COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

RECORDS

NO. 1958/104.

PRELIMINARY NOTES TO ACCOMPANY THE ELECTRICAL LOGS OF B.M.R. STRATIGRAPHIC BORES, WEST AUSTRALIA.

1958.

by

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and

N. D. JACKSON. T.O. Sen. Rsd. Tech.

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ABSTRACT.

Electrical and radioactive logs were recorded by officers of the Bureau in three bores drilled by the Bureau for stratigraphic information in Western Australia during 1958. Electrical logs only were recorded in a fourth bore.

The logs are presented and described briefly.

I. INTRODUCTION.

The Bureau of Mineral Resources, Geology and Geophysics carried out a stratigraphic drilling programme in West Australia during 1958. Bores were put down at Wallal, Giralia and Muderong (two bores).

These bores were electrically logged using single point resistivity technique with simultaneous self potential recording. Radioactive (gamma ray) logging of the holes was also done except for the hole at Wallal. The logging was carried out by the geophysical section of the Bureau. An officer of the Darwin Office logged the Wallal hole (B.M.R. No. 4A) and an officer of the Melbourne Office logged the other bores.

Table 1 sets out the details of the bores and the equipment used for logging in each instance.

TABLE 1.

Situation	Designation.	Co-ordinates. Lat.	Long.	Total Depth (Drilled)	Depth to which logged	Method	Equip.
Wallal	B.M.R. No. 4A	19°44'12"S	120°44'28"E	2223	1520	Electrical	2000' Widco
Giralia	B.M.R. No. 5	22°39'15"S	114°14'25"E	2070	2070	Elect. Radioactive	4000' 2000' Widco
Muderong	B.M.R. No. 6	24° 5'55"S	114°46'20"E	1002	995	"	2000' Widco
Muderong	B.M.R. No. 7	24° 5'55"S	114°46'30"E	1997	1997	"	"

The Widco loggers are manufactured by the Well Instrument Development Company. A modified Brown "Electronik" Potentiometer is used in the recorder. The self potential and resistance logs are recorded automatically and simultaneously, as an electrode is lowered and raised in the hole.

The 2000ft. unit is Model XDM and the 4000ft. unit Model ZDE. The former unit has been modified to use a radioactive probe interchangeable with the electrical logging electrode and thus the gamma ray intensity log can be recorded in a separate operation.

II. DISCUSSION OF THE INDIVIDUAL LOGGING OPERATIONS.

1. B.M.R. No. 4A, WALLAL - Plates 2 and 3.

The electrical logging of this hole was conducted by an officer from the Darwin Office of the Bureau. As the upper section of the hole was to be cased, the logging was done in two sections.

(i) When the hole was at a depth of 600 ft. (approx.) and before the insertion of the casing to 522 feet.

(ii) When the hole was at a depth in excess of the length of the logging cable (1600ft. approx.) attached to the 2000 ft. logger.

The 4000 ft. logger was not available for the logging of this hole as heavy rains delayed the shipment of the logger from the previous site of operation at Karumba, Queensland.

A vertical scale of 20 feet equals 1 inch was used in the logging operations but for reproduction this has been reduced to a scale of 50 feet equals one inch.

The horizontal scales of the resistivity graphs on Plates 2 and 3 are not the same. The recording scale for the resistivity graph on Plate 3 was one inch equals 10 ohm metres. In redrafting the sensitivity of this scale has been increased by a factor of approximately $2\frac{1}{2}$ so the recorded features are more easily distinguished.

The significance of the feature recorded at 378 feet is questionable. This feature may have been caused by the poor condition of the logging cable, the insulation of which may have been broken. The two sections of the log between 790 and 815 feet and between 900 and 925 feet are doubtful in detail because of sporadic faults in the recording over these intervals.

No mud resistivity value was determined at the time of logging but a later Schlumberger log records a mud salinity of 1 ± ohm metre. Such mud is somewhat saline and the form of the S.P. graph indicates that the S.P. polarity is reversed. Such S.P. polarity reversal frequently occurs with saline muds.

The operator unfortunately did not understand that the drilling contractor was obliged to make available all the time necessary to obtain the best possible logs. Consequently additional logs were not run at different scale and sensitivities to give better detail.

The resultant log obtained (Plate 3) correlates quite well with the Schlumberger logs which were run to the bottom of the hole at a later date. Nevertheless the Schlumberger logs are more reliable and they should be used in preference to the Bureau log,

2. <u>B.M.R. No. 5, GIRALIA</u> - Plate 4.

Before logging was commenced at Giralia the 2000 ft. logger was completely overhauled and the logging cable was replaced.

The 4000 ft. logger was also available at this site and several logging runs were made at various hole depths with both loggers and using different scale sensitivities. Close agreement was obtained between the two instruments upon all tests. The S.P. and resistivity graphs are characterized by minor irregularities or "hunting". This "hunting" may have been caused by a fault in the power supply associated with the logger

as minor adjustments within the logger caused a "square" trace, a sign of lack of response. The "hunting" is superimposed upon the principal features of the log and will not deter from the log as a basis for lithological correlation. The "hunting" is not evident on the radioactive (gamma ray) log.

The drift associated with both the S.P. and resistivity graphs to a depth of approximately 800 feet may be caused by the decreasing weathering to this depth. Below approximately 750 feet a reversal of the S.P. polarity occurs. This may be caused by a mud which is more saline than the pore solutions below this level.

3. B.M.R. No. 6 and 7, MUDERONG - Plates 1, 5 and 6.

The 2000 ft. logger was used for the logging of the two holes at Muderong. Both electrical and radioactive logs were obtained.

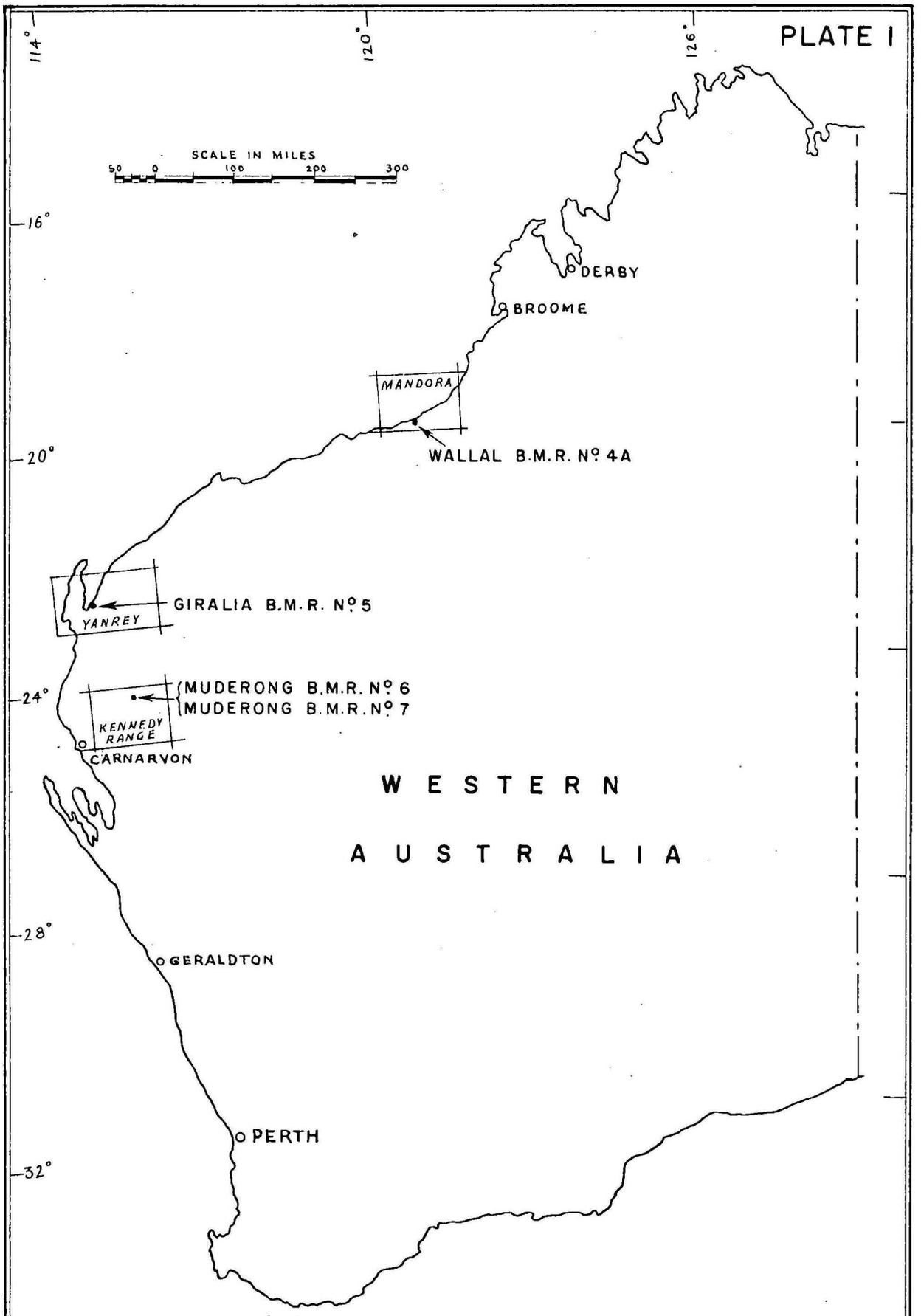
The resultant logs are technically quite satisfactory and, although the mud resistivity is low, there is no indication of reversed polarity in the S.P. graphs.

The drifts associated with the electrical logs may be partially caused by the effects of weathering within the upper sections of the bores. With the resistivity graph this may be superimposed upon a drift throughout the total depths of the bores due to the induction within the reeled cable not being fully compensated.

The electrical properties indicated by the log are typical of what may be expected from the sedimentary sequence as indicated by the provisional core descriptions.

A comparison of the electrical and gamma ray logs from the two bores does not indicate any obvious correlation but correlation of specific features may follow when studied in conjunction with the ditch samples and core logs.

PLATE I



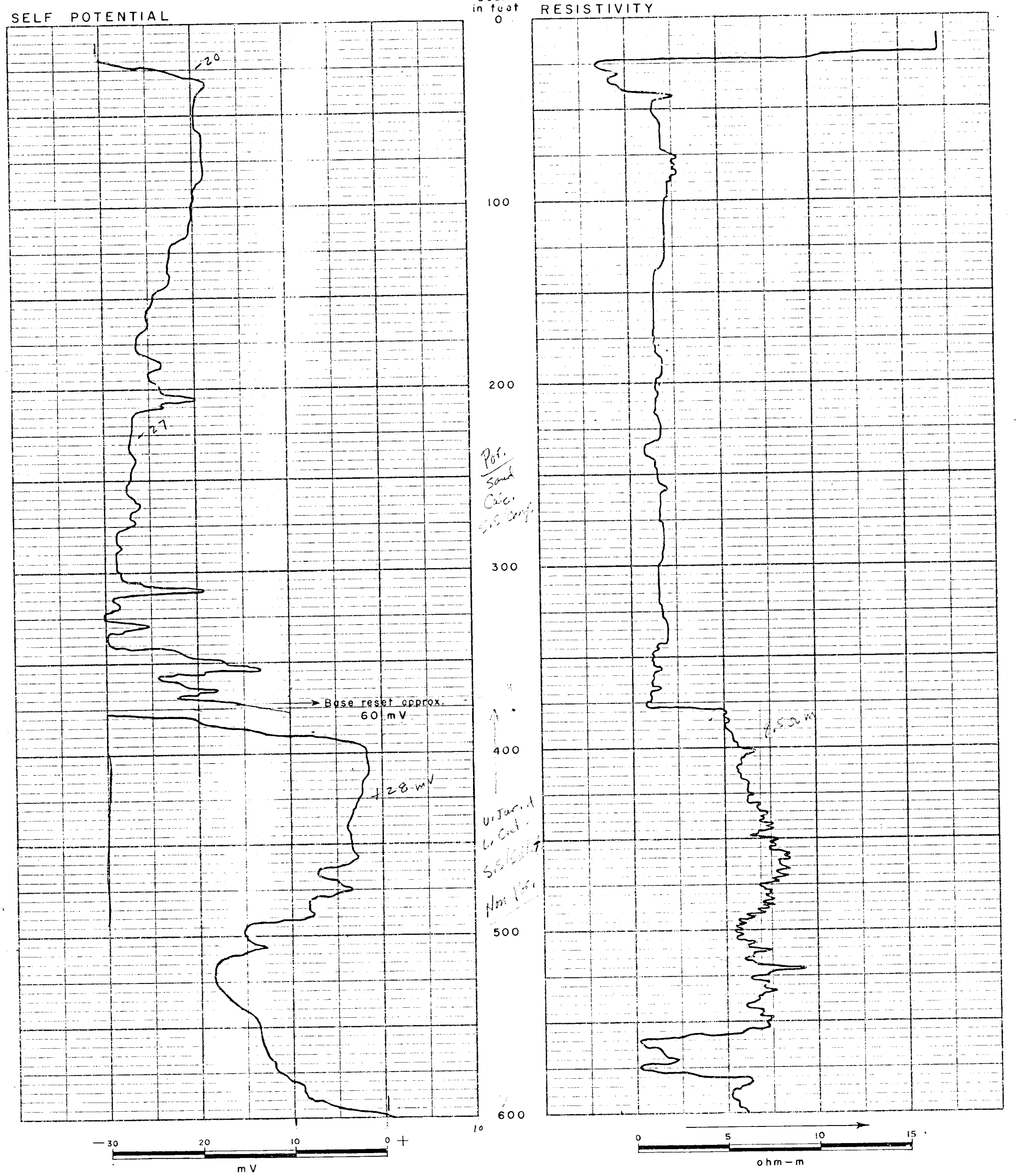
B.M.R. STRATIGRAPHIC BORES, W. A. 1958

LOCALITY MAP

REFERENCE TO AUSTRALIAN
4 MILE MILITARY MAP SERIES

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics. 721

PLATE 2



REMARKS:−

BORE LOG − B.M.R. Nº 4A
WALLAL, W. A.

COORDINATES	19° 44′ 12″ S / 120° 44′ 28″ E
ELEVATION	K.B. _____ G.L.

Instrument	2000′ WIDCO
Logged by	L. SKATTERBOL

Date	MAY 1958
First Reading	600
Last Reading	10
Footage Logged	590
Bottom (Driller)	
Casing (from Log)	
Casing (Drilling)	
Casing Size	
Bit Size:	
Bit Size:	
Cable Stretch	

MUD	
Nature	
Density	
Viscosity	
Resistivity	
Res. at BHT	
pH	
Circ. Temp	
B.H. Temp.	
Water Loss	

PLATE 3

SELF POTENTIAL

RESISTIVITY

Depth in feet

500
600
700
800
900
1000
1100
1200
1300
1400
1500

-10
-20
-30

5.5'
5.5'
5.5'

9.6
4.6
9.2
6.5

— 60 40 20 0 +
mV

0 4 8 12 Approx.
ohm-m

REMARKS:—

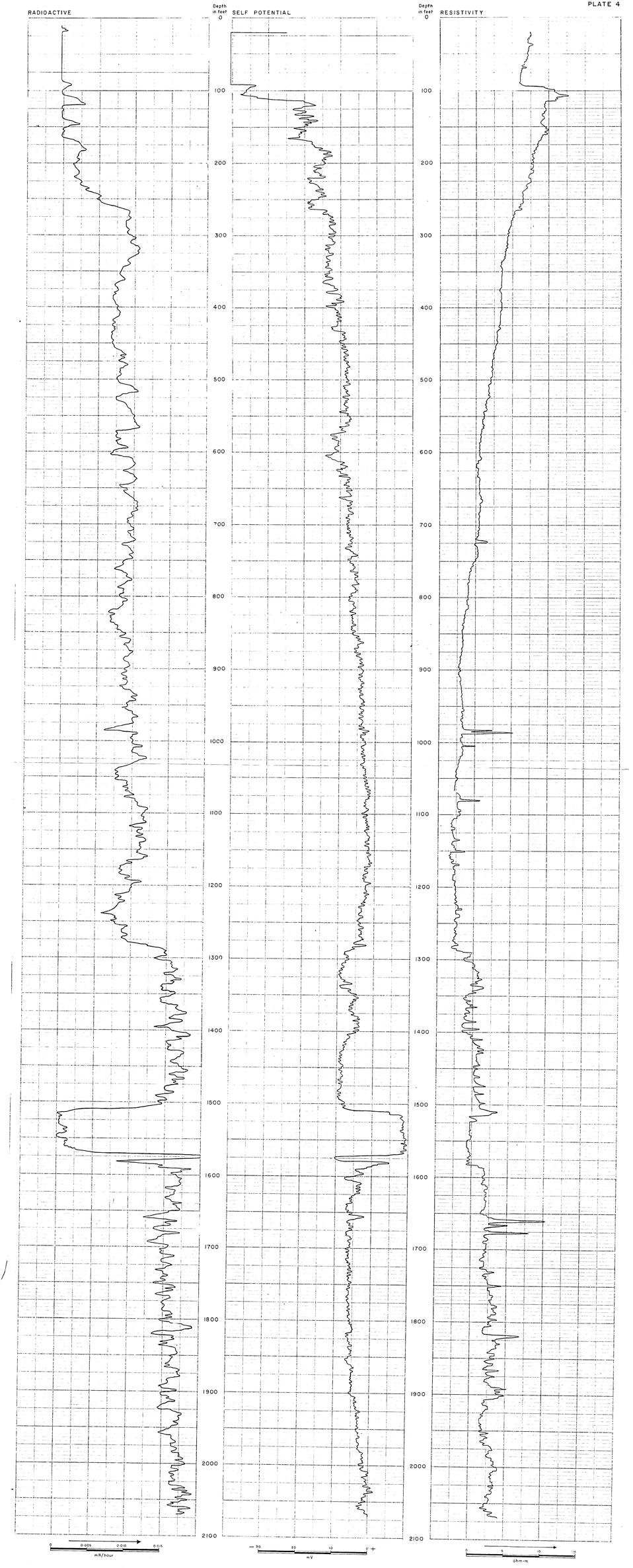
BORE LOG — B.M.R. No. 4A
WALLAL, W. A.

COORDINATES	19° 44' 12" S 120° 44' 28" E
ELEVATION	K.B. _____ G.L.

Instrument	2000' WIDCO
Logged by	L.SKATTERBOL

Date	MAY 1958
First Reading	1510
Last Reading	500
Footage Logged	1010
Bottom (Driller)	
Casing (from Log)	522
Casing (Drilling)	517
Casing Size	
Bit Size	5½ inches
Bit Size	
Cable Stretch	CORRECTIONS MADE

MUD	
Nature	
Density	
Viscosity	
Resistivity	
Res. at BHT	
pH	
Circ. Temp.	
B.H. Temp.	
Water Loss	



BORE LOG — B.M.R. No 5
GIRALIA, W.A.

COORDINATES	22° 39' 15" S 114° 14' 25" E
ELEVATION	K.B. —— G.L. ——

Instrument	Electrical Log 4000' Widco Radioactive Log 2000' Widco
Logged by	N. JACKSON

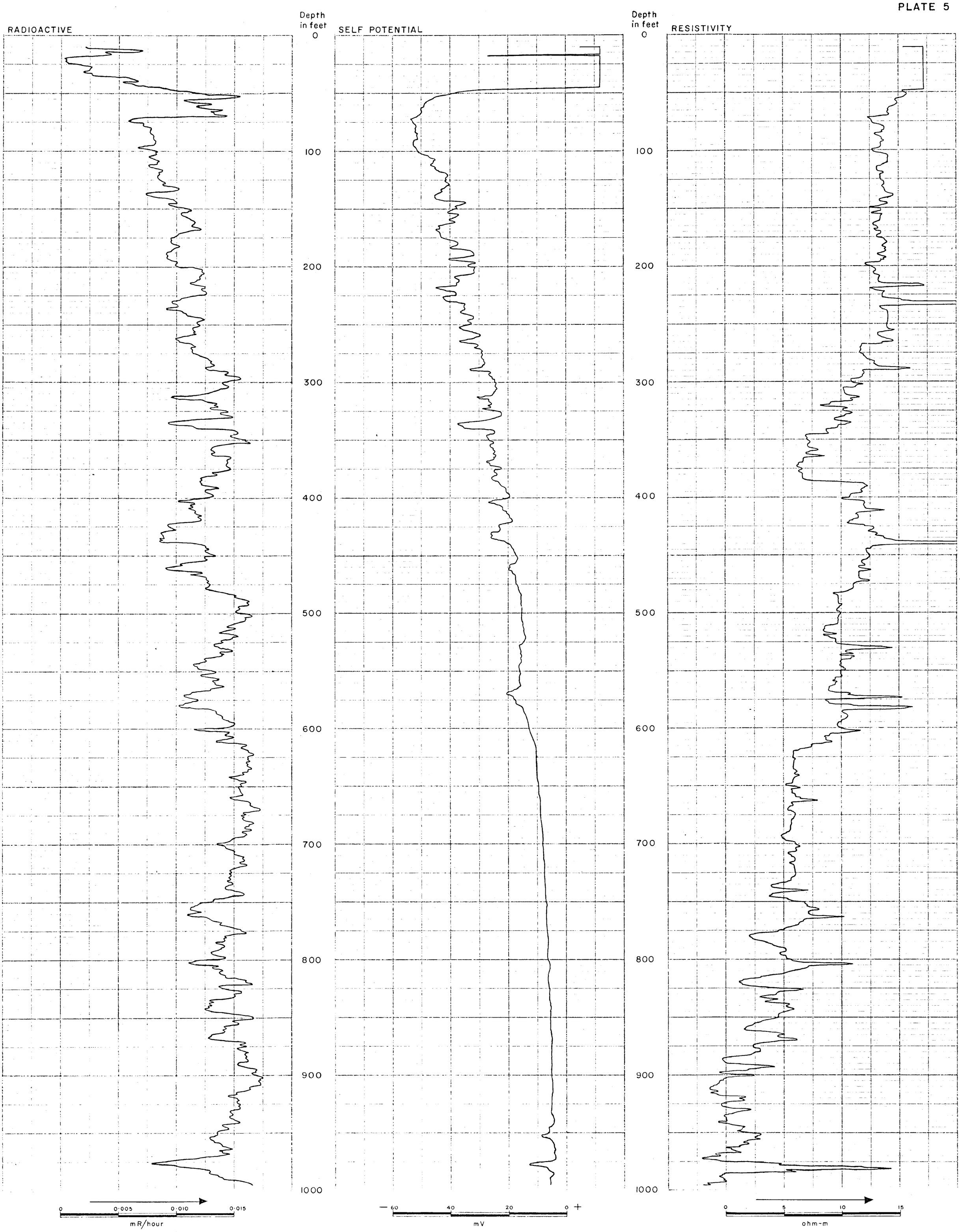
Date	30-7-58
First Reading	2070
Last Reading	20
Footage Logged	2050
Bottom (Driller)	2070
Casing (from Log)	93
Casing (Driller)	93
Casing Size	7" O.D.
Bit Size	5¾"
Bit Size	
Cable Stretch	Approx 15" per 1000 ft

MUD	
Nature	LIME BASE
Density	77 lbs per Cubic ft.
Viscosity	55 S
Resistivity	·9 ohm-m at 72°F
Res. at BHT	
pH	8·2
Circ. Temp.	
B.H. Temp.	
Water Loss	3 C.C. per 30 mins.

REMARKS:—

Depth with reference to rotary table.

Rotary table 5' above ground.



BORE LOG - B.M.R. Nº6
MUDERONG, W.A.

COORDINATES	24° 5' 55" S / 114° 46' 20" E
ELEVATION	K.B. ——— G.L.

Instrument	2000' WIDCO
Logged by	N. JACKSON

Date	19-8-58
First Reading	995
Last Reading	10
Footage Logged	985
Bottom (Driller)	1002
Casing (from Log)	44
Casing (Drilling)	44
Casing Size	6⅝"
Bit Size:	5⅝
Bit Size:	
Cable Stretch	NEGLIGIBLE

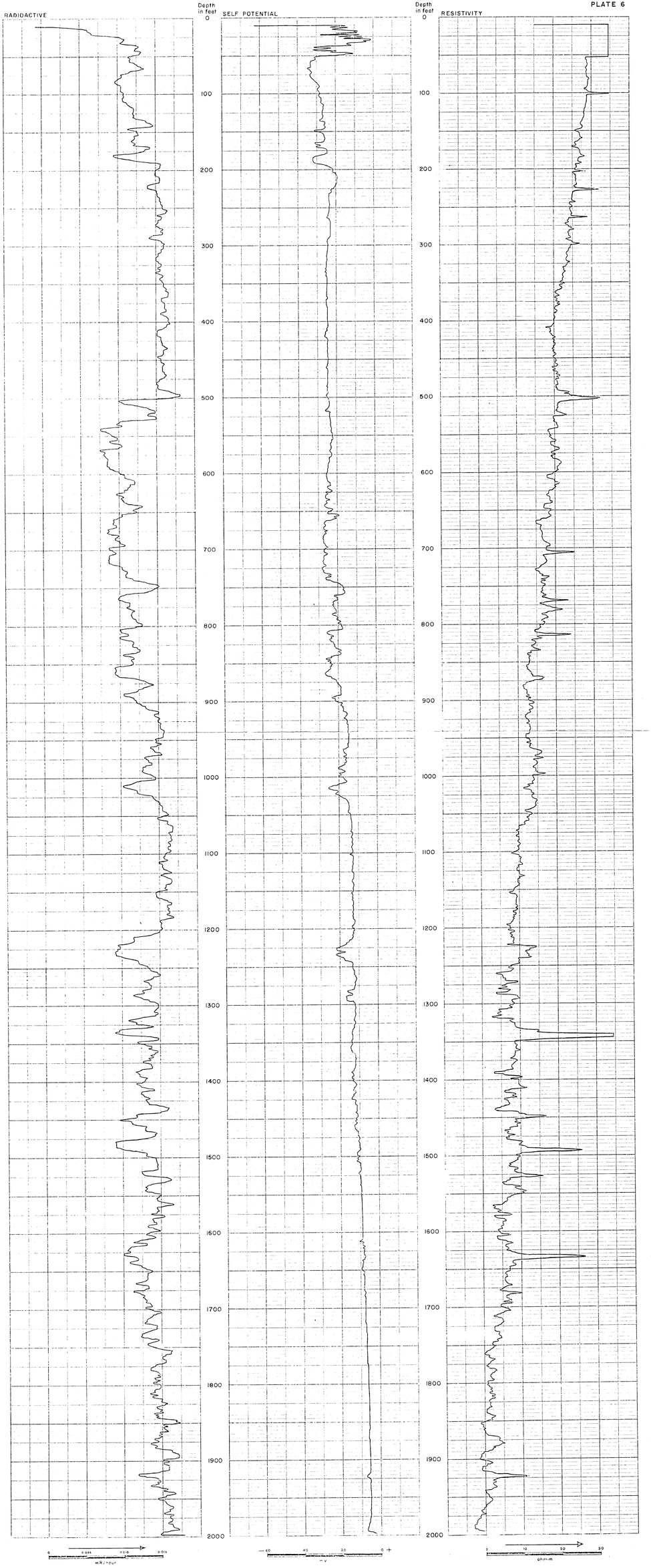
MUD	
Nature	CLAY BASE
Density	80-90 lbs. per cub. ft.
Viscosity	41 S
Resistivity	1·5 ohm-m at 72°F.
Res. at BHT	
pH	8·1
Circ. Temp.	
B.H. Temp.	
Water Loss	

REMARKS :—

Depths with reference to rotary table.

Rotary table 5' above ground.

Approximately 8' of core left at bottom of hole.



BORE LOG — B.M.R. Nº7
MUDERONG, W.A.

COORDINATES	24° 5' 55" S 114° 46 30" E
ELEVATION	K.B. G.L.

Instrument	2000' WIDCO
Logged by	N. JACKSON

Date	14-9-58
First Reading	1997'
Last Reading	10'
Footage Logged	1987'
Bottom (Driller)	1997'
Casing (from Log)	
Casing (Drilling)	23'
Casing Size	6⅞
Bit Size	6¼
Bit Size	
Cable Stretch	LOG CORRECTED

MUD	
Nature	BENTONITE BASE
Density	73 lbs per Cubic foot
Viscosity	38S
Resistivity	1·5 ohm-m at 72° F
Res. at BHT	
pH	8·3
Circ. Temp.	
B.H. Temp.	
Water Loss	

REMARKS :—

Depths with reference to rotary table.

Rotary table 5' above ground.

Fluid level at 53' during logging.