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SML 335

SPRINGFIELD BASIN

PROGRESS REPORTS TO LICENCE EXPIRY FOR THE PERIOD 18/9/69 TO 17/9/70

Submitted by CRA Exploration Pty Ltd 1970

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C.R.A. EXPLORATION PTY. LIMITED.

14th November, 1969.

Memorandum to : A.F. McQUEEN

copy : C.L. Knight

from : G.F. Pigott

Reconnaissance Survey in Special Mining Lease 335, Springfield, South Australia

SUMMARY

Scintillometer traverses were carried out over the area of the Springfield Coal Basin, and 6,000 feet of percussion and diamond drilling samples collected in 1958-59 were scanned with a scintillometer. A fresh unleached section of a sandstone in the basal beds gave radioactive values of $2\frac{1}{2}$ times background. A slightly anomalous section of $1\frac{1}{2}$ times background was found over arenaceous and carbonaceous beds higher up in the succession. Sandstones exposed at the surface were found to be decomposed, leached and only faintly radioactive compared with interbedded siltstones. Further work is recommended to investigate the radioactive occurrences.

INTRODUCTION

The presence of a thick basal clastic series, together with interbedded carbonaceous and arenaceous beds, in the Springfield Coal Basin makes the area one of interest as being a suitable environment in which a solution front type of uranium deposit could have formed. Samples from twenty two bores drilled by Mines Department in 1958-1959 were scanned with a scintillometer and scintillometer traverses were carried out over certain sections of the basin.

LOCATION AND ACCESS

The area covered by the lease lies within the Orroroo 1:250,000 sheet SI 54-1. It lies 30 miles northeast of Quorn by road and 14 miles south of Hawker. Access is by a rough track between the abandoned railway siding of Gordon and the town of Cradock from which the area is 13 miles by road. The area occupied by the basin forms a slightly undulating depression in a region of moderate relief.

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GEOLOGY

The sediments of the Springfield Basin occur in an intermontane basin measuring $2\frac{3}{4}$ by $1\frac{1}{4}$ miles elongated in a northeast-southeast direction. It is bounded by sedimentary and cataclastic rocks of the Proterozoic Adelaidean Appila Tillite, and the Topley Hill Formation (1). The following succession with thicknesses has been recognised by Johnson (2):

(?) Tertiary-Quaternary

0-20 feet: Calcrete cemented boulder conglomerates overlain by sands, clays and interbedded pebble lenses.

Triassic

Baked Argillites 70-90 feet: a sequence of mudstones containing freshwater molluscs and plant remains baked by a burning coal seam of the underlying beds.

Upper Coal Measures 350 feet: generally an arenaceous sequence with impure coal seams which have been fused.

Upper Sandstone Beds 125-140 feet: Leached and weathered soft yellow sandstones, medium-coarse grained clasts mainly of well rounded quartz, interbedded with concretionary limonite ironstones and ferruginised shales.

Lower Coal Measures 200-700 feet: carbonaceous and ferruginous shales, coal seams and limonite ironstones.

Lower Sandstone Beds 180-340 feet: Current bedded siltstones with mud flake breccias and fine-medium grained current bedded sandstone lenses. Very leached and decomposed.

Red Argillite 0-430 feet: Red massively bedded mudstones and siltstones.

Basal Conglomerate 0-600 feet: unsorted boulder conglomerates with red siltstones, red shales mud flake breccias and medium-coarse sandstones. The lowest conglomerate horizons contain only Adelaidean clasts, higher units contain uncleaved red shales and mudstones.

Basal shales 200 feet: grey shales.

UNCONFORMITY

Adelaidean

Cleaved grey siltstones and mudstones, coarse psammitic tillite and mylonites.

The sediments are folded in the form of a crescent shaped assymmetric syncline downwarped into a basin with radial and tangential faults (2). The deformation is probably of Quaternary age.

INVESTIGATION

The area underlain by the basal arenaceous beds was traversed and the radioactivity noted at 100 foot centres using a Scintrex BGS-1S scintillomter. Some higher radioactivity was found to be in areas underlain by rocks further up in the sequence; a series of traverses were carried out over the centre of the basin. Rock samples were collected for assay.

RESULTS

The samples from the twenty-one 200 feet percussion drill holes and the 1140 foot stratigraphic test hole drilled in 1958-59 were scanned using a scintillometer in the South Australian Department of Mines core shed at Thebarton in It was found that the clastic sediments underlying the Lower Coal Measures gave only background values of radioactivity. However, there was only 2 feet of core representing the basal conglomerate. background values were obtained from a 5 foot section at 290 feet in hole 1A and a 3 foot section at 120 feet in hole 6. The lithology in both holes was the same - grey laminated siltstone occurring approximately 110 feet below the boundary between the Lower Coal Measures and the Upper Sandstone beds.

The scintillometer traverses across the succession did not locate the radioactive siltstone mentioned above, nor could it be located in outcrop. It was found, however, that an area overlying part of the Upper Sandstone Beds and the Upper Coal Measures gave radioactivity values of up to $1\frac{1}{2}$ times background. The beds are very ferruginised with concretionary limonite and limonite-filled joints and fissures widely developed. The sandstones are leached and soft and almost decomposed. The area occupied by the central mesa composed of Baked Argillite overlying ferruginised beds of the Upper Coal Measures, also gave readings of $1\frac{1}{2}$ times background but this is probably due to the mass effect of the topography.

The area in the northeast of outcropping arenaceous and argillaceous beds gave radioactive values of 30-50 c.p.s. Readings of up to 60 c.p.s were obtained from red siltstones in the basal conglomerate and Lower Sandstone Beds. Ferruginised and leached sandstone horizons were only faintly radioactive.

A 6 foot sequence of well bedded red quartz sandstone and red siltstones, exposed in the Slately Cliffs Creek on the northwest boundary of the basin, gave radioactive values of $2\frac{1}{2}$ times background. This sequence occurs 15 feet above the unconformity between the Appila Tillite and the coarse boulder conglomerate of the basal Triassic. The section is only radioactive where it is relatively unleached and has been exposed due to recent downcutting by the creek. The same sequence exposed on the hillside gives values of 40 c.p.s for the sandstone and 60-70 c.p.s for the siltstone compared to 130 c.p.s in the unweathered section.

CONCLUSIONS AND RECOMMENDATIONS

An unweathered section of basal sandstone was found to give radioactive readings of $2\frac{1}{2}$ times background; the same sandstone sequence where it has been leached gave only background values. A slightly anomalous section parallel to the strike was located down dip from the radioactive basal beds overlying ferruginous and carbonaceous rocks of the upper part of the sedimentary sequence. It is recommended that further work be carried out to examine the possibility that radioactive material leached from the weathered sandstones might be concentrated at depth down dip from the radioactive anomalous section exposed in Slately Cliffs Creek.

G.F. Pigott

GFP: jp

REFERENCES

(1) Geol. Surv. of S.A. 1958 Orroroo 1: 250,000 Sheet SI 54-1.

(2) Johnson, W.

1960 "Exploration for Coal Springfield Basin in the Hundred of Cudla-Mudla, Gordon-Cradock District".

Rep. Invest., Geol. Surv. of South Australia, 16:62p.

KEYWORDS

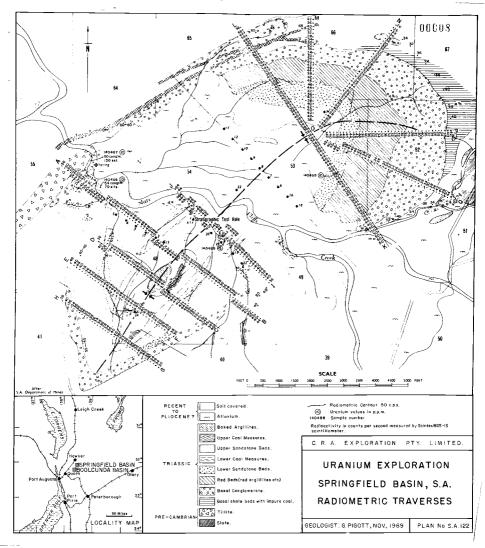
Reconnaissance, uranium, coal measures, Triassic, radiometric, sedimentary.

PLAN

No.

Scale

SA 122 Radiometric Traverses, Uranium 1500': 1' Exploration, Springfield Basin, South Australia.



C.R.A. EXPLORATION PTY. LIMITED

October, 1970.

Memorandum to : A.F. McQUEEN

Copies : D.S. Carruthers

C.L. Knight

From : A.K. Hodgkin

Scout Drilling for Sedimentary Uranium, S.M.L. 335,

Springfield Basin, South Australia.

SUMMARY AND RECOMMENDATIONS

The Triassic sediments of the Springfield Basin were considered to be possibly favourable environments for the formation of roll-front uranium deposits. Previous scintillometer traverses showed anomalous radioactivity, particularly in the west of the basin. Two holes were rotary drilled and gamma logged down dip of the anomalous outcrops. These holes did not intersect unusually radioactive sediments and the lithologies drilled do not appear to be suitable for large-scale ore formation. Relinquishment of the S.M.L. is recommended.

LOCATION AND ACCESS

The Springfield Basin is located in hilly country of the South Flinders Ranges, about 14 miles south of Hawker (see inset on Plan. S.A. 141). Access is by a graded road either from the Hawker-Quorn road on the west or the Hawker-Orroroo road on the east.

(Refer Plan S.A. 141)

For a full account see Johnson, 1960.

The Springfield Basin is a folded sequence of Triassic terrestrial and lacustrine sediments, some of which are highly carbonaceous, lying within the Proterozoic rocks of the Adelaide System. It was probably originally part of a larger basin and has been preserved by a combination of folding and faulting. The folding has formed an asymmetrical basin of 3.5 square miles with a south-curving northeast axis.

Deposition probably took place in an intermontain basin, with climate changing from arid (red bed deposition) to sub-tropical (coal measures).

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The Triassic succession is as follows: (per Johnson, page 6)

Baked Argillites: Pink and buff baked mudstones, fresh

water fossils, baked by a burning

coal seam (70 to 90 feet).

Upper Coal Measures: Grey sandy shale, fine grained sand-

stone with coarse arkose or greywacke

at top; carbonaceous shales,

argillites and siltstones with impure

coal seams (350 feet).

Upper Sandstone Beds: White to yellow siltstone or fine

grained micaceous sandstones with interbedded carbonaceous shales and impure coal seams; some coarse sand-

stones (125 to 140 feet).

Lower Coal Measures: Carbonaceous shales and argillites

with impure coal seams (200 to 700

feet).

Lower Sandstone Beds: Red, mauve and buff, fine to coarse

grained sandstones, in places arkosic

and with clay pellets (180 to 340

feet).

Red Argillite: Chiefly red to chocolate structure-

less argillite. Some interbedded sandstone and siltstones (0 to 430

feet).

Basal Conglomerate: Interbedded torrential conglomerate

and mauve to buff and purple coarse to very coarse, current bedded sandstone. Pebbles and boulders mainly

quartzite (0 to 600 feet).

Basal Shales: Grey to yellow shales with carbon-

aceous beds (0 to 200 feet).

(Total thickness: 1,135 - 2,850 feet)

The underlying Precambrian rock is, in the area drilled, a tillite.

The Springfield Basin appears to be a suitable environment for the formation of uranium ore roll deposits, in spite of the lack of obvious source rocks for the uranium. In particular, the existence of carbonaceous and pyritic sandy beds in the Lower Coal Measures, Lower Sandstone Beds and perhaps the Red Beds is encouraging.

^{*} Not present in area drilled,

PREVIOUS WORK

- (a) In 1958 and 1959 the South Australian Department of Mines carried out a thorough surface mapping and drilling program in order to test for economic deposits of coal. Seams were thin, discontinuous and impure (Johnson, 1960).
- (b) In 1969 G.F. Pigott carried out scintillometer traverses across the basin and scanned the samples from the Department of Mines' drilling program. Some anomalous results were found, both surface and subsurface. The most promising area was on the central western edge of the basin, where an outcrop of red quartz sandstone and siltstone 15 feet above the Precambrian basement gave readings of $2\frac{1}{2}$ times background (G.F. Pigott, 1969).

Another anomalous section was found in 1970 by G.F. Pigott and A.F. McQueen (personal communication, A.F. McQueen) in the same area.

PRESENT SURVEY

In September, 1970 tow holes (SFB 1 and 2) were rotary drilled to basement. These were located 530 feet apart, approximately down dip from the two radioactively anomalous outcrops. The map shows the location of the holes.

The holes intersected the lower part of the Triassic sequence (252 and 222 feet thick in SFB 1 and 2 respectively). Brief lithological descriptions of the holes are given on page 4.

Methods Used

- 1. Samples collected and described every ten feet.
- 2. Samples scanned with Scintrex B.G.S.1 scintillometer.
- 3. Hole logged for gamma rays, self potential and resistivity. Logging machine and operator were from the South Australian Department of Mines.
- 4. One sample was sent to The Zinc Corporation for uranium assay and one sample of basement was sent to A.M.D.E.L. for heavy mineral identification.

Drilling Information

Contractor: Department of Mines, South Australia.

Machine: Truck-mounted Mayhew 1000 rotary drill rig.

Conditions: Hard rock bit used throughout.

SUMMARY LITHOLOGS

For detailed logs, refer Appendix.

Hole No	. Footage	Description	Unit
SFB 1	0 - 26	Brown and grey gravels, sands, silts and muds.	Alluvium
	26 - 126	Medium to pale grey carbonaceous mudstone, siltstone and sandstone, especially sandy below 64 feet.	Lower Coal Measures(?)
	126 - 159	Mixture of grey and brown mudstones and siltstones.	}
	159 - 176	Pale and dark grey silt- stones and mudstones.	/)Lower Sandstone)Beds and Red)Beds (?)
	176 - 195	Mainly red-brown sandy siltstones and mudstones.)))
	195 - 236	Pale grey to black shales and mudstones.	\
	236 - 282	Mixture of red-brown and pink-grey siltstones and mudstone; minor black shale.	Basal Conglomerate (?)
	$282 - 283\frac{1}{2}$	Silicified quartz gravel. Very hard.	Precambrian tillite.
SFB 2	0 - 36	Brown and grey gravels, sands, silts and muds.	Alluvium
	36 - 67	Mainly grey sandy silt- stone.	Lower Coal Measures(?)
	67 - 114	Mixture of grey and brown mudstones and siltstones.	
	114 - 126	Pale grey sandy siltstone	beds and ked
	126 - 174	Mixture of red-brown, grey and black siltstones	\frac{\text{Beds(?)}}{\text{.}}
	174 - 227	Mainly deep brown mud- stone and siltstone, minor pale grey mudstone.	\ \ \
	227 - 262	Very pale grey sandy siltstone; trace gravel	Basal Conglomerate
	262 - 270	Silicified coarse quartz sand. Very hard. Analysis showed heavy minerals to be pyrite, siderite and quartz.	Precambrian tillite.
		siacrito and quarter,	

82.30 m

- 5 -

Unit identification and correlation are very tentative.

Assay Results

Sample No. 141407, 140' - 150', SFB2 - 8 ppm U.

Gamma Log Results

Refer Appendix for details.

Only one significant gamma kick was recorded; this was in SFB 2 at 141' to 144', five times surface background. It occurs in a pale grey mudstone, at the base of a dark grey mudstone with traces of carbon and pyrite. It is doubtful if this kick can be correlated with the surface anomalies, and it is not large enough or in a suitable rock type to warrant further drilling.

CONCLUSIONS

The two holes drilled did not intersect any thick and lithologically favourable sandstones; most sands were both too thin and too impermeable for the formation of economic deposits of uranium of the western United States type. The gamma logs confirm the unfavourability of the area.

In addition, the basin is small (3.5 square miles) and has been thoroughly drilled (refer Plan S.A. 141). The drill chips and core have been scanned by a scintillometer with negative results. It is unlikely that an economic uranium deposit could exist in the small undrilled area.

Relinquishment of the S.M.L. is recommended.

A.K. Hodgkin

AKH:dc

REFERENCES

Johnson, W. 1960 Exploration for Coal, Spring-field Basin.
Department of Mines, South
Australia Report of Investigations
No. 16.

Pigott, G.F. 1969 Reconnaissance Survey in S.M.L.
335, Springfield, South
Australia. C.R.A.E. Report
(unpublished).

KEYWORDS

Uranium, sedimentary, Triassic, drilling - rotary, logging-gamma.

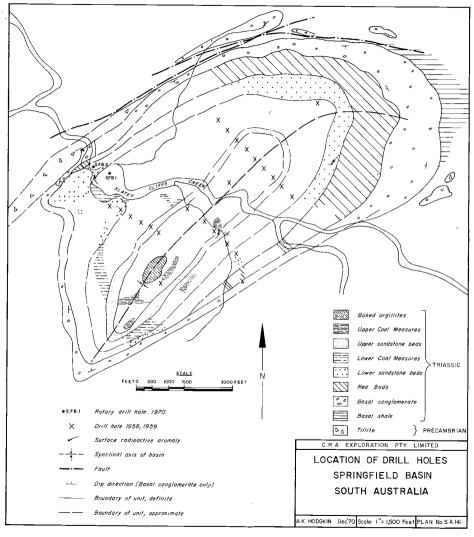
Locality: Orroroo SI54-1 1:250,000 map sheet.

PLAN

S.A. 141 Location of Drillholes, Springfield
Basin, South Australia. 1" = 1,500'

APPENDIX

Detailed Lithologies of SFB1 and SFB2. Gamma Logs and Electric Logs of SFB1 and SFB2. (Plans S.A. 142 - 147).



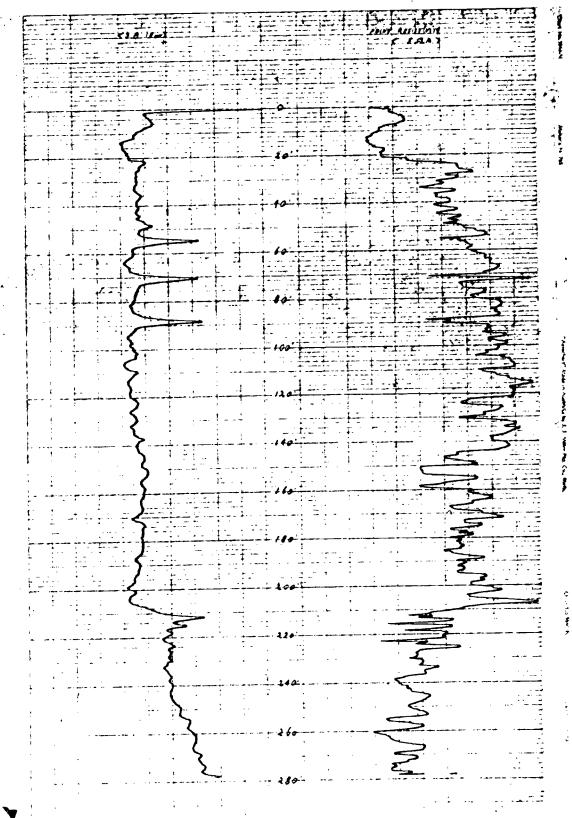
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LAST READING: 216 / / / / AST READING: 0 / / /

LASING SHOE DEPTH ("): LOG feet D. L. feet TOTAL DEPTH LOG feet DR LL feet

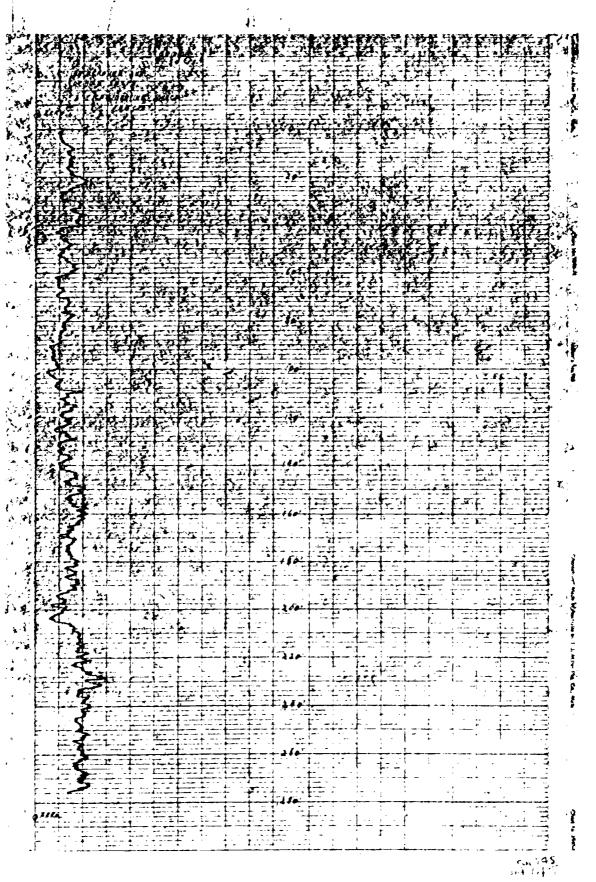
MUD: Type Density VIB ity Restricting G of BHT g of

pH Fluid Loss cc/30 into five / 12" Raid g of Ring

GPERATING TIME: 20 may / /

RECORDED BY: BACBRICE

REMARKS:



SOUTH AUST FACIAN DEPARTMENT OF MINES

TYPE OF LOG (S): S.P. D. Paint Resistivity

DATE: 26/7/70

TIME: 1225 1290 1

AREAI Spring Field Botio S.A. LOGATIC 4: Lat. Long.

WILL: S.F. No. 2

ELEVATION G. L.: K.B.: Log from feet above G. L. DEPTH CALE:

13 IN NUMBER: 2/ / / / INTREADING: 0/ / /

DASING SHOE DEPTH ("):LOG feet C.L. fret TOTAL DEPTH LOG feet DR. LL fret

NUD: Type Density Viv. 14 Resistivity & °F BHT & °F

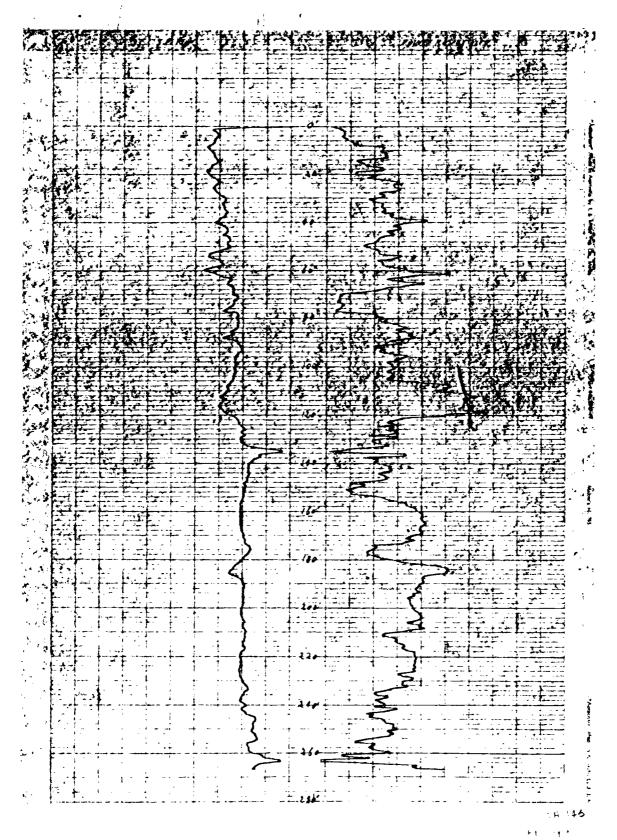
PH Fluid Lose cc/30 in (Ve /32" Rid - *F Rmc G °F

BIT SIZE. "ADDITIONAL CASI"

GPERATING TIME: 15 - 4 / /

RECORDED BY: B.A.C.BAICE

REMARKS:



TYPE OF LOG (S) GRIMMA SO CPS.

DATE 26/7/70

ARFA. Spring Field Batin SA LOGATION Late Long

WELL SF No 2

FLEVATION G.L XX.B. Log from feet above G.L. DEPTH GALE:

N NUMBER: //E / / / / AST READING: 0/ / /

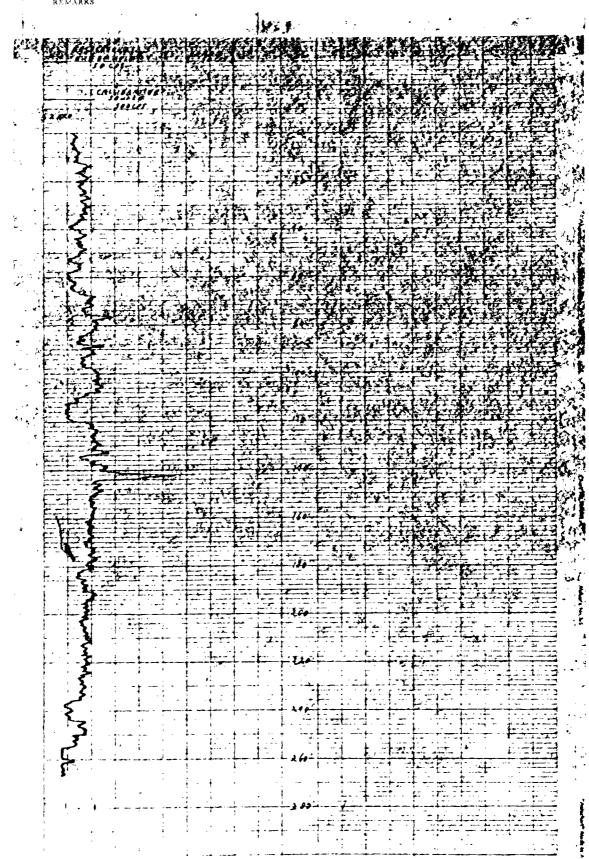
ASING SHOE CERTIN (") LOG feet D. El. feet TOTAL DEPTH LOG feet DR LL feet

NIUD Type Density VIR city Resistivity 3°F BHT 8°C

BIT SIZE: "ADDITIONAL CASING! / CELL feet

CPERATING LIMF: 20 AM / /

RECORDED BY BAC BRICE



TYPE OF LOG (S): S.P. D Point Resistivity

DATE: 26/7/70 10 mv.

TIME: 1225 1 12901 1

AREA: Spring Field Basin SA

LOCATION: Lat. Long.

WELL: S.F. No. 2.

E EVATION G. L.: ... K.B.: Log from feet above G. L. DEPTH SCALE:

fun number: 2/ / / /

Transferrence $\frac{267}{1}$ / 1 and $\frac{67}{1}$ / 1 and $\frac{67}{1}$ / 1

SASING SHOE DEPTH ("):LOG feet F. T. feet TOTAL DEPTH:LOG feet DRILL feet

fMUD: Type Density ViT + . lty Resistivity @ OF BHT

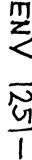
pH Fluid Loss cc/30 min. Professor /32" Rmf @ F Rmc @ F

feet

BIT SIZE: " ADDITIONAL CASING "

OPERATING TIME: 15 min /

RECORDED BY: B. A. C. BRICE



feet

pH Fluid Loss cc/30 min. Calle /32" Rmf @ F Rmc @ F BIT SIZE: " ADDITIONAL CASING! (" OPERATING TIME: 20 Min. / RECORDED BY: B.A.C.BRICE

ENV 1251-2

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AREA: Springfield Basin SA

TIME: 1700 1 1725 /

LOCATION: Lat.

Long.

WELL: S.F. No. 1 E EVATION G. L.: K.B.: Log from feet above G. L. DEPTH SCALE:

IN NUMBER: 2/ / / / RST READING: 278'/ / / AST READING: 0'/ / /

SASING SHOE DEPTH ("):LOG feet I "II. feet TOTAL DEPTH:LOG feet DRILL feet

Tulud: Type Density Vit Lty Resistivity @ °F BHT

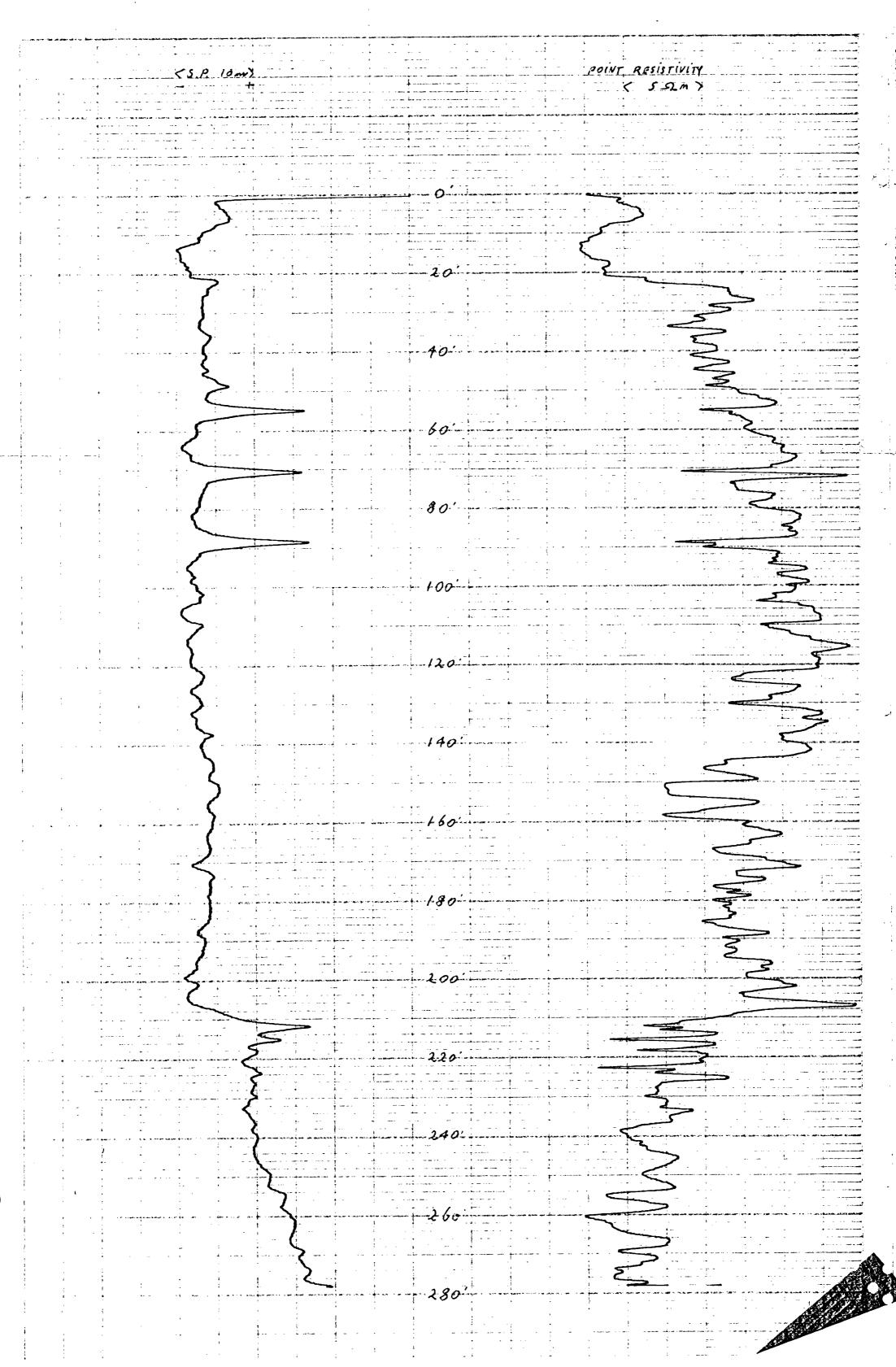
pH Fluid Loss, cc/30 mis, +: Caire /32" R_{mf} @ F R_{mc} € oF

DET SIZE: " ADDITIONAL CASING "

OPERATING TIME: 25 min / /

RECORDED BY: B, A.C. BRICE

REMARKS:



TIME: 1635 47 1655 1

DATE: 23/7/70 AREA: Springfield Basin SA.

LOCATION: Lat. Long.

WELL: S.F. No 1

E EVATION G.L.: K.B.: Log from feet above G.L. DEPTH SCALE:

IUN NUMBER: / / / /

RST READING: 276 / / LAST READING: 0 / / /

CASING SHOE DEPTH ("):LOG feet D. LL feet TOTAL DEPTH:LOG feet DRILL feet

MUD: Type Density Vivality Resistivity @ °F BHT @ °F pH Fluid Loss cc/30 min. 19: Cake /32" R_{mf} @ F R_{mc} @ oF

OPERATING TIME: 20 min 1 /

RECORDED BY: B.A.C. BRICE

RÉMARKS:

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