K- SAGE CREEK 73(1)A

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N.T.S.: 82-G-2

SAGE CREEK COAL
FLATHEAD VALLEY, B.C.
REPORT ON EXPLORATION
JANUARY TO APRIL 1973

May, 1973
Toronto, Ontario

R. C. Hart
O. Cullingham

00362 (1)

N.T.S.: 82-G-2
SAGE CREEK COAL
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SUMMARY

A drilling programme, consisting of 6,374 feet of reverse circulation rotary drilling in 9 holes, was carried out to better evaluate the potential of the east end of South Hill as a viable mining concern and to gain greater control for calculating reserves. The programme proved successful in fulfilling these objectives and bore out previous geological interpretation fairly well.

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INTRODUCTION

Previous examination of the geology on the east end of South Hill was confined to surface mapping, some trenching along road exposures, and five drill holes drilled during the winter of 1970/1971. Information available from three holes drilled by Stelco during the fall of 1968 and summer of 1969 is sketchy and the lack of geophysical logs makes the use of this information unreliable.

Testing and analysis of coal taken from the North Hill indicates a favourable coking coal, however, reserves were depleted because of the low yield of Seam 5. To augment reserves, a ten hole drilling programme was proposed for South Hill. The drilling commenced February 2 and was concluded April 10, 1973 with the completion of the ninth hole. Due to the slow progress of the programme and the beginning of 'spring breakup' conditions the drilling was concluded prematurely.

The drilling contract was awarded to McAuley Drilling Company Ltd. of Edmonton, Alberta who used a 1970 Failing Model 1250 HD air-water drill with double wall drill pipe. In addition McAuley Drilling supplied a trailer camp and board. McMeekin Construction Ltd. of Rocky Mountain House, Alberta supplied one D-8 Cat used for the construction of access roads and leases and for snowplowing when necessary. It was also required to assist with rig moves. Roke Oil Enterprises Ltd. of Calgary carried out all downhole geophysical logging.

DRILLING PROGRAMME - JANUARY TO APRIL 1973

The programme got underway January 23, with commencement of snowplowing and road and lease construction. The camp was moved in by the end of the month and drilling began February 2. Lease preparation of the 10 proposed drill locations was completed toward the end of February with three additional drill locations being constructed during early March. Because of

slow progress only nine of the holes were completed before a shut down on April 10 was necessitated by deteriorating road conditions. (For location of drill holes 21 to 29 inclusive, see Surface Geology Map of South Hill attached to this report) All drill sites have been surveyed by compass and chain only.

Drill Hole SCC No. 21 intersects what appears to be a normal stratigraphical section for the most part, however, Seam 2 was not intersected. This can be explained either by (a) depositional thickening of the strata between Seam 4 and Seam 2 or (b) the existence of a normal fault displacing Seam 2 downwards to the west. If (b) is the case, a fault could have been intersected at approximately 140' below surface. Total depth is 595 feet..

Drill Hole SCC No. 22 intersects what appears to be a normal section to approximately 328 feet below surface where a normal fault was intersected, displacing approximately 160 to 190 feet of section downwards to the west. From 328 feet to the total depth of 705 feet, a normal section was encountered.

Drill Hole SCC No. 23 intersects what appears to be a normal section. Total depth is 478 feet.

Drill Hole SCC No. 24 intersects what appears to be a normal section. There appears to be a depositional thinning between Seam 4 and Seam 2. Total depth is 672 feet.

Drill Hole SCC No. 25 intersects the Tertiary Kishenehn Formation from surface to 145 feet below surface. Below the Kishenehn Formation, the Basal Blairmore Conglomerate was penetrated for approximately 140 feet. This is an abnormally thick sequence of conglomerate which could be explained by gravity sliding depositing blocks of conglomerate one upon the other. The strata below the conglomerate appears as a normal section. The total depth reached was 927 feet below the surface, however, the hole had to be abandoned before penetrating Seam 5, because of bad downhole conditions. Caving prevented the drillers from regaining the bottom of the hole after tripping for a bit and the hole was logged to a depth of 842 feet.

Drill Hole SCC No. 26 intersects what appears to be a normal section to Seam 5. Seam 5 has greatly increased in thickness and it is believed to be depositionally controlled rather than tectonic. The seam deteriorates downward to very shaly coal and coaly shale which could be due to the proximity of a channel which periodically overflowed its banks depositing silt and mud over the developing swamp. The total depth of the hole is 870 ft.

Drill Hole SCC No 27 intersects what appears to be a normal section although a thickening between Seam 4 and Seam 2 does occur. The total depth of the hole is 705 feet.

Drill Hole SCC No. 28 intersects the Tertiary, Kishenehn Formation from surface to 325 feet below surface. At approximately 550 feet below surface a fault is intersected with an apparent displacement of 220 feet to 280 feet downwards to the west. Between 325 feet and 550 feet. Correlation is difficult however, it is believed to be a fairly normal section of Upper Kootenay strata. Although Seam 2 is not positively identified, a trace of coal was intersected at approximately 380 to 385 feet below the surface which would seem to fit the normal sequence of deposition. Below 550 feet, correlation is better and there appears to be a normal section of the lowermost beds of the Kootenay. Seam 5 has thinned and become very shaly. An alternate possibility is the strata above the fault is uppermost Kootenay lying in the section above Seam 2 and that the fault displaces approximately 400 feet. The total depth of the hole is 754 feet.

Drill Hole SCC No. 29 intersects what appears to be a normal section of upper Kootenay strata. A fault is intersected at approximately 420 feet below the surface displacing about 80 feet of section downwards to the west. Below the fault is a normal section of lower Kootenay strata. The total depth of the hole is 668 feet.

GEOLOGY

Previous geological interpretation was borne out fairly well, however, two additional normal faults have been introduced and the trends of previous interpreted faults have been altered slightly. (See Surface Geology Map of South Hill accompanying report.) The east part of South Hill is geologically divided into several fault blocks each upthrown to the east relative to the other. This has the effect of returning the coal bearing strata closer to the surface, thus increasing reserves and decreasing the waste to coal ratio. However, if as suspected, the coal is adversely affected by proximity to fault zones, a slightly lower yield will result.

Five sections across the east part of South Hill have been constructed utilizing the data derived from the recent drilling. (See sections included in report.) Lithology descriptions of the drill holes and geophysical logs have also been attached to this report.

COAL

Seams 2 and 4 are similar in appearance to those seams on North Hill and will presumably have similar characteristics. The diagnostic parting between 4a and 4b on North Hill has thinned considerably and on South Hill is considered as a waste band within Seam 4, which cannot be mined out. Seam 5 generally bears marked similarities wherever intersected with the exceptions of holes 26 and 28. The seam is basically divided into two benches with shale, carbonaceous shale and coal bands separating them. The upper bench is generally reasonably clean however, a thinning trend to the south is apparent seemingly decreasing the yield of the seam. The lower bench rests on the basal sandstone member and generally appears fairly clean. The overall yield of the seam by visual observation appears low due to the high waste content separating the benches.

Four of the holes were investigated by Sidewall Density Logs and a comparative ash determination of the coal seams was attempted using information supplied from bulk samples taken from North Hill during 1972. Nine samples were sent to Coal Science and Minerals Testing Ltd. in Calgary for qualitative and petrographic analysis and to determine the accuracy of the ash determinations from the Density Logs. At the time of writing, results of the analyses have not been received.

RESERVES

The reserves calculated for South Hill are summarized in the Table below. Information gained during the recent drilling programme added to that gained during the 1971/1972 drilling programme has been used in the calculations. A factor of 22 cubic feet/long ton of coal was used to calculate the tonnage. Coal intervals were derived from drill hole probe logs and are rather liberal. Because of mining considerations, it is felt that partings of less than 5 feet in thickness must be included in the reserve calculations.

The reserves for South Hill have been calculated for an area between lines 848,060 N and 845,260 N to the north and south respectively and from the surface traces of the seams to the west down dip to the east to a basement level of 4,000 feet above sea level. The sections listed in the table below are considered to have a zone of influence of 600, 800, 600, 400 and

400 feet in a north-south direction respective to the order in which they are listed. The total reserves calculated for this block are 64,291,366 tons.

Section	Seam 2	Seam 4	Seam 5	Total Seam 2, 4, 5
845,460N	1,717,877	6,467,601	3,775,883	11,961,361
846,260N	1,305,983	11,326,974	6,710,188	19,343,145
847,060N	1,067,688	10,606,012	4,519,888	16,193,588
847,460N	669,091	5,146,909	3,020,545	8,836,545
847,860N	657,636	4,309,091	2,990,000	7,956,727
TOTAL	5,418,275	37,856,587	21,016,504	64,291,366
	8.4%	59.0%	32.6%	100.0%

CONCLUSIONS AND RECOMMENDATIONS

Investigations to date at Sage Creek Coal have rendered enough information to determine the reserve potential of the greater part of North Hill and the east side of South Hill. Additional drilling is required to the north on North Hill and to the south and west on South Hill to determine (a) the reserve potential underlying those areas and (b) the pit boundaries in those directions.

An indication as to quality, has been determined from bulk samples taken from Seams 2, 4 and 5 on the south face of North Hill. Although the quality is not expected to show any marked differences, additional bulk sampling on the north slopes of both North and South Hills should be undertaken to better evaluate the coal.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA R. C. HART Expiry Date: May 31, 1974

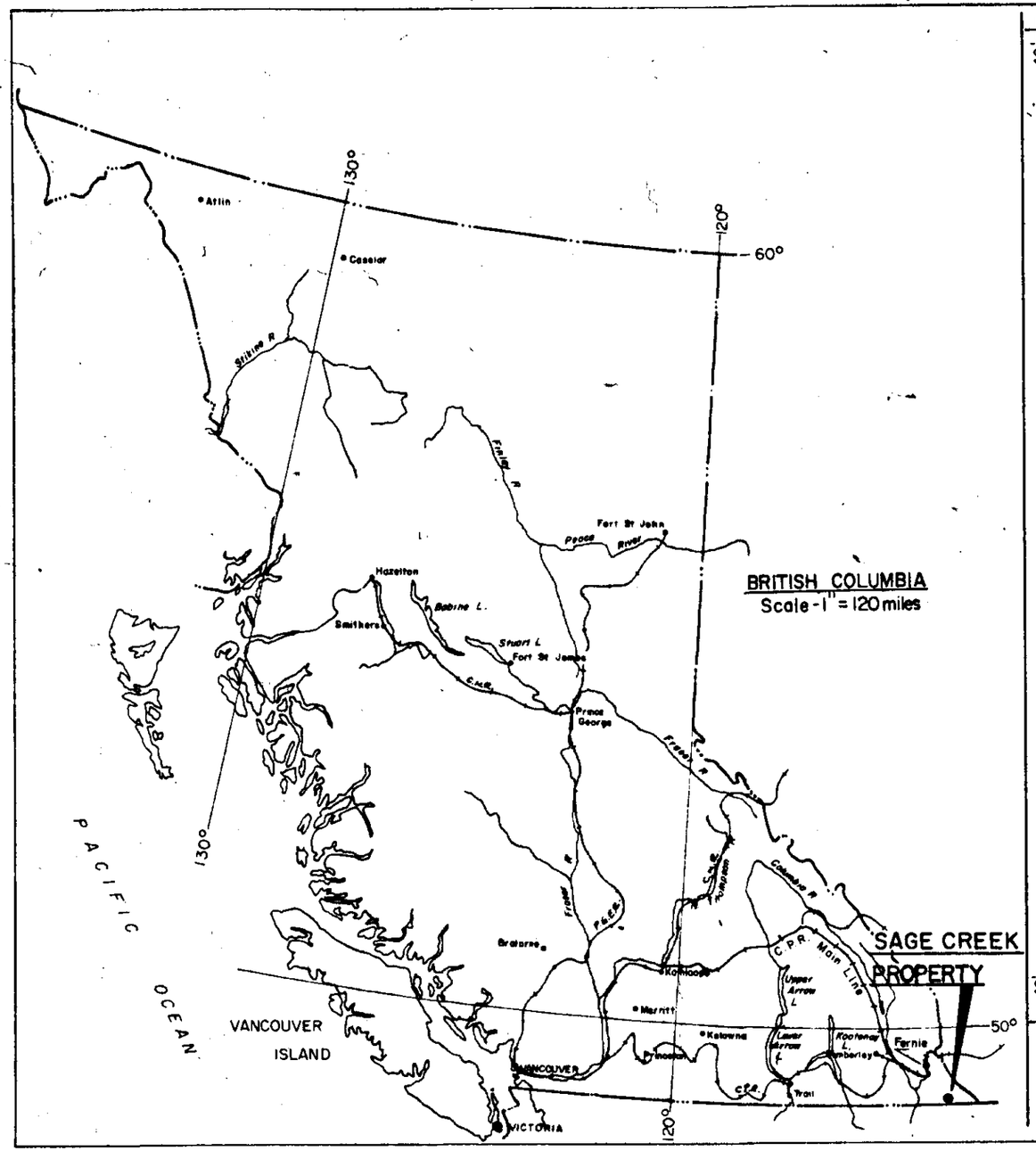
R. C. Hart, Exploration Manager

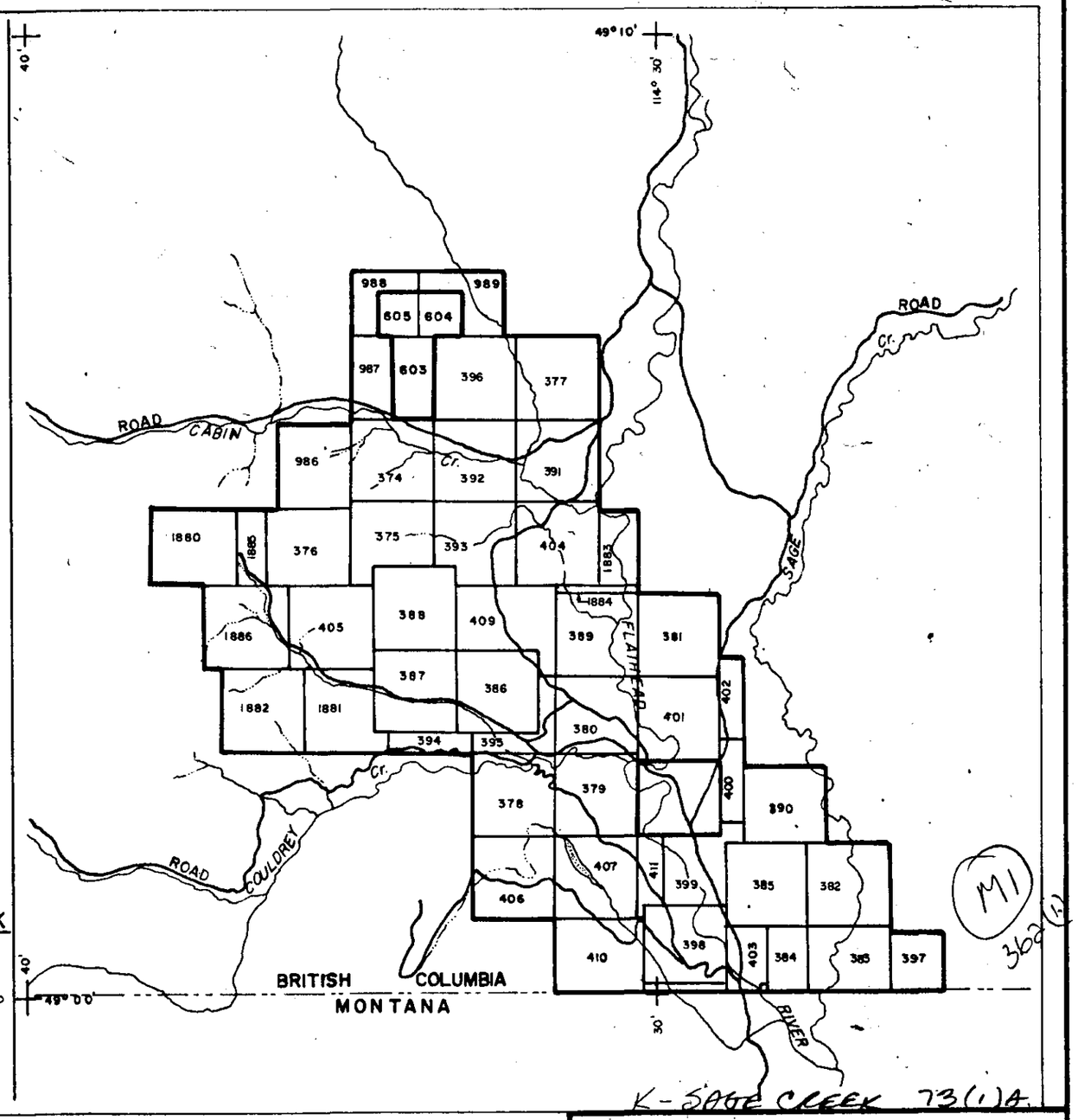
O. Cullingham, Geologist

May, 1973
Toronto, Ontario

REFERENCES

Hennessey, W. J.; Correspondence and verbal communications February - April 1973





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Note: All licenses have prefix C.L.

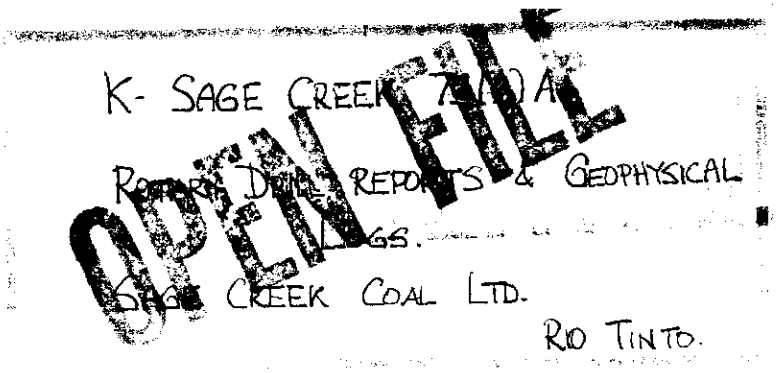
0 1 2 3 4 Miles
1:100,000

RIO TINTO CANADIAN EXPLORATION LTD.

SAGE CREEK COAL LIMITED —— B. C.

LOCATION MAP

MAY 1971 | R.A.B. / k.h. | DWG L-2559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RIO TINTO.
OPEN FILE

00362 (3)

RIO TINTO CANADIAN EXPLORATION LIMITED

ROTARY DRILL RECORD

362

Hole No: S.C.C. 21 Property: Sage Creek Coal

Location: South Hill
17,847,460 ft. N.
583,250 ft. E.

Elevation: 5215 ft. A.S.L.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date: Mar. 3, 1974

Date Commenced Drilling: February 2, 1973

Date Finished Drilling: February 7, 1973

Date Hole Completed: February 7, 1973

Contractor: McAuley Drilling Company Ltd., Rig 55 Hole Size: 4 3/4"

Logged by: O. Cullingham Date: February 7, 1973

Probed by: Roke Oil Enterprises Ltd. Date: February 7, 1973

Total Depth Drillers: 595

Total Depth Roke: 571

DRILL REPORT

1 WM 6 1/4" Bit 10' -
10' Surface Casing left in hole

3 WM 4 3/4" Bits 585'
Total footage 595 ft.
Total Standby Time of logging 8 hours
other Standby Time 1 hour
Total Standby time after 1 free hour 8 hours
Moving between leases after 1 free hr.

PROBE REPORT

570 - 0 Gamma/Neutron - Open Hole
568 - 0 Sidewall Density - Open Hole
564 - 0 Caliper - Open Hole

COAL HORIZONS

Coal Horizon	Drillers Picks		Log Picks	
Horizon #4				
Seam 4a	260 - 296 -	36	262 - 297	34
Seam 4b	300 - 314	14	302 - 315	13
Seam 4c	318 - 323.8	5.8	320 - 325	5
Horizon #5				
Seam 5 (upper)	518 - 531	13	519 - 533	14
Seam 5 (lower)	537 - 549	12	540 - 552	12
	552 - 558	6	554 - 562	8

INTERVAL	UNIT THICKNESS	DESCRIPTION
0 - 60	60	Sandstone m.gy. to m.brn.gy., wthrd., some Fe stn (prbly lmn), v.f-m. gr., qtz and chert gr., grades from v.f to m. gr with depth, arg. and sil. matrix - mod. hd., a /some A gr- mod sort. 0-5' sltst m.gy., wthrd, arg., few frag. to f. gr. ss. 30-35' sltst AA.
60 - 140	80	Siltstone and shale m. gy., slty to arg., some thn. strgs. coal & carb. sh., blocky, mod. hd., some Fe stn., some frag. to v.f.gr.ss. 60-65' sh m.gy., - slty - abrupt change to sltst. below 65.5-65.6' coal strng. (drillers log) 70.1 - 70.2' Coal strng. (drillers log) 95-100' SS m.lt.gy., arg., v.f. to f.gr., a, 110-115' SS AA 125-140' Larger fragments-appears wthrd., Fe stn., could be broken area
140 - 175	35	Sandstone m.gy., v.f. to m.gr., arg. matrix/sil amt, mod. hd., a-A gr., p. sort., few sltst frag. 140-145 - More arg. at base of unit 164-168 - Broken rock - larger frag.
175 - 260	85	Shale m.gy., some intvls m.dk.gy, slty to sdy in part., gradational from above, blocky to fissile, mod. hd., becomes softer toward base. 195-200 sltst m.gy., arg., some v.f.gr. ss. ptcls. 205-210 sltst m.gy., arg. 250-260 shale m.brn.gy., soft, carb.
260 - 329	69	COAL HORIZON No 4 (Drillers Intervals) 260-296 Coal - Seam 4a - finely grnd. Difficult to evaluate-No apparent salting from above. Mostly clarain/ 20% vitrain - little fusain and durain. Some pyrite-more in upper part of seam. 266-268 appears dull &/higher ash? 30% ash 284-286 dull-some coaly shale fragments high ash. 294-296 dull to bright-fusain-coaly shale - high ash 296-300 shale 300-314 Coal Seam 4b - finely grnd. with a few fine fragments. Not as clean as 4a - higher coaly shale & shale content. Mostly clarain with little vitrain - some fusain. Little pyrite. No apparent contamination. 314-318 Shale

INTERVAL	UNIT THICKNESS	DESCRIPTION
		318-323.8 Coal Seam 4c - finely ground/some fine fragments-dull-clarain/fusain/shaly coal & coaly shale 20% ash. 323.8-326.4 Shale 326.4-329 Coal 326.4-327 Coal-finely grnd/some small fragments-dull to vitreous-mostly clarain-some coaly shale- 20% ash. 327-329 Coaly shale to Shaly coal-dull-high ash 50%.
329 - 385	56	Shale m.to mdk.gy., soft, carb, in part. - silty in part. unconsolidated over some intervals. Shale fragments in clay. 365.2-365.4 Coal Stringer.
385 - 475	90	Siltstone m.brn.gy., blocky-arg.-mod. hd., in part v.f.gr.ss. 390-400 - Siltstone fragments in clay. 405-425 - sandstone - m.gy.,-v.f.-f.gr., arg. matrix, slt & ppr., becoming silty towards base.
475 - 518	40	Sandstone m.gy., arg. matrix, v.f.-f.gr, p-mod. sort., a. gr., greywacke, v. sl. carb. in part.,/few coal flecks in part. 490-495 Siltstone m.gy., arg., frag. within finely grnd sh or clay-muddy. 505-510 Siltstone m.gy., arg.,/some frag. of m.dk.gy. in part carb. sh. 510-518 Shale m.dk.gy., v.sl.slty., v.sl.carb. to coaly-
518-558	40	Coal Horizon #5 518-531 Coal Seam 5 (upper bench)-finely grnd.-difficult to evaluate-mostly clarain-dull to vitreous coaly shale-mod. to high ash. 531-537 Coaly shale/shaly coal- 50% ash 537-549 Coal Seam 5 (lower bench)-finely grnd., mod. ash. - mostly clarain/some fusain & shaly coal. 537-539 - high ash-some coaly sh. 543-545 - good, clean-low ash 547-549 - appears clean-low ash 549-552 Coaly to carb. shale - soft-few coal fragments 552-558 Coal appears as fairly clean coal with low ash. Fine grnd. few coaly sh. frag. 554-556.
558 - 560	2	Coaly to carb. shale
560 - 595	35	Sandstone m.gy., f-m.gr., qtz & chert gr., a & gr., ho., sil crit., in part broken. Basal sandstone unit., mod to well sorted. some carb. material in upper 5'.
595		Total depth.

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RIO TINTO CANADIAN EXPLORATION LIMITED
ROTARY DRILL RECORD

Hole No: S.C.C. 22 — Property: Sage Creek Coal

Location: South Hill
17,847,460 N
583,700 E

Elevation: 5,150.

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — R. C. HART

Expiry Date: Mar. 3, 1974

Date Commenced Drilling: February 7, 1973

Date Finished Drilling: February 11, 1973

Date Hole Completed: February 12, 1973

Contractor: McAuley Drilling Company Ltd., Rig 55 — Hole Size: 4 3/4"

Logged by: O. Cullingham — Date: February 12, 1973.

Probed by: Roke Oil Enterprises Ltd. — Date: February 12, 1973

Total Depth Drillers: 705

Total Depth Roke: 702

DRILL REPORT

1	6 1/4" WM Bit	10'
		10' Surface Casing - pulled
3	4 3/4" WM Bits	695 ft.
		Total Footage 705 ft.
		Standby time for logging 8 hours
		Other Standby Time -------
		Total Standby Time after 1 free hr. 7 hours
		Moving to new lease after 1 free hr. -------

PROBE REPORT

701 - 0	Gamma/Neutron (Slim Hole)	Through Pipe
249 - 1	Sidewall Density	Open Hole

COAL HORIZONS

Coal Horizon	Drillers Picks		Log Picks	
Horizon No. 2				
Seam 2	191.4 - 200	8.6	191 - 200	9
Horizon No. 5				
Upper Bench	505 - 519	14	508 - 516	8
Lower Bench	523 - 547	24	532 - 547	15

Note: (1) Horizon No. 4 faulted off
(2) Log picks from Gamma/Neutron Log
(3) Lower bench of No. 5 visibly shaly

INTERVAL	UNIT THICKNESS	DESCRIPTION
0 - 26.5	26.5	Shale with thin Coal seams m.dk. to dk. gy., slty in part - carb. to coaly in part - High in the Kootenay section. 0-0.2 Thin Coal 3.6 - 4.7 Small coal seam 5.9-8.3 Coal / coaly shale 15 - 16 Shale/coaly shale 17.5-20 Coal some carb. & coaly shale 22.5-23 Coal /shaly coal & coaly shale 26-26.5 Coal/coaly shale
26.5 - 144.5	118	Sandstone m.gy.-gr. size varies from silt to m. gr., p. to mod. sorted., appears wthrd., Fe stn., qtz & chert gr. - chert gr. tend to be larger than qtz. gr., r-a gr- mod. hd. @ 35 siltstone/sandstone frags. imbedded in clay. @ 45 unconsolidated sd. gr. in clay matrix. 70-90 sandstone fragments imbedded in m.brn. clay. - Possibly broken zone. 107.4-109 Coal/Shaly coal dull to bright - fragmental - high ash.
144.5-191.4	46.9	Shale / few coal & coaly shale seams m. dk.gy. to dk. gy., - v. sl. slty in part & in part carb to coaly. 144.5-146 Coal fragmental-gd. clean, bright, clarain/vitrain, few fragments of dull shaly coal. 148.4-149.9 Coal fragmental-dull to bright/some coaly shale-few shale fragments. 170.5-171.5 Coal band 180.2-180.3 Coal stringer 190-190.5 Coal band
191.4-200	8.6	Coal Horizon NO. 2 Seam 2 finely grnd. to fragmental appears as gd. clean coal - low to mod. ash - some shaly coal fragments-mostly clarain with little vitrain-dull to bright. 194-198 - some coaly shale fragments high ash interval.
200-220	20	Shale m.gy., sl. carb. near topof unit-slty to sdy increasing downwards to arg. siltstone., mod. td.
220 - 262	42	Sandstone m.gy. - alt to m.gr.- arg. matrix, sil. cmt., p. sort., a. gr., chert & qtz. gr., some Fe stn., hd., 247-249 SS fractured or broken-strong Fe (stn (hem).

INTERVAL	UNIT THICKNESS	DESCRIPTION
262 - 300	38	Intbd. shale, siltstone and sandstone Sh - m.gy., mod.hd., at 265 v.sl.carb abrupt change from above SS to shale at 262. Sltst m.gy., arg., in part sdy., blocky. SS m.gy., v.f. to f.gr., mod. sort., a.gr., mod.hd., qtz & chert gr., arg, matrix, sil cmt.
300 - 327	27	Sandstone m.brn.gy. to buff brn., small to large fragments - appears wthrd., v.f. to m.gr., p.sort., arg. matrix., a.gr., mod.hd., fractured-some Fe stn. 323-326 siltstone m.gy.,sdy.,arg.,hd. Note Possibly a large fault at 327-abrupt change in lithology-broken sandstone
327 - 356	29	Shale and siltstone Shale m.dk.gy., sl.carb., sl.slty., soft-pwd, near top. Sltst. m.gy., arg., sdy., hd. 330-345 Sltst
356 - 383	27	Carb. to coaly shale/coal stringers & bands. dk.gy., soft,. carb in part/some coal strgs. 357-362 coal/shaly coal to coaly shale - dull-v. high ash. 364-365 coal/shaly coal-high ash-clarain pyr.flms. 376-379 Carb to coaly shale few small frags of coal 379-383 Coal fragmental-shaly-high ash.
383 - 395	12	Shale m.gy., slty., sdy. in part., mod. hd.
395 - 425	30	Siltstone m.gy., sl.arg. matrix, hd. to.v.f.gr.SS. few frag. of white cryptocrystalline dol. fizzes when powdrd.-cherty in part
425 - 460	35	Shale and siltstone m.gy., slty. to arg., blocky, mod.hd., approaches v.f.gr. arg.SS in part.
460 - 480	20	Siltstone to Sandstone m.gy., silt to v.f.gr-arg. matrix, mod.hd., some f.crystalline dol. frag (fizzed/10% HCl when grnd). Becoming harder with less matrix towards base.

3662 (3) Between Logs 2-4 11)

INTERVAL	UNIT THICKNESS	DESCRIPTION
480 - 505	25	Sandstone m.gy., m.gr., a to A gr., mod. sort., chert. & qtz. gr., hd. -becoming f.gr. at base of unit.- some secondary qtz. veining @ 500'
505 - 547	42	Coal Horizon No. 5 505-519 Coal Seam 5 (upper bench)- fragmental, dull to bright - some coaly sh. frags., moderate ash-few higher ash intvls. 519-523 Shale dk.gy., carb. to coaly. 523-547 Coal Seam 5 (lower Bench) finely grnd. to fragmental - coaly shale & shaly coal throughout - dull- high ash. dirty seam 533-535 Shale little coal - dull
547 - 570	23	Sandstone m.gy., f.gr., in part m. gr., a-r gr., mod. sort., mod.hd., qtz. & chert. 553 Sandstone lt. gy., f.gr., r.gr., well sort., hd., qtz. gr-possibly a dune sand.
570 - 640	70	Sandstone m.brn.gy., v.f.gr., arg. matrix, a-r gr., mod.sort., mod.hd.- approaching greywacke SS. 570-575 Shale m.dk.gy., soft, micromica. 625-630 Siltstone m.gy., arg., micromica, few frags. of dk.grn.gy. sh., soft.
640 - 705	65	Siltstone/intbds of shale - m.brn. gy., arg., sdy. in part., some dk. gy., micromica. sh. frags., - some intvls approaching v.f.gr.SS. 670-680 Shale& Siltstone fragments imbedded in clay. 695-700 Siltstone pa with few frags & veinlets of crystalline calcite.
705		Total Depth

ROKE

SIDEWALL DENSILOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.
LSD
SEC
TWP
RGE
W ___ M

COMPANY SAGE CREEK COAL CO. LTD.

WELL SCC 21

LOCATION SOUTH HILL

FIELD FLATHEAD VALLEY

PROVINCE BRITISH COLUMBIA

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA R. C. HOPE

Elev. Saved Dec. 3, 1974 GRN

Permanent Datum GROUND LEVEL Elev. K.B.
Log Measured from GROUND LEVEL Ft. Above Perm. Datum CSG
Well Depths Measured from G.L.

Run. No.	ONE
Date	7 FEBRUARY 73
First Reading	568
Last Reading	0
Footage Logged	568
Depth Reached	571
Depth Driller	595
Casing Rake	
Casing Driller	
Fluid Type	AIR/WATER
Liquid Level	
Bit Size	4 3/4
Rm. @ °F	
Operating Time	3 1/2 HOURS
Truck No.	30

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Recorded By SUNDERLAND Witnessed By CULLINGHAM

LOGGING DATA

RUN NO.	DEPTH FROM	DEPTH TO	SPEED FT/MIN	T.C. SEC.	SENS SETTINGS	CPS/DIV. DIV.	ZERO LOG R
1	10	568	8	3	1000		

REMARKS LOGGED OPEN HOLE CALIPER SPEED - 20 FT/MIN
NOTES: DENSITY IS RECORDED 4.0 FT LOW

DENSITY

CPS

BULK DENSITY (GRAMS/CC)

2.70
2.60
2.50
2.40
2.30
2.20
2.10
2.00
1.90
1.80
1.70
1.80

DEPTHS

000 100 200 300 400 500

CALIPER

HOLE DIAMETER (INCHES)

12
1.40
1.30
1.20
2
1.10

4.8

ROKE

GAMMA RAY NEUTRON LOG

FILE NO.

LOG
SEC
TWP
RGE
W M

COMPANY SAGE CREEK COAL CO. LTD.
WELL SCC 21
LOCATION SOUTH HILL
FIELD FLATHEAD VALLEY
PROVINCE BRITISH COLUMBIA

OIL EXPLORATIONS LTD. CALGARY, ALBERTA

Permanent Datum GROUND LEVEL Elev. 0
Log Measured from GROUND LEVEL Ft. Above Perm. Datum
Drilling Measured from

K.B. —
D.F. —
G.L. —

Date Run: 7 FEBRUARY 73
Depth Driller 570
Depth Logger 570
Bottom Logged Interval 570
Top Logged Interval 555
Casing Driller
Casing Logger
Bit Size
Type Fluid in Hole AIR/WATER
Fluid Level 183 FT
Max. Rec. Temp. Logged 4 3/4
Operating Time 2 HOURS
Unit No. 30
Recorded By BERNERSKARD
Witnessed By CULLINGHAM

362

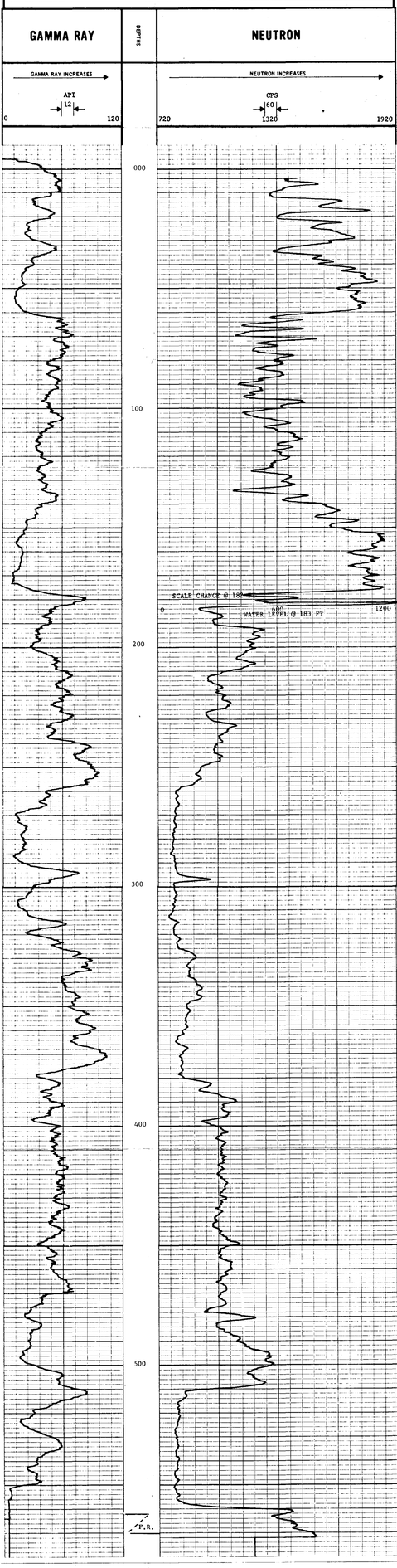
EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO	ONE	RUN NO.	ONE
TOOL MODEL NO		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1¼INCH	TOOL MODEL NO	
DETECTOR MODEL NO		DIAMETER	
TYPE	GEIGER	DETECTOR MODEL NO	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT	LENGTH	6 INCH
GENERAL		SOURCE MODEL NO.	MRC-N-SS-W
HOIST TRUCK NO	30	SERIAL NO.	N 256
INSTRUMENT TRUCK NO		SPACING	19 INCH
TOOL SERIAL NO.	CGN27B6A65	TYPE	AmBe
		STRENGTH	5.70 x 10^6 N/S

LOGGING DATA

RUN NO	DEPTHS FROM	DEPTHS TO	SPEED FT/MIN	GAMMA RAY T.C. SEC	GAMMA RAY SENS SETTINGS	GAMMA RAY ZERO DIV. L OR R	GAMMA RAY API G R UNITS PER LOG DIV.	NEUTRON T.C. SEC.	NEUTRON SENS SETTINGS	NEUTRON ZERO DIV. L OR R	NEUTRON API N. UNITS PER LOG DIV.
1	0	182	10	5	100	OL	12 API	3	1000	12L	60 CPS
	182	570	10	5	100	OL	12 API	3	1000	OL	60 CPS

REMARKS LOGGED OPEN HOLE, MAP CO-ORDINATES 17,847, 460 N & 583, 250 E Elevation 5,215 FT



ROKE

SIDEWALL DENSILOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.

LSD
SEC
TWP
RGE
W ____ M

COMPANY SAGE CREEK COAL CO. LTD.

WELL SCC 22

LOCATION SOUTH HILL

FIELD FLATHEAD VALLEY

PROVINCE BRITISH COLUMBIA

Other Services: GRN

Permanent Datum GROUND LEVEL Elev. ____ K.B. ____

Log Measured from GROUND LEVEL Ft. Above Perm. Datum CSG ____

Well Depths Measured from ____ G.L. ____

Run. No.	ONE		
Date	13 FEBRUARY 73		
First Reading	250		
Last Reading	1		
Footage Logged	249		
Depth Reached	253		
Depth Driller	705		
Casing Roke			
Casing Driller			
Fluid Type	AIR/WATER		
Liquid Level			
Min. Diam.			
Rm @ °F			
Operating Time	1 HOUR		
Truck No.	30		

362 (3)

Recorded By SUNDERLAND Witnessed By CULLINGHAM

L.3

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA R.C. HART

Expiry Date: Mar. 3, 1974

LOGGING DATA

RUN NO.	DEPTHS FROM	DEPTHS TO	SPEED FT/MIN	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	CPS/DIV.
1	1	250	8	3	1000	3R	

REMARKS NO CALIPER DESIRED

DENSITY — CPS — BULK DENSITY (GRAMS/CC)

2.70 2.60 2.50 2.40 2.30 2.20 2.10 2.00 1.90 1.80 1.70 1.60

DEPTHS 1.50

CALIPER — HOLE DIAMETER (INCHES) 1.40 1.30 1.20 1.10

000 100 200 F.R.

ROKE

GAMMA RAY NEUTRON LOG
SLIMLINE

FILE NO.

COMPANY: BASIC RESERVES COAL CO. LTD.
OIL ENTERPRISES LTD. CALGARY, ALBERTA

WELL: SEC 22
LOCATION: SOUTH HILL
FIELD: FLATHEAD VALLEY
PROVINCE: BRITISH COLUMBIA

Permanent Datum: GROUND LEVEL
Log Measured from: Ft. Above Perm. Datum
Drilling Measured from: K.B. D.F. G.L.

Rig No. ORE
Date 12 FEBRUARY 75
Type Log Reading 1ST
Last Reading 701
Footage Logged 701
Depth Reached 701
Bit Size 7 7/8
Casing Size
Casing Depth
Type Fluid in Hole
Level
Max. Rec. Temp. 100°F

Operating Time
Truck No. 349
Recorded By JAMES
Witnessed By CITILTRONIX

362

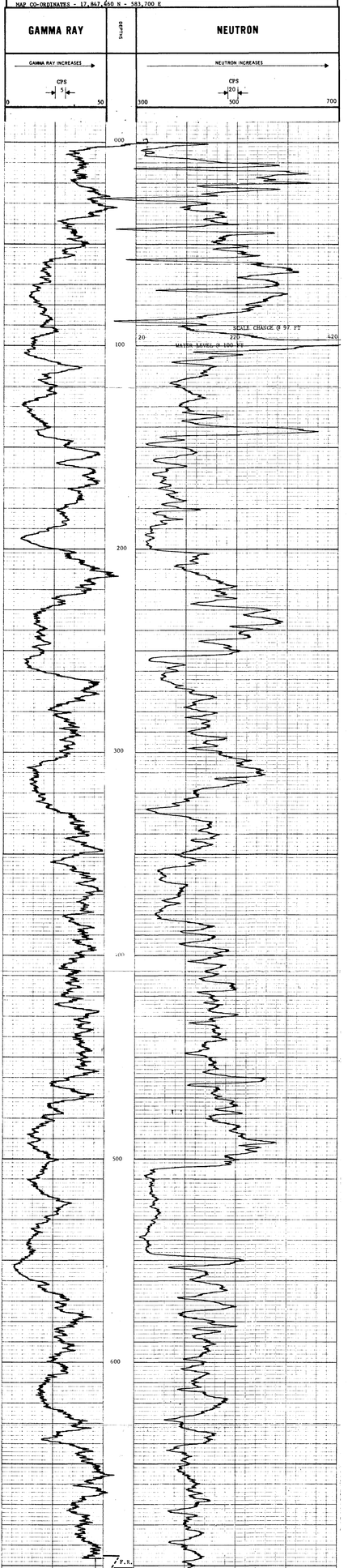
EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO	ONE	RUN NO.	ONE
TOOL MODEL NO		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1INCH	TOOL MODEL NO	
DETECTOR MODEL NO		DIAMETER	1INCH
TYPE	GEIGER	DETECTOR MODEL NO	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.88 FT	LENGTH	6 INCH
GENERAL		SOURCE MODEL NO	MRC-N-SS-W
		SERIAL NO	598
HOIST TRUCK NO	30	SPACING	15 INCH
INSTRUMENT TRUCK NO		TYPE	AmBe
TOOL SERIAL NO	CGN16U4A10	STRENGTH	4.94×10^6 N/S

LOGGING DATA

RUN NO.	DEPTHS FROM	DEPTHS TO	SPEED FT/MIN	T.C SEC	SENS SETTINGS	GAMMA RAY ZERO DIV. L OR R	GAMMA RAY API G R UNITS PER LOG DIV.	N T.C SEC	NEUTRON SENS SETTINGS	NEUTRON ZERO DIV. L OR R	NEUTRON API N UNITS PER LOG DIV.
1	0	97	12	10	50	0L	5 CPS	3	500	15L	20 CPS
	97	701	12	10	50	0L	5 CPS	3	500	1L	20 CPS

REMARKS: LOGGED THROUGH DOUBLE WELL DRILL STEM
MAP CO-ORDINATES - 17,867,660 N - 583,700 E



RIO TINTO CANADIAN EXPLORATION LIMITED

ROTARY DRILL RECORD

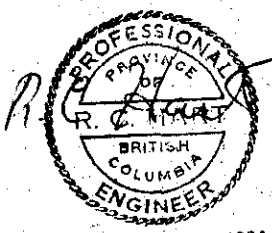
362

Hole No: S.C.C. 23

Property: Sage Creek Coal

Location: South Hill
17,845,460 N.
582,350 E.

Elevation: 5,295' ASL



Expiry Date: Mar. 3, 1974

Date Commenced Drilling: February 12, 1973

Date Finished Drilling: February 14, 1973

Date Hole Completed: February 15, 1973

Contractor: McAuley Drilling Company Ltd.

Hole Size: 4 3/4"

Logged by: O. Cullingham

Date: February 14, 1973

Probed by: Roke Oil Enterprises Ltd.

Date: February 15, 1973

Total Depth Drillers: 478'

Total Depth Roke: 472'

DRILL REPORT

1 6 1/4" WM Bit 15'
15' Surface casing - pulled
3 4 3/4" WM " 463'. Total Footage 478'. Total Standby Time for logging - 5 hrs. Other Standby Time - 3 hrs. Total Standby Time after 1 free hr. - 7 hrs. Moving between leases after 1 free hour -
1 4 3/4" WM Drill Bit Serial No. A2155 chargeable to Rio - ($67.00).

PROBE REPORT

471 - 0	Gamma/Neutron	Open Hole
471 - 0	Sidewall Density	Open Hole
471 - 0	Caliper Log	Open Hole

COAL HORIZONS

Coal Horizon	Drillers Picks		Log Picks	
Horizon No. 4				
Seam 4a	151.4-184	32.6	152-185	33
Seam 4b	189-193	4	189-194	5
Seam 4c	202-206	4	203-208	5
Horizon btw.4&5	301-305	4	301-305	4
Horizon No. 5				
Upper bench	411-417	6	410-417	7
Lower bench	423-431	8	423-432	9

INTERVAL	UNIT THICKNESS	DESCRIPTION
0 - 21	21	Overburden
21 - 45	24	Sandstone m. gy., wthrd., chert/little qty., arg. matrix - sil. + brn. cmt., mod. hd., c. gr. to conglomeratic. Fe stn. Less congl. gr. downward a-A gr.
45 - 50	5	Shale dk. gy., Fe stn., soft - abrupt change from above.
50 - 115	65	Sandstone m. gy., wthrd. to 65', f. gr. p. sort from v. f. to c. gr. in part., a gr., mod. hd. arg. matrix, sil. + brn. cmt., chert + qtz. gr. 50-55 sandstone frag. in clay. 65-80 siltstone m. dk. gy., arg., mod. hd., grades downward into v. f. gr. ss. 90-95 sandstone m. gy., m. gr., some c. gr., p. sort., r to A gr., abrupt change from v. f. gr. ss. from 85'-90' - abrupt change below to v.f. to f. gr.
115-151.4	36.4	Shale m. to m. dk. gy., v. sl. slty. in part, sl. carb. few coaly shale frag.- poss. coalified pl. remn. blocky. 125-130 shale as above/few frag. of v. f.gr. ss.
151.4-206	54.6	COAL HORIZON No. 4 - Coal in three benches. 151.4-184 - Seam 4a - fragmental - for the most part appears good clean coal - mostly clarain/little vitrain - probably low ash. - some shaly coal fragments - some py., .5% cavings - visible only in a few intervals. 158-160 fragmental - shaly coal fragments, 2-3% cavings, high ash. 166-168 fragmental - fragments of coaly shale, high ash. 168-172 fragmental - few frag. coaly shale. mod. ash. 178-180 fragmental - coal/coaly shale - 35% ash. 182-184 Coal/coaly shale - dirty coal - high ash. 184-189 shale dk. gy., carb., coaly strgs. 189-193 Coal Seam 4b - fragmental - dull to bright, coaly shale fragments some caving from above 3% - mod. to high ash. 193-202 shale and siltstone - m. gy., sl. carb., sltst. is arg. and contains some gr. to v. f. gr. ss. - blocky. 202-206 Coal Seam 4c - dull - coaly shale fragments - little py., high ash. 30%.
206-301	95	Interbedded shale and siltstone - sh m. gy., sl. slty., v. sl. micromicaceous in part., in part sdy., blocky. sltst. m. gy., arg., approaches v. f. gr. ss. in some intvls., mod. hd.

INTERVAL	UNIT THICKNESS	DESCRIPTION
		206-208 coaly to carb. shale - few coal frag. 285-295 sandstone - m. gy., arg., v. f. to f. gr., chert + qtz. gr., a-A gr., p. sort., greywacke. 295-301 shale dk. gy., carb. ptcls., abrupt change from ss. above.
301-305	4	Coal Horizon - small zone between No. 4 and No. 5. fragmental, good, clean, bright, low ash., up to 10% coaly shale frags.
305-331	26	shale and coaly shale to shaly coal - m. dk. gy. v. sl. micromica., little pyr. sl. slty. in part., some coaly shale and shaly coal frag. 305-313 - shale - sl. carb. 313-315 - shaly coal 314-320 - shale carb. to coaly. 320-321 - coaly shale to shaly coal. 321-325.5 - coal - no sample - appears as mod. ash. on density log. 325.5-330 - shale - sl. slty. few frags. of coaly sh. 330-331 - carb. to coaly shale.
331-360	29	siltstone - m. brn. gy., arg., v. sl. micromica, soft. to mod. hd., blocky, few. frags. of v. f. gr. ss. - appears like Fernie?
360-385	25	shale - m. gy., sl. slty., blocky, in part sdy., micromica. Appears as Fernie?
385-401	16	shale - m. dk. gy., sl. carb. in part, blocky, - v. sl. coaly towards base of eurite.
401-411	10	coaly shale - few coal fragments up to 20% coal - some shale intvls.
411-431	20	COAL HORIZON No. 5 - Horizon in two benches. 411-417 - Coal - Upper bench - appears as dirty coal - shaly - high ash., fragmental. 417-423 - shale - m. dk. to dk. gy., carb in part. 423-431 - Coal - lower bench - appears as dirty coal/high ash - shaly - almost to the point of being coaly shale. Note - sidewall density log shows two benches of coal but suggests mod. ash. Possibility of samples containing contamination.
431-478	47	Sandstone m. to m. dk. gy., f. gr., a-r mod. sort., qtz. chert gr., sil. cmt., hd., little arg. material - Basal unit. 455-465 - greater arg. content.
478		Total Depth.

RIO TINTO CANADIAN EXPLORATION LIMITED
ROTARY DRILL RECORD

362

Hole No: S.C.C. 24 Property: Sage Creek Coal

Location: South Hill
17,845,460 N
583,350 E

Elevation: 5,125'

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA R. C. GRANT
Expiry Date: Mar. 3, 1974

Date Commenced Drilling: February 15, 1973

Date Finished Drilling: February 19, 1973

Date Hole Completed: February 20, 1973

Contractor: McAuley Drilling Co. Hole Size: 4 3/4"

Logged by: O. Cullingham Date: February 19, 1973

Probed by: Roke Oil Enterprises Date: February 20, 1973

Total Depth Drillers: 672

Total Depth Roke: 662

DRILL REPORT

1 6-1/4" W.M. Bit 13'
13' Surface Casing - Left in hole.

2 4-3/4" W.M. Bit 659' Moving Between Leases After 1 Free Hour - 1 hr.
Total Footage - 672
Total Standby time for logging - 5 hrs.
Other Standby Time - 5 hrs.
Total Standby Time After 1 Free Hour - 9 hrs.

PROBE REPORT

661 - 0	Gamma/Neutron	Open Hole
659 - 0	Sidewall Density	Open Hole

COAL HORIZONS

Coal Horizon	Drillers Picks		Log Picks	
Horizon #2				
Seam 2	195 - 212	17	199 - 211	12
Horizon #4				
Seam 4a	355.5 - 383	27.5	353 - 384	31
Seam 4b	392.5 - 397	4.5	390 - 394	4
Seam 4c	416.5 - 421	4.5	414 - 421	7
Horizon #5				
Seam 5 Upper Bench	598.5 - 612	13.5	596 - 603	7
Seam 5 Lower Bench	618.0 - 628	10	618 - 626	8

INTERVAL	UNIT THICKNESS	DESCRIPTION
0 - 13	13	Overburden - fill and clay, into weathered sandstone @ 13'.
13 - 30	17	Sandstone Lt. to m. brn. gy., wthrd., some Fe stn., conglomeratic, m-c gr. ss., a-A gr., p. sort., hem. stn, sil & lmn cmt., qtz. & chert. - chert more A than qtz & larger. 13 - 15 Conglomerate - qtz & chert frags. of pbls., m-c gr. ss. matrix, Fe stn. - hv - Basal Blairmore?
30 - 60	30	Siltstone and Shale Imbedded in Clay - gy. bm., soft, in part strng. hem. stn. highly wthrd, oxidized - qtz & chert gr.
60 - 152	92	Sandstone m. lt. gy. bn to m. gy., wthrd., Fe stn., v.f. - m. gr., p. sort., a-A, arg. matrix /sil. & lmn. cmt. 70 - 80 fragments of above in a dusky yellow clay. 95 unconsolidated sd. gr., qtz & chert, in a pale brn. clay matrix. 100 - 105 Siltstone dk. gy., hv., cherty, wthrd, - lmn. stn., possibly fracture zone. 130 Sandstone fragments in lt. brn. gy. clay. 145 - 150 Conglomerate - dk. gy., c. gr.ss. to granule congl., chert granules qtz. granules., hv., sil., A.
152 - 195	43	Siltstone / some sandstone intvls. m to m dark gy., arg., mod. hv., some Fe (hem) stn. - in part sdy. to arg. sandstone. 155 - 160 hematitic stn. pbls. of sh & sltst. imbedded in mod. red. brn. clay. 170 - 175 Sandstone m. brn. gy., v.f. to f. gr., mod. sort., a., chert & qtz. gr., arg. matrix, sil. & lmn. cmt. 175 - 180 Shale m. gy., slty to sdy., Fe. stn. 193.5 - 195 Shale carb. to coaly.
195 - 212	17	Coal Horizon No. 2 _ 195 - 212 Seam 2 - fragmental - dull to bright, clarain mostly, some fusain & durain - v. little

INTERVAL	UNIT THICKNESS	DESCRIPTION
195 - 212	17	Coal Horizon No. 2 - Cont'd. vitrain - some coaly shale up to 50% on some 2' intervals - appears as good coal but with high % coaly Sh.
212 - 230	18	Siltstone/Sandstone m. gy., arg., sdy. sltst. to arg. ss., Fe stn.(hem) approaching greywacke. Grades downward to f. gr. ss.
230 - 325	95	Sandstone m. to m. dk. gy., f-m. gr., mod. sort., a, hv., qtz. & chert, chert is generally coarser than qtz., arg. matrix, sil. cmt.
		235 - 240 m. gy., f-c gr., p. sort., qtz. more abundant than chert., a to A.
		240 - 245 Conglomeratic sandstone - m. dk. gy. c. gr., granules of chert., hv., a to A.
		285 - 290 Sandstone m. dk. gy., chert more abundant than qtz - hem. stn.
		295 - 300 Sandstone As above, rich hem. stn.
325 - 340	15	Siltstone Mod. red. brn. to m. gy., Fe stn. (hem) arg., sdy., md. frag., possibly erosion surface.
240 - 355.5	15.5	Shale Dk. gy., carb., in part coaly - grading into coaly sh. at base.
355.5 - 424	68.5	Coal Horizon No. 4
		355.5 - 383 Coal seam 4a - fragmental - gd. clean coal for the most part - some coaly sh. frag., low ash. some cavings 1%.
		355.5 - 362 Coal coaly shale to shaly coal - mod. ash.
		377 - 379 Coal coaly shale - dull high ash.
		383 - 392.5 Shale Dk. gy., carb. to coaly in part,
		385 - 387 Coal coaly shale - dull v. high ash.
		392.5 - 397 Coal seam 4b - fragmental - some coaly shale, dull to brt. mod. ash.
		397 - 401 Shale m. dk. gy. - slty to sdy in part blocky.

INTERVAL	UNIT THICKNESS	DESCRIPTION
355.5 - 424	68.5	Coal Horizon No. 4 - Cont'd.
		401 - 405 Coal/ Coaly shale & shaly coal, fragmental, some py., high ash.
		405 - 417 Shale m. dk. gy. to dk. gy., slty to sdy in part - Carb. to coaly in part.
		417 - 424 Coal Seam 4c - fragmental, some shaly coal & coaly shale frags., dull, high ash.
424 - 598.5	174.5	Shale m. gy to m. dk. gy., sl. carb in part, slty in part, blocky - few strings & bnds of coal - some short intvls of sltst and sandstone - mod. hv.
		455 - 460 fragments of shale & sltst. imbedded in clay.
		488 - 490½ Coal _ DULL to shiny, mod. ash, some coaly shale frags.
		491 - 500 Sandstone - m. gy., silt to v. f. gr., arg., blocky, mod. hv.
		520 - 525 Silstone - m. dk. gy., arg., hv., blocky.
		550 - 560 Sandstone - m. gy., arg., v. f. gr.
		565 - 575 Siltstone - m. gy., arg., sdy. ir part, mod. hv.
		588 - 590 Coaly shale/coal fragmental, dull.
		596.3 - 598.5 Shaly coal & carb. to coaly shale.
598.5 - 628	29.5	Coal Horizon No. 5
		598.5 - 612 Coal Seam 5 Upper bench - fragmental, dull, dome bright intvls, some coaly shale - mod to high ash - appears as thougl contains numerous sh. bnds.
		612 - 618 Shale some coaly shale & thin strgs. of coal, dull, some py.
		618 - 628 Coal Seam 5 (lower bench) fragmental, dull, some bright coal some coaly shale frags. mod. ash.
		624 - 628 cleaner coal - low ash.
628 - 672	44	Sandstone m. gy. to m. dk gy., f. gr., mod sort., hv., qtz gr., sl-arg. matrix, sil. cmt., a-r.gr. Some chert gr. becomes more f-m gr. towards bottom of hole.

ROKE

GAMMA RAY NEUTRON LOG

DRL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.	
L.S.D.	
SEC.	
TWP.	
RGE.	
W. of ___ M.	
COMPANY	SAXON CREEK COAL CO. LTD.
WELL	DDH # 23
LOCATION	SOUTH HILL
	FLATHEAD VALLEY
FIELD	
PROVINCE	BRITISH COLUMBIA

Log Measured from GROUND LEVEL — Elev. —
Drilling Measured from GROUND LEVEL — Ft. Above Perm. Datum
Elev.: K.B. —, D.F. —, G.L. —

Permanent Datum GROUND LEVEL
Log Measured from GROUND LEVEL
Drilling Measured from

Run No. ONE
Date 15 FEBRUARY 73
First Reading 471
Last Reading 0
Drilling Stopped 472
Drilled Depth 472
Casing Depth 483
Casing Bote
Casing Driller
Fluid Type AIR/WATER
Liquid Level 50 FT
Max. Recd. Temp.

Operating Time
Truck No. 30
Recorded By STRICKLAND

Witnessed By CULLINGHAM

2 1/2 HOURS

362

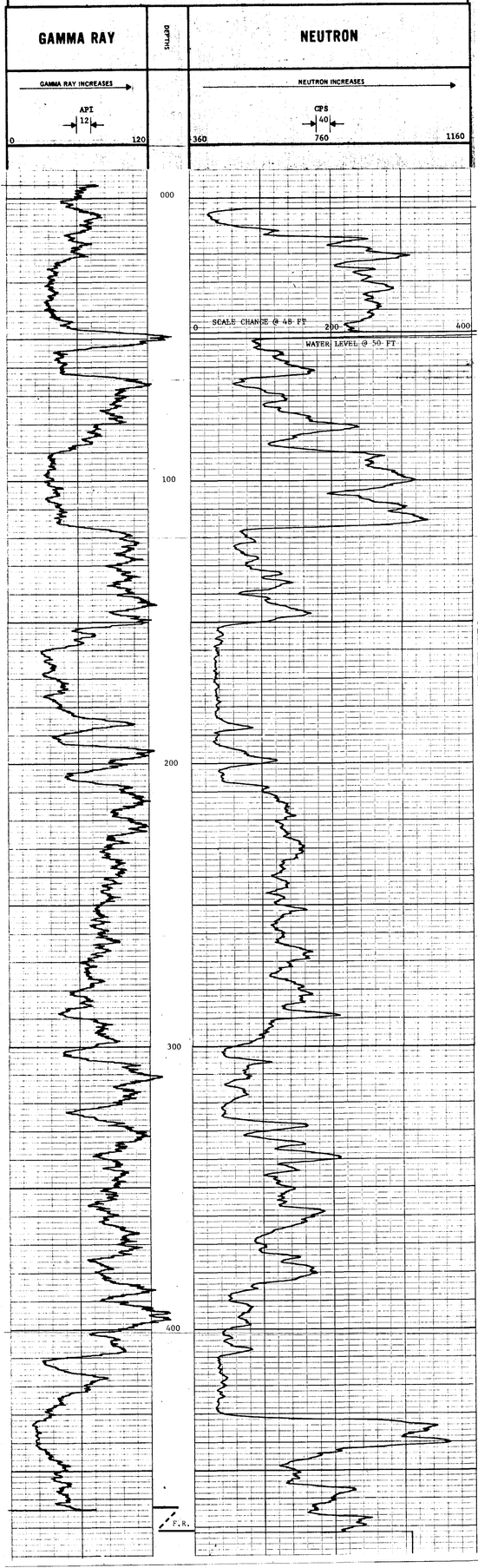
EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1¾	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1¾
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT	LENGTH	6 INCH
GENERAL		SOURCE MODEL NO.	MRC-N-SS-W
HOIST TRUCK NO.	30	SERIAL NO.	N256
INSTRUMENT TRUCK NO.		SPACING	19 INCH
TOOL SERIAL NO.	CGN27U4A85	TYPE	AmBe
		STRENGTH	6.70 X10⁶ N/S.

LOGGING DATA

RUN NO.	GENERAL DEPTHS FROM	GENERAL DEPTHS TO	SPEED FT/MIN.	T.C. SEC.	GAMMA RAY SENS SETTINGS	GAMMA RAY ZERO DIV. L OR R	GAMMA RAY API G.R. UNITS PER LOG DIV.	NEUTRON T.C. SEC.	NEUTRON SENS. SETTINGS	NEUTRON ZERO DIV. L OR R	NEUTRON API N. UNITS PER LOG DIV.
1	0	48	10	5	100	OL	12 API	3	1000	9L	40 CPS
	48	471	10	5	100	OL	12 API	3	1000	OL	20 CPS

REMARKS: LOGGED OPEN HOLE, MAP CO-ORDINATES 17,845,460 N & 582,350 ELEVATION 5,295 FT



ROKE

SIDEWALL DENSILOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.

LSD
SEC
TWP
RGE
W M

COMPANY SAGE CREEK COAL CO, LTD.

WELL SCC # 23

LOCATION SOUTH HILL

FIELD FLATHEAD VALLEY

PROVINCE BRITISH COLUMBIA

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA R. B. HART

Expiry Date: Nov. 3, 1974

Other Services: GRN

Permanent Datum GROUND LEVEL Elev. K.B.

Log Measured from GROUND LEVEL Ft. Above Perm. Datum CSG

Well Depths Measured from — G.L.

Run. No.	ONE
Date	15 FEBRUARY 73
First Reading	471
Last Reading	0
Footage Logged	471
Depth Reached	474
Depth Driller	483
Casing Roke	
Casing Driller	
Fluid Type	AIR/WATER
Liquid Level	
Min. Diam.	
Rm @ °F	
Operating Time	5 HOURS
Truck No.	30

362

Recorded By SUNDERLAND Witnessed By CULLINGHAM

LOGGING DATA

RUN NO.	DEPTHS FROM	DEPTHS TO	SPEED FT/MIN	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	CPS/DIV.
1	0	471	8	3	1000	OR	

REMARKS

DENSITY — CPS — BULK DENSITY (GRAMS/CC): 2.70, 2.60, 2.50, 2.40, 2.30, 2.20, 2.10, 2.00, 1.90, 1.80, 1.70, 1.60

DEPTHS: 000, 100, 200, 300, 400, F.D.

CALIPER — HOLE DIAMETER (INCHES): 12, 2; 1.60, 1.40, 1.30, 1.20, 1.10

ROKE

SIDEWALL DENSILOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.

COMPANY SAGE CREEK COAL CO. LTD.

WELL SCC 24

LOCATION SOUTH HILL

FIELD FLATHEAD VALLEY

PROVINCE BRITISH COLUMBIA

Permanent Datum: GROUND LEVEL Elev. 1 Ft. Above Perm. Datum

Log Measured from GROUND LEVEL 1 Ft. Above Perm. Datum

View Depths Measured from GROUND LEVEL

Elev.: K.B. 1 D.F. G.L.

LSD SEC TWP RGE

M

Run No. 20

Date FEBRUARY 73

First Reading 659

Last Reading 0

Footage Logged 659

Depth Driller 659

Depth Logger 672

Casing Driller

Casing Size

Fluid Type AIR/WATER

Fluid Level 74 FT

Max. Rec. Temp. Deg. F

Equip. Location

Recorded By STRUTHERS

Witnessed By MOUNTNEY

Operating Time 2 HOURS

Truck No. 30

362

LOGGING DATA

RUN NO.	DEPTHS FROM	DEPTHS TO	SPEED FT/MIN	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	CPS/DIV.
1	0	659	8	3	1000	OR	

REMARKS CALIPER NOT OBTAINABLE DUE TO BLOCKAGE NEAR SURFACE.

CALIPER

HOLE DIAMETER (INCHES)

6.0 6.5 7.0 7.5 8.0

DEPTHS

DENSITY

CPS

BULK DENSITY (GRAMS/CC)

1.90 1.80 1.70 1.60 1.50 2.00 2.10 2.20 2.30 2.40 2.50 2.60 2.70 2.80 2.90

000 100 200 300 400 500 600

F.R.

ROKE

GAMMA RAY NEUTRON LOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

File No.

LSD
SEC
TWP
RGE
M

COMPANY SAGE CREEK COAL CO. LTD.

WELL SSC 24

LOCATION SOUTH HILL

FIELD FLATHEAD VALLEY

PROVINCE BRITISH COLUMBIA

Permanent Datum GROUND LEVEL Elev.
Log Measured from GROUND LEVEL 4 ft. Above Perm. Datum
Drl. Measured from GROUND LEVEL

Elev.: K.B. D.F. G.L.

	ONE	TWO
Run No.	ONE	
Date	27 FEBRUARY 72	
First Reading	661	
Last Reading	40	
Bottom Logged	661	
Top Logged	GROUND	
Casing Driller	972	
Casing Logger		
Casing Bottom		
Fluid in Hole	WATER	
Max. Temp.	34 °F	
Equip. Location	972	
Recorded By	J. BOYD	
Witnessed By	COLTHORPE	

Other Services: GAMMA RAY NEUTRON

Permanent Datum: GROUND LEVEL
Log Measured from: GROUND LEVEL
Drl. Measured from: GROUND LEVEL

Elev.: K.B. D.F. G.L.

Recorded By: J. BOYD
Witnessed By: COLTHORPE

295

EQUIPMENT DATA

GAMMA RAY	ONE
RUN NO.	
TOOL MODEL NO.	
DIAMETER	1½
DETECTOR MODEL NO.	
TYPE	GEIGER
LENGTH	18 INCH
DISTANCE TO N. SOURCE	8.55 FT

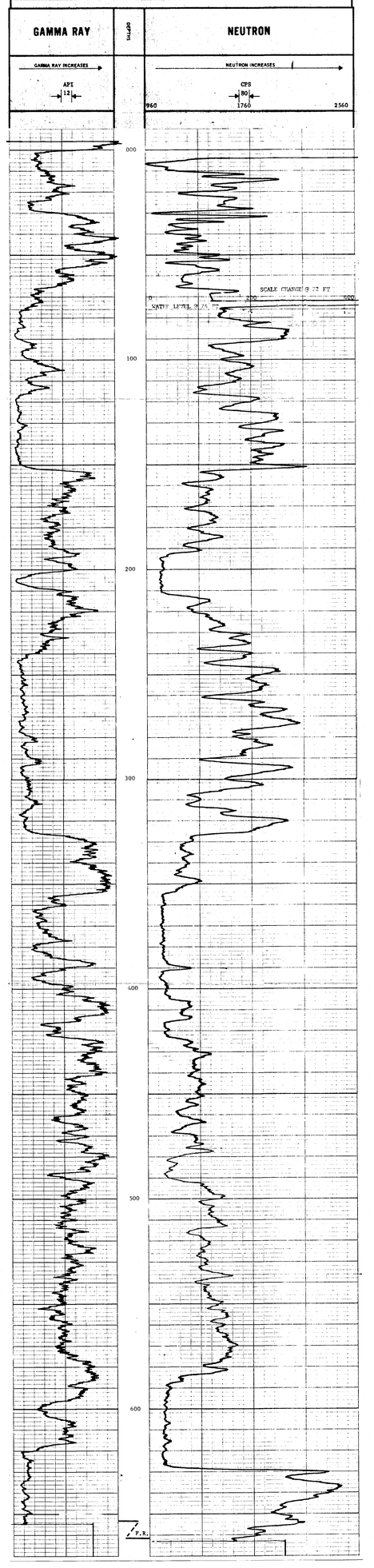
NEUTRON	ONE
RUN NO.	
LOG TYPE	NEUTRON/NEUTRON
TOOL MODEL NO.	
DIAMETER	1½
DETECTOR MODEL NO.	
TYPE	PROPORTIONAL
LENGTH	6 INCH
SOURCE MODEL NO.	MRC-N-SS-W
SERIAL NO.	N 256
SPACING	19 INCH
TYPE	AmBe
STRENGTH	6.70×10^6 N/S

GENERAL	
HOIST TRUCK NO	30
INSTRUMENT TRUCK NO	
TOOL SERIAL NO	CDN2704665

LOGGING DATA

RUN NO.	DEPTH FROM	DEPTH TO	SPEED FT/MIN	GAMMA RAY T.C. SEC.	GAMMA RAY SENS SETTINGS	GAMMA RAY ZERO DIV. L OR R	GAMMA RAY API G R UNITS PER LOG DIV.	NEUTRON T.C. SEC.	NEUTRON SENS SETTINGS	NEUTRON ZERO DIV. L OR R	NEUTRON API N. UNITS PER LOG DIV.
1	0	72	10	5	100	0L	12 API	3	1000	12L	80 CPS
	72	661	10	5	100	0L	12 API	3	1000	0L	25 CPS

REMARKS



RIO TINTO CANADIAN EXPLORATION LIMITED

ROTARY DRILL RECORD

362

Hole No: S.C.C. 25 Property: Sage Creek Coal

Location: South Hill
17, 847; 060N
586, 300E Elevation: N 4,435

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — R.C. HART

Expiry Date: Mar. 3, 1974

Date Commenced Drilling: February 20, 1973

Date Finished Drilling: March 10, 1973

Date Hole Completed: March 10, 1973

Contractor: McAuley Drilling Company Limited Hole Size: 4 3/4"

Rig No: 55

Logged by: O.Cullingham and R.Benkis Date: March 10, 1973

Probed by: Roke Oil Enterprises Limited. Date: March 10, 1973

Total Depth Drillers: 927

Total Depth Roke: 842

DRILL REPORT

1 6¼" W.M. Bit 35'

35' Surface casing - Left in hole

4 3/4" W.M. Bits

Total footage -

Total standby time for logging -

Other standby time -

Total standby time after 1 free hour -

Total hourly contract -

Moving between lenses after 1 free hour -

PROBE REPORT

840 - 0 Gamma/Neutron Slim Line Thru Pipe.

COAL HORIZONS

Coal Horizon	Drillers Picks		Log Picks	
Horizon No. 2				
Seam 2	505.5 - 519	13.5		
Horizon No. 4				
Seam 4a	715 - 735	20		
Seam 4b	738 - 752	14		

INTERVAL	UNIT THICKNESS	DESCRIPTION S.S.C. 25
0 - 27	27	Overburden - Glacial till, gravel and clay
27 - 145	118	Clayey shale - lt. gy., loosely consolidated., clayey shale, pbls. of same - possibly kishenena Fm. - marly - sl. to mod. effervescent in 10% hcl.
		45-70 similar to above with mod. to shng. hem. str.
		70-80 ss. frags., v.f.gr., m. hd., imbedded in lt. yel. brn. clay sl. Fe (hem) str.
		115-125 clayey shale - lt. yel.brn., clayey shale, sl. Fe str. (lmn soft, powdery.
		130-135 ss. frags. v.f. gr., m.hd., imbedded in lt.yel.brn. clay.
		140-145 shale m. dk.gy., lt.gy brn., wthrd., soft,rnd, frags.,some clay material - possibly old erosion surface.
145 - 160	15	Sandstone/Shale - argo. to sdy.,appear wthrd., fe.str.(hem).,m.dk.gy. to light sandy brown - some clay matrix.
160 - 190	30	Sandstone lt.sdy.,brn.,wthrd.,Fe.str(hem silt to f.gr., p.sort.,arg. matrix.,mod.hd.,appears broken large fragments.
190- 290	100	Conglomerate pbls. of qtz.,chut/few of shale.,-f.to c.gr.,s.s. matrix Fe str.,appears wthrd.,Busal Blairmore Congl.
		205-210 Sandstone/few fragments of conglomerate v.f. to f.gr.,lt. gy.,good porosity a-r gr.,mod. hd., Fe.str (hem).
		225-230 sandstone lt.brn.gy., f.gr.gd. poros., r-a.gr., Fe.str., few fragments of qtz. & chert.pbls
		245-250 Conglomerate and sandstone fragments imbedded in clay matrix, possibly an erosion surface.
		275-285 sandstone m. gy., Fe. str.(hem m-c. gr. a-A gr., sil crnt., some arg. matrix., mod. hd. few fragments of qtz & chert pbls.

INTERVAL	UNIT THICKNESS	DESCRIPTION S.S.C. 25
290 - 330	40	Conglomerate sandstone m.gy., wthrd. appearance, Fe. str., qtz & Chert. gr., gr. to granite size. p. sort., r to A., sil. crnt. ld. 305-310 conglomerate Fe. str., granule to pebble chert. qtz. conglomerate, hd. 325-330 fragments of qtz. & chert pbls with few sandstone and shale fragments imbedded in lt. yel. brn. clay.
330 - 385	55	Sandstone Appears wthrd., Fe. str (hem)., fragments of sandstone imbedded in buff brownclay., v.f. gr. to f. gr., some shale fragments. Possibly erosion surface or broken (breccia) zone. - Few frags. of pyritized petrified wood, some coalified woody material. 350-355 Shale dk.gy. carb. in pact.,soft rounded fragments. 352-353.5 Coal/carb. to coaly shale. 360-375 Shale dk.gy., sl. carb. in part. in part silty., some buff brn. clay material.
385 - 425	40	Conglomeratic sandstone dk. gy., in part Fe. str. (hem) chert granules., a-A., c.gr. ss., qtz. & chert. gr. - Few fragments of coalified wood., sil. crnt., hd. 400-420 Sandstone m. dk. gy., strongly Fe. str.(hem) at top of unit - some Fe. str. towards sil. crnt. some arg. matrix., hd., some orthogenic qtz. 415 sample contains n 5% coal frags
425 - 505.5	80.5	Shale m.dk. to dk.gy., in part. carb. to sl. coaly., m. part Fe. str. brn. streak. 435-440 shale AA /v 25% coal frags. (438-441 coaly shale to shaly coal) 440-450 Sandstone m.brn. to dk.gy.,upper part appears wthrd./some Fe.str v.f. to f.gr., arg. matrix, mod.hd., 455-460 clay lt.yel.brn.-contains fragments of shale & sandstone. 460-465 agglomeration of ss.,str.,coaly to carb.sh., some coal., large fragments. broken zone - possible fault zone.

INTERVAL	UNIT THICKNESS	DESCRIPTION S.S.C . 25
		497.5-504 Shaly coal to coaly shale < 50% shaly coal and coal.
505.5 - 519	13.5	Coal Horizon No. 2 505.5-507 Coal/some coaly shale - finely grnd. to f. fragmental., dull t bright, some Fe.str.(sideritic) mod.yield, mod. to high ash., some cavings (<1%)
		507-515 coal finely grnd. to f.fragmenta dull to bright, mostly clarain, some coaly shale 0 little pyr., some sideritic stn., -<1% caving Probably mod. ash.
		515-519 coal/coaly shale finely grnd. to fragmental, low yield, high ash., few ss. frags.
519 - 535	16	Shale m. to dk. gy., carb. in part., becoming blocky downward in section - mod. hd., becomes silt to sdy. downwards.
		530-535 siltstone m.gy., arg., sdy., blocky, mod. hd.
535-685	150	Sandstone m.gy., v.f.b.m.gr., for the mos part is p. sort., qtz. & chert. gr., chert gr.usually larger than qtz - a-A., mod. hd. to hd al: arg matrix., sil crnt.,
		540-550 sandstone wthrd. appearance, Fe. str., some carb. to coaly flecks, clayey matrix, possible breccia zone.
		580-595 sandstone m.dk.gy., cherty, hd. m.gr./some c.gr. chert., a-A.
		605-610 shale & sandstone fragments in a buff brn. clay., - some rounded fragments - pea gravel. Fe. str., Possibly erosion or brocken zone.
		625-635 shale & siltstone m. to m.dk.gy in part carb., blocky, mod.hd. some ss. fragments.
		661-664 shale
		665-685 sandstone m.dk. gy., m-c.gr., p sort., chert > qtz., a-A, some arg. matrix material, sil. crnt hd. Fe str. toward base of unit becoming more arg. with few car shale fragments.

INTERVAL	UNIT THICKNESS	DESCRIPTION S.S.C. 25
685-715	30	Shale m. /to dk. gy., silty in part, carb.in part., mod. hd., blocky Some Fe. str., - few frags. of v.f. gr. ss. 695-698 Siltstone 713-714 Siltstone
715- 755	40	Coal Horizon No. 4 715-735 Seam 4a - fragmental - appears fairly clean, some fusain and durain, strs., dull to bright. 731-735 coal as above with some shale content. 735-738 Shale dk. gy., carb. in part. 738-755 coal seam 4b - fragmental, clea sks., appearance of good clean coal. 744-748 coal duller than above, somewhat shaly. 748-752 coal dull l carb. sh. frags 752-755 carb. to coaly shale - minor coal fragments.
755 - 927	172	Shale dk. gy., carb. in part.,slty in part., some coalified pl. remn., some calcitic fracture infillings - in part sl. micromicaceous., pl. imprints. 770-775 siltstone m. dk. gy., calc. fracture fillings, fine grained arg. 840-845 carb. to coaly shale - hematized, white sandstone grains, sil. dk. fragments. 845-880 Siltst. solft. m. light gy. 895-915 Siltst. dk.gy. f. gr. micromicaceous, mod. hd., carb pl. remn. 915-920 AA with sks, & calc. sks. surface.
927		Total Depth - Hole abandoned.

RIO TINTO CANADIAN EXPLORATION LIMITED

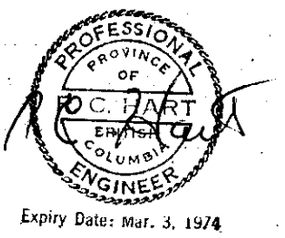
ROTARY DRILL RECORD

362

Hole No: S.C.C. 26 Property: Sage Creek Coal

Location: South Hill
17,847,860 N
585,000 E

Elevation: N 4570



Expiry Date: Mar. 3, 1974

Date Commenced Drilling: March 11, 1973

Date Finished Drilling: March 16, 1973

Date Hole Completed: March 16, 1973

Contractor: McAuley Drilling Co. Hole Size: 4-3/4"
Rig No. 55

Logged by: O. Cullingham Date: March 16, 1973

Probed by: Roke Oil Enterprises Date: March 16, 1973

Total Depth Drilled : 870

Total Depth Roke: 865

DRILL REPORT

1 6¼" W. M. Bit 10' (10' Surface Casing left in hole.)
4 4-3/4" W.M. Bits

Total Footage	870'
Total Standby time for logging	5 hrs.
Other Standby time	-
Total standby time after 1 free hr.	4 hrs.
Moving between leases after 1 free hr.	2 hrs.

PROBE REPORT

863 - 0 Gamma Ray/Neutron Slim Line Thru Pipe

COAL HORIZONS

Coal Horizon	Drillers Picks		Log Picks	
Horizon No. 2	236.2-246.1	9.9	237 - 246	9
Horizon No. 4				
Seam 4a	470.3-514	43.7	471 - 513	42
Seam 4b	520 - 544.1	24.1	522 - 540	18
Horizon No. 5				
Upper bench	734 - 746	12	733 - 746	13
Lower bench	766.2 - 768	1.8		
	780 - 806	22	759 - 806	45

INTERVAL	UNIT THICKNESS	DESCRIPTION
0 - 25	25	Sandstone m. brn., Fe Stn., wthrd., qtz & chert, cmt. but most wthrd. out. (10 ft. of surface casing)
25 - 60	35	Siltstone m. to dk. gy., arg., mod. hv., sdy. near base of unit, blocky. 40-45 shale dk. gy. blk., carb., soft, plty., minor coal @ 43-45. 45-50 shale m. dk. gy., slty to sdy.
60 - 130	60	Sandstone m. gy. to m. brn. gy., wthrd in part, Fe stn. in part, v.f. gr. @ top of unit becoming coarser down in the section. Ranges up to conglomeratic sandstone. Some arg. matrix near top, mod. hd. to v. hd., sil. cmt. For the most part a-A, p. sort., qtz. and chert gr. 75-80 shale or sandstone (greywacke) m. dk. brn. gy. 85-100 sandstone m. brn. gy., wthrd. from gr., qtz./chert. gr., some arg. matrix, some sil. cmt., - Appears muggy - cmt. possibly wthrd. - Fragments imbedded in clay. Frags. tend to rnd. Possibly erosion surface or broken (breccia) zone. 115-125 Conglomeratic Sandstone m. gy. qtz. & chert gr., f - pbl., mostly m. gr., sil. cmt., hd.
130 - 195	65	Siltstone m. dk. gry., blocky, mod. hd., in part wthrd. Abrupt change from above. 135-140 Shale dk. gy. blk, carb., with coal flecks. 170-180 Sandstone m. dk. gy., qutz. & chert., v.f. to f. gr., mod. sort., a-A, roller to blade, sil. cmt., mod. hd., little arg. matrix.
195 - 215	20	Shale m. dk. to dk. gy., silty in part, blocky near top of unit, carb. with small coal flecks near base of unit. Some coalified pl. remn.
215 - 225	10	Siltstone M. DK. gy., blocky, arg., sdy. in part, hd., v. sl. micromicaceous. Distinct change from above.
225 - 236.2	11.2	Shale Dk. gy., sl. slty. to sl. carb., few coal frags. at base of unit.

INTERVAL	UNIT THICKNESS	DESCRIPTION
236.2 - 246.1	9.9	Coal Horizon No. 2
		236.2 - 238.0 Coaly shale, carb. shale & coal - dull to biright, v. lo yield, coal appears fairly good, prbly low ash for the coal.
		238.0 - 242.0 Coal - fragmental dull to bright, appears fairly good clean coal, few frags. of shaly coal, high yield with a prbl low ash.
		242.0 - 244.0 Coal - finely grnd. to f. frag., dull to bright, some coaly shale to shaly coal, mo yield, coal to middlings.
		244.0 - 246.1 Coaly shale with shaly coal - Some coal 20% - dull - low yield.
246.1 - 280.0	33.9	Shale M. to dk. gy., slty., blocky, mod. hd few coal frags at top of unit.
280.0 - 345.0	65	Sandstone M. gy., to m. dk. gy., colour varies with chert content. M. to c.gr a-A, mod. sort., sil. cmt., qtz. & chert. gr., hd. little hem. stn.(in part). Generally coarse gr. lower hal of unit.
345.0 - 370.0	25	Shale M. dk. gy., blocky & silty in lower half, some carb. shale with coaly frags in upper half, - coalified pl. remn., mod. hd.
		@ 350 Coal hd., dull to bright, bone coal, strs., sheared, high in ash.
370.0 - 335.0	15	Siltstone M. gy., arg., sdy., blocky, mod. hd., becoming more sdy. downwards in section.
385.0 - 425.0	40	Sandstone M. gy., Fe. stn. (hem.), f-m. gr. a, generally poor sort., arg. matrix sil. cmt., qtz. & chert., mod. hd. to hd.
		@ 425 larger fragments of above, perhaps a broken zone.
425.0 - 470.3	45.3	Shale M. to dk. gy., blocky, slty., mod. hd. In part carb. to sl. coaly.
		425-430 Shale gy. blk., carb. to coaly.
		465-470.3 Shale dk. gy. to gy. blk., carb. to coaly, some coalifie pl. remn.

INTERVAL	UNIT THICKNESS	DESCRIPTION
470.3 - 544.1	73.8	Coal Horizon No. A
		470.3-514.0 Coal Seam 4a
		470.3-472.0 Coal fragmental, sks., dull to bright shaly, low to mod. yield, high ash.
		472 - 476 Coal fragmental, dull to bright, sks., sheared, some metallic gy. coal(Durain) mod. to high yield, mod. ash.
		476 - 478 Coaly shale to shaly coal dull, high ash, low yield.
		476-476.4 shale parting.
		478 - 480 Coal fragmental, dull to vitreous, some metallic gy. (durain) mod. ash., little coal - mod. yield.
		480 - 483.2 Coal fragmental, vitreous to bright, little shaly coal, mostly clarain/some vitrain - appears as fairly good clean coal, low ash with high yield.
		483.2-484.3 Shale parting
		484.3-486.0 Coal fragmental, dull to bright, clarain/some vitrain small amt. coaly shale, some sdy, sh. possibly cavings, mod. yield, low to mod. ash.
		486 - 490 Coal fragmental, dull to bright, clarain/some vitrain low ash, high yield, some py. films in shear face.
		490 - 490.4 Shale parting
		490.4-500.0 Coal fragmental, dull to br bright, little durain, mostly clarain/some vitrain appears fairly good clean coal. High yield & low ash.
		496-496.4 shale parting.
		500 - 502 Coal dull to bright, some shaly coal, few frags of cavings, high yield, mod. ash.
		504 - 506 Shale dk. gy. to gy. blk., carb.,, few coaly frags.
		506 - 508 Coal fragmental, dull to bright, clarain, shale in part, mod. yield, mod. ash.

INTERVAL	UNIT THICKNESS	DESCRIPTION
470.3 - 544.1	73.8	Coal Horizon No. 4 Cont'd. 470.3-514.0 Coal Seam 4a Cont'd. 508-512 Coal fragmental, gd. clean coal, high yield, low ash, sheared vitreous to bright, mostly durain. 512-514 Coal dull to bright, fragmental, some coaly shale, mod. yield, mod. to high ash. 514.0 - 520 Shale/Some Siltstone 520.0 - 544.1 Coal Seam 4b 520-526 Coal fragmental, dull to bright, some coaly shale fragments, mod. yield, low to mod. ash. 526-530 Coal fragmental, appears fairly gd. clean coal, low ash, high yield, vitreous to bright, mostly clarain. 530-532 Coal/coaly shale, dull to brt., clarain, low yield, prbly low to mod. ash on coal. 532-534 Coal f. fragmental, vitreous to bright, low ash, high yield. 534-544.1 Coal with shale interbeds, coaly shale to shaly coal - some py. films on shear faces. Very low yield 20%.
544.1 - 734.0	189.9	Shale/some Siltstone m. to m. dk. gy., slty. to sl. sdy. in part, blocky, mod. hd. 544.1-545 dk. gy. to by/blk., carb. to sl. coaly shale. 565-575 Sltst. m. gy., blocky, hd. arg. matrix, v. sl. sdy. 595-600 Shale m. dk. gy., v. sl. carb. slty., blocky, few bnds. of .5 mm. pyr., - few coal frags. 605-630 Shaly coal, coaly shale & coal fragmental, pyr. flakes on shear faces - prbly. intbd. strgs of coal/shale & coaly shale. 640-660 Shale dk. gy., sl. carb., in part. sl. coaly. 675-680 Sltst. m. gy., arg. matrix, blocky, mod. hd. 685-690 Sltst. AA

INTERVAL	UNIT THICKNESS	DESCRIPTION
734 - 840	106	Coal Horizon No. '5
		734 - 736 Coal fragmental, dull to bright little shaly coal, mostly clarain, minor pyr. flakes on shear faces. Pbly mod. ash-med. yield.
		736 - 738 Coal finely ground to fragmental, dull with some bright, some coaly shale - low yield/mod. ash.
		738 - 742 Coal finely ground to fine fragmental, dull to bright, appears as fairly good clean coal, high yield, low ash.
		742- 744 Coal fragmental, dull to vitreous blk. to metallic gy., high in durain & fusain, shaly, low yeild, high ash.
		744 - 746 Coal fragmental, dull to vitreous some bright coal, sheared, py. on shear faces, mod. yield, mod ash.
		746-766.2 Shale carbonaceous to coaly shale shaly coal & coal - dull, dk. gy. to blk., carb. to sl. coaly, 50% coal, frags from 758-764. Dirty. Interval could represent coal & & shale interbanding.
		766.2-768 Coal finely grnd. to fine fragmental, appears as fairly good clean coal, vitreous to bright, high yield, low ash.
		768 - 780 Shale/coaly shale & shaly coal, SOME COAL Shale, dull, finely grnd to fragmental, carb. to coaly, some py. on shears.
		772-774 Coal/coaly shale, dull to bright, mod. yield, mod. ash.
		780 - 802 Coal finely ground to fine fragmental, dull to bright, little shaly coal & coaly shale, appears as fairly good clean coal, high yield with low to mod. ash.
		802 - 804 Coal/coaly shale, fragmental, dull to bright - low to mod. yield, mod to high ash.
		804 - 806 Coal/some shaly coal fragments, fragmental, dull to bright, appear as fairly clean, high yield/mod. ash.
		806 - 817 Shale, dk. gy. to gy./blk., carb. to sl. coaly.

INTERVAL	UNIT THICKNESS	DESCRIPTION
734 - 840	106	Coal Horizon No. 5 Cont'd.
		817 - 820 Coal fine fragmental, some shaly coal fragments, appears fairly good clean coal, mod. to high yield, low to mod. ash.
		820 - 835 Shale/coaly shale & minor coal fragmental, carb. to coaly, some intervals with up to 50% coal - dirty.
		835 - 838 Coal, some shaly coal & coaly shale, dull to bright, appears fairly good clean coal, mod. to high yield, low to mod. ash.
		838 - 840 Shale/coaly shale, shaly coal & COAL, coal 40%, dull, dirty to touch, v. high ash, low yield.
840 - 870	30	Sandstone large fragments near top of unit, (possibly broken zone), m. gy., f. gr., a-r, mod. to well sort., sil. cmt., sl. arg. matrix, qtz. ss., appears as beach ss., few coaly ptchs. possibly cavings or coal strgs. some sltst. frags. in last sample.
870		TOTAL DEPTH

ROKE

GAMMA RAY NEUTRON LOG
SLIMLINE

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.

COMPANY BASIC CREEK COAL CO. LTD.

WELL SEC 23

LOCATION SOUTH HILL

FIELD FLATROCK VALLEY

PROVINCE BRITISH COLUMBIA

Permanent Datum: GROUND LEVEL Elev.
Log Measured from: KELLY BUSHING Ft. Above Perm. Datum
Drilling Measured from: KELLY BUSHING

K.B.
D.F.
G.L.

Date	23 MARCH 72
Run No.	ONE
Depth Driller	840
Depth Logger	842
Bottom Logged Interval	842
Top Logged Interval	SURFACE
Casing Driller	8 5/8 @ 30
Casing Logger	30
Bit Size	7 7/8
Type Fluid in Hole	WATER
Dens. Visc.	
pH Fluid Loss	
Source of Sample	
Rm @ Meas. Temp.	
Rmf @ Meas. Temp.	
Rmc @ Meas. Temp.	
Source of Rmf & Rmc	
Rm @ BHT	
Time Since Circ.	
Max. Rec. Temp.	
Equip. No. & Location	
Recorded By	S. BOWES
Witnessed By	BROWN

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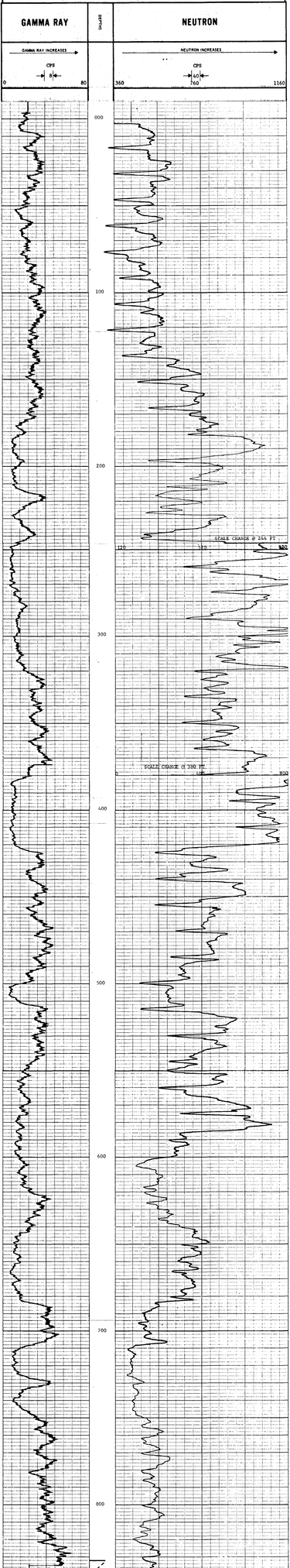
EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO	ONE	RUN NO	ONE
TOOL MODEL NO		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1INCH	TOOL MODEL NO	
DETECTOR MODEL NO		DIAMETER	1INCH
TYPE	GEIGER	DETECTOR MODEL NO	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.58 FT	LENGTH	6 INCH
GENERAL		SOURCE MODEL NO	MRC-N-SS-W
HOIST TRUCK NO	30	SERIAL NO.	598
INSTRUMENT TRUCK NO		SPACING	15 INCH
TOOL SERIAL NO.	CONSOLE AT 0	TYPE	Am/Be
		STRENGTH	6.94 X10⁶ N/S

LOGGING DATA

RUN NO	GENERAL DEPTHS FROM	TO	SPEED FT/MIN	T.C SEC.	GAMMA RAY SENS SETTINGS	GAMMA RAY ZERO DIV. L OR R	GAMMA RAY API G.R. UNITS PER LOG DIV.	T.C SEC	NEUTRON SENS SETTINGS	NEUTRON ZERO DIV. L OR R	NEUTRON API N. UNITS PER LOG DIV.
1	0	244	12	10	50	OL	8 CPS	3	500	9L	40
	244	380	12	10	50	OL	8 CPS	3	500	3L	40
	380	840	12	10	50	OL	8 CPS	3	500	OL	40

REMARKS



ROKE

OIL ENTERPRISES LTD. CALGARY, ALBERTA

GAMMA RAY-NEUTRON LOG

SLIMLINE

FILE NO.

COMPANY BEAR CREEK OIL CO. LTD.

WELL SEC # 36

L.S.D. SEC. TWP. RGE. W M

LOCATION SOUTH WELL

FIELD PLATEAU VALLEY

PROVINCE BRITISH COLUMBIA

Permanent Datum GROUND LEVEL Elev. 0

Log Measured from KELLY BUSHING 14 Ft. Above Perm. Datum

Drilling Measured from KELLY BUSHING

	Run No.	One
Date		14 MARCH 73
Time First Reading		0800
Time Last Reading		0855
Footage Logged		863
Depth Driller		863
Depth Logger		863
Casing Size		8 5/8 INCH
Casing Depth		863
Fluid Type		WATER/AIR
Fluid Level		120 FT

Recorded By: BRENDA STEVENS

Witnessed By: CHRISTOPHER JANE

Operating Time: Tool No. 5 1/2 HRS.

(16)

362

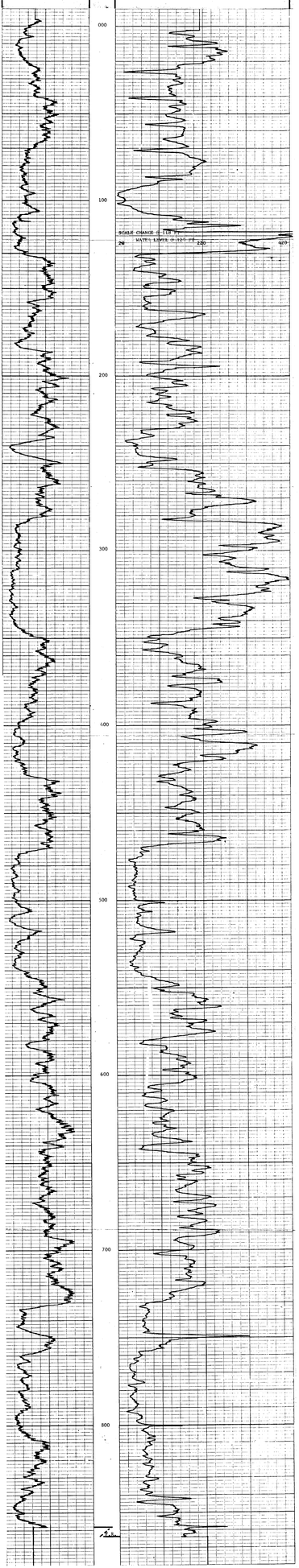
EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1 INCH	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1 INCH
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT	LENGTH	6 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
GENERAL		SERIAL NO.	598
HOIST TRUCK NO.	30	SPACING	15 INCH
INSTRUMENT TRUCK NO.		TYPE	Am/Be
TOOL SERIAL NO.	CGN18U4A1G	STRENGTH	$\times 10^6$ N/S

LOGGING DATA

RUN NO.	GENERAL DEPTHS FROM	TO	SPEED FT/MIN.	T.C. SEC.	GAMMA RAY SENS SETTINGS	ZERO DIV. L OR R	API G-R UNITS PER LOG DIV.	T.C. SEC.	NEUTRON SENS SETTINGS	ZERO DIV. L OR R	API N. UNITS PER LOG DIV.
1	0	118	12	10	50	OL	5 CPS	3	500	5L	40 CPS
	118	863	12	10	50	OL	5 CPS	3	500	1L	20 CPS

REMARKS: LOGGED THROUGH DOUBLE-WALL DRILL STEM



RIO TINTO CANADIAN EXPLORATION LIMITED
ROTARY DRILL RECORD

362

Hole No: S.C.C. 27 Property: Sage Creek Coal

Location: South Hill
17,847,850N
585,000E

Elevation: 4850 ft.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
R. C. HART

Expiry Date: Mar. 3, 1974

Date Commenced Drilling: March 17, 1973.

Date Finished Drilling: March 23, 1973

Date Hole Completed: March 23, 1973

Contractor: McAuley Drilling Co. Ltd Hole Size: 4 3/4"
Rig 55

Logged by: O. Cullingham Date: March 23, 1973

Probed by: Roke Oil Enterprises Ltd Date: March 23, 1973

Total Depth Drillers: 705

Total Depth Roke: 685

DRILL REPORT

1 61/4" W.M. Bit 8'
10' Surface Casing left in hole
4 43/4" W.M. Bits 697'
Total Footage 705
Total Standby Time for logging 5 hours
Other Standby Time
Total Standbytime after 1 full hour 4 hours
Moving between leases after 1 free hour 2 hours

PROBE REPORT

684 - 0	Gamma Ray/Neutron	Open Hole
673 - 0	Sidewall Density	Open Hole

COAL HORIZONS

Coal Horizon	Drillers Picks		Log Picks	
Coal Horizon 2	23 - 42 (sh.ptg.26-31)	19'	23 - 41 (sh.ptg. 26-31)	18'
Coal Horizon 4				
Seam 4a	321 - 360.1	39.1'	321 - 360	39'
Seam 4b	370 - 394.5 (sh.ptg. 386-390)	24.5	369 - 394	25'
Coal Horizon 5				
Upper bench	608 - 626	18'	604 - 627	23'
lower bench	640 - 659.5	19.5'	642 - 661	19'

INTERVAL	UNIT THICKNESS	DESCRIPTION
0 - 23	23	Siltstone m.gy., v. arg., mod.hd., wthrd, Fe. Stn.
23 - 44.5	21.5	Coal Horizon No. 2 23-26 Coal finely ground to f. fragmental, dull to bright, 10% coaly shale, moderate yield, low ash. 26-31 Shale / carb. & coaly shale 31-42 Coal finely ground to f. fragmental, dull to bright, for the most part appears as good clean coal, some coaly shale fragments 5-10%, high yeild, low ash. 42-44.5 Coal / coaly shale, dull to bright, f. fragmental, low yield, prbly low to mod. ash. for the coal.
44.5 - 50	5.5	Shale m. lt. gy. to dk. gy., some carb. to coaly shale at top of unit becoming lighter grey & silty towards base.
50 - 81	31	Siltstone m.gy., arg., blocky, sdy. in part., mod. hd. 70-75 sltst AA./sl. Fe. stn.
81 - 130	49	Sandstone m. gy., v.f. to m.gr., poor sort, v. arg., a-A, greywacke 95-100 ss m. gy., v. f. to m. gr. p. sort., chert & qtz. gr., arg. matrix, a-A gr., sil, cmt, hd., sl. Fe. (lmn) stn. 125-130 ss m.gy., f-m.gr., mod. sort., a-A, chert & qtz., hd., Fe (lmn) stn. sltst @ 126-128
130 - 145	15	Shale m.dk. gy., sl. slty., blocky, hd., some coalified pl. remn. near base of unit.
145 - 200	55	Interbedded siltstone/sandstone sltst m.gy., blocky, arg. matrix, mod. hd., some Fe. stn. 160-165 SS m.gy., v.f.gr., a, mod. sort, mod.hd., arg. matrix, mostly qtz/ little chert.
200 - 230	30	Sandstone m.gy., some Fe. stn., some arg. matrix, sil. cemt, hd., f. gr., p-mod. sort., a.gr., qtz./chert. 215 - 220 SS m.dk.gy., m.gr., p. sort with f-c gr., hd. 220-230 SS m. gy., blocky, silt to v.f.gr.ss., some arg. matrix, hd., becoming sdy. siltstone at base.
230 - 290	60	Siltstone m.gy., blocky, arg., (becomes more arg. downwards in section). mod. hd., sdy. in part., slty shale frags. near base. 245 - 250 sandstone m.brn.gy., wthrd. appearance, v.f.gr., arg.& slty.
290 - 321	31	Shale m.gy. to m.dk.gy., sl. slty,

INTERVAL	UNIT THICKNESS	DESCRIPTION
		vinlets @ 300'. Some arg. sltst. fragments.
321 - 394.5	73.5	Coal Horizon No. 4 321-360.1 Coal seam 4a 321-324 Coal finely ground to f. fragmental, appears fairly gd. clean coal, high yield/low ash. 324-326 Shale carb to coaly with minor coal fragments, gy.blk., dirty to touch. 326-330 Coal finely grnd., appears dirty, high content of carb to coaly shale, low yield/mod. to high ash. 330-340 Coal finely ground to fragmental, dull to vitreous/some bright, little pyr, mod. yield, mod. ash. some coaly shale fragments. 340-342 Coal/coaly shale dull, dirty to touch, low yield (50%) -prbly high ash. 342-350 Coal finely grnd to fragmental, dull to bright, medium to high yield, low to mod. ash., some coaly shale & shale fragments 10%. 344-345 shale prtg (drillers). 350-354 Shale/coaly shale & miner coal gy.blk, carb. to coaly, 30% coal fragments. dull. 354-360.1 Coal finely grnd. to f. fragmental, dull, high %age coaly shale, low yield, mod. to high ash. 360.1-370 Shale & siltstone m.gy., blocky, mod. hd., carb. to sl. coaly toward base of unit. 370-394.5 Coal Seam 4b 370-386 Coal finely ground to f. fragmental, appears as failry good clean coal/ 10% shaly & coaly shale fragments. high yield with low to mod. ash. some pyr. flakes. 386-390 Shale, carb. to coaly/minor coal dull, finely grnd. to fragmental. 390-394.5 Coal finely grnd. to f. fragmental, dull to bright, appears as fairly gd. clean coal, some coaly shale & shale frags (15%). mod. yield, mod. ash.
394.5 - 480	85.5	Shale m.to m. dk. gy., in part sl. slty., in part sl. carb., soft to mod. hd. 415-425 sltst m.gy., quite arg., blocky, mod. hd. 445-480 Shale m.dk.gy., sl. carb., some frags with coaly flakes, some pl. remn. Few short intvls of carb. to coaly sh.

INTERVAL	UNIT THICKNESS	DESCRIPTION
480 - 590	110	Interbedded Shale and Siltstone Shale m.gy., slty, mod. hd., blocky. sltst m.gy., arg., mod.hd., blocky, sl. sdy. in part. 515-525 sandstone m.gy., v.f. to f.gr., poor to mod. sort., arg., slty., a. gr., mod. hd. to hd.
590 - 608	18	Shale/carb shale mdk.gy., to dk. gy., carb., soft, woody structures. -minor fragments of coal. 595 - Coal few shale fragments, dull to vitreous, 70% coal, low to mod. ash.
608 - 659.5	51.5	Coal Horizon No. 5 608-612 Coal fine fragmental, dull to bright, v.sl.shaly, mostly clarain, appears fairly gd. clean coal, high yield, low to mod. ash. 612-624 Coal finely ground to fragmental, dull to bright, shaly, 25% shale & coaly shale, low yield, coal is prbly mod. ash. 624-626 Coal fine fragmental, dull to bright, some coaly shale, (10%) appears fairly gd. clean coal, high yield, prbly low ash. 626-640 Shale and coaly shale m.dk. gy. to gy.blk., carb., little coal. 640-646 Coal finely grnd, dirty, appears quite shaly, low yield, prbly with a high ash. 646-649.5) Shale m.dk.gy., sl. carb. 649.5-652 Coal fine fragmental, dull to bright, 10% coaly shale frags., appears fairly gd. clean coal, high yield, prbly low ash. 652-656 Coal finely grnd. to f. fragmental, dull, some bright coal but 10%, shaly, 25% carb. to coaly shale frags., low to mod. yield, mod. ash. 656-659.5 Coal finely ground to fragmental, appears as fairly gd. clean coal, some (10%) coaly shale, high yield, prbly low to mod. ash.
659.5 - 705	45.5	Sandstone m.gy., f.gr., mod. to well sort., a-r, sl. arg. matrix, sil. cmt., hd., mostly qtz/few chert gr., some chunky fragments, becoming a little more arg. downward in section. Appearance of basal Kootenay sandstone.
705		Total depth

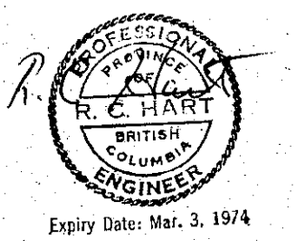
RIO TINTO CANADIAN EXPLORATION LIMITED

ROTARY DRILL RECORD

362

Hole No: S.C.C. 28 Property: Sage Creek Coal

Location: South Hill Elevation: 4,850' A.S.L.
17,845,460 N
584,800 E



Expiry Date: Mar. 3, 1974

Date Commenced Drilling: March 23, 1973

Date Finished Drilling: April 4, 1973

Date Hole Completed: April 4, 1973

Contractor: McAuley Drilling Co. Ltd Hole Size: 4 3/4"
Rig No. 55

Logged by: O. Cullingham Date: April 4, 1973

Probed by: Roke Oil Enterprises Ltd Date: April 4, 1973

Total Depth Drillers: 754

Total Depth Roke: 751

DRILL REPORT

1 6 1/4" W.M. Bit 28'
30' Surface Casing Left in Hole
5 4 3/4" W.M. Bits Total Footage: 754'
Total Standby Time for Logging: 4½ hours
Other Standby Time: 2 hours
Total Standby Time after 1 free hour: 5½ hours
Moving between leases after 1 free hour: 1 hour

PROBE REPORT

749 - 4 Gamma Ray/Neutron Slimline thru Pipe

COAL HORIZONS

Coal Horizon	Drillers Picks		Log Picks	
Horizon No. 5	632 - 669.2	37.2	634 - 648 658 - 668	14 10

INTERVAL	UNIT THICKNESS	DESCRIPTION
0 - 20	20	OVERBURDEN Clay, sand and till
20 - 325	305	Clay and marl greyish yellow green for the most part, shorter intervals of yellowish gray and greenish grey. Slight to very effervescent in 10% Hcl - slimy to touch when immersed in acid - swells when wet- plasticine texture when damp-caused plugging of drill stem. Kishenehn Formation 155-165 Sandstone m.gy., f.gr., qtz ss., sil omt, hd., interdis-persed pyrite, sample contains 20% pyritized and partly coalified wood fragments - Pyrite tends to cement particles of qtz together - some greenish grey clay.
325 - 375	50	Sandstone and conglomerate m.gy., for the most part has wthrd. appearance, fragments imbedded in clay matrix, clay sl. calc., a-A gr., poor sort., v.f. to granule, qtz/chert, some Fe. stn., 360-365 Agglomeration of shale siltstone & sandstone fragments, wthrd., fe. stn., lt. orange brn. to m.gy., frags are rnd. 365-375 No samples - clay with thin bands of rock. Caused plugging of bit. Note Interval could represent reworked erosion surface.
375 - 395	20	Sandstone m.brn.gy., Fe. stn., wthrd. appearance, a-A gr., qtz/chert, arg. matrix, silt to f.gr., p. sort., some clay matrix. 380-385 Coaly clay blk., clayey, plasticine texture. Could represent a highly wthrd. Seam 2.
395 - 480	85	Sandstone m. to m.dk.gy., m.gr. with gr. from f to c., some conglomeratic sandstone intervals, poorly sort., qtz/chert., chert gr. usually more angular & coarser. Some arg. matrix sil. cmt., hd.
480 - 535	55	Sandstone m.gy., some Fe. stn. in part., v.f.gr., mod. sort., mod. hd., some arg. matrix 480-485 Shale&Siltstone m.brn.gy., wthrd. appearance, Fe. stn., some clay matrix

INTERVAL	UNIT THICKNESS	DESCRIPTION
		485-490 Sandstone rusty colour, very heavily Fe. stn. (hem). 495-500 Clay dk.gy., gumbo. 520-530 Siltstone m.gy., blocky, arg., mod. hd.
535 - 545	10	Sandstone m.to m.dk.gy., m.gr/some grs. to c., chert/qtz., a-A, hd., sil. cmt., abrupt change from above
545 - 555	10	Siltstone m.gy., Fe.stn., appears wthrd., blocky., mod. hd., abrupt change from above.
555 - 560	5	Shale dk.gy., blocky., pl. frags., some coalified pl. remn., v.sl. carb.
560 - 580	20	Siltstone m.gy., blocky, mod.hd., arg., distinct difference from siltstone above. v.sl.micromicaceous 561-562 Coal/traces of coal to 567
580 - 632	52	Sandstone to Siltstone m.gy. to m.dk. gy., silt to f.gr., mod.hd., arg., almost a greywacke. 620-625 Shale m.gy., wthrd. appearance, blocky., few frags. of ss. 625-632 Siltstone m.dk.gy., arg. to sl. sdy., carb. in part., coalified blebs.
632 - 669.2	37.2	COAL HORIZON No. 5 Seam 5 has deteriorated to coaly shale and shaly coal with a few coal bands. It is possible that the samples are contaminated however the seam is undoubtedly very shaly.
669.2 - 715	45.8	Sandstone m.gy., f.gr., r-a, mod. to well sort., sil cmt., qtz/v.few chert gr., few coal frags., has all appearance of basal Kootenay. Becomes sl. arg. toward base of unit.
715 - 754	39	Sandstone m.gy., v.f. to f.gr., mod. sort., mostly qtz., some arg. matrix., py. spheres with radiating pattern
754		TOTAL DEPTH

RIO TINTO CANADIAN EXPLORATION LIMITED
ROTARY DRILL RECORD

362

Hole No: S.C.C. 29 Property: Sage Creek Coal

Location: South Hill
17,847,060 N
584,450 E

Elevation: 5,050' ASL

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA R. CANART
Expiry Date: Mar. 3, 1974

Date Commenced Drilling: April 4, 1973

Date Finished Drilling: April 9, 1973

Date Hole Completed: April 10, 1973

Contractor: McAuley Drilling Co. Hole Size: 4-3/4"
Rig No. 55

Logged by: O. Cullingham Date: April 9, 1973

Probed by: Roke Oil Enterprises Date: April 9, 1973

Total Depth Drillers: 668

Total Depth Roke: 666

DRILL REPORT

1 6¼" W.M. Bit 12'
10' Surface Casing left in hole.

3 4-3/4" W.M. Bits	Total Footage	:	668
	Total Standby time for logging	:	2 hrs.
	Other Standby Time	:	2 hrs.
	Total Standby Time after 1 free hr.	:	3 hrs.
	Moving from lease to camp after 1 free hr.	:	5 hrs.

PROBE REPORT

664 - 000 Gamma Ray/Neutron Slim Line Through pipe.

COAL HORIZONS

Coal Horizon	Drillers Picks		Log Picks	
Horizon No. 2 Seam 2	250.2 - 265.0	6.8	257 - 264	7
Horizon No. 4 Seam 4 (lower bench)	422.0 - 433.8	11.8	423 - 433	10
Horizon No. 5 Seam 5 (Upper bench)	580.0 - 595.0	15	580 - 593	13
Horizon No. 5 Seam 5 (Middle bench)	610.0 - 616.0	6	610 - 616	6
Horizon No. 5 Seam 5 (Lower bench)	620.0 - 628.0	8	619 - 626	7

INTERVAL	UNIT THICKNESS	DESCRIPTION
0 - 15	15	-Broken and Weathered Sandstone _ No samples collected from first 10 feet. 10' surface casing left in hole. 10-15 Sandstone - M. red,brn,gy, wthrd., Fe stn. f-m gr., arg. matrix, r-a qtz. gr., mod. sort.
15 - 50	35	Fragments of Wthrd. Conglomerate, Sandstone and Shale Wthrd., Fe. Stn., brocken qtz & chert. pbls., few ss. frags., few frags. of carb. sh. some clay matrix material.
50 - 90	40	Sandstone m. gy. to m. red. brn., Fe. stn. (hem), f to c gr., p. sort., arg. matrix, a-A gr., some sil. cmt., mostly qtz./some chert. 55-75 No samples collected - brown clay with few rock bands.
90 - 110	20	Siltstone M. dk. gy., red.brn. hem. stn., arg., mod. hd., blocky, few pyr. veinlets. @ 104.5 Trace of coal ~0.3'
110 - 135	25	Shale M. dk. gy., to dk. brn. gy., carb. and coaly bands, sl. sdy. in lower part of unit. @ 114.3 Coal trace ~0.5' 119-120.8 Coal contains frags. of carb. sh., appears as fairly bright coal.
135 - 150	15	Sandstone M. gy., broken, imbedded in clay or unconsolidated material - could be fault scour. - frags. of m-c gr. ss.- few frags of qtz. & chert. pbls., Fe. stn.
150 - 227	77	Sandstone M. gy., varies between v.f. to f. grained up to conglomeratic, some Fe. stn., mod. sort., with some coarser chert. pbls. to A., arg. matrix, some intvls. of graywacke. 164-168.5 Shale m. gy., blocky, mod. hd., slty., large frags, chunky. 168.5-177.5 Sandstone conglomeratic.

INTERVAL	UNIT THICKNESS	DESCRIPTION
150 - 227	77	Cont'd. 177.5-184 Shale m. gy., blocky, silty, mod. hd. 209.5-215 Shale m. to m. dk. gy., slty., blocky., mod. hd. 0.2' coal @ 209.6 0.3' coal @ 214 215-220 Siltstone m. gy., silt. to v.f. gr., ss., arg., mod. hd.
227 - 258.2	31.2	Shale M. to dk. gy., blocky, v. sl. slty., carb. in part., few coal pbls. & strgs., some pyr. veinlettes. 229.2-231.2 Coal fine fragmental, dull to bright, shaly, some ss. cavings from above, mod. yield, high ash. 250.6-252 Shale/Coaly Shale ∿5% bright coal fragments, minor py., flakes on shear faces.
258.2 - 265.0	7.8	Coal Horizon No. 2 258.2-260 Coal finely grnd. to fragmental, dull to vitreous, some bright coal, some shaly coal, minor contamination from above, mod. yield, prbly. mod. ash. 260 -264 Coal finely grnd. to fine fragmental, appears as good clean coal, high yeild, prbly. low ash. 264 -265 Coal to Coaly Shale few bright coal frags.
265.0 - 312.0	47	Sandstone M. to m. dk. gy., m. gr., some intvls. of c gr., mod. sort., a, some arg., matrix., sil. cmt., qtz. and chert. gr., hd., few grags. carb. sh. probably cavings from above.
312.0 - 370.0	58	Interbedded Siltstone, Shale and Sandstone- m. gy. to m. dk. gy., arg., blocky, mod. hd. abrupt change from above, few calcite frags. in upper part of unit. ss to v. f. to f. gr. some minor Fe st
370.0 - 393.0	23	Sandstone, m. gy., m. gr., p. sort., qtz./ chert, a, some arg. matrix, sil. cmt., mod. hd. to hd. sl. Fe. stn. in part., some cmt.
393.0 - 422.0	29	Siltstone/Shale, m. dk. gy. to gy. blk., silstone grading down section to shale Blocky, arg. to silty mod. hd. at top of unit, abrupt change from above.

INTERVAL	UNIT THICKNESS	DESCRIPTION
393.0 - 422.0	29	Cont'd. 393-395 Frags. of sh/sltst. m. gy. to m. gy. brn., Fe stn., appears wthrd. md. frags., broken zone or erosion surface. 410-415 Shale few frags. carb. sh. NOTE: Interpreted normal fault at 422'. - Possibly entire interval broken zone.
422.0 - 433.8	11.8	Coaly Section - Possibly lowermost bench of seam 4 badly broken up and contaminated. Dk. gy. blk. to blk., coal /coaly shale and carb. shale, 25% to 50% coal frags. Possibility of cavings from above.
433.8 - 465.0	31.2	Shale M. gy., sl. slty to slty, blocky, mod. hd. 435-445 Sltst. v. arg., blocky, mod. hd.
465.0 - 490.0	25	Sandstone M. gy., v. f. gr., slty., arg., a, qtz./minor chert., mod.hd. to hd., Sil. cmt. 475-480 Shale m. gy., v. sl. slty. 480-485 SS, m. gy., f-m gr., mod. sor a-r grs., sil. cmt. hd. 485-490 Siltstone M. gy., arg., mod. hd.
490.0 - 510.0	20	Shale M. dk. gy., blocky, carb., v. sl. coaly, minor py. 508-510 Coal
510.0 - 575.0	65	Siltstone with Sandstone Interbeds, m. gy., silt to v. f. gr., arg., mainly qtz. gr., sil., mod.hd., becoming more arg. down sections.
575.0 - 580.0	5	Shale, soft, grey, carb.
580.0 - 629.2	49.2	Coal Horizon No. 5 580-582 Coal fragmental, appears as fairly good clean coal, vitreous to bright, high yield/ probably low ash. 582-584 Coal finely ground to fine frags., some coaly sh. frags. dull to vitreous, mod. yield, mod. to high ash.

INTERVAL	UNIT THICKNESS	DESCRIPTION
580.0 - 629.2	49.2	Cont'd. 584-586 Shale/Dull Coal, finely grnd., v. high ash. 586-595 Coal, fine, fragmental, dull, to bright, some shaly material appears as a fairly good clean coal, high yield with low to mod. ash. 595-610 Shale, CARB. TO COALY, DULL, few coal bands. Coal prbly > 10%. 610-616 Coal finely ground to fine fragmental, dirty to touch, some carb. & coaly shale ptgs. high fusain content. Mod. yield - mod. ash. 616-620 Shale, carb. to coaly/~30% coal fragments, coal appears mod. to high in ash, low yield. 620-628 Coal, finely ground to fine fragmental, dull to bright, some shaly material - carb. to coaly shale bands throughout, low to moderate yield - coal appears fairly good/ prbly. a low to mod. ash. 628-629.2 Coal/Shale, dk. gy. blk., - coal ~60%, low yield - coal prbly. has mod. ash.
629.2 - 668.0	38.8	Sandstone M. gy., f. gr., a-r, mod. to well sort., sil. cmt., some arg. matrix, mostly qrz/little chert., mod. hd., few coaly & carb. frags.(possibly from above). Has appearance of basal kootenay, becomes a cleaner ss, downwards in section/s/high chert content.
668.0		TOTAL DEPTH

ROKE

SIDEWALL DENSILOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.

COMPANY BASIN CREEK COAL CO. LTD.

WELL BSC # 27

LOCATION SOUTH HILL

FIELD PLATEAU VALLEY

PROVINCE BRITISH COLUMBIA

Permanent Datum GROUND LEVEL Elev.

Log Measured from GROUND LEVEL Ft. Above Perm. Datum

Drilling Measured from

Elev.: K.B. CDS G.L.

Other Services: CBS

Rec. No. ONE

Date 23 MARCH 73

First Reading 673

Last Reading 8

Bit Size Logged 6 3/4

Bit Size Drilled 6 3/4

Depth Driller 676

Depth Logger 706

Casing Driller

Casing Logger

Fluid Type WATER/AIR

Liquid Level

Max. Temp.

Rm @ °F

Operating Time

Truck No. 30

Recorded By STONEHOUSE

Witnessed By CHILLINGHAM

Survey Date: Mar. 23, 1973

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LOGGING DATA

RUN NO.	DEPTHS FROM	DEPTHS TO	SPEED FT/MIN	T.C. SEC	SENS SETTINGS	ZERO DIV. L OR R	CPS/DIV.
1	0	673	8	3	1000	0R	

REMARKS

CALIPER

HOLE DIAMETER

(INCHES)

0 12

1.50 1.60 1.70 1.80

DEPTHS

000 100 200 300 400 500 600

DENSITY

CPS

BULK DENSITY (GRAMS/CC)

1.90 1.80 1.70 1.60 1.50 1.40 2.00 2.10 2.20 2.30 2.40 2.50 2.60 2.70 2.80 2.90

F.R.

ROKE

GAMMA RAY NEUTRON LOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.	
COMPANY	BAUER CREEK COAL CO. LTD.
WELL	SEC # 27
FIELD	FLATROAD VALLEY
LOCATION	BOOTH HILL
Elev.	
Perm. Datum	
Log Measured from	GROUND LEVEL
Drilling Measured from	G.L.

Run No.	ONE
Date	23 MARCH 73
First Reading	686
Last Reading	246
Footage Logged	684
Depth Driller	685
Depth Logger	706
Casing Driller	8 5/8 @ 246
Casing Logger	246
Fluid Type	WATER/AIR
Fluid Level	248
Max. Temp. Deg. F.	
Operating Time	
No. of Runs	1
Recorded By	3 BOXES
Witnessed By	

Other Services: Caliper Neutron Gamma Ray

Permanent Datum: GROUND LEVEL Elev. 0 ft. Above Perm. Datum

Log Measured from: G.L. 0 ft. Above Perm. Datum

Drilling Measured from: G.L.

Rig No. 1

Engineer: BRUNELLARD

Witnessed By: COULTHORN

Permit No. L 1345

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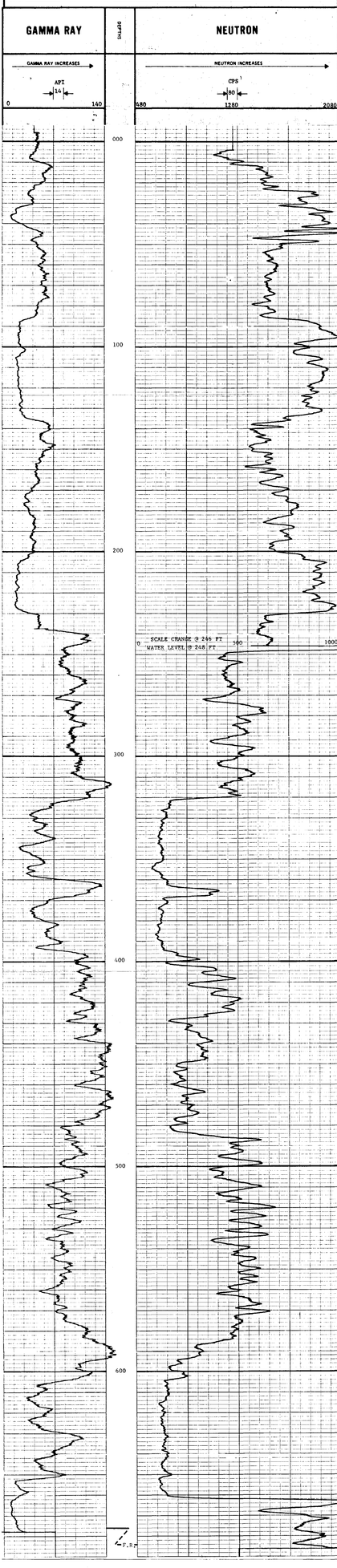
EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1¾	TOOL MODEL NO	
DETECTOR MODEL NO.		DIAMETER	1¾
TYPE	GEIGER	DETECTOR MODEL NO	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT	LENGTH	6 INCH
GENERAL		SOURCE MODEL NO	MRC-N-SS-W
		SERIAL NO	698
HOIST TRUCK NO	30	SPACING	19 INCH
INSTRUMENT TRUCK NO		TYPE	Amite
TOOL SERIAL NO	CDN2704A64	STRENGTH	6.70×10^6 N/S

LOGGING DATA

RUN NO.	GENERAL DEPTHS FROM	TO	SPEED FT/MIN	GAMMA RAY T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	API G R UNITS PER LOG DIV.	NEUTRON T.C. SEC	SENS. SETTINGS	ZERO DIV. L OR R	API N. UNITS PER LOG DIV
1	0	246	10	5	100	0L	14 API	3	1000	5L	80 CPS
	246	684	10	5	100	0L	14 API	3	1000	0L	50 CPS

REMARKS: LOGGED IN OPEN HOLE



ROKE

GAMMA RAY NEUTRON LOG
SLIMLINE

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.

COMPANY SAGE CREEK COAL CO. LTD.

WELL SEC # 28

LOCATION SOUTH HILL

FIELD FLATHEAD VALLEY

PROVINCE BRITISH COLUMBIA

Permanent Datum: GROUND LEVEL — Elev.: K.B. —, D.F. —, G.L. —
Log Measured from: GROUND LEVEL — 7 ft. Above Perm. Datum
Drilling Measured from: GROUND LEVEL

Date: July 26, 1974

Run No.	ONE
Depth Driller	749 FEET
Depth Logger	749 FEET
Bottom Logged Interval	748 FEET
Top Logged Interval	SURFACE
Casing Driller	7 INCH @ SURFACE
Casing Logger	7 INCH @ SURFACE
Bit Size	6 INCH
Type Fluid in Hole	WATER
Max. Rec. Temp.	FULL
Equipment No.	
Location	
Recorded By	GERRARD
Witnessed By	CUTLER

L.S.D. SEC. TWP. RGE. — W4M

Other Services: 3D, 3 SERIES

Permanent Datum: GROUND LEVEL. Elev.: K.B. —, D.F. —, G.L. —. Log Measured from: GROUND LEVEL, 7 ft. Above Perm. Datum. Drilling Measured from: GROUND LEVEL. Date: July 26, 1974. Run No. ONE. Depth Driller 749 FEET. Depth Logger 749 FEET. Bottom Logged Interval 748 FEET. Top Logged Interval SURFACE. Casing Driller 7 INCH @ SURFACE. Casing Logger 7 INCH @ SURFACE. Bit Size 6 INCH. Type Fluid in Hole WATER. Max. Rec. Temp. FULL. Equipment No. Location. Recorded By GERRARD. Witnessed By CUTLER. Other Services: 3D, 3 SERIES.

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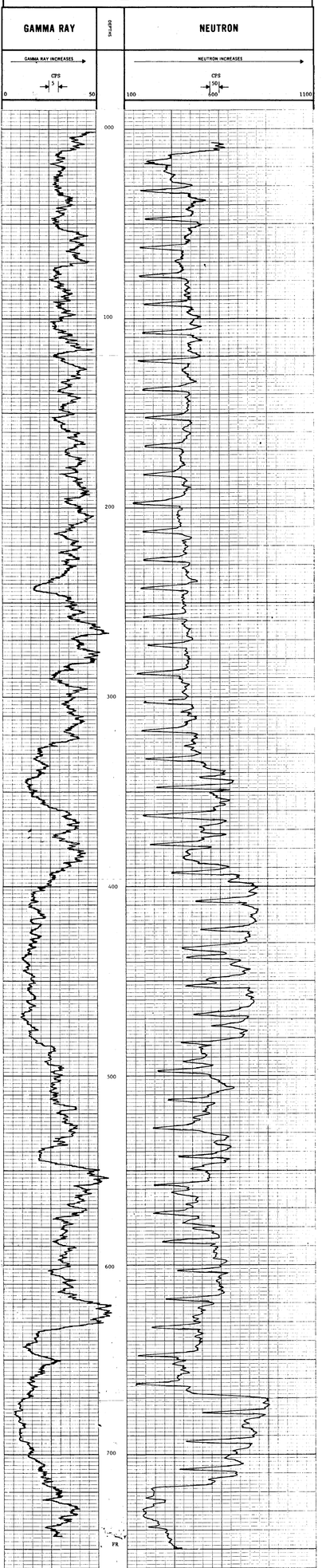
EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1 INCH	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1 INCH
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.33 FT	LENGTH	8 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
GENERAL		SERIAL NO	398
HOIST TRUCK NO	30	SPACING	15 INCH
INSTRUMENT TRUCK NO		TYPE	AmBe
TOOL SERIAL NO.	CGN16U24A10	STRENGTH	6.94×10^6 N/S

LOGGING DATA

GENERAL				GAMMA RAY				NEUTRON			
RUN NO.	DEPTHS FROM	DEPTHS TO	SPEED FT/MIN	T.C. SEC	SENS. SETTINGS	L. ZERO DIV. L OR R	API G.R. UNITS PER LOG DIV.	T.C. SEC	SENS. SETTINGS	ZERO DIV. L OR R	API N. UNITS PER LOG DIV
1	4	749	10	10	50	0 L	5 CPS	5	1000	2 L	50 CPS

REMARKS: LOGGED THROUGH DOUBLE WALL DRILL STEM



ROKE

GAMMA RAY NEUTRON LOG
SLIMLINE

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.

LSD
SEC 29
TWP
RGE
W4M

COMPANY: SAGE CREEK COAL CO. LTD.

WELL: SCC # 29

LOCATION: BOOTH HILL

FIELD: FLATBAD VALLEY

PROVINCE: BRITISH COLUMBIA

Permanent Datum: GROUND LEVEL — Elev.: K.B. —
Log Measured from: KELLY BUSHING — 7 ft. Above Perm. Datum — D.F. —

Date	10 APRIL 73
Run No.	ONE
First Reading	664
Last Reading	0
Bottom Logged	664
Bottom Driller	668
Depth Driller	668
Casing Size	6"
Casing Bore	6.06
Casing Depth	668
Fluid Type	WATER/AIR
Fluid's Order	
Liquid Level	204
Max. Rec.	
Operating Time	2 1/2 HOURS
Truck No.	30
Recorded By	SUTHERLAND
Witnessed By	CULLINGHAM

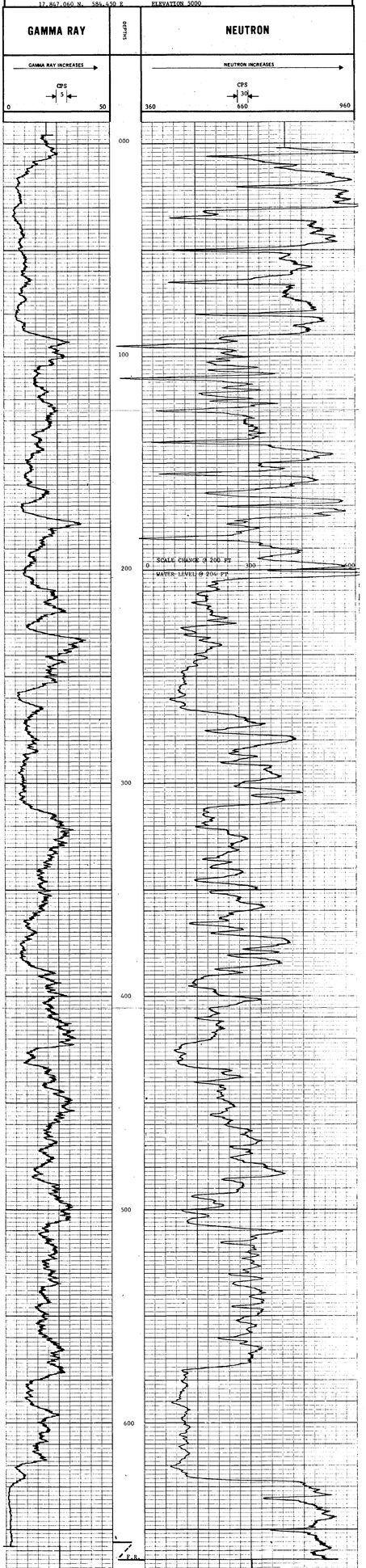
EQUIPMENT DATA

GAMMA RAY		NEUTRON	
RUN NO.	ONE	RUN NO.	ONE
TOOL MODEL NO.		LOG TYPE	NEUTRON/NEUTRON
DIAMETER	1INCH	TOOL MODEL NO.	
DETECTOR MODEL NO.		DIAMETER	1INCH
TYPE	GEIGER	DETECTOR MODEL NO.	
LENGTH	18 INCH	TYPE	PROPORTIONAL
DISTANCE TO N. SOURCE	8.55 FT	LENGTH	6 INCH
		SOURCE MODEL NO.	MRC-N-SS-W
GENERAL		SERIAL NO.	598
HOIST TRUCK NO.	30	SPACING	15 INCH
INSTRUMENT TRUCK NO.		TYPE	AmBe
TOOL SERIAL NO.	CGN16U4A10	STRENGTH	6.94×10^6 N/S

LOGGING DATA

RUN NO.	GENERAL DEPTHS FROM	TO	SPEED FT/MIN	GAMMA RAY T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	API G R UNITS PER LOG DIV.	NEUTRON T.C. SEC.	SENS. SETTINGS	ZERO DIV. L OR R	API N. UNITS PER LOG DIV.
1	0	200	12	10	50	0 L	5 CPS	3	500	12 L	30 CPS
	200	664	12	10	50	0 L	5 CPS	3	500	0 L	30 CPS

REMARKS: LOGGED THROUGH DOUBLE WALL DRILL STEM
17,847,060 N, 584,450 E ELEVATION 5000



F.R.

K- SAGE CREEK 73(2)A

MAPS & CROSS SECTIONS

SAGE CREEK COAL LTD.

RIO TINTO.

00 362

(2)

LEGEND:

- Jf — JURASSIC - FERNIE Fm.
- Kk — CRETACEOUS - KOOTENAY Fm.
- Kbl — CRETACEOUS - BLAIRMORE Gp.
- Tk — TERTIARY - KISHENEHN Fm.
- Zone of Outcrop
- Contact — Defined, Inferred, Estimated
- Coal seam (surface trace)
- X , ▬ Coal wash, coal outcrop
- Normal fault with direction of downthrow
- Small fault
- 30 Strike with dip direction and angle
- 7 Drill hole (Sage Creek Coal)
- St. 2 Drill hole (Stelka)
- Adit location
- L 9384 Lot number
- CL 987 Coal Licence number
- Note: Caution error in topo contours (Dilly Hill Area)

CL 989 · L 10450 · CL 605 · CL 987 · L 9348 · CL 603 · L 3506 · CL 374 · L 3510 · CL 986 · L 3509 · CL 376 · L 7848 · CL 388 · L 3508 · CL 375 · L 8728 · CL 393 · L 8727 · CL 392 · L 9385 · CL 396 · L 9495 · CL 604 · CL 988

Base Line 584,302

Howell Creek

Possible surface trace of Harvey fault

Cabin Creek

Seam 5 · Seam 4b · Seam 4a · Seam 3 · Seam 2 · Seam 1

Adit-5 (New) · Adit-4 · Adit-5 (Old) · Adit-2

DILLY HILL

Land Slip

(17,859,060) Section 859,060 — 858,660 — 858,260 — 857,860 — 857,460 — 857,060 (40,000) — 856,660 — 856,260 — (37,000) — 855,860 — 855,460 — (35,000) — 855,060 — 854,660 — 854,260 — (37,000) — 853,860 — 853,460 — 853,060 (34,000) — 852,660 — 852,260 — (35,000) — 851,860 — 851,460 — 851,060 (34,000) — 850,660 — 850,260 (33,000) — 849,860 — 849,460 — 849,060 (33,000) — 848,660 — 848,260 — 31,000 — 847,860 — 847,460 — 847,060 (30,000) — 846,660 — 846,260 (31,000) — 845,860 — 845,460 — 845,060 (32,000) — 844,660 — 844,260 — 843,860 — 843,460 — 843,060 — 842,660 — 842,260 (17,842,260)

N.T.S. 82-G-1,2

SCALE 400 0 400 800 1200 1600 FEET

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RIO TINTO CANADIAN EXPLORATION LIMITED

SAGE CREEK COAL LIMITED

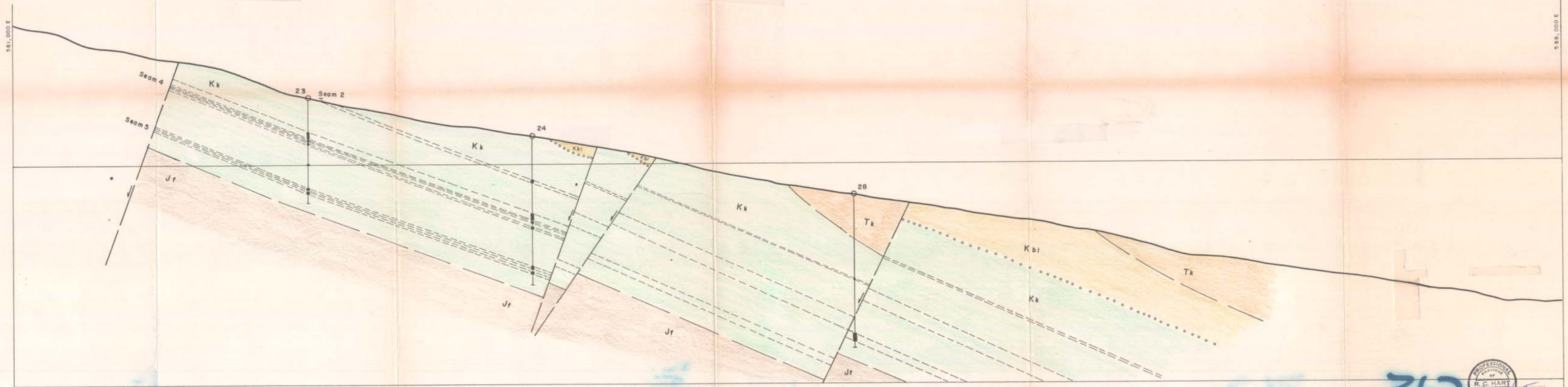
GEOLOGICAL MAP

K-SAGE CREEK 73(2)A

June - 1973 O. C. / e.k. DWG. G-4430

W.

E.



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N.T.S.
82-G-1,2

SCALE
200 0 200 400 600 800
One Inch = 200 Feet

PROFESSIONAL ENGINEER OF R.C. HART
Expiry Date, Mar. 3, 1974

RIO TINTO CANADIAN EXPLORATION LIMITED

SAGE CREEK COAL LTD — B.C.

SECTION 17, 845, 460N

K-SAGE CREEK 75(G)1A

April — 1975 | D.C. / e.k. | DWG. D-3418-1

W.

E.

581,000 E.

588,000 E.

Seam 5

Seam 4

Seam 2

19

st.6

Kk

Kbl

Jf

Elev. 5000'

846,260N.

Elev. 4000'

362

(2)

N.T.S.
82-G-1,2

SCALE

200 0 200 400 600 800

One inch = 200 Feet

RIO TINTO CANADIAN EXPLORATION LIMITED

SAGE CREEK COAL LTD – B.C.

SECTION 17, 846,260N

(M3)

K-SAGE CREEK 79(2)A

April – 1973 | D.C. / e.k. | DWG. D-3418-2

W.

E.

581,000 E

589,000 E

Seam 5

Seam 4

Seam 2

13

29

25

Kk

Jf

Kbl

Tk

Elev. 5000'

Elev. 4000'

847,060N

N.T.S.
82-G-1,2

SCALE

200 0 200 400 600 800

One Inch = 200 Feet

362

(2)

(M4)

Entry Date: Mar. 3, 1974

RIO TINTO CANADIAN EXPLORATION LIMITED

SAGE CREEK COAL LTD – B.C.

SECTION 17, 847,060N

K-SAGE CREEK 73(2)M

April – 1973 | D.C. / e.k. | DWG. D-3418-3

W.

E.

581,000 E

568,000 E

Seam 5

Seam 4

Seam 2

21

22

Kk

Jf

Kbl

Elev. 5000'

Elev. 4000'

SAE 362

(2)

(MS)

PROFESSIONAL ENGINEER
R. C. HART
Province of British Columbia

Expiry Date: Nov. 3, 1974

N.T.S.
82-G-1,2

SCALE

200 0 200 400 600 800

One inch = 200 Feet

RIO TINTO CANADIAN EXPLORATION LIMITED

SAGE CREEK COAL LTD – B.C.

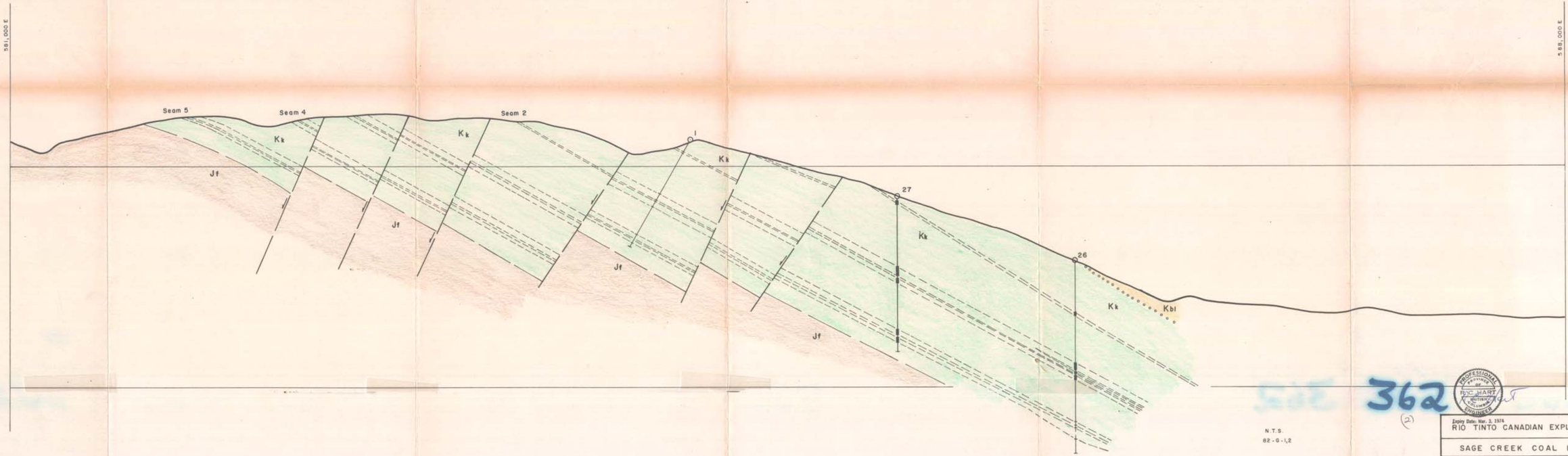
SECTION 17,847,460N

K-SAGE CREEK 78(2)A

April – 1973 | D.C. / e.k. | DWG. D-3418-4

W.

E.



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N.T.S.
82-G-1,2

SCALE
200 0 200 400 600 800
One Inch = 200 Feet

Expiry Date: Mar. 3, 1974

RIO TINTO CANADIAN EXPLORATION LIMITED

SAGE CREEK COAL LTD – B.C.

SECTION 17,847,860N

K SAGE CREEK 72(2)A

April – 1973 | D.C. / e.k. | DWG. D-3418-5