

Report No. NT/67/213.

THE PAPUAN APINAIFI PETROLEUM COMPANY LIMITED.

OPEN FILE

P.A.P. BRUNETTE DOWNS No.1 WELL,
NORTHERN TERRITORY.

By :
MINES ADMINISTRATION PTY. LIMITED.

Report No. NT/67/213.

P.A.P. BRUNETTE DOWNS No.1 WELL
NORTHERN TERRITORY

Well Completion Report

by
MINES ADMINISTRATION Pty. Ltd.

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P A P BRUNETTE DOWNS No.1

PR64/ 4 A-B.

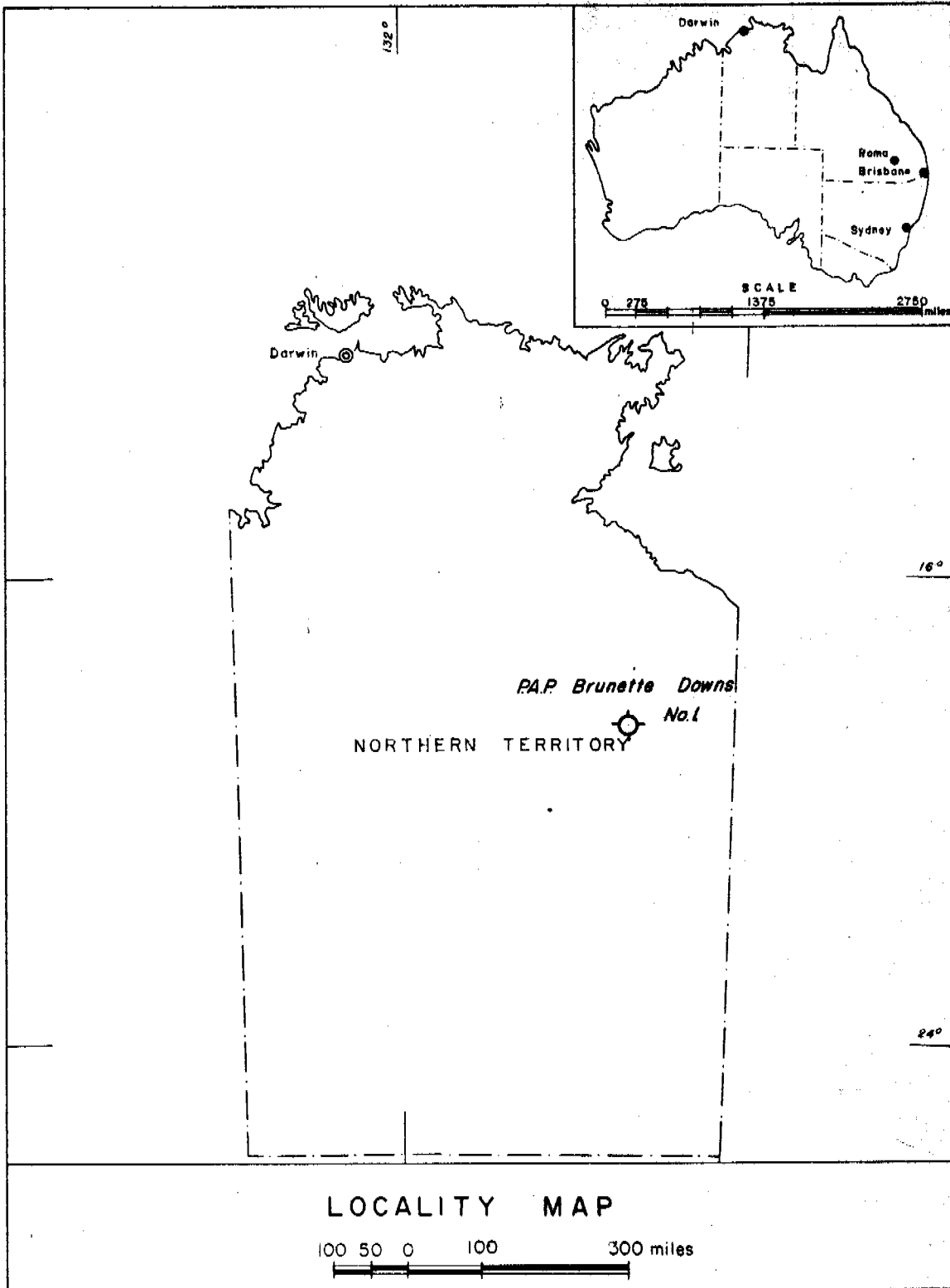
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PART A: WELL COMPLETION REPORT & PAPER LOGS

LOGS:

Composite Well Log	19
Gamma Ray Neutron Log	
Run 1 5"	20
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PART B: WELL FILE (always closed file)



ENCLOSURE 1b.

FOREWORD :

P.A.P. Brunette Downs No.1, Northern Territory, was drilled under contract by Sedco Exploration (Aust.) Pty. Ltd. for the Associated Group which consists of -

The Papuan Apinaipi Petroleum Company Limited (titleholder)
 Associated Australian Oilfields N.L.
 Associated Freney Oil Fields N.L.
 Associated Continental Petroleum N.L.
 Interstate Oil Limited.
 Sleigh Exploration N.L.

Mines Administration Pty. Limited is the technical and administrative Company for the Associated Group. J.F. Kennedy of Mines Administration Pty. Limited supervised drilling procedure with V. Knayer of Richter Bawden Drilling Pty. Ltd. as Drilling Superintendent on the site. Wellsite Geologist was O.W. Nugent of Mines Administration Pty. Limited. Wellsite geology and final report were supervised by S.S. Derrington, Mines Administration Pty. Limited. D.M. Traves, Exploration Director, Mines Administration Pty. Limited exercised overall control of the conduct of the operation.

I. Summary.

P.A.P. Brunette Downs No.1, drilled in the northern part of the Georgina Basin, penetrated 1050 feet of Lower Middle Cambrian carbonate rocks and 990 feet of sandstone, siltstone and shale of Cambrian or Upper Proterozoic age.

The carbonate section contained water-filled, cavernous limestone zones. The non-carbonate section had low porosity and permeability.

II. Introduction.

P.A.P. Brunette Downs No.1, a stratigraphic well, was sited $\frac{3}{4}$ mile south-west of Brunette Bore, Barkly Stock Route. The well was drilled to determine whether there was sufficient thickness of Cambrian sediment containing possible hydrocarbon reservoir rocks to warrant further exploration in the area.

III. Well History.(1) General data.

- (a) Well name and number - P.A.P. BRUNETTE DOWNS No.1.
- (b) Location (co-ordinates) - $18^{\circ} 35'17''S$; $136^{\circ} 5'00''E$. ✓
- (c) Name and address of
 tenement holder - The Papuan Apinaipi Petroleum Company
 Limited,
 31 Charlotte Street,
 Brisbane, Queensland.

III. Well History (contd.)

(1) General data (contd.)

- (d) Details of petroleum tenement - Oil Permit No.67, Northern Territory. Permit held over an area of 9615 square miles until 30/9/66.
- (e) District - Barkly Tableland, Northern Territory.
- (f) Total depth - 2040 feet. ✓
- (g) Date drilling commenced - 5/9/64. ✓
- (h) Date drilling completed - 3/12/64. ✓
- (i) Date well plugged - Plugged back to 1000 feet, 6/12/64. ✓
- (j) Date rig released - 7/12/64.
- (k) Drilling time - 46 days.
- (l) Elevation - (ground) - 770 feet approx.
(K.B.) - 776 feet approx.
- (m) Status - Plugged back to 1000 feet. Abandoned as water well. ✓
- (n) Cost - An audited cost statement will be forwarded when available.

(2) Drilling data.

- (a) Name and address of drilling contractor - ✓
Sedco Exploration (Aust.) Pty. Ltd.,
45 Brisbane Corso,
Fairfield, Brisbane, Queensland.
- (b) Drilling plant -
- make : Mayhew.
type : Double Drum.
rated capacity with 2 $\frac{7}{8}$ " drillpipe : 2000 feet.
motors -
- make : International.
type : RD-450
B.H.P. : 182.
- (c) Mast -
- make : Mayhew.
type : Free Standing.
rated capacity : 75,000 lbs.
- (d) Pump -
- make : Failing.
type : Duplex.
size : 5" x 6 $\frac{1}{2}$ "
- (e) Blowout preventor equipment-
- make : Hydril GK.
size : 6".
working pressure : 3000 p.s.i.

III. Well History (contd.)

(2) Drilling data (contd.)

(f) Hole sizes and depths - 9" to 313 feet.
 6 1/4" to 430 feet.
 5 7/8" to 2040 feet.

(g) Casing details -
 size : 7"
 weight : 23 lbs.
 grade : J55.
 range : 2.
 setting depth : 295 feet.

(h) Casing cementing details -
 size : 7".
 setting depth : 295 feet.
 quantity cement used : 68 sacks.
 cemented to : Surface.
 method used : Plug.

(i) Drilling fluid -
 type : The well was drilled to 518 feet using a water base, bentonite mud. At 518 feet circulation was lost. From 518 feet to 784 feet lost circulation material was added to the mud in a vain attempt to regain circulation. From 784 feet to total depth the well was drilled with water.

daily mud properties -

DATE	SG.	VISC. sec.	FL. cc.	CAKE ml.	pH	SAND %
7/9/64	1.10	60	7	1	7	1
8/9/64		Lost	circulation.			
9/9/64	1.20	36	4.8	2	8	3/4
10/9/64	1.13	33	6.0	2	8	3/4
11/9/64	1.12	34	6.0	2	8	3/4
12/9/64		Waiting on water.				
13/9/64						
to						
16/9/64		Pipe twisted off. Fishing.				
17/9/64	1.07	67	5.5	1	8	1 1/4
18/9/64	1.04	37	6.0	1	8	0
19/9/64	1.05	37	16.5	3	11	0
20/9/64	1.04	40	6.0	1	8	0 1/4
21/9/64	1.05	37	12.0	3	8	1/4
22/9/64						
to						
21/10/64		Drilling with water.				
22/10/64						
to						
11/11/64		Rig shut down awaiting repairs.				
12/11/64						
to						
3/12/64		Drilling with water.				

III. Well History (contd.)

(2) Drilling data (contd.)

(i) Drilling fluid (contd.)

total mud consumption :

Bentonite	334 sacks	-	33,400 lbs.
C.M.C.	24 sacks	-	1,200 lbs.
Barytes	7 sacks	-	700 lbs.
LoVis	1 sack	-	50 lbs.
Caustic Soda	1/2 drum	-	75 lbs.
Diesel Oil	3 drums	-	135 gals.
Mica Flakes	107 bags	-	2,675 lbs.
Jellflakes	56 bags	-	1,400 lbs.
Celoceal	36 bags	-	900 lbs.
Bran	132 bags	-	11,200 lbs.
Oat Hulls	120 bags	-	7,200 lbs.
Peanut Shells		-	2,240 lbs.

mud problems :

The well was spudded in with a water base, bentonite mud. At 140 feet cavities in the limestone caused lost circulation. Circulation was partially regained by plugging the cavities with lost circulation material.

At 518 feet circulation was completely lost in cavernous limestone. Attempts to regain circulation by pumping -

- (1) drilling cuttings.
- (2) lost circulation material, into the cavities proved unsuccessful as did attempts to cement off the cavernous zone.

From 784 feet efforts to regain circulation were abandoned and the well was drilled to total depth with water.

(j) Water supply -

Water was carted from two bores, Brunette Bore, Barkly Stock Route, 3/4 mile north-east of the site and Bore D40, 4 miles south-west of the site.

(k) Perforation and shooting record -

Nil.

(l) Plugging back -

LENGTH OF PLUG	SACKS OF CEMENT	TESTED	METHOD
200 feet (1000 to 1200 ft.)	36	Yes - Top at 1130 feet	Conventional displacement.

(m) Fishing operations -

- (i) depth : 302 feet.
- equipment left in hole : 372 feet of drill string.
- equipment used : Overshot, safety joint and jars.
- result : An overshot was run and 300 feet of the string were backed off. Safety joint and jars were then run and the remaining 82 feet of the string was jarred loose.

- 5 -

III. Well History (contd.)(2) Drilling data (contd.)

(m) Fishing operations (contd.)

- (ii) depth : 955 feet.
 equipment left in hole : 740 feet of drill string.
 equipment used : Spear, safety joint and jars.
 result : A spear was run and the broken single backed off. Safety joint and jars were run and the string jarred free.
- (iii) depth : 1460 feet.
 equipment left in hole : Tricone bit.
 equipment used : 120 feet of drill collars and 1340 feet of drillpipe.
 result : The drill string was run and connection with the bit effected. The bit was then pulled.

(3) Logging and testing.

(a) Ditch cuttings -

- method : Samples from the shale shaker were washed through a coarse sieve to remove large cavings, dried and stored in labelled polythene bags.
- interval : Samples were taken at 10 ft. intervals from 30 to 518 feet. Lost circulation prevented any sampling of the cuttings below 518 feet.

(b) Coring -

- original programme : The programme called for 10 ft. cores at 300 ft. intervals, the first core to be cut at approximately 500 feet.
- programme executed : The first core was not cut until 893 feet because of the possibility of the core barrel sticking due to loss of circulation in the cavernous limestone section. From 893 feet to total depth cores were cut at 100 ft. intervals.
- total number of cores cut : 11.
 total footage cored : 57½.
 recovery : 68%.
 equipment used : The cores were cut using a 20 ft. Reed barrel with 5½" Reed hard formation coreheads cutting a 2-5/16" core.

(See overleaf).

III. Well History (contd.)

(3) Logging and testing (contd.)

equipment used (contd.)

CORE NO.	INTERVAL (feet)	RECOVERY	
		Footage	%
1	893 to 903	5"	4
2	1009 to 1019	2'9"	28
3	1103 to 1105	2'0"	100
4	1216 to 1220	4'0"	100
5	1323 to 1333	4'11"	49
6	1410 to 1420	10'0"	100
7	1550 to 1559	8'6"	94
8	1630 to 1635	1'4"	27
9	1755 to 1762½	7'6"	100
10	1850½ to 1858	6'6"	87
11	2030 to 2040	9'7"	96

(c) Sidewall sampling - None taken.

(d) Electrical and other logging-

Schlumberger - Laterolog - Run 1, 295 to 1674 feet.
Run 2, 1570 to 2015 feet.

Gamma Ray/Neutron -
Run 1, 230 to 1674 feet.
Run 2, 0 to 260 feet.
1570 to 2016 feet.

Section Gauge -
Run 1, 295 to 2015 feet.

(e) Drilling time and gas log -

drilling time log : Computed from the time to drill 10 feet and plotted as minutes per 5 feet for the interval from 30 feet to 2040 feet.

gas log : From 313 feet a Core Laboratories single bridge hot wire detector and an Esterline-Angus recorder were used to detect and record gas.

However, circulation in the well was completely lost from 518 feet rendering the detector of little value.

(f) Formation testing -

reasons for testing : To test the fluid content of the sandstone in Zone C. Six drill stem tests were carried out.

Two tests were abortive and four were inconclusive.

bottom choke : 1"
top choke : 2"
DRILL STEM TEST No.1.

date : 17/11/64.
interval : 1078 to 1460 feet.
result : Trip valve failed to open.
Tester pulled immediately.

III. Well History. (contd.)(3) Logging and testing (contd.)

(f) Formation testing (contd.)

DRILL STEM TEST No.2.

date : 19/11/64.
 interval : 1074 to 1461 feet.
 initial shut-in period : 11 mins.
 flow period : 88 mins.
 final shut-in period : 11 mins.
 result : Trip valve failed to open.

DRILL STEM TEST No.3.

date : 19/11/64.
 interval : 1077 to 1461 feet.
 initial shut-in period : 10 mins.
 flow period : 60 mins.
 final shut-in period : 12 mins.
 result : Inconclusive.

DRILL STEM TEST No.4.

date : 20/11/64.
 interval : 1097 to 1461 feet.
 shut-in period : 36 mins.
 flow period : 27 mins.
 result : Inconclusive.

DRILL STEM TEST No.5.

date : 25/11/64.
 interval : 1085 to 1635 feet.
 shut-in period : 8 mins.
 flow period : 41 mins.
 result : Inconclusive.

DRILL STEM TEST No.6.

date : 25/11/64.
 interval : 1107 to 1635 feet.
 shut-in period : 10 mins.
 flow period : 75 mins.
 result : Weak air blow for 3 mins.
 Recovered 500 feet of brackish water. The brackish water came from leaking tool joints in the string.
 conclusions : Inconclusive.

The trip valve did not open during D.S.Ts. Nos. 1 and 2. As 450 feet of water was recovered in D.S.T. No.2, it is apparent that the drillpipe was leaking.

It is impossible to correctly assess the results of D.S.Ts. Nos. 3 to 6 for the following reasons :-

- (a) The pressure charts are indecipherable.
- (b) Due to lost circulation, it was impossible to observe the behaviour of the annulus. In fact, there was a standing water level at 165 feet at all times.

III. Well History (contd.)(3) Logging and testing (contd.)

(f) Formation testing (contd.)

- (c) A recovery of water was made in each case - however as the pipe string was probably leaking this could have come from either above or below the packer.
- (d) The caliper shows that packers should have seated in these tests.

Although this has not been a successful programme, it is thought that the interval tested had low permeability because of log evidence.

(g) Deviation surveys -

equipment :

Sperry-Sun 10° recorder.

results :

DEPTH (feet)	DEVIATION (degrees)
300	1
1000	3½
1510	4
1730	5

(h) Temperature survey -

Nil.

(i) Other well surveys -

Nil.

IV. Geology.

(1) Summary of previous work.

(a) Geological.

Many workers have carried out geological reconnaissance on the Barkly Tableland. However, the first detailed mapping of the area was conducted by Randal and Nichols (1963).

The land surface consists largely of black soil, gibber plains and small areas covered by limestone or dolomite scree. The lack of good rock outcrop has hindered structural interpretation of the area.

(b) Geophysical.

An aeromagnetic survey was flown over the Brunette Downs area in 1963 for Mines Administration Pty. Limited. As a result of this survey, the well was sited on a basement low having a cover of approximately 1800 feet of sediment. However, lack of suitable ties hampered interpretation of the survey. Also, it was not clear what subsurface feature was magnetic basement. The magnetic marker could be the Cambrian/Proterozoic unconformity or this marker could be within the Precambrian rocks.

(c) Drilling.

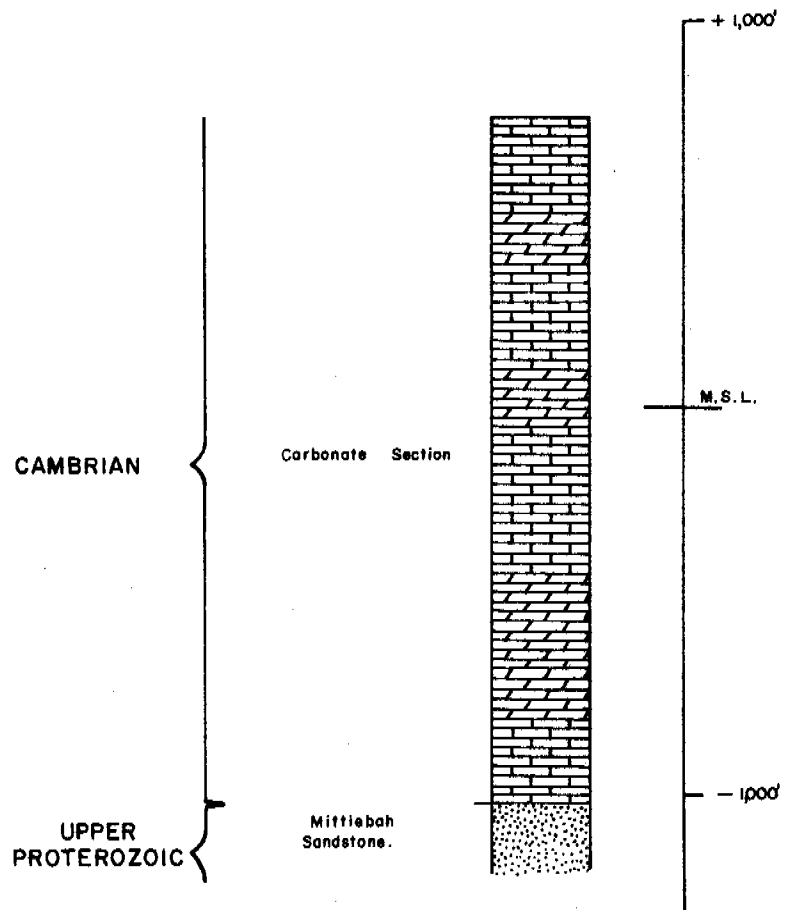
No previous wells have been sited on the Barkly Tableland. Numerous water boreholes have been drilled in the Permit area. These are generally shallow holes with a few deeper boreholes reaching 500 or 600 feet. Outside the Permit, Alexandria No.1 bore reached a depth of 1760 feet in probable Mittiebah Sandstone which is dated as Upper Proterozoic.

(2) Summary of regional geology.

The stratigraphic sequence in the general area set out below has been constructed using information from Randal and Nichols (1963).

(SEE OVERLEAF).

STRATIGRAPHIC COLUMN
P.A.P. BRUNETTE DOWNS Nº 1.
Anticipated before Drilling.



ENCLOSURE 2.

IV. Geology (contd.)

(2) Summary of regional geology (contd.)

AGE	FORMATION	THICKNESS (feet).
GAINOZOIC	Alluvium Laterite Travertine	15+
TERTIARY	Brunette Limestone - limestone	0 - 60
MESOZOIC Undifferentiated	Unnamed sandstone	?
LOWER MIDDLE CAMBRIAN	Anthony Lagoon Beds - dolomite/ limestone/sandstone.	700+
LOWER MIDDLE CAMBRIAN	Wonarah Beds - chert/shale/limestone/ dolomite	450+
UPPER PROTEROZOIC	Mittiebah Sandstone - sandstone	9000+

The Barkly Tableland area is a marginal sub-basin of the Georgina Basin. During the Proterozoic, this area acted as a stable foreland to the geosynclinal activity of the Warramunga and Davenport Geosynclines to the west and north.

Proterozoic sediments were laid down and later folded. The Cambrian marine transgression deposited sediments over the folded Proterozoic and the drape structures thus formed represent the main structure in the sub-basin.

(3) Stratigraphic table.

AGE	FORMATION	DEPTH		INTERVAL feet
		M.S.L. feet	K.B. feet	
LOWER MIDDLE CAMBRIAN ?	Unit A	+ 776	0	670
	Unit B	+ 106	670	380
LOWER to LOWER MIDDLE CAMBRIAN or UPPER PROTEROZOIC	Unit C	- 274	1050	360
	Unit D	- 634	1410	630.

IV. Geology (contd.)

(4) Stratigraphy.

The above subdivision was based on lithological differences and electric and radioactive log characteristics. Units A and B can be correlated lithologically with the Lower Middle Cambrian, Anthony Lagoon Beds defined by Plumb and Rhodes, 1963.

The age of Units C and D is uncertain. They may be Lower to Lower Middle Cambrian or Upper Proterozoic. No macrofossils were found in this section. However, micro-organisms of unknown stratigraphic significance have been recorded in Unit D.

LOWER MIDDLE CAMBRIAN.

UNIT A - 0 to 670 feet (670 feet).

Lithology :

This unit is composed dominantly of limestone, white, fine to medium grained, crystalline, argillaceous in part, slightly dolomitic.

Minor chert bands are present and in part the limestone contains chalcedony.

Palaeontology :

No macrofossils were recorded.

Log Characteristics:

To 165 feet the Gamma Ray reading is approximately 3 units which coupled with a Neutron reading of 600 CPS indicates a shaly limestone with low porosity. From 165 feet the Gamma Ray reading is very low at approximately 1 unit. The Neutron readings are generally low, averaging about 300 CPS. This section is a porous, permeable, water filled zone. The porosity and permeability are due to the presence of cavities in the limestone.

Petroleum Manifestations:Nil.

LOWER MIDDLE CAMBRIAN.

UNIT B - 670 to 1050 feet (380 feet).

Lithology :

This unit consists of dolomitic limestone, white to grey, fine to medium grained, massive, crystalline, argillaceous. The rock has been extensively recrystallised and has undergone partial dolomitization. Geodes with an outer siliceous layer with either calcite or dolomite crystals partly filling the cavity, occur in the section.

IV. Geology (contd.)
(4) Stratigraphy (contd.)

LOWER MIDDLE CAMBRIAN.

UNIT B (contd.)

Palaeontology :

Recrystallisation has tended to destroy fossil evidence. However, some small shell remains have been preserved. These appear to be inarticulate brachiopods with a chitino-phosphatic shell which has withstood recrystallization.

Log Characteristics :

Gamma Ray readings indicate that the section is composed of interbeds of clean limestone and shaly limestone. On the Neutron Log, the unit appears in general to have low porosity with however, small intervals with high porosity.

Petroleum Manifestations: Nil.

LOWER TO LOWER MIDDLE
CAMBRIAN OR UPPER
PROTEROZOIC.

UNIT C - 1050 to 1410 feet (360 feet).

Lithology :

Sandstone, reddish, medium to coarse grained, well sorted, quartzose. The grains are dominantly subrounded to rounded. The sandstone is cemented by silica, formed by solution of primary quartz and redeposition as overgrowths on the crystal faces. The end point of this process is reached in the formation of orthoquartzite at the top of the interval. Lower down the interval, a ferruginous matrix is present with the silica cement.

Palaeontology :

No macrofossils were recorded.

Log Characteristics :

Gamma Ray readings are generally low, averaging 1 unit, apart from some thin shaly intervals near the base of the unit. Neutron readings are in general high, indicating that the sandstone has low porosity.

Petroleum Manifestations: Nil.

IV. Geology (contd.)

(4) Stratigraphy (contd.)

LOWER TO LOWER MIDDLE
CAMBRIAN OR UPPER
PROTEROZOIC.

Lithology :

UNIT D - 1410 to 2040 feet (630 feet).

This unit is dominantly shale. At the top of the unit the shale is red, ferruginous, micaceous, silty in part. Lower in the section the shale is greenish, glauconitic, micaceous.

Thin dark brown to black, micaceous shales interbedded with the green shale. Minor greenish-white, glauconitic, argillaceous, micaceous, quartzose, siltstone beds are present. Traces of pyrite and marcasite occur in the shales.

Palaeontology :

No macrofossils were recorded. However, micropalaeontological examination has revealed the presence of unnamed microorganisms which as yet have no stratigraphic significance.

Log Characteristics :

The logs run indicated that the section was almost entirely shale.

(5) Structure.

Very little is known of the structure of the sub-basin. Existing subsurface structure is believed to be due to draping of sediments over basement highs. The well was drilled in a basement low detected by an aeromagnetic survey carried out for Mines Administration Pty. Limited in 1963.

(6) Relevance to the occurrence of petroleum.

No traces of hydrocarbons were discovered in the well.

The carbonate section was water filled. It appears likely that any hydrocarbons present in the carbonate section would have escaped into the atmosphere during the long period since the end of Cambrian sedimentation. However, possible hydrocarbon source rocks exist in the Unit D shale. The Unit C sandstone could have acted as a hydrocarbon reservoir with the orthoquartzite at the top of the unit as cap rock. For the sandstone to act as a hydrocarbon trap, migration of the fluids would have had to occur after secondary silicification of the sandstone produced a suitable cap rock.

IV. Geology (contd.)(7) Porosity and permeability of sediments.

Unit A contains numerous, porous, permeable, limestone intervals. These intervals consisting of interlocking caverns, are water filled. The water, which is moderately saline, is suitable for stock but not for human consumption.

Unit B, a limestone section, has in general low porosity, but some cavernous, water filled intervals are present.

The arenaceous Unit C consists of sandstone of low porosity with a cap rock of orthoquartzite.

Unit D is a non-porous shale section.

(8) Contributions to geological concepts.

P.A.P. Brunette Downs established the thickness of the carbonate section in the area at 1050 feet.

Unit B overlies Unit C disconformably. The Unit C sandstone has undergone sub-aerial weathering, evidence of which is supplied by the widespread presence of the ferric iron in the unit. Lack of evidence of bedding in the carbonate section prevents determination of whether the break is an angular unconformity.

V. References.

PLUMB, K.A. and
RHODES, M., 1963 - "Wallhallow 1 : 250,000 geological series."
Bur. Min. Resour. Aust. Explan. Notes
E/53-7.

RANDAL, M.A. and
NICHOLS, R.A.H., 1963 - "Alroy and Brunette Downs 1 : 250,000
geological series."
Bur. Min. Resour. Aust. Explan. Notes.

VI. Enclosures.

1. (a) Locality Map (frontispiece).
(b) Map Showing Relation to Regional Geology
(front pocket).
2. Stratigraphic Column
(Opp. page 10).
3. Composite Log (front pocket).
4. Schlumberger Logs (front pocket).



65.7012
64.4098

22nd September, 1965.

Managing Director,
Mines Administration,
31 Charlotte Street,
BRISBANE. QUEENSLAND.

Dear Sir,

... I enclose a copy of a report by Dr. Harding on his results of the radiogenic age determination on the bottom cores (between 1552 to 2038 feet) from your P.A.P. Brunette Downs No. 1 well which gives an age of 1520 ± 165 million.

Dr. Harding is one of our officers who is working in conjunction with the Geochronology Group at the Australian National University.

Yours faithfully,

(N.H. Fisher) *NH*
Assistant Director (Geology)

cc. Resident Geologist, Darwin

Age Determination

Dept of Mines

For your information

R.G.S.

28/9/65

Mr Venk

[Signature] 15/10/65

APPENDIX 1.

Petrological Reports.

No petrological examinations have been carried out on samples from this well.

APPENDIX 2.

Palaeontological Reports.

Palaeontological report on Cores 7, 8, 9 and 11, P.A.P. Brunette Downs No.1. By: P.R. Evans, Bureau of Mineral Resources, Canberra. 28/4/65.

Core samples from P.A.P. Brunette Downs No.1 well, Georgina Basin, Northern Territory were submitted by Mines Administration Pty. Limited, for palaeontological examination. Cores below 1550 feet from green glauconitic, micaceous shales thought to be either Cambrian or Upper Proterozoic were of particular interest. Samples examined were taken from the following depths -

- Core 7, 1550 to 1559 feet (+).
- Core 8, 1630 to 1638 feet.
- Core 9, 1755 to 1762½ feet.
- Core 11, 2030 to 2040 feet (+).

The samples marked (+) yielded probable organic fossils; the others were barren. The organic bodies included ones which were unicellular, about 25-38 microns diameter, circular in outline, probably spherical in their unflattened state, light brown in colour, with no ornament on their tests. The genus Leiosphaeridia would probably accommodate them.

No stratigraphic significance can yet be afforded these microfossils. Leiospheres occur in Palaeozoic and Mesozoic rocks and a means of distinguishing types among these featureless shapes is usually lacking.

The nearest known occurrence of similar bodies is in the Proterozoic Mulera Formation in the Constance Range area, where the microfossils were discovered in cores from BHP drill hole samples from above the ironstone member.

APPENDIX 3.

Water, Oil and Gas Analyses.

No formation fluids were recovered from the well.

APPENDIX 4.

Core Descriptions and Analyses.

Core descriptions by O.W. Nugent, Mines Administration
Pty. Limited.

CORE No.1 - Interval : 893 to 903 feet
Recovery : 5" (4%).

Limestone, grey, massive, consisting of very fine grained calcite. The interlocking calcite grains are dominantly anhedral to subhedral.

Small geodes were present, containing mainly rhombohedral dolomite or scalenohedral calcite. In one geode, replacement of quartz by calcite was evident.

Some very small phosphatic (?) shell fragments were observed in thin section.

No evidence of bedding was observed.

Petroleum Manifestations - Nil.

CORE No.2 - Interval : 1009 to 1019 feet.
Recovery : 2'9" (28%).

Dolomitic limestone, white to grey, crystalline, fine to medium grained. The limestone has been completely recrystallised. Geodes containing calcite and dolomite crystals are common. These cavities range in size from 0.1 mm. to 4 mm. Minor pyrite is present in some of the geodes.

Small phosphatic shells were preserved. They are probably inarticulate brachiopods.

The limestone is massive with no evidence of bedding.

Petroleum Manifestations - Nil.

CORE No.3 - Interval : 1103 to 1105 feet.
Recovery : 2 feet (100%).

Orthoquartzite, white, consisting of medium to coarse grained, sub-spherical, subrounded to rounded, quartz. The rock is well sorted. Silica cementation of the grains has resulted in the development of overgrowths on the quartz grains. Pitting of the grains by crystal edges is evident. The grains show undulose extinction.

Porosity and permeability are very low. However, a few small cavities are present. Some of these are filled with a white sericitic clay.

The rock is massive with no clear evidence of bedding.

Petroleum Manifestations - Nil.

APPENDIX 4 (contd.)

CORE No.4 - Interval : 1216 to 1220 feet.
Recovery : 4 feet (100%).

Sandstone, reddish-brown, medium to coarse grained, sub-spherical, subrounded to rounded, well sorted, quartzose. In part the sandstone has an ortho-quartzitic texture with very low porosity. It is slightly more porous where a ferruginous matrix is allied with silica cement.

Bedding is not readily definable but dip appears to be less than 10° where it can be determined.

Petroleum Manifestations - Nil.

CORE No.5 - Interval : 1323 to 1333 feet.
Recovery : 4'11" (49%).

1' Red, earthy quartzose siltstone with a haematite matrix.

3'11" Sandstone, reddish to reddish-brown, fine to coarse grained, sub-angular to subrounded, quartzose. It has a haematite matrix from 1324 to 1325 feet. From 1325 to 1327 feet 11 inches, the grains are mainly silica cemented.

Bedding is not clearly definable but dip appears to be about 10° .

Petroleum Manifestations - Nil.

CORE No.6 - Interval : 1410 to 1420 feet.
Recovery : 10 feet.

Dominantly shale, reddish with minor black beds, micaceous, silty in part, with minor pyrite.

Thin interbeds of white, quartzose, argillaceous, micaceous siltstone are present.

White, sub-circular spots occur on part of the red shale. A normal fault dipping at approximately 45° occurs at 1417 feet. Slumping is evident at 1419 feet. Bedding dip is 10° to 15° approximately.

Petroleum Manifestations - Nil.

CORE No.7 - Interval : 1550 to 1559 feet.
Recovery : 8'6" (94%).

Shale, green, glauconitic, micaceous; muscovite is the dominant mica with minor biotite. Traces of pyrite are present. The shale is dark brown in part.

The lower 5 feet represent a fault zone. Bedding dip is 10° to 15° approximately.

Petroleum Manifestations - Nil.

APPENDIX 4 (contd.)

CORE No.8 - Interval : 1630 to 1635 feet.
Recovery : 1'4" (27%).

10" Shale, green, glauconitic, micaceous.

6" Siltstone, greenish-white, glauconitic, micaceous, quartzose, sandy
in part.

Slumping is evident at the base of the cored interval. Bedding
dip is 10° approximately.

Petroleum Manifestations - Nil.

CORE No.9 - Interval : 1755 to 1762½ feet.
Recovery : 7' 6" (100%).

6'6" Shale, green, glauconitic, minor siltstone, greenish-white, glaucon-
itic, argillaceous, micaceous, quartzose.

1' Interbeds of green shale as above and white, silty shale.

A small normal fault with a dip of 30° approximately occurs at 1757'4".
Bedding dip is approximately 10°.

Petroleum Manifestations - Nil.

CORE No.10 - Interval : 1850'6" to 1850 feet.
Recovery : 6'6" (87%).

Interbeds of dark green shale, silty in part, glauconitic, micaceous and
siltstone, white to greenish-white, glauconitic, micaceous, quartzose.
The siltstone grades to a sandy siltstone with only minor glauconite and
mica.

Traces of marcasite are present on some joint planes and bedding planes.
Bedding dip is approximately 12°.

Petroleum Manifestations - Nil.

CORE No.11 - Interval : 2030 to 2040 feet.
Recovery : 9'7" (96%).

Interbeds of dark green shale and siltstone, greenish-white, glauconitic,
quartzose, micaceous. The siltstone grades into a greenish-white sandstone,
very fine grained, glauconitic, micaceous, quartzose, silty in part, tight.
Bedding dip is 10° approximately.

Petroleum Manifestations - Nil.

APPENDIX 5.List and Interpretation of Electrical and Other Logs.(a) List of Logs.

Schlumberger - Laterolog Run 1, 295 to 1674 feet.
 Run 2, 1570 to 2015 feet.

Gamma Ray/Neutron Run 1, 230 to 1674 feet.
 Run 2, 0 to 260 feet.
 1570 to 2016 feet.

Section Gauge Run 1, 295 to 2015 feet.

APPENDIX 5 (contd.)(b) Interpretation of logs by Schlumberger Seaco Inc., Brisbane. 16/2/65.

Rt was taken from the Laterolog and the formation factor F from the Neutron.

Sw was calculated from the formula $Sw = \sqrt{\frac{FR_w}{R_t}}$

Rw was assumed as 1.1 at 105°F. The accuracy of this assumption will of course change the calculated water saturations.

DEPTH	R11	Neps.	ϕ_n	F	Sw
1345	15	300	19.5	21	100
1300	50	440	7.5	160	100
1105	320	565	3.3	920	100
1032-1045	80	390	11	70	100
1010	400	480	6	250	87
909-920	280	440	7.5	160	100
886	200	420	9	106	89
840-865	30	270	24	13	75
690	200	480	6	250	100

APPENDIX 6.

Testing Reports.

Details of drill stem testing by O.W. Nugent, Mines
Administration Pty. Limited.

(1) HOLE CONDITIONS.

- (i) Tested in : Open hole ($5\frac{5}{8}$ ") TD. 1460 feet.
- (ii) Testing string : Johnston, type E, 3000 psi.
bottom hole pressure recorder.
Perforated tailpipe.
Johnston full hole, type X, $4\frac{1}{2}$ " packer.
Johnston $2\frac{7}{8}$ " bar tester.
Choke - $\frac{1}{4}$ ".
String : $2\frac{7}{8}$ " IF, 10.6 lbs./ft. Grade D,
Range 1 drillpipe.
 $4\frac{3}{4}$ " drill collars with 2" bore.
- (iii) Surface connections: 2" valve with flow manifold for bubble
hose.

(2) SURFACE EQUIPMENT.

Take off through 2" valve to 40 feet
of $2\frac{7}{8}$ " IF drillpipe.

DRILL STEM TESTS Nos. 1, 2, 3, 4, 5 and 6.

- (i) Reason for tests : To test the fluid content of the Zone
C sandstone.
- (ii) Hole conditions : See above.
- Packer depths -
- D.S.T. No.1 - 1078 feet.
 - D.S.T. No.2 - 1074 feet.
 - D.S.T. No.3 - 1077 feet.
 - D.S.T. No.4 - 1097 feet.
 - D.S.T. No.5 - 1085 feet.
 - D.S.T. No.6 - 1107 feet.
- (iii) Surface equipment : See above.
- (iv) Production data : See attached sheets.
- (v) Record copies : Copies of data sheets are attached.
Bottom hole pressure charts are inde-
cipherable.
- (vi) Analyses : No formation fluids were
recovered from the tests.
- (vii) Conclusions : D.S.Ts. Nos. 1 and 2 were abortive due
to inoperative trip valve.
D.S.Ts. Nos. 3 to 6 were inconclusive.
- (viii) Strip log : See attached Composite Log.

WHEN CHANGING PETROLEUM REPORTS, CHECK THAT ALL BELOW ARE CORRECTED.

PR. 66.14.... A-B

REPORT NUMBER AND CONTENTS (eg: logs etc)

REGISTER

O/C OILGAS

INDEX SHEET(s)

OPEN OR CLOSED SEPIAS

WELL NAMES OR SEISMIC SURVEYS

2 BOOKS OF CONTENTS

ANY CONTENTS IN REPORT (eg: front cover listing parts)

MICROFICHE (new and old, originals and duplicates)

WELL FILES AND WELL FILE BOOK

STAIRS

Section
Run 1

Gauge

COMPOSITE WELL LOG

COMPANY : THE PAPUAN APINAUPI PETROLEUM COMPANY LIMITED

PETROLEUM TENEMENT : Oil Permit No. 67

WELL NUMBER : BRUNETTE DOWNS No. 1.

STATE : Northern Territory

4-MILE SHEET : Brunette Downs

BASIN : Georgina

WELL STATUS : Plugged to 1000'. Completed as a water well.

LOCATION : LAT. 18°35'17" S. LONG. 136°05'00" E.
ELEVATION : REFERENCE PT. 776' A.S.L.
GROUND 770' A.S.L.

DATE SPUNDED : 5th September, 1964.
DATE DRILLING STOPPED : 3rd December, 1964.
DATE RIG OFF : 7th December, 1964.
TOTAL DEPTH : DRILLER 2040'
E. LOG 2017'

HOLE SIZE : IN. FROM TO
9" surface 313'
6 1/2" 313' 430'
5 1/2" 430' 2040'

CASING : IN. WT. GR. DEPTH CMT. CMT'D TO
7" 23 L. 55 295' 68 bags surface

CEMENT PLUGS : FROM TO SACKS
1000' 1200' 35

PERFORATION : TYPE SIZE FROM TO No/FT.

LATERO LOG DATA

RUN NUMBER	1	2					
DATE	27.11.64	6.12.64					
FOOTAGE LOGGED	1379'	445'					
LOGGED FROM	1674'	2015'					
LOGGED TO	295'	1570'					
TOTAL DEPTH - ELECTRIC LOG	1678'	2017'					
TOTAL DEPTH - DRILLER	1701'	2040'					
CASING SHOE - ELECTRIC LOG	295'	295'					
CASING SHOE - DRILLER	295'	295'					
BIT SIZE	5 1/2"	5 1/2"					
MUD - KIND	Water	Water					
TREATMENT							
WATER LOSS cc/30 min.							
WEIGHT lbs/cu.ft							
VISCOSITY (Marsh) Sec.							
pH							
RESISTIVITY Ω m ² /m @ TEMP °F	2.0 @ 88°F	2.2 @ 79°F					
	1.6 @ 105°F	1.6 @ 114°F					
MAX. RECORDED TEMP.	105°F	114°					
ELECTRODE SPACING							
SYMMETRICAL							
Current Beam	32"	32"					
NON-SYMMETRICAL							
RECORDED BY	G. Greau	H. V. Roberts					

RADIOMETRIC LOG DATA

TYPE OF LOG	Gamma	Ray-Neutron		
RUN NUMBER	1	2		
DATE	27.11.64	6.12.64		
TOTAL DEPTH - DRILLER	1701'	2040'		
TOP OF LOGGED INTERVAL	230'	1570'		
BOTTOM OF LOGGED INTERVAL	1674'	2016'		
TYPE OF FLUID IN HOLE	Water	Water		
FLUID LEVEL	165'	165'		
MAXIMUM RECORDED TEMPERATURE	105°F	114°F		
NEUTRON SOURCE, STRENGTH & TYPE	600 mc	Ra'Be		
SOURCE SPACING - IN.	19"	19"		
LENGTH OF MEASURING DEVICE	8"	8"		
O.D. OF INSTRUMENT - IN.	3 1/2"	3 1/2"		
TIME CONSTANT - SECS.	3	3		
LOGGING SPEED - FT/MIN.	30'	30'		
STATISTICAL VARIATION - IN.	2"	2"		
SENSITIVITY REFERENCE	C.R. 400	400		
	N. 500	500		
RECORDED BY	G. Greau	H. V. Roberts		

CASING RECORD				OPEN HOLE RECORD			
RUN No.	SIZE - IN.	WT. - LBS.	INTERVAL - FT. TO	BIT SIZE - IN.	INTERVAL - FT. TO		
1	7	23	surface 295'	9"	surface 313'		
				6 1/2"	313' 430'		
				5 1/2"	430' 2040'		

WELL HEAD FITTINGS : Capped
 DRILLED BY : Sedco Exploration (Aust.) Pty. Ltd.
 LOGGED BY : Schlumberger
 DRILLING METHOD : Rotary
 CEMENTED BY : Sedco
 MUD LOGGING BY : Minad

WELL SYMBOLS

- Gas show, slight
- Gas show, strong
- Oil show, slight
- Oil show, strong
- Oil and gas show
- Fluorescence
- ↖ Circulation loss, partial, and s.g. mud
- ↘ Circulation loss, complete, and s.g. mud
- Flow into well, and s.g. mud
- ↑ Blowout
- Core, interval, number and recovery
- ▲ Sidewall core
- ⊖ Perforated interval
- ⊗ Formation test interval and No. { ① O.H. ② in csg.
- ⊕ Plugged interval
- ⊙ Macro
- ⊙ Micro
- ⊙ Plant
- ⊙ Spore, pollen } Fossils

LITHOLOGIC REFERENCE

Conglomerate	Greywacke	Dolomite	Coal
Breccia	Siltstone	Calcarenite	Igneous Rocks gr: Granite
Tillite	Claystone	Calclutite	Volcanic Rocks b: Basalt
Quartz Sandstone	Shale	Marl	Metamorphic Rocks gn: Gneiss
Arkose	Limestone	Evaporite s: Salt	mi: Micaceous

OTHER BORE-HOLE LOGS

cal: Calcareous	Temperature
gl: Glauconitic	Micro-Caliper
py: Pyritic	Velocity
c: Carbonaceous	
ch: Cherty	

BIT TYPES & REMARKS	DRILLING RATE (min/5ft)	LITHOLOGY %age of cutting	MUD GAS DETECTION (Arbitrary Units)	DEPTH	EVIATION AZ	CASING & PLUGS	IPS VISUAL MEASURED	CORES & SPECIFIC GRAVITY	DETAILED LITHOLOGY	RESISTIVITY ohms m ² /m		GAMMA RAY NEUTRON		FORMATION TEST and other RESERVOIR ENGINEERING DATA	STRATIGRAPHIC COLUMN
										100 millivolts	20mV	Gamma Ray 10 ⁻⁶ Gr Ra eq/m	Neutron Cps		
			1 2 3 Live Oil							0 20 40	0 400	Zero 0 divisions to left of this line	Zero 10 divisions to left of this line		
										0 2000 4000	0 4000	0 7.5 15.0			
												200	400	600	

COMPOSITE WELL LOG

COMPANY: THE BRUNNEN ARMAID PETROLEUM COMPANY LIMITED

PETROLEUM TENEMENT: Oil Permit No. 67

WELL NUMBER: BRUNETTE DOWNS No. 1

STATE: Northern Territory

4-MILE SHEET: Brunette Downs

Basin: Georgina

WELL STATUS: Plugged to 1000'. Completed as a water well.

LATER LOG DATA

RUN NUMBER	1	2			
DATE	27.11.64	6.12.64			
FOOTAGE LOGGED	157'	445'			
LOGGED FROM	1674'	2015'			
LOGGED TO	295'	157'			
TOTAL DEPTH - ELECTRIC LOG	1675'	2017'			
TOTAL DEPTH - DRILLER	1701'	2040'			
CASING SHOE - ELECTRIC LOG	295'	295'			
CASING SHOE - DRILLER	295'	295'			
BIT SIZE	5"	5"			
MUD - KIND	Water	Water			
TREATMENT					
WATER LOSS ccs/30 min					
WEIGHT lbm/cu ft					
VISCOSITY (Marsh) Sec					
pH					
RESISTIVITY Δ m Ω m	2.0 - 58	1.2 - 79			
A TEMP Δ F	1.0 - 105	1.0 - 114			
MAX RECORDED TEMP	105 Δ F	114 Δ F			
ELECTRODE SPACING					
SYMMETRICAL					
Current Beam	32"	32"			
NON-SYMMETRICAL					
RECORDED BY	C. Green, H. V. Roberts				

RADIOMETRIC LOG DATA

TYPE OF LOG	Gamma	Ray-Neutron		
RUN NUMBER	1	2		
DATE	27.11.64	6.12.64		
TOTAL DEPTH - DRILLER	1701'	2040'		
TOP OF LOGGED INTERVAL	230'	1570'		
BOTTOM OF LOGGED INTERVAL	1674'	2016'		
TYPE OF FLUID IN HOLE	Water	Water		
FLUID LEVEL	165'	165'		
MAXIMUM RECORDED TEMPERATURE	105 Δ F	114 Δ F		
NEUTRON SOURCE, STRENGTH & TYPE	600 mc Ra Be			
SOURCE SPACING - IN	19"	19"		
LENGTH OF MEASURING DEVICE	8"	8"		
O.D. OF INSTRUMENT - IN	3"	3"		
TIME CONSTANT - SECS	3	3		
LOGGING SPEED - FT/MIN	30'	30'		
STATISTICAL VARIATION - IN	2"	2"		
SENSITIVITY REFERENCE	C.P. 301	400		
RECORDED BY	C. Green, H. V. Roberts			

LOCATION	FLAT 5317 S.	LONG	SECTION 17		
ELEVATION	REFERENCE BY	720'		A.S.L.	
DATE SKIPPED	DATE DRILLING STOPPED	DATE RIG OFF	TOTAL DEPTH - DRILLER		
			2017'		
HOLE SIZE	IN	FROM	TO		
	7"	23	1.55	295'	65 bags surface
CEMENT PLUG	FRUM	TO	SACKS		
		1000'	1200'	55	
PERFORATION	TYPE	SIZE	FROM	TO	NOVET

WELL HEAD FITTINGS

WELL SYMBOLS

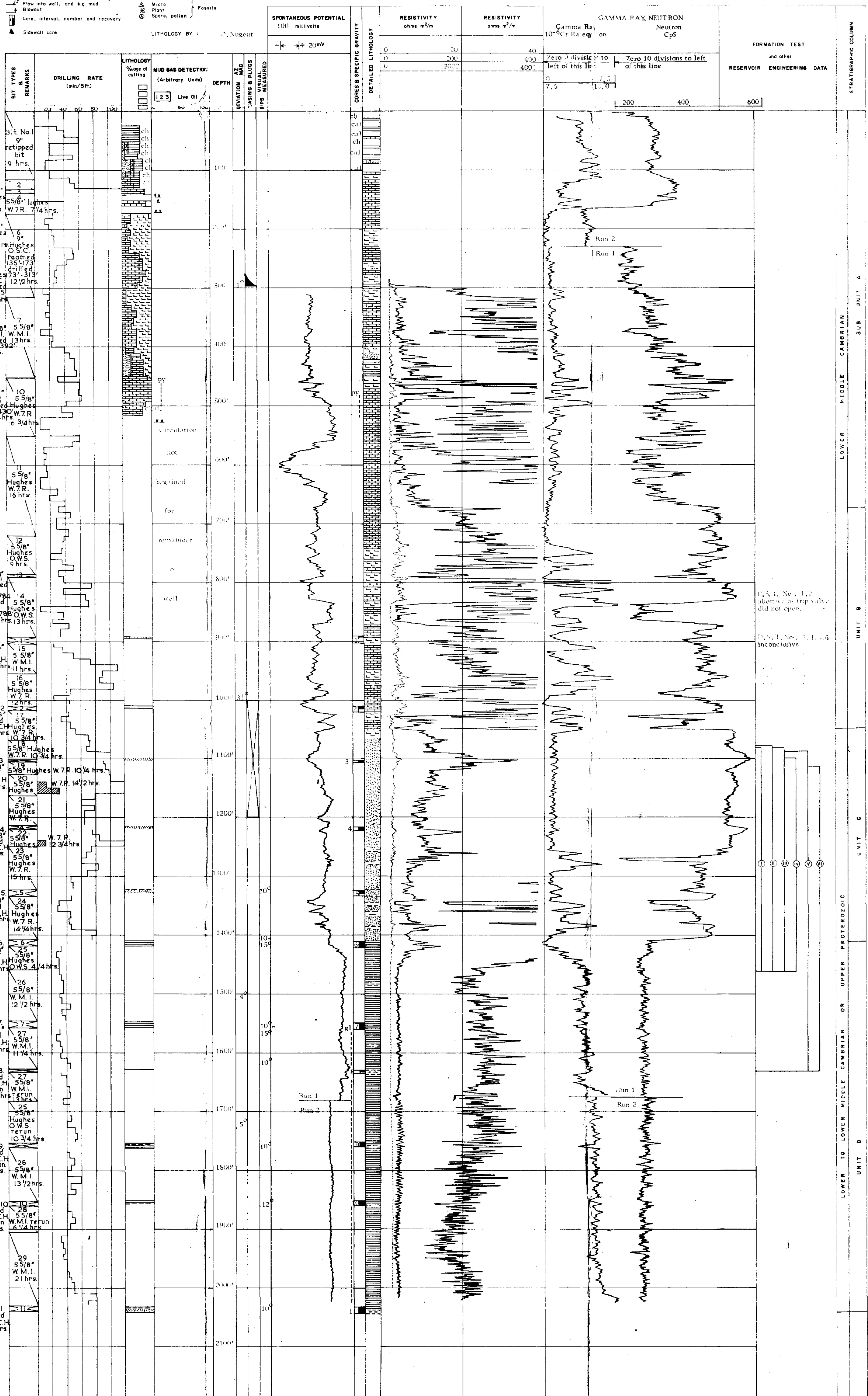
- Gas show, slight
- Gas show, strong
- Oil show, slight
- Oil show, strong
- Oil and gas show
- Fluorescence
- Circulation loss, partial, and s.g. mud
- Circulation loss, complete, and s.g. mud
- Flow into well, and s.g. mud
- Blowout
- Core, interval, number and recovery
- Sidewall core

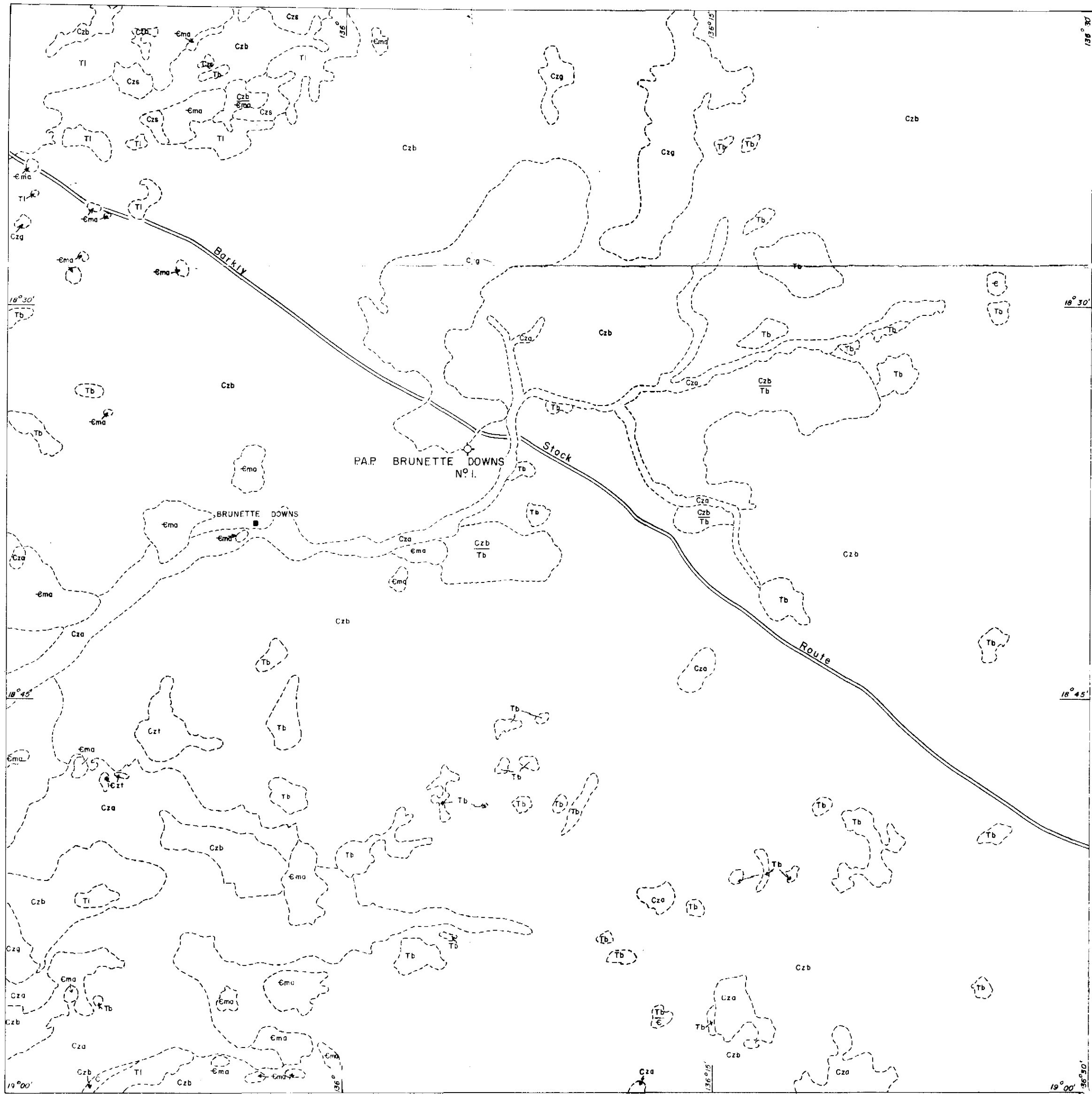
LITHOLOGIC REFERENCE

- Conglomerate
- Breccia
- Tuffite
- Quartz Sandstone
- Arkose
- Greywacke
- Siltstone
- Claystone
- Shale
- Limestone
- Garnite
- Calcarenite
- Caliche
- Marl
- Evaporite & Salt
- Coal
- Igneous Rocks Granite
- Volcanic Rocks Basalt
- Metamorphic Rocks gneiss
- Micaceous
- cal. Calcareous
- gl. Glauconitic
- py. Pyritic
- Carboneous
- Cherty

OTHER BORE-HOLE LOGS

- Temperature
- Micro-Caliper
- Velocity





CAINOZOIC	Cza	Alluvium, River Gravel & some black soil.	
	Czb	Black and gray clayey soils some sand and gravel.	
	Czg	Gravelly pebbles of pisolitic ironstone and chert.	
	Cza	Residual sand some black soil and gravel.	
	Czt	Travertine.	
	TERTIARY	Tb	Brunette Limestone.
		Tl	Laterite.
	CAMBRIAN	E	Undifferentiated.
	MIDDLE CAMBRIAN	Ema	Anthony Lagoon Beds.

Geological Map BRUNETTE DOWNS

After Randal & Nichols, 1963.
1:250,000 Geological Sheet Series S.E. 53-11.

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