COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Petroleum Search Subsidy Acts

PUBLICATION No. 81

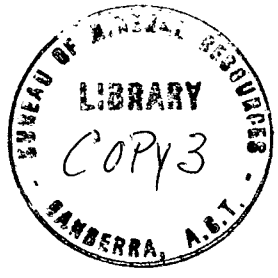
SUMMARY OF DATA AND RESULTS

PERTH BASIN, WESTERN AUSTRALIA

Sue No. 1 Well

OF

WEST AUSTRALIAN PETROLEUM PTY LIMITED



Issued under the Authority of the Hon. David Fairbairn,
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1967

13552/66.—L

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

MINISTER: THE HON. DAVID FAIRBAIRN, D.F.C., M.P.

SECRETARY: R. W. BOSWELL

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

DIRECTOR: J. M. RAYNER

THIS REPORT WAS PREPARED FOR PUBLICATION IN THE PETROLEUM EXPLORATION BRANCH

ASSISTANT DIRECTOR: M. A. CONDON

Published by the Bureau of Mineral Resources, Geology and Geophysics

Canberra A.C.T.

FOREWORD

Under the Petroleum Search Subsidy Act 1959-1964, agreements relating to subsidized operations provide that the information obtained may be published by the Commonwealth Government six months after the completion of field work.

The growth of the exploration effort has greatly increased the number of subsidized projects and this increase has led to delays in publishing the results of operations.

The detailed results of subsidized operations may be examined at the office of the Bureau of Mineral Resources in Canberra (after the agreed period), and copies of the reports may be purchased.

In order to make the main results of operations available early, short summaries are being prepared for publication. These will be grouped by area and date of completion as far as practicable. Drilling projects and geophysical projects will be grouped separately. In due course, full reports will be published concerning those operations which have produced the more important new data.

This Publication contains a summary of data and results of the drilling operation undertaken at Sue No. 1 in the Perth Basin, Western Australia. The information has been abstracted by the Petroleum Exploration Branch of the Bureau of Mineral Resources from the well completion report furnished by West Australian Petroleum Pty Limited.

J. M. RAYNER
Director

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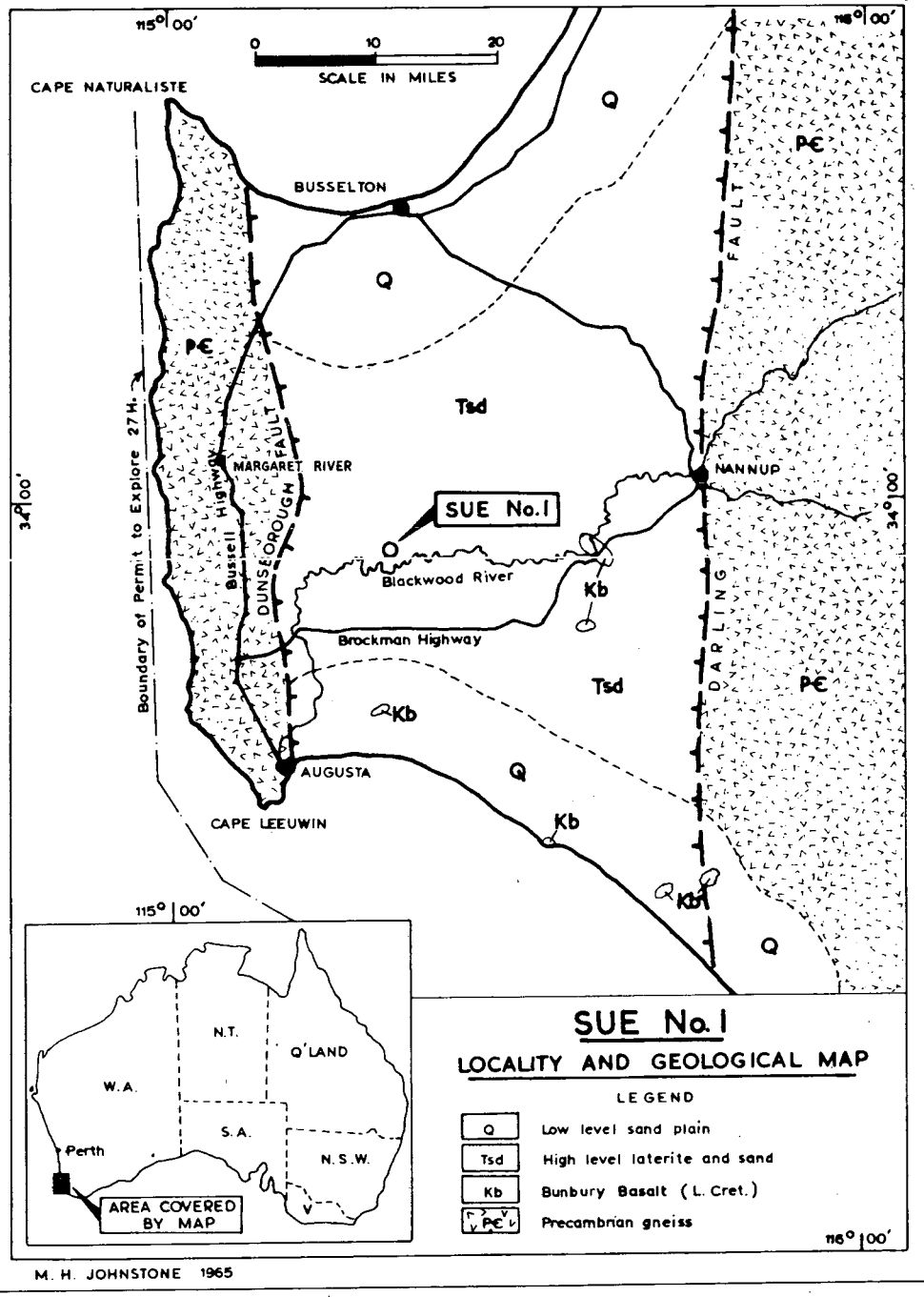

M. H. JOHNSTONE 1965

SUE NO. 1

SUMMARY OF DATA AND RESULTS*

SUMMARY

Sue No. 1 Well was located in the southern Perth Basin, Western Australia, about 150 miles south-south-west of Perth and sixteen miles east of the town of Margaret River. The well was drilled by Oil Drilling and Exploration Limited for West Australian Petroleum Pty Limited, to total depth of 10,097 feet. Drilling commenced on 31st January, 1966 and was completed on 5th March, 1966. A full programme of coring and logging was undertaken; no drillstem testing was conducted.

The well penetrated sediments equated to the Lower Cretaceous - Upper Jurassic Yarragadee Formation from surface to 3730 feet, and then entered Permian sandstones. Formation affinities have not yet been definitely established, but these sediments may be correlatable with parts of the Permian section in the Collie Basin, an outlier in the Precambrian Shield to the north-east.

The Permian rocks, 6291 feet thick in Sue No. 1, are salt-water bearing (average 20,000 ppm. NaCl). Small gas shows of methane were associated with carbonaceous sections. An igneous intrusive body, 22 feet thick, of dolerite was intersected at 9390 feet. A small gas show of methane and ethane was recorded immediately below these rocks, and traces of fluorescence were noted in the underlying sandstones. However, the rocks in which these shows occurred were tight and impermeable.

A thin, basal conglomerate was intersected before drilling into Precambrian basement at 10,021 feet. The well reached total depth at 10,097 feet in these metamorphic rocks.

Sue No. 1 was drilled near the crest of an anticline, located by seismic surveys carried out in 1964-1965. The well was programmed to test the stratigraphy and hydrocarbon-bearing potential of the Mesozoic and Palaeozoic sediments in this little-known area, near the western margin of the southern Perth Basin, in a graben bounded by major faults to the west and east. Only minor shows of gas were recorded while drilling Sue No. 1, and the well was plugged and abandoned.

The stratigraphic drilling operation at Sue No. 1 was subsidized under the Petroleum Search Subsidy Act 1959-1964, from surface to total depth.

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* Abstracted from: Well Completion Report, Sue No. 1, by C.T. Williams and J. Nicholls, West Australian Petroleum Pty Limited, March, 1966.

WELL HISTORY

General Data

Well name and number:	Sue No. 1
Location:	Latitude 34°03'57"S. Longitude 115°19'04"E.
Name and address of Tenement Holder:	West Australian Petroleum Pty Limited, 251 Adelaide Terrace, Perth, Western Australia
Details of Petroleum Tenement:	Permit to Explore 27H, Licence to Prospect 152H
Total Depth:	10,086 feet (driller) 10,097 feet (Schlumberger)
Date drilling commenced:	31st January, 1966
Date drilling completed:	5th March, 1966
Date rig released:	8th March, 1966
Elevation (ground):	269 feet
Elevation (R.T.):	282 feet (datum for depths)
Status:	Plugged and abandoned
Cost:	$226,170

Drilling Data

Drilling Plant:

Make:	Ideco
Type:	Super 7-11

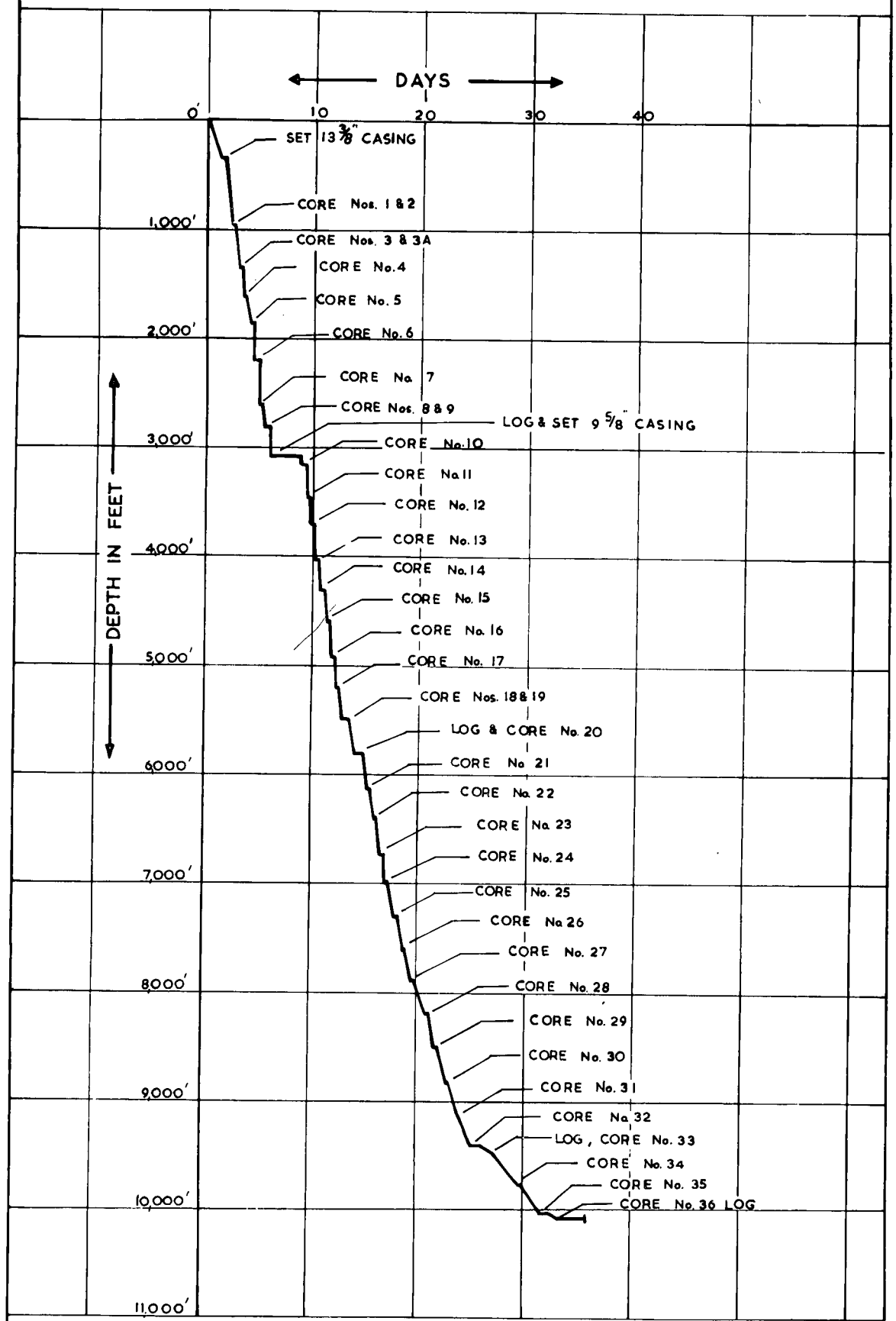
Hole sizes and depths:

17 1/2 in.	to	356 ft
12 1/4 in.	to	3062 ft
8 3/4 in.	to	10097 ft (T.D.)

Casing details:

Size (in.):	13 3/8	9 5/8
Weight (lb./ft):	48	36 & 40
Grade:	H.40	J.55
Setting depth (ft):	337	3061

Fig.2



REVISIONS	WEST AUSTRALIAN PETROLEUM PTY. LTD.
	SOUTH PERTH BASIN
	SUE No.1
	DEPTH V DRILLING TIME
	J. D. LENAGAN — 17 JUNE 1966
DR. BY	DATE: 17:6:1966 — SCALE:
TR. BY	
CH. BY	

Logging and Testing

Ditch Cuttings:

Interval:	Ten feet from surface to total depth, and five feet when coring.
Coring:	Thirty-six cores were cut using 7 7/8 in. hard formation, soft formation, and diamond cutter heads. A total of 440 feet was cored and 200.7 feet (45.5%) recovered.
Sidewall Cores:	Forty-one sidewall samples were taken.
Electric and other logging (Schlumberger):	
Induction-Electrical Log:	342-10096 feet (5 runs)
Microlog-Caliper:	342-10096 feet (4 runs)
Sonic-Gamma Ray Log:	22-10087 feet (4 runs)
Continuous Dipmeter:	342-10091 feet (2 runs)
Velocity Survey:	A velocity survey was carried out at total depth; eight shots were fired at four different depths.
Drilling Rate and Gas Log:	Continuous drilling rate and mud-gas detector logs were recorded during drilling.
Formation Testing:	No drillstem testing was conducted.
Deviation Sarvey:	Twenty-five readings were taken with a Totco drift indicator during drilling between 350 and 9970 feet. Maximum hole deviation of 4^{o} was recorded at 7564 feet. The final reading at 9730 feet was 1^{o}.

GEOLOGY

Summary of Previous Work

Geological:

The area of the southern Perth Basin contains very little outcrop, as is typical of the main part of the Basin. Information available has been collected and published by the following workers: Saint-Smith (1912), Teichert (1947), Fairbridge (1953), McWhae et al (1958), and Lowry (1965). Only limited knowledge of the stratigraphy has been gained and this is confined mainly to surface exposures, and a few shallow bore holes.

Geophysical:

A regional gravity survey was carried out by the Bureau of Mineral Resources in 1953 and 1954 (Thyer and Everingham, 1956). Seismic work was carried out by the Bureau during 1955 and 1956 (Lodwick, 1962). In 1957, the Bureau carried out an aeromagnetic survey of the area (BMR, 1960, and Quilty, 1963). United Geophysical Corporation carried out a reconnaissance gravity survey early in 1963 (Augusta-Moora Gravity). A large gravity minimum was recorded to the west of the Darling Fault and has been interpreted as the Bunbury Trough (Thyer and Everingham, 1956). Among the gravity maxima of interest are the Alexandra Bridge and Sue structures.

A reconnaissance seismic survey from south of Busselton to the south coast was carried out by United Geophysical Corporation in 1964 (Darradup Seismograph Survey). The survey indicated the presence of a series of major faults striking north-south associated with two anomalous features: the Sue and the Alexandra Bridge structures. The Blackwood Seismograph Survey was undertaken by United Geophysical Corporation, and Goophysical Service International, for West Australian Petroleum Pty Limited, as a follow-up to leads found in the previous seismic survey, and to outline a structure to enable a drilling site in the area to be selected.

Drilling:

The published data on the stratigraphy in this area have been derived from study of the sparse outcrops and scattered, shallow bore holes. A list of bores in the southern Perth Basin is given in Table 1 of Lowry's (1965) report on this area. In summary, the bores listed penetrated Upper Jurassic and Lower Cretaceous sediments, the latter being marine in their upper parts. A lithological and palynological study of samples from seismic shotholes was carried out, but indicated only continental sediments of Lower Cretaceous age. A deeper stratigraphic test, Alexandra Bridge No. 1 (Jones, 1965) was drilled by West Australian Petroleum Pty Limited in this area. It penetrated 1339 feet of Lower Cretaceous sandstones and then 1174 feet of Upper Permian sandstones, shales, and siltstones with interbedded coal seams.

The nearest deep test is Pinjarra No. 1 Well. This well is located about 100 miles north of the Sue location and, at shallow depth, encountered the Lower Cretaceous Yarragadee Formation Equivalent. Beneath a shallow (489 feet) major unconformity which can probably be identified with the Permian (Neocomian) unconformity in Sue No. 1, the Pinjarra No. 1 Well drilled a thick section of Lower Jurassic to Upper Triassic (Cockleshell Gully Formation and Lesueur Sandstone) to its total depth of 15,001 feet (West Australian Petroleum Pty Limited, 1966).

Regional Geology

From data mentioned in the above reports, interpretations indicate that the southern Perth Basin is a large graben which, in the area under discussion, is bounded on the west by the Precambrian Leeuwin Gneiss complex, and to the east by the Precambrian Shield. The tectonic history of the area was controlled mainly by two major structures - the Dunsborough and Darling Faults. Movement on these faults is reflected in the sedimentary history. Geophysical data indicate upward of 20,000 feet of section in the eastern margins of this basin. Lava flows of tholeiitic basalt are found interbedded with sediments of Lower Cretaceous age in this part of the basin. These were probably extruded during one of the last major movements along the

Darling Fault in this area. An intrusive dolerite sill was also found in Permian rocks intersected in the Sue No. 1 Well. This may prove to be genetically related to the tholeiitic basalts.

Stratigraphy

General:

Formations penetrated in Sue No. 1 are tabulated in the following Table. Palynological, lithological, and electric log data were used to delineate formation boundaries. Results of palynological studies by B.E. Balme are included in Appendix 1 to the well completion report.

Sue No. 1 Well spudded in Lower Cretaceous - Upper Jurassic Yarragadee Formation Equivalent, and penetrated a completely unknown Permian sequence of sediments before reaching total depth at 10,097 feet in crystalline basement rocks.

Age	Formation	Depth Intervals (feet)	Thickness (feet)
Lower Cretaceous - Upper Jurassic	Yarragadee Formation Equivalent	13- 3730	3717+
---------- UNCONFORMITY ----------			
Permian (Upper Permian, Artinskian, and Sakmarian)	Undifferentiated	3730-10021	6291
---------- UNCONFORMITY ----------			
Precambrian	Metamorphics	10021-10097 (T.D.)	76+

Detailed:

Yarragadee Formation Equivalent (Lower Cretaceous to Upper Jurassic): 13 to 3730 feet (3717 feet+)

Because of the lack of age data, this section is provisionally correlated with the Yarragadee Formation (as identified palynologically in nearby deep seismic shot holes) on lithological grounds only. It consists largely of sandstone, apparently lateritized near the surface. Down to 470 feet, the sandstone is white to yellow, medium to very coarse-grained, angular to subrounded, with abundant feldspar and muscovite. From 470 to 550 feet, the sandstone is argillaceous and silty, with coal, carbonized wood, wood, and pyritic sandstone fragments in the cuttings. Below 550 feet, the sequence is one of massive to coarse and fine-grained, current-bedded sandstone. The sandstone is yellow to yellow-brown, less commonly white, feldspathic, micaceous, in part pyritic, calcareous, and sideritic. It ranges from a clean, friable sandstone to a very clayey and soft rock.

Permian (Undifferentiated): 3730 to 10,021 feet (6291 feet)

This sequence is unconformable beneath the Yarragadee Formation Equivalent. The major part of the sequence consists of interbedded and interlaminated sandstone and siltstone, with scattered thin coal seams, although the top 300 feet consists of bottle-green, micaceous and glauconitic sandstone. The sandstone is fine to granular or pebbly, poorly

to well sorted, generally subrounded, pale grey to white or green, kaolinitic, with micas, garnet, feldspar, glauconite, and carbonaceous matter as major accessories, and pyrite, dark minerals, and graphite, as minor ones. Current bedding is common and some evidence of slumping was noted. The siltstone is dark grey-brown to black, generally argillaceous and soft but in part firmer, more micaceous, and shaly, and in part grading to shale. Pyrite, marcasite, and garnet are present. The coal is generally interbanded, dark brown to black, crumbly, argillaceous material and thin bands of a resinous to vitreous, brittle subbituminous coal.

Plant macrofossils Glossopteris and Vertebraria are common in the carbonaceous sediments and in some sandstones. Gas was recorded in association with some coal beds. Chromatograph analysis revealed only the presence of the methane fraction. A dull greenish fluorescence could be obtained by soaking the coal in acetone.

Between 9390 and 9412 feet, an intrusive basic igneous rock was encountered. This rock has been classified as a dolerite but the nature of the body is not known although it is thought that it may be a sill which selectively replaces a coal seam. A minor gas show was recorded immediately below the dolerite. Core No. 33 was cut in sandstone below the dolerite, and showed minor spotty fluorescence. However the rock was tight and impermeable.

Sandstone, siltstone, and minor coal continued below the intrusive rocks to 10,018 feet. Core No. 35, from 10,018 to 10,028 feet, cored out of sandstone into a thin basal conglomerate. The latter contained pebbles and boulders of granulite, mainly set in a greenish, coarse-grained sandstone matrix, and rested with a normal sedimentary contact on the crystalline basement.

The Permian section is a thick (6291 feet) sequence of continental sediments. The sandstones are salt-water saturated; salinities increase with depth, ranging from 300 ppm. to 45,000 ppm. NaCl. The age of this section has been shown to include Upper Permian, Artinskian, and Sakmarian; that is, it contains the age equivalents of the Permian section of the northern Perth Basin. However, the latter contains marine formations that record major transgressions of the sea which were not effective in the area of the Sue No. 1 Well.

This fundamental difference, in the history of depositional environments, between the southern and northern sections of the Perth Basin precludes direct formational correlations. Until further information is available this section will be regarded as 'undifferentiated Permian'.

Precambrian: 10,021 to 10,097 feet (76 feet+)

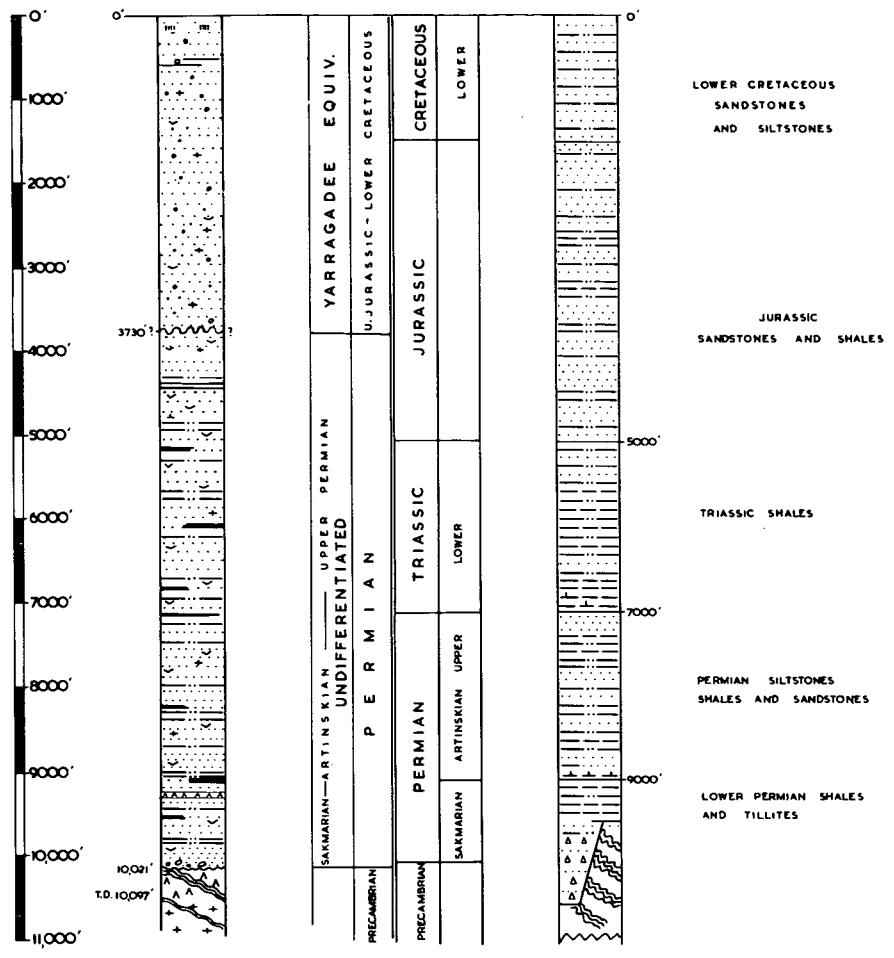
The Precambrian basement consists of granulite, and gneissic, medium to coarse-grained, biotite granite.

Structure

Cores from Sue No. 1 showed quite variable dip values throughout both the Yarragadee Formation Equivalent and the Permian sequence. This is due to the current-bedded nature of the lithologies, which can be coarse to micro-crossbedded. One core at least showed evidence of folding due to soft-sediment movement. Most cores indicated some very flat dips,

Fig.3

SUE No1 WELL
ACTUAL & PREDICTED SECTION



LITHOLOGICAL SYMBOLS

- SANDSTONE
- SILTSTONE
- SHALE
- TILLITE
- COAL
- CONGLOMERATE
- BASIC IGNEOUS
- METAMORPHICS

REVISIONS	WEST AUSTRALIAN PETROLEUM PTY LTD
	PERTH BASIN
	SUE No1 WELL
	ACTUAL & PREDICTED SECTION
DRN BY	C.T. WILLIAMS
DATE	14 APR. 66
TR BY	DATE 14 APR 66
CH BY	SCALE

especially cores containing thinly bedded lithologies. These dips can be considered more regionally representative, which would be expected since the well was drilled on the crest of an anticline.

The continuous dipmeter plot also indicated very low regional dips (0^{o} to 2^{o}) with a dominant azimuth of 315^{o} through the Permian. The poorly consolidated and massive Jurassic-Cretaceous sandstones have much more variable dips and azimuths, and no recognisable trend is apparent.

Oil and Gas Indications and Potential

Only minor shows of gas were recorded while drilling Sue No. 1 and, with only one exception, all showed the presence of methane alone. The methane originated from within the carbonaceous sections penetrated.

One show also recorded the presence of ethane in association with methane and minor gold-coloured fluorescence. This show occurred immediately below the igneous intrusive body. While these rocks may be considered to be excellent cap rocks, the sandstones underlying them showed low porosities and were impermeable, thus causing the show to be less prospective.

The lack of marine sediments and the wide-spread occurrence of coal through the thick Permian sequence could make the likelihood of source rocks, within this part of the Perth Basin, remote. However, the Permian contains some sandstones with good reservoir characteristics. If, in some other part of this basin, these rocks can be shown to be continguous with sediments of marine origin, either due to facies change or faulting, the possibility of hydrocarbon accumulation in Permian rocks may not seem too remote.

The younger sediments penetrated in Sue No. 1 are poorly consolidated, continental deposits, but have excellent porosity and permeability.

Porosity and Permeability of Sediments Penetrated

These data, measured on cores by Exploration Logging, are tabulated in Appendix 2 to the well completion report. As mentioned above, Cretaceous-Jurassic rocks show excellent reservoir characteristics, while the Permian sandstones are more variable and range from very poor to very good reservoir rocks.

Contribution to Geological Concepts resulting from Drilling

(i) The Upper Permian to Artinskian section in Sue No. 1 is exceptionally thick (6291 feet) when compared with sediments of this age in the northern Perth Basin. The total thickness of Permian sediments in the northern Perth Basin is thought to be about 7000 feet (Playford and Wilmott, 1958), and the Sakmarian formations (thin in Sue No. 1) make up more than 4000 feet of this thickness.

(ii) The shallow, angular unconformity at the base of the Neocomian in the vicinity of Pinjarra No. 1 (West Australian Petroleum Pty Limited, 1966) was not recorded in Sue No. 1, which drilled Lower Cretaceous - Upper Jurassic sandstones before encountering the Permian section.

(iii) The absence of Lower Jurassic and Triassic sediments in Sue No. 1 marks the presence of a major post-Permian unconformity.

(iv) The Permian in Sue No. 1 includes all ages recorded in the northern Perth Basin. The complete section is of continental sediments; no marine incursions were recorded. Time-equivalent correlations with the formations in the northern Perth Basin only are possible.

(v) There was some post-Permian igneous activity, causing the injection of doleritic intrusive bodies into the Permian strata.

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WEST AUSTRALIAN PETROLEUM PTY LIMITED,	1964:	Darradup seismograph survey. P.S.S.A. unpublished report.
WEST AUSTRALIAN PETROLEUM PTY LIMITED,	1965:	Blackwood seismograph survey, Perth Basin. P.S.S.A. unpublished report.
WEST AUSTRALIAN PETROLEUM PTY LIMITED,	1966:	Pinjarra No. 1 Well Completion Report. P.S.S.A. unpublished report.

ADDITIONAL DATA FILED IN THE BUREAU OF MINERAL RESOURCES

The following additional data relating to Sue No. 1 Well, have been filed in the Bureau of Mineral Resources, Canberra, and are available for reference:

(i) Well Completion Report, by C.T. Williams and J. Nicholls — 13 pp.

Appendix 1: Palynological Report, by B.E. Balme — 8 pp.

Appendix 2: Core Analyses and S.G. Data — 5 pp.

Appendix 3: List of Schlumberger Logs — 1 p.

Appendix 4: Deviation Survey Records — 1 p.

Appendix 5: Petrological Reports, by J.E. Glover — 14 pp.

Appendix 6: Velocity Survey Report, by D.D. Taylor — 2 pp.

Appendix 7: Log Analysis Report, by S.P. Willmott — 1 p.

(ii) Daily drilling reports for the period 25th January, 1966 to 18th March, 1966.

(iii) Schlumberger well logs including the following:

(a) Induction-Electrical log

Run 1, 342 - 3068 feet (scale 1", 2", 5" : 100 ft)
Run 2, 3056 - 5811 feet (scale 2", 5" : 100 ft)
Run 3, 5700 - 9440 feet (scale 1", 2", 5" : 100 ft)
Run 4, 8487 - 9487 feet (scale 2", 5" : 100 ft)
Run 5, 9387 - 10096 feet (scale 1", 2", 5" : 100 ft)

(b) Microlog-Caliper

Run 1, 342 - 3054 feet (scale 2", 5" : 100 ft)
Run 2, 3056 - 5803 feet (scale 2", 5" : 100 ft)
Run 3, 5700 - 9439 feet (scale 2", 5" : 100 ft)
Run 4, 9339 - 10096 feet (scale 2", 5" : 100 ft)

(c) Sonic-Gamma Ray Log

Run 1, 22 - 3056 feet (scale 2", 5" : 100 ft)
Run 2, 3056 - 5799 feet (scale 2", 5" : 100 ft)
Run 3, 5700 - 9476 feet (scale 2", 5" : 100 ft)
Run 4, 9376 - 10087 feet (scale 2", 5" : 100 ft)

(d) Continuous Dipmeter

Run 1, 342 - 3065 feet (scale 2", 5" : 100 ft)
(with data sheets)
Run 2, 3056 - 10091 feet (scale 2", 5" : 100 ft)
(with data sheets)

PLATE 1
SHEET 1

COMPOSITE WELL LOG

WEST AUSTRALIAN PETROLEUM PTY LIMITED

SUE No1

PERMIT TO EXPLORE 27H.
LICENCE TO PROSPECT 152 H.

STATE WESTERN AUSTRALIA 4 MILE SHEET AUGUSTA BASIN: SOUTHERN PERTH WELL STATUS: PLUGGED & ABANDONED

LOCATION 34° 03′ 57″ S.: 115° 19′ 04″E.
ELEVATION GROUND LEVEL 269′
ROTARY TABLE 282′

DATE SPUDDED: 31 JANUARY 66.
DATE DRILLING STOPPED 5 MARCH 66.
TOTAL DEPTH R.T. 10,097′ (SCHLM.)

HOLE SIZE:

IN.	FROM	TO
17½	20′	356′
12¼	356′	3062′
8¾	3062′	T.D.

CASING:

SIZE:	WT	G R	DEPTH	CMT.	CMT TO
13⅜″	48	H40	337·5′	350 SAX +40	SURFACE
9⅝″ {81 JNTS / 15 JNTS}	36 / 40	J 55 / J 55	3061′	545 SAX	SURFACE

CEMENT PLUGS:

FROM	TO	TOP	SACKS
3160	2738	2738	125
3800	3500	3440	175

PERFORATIONS : NIL

INDUCTION LOG DATA

RUN NUMBER	1		2		3		4		5	
DATE	6 FEB.		14 FEB.		27 FEB.		28 FEB.		6 MARCH.	
FIRST READING	3068		5811		9440		9487		10,096	
LAST READING	342		3056		5700		8487		9387	
INTERVAL MEASURED	2726		2755		3740		1000		709	
CASING SCHLUMBERGER	342		3056		3056		3056		3056	
CASING DRILLER	337		3061		3061		3061		3061	
DEPTH REACHED	3069		5812		9441		9488		10,097	
BOTTOM DRILLER	3062		5808		9431		9478		10,086	
MUD NATURE	Fresh Water Gel.		F.W. Gel.		F.W. Gel.		F.W. Gel.		F.W. Gel.	
DENSITY lb/cu ft. / VISCOSITY	69	42 sec	67	46	70	43	70	43	71.6	64
PH / WATER LOSS cc/30 min	10	11.5	9.5	8.6	9	7.2	9	7.2	9	7.4
MUD RESISTIVITY	2·74 @ 80°F		2·83 @ 84°F		2·53 @ 88°F		2·53 @ 88°F		1.8 @ 87°F	
MUD RESISTIVITY @ BHT	2·3 @ 104°F		2·0 @ 125°F		1·50 @ 165°F		1·5 @ 165°F		0·9 @ 176°F	
Rmf. MEASURED	2·6 @ 90°F		1·53 @ 75°F		2·83 @ 78°F		2·83 @ 78°F		1·9 @ 77°F	
Rmc. MEASURED	2·4 @ 90°F		2·99 @ 75°F		2·96 @ 78°F		2·96 @ 78°F		2·0 @ 85°F	
BIT SIZE	12¼″ to 3062		8¾″ to 5808		8¾″ to 9431		7⅞″ to 9478 8¾″ " 9461		7⅞ to 10,086 8¾″ " 10,083	
MAXIMUM RECORDED TEMP	104°F		125°F		165°F		165°F		176°F	
ELECTRODE SPACING										
AM	16″		16″		16″		16″		16″	
IND	40″		40″		40″		40″		40″	
S.O.	1½″		1½″		1½″		1½″		1½″	
RECORDED BY	F.J. LASA		J. CLERET.		J. CLERET		J. CLERET.		J. CLERET.	
WITNESSED BY	C.T. WILLIAMS		C.T. WILLIAMS		M.H. BROWNHILL		M.H. BROWNHILL		C.T. WILLIAMS	
REMARKS										

RADIOMETRIC LOG DATA

TYPE OF LOG	GR–S	GR–S	GR–S	GR–S
RUN NUMBER	1	2	3	4
DATE	7. FEB. 66	14. FEB. 66	28 FEB. 66	7. MAR. 66
FIRST READING	3056 SONIC 3056 GR.	5799	9476	10,087
LAST READING	342 SONIC 22 GR.	3056	5700	9376
INTERVAL MEASURED	2714	2743	3776	711
DEPTH REACHED	3069	5811	9487	10,095
MUD NATURE	Fresh Water Gel.	F.W. Gel.	F.W. Gel.	F.W. Gel.
FLUID LEVEL	SURFACE	SURFACE	SURFACE	SURFACE
MAXIMUM RECORDED TEMP	104°F	125°F	165°F	176°F
SONDE TYPE	GNT–H	GNT–H	GNT–H	GNT–H
TIME CONSTANT Seconds	2	2	2	2
LOGGING SPEED Ft/hr.	1800	1800	1800	1800
SENSITIVITY REFERENCE	300	300	300	300

OTHER ELECTRICAL LOGS

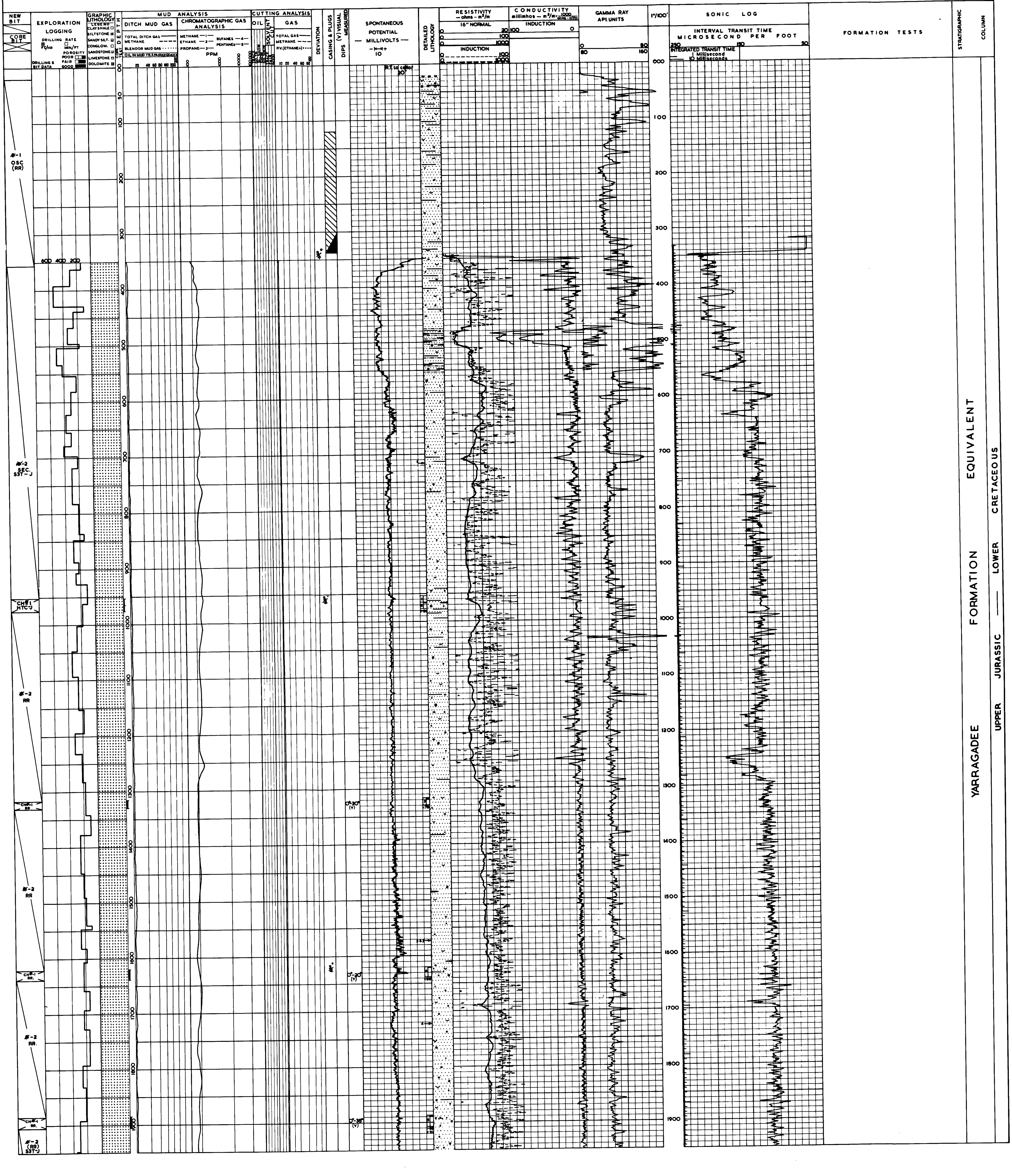
MICROLOG - CALIPER	10096 — 342	4 RUNS
CONTINUOUS DIPMETER	10091 — 342	2 RUNS

WELL HEAD FITTINGS: OCT 13⅜″x12″ Series 900 bowl 12″x12″ Series 900 Casing Spool
DRILLING BY: OIL DRILLING & EXPLORATION PTY. LTD.
DRILLING METHOD: ROTARY.

LITHOLOGIC REFERENCE & WELL SYMBOLS

- CONGLOMERATE
- CLAYSTONE
- SANDSTONE, COARSE
- SANDSTONE, FINE
- SILTSTONE
- CALCILUTITE
- SHALE
- PYRITIC
- COAL
- CARBONACEOUS MATTER
- PEBBLY
- CALCARENITE
- CALCAREOUS
- FOSSILIFEROUS
- OIL SHOW / GAS SHOW
- CORE (Recovery black) BULK DENSITY
- SIDE WALL CORE
- CASING SHOE
- GARNETIFEROUS
- DOLERITE

LITHOLOGY BY: C.T.WILLIAMS, M.H.BROWNHILL, O.J.W.BOWERING.
COMPILED BY: C.T.WILLIAMS.
LOGGED BY: EXPLORATION LOGGING OF AUSTRALIA INC.(MUD)
SCHLUMBERGER SEACO INC. (WIRELINE)



COMPOSITE WELL LOG

WEST AUSTRALIAN PETROLEUM PTY. LTD.

SUE No1

LOCATION: LAT. 34° 03' 57" S. LONG. 115° 19' 04" E.
ELEVATION: GROUND LEVEL – 269' ROTARY TABLE – 282'

STATE: WESTERN AUSTRALIA

4 – MILE SHEET: AUGUSTA

BASIN: PERTH

NEW BIT / CORE BIT

EXPLORATION LOGGING
DRILLING & BIT DATA
DRILLING RATE Ft/HR / MIN/FT.
POROSITY GOOD / FAIR / POOR
600 400 200

GRAPHIC LITHOLOGY LEGEND
CLAY SHALE
SILTSTONE
SANDY SILT.
CONGLOM
SANDSTONE
LIMESTONE
DOLOMITE

DEPTH
CORE TEST

MUD ANALYSIS
DITCH MUD GAS
TOTAL DITCH GAS
METHANE
BLENDOR MUD GAS
OIL IN MUD TR.X FAIRXXGOODXXX
20 40 60 80 100 200
CHROMATOGRAPHIC GAS ANALYSIS
METHANE — 1 — BUTANES — 4 —
ETHANE — 2 — PENTANES — 5 —
PROPANE — 3 —
PPM
0 1000 2000 3000

CUTTING ANALYSIS
OIL
SOLVENT CUT
GAS
TOTAL GAS
METHANE
PV. (ETHANE+)
10 20 40 60 80

DEVIATION

CASING & PLUGS

DIPS (V) VISUAL MEASURED

SPONTANEOUS POTENTIAL — MILLIVOLTS —
10

DETAILED LITHOLOGY

RESISTIVITY — ohms – m^2/m
16" NORMAL
0 20 100
0 100 1000
INDUCTION
0 100 1000

CONDUCTIVITY
millimhos — m^2/m — 1000 / ohms-m/m
INDUCTION
100 0

GAMMA RAY API UNITS
0 80 160

1"/100'

SONIC LOG
INTERVAL TRANSIT TIME MICROSECONDS PER FOOT
250 150 50
INTEGRATED TRANSIT TIME
1 Millisecond
10 Milliseconds

FORMATION TESTS

STRATIGRAPHIC COLUMN

*-2 (RR.) S3T-J
*-1 RR
*-2 (RR.)
*-1 RR.
*-2 (RR.)
*-1 RR
*-2 HTC – SPCH
*-2 (RR)
*-3 SMITH DT-J
*-3 HTC – J – HF
*-3 (RR) DTJ
SCALE CHANGE 300 200 100
*-3 RR
*-3 (RR) DTJ
D.BIT *-4 Smith DT-J (pinched)
*-2 RR
*-5 SMITH DT-J
*-2 RR
*-5 (RR.)
*-2 DT-J RR.
*-5 SMITH DT-J (RR)

RUN 2 SCALE CHANGE
16 NORMAL 10 200 CONDUCTIVITY 50 400
INDUCTION 50 500 500

RUN 2 SCALE CHANGE 0 150 300 / 0 150 200

RUN 2 SCALE CHANGE 140 90 190 40 140

0-30° (V)
0-20° (V)
0-40° (V)

2000 2100 2200 2300 2400 2500 2600 2700 2800 2900 3000 3100 3200 3300 3400 3500 3600 3700 3800 3900 4000 4100 4200 4300 4400 4500

3730

YARRAGADEE FORMATION EQUIVALENT
UPPER JURASSIC — LOWER CRETACEOUS

PERMIAN UNDIFFERENTIATED
UPPER PERMIAN

PLATE 1
SHEET 3

COMPOSITE WELL LOG
WEST AUSTRALIAN PETROLEUM PTY. LTD.

SUE No1

LOCATION: LAT. 34° 03' 57" S. LONG. 115° 19' 04" E.
ELEVATION: GROUND LEVEL – 269' ROTARY TABLE – 282'

STATE: WESTERN AUSTRALIA

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BASIN: SOUTHERN PERTH

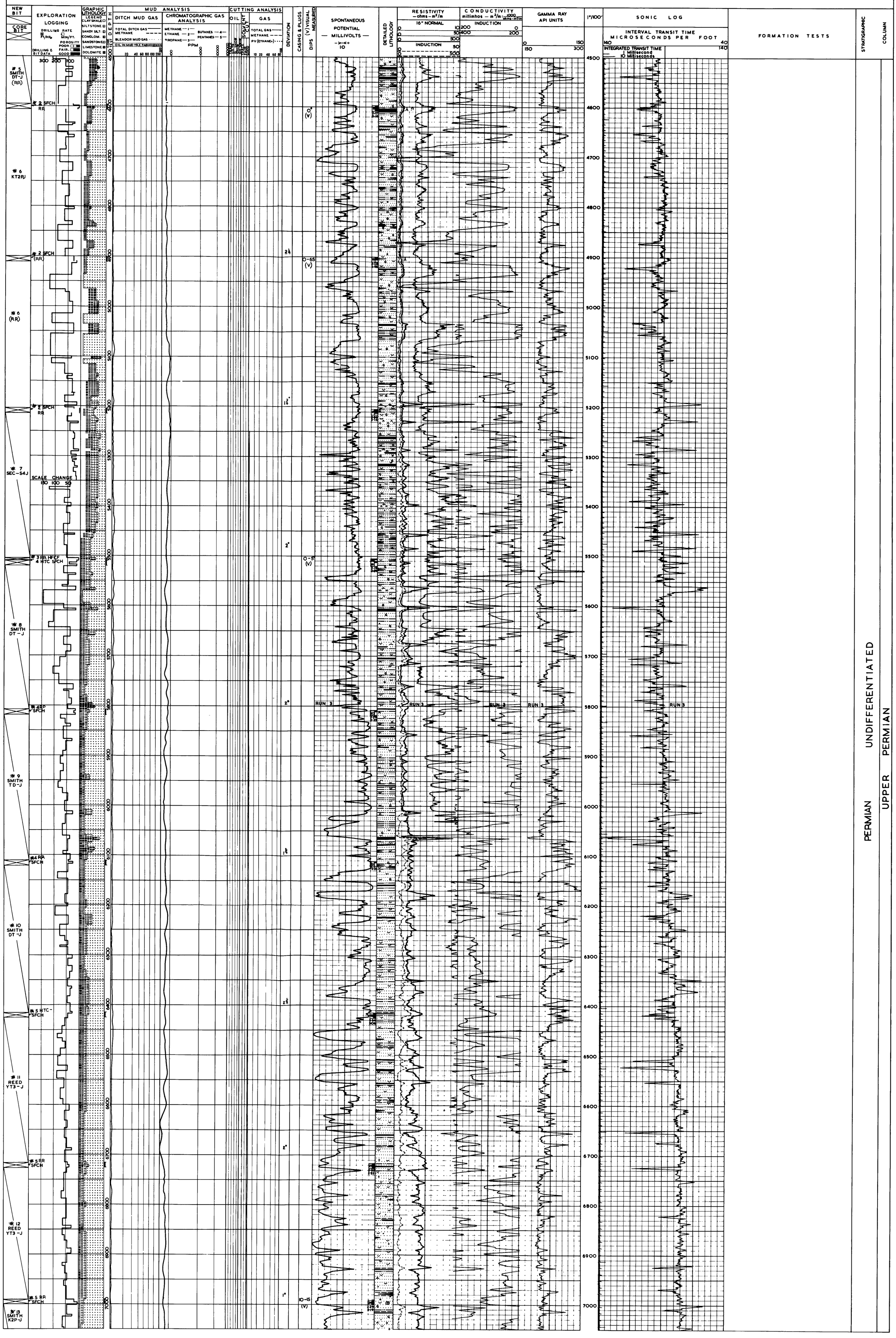

PLATE 1
SHEET 4

COMPOSITE WELL LOG
WEST AUSTRALIAN PETROLEUM PTY. LTD.

SUE No1

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