

Rept. Bk. No. 59/49
G.S. No. 2951
D.M. 846/64
Petroleum 2/64



**DEPARTMENT OF MINES
SOUTH AUSTRALIA**

GEOLOGICAL SURVEY

PETROLEUM SECTION

FORTVILLE NO. 3

Well Completion Report

by

**H. Wopfner
Senior Geologist**

&

**B. E. Cornish
Geologist**

24th August, 1964

D.M. 846/64

59/49

REPORT FOR

**SOUTH AUSTRALIA DEPARTMENT OF
MINES AND ENERGY****Bulk Mineralogy, Clay Mineralogy,
and Total Organic Carbon of
Cores from SADME Library**

- Reid 1
- Ooldea 1
- Wallira 1 & 2
- Mt Willoughby 1
- Tinga Tingana 1
- Murnaroo 1
- Murteree 1A, 1C
- Lake Hope 1
- Fortville 3
- Kalladeina 1
- Mallabie 1
- Hughes Well 1

The underlined wells are confidential and so make this report confidential. The original report is filed under Kalladeina 1.

R. C. Surdam

J. E. Warne

S. W. Boese

K. O. Stanley

15 June 1982

RB 59/49

DEPARTMENT OF MINES
SOUTH AUSTRALIA

FORTVILLE NO. 3

Well Completion Report

by

H. Vopner
Senior Geologist

B. F. Lermick
Geologist

Geological Survey of South Australia
Petroleum Section

Rept. No. 59/49
O.S. 2951
D.M. 846/64
Petroleum 2/64

24th August, 1964.

CONTENTS

	Page
SUMMARY	1
GENERAL WELL DATA	2
INTRODUCTION	3
PHYSIOGRAPHY AND ACCESS	4
WELL HISTORY	6
WELL COMPLETION	11
GEOLOGY	13
Surface geology	13
Summary of geophysical work	14
Well - stratigraphy	15
Porosity and Permeability of Sediments	
Penetrated	19
Relevance to the Occurrence of	
Petroleum	19
Correlation	20
CONCLUSIONS	21
REFERENCES	23

APPENDICES

- A. Core descriptions
- B. Petrological descriptions
- C. Petrology of Core No. 1
- D. Summary of Seismic results
- E. Water and Gas analyses
- F. Drilling Test Statement

DEPARTMENT OF MINES
SOUTH AUSTRALIA

FORTVILLE NO. 3

Well Completion Report

SUMMARY

S.A. Government, Fortville No. 3, was drilled as a combined water and stratigraphic well. It is located at 29°07'35" south latitude and 140°53'55" east longitude, about 16 miles south-west of the tri-state corner of South Australia, Queensland and New South Wales.

Fortville No. 3 was rotary drilled with a modified Mindrill 85000 rig, owned and operated by the South Australian Department of Mines. The well was programmed to the total capacity of the rig (4000 feet) or prior basement.

Drilling commenced on the 28th of March, 1964. An attempt was made to penetrate the Mesozoic sequence down to the base of the Moega Sandstone. The sequence which was encountered consists of 62 feet recent sediments; 338 feet Lower Tertiary sands and lignitic clays; 2603 feet Cretaceous sediments (Winton, Tanook, Bone Formation and Transition Beds) and 483 feet Moega Sandstone. At the base of the Moega Sandstone at 3495 feet an angular unconformity was intersected and the drill entered strongly weathered, laminated metamorphics. The well bottomed in severely folded, dark green quartz-sericite phyllite of Lower Proterozoic age.

Drilling was completed on the 12th of May, 1964, at a total depth of 3610 feet.

Electric logs were run from 444 feet to 3026 feet and from 2873 feet to total depth. Gamma ray log was run from 12 feet to total depth.

Water production was obtained from the Moega Sandstone, the main producing intervals being 3005 to 3100 feet and 3125 to 3495 feet. On completion the well flowed good quality water (1604 p.p.m.) at the rate of 18,000 g.p.m. through 5" casing. The well was completed on the 22nd May, 1964.

No significant amounts of hydrocarbons were detected.

GENERAL WELL DATA

Well Name and Number:

South Australian Government, Fortville No. 3

Location:

General: Linden Station, 10 miles SW of Tri-state
Corner. (N.S.W., Vic., S.A.)

Latitude: 29°07'33" S

Longitude: 140°53'55" E

Elevation:

Ground - 325 feet A.M.S.L.

Kelly Bushing - 331 feet A.M.S.L.

Map Reference:

4-mile military sheet: Collabenna

1-mile military sheet: Carravonica

4-mile pastoral sheet: 11 North

Pastoral Lease:

Pastoral Block No. 1093

Pastoral Lease No. 2186

Lessee: H. F. Robertson

Oil Exploration Licence:

O.E.L. No. 20 and 21

Licence: Delhi Australian Petroleum Ltd. and
Santos Ltd.

Total Depth:

3610 feet

Date Drilling commenced:

March 28, 1964.

Date Drilling Completed:

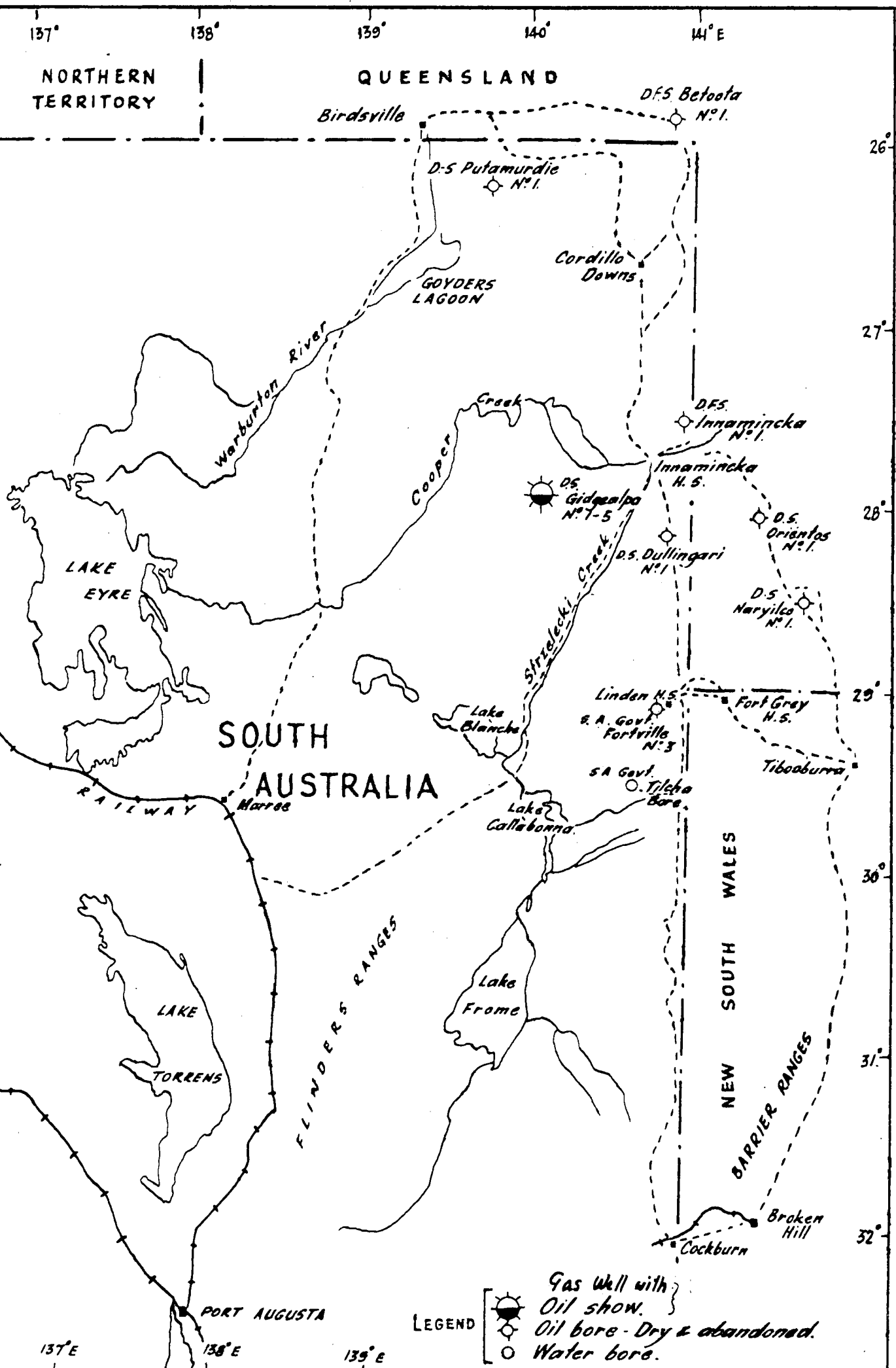
May 12, 1964.

Date Well Completed:

May 22, 1964.

Status:

Completed as a Government Artesian Water Well, *
producing 5000 g.p.m. through a 1 inch diameter
well-head restrictor plate.



S.A. DEPARTMENT OF MINES

Approved	Passed	Drn. B.E.C.	LOCATION MAP FORTVILLE-3 AND OTHER MAJOR WELLS	D.M.	Scale 48 M. to 1."
		Tcd. <i>AK</i>		Req.	
		Ckd.			S. 3792
Director		Exd.			Date 24.7.64 9942

INTRODUCTION

On request from the South Australian Pastoral Board, the South Australian Department of Mines undertook to construct a water bore in the vicinity of the tri-state corner. The objective of this bore was:

- 1) To provide a permanent watering place for livestock on a proposed stock route from Innamincka to Yunta and
- 2) to provide stock water for local usage in developing pastoral blocks No. 1094 (Bellards Lagoon) and No. 1095 (White Latch).

A site was chosen about 16 miles south-west from the tri-state corner and about 1/2 mile south from the boundary of the two pastoral blocks. A well constructed on this locality would thus fill the gap which existed on the proposed stock route between Aidman No. 1 bore on the "Innamincka bore track" and Tilcha bore and also serve both pastoral blocks as well.

A first attempt to obtain water from the shallow, Lower Tertiary aquifer was abandoned in 1959, at 217 feet because of a collapsed casing shoe.

Subsequently, the South Australian Pastoral Board suggested that the water supplies from the shallow aquifer would be insufficient and therefore requested the construction of an artesian water well. At this stage, the artesian aquifer (Mooge Sandstone) was thought to be about 2000 to 2500 feet below surface and in 1960 a suitable percussion rig was moved on the location. However, severe crooked hole conditions were encountered after setting 5-inch casing and the hole finally had to be abandoned at 2527 feet in 1961.

In the following years a marked increase of oil-exploration activities by both private companies and the S.A. Department of Mines took place in and around the Fortville area, and it became apparent that a well at the Fortville location would provide a most needed control point for the interpretation of seismic results. Furthermore, any stratigraphic information

obtained from such a well, particularly below the Mooga Sandstone, would be a valuable contribution towards a better understanding of the geology of this portion of the Great Artesian Basin.

In 1964 it was thus decided to redrill the Fortville location as a combined stratigraphic test and waterwell. The well, designated Fortville No. 3, was to be rotary-drilled beyond the artesian aquifer (Mooga Sandstone) to the total capacity of the rig (4,000 feet) or prior basement. After total depth had been reached, the well was to be completed as an artesian water well, producing from the Mooga Sandstone.

The rig and camp facilities were moved on location in March 1964, and the well was spudded on the 28th of March, 1964.

The drilling operation was conducted by the Drilling and Mechanical Branch of the B.A. Department of Mines, utilising the Department's converted Windrill B 3000 rig. Engineers supervising the drilling operations were Messrs. R. B. Hancock, D.P., L. Limb and T. J. Starr.

Well site geology was carried out by Mr. E. Hillwood (Hydrology Section) and Mr. D. E. Cornish of the Petroleum Section. Dr. H. Kopfer was on location when electric logs were being run and for the completion of the well.

The assistance of the B.A. Department of Mines in providing, without charge, a well logging unit and personnel is acknowledged. In addition, Delhi-Santos accepted a share of the cost of providing a well logging contractor for a total depth log.

PHYSIOGRAPHY AND CLIMATE

The country in the vicinity of the Fortville location is essentially flat, barren and, but for the omnipresence of desert sand dunes, lacking any topographic feature whatsoever.

The sand dunes are dark red in colour, generally linear and trend from south-west to north-east. The steeper side of the dunes reaches usually the angle of repose, and is nearly

always facing north-west. These sand-ridges reach a height of 20 to 30 feet and their crests are quite mobile and devoid of vegetation.

The only major drainage channels within the area are the Callabonna and the Yandana creeks, situated some 40 to 50 miles to the south of the location. Both creeks, following the gentle eastward gradient of the country, terminate in the normally dry Lake Callabonna.

In the immediate vicinity of the well-location, the regional gradient is extremely low, leading to the development of numerous interdunal claypans and "gilgai" - swamps. These internal catchment areas vary in length from a few hundred feet to 4 miles and more. No permanent surface waters exist in the area.

No accurate rainfall - gaugings are available from this area but average annual rainfall is estimated not to exceed 5 inches. Average daytime shade temperatures range from about 45°F in winter months to 117°F in the summer.

Vegetation is extremely sparse, although grasses and herbs will flourish after good rain. Permanent vegetation consists largely of salt grass (*Lycopodium paradoxum*) which inhabits the "gilgai" swamps and the lower flanks of the dunes, and of needlebush (*Nauclea leucoptera*) which usually grows in thinly scattered clumps in interdunal corridors.

Access for heavy transport is facilitated by a graded road from Tibooburn in N.S.W. to Port Grey thence by a good bush-track via Paddy's bore to Linden Station. Four wheel drive vehicles may gain access from Meelavatana Station in South Australia via the track along Yandana Creek to Mackera Gate, and thence following the border fence to the tri-state corner where the track from Paddy's bore is met. The Innamincka bore track from Innamincka to Paddy's bore allows access from the north, but again for four wheel drive vehicles only.

While drilling of Vestville No. 3 was in progress an airstrip, suitable for light aircraft, was prepared about 3 miles

south-west from the well-location.

WELL HISTORY

Operator

The South Australian Department of Mines, Mechanical and Doring Branch, 3a Highgate Street, West Thebarton, South Australia.

Drilling Rig

Modified Mindrill B-5000 Rotary Rig, using a twin pole derrick and a Mayhew Rotary Table.

Mud pump: 1 Gordon Denver 5" x 10", 4" liner
1 Mindrill 4 1/2" x 3", 3 1/2" liner

Hole size and casing

Eight feet of 11 1/2" water bore casing was run at the surface, after which the hole was deepened to 487 feet with a 9-7/8" rock bit, 6 1/2" blades and bits and then runned out to 487 feet with 9-7/8" Southern Blades. 487 feet of 6" water bore casing was run to a depth of 484 feet and cemented to surface.

A 6 1/2" hole was drilled from 487 feet to 3087 feet and then 149 joints of 5" water bore casing were run and set at 2873 feet.

Owing to severe mud and cement losses it was not possible to cement the full string of 5" casing so 200 feet of cement was spotted above the shoe at 2873 feet.

A 4 1/2" hole was drilled from 3087' to 3601'. The interval 3601 to 3606 feet was cored with a Mindrill 3.907" diamond core head, the hole was then runned with a 4 1/2" Varol VHL bit and core No. 3 cut from 3603' - 3610'. The hole was then runned with a Varol VHL 4 1/2" bit to the total depth of 3610 feet.

A discrepancy of approximately 10 feet exists between the depths taken from the drillers log and the electric log, across and below the major unconformity at 3495 (electric logs).

Fig. 2. *DEPTH IN FEET*

0
500
1000
1500
2000
2500
3000
3500
3610

120

240

360

480

600

720

840

960

1080

1100

1220

1300

HOURS SINCE SPUD DATE

Reaming

Running 8" casing
Cementing

Mechanical repairs

Core N° 1

Wireline Survey
Conditioning
Logging

Running 5" casing
Running casing
Circulating
Preparing to cement
Cementing
Cementing & reaming

Core N° 2

Core N° 3

Core N° 4
Cementing 8" & 11" casing
Service Rig
Core N° 5

Circulating
Conditioning hole
Awaiting arrival logging crew

Circulating

Logging

Well preparation

Well completion

SOUTH AUSTRALIAN GOVERNMENT

FORTVILLE N° 3

TIME/DEPTH

Since all major formation breaks and boundaries from the surface down to this depth have agreed consistently well on both the driller's and electric logs, the electric log depth figures have subsequently been assumed to be correct.

The interval affected is from 3490 feet to total depth (3610 ft.), thus the corrected depth of the unconformity becomes 3495 feet, and the total depth 3610 feet, instead of 3505 feet and 3620 feet respectively as thought to be the case prior to running the electric logs. The final corrected log is shown in detail on the Composite Log Plan.

A total of 20 bits were used during the drilling of this hole and the following table gives details.

TABLE I BIT RECORD

Number of bits used	Type and Size
One	9-7/8" Hughes G.S.C. - Run 3 times
One	6 1/2" Hawthorn Blades
One	9-7/8" Hawthorn Blades
Nine	6 1/2" Roller Bits, (Hughes G.S.C. Varel V3)
Five	4 1/2" Roller Rock Bits, Varel V81, V2, V3 and Gruner Fris.
Three	3.907" Diamond Core Heads, Mindrill Bottom Discharge
Total Twenty	

Drilling Fluids

A bentonite and water based mud was used with caustic and tannin additives as dispersing agents.

Serious mud losses were encountered in the intervals 1560'-1570' and 2000'-2050' with minor mud losses over the interval 2175' to 2220'. These losses were considered to be due to fracturing of sandstones and coal shales of the Winton Formation which occurred when fresh mud was pumped to the bottom of the hole after a 52 hour shut down period necessitated by the breakdown of the mud-pump gear box.

Drilling the water bearing Neoge sands affected the viscosity and specific gravity of the drilling fluid necessitating a constant check on the mud properties.

The following is a list of all the materials used for drilling the well.

Material	Amount used
Bentonite	- 13 tons
Saustic Soda	- 16 x 25 lb. cans
Myrtan	- 16 x 36 lb. sacks
C.M.C.	- 12 x 36 lb. sacks
Spersene	- 14 x 36 lb. sacks
Synergie	- 16 galls.
Calgon	- 2 galls
Detergent	- 6 galls
Distillate	- 28 galls.
Barytes	- 1 ton

TABLE II

Mud materials used at Fortville No. 1.

Water Supply

Water was carted from several shallow holes located between 4 and 18 miles from the drill site in a Dunlop collapsible rubber tank mounted on a Leyland Hippo.

Fishing operations

No fishing operations were conducted.

Perforations

No perforation operations were conducted.

Plugs

No plugs were spotted in this well.

Sampling, coring, testing and logging

Pitch cuttings

Over the interval 0-300 feet, samples were collected at 25 foot intervals and 10 foot intervals were sampled from 300 feet to total depth.

10-foot samples were collected during coring.

Coring

Five cores were cut in Fortville No. 3 well as summarised on Table No. III

TABLE III

Core No.	Interval in feet	Recovery Ft. %		Coring Equipment	Formation
1	2920 - 2936	13.8'	99%	Mudrill Double Barrel Bottom discharge with 3.907" Diamond core Heads	Transition Bed
2	3371 - 3390	13.0'	68%		Meega
3	3494 - 3502	2.0'	25%	"	Meega Unconformity Wilyyana
4	3601 - 3603	12"	30%	"	Wilyyana Phyllites
5	3603 - 3610	7.0'	100%	"	"

Total footage Cored: 46 feet

Recovery: 35.8 feet or 84.4%

Distribution and Storage of Pitch Samples and Cores

The samples were collected and marked by the geologist on site, and a cut was made for reference. The remainder was washed, dried and bottled at the Core Laboratory at Thebarton depot.

All cores and samples are permanently stored at the Core Laboratory of the South Australian Department of Mines, Thebarton, S.A.

Electric Gamma Ray and Temperature Logging

An electric log was run from 489' to a depth of 3026' by the M.S.W. Mines Department using a Neitronic logger. At the completion of the hole, Mines Administration using a Failing Logmaster Unit ran an electric log from the base of the 5 inch casing at 2873' to the total depth of 3610' and a Gamma Ray Log from 32' to total depth.

TABLE IV
Wire-line surveys

Type	Run No.	Interval	Curves	Scale	Depth Scale
Electric (MSW Mines Dept.)	1	489'-3026'	SP Single point resistivity		1" = 50' 1" = 50'
Electric (Mines Admin)	2	2873'-3610'	SP	5 mv/div.	1" = 50'
		2873'-3610'	Short, normal	1 ohm = m/div	1" = 50'
		2873'-3610'	Long, normal	1 ohm = m/div.	1" = 50'
Gamma Ray (Mines Admin)	2	32'-3610'	Gamma Ray	0.005 MR/hour/inch	1" = 50'

Drilling Time

The time taken to drill each 10 feet was recorded by the driller and entered in the geological log sheet. Drilling times at 1 foot intervals were recorded during casing operations and when critical sections were being drilled.

The drilling rate or rate of penetration is graphically recorded in mins. per 10 feet on the composite log, and the progress rate which includes time to make connections is shown on fig. 3(a) in the form of drilling rate expressed in feet per hour.

The time/depth relationship expressed in hours since "spud date" is shown in fig. 2.

Hydrocarbon Detection

No mud gas analysis unit was considered necessary for the monitoring of the mud, however each sample before being dried was checked under a portable Ultra Violet unit to detect the presence of any hydrocarbons in the cuttings.

Formation Testing

No drill stem testing was conducted on Fortville No. 3.

Deviation Surveys

No deviation surveys were conducted at Fortville No. 3.

Temperature Surveys

No temperature surveys were conducted at Fortville No. 3.

WELL COMPLETION

Fortville No. 3 reached total depth of 3610 feet on May 12th, 1964. The following three days were spent conditioning the hole while awaiting the Mines Administration Logging crew to arrive on site.

The well was logged to total depth with a falling log-mechanism on 16th May, 1964, and on 17th May preparations were made to displace the drilling mud from the hole to establish the artesian water flow.

17/5/64

Ran in hole with open ended drill pipe to 3610 feet. Began circulation at 1000 hours. At 1120 hours a mud test was taken giving a value

$R_m = 1.41 \text{ ohm. m at } 64^\circ \text{ F.}$

Viscosity	117
Weight	90 lbs.
Mud Cake	2/32"
Sand	2.5%
Water	6
P.H.	8
Temp. °F	104°

At 1130 hours began thinning mud with 320 gallons of water, after circulating until 1230 hours at which stage viscosity had decreased to 77. A further 1000 gallons of water was pumped down the hole after which the viscosity value was 40. Pulled out 20 stands to 2820 feet and displaced mud with water. By 1320 a total of 1800 gallons of water had been pumped down the hole.

At 1445, 6 stands were added so that the bottom of the pipe was at 3010 feet and the pipe was worked while the hole was washed with water. A further 3 stands were added while washing with water to a depth of 3100 feet. Complete returns were maintained throughout pumping operations.

At 1715 all mud down to 3100 feet had been displaced with water. Pulled out of the hole, and watched for movement in the water level in the casing.

At midnight of the 17th the water came within 1.5 feet of the surface, and this remained static till 0800 on the 18th.

18/5/64

A centrifugal pump was rigged up on the floor and pumping commenced at 1130 and was tested for 10 minutes. Immediately water began to rise in the casing to the surface. At 1230 pumping was repeated for 40 minutes at which time a strong flow was established, and by 1400, water was flowing in excess of 3000 galls./hr. at a temperature of 157°F.

By 1545 the well flowed at the rate of 18000 galls. per hour at a flowline temperature of 159.5°F.

After a short shut in period of 10 mins. at 1600 it was established that the well was flowing at the rate of between 450,000 and 500,000 gallons per day with a flow line temperature of 167°F.

The well was allowed to flow at this rate overnight.

19/5/64

The well was allowed to flow till noon at which stage the well had completely cleared itself from mud cake and filtrate,

flowing clear water with a very faint gas odour, at a constant rate of 18600 gallons per hour @ 169° F. *

Water samples were taken prior to shutting in the well.
(See appendix t).

20/5/64 to 22/5/64

The well head was fitted onto the casing and connected to the flow line and tested.

The rig was released on the 22nd of May, 1964.

Subsequently a well head restrictor plate, 1" in diameter was fitted, reducing the flow of the well to 5000 gallons per hour or 120,000 gallons per day.

The following well head pressures were recorded:

Shut in pressure	21 psi
Flow pressure	18 psi

GEOLOGY

Surface geology

From the physiographic descriptions of the country surrounding the Fortville location, it will have been apparent that surface outcrops are few and widely scattered. The only exposed rocks are dark reddish brown, coarse grained and cross-bedded sandstones which are exposed intermittently on the floors of interfluvial corridors between Yandana Creek and Bellards Lagoon. Some lanceolate leaf-impressions of (?) *Cinnamomum* sp. were observed. These sandstones are of Lower Tertiary age and can be correlated with the Lower Tertiary sandstones outcropping east of Innamincka and in the vicinity of Mt. Stuart Station near Tibecurra. A very typical conglomerate occurs at the base of this Lower Tertiary sequence characterised by the great abundance of pebbles of black, silicified fossil wood and amber coloured agate as well as the high polish of the individual grains.

The nearest outcrops of Cretaceous sediments are in the Stoken Range about 35 miles N from the Fortville location. Extensive exposures of Cretaceous strata also occur N of Tiboburra, between Warri Gate and the Narratta Range. The Cretaceous sediments are generally flat lying or gently undulating but are steeply dragged along the Narratta fault.

Equivalents of the Upper Jurassic Moega Sandstone are exposed near Milparinka and Tiboburra. The Moega Sandstone rests with strong angular unconformity either on the metamorphics of the Willmann Complex which form the Narratta inlier or on the Upper Devonian inlier of the Tiboburra Terrane. Remarkable outcrops of Moega Sandstone occur near Mt. Wood Station, about 12 miles east of Tiboburra, where a great abundance of well preserved, silicified tree-trunks and Gomphites litter the surface of the sandstone exposures.

No Lower Mesozoic or Palaeozoic sediments are known in the area.

Summary of Geophysical Work

The only geophysical work carried out in the area prior to the drilling of Fortville No. 3 was a regional gravity survey undertaken by the Frane - Broken Hill Company in 1949 and two seismic reconnaissance traverses carried out by the South Australian Department of Mines in 1963.

Frane - Broken Hill's gravity survey was of very limited value for the Fortville project, as the station-density is much too low to allow any depth estimates. However, it shows the general northward deepening of the Great Artesian Basin and indicates certain structural trends, assumed to be basement trends. (see fig. 4).

The seismic reconnaissance traverses were shot from Delhi-Santos Dullingeri No. 1 southward past Fortville to Tilika and from Bollaards Lagoon to the Kurnalooki track. Record quality in the Fortville area was extremely poor due to local

surface conditions. At shot point 59, situated about 1,000 feet from the Fortville location, the "C" reflector, thought to originate from the Transition Beds, was present at about 2,900 feet below surface. Therefore it was expected to intersect the producing artesian aquifer between 2,900 and 3,000 feet.

A lower event, .184 seconds below the "C" was correlated with the "P" event observed further north along this line. The well was therefore expected to enter Permian sediments between 3,600 and 3,800 feet.

The seismic records suggested no definite high speed basement within the 4,000 foot capacity of the A-1000 rig.

A more detailed discussion of the results of this seismic survey is given in appendix B.

Extensive seismic work has been done in the Pullingari-Nariyica area 60 miles north of Fortville No. 3 by United Geophysical Seismic work for Delhi - Australian Petroleum Ltd. and Santos Ltd. and this was taken into account when interpreting the lithological cross sections.

Well - Stratigraphy

The nomenclature used in this report follows substantially that currently used by Delhi-Santos and other Petroleum companies operating in the Great Artesian Basin. This nomenclature is based on Whitehouse's (1954) subdivision of the Mesozoic strata of the basin, although additions and slight modifications were made in adapting his nomenclature for sub-surface work.

All formation boundaries are based on electric-log characteristics, therefore all formations and numbers have to be regarded as rock units. A summary of the formations encountered is given in Table V. For detailed stratigraphy see composite well-log.

Formation	Age	Formation Tops		Thickness
		N.S. + 331 ft.	N.S.L.	
-	Recent	Surface	+ 383ft.	62ft.
Unnamed	Lower Tertiary	62 ft.	+ 263ft.	330ft.
Winton Formation	(?) Cenomanian	400 ft.	- 75ft.	917ft.
Tambo Formation	Albian	1317 ft.	- 992ft.	370ft.
Rosa Formation	Aptian	1833ft.	-1873ft.	781ft.
Transition Beds	Aptian to Neocomian	2630ft.	-2709ft.	371ft.
Mooga Sandstone	Upper Jurassic	3003ft.	-2600ft.	490ft.
Villyama Phyllite	Lower Proterozoic	3493ft.	-3170ft.	115ft.

TABLE V. Formation tops and thickness,
U.S. Govt. Fortville No. 3

Recent:

Surface - 62 feet, thickness 62 feet.

Red-brown leamy sand, medium grained quartz, grains coated with limonite film. Trace of gypsum.

Unnamed Formation: Lower Tertiary

62 feet - 400 feet; thickness 330 feet

Sands, silts and lignitic clays with embedded granules, pebbles and cobbles of chert and silicified sandstones and siltstones. At the base are 75 feet of highly polished clear - opaque, well rounded, well sorted quartz sands, medium to coarse grained with gritty lenses, containing black grains of silicified wood.

Winton Formation: (?) Cenomanian

400 feet - 1317 feet; thickness 917 feet

Predominantly very fine grained elastics with interbeds of salt and pepper sands, impure, sandy limestones and low grade coal.

The fine grained elastics consist of siltstones, light

gray to medium greenish-gray coarse silt to very fine sand, clayey, quartzose, glauconitic, poorly sorted, often carbonaceous, soft to firm and shale, light gray, greenish-gray and dark gray, clayey to silty occasionally carbonaceous poorly sorted, soft to firm. The salt and pepper sandstones are pale greenish-gray silty and clayey. Grain size ranges from medium sand to fine silt grading to siltstone, quartzose, non-carbonaceous, occasionally glauconitic, subangular to subrounded, low porosity, soft to firm, and often interbedded with thin bands or lenses of limestone, dark greenish-gray, dense, hard very sandy with flakes of carbonaceous material.

Tambo Formation (Albian)

1317 feet - 1853 feet; thickness 570 feet.

Predominantly shale, dark gray to dark bluish-gray, soft, fissile, micro micaceous with occasional interbeds of gray, soft shaly siltstone to very fine grained sandstone. Infrequent bands and lenses of gray to brown, finely micro-crystalline, argillaceous limestone occur at irregular intervals.

Lenses of low grade coal near top of sequence.

At the base of the Tambo formation a distinctive member is observed, characterized by several peaks on the electric log-curve which is considered equivalent to Delhi's "Fish Scale Zone" or the Toolobuc Member (Reynolds, M. 19). This member extends from 1733 feet - 1853 feet and is composed of interbeds of shale, argillaceous and glauconitic sandstones and bands of dense, marly, limestones.

Rosa Formation (Aptian)

1853 feet - 2643 feet; thickness 781 feet

Predominantly dark gray fissile micaceous silty occasionally pyritic shale, with frequent thin interbeds of gray very fine grained glauconitic sandstone with occasional calcareous cement. Lenses and bands of hard, dense, dark gray, fossiliferous limestone near base.

Blythedale Group

Upper Jurassic to lower Cretaceous

2634 feet - 3495 feet, thickness 861 feet

Transition Beds (Aptian-Miocenian)

2634 feet - 3005 feet; thickness 371 feet.

Interbedded very fine grained clastics grading downwards to fine grained clastics and medium grained sandstones. Grey to greenish-grey shale silty, slightly calcareous, carbonaceous, sandy, occasionally fissile with coarse siltstone interbeds. Below 2857 feet predominantly sandstone, very fine to medium grained, quartzose-feldspathic, angular, finely micaceous, conchoidal, and sandstone, fine grained, calcareous (faintly bluish) hard, trace glauconite and mica. Pyrite abundant throughout sequence. The sandstones have medium to low porosity (see core description and petrology of core No. 1, appendix A and B).

Heavy Sandstone (Upper Jurassic)

3005 feet - 3495 feet; thickness 490 feet.

Predominantly sandstone with thin conglomeratic beds of rounded quartz pebbles and minor shale beds. Sandstone: Light grey very coarse grained, rounded clear quartz, kaolin cement and sandstone, white to pale grey, fine grained to medium grained, quartzose very slightly feldspathic and kaolinitic, micaceous, carbonaceous, traces of pyrite, moderately well sorted, rounded, fair porosity, thin wavy bedding with rare thin interbeds and laminae of shale, medium grey to dark grey, fine to medium silt range, argillaceous silty micaceous, carbonaceous, non-calcareous, trace of pyrite, fissile (see core description and petrology of core No. 2, appendix A and B).

William Phyllite (Lower Proterozoic to Archean)

3495 feet - 3610 feet; thickness penetrated to T.M.
115 ft.

Weathered zone: These rocks are intensely weathered to a depth of approximately 20 feet below the marked angular unconformity to a white-silver grey quartz sericitic schist, very kaolinitic,

soft, friable, micaceous, soapy feel.

Unweathered Phyllites: Highly sheared and folded, banded quartz-sericite schists and phyllites, pale olive green with silky sheen. Quartz bands, up to $\frac{1}{2}$ inch thick are drag folded and reverse folded. Quartz also fills in sheared regions. Often open vugs left along fold axes. Abundant small but well developed pyrite crystals interspersed throughout, often associated with quartz veining.

Quartz veins occur at 90° to foliation (bedding) plane. (see core description and petrology of cores No. 3 to 5, appendix A and B).

Porosity and Permeability of Sediments Penetrated

Visual estimates were made of porosity of rock types seen in the ditch samples.

The Meaga Formation possesses fair to good reservoir qualities and showed a porosity in the range of 20% - 30%.

No evidence is at hand to show what degree permeability is present in the Meaga Sands, however the strong flow of 18,000 g.p.h. water at the surface indicates this to be good to excellent.

Reference to the Occurrence of Petroleum

The only evidence of hydrocarbons was detected in cutting samples from the Meaga Sandstone between 3020 and 3093 feet which showed a slight gold fluorescence under the U-V lamp. Only about 1-3% of the sample exhibiting this fluorescence.

Of interest however, were repeated occurrences of black sticky bituminous material, collecting in small gubules on the base of the heating tray when drying the sample for storage.

These were tested with carbon tetrachloride, and a slow rate of solution was noticed under the U-V lamp leaving a dull gold fluorescence.

This evidence was not considered to constitute a significant showing of hydrocarbons and no further methods of evaluation were undertaken. This occurrence is interesting when considering the very common presence of hydro-carbon gas in Jurassic sandstones of the region, as for example in the Comana and Yandama bores.

Correlation

The following table shows the correlation of the tops of the various stratigraphic units between Innamincka No. 1, Gullingham No. 1 drilled by DeLhi-Santos Ltd., and Tilcha Water Bore, Fortville No. 3 Water Bore drilled by the South Australian Mines Department.

Formation	NORTH						SOUTH	
	Innamincka		Gullingham		Fortville No. 3		Tilcha Bore	
	KB(+415')	SUB-SEA	KB(+320')	SUB-SEA	KB(+331')	SUB-SEA	KB(+281')	SUB-SEA
Recent and Tertiary	Not present		Surface	+305	Surface	+325	Surface	+27
Winton Formation	Surface	+401	445	+228	400	-75	500	-225
Tambo Formation	1795	-1394	2549	-2229	1317	-992	650	-37
Rona Formation	2965	2564	3538	-3218	1853	-1475	1400	-1125
Transition Beds	3928	-3527	4492	-4172	2634	-2309	2000	-1725
Mooga Formation	4420	4019	4774	-4454	3005	-2680	2220	-1945
Salween Formation	5136	4755	5792	-5472	Not present		Not present	
Triassic	5920	5519	6182	-5862	Not present		Not present	
Permian	6723	-6322	6707	-6387	Not present		Not present	
Ordovician	7050 (Dev.)	-6649	9050	-8730	Not present		Not present	
Pretertiary	Not reached		Not reached		3495	-3170	Not present	
Total Depth	12637	-12236	11503	deviated hole	3610	-2299	2353	-2078

TABLE VI. Correlation chart D.F.S. Innamincka No. 1 to Tilcha Bore

Correlation between D.F.S. Innamincka No. 1, Gullingham

No. 1 and S.A.S. Fortville No. 3 is based on electric and gamma ray log-characteristics, which show excellent agreement between

these wells.

Some discussion however will be needed on the boundary between the Transition Beds and the Neoga Sandstone. In the case of Fortville No. 3 Well, the top of the Neoga Sandstone is picked at the second resistivity - peak at 3005 feet rather than at the first peak at 2837 feet for the following reasons:-

(1) The sequence between 2837 feet and 3005 feet consists of fine grained, micaceous, and felsepathic sandstones, and calcareous glauconitic (fountainsbleau) sandstones, interlaminated with silty shale. This lithology is different from the composition of the Neoga Sandstone (see Appendix B) but typical for basal cretaceous sediments as observed in marginal outcrops.

(2) The flora contained in this sequence (core No. 1) is Lower cretaceous in age (see Appendix C).

Therefore the boundary as defined above is a realistic stratigraphic separation between the non-marine Neoga Sandstone and the basal cretaceous sediments (Transition Beds), heralding the onset of the cretaceous marine transgression.

The sericite phyllites which were encountered below the unconformity are correlated with the metamorphics of the Williams complex which underlie equivalents of the Adelaide System (Terrevanges "Series") north of Broken Hill and in the Gullin-Mootwingee region (Kenney, F.J. 1936).

CONCLUSIONS

The north-south section from D.F.S. Innamincka No. 1 through D.S. Dulligari No. 1 and S.A.O. Fortville No. 3 to Tilcha Bore (fig. 5) clearly shows that a marked regional thinning of the Mesozoic section takes place in this southern marginal region of the Great Artesian Basin.

The regional thinning continues southward into the eastern Kroms Embayment as demonstrated by the Black Oak Bore, where the whole Mesozoic section has been reduced to 450 feet. The Vinton Formation and Tamba Formation equivalents have

disappeared completely leaving a section composed of Tertiary, Aptian and Aptian-Miocene sediments which rest with marked angular unconformity on Pre-Cambrian Slates.

The thickness of the Moega Sandstone in S.A.G. Fortville No. 3 is consistent with the regional thinning of the Mesozoic section towards the Freme Embayment.

The strong kaolinisation and deep weathering of the underlying Wiliyama Phyllites shows that a prolonged and stable period of subaerial weathering preceded the deposition of the Moega Sandstone. Near-peneplain conditions must have prevailed in order to facilitate an equilibrium suitable for the development of such deep weathering profile.

The most important geological facts arising from S.A.G. Fortville No. 3 are the complete disappearance of pre-Moega Sandstone sediments, particularly of Triassic and Permian age and the absence of Lower Palaeozoic sediments below the unconformity. The two facts combined, greatly reduce the petroleum potential of the eastern Freme Embayment and the regions between S.A.G. Fortville No. 3 and Tiboburra and Kalbarinka, where extensive areas of non-prospective Pre-Cambrian rocks, intruded by Devonian tonalites are exposed at the surface.

H. Wopfinger
H. Wopfinger
Senior Geologist

Brian S. Cornish
B. S. Cornish
Geologist

HV:AGX
24/8/64

REFERENCES

- Amphlett, I.R., Harrison, J. and Higginbotham, G.T. - 1963.
Well completion report, Melhi-Santos Maryilee No. 1
Well, Queensland (unpublished).
- Freytag, I.R. - 1963.
Explanatory notes for a structural contour map of
portion of the Great Artesian Basin.
Geol. Surv. N.S.W. Rept. No. 2625. (unpublished)
- Harrison, J. and Greer, W.J. - 1963.
Well completion report, Melhi-Santos Dullingari
No. 1 Well, South Australia. (unpublished)
- Kenney, E.J. - 1934.
West Darling District; Geological reconnaissance
with special reference to the resources of sub-
surface water; N.S.W. - Dept. of Mines, Public No. 36
- Ludbrook, N.M. - 1962.
Material from the southern margin of the Great
Artesian Basin and the Frome Embayment. - Geol.
Surv. Rept. No. (unpublished).
- Whitchouse, F.W. - 1934.
The Geology of the Queensland portion of the Great
Australian Artesian Basin. - Dept. Geod. Pub.
Works, Brisbane.
- Synn, J.C. - 1961.
Well completion reports Melhi-Frome-Santos Innamincka
No. 1 well, South Australia.
Bur. Min. Res., Petrol. 2, Sub. Acqs. Public. No. 9,
Canberra.
- Reynolds, N.A. - 1960.
Review of Type Localities and Stratigraphy of
the Cretaceous of the Great Artesian Basin in
Queensland.
Bur. Min. Res., Records. 1960/67.

TEXT TO FIGURES

Fig. 6 converted Minderill B3000 rig, drilling N.A. Gov.
Fortville No. 3 Well.

(photo: H. Wepfner)

Fig. 7 Mr. D. Pagan, Senior Geophysicist
N.S.V. Department of Mines running electric log
in Fortville No. 3 Well.

(photo: H. Wepfner)

Fig. 8 Steam rising from artesian water flow, 3 hours after
well was brought in.

(photo: H. Wepfner)



Fig. 6

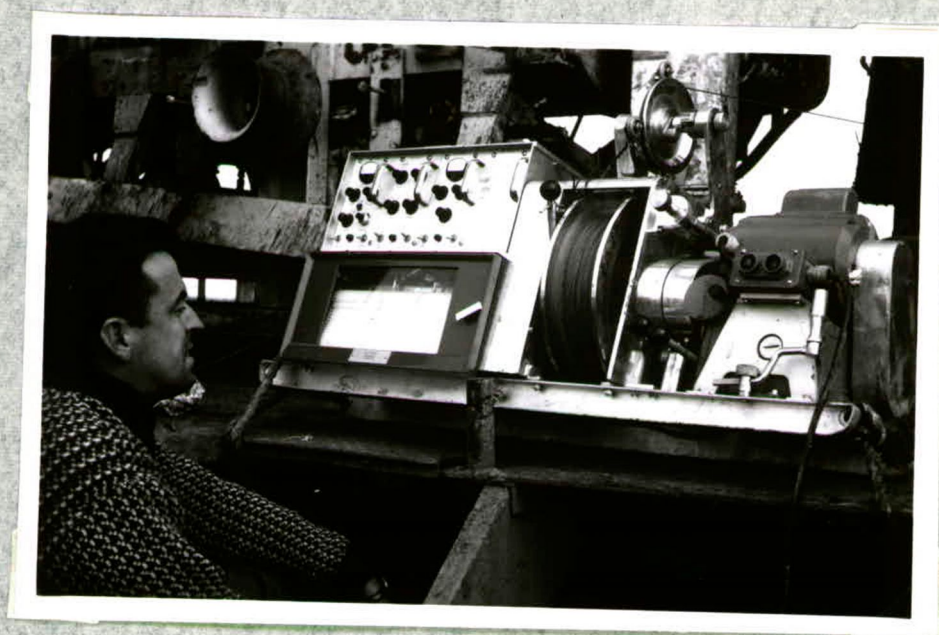


Fig. 7



Fig. 8

APPENDIX A

FORE DESCRIPTION

PETROLOGY OF CORE SAMPLES

Petrology by Mineralogy Section, Australian Mineral Development Laboratories, Samples P.180/64 and P.181/64

investigated by R. Townsend. Samples P. 231/64 to P. 236/64 investigated by S. Kvale.

Formation: Transition Beds

Core No. 1, Depth 2926.1 feet.

P. 180/64: MW76; T513570; T513571

This sample is a calcareous subarkose, or feldspathic sandstone. It is thus primarily composed of quartz grains cemented by a carbonate matrix, which gives it a compact texture. In the section parallel to the bedding (13870) there is a primary fabric, represented by the preferred orientation of elongate quartz grains, and muscovite plates. These elongate quartzes have a normal grain-size of 0.15×0.04 mm, but are subordinate to more spherical angular quartzes which have two main size groups, 0.08 to 0.12 mm diameter, and 0.03 to 0.05 mm diameter. Microcline and sodic plagioclase are present in minor quantities as angular basal cleavage fragments (0.1×0.04 mm).

The occasional muscovite laths are often bent and average $0.15 \times .02$ mm, with one flake measuring 0.9×0.025 mm. The accessories consist of rounded to subrounded zircon (0.04×0.02 mm), euhedral to subrounded tourmaline (0.08×0.04 mm), subangular to subrounded or elongate opaques, and rare, very angular sphene and rutile.

These grains are cemented by carbonate, of which individual areas are 2 to 3 mm across.

In the section perpendicular to the bedding, elongate quartz grains are less prominent. The normal spherical quartz grains are angular and range from 0.04 to 0.8 mm, with occasional grains up to 0.15 mm. Microcline forms angular grains, averaging 0.08 mm. Accessories are more numerous in this section. Tourmaline is rounded in cross section, and usually less than 0.08 mm diameter. One small tourmaline grain is included in a large quartz crystal. Sphene and opaques are rounded whilst zircon tends to be subhedral.

Formation: Transition Beds

Core No. 1, Depth 2933'± feet

P. 181/64; HW77; T513872; T513873

This is a porous feldspathic arenite, lacking the calcareous cement of the previous specimen, and is thus rather friable. In the section parallel to the bedding (13872) it has a similar fabric exemplified by common elongate quartz grains (0.08×0.04 mm), but also has vague bands of muscovite laths and hydrated iron oxides. Quartz is present also as subrounded grains varying from 0.1×0.015 mm to 0.15×0.03 mm. Occasional angular grains of microcline perthite average 0.05×0.06 mm.

Accessories consist of tourmaline (0.08×0.04 mm) which may be deep blue in colour; rounded to subrounded zircon, 0.04 mm diameter; and angular opaques with a diameter varying from 0.04 to 0.08 mm. Carbonate matrix is present in very minor amounts.

In the section perpendicular to the bedding quartz grains have three main habits; subangular spherical crystals averaging 0.08 mm diameter; elongate grains, less common in this section (0.1×0.015 to 0.15×0.04 mm); and small angular grains varying from 0.04 to 0.06 mm. Microcline is in minor quantities, forming angular grains measuring 0.03×0.05 mm to 0.08×0.03 mm, and rarely 0.15×0.10 mm.

Brown tourmaline is either anhedral (0.03×0.03 to 0.07×0.15 mm) or rounded (0.06 mm). Zircon may be euhedral (0.15×0.4 mm) but normally occurs as minute angular crystals, less than 0.02 mm across. Opaque grains are normally angular, (0.02×0.04 mm) and rarely 0.2×0.1 mm. Rutile and sub-angular sphene are rare, whilst one euhedral apatite grain was detected. The matrix where present, is either carbonate or goethite-like material. Muscovite is sporadically present in this section as laths measuring 0.08×0.06 mm.

Formation: Neoga Sandstone

Core No. 2, Depth 9371 feet

P. 251/64: HV78: T514216X

This is a poorly-cemented quartz sandstone or proto-quartzite. Though the rock is fairly well sorted (the grains being between 0.1 and 0.6 mm across) they are seldom more than subrounded, and most are subangular. Almost all are quartz; they form about 60 per cent of the rock. Minor muscovite flakes are present, not generally more than 0.6 mm long, though a few are considerably longer. A few silt fragments, in which quartz and sericite are the dominant minerals, are present amongst the grains. Tourmaline, plagioclase and grains of felsitic rock are accessory; only one grain of zircon was observed.

Cementation has been effected to a small extent by pressure solution between the grains, but most is done by the clay matrix, consisting mainly of kaolin with subdominant illite and montmorillonite. However, clay forms only a small proportion of the rock, and by no means completely fills the interstices. Sericite is present to a minor extent.

The bedding is very indistinct in thin section; it is shown by subtle variations in grain size, and by weakly-defined alignment of any elongated grains.

Formation: Neoga Sandstone

Core No. 2, Depth 9376 feet

P. 252/64: HV79: T514217X

This is an orthoquartzite, consisting almost entirely of subangular to well-rounded quartz grains with very little matrix or cement. The grains are 0.1 to 1 mm across; each has a veneer of sericite flakes, but apart from this most of the interstices are almost empty; there being only small amounts of clay and sericite present. A little cementation has taken place between the grains by pressure solution. Tourmaline and microcline are accessory.

The bedding is indicated by a few bands of rather fine grains having a general grain size of about 0.3 mm as opposed

to the more usual 0.6 mm of the rest of the rock.

Formation: Meoga Sandstone

Core No. 2, Depth 9393 feet

P. 232/64: NW20: T514215E

This is a conglomerate containing fragments varying in size from 2 to 25 mm. The matrix consists of quartz sandstone with grains 0.2 to 1 mm across.

Three types of rock are present among the fragments: quartzite, fine quartz sandstone, and silty claystone. Though some of the smaller fragments are subangular, the larger fragments are generally rounded or well-rounded. The quartzite fragments have a very irregular grain size from virtually nothing up to several millimetres; boundaries between the grains are highly crenulate, and the rock usually shows strain. In the fine quartz sandstone there is very little present among the grains apart from quartz; the grains are 0.05 to 0.1 mm across, and form about 60 per cent of the rock. The matrix consists of fine clay and quartz. The silty claystone contains 10 to 20 per cent of silt grains of quartz, but most is clay.

The larger sand grains of the matrix are generally rounded, but some of the smaller ones may be very angular. They are poorly cemented, and there is little material present finer than the sand grains, though there is a little clay. Most of the interstitial voids have not been filled. Tourmaline is accessory.

Formation: Meoga Sandstone

Core No. 3, Depth 9506 feet

P. 250/64: NW31: T514219E

This is a very compact quartz sandstone or proto-quartzite. Angular to subrounded grains form about 70 per cent of the rock, and are 0.05 to 0.25 mm across. Most of the grains are quartz, but a few muscovite flakes are present. Plagioclase, tourmaline, zircon and opaques are accessory. Most of the

matrix and cement is clay, but some sericite is also present. Of the clay minerals kaolin is dominant and illite subdominant.

Tourmaline is more abundant in the section parallel to bedding.

Formation: Williams Phyllite (strongly weathered)

Core No. 3, Depth 3510 feet

P. 235/64: HWB2: TS14220

This is a foliated quartz-sericite rock, probably a schist. Quartz and sericite each form about half the rock and form separate layers varying in thickness from 0.1 to 2 mm. The rock has been considerably contorted; though the sericite flakes are all aligned, the direction of alignment is by no means constant; parts of the rock appear to have rather "knotted" structure, at points where there is a change in the direction of the foliation. The quartz has a grain size of about 0.02 mm, and forms a mosaic. A few poorly-defined, small, circular to lenticular patches of quartz are present up to 0.5 mm across, in which the grain size is about 0.1 mm. These may be either incipient porphyroblasts or relict grains. The quartz bands show a tendency to lane around them.

Formation: Williams Phyllite (fresh)

Core No. 5, Depth 3603 feet.

P. 236/64: HWB3: TS14221

This is a quartz-muscovite schist, folded both microscopically and mesoscopically. The quartz and the muscovite occur in distinct bands, the muscovite bands consisting of a mass of small parallel flakes having marked lineations or microfolds. Very fine-grained opaques occur with the muscovite, and tend to be concentrated on the flanks of the microfolds. They cause the specimen. On the flanks of the mesoscopic fold the microfolding is so tight that fracture has occurred in many places. As the axes of the microfolds are parallel to the axis of the mesoscopic fold, these fractures thus form axial plane cleavage.

The quartz has an average grain size of about 0.02 mm, and forms a mosaic. Virtually no muscovite occurs within the quartz bands, but small masses of carbonate are fairly common. Carbonate also forms a narrow band within one of the muscovite bands.

A few fairly euhedral opaque crystals (probably pyrite) are present, about 0.1 mm across, though some are larger. Petrified tourmaline is accessory.

PALYNOLOGICAL REPORT 6/60

PALYNOLOGICAL EXAMINATION OF CORE 1 PORTVILLE NO. 1

by

W. E. Harris

A sample from Core 1 at 2,939 ft. has been examined for pollens and spores with the following results. The assemblage contained the following species:

Alisporites grandisAequitriradites spinulosusBaculatisporites communensisBiretisporites spectabilisCicatricosisporites ludbrookiiCeratoperites equalisGlossopellis torosusGenticolporites seckmaniiCoronatispora perforataGyathidites australisG. minorInaperturopollenites sp.Muklisporites ascheriaLeptolepidites majorLycopodiumsporites austroclavaticitesMicrocachrydites antarcticusMakospora floridaPedocarpidites ellipticusPodosporites microasacatusStereisporites antiquasporitesTrilobesporites trioreticulatusTungaspollenites sampieriVitreisporites sp.

The presence of G. ludbrookii together with A. spinulosus permits a correlation with the "Speciesus Assemblage" of Dettmann (1969) although the index species Dicretosporites speciesus,

is not present in the sample studied. The microfossils appears to be near the base of Bottmann's Assemblage as evidenced by the presence of E. spectabilis, E. florida, C. cooksonii which do not occur in stratigraphically higher beds containing O. speciosus. The assemblage occurs in Gadsdenatta Bore No. 1 at 783-1,292 ft. and Gootabarlow Bore No. 2 at 1,330-1,402 ft. and is considered to range from Valanginian to Aptian age (Bottmann op. cit.).

APPENDIX B

SEISMIC RESULTS, FORTVILLE AREA

by

K. R. Seedman

In 1963 a seismic traverse (labelled DT) was shot from the vicinity of Dulligari No. 1 southward past Bellard's Lagoon and Fortville. Shot points were at intervals of approximately one mile, and reflections have been correlated by consideration of character and interval.

At DT 1, two miles north-east of Dulligari No. 1, the "C" reflection (associated with the Transition Beds) is recorded at 1.134 seconds below sea level datum. Using a velocity function described in "A Velocity Distribution from Surface to the Blythesdale Group in the Western Portion of the Great Artesian Basin. Calculated from T T Analysis of Reflection Profiles," by Milton & Seedman (66.2373), this is equivalent to a depth of 5950 feet below surface. The top of the "P" band of Permian reflections is at 1.507 seconds, or .353 seconds deeper than "C".

Both "C" and "P" can be traced with considerable certainty to DT24, 21 miles south of Dulligari, becoming generally shallower. At DT24, "C" is 6700 feet below surface and "P" is .323 seconds below "C".

Further southward, record quality generally deteriorates considerably probably due to near-surface conditions. On many records "C" and "P" cannot be identified. However, it is reasonably certain that "P" persists as far south as DT59, 47 miles south of Dulligari. Here, "C" is 8000 feet below surface, and "P" is .315 seconds deeper than "C".

South of DT59, records continue to be of relatively poor quality, and typical "P" reflections are not recorded. With some doubt, due to poor records, "C" can be correlated to DT89½, 1,000 feet from Fortville Bore, 76 miles south of Dulligari, where it occurs at 2,800 feet below surface. Between DT59 and DT89½, although typical "P" reflections are not recorded,

an occasionally strong band of energy below "C" has tentatively been correlated to DT394, where it occurs .184 seconds below "C". Although no local velocity information is available, this reflection would be at approximately 3,600 feet below surface at DT394.

Originally it was thought that this particular band originated from Permian section, and that its different character from "P" further north might be due to facies changes towards the margin of the Permian Basin. However, since the completion of the Fortville Well, it seems that the reflection must come from the basement surface below the Meigs Sandstone. The southern limit of Permian section must be somewhere between DT39 and DT394.

APPENDIX 2

WATER ANALYSIS

Sample No. W. 177/64 - Full Water Analysis

Sample collected after well flowed for 24 hours.

Name and Address: Linden Station, 10 miles S.W. of Three State Corner.

Sample collected by: Mr. H. Vepfner. Bore No.: Fortville No. 3.

Date collected: 19.5.1964.

	ppm	Assumed composition of salts	ppm
Chlorine, Cl	299	Calcium carbonate	25
Sulphuric acid (radicle), SO ₄	Nil	Calcium sulphate	-
Carbonic acid (radicle), CO ₂	691	Calcium chloride	-
Nitric acid (radicle), NO ₃	Nil	Magnesium carbonate	10
Sodium, Na	661	Magnesium sulphate	-
Potassium, K	-	Magnesium chloride	-
Calcium, Ca	10	Sodium carbonate	1076
Magnesium, Mg	3	Sodium sulphate	Nil
Silica, SiO ₂	-	Sodium chloride	493
		Sodium nitrate	Nil
		Potassium Chloride	-
HARDNESS			
Total saline matter, parts per million	1604		ppm
Total saline matter, grains per gallon		Total	37
		Temporary	37
		Permanent	-
Total saline matter, ounces per gallon		Due to calcium	25
		Due to magnesium	12
Suspended matter			
Organic matter			
Bore No. Fortville No. 3 Depth 2,610 ft. Water level surface Water cut 3003 - 2495 Supply C.P.M. 18,000 gphour.		Remarks Analysis by T.R. Frost, Analytical Section, Australian Mineral Development Laboratory. T.A. BARNES Government Geologist	

Sample A. 108/64 Water test for hydrocarbons

Sample collected after well flowed for 24 hours.

The container was completely full on receipt. To provide a void space 15 ml. of water were removed, the bottle reclosed, shaken vigorously and left to stand for 24 hours to reach equilibrium. A sample of air in the bottle was subject to Gas Chromatographic examination and yielded the following results.

Methane	3900 ppm
Ethane	500 ppm
Propane	50 ppm
Butane	10 ppm

No higher hydrocarbons could be detected.

Analysis by D.K. Sears.

Australian Mineral Development Laboratories

APPENDIX P

DEPARTMENT OF MINES SOUTH AUSTRALIA

ROTARY DRILLING COST STATEMENT

Project: Portville No. 3

Debit Order: BB 116

Driller: Martin, Jarvis, Jensen

445,000

	Costs for period 23.4.64				Cost for period 26.4.64-22.5.64				Aggregate costs to 22.5.65			
	Total Cost p/ft.				Total Cost p/ft.				Total Cost p/ft.			
	£	s	d.	d.	£	s	d.	d.	£	s	d.	d.
Wages	2515				1384				3899	1.	1.	64
Grout	949				587				1536		8.	60
Stores	3058				66				5124	1.	8.	44
Plant Rental	4385				3387				7972	2.	4.	11
Bonus	20				21				49			31
Casing	3142				-				3142		17.	44
Other	2831				1749				4570	1.	5.	31
TOTAL	19698				7194				26292	7.	5.	31

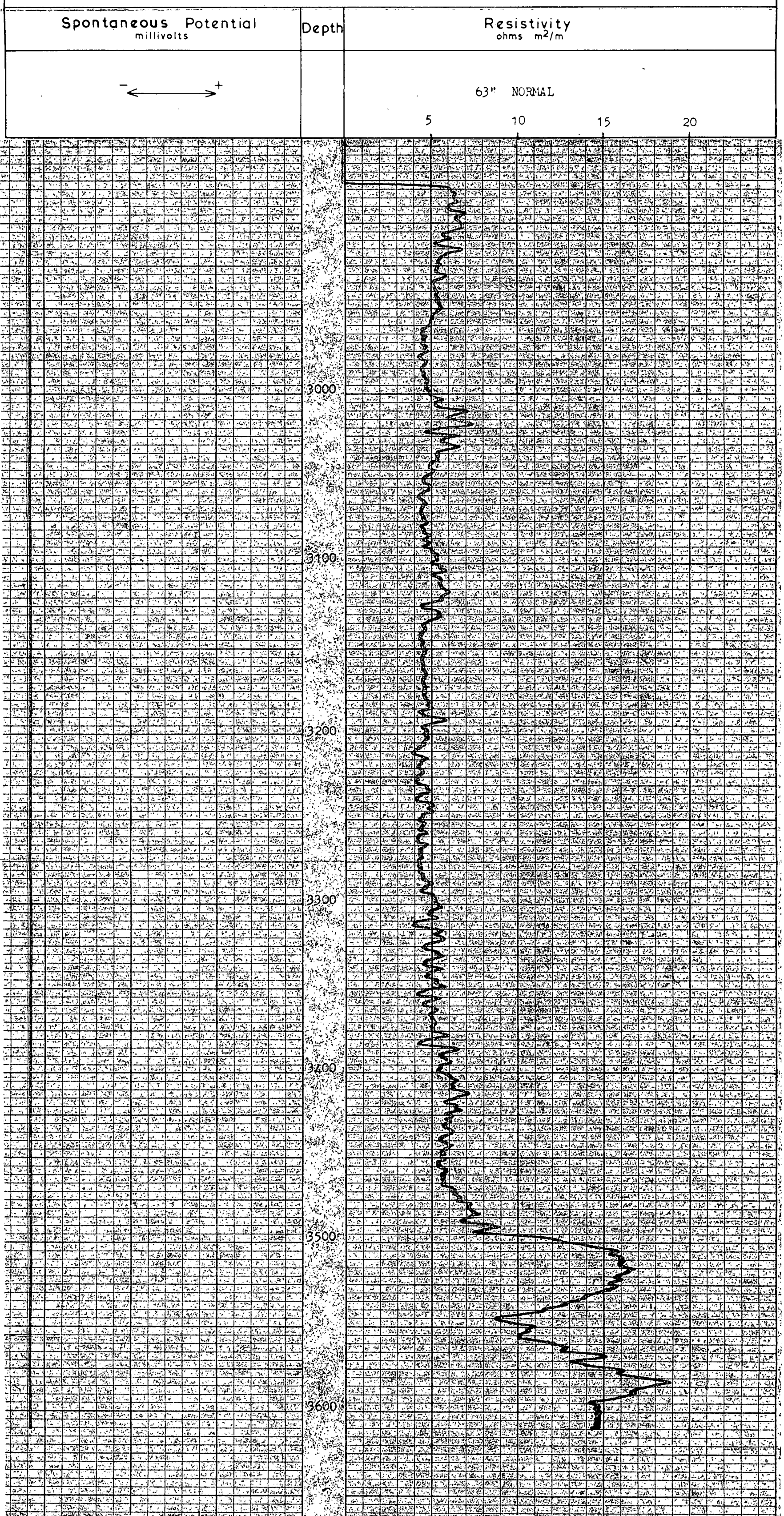
Footage drilled - foot

- foot

3610 feet

ELECTRIC LOG

MUD TYPE : CAUSTIC - MYRTAN
RECORDED BY : J.E.BURBURY
WITNESS : H. WOPFNER



ELECTRIC LOG

WELL : S.A. GOV. FORTVILLE No. 3.

RUN No. : 1.

COMPANY : S.A. MINES DEPARTMENT

DATE : 16 - 5 - 64

LOCATION : Lat. 29° 07' 33" S.

FOOTAGE LOGGED : 731

Long. 140° 53' 57" E.

LOGGED FROM : 3601

LOGGED TO : 2870

CSG. LOGGER : 2870

CSG. DRILLER : 2873

BOTTOM LOGGER : 3601

BOTTOM DRILLER : 3620

BIT SIZE : 4 1/2 inch

MUD RESISTIVITY : 1.41 ohm-m @ 84 °F

ELEVATION : DF R.T. 331 Ft.

KB

or GL

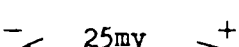
DEPTH DATUM : RT

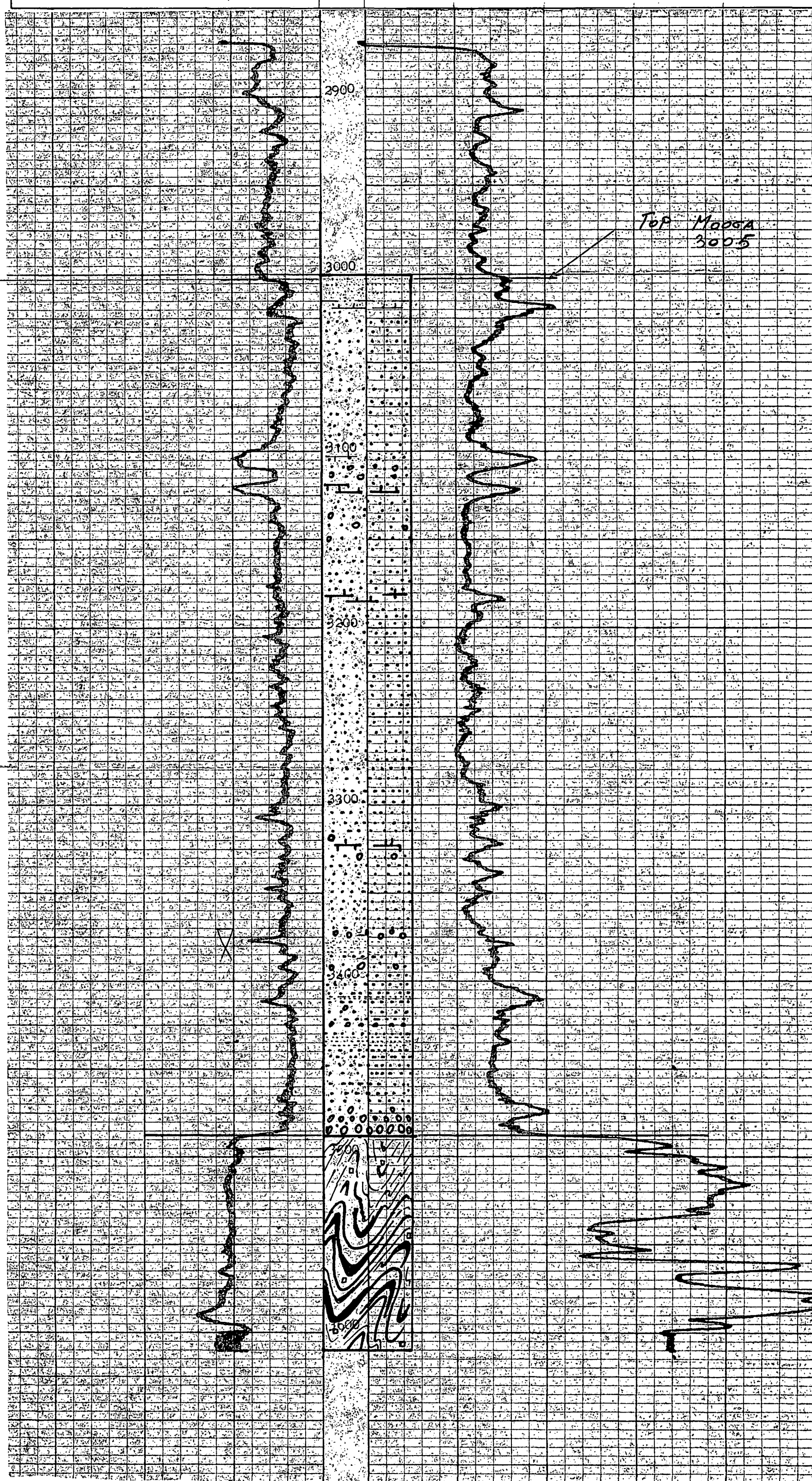
MUD TYPE : CAUSTIC - MYRTAN

RECORDED BY : J.F. FURBURY

WITNESS : H. WOPNER

UNIT : FAILING LOGMASTER
CORRELATION UNIT

Spontaneous Potential millivolts	Depth	Resistivity ohms m ² /m
		16" NORMAL
		5 10 15 20



ELECTRIC LOG

WELL : S.A. GOV. FORTVILLE No. 3

RUN No. : 1.

COMPANY : S.A. MINES DEPARTMENT

DATE : 16 - 5 - 64.

LOCATION : Lat. 29° 07' 33" S.
Long. 140° 53' 57" E.

FOOTAGE LOGGED : 731
LOGGED FROM : 3601
LOGGED TO : 2870
CSG. LOGGER : 2870
CSG. DRILLER : 2873
BOTTOM LOGGER : 3601
BOTTOM DRILLER : 3620

ELEVATION : DF R.T. 331 Ft.
KB
or GL

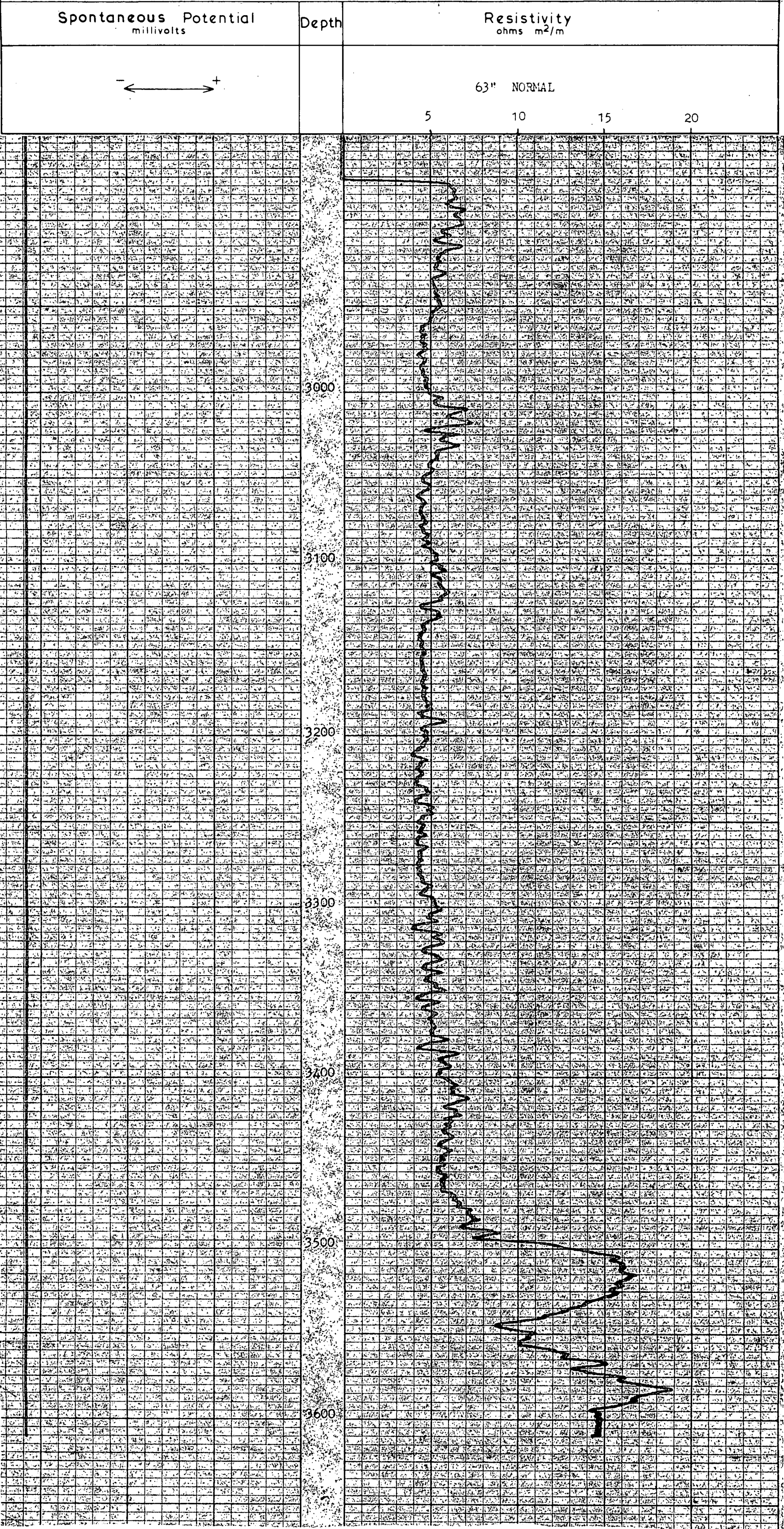
BIT SIZE : 4 1/4 inch
MUD RESISTIVITY : 1.41 ohm-inches @ 84 °F
@ °F

DEPTH DATUM : RT

MUD TYPE : CAUSTIC - MYRTAN

UNIT : FAILING LOGMASTER
CORRELATION UNIT

RECORDED BY : J.E.BURBURY
WITNESS : H. WOPFNER



ELECTRIC LOG

WELL : S.A. COV. FORTVILLE No. 3.

COMPANY : S.A. MINES DEPARTMENT

LOCATION : Lat. 29° 07' 33" S.
Long. 140° 53' 57" E.ELEVATION : DF R.T. 331 Ft.
KB
or GL

DEPTH DATUM : RT

UNIT : FAILING LOGMASTER
CORRELATION UNIT

RUN No. 1.

DATE 16 - 5 - 64

FOOTAGE LOGGED : 731

LOGGED FROM : 3601

LOGGED TO : 2870

CSG. LOGGER : 2870

CSG. DRILLER : 2873

BOTTOM LOGGER : 3601

BOTTOM DRILLER : 3620.

BIT SIZE : 4 1/2 inch

MUD RESISTIVITY : 1.41 ohm-m (a) 84 °F

(a) °F

MUD TYPE : CAUSTIC - MYRTAN

RECORDED BY : J.E. BURBURY

WITNESS : H. WOPFNER

Spontaneous Potential
millivolts

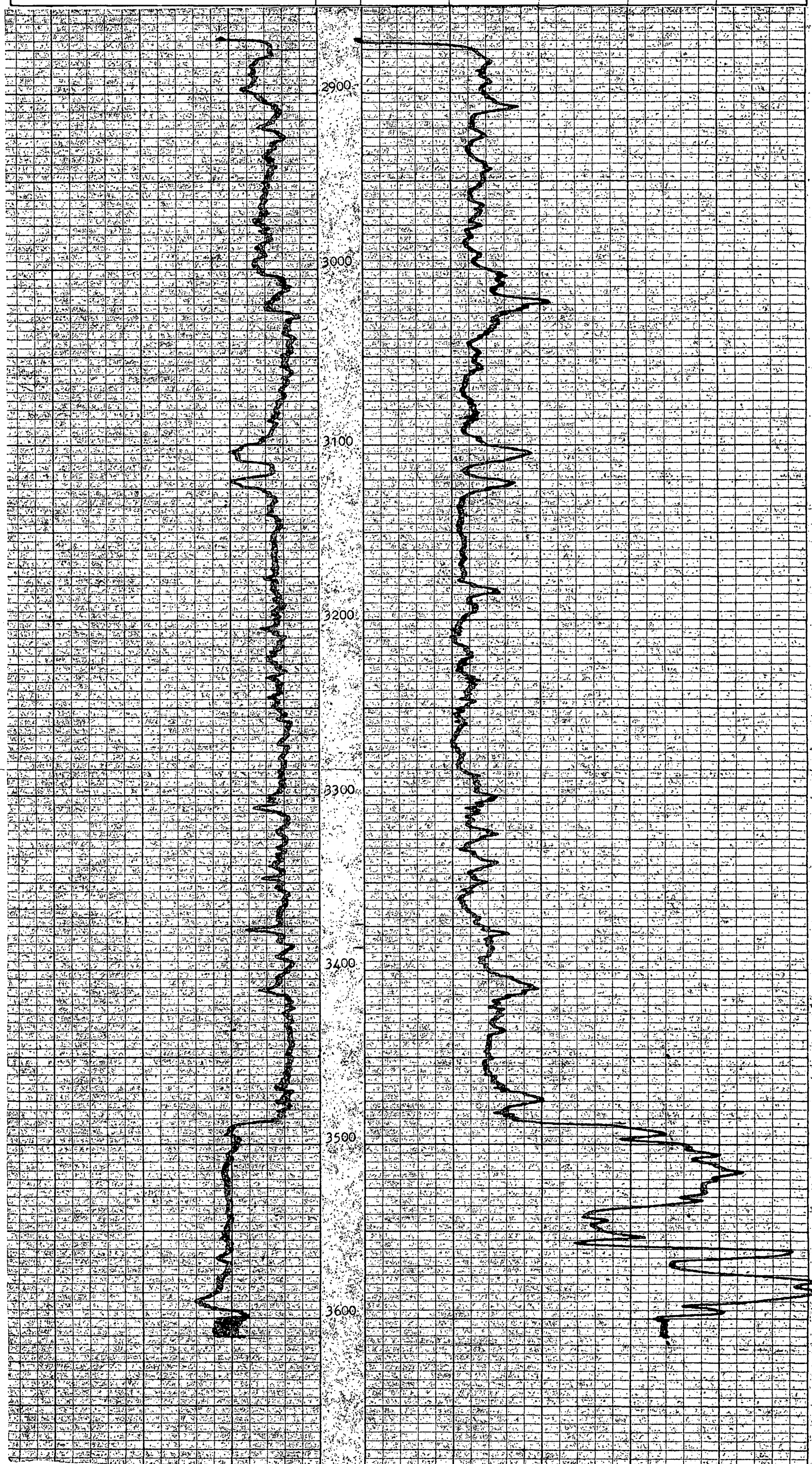
Depth

Resistivity
ohms m²/m

- 25mv +

16" NORMAL

5 10 15 20



ELECTRIC LOG

WELL : S.A. GOV. PORTVILLE No. 3.

COMPANY : S.A. MINES DEPARTMENT

LOCATION : Lat. 29° 07' 33" S.
Long. 140° 53' 57" E.

ELEVATION : DF R.T. 331 Ft.
KB
or GL

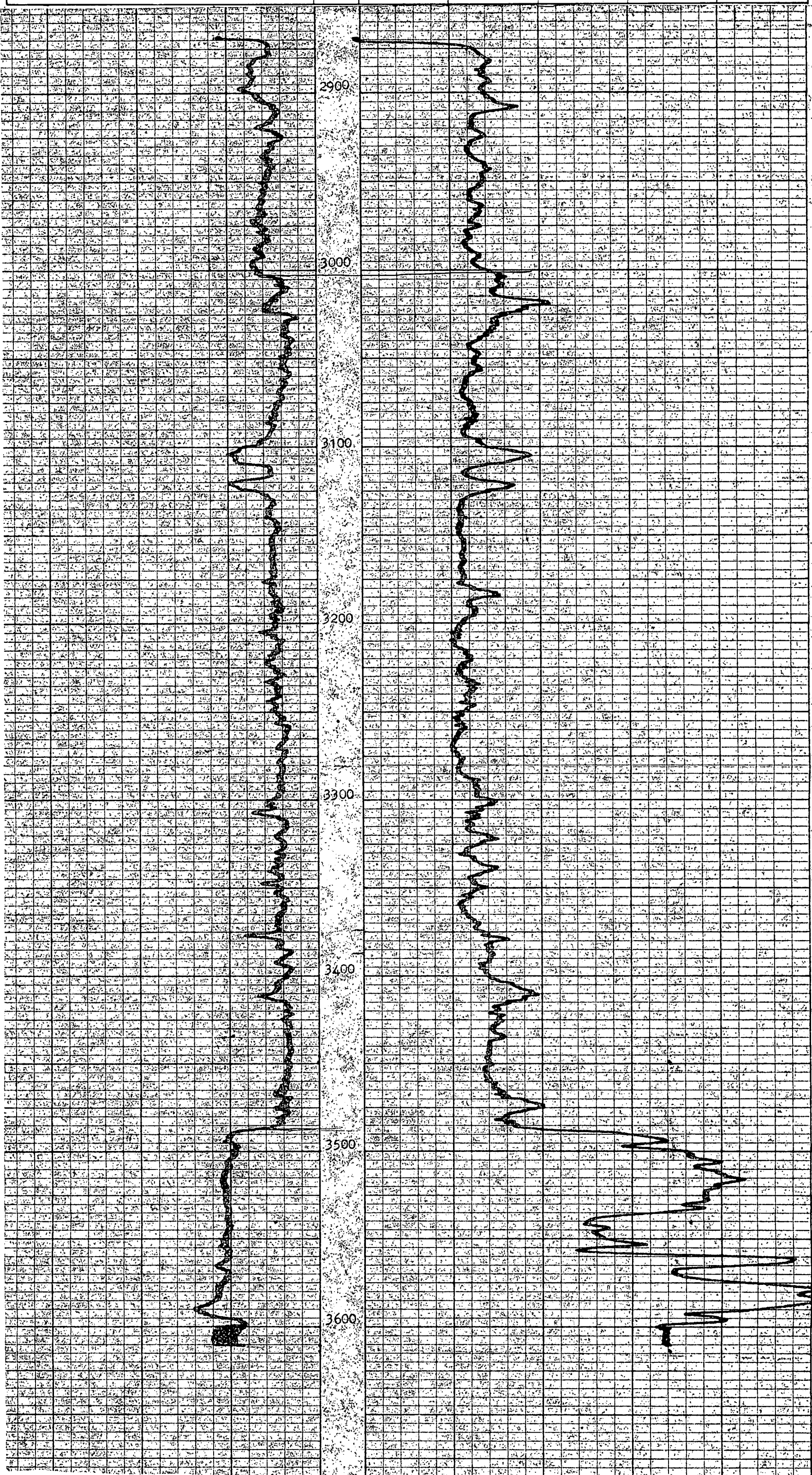
DEPTH DATUM : RT

UNIT : FAILING LOGMASTER
CORRELATION UNIT

RUN No. 1.
DATE 16 - 5 - 64
FOOTAGE LOGGED : 731
LOGGED FROM 3601
LOGGED TO 2870
CSG. LOGGER 2870
CSG. DRILLER 2873
BOTTOM LOGGER : 3601
BOTTOM DRILLER : 3620
BIT SIZE 4 1/2 inch
MUD RESISTIVITY : 1.41 ohm/m @ 84 °F
@ °F

MUD TYPE : CAUSTIC - MYRTAN
RECORDED BY : J.E. PURBURY
WITNESS : H. WOFFNER

Spontaneous Potential millivolts	Depth	Resistivity ohms m ² /m
← 25mv →		16" NORMAL 5 10 15 20



MINES ADMINISTRATION PTY. LTD.
GAMMA RAY LOG

WELL : S.A.GOV. PORTVILLE No. 3.
COMPANY : S.A. MINES DEPARTMENT
LOCATION : Lat. 29° 07' 33" S.
Long. 140° 53' 57" E.
ELEVATION : DF R.T. 331 Ft.
KB
or GL
DEPTH DATUM : RT
UNIT : FAILING LOGMASTER
CORRELATION UNIT

RUN No. 1.
DATE 16 - 5 - 64
FOOTAGE LOGGED : 3588
LOGGED FROM 3620
LOGGED TO 32
CSG. LOGGER 2870
CSG. DRILLER 2873
BOTTOM LOGGER 3620
BIT SIZE 4 1/2"
MUD RESISTIVITY : 1.4 ohm/m @ 84 °F
MUD TYPE CAUSTIC - MYRTAN
RECORDED BY J.E. BURBURY
WITNESS H. WOPFNER

Depth GAMMA RAY

TIME CONSTANT 1 sec
LOGGING SPEED 30' / min
RADIATION INCREASE 0.005 MR/Hour/Inch

RECENT

sd. med. grained dr. red
to yellowish red,
uncensol.

LOWER TERTIARY

sd. cgl. dr. sub. clean gr.
grains highly polished
loosely censol.

aa
sd. cgl. dr. pale gr. censol.
w. dr. rock fragm., in pyr

siltst, olivegreen to greenish
gray, soft w/ string of
very fine sand.

Intermittent
Instrument
Operation.

500' Hand-Up
3620.

MINES ADMINISTRATION PTY. LTD.

GAMMA RAY LOG

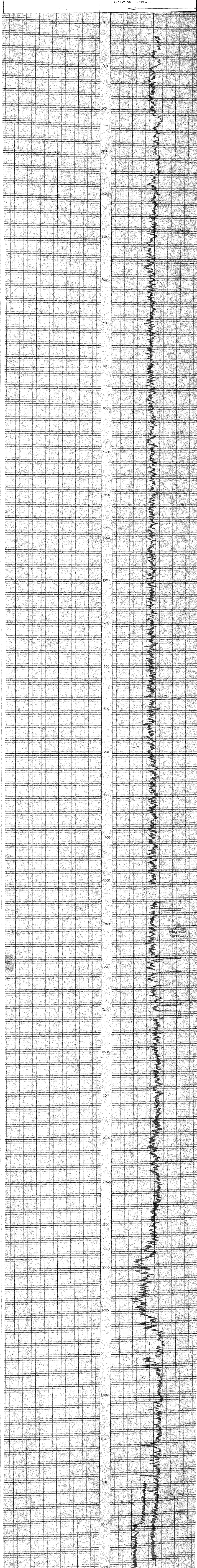
WELL : S.A.GOV. FORTVILLE No. 3.
 COMPANY : S.A. MINES DEPARTMENT
 LOCATION : Lat. 29° 07' 33" S.
 Long. 140° 53' 57" E.
 ELEVATION : OF R.T. 331 Ft.
 KB
 or GL
 DEPTH DATUM : RT
 UNIT : FAILING LOGMASTER
 CORRELATION UNIT

RUN No. 1.
 DATE 16 - 5 - 64
 FOOTAGE LOGGED : 3588
 LOGGED FROM 3620
 LOGGED TO 32
 CSG. LOGGER 2870
 CSG. DRILLER 2873
 BOTTOM LOGGER 3620
 BOTTOM DRILLER 3620
 BIT SIZE 4"
 MUD RESISTIVITY 1.41 ohm/m @ 84 °F
 MUD TYPE CAUSTIC - MYRTAN
 RECORDED BY J.E. BURBURI
 WITNESS H. WOPFNER

Depth

GAMMA RAY

TIME CONSTANT 1 sec
 LOGGING SPEED 30' / min.
 RADIATION INCREASE 0.005 MR/Hour/Inch





THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES



CONYNGHAM STREET · PARKSIDE · SOUTH AUSTRALIA
TELEPHONE 79 1662 · TELEGRAMS 'AMDEL' ADELAIDE

Please quote this reference in your reply:

AN 1/2/0

23rd July, 1964

The Director,
Department of Mines,
Rundle Street,
ADELAIDE.

W177/64

REPORT AN1099-64-WATER ANALYSIS

	PARTS PER MILLION	GRAINS PER GALLON	ASSUMED COMPOSITION OF SALTS	PARTS PER MILLION	GRAINS PER GALLON
Chloride, Cl	299		Calcium carbonate	25	
Sulphate, SO ₄	N11		Calcium sulphate	-	
Carbonate, CO ₃	631		Calcium chloride	-	
Nitrate, NO ₃	N11		Magnesium carbonate	10	
Sodium, Na	661		Magnesium sulphate	-	
Potassium, K	-		Magnesium chloride	-	
Calcium, Ca	10		Sodium carbonate	1076	
Magnesium, Mg	3		Sodium sulphate	N11	
Silica, SiO ₂	-		Sodium chloride	493	-
			Sodium nitrate	N11	
			Potassium chloride	-	
Total soluble matter	1604				
Suspended matter					
Organic matter					
HARDNESS (as Calcium Carbonate)					
Total				37	
Temporary				37	
Permanent				-	
Due to calcium				25	
Due to magnesium				12	
Name					
Address					
	Linden Station,				
	Fortville, 8 miles S.W. of				
	Hundred Three State Corner				
Section					
Sample collected by					
Bore No.	3				
Water Out					
Water Level					
Supply					
Depth Bore					
Date Collected					

L. Wallace Coffer
Director.

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

CONYNGHAM STREET · PARKSIDE · SOUTH AUSTRALIA
TELEPHONE 79 1662 · TELEGRAMS 'AMDEL' ADELAIDE

Please quote this reference in your reply:

AN 1/2/0

23rd July, 1964

The Director,
Department of Mines,
Rundle Street,
ADELAIDE.

W177/64

REPORT AN1099-64-WATER ANALYSIS

	PARTS PER MILLION	GRAINS PER GALLON	ASSUMED COMPOSITION OF SALTS	PARTS PER MILLION	GRAINS PER GALLON															
Chloride, Cl	299		Calcium carbonate	25																
Sulphate, SO ₄	N11		Calcium sulphate	-																
Carbonate, CO ₃	631		Calcium chloride	-																
Nitrate, NO ₃	N11		Magnesium carbonate	10																
Sodium, Na	661		Magnesium sulphate	-																
Potassium, K	-		Magnesium chloride	-																
Calcium, Ca	10		Sodium carbonate	1076																
Magnesium, Mg	3		Sodium sulphate	N11																
Silica, SiO ₂	-		Sodium chloride	493																
			Sodium nitrate	N11																
			Potassium chloride	-																
Total saline matter	1604																			
Suspended matter																				
Organic matter																				
Name Address <u>Linden Station,</u> <u>Fortville, 8 miles S.W. of</u> <u>Three State Corner</u> Section <u>-</u> Sample collected by Bore No. <u>3</u> Water Out Water Level Supply Depth Bore Date Collected HARDNESS (as Calcium Carbonate) <table border="1"> <tbody> <tr> <td>Total</td> <td>37</td> <td></td> </tr> <tr> <td>Temporary</td> <td>37</td> <td></td> </tr> <tr> <td>Permanent</td> <td>-</td> <td></td> </tr> <tr> <td>Due to calcium</td> <td>25</td> <td></td> </tr> <tr> <td>Due to magnesium</td> <td>12</td> <td></td> </tr> </tbody> </table>						Total	37		Temporary	37		Permanent	-		Due to calcium	25		Due to magnesium	12	
Total	37																			
Temporary	37																			
Permanent	-																			
Due to calcium	25																			
Due to magnesium	12																			
L. Wallace Coffey Director.																				

ELECTRIC LOG

WELL : S.A. GOV. FORTVILLE No. 3

RUN No. : 1.

COMPANY : S.A. MINES DEPARTMENT

DATE : 16 - 5 - 64.

LOCATION : Lat. 29° 07' 33" S.
Long. 140° 53' 57" E.

FOOTAGE LOGGED : 731

LOGGED FROM : 3601

LOGGED TO : 2870

CSG. LOGGER : 2870

CSG. DRILLER : 2873

BOTTOM LOGGER : 3601

BOTTOM DRILLER : 3620

ELEVATION : DF R.T. 331 Ft.

KB

or GL

BIT SIZE : 4½ inch

MUD RESISTIVITY : 1.41 ohm-in. @ 84 °F

MUD TYPE : CAUSTIC - MYRTAN

DEPTH DATUM : RT

RECORDED BY : J.E. RURBURY

UNIT : FAILING LOGMASTER
CORRELATION UNIT

WITNESS : H. WOPFNER

Spontaneous Potential
millivolts

Depth

Resistivity
ohms m²/m

- ← → +

63" NORMAL

5

10

15

20

3000

3100

3200

3300

3400

3500

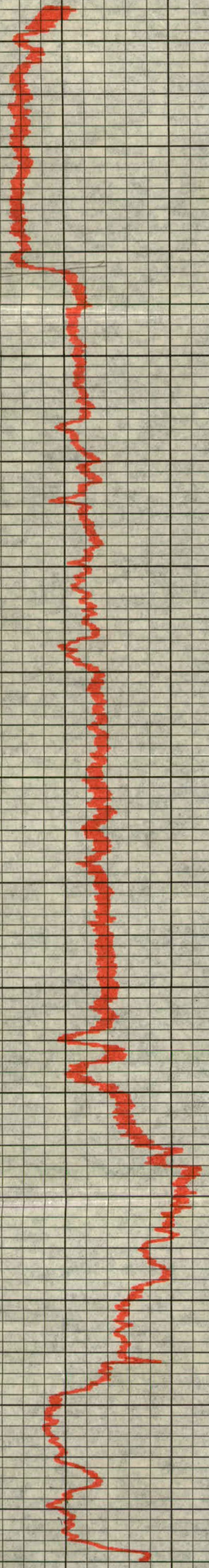
3600

2873

PRINTED IN U.S.A.

PRINTED IN U.S.A.

PRINTED IN U.S.A.



25 m/°

SP

3600

3490

3400

C#2

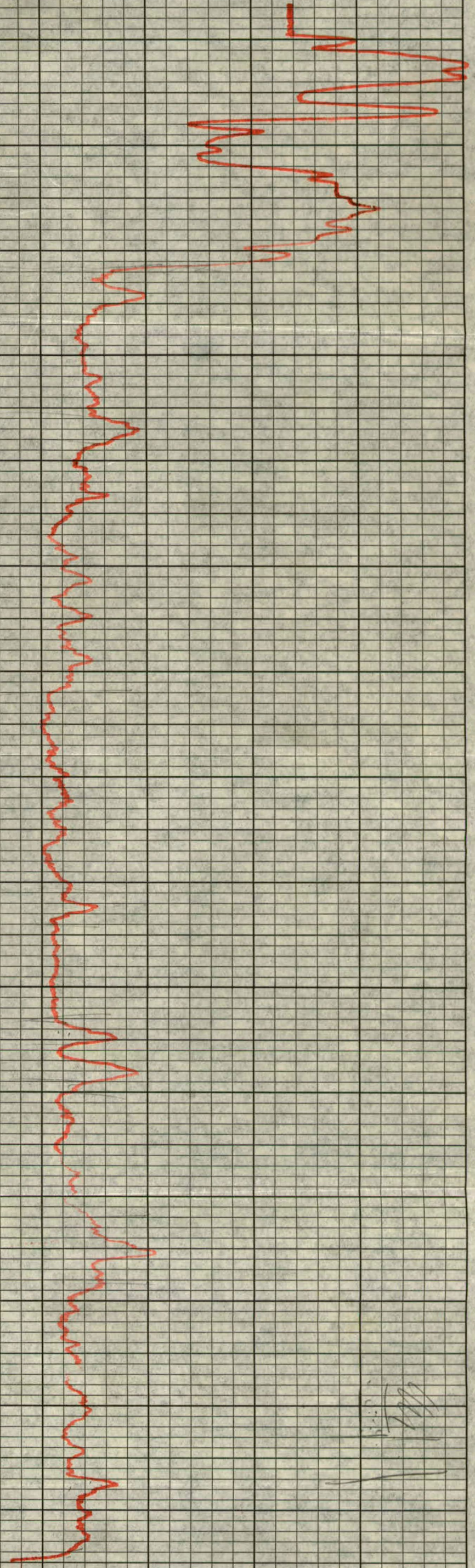
3300

3200

3100

3000

2850



50/°

Subnormal

ELECTRIC LOG

WELL COAL, FUG-VI-1, No. 1

COMPANY S.A. MINES DEPARTMENT

LOCATION Lat. 29° 07' 33" S.
Long. 120° 53' 57" E.ELEVATION DF. P.T. 331 Ft.
KB
of GL

DEPTH DATUM RT.

UNIT FAILING LOGMASTER
CORRELATION UNIT

RUN No.

DATE 16 - 5 - 64

FOOTAGE LOGGED 731'

LOGGED FROM 3601

LOGGED TO 2870

CSG. LOGGER 2870

CSG. DRILLER 2873

BOTTOM LOGGER 3601

BOTTOM DRILLER 3600

BIT SIZE 4 1/2 in. h

MUD RESISTIVITY 1.61 ohm-ft @ 84 °F

MUD TYPE

CAUSTIC - MHTEN

RECORDED BY

J. S. BURRBY

WITNESS

H. WOFFER

Spontaneous Potential
millivolts

Depth

Resistivity
ohms. m²/m