PR Bullmoose 72(1)A

REPORT ON BULLMOOSE PROJECT, 1972
SUKUNKA RIVER AREA, B. C.

by

R. S. Verzosa

January 30, 1973 Vancouver, B.C.

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SHORT LIST OF ILLUSTRATIONS

INTRODUCTION

This report contains details of work done in 1972 by Teck Corporation Limited on a block of ground covering a number of coal licences in the Sukunka River area, British Columbia (Figure 1). The area is located southeast of Chetwynd, British Columbia and is accessible through 48 miles of gravel road.

The work completed in 1972 primarily consisted of diamond drilling and geologic mapping in a limited programme that was essentially a part of a continuing effort by Teck Corporation Limited to evaluate the coal potential of the area. The drilling totalled 3,692 feet in 4 holes that were spaced 2000 feet from previously drilled holes.

In 1971 Teck Corporation Limited carried out an extensive drilling and geologic mapping programme in two areas designated as Block "B" and Block "E" (Figure 1). That programme resulted in the completion of a comprehensive geologic map of the important part of the area and of a total of 14,657 feet of drilling in 15 holes.

For purposes of this report the section on Geology is presented only as a summary of the general geology of the area. A detailed account of the geology of the area is contained in a report by R. E. Hindson, 1972, entitled "Exploration Report, Teck Corporation Limited" a copy of which is appended herein.

The term "map area" used in this report refers to the area covered by the enclosed geologic map covering a northwestern portion of the property.

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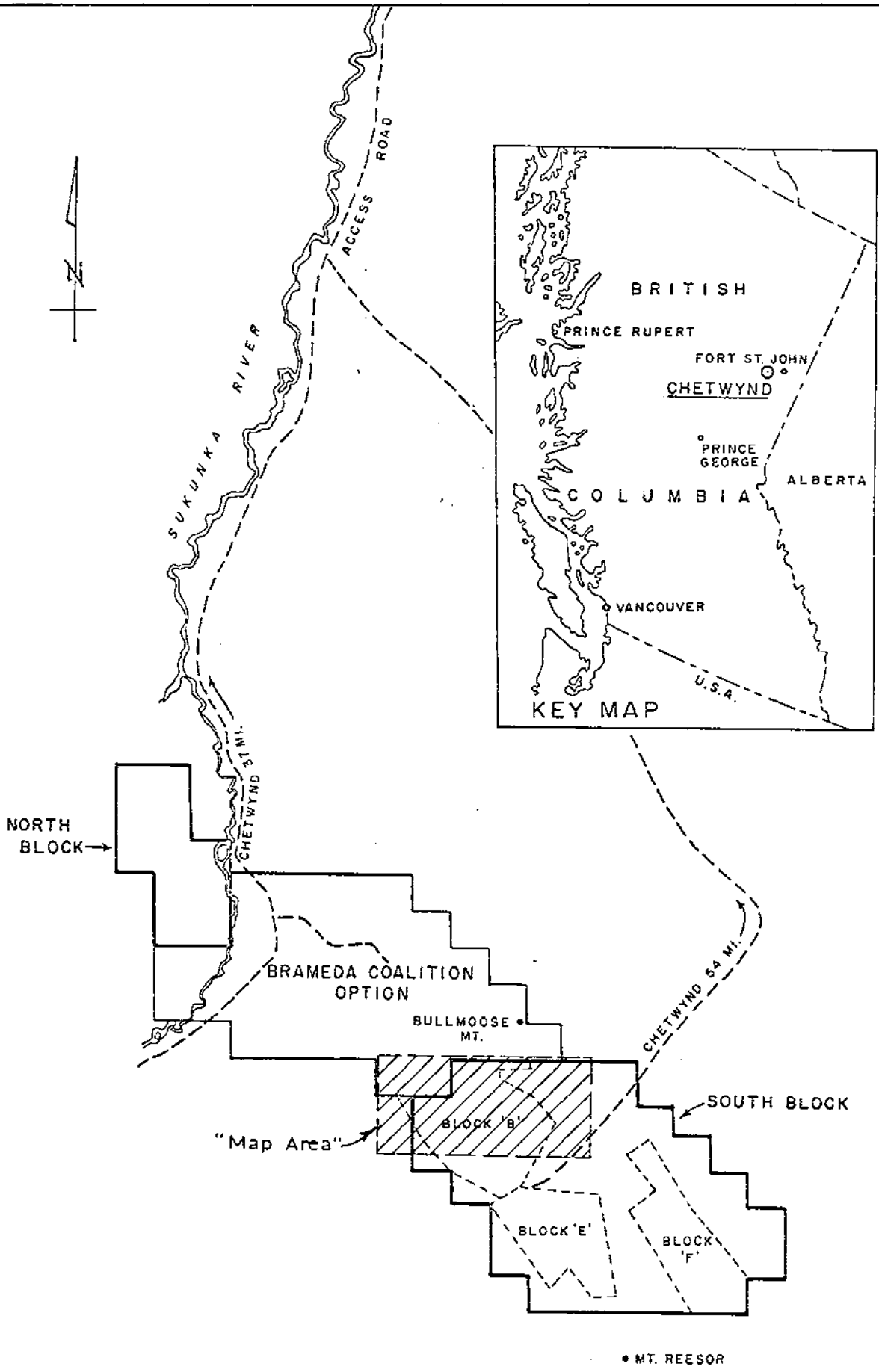

TECK CORPORATION LTD.

BULLMOOSE PROJECT

PROPERTY LOCATION MAP

Scale: 1 in. = 4 mi.

Figure 1

SUMMARY AND CONCLUSIONS

The Teck property in the Sukunka River area is underlain by Lower Cretaceous sediments belonging to the Bullhead and Fort St. John Groups and includes the coal-bearing Gething Formation. The sediments are generally less deformed, the prospective part of the area being on a gently dipping limb of a broad syncline.

The outstanding Chamberlain seam that is presently being developed by Coalition Mining Ltd. to the north continues southward into the property although a sedimentary facies change within the seam drastically diminishes its thickness and quality as it progresses further south. The Skeeter seam is consistently represented in most of the drill holes and closely ranks with the Chamberlain seam in quality but does not show sufficient thickness to warrant further appraisal. The Bird seam exhibits a consistent thickness of greater than 6 feet over a wide area but the seam contains an exceedingly high sulfur. This undesirable feature coupled with the fact that the seam is practically roofed by the incompetent Moosebar Formation makes an economic evaluation of the seam impractical at the present time.

Additional drilling is required to further evaluate the Chamberlain seam in the Teck property particularly in regard to the limiting effect of the facies change within the seam on the coal potential of the property. The area bounded by the prominent synclinal axis to the west, the Coalition property line to the north and the latitude of T-8 to the south offers good prospecting ground.

GENERAL GEOLOGY

Geologic Setting

The immediate area is underlain by a sequence of marine and non-marine clastic rocks belonging to the Lower Cretaceous Bullhead and Fort St. John

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Groups of the Peace River area. It lies in a northwesterly belt that is relatively undeformed and is bounded to the west and east by similar tightly folded and thrust-faulted strata.

STRATIGRAPHY

The stratigraphy of the map area in this report is based on rock exposures along Saddle Creek, drill cores of T-19 and outcrops along the cirque west of base camp No. 1. Nomenclatures are adopted from Stott (1968) and correlations are made solely on lithologic characteristics. No detailed stratigraphy is available of the Lower Gething due to the lack of continuous exposures. However, detailed stratigraphic descriptions of the Upper Gething up to parts of the Gates Member of the Commotion Formation are contained in columnar sections of diamond drill holes.

Bullhead Group

Cadomin Formation

The cliff-forming conglomerate along Saddle Creek consists of granules to rounded pebbles and cobbles of quartz, chert and metasediments in a very coarse quartzose sandstone matrix. The phenoclasts are generally poorly sorted and the formation as a whole contain inter-tongues of cross-bedded very coarse massive sandstone. Although the base of the formation was not directly observed the Cadomin in Saddle Creek is at least 300 feet thick. The Cadomin is conformably overlain by the Gething Formation.

Gething Formation

In the map area the coal-bearing Gething Formation is sub-divided into two members, vis. the Upper Gething and the Lower Gething. Although there is essentially no formational change from one member to another a distinct recognition of the Chamberlain coal seam makes the sub-division not

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STRATIGRAPHIC AND CORRELATION CHART

Teck Area (1973)				Stott (1968)			Teck Area
Group	Formation		Thickness Feet	Formation		Thickness Feet	Lithology
Fort St. John	Hasler		450	Hasler		500?-1500	Dark grey interbedded shale, siltstone and mudstone with ferruginous concretions and layers. Local minor conglomerate.
	Commotion	Boulder Creek Mb	300	Commotion	Boulder Creek Mb	240 - 560	Fine to medium-grained sandstone; interbedded siltstone and mudstone, in parts conglomeratic
		Hulcross Member	300		Hulcross Member	0 - 450	Dark grey marine shale and mudstone with common pyritic and ferruginous concretions.
		Gates Member	920		Gates Member	220 - 900	Fine to medium to coarse sandstone with interbedded shale, mudstone and siltstone. Coal. Layers of massive pebble conglomerate.
		Sukunka Member	430	Moosebar		100 - 1000	Interbedded fine-grained sandstone, mudstone and siltstone.
	Moosebar		300				Dark grey mudstone with pyritic and ferruginous concretions and layers
Bullhead	Gething	Upper	113-205	Gething		75 - 1000	Fine to medium to coarse-grained sandstone with interbedded shale, mudstone and siltstone Chamberlain Seam at base. Glauconitic mudstone at top.
		Lower	1200				Fine to medium to coarse-grained sandstone with interbedded shale, mudstone and siltstone Locally carbonaceous. Coal and coaly seams near base. Local thin conglomerates.
	Cadomin		300	Cadomin		45 - 600	Pebble to cobble conglomerate with intertongue of coarse sandstone.

Figure 2. Stratigraphic and Correlation Chart of the Lower Cretaceous in the Teck Bullmoose Project area.

only possible but for mapping purposes convenient.

The Lower Gething exposed along Saddle Creek consists of a sequence of medium-bedded to massive, medium to coarse to very coarse sandstone with interbedded siltstone, mudstone and shales. Occasional to common occurrences of carbonaceous and coaly partings are found throughout the section. At a point approximately 350 feet stratigraphically above the top of the underlying Cadomin Formation is a 20 foot interlaminations of carbonaceous siltstone and mudstone with coal partings and bands of up to 1 inch thickness at its base. A 2 foot coal seam is present approximately 50 feet stratigraphically above the top of the Cadomin. The thickness of the Lower Gething measured from the top of the Cadomin to the base of the Chamberlain seam as exposed along Saddle Creek is approximately 1200 feet.

The Upper Gething in the map area consists of flaggy, fine to medium to coarse grained, medium to thick-bedded sandstone in its upper half and interbedded to interlaminated fine sandstone, siltstone and mudstone in its lower half. The unit contains the Bird coal seam near its top and the Skeeter and Chamberlain coal seams at its base. Overlying the Bird seam is a thin but persistent layer of glauconitic and commonly pyritic argillaceous and occasionally pebbly sandstone which serves as a marker between the Gething Formation and the overlying Moosebar Formation.

The nature of the contact between the Upper Gething and the overlying Moosebar Formation is not clear although the indicated difference in the sedimentary environments between the two may suggest at least a disconformable relationship. The thickness of the Upper Gething as shown by drill holes in the map area taken from the base of the overlying Moosebar Formation to the base of the Chamberlain seam is variable and range from 113 feet in DDH T-7 to 205 feet in DDH T-19. The variations in thicknesses could partly be due to repetition of strata by faulting.

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Fort St. John Group

Moosebar Formation

The Moosebar Formation overlying the Gething primarily consists of a dark brown to dark grey brittle mudstone. A number of sideritic and bentonitic layers may abound anywhere within the section although the bentonitic layers usually occupy the lower half. Pyrite nodules and concretions are common towards the base of the section. The only criteria for recognition of the Moosebar is its stratigraphic position in relation to the underlying Gething and the overlying Commotion Formation. Lithologically it is similar to some mudstone horizons within the Gething and to some parts of the Hulcross Member of the Commotion Formation. The Moosebar Formation grades insensibly into the overlying Sukunka Member of the Commotion although for purposes of mapping its upper contact is arbitrarily set at the first appearance of a sandstone layer of the overlying Sukunka Member. The thickness of the Moosebar Formation gathered from drill hole data in the area show an approximate average of 300 feet.

Commotion Formation

Sukunka Member:

The term "Sukunka" is the result of the study of previous workers on the Brameda-Coalition ground immediately north of the map area. The member is equivalent to the upper part of the Moosebar Formation described by Stott in his study of the Peace River area. In the map area the Sukunka Member consists of a sequence of interbedded to interlaminated sandstone, siltstone and mudstone. The sandstone and siltstone units are generally cross-bedded and ripple marked and occasionally contain plant fossils and/or carbonaceous partings. The sandstone increases in proportion upwards and at the same time

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gets coarser-grained. In the map area the upper contact of the Sukunka Member is set at the base of the massive coarse-grained sandstone below the lowest conglomerate horizon of the conformably overlying Gates Member. Its thickness from drill hole data in the map area show an average of 430 feet.

Gates Member

The prominant ledges, cliffs and cirques on the eastern part of the map area is formed by the coarse sandstone and conglomerate units of the Gates Member. Interbedded with the sandstone and conglomerate are finer clastics of generally carbonaceous shale, siltstone and mudstone. In the middle part of the section, particularly in DDH T-19 at least six coal seams are present ranging in thickness from 6 inches to as much as 3-1/2 feet.

The conglomerate units in the Gates consists of well sorted, subrounded to rounded granules and pebbles of quartz and chert in a medium to coarse-grained quartzose sandstone matrix. The outcrops are generally massive and very thick-bedded. The upper contact of the Gates Member with the overlying Hulcross Member in the map area lies on top of a thin layer of conglomeratic sandstone and is well observed in cores of previous diamond drilling. The contact is sharply defined and exactly conforms with Stott's (1968) description of the Hulcross Member at its type locality. The thickness of the Gates Member in the map area is approximately 920 feet.

Hulcross Member:

The Hulcross Member in the map area is exposed along the cirque west of Base Camp No. 1 and along a number of access roads in the property. On outcrops the Hulcross comprises an interbedded sequence of generally dark brown to dark grey fine sandstone, shale, siltstone and mudstone. Ferruginous

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layers and concretions are variably common and imparts a bright reddish brown colour to some weathered outcrops that usually can be seen from a distance. Although the upper contact of the Hulcross Member was not physically observed by the writer it reportedly grades into the sandstones of the overlying Boulder Creek Member. The mapped thickness of the Hulcross Member southeast of Base Camp No. 1 is at least 300 feet.

Boulder Creek Member:

The elevated area bordered by sheer drops and hogbacks in the west central part of the map area is underlain by predominantly thick-bedded conglomeratic sandstone of the Boulder Creek Member. This member is described in detail by Stott (1968) and Hindson (1972) and reportedly includes three consistent facies; a lower, consisting of bedded, fine-grained sandstone; a middle, consisting of a massive conglomerate; and an upper, consisting of sandstone, siltstone, mudstone and coal. Immediately west of Camp No. 1 in the property the cliffs are formed by granular to pebbly to conglomeratic, fine to very coarse, cross-bedded and thick-bedded to massive quartzose sandstone. Occasionally along the section are interbeds of thin dark brown siltstone and mudstone. The top of the Boulder Creek Member in the map area was not observed although a minimum of 300 feet of thickness is indicated.

Hasler Formation

The Hasler Formation occupies the top of the stratigraphic sequence in the property. The formation was not observed by the writer although it was recognized and mapped by Hindson for Teck in 1971. The Hasler Formation [illegible] occurs in an erosional remnant southeast of Mount Chamberlain and reportedly consists of interbedded shale and siltstone and within the section minor conglomeratic sandstone. No thickness measurement was reported although a minimum of 450 feet is indicated in the map.

STRUCTURE

Folds

The dominant structural trend in the map area is north-northwest with bedding attitudes ranging from zero to a maximum of 75 degrees. In the central part of the map lies a broad assymetrical syncline whose eastern limb dips a gentle 15 degrees. Its western limb dips as much as 75 degrees and forms the eastern limb of a tightly folded northwesterly anticline whose axis lies only a few hundred west of Mount Chamberlain. Other less significant folds were mapped along the slope north of Saddle Creek.

The majority of bedding attitudes measured from drill cores average 5 to 12 degree dips. However, higher dips of 25 degrees and as much as 60 degrees were recorded in strata close to or within the coal seams in the Upper Gething. These higher dips are limited and are believed to have been localized by the less competent coal seams.

Faults

Other than a thrust fault that separates the Sukunka Member and the Lower Gething on the southwest corner of the map area no other fault of signifcant magnitude is known. Along Saddle Creek a northerly thrust fault dipping 28 degrees west was noted and local marker planes indicate a vertical displacement of not more than 20 feet. The tightly folded anticline west of Mount Chamberlain is breached by a minor northwesterly high angle thrust fault dipping 70 degrees west with a vertical displacement of only about 15 feet. From drill core observations particularly in the Moosebar Formation a number of faults evidenced by crushed zones, gouge and slickensides were noted. However, the lack of marker beds in the Moosebar Formation prevents the measurement of vertical displacement along these fault planes, but judging from the fairly consistent thickness of the Moosebar formation from one hole to another the vertical displacements that could result from these number of

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faults are probably minor in regard to their significance to the underlying coal seams. Furthermore, the incompetence of the Moosebar Formation could have confined these structural features within itself so as not to be appreciably reflected by the overlying and underlying strata. Additional drilling could provide information leading to a more reliable interpretation of the subsurface structure of the area.

COAL SEAMS

The main target of exploration in the property is the so-called Chamberlain seam which in the Brameda-Coalition option immediately to the north has been recognized and verified to be consistently high in quality with indicated reserves exceeding 60 million tons.

While a number of other seams exist in the Teck property particularly those in the Gates Member of the Commotion Formation and in the Lower Gething Member only the important Bird, Skeeter and Chamberlain seams that are found in the Upper Gething are considered and described in this report. Drill logs from previous drilling have been referred to in assessing the general character of each individual seam.

Coal outcrops in the area are generally poor except where found in deeply incised gullies. On one of the northerly tributaries of Saddle Creek both the Chamberlain and Skeeter seams are well exposed. Another small tributary in the same vicinity offered an excellent exposure of the Bird seam. However, the massive and hard sandstone layer that forms the floor of the Bird and Chamberlain seams is easily recognizable and stand out as ledges along steeper topographies. On top of these sandstone ledges and under 6 to 12 inches of top soil weathered coal mixed with overburden can usually be found thus, providing a means for mapping. Because of the general lack of good

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exposures the descriptions of the coal seams that follow are primarily based on diamond drill intersections.

Chamberlain Seam

The Chamberlain seam is characteristically hard and exhibits alternating bands of bright and dull coal. The seam rests on a massive coarse-grained carbonaceous sandstone floor and is generally roofed by thin bedded and interbedded commonly carbonaceous siltstone and shale. The seam thickness vary although at least five drill holes including 2 holes drilled in 1971 returned a minimum thickness of 12 feet. The general character of the seam changes to the south and southwest and takes one or a combination of forms such as thinning, splitting into as much as 5 seams and/or exhibits varying amounts of clastic components within the seams such as sandstone and shale. No study has yet been made to determine the character of the facies changes within the seam in the area insofar as its economic implication is concerned. Additional drilling would be required to provide a reliable picture in this regard.

Skeeter Seam

The Skeeter seam is generally less harder than the Chamberlain seam and is usually duller in appearance. The seam is commonly roofed by carbonaceous sandstone that usually contains coal partings and wisps. The floor of the seam is about 20 feet above the roof of the Chamberlain seam and consists of interbedded sandstone, siltstone and shale. The thickness of the Skeeter seam ranges from less than 2 feet to less than 5 feet. The seam, like the Chamberlain seam below exhibits lateral facies changes southwestward.

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Bird Seam

The Bird seam is hard and banded although generally dull. Pyrite disseminations and nodules are common to abundant particularly in the upper half of the seam. The Bird seam is roofed by the thin layer of glauconitic, and pyritic sandy mudstone or argillaceous sandstone that marks the top of the Gething Formation and rests on a massive coarse-grained carbonaceous sandstone. The thickness of the seam is fairly consistent over a wide area and averages only slightly more than 6 feet.

Coal Seam Intersections (Upper Gething)

All the four holes drilled in 1972 intersected the Bird, Skeeter and Chamberlain seams as follows:

Hole No.	Bird Seam	Skeeter Seam	Chamberlain Seam
T-16	1052.6-1071.5 1074.0-1077.5	1188.8-1193.5	1213.0-1214.5 1216.6-1238.5 1247.5-1265.1
T-17	248.0- 255.0 257.6- 258.6	342.0- 345.0	353.4- 357.8
T-18	337.0- 344.4	426.2- 429.6	454.0- 467.7
T-19	1366.0-1370.0 1371.0-1376.5	1462.0-1468.8	1488.0-1501.8

Sample Analysis

The Chamberlain seam intersected in holes T-16, T-17 and T-19 were sampled and designated as follows:

T-16	Sample 1	(1248.5-1258.0)	-	6" shale at base
	Sample 2	(1258.0-1261.1)	-	
T-17	Sample 3	(346.0- 353.4)	-	only 1.7' recovered
	Sample 4	(353.4- 357.8)		
T-19	Sample 5	(1488.0-1491.8)	-	1" shale at base
	Sample 6	(1491.8-1501.4)		

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The cores of the Chamberlain seam in T-18 was not sampled and is being saved for future reference. The sampled cores were submitted to Commercial Testing and Engineering Company of North Vancouver for a standard coal analysis the results of which are appended in this report.

DIAMOND DRILLING

A total of 3,692 feet of NQ size diamond drilling in four holes was done by Connors Drilling Ltd. Only one drill rig was used and worked on a two-10 hour shift basis. No major delay was encountered during the drilling while 100 feet of drilling per shift was average under normal conditions.

Footage Distribution

Hole No.	Depth	Dip Angle
T-16	1,278'	-90°
T-17	408'	-90°
T-18	488'	-90°
T-19	1,518'	-90°
Total	3,692'	

Tropari Survey

As an adjunct to the diamond drilling operations at least one Tropari test was made in each hole. No more than 6 degrees deviation from vertical was recorded.

Bulldozer

A Caterpillar D-6C was made available during the entire drilling operations. Operating time mostly involved road repair, road building, drill-site preparation and moving the drill rig and equipment as required.

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Borehole Logging

In this programme the use of gamma ray-neutron and sidewall density hole surveys was introduced for the first time on the property. Unfortunately, the equipment was not immediately available upon the completion of T-17 and T-18 where subsequent caving and bridging in the holes prevented the entry of the survey tool. As can be seen from the enclosed logs of T-16 and T-19 the important horizons within the formations as well as the widths of the individual coal beds are very well depicted. The logs of T-16 particularly confirms two coal beds comprising the Chamberlain seam and negates a previous interpretation that the two beds represented a repetition by faulting. Such borehole data could have resolved the problem of the Skeeter-Chamberlain seam intersection in T-17 where excessive core loss was encountered.

Respectfully submitted,

R. S. Verzosa

R. S. Verzosa, P. Eng.

January 29, 1973
Vancouver, B. C.

TECK CORPORATION LIMITED

"Bullmoose" Project Expenditures

From January 1, 1972 to September 30, 1972

Field Supervision, Engineering, and Administration	$ 17,908.38
Geological Mapping	9,132.38
Diamond Drilling	33,646.41
Road Construction	5,839.98
Vehicle operation, travel, and transportation	2,687.12
Assaying	2,954.70
Camp Operation	620.47
Maps and prints	1,074.25
Telephone	24.45
General expenses	80.36
Government licenses and fees	2,872.65
	$ 76,841.15

Controller
Teck Corporation Limited

December 7, 1972

for:

APPENDIX I : COAL SAMPLE ANALYSES

see:

PR - BULLMOOSE 72 (4)A

CONFIDENTIAL ANALYSIS FILE

T-1
D.D.H. T2
T4 - T7 INCL.
T9
Base Camp No. 1
150'
T-4
150'
T-5
T-3
150'
T-2
T-6
T-8
T-9
T-10
200'
150'
T-11
200'
T-7
T-12
Base Camp No. 2
D.D.H. T11 - T15 INCL.
250'
T-15
T-14
T-13
250'

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△ - DIAMOND DRILL CORE STORAGE LOCATIONS

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BULLMOOSE PROJECT

ISOPACH MAP

SEDIMENTS BETWEEN MOOSEBAR - GETHING CONTACT
AND BASE OF CHAMBERLAIN SEAM

1000 500 0 1000 2000 3000 4000

Scale - Feet

DRAWN: R.E.H. / O.C.	DATE: FEB. 72	REVISED:	DATE:	MAP NO: M106

#2(2)B

Pre-BUL 72(2)B

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PR-BULLMOOSE 72(2)A

LEGEND

Lithology

	Formation	Dominant rocks
	ha Hasler	Shale, mudstone
Commotion	cobc Boulder Creek member	Sandstone, siltstone, mudstone, conglomerate
	coh Hulcross member	Shale, siltstone, mudstone
	cog Gates member	Sandstone, conglomerate, shale, mudstone, coal
	cos Sukunka member	Sandstone, siltstone, mudstone
	mb Moosebar	Mudstone
Gething	geu Upper Gething	Sandstone, siltstone, mudstone mudstone, shale, coal
	gel Lower Gething	Sandstone, siltstone, mudstone, shale, conglomerate, coal
	cd Cadomin	Conglomerate, sandstone

Geologic Symbols

- Bedding
- Contact (approximate, inferred)
- Thrust Fault
- Anticline
- Syncline - showing direction of plunge
- Chamberlain-Skeeter seam horizon (observed, interpreted)

Map Symbols

- Access roads
- T-3 Diamond Drill holes
- ALMOST Triangulation stations
- Lake or pond
- 1108 1109 / 1148 1115 Coal Licence corner

Source of Information:
a) 1971 geological mapping (Teck Corporation Ltd.)
b) 1972 geological mapping (Teck Corporation Ltd.)

TECK CORPORATION LIMITED
Bullmoose Project

GEOLOGICAL MAP
OF THE
NORTHWEST CORNER OF THE
TECK COAL PROPERTY
Sukunka River Area, B. C.

(Block "B" of South Block)

Scale: 1 in = 1000 ft.	Compiled: R.S.V., Jan.1973

PLATE 1

SERIES	GROUP	FORMATION	MEMBER	SUB-MEMBER OR SEAM	SEAMS	SYMBOLS GROUPS FORMATIONS MEMBERS	
		HASLER				FTHS	
	FORT ST. JOHN	COMMOTION	BOULDER CREEK			CMBC	
			HULCROSS			CMHL	
			UPPER GATES	UPPER GATES SEAMS 1 TO 8 INCL.	UG1 – UG8 INCL.	CMGU	
			LOWER GATES	LOWER GATES SEAMS 1 & 2	LG1 & LG2	CMGL	Elwood
			SUKUNKA			CMSK	
		MOOSEBAR				FTMS	
LOWER CRETACEOUS	BULLHEAD	GETHING		BIRD SEAM	BD		
				UPPER	UBD		
				MIDDLE	MBD		
				LOWER	LBD		
				SKEETER SEAM	SK		
				UPPER	USK	BLGT	
				MIDDLE	MSK		
				LOWER	LSK		
				MID SEAMS	MS		
				CHAMBERLAIN SEAM	CH		
		CADOMIN				BLCD	

GEOLOGICAL CONTACT – defined
" " – diamond drill controled
" " – approximate
" " – air photo interpretation
FAULT
SYNCLINE
ANTICLINE
MONOCLINE
BEDDING, strike & dip
" horizontal

COAL OUTCROP
DT-7 DIAMOND DRILL HOLE
STRIPPED SECTION
ROADS
SEISMIC LINE
DIAMOND DRILL GRID
MEASURED SECTION

TECK CORPORATION LTD.

BULLMOOSE PROJECT

72(2)8

GEOLOGICAL PLAN

1000 500 0 1000 2000 3000 4000

Scale – Feet

DRAWN: R.E.H. / O.C. | DATE: FEB. 1972 | REVISED: | DATE: | MAP NO: A103

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SERIES	GROUP	FORMATION	MEMBER	SUB-MEMBER OR SEAM	SYMBOLS: SEAMS	SYMBOLS: GROUPS FORMATIONS MEMBERS	
LOWER CRETACEOUS	FORT ST. JOHN	HASLER				FTHS	
		COMMOTION	BOULDER CREEK			CMBC	
			HULCROSS			CMHL	
			UPPER GATES	UPPER GATES SEAMS 1 TO 8 INCL.	UG1 – UG8 INCL.	CMGU	
			LOWER GATES	LOWER GATES SEAMS 1 & 2	LG1 & LG2	CMGL	
			SUKUNKA			CMSK	
		MOOSEBAR				FTMS	
	BULLHEAD	GETHING		BIRD SEAM	BD	BLGT	
				UPPER	UBD		
				MIDDLE	MBD		
				LOWER	LBD		
				SKEETER SEAM	SK		
				UPPER	USK		
				MIDDLE	MSK		
				LOWER	LSK		
				MID SEAMS	MS		
				CHAMBERLAIN SEAM	CH		
		CADOMIN				BLCD	

T-3
DIAMOND DRILL HOLE

PIERCE POINT ⊗ MOOSEBAR - GETHING CONTACT

T-8 T-3 T-10 T-1 T-6 T-11 T-12 T-4 T-5 T-13 T-2 T-9 T-7 T-14 T-15

OVB CMHL CMGU CMGL CMSK FTMS BLGT

UG8 UG7 UG6 UG5 UG4 UG3 UG2 UG1 LG2 LG1

BD SK MS USK LSK MSK LBD MBD UBD CH

98,000 E 102,000 E 106,000 E 110,000 E

12,000 N 16,000 N 20,000 N 24,000 N 8,000 N

TECK CORPORATION LTD.

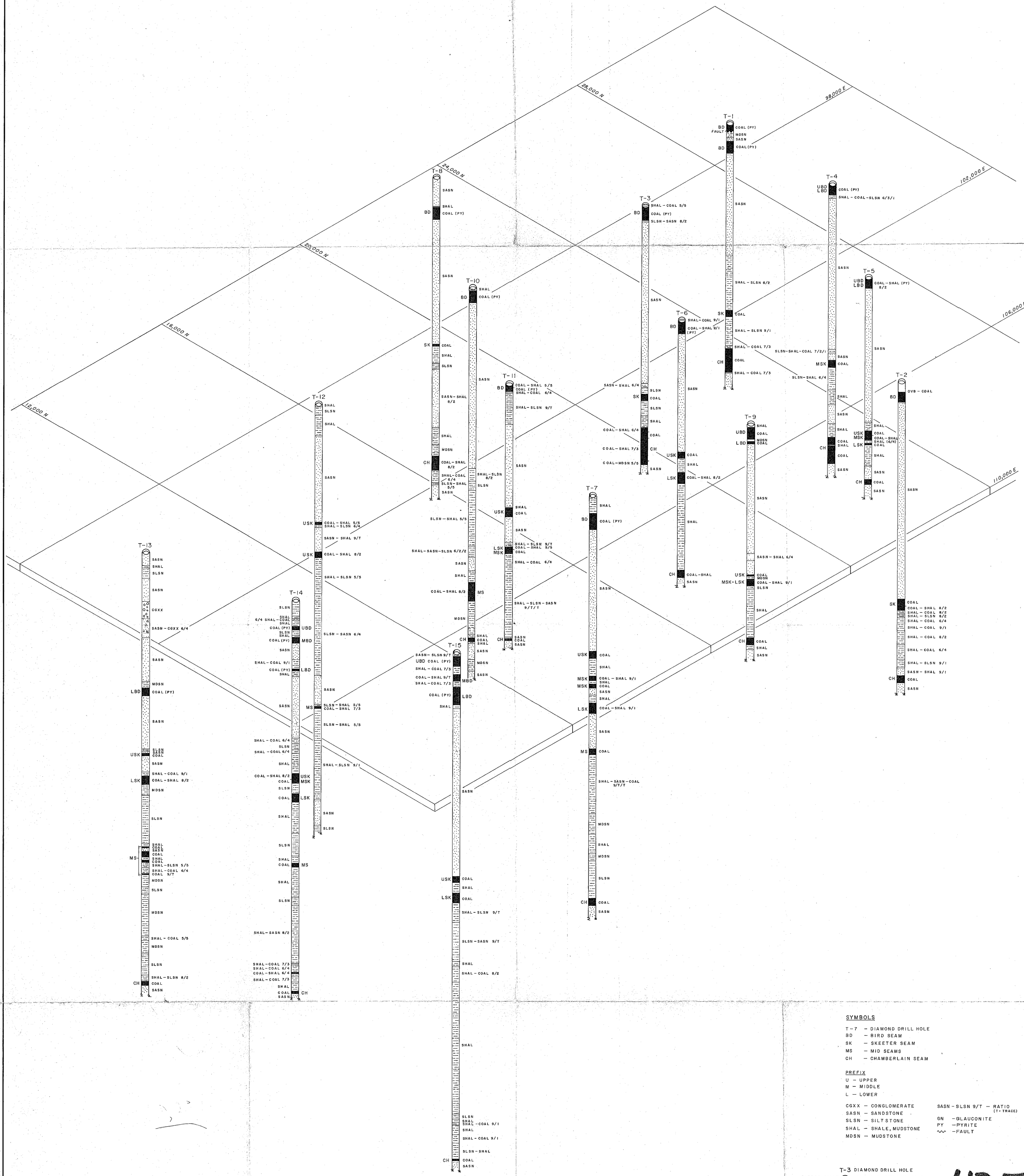
BULLMOOSE PROJECT

RECONSTRUCTED FENCE DIAGRAM

FORT ST. JOHN & BULLHEAD GROUPS

VERTICAL SCALE: 1 in. = 100 ft.

DRAWN: R. E. H./O.C.	REVISED:	MAP No: A 104 A
DATE: FEB. 1972	DATE:	N.T.S. 93 P



SYMBOLS

T-7 – DIAMOND DRILL HOLE
BD – BIRD SEAM
SK – SKEETER SEAM
MS – MID SEAMS
CH – CHAMBERLAIN SEAM

PREFIX
U – UPPER
M – MIDDLE
L – LOWER

CGXX – CONGLOMERATE
SASN – SANDSTONE
SLSN – SILTSTONE
SHAL – SHALE, MUDSTONE
MDSN – MUDSTONE

SASN – SLSN 9/T – RATIO (T = TRACE)
GN – GLAUCONITE
PY – PYRITE
〰 – FAULT

T-3 DIAMOND DRILL HOLE
PIERCE POINT — MOOSEBAR – GETHING CONTACT

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PR-BUL 72(2)B

TECK CORPORATION LTD.

72(2)B

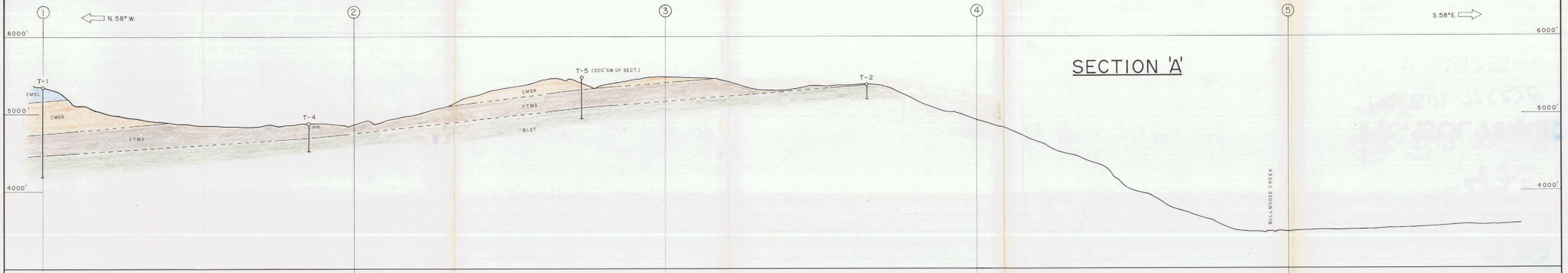
BULLMOOSE PROJECT

RECONSTRUCTED DIAMOND DRILL INTERSECTIONS

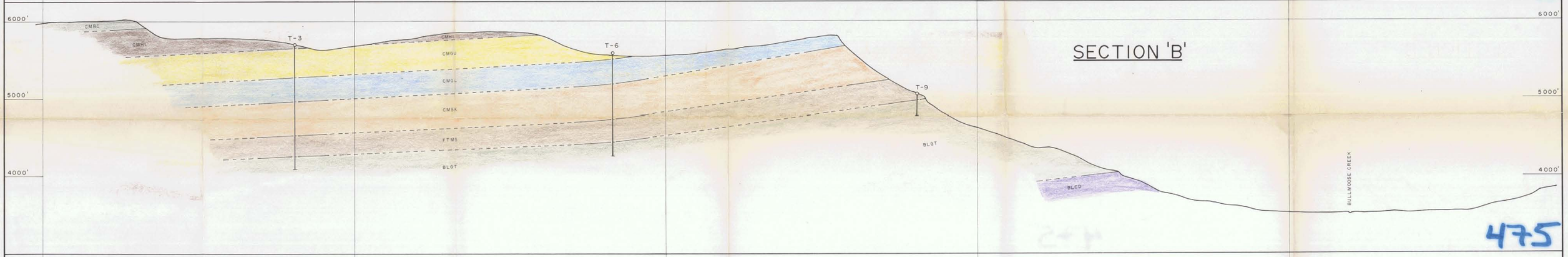
GETHING FORMATION

VERTICAL SCALE: 1 in. = 20 ft.

DRAWN: R.E.H./O.C. DATE: FEB. 1972	REVISED: DATE:	MAP No: A104 D N.T.S. 93 P



SECTION 'A'



SECTION 'B'

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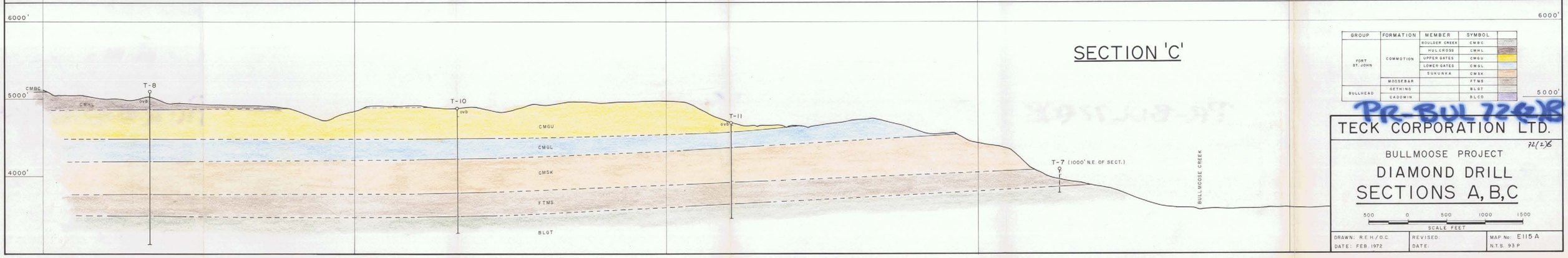


SECTION 'C'

GROUP	FORMATION	MEMBER	SYMBOL
FORT ST. JOHN	COMMOTION	BOULDER CREEK	CMBC
		HULCROSS	CMHL
		UPPER GATES	CMGU
		LOWER GATES	CMGL
		SUKUNKA	CMSK
	MOOSEBAR		FTMS
BULLHEAD	GETHING		BLGT
	CADOMIN		BLCD

PR-BUL 72&73

TECK CORPORATION LTD.

72(2)8

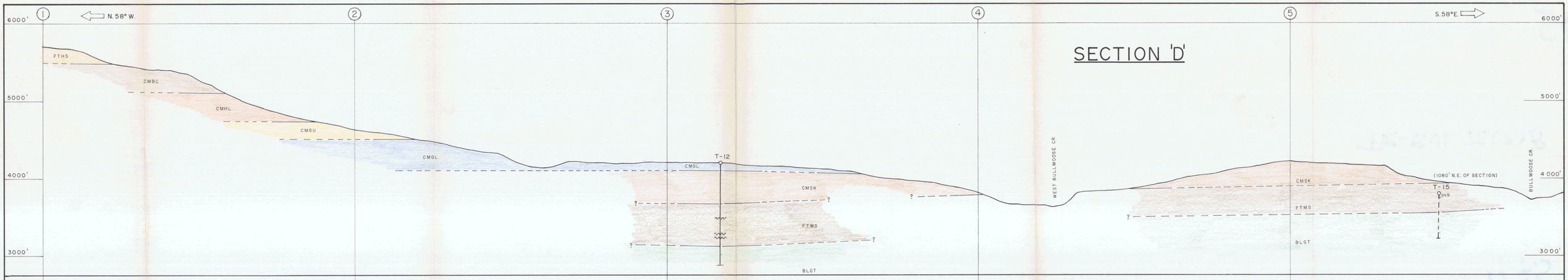
BULLMOOSE PROJECT

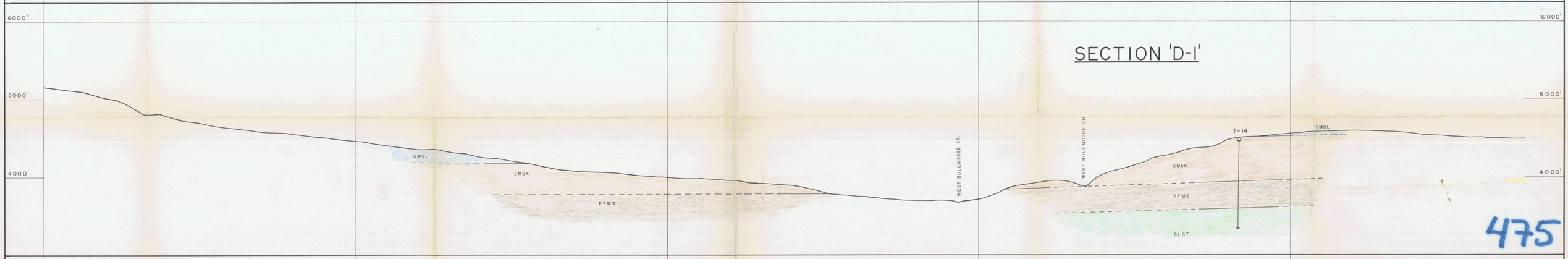
DIAMOND DRILL SECTIONS A, B, C

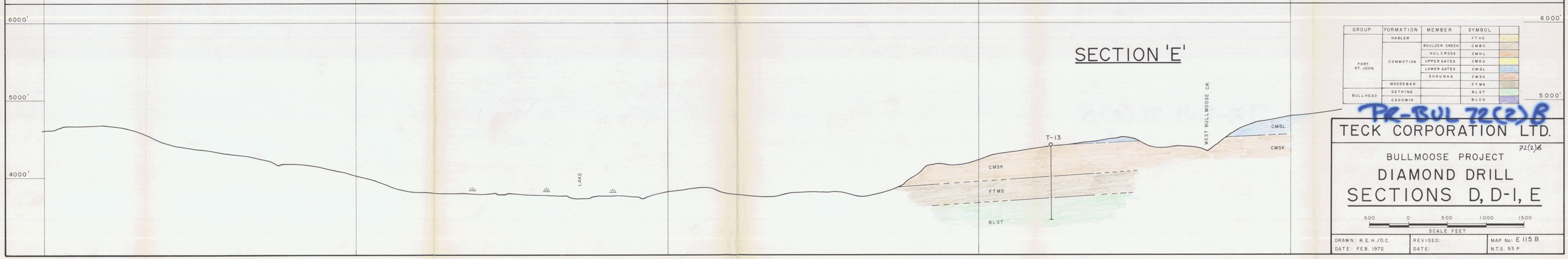
500 0 500 1000 1500

SCALE FEET

DRAWN: R.E.H./O.C.	REVISED:	MAP No: E115A
DATE: FEB. 1972	DATE:	N.T.S. 93 P







GROUP	FORMATION	MEMBER	SYMBOL	
FORT ST. JOHN	HASLER		FTHS	
	COMMOTION	BOULDER CREEK	CMBC	
		HULCROSS	CMHL	
		UPPER GATES	CMGU	
		LOWER GATES	CMGL	
		SUKUNKA	CMSK	
	MOOSEBAR		FTMS	
BULLHEAD	GETHING		BLGT	
	CADOMIN		BLCD	

PR-BUL 72(2)B

72(2)B

475

TECK CORPORATION LTD.

BULLMOOSE PROJECT

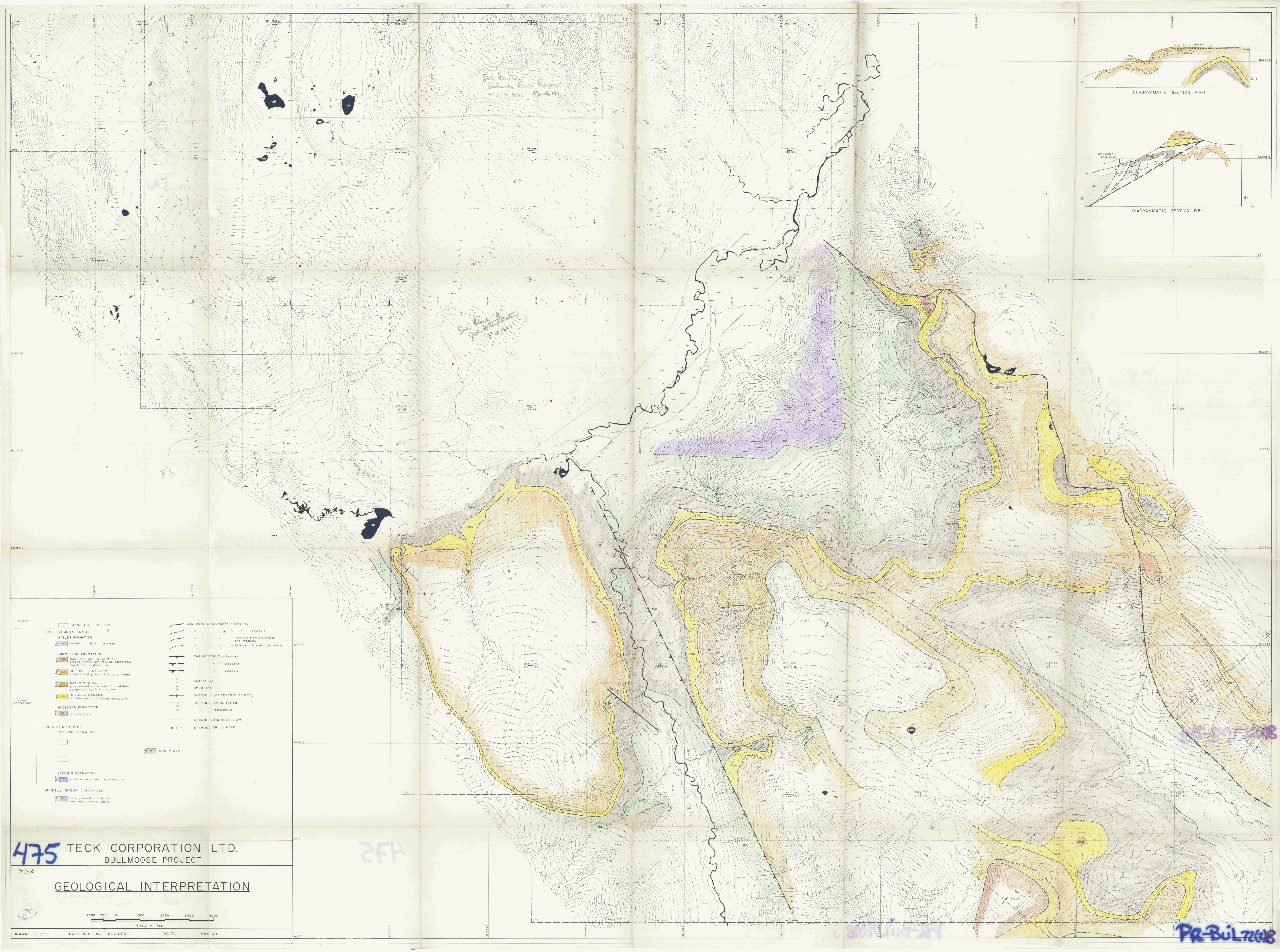
DIAMOND DRILL

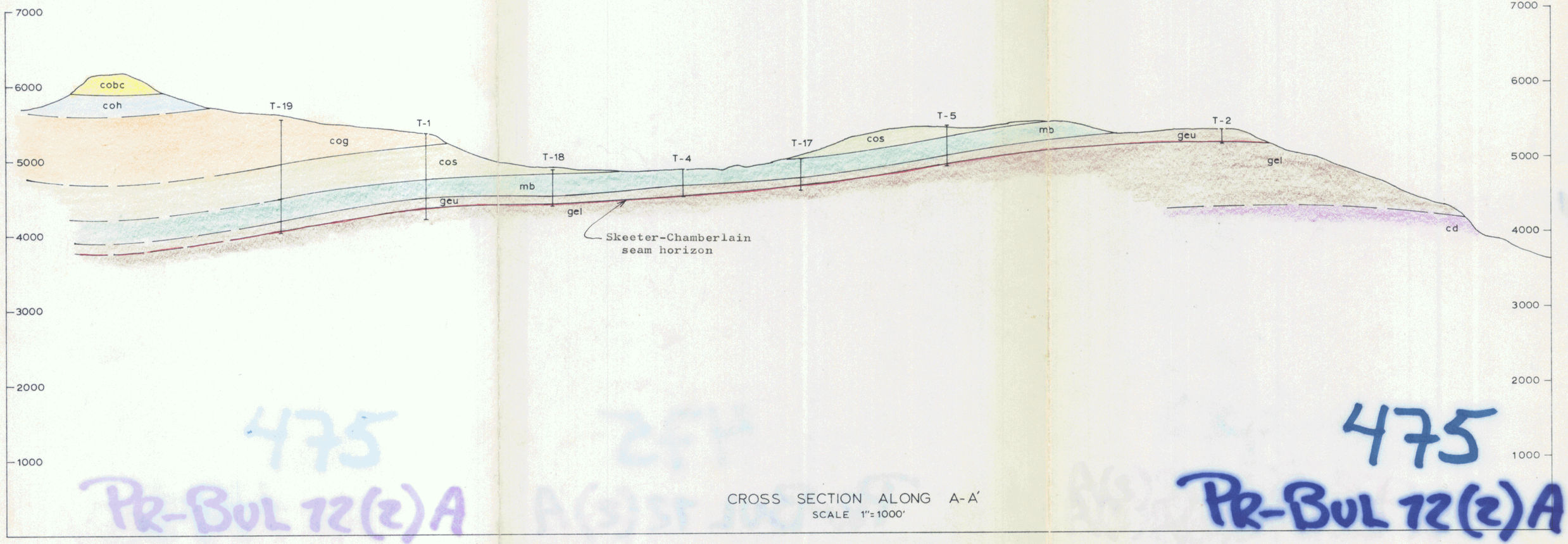
SECTIONS D, D-I, E

500 0 500 1000 1500

SCALE FEET

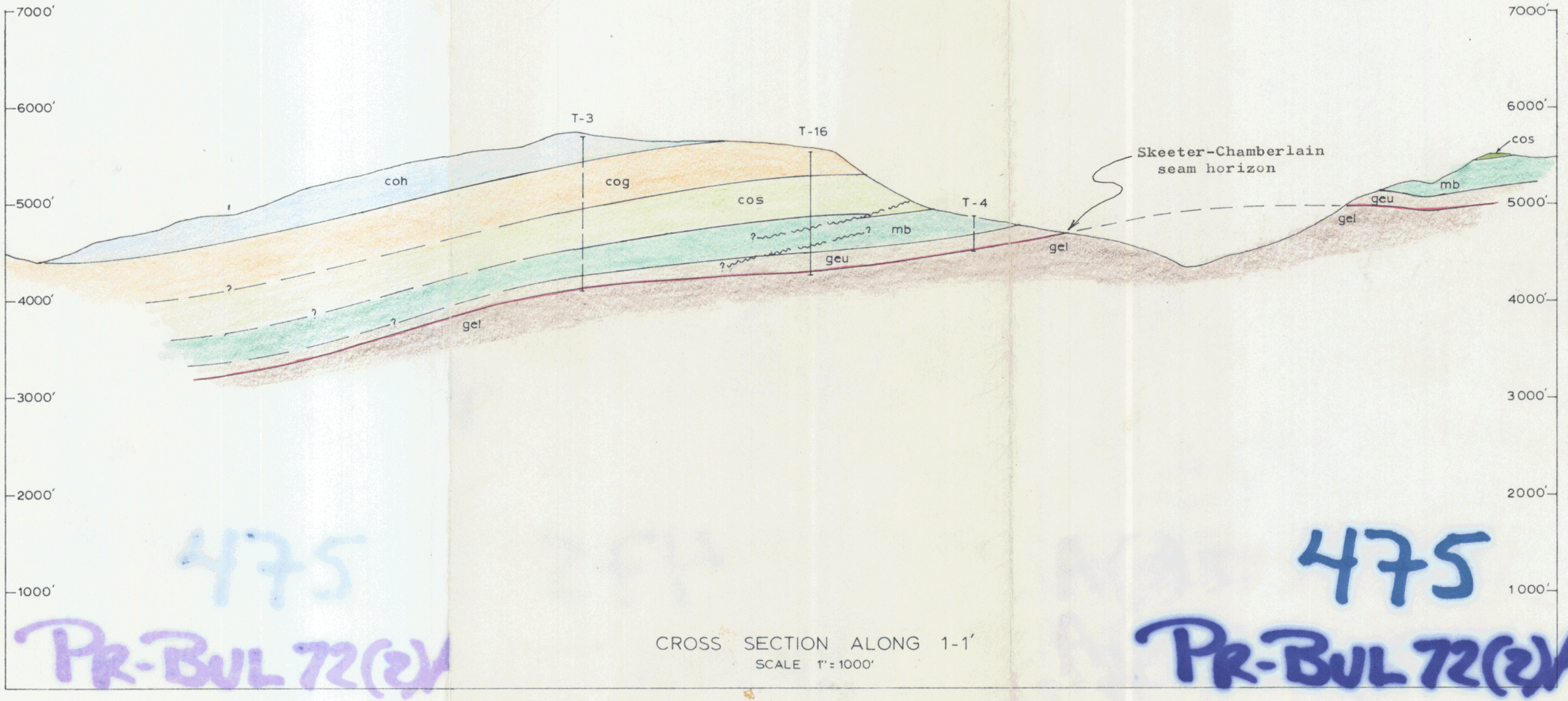
DRAWN: R.E.H./O.C.	REVISED:	MAP No: E 115 B
DATE: FEB. 1972	DATE:	N.T.S. 93 P


DIAGRAMMATIC SECTION AA-1
DIAGRAMMATIC SECTION BB-1
See Browndo Sukunka River Prospect 1" = 1000' March 1971
RECENT
LOWER CRETACEOUS
ls LANDSLIDE DEPOSITS
FORT ST. JOHN GROUP
HASLER FORMATION
ha predominantly marine shale
COMMOTION FORMATION
cobc BOULDER CREEK MEMBER predominantly non-marine sandstone, conglomerate, shale, coal
coh HULLCROSS MEMBER predominantly marine shale, siltstone
cog GATES MEMBER predominantly non-marine sandstone conglomerate, siltstone, coal
cos "SUKUNKA" MEMBER marine shale, siltstone, sandstone
MOOSEBAR FORMATION
mb marine shale
BULLHEAD GROUP
GETHING FORMATION
ge UNDIVIDED
CADOMIN FORMATION
cd massive conglomerate, sandstone
MINNES GROUP (UNDIVIDED)
mi fine grained sandstone and carbonaceous shale
GEOLOGICAL BOUNDARY - observed
" " - " (approx.)
" " - inferred from air photos and mapping
" " - inferred from air photos only
THRUST FAULT - observed
" " - probable
" " - possible
ANTICLINE
SYNCLINE
OVERFOLD (OR REVERSE FAULT?)
BEDDING - strike and dip
" - horizontal
CHAMBERLAIN COAL SEAM
T-7 DIAMOND DRILL HOLE
475 TECK CORPORATION LTD.
BULLMOOSE PROJECT
72(2)B
GEOLOGICAL INTERPRETATION
1000 500 0 1000 2000 3000 4000
Scale - Feet
DRAWN: F.L./O.C.
DATE: SEPT. 1971
REVISED:
DATE:
MAP NO:
PR-BUL 72(2)B



CROSS SECTION ALONG A-A'

SCALE 1"=1000'



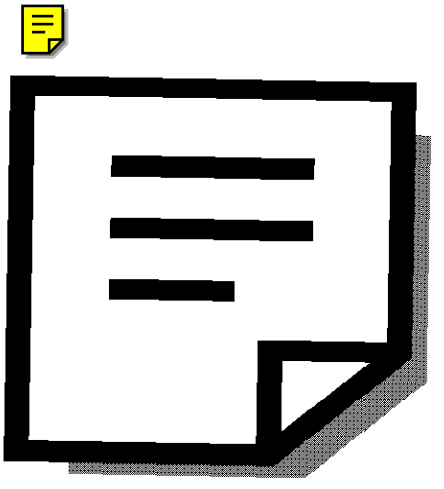
CROSS SECTION ALONG 1-1'
SCALE 1" = 1000'

475

PR-BUL 72(2)

475

PR-BUL 72(2)A



Re Bullmoose 72(4)A

NOTE: COAL ANALYSIS DATA WAS TAKEN FROM OPEN FILE PR-BULLMOOSE 72(1)A

REPORT ON BULLMOOSE PROJECT, 1972

SUKUNKA RIVER AREA, B. C.

by

R. S. Verzosa

January 30, 1973 Vancouver, B.C.

CONFIDENTIAL

Appendix I : Coal Sample Analyses

CABLE ADDRESS COMTECO

[illegible] LTD. IN ASSOCIATION WITH [illegible] INC.
GENERAL OFFICES: 205 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-3464

Please address all correspondence to:
147 Riverside Drive, North Vancouver, B.C.

Office: Tel. (604) 929-2228
Roberts Bank Tel. (604) 946-7021

November 24, 1972

Teck Corporation Ltd.,
700-1177 W. Hastings St.,
Vancouver, B. C.

Gentlemen:

Enclosed are tabulated test results for coal cores from D.D.H. 1-6.

Following is the procedure for testing and the analysis.

1. Core was crushed to minus 3/4" sq.

2. Crushed sample was subjected to float-sink tests at 1.35, 1.40, 1.45 and 1.55 specific gravities. Weight reporting to each gravity fraction was recorded.

3. Each gravity fraction was analyzed for ash and sulfur.

4. The 1.35 float and the 1.40 float was analyzed for ash, volatile, fixed carbon, BTU, sulfur and free swelling index.

5. The plasticity index was determined for the raw coal from D.D.H. No.6.

6. Tabulations were made and charts were drawn to show the cumulative recovery and cumulative rejects.

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

R. A. Houser,
Division Manager.

Encl.
R.A.H:dek

CABLE ADDRESS COMTECO

COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434

Please address all correspondence to:
147 Riverside Drive, North Vancouver, B.C.

SINCE 1908

Office: Tel. (604) 929-2228
Roberts Bank Tel. (604) 946-7021

November 24, 1972

CERTIFICATE OF ANALYSIS FOR:
Teck Corporation Ltd.,
700 - 1177 W. Hastings St.,
Vancouver, B. C.

Sample Identification: Report No. 67-3672

D.D.H. No. 6,
Raw Coal.

COAL PLASTICITY (GIESELER PLASTOMETER)

Maximum Fluidity, D.D.P.M.	22.0
Temp. at Maximum Fluidity, °C	465
Temp. at Initial Fluidity, °C	434
Temp. at Final Fluidity, °C	482
Range, °C	48

Torque - 40 gram inches

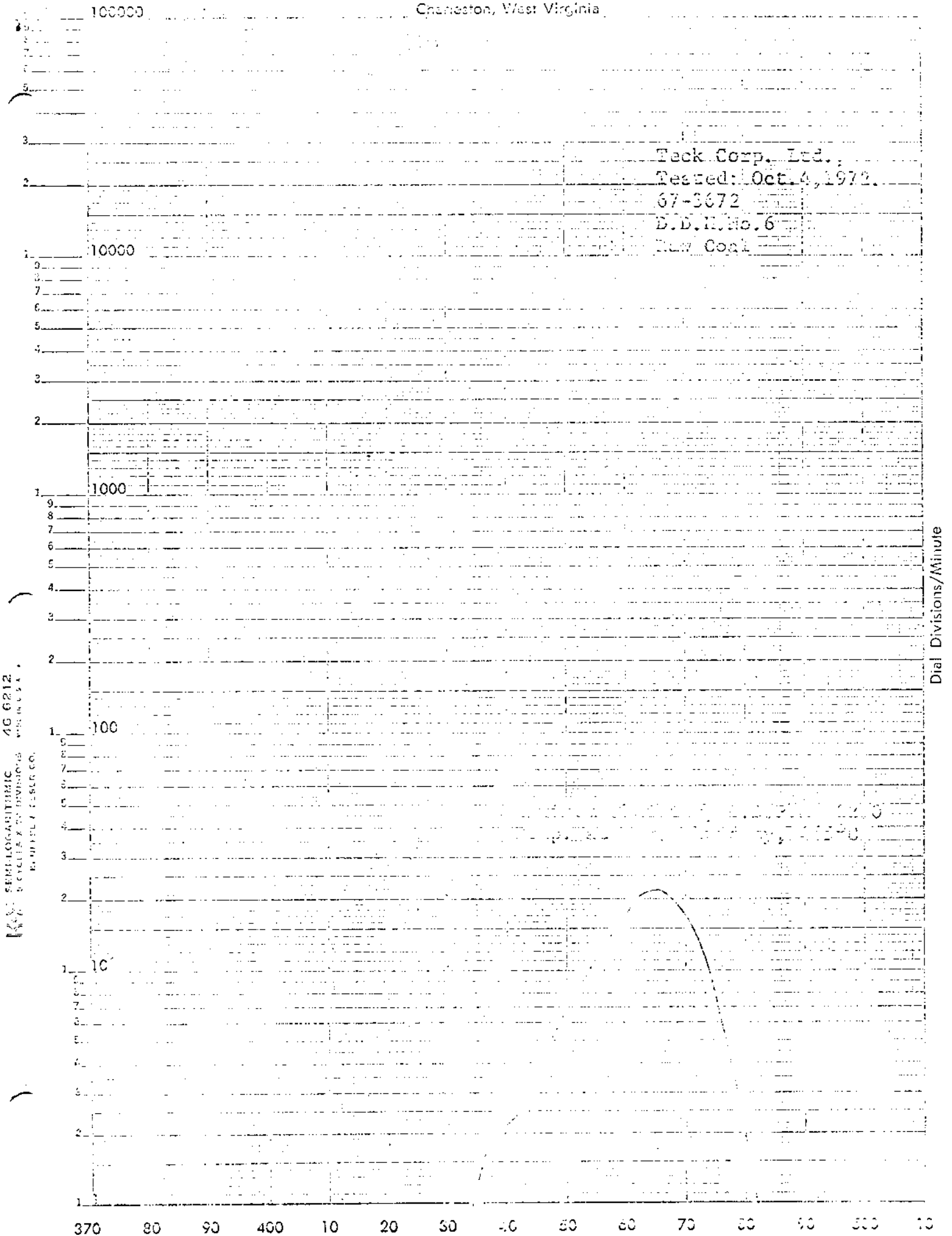
Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

R. A. Houser,
Division Manager.

RAH:dek

FUEL RESEARCH & INSTRUMENT COMPANY
Charleston, West Virginia



File No. 67-3[illegible]8

TECK CORPORATION

VANCOUVER B.C., CANADA

Sample #1 — FLOAT & SINK ANALYSIS — TESTED OCT.-NOV., 1972

Raw Coal Crushed to 3/4" sq. x 0

Specific Gravity			Dry Basis		Cumulative Recovery			Cumulative Reject		
Sink	Float	% Wt.	% Ash	% Sul.	% Wt.	% Ash	% Sul.	% Wt.	% Ash	% Sul.
	1.35	51.2	3.88	0.28	51.2	3.88	0.28	100.0	20.50	0.23
1.35	1.40	16.2	8.29	0.26	67.4	4.94	0.28	48.8	37.93	0.19
1.40	1.45	9.7	14.76	0.27	77.1	6.18	0.27	32.6	52.66	0.15
1.45	1.55	1.9	18.48	0.31	79.0	6.47	0.28	22.9	68.71	0.10
1.55		21.0	73.26	0.08	100.0	20.50	0.23	21.0	73.26	0.08

PROXIMATE ANALYSIS

	1.35 Float = 51.2%	1.40 Float = 67.4%
% Ash	3.88	4.94
% Volatile	19.41	19.20
% Fixed Carbon	76.71	75.86
BTU	14891	14661
% Sulfur	0.28	0.28
FSI	1	1

COMMERCIAL TESTING & ENGINEERING CO.

Co. Teck Corp. Ltd.
Lab. No. 67-3318
Mine XXXXXX
Size O.D.H. # 1
Raw Coal Ash 20.50%
Raw Coal Sul. 0.23%

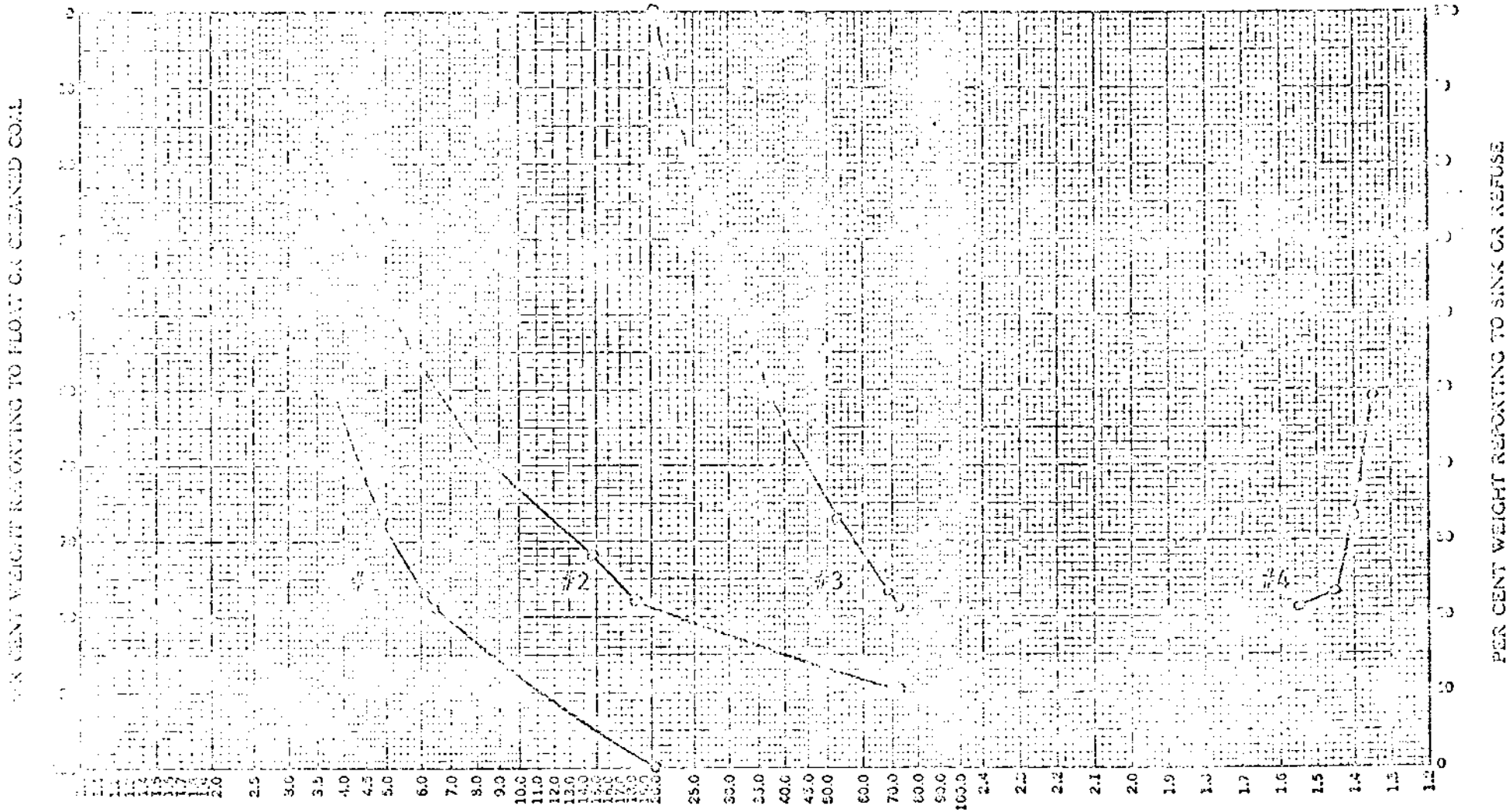
Commercial Testing & Engineering Co.
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.

Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

WASHABILITY CURVES



Form WCR 3M 9-49

File No. 67-3819

TECK CORPORATION

VANCOUVER, B.C., CANADA

Sample #2 — FLOAT & SINK ANALYSIS — TESTED OCT.-NOV., 1972

Raw Coal Crushed to 3/4" sq. x 0

Specific Gravity			Dry Basis		Cumulative Recovery			Cumulative Reject		
Sink	Float	% Wt.	% Ash	% Sul.	% Wt.	% Ash.	% Sul.	% Wt.	% Ash	% Sul.
	1.35	42.8	5.99	0.40	42.8	5.99	0.40	100.0	11.00	0.33
1.35	1.40	32.8	8.26	0.32	75.6	6.97	0.37	57.2	14.74	0.28
1.40	1.45	16.6	14.30	0.29	92.2	8.29	0.35	24.4	23.46	0.26
1.45	1.55	1.8	20.74	0.27	94.0	8.53	0.35	7.8	42.96	0.21
1.55		6.0	49.62	0.19	100.0	11.00	0.34	6.0	49.62	0.19

PROXIMATE ANALYSIS

	1.35 Float = 42.8%	1.40 Float = 75.6%
% Ash	5.99	6.97
% Volatile	18.76	18.31
% Fixed Carbon	75.25	74.72
	100.00	100.00
BTU	14542	14206
% Sulfur	0.40	0.37
FSI	1	1

Job Teck Corp. Ltd.
L. S. No. 67-3819
Mine XXXXXXX
Size D.D.H. # 2
Raw Coal Ash 11.00%
Raw Coal Sul. 0.34%

Commercial Testing & Engineering Co.

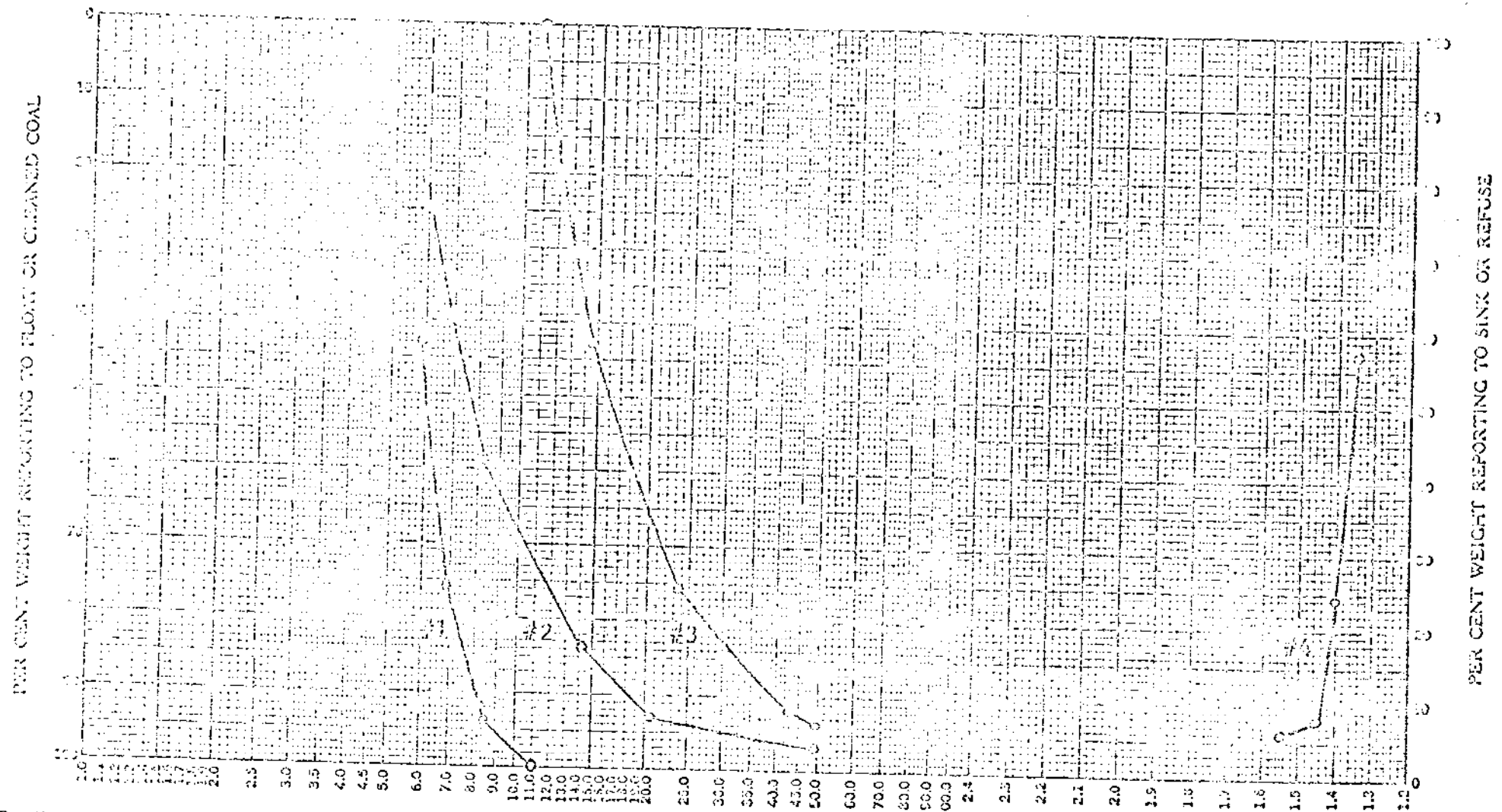
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.

Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

WASHABILITY CURVES



Form WCR 3M 9-49

File No. 67-3820

TECK CORPORATION

VANCOUVER B.C., CANADA

Sample #3 — FLOAT & SINK ANALYSIS — TESTED OCT.-NOV., 1972

Raw Coal Crushed to 3/4" sq. x 0

Specific Gravity		Dry Basis			Cumulative Recovery			Cumulative Reject		
Sink	Float	% Wt.	% Ash	% Sul.	% Wt.	% Ash	% Sul.	% Wt.	% Ash	% Sul.
	1.35	48.0	5.26	0.37	48.0	5.26	0.37	100.0	16.83	0.33
1.35	1.40	19.3	8.82	0.35	67.3	6.28	0.36	52.0	27.51	0.30
1.40	1.45	7.6	17.08	0.36	74.9	7.38	0.36	32.7	38.54	0.27
1.45	1.55	6.6	27.14	0.35	81.5	8.97	0.36	25.1	45.04	0.25
1.55		18.5	51.43	0.21	100.0	16.83	0.33	18.5	51.43	0.21

PROXIMATE ANALYSIS

	1.35 Float = 48.0%	1.40 Float = 67.3%
% Ash	5.26	6.28
% Volatile	18.77	18.05
% Fixed Carbon	75.97	75.67
	100.00	100.00
BTU	14630	14407
% Sulfur	0.37	0.36
FSI	1½	1½

COMMERCIAL TESTING & ENGINEERING CO.

Job Tech Corp. Ltd.
Lab. No. 13820
Mine XXXXXX
Size D. D. H. # 3
Raw Coal Ash 16.83%
Raw Coal Sul. 0.33%

Commercial Testing & Engineering Co.

CONSULTING FUEL ENGINEERS
AND CHEMISTS

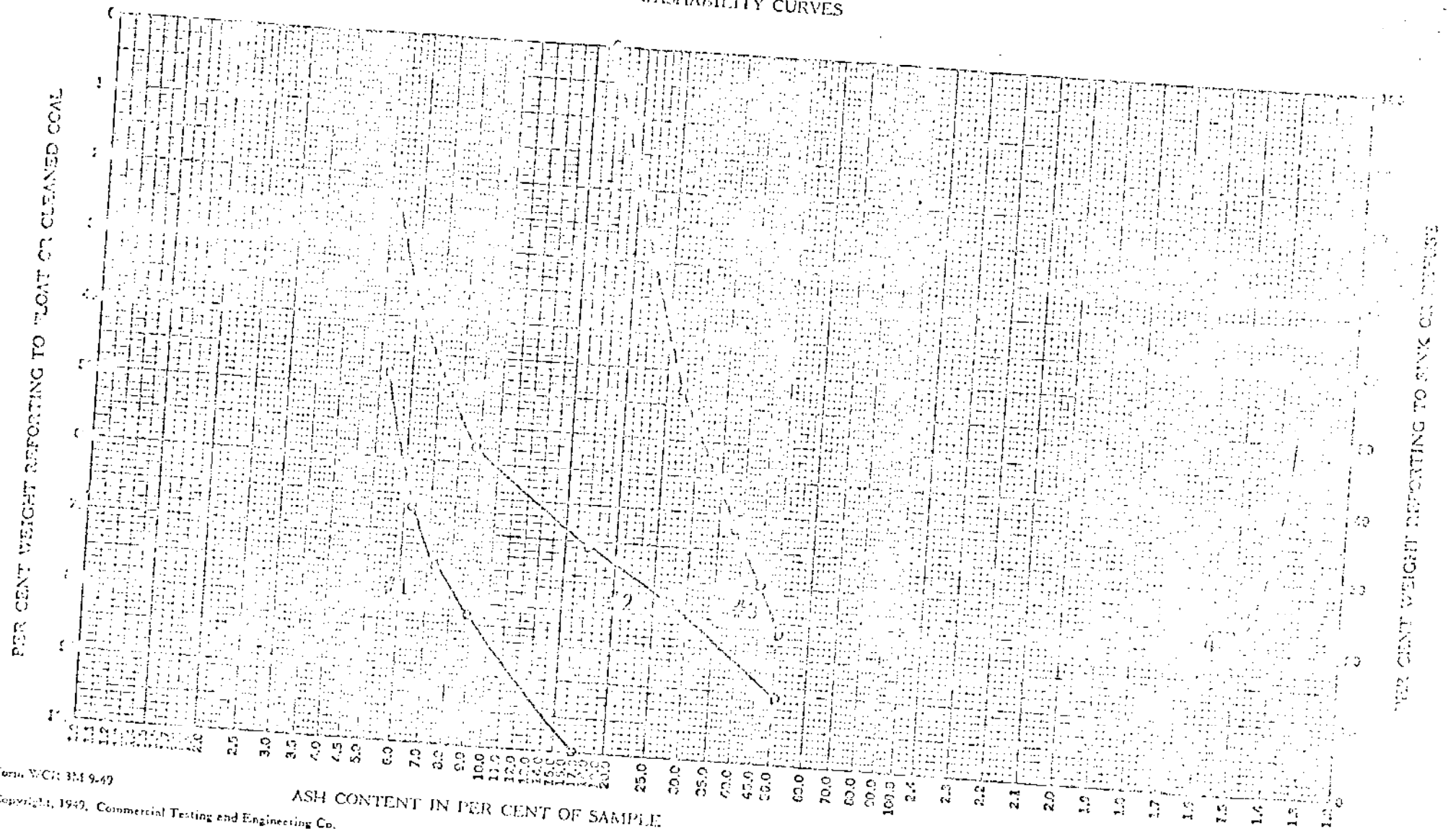
CHICAGO, ILL.

Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

WASHABILITY CURVES



Form WCR 3M 9-49

TECK CORPORATION

VANCOUVER, B.C., CANADA

Sample #4 — FLOAT & SINK ANALYSIS — TESTED OCT.-NOV., 1972

Raw Coal Crushed to 3/4" sq. x 0

Specific Gravity		Dry Basis			Cumulative Recovery			Cumulative Reject		
Sink	Float	% Wt.	% Ash	% Sul.	% Wt.	% Ash	% Sul.	% Wt.	% Ash	% Sul.
	1.35	76.0	3.04	0.47	76.0	3.04	0.47	100.0	8.26	0.43
1.35	1.40	6.6	9.89	0.37	82.6	3.59	0.46	24.0	24.81	0.33
1.40	1.45	1.6	13.47	0.38	84.2	3.78	0.46	17.4	30.47	0.29
1.45	1.55	1.9	22.08	0.34	86.1	4.18	0.46	15.8	32.19	0.28
1.55		13.9	33.57	0.27	100.0	8.26	0.43	13.9	33.57	0.27

PROXIMATE ANALYSIS

	1.35 Float = 76.0%	1.40 Float = 82.6%
% Ash	3.04	3.59
% Volatile	21.74	21.34
% Fixed Carbon	75.22	75.07
	100.00	100.00
BTU	15207	15013
% Sulfur	0.47	0.46
FSI	9	8½

Job Tock Corp.
Lab. No. 67-3821
Mine XXXXXX
Size D.D.H.C.
Raw Coal Ash 8.76%
Raw Coal Sul. 0.43%

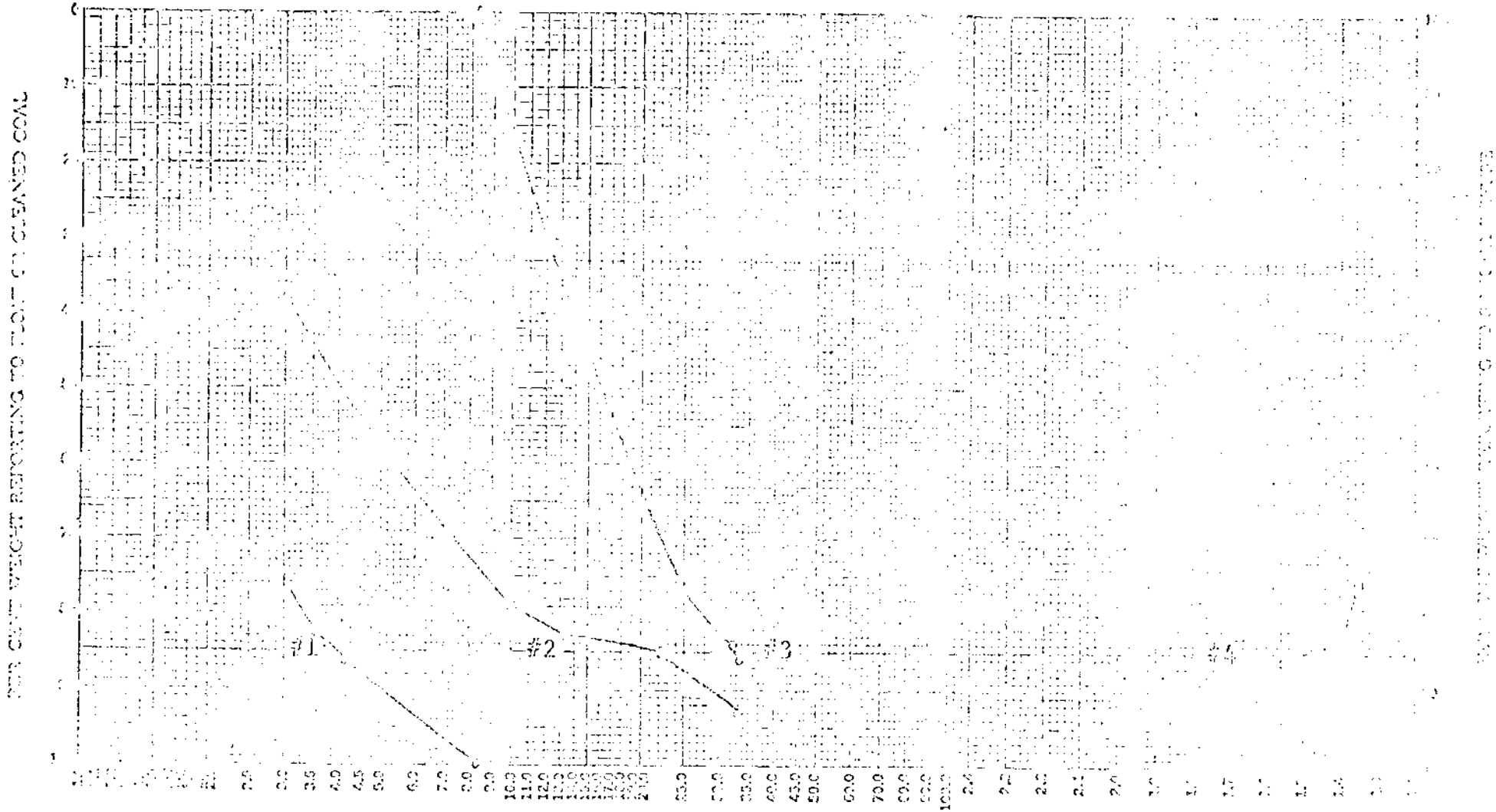
Commercial Testing & Engineering Co.
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.

Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

WASHABILITY CURVES



ASH CONTENT IN PER CENT OF SAMPLE

SPECIFIC GRAVITY

Form WCR 3/19/49

File No. 67-3822

TECK CORPORATION

VANCOUVER, B.C., CANADA

Sample #5 — FLOAT & SINK ANALYSIS — TESTED OCT.-NOV., 1972

Raw Coal Crushed to 3/4" sq. x 0

Specific Gravity		Dry Basis			Cumulative Recovery			Cumulative Reject		
Sink	Float	% Wt.	% Ash	% Sul.	% Wt.	% Ash	% Sul.	% Wt.	% Ash	% Sul.
	1.35	58.3	3.72	0.35	58.3	3.72	0.35	100.0	8.49	0.31
1.35	1.40	16.3	9.46	0.27	74.6	4.97	0.33	41.7	15.16	0.26
1.40	1.45	17.7	13.34	0.27	92.3	6.58	0.32	25.4	18.83	0.25
1.45	1.55	3.9	21.27	0.25	96.2	7.17	0.32	7.7	31.44	0.25
1.55		3.8	41.87	0.17	100.0	8.49	0.31	3.8	41.87	0.17

PROXIMATE ANALYSIS

	1.35F = 58.3%	1.40 Float = 74.6%
% Ash	3.72	4.97
% Volatile	21.67	20.84
% Fixed Carbon	74.61	74.19
	100.00	100.00
BTU	15089	14805
% Sulfur	0.35	0.33
FSI	8	7

COMMERCIAL TESTING & ENGINEERING CO.

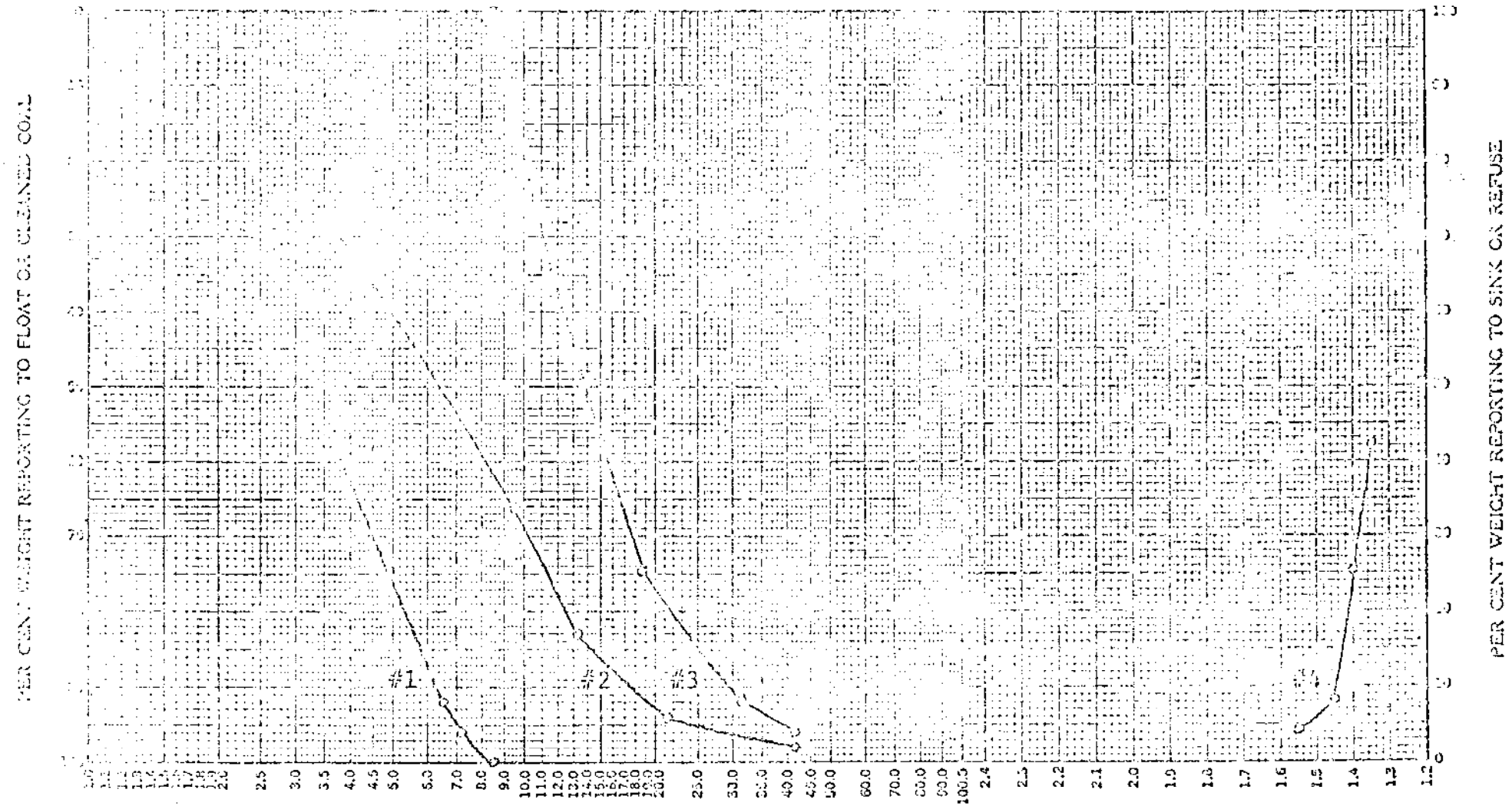
Job Teck Corp.
Lab. No. 67-3822
Mine XXXXXX
Site D.D.H. # 5
Raw Coal Ash 3.49%
Raw Coal Sul. 0.31%

Commercial Testing & Engineering Co.
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

WASHABILITY CURVES



Form WCR 3M 9-49

File No. 67-3823

TECK CORPORATION
VANCOUVER, B.C., CANADA

Sample #6 FLOAT & SINK ANALYSIS TESTED OCT.-NOV., 1972

Raw Coal Crushed to 3/4" sq. x 0

Specific Gravity			Dry Basis		Cumulative Recovery			Cumulative Reject		
Sink	Float	% Wt.	% Ash	% Sul.	% Wt.	% Ash	% Sul.	% Wt.	% Ash	% Sul.
	1.35	76.9	3.42	0.32	76.9	3.42	0.32	100.0	5.31	0.30
1.35	1.40	10.2	7.94	0.27	87.1	3.95	0.31	23.1	11.62	0.25
1.40	1.45	7.1	11.48	0.26	94.2	4.52	0.31	12.9	14.53	0.24
1.45	1.55	3.7	14.79	0.22	97.9	4.91	0.31	5.8	18.27	0.21
1.55		2.1	24.41	0.19	100.0	5.31	0.30	2.1	24.41	0.19

PROXIMATE ANALYSIS

	1.35F = 76.9%	1.40 Float = 87.1%
% Ash	3.42	3.95
% Volatile	21.54	21.43
% Fixed Carbon	75.04	74.62
	100.00	100.00
BTU	15072	14941
% Sulfur	0.32	0.31
FSI	8	7

Job Teck Corp. Ltd.
Lab. No. 67-3823
Mine XXXXXXX
Si D.D.H. # 6
Raw Coal Ash 5.31%
Raw Coal Sul. 0.30%

Commercial Testing & Engineering Co.

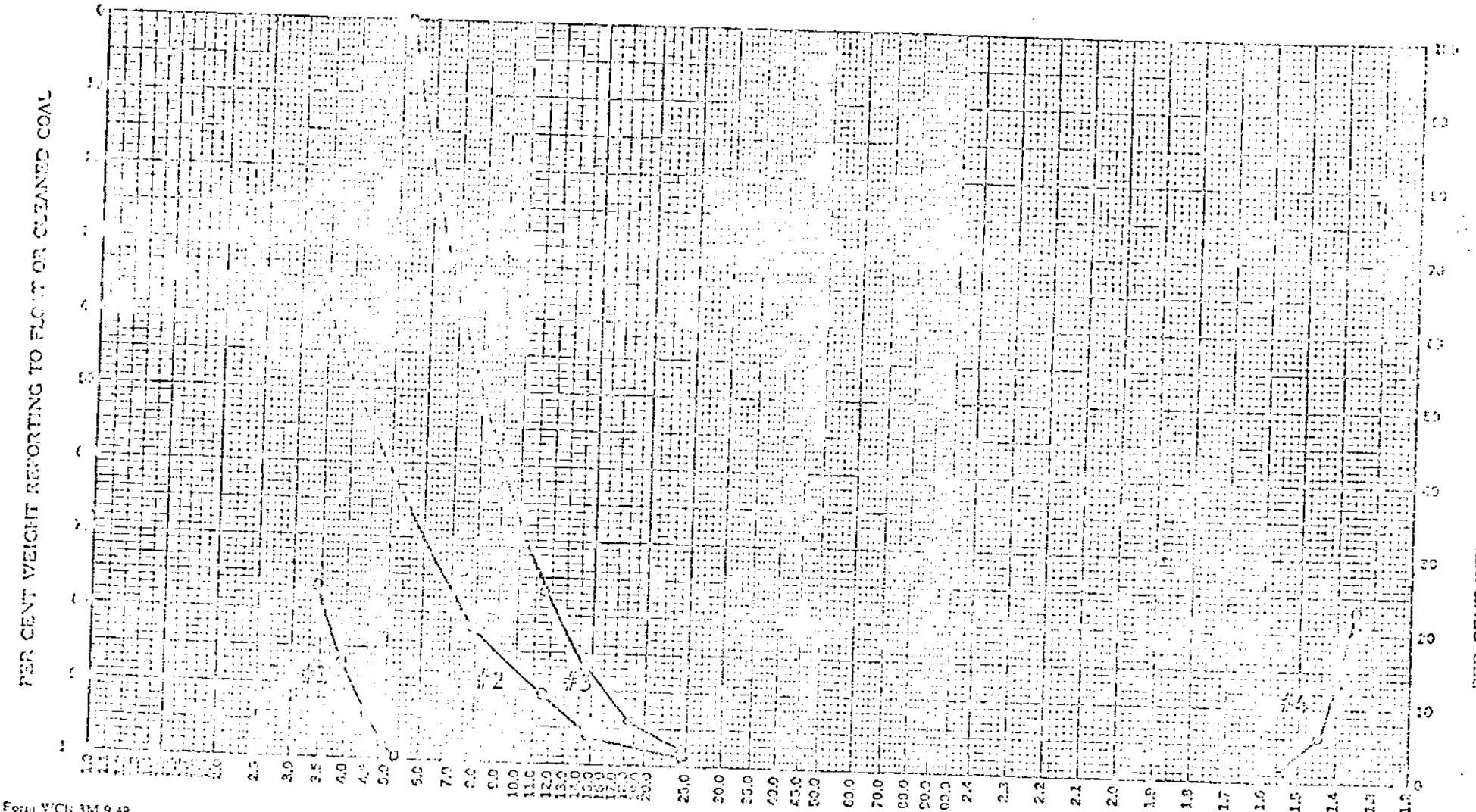
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.

Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

WASHABILITY CURVES



PER CENT WEIGHT REPORTING TO FLOAT OR CLEANED COAL

PER CENT WEIGHT REPORTING TO SINK OR REFUSE

ASH CONTENT IN PER CENT OF SAMPLE

SPECIFIC GRAVITY

Form WCR 3M 9-49