OIL DEVELOPMENT NO LIABILITY

WELL COMPLETION REPORT

BATHURST ISLAND WELL NO. 2

by

R. HARE & ASSOCIATES

19th. January, 1962

NORTHERN TERRITORY
GEOLOGICAL SURVEY
Rc62/16

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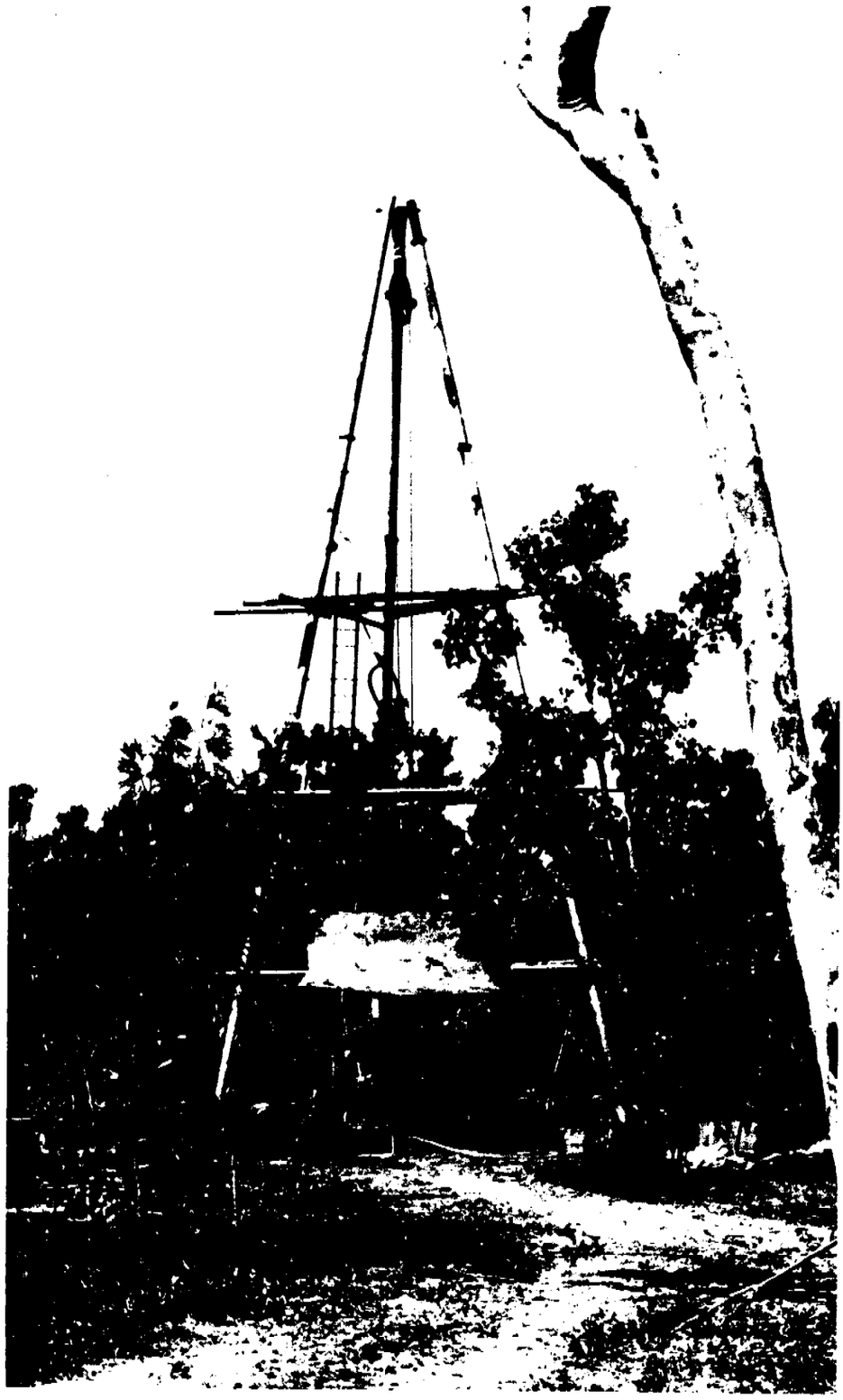


MINDRILL A 3000 RIG
ON BATHURST ISLAND WELL No.2

OIL DEVELOPMENT NO LIABILITY

Well Completion Report
Bathurst Island Well No. Two

SUMMARY

Bathurst Island Well No. 2 was drilled as a continuously cored diamond drill hole to a depth of 1,024 feet during 1961.

The core showed no appreciable dip and an extremely uniform lithology throughout.

A small flow of methane gas associated with water was encountered close to final depth. As a result of this the hole condition deteriorated to such an extent that progress was no longer possible and the well was abandoned without having reached its objective. The section penetrated consisted of 70 feet of glauconitic sandstone at the top followed by mudstone with minor amounts of siltstone. The glauconitic sandstone was unfossiliferous but correlates lithologically with a section of Turonian age in Bathurst Island Well No. 1. The mudstone was highly fossiliferous and all of Cenomanian age.

The full thickness of the Cretaceous sequence and the total thickness of sediments above basement remains undetermined.

INTRODUCTION

Bathurst Island Well No. 2 was planned to drill to a depth of 2,000 feet or shallower basement with the object of proving a sufficient thickness of prospective sediments in the area to justify seismic exploration. This well was located 10.4 miles from Bathurst Island Well No. 1 which was drilled to a depth of 828 feet in 1960 without encountering basement. (see Annex 1)

A location was selected which had an adequate supply of fresh water and was accessible to the mission wharf facilities by a well defined track.

The well was drilled with the full time supervision of a geologist who daily logged the core and regularly forwarded samples for micropalaeontological examination. Communication was maintained by outpost radio network and a weekly mail plane service.

WELL HISTORY

General Data

Well name and number: Bathurst Island Well No. 2.

Well History (Cont'd)

Location:	Latitude 11° 45' 30" South, Longitude 130° 22' East, approximately. Located by stadia survey from military astro fixes.
Permit Holder:	Oil Development No Liability, of 100 Collins Street, Melbourne, Victoria.
Permit:	Oil Permit No. 8 of the Northern Territory of Australia.
District:	Melville and Bathurst Islands, Northern Territory of Australia.
Total Depth:	1,024 feet.
Date Drilling Commenced:	20th. July, 1961.
Date Drilling Completed:	8th. September, 1961.
Date Well Abandoned:	29th. September, 1961.
Date Rig Released:	2nd. October, 1961.
Actual Drilling Time:	25 days.
Collar Elevation:	83 feet above mean high tide sea level.
Status:	Abandoned.
Cost of Well:	The total cost of the well was £ 13,777. Actual drilling costs including casing amounted to £ 7,053. Road transport costs from Melbourne and Mt. Isa to Darwin, return to Mt. Isa amounted to £ 1,870. Road transport costs on Bathurst Island amounted to £ 472. Total cost of transport by sea was £ 783. Cost of core trays was £ 200. Geological and palaeontological services, travelling and accommodation expenses and miscellaneous freight charges amounted to £3,399.

Drilling Data

Name and Address of Drilling Contractor:	Associated Diamond Drillers Pty. Ltd., 1017 Burke Road, Camberwell, Victoria.
Drilling Plant:	Make - Mindrill, Type - A 3000, Rated capacities - 3,000 feet with "AX", Motors - Perkins type P6 rating 60 H.P.

Drilling Data (Cont'd)

Mast/Derrick: Mindrill mast, tripod type, 48', 30' pull, 6" seamless tubing. Rated capacity 3,000 feet with "A" rods.

Pumps: Make - Mindrill, Type - Duplex, Size - 3" x 4". Pump motors, make, type, BHP. Enfield Diesel, Model HO-100 Mk.1, 13.5 H.P. at 1500 r.p.m.

Hole sizes and Depths: 0' - 120' (BX casing bit) 2 61/64".
120' - 1024' (O.D. of AX casing) 2¼".

Casing details:

	BX	AX
Size:		
Weight (lbs/ft):	6.7	3.8
Grade:	Standard	Standard
Range:	10' lengths	10' lengths
Setting depth:	120'	991'

Casing and cementing details:

Size:	BX
Setting depth:	120'
Quantity cement used:	160 lbs. Fondu (i.e. 2 pails).
Cement to (rise behind casing):	120' to surface.
Method used:	Cement pumped into casing, followed by Mud and then casing pushed into formation to seal casing shoe.

Drilling fluid:

Type:	Bentonite and water with CMC.
Average weight:	69 lbs/cu.ft.
Brief details of treatment:	5 lbs. of CMC added to Mud System.
Average weekly analysis:	Viscosity 38 seconds - Marsh funnel.

Water supply: Fresh water creek 140' from well head.

Fishing operations:

Depth:	850'
Nature of fishing job:	Attempt to screw on Rods.
Equipment left in hole & depth:	50' Rods - left behind casing. 850' - 900'

Coring: The hole was cored continuously to final depth. A total of 107 cores were cut from 11 feet to 1024 feet. Core recovery averaged approximately 80%. The equipment used consisted of Mindrill AX core barrels of the double tube type with stationary inner barrel.

Drilling Data (Cont'd)

Logging and Testing: No logging or testing was carried out in the hole. Small gas flows associated with water were encountered at an undefined depth between 991 and 1024 feet. Samples of this gas were analysed by the Bureau of Mineral Resources using a gas chromatographic technique. "The gas was found to contain no traces of paraffin homologues higher than methane; and the volume of methane present was found to be less than 10%."

Deviation Surveys: Acid tube.

Depth	Deviation
150'	$\frac{1}{4}^{o}$
350'	$\frac{1}{4}-\frac{1}{2}^{o}$
750'	$\frac{1}{2}^{o}$

GEOLOGY

Previous Work

Before 1954 very little was known of the geology of Bathurst and Melville Islands. Several earlier observations had established the presence of Cretaceous sediments containing Ammonites on both islands.

In 1954, in association with a National Geographical Society's expedition to Melville Island, Dr. B. Daily made a geological reconnaissance of the two islands and obtained a fossil collection which is still being studied.

A reconnaissance gravity survey carried out by Santos Limited in 1956 and later continued in 1959, indicated a thickening of the sedimentary section westward on the island.

In 1960 Oil Development N.L. decided that before proceeding with more intensive geophysical surveys it was first necessary to prove a sufficient thickness of prospective sediments on the island by drilling a slim hole. Accordingly, in that year, Bathurst Island Well No. 1 established a minimum thickness of 828 feet of marine Cretaceous sediments at the well location.

Stratigraphy

The section penetrated by the well has been divided into 3 upper Molluscan zones and 2 lower Foraminiferal zones by Drs. M.F. Glaessner and M. Wade of the University of Adelaide. The details of this zoning are given in Annex 3 and illustrated in the section showing the correlation of this well with Bathurst Island Well No. 1, Annex 4.

The only lithological unit that has been identified with the palaeontological zoning is the glauconitic sandstone of Molluscan Zone 1.

Stratigraphy (Cont'd)

Age	Zone	Lithology	Depth	Thickness
	No samples		0'-11'	11'
	Surface Sandy Clay		11'-31'	20'
Turonian	Molluscan Zone 1	Glauconitic Sandstone	31'-70'	39'
Cenomanian	Molluscan Zone 2	Mudstone	70'-700'	630'
	Molluscan Zone 3	Mudstone	700'-849''	149'
	Foraminifera Zone 4	Mudstone	849'-1023'	174'
	Foraminifera Zone 4	Mudstone	1023'-1024'	1'
		Bottom of Well 1024 feet.		

1. Surface sandy clay 11' - 31'

Lithology: Sandy clay or argillaceous sand, limonitic.

Palaeontology: Unfossiliferous. Leaching of calcite may have removed all trace of fossil content if this was present.

2. Turonian 31' - 70'

Lithology: Fine-grained greenish grey friable glauconitic sandstone, composed of sub-angular to sub-rounded clear and pale green quartz grains with few black grains; occasional specks of mica; occasional band of hard sandstone and dark grey clay.

Palaeontology: Unfossiliferous which is probably due to leaching out of calcite from any fossils which may have been present.

3. Cenomanian 70' - 1024'

Upper Lithological Unit 70' - 110'

Lithology: Grey, slightly greenish siltstone which grades to grey mudstone and to a lesser extent to grey glauconitic fine-grained sandstone. Siltstone also contains occasional irregular shaped small lenses of fine-grained glauconitic sandstone. Occasional external moulds of fossil lined with pyrites crystals.

Palaeontology: Unfossiliferous except for possible plant material

Lower Lithological Unit 110' - 1024'

Lithology: Very uniform grey mudstone with occasional very thin streaks, patches and lenses of grey siltstone. Both mudstone and siltstone

Stratigraphy (Cont'd)

3. Cenomanian - Lower Lithological Unit 110'-1024' (Cont'd)

contain small specks of mica and small black grains. Grey argillaceous limestone nodules present in mudstone. Slickensides present. Occasional small aggregates of minute pyrites crystals present.

Palaeontology: Fossils present throughout this unit both as fragments and whole specimens. Foraminifera and Molluscs common. Annexes 2 and 3.

REFERENCES

R. Hare & Associates: "Well Completion Report, Bathurst Island Well No. 1" Private report for Oil Development N.L., 1961.

Sprigg, R.C.: "The Prospects of Commercial Oil on Bathurst and Melville Islands, Northern Territory." Private report for Santos Limited, 1958.

APPENDICES

Annex 1 - Locality plan of Bathurst Island showing positions of Wells Nos. 1 and 2.

Annex 2 - Preliminary Micropalaeontological Report by Dr. M. Wade.

Annex 3 - Micropalaeontological Report on Final Samples and Correlation by Dr. M. Wade.

Annex 4 - Section showing correlation between Foraminiferal and Ammonite zones in Wells Nos. 1 and 2.

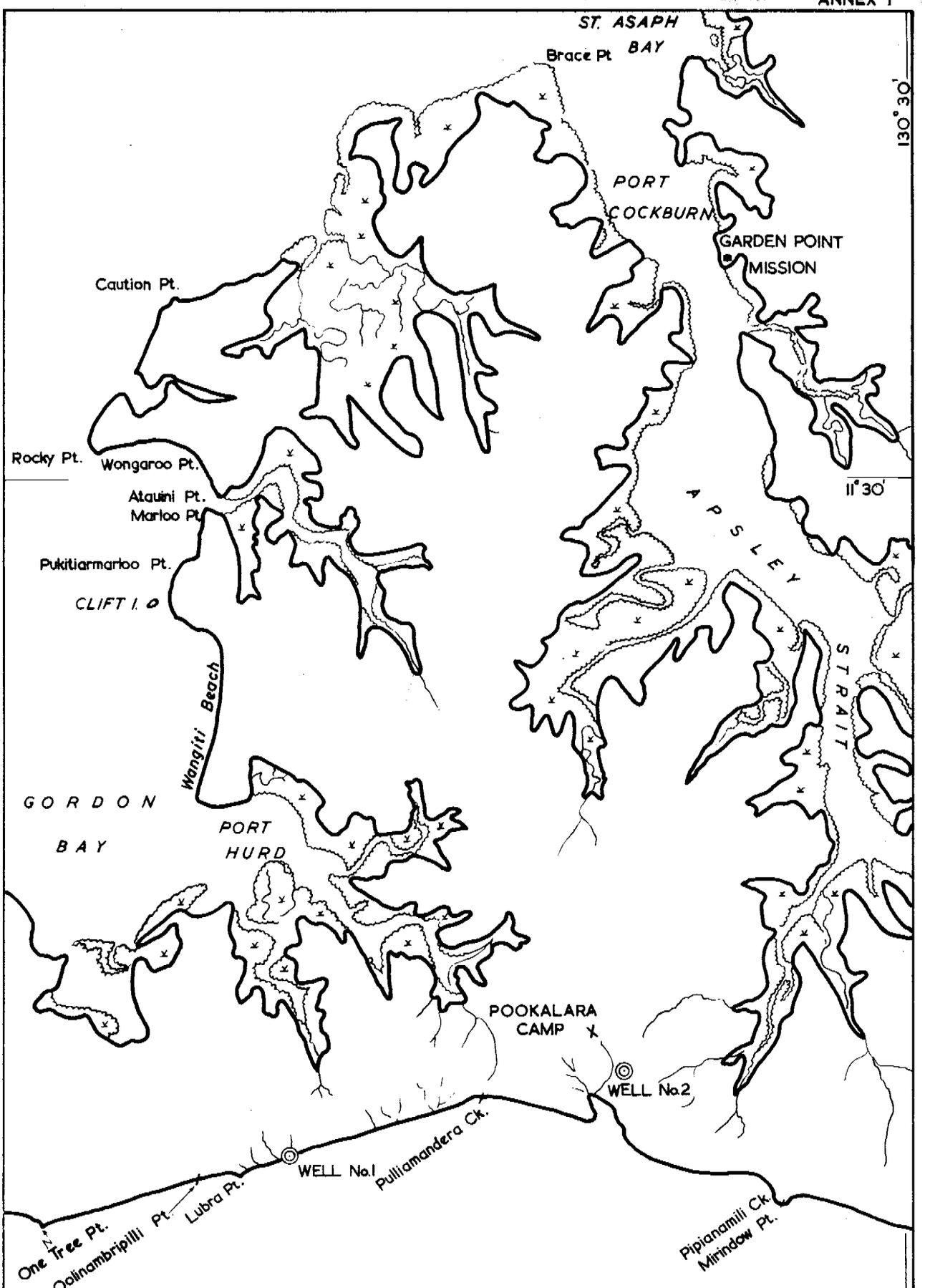
Annex 5 - Composite Well Log.

OIL DEVELOPMENT N.L.

H. G. Newton

R. HARE & ASSOCIATES
Technical Managers

ANNEX I



OIL DEVELOPMENT N. L.

OIL PERMIT No.8 N. T.

LOCALITY PLAN OF BATHURST ISLAND SHOWING POSITION OF WELL No.1 & No.2

R. HARE & ASSOCIATES			SCALE 1 inch = 4 Miles
Prepared: P.W. Bollen	REVISION		DRG. No. O.D/62
Drawn: B.L.			
Date: 14 · 11 · 61			

OIL DEVELOPMENT BATHURST ISLAND NO.2 BORE
PRELIMINARY MICROPALAEONTOLOGICAL REPORT

11' - 21'	**yellow-stained quartz sand; unfossiliferous.**
49'6" - 50'	**fine glauconitic sand; unfossiliferous.**
99'6" - 100'	**very fine, glauconitic, clayey sand; unfossiliferous except for possible plant material.**
149'6" - 150'	**grey-green, glauconitic clay with fairly good Lower Cenomanian foraminiferal fauna, including Textularia washitensis Carsey, Haplophragmoides sp.1, Bulimina sp.1, B. nannina Tappan, Hoglundina sp., Globigerina infracretacea Glaessner & G. planispira Tappan.**
199'6" - 200'	grey-green, glauconitic clay, similar foraminiferal fauna, also including Gyroidinoides loetterli (Tappan) and Conorboides sp. nov.
230' - 240'	(from top of 5'6" core recovered) ammonite Sciponoceras glaessneri Wright (manuscript name), upper Lower Cenomanian, according to Wright.
240' - 240'6"	grey-green, glauconitic clay, foraminiferal fauna as above, also including Gavelinella n. sp. aff. barremiana Bettenstaedt, Anomalina sp.1 & Hoglundina chapmani (ten Dam).
299' - 299'6"	grey-green, glauconitic clay, rich foraminiferal fauna as above, including rare species Rectobolivina sp.1, Bifarina sp.1, Colomia sp.; very rich in ostracods.
350' - 350'6"	grey-green glauconitic clay, rather poor foraminiferal fauna similar to preceeding samples, similar ostracods.
418'6" - 419'	grey-green glauconitic clay; arenaceous foraminifera, and Lenticulina gaultina Berthelin, predominate.
456'3" - 457'	grey-green, glauconitic clay, rather silty; foraminiferal fauna includes G. infracretacea, Gavelinella n. sp. aff. barremiana, Gyroidinoides cf. nitida, G. loetterli, rare Bifarina sp.1, ostracods.
499' - 499'6"	dark, grey-green glauconitic clay, rather silty, arenaceous foraminifera and Lenticulina gaultina predominate.
550' - 550'6"	dark grey glauconitic clay; arenaceous foraminifera predominate, many Textularia washitensis and Haplophragmoides sp.2.
600' - 600'6"	dark grey glauconitic clay with G. infracretacea, Gavelinella n. sp. aff. barremiana, and Conorbodies sp. nov.

650' - 650'6" dark grey clay; arenaceous foraminifera, particularly Bathysiphon, Textularia washitensis, T. aff. rioensis Carsey, Haplophramoides sp.2, predominate. Hoglundina chapmani only common calcareous foraminifera.

700'6" - 701' dark grey clay, fairly good foraminiferal fauna. Marssonella oxycona Reuss & Dorothia filiformis Berthelin, accompany the arenaceous forms found above. Cibicides cenomanica Brotzen and Praeglobotruncana stephani stephani are fairly common, Globigerina infracretacea very rare.

749'6" - 750' grey clay; rich benthonic foraminiferal fauna.

780' - 790' grey clay; rich foraminiferal fauna including well-developed Globigerina infracretacea and rare Praeglobotruncana stephani.

816'6" - 817' dark grey clay; rich benthonic fauna, fewer planktonic species - Globigerina infracretacea, G. planispira and several specimens of Praeglobotruncana stephani stephani and one P. stephani turbinata.

Examination of the last 3 samples, which arrived yesterday evening, is not yet completed.

Over all, this fauna is identical with that obtained from Bathurst Island No.1 bore, Ticklitipinapitta. The occurrence of Praeglobotruncana stephani is the most important foraminiferal evidence for age, as this form commences above the base of the Cenomanian. As most of the accompanying fauna ranges from the Albian into the Cenomanian, it is considered that the true age is low in the Cenomanian.

The new ammonite Sciponoceras glaessneri was found in large numbers just below the "Tapara bed" (Daily, 1954 report) in clays considered to be upper Lower Cenomanian on the evidence of another ammonite. These clays contain substantially the same foraminiferal fauna as the two bores. Literature that has become available since the fauna from the coastal section was first identified indicates that these names used in my preliminary report on Bathurst Island No.1 (22nd. July, 1960) should be changed (as they are in my foraminiferal distribution chart, 4th. August, 1961): Anomalina intermedia Berthelin to Gavelinella n. sp. aff. barremiana Bettenstaedt; Valvulineria gracillima (ten Dam) to Gyroidinoides cf. nitida (Reuss).

The 11' to 21' sample is a yellow sand such as is found in the auger holes. The unfossiliferous sandy beds represented by samples 49'6" and 99'6" - 100' are apparently more or less equivalent to the sandy beds at the top of bore No.1, since there seems to be no break in the sequence in either bore, and the underlying faunas are alike. From 149'6" to 817' Bathurst Island No.2 bore passes through Lower Cenomanian, with reliable data indicating some distance above basal Cenomanian at 230' - 240' and from 701' to 817'.

Mary Wade,
University of Adelaide.

Adelaide, 17th. August, 1961

OIL DEVELOPMENT BATHURST ISLAND NO.2 BORE

MICROPALAEONTOLOGICAL REPORT ON FINAL SAMPLES, & CORRELATION

849' - 849'6" Dark grey clay; very rich benthonic fauna, including Cibicides cenomanica Brotzen and Conorboides sp. nov., few planktonic species Hedbergella brittonensis Loeblich and Tappan, Rotalipora greenhornensis (Morrow), Globigerina planispira Tappan, G. infracretacea Glaessner (very rare).

900' - 900'6" Dark grey clay; fair benthonic fauna including Siphogenerinoides? sp. and Cibicides cenomanica, few G. infracretacea, rare Rotalipora greenhornensis.

951' - 951'6" Dark, grey-green glauconitic clay; fairly rich benthonic fauna including Siphogenerinoides? sp. Cibicides cenomanica, Gavelinopsis? sp. nov., Gavelinella n. sp. aff. barremiana, Conorboides sp. nov. Hoglundina chapmani, Rotalipora greenhornensis with some variants equivalent to R. appenninica (Renz), G. infracretacea.

994' - 1004' Grey-green glauconitic clay; rich benthonic fauna similar to that of the 951'-951'6" sample, also including Reinholdella sp., Discorbis minima Vicaux, Gavelinella sp., 1, Rotalipora greenhornensis with some variants equivalent to R. appenninica, Globigerina infracretacea, G. planispira.

1023'6" - 1024' Grey-green, glauconitic clay; rich benthonic fauna including Hoglundina sp. 2 in place of H. chapmani, other species as in the 994'-1004' sample, and the additional planktonic foraminifera Rotalipora cushmani (Morrow) and Planomalina buxtorfi (Gandolfi).

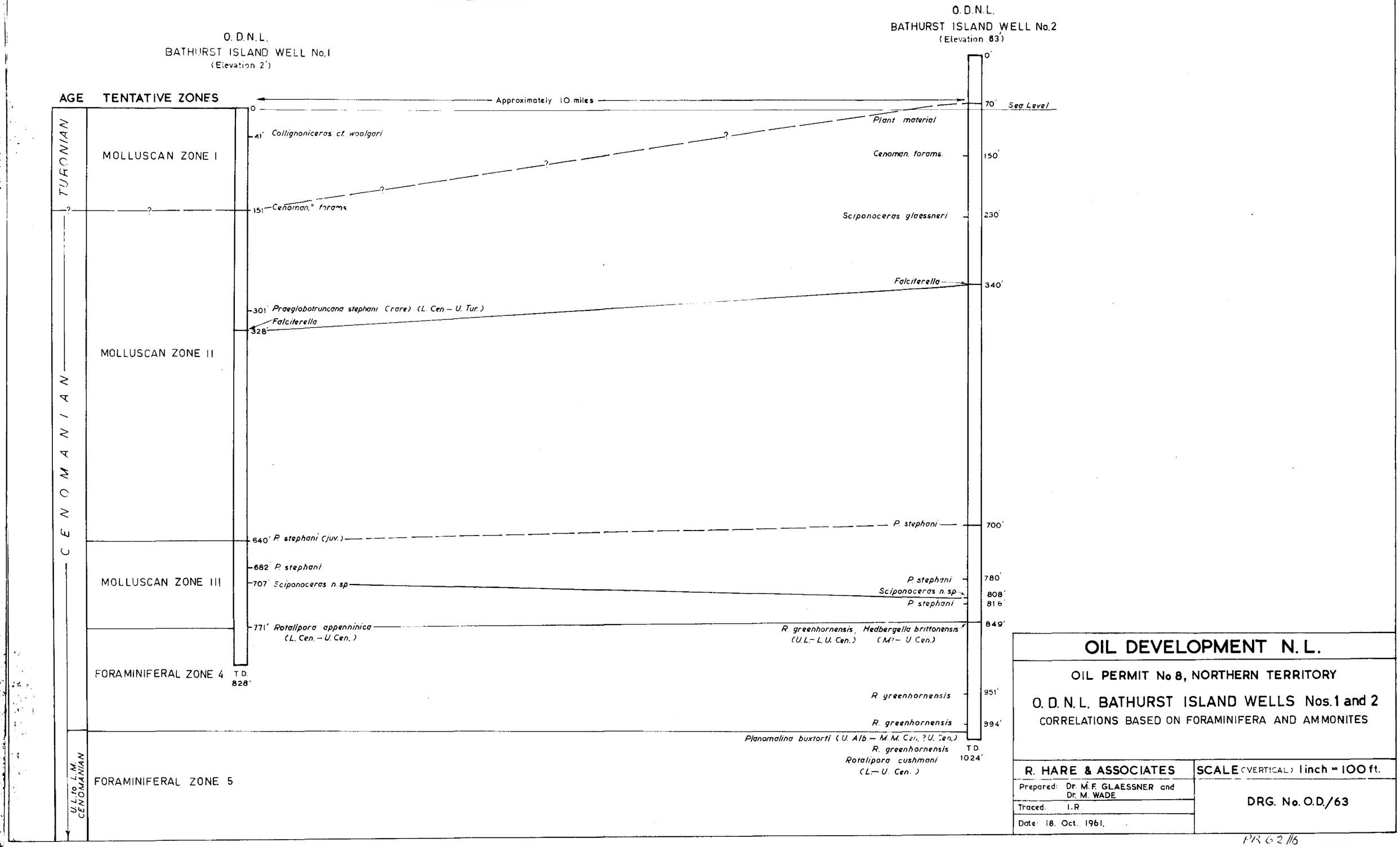
The fauna of the basal sample (1023'6" - 1024') contains Rotalipora of the greenhornensis - appenninica group, mainly the more restricted greenhornensis forms which range from Upper Lower Cenomanian to Upper Cenomanian, also R. cushmani which ranges from Upper Lower Cenomanian to Upper Cenomanian, and Planomalina buxtorfi (Albian to Middle Cenomanian). Hoglundina sp. 2, a very prominent species, makes its first appearance and Reinholdella sp. and Gavelinella sp. 1, and Siphogenerinoides? sp., the first two of which are first seen respectively one and three samples higher, continue. These make a recognizable zone of Upper Lower Cenomanian to Middle Cenomanian age. Above this bottom-hole sample, those from 849' - 1004' containing Rotalipora greenhornensis (rarely grading into R. appenninica) seem to make another zone which appears in bore No.1 (771') in a similar position below a number of samples in which Praeglobotruncana stephani is present (from 640' down in bore No.1 and 700'6" down to 817' in bore No.2).

A potential marker bed is indicated by the ammonite Sciponoceras sp. 1 in bore No.1 at 707' and in bore No.2 at 806', 808' and 810'. Similarly the occurrence of Falciferella in bore No.1, at 327'3" and 329' and in bore No.2 at just over 340' (6" below top of 8'6" recovery, 340 - 350') indicates another potential marker bed. The presence of Sciponoceras glaessneri Wright (MS.), in the 230 - 240' sample (from top of 5'6" recovered) in bore No.2 invites comparison with the coastal bed so rich in this species, which outcrops below the "Tapara bed" (Daily, 1954 report). Independently, Wright has re-assessed the age of S. glaessneri as Middle Cenomanian, on the evidence of accompanying ammonites. The Tapara bed is correlated as being about 100-150 feet by correlation (Daily, 1954 report) below the proven Turonian with the ammonite Collignoniceras cf. woolgari. This ammonite has now been identified from the 41'6" sample from bore No.1, and dates this sample as Turonian. The lithological change from sands to clays seen below the Turonian on the coast and proved to occur in bore No.1 somewhere between 117' and 151'6" can be considered the same change as occurs in bore No.2 from clays below, through silty beds, to sands above, at a little less than 100'. The upper samples from both bores have very poor microfaunas (as has been reported, 22.7.60 and 17.8.61) and it is not possible to establish the position of the Cenomanian - Turonian boundary precisely. For convenience, it could be assumed to tie in with the lithological change from sands to clays.

The close correlation possible between the two bores suggests an uncomplicated picture of structure, as having only a slight westerly dip. This is, to some extent, contradicted by the sample from auger hole F3 which contains Praeglobotruncana stephani and Rotalipora cushmani, an assemblage that could be expected from bore evidence from about 900' below beach level. It is to be assumed that only faulting could bring this bed so close to the surface, as no correspondingly strong folding has been observed. The Albian ammonites collected by Daily in 1953 from the coastal section at Numungumpi, separated from Turonian by a fault on one side and a "covered interval" on the other, may provide further evidence for strong faulting in the area.

1 November 1961

M. Wade,
University of Adelaide.



OIL DEVELOPMENT N. L.

OIL PERMIT No 8, NORTHERN TERRITORY

O. D. N. L. BATHURST ISLAND WELLS Nos. 1 and 2

CORRELATIONS BASED ON FORAMINIFERA AND AMMONITES

R. HARE & ASSOCIATES	SCALE (VERTICAL) 1 inch = 100 ft.
Prepared: Dr. M.F. GLAESSNER and Dr. M. WADE	DRG. No. O.D./63
Traced. I.R.	
Date: 18. Oct. 1961.	

PR 62/16

COMPOSITE WELL LOG

COMPANY: OIL DEVELOPMENT N. L.

WELL NUMBER: O.D.N.L. BATHURST ISLAND WELL No. TWO

PETROLEUM TENEMENT
OIL PERMIT No8

STATE: NORTHERN TERRITORY

4 — MILE SHEET: MELVILLE ISLAND

WELL STATUS: ABANDONED

LOCATION — Lat 11° 45' 20" Long. 130° 22' 00"

ELEVATION — Ground 83 feet

Date Spudded: 20th July, 1961
Date Drilling Stopped: 8th Sept., 1961
Date Rig Off: 2nd Oct., 1961
Total Depth: Drilled 1024 feet

Well Head Fittings: Nil.
Drilled by: Associated Diamond Drillers Pty. Ltd.
Logged by: P. W. Bollen
Drilling Method: Diamond Coring
Cemented by: Associated Diamond Drillers Pty. Ltd.

LITHOLOGIC REFERENCE

- Quartz sandstone
- Limestone
- Siltstone
- Dolomite
- Mudstone
- gl Glauconitic

Lithology by P.W. Bollen

Hole Size	In.	From.	To.
Bx Casing	2 61/64	0'	120'
Ax Casing	2¼	120'	1024'

Casing

In.	Wt.	Gr.	Depth.	Cmt.	Cmt'd. To
Bx	6·7 lb/ft	Std	120'	160 lb	Surface
Ax	3·8 lb/ft	"	991'	—	—

Cement Plugs	From	To	Sacks
	0'	30'	2

WELL SYMBOLS

- O Gas show, slight
- Flow into well and s.g. mud
- Casing shoe
- ≤ Slickensides

OIL DEVELOPMENT N. L.

O.D.N.L. BATHURST ISLAND WELL No.2
COMPOSITE WELL LOG

R. HARE & ASSOCIATES

Prepared: P. W. BOLLEN
Drawn: I. R.
Date: 22. II. 61.

VERTICAL SCALE: 1 INCH = 100 FEET

DRG. No. O D./64

BIT TYPES & REMARKS	DRILLING RATE Minutes per feet (40 30 20 10 0)	CASING Depth	DEPTH Feet	GRAPHIC LOG	CORE Recovery %	DEVIATION	LITHOLOGY	TENTATIVE ZONE	AGE
MINDRILL AMS Throughout this well two at a time bottom discharge diamond core head used alternatively		Cemented 160 lb Fondu cement. Bx 120	100 200 300 400 500 600 700 800 900 Ax 991 1000 T.D. 1024	gl gl ≤ ≤ ≤ ≤	15, 16, 15, 28, 53, 55, 53, 50, 100, 76, 60, 93, 23, 100, 35, 60, 97, 100, 83, 85, 55, 88, 56, 40, 23, 40, 100, 40, 100, 97, 95, 97, 80, 85, 80, 100, 84, 67, 100, 12, 1, 17, 100, 34, 14, 100, 95, 100, 70, 100, 85, 84, 90, 100, 100, 93, 100, 95, 100, 90, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 10, 60, 25, 7½, 100, 100, 50, 100, 66, 67, 78, 100, 25, 100, 100, 100, 100, 21, 100, 70, 50, 100, 100, 40, 100, 100	150' ½° 350' ½-¼° 750' ½° 1.1 Below 991'	*Surface sands and clay, iron stained, with few ironstone pebbles.* *Sandstone, glauconitic, greenish grey, friable* *Few thin stringers glauconitic clay.* *Siltstone and mudstone, glauconitic* *Mudstone, grey with small specks mica and scattered small black grains; with occasional included irregular patches and lenses of grey siltstone containing small specks mica and scattered black grains. Siltstone % less with depth.* *Limestone nodules present in mudstone.* *Fossils present throughout mudstone. Fossils as fragments and whole specimen.* *Slickensides rarely present.*	MOLLUSCAN ZONE I MOLLUSCAN ZONE II MOLLUSCAN ZONE III FORAMINIFERA ZONE 4 FORAMINIFERA ZONE 5	TURONIAN? CENOMANIAN ULL M. Cenomanian