

COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF NATIONAL DEVELOPMENT
BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Petroleum Search Subsidy Acts
PUBLICATION No. 75

**SUMMARY OF DATA AND RESULTS
BONAPARTE GULF BASIN
WESTERN AUSTRALIA**

Bonaparte No. 1 and No. 2 Wells

OF

ALLIANCE OIL DEVELOPMENT AUSTRALIA NO LIABILITY

*Issued under the Authority of the Hon. David Fairbairn
Minister for National Development*

1966

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 summaries of data and results of two drilling operations undertaken in the Bonaparte Gulf Basin, Western Australia : Bonaparte No. 1, and Bonaparte No. 2. The information has been abstracted by the Petroleum Exploration Branch of the Bureau of Mineral Resources from well completion reports furnished by Alliance Oil Development Australia No Liability.

J. M. RAYNER
DIRECTOR

CONTENTS

	<u>Page</u>
 <u>BONAPARTE NO. 1</u>	
SUMMARY	1
WELL HISTORY	2
GEOLOGY	4
ADDITIONAL DATA FILED IN THE BUREAU OF MINERAL RESOURCES	13

 <u>BONAPARTE NO. 2</u>	
SUMMARY	17
WELL HISTORY	18
GEOLOGY	20
REFERENCES	24
ADDITIONAL DATA FILED IN THE BUREAU OF MINERAL RESOURCES	25

ILLUSTRATIONS

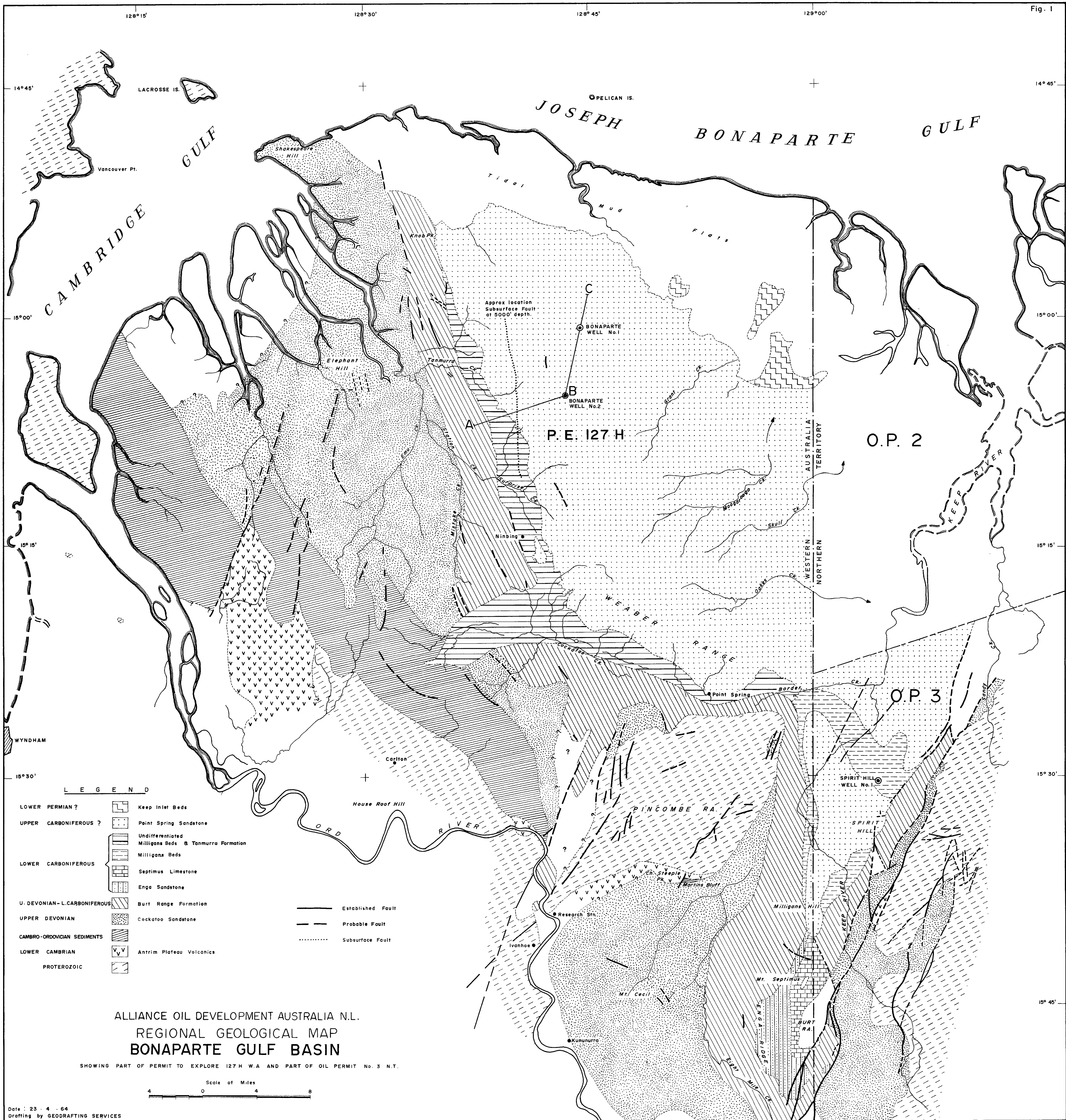
Figure 1:	Regional geological map, showing locations of Bonaparte No. 1 and No. 2 wells	Frontispiece
Figure 2:	Geological cross-sections before and after drilling Bonaparte No. 1	10
Figure 3:	Geological cross-sections before and after drilling Bonaparte No. 2	22
Plate 1 :	Composite well log, Bonaparte No. 1 (5 sheets) ..	At back of report
Plate 2 :	Composite well log, Bonaparte No. 2 (3 sheets) ..	At back of report

BONAPARTE NO. 1

of

ALLIANCE OIL DEVELOPMENT AUSTRALIA NO LIABILITY

SUMMARY OF DATA AND RESULTS



BONAPARTE NO. 1

SUMMARY OF DATA AND RESULTS*

SUMMARY

Bonaparte No. 1 Well, located approximately 52 miles north-east of Wyndham, in the Bonaparte Gulf Basin of Western Australia, was drilled by Reading and Bates (Australia) Pty Ltd for Alliance Oil Development Australia No Liability to total depth of 10,530 feet. Drilling commenced on 18th July, 1963, was suspended at 10,283 feet on 19th December, 1963, resumed on 25th April, 1964, and was completed on 4th June, 1964. A full programme of logging, coring, and testing was undertaken.

The well penetrated the Upper Carboniferous Point Spring Sandstone from surface to 638 feet; the Lower Carboniferous Tanmurra Formation to 1630 feet, and Milligans Beds to 7480 feet; the Lower Carboniferous to Upper Devonian Burt Range Formation Equivalent to 9492 feet; and the Upper Devonian Cockatoo Sandstone Equivalent to 10,530 feet, total depth. An angular unconformity occurred at the base of the Milligans Beds.

Of the twenty drillstem tests conducted during the drilling operation, three yielded fresh water from the Tanmurra Formation, and one yielded gas-cut salt water from the interval 5627 to 5696 feet in the Milligans Beds. Four tests were misruns, and twelve obtained no recovery other than drilling fluid. The well was plugged and abandoned as a dry hole on 6th June, 1964.

The stratigraphic drilling operation at Bonaparte No. 1 Well was subsidized under the Petroleum Search Subsidy Act 1959-1961, from surface to total depth.

* Abstracted from: Well Completion Report, Bonaparte Well No. 1, by M.C. Le Blanc, Alliance Oil Development Australia No Liability, July, 1964.

WELL HISTORY

General Data

Well name and number:	Bonaparte No. 1
Location:	Latitude 15° 01' 00" S. Longitude 128° 44' 30" E.
Name and address of Tenement Holder:	Alliance Oil Development Australia N.L., 100 Collins Street, Melbourne, Victoria
Details of Petroleum Tenement:	Permit to Explore 127H, Western Australia (approximately 13,800 square miles)
Total Depth:	10,530 feet
Date drilling commenced:	18th July, 1963
Date drilling suspended:	19th December, 1963, at 10,283 feet with fish in hole
Date drilling resumed:	25th April, 1964
Date drilling completed:	4th June, 1964
Date well abandoned:	6th June, 1964
Date rig released:	6th June, 1964
Elevation (ground):	339 feet
Elevation (K.B.):	355.3 feet (datum for depths)
Status:	Plugged and abandoned as a dry hole
Cost:	£427,000 approx.

Drilling Data

Drilling Plant:			
Make:	National		
Type:	75		
Hole sizes and depths:	20" to 29 feet 17 1/2" to 560 feet 12 1/4" to 4964 feet 8 3/4" to 10530 feet (T.D.)		
Casing details:			
Size (in.):	18 1/2	13 3/8	9 5/8
Weight (lb./ft):		48	36
Grade:		H.40	J.55
Setting depth (ft):	29	510.9	4911

Logging and Testing

Ditch Cuttings:

Interval:

Ten feet from surface to total depth.

Interval reduced to five feet during coring, and in zones of special interest.

Coring:

Thirty-four cores, with a total length of 329 feet and a recovery of 263 feet 7 inches (82.6%), were cut. The core barrel was a 30-foot, 6 7/8" OD., C.D.T. core barrel, and the bits used were "Truco Tridia" and "Mindrill" diamond coreheads and "Hughes" conventional drag-type and cone-type coreheads.

Sidewall Cores:

Although forty-six shots were fired, only twelve samples were recovered, of which five were inter-mixed filter cake and rock fragments.

Halliburton equipment was used.

Electric and other logging (Halliburton):

Induction-Electric Log: 100-10278 feet (5 runs)

Dip Log: 4904- 9949 feet (1 run)

Contact Caliper Log: 510-10280 feet (4 runs)

Acoustic Velocity Log: 60- 556 feet (1 run)

Acoustic Velocity Log
with Gamma Ray: 510- 9944 feet (2 runs)

Velocity Survey:

A velocity survey (21 shots) was run from 5100 to 9400 feet by Petty Geophysical Engineering Company.

Drilling Rate and Gas Log:

Continuous drilling rate and gas plots were recorded during drilling.

Formation Testing:

Twenty Halliburton formation tests were carried out during the drilling operation.

Sixteen tests were conducted in open hole, concurrently with drilling operations; four were misruns because of packer seat failures. An additional four tests were conducted in open hole after the well had reached total depth; one was a misrun because of packer failure.

Detailed results of the formation tests are given in Appendix 6 to the well completion report.

Copies are available for inspection at the Bureau of Mineral Resources, Canberra.

Deviation Survey:

Seventy-one readings with a Totco instrument were taken during drilling. The maximum hole deviation of $5 \frac{1}{4}^{\circ}$ was recorded at 9063 feet. The final reading at 10,508 feet was $1\frac{1}{2}^{\circ}$.

Temperature Survey:

Bottom-hole temperatures were taken at 4964, 7960 and 9952 feet; the readings were 137°F , 188°F , and 216°F , respectively.

GEOLOGY

General

Structurally, the Bonaparte Gulf Basin is bounded on the east by the Sturt Block and to the south-west by the Kimberley Block, both of Precambrian age. The seaward extent of the Basin is at present unknown but it can be inferred to extend as far northwards as the off-shore area to the west of Bathurst Island, where an aeromagnetic survey conducted in 1963 indicated a gradual thickening of the sedimentary section.

The land area comprising the southern portion of the Basin is divided into two embayments by a Precambrian basement ridge, known as the Pincombe Range, which trends north-east: the Carlton Embayment lies to the north and north-west of the Pincombe Range, and the Burt Range Embayment to the south and east. Structurally, the Basin is believed to have originated through subsidence of the north-eastern end of the Kimberley Block, and downsinking by step faulting (with downthrow to the west) of an associated mobile zone between the Kimberley and Sturt Blocks (Drummond, 1963).

Within the Carlton Embayment, Palaeozoic strata approximately 9500 feet thick, are exposed at the surface. The outcropping sediments are of Permian (?), Carboniferous, Devonian, Ordovician, and Cambrian age. Seismic and gravity data indicate that a much thicker section, approximately 12,000 to 15,000 feet thick, is present in the deeper part of the Embayment. Basement consists of relatively unmetamorphosed Proterozoic sediments; Lower Cambrian volcanics, which occur sporadically around the southern margin of the Embayment, locally may constitute effective basement.

In general, surface expression of structure within the Carlton Embayment is confined to the southern and western margins of the Embayment where, during early Carboniferous time, Cambrian, Ordovician, and Devonian to Lower Carboniferous sediments were strike-faulted and tilted 20 to 30 degrees to the north-east (Veevers et al., 1964). The development of the deeper part of the Embayment, the approximate on-shore limits of which are defined by the area of outcrop of Point Spring Sandstone as shown on Figure 1, probably was accelerated in early Carboniferous time through further downwarping, with associated block-faulting, of a portion of the Precambrian Kimberley Block. A thick sequence of Lower Carboniferous and early Upper Carboniferous sediments, in excess of 7400 feet, was subsequently deposited in the deeper part of the Embayment; these sediments unconformably overlap the older sediments of the upthrown block to the west.

Over the deeper part of the Embayment there is little surface evidence of structure and the strata for the most part dip gently basinwards. However, the data obtained from

the gravity survey conducted in 1961, and from subsequent seismic surveys, indicate that closed structures are present in the subsurface. Since significant folding is not known to have occurred in the Embayment, it is considered that these features represent draped structures resulting from differential compaction of sediments over and around the upthrown portions of tilted fault blocks, or above topographic "highs" on the basement floor.

Abundant cap rock, source, and reservoir beds are present within the outcropping Palaeozoic sequence. Although the nature of the sediments of the deeper part of the Embayment is but little known at present, the results of the Bonaparte No. 1 Well have shown that a similar favourable lithological combination can be expected throughout most of the Embayment.

Stratigraphy

General:

Bonaparte No. 1 Well spudded in the Upper Carboniferous Point Spring Sandstone, and then penetrated the Lower Carboniferous Tanmurra Formation, and Milligans Beds to an angular unconformity at the base of the latter. Below the unconformity the well entered the Lower Carboniferous to Upper Devonian Burt Range Formation Equivalent, followed by the Upper Devonian Cockatoo Sandstone Equivalent in which it bottomed at 10,530 feet. The stratigraphic sequence encountered in Bonaparte No. 1 is shown in the Table below:

<u>Age</u>	<u>Formation</u>	<u>Depth Intervals</u> (feet)	<u>Thickness</u> (feet)
Upper Carboniferous	Point Spring Sandstone	16 - 638	622+
Lower Carboniferous	Tanmurra Formation	638 - 1630	992
Lower Carboniferous	Milligans Beds	1630 - 7480	5850
————— Angular Unconformity —————			
Lower Carboniferous to Upper Devonian	Burt Range Formation Equivalent	7480 - 9492	2012
Upper Devonian	Cockatoo Sandstone Equivalent	9492 - 10530(T.D.)	1038+

Detailed:

Point Spring Sandstone (Upper Carboniferous, Namurian): Surface to 638 feet (622 feet+)

The upper part consists of colourless to white, medium to coarse-grained, porous, poorly consolidated, quartz sandstone. The lower part differs in that the quartz grains are frosted, and in the presence of kaolin cement.

Tanmurra Formation (Lower Carboniferous, Visean): 638 to 1630 feet (992 feet)

The top 86 feet is a buff to medium grey, sandy and silty, medium-grained oolite grading downwards into coarse-grained calcirudite, and then into fine-grained calcarenite.

The middle unit of the formation (840 feet) consists mainly of white to medium grey, fine to medium-grained, angular, porous, quartz sandstone with interbeds of finely crystalline, silty to sandy limestone and recrystallized calcarenite near the top. Lower down, interbeds of dolomite are common and, in several places, the matrix of the sandstone is 40 percent dolomitic.

The bottom 66 feet consist of a light brown, fine-grained calcarenite which is partly pelletoidal.

Milligans Beds (Lower Carboniferous, Visean to Tournaisian): 1630 to 7480 feet
(5850 feet)

The formation consists predominantly of medium grey, marine shale with, from 3800 feet, sandstone and siltstone interbeds. Concretionary and bedded ironstone is common in the upper part of the formation. On the basis of gross lithological characteristics, the formation has been subdivided into four units:

1630 to 3800 feet:

This unit consists essentially of medium grey, non-silty to moderately silty, fossiliferous, sub-fissile to fissile, marine shale. Numerous crinoid stem-fragments are present between 1800 to 2100 feet; within this same interval several beds of fine to medium-grained, sandy to silty, bioclastic and fragmental limestone are present.

The uppermost 120 feet of the unit, which is very silty and includes interbedded sandstone and siltstone, may be a zone of transition to the overlying Tanmurra Formation.

A few beds of medium grey, sandy and argillaceous sandstone are present in the upper part of the unit; concretionary and bedded ironstone is common throughout.

3800 to 6453 feet:

This unit consists of shale with approximately 11 percent of interbedded quartz sandstone and includes scattered thin beds of siltstone. The shale is medium to medium dark grey, rarely brownish and greenish-grey, generally slightly silty and occasionally sandy, sub-fissile to chunky.

The sandstone consists of white to buff, very fine-grained, subround to subangular, moderately well-sorted to poorly sorted quartz which is cemented with calcite and/or silica. Many of the sandstone beds show fair to good intergranular porosity; others are tight as a result of high silt content and/or of secondary silicification.

A few interbeds of grey to brown, argillaceous, slightly calcareous siltstone are scattered throughout the unit.

6453 to 7100 feet:

The unit consists of silty shale with approximately 24 percent of interbedded, quartz sandstone and a lesser amount of argillaceous siltstone. The shale is medium grey, moderately silty and in part sandy, platy to blocky.

The sandstone consists of light grey to buff, very fine-grained, angular to subangular, poorly sorted quartz which is well cemented, most commonly with silica. The sandstone is generally very silty and tight although some poor intergranular and capillary porosity is present in several of the beds.

The siltstone is grey, siliceous and argillaceous.

7100 to 7480 feet:

This unit consists entirely of medium light to medium dark grey, slightly silty, sub-fissile to blocky shale, which becomes bituminous near the base of the unit.

These basal beds rest with angular unconformity upon the Burt Range Formation Equivalent.

Burt Range Formation Equivalent (Lower Carboniferous to Upper Devonian):
7480 to 9492 feet (2012 feet)

The formation has been divided on lithological and electrical log characteristics into six units as follows:

7480 to 7865 feet:

This unit, the "Upper Shale Unit", consists of medium grey, platy to blocky shale, which is in part slightly silty and occasionally waxy to bituminous. The induction-electric and contact caliper logs suggest that some siltstone is present near the top of the unit, but none was observed in the cuttings. Several thin beds of very fine-grained quartz sandstone are present near the middle of the unit.

7865 to 8195 feet:

This unit, the "First Shale and Siltstone Unit", consists of shale with interbeds of siltstone, which become thicker and more common towards the base of the unit.

In the upper part the shale is medium grey, moderately to very silty, moderately micaceous, slightly calcareous, and platy to blocky. Towards the base of the unit it becomes less silty and micaceous, is often bituminous, and for the most part is non-calcareous.

The siltstone is light to medium grey, commonly calcareous and in part micaceous; towards the base of the unit several beds are moderately sandy and argillaceous.

8195 to 8300 feet:

This unit, the "First Sandstone Unit", consists of white to light grey (in part brownish-grey), fine-grained, angular to subangular, quartzose sandstone with some shale grains. The sandstone is moderately to very silty, very calcareous, and is cemented with carbonate cement which becomes more

abundant towards the base, where several thin beds of sandy and silty limestone are present. A few thin beds of siltstone also occur near the base of the unit.

8300 to 9035 feet:

This unit, the "Second Shale and Siltstone Unit", consists mainly of interbedded shale and argillaceous siltstone, but also includes a few beds of silty sandstone.

In the upper part the shales are light to dark grey, silty and in part micaceous, commonly slightly calcareous, occasionally bituminous, sub-fissile to blocky; in the lower part they become greenish and brownish-grey, blocky, and for the most part are moderately silty.

The siltstones are light to medium grey and greenish-grey, calcareous, and moderately argillaceous. They become very finely sandy and siliceous towards the base of the unit. Several beds of very fine-grained, moderately to very silty, calcareous, quartzose sandstone are also present.

9035 to 9260 feet:

This unit, the "Second Sandstone Unit", consists of interbedded and gradational silty sandstone and lesser sandy siltstone.

The sandstone is light grey (in part greyish-brown) very fine-grained, calcareous, moderately to very silty, and is generally siliceous; it consists of angular to subangular quartz and rare shale grains which are cemented with abundant carbonate cement. The siltstone is grey, green, and brownish-grey, siliceous, calcareous, and is generally very finely sandy. Several interbeds of grey, green, and black, silty shale are also present.

9260 to 9492 feet:

This unit, the "Basal Variegated Shale Unit", consists of variegated (green with lesser amounts of black, brown and rust), micaceous, moderately silty shale. The sequence includes a few thin beds and lenses of siltstone and of silty, very fine-grained, calcareous, quartzose sandstone.

Cockatoo Sandstone Equivalent (Upper Devonian): 9492 to 10,530 feet (1038 feet+)

The sequence present in the interval 9492 feet to total depth has been correlated with the Cockatoo Sandstone on the basis of a marked change in the lithological, electrical, and velocity characteristics of this unit from those of the overlying sediments.

The sequence consists predominantly of interbedded sandstone, siltstone, and shale. The sandstones differ from those of the Burt Range Formation Equivalent in that they are generally of a coarser grain size and are most commonly non-calcareous. The shales, however, are very similar to those of the "Basal Variegated Shale Unit" of the Burt Range Formation Equivalent.

The sandstones consist of white to light grey, very fine-grained to fine-grained, angular to subangular quartz, cemented with a powdery siliceous cement. They are commonly very siliceous and are generally silty.

In the upper part of the formation the shales are variegated in colour, generally moderately silty, and are commonly micaceous. Towards the base of the formation, medium dark grey, micaceous and silty shale predominates although some variegated shale is also present.

The siltstones are generally light to medium grey, slightly calcareous and are commonly siliceous. In the interval 10,280 feet to 10,320 feet they become medium grey to olive-grey, very calcareous, and in part grade to silty, microcrystalline limestone.

Structure

The well was located on what was thought to be a small structure identified by seismic survey, having a closure of about 125 feet at a depth of 5000 feet. Further seismic work during the drilling of Bonaparte No. 1 indicated that, in fact, the well was located low down on the north-east flank of a closed structure, five miles north of its culmination. The continuous dipmeter survey indicated dips generally between 4° and 6° north above 7472 feet; below 7520 feet the direction changed abruptly to east-south-east and then, at 8524 feet, to south or south-east.

The dipmeter data have been interpreted as indicating that an angular unconformity is present within the interval 7472 to 7520 feet, where gently dipping Lower Carboniferous strata with a northerly dip component overlie Burt Range and older sediments which have been block-faulted and tilted to the east-south-east.

Oil and Gas Indications and Potential

Neither fluorescence nor oil staining was observed in cuttings and cores. Trip gas was considered to have originated in the bituminous shales in the lower part of the Milligans Beds and the upper part of the Burt Range Formation Equivalent.

The Milligans Beds contain abundant source, cap, and reservoir beds. Cap rocks and source rocks are present in the older sediments but the sandstone horizons were mostly too well cemented or too silty to be suitable reservoir rocks.

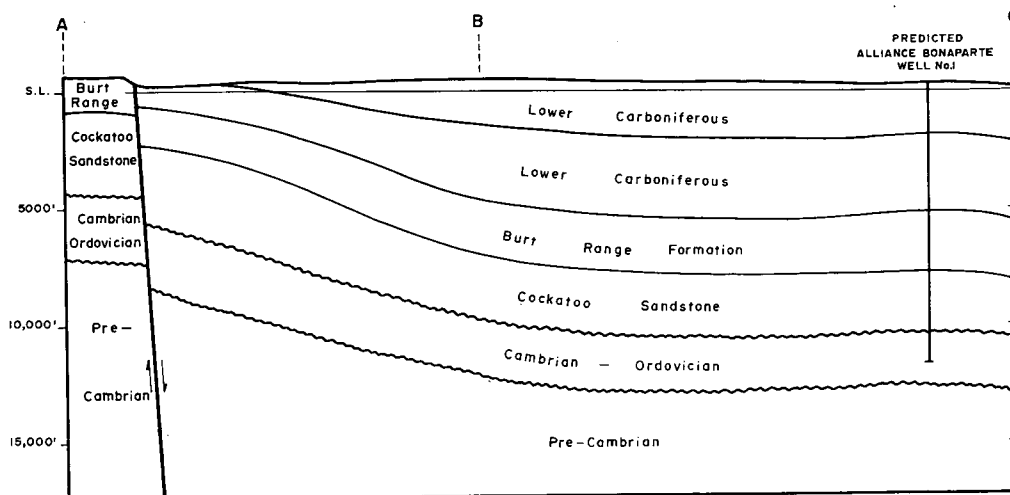
Porosity and Permeability of Sediments Penetrated

In general, the sandstones above 6453 feet have good porosity and permeability; those below this depth are most commonly tight.

The acoustic velocity log and core analyses indicate good porosity for the sandstone beds of the Point Spring Sandstone, and those of the Tanmurra Formation. The analysis of a core from the Point Spring Sandstone gave a porosity of 26 percent, a vertical permeability of 660 millidarcys and a horizontal permeability of 1200 millidarcys. Analyses of sandstone cores obtained from the Tanmurra Formation indicate a porosity of up to 30 percent but the sandstones have permeabilities of from 6 to 87 millidarcys only. The limestone members of the Tanmurra Formation are essentially tight.

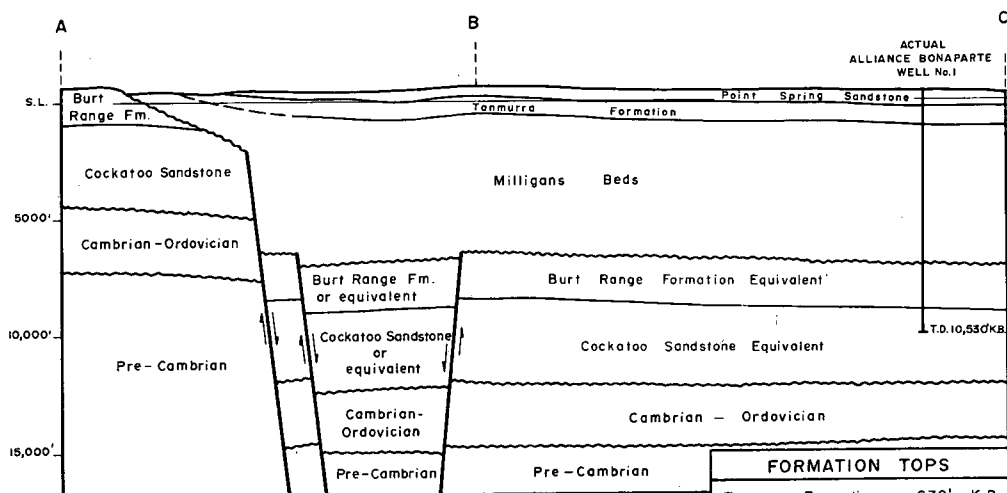
No cores were obtained from any of the porous sandstones which are interbedded in the upper part of the Milligans Beds (1630 to 6453 feet) but the acoustic velocity

Fig. 2



CROSS SECTION A-B-C

Through part of Bonaparte Gulf Basin as assumed before drilling.



CROSS SECTION A-B-C

Through part of Bonaparte Gulf Basin as determined after drilling.

ALLIANCE OIL DEVELOPMENT AUSTRALIA N.L.
 PERMIT TO EXPLORE 127H, WESTERN AUSTRALIA

ALLIANCE BONAPARTE WELL No.1

INTERPRETED GEOLOGICAL CROSS SECTIONS BEFORE DRILLING
 AND STRATIGRAPHIC DATA OBTAINED FROM DRILLING

Drafting by GEODRAFTING SERVICES, JULY 1964.



Note: Refer to Fig. 1 for location of section

logs indicate that these sandstones have porosities which vary between 5 and 35 percent. The caliper log suggests that the permeability of the sandstone beds is also quite variable. The variation in porosity and permeability of the sandstone beds appears to be related to grain size and content of silt and argillaceous matrix rather than to secondary cementation.

Sandstone beds of the lower part of the Milligans Beds (6453 to 7480 feet), and the equivalents of the Burt Range Formation and Cockatoo Sandstone, have poor porosity and permeability. Porosity values of up to 7 percent were obtained from the acoustic velocity logs (using a matrix velocity of 19,000 feet/sec.) for sandstones within this interval; the actual porosity of the sandstones, however, is most probably in all cases considerably less than that determined from the acoustic velocity logs. Analyses of sandstones from depths of 6278 feet (Core No.22) and 6987 feet (Core No.25) indicate porosities of 4 percent and 1 percent respectively; the acoustic velocity log interpretation gives a porosity value of 7 percent for both of these sandstones. No sandstones were present in cores cut in the Burt Range Formation Equivalent. Core analysis data are available for only one sandstone in cores recovered from the Cockatoo Sandstone Equivalent; the porosity of this sandstone was found to be 3 percent.

Poor permeability is also indicated for the sandstone beds in the interval 6453 feet to 10,530 feet, where nine mechanically successful formation tests yielded no recovery other than drilling fluid.

Contribution to Geological Concepts resulting from Drilling

Data obtained from Bonaparte No. 1 Well support the seismic evidence which indicates that at least 15,000 feet of sediments are present within the deeper parts of the Bonaparte Gulf Basin.

The Upper Carboniferous sequence, which is thinner than had been anticipated, consists of 622 feet of Point Spring Sandstone at the well location.

The uppermost Lower Carboniferous sediments consist of 992 feet of sandstone and carbonate of the Tanmurra Formation. The formation was previously known only from scattered outcrops between Ninbing and Knob Peak to the west of the well.

The Tanmurra Formation is underlain by 5850 feet of the Lower Carboniferous Milligans Beds. Before drilling the well, the maximum known thickness of this formation was in the Burt Range Embayment where the Spirit Hill No. 1 Well penetrated 786 feet of shale correlated with the Milligans Beds.

In Bonaparte No. 1, the Milligans Beds consist of marine shales which exhibit the characteristics commonly attributed to source rocks and which also form an effective seal for the numerous porous sandstones which are included in the sequence. The petroleum prospects of the Bonaparte Gulf Basin are considerably enhanced by the presence of this thick sequence of Lower Carboniferous source, reservoir, and seal rocks.

The results of a dipmeter survey of the interval 4904 to 9949 feet in Bonaparte No. 1, show that an angular unconformity is present between the Burt Range Formation Equivalent and the overlying sediments. The angular unconformity results from the block-faulting and tilting of the Burt Range Formation and older sediments, which occurred in early Carboniferous time.

Six miles west of the well the Burt Range Formation crops out in carbonate facies. At the well, however, no carbonate is present, and the Burt Range Formation Equivalent is represented by a sequence of calcareous sandstone and siltstone with some shale.

On the western and southern margins of the Carlton Embayment the Cockatoo Sandstone crops out as a medium to coarse-grained sandstone which is considered to have been deposited under high energy conditions in a near-shore environment. The Cockatoo Sandstone Equivalent encountered in the Bonaparte No. 1 Well consists of sandstone, shale, and siltstone which were deposited under quieter conditions in the deeper part of the embayment.

ADDITIONAL DATA FILED IN THE
BUREAU OF MINERAL RESOURCES

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

- (i) Well Completion Report, by M.C. Le Blanc 30 pp.
 - Appendix 1: Upper Devonian and Carboniferous fossils from Bonaparte No. 1 Well, by D.J. Belford, P.J. Jones, and J. Roberts 6 pp.
 - Appendix 2: Water analyses, by BMR. 2 pp.
 - Appendix 3: Core analyses, by BMR. 5 pp.
 - Appendix 4: Core descriptions by M.C. Le Blanc and G. Stephens 15 pp.
 - Appendix 5a: Log evaluation, 500 to 4962 feet, by R.H. Win 3 pp.
 - Appendix 5b: Log evaluation, 4962 to 9952 feet, by J.E. Haynes 2 pp.
 - Appendix 6: Formation testing (with pressure records), by M.C. Le Blanc 24 pp.
 - Appendix 7: Deviation survey 1 pp.
 - Appendix 8: Well velocity survey, by J.S. Thompson 3 pp.
- (ii) Daily drilling reports for period 18th July, 1963, to 6th June, 1964.
- (iii) Welex well logs including the following:
 - (a) Induction-Electric Log
 - Run 1, 100- 556 feet (1", 5" = 100 ft)
 - Run 2, 510- 4960 feet (1", 5" = 100 ft)
 - Run 3, 4904- 7956 feet (1", 5" = 100 ft)
 - Run 4, 7940- 9948 feet (1", 5" = 100 ft)
 - Run 5, 9930-10278 feet (1", 5" = 100 ft)
 - (b) Acoustic Velocity Log
 - Run 1, 60- 556 feet (1", 5" = 100 ft)
 - Run 2, 510- 4960 feet (1", 5" = 100 ft)
 - Run 3, 4950- 9944 feet (1", 5" = 100 ft)
 - (c) Contact Caliper Log
 - Run 1, 510- 4962 feet (1", 5" = 100 ft)
 - Run 2, 4904- 7830 feet (1", 5" = 100 ft)
 - Run 3, 7800- 9950 feet (1", 5" = 100 ft)
 - Run 4, 9730-10280 feet (1", 5" = 100 ft)
 - (d) Dip Log
 - Run 1, 4904- 9949 feet (1" = 100 ft)

BONAPARTE NO. 2

of

ALLIANCE OIL DEVELOPMENT AUSTRALIA NO LIABILITY

SUMMARY OF DATA AND RESULTS

BONAPARTE NO. 2

SUMMARY OF DATA AND RESULTS*

SUMMARY

Bonaparte No. 2 Well was located about five miles south-south-west of Bonaparte No. 1, in the Bonaparte Gulf Basin of Western Australia. It was drilled for Alliance Oil Development Australia No Liability by Reading and Bates (Australia) Pty Ltd, to total depth of 7008 feet. Drilling commenced on 25th July, 1964 and was completed on 9th October, 1964. A full programme of logging, coring, and testing was undertaken.

The well penetrated the Upper Carboniferous Point Spring Sandstone from surface to 608 feet; the Lower Carboniferous Tanmurra Formation to 1577 feet, and Milligans Beds to 6675 feet; and the Lower Carboniferous to Upper Devonian Burt Range Formation Equivalent to 7008 feet, total depth.

Fourteen drillstem tests were conducted during the drilling operation. Two of these produced gas from a thin sandstone bed in the interval 4716 to 4726 feet within the Milligans Beds. On initial test, gas flowed at a maximum rate of 1,540,000 cubic feet per day. Analysis of the gas indicated that it contains at least eight percent of higher hydrocarbons. The gas-bearing zone was retested over a 4 1/2-hour flow period after the well had reached total depth; during this second test the gas flow stabilized at a rate of 1,150,000 cubic feet per day. This was considered to be uncommercial and the well was plugged and abandoned.

The test drilling operation at Bonaparte No. 2 Well was subsidized under the Petroleum Search Subsidy Act 1959-1964, from surface to total depth.

* Abstracted from: Well Completion Report, Bonaparte Well No. 2, by M.C. Le Blanc, Alliance Oil Development Australia No Liability, January, 1965.

WELL HISTORY

General Data

Well name and number:	Bonaparte No. 2
Location:	Latitude 15°05'07" S. Longitude 128°43'16" E.
Name and address of Tenement Holder:	Alliance Oil Development Australia N.L., 100 Collins Street, Melbourne, Victoria.
Details of Petroleum Tenement:	Permit to Explore 127H, Western Australia
Total Depth:	7008 feet
Date drilling commenced:	25th July, 1964
Date drilling completed:	9th October, 1964
Date well abandoned:	14th October, 1964
Date rig released:	14th October, 1964
Elevation (ground):	383 feet
Elevation (K.B.):	399.6 feet (datum for depths)
Status:	Plugged and abandoned as a non-commercial gas discovery
Cost:	£228,964

Drilling Data

Drilling Plant:			
Make:	National		
Type:	75		
Hole sizes and depths:	20" to 31 feet 17 1/2" to 545 feet 12 1/4" to 2563 feet 8 3/4" to 7008 feet (T.D.)		
Casing details:			
Size (in.):	18 1/2	13 3/8	9 5/8
Weight (lb./ft):		48	36
Grade:		H.40	J.55
Setting depth (ft):	31	545	2563

Logging and Testing

Ditch Cuttings:	
Interval:	Ten feet from surface to total depth, reduced to five feet when coring, and in zones of special interest.
Coring:	Fifteen cores, with a total length of 199 feet and a recovery of 162 feet 1 inch (81.45%), were cut using a 30-foot, 6 7/8" OD., C.D.T. core barrel, and Mindrill diamond coreheads, Hughes drag-type coreheads, and Hughes cone-type coreheads.
Sidewall Cores:	Four samples were recovered from 39 shots fired. Halliburton equipment was used.
Electric and other logging (Halliburton):	
Induction-Electric Log:	50-7000 feet (5 runs)
Acoustic Velocity Log with Gamma Ray:	30-7000 feet (4 runs)
Contact Caliper Log:	540-7002 feet (4 runs)
Caliper Log:	4396-6500 feet (1 run)
Dip Log:	3300-6517 feet (1 run)
Velocity Survey:	Sixteen horizons were tested between 2563 and 6501 feet. The survey was made by Petty Geophysical Engineering Company.
Temperature Survey:	Five bottom-hole temperature readings were taken by Halliburton Limited during the course of logging operations. The B.H.T. at 7005 feet was 182° F.
Deviation Survey:	Eighty readings were taken with a Totco instrument during drilling. The final reading at 7008 feet showed a deviation of 1°.
Drilling Rate, Oil, and Gas Log:	Continuous drilling rate (from 31 feet) and gas plots (from 545 feet) were recorded during drilling.
Formation Testing:	Fourteen Halliburton formation tests were carried out during the drilling operation. Ten were conducted in open hole concurrently with drilling operations; one was a misrun because of packer seat failure. An additional four tests were conducted in open hole after the well had reached total depth; one was a misrun because of packer failure.

DST No. 6 of the interval 4712 to 4819 feet flowed gas at maximum rate of 1.54 MMcf/D.

DST No. 14 of the interval 4694 to 4760 feet flowed gas at maximum rate of 1.15 MMcf/D.

Detailed results of the formation tests are given in Appendix 6 to the well completion report. Copies are available for inspection at the Bureau of Mineral Resources, Canberra.

GEOLOGY

Stratigraphy

General:

Bonaparte No. 2 Well spudded in the Upper Carboniferous Point Spring Sandstone and then penetrated the Lower Carboniferous Tanmurra Formation and Milligans Beds. The well bottomed in Lower Carboniferous to Upper Devonian Burt Range Formation Equivalent, unconformable below the Milligans Beds.

There is no essential difference between the stratigraphic sequences in Bonaparte No. 1 and Bonaparte No. 2. The Milligans Beds are 752 feet thicker in the No. 1 Well; this difference is attributed in part to a normal fault upthrown to the west, intersecting Bonaparte No. 2 at 4950 feet, and cutting out about 420 feet of the Milligans Beds. The remainder is caused by thinning of the section between the two wells.

The stratigraphic sequence encountered in Bonaparte No. 2 is shown below:

<u>Age</u>	<u>Formation</u>	<u>Depth Intervals</u> (feet)	<u>Thickness</u> (feet)
Upper Carboniferous	Point Spring Sandstone	17 - 608	591+
Lower Carboniferous	Tanmurra Formation	608 - 1577	969
Lower Carboniferous	Milligans Beds	1577 - 6675	5098
————— (?) Angular Unconformity —————			
Lower Carboniferous to Upper Devonian	Burt Range Formation Equivalent	6675 - 7008(T.D.)	333+

Detailed:

Point Spring Sandstone (Upper Carboniferous, Namurian): Surface to 608 feet (591 feet +)

The upper part consists of loose, iron-stained, fine to very coarse-grained, quartz sand, with minor amounts of variegated, silty to sandy, very ferruginous shale. From 470 feet, the section consists of fine to medium-grained, subangular to round, poorly sorted and poorly consolidated, quartz sandstone with good intergranular porosity.

Tanmurra Formation (Lower Carboniferous, Visean): 608 to 1577 feet (969 feet)

The formation consists of sandstone with lesser amounts of interbedded dolomite, siltstone, and shale.

In the upper part, the sandstone is predominantly light grey to brown, very fine-grained to fine-grained, quartzose, often silty, in part kaolinitic, calcareous to dolomitic, and has moderate intergranular porosity. Below 850 feet, in addition to the sandstone described above, the sequence includes numerous thick beds of very fine to very coarse-grained, very poorly sorted, angular to subangular, quartzose sandstone.

The dolomite is olive-grey to medium brown, moderately to very arenaceous, and becomes argillaceous towards the base of the formation.

The siltstone is grey, often carbonaceous, in part very finely sandy, in part dolomitic and argillaceous.

The shale is grey, silty, and carbonaceous.

Milligans Beds (Lower Carboniferous): 1577 to 6675 feet (5098 feet)

The formation consists predominantly of shale. Below 3274 feet, the sequence includes some interbedded sandstone and very minor siltstone.

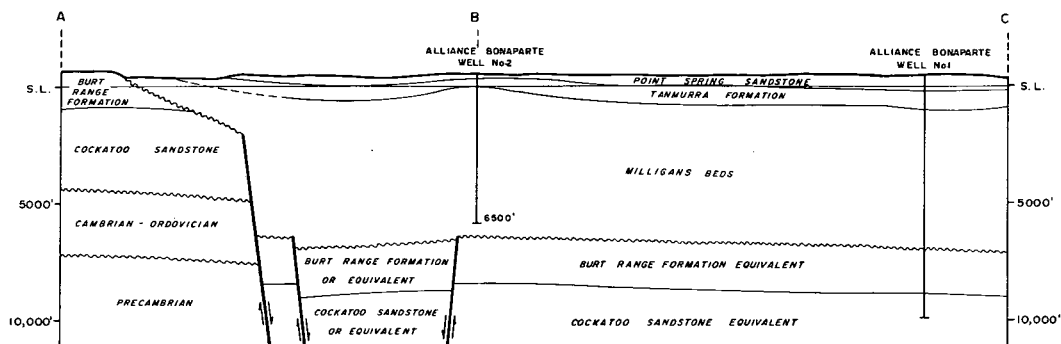
1577 to 3274 feet:

Light to dark grey and greenish-grey, non-silty to moderately silty, slightly fossiliferous shale. A bed of fine-grained, porous, quartz sandstone is present from 1742 to 1750 feet.

3274 to 6675 feet:

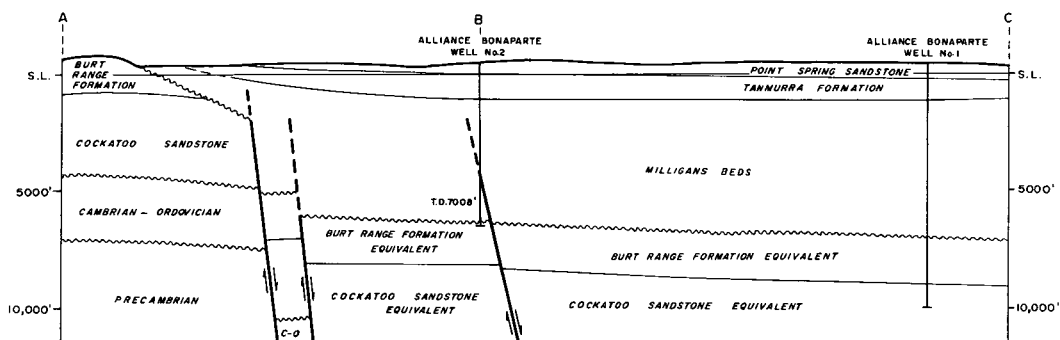
Shale with some sandstone and very minor siltstone. The shale is medium to dark grey, slightly silty and carbonaceous, and rarely slightly calcareous. Several zones of slightly to moderately sandy shale with medium to coarse quartz grains are present below 4300 feet.

On the basis of its stratigraphic position and of its electrical characteristics the sequence of shale and sandstone from 6675 feet to total depth can be broadly correlated with the Burt Range Formation Equivalent which at Bonaparte No. 1 Well underlies the Milligans Beds with slight angular unconformity. As a dipmeter survey was not conducted below 6517 feet at Bonaparte No. 2 it is not known whether the relationship between the Milligans Beds and Burt Range Formation Equivalent at this location is also unconformable.



CROSS SECTION A-B-C

Through part of Bonaparte Gulf Basin as assumed before drilling.



CROSS SECTION A-B-C

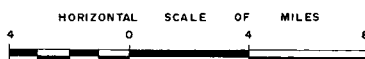
Through part of Bonaparte Gulf Basin as determined after drilling

FORMATION TOPS	BONAPARTE WELL NO. 2	BONAPARTE WELL NO. 1
TANMULLA FORMATION	608'	638'
MILLIGANS BEDS	1577'	1630'
BURT RANGE FM. EQUIVALENT	6675'	7480'
COCKATOO SANDSTONE EQUIVALENT		9492'

ALLIANCE OIL DEVELOPMENT AUSTRALIA N.L.
PERMIT TO EXPLORE 127 H, WESTERN AUSTRALIA

ALLIANCE BONAPARTE WELL No.2

INTERPRETED GEOLOGICAL CROSS SECTIONS BEFORE DRILLING
AND STRATIGRAPHIC DATA OBTAINED FROM DRILLING



Note: Refer to Fig. 1 for location of section.

Burt Range Formation Equivalent (Lower Carboniferous to Upper Devonian):
6675 to 7008 feet (333 feet+)

This unit consists of shale with, in its upper part, an appreciable amount of interbedded sandstone and several stringers of very sandy limestone. The shale is medium to dark grey, in part slightly silty, and sub-fissile to blocky.

The sandstone is light grey and brownish-grey, poorly sorted, and consists of very fine-grained to medium-grained quartz cemented with silica. The sandstone beds are usually moderately silty, occasionally kaolinitic, and in part show poor to fair porosity. Several of the beds are slightly to moderately calcareous and in part grade to very sandy limestone.

Structure

The Bonaparte No. 2 Well was located on a closed seismic structure having a minimum of 150 feet of closure mapped on a phantom horizon about 5600 feet below sea level. The seismic data indicated that the location is about 800 feet structurally higher than that of Bonaparte No. 1.

The continuous dipmeter survey conducted over the interval 3300 to 6517 feet indicated that the well intersects a fault at approximately 4950 feet. A tentative correlation of the sediments at Bonaparte No. 2 with their possible equivalents at Bonaparte No. 1 suggests that the fault is a normal one with the eastern fault-block down-thrown. The fault is correlated with a possible north-trending fault mapped on the surface, north-west of the well, in the Point Spring Sandstone.

Oil and Gas Indications and Potential

A drillstem test of a thin sandstone between 4716 and 4726 feet in the Milligans Beds, flowed gas at the rate of 1.54 MMcf/D. Analyses show that the gas contains at least eight percent of higher hydrocarbons.

Fluorescence was noted in several zones between 3500 feet and 6100 feet but drillstem tests yielded only drilling mud and salt water, and no hydrocarbons.

Porosity and Permeability of Sediments Penetrated

The Point Spring Sandstone and Tanmurra Formation consist predominantly of porous and permeable sandstones containing fresh water. The Milligans Beds contain several sandstone horizons most of which are tight, but three permeable beds having a porosity of 13 to 16 percent occur between 4541 and 4860 feet.

Contribution to Geological Concepts resulting from Drilling

The well penetrated a sedimentary sequence essentially similar to that encountered at Bonaparte No. 1, and did not make any noteworthy addition to geological knowledge of the Bonaparte Gulf Basin.

The strong gas flow which resulted from a drillstem test of a thin sandstone member of the Milligans Beds has established that source beds for hydrocarbons and suitable sandstone reservoirs are present in the Palaeozoic sediments of the Bonaparte Gulf Basin.

REFERENCES

- | | | |
|--|-------|---|
| ALLIANCE OIL DEVELOPMENT
AUSTRALIA N.L., | 1964: | Surprise Creek seismic survey final report (Unpubl.). |
| DRUMMOND, J.M., | 1963: | Compilation and review of the geology of Bonaparte Gulf Basin, 1962. <u>Bur. Min. Resour. Aust. Rec.</u> 1963/133 (Unpubl.). |
| VEEVERS, J.J., ROBERTS, J.,
KAULBACK, J.A., and JONES,
P.J., | 1964: | New observations on the Palaeozoic geology of the Ord River Area, Western Australia and Northern Territory. <u>Aust. J.Sci.</u> , 26, 11. |
| WESTRALIAN OIL LTD, and
OIL DEVELOPMENT N.L., | 1963: | Spirit Hill No. 1 Well completion report (Unpubl.). |

ADDITIONAL DATA FILED IN THE
BUREAU OF MINERAL RESOURCES

The following additional data relating to Bonaparte No. 2 Well have been filed in the Bureau of Mineral Resources, Canberra, and are available for reference:

- (i) Well Completion Report, by M.C. Le Blanc 22 pp.
 - Appendix 2: Gas analyses, by BMR, and Government 3 pp.
Chemical Laboratories, W.A.
 - Appendix 4: Core analyses by BMR. 3 pp.
 - Appendix 5: Core descriptions, by M.C. Le Blanc and 10 pp.
B. Clarke
 - Appendix 6: Formation testing (with pressure records), by 9 pp.
M.C. Le Blanc
 - Appendix 7: Deviation survey 2 pp.
 - Appendix 8: Well velocity survey, by Petty Geophysical 3 pp.
Engineering Company
- (ii) Daily drilling reports for period 17th July, 1964 to 22nd October, 1964.
- (iii) Welex well logs including the following:
 - (a) Induction-Electric Log
 - Run 1, 50- 538 feet (2", 5" = 100 ft)
 - Run 2, 540-2553 feet (2", 5" = 100 ft)
 - Run 3, 2564-4810 feet (2", 5" = 100 ft)
 - Run 4, 4800-6502 feet (2", 5" = 100 ft)
 - Run 5, 6450-7000 feet (2", 5" = 100 ft)
 - (b) Acoustic Velocity Log (with Gamma Ray)
 - Run 1, 30- 534 feet (2", 5" = 100 ft)
 - Run 2, 540-2550 feet (2", 5" = 100 ft)
 - Run 3, 2564-6499 feet (2", 5" = 100 ft)
 - Run 4, 6490-7000 feet (2", 5" = 100 ft)
 - (c) Contact Caliper Log
 - Run 1, 540-2555 feet (2", 5" = 100 ft)
 - Run 2, 2564-4812 feet (2", 5" = 100 ft)
 - Run 3, 4800-6502 feet (2", 5" = 100 ft)
 - Run 4, 6490-7002 feet (2", 5" = 100 ft)
 - (d) Caliper Log
 - Run 1, 4396-6500 feet (5" = 100 ft)
 - (e) Dip Log (with calculations)
 - Run 1, 3300-6517 feet (2" = 100 ft)

COMPANY: ALLIANCE OIL DEVELOPMENT AUSTRALIA N. L.
WELL NUMBER: ALLIANCE BONAPARTE WELL No.1

WELL STATUS: DRY and ABANDONED

LOCATION: 128° 44' 30" E Longitude, 15° 01' 00" S Latitude

ELEVATION: Reference Pt. Ground - 339'

K.B. - 355.3'

Date Spudded:	18 July, 1963
Date Suspended:	19 Dec., 1963
Date Operation Resumed:	25 April, 1964
Date Drilling Stopped:	4 June, 1964
Date Rig Released:	6 June, 1964
Total Depth Driller:	10,530' K. B.

<u>Hole Size:</u>	<u>Inches</u>	<u>From</u>	<u>To</u>
	20	16'	29' K. B.
	17 1/2	29'	560' K. B.
	12 1/4	560'	4964' K. B.
	8 3/4	4964'	10,530' K. B.

Casing	Inches	Wt.	Gr.	Depth	Cmt	Cmt'd to
Conductor	18 1/2			29' K.B.	25 sax	18-8' K.B.
Surface	13 3/8	48	H-40	510-9' K.B.	500 sax	Surface
Intermediate	9 1/2	36	J-55	4911' K.B.	300 sax.	4280' K.B.

Recovered 2500 feet of intermediate casing

<u>Cement Plugs:</u>	<u>From</u>	<u>To</u>	<u>Sacks</u>
	16'	38'	20
	1700'	1750'	40
	2450'	2550'	47
	5580'	5680'	41

Drilled by: Reading and Bates (Australia) Pty. Ltd.
 Logged by: Halliburton
 Cemented by: Reading and Bates (Australia) Pty. Ltd.
 Drilling Method: Rotary

Lithology by: Le Blanc, Stephens

INDUCTION LOG DATA

RUN NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000
Date	18 July, 1963	24 August, 1963	18 October, 1963	17 December, 1963	6 May, 1964	24 August, 1963	18 October, 1963	18 December, 1963	6 May, 1964	19 July, 1963	25 August, 1963	18 December, 1963																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												

CONTACT CALIPER DATA








ACOUS TIC LOG DATA

OTHER SURVEYS

Continuous Dipmeter Survey 4904' to 9949' K.B.

Well Velocity Survey

WELL SYMBOLS

○	Gas show slight		Core interval, number
○○	Gas show strong		Formation test interval
●	Oil show slight		Sidewall core
●●	Oil show strong		Casing shoe
●○	Oil and gas show		Plugged interval
FI	Fluorescence		Perforated interval
—	Circulation loss partial		Dipmeter results (dip and azimuth)
—	Circulation loss complete		
↑	Gas cut mud		
↑	Blowout		

LITHOLOGIC REFERENCE

	No sample		Dolomite
	Conglomerate		Reefoid limestone
	Breccia		Reefoid dolomite
	Sandstone		Evaporite
	Siltstone		Coal
	Limestone		Igneous rock (granite)
	Shale, claystone,		Volcanic rock (basalt)

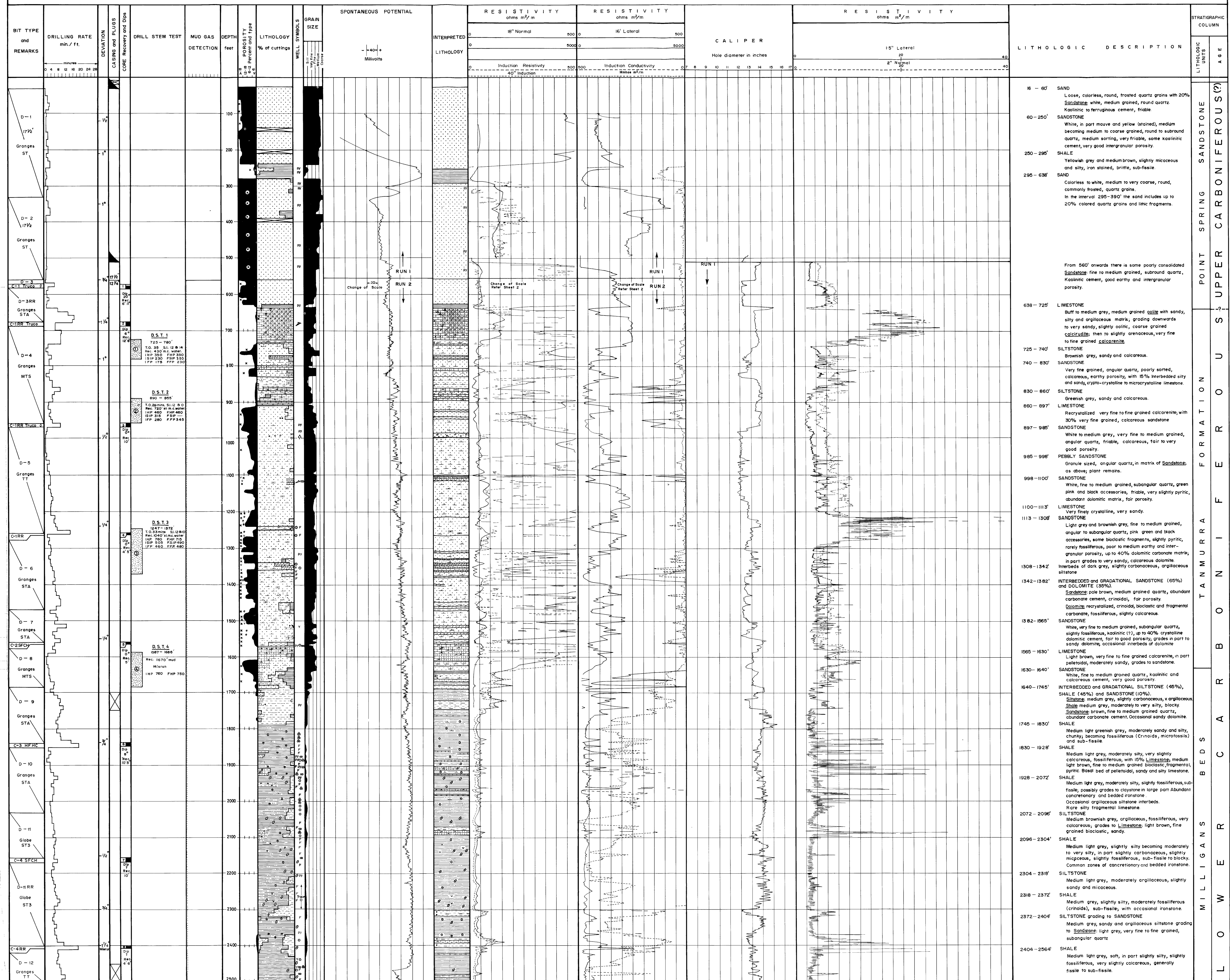
POROSITY TYPE

<input type="checkbox"/> G	Glauconitic	<input type="checkbox"/> x	Intercrystalline, intergranular
<input type="checkbox"/> py	Pyritic	<input type="checkbox"/> e	Earthy (capillary)
<input type="checkbox"/> C	Carbonaceous	<input type="checkbox"/> f	Fracture
<input type="checkbox"/> S	Siliceous	<input type="checkbox"/> v	Vugular
<input type="checkbox"/> B	Bituminous	<input type="checkbox"/> o	Organic, bridged, intrafossil
<input type="checkbox"/> x	Vug grown crystal		
<input type="checkbox"/> c	Concretion		

FOSSILS and CARBONATE CONSTITUENTS

◊ Crinoid	✓ Plant
⚓ Coral	Ⓢ Macrofossil
☂ Stromatolite	Ⓢ Microfossil
☂ Algae	F Fossiliferous (fragmental or indeterminate)
Y Bryozoa	
⌒ Lithic carbonate fragments	
⌒ Pellets, pseudo oolites	
⌒ Oolites	
⌒ Molluscs or brachiopods	

DRG. No. O.D/313



BIT TYPE and REMARKS	DRILLING RATE min./ft.	CASING AND PLUGS CORE CORRELATION	DRILL STEM TEST	MUD GAS DETECTION	DEPTH feet	POROSITY Percent and type	LITHOLOGY % of cuttings	WELL SYMBOLS	SPONTANEOUS POTENTIAL - 20 + Millivolts	INTERPRETED LITHOLOGY	RESISTIVITY ohms m ² /m		CALIPER Hole diameter in inches	RESISTIVITY ohms m ² /m		LITHOLOGIC DESCRIPTION	STRATIGRAPHIC COLUMN		
											16" Normal			16" Lateral				1-5" Lateral	
											0	500		0	500			0	40
											Induction Resistivity 40" Induction	Induction Conductivity Mhos m ² /m							
											0	500	0	500	0	40			
C-5 Truco 6					2564												Occasional interbeds of argillaceous siltstone and some ironstone.		
D-13 Globe ST3	Weight on bit 15-18,000 lbs				2564												Very light grey, very fine to fine grained, angular quartz, rare shale grains, slightly becoming moderately silty, friable, good porosity, grades to 5-foot unit of sandy siltstone.		
					2566												SHALE		
					2672												Medium light to dark grey and greenish grey, slightly to moderately silty, fissile to sub-fissile, with occasional interbeds of siltstone and abundant concretionary and bedded ironstone.		
					2672												SHALE		
					2713												Medium grey, moderately to very silty, chunky; with occasional interbeds of argillaceous siltstone.		
C-5 RR Truco 2					2713												SHALE		
D-13 RR Globe ST3	Weight on bit increased to 30-35,000 lbs				2713												Medium light to medium grey, in part slightly to moderately silty, rarely pyritic, slightly fossiliferous (occasional crinoids and rare micro fossils), rarely slightly calcareous, fissile to sub-fissile, with occasional very silty zones and some interbedded argillaceous sandstone; occasional concretionary ironstone.		
					3080												SHALE		
D-14 Globe ST3					3080												Medium light grey, occasionally slightly silty, rarely fossiliferous, platy to fissile. Common ironstone.		
C-5 RR Truco 3					3310												SHALE		
D-14 RR Globe ST3					3310												Medium grey, becoming medium light grey, non-silty, generally sub-fissile to platy, becoming fissile and very slightly fossiliferous near base of unit. Scattered concretionary ironstone.		
					3600												SHALE		
C-5 RR Truco 4					3600												SANDSTONE grading to SILTSTONE		
D-15 Globe ST3					3600												White to pale brown, very fine grained, subangular quartz and occasional green grains, calcareous, poor earthy porosity, silty, grades to basal sandy siltstone.		
					3825												SHALE		
					3825												Medium to dark grey, slightly silty, sub-fissile to blocky; with 5% Sandstone: white, in part brown, very fine to fine grained, subround to subangular quartz, very siliceous, tight.		
					3940												SANDSTONE		
					3940												White, fine grained becoming very fine grained, subround to subangular quartz, powdery siliceous and calcareous cement, poor earthy porosity.		
					3956												SHALE		
					3956												Medium grey, slightly silty, platy, with occasional Siltstone: light to medium grey, moderately to very argillaceous, slightly calcareous; rare interbeds of fine grained, dolomitic sandstone.		
					4092												SANDSTONE		
					4092												White, very fine to fine grained, subangular quartz, moderately friable, powdery calcareous cement, fair earthy porosity; becoming siliceous and tough and in part grading to orthoquartzite.		
					4122												SHALE		
					4122												Medium grey, slightly silty and sandy, platy to blocky.		
					4160												SILTSTONE		
					4160												Medium grey to brownish grey, micaceous, argillaceous, slightly pyritic, coarsely sandy; grades to 13-foot thick basal unit of poorly sorted, silty sandstone.		
					4190												SHALE		
					4190												Medium light to medium grey, generally silty, in part moderately to very silty, in part finely to coarsely sandy, in part slightly calcareous, in part slightly pyritic, trace crinoid fragments, blocky becoming platy to fissile. Occasional interbeds of micaceous and argillaceous siltstone. Some ironstone near base of unit.		
C-5 RR Truco 5					4584												SANDSTONE		
D-23 Granges MTS					4584												White, very fine to fine grained, subangular quartz, poorly sorted with common medium grains, very friable, good earthy porosity		
					4603												SHALE		
					4603												Medium grey, silty, chunky, with some siliceous siltstone		
					4640												INTERBEDDED SHALE (70%), SILTSTONE (20%) and SANDSTONE (10%)		
					4640												Shale: light grey and brownish grey, moderately silty, platy. Siltstone: light brownish and greenish grey, argillaceous, sandy, siliceous. Sandstone: greenish grey, very fine grained, very silty, siliceous, tight.		
					4690												SHALE		
					4690												Medium grey, in part slightly brownish, slightly to moderately silty, some very silty zones, rarely sandy, platy to blocky; with 5-10% interbedded Siltstone: medium brownish grey, moderately to very argillaceous, slightly sandy, very slightly calcareous.		
					5000												Occasional interbeds of very fine grained, siliceous sandstone and occasional zones of ironstone.		

PLATE 1
SHEET 3

Sheet 3 of 5

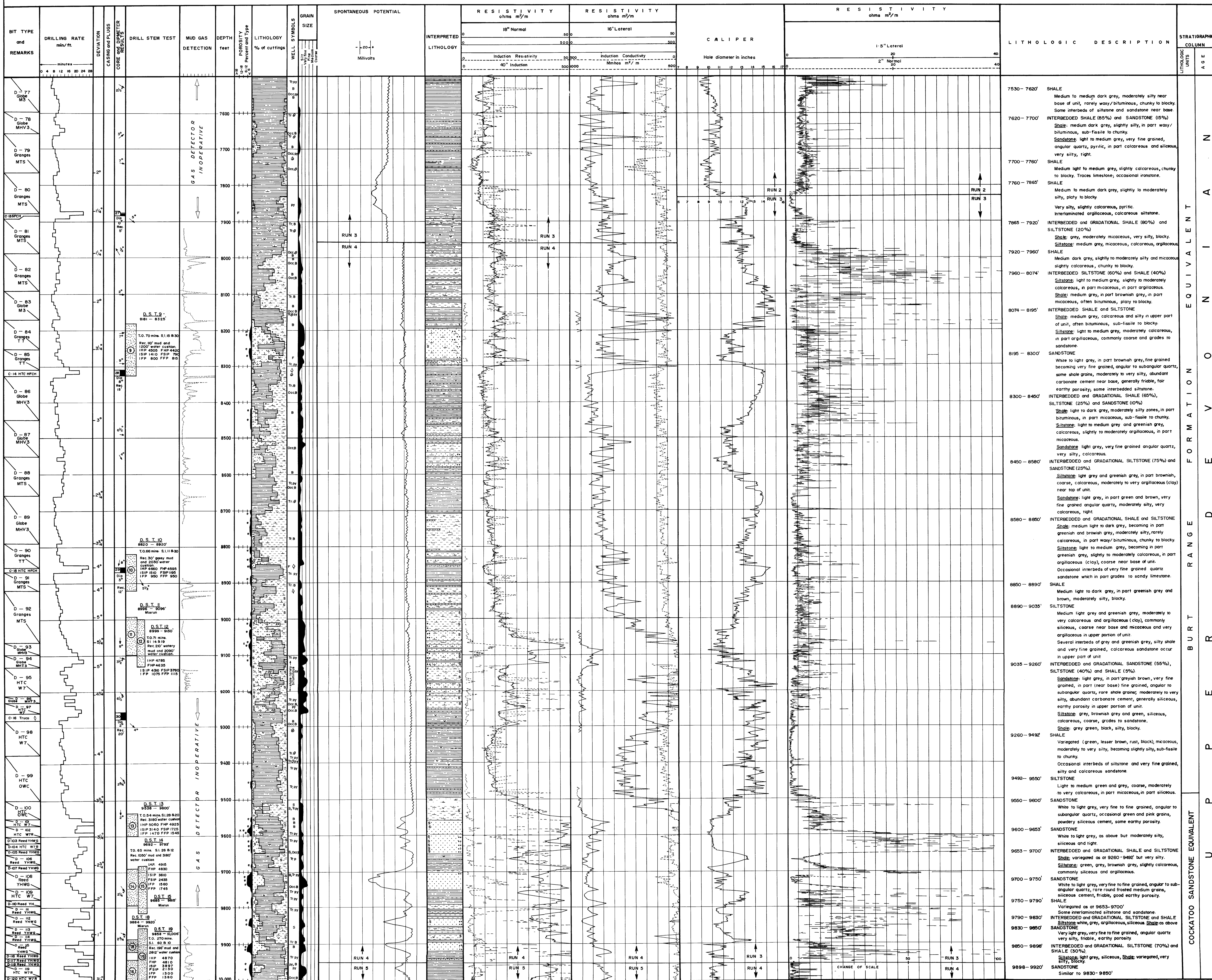
DRG. No. O.D/313

BIT TYPE and REMARKS	DRILLING RATE Min./ft.	DEVIATION	Casing and PLUGS RESULTS	DRILL STEM TEST	MUD GAS DETECTION	DEPTH feet	LITHOLOGY % of cuttings	GRAIN SIZE	SPONTANEOUS POTENTIAL Millivolts	INTERPRETED LITHOLOGY	RESISTIVITY ohms m/m			CALIPER Hole diameter in inches	RESISTIVITY ohms m/m			LITHOLOGIC DESCRIPTION	STRATIGRAPHIC COLUMN				
											18" Normal				16" Lateral				15" Lateral			LITHOLOGIC UNIT	AGE
											0	50	500		0	50	500		0	50	500		
D-30 Globe M5																	5000-5086' SHALE Medium light to dark grey, in part slightly silty, fissile to platy. At 5023-5027' Sandstone: very fine to fine grained, subangular quartz, dolomitic cement, light.	S D E E R O U S B I N S A R B O N I G A R B O N I L					

COMPOSITE WELL LOG
ALLIANCE BONAPARTE WELL No.1

7500 - 10,000'
Sheet 4 of 5
DRG. No. QD/313

PLATE I
SHEET 4



DRG. No. O.D./313

BIT TYPE and REMARKS	DRILLING RATE min. / ft. <div>minutes</div> <div>0 4 8 12 16 20 24 28</div>	DEVIATION Casing and Plugs Cores Recovery and Dips	DRILL STEM TEST	MUD GAS DETECTION	DEPTH feet	POROSITY Percent and type	LITHOLOGY % of cuttings	WELL SYMBOLS <div>SH Very fine Fine Coarse</div>	SPONTANEOUS POTENTIAL <div>-20 +</div> <div>Millivolts</div>	INTERPRETED LITHOLOGY	RESISTIVITY Ohms - m ² /m		CALIPER Hole diameter in inches	RESISTIVITY Ohms - m ² /m		LITHOLOGIC DESCRIPTION	STRATIGRAPHIC COLUMN	
											18" Normal 50 500	16' Lateral 500		1:5" Lateral 50 100	2" Normal 50 100		LITHOLOGIC UNITS	AGE
D-121 HTC W7R D-122 HTC W7R D-123 HTC W7R D-124 HTC W7R D-125 HTC W7R D-126 HTC W7R D-127 HTC W7R D-128 HTC W7R D-129 HTC W7R D-130 HTC W7R D-131 HTC W7R D-132 RR D-133 HTC W7R D-134 HTC W7R D-135 HTC W7R D-136 HTC W7R D-142 HTC W7R D-143 HTC W7R D-144 HTC W7R D-145 HTC W7R D-146 HTC W7R D-147 HTC W7R D-148 HTC W7R D-149 W7R D-150 W7R D-151 HTC W7R D-152 HTC W7R D-153 HTC W7R D-154 HTC W7R D-155 HTC W7R D-156 HTC W7R D-157 HTC W7R D-158 HTC W7R D-159 Trace O	<div>minutes</div> <div>0 4 8 12 16 20 24 28</div>	<div>34°</div> <div>1 1/4°</div> <div>1 1/4°</div> <div>0°</div> <div>1/2°</div> <div>12°</div> <div>1° 9'</div>	<div>16</div> <div>19</div> <div>D.S.T. 16</div> <div>9943-10,011'</div> <div>T.O. 62 mins. S.I. 60 832</div> <div>Rec. 576' mud and 3336'</div> <div>water cushion</div> <div>IHP 5300 FHP 5100</div> <div>ISIP 4050 FSIP 2180</div> <div>IFP 1556 FFP 1615</div> <div>D.S.T. 17</div> <div>10,136 - 10,283'</div> <div>T.O. 276 mins. S.I. 62850</div> <div>Rec. 3650' water</div> <div>cushion</div> <div>IHP 5185 FHP 5185</div> <div>ISIP 3850 FSIP 1630</div> <div>IFP 1600 FFP 1630</div> <div>31</div> <div>Dip</div> <div>Rec.</div> <div>2° 3'</div> <div>32</div> <div>Dip</div> <div>Rec.</div> <div>8°</div> <div>33</div> <div>Dip</div> <div>Rec.</div> <div>6°</div> <div>34</div> <div>Dip</div> <div>Rec.</div> <div>12°</div> <div>1° 9'</div>		10,100 10,200 10,300 10,400 10,500 10,600 10,700	<div>py. B</div> <div>S</div> <div>py</div> <div>Tr. G</div> <div>Occ. py</div> <div>B</div> <div>Occ. B</div> <div>Tr. B</div> <div>Tr. G</div> <div>Tr. G</div> <div>py</div> <div>Tr. py</div> <div>py</div> <div>Tr. py</div> <div>F</div> <div>py</div>						9920 - 10,030' 10,030 - 10,160' 10,160 - 10,240' 10,240 - 10,340' 10,340 - 10,390' 10,390 - 10,530'	SHALE Grey and green, in part rust and black, waxy, silty. INTERBEDDED SANDSTONE and SILTSTONE Sandstone: White, very fine to fine grained, subangular quartz, poor earthy porosity. Siltstone: Grey and greenish grey, in part calcareous and argillaceous. SHALE Variegated (grey, green, rust, black), in part silty, subfissile to blocky. Occasional siltstone and sandstone interbeds. SILTSTONE Medium grey, calcareous, in part grades to silty limestone. SANDSTONE Very light grey, very fine to fine grained, subangular quartz, siliceous, tight. INTERBEDDED SHALE, SILTSTONE (20%), and SANDSTONE (10%). Shale: medium dark grey, in part rust and olive, in part silty, becomes calcareous near base of unit. Siltstone: grey and greenish grey, slightly calcareous. Sandstone: as above, tight.	COCKATOO SANDSTONE EQUIVALENT UPPER DEVONIAN				

COMPOSITE WELL LOG

ALLIANCE OIL DEVELOPMENT AUSTRALIA N.L.

ALLIANCE BONAPARTE WELL No.2

PETROLEUM TENEMENT: 127H

STATE: WESTERN AUSTRALIA

4-MILE SHEET CAMBRIDGE GULF

BASIN: BONAPARTE GULF

WELL STATUS: PLUGGED and
ABANDONED NON-COMMERCIAL
MILLIGANS BEDS GAS DISCOVERY

LOCATION 128° 43' 16" E. Longitude
15° 09' 07" S. Latitude

ELEVATION: Reference Pt. Ground 383 feet
K.B. 399.6 feet

Date Spudded: 25 July, 1964
Date Drilling Stopped: 9 October, 1964
Date Rig Released: 14 October, 1964
Total Depth: Driller 7008' K.B.
Logger 7005' K.B.

Hole Size Inches From To
20 16' 6" 31'
17 1/2 16' 6" 540'
12 1/2 540' 2563'
8 2563' 7008'

Casing Inches Wt Gr Depth Cmt Cmt'd to
Conductor 18 1/2 48 H-40 545' K.B. 35 sacks 19' 0" K.B.
Surface 13 3/4 48 H-40 545' K.B. 480 sacks 19' 1" K.B.
Intermediate 9 3/4 36 J-55 2563' K.B. 380 sacks 1800' K.B.

Cement Plug From To Sacks Felt at
No. 1 6050' 6200' 65 Not felt for
No. 2 5700' 5800' 55 Not felt for
No. 3 4760' 4900' 100 4760'
No. 4 4450' 4600' 100 Not felt for
No. 5 2900' 2620' 100 Not felt for
No. 6 19' 31' 20 19'

Drilled by: Reading & Bates (Australia) Pty. Ltd.
Drilling Method: Rotary
Cemented by: Halliburton Limited
Logged by: Halliburton Limited
Lithology by: Le Blanc and Clarke

INDUCTION ELECTRIC LOG DATA

CONTACT CALIPER LOG DATA

ACOUSTIC VELOCITY LOG DATA

OTHER SURVEYS

RUN NUMBER	1	2	3	4	5	1	2	3	4	1	2	3	4
Date	July 29, 1964	August 11, 1964	September 7, 1964	October 1, 1964	October 9, 1964	August 11, 1964	September 7, 1964	October 1, 1964	October 9, 1964	July 29, 1964	August 11, 1964	September 7, 1964	October 1, 1964
First Reading	538'	2553'	4810'	6502'	7000'	2553'	4812'	6502'	7000'	554'	2553'	4810'	6502'
Last Reading	50'	540'	2564'	4803'	6490'	540'	2564'	4803'	6490'	30'	540'	2564'	4803'
Interval Logged	488'	2013'	2246'	1702'	900'	2013'	2248'	1702'	900'	504'	2013'	2246'	900'
Depth Reached	544'	2563'	4815'	6503'	7000'	544'	4815'	6503'	7000'	544'	2563'	4815'	6503'
Depth Driller	544'	2563'	4815'	6527'	7008'	544'	4817'	6527'	7008'	544'	2563'	4817'	6527'
Casing Logger	---	540'	2564'	2564'	2564'	540'	2564'	2564'	2564'	---	540'	2564'	2564'
Casing Driller	---	540'	2563'	2563'	2563'	540'	2563'	2563'	2563'	---	540'	2563'	2563'
Casing Size	---	12 1/2" Surface	9 3/4" Intermediate	9 3/4" Intermediate	9 3/4" Intermediate	12 1/2" Surface	9 3/4" Intermediate	9 3/4" Intermediate	9 3/4" Intermediate	---	12 1/2" Surface	9 3/4" Intermediate	9 3/4" Intermediate
Bit Size 1	17 1/2"	17 1/2"	17 1/2"	12 1/2"	17 1/2"	17 1/2"	17 1/2"	12 1/2"	17 1/2"	17 1/2"	17 1/2"	12 1/2"	17 1/2"
Bit Size 2	---	12 1/2"	8 3/4"	8 3/4"	8 3/4"	12 1/2"	8 3/4"	8 3/4"	8 3/4"	---	12 1/2"	8 3/4"	8 3/4"
Mud Type	Bentonite	Bentonite	Bentonite	Bentonite	Bentonite	Bentonite	Bentonite	Bentonite	Bentonite	Bentonite	Bentonite	Bentonite	Bentonite
Density / Viscosity	9.4 / 50	10.0 / 50	10.5 / 58	10.5 / 58	10.5 / 58	10.0 / 50	10.2 / 58	10.5 / 58	10.5 / 58	9.4 / 50	10.0 / 50	10.5 / 58	10.5 / 58
pH / Fluid Loss	10.2 / 4.5	11.0 / 3.4	9.0 / 3.2	9.9 / 4.0	8.5 / 5.0	11.0 / 3.4	9.0 / 3.2	9.9 / 4.0	8.5 / 5.0	10.2 / 4.5	11.0 / 3.4	9.0 / 3.2	9.9 / 4.0
Mud Resistivity	5.5 @ 80°F	1.05 @ 96°F	1.82 @ 90°F	1.40 @ 90°F	1.80 @ 90°F	1.05 @ 96°F	1.82 @ 80°F	1.40 @ 90°F	1.80 @ 90°F	5.5 @ 80°F	1.05 @ 96°F	1.82 @ 90°F	1.40 @ 90°F
Mud Resistivity BHT	3.7 @ 120°F	0.79 @ 132°F	1.05 @ 151°F	0.75 @ 180°F	0.90 @ 182°F	0.79 @ 132°F	1.05 @ 151°F	0.75 @ 180°F	0.90 @ 182°F	3.7 @ 120°F	0.79 @ 132°F	1.05 @ 151°F	0.75 @ 180°F
Rmt	6.05 @ 80°F	0.95 @ 96°F	1.28 @ 90°F	0.95 @ 90°F	1.20 @ 90°F	0.95 @ 96°F	1.28 @ 80°F	0.95 @ 90°F	1.20 @ 90°F	6.05 @ 80°F	0.95 @ 96°F	1.28 @ 90°F	0.95 @ 90°F
Rmc	3.7 @ 80°F	1.15 @ 96°F	2.02 @ 90°F	1.90 @ 90°F	1.90 @ 90°F	1.15 @ 96°F	2.02 @ 80°F	1.90 @ 90°F	1.90 @ 90°F	3.7 @ 80°F	1.15 @ 96°F	2.02 @ 90°F	1.90 @ 90°F
Recorded by	Brooke	Brooke	Brooke	Brooke	Brooke	Brooke	Brooke	Brooke	Brooke	Brooke	Brooke	Brooke	Brooke
Witness	Le Blanc	Le Blanc	Le Blanc	Le Blanc	Le Blanc	Le Blanc	Le Blanc	Le Blanc	Le Blanc	Le Blanc	Le Blanc	Le Blanc	Le Blanc

Continuous Dipmeter Survey 3300' to 6507' K.B.
Velocity Survey

WELL SYMBOLS

LITHOLOGIC REFERENCE

POROSITY TYPE

FOSSILS AND CARBONATE CONSTITUENTS

n Fluorescence
⊕ Gas zone
--- Circulation loss partial
--- Circulation loss complete
--- Core interval, number and recovery
--- Sidewall core
--- Formation test, interval and number
--- Casing shoe
--- Plugged interval

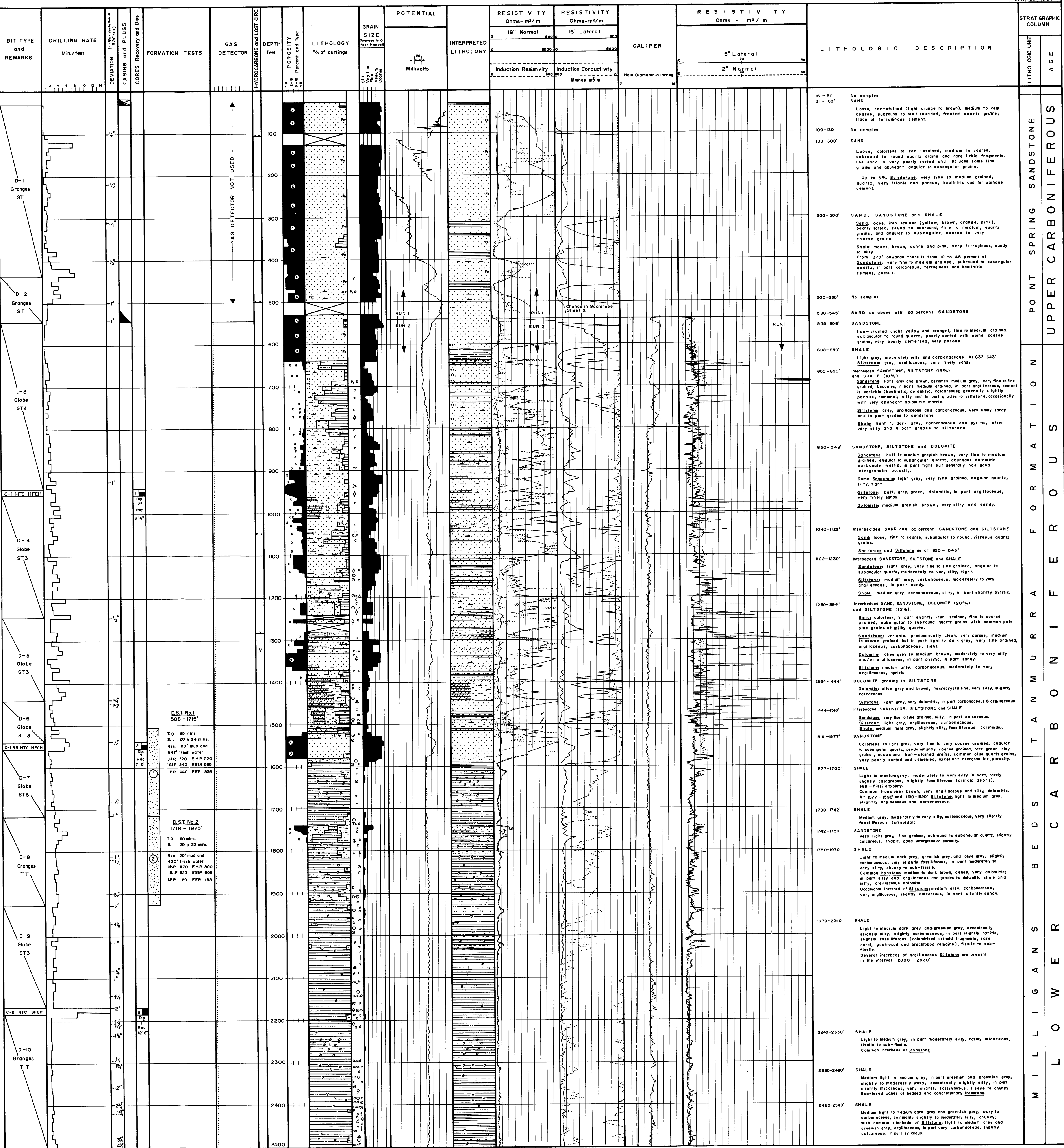
No sample
Conglomerate
Sandstone
Siltstone
Shale
Limestone
Dolomite
Argillaceous
Sandy
Silty
Calcareous
Dolomitic
Micaceous
Cherty

Pyritic
Carbonaceous
Siliceous
Ferruginous
Concretion

Intergranular, intercrystalline
Earthy (capillary)

Crinoid
Coral
Bryozoa
Lentic carbonate fragments (includes calcinules, calcinules)
Molluscs or brachiopods
Plant
Macrofossil
Microfossil
Fossiliferous (fragmental or indeterminate)

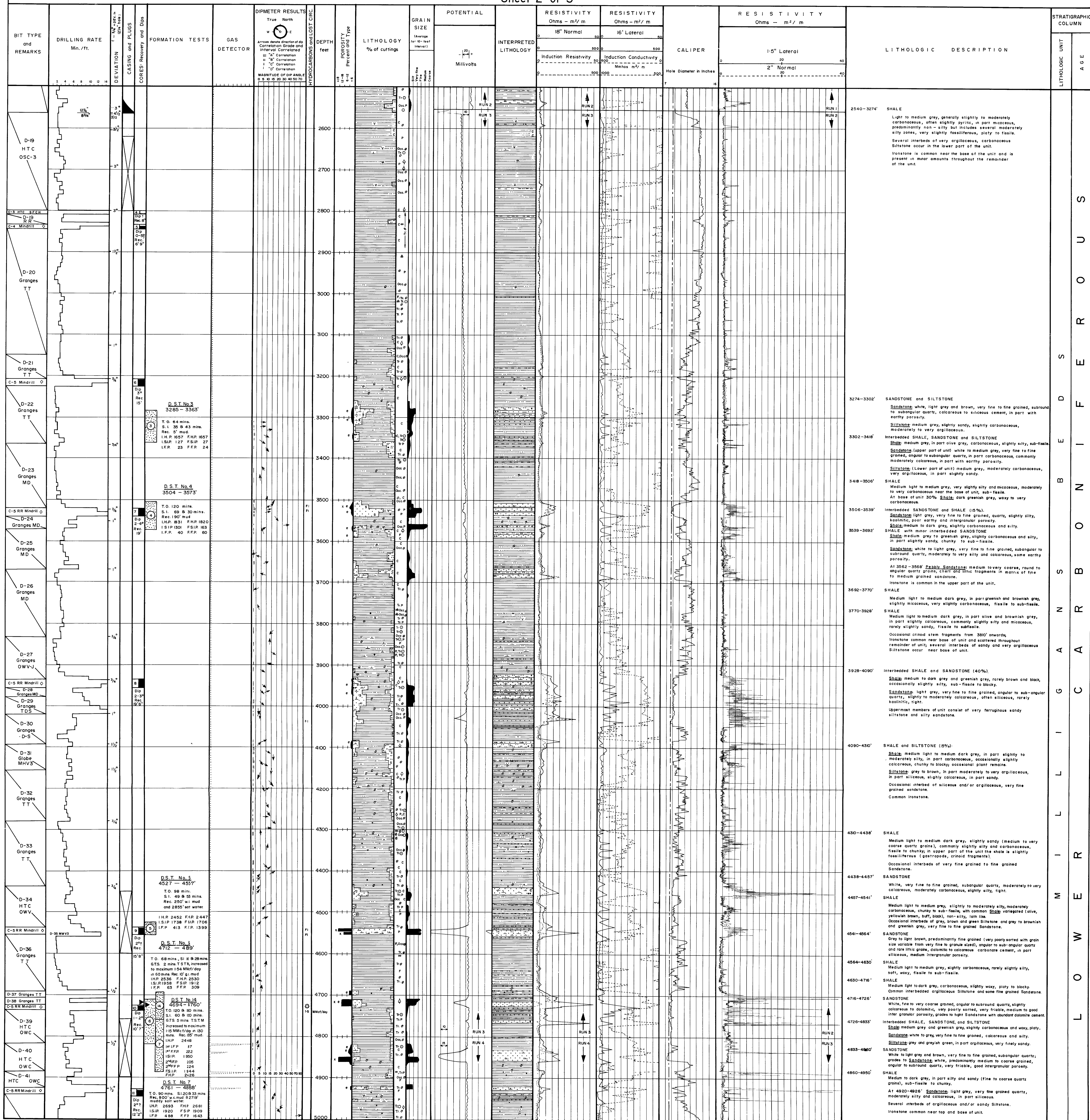
Drafting by GEODRAFTING SERVICES
December, 1964



COMPOSITE WELL LOG ALLIANCE BONAPARTE WELL No.2

2500 - 5000'
Sheet 2 of 3

PLATE 2
SHEET 2



COMPOSITE WELL LOG

ALLIANCE BONAPARTE WELL No.2

5000 - 7008'
Sheet 3 of 3

PLATE 2
SHEET 3

