837 File 2257-2. N.T.S. 82-J-6; 7, 10, 11 VINCENT OPTION UPPER ELK VALLEY, BRITISH COLUMBIA GEOLOGICAL REPORT January 20, 1971 Rolands A. Benkis foronto, Ontario. Robert C. Hart RIO TINTO CANADIAN EXPLORATION LIMITED ŝ



PLATE 1

Elk Valley (looking S.E.). Elk Range in background, Front Range at right. Elevated tree covered area at right represents Kootenay Formation, depressed area in centre of photo is underlain by Fernie Group.

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VINCENT OPTION

UPPER ELK VALLEY, BRITISH COLUMBIA

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SUMMARY

A program of geological mapping and prospecting on a coal property owned by C. Vincent Construction Ltd. in the Upper Elk Valley, located certain coal occurrences. Steep structural dips and unfavourable topography over most of the property make the mining potential of this prospect doubtful. However, the possibility cannot be ruled out that additional studies, concentrated on the northwestern portion of the property, might disclose an area with mine-making potential.

ACKNOWLEDGEMENT

This report is the result of work done by a group of individuals with common interests in geology, under the able supervision of Owen Cullingham. Cullingham's report summarizing the summer's activities has been quoted liberally in this presentation. B. Coulter and R. A. Chaudhry made excellent contributions in their role as leaders of mapping parties; they were assisted greatly by junior student assistants. Everyone involved in this project is most grateful to Mr. W. J. Hennessey of Calgary whose experience and guidance did much to make this project a success. Garry Forman and Dirk Havler of Alpine Helicopters Ltd. must be complimented for their virtuosity in piloting a helicopter as they made our work easier and less time consuming.

GEOLOGICAL REPORT

VINCENT OPTION

UPPER ELK VALLEY, BRITISH COLUMBIA

<u>N.T.S. 82-J-6,7,10,11</u>

INTRODUCTION

General Statement

During the early part of 1970, Rio Tinto Canadian Exploration Limited signed an agreement with C. Vincent Construction Ltd. of Dawson Creek, British Columbia, to option certain coal lands held by the company in upper Elk Valley near the British Columbia -Alberta provincial boundary. Geological mapping and prospecting for coal was carried out over the property during the month of June and part of July; this report presents the results of this work.

Property

When first optioned, the property comprised 9,256 acres held under 19 coal licences; last July, before our crews left the

area, seven additional coal licences were staked covering 3,680 acres:

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c	.L.	574	•	•	L.	8480		640	
c	.L.	575			L.	8481		640	•
c	.L.	576			L.	8482	-	640	•
c	.L.	577			L.	8483		640	
· c	L.	578			L.	8484		320	
Ċ	.i.	579		•	L.	8485		640	
C	.L.	580			L.	8486		640	
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С	L.	583	÷ •		\mathbf{L}_{1}^{2}	8489		640	
C	L.	584-	2		L.	8490		592	
C	.L.	585			L.	8491		233	

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COAL LICENCE	LOT NO.	ACRES	•
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C.L. 587	L.8493	129	
C.L. 798	Unsurveyed	640	
C.L. 799	Unsurveyed	610	
C.L. 800	Unsurveyed	640	· · · · · · · · · · · · · · · · · · ·
C.L. 1012	Unsurveyed	320	
C.L. 1013	Unsurveyed	640	
C.L. 1014	` Unsurveyed	640	-
C.L. 1015	Unsurveyed	640	
C.L. 1016	Unsurveyed	640	
C.L. 1017	Unsurveyed	640	
C.L. 1018	Unsurveyed	. 160	-
, · ·	· · · · · ·		· ·

TOTAL

12,936 acres

Location and Accessibility

The Vincent property lies in the Upper Elk Valley on the British Columbia side of the Alberta-British Columbia provincial boundary. It is some 55 air miles and 85 road miles southwest of Calgary, Alberta and 55 miles north of Sparwood, B. C. Geographically, the centre of the Vincent property is at:

> 50° 30' north latitude 115° 00' west longitude N.T.S.: 82-J-6,7,10,11

Access to the property is via the Elk Pass road which is maintained by Calgary Power Limited to service their transmission line crossing the property. The road is in dismal condition and at best should be negotiated only by four-wheel drive vehicle. During the spring break-up in May and June it is impassable. The Elk Pass Road connects Kananaskis Highway to the north of Vincent property with Sparwood to the south. Recently, the B.C. Forest Service constructed a new road on the west bank of Elk River which provides reasonably good access to part of the Upper Elk Valley; the new road joins the Elk Pass road approximately five miles south of the property.

Presently, the nearest railroad is C.P. rail line under construction to the mine site of Fording Coal Ltd.; the new line leaves Elk Valley and enters Fording River Valley approximately 40 miles south of our claims. It is expected that another rail line will be constructed northwards to Weary Ridge in Emkay-Scurry property, nine miles south of the Vincent property.

A Calgary Power Ltd. high-voltage transmission line (132,000 volts) crosses the entire length of the Vincent property. The line transmits power from the Elko plant south of Fernie, B.C. to as far north as Edmonton, Alberta. Topography

The Upper Elk Valley is a narrow, north-south situated, depression between the Elk Range to the east and the Front Range of Rocky Mountains to the west (Plates 1 & 2). The elevations in both ranges reach 9,000 \pm feet above sea level whereas the highest point in the valley is on Elk Pass near the provincial boundary at 6,700 feet. The valley floor drops towards the south and at the south end of the property the elevation is 5,300 feet above sea level.

The Elk River, flowing out of Elk Lakes near the

northern end of the property, winds its way down the valley along the length of the Vincent property and carries considerable volume of water for the better part of the year. A number of creeks enter Elk River off both mountain ranges, but as these streams carry mostly spring run-off water they are dry during most of the year. The south end of the property is crossed by Cadorna Creek, a major tributary of Elk River from the west and which, similar to the Elk River, also carries considerable volume of water for most of the year.

The valley floor lies under a thick cover of gravel and till, and rock outcrops are sparse. The vegetation cover is mostly second growth, spruce and balsam. Forest fires during the 1930's destroyed vegetation in upper Elk Valley and left numerous upright dead trees or "snags", which make helicopter landings difficult or impossible.

Previous Work

Very little is known regarding coal exploration in the Upper Elk Valley prior to the mapping and prospecting by Rio Tinto Canadian Exploration Limited last summer. Geological Survey of Canada Memoir 53 (Dowling,pp. 74) reports analyses of three coal samples, apparently taken from seams near Elk Lakes at the northern end of Elk Valley; the memoir was published in 1914 and thus indicates some investigations during the early part of this century. During the course of our mapping, several old coal adit sites were discovered in the southern part of C.L. 576 and on the east side of C.L. 579. The physical appearance of these workings suggest that they also date back to the early 1900's.

In the summer of 1969, Rio Tinto Canadian Exploration Geologists mapped certain coal lands north of the Vincent property on the Alberta side of the provincial boundary. During the course of this work, a reconnaissance survey was made of the Upper Elk Valley between Elk Pass and Weary Ridge. Several positive and possible coal occurrences which were found on the Elk Pass Road and on Tobermory Hill between Tobermory Creek and the road near the north end of the property, contributed to the subsequent optioning of the property.

Other known geological investigations in the general area have been at Weary Ridge, approximately six miles south of the confluence of Cadorna Creek and Elk River on a property now being readied for production by EmKay-Scurry Ltd.

During the past two summers Rio Tinto Canadian Exploration Limited has been exploring a coal property north of the Vincent property on the Alberta side of the provincial boundary.

FIELD WORK

The first attempt to enter the Elk Valley was by R. A. Benkis and R. A. Chaudhry on May 2nd. It was an abortive scouting trip because deep snow on the Elk Pass Road forced us back at a point some 45 miles north of Sparwood.

It had been intended to start the field season late in May; although the first trip into Elk Valley was made on May 22, it was June 6 before work could get underway. Poor ground conditions during spring thaw made entering the valley difficult (Plates 5 & 6) and caused delays in establishing a camp. Camp trailers being towed to the property became stuck in the mud and it was necessary to bring in a bulldozer from Sparwood to tow the trailers the last four miles to the selected camp site.

The field work was done by four two-man parties flown into the field daily by a helicopter or driven to work in fourwheel drive vehicles. The aircraft, a Bell 47G3B-1 model equipped with supercharger for high altitude operations, was under charter to Rio from Alpine Helicopters Ltd. of Calgary. The availability of a helicopter contributed to rapid coverage of the property. Our parties left Elk Valley on July 8.

The mapping was done by traversing across the formations in search of outcrop, mainly along stream beds. Dead fall timber from forest fires in the 1930's covered the ground almost everywhere and made walking difficult and hazardous, particularly during wet periods. The information gathered in the field was plotted on overlays of air photos to the scale of 4" = 1 mile and later transferred to a base map of the same scale. The base map

was a blow-up of 1:50,000 scale maps of the National Topographic Series. Where indications of coal were found, attempts were made to locate and explore the concealed seams through trenching by hand. These attempts were not always successful because of a heavy cover of drift in the valley.

The crews were housed in industrial trailers leased from ATCO (Western) Ltd. in Calgary; catering service was provided by Classic Catering Ltd. of Calgary.

GEOLOGY

General Geology

Rocks ranging in age from Palaeozoic to Lower Cretaceous underlie the Vincent property; however, the major lithological unit encountered on the property is the Kootenay formation of Jurassic-Cretaceous age. This formation consists of a sequence of shale, conglomerate and non-marine sandstone beds. The coking coal deposits of southeastern British Columbia and southern Alberta all occur in the Kootenay formation. It is typical of the beds that they generally do not outcrop well but become converted to soil easily and are hidden under dense vegetation (Plate 3).

The topography of Upper Elk.Valley closely relates to

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its geology. The bordering mountain ranges are formed by competent Palaeozoic carbonates which have been thrust upon and now overlie the much softer Mesozoic sediments. Along the west side of the valley, Palaeozoic formations have been thrust along Borgeau Thrust upon Kootenay beds which occupy a lower topographical position. The Kootenay, in turn, overlies the soft shales of the Fernie group at the bottom of the valley; over most of its way the course of the Elk River has been confined to the Fernie. Along the east side of the valley the topography is rising again, passing through progressively harder formations of Mesozoic and Palaeozoic age.

The Laramide orogeny at the beginning Eocene time elevated the Rocky Mountains and resulted in tectonic deformation of sediments of the preceding eras, particularly of the coalbearing Kootenay beds.

Stratigraphy

No attempt will be made to give a detailed description of the stratigraphic column; instead, only formations on, or near the Vincent property will be considered. Lower Mesozoic and Palaeozoic rocks will be considered as an undivided unit.

TABLE OF FORMATIONS

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	· · · · · · · · · · · · · · · · · · ·			
Era	Period of Epoch	Group or . 	Lithology	Thickness in Feet
•				
Cenozoic	Quaternary	Gra	avel, soil, till	
	· .	60 m. Na - anni - Andre		
	UNCO	NFORMITY		
Mesozoic	Lower Cretaceous	Elk Formation	Conglomerate, sandstone, sh	900 <u>+</u> ale
			Deltaic.	
	Lower Cretaceous- Jurassic	Kootenay Formation	Coarse and fi grained sands	ne $2000+$ tone,
			glomeritic sa	nd- one
· · · · · · · · · · · · · · · · · · ·	, :	• • •	shale, COAL.	,
, , , , , , , , , , , , , , , , , , ,		· · ·	Non-marine.	•
	Jurassic	Fernie	Black shale, interbeds of	750 <u>+</u>
	· · · ·		siltstone and	silty
			shale. Marine.	•
3 M 1 ² 1	• •			•
	DISCO) NF ORMITY	Č Š	
		-		•
· •	Triassic	Spray River	Siltstone & silty shale.	· 1000 <u>+</u>
• :		Formation	Marine.	×
• • •	DISCO	ONFORMITY	ζ.	
Palaeozoic		· . 4	Carbonate roc limestone, do calcareous sh	ks, lomite ale,
		· ·	Mostly Marine	
	•	- - - -	-	
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<u>Palaeozoic</u>

Lower Mesozoic-Palaeozoic formations form the mountains of Elk Range east of the Vincent property and Eastern Frontal Range of the Rocky Mountains along the west side of the ground. The formations consist of limestone, calcareous shales and dolomitic rocks.

--Spray River-Formations-

The rocks of the Triassic Spray River formation outcrop east of the Vincent property along the west flank of Elk Range.

The Spray River formation is in an erosional contact with the underlying Palaeozoic formations. The estimated thickness of this formation in Upper Elk Valley is $1,000 \pm$ feet. The formation is decreasing in thickness from west towards the east; near Banff its thickness is approximately 1,800 feet whereas along the west flank of Highwood Range it is estimated to be only 200 to 400 feet thick.

The Spray River rocks are moderately competent, thin bedded, grey to dark grey siltstones, silty shales and white quartzose sandstones.

Fernie Group

The Fernie Group underlies a strip of ground along the east side of the property. Being the most recessive formation in the area the Fernie occupies topographically lowest positions of upper Elk Valley and outcrops only rarely. The Fernie rocks are in disconformable contact with the Spray River formation. The thickness of the Fernie strata in the Highwood area is known to be approximately 700 feet; as the Fernie sediments thicken towards the west in Upper Elk Valley their thickness is in excess of 700 feet.

Kootenay Formation

At least two thirds of the total acreage of the Vincent property is underlain by Kootenay formation which occupies the area between Borgeau thrust fault and the ground underlain by Fernie Group.

The bulk of the Kootenay formation consits of medium grey, silty shales, siltstones, very fine to medium grained argillaceous sandstones and coal seams. Conglomerate lenses appear throughout the formation but become more extensive, and the size of the pebbles increases, towards the top of the sequence. All units are lenticular and laterally grade into one another making correlation difficult. The formation lacks a definite marker horizon.

The contact between the Kootenay formation and the Fernie group is gradational and is arbitrarily placed at the base of a massive bedded, fine to medium grained sandstone unit. This basal-sandstone unit is commonly medium to dark grey with "salt and pepper" texture, but in the Upper Elk Valley it has a medium light olive color; it weathers to a medium brown-grey color and becomes iron stained. The thickness of the basal-sandstone is 40 to 150 feet. The thickness of the Kootenay formation in Upper Elk Valley

is estimated at 1,200 to 2,000 feet; repetition through thrust faulting render an accurate measurement of the true thickness impossible. Generally the thickness of the formation varies considerably from area to area but on the whole the formation thickens from the east towards the west.

With the exception of the basal-sandstone member, all Kootenay beds are commonly of non-marine origin.

Elk Formation

The Elk formation overlies conformably the Kootenay formation. It occurs in the Elk Valley as far north as Lower Elk Lake; the absence of the formation further north might be explained by lateral facies change, pre-Blairmore erosion or having been cut off by the Borgeau thrust fault. At its maximum development in the southern regions of Elk Valley the formation attains a thickness of approximately 1,700 feet whereas in the Upper Elk Valley it is estimated to be some 900 feet thick. On the Vincent property the Elk formation underlies the northwestern corner near Lower Elk Lake, and again an area near the southeastern third of the property.

The Elk formation consists of resistant, commonly ridge forming, chert pebble conglomerate interbedded with medium to light grey, fine to coarse grained sandstone with gradational contacts. The formation weathers to a light grey color with iron staining. Commonly the pebble diameter is 4 to 40 mm; the size decreases towards the north. The matrix of the conglomerate is siliceous, fine to coarse grainded sandstone; it fractures through the matrix rather than the pebbles which distinguishes it from the Blairmore (Cadomin) conglomerate.

The Elk formation represents a deltaic depositional environment.

Quaternary

The Quaternary is represented by a considerable cover of unconsolidated river deposits and glacial debris, such as gravel, till, clay, etc.

Structural Geology

The Kootenay formation in the Upper Elk Valley lies in the Lewis Thrust Plate and generally strikes 330° to 350° although local variations in the strike are common. The lower contact of the Kootenay formation is exposed in several locations on the Vincent property, where it is seen in conformable contact with Fernie group. The upper contact of the Kootenay is lost under the Borgeau thrust in the areas where the Elk formation is absent.

For the most part, the structure in the area under study is relatively simple; this may be more apparent than real because the drift covering the valley floor makes outcrop information sporadic. Folding is apparent in the area; a southwards plunging major syncline and anticline follow the length of the property. Thrust faulting and minor folding are also present and had more outcrop information been available, probably would account for a more complex structural picture than the one presented in this report. The structural dips in the area are mainly SW although

NE dips were also located; the magnitude of the dips vary between 35° and 85° with the average being approximately 60° . The steeper dips generally occur in the upper Kootenay on the southwest side of the valley whereas the more gentle dips are prevalent in lower Kootenay along the northeastern side of the property.

At Elk Pass near the B.C.-Alberta boundary, thrust faulting appears the major structural element complicating the geological setting. Folding is also apparent and could have a profound effect on the structural picture. The strata here dip 25° to 50° SW with the average dip on Tobermory Hill being somewhat less than 40° SW. Dips towards NE are also encountered. The absence of good marker horizons in the Kootenay formation as well as the interfingering relationship of individual beds make a structural analysis of the area difficult.

Seven cross sections have been constructed (DWG.G-3352) to present the structural interpretation for the Vincent property. The dotted lines are structural lines rather than traced horizons; however, lithology was taken into consideration in placing the structure lines.

Sections 1-1' and 7-7':

There is evidence of folding in the upper, and of thrust faulting, in the lower Kootenay. A syncline is suspected beneath the overburden east of Lower Elk Lake.

Two coal horizons exist in this part of the property which are believed to be a repetition of the same horizon through thrust faulting:

Section 2-2':

The evidence of folding in the lower Kootenay and a small thrust fault near the Kootenay-Elk contact do not adequately account for the 4000 foot thickness of the Kootenay in the section. It must be assumed that additional faulting and/or folding has gone undetected. Evidence of coal was found in the drift near the section line, but the thickness of the cover defeated the attempt to expose bedrock.

Section 3-3'

Thrust faulting in upper Kootenay and evidence of folding elsewhere in the sequence partially. explain the total mapped thickness of Kootenay strata; however, at least another thrust fault or additional folding is required to explain the apparent thickness.

Coal wash was found along the line of section, but no bedrock could be located. A 3-foot coal seam, believed to represent a similar stratigraphical horizon, was found some 700 feet northwest of the section line.

Section 4-4':

Evidence of folding in this area was found in the lower part of the Kootenay. To account for the apparent thickness of the Kootenay strata it must be assumed that a syncline in the southwestern half of the section, well developed in sections 5-5' and 6-6', has gone undetected beneath the overburden. Coal wash and two old adits were found along the line of section. Where bedrock could be exposed, a few coal seams were found, one approximately 8 feet thick.

Coal was also found approximately half way between sections 3-3' and 4-4'; it would appear to be in the same horizon as coal in section 4-4'.

Section 5-5':

A well developed syncline is present east of Borgeau thrust. Between the syncline and the fault, additional complex folding has occurred. Northeast of the syncline are some minor folds giving an apparent thickness of the Kootenay in excess of 2,000 feet.

Coal wash was found in the section but overburden prevented locating the source. It is possible that coal here lies in the same horizon as coal in section 4-4'.

Section 6-6':

As presented in this section, the Kootenay formation northeast of the syncline at the centre of the section line has an apparent thickness of 2,500 feet. To reduce this to the estimated thickness of 1,200 to 2,000 feet, thrust faulting or tight folding must exist in the area northeast of the syncline. No evidence to support such an assumption was found in the field.

Coal '

Coal sufficiently interesting to warrant further consideration was found in the area immediately south of British Columbia-Alberta boundary. It does not mean that coal in similar quantities does not exist elsewhere on the Vincent property; overburden may have prevented us from finding it. However, interpretation of the structural information presently available nowhere indicates that a situation favourable for open-cut or underground mining might exist on the Vincent property beyond the height of land at Elk Pass. Considering this, an expensive exploration programme, which would be necessary because of the thick overburden, does not appear to be warranted.

Along the west flank of Tobermory Hill, a chance exists that some open-cut mining might be possible. The formations dip in the same direction as the topography; although the dips are steeper than the hill slope, additional work here could possibly outline a limited area for mining of coal.

RECOMMENDATIONS

No additional field work is recommended for the present. The assembled geological data should be analyzed further, with an emphasis on the Tobermory Hill area. Should the office work suggest that the area warrants more attention, the next step in the field will have to be a diamond drill programme supplemented by bulldozer trenching on the southwest flank of Tobermory Hill.

Rolands A. Benkis

Robert

Expiry Date: Mar. 3, 1972 -

RIO TINTO CANADIAN EXPLORATION LIMITED

1971

January,

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PLATE 2

Elk Valley (looking NW). Cadorna Creek Valley in left-central part of photo. Note the sharp contact between vegetation-covered Mesozoic sediments and barren Palaeozoic carbonates.

PLATE 3

Camp in Elk Valley (looking NW). Elk Pass and Tobermory Hill in upper-central part of photo.

PLATE

Hand trench across a steeply dipping coal seam. Light coloured shale parting in upper part of the seam.



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PLATE 5

PLATE 6

Both photos illustrate road conditions in Elk Valley during the early part of field season.

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VINCENT OPTION

UPPER ELK VALLEY, BRITISH COLUMBIA

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VINCENT OPTION

UPPER ELK VALLEY, BRITISH COLUMBIA

GEOLOGICAL REPORT

SUMMARY

A drilling programme consisting of three bore holes was carried out in August of 1971 by Rio Tinto Canadian Exploration Limited on a property optioned from C. Vincent Construction Ltd. in the Upper Elk Valley of British Columbia. The drilling consisted of 2,400 feet of reverse circulation rotary drilling and intersected a total of 384 feet of coal in all three holes. An indication as to the quality of coal was obtained from twentyfive samples analysed by Cyclone Engineering Sales Ltd. of Edmonton and is dealt with later in the report.

References are made to a fourth hole drilled on an adjoining property, the Cassidy Option, which lies directly to the north of the Vincent Option in Alberta.

ACKNOWLEDGEMENTS

The work done by W. J. Hennessey of Calgary on behalf of Rio Tinto is gratefully acknowledged and his advice and assistance enabled the programme to run more efficiently. Mr. R. A. Benkis is gratefully acknowledged for his advice and assistance during the full course of operations and he is responsible for the statistical summation of the qualitative coal analysis included in this report.

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VINCENT OPTION

UPPER ELK VALLEY, BRITISH COLUMBIA

GEOLOGICAL REPORT

INTRODUCTION

The Vincent property lies in the Upper Elk Valley of southeast British Columbia and extends south from the Alberta-British Columbia provincial boundary for approximately 11 miles to the confluence of the Elk River and Cadorna Creek.

An unimproved forestry road, maintained by Calgary Power, traverses the property and provides access from the north and south. To the north, the road links up with the Kananaskis Hwy., an improved forestry road, which joins the Trans-Canada Highway (#1) near Seebe some 40 miles west of Calgary, Alberta. To the south, the road links up with an improved forestry road which joins the Crowsnest Highway (#3) at Sparwood, British Columbia.

The Elk Valley is a northwest-southeast trending valley between the Front Range of the Rocky Mountains to the southwest and the Elk Range to the northeast. The Elk Pass at the north end of the property has an elevation of 6,500 feet while the south end of the property is at 5,300 feet above sea level. Tobermory Hill in the region of the Elk Pass is the highest point on the property with an elevation of 6,750 feet above sea level.

For a fuller description of topography and location, refer to "Geological Report, Vincent Option, Upper Elk Valley, British Columbia" of January 1971, by R. A. Benkis.

PREVIOUS WORK

Little is known regarding coal exploration in the Upper Elk Valley of British Columbia prior to excursions into the field by Rio Tinto Canadian Exploration Limited. It is recognized, however, that some work was done in the early years of this century. A few old adits were encountered during a property examination in June of 1970 which were believed to have been : worked in the early 1900's. Geological Survey of Canada Memoir 53 (Dowling, pp 74) published in 1914, resulted from investigations in the early part of the century and reports analysis of three coal samples taken from seams near Elk Lakes at the northern end of the property.

In 1969, a reconnaissance of the Upper Elk Valley by Rio Tinto Canadian Exploration Limited recognized several coal occurrences which resulted in the optioning of the property and a mapping and prospecting excursion in the summer of 1970. During this visit (June and July 1970) numerous coal occurrences were mapped and although the structural geology of the area appeared complicated, the quantity of coal found led to additional work in August 1971.

EXPLORATION - AUGUST 1971

A drilling programme consisting of seven holes was laid out for the Vincent Option, but owing to higher overall costs, only three of the holes were drilled. The purpose of the programme was to intersect the coal-bearing Kootenay Formation and to obtain coal samples for gualitative analysis.

Armsco Exploration Limited of Calgary moved a D-8 'Cat' into the area in early August and after improving the Elk Valley road, prepared the drill sites. A setback in the commencement of drilling occured when Rig 58, owned and operated by Big Indian Drilling Ltd. of Calgary, was rolled enroute to the property. Drilling commenced on the Vincent Option with the completion of C.V.-1 on the Cassidy Option, August 19th and was concluded with the completion of hole C.V.-4, August 31st, 1971. (Plate 4).

A trailer camp, supplied by Corab Services Ltd. of Calgary was established atRiverside Flats along the Elk River some ten miles south of the area of operations. (Plate 2)

The three holes drilled were along the Elk Pass Road separated by approximately ½ of a mile. C.V.-2 was the most northerly of the three and was located ½ of a mile south of the Alberta-British Columbia Provincial Boundary. All holes were drilled to a depth of approximately 800 feet. Downhole caving in hole C.V.-2 prevented deeper penetration and also prevented a complete log of the hole. Roke Oil Enterprises Ltd. of Calgary probed the holes with Gamma-Ray, Neutron and sidewall density tools.

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Armsco Exploration Ltd. commenced the 'clean'up' operation September 3rd and brought the programme to completion September 9th, 1971 when it was inspected and approved by the British Columbia Forest Service.

GEOLOGY

General

Kootenay strata in this area is part of the Lewis Thrust Platerandrowestits present position to deformation and erosion is a subsequent to the Laramide Orogeny. The rocks strike northwestsoutheast and dip fairly steeply to the west. (Plate #3) The regular succession of strata is interrupted by thrusting and folding which strikes or trends subparallel to the strike of the rocks.

The lower contact of the Kootenay lies conformably on the Fernie Shales and is exposed at various places along the eastern edge of the property. The upper contact is overlain by the Elk formation in the south and north, but disappears under the Bourgeau Thrust in the centre region.

Outcrop over the property is poor due to a thick cover of glacial till, soil and other debris.

Stratigraphy

TABLE OF FORMATIONS

Era Period Formation Brief Description Thickness Cenozoic Quarternary Overburden of gravel, glacial till, and soil UNCONFORMITY Mesozoic Cretaceous Blairmore Group Non-marine conglomerates ? sandstones and shales ?	-	n.		, ,	
Cenozoic Quarternary Overburden of gravel, glacial till, and soil UNCONFORMITY Mesozoic Cretaceous Blairmore Non-marine Group conglomerates ? sandstones and shales	Era	Period	Group or Formation	Brief Description	Thickness
UNCONFORMITY Mesozoic Cretaceous Blairmore Non-marine Group conglomerates ? sandstones and shales	Cenozoic	Quarternary		Overburden of gravel, glacial till, and soil	
Mesozoic Cretaceous Blairmore Non-marine Group conglomerates ? sandstones and shales	•		UNCONFOR	MITY	
	Mesozoic -	Cretaceous	Blairmore Group	Non-marine conglomerates sandstones and shales	? ?
	1		•		
- -	• * • •	:			-

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Undivided Paleozoics

Limestones, dolomites, quartzites, chert beds and dark grey calcareous shales mostly of marine origin make up this group. The formations of the Palaeozoic form the mountains of the Elk Range to the east and the Eastern Front Range to the west of the property. The Palaeozoics of the Eastern Front Range are thrust over the less competent beds of the Kootenay Formation by the Bourgeau Thrust.

Spray River Formation

The rocks of the Spray River Formation lie disconformably on the Palaeozoics. These rocks are moderately competent and consist of gray to dark gray siltstones, silty shales and white quartzose sandstones which are in part dolomitic. The formation in this area is about 1000 feet thick and is found outcropping on the southwestern flank of the Elk Range.

Farnie Group

The rocks of the Fernie Group lie disconformably on the Spray River Formation and consist mainly of marine black and gray fissile shale with siltstone and silty shale interbeds. Some green glauconitic shales are found in this group.

Kootenay Formation

The Kootenay Formation conformably overlies the Fernie Group and is for the most part composed of non-marine strata. An exception is the basal sandstone unit which is marine and transitional.

The basal sandstone unit is commonly a massive, medium to dark gray, fine to medium grained with subangular to subrounded grains, salt and pepper sandstone. Locally this unit is of a medium olive gray colour and is 40' to 60' thick.

The bulk of the Kootenay consists of medium gray shales, silty shales, siltstones and sandstones. In the upper part of this formation, some conglomeratic sandstones have been observed. The beds are lenticular and grade laterally into one another making correlation difficult.

Coal is an important constituent of the Kootenay Formation and seams have been found up to thirty-four feet thick.

Elk Formation

The Elk Formation lies conformably on the Kootenay Formation and outcrops in the northwest and southeast regions of the property. The Elk Formation is commonly a resistant ridge forming chert pebble conglomerate interbedded with medium to light gray, fine to coarse grained sandstones. The conglomerate beds are markedly different from the basal Blair more conglomerate. The Elk conglomerate fractures through the matrix and weathers more readily than does the Blairmore conglomerate which is very siliceous and fractures through the pebbles.

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Blairmore Group

The Blairmore Group rests disconformably on the Elk Formation but is absent in the property area; it is probably lost under the Bourgeau Thrust.

The Blairmore Group commonly consists of a basal chert, pebble conglomerate which is extremely resistant overlain by sandstone and shales of non-marine origin.

Quaternary

The Quarternary is represented by the overburden consisting of gravel, glacial till, clay soil.

Correlation

The absence of any good continuous marker horizons, probably due to deltaic deposition and modification to the strata by tectonism, renders correlation difficult. Using the Gamma-Ray and Neutron Logs, correlation of strata penetrated by the bore holes has been attempted but is not entirely convincing. A number of marker horizons were isolated but the strata between these horizons is inconsistent. The variation in lithology and thickness is explained by structural and depositional features. The table below lists possible correlative points which were used to facilitate a correlation.

	POSSIBLE	CORRELATIVE	POINTS	THROUGH HOLES	c.v1	to C.V4
<u>c.v.</u>	<u>,-1</u>	<u>C.V2</u>		<u>C.V3</u>	•	<u>C.V4</u>
347	7	, 	•	· 🛶		2 6
403	}	• • • •		. (•	· 79 ·
601	-	-		170	×	263
641		-		249	•	398
728	}		1	332		457
		49		442		514
	• .	-		656	•	708
		- 297		680		730 °
		340		733		
-	. .	364		758		-

Assuming the above correlation to be accurate, then the purpose of the drilling programme to intersect successive intervals of the Kootenay Formation, with a little overlap was not realized.

Because of the distance separating the drill holes and the variation in lithology of the continental deposits, the author questions the validity of attempting correlation at this time, but does so with reservations. (See correlation chart submitted with this report; pocket G-3374)

Structure

Little more can be added to the structural picture of the Vincent property over and above that described in a previous geological report of January 1971. Generally, thrusting subparallel to the strike of the beds interupts the normal succession of stratigraphic events. Because of lithology variations, and scarce outcrop, these thrust slices cannot be accurately located rendering a structural interpretation which is generalized and not accurate.

Three structural cross sections were prepared passing through each of the bore holes and approximately at right angles to the strike. Where available, surface exposures were incorporated into the sections. One section through all the bore holes was prepared in an attempt to show the relationship between the holes and surface exposure. (Included in this report in pocket G-2567 to 2570)

If the above correlation is accepted as accurate, then thrust faults presumably are responsible for bringing sections of the Kootenay strata back to the surface. The surface trace of the thrusts would pass between the holes striking north to northwest.

COAL

A total of 384 feet of coal in all three bore holes was intersected but of this over 100 feet of coal occupied seams of less than six feet in thickness. The calculated true thickness (using dips measured at the surface of each hole) of what is considered mineable coal is only 180 feet giving an overall approximate stripping ratio of 8:1. The identifiable coal horizons were picked from the Gamma-Ray and sidewall Density Logs and are listed below:
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		COAL HORIZON	<u>S C.V2</u>	
			*True	
No.	Interval	Thickness	Thickness	Comments
1.	9'- 12'	3 '	2.2	Not analysed- Prbly weathered
2.	50'- 53' 64'- 68'	3' 4'	2.2' , 2.8'	Horizon in 3 benches. Not sampled because
	69'- 72'	3'.	2.2'	Content and small size of seams
3.	178' - 184' 184' - 195' 199' - 204' 217' - 220' 229' - 231'	6' 1' 5' 3' " 2'	4.2' 1.0' 3.5' 2.2' 1.5'	Horizon badly split small coal intervals Samples showed predominantly shale therefore no samples analysed.
4.	276' - 278' 286' - 296'	2' 10'	1.5' 7.1'	Horizon in 2 benches. Only 5' of coal sampled No analysis
5.	341' - 350' 353' - 363'	10' Sampled	6.4' 7.1'	Horizon in 2 benches. Higher bench predomi- nantly shale. Lower bench analysed.
6.	439' 453' 473' 481'		9.9' 5.7'	Horizon in 2 benches. Upper bench sampled. Lower bench showed predomi- nantly coaly sh and was not analysed.
7.	505' - 515'. . :	10' :	7.1'	Samples showed carbonaceous to coal shale and were not analysed

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<u>No.</u>	Interval	Thickness	*True Thickness -	Comments
8.	748' - 798'	50° Z sawale	⁵ 35.4'	Interval divided into 3 samples for analysis. No log obtained for this seam.
	* True Thickn of 45 ⁰ S.W.	ess of the coal	L was calculat	ted using a dip
		COAL HORIZON	NS C.V3	
No.	Interval	Thickness	*True Thickness	Comments
1.	19'- 22' 36'- 40'	3'	1.9' 2.7'	
2.	67' - 70' 86' - 90' 95' - 98'	3' 4' 3'	1.9' 2.7' 1.9'	Samples are small and many showed high ash and were not sent for analysis
3.	129' - 132' 135' - 137'	3'2'	1.9' 1.1'	
. 4.	172' - 176	4 *	2.7'	
5.	249' - 254'	5'	3.4'	Only 3' of coal recovered-not analysed
6.	332' - 352' 366' - 373'	20:) both 7:) Sample	13.7' 4.8'	Horizon in 2 benches. B <u>oth</u> benches were analysed
7.	442' - 465' -	23' 3 sampl	15.3'	Interval divided into 3 samples of analysis
	· ·	· · · · · · · · · · · · · · · · · · ·		- . <u>-</u> . <u>f</u>
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			*True	
NO.	Interval	Thickness	Thickness	Comments
8.	496' - 498'	2'	1.1'	Horizon is badly
- •	501' - 509'	8'	5.5'	broken up into
	519' - 522'	31	1.9'	small seams.
	525' - 527'	2'	1.1'	Samples showed
	5321 - 5341	2'	 יוו	high ash and
	549' - 552'	<u>-</u> זי	1 9'	recovery was not
	554' - 556'	2	7.7*	good No samples
		-		were analysed.
0	6671 6631	61)	.4 01	Horizon in 2
Э.	6721 - 6721	7. 1both		henches Both
	012 - 019	conste	人 · 🐨	henches ware
		5001-16		nemeleg were
			* *	sampred and
	-			anaryseu.
		and a land	ple 5	· · · · · · · · · · · · ·
10.	734' - 757'	י 1,50 בי 23	' 15.3'	Horizon divided
				into 2 samples
	•	•	•	for analysis
	tobe true that	knorg of the		ulated using a
	dip of 48° S		COAL WAS CALC	ataled using a .
		• * * •	•	
		COAL HORIZ	ONS C.V4	
-			*True	• •
NO.	Interval	Thickness	Thickness	Comments
		1	· · · · · ·	· · · ·
1.	18' - 25'	. 7'	5.0	Seam analysed
	•	l i	- · · ,	Weathered
	,	. nin	e · · ·	
2.	80'- 95'	15- 50007	10.6'	Horizon in 2
	105' - 107'	2'	1.5'	benches. Only
		·		· upper bench
_	,			sampled for
	•	•		analysis
3.	164 167.	3.	2.2	
_	-	<u>.</u>		Seams ald not
4.	191' - 193'	2 "	±.5'	snow in samples
	203' - 204'	± ⊥'	T.0,	and may not
	232' - 236'	4	2.8'	exist
5.	266' - 272'	: 6' 10	4.2'	Seam was sampled
~•		= Sample		and analysed.
				·····

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NTO	$T \sim t \sim mr \sim 1$	Thighness	Thiokness	Comments
NO.	<u>incervar</u>	Interness	THICKNESS	
6.	328' - 329'	1.'	. 1.0'	
	347' - 351'	41	2.8'	
	356' - 358'	2 '	1.5'	
		•		Seams are small
7.	398' - 400'	2'	1.5'	and many showed
	408' - 409'	1'	1.0'	high ash
	414' - 416'	2'	1.5'	
	434' - 436'	2'	1.5'	-
	458' - 462'	4'	2.8'	•••• •• •• •
	478' - 486'	8'	5.7'	
		et led	C 41	
8.	514 - 523	9 Lower	. 0.4	Sampre was anarysed
9.	569' - 571'	2'	1.5'	. Horizon in 3
~.	586' - 589'	3'	2.2'	benches. Poor
	611' - 622'	11' N.K	7.8'	recovery. Only 4'
		~ and	ha	of last bench
	•	. Samp		sampled for
		•	• • •	analysis
10.	714' - 724'	10' _ (ampl	ed 7.1'	Horizon sampled
	* The true th a dip of 45	ickness of the S.W.	coal was cal	culated by using
were qual in th chara given	Twenty five sent to Cyclon itative analysi his report as a acteristics of n below.	samples of co e Engineering s. The result n appendix but $\frac{1}{4}$ "xO float at	al from the t Sales Ltd. of s of the anal a summary of - 1.55 speci	hree bore holes Edmonton for ysis are included calculated fic gravity is
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_	True	Weight	Ash
ŝ	Thickness	%	_%
•	5 7 1	06 50	5 0
	4:2'	54.47	11.8
	4.2'	71.46	10.9
	- 26 91	66 57	10 9

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918 0			۰						
E Drill	Interval	Apparent	True	Weight	Ash	Volatile	Fixed	Sulphur	
e <u>Hole</u>	Drillers Depths	Thickness	Thickness	%	_%	Matter %	<u>Carbon %</u>	<u>%</u>	F.S.I.
CV-2	356 - 364	8'	5.7'	86.58	5.28	27.6	65.9	0.62	5,80
	448 - 454	6'	4:2'	54.47	11.81	25.2	61.8	0.50	5.91
-	748 - 754	6'	4.2'	71.46	10.9	24.8	63.1	0.49	6.93
	754 - 792	38*	- 26.9'	66.57	10.9	25.2 ·	62.8	0.35	7.74
	792 - 798	6'	4.2'	35.27'	23.3	25.1	56.3	0.34	7.45
	748 - 792	44'	~31.1'	67.3	10.9	25.1	62.9	0.36	7.92
	748 - 798	·50'	_35.4'	63.5	12.0	25.2	62.6	0.36	7.75
	·	·		i i					
CV-3	331 - 347	16'	-10.7'	96.44	3,49	33.6	61.9	0.60	8.40
	^{**} 3 ⁶ 1 – 367	6'	4.0'	95.79	3.08	32.6	61.8	0.51	8.94
	442 - 452	10'	6.7°	84.26	6.26	33.8	58.5	0.47	9.35
	452 - 458	• 61	4.0'	92,88	2.88	32.9	63.2	0.36	. 8.89
	· 458 - 464	6'	4.0'	69,82	10.85	31.8	58.2	0.47	8,85
	442 - 458	16'	_10.7'	87.4	4.50	33.5	60.2	0.43	8.82+
1.	442 - 464	22'	-14.7	82.6	6.30	33.4	59.4	0.43	8.87+
	656 - 660	4'	2.7'	92.44	5,65	27.3	66.1	0.42	7.21
	672 - 677	6'	3.4'	63.61	10.84	28.0	60.4	0.48	7.40
	736 - 746	10'	6.7'	56,98	7.01	27.7	64.4	0_39	7.76
	746 - 757	11'	.7.4'	60.38	10.54	26.7	61.8	0.62	7.39
	736 - 757	21'	-14.1'	58.8	9.15	27.2	61.9	0.50	7.57
		· · · · · · · · · · · · · · · · · · ·	,		:				
CV-4	22 - 28	. 6'	4.2'	87.17	3.11	34.7	60.8	0.52	3.97
1	85 - 96	11,	7.8'	78,67	4.73	34.7	59.2	0.37	6.30
	272 - 276	4'	2.8'	84.93	2,92	34.6	61.2	0.87	6.87
	518 - 526	8'	5.7'	82.71	3.99	32.2	62.7	0.58	7.37
	617 - 621	4'	2.8'	95,68	3,96	32.6	62.5	0.59	8.40
	714 - 724	10'	7.1'	78.54	7.91	31.0	60.2	0,50	8.33
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The raw ash content of the coal appears high but after washing is fairly reasonable. However, in the larger seams, the ash content appears to be a little on the high side even after washing. The volatile matter falls in the category of medium to high and high which would probably be an unfavourable aspect in securing a market.

The sulphur content is variable between 0.35% and 0.62% with the exception of one sample from bore hole C.V.-4, 272'-276', which has a value of 0.87%. The coking characteristics appear very good with the F.S.I. ranging from 5.8 to 9.35. One seam, from 22'-28' in hole C.V.-4, shows and F.S.I. of only 3.97 but it is felt this is due to oxidation because of its proximity to the surface. The sampling technique employed by Big Indian . Drilling is explained in detail in a geology report on the J.A.Cassidy Option of October 1971 and will not be dealt with here. However, it should be noted that the technique was deemed very satisfactory, by the author, for retaining nearly 100% of the fines (Plate 5). Contamination of the samples was very little to non-existent and it is therefore felt that the results of the analysis should be taken as a good indication as to the quality of the coal. It should be noted that in some cases, the raw ash content seems unreasonably high.

CONCLUSIONS

- Bore hole C.V.-2 penetrated the deepest in the Kootenay Formation. Bore holes C.V.-3 and C.V.-4 essentially penetrated the same horizon.
- 2. The stratigraphic record is probably interrupted by thrust faulting of small magnitude.
- 3. Shale partings and splits in the coal seams are numerous and common.
- 4. A high percentage of volatile matter in the coal could be unfavourable in securing a market.
- 5. Correlation with any degree of confidence is difficult.
- 6. Structural interpretation is very generalized and is not accurate.
- 7. The thickest coal seams appear to occur in the lower Kootenay.

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RECOMPLENDATIONS

Any future investigation of the Vincent Property should be carried out by a drilling operation designed to facilitate a better understanding of the structure as well as sampling the coal intersected for qualitative analysis. A programme consisting of a number of holes drilled in close proximity and at right angles to the strike would give the best results. Emphasis should be placed on investigating the lower Kootenay horizon and at least one hole should penetrate in the Fernie Group to allow definite recognition of the Lower Kootenay.

Tobermory Hill at the north end of the property has a more favourable topography for a mining situation and additional drilling throughout the hill would shed more light on the potential of the entire Elk Pass area. It has been recognized that without this area, the southern end of the property holds little interest.

In view of the amount of activity regarding coal exploration being conducted adjacent to the southern boundary of the Vincent property, a programme in the south might prove interesting. The best location for such a programme would be to the west of the Elk River on the west half of the area covered by Coal Licence 572.

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Owen Cullingham

Expiry Date: Mar. 5, 1972

REFERENCES

L: Correspondence re: "Cassidy-Vincent Drill Holes" - Private Report of September 1971.

RIO TINTO CANADIAN EXPLORATION LIMITED



PLATE 4

Rotary Drilling rig. - Looking south into Elk Valley from Tobermory Hill.

PLATE 5

Apparatus used for coal sampling.



PLATE 1

View of Elk Valley looking northwest toward the Elk Lakes.

PLATE 2

Trailer camp established at Riverside Flats - Elk Valley.





PLATE 3

Prepared drill site #C.V.-3 showing steeply dipping strata. BOREHOLE SAMPLES:

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REPORT OF ANALYSES ON RAW MATERIAL

-1

	CLIENT: Rio Tinto Canadian Explo Limited PROJECT: CLIENT SAMPLE NO.: C-21884 CV-2 (356' - 358') CV-2 (358' - CV-2 (360' - 362') CV-2 (362' -	C.E.S. PROJECT NO.: S1-71 360') C.E.S. SAMPLE NO.: 144
	ANALYSES ON AIR DRY BASIS:	
	ASII:	15.39%
	VOLATILE MATTER:	24.71%
	RESIDUAL MOISTURE:	0.96%
	FIXED CARBON:	
\bigcirc	FREE SWELLING INDEX:	5
х.	B.T.U./1b.:	12,260
	SULPHUR:	0.57%
	RANK:	mvb
date: <i>Us.jc.</i> location: <i>J</i> . <i>RHC</i>	<u>al-242,71</u> <u>hireent-Oplin</u> <u>k2</u>	
width:	77 7 3. 6. 4.	· · · · · · · · · · · · · · · · · · ·
s.L. Vilsa 	C 21884	Per: R. S. Schgal, A. Eng. Laboratory Manager.

NOREMOLE SAMPLES

REPORT OF ANALYSES ON FLOAT-SINK MATERIAL

CLIENT: Rio Tinto Canadian Exploration Limited DATE: Sept. 23, 1971.

PROJECT:

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SAMPLE NO: C-21884

C.E.S. PROJECT NO. S1-71

C.E.S. SAMPLE NO. 144

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property							_	
Fraction	Wt.%	Ash%	RMZ	VM%	FC%	S.%	FSI	
- 1.45	82.70	4.68		27.85	66.51	0.63	6	
1 / 5 2 55								
1.40-1.55	3.88	18.18		23.52	57.34	0.55	1½	
L 1 ES								
T 1.55	13.42	75.33					N.A.	
TOTAT								
IUIAL	100.00	14.69				Į		1

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, P. Eng., Laboratory Manager EOREROLE SAMPLES:

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REPORT OF ANALYSES ON RAW MATERIAL

7

	CLIENT: Ri PROJECT: CLIENT SAMPI CV-2 (448' CV-2 (450'	o Tinto Canadian Ex Limit E NO.: C-21885 - 450') - 452') CV-2 (452'	ploration ed - 454')	DATE: C.E.S. C.E.S.	Sept. 23, 1971. PROJECT NO.: S1-71 SAMPLE NO.: 145
1	ANALYSES ON	AIR DRY BASIS:			
		ASII:	42.17%		
		VOLATILE MATTER:	17.73%		
		RESIDUAL MOISTURE:	0.92%		
		FIXED CARBON:	39.18%		
\bigcirc		FREE SWELLING INDEX	: <u>2</u>		
		B.T.U./10.:	8,330		
		SULPHUR:	0.49%		
		RANK:	mvb		
DATE: ()	1- 842 77	∠	. <u>Burga (ka ka sera s</u> era sera sera sera sera sera sera sera s		
LOCATION:	L'incirer Op	has			
C. V					
WIDTH:	6 45-415 4				
REMARKS:			\$***** <u>~*</u> ***		
			ĊYCLOME	ENGINEE	RING SALES LTD.
		·······	Per:) 	1 - 1
RIG	OCANEX	$_{\sim}$ C 2188	15 Lab	S. Sehga oratorv i	1, PLEng. Manager.

BOREHOLE SAMPLES

REPORT OF ANALYSES ON FLOAT-SINK MATERIAL

CLIENT: Rio Tinto Canadian Exploration Limited DATE: Sept. 23, 1971. PROJECT: C.E.S. PROJECT NO. S1-71

SAMPLE NO: C-21885

C.E.S. SAMPLE NO. 145

TABLE 1. Float-Sink Analyses on 1/4" x 0

.

Property]							
Fraction	Wt.%	Ash%	RM%	VM%	FC%	S.%	FSI	
- 1.45	39.85	10.55		25.54	62.99	0.53	6 ¹ 2	
1.45-1.55	14.62	16.12		24.21	58.75	0.46	5	
+ 1.55	45.53	78.70					N.A.	
TOTAL	100.00	42.39						

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, P. Eng., Laboratory Manager.

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\bigcirc				
\bigcirc	EORALOL: SAUTES:	REPORT OF	ANALYS	ES ON RAW MATERIAL
	CILENT: Rio Tinto Canadian Explo	oration	DATE:	Sept. 23, 1971.
	PROJECT:		C.E.S.	PROJECT NO.: S1-71
	CLIENT SAMPLE NO.: C-21886		C.E.S.	SAMPLE NO.: 146
	AMALYSES ON AIR DRY BASIS:	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		*******
	ASII:	30.31%		
	VOLATILE MATTER:	20.33%		
	RESIDUAL MOISTURE:	0.99%		
	FIXED CARBON:	48.37%		
\bigcirc	FRIE SWELLING INDEX:	4		
	B.T.U./1b.:	10,530		
	i SULPHUR:	0.45%		
	RANK :	mvb		
.15:	yut 2, 2 171 Visint Option			
R-4/	C.V = 3			
WIDTH:	245 - 75-4-			
Bette	w. Frith	CYCLOI	ENGINER	CRING SALES LTD.
R	IOCALIEX C 21886	R. S Lt. o	. Sehga ratory	il, P. Eng. Managyr.

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	BOREHOLE SAMPLES			REI	PORT OF	ANALYSE	<u>s on Fl</u>	DAT-SINK	(MATERIA	
	CLIENT: Rio Tint	to Canad	lian Exp	lorati	on Limi	ted DA	rE: Se	ept. 23,	1971.	
	PROJECT:					C.1	E.S. PRO	OJECT NO	D. S1-71	
	SAMPLE NO: C-2	1886			•	C.]	E.S. SAI	MPLE NO	• 146	
TABLE 1. Float-Sink Analyses on 1/4" x 0										
	Property Fraction	Wt.%	Ash%	RM%	VM%	FC%	s.%	FSI		
	- 1.45	62.48	9.57		25.51	63.93	0.50	7 ¹ 2		
	1.45-1.55	8.98	20.05		22.13	56.78	0.39	3		
	+ 1.55	28.54	76.19					<u>N.A.</u>		
	TOTAL	100.00	29.52							
	Remarks:									
								,	•	
C.	E.S. Form 34				CYCL	ONE ENGI	NEERING	SALES	LTD.	
				Pa		L.	1	\sim	l .	

R.S. Schgal, P. Eng., Laboratory Manager.

RSS:hg

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DOREHOLE SAMPLES:

REPORT OF ANALYSES ON RAW MATERIAL

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	CLLENT: Rio Tinto Canadian Explor Limited PROJECT: CLIENT SAMPLE NO.: C-21887	DATE: Sept. 23, 1971. C.E.S. PROJECT NO.: S1-71 C.E.S. SAMPLE NO.: 147
	ANALYSES ON AIR DRY BASIS:	
	ASR:	31.53%
	VOLATILE MATTER:	21.34%
	RESIDUAL MOISTURE:	1.09%
	FIXED CARBON:	46.04%
	FREE SWELLING INDEX:	3 ¹ 2
	B.T.U./Lb.:	10,270
	SULPHUR:	0.32%
	RANK :	mvb
NTE: (1315) CATION:	ist 24th Vincist Cepties	
Riff. C.	<u>V - </u>	
	38 54 - 742	
<u> </u>	Dyrka	CYCLONE ENGINEERING SALES LTD.
	$\mathbf{C} 21887$	Per: R. S. Schgal, P. Eng.

PORFHOLE SAMPLES REPORT OF ANALYSES ON FLOAT-SINK MATERIAL

CLIENT: Rio Tinto Canadian Exploration Limited	DATE: Sept. 23, 1971.
PROJECT:	C.E.S. PROJECT NO. S1-71
SAMPLE NO: C-21887	C.E.S. SAMPLE NO. 147

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property]		
Fraction	Wt.%	∆sh%	RM%	VM%	FC%	S.%	FSI	
- 1.45	59.03	10.00		25.44	63.47	0.35	8	
1.45-1.55	7.54	17.75		22.94	58.22	0.33	5	
+ 1.55	33.43	70.49					7)/4	
TOTAL	100.00	30.81						

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, P. Eng., Laboratory Manager.

EOREHOLE SAMPLES:

REPORT OF ANALYSES ON RAW MATERIAL

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ARALYSES ON AIR DRY BASIS: ASII: 53.42% VOLATILE MATTER: 16.79% RESIDUAL MOISTURE: 1.35% FIXED CARBON: 28.44% FREE SWELLING INDEX: 2 B.T.U./1b.: 6,660 SULPHUR: 0.31% RANK: mvb ATE. $Arguich = R + g^{(5)} \cdot 2/$ OCATION: $Arguich = R + g^{(5)} \cdot 2/$ OCATION: $Arguich = R + g^{(5)} \cdot 2/$ DCATION: $Arguich = R + g^{(5)} \cdot 2/$ DCATION: $Arguich = R + g^{(5)} \cdot 2/$ CATION: $Arguich = R + g^{(5)} \cdot 2/$ CYCLONE ENGINEERING SALES LTD.		CLIENT: Rio Tinto Canadian Explor L imited PROJECT: CLIENT SAMPLE NO.: C-21888	ation DATE: Sept. 23, 1971. C.E.S. PROJECT NO.: S1-71 C.E.S. SAMPLE NO.: 148
ASII: 53.42% VOLATILE MATTER: 16.79% RESIDUAL MOISTURE: 1.35% FINED CARBON: 28.44% FREE SWELLING INDEX: 2 B.T.U./1b.: 6,660 SULPHUR: 0.31% RANK: mvb ATE: $Aigust = 3.9^{-5} \cdot 37/$ CATION: $Jistes A = 0.52$ MDTH: $A = 0.52$ CYCLONE ENGINEERING SALES LTD.		AMALYSES ON AIR DRY BASIS:	
VOLATILE MATTER: 16.79% RESIDUAL MOISTURE: 1.35% FIXED CARBON: 28.44% FREE SWELLING INDEX: 2 B.T.U./1b.: 6,660 SULPHUR: 0.31% RANK: mvb ATE: $August = 2 + 2 - 2 / 2 / 2 / 2 / 2 / 2 / 2 / 2 / 2 /$		ASN:	53.42%
NESIDUAL MOISTURE: 1.35% FIXED CARBON: 28.44% FREE SWELLING INDEX: 2 B.T.U./1b.: 6,660 SULPHUR: 0.31% RANK: mvb ANE. $Aigust = 3.9^{45}$ $37/$ DCATION: $Vizies J = 0.000000000000000000000000000000000$		VOLATILE MATTER:	16.79%
FIXED CARBON: 28.44% FREE SWELLING INDEX: 2 B.T.U./1b.: 6,660 SULPHUR: 0.31% RANK: mvb ATE: $August 329^{-4}$ 77 OCATION: $Virtuin Calaria P.HCul - 2 VIDTH: Cil - 2 Support Calaria Cyclone Engineering Sales LtD.$		RESIDUAL MOISTURE:	1.35%
$\begin{array}{c cccc} FREE SWELLING INDEX: 2 \\ B.T.U./1b.: 6,660 \\ SULPHUR: 0.31% \\ RANK: mvb \\ \hline \\ ATE: \begin{array}{c ccccccccccccccccccccccccccccccccccc$		FIXED CARBON:	28.44%
B.T.U./1b.: $6,660$ SULPHUR: 0.31% RANK: mvb ATE: $Muguut & 3' gt^{(3')} 7/$ OCATION: $1'/1' uut, 1 & 0'/1' uut, 1 & 0'/1'' uut, 1 & 0'/1' uut, 1 & 0'/1' uut, 1 & 0'/$		FREE SWELLING INDEX:	2
SULPHUR: 0.31% RANK: mvb ATE: $August 3 q^{4} 7/OCATION: 1^{1} 2^{1} 2^{1}R^{1} C^{1} -2^{2}MIDTH: C^{1}EMARKS: 7^{1} -7^{2}$		B.T.U./1b.:	6,660
RANK: mvb ATE: $August 3 g^{3} 7/$ OCATION: $firstig CAta_{i}$ RANK: $mvbOCATION: firstig CAta_{i}RANK: RANK: The second secon$		SULPHUR:	0.31%
ATE: $August & g^{d} > 7/$ DCATION: $\int f = 1 + C + C + C + C + C + C + C + C + C +$		RANK :	mvb
I WARAN	ATE: <u><u><u>A</u>UUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU</u></u>	1	CYCLONE ENGINEERING SALES LTD.

BOREHOLE SAMPLES	REPORT OF ANALYSES	ON FLOAT-SINK MATERIAL
;		
CLIENT: Rio Tinto Canadian E	xploration Limited DAT	E: Sept. 23, 1971.
PROJECT:	C. E	.S. PROJECT NO. S1-71
SAMPLE NO: C-21888		S.S. SAMPLE NO. 148

TABLE 1. Float-Sink Analyses on 1/4" x 0

· · · · · · · · · · · · · · · · · · ·								
Property								
Fraction	Wt.%	Ash%	RM%	VH%	FC%	S.%	FSI	
7.65								
- 1.43	27.92	12.74		26.16	59.75	0.35	8½	
1 / 5 7 55								
1.49~1.99	7.35	32.00		21.37	45.28	0.30	3 ¹ 2	
L 7 55								
رد.۲ ۲	64.73	73.31					1/2	
TOTAL	100.00	53,36						

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, P. Eng., Laboratory Manager.

RSS:hg

 BOREHOLE S	SAMPLES	REPORT	OF	ANALYSES ON	FLOAT-SINK	MATERIAL
CLIENT:	Rio Tinto	Canadian Exploratio Limited	n	DATE:	Sept. 28,	1971.
PROJECT:				C.E.S.	PROJECT NO.	S1.71
SAMPLE NO:	C-21889	(331' - 347')		C.E.S.	SAMPLE NO.	149

TABLE 1. Float-Sink Analysis on 1/4" x 0

Property			· · · · · ·		·			
Fraction	Wt.%	Ash%	RM%	VM%	FC%	S.%	FSI	
- 1.45	94.27	3.10		33.68	62.07	0.60	8½	
1.45-1.55	2.17	19.94		27.96	50.95	0.54	4	
+ 1.55	3.56	62.88					212	
TOTAL	100.00	5.59						

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, P. Eng., Laboratory Manager.

RSS:hg

BOREHOLE SAMPLES:

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RIOCANEX

REPORT OF ANALYSES ON RAW MATERIAL

	CLLENT: RIO T PROJECT: CLIENT SAMPLE	into Canadian Explo Limited NO.: C-21889 (331' - 347')	ration	DATE: Sept. 28, 1971. C.E.S. PROJECT NO.: S1-71 C.E.S. SAMPLE NO.: 149
	ANALYSES ON AI	R DRY BASIS:		
	ASI	11:	5.85%	
	vo	LATILE MATTER:	31.24%	- -
	RE:	SIDUAL MOISTURE:	1.15%	
	FI	(ED CARBON:	61.76%	
\bigcirc	FRI	E SWELLING INDEX:	712	
	в.:	f.U./15.:	14,000	:
	ຽນາ	.PHUR:	0.58%	
	RAI	₩:	hvAd	
date: \underline{A}	<u>t 38⁴ 171</u> in cost Optim			·
WIDTH:	16 31 - 347			. ,
	Dpith.		CYCLONE - $\frac{1}{P_{er}}$	E ENGINEERING SALES LTD.

R. S. Sehgal, P. Eng. Laboratory Minager.

C 21889

BOREHOLE SAMPLES:

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REPORT OF ANALYSES ON RAW MATERIAL

	CLIENT: RIO PROJECT: CLIENT SAMPLE 1	Tinto Canadian Exp Limite XO.: C-21890 (361' - 367')	loration d	DATE: Sept. 28, 1971. C.E.S. PROJECT NO.: S1-71 C.E.S. SAMPLE NO.: 150
	ANALYSES ON AIR	CORY BASIS:		
	ASI	l:	6.21%	
	VÕI	ATILE MATTER:	31.95%	
	RES	IDUAL MOISTURE:	1.02%	
	FIX	ED CARBON:	60.82%	•
	FRE	E SWELLING INDEX:	8	
	B.1	.u./16.:	13,970	
	ទហា.	PHUR:	0,55%	
	RAN	К:	hvAb	
DATE: <u>(121)</u> OCATION: <u>i</u> R.H WIDTH: REMARKS: <u>3</u>	L- 25 K :71 Line Cophin C.V 3 L- 367 D- 21/	-	CYCLONE	ENCINEERING SALES LTD.
	CANEY	C 21890	Per:_// R./ Lab	S. Sehgal, f. Eng.

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REPORT OF ANALYSES ON FLOAT-SINK MATERIAL

CLIENT:	Rio	Tinto	Canadian	Exploration	Limited	DATE:	Sept. 28,	1971.
PROJECT:						C.E.S,	PROJECT NO	S1-71
SAMPLE N	0:	C-2189	0 (361'	- 367')		C.E.S.	SAMPLE NO.	150

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property	r		<u> </u>				 	11
Fraction	Wt.%	Ash%	RM%	VM%	FC%	S.%	FSI	
- 1.45	93.89	2.79		34.15	62.04	0.51	9	
1.45-1.55	1.90	17.21		27.18	54.59	0.65	6	
+ 1.55	4.21	70.85					N.A.	
TOTAL	100.00	.5.93						

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, P. Eng., Laboratory Manager.

RSS:hg

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BOREHOLE SA	MPLES REPORT OF ANA	LYSES ON	FLOAT-SINK M	ATERIAL
CLIENT:	Rio Tinto Canadian Exploration Ltd.	DATE:	Sept. 28/7	1
PROJECT:		C.E.S.	PROJECT NO.	S1 - 71
SAMPLE NO:	C-21891 (442' - 452')	C.E.S,	SAMPLE NO.	151

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property		·		1		· · · ·		· · · · · · · · · · · · · · · · · · ·
Fraction	Wc.%	Ash%	RM%	VM%	FC%	S.%	FSI	
- 1.45	76.19	5.34		34.72	58.94	0.46	9+	
1.45-1.55	8.07	14.99		30.25	53.76	0.58	8	
+ 1.55	15.74	72.06					1/2	
TOTAL	100.00	16.62						

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, P/Eng., Laboratory Magager.

RSS:hg

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\bigcirc	EOREHOLE SAMPLE	25:	REPORT OF	ANALYSES ON RAW MATERIAL
	CLIENT: Rio Ti	nto Canadian Explo	ration Ltd.	DATE: Sept. 28/71
	PROJECT:			C.E.S. PROJECT NO .:
	CLIENT SAMPLE N	80.:		S1 - 71
	C-218	91 (442' - 452')		C.E.S. SAMPLE NO.: 151
	ANALYSES ON AIR	DRY BASIS:		
	ASH	:	16.29%	
	TOA	ATILE MATTER:	28.88%	
	RES	IDUAL MOISTURE:	1.00%	
	FIX	ED CARBON:	53.83%	•
	FRE	E SWELLING INDEX:	7½	
\bigcirc	B.T	.U./1b.:	12,440	
	SUL	PIUR:	0.48%	-
	KAN	<: ·	hvAb	
	·H :			-
DATE: Carl	ot 13 4 11	•		
	Chierset Opher	- -		•
R.H C	3.13			
		•	F	
WIDTH:				
			· · ·	
- celiera	Depth		CYCLONE E	NGINEERING SALES LTD.
		<u> </u>	- R	st i l ~ l
Dir)CANEY	21201	Per: R. S.	Sebgal, P. Eng.
		<pre>> #IOUT</pre>	ALL OF L	

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BOREHOLE S/	MPLES	REPORT OF	ANALYSES ON	FLOAT-SINK	MATERIAL
CLIENT:	Rio Tinto Canadian E	xploration L	td. DATE:	Sept. 28	3/71
PROJECT:			C.E.S.	PROJECT NO	. S1 - 71
SAMPLE NO:	C-21892 (452' - 458')	C.E.S.	SAMPLE NO.	152

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property	115 %	1 - h 9	D)497	111401		n %	DOT	<u> </u>
Fraction	WC. /	ASIL &	KM /s	VM /6	よい <i>か</i>	5.6	r51	
- 1.45	82.71	2.38		33.12	63,56	0.35	9	
1.45-1.55	10.17	6.90		31.36	60.80	0.44	8	
+ 1.55	7.12	70.73					1/2	
TOTAL	100.00	7.71						

Remarks:

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C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

ier: R.S. Schgal, P. Eng., Laboratory Manager.

RSS:hg

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\bigcirc	BOREHOLE SAMPLES:	REPORT OF ANALYSES ON RAW MATER	RIAL
	CLIENT: Rio Tinto Canadian	n Exploration Ltd. DATE: Sept. 28/71	
	PROJECT:	C.E.S. PROJECT NO.: S1 - 71	
	CLIENT SAMPLE NO.: C-21892 (452' - 4	58') C.E.S. SAMPLE NO.: 152	
	ANALYSES ON AIR.DRY BASIS:		
	ASH:	7.40%	
	VOLATILE MATTER	30.01%	
	RESIDUAL MOIST	RE: 0.94%	
	FIXED CARBON:	61.65%	-
\bigcirc	FREE SWELLING I	NDEX: 8	
\bigcirc	B.T.U./1b.:	13,860	
	SULPHUR:	0.34%	
	kank :	hvAb	
ate: <u>2144</u>)cation: <u></u> 	<u>- 78 6 17</u> 1. i.i		
IDTH:6 MARKS:4	<u> </u>	•	
D.U s.	D.pth	CYCLONE ENGINEERING SALES LTD. Per: Per:	
RIO	CANEX C 21	R. S. Sehgal,/P. Eng. Laboratory Manager.	

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BOREHOLE SAMPLES:

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REPORT OF ANALYSES ON RAW MATERIAL

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	CLIENT: Rio PROJECT: CLIENT SAMPLE C-21	Tinto Canadian Explor NO.: 893 (458' - 464')	cation Ltd.	DATE: Sept. 28/71 C.E.S. PROJECT NO.: S1 - 71 C.E.S. SAMPLE NO.: 153				
	ANALYSES ON A	IR DRY BASIS:						
	. A	SII:	30.57%					
	V	OLATILE MATTER:	23.76%					
	R	ESIDUAL MOISTURE;	0.95%					
	F	IXED CARBON:	44.72%					
\bigcirc	F	REE SWELLING INDEX:	6					
	В	.T.U./1b.:	9,660					
	S	ULPHUR:	0.37%					
	R	ANK:	hvAb					
	·		-					
TE: <u>A:2344</u> CATION: <u>//ier</u> H. – C. TH: <u>C</u> ARKS: <u>9-3</u>	t 25 # 1711 int Optim 1'-3 5'- 46 4							
<u>D</u> Gun	-,2p#4		CYCLONE I	ENGINEERING SALES LTD.				
RIOC	ANEX	C 21893	Per: R. S. Labor	Sehgal, P. Eng. satory Manuger.				

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BOREHOLE SA	MPLES	REPORT OF ANAL	YSES ON	FLOAT-SINK M	ATERIAL
				6 . oola	-
CLIENT:	Kio linto	Canadian Exploration Ltd.	DATE:	Sept. 28/7	1
PROJECT:			C.E.S.	PROJECT NO.	S1 - 71
SAMPLE NO:	C-21893 (4	58' - 464')	C.E.S.	SAMPLE NO.	153

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property			,					
Fraction	Wt.%	Ash%	RM%	VM%	FC%	S.%	FSI	
- 1.45	52.18	9.98		32.31	56.76	0.44	` 9	
1.45-1.55	17.64	13.55		30.24	55.26	0.50	8	
+ 1.55	30.18	76.97					1/2	
TOTAL	100.00	30.83						

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Remarks:

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C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per: R.S. Schgal, P. Ing., Laboratory Managor.

RSS:hg

BORLHOLE SAMPLES

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REPORT OF ANALYSES ON FLOAT-SINK MATERIAL

CLIENT: Rio Tinto Canadian Exploration Limited DATE: Sept. 29, 1971. PROJECT: C.E.S. PROJECT NO. S1-71 SAMPLE NO: C-21894 CV-3 (656' - 660') . C.E.S. SAMPLE NO. 154

TABLE 1. Float-Sink Analyses on 1/4" x 0

have				_				
Property Fraction	Wt.%	Ash%	RM%	VM%	FC%	S.%	FSI	
- 1.45	87,83	4,90		27.49	66 62	e 41	71	
1.45-1.55	07.00			61.49			12	<u>.</u>
	4.61	19.73	<u></u>	22.24	57.04	0.50	1½	
+ 1.55	7.56	62.41					1/2	
TOTAL	100.00	9,93						

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Por: R.S. Sehgal, P. Eng.,

R.S. Sehgal, //P. Eng., Laboratory Manager.

EOREHOLE SAMPLES:

REPORT OF ANALYSES ON RAW MATERIAL

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1	· · · · · · · · · · · · · · · · · · ·				
	CLIENT: RIO T PROJECT: CLIENT SAMPLE 1	into Canadian Expl Limited VD.: C-21894 CV-3 (656' -	oration 660')	DATE: C.E.S. C.E.S.	Sept. 29, 1971. PROJECT NO.: SI-71 SAMPLE NO.: 154
	ANALYSES ON AIR	DRY BASIS:			
	ASI	!:	10.93%		. ·
	VOI	ATILE MATTER:	26.25%		
	RES	IDUAL MOISTURE:	0.99%		
	FIX	ED CARBON:	61.83%		
\square	Fre	E SWELLING INDEX:	6		
	B.1	.U./ib.:	13,420		
	SUL	PHUR:	0.43%		
	RAN	К:	mvb		
DATE: <u><u><u></u></u> LOCATION: <u>·</u><u></u></u>	<u>et 23-13 171</u> mint Ophic 1				. 4
REMARKS:نيــــــــــــــــــــــــــــــــ	51-660				
	Dipth		CYCLONE	ENGINEE	RING SALES LTD.
BIO	TANEY	C 21801	Per:	S. Sehar	Manager.
KION	JAINEN	~ WI004		-	

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BOTENDLE SAMPLESREPORT OF ANALYSES ON FLOAT-SINK MATERIALCLIENT: Rio Tinto Canadian Exploration LimitedDATE: Sept. 29, 1971.PROJECT:C.E.S. PROJECT NO. S1-71SAMPLE NO: C-21895
CV-3 (672' - 677')C.E.S. SAMPLE NO. 155

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property	}							
Fraction	Wc.%	Ash%	RM%	VM%	FC%	S.%	FSI	
- 1.45	57.01	10.40		28.26	60.48	0.47	7½	
1.45-1.55	6.60	14.69		25.75	58.70	0.59	6 ¹ 3	
+ 1.55	36.39	74.86					1	
TOTAL	100.00	34.14						

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, P. Eng., Laboratory Manager.

RSS:hg

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\bigcirc	BOREHOLE SAMPLES:	REPORT OF ANALYSES ON RAW MATERIAL
	CLIENT: Rio Tinto Canadian Explo Limited PROJECT: CLIENT SAMPLE NO.: C-21895 CV-3 (672'	oration DATE: Sept. 28, 1971. C.E.S. PROJECT NO.: S1-71 - 677') C.E.S. SAMPLE NO.: 155
	ANALYSES ON AIR DRY BASIS:	·
	ASII:	33.79%
	VOLATILE MATTER:	21.33%
	RESIDUAL MOISTURE:	0.86%
	FIXED CARBON:	44.02%
\bigcirc	FREE SWELLING INDEX:	4
	B.T.U./1b.:	9,350
	SULPHUR:	0.45%
	RANK:	тvЪ
ATE: (7) OCATION: 	<u>ent 75-417/</u> Vinitat Option <u>C.V3</u>	
/IDTH:		
= <u></u>		CYCLONE ENGINEERING SALES LTD.
		- Per: <u>R. S. Sehgell</u> , P. Eng.
RIO	CANEX \bigcirc $\&$ $\&$ $\&$ $\&$ $\&$ $\&$ $\&$ $\&$ $\&$ $\&$	tenoratory settinger.

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\bigcirc	EOREHOLE SAMPLI	35:	REPORT OF	ANALYSES	ON RAW MATERIAL
	CLLENT: Rio Tin PROJECT: CLLENT SAMPLE 1	nto Canadian Explor Limited CO.: C-21896 CV-3 (736'	ration - 746')	DATE: Sep C.E.S. PF SI- C.E.S. SA	ot. 29, 1971. ROJECT NO.: 71 MPLE NO.: 156
	ANALYSES ON AII	C DRY BASIS:			
	ASI	· 1:	36.97%		
	VOI	ATILE MATTER:	21.17%		
•	RES	SIDUAL MOISTURE:	0.94%		
	FIX	ED CARBON:	40.92%		· ·
\bigcirc	FRE	E SWELLING INDEX:	3½		
\rightarrow	B.1	.u./ib.:	8,830		
	SUL	PHUR:	0.41%		
	RAN	ΥK ;	mvb		
ATE:Z CATION: APH	<u>ut 25.^k 37)</u> induct Ophen C.V - 3				
DTH:Z	10 76 - 246		CYCLONE	ENGI NEER I	NG SALES LTD.
RIO	CANEX	C 21896	Per:	Schgal, ratory Ma	P. Eng. niger.

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,	BOREHOLD SAMPLES			REF	YORT OF	ANALYSES	ON FLO	DAT-SINK	MATER	IAL
	CULENT. Rio Tin	to Canad	lian Exp	lorati	on Limit	ted DA1	re: Se	pt. 29,	1971.	
				202000		<i>D</i>	. e			71
	PROJECT:					0.1	5. FA	JUCCI NC). <u>51</u> -	/1
	SAMPLE NO: C-2 CV-1	1896 3 <u>(736</u> '	- 746'	<u>) .</u>		C.1	2.S. SAI	MPLE NO.	. 15	6
	TABLE 1. Float-Sink Analyses on 1/4" x 0									
	Property									
	Fraction	Wt.%	Ash%	RM%	VM%.	FC%	S.%	FSI		
	- 1.45	50.18	5.87	i 	28.10	65.09	0.38	8		
\bigcirc	1.45-1.55	6.80	16.87		24.66	57.53	0.45	6		
	+ 1.55	43.02	77.13					<u>}</u>		
	TOTAL	100.00	37.27	•						
	Remarks:									
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	· ·									
									•	
C.	4.5. form 34				CYCL	ONE ENGI	NEERING	; SALES	LTD.	
\bigcirc	Per: Pfl/l.									
RSS	RSS:hg K.S. Sengal, r. Jing., Laboratory Manager.									
\bigcirc	EOREHOLE SAMPLES:		REPORT C	OF ANALYSES ON RAW MATERIAL						
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	CLIENT: RIO TINE PROJECT: CLIENT SAMPLE NO.	Canadian Expl Limited C-21897 CV-3 (746'	- 757')	DATE: Sept. 29, 1971. C.E.S. PROJECT NO.: S1-71 C.E.S. SAMPLE NO.: 157						
	ANALYSES ON AIR DI	RY BASIS:		······						
	ASII:	•	35.25%							
	VOLATI	LLE MATTER:	20.80%	-						
	RESID	JAL MOISTURE:	0.92%							
	FIXED	CARBON:	43.03%							
\bigcirc	FREE S	WELLING INDEX:	4							
)	в.т.ч.	/łb.:	11,760							
	SULPHL	IR:	0.51%							
	KANK :		mvb							
т <u>е. <i>Олу</i> и</u> сатіон: <i>1</i> <i>24.</i> DTH:	<u>+ p8 + 72</u> <u>5 Jul Ciplin</u> <u>2 + - 3</u> <u>1 25 2</u> <u>Diplin</u>		CYCLONE	E ENCINEERING SALES LTD.						
กเล	CANFX	C 21897	Per: /* R. Lab	S. Schgal, P/Eng.						

746-757

BORIHOLE SAMPLES	REPORT OF ANAL	YSES ON FLOAT-SINK MATERIAL
CLIENT: Rio Tinto Canadian	Exploration Limited	DATE: Sept. 29, 1971.
PROJECT:	•	C.E.S. PROJECT NO. S1-71
SAMPLE NO: C-21897 CV-3 (746' -	757')	C.E.S. SAMPLE NO. 157

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property	[]							
Fraction	Wt.%	Ash%	RM%	VM%	FC%	s.%	FSI	
- 1.45	48.25	8.58		27.13	63.37	0.56	8	
1.45-1.55	12.13	18.32		24.79	55.97	0.79	5	
+ 1.55	39.62	73.21					-1/2	
TOTAL	100.00	35.37						

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Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, 2. Eng., Laboratory Manager.

RSS:hg

PORFHOLE S	SAMPLES:
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REPORT OF ANALYSES ON RAW MATERIAL

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	CLIENT: Rio t PROJECT: CLIENT SAMPLE	into Canadian Expl Limited NO.: C-21898 CV-4 (22' -	oration 28')	DATE: C.E.S. C.E.S.	Sept. 29, 1971. PROJECT NO.: SI-71 SAMPLE NO.: 158
	ANALYSES ON AL	R DRY BASIS:			
	ASI	n:	.14.13%		
	toy	LATILE MATTER:	30.72%		
	RES	SIDUAL MOISTURE:	1.33%		
	FI)	(ED CARBON:	53.82%		
\bigcirc	TRI	E SWELLING INDEX:	31/2		
	B.J	r.u./1b.:	9,450		
	SUL	PHUR: ,	0.52%		
	KAN	IK :	hvCb		•
DATE: (7	: 30th 17/		•		
WIDTH:					
i) lun I	<u>.</u>		CYCLONE	ENGI NEE	RING SALES LTD.
	CANEX	C 21898	Per:	S. Sehga	$\frac{1}{1, P. Eng.}$ Majager.

BOREBOLE SAMPLES

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REPORT OF ANALYSES ON FLOAT-SINK MATERIAL

CLIENT: Ric	Tinto Canadian Exploration Limited	DATE: Sept. 29, 1971.	
PROJECT:		C.E.S. PROJECT NO. S1-71	
SAMPLE NO:	C-21898	C.E.S. SAMPLE NO. 158	

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property	1							
Fraction	Wt.%	Ash%	RM%	VM%	FC%	5.%	FSI	
- 1.45	84.20	2.77		34.86	61.04	0.52	4	
1.45-1.55	2.97	12.75		29.10	56.82	0.68	3	
+ 1.55	12.83	82.72					N.A.	
TOTAL	100.00	13.32						

Remarks:

C.E.S. Form 34

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CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, P. Eng., Laboratory Manager.

RSS:hg

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REPORT OF ANALYSES ON RAW MATERIAL

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	CLIENT: Ric	Tinto Canadian Exp Limited	loration	DATE: Sept. 29, 1971.
	PROJECT:			C.E.S. PROJECT NO.:
	CLIENT SAMPLE	.NO.: C-21899 CV-4 (85'-	96').	C.E.S. SAMPLE NO.: 159
	ANALYSES ON A	FR DRY BASTS		
		<0.	10 209	
			19.29%	
	V	JLATILE MATTER:	30.83%	·
	R	ESIDUAL MOISTURE:	1.30%	
	F	EXED CARBON:	48.58%	·
$ \bigcirc $	FI	WE SWELLING INDEX:	412	
	В	.T.U./1b.:	11,660	
	รเ	Л.PHUR:	0 38%	
	RA	NK:	1 11	
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<u>D)</u>			CYCLONE	ENGINEERING SALES LTD.
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	····	L	Per:	Hun.
RIOC	ANEX	C 21899	RJ S Labo	5. Sehgal, P. Eng. pratory Magager.
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BOREHOLE SAMPLESREPORT OF ANALYSES ON FLOAT-SINK MATERIALCLIENT: Rio Tinto Canadian Exploration LimitedDATE: Sept. 29, 1971.PROJECT:C.E.S. PROJECT NO. S1-71SAMPLE NO: C-21899
CV-4 (85' - 96')C.E.S. SAMPLE NO. 159

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property			•					
Fraction	Wc.%	Ash%	RM%	VM%	FC%	S.%	FSI	
- 1.45	75,02	4.11		35.03	59,56	0.37	6 ¹ 3	
1.45-1.55	3.65	17.60		28.74	52.36	0.44	2 ¹ ;	
+ 1.55	21.33	71.17					10	
TOTAL	100.00	18.91						

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, P. ing., Laboratory Manager.

RSS:hg

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\bigcirc	BOREHOLE SAMPLES:		REPORT OF	- ANALYS	es on raw material
	CLLENT: RIO TI	nto Canadian Expl	loration Lto	i date:	October 5, 1971
	PROJECT:			C.E.S.	PROJECT NO.: S1 - 71
	CLIENT SAMPLE NO.	: C-21900 CV-4 (272' -	276 ')	C.E.S.	SAMPLE NO.: 160
	ANALYSES ON AIR D	RY BASIS:			
	ASH:		13.36%		
	VOLAT	ILE MATTER:	29.70%		
	RESID	UAL MOISTURE:	1.29%		
	FIXED	CARBON:	55.65%		
\bigcirc	FREE	SWELLING INDEX:	512		
\bigcirc	B.T.U	./lb.:	12,070		
	Sulph	UR:	2.73%		
	RANK :		lvAb }:		
	at 30 ²¹⁷				
X.H C. ;	· · · · · · · · · · · · · · · · · · ·				
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<u>-0</u>	<u></u>		CYCLONE	enci nei	ERING SALES LTD.
	······		Per:	S. Scho	1. P. Eng.
RIO	CANEX	C 21900	Labo	oratory	Manager.

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BOLIENOLE SAMPLESREPORT OF ANALYSES ON FLOAT-SINK MATERIALCLIUNT:Rio Tinto Canadian Exploration Ltd. DATE:October 5, 1971PROJECT:C.E.S. PROJECT NO. S1 - 71SAMPLE NO:C-21900 , CV-4 (272' - 276')C.E.S. SAMPLE NO. 160

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property Fraction	Wc.%	Ash%	RM%	VM%	FC%	S.%	FSI	
- 1.45	82.22	2.38		34.80	61.53	0.86	7	
1.45-1.55	2.71	19.49		27.97	51.25	1.15	2½	
+ 1.55	15.07	72.31				13.05	n.a.	
TOTAL	100.00	13.38				2.70		

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

RSS:hg

Per:

R.S. Schgal, P. Eng., Laboratory Manager.

\bigcirc	POREHOLE SAM	PLES:	REPORT OF	ANALYSES ON RAW MATERIAL
	CLIENT: Ric PROJECT: CLIENT SAMPLE	! D Tinto Canadian Explo Limited E NO.: C-21901 CV-4 (518' -	oration 526')	DATE: Sept. 29, 1971. C.E.S. PROJECT NO.: S1-71 C.E.S. SAMPLE NO.: 161
	ANALYSES ON A	AIR DRY BASIS:		
		NSII:	16.11%	
	1	OLATILE MATTER:	28.25%	
]	ESIDUAL MOISTURE:	1.03%	
	J	TXED CARBON:	54.61%	
\bigcirc	E E E E E E E E E E E E E E E E E E E	TREE SWELLING INDEX:	6½	
	l I	1.T.U./tb.:	12,190	
	S	ULPHUR:	0.51%	
	R	ANK:	hvAb	
ATE: <u>(24)</u> DCATION: <u>12</u> N.H. <u>C</u> IDTH: <u>5</u> MARKS: <u>5</u>	31 = 27/ wint Office 2. 0 4 5- 5.26			
30111			CYCLONE Per: R . S	ENGINEERING SALES LTD.
RIOC	CANEX	C 21901	Labo	ratory Manager.

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PROJECT: C.E.S. PROJECT NO. S SAMPLE NO: C-21901 CV-4 (518' - 526')											
TABLE 1. Floa	t-Sink A	nalyses	on 1/4	4"x0	-						
Property Fraction	Wt.%	Ash%	RM%	VM%	FC%	S.%	FSI				
- 1.45	78.63	3.49		32.63	62.85	0.58	7½				
1.45-1.55	4.08	15.16		26.49	57.32	0.49	5				
+ 1.55	17.29	72.38					1.				
TOTAL	100.00	15.53	*	 				•			
Remarks:		-						-			

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Schgal, / Eng., Laboratory Mapager.

RSS:hg

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BOREHOLE SAMPLES: REPORT OF ANALYSES ON RAW MATERIAL ŕ CLIENT: DATE: Sept. 29, 1971. Rio Tinto Canadian Exploration Limited C.E.S. PROJECT NO .: PROJECT: S1-71 CLIENT SAMPLE NO .: C-21902 C.E.S. SAMPLE NO.: 162 CV-4 (617' - 621') ANALYSES ON AIR DRY BASIS: ASH: 7.08% VOLATILE MATTER: 31.41% **RESIDUAL MOISTURE:** 1.00% FIXED CARBON: 60.51% FREE SWELLING INDEX: 8 B.T.U./16.: 13,000 SULPHUR: 0.60% RANK: hvAb 30 H ATE: EMARKS: CYCLONE ENGINEERING SALES LTD.

C 21902

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RIOCANEX

Per: R.

R. S. Schgal, 44 Eng. Laboratory Manager. BOREHOLE SAMPLESREPORT OF ANALYSES ON FLOAT-SINK MATERIALCLIENT: Rio Tinto Canadian Exploration LimitedDATE: Sept. 29, 1971.PROJECT:C.E.S. PROJECT NO. S1-71SAMPLE NO: C-21902
CV-4 (617' - 621')C.E.S. SAMPLE NO. 162

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property Fraction	WE.Z	Ash%	RM%	VM%	FC%	s.%	FSI	
- 1.45	93.47	3.56		32.81	62.63	0.59	8 <u>1</u> 2	
1.45-1.55	2.21	22.96		24.67	51.37	0.68	4	
+ 1.55	4.32	64.02					1	
TOTAL	100.00	6.60						

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

Per:

R.S. Sehgal, P. Ang., Laboratory Manager.

RSS:hg

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REPORT OF ANALYSES ON RAW MATERIAL

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	CLIENT: RÍO PROJECT: CLIENT SAMPLE	Tinto Canadian Expl Limited NO.: C-21903 CV-4 (714' -	loration 1 724')	DATE: C.E.S. C.E.S.	Sept. 29, 1971. PROJECT NO.: S1-71 SAMPLE NO.: 163
	ANALYSES ON A	IR DRY BASIS:			
	· A8	50:	19.81%	·	
	vo	LATILE MATTER:	28.02%		
	RE	SIDUAL MOISTURE:	0.93%		
	FI	XED CARBON:	51.24%		-
\bigcirc	FR	EE SWELLING INDEX:	7		
	В.	T.U./1b.:	11,730		
	ទប	LPHUR:	0.49%		
	RA	NK:	hvAb		
DATE: <u>Clud</u> LOCATION: <u>L</u>	<u>. 31^{8!} 17/</u> meant Ophin				
WIDTH:/ REMARKS:7.4-5	<u>e</u> 1. – 734		•		•
<u>.1. J</u> ices N	<u>_}//4</u>	-	CYCLONE	ENCINEE	RING SALES LTD.
		· ·	$- P_{er: \prod_{R}}$	S. Schuz	I. P. Eng.
RIOC	CANEX	C 21903	Lab	oratory	Manager.

BOREHOLE SAMPLESREPORT OF ANALYSES ON FLOAT-SINK MATERIALCLIENT: Rio Tinto Canadian Exploration LimitedDATE: Sept. 29, 1971.PROJECT:C.E.S. PROJECT NO. S1-71SAMPLE NO: C-21903
CV-4 (714' - 724')C.E.S. SAMPLE NO. 163

TABLE 1. Float-Sink Analyses on 1/4" x 0

Property Fraction	Wt.%	Ash%	RM%	VM%	FC%	s.%	FSI	
- 1.45	60.20	6 20		32 78	60.09	0.50	<u>8]-</u>	
1.45-1.55	09.20	0.20		52.70	00.05	0.50		
+ 1 55	9.26	20.65		17.21	61.21	0.53		
(1.55 	21.46	59.89					1	
TOTAL	100.00	19.06						

Remarks:

C.E.S. Form 34

CYCLONE ENGINEERING SALES LTD.

R.S. Schgal, E./ Eng., Laboratory Manager.

RSS:hg

Per:



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Expiry Date: Mar. 3, 1972

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RIC TINTO CANADIAN EXPLORATION LTD	
RIO TINTO CANADIAN EXPLORATION LTD. VINCENT OPTION - ELK VALLEY - B.C LOCATION MAP	
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IOIST NSTR OOL RUN NO 1		UCA 1 NT T IAL * FR(70	NO RUCH N NO GENE DEPT DM O	0 RAL HS TO 77	1	SP FT	εεD /ΜΙΝ .1	C(T C - SE(5	SN27	'U4(Sε Sε τ 1 10	NS TINGS	7 [G	.OGGł AMMA ZEI DIV L OIV L	NG DI RAY OR F		PER PER 9 C	R UNIT	S T 7 SE 3	C. SE 1 J	ENS	7.00 NE CS 0	0 × 10 ⁶ N UTRON ZERO DIV. L OR R 1L	APIN. UNITS PER LOG DIV. 50 CPS
IDIST NSTR OOL RUN NO 1 2		UCA I NI T IAL ⁶ FR(70)	NO RUCH N NO GENE DEPT DM 0 0	0 RAL HS TO 77 74	1 8	SP FT	εεD /MIN .1 .1	C(r c · sec 5 5		204 (SE SE T 1 10 10	NS TINGS		.0GGł AMMA ZER DIV L OI OI OI	NG D RAY RO OR F		PENG PIG PER 9 C	rh R UNIT LOG DIV PS PS	S T 2 SE 3 3	C SE 1	ENS TIN 1000	7.00 NE CS 0 0	0 × 10 ⁶ N UTRON ZERO DIV. L OR R 1L 1L	APIN. UNITS PER LOG DIV. 50 CPS 60 CPS
IOIST NSTR OOL RUN NO 1 2		INT T IAL * FR(70	NO RUCH N NO GENE OEPT DM O O	0 RAL HS TO 77 74	1.8	SP FT 1	EED /MIN .1 .1	C(SN27	2040 SE SETT 10 10	NS 71NGS 100	7 G	.0GGł AMMA ZEI DIV L OI OI OI	NG DA		PER PER 9 C	R UNIT LOG DIV PS	S T / SE 3 3	C SET	ENS TIN 1000	7.00 NE GS 0 0	0 × 10 ⁶ N UTRON ZERO DIV. L OR R IL (11)	APIN. UNITS PER LOG DIV. 50 CPS 60 CPS
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Shaly Coal to Cooly Shi 3H: st. carb. - Few coal Frag. st. stry sitst, ss iii; m. to make gy, hd. sit to v. f. gr. ss Fan P/4 55: m.gy. sil. ha. Few sitst ptals. × a = w311: m.gy. mod. hd. sdy F x ø ٠, 54/55 m.gy mod. hd some calcite reinlets ____/..... % 1 /a /w 55, "*"* ,." ×/ . . . /. 55 1stist : no to mille gy. hd. slt. to v. f. gr. 35: m.gy. v. st. arg. mod. hd. to hd. sil. some cale. reinlets a on infilling. Decomes coarser or towards base of unit. f f  $\omega$ 9 F-m 9  $\omega$ ٠. uf-P a m . .  $\mathcal{m}$ 9  $\omega$ . · · · · · · m-c a m-u *m*-c A X m.a . . . . . . · · · · · m-c a m-w х ¢ SH: m.gy. hd. st. sty in part, mod. hd to hd. blocky, corb. in part 1. st. micro-mico in part æ 7. · · · · · · · · · · · · · · · SHI 55. m. dt. gy, stt. to sdy, blocky bd. •/{ æ ..... SH: m. de, gy, blocky carb in part. */4 e 351 SH : As for 655'-660' sti m.gy. to de, gy. sty in part carb in part mod. hd. NP.A a m-u */ş 55 154:1.1. 55: m. gy, sil, sl. ang. bd. tr. calcite '/ę SH: m. gy. to m. dt. gy. sty to sdy in part hat. st.t. a min ×/e SH: m. to m dt. gy. sl. carb. in part 4. sl. sdy mod. hd. e feu coal ptols nr. bese of unit ę coal : st. arg. for top + ft. m to hi sch. Hostly alaro - vitrain = 20% vitrain, some come in come structure, low ash Last 9ft. med. ash underela Total Depth . 198'





			<u>.</u>				DRILL & CORE LOG		
PR	OP	ER	Y: Vince	nt (	5 eC	i ôn,	Elk Valley, B.C HOLE NO.	$C_{22} = 4$	
			N: 2.500	<u> </u>		.900	'S of NW corner, Lot 8490 (C.L.584)		
- <u>72</u>	TAI		DEPTH: or:	<u>^ .</u>			ELEVATION: 6,310 (approx.) DIP:	· · · · · · · · · · · · · · · · · · ·	
но	LE		51ZE: 4	7/8	1	<u> </u>	CORE SIZE:	<u>.</u>	
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DA	ΤE	c	OMPLETED:	Auc	<u>jus</u> :	<u>t 31</u>	1071 LOGGED BYLM, Sullingham DATE Page	<u>(61_78-01_1</u>	971
CO	NT	RAG	TOR: Dig	lne	liar	<u>n</u> Dz	illing PROBED BY Joko Gil EnterprisDATE Duce	ust 31, 107)	
							Vincent Option. R. C. HART BRILLEH BRILLEH COLUMBER		
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FORMATIO	a 3 0	PORCS -	Li TH O	GRAIN or SIZE 7	ROUND	SORTI	DESCRIPTION	ANALYSIS	ENGINE
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		۲				ļ	m. sort. sil. sl. arg. hd.		
		۲		-			SH: m.gy. st. stty in part, med. hd.		
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		<b> </b> _		\$1+44			sdy, st. carb.		
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							Finely good. sit. to bright. claro	•	1
							coal Houson: ritrain . Nostly low ash.		
	اميد	×		J.F	<u> </u>	<b>†</b>			⁻
		•		<u>*</u>	6	P	55: 10.971 SII. NA. Same cale veinlets		
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د السلم الم			Ì		Ì
				coal clean, clare vitrain ~ 20% vitrain low ash	
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	4				
				SH: m. de. to de. gy. platy mad. Ad.	
	-			st. corb. in part, coaly sh ptels in part	
	-				
f#0' e	- I.			402'- 404'- sh / coal a 30% coal	
	-				
	16.6			in the man accurache same oil from he	,
			ľ	33 M. 20.99. 29. 94 - 4. , 200 - 4. 1 9	
	4	Į		coal : dut to bri, claro-minain, sts, fer coal	
	-			sh , ptels , med. ash.	
	<i>↓₽</i> -₽	-	~	SH: de gy, carb. to coaly brach that, f. god.	
e	<b>.</b>			SS: m. dk. gy. arg. groy wacke, Nd.	
		•	P	SN: m. de. gy v. st. sthy in part, mod. ha	ľ.
	4	1		coaly from \$35'- \$36'	
4.90'	4			35: m. gy. st. ang. mod. hd. sit cont the ale.	
	•	<u>م</u>	_		
*	-   · · · · /	-	ļ~		1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	· · · ·			coal Horizon: dull to vit high ash care. to coaly sh tog.	
	- 1	9	2	SN 155;	1.
	<u>'</u>			Ser. p. a. gy. stry in part poor at	
e			ļ –	55 : m. du. gy. SI' MOR. N. T. CAR. VEIMIETE.	1
				SN: m. de, to de, gy, tr. sty in part	i
	7	l		carb. to cook in part.	1
	-	1		400- 488' sh/coal de, gy, bon, tint; 20 - 00 %	
500 4		1	1	cont atels.	1

	x		\$# \$.F.		~	35: m. de, gy. st. to. e. f. gr. mad, sort all the rained
	Ľ					sell on gy. say to v. say ist cak, appro, amounte
						coal Horizon with to brin shearing , cleaner , low and
	æ					ten ocaly sh ptels at bose
	×		* f. p	•	m	55: m.gy. sil. hd. tr. cak.
						543' sh db, 97, carb. sdy.
	150'		1.F.m	-		
			v.F-m	1	p.	
	× *				:	all a cash h coath few and free the
	i i					wd. struct. to part, say sh.
			afif afif	•	-	SN: de, gy, brn. tint, few coal frog. corb. to coaly
	e		]			35: m. dl., gy, arg. sil. cmt. some cakite
	se e					54: m. d. gr, corb. in part
			1.			coal: clean, with to bri clara-aitrain, cooly shi frag. high ash
	e				 	SH i m. dk, gy, and in part, med. hd. tr. cak.
						Coal Horizon: vit to bri, claro - atrain, sta, 20% atrain, low ash
	e					sti: m. db. ax. bro. tint in part carb. in
			]			part sl. sity to soly. tr. colc. veinlets.
			] <i>``</i> ^`	~	1	SS: m. db, gy, arg. in part, sil. cont. hd.
	10					SN: m. dk, gy, mod. hd. tr. calcite
	e					veinlets sl. carb. in part.
			s/+ - F	-	P	Stit to SS: m. de. gy, str. to f. gr. st. hd. calc. rein lets.
	a a					. SH: m. de. to de. gy. carb. in part, play
						st. sity in part.
	· •/1		•		Í .	SH 1 55: SH - AA 55 - M. 97 Sil. hd. cat. reinlets
						690'- 695' - Minor pyr.
	700					55/54 55-AR TH - M. dl., 97, 5dy, 51. 5006.
						SH - M- m db. gy, carb. to costy sts. mod Ad.
					[	Coal Horizon: sh, ptcls, bon, tint. Possibly same cante-
	e	·			;	SH: m. dk, to dk, ny, st. sthy in part,
						blocky mod. hd. carb. to coaly in part
						735'- 140' 20 % 55 from m H. my. 1. f. f. sil.
	70 E					hd. a med. sort.
s. •						795'- 750" 15% coal frag.
			-			755'-760' - feu cool ptcls.
			<u> </u>			795'-802' . 50% 35 m 97 quartzike, sil. hd.
			-			a, v.f-f gr. mod. sort cale reads
	,					
		, .	]			
	1001	/:	<u>-</u>			
			-			Total Double enal

