	23.50	71.68	24.69	$8\frac{1}{2}$ - 8
19	1.40	2.63	22.30	73.67	23.23	7 - $7\frac{1}{2}$
18	1.41	2.18	18.72	77.69	19.41	$1\frac{1}{2}$ - 2
17	1.44	1.70	22.39	74.47	23.11	$7\frac{1}{2}$
16	1.44	1.13	21.62	75.81	22.19	$1\frac{1}{2}$ - 5
15	1.39	1.61	22.34	74.66	23.03	8
14	1.31	1.64	22.11	74.94	22.78	$6\frac{1}{2}$
13	1.44	1.90	22.33	74.33	23.10	$6\frac{1}{2}$ - 7
12	1.47	1.74	23.03	73.76	23.79	8
11	1.48	3.12	22.53	72.87	23.61	8
10	1.57	10.01	22.01	66.41	24.89	8
7	1.67	4.39	21.43	72.51	22.81	7 - $7\frac{1}{2}$
6	1.67	3.35	20.63	74.35	21.72	6
5	1.62	5.15	20.08	73.15	21.58	4
4	1.64	4.96	19.01	74.39	20.35	4

Sample No.	Proximate Analysis				Volatile matter (daf)	C.B.I.
	Moisture	Ash	Volatile matter	Fixed carbon		
3	1.51	6.01	20.95	71.53	21.65	6
2	1.60	8.84	21.51	68.05	24.01	6½ - 7
1	1.78	8.38	21.18	68.66	23.57	4½

(B) Samples from Seam B

(Unit: %)

Sample No.	Proximate Analysis				Volatile matter (daf)	C.B.I.
	Moisture	Ash	Volatile matter	Fixed carbon		
30	2.68	46.39	13.96	36.97	27.41	
31	1.81	22.70	17.33	58.16	22.91	1
32	2.33	10.03	18.22	69.42	20.78	2
33	1.36	4.30	18.76	75.58	19.88	8
34	1.34	16.83	17.08	64.75	20.87	5
35	1.46	17.29	16.53	64.72	20.34	4½
36	1.36	8.31	19.10	71.23	21.14	6½
37	1.50	4.95	19.80	73.75	21.16	7½
38	1.43	3.92	19.28	75.37	20.37	7
39	1.42	7.92	17.49	73.17	19.29	3½
40	1.31	16.25	20.88	61.56	25.32	2½
41	1.42	4.90	17.45	76.23	18.62	5
42	1.43	6.14	18.57	73.86	20.09	5½
43	1.36	16.91	16.26	65.47	19.89	1½
44	1.23	37.93	14.41	46.43	23.68	1
45	1.38	12.06	16.53	70.03	19.09	3
46	1.20	6.19	18.70	73.83	20.19	4½

Sample No.	Proximate Analysis				Volatile matter (daf)	C.B.I.
	Moisture	Ash	Volatile matter	Fixed carbon		
47	1.38	9.94	22.00	66.86	24.80	6
48	1.26	1.88	17.48	79.26	18.08	4
49	1.05	1.37	18.34	79.03	18.79	7
50	1.09	16.75	14.73	67.43	17.92	1
51	1.05	16.69	26.14	56.12	31.77	4
52	1.27	4.83	19.42	74.48	20.68	6½
53	1.05	10.77	19.02	69.16	21.57	6
54	1.18	9.93	19.72	69.17	22.18	6
55	1.38	8.85	19.37	70.40	21.57	6
56	0.99	17.97	24.36	56.68	30.05	4½
57	1.35	9.62	18.52	70.51	20.80	5

(2) Samples from Drills

(A) Sample from Drill J-1

(Unit: %)

Seam	Sample No.	Proximate Analysis				Volatile matter (daf)	Total sulphur	C.B.I.
		Moisture	Ash	Volatile matter	Fixed carbon			
	3	0.86	13.24	23.74	62.16	27.63		8½
	4	1.24	7.38	23.39	67.99	25.59		9
	5	0.89	11.48	22.44	65.19	25.60		9
F Seam	6	0.84	22.81	21.43	54.92	28.06		8½
	7	0.83	51.27	14.25	33.65	29.74		1
	8	1.24	25.60	19.69	53.47	26.91		8
	9	1.60	83.79	7.50	7.11	51.33		-

Seam	Sample No.	Proximate Analysis				Volatile matter (daf)	Total sulphur	C.B.I.
		Moisture	Ash	Volatile matter	Fixed carbon			
F Seam	10	1.34	42.52	16.51	39.58	29.40		1½
	11	0.89	21.79	19.68	57.64	25.45		8
	12	0.87	67.62	16.48	15.03	52.30		1
	13	1.08	34.03	18.32	46.57	28.23		6
	14	1.20	75.95	9.77	13.08	42.76		1
	15	1.17	15.70	21.06	62.07	25.33		9
	16	0.75	18.35	22.02	58.88	26.88		7½
	17	1.00	48.35	15.46	35.19	30.52		5½
D Seam	18	0.85	24.78	18.52	55.85	24.90		7
	19	0.97	58.90	12.23	27.90	30.47		1
	20	0.88	22.05	19.62	57.45	25.45		7½
	21	0.91	61.60	12.10	25.39	32.28		1
	22	0.81	17.95	12.03	60.21	26.37		8
B Seam	23-1	0.86	7.20	24.77	67.17	26.94	0.47	8½
	23-2	0.89	6.14	20.79	72.18	22.37	0.49	4½
	23-3	1.30	5.54	22.27	70.89	23.90	0.45	8½
	24	1.30	6.99	20.96	70.75	22.85	0.37	4½
	25	1.24	3.23	21.93	73.60	22.95	0.34	8½
	26	1.12	8.88	23.60	66.40	26.22	0.37	6
	27	0.26	59.18	40.56	0.00	-	0.06	-
	28	1.28	63.24	11.10	24.58	31.10	0.28	1½
	29	1.15	20.30	18.75	59.80	23.87	0.57	5
	30	1.33	80.58	7.93	10.16	43.83	0.23	-
	31	1.04	71.25	9.66	18.05	34.86	0.25	1
	32	1.12	32.43	16.46	49.99	24.77	0.47	6½

(B) Samples from Drill J-2

(Unit: %)

Seam	Sample No.	Proximate Analysis				Volatile matter (daf)	C.B.I.
		Moisture	Ash	Volatile matter	Fixed carbon		
	33	0.80	51.72	13.58	33.90	28.60	4½
	34	1.10	72.68	9.47	16.75	36.11	1
	35	0.82	26.61	17.55	55.02	24.18	6
	36	1.09	73.21	9.32	16.38	36.26	1
F Seam	37	0.99	50.86	13.93	34.22	28.93	5
	38	1.28	71.88	9.71	17.13	36.17	1
	39	1.07	70.12	10.26	18.55	35.61	1
	40	0.76	16.45	20.75	62.04	25.06	8
	41	1.03	68.11	10.50	20.36	34.02	1
	42	0.95	46.51	14.63	37.91	27.84	6
	43	0.78	62.69	11.52	25.01	31.53	3½
	44	0.89	56.37	12.77	29.97	29.87	6
	45	0.88	50.91	12.74	35.47	26.42	3½
	46	0.92	40.04	15.05	43.99	25.49	6½
	47	1.15	15.98	18.25	64.62	22.02	8
	48	1.00	30.10	16.68	52.22	24.20	7½
	49	0.99	60.15	10.82	28.04	27.34	1
	50	1.34	10.96	19.13	68.57	21.81	8½
	51	1.13	7.40	20.37	71.10	22.26	9
	52	0.98	31.83	15.83	51.36	23.56	7
D Seam	53	1.22	21.55	17.25	59.98	22.33	6½
	54	1.09	5.32	20.27	73.32	21.65	9
	55	0.95	44.34	13.87	40.84	25.35	5
	56	1.17	33.82	15.29	49.72	23.51	3½

Seam	Sample No.	Proximate Analysis				Volatile matter (daf)	C.B.I.
		Moisture	Ash	Volatile matter	Fixed carbon		
	57	1.03	23.37	15.57	58.03	22.93	8½
C Seam	58	1.02	46.50	13.07	39.41	30.76	1½

(C) Samples from Drill J-3 (Unit: %)

Seam	Sample No.	Proximate Analysis				Volatile matter (daf)	C.B.I.
		Moisture	Ash	Volatile matter	Fixed carbon		
D Seam	70	1.46	66.14	8.93	23.47	27.56	1
	71	1.30	2.94	17.93	77.82	18.73	4½
	72	1.20	19.73	17.83	61.24	22.54	3½
	73	1.39	7.71	17.31	73.59	19.04	4
	74	1.16	14.86	17.39	66.59	20.70	4½
	75	1.47	77.89	16.64	4.00	82.62	-
	76	1.24	24.23	14.63	59.90	19.12	1
	77	1.39	7.09	19.63	71.89	21.44	4½
	78	0.29	58.15	41.56	0	100.00	-
	79	1.20	10.05	17.81	70.94	20.06	5
	80	1.29	25.73	14.59	58.39	19.99	1
	81	1.17	26.45	15.32	57.06	21.16	5
	82	1.37	63.28	9.75	25.60	27.58	1
	83	1.24	12.21	16.45	70.10	19.00	5
	84	1.34	43.30	15.34	40.02	27.70	1
C Seam	85	1.16	58.53	10.28	30.03	25.50	1
	86	1.25	24.76	16.97	57.02	22.93	2½

Seam	Sample No.	Proximate Analysis				Volatile matter (daf)	C.B.I.
		Moisture	Ash	Volatile matter	Fixed carbon		
	87	1.31	7.38	17.96	73.35	19.66	5
	88	1.24	22.28	16.60	59.88	21.70	1
	89	1.34	8.74	22.04	67.88	24.51	6
	90	1.19	9.56	21.40	67.84	23.97	2½
	91	1.14	18.98	20.80	59.08	26.03	1½
	92	1.12	7.02	18.02	73.84	19.61	3
	93	1.03	82.34	13.70	2.93	82.38	-
	94	0.94	59.77	16.25	23.04	41.36	1
	95	0.86	73.22	15.45	10.47	59.60	-
	96	1.29	7.97	19.77	71.02	21.78	4½
	97	1.32	4.94	19.16	74.58	20.43	4½
B Seam	98	1.10	20.41	23.64	54.85	30.11	2½
	99	1.45	7.36	18.92	72.27	20.74	3
	100	1.02	18.62	24.03	56.33	29.90	1
	101	1.22	10.67	18.81	69.30	21.34	2½
	102	1.10	16.31	17.04	20.63	65.55	1
	103	1.43	4.48	17.03	77.06	18.09	1½
	104	1.40	9.45	17.30	71.85	19.40	1½
	105	1.26	11.26	22.33	65.15	25.52	1
	106	1.23	4.24	18.62	75.91	19.69	5
	107	1.32	4.13	18.26	76.29	19.31	7
	108	1.19	5.02	19.04	74,75	20.30	6
	109	0.92	15.86	23.46	59.76	28.19	1
	110	1.26	9,27	18.56	70.89	20.73	7

Seam	Sample No.	Proximate Analysis				Volatile matter (daf)	C.B.I.
		Moisture	Ash	Volatile matter	Fixed carbon		
	111	1.21	11.00	13.14	69.65	20.66	4
	112	1.16	19.06	16.62	63.16	20.83	1
	113	1.04	64.40	15.73	18.83	45.50	1
	114	1.25	27.68	17.22	53.85	24.23	2½
	115	1.16	13.31	22.27	63.26	26.93	4
	116	0.92	24.92	26.76	47.40	36.08	1
B Seam	117	1.20	4.29	18.83	75.68	19.94	4
	118	1.11	10.53	22.42	65.94	25.37	3½
	119	0.78	22.75	29.85	46.62	39.01	1
	120	1.17	13.46	17.64	67.73	20.66	4½
	121	0.95	21.51	25.72	51.82	33.16	1
	122	1.14	18.94	16.67	63.25	20.85	2
	123	1.19	77.90	13.70	7.29	65.51	-
	124	1.27	10.53	19.20	69.18	21.56	4
	125	1.24	12.52	16.81	69.43	19.49	3
	126	1.26	60.01	10.09	28.64	26.05	
	127	1.37	84.48	6.16	7.99	43.53	
	128	1.24	86.43	7.49	4.84	60.74	
	129	1.00	21.87	21.55	55.58	27.93	1½
	130	1.20	7.16	19.03	72.61	20.76	4½
	131	1.15	6.35	19.00	73.50	20.54	5½
	132	0.87	18.35	26.91	53.87	33.31	1
	133	1.25	7.60	20.47	70.68	22.45	5

Seam	Sample No.	Proximate Analysis				Volatile matter (daf)	C.B.I.
		Moisture	Ash	Volatile matter	Fixed carbon		
	134	1.00	3.65	24.66	60.69	28.89	6
	135	0.93	19.96	27.56	51.55	34.83	1′
	136	1.10	20.71	20.70	57.49	26.47	3½
	137	1.07	9.36	17.03	72.54	19.01	2½
	138	1.24	8.33	16.91	73.52	18.69	4
	139	1.33	68.10	9.29	21.28	30.38	1
	140	1.29	9.56	16.60	72.55	18.62	3½
	141	0.73	31.19	17.56	50.52	25.79	1
	142	1.18	7.62	16.88	74.32	18.50	4
	143	0.84	62.86	11.64	24.66	32.06	1
	144	1.04	65.46	12.30	21.20	36.71	1
	145	1.11	41.98	13.38	43.53	23.51	1½
	146	1.15	48.18	12.29	38.38	24.25	1
	147	1.13	21.15	16.04	61.68	20.63	5
	148	1.36	56.97	10.33	31.34	24.79	1
	149	1.24	74.02	8.17	16.57	33.02	-
	150	1.13	10.10	16.24	72.53	18.29	1½
	151	1.05	7.12	16.97	74.86	18.47	1½
	152	0.94	6.83	18.33	73.90	19.87	5½
	153	1.03	19.31	15.69	63.97	19.69	6
	154	1.10	19.60	15.65	63.65	19.73	3½

(3) Samples from outcrops

(Unit: %)

Outcrop No.	Location	Sample No.	Proximate Analysis			
			Moisture	Ash	Volatile matter	Fixed carbon
153 (B Seam)	Pipeline Road	1	9.96	27.08	22.99	39.97
		2	8.38	16.74	25.42	49.46
		3	4.80	67.76	11.93	15.51
		4	4.76	55.02	14.99	25.23
		5	4.58	73.63	11.53	10.26
		6	3.77	78.79	10.01	7.43
		7	4.70	68.57	12.43	14.30
		8	7.35	53.40	17.52	21.73
		9	10.76	16.17	25.74	47.33
		10	13.49	11.60	26.74	48.17
		11	11.86	6.56	26.69	54.89
156 (B Seam)	Pipeline Road	12	10.88	20.48	23.30	45.34
150 -151 (A Seam)	Pipeline Road	13	10.77	31.40	20.32	37.51
		14	4.54	64.14	12.93	18.39
		15	11.58	22.60	23.99	41.83
		17	10.43	21.75	22.97	44.85
		18	6.87	38.72	20.65	33.76
		19	10.81	16.70	25.38	47.11
		20	8.68	33.20	21.07	37.05
		21	4.47	61.11	13.17	21.25
		22	5.95	3.14	22.51	68.40
		23	5.85	9.59	25.11	59.45

Outcrop No.	Location	Sample No.	Proximate Analysis			
			Moisture	Ash	Volatile matter	Fixed carbon
		24	6.55	4.47	23.57	65.41
		25	3.39	6.20	22.07	68.34
148 (A Seam bottom)	Pipeline Road	26	9.32	44.10	18.64	27.94
		27	10.37	27.09	21.68	40.86
		28	10.66	11.00	25.31	53.03
		29	6.94	12.33	23.39	57.44
		30	5.50	18.85	20.38	55.27
234	Pipeline Road	31	7.80	33.42	18.65	40.13
		32	4.92	16.29	19.12	59.67
		33	3.99	19.72	18.08	58.21
		34	5.59	18.37	20.07	55.37
		35	8.22	13.27	24.12	54.39
		36	4.71	14.05	19.48	61.76
		37	3.54	47.04	15.55	33.87
235	Pipeline Road	38	9.57	14.81	22.86	52.76
		39	5.93	17.07	20.08	56.92
		40	6.66	16.19	20.97	56.21
		41	3.25	8.12	22.30	61.33
252	Pipeline Road	42	11.06	28.77	23.43	36.74
		43	10.91	19.19	23.90	46.00
142	Pipeline Road	44	12.26	22.85	24.21	40.68
		45	9.12	31.68	20.81	38.39
261	No.11 Ridge	46	12.94	17.96	28.41	40.69
266	No.11 Ridge	47	11.13	13.79	23.38	51.70

Outcrop No.	Location	Sample No.	Proximate Analysis			
			Moisture	Ash	Volatile matter	Fixed carbon
271	No.11 Ridge	48	7.35	7.59	25.41	59.65
		49	4.36	23.26	20.09	52.29
		50	9.53	14.44	25.94	50.09
		51	11.21	8.71	27.25	52.83
		52	9.68	5.83	24.88	59.61
		53	6.82	16.75	21.11	55.32
		54	4.55	15.27	20.06	60.12
346-347	No.7 Ridge	55	10.94	10.09	26.88	52.09
		56	9.12	17.44	26.46	46.98
		57	10.27	18.89	23.93	46.91
811	No. 7 Ridge	60	11.51	9.86	26.48	52.15
		61	8.37	37.17	19.51	34.95
		62	6.21	58.20	17.00	18.59
		63	10.72	10.22	24.60	54.46
		64	11.78	13.78	25.41	49.03
		65	10.48	9.27	24.97	55.28
421	No. 3 Ridge	66	12.75	17.40	23.93	45.92
		67	11.92	14.82	23.49	49.77
435	No.3 Ridge	68	15.95	13.25	25.90	44.90
		69	5.10	74.41	9.57	10.92
		70	15.41	14.67	25.27	44.65
405'	No.9 Ridge	71	8.88	37.60	19.71	33.81
		72	13.67	17.68	24.93	43.72
		73	4.09	73.79	10.72	11.40

Outcrop No.	Location	Sample No.	Proximate Analysis			
			Moisture	Ash	Volatile matter	Fixed carbon
		74	12.17	15.43	26.37	46.03
		75	11.68	9.18	25.78	53.36
1934	No.7 Ridge	76	6.69	32.38	17.60	43.33
		77	6.03	17.12	19.79	57.06
		78	5.76	39.39	18.42	36.43
		79	7.05	13.81	20.97	58.17
		80	9.06	19.44	21.74	49.76
1152	No.7 Ridge	81	8.51	8.63	22.02	60.84
1143	No. 7 Ridge	82	9.18	38.30	19.25	33.27
		83	11.07	42.38	18.78	27.77
		84	13.40	21.65	23.37	41.55
343	No. 7 Ridge	85	10.35	4.69	25.69	59.27
		86	7.94	6.19	24.13	61.74
		87	5.44	14.46	20.86	59.24
		88	4.57	6.96	21.38	67.09
503	No. 5 Ridge	89	5.70	31.53	16.64	46.13
		90	5.49	7.51	20.47	66.53
		91	5.53	41.65	16.28	36.54
532	No. 5 Ridge	92	8.85	13.26	24.50	53.39
		93	10.44	17.52	25.11	46.93
		94	6.52	41.93	17.19	34.36
		95	10.65	15.18	24.08	50.09
		96	12.91	17.09	24.66	45.34
		97	10.24	42.71	18.87	28.18

Outcrop No.	Location	Sample No.	Proximate Analysis			
			Moisture	Ash	Volatile matter	Fixed carbon
532	No. 5 Ridge	98	12.28	10.99	25.04	51.59
		99	11.72	13.43	23.72	51.13
		100	7.91	6.56	23.48	62.05
		101	6.39	21.75	20.45	51.41
		102	7.07	6.88	21.75	64.30
		103	7.49	5.45	22.15	64.91
		104	8.22	5.63	23.50	62.65
		105	7.75	43.17	16.45	32.63
		106	7.13	31.58	19.21	42.08
		107	8.01	17.01	21.71	53.27
		108	8.37	19.64	20.32	51.67
		109	6.86	17.88	20.71	54.55
527	No. 5 Ridge	110	12.42	8.33	23.94	55.31
		111	9.57	5.28	24.36	60.79
509	No. 5 Ridge	112	10.55	14.79	23.98	50.68
B Seam	No. 11 Ridge	113	11.65	13.50	25.29	49.56
		114	9.92	10.21	25.49	54.38
B Seam	No.13 Ridge	115	14.15	10.82	29.52	45.51
		116	11.22	33.21	21.27	34.30
B Seam	No. 14 - 15 Ridge	117	14.75	10.98	26.93	47.34
		118	9.72	12.84	21.36	56.08
		119	8.60	20.28	22.94	48.18
		120	8.52	15.88	22.32	53.28
		121	12.42	19.89	24.33	43.36

Outcrop No.	Location	Sample No.	Proximate Analysis			
			Moisture	Ash	Volatile matter	Fixed carbon
B Seam	No.13 Ridge	122	14.17	11.23	26.25	48.35
		123	14.53	8.55	26.77	50.15
A Seam	No.13 Ridge	124	13.51	12.26	26.79	47.44
		125	9.40	44.00	18.91	27.69
		126	10.45	41.08	18.49	29.98
		127	9.63	41.72	18.17	30.48
		128	14.67	12.51	26.31	46.51
		129	12.49	26.67	22.74	38.10
A Seam	No. 14 - 15 Ridge	130	5.48	57.14	14.03	23.35
		131	10.71	15.03	24.62	49.64
		132	11.32	20.21	22.77	45.70
		133	10.69	39.10	20.07	30.14
		134	13.58	19.16	24.64	42.62
		135	14.25	20.60	26.61	38.54
434" (B Seam Bottom)	No. 3 Ridge	136	11.01	11.54	24.27	53.18
		137	11.69	25.98	22.66	39.67
		138	13.45	22.33	24.49	38.73

XII COAL RESERVE

(See 3. Reserve Calculation Table)

In view of extensive size of lease, exploration in depth through drilling has so far been restricted to the western parts, and data are more or less nonexistent now on these seams except for the outcrops.

As a result, it is not necessarily appropriate to calculate the precise tonnage of reserve at this stage. The following calculation which has been made to give an approximate estimate is based on the assumptions which are listed below.

1. Bases for coal reserve calculations

(1) Seams included in calculation

Seams A and B are included in the calculations.

(2) The following sections of Seams A and B are excluded:

(i) A strip of about 500 meters in width along the Morrissey Creek

(ii) A lot of about 600 meters lying to the east of Ridge No. 20 and extending to the border of the lease.

(3) Cross sections

In the sections covered for the calculations, a strike distance of about 7,000 meters is cut into 15 cross sections, and these are used as area units in the computation.

On the basis of seam conditions (mainly seam thickness), following lengths are covered for the calculations.

Seam A — No. 11 to No. 15 sections	-- 2,000 meters in strike
Seam B -- No. 1 to No. 15 sections	-- 7,000 meters in strike

(4) Excluded sections

50 meters from the outcrop to dipside is excluded from the calculations. Sections lower than 1,160 meters above the sea level at which mining is expected to be executed are also excluded.

(5) Calculation formulas

(i) Gross reserve: area x total seam thickness x specific gravity

(ii) Recoverable reserve: area x recoverable seam thickness x specific gravity

(iii) Economically recoverable reserve: recoverable reserve x recovery

(iv) Clean coal reserve: economically recoverable reserve x yield

(6) Calculation bases

(i) Inclination

It is difficult to infer the real inclination due to creepings of the outcrops, but it is set temporarily at 20 degrees provided it is to be revised when and if future drillings are conducted.

(ii) Recoverable coal thickness

There are sections in which it is disadvantageous to mine because of partings, and some of these sections are excluded, taking coal quality and yield into account in addition.

(iii) Safety factor

No safety factor has been taken into consideration at this time. This is because the surveys have so far revealed almost no faults that would seriously affect mining and the seams have the minimum recoverable thickness although there are considerable changes in the thickness. For the sake of safety, as stated above, the estimate on the seam thickness in the deeper sections is held down to 70 percent of that of the outcrop.

(iv) Recovery (Mining) 75 %

Safety pillar	15%	
Remaining coal	5%	100% -
Loss from screening	5%	25% = 75%
Total	25%	

(v) Yield (Cleaning)

Seam A --- 80 percent

Seam B --- 70 percent

(Ash content of clean coal is expected to be 6.5 - 7.0 percent)

2. Gross Reserve

Name of Seam	Sections	Thickness(m)		Area (m^2)	Specific gravity	Gross reserve (M/ton)
		Total seam thickness	Coal thickness			
A seam	11-15	3.13-7.99	1.59-4.47	4,509,500	1.3	23,000,000
B Seam	1 - 4	5.92-18.43	5.14-13.82	2,156,200	1.3	30,000,000
	4 - 15	3.67(+)-7.36	2.42-5.14	11,675,900	1.3	54,000,000
	Total			13,832,100	1.3	84,000,000
Grand Total				18,341,600		107,000,000

3. Reserve Calculation Table

Seam	Section	Minable thickness	Area (m^2)	Recoverable reserve (M/ton)	Recovery (%)	Economically recoverable reserve (M/ton)	Yield (%)	Clean Coal reserve (M/ton)
Seam A	11-11	1.01	612,900	800,000	75	600,000	80	
	11-12	1.86	745,300	1,800,000	75	1,350,000	80	
	Sub-total		1,358,200	2,600,000		1,950,000	80	1,560,000
	12-13	2.79	1,272,000	4,610,000	75	3,460,000	80	
	13-14	3.10	774,600	3,120,000	75	2,340,000	80	
	14-15	3.39	1,104,700	4,870,000	75	3,650,000	80	
	Sub total		3,151,300	12,600,000		9,450,000	80	7,560,000
	Total		4,509,500	15,200,000		11,400,000	80	9,120,000
Seam B	1-2	4.00	505,200	2,627,000	75	1,970,000	70	
	2-3	4.00	683,500	3,554,000	75	2,665,000	70	
	3-4	4.00	967,500	5,031,000	75	3,773,000	70	
	Sub total		2,156,200	11,212,000		8,408,000	70	5,885,000
	4-5	3.65	1,188,300	5,640,000	75	4,230,000	70	
	5-6	2.90	1,169,500	4,410,000	75	3,310,000	70	
	6-7	2.51	889,200	2,900,000	75	2,180,000	70	
	7-8	2.81	673,500	2,460,000	75	1,850,000	70	
	8-9	3.11	715,500	2,890,000	75	2,170,000	70	
	9-10	2.69	1,235,400	4,320,000	75	3,240,000	70	
	10-11	2.28	1,095,600	3,250,000	75	2,440,000	70	
	Sub total		6,967,000	25,870,000	75	19,420,000	70	13,594,000
	11-11'	1.84	629,400	1,510,000	75	1,130,000	70	
	11'-12	1.48	767,400	1,480,000	75	1,110,000	70	
	12-13	1.69	1,293,800	2,840,000	75	2,130,000	70	
	Sub total		2,690,600	5,830,000		4,370,000	70	3,059,000
	13-14	2.14	786,800	2,190,000	75	1,640,000	70	
	14-15	2.56	1,131,500	3,770,000	75	2,830,000	70	
	Sub total		1,918,300	5,960,000		4,470,000	70	3,129,000
	Total		13,832,100	48,872,000		36,668,000	70	25,667,000
Grand Total			18,341,600	64,072,000		48,068,000	70-80	34,787,000

XIII RECOMMENDATION

(See Fig. 20 Explanation map of further exploration)

Exploration so far conducted have been spot by spot and not adequate to conduct the comprehensive valuation of the lease.

The most important point to find is the quality of coal. Paticularly in Canada today, there is no demand for steam coal and the fate of this coal field is depend upon whether quality is suitable for the metallurgical purposes in Japanese steel industry. Thus the first thing to be achieved is to prove the quality and the further exploration for Seam A and B is essential for this purposes.

1. Sampling tunnels

So far, coal samples have been collected at one site respectively in Seams A and B and no information on the generating of quality of Fernie coal as a whole has been obtained.

As a result, it is necessary to dig more of sampling tunnels evenly spread over the outcrops and to take enough samples from those places in order to get average quality.

In the case of Seam B of which outcrops extend over a distance of 8 kilometers over a considerably steep mountainous terrain, severe restrictions are imposed in the selection of sampling sites. Four spots (Ridges No. 5, No. 7, No. 10 and No. 20) are conceivable as the result of work by bulldozers last year.

Regarding Seam A, explorations are necessary in the western portion. Since the intervals are wide (about 3 kilometers) between Ridges No. 10 and No. 20, one spot each on seams A and B should

be chosen for sampling at least. Consequently, a total of 6 spots (totalling five on Seam B and one on Seam A) have been recommended for the purpose of studying the quality of coal from both seams.

A plan to construct a road from the Ridge No. 10, to the neighborhood of Ridges No. 14 and No. 15, is a little difficult so that a bulldozer has to be employed for an estimated two or three weeks. Nevertheless, these places are indispensable to get the data in judging the overall quality.

2. Drilling

After the above sample collection plan is actually executed, more facts about the coal quality will be found. But the variance in coal quality toward the dip side of coal seam and data to back up the calculation on coal reserve will have to be found. This makes it necessary to drill in depth.

There is a need to choose appropriate spots to sink 8 drills, of which five are to explore the coal seam conditions at the level of 1,160 meters above the sea and the rest is to reach the middle between the outcrops and that level.

3. Surveying

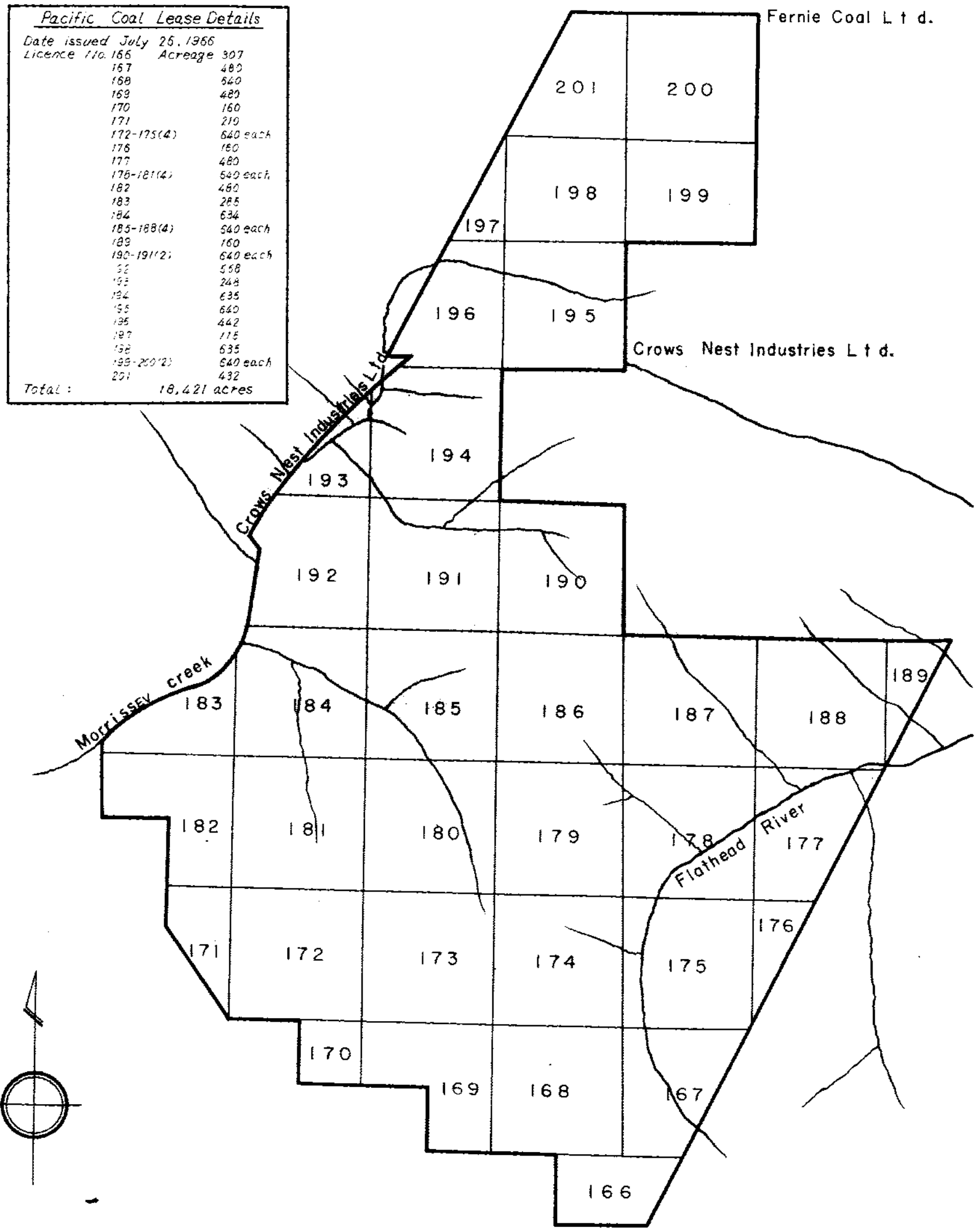
For the purpose of insuring accuracy in the above exploration plan, surveys will be carried out on the sampling tunnels and the drilling spots. A survey will also have to be made to learn how the Seam B outcrops (already confirmed) run and a survey on the plateau north of the ridges which was left out of the current explorations.

The implementation of the various probes is expected to reveal a general outline of Seams A and B in the coal field.

In addition, it is important to learn if the Seams K-1 and K-5 change in thickness and coal quality as they run toward the east (Seam K-1 has been confirmed to have enough thickness for mining) and also to conduct probes into the other seams.

CLAIM MAP

Pacific Coal Lease Details		
Date issued July 26, 1966		
Licence No.	166	Acreage 307
	167	480
	168	640
	169	480
	170	160
	171	219
	172-175(4)	640 each
	176	160
	177	480
	178-181(4)	640 each
	182	480
	183	285
	184	634
	185-188(4)	640 each
	189	160
	190-191(2)	640 each
	192	558
	193	248
	194	635
	195	640
	196	442
	197	115
	198	635
	199-200(2)	640 each
	201	432
Total :		18,421 acres



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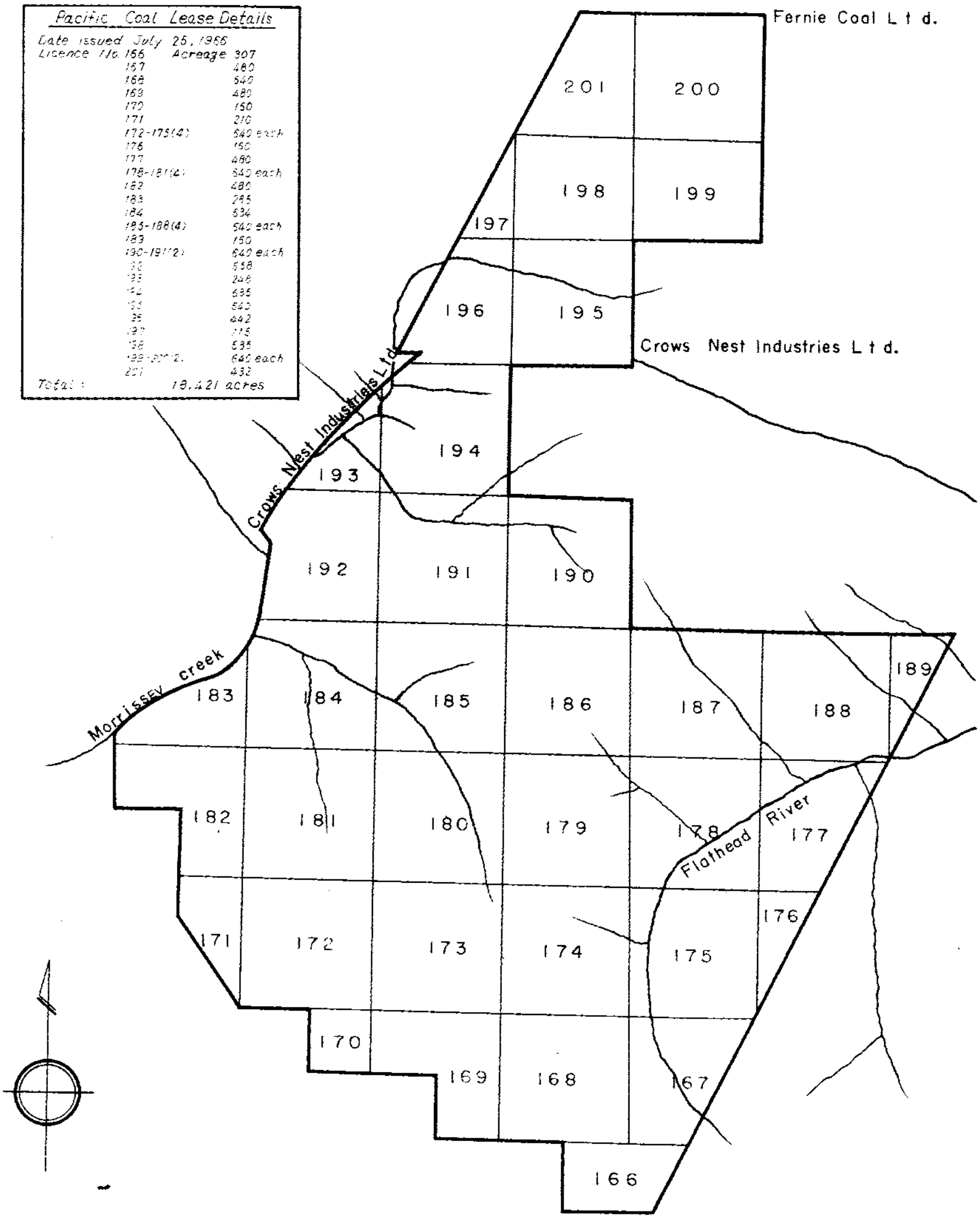
CLAIM MAP

Pacific Coal Lease Details

Date issued July 25, 1966

Licence No.	Acreage
166	307
167	480
168	540
169	480
170	150
171	210
172-175(4)	540 each
176	150
177	480
178-181(2)	640 each
182	480
183	295
184	634
185-188(4)	540 each
189	150
190-191(2)	640 each
192	558
193	248
194	695
195	540
196	442
197	115
198	535
199-201(3)	640 each
201	432

Total : 18,421 acres



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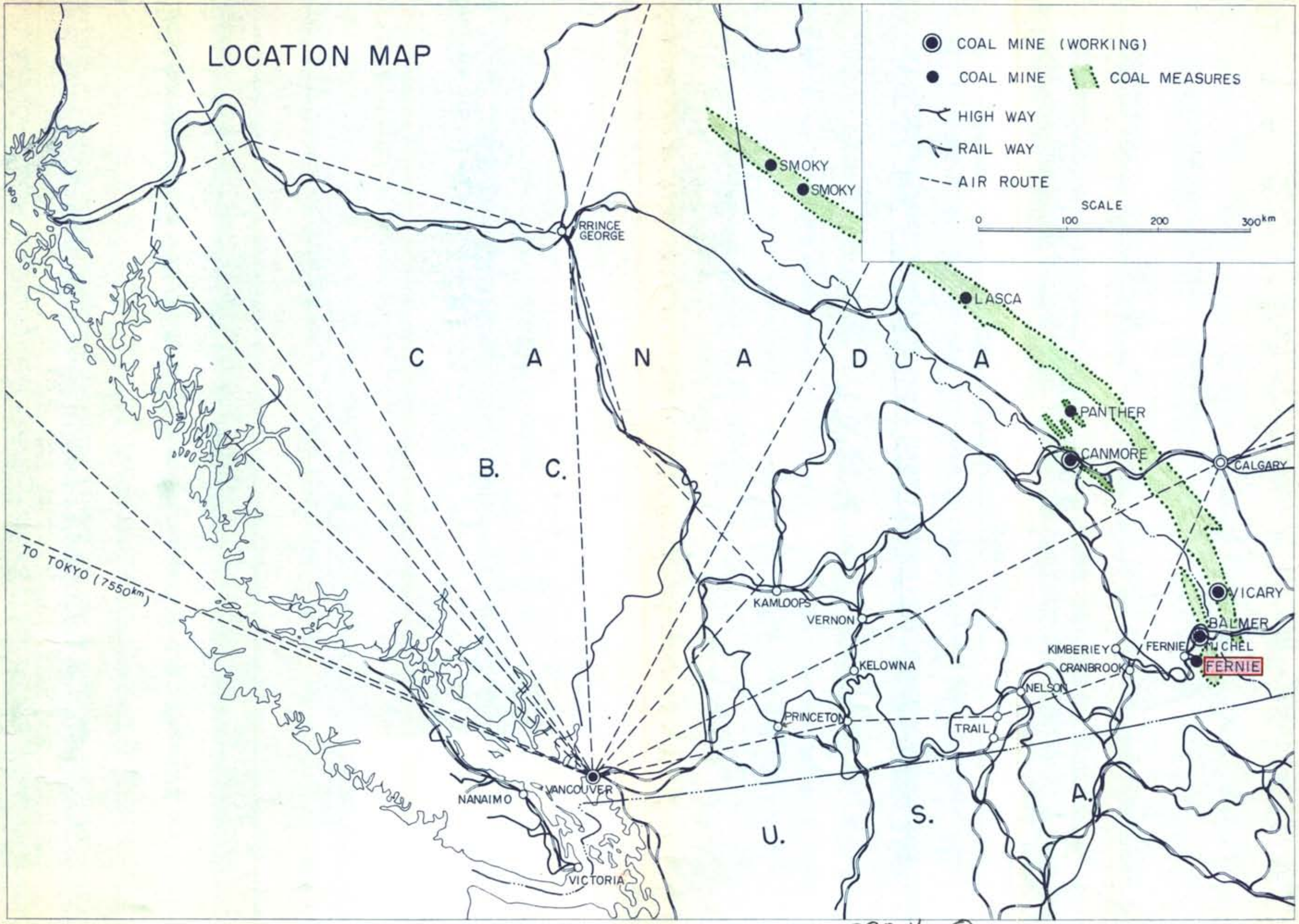
LOCATION MAP



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