WELL COMPLETION REPORT

DINGO - 2

NORTHERN TERRITORY
GEOLOGICAL SURVEY

PR 85/7

CONTENTS

APPENDICES

		Sect.
A	Description of Cuttings Samples	19-22
B	Conventional Core Descriptions	23
C	Conventional Core Analysis	24
D	Core Petrography	25
E	Gas Analysis	26
F	Bit Record	27
G	Wireline Log Evaluation	28
H	Source Rock Analysis	29
I	Drilling Fluids Report	30-31
J	Survey of Well Location	32
K	Drill Stem Test Results	33-34
L	Velocity Survey	35-36
M	Hydrocarbon Well Logging Report	37-38

FIGURES

TABLES

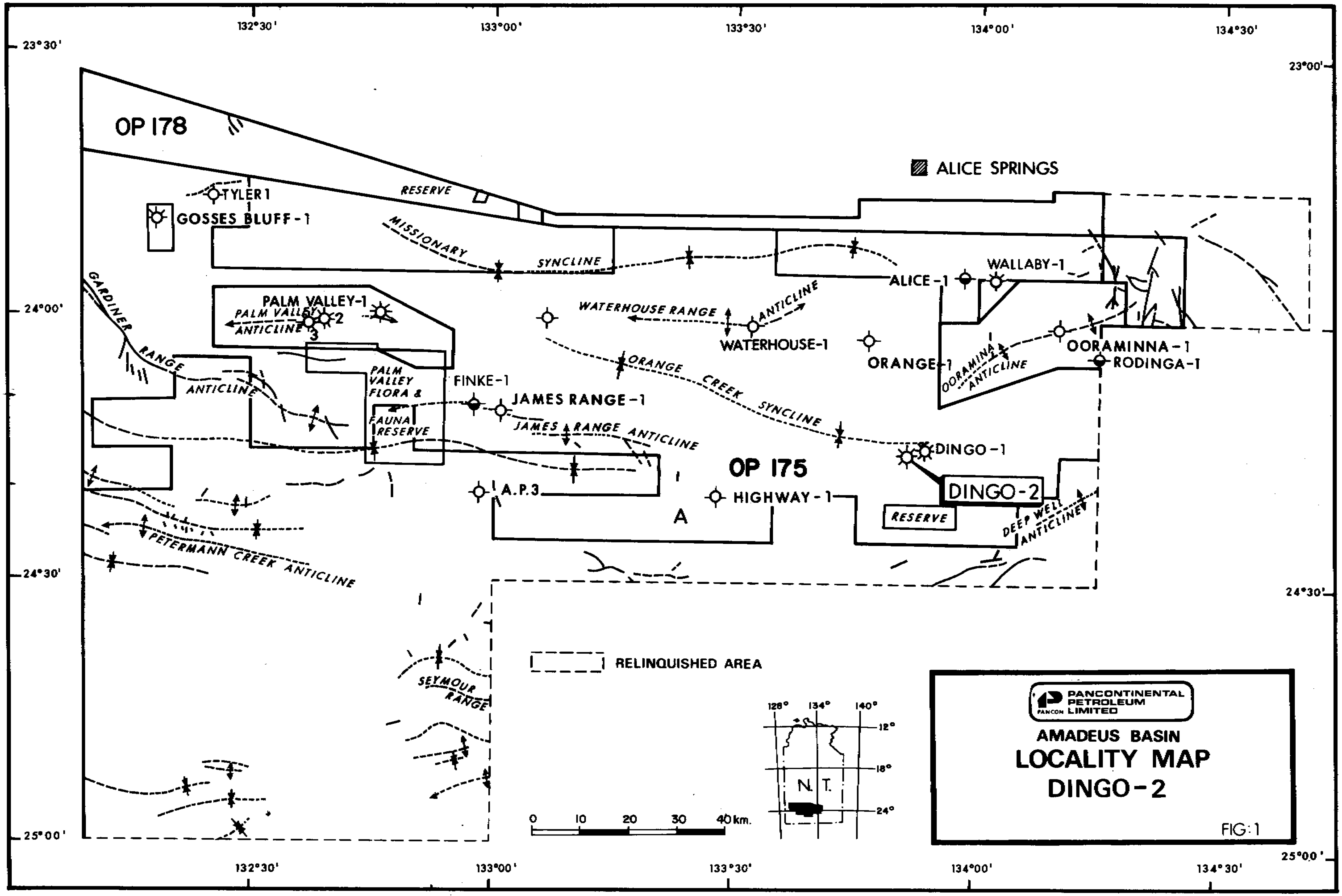
ENCLOSURES

1. INTRODUCTION

The Dingo No. 2 appraisal well was spudded on April 20, 1984 approximately 75 kilometres south of Alice Springs and 2 kilometres west of the Dingo No. 1 well. The well was drilled in Oil Permit 175 of the Northern Territory using Richter Drilling Rig 8 (Figure 1). The Joint Venture exploration consortium for OP 175 at the time of drilling is listed below:

Magellan Petroleum (N.T.) Pty. Limited (Permit Holder)	30.8705%
International Oil Proprietary	14.1704%
Pancontinental Petroleum Limited (Operator)	10.0000%
Amadeus Oil N.L.	9.8891%
International Energy Development Corporation of Australia Pty. Limited	9.8891%
Orca Petroleum N.L.	5.9484%
Farmout Drillers N.L.	4.9556%
Canso Resources Limited	4.6306%
Apollo International Minerals N.L.	3.3908%
Oilmin N.L.	3.2113%
C.D. Resources Pty. Limited	1.5822%
Transoil N.L.	1.3763%
Canada Southern Petroleum Limited	0.0705%
Petromin N.L.	0.0152%

Dingo No. 2 was drilled to assess the gas reserves of the Late Proterozoic Arumbera Sandstone discovered by the Dingo No. 1 well.


132°30'
133°00'
133°30'
134°00'
134°30'
23°30'
23°00'
24°00'
24°30'
25°00'
OP 178
ALICE SPRINGS
TYLER 1
RESERVE
GOSSES BLUFF - 1
MISSIONARY
SYNCLINE
GARDINER
RANGE
ANTICLINE
PALM VALLEY-1
PALM VALLEY
ANTICLINE
2
3
WATERHOUSE RANGE
ANTICLINE
WATERHOUSE-1
ALICE - 1
WALLABY-1
ORANGE-1
OORAMINNA - 1
RODINGA-1
OORAMINNA
ANTICLINE
PALM VALLEY FLORA & FAUNA RESERVE
FINKE-1
JAMES RANGE - 1
JAMES RANGE ANTICLINE
ORANGE CREEK SYNCLINE
DINGO - 1
OP 175
DINGO-2
A.P.3
HIGHWAY - 1
A
RESERVE
DEEP WELL
ANTICLINE
PETERMANN CREEK ANTICLINE
SEYMOUR
RANGE
RELINQUISHED AREA
0
10
20
30
40 km.
128°
134°
140°
12°
18°
24°
N.T.
PANCONTINENTAL PETROLEUM LIMITED
PANCON
AMADEUS BASIN
LOCALITY MAP
DINGO - 2
FIG: 1

2. SUMMARY

2.1 Drilling

Dingo No. 2 was spudded in at 0120 hours on April 20, 1984. A 17-1/2" surface hole was drilled to 125.9 metres then opened to 26" using a Gel-Benex spud mud. The 20" casing was run and cemented, the shoe being set at 125 metres (Figure 2).

After rigging up the BOPs and rotating head, the 20" casing shoe and cement were drilled out with water. The hole was then unloaded with air, and the blooie line installed. Drilling proceeded with air/foam to 722 metres, where a valve in the blooie line blew out and it became necessary to revert to mud drilling. The 17-1/2" hole was drilled to 1025 metres, where electric logs were run and 13-3/8" casing set.

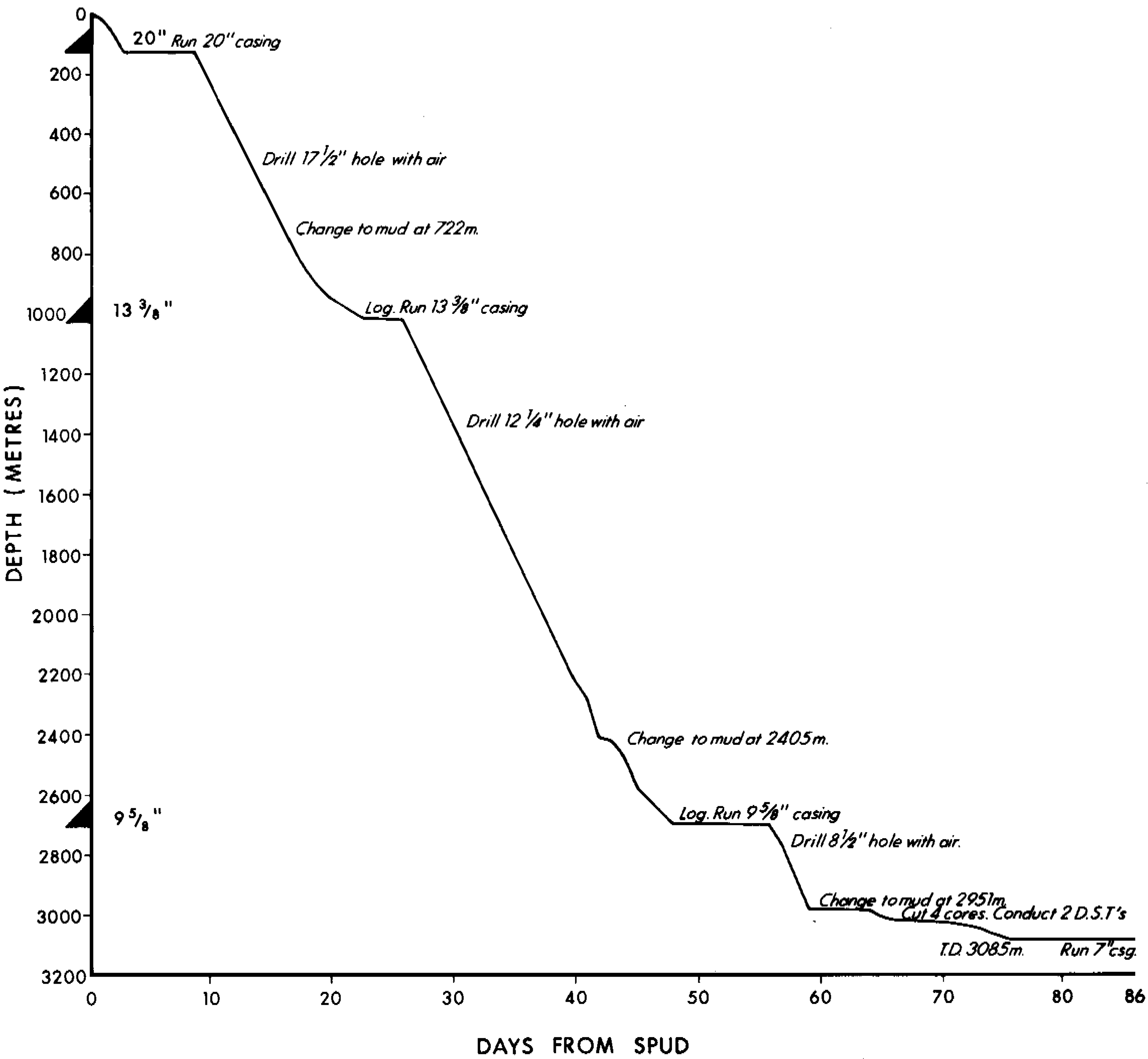
The rig was then placed on standby status to repair the main drive shaft prior to resuming air drilling. Drilling of the 12-1/4" hole with air/foam continued to 2405 metres, while a salt(NaCl) polymer fluid was prepared. At 2405 metres the displacement was made from air to mud. A water spacer was pumped ahead of the mud to prevent any foaming problems. As drilling proceeded through the Chandler Formation the Cl concentration rose from 145,000 mg/l at 2517 metres to 188,000 mg/l (saturation point) at 2583 metres.

At 2605 metres a tight spot was encountered while tripping and three joints were reamed back to bottom. Drilling proceeded with no further problems to 2701 metres. A short wiper trip was commenced, and a tight spot was hit four stands out. The pipe had to be worked out of the hole one joint at a time in order to get the stabilisers through the tight spot. The problem area, which corresponded to that which was noted on the trip at 2605 metres, appeared to be a fifty metre section of sticky plastic

PANCONTINENTAL PETROLEUM LIMITED

DINGO – 2

TIME DEPTH CHART



AUTHOR : G.R.M.	DATE: NOV '84
	FIG. Nº : 2

silty claystone within the halite section. After pulling fifteen stands, the bit was run back to bottom, circulation broken, then fifteen stands again pulled to check on hole condition. No contact was made on the way out. The bit was again run back to bottom (no contact) and circulation resumed. After circulating one system cycle the pipe was tripped out and electric logs run.

Logs were completed without incident, and a wiper trip made. A section (2547-2744 metres) through the claystone required reaming, and in addition 8 metres were reamed to bottom. A fifteen stand wiper trip was made and encountered good hole conditions. The hole was circulated and the pipe pulled. The 9-5/8" casing was run and cemented with the shoe being set at 2699 metres.

The 9-5/8" casing shoe and cement were drilled out, and 8-1/2" hole drilled to 2704 metres, with the saturated salt mud. A trip was made to rig up for air drilling. The pipe was staged back into the hole, unloading the mud from the hole every eight to ten stands. Air drilling resumed and proceeded to 2952 metres, where displacement to a KCl-polymer mud was initiated. Drilling proceeded with mud to 2985 metres, where a core was cut to 2993.5 metres. A conventional drill stem test was then run over the interval 2947.4-2993.5 metres, flowing gas at 1.38 MMcfg/day. A second core was then cut to 2995.9 metres. The core barrel and top stabiliser were lost on the trip out, but were successfully fished with an overshot.

After drilling resumed a small drilling break was encountered at 3015 metres and the gas levels began increasing. The pumps were stopped with no flow being observed. The mud weight was raised from 9.7 to 9.8 lb/gal and a twelve stand wiper trip made. Gas was recorded at 2640 units. Fluid density was raised to 9.9 lb/gal and a core was then cut from 3021.79 to 3022.55 metres.

An 8-1/2" hole was then drilled to 3035.8 metres, where, in response to increasing gas levels, the mud weight was increased to 10.5 lb/gal with calcium carbonate and barytes. Although flow checks were negative, gas levels continued to rise, and gas cutting was evident in mud weights recorded at the shakers. The mud weight was raised to 11.1 lb/gal. A further core was cut to 3044.9 metres with the density being further raised to 11.4 lb/gal in the process, again in response to gas levels.

A second conventional drill stem test was run over the interval 3002.9-3044.9 metres and flowed gas at a rate of 144 Mcf/day.

8-1/2" hole was then drilled to a total depth of 3085 metres with 11.3+ lb/gal mud. Electric logs were run with no problems encountered. A wiper trip was made and 7" casing was run. 2-7/8" tubing was run with the following intervals being perforated by a tubing conveyed perforating system:

2954.0 - 2958.1 m KB
2961.0 - 2966.2 m KB
2980.7 - 3001.5 m KB

A well-head was installed after the rig was moved out.

2.2 Geological

The Dingo No. 2 appraisal well was spudded near the structural crest of the Dingo Anticline at a location 2 kilometres west of Dingo No. 1. The well penetrated 973 metres of Devonian sandstones unconformably above 52 metres of Ordovician sandstone, siltstone, shale and carbonates overlying 1388.5 metres of Cambrian sandstones, shales, limestones and dolomites. The well then drilled a 263 metre sequence of evaporites and shales overlying 364.5 metres of Late Proterozoic to Early Cambrian sandstone, siltstone and shale. The well reached a total depth of 3085 metres in the shales of the Late Proterozoic Pertatataka

Formation.

Dingo No. 2 was drilled to assess the gas reserves of the Late Proterozoic Arumbera Sandstone discovered by Dingo No. 1.

The well encountered significant gas shows in the Late Proterozoic Arumbera 1 Sandstone and Julie Formation Equivalent. The sandstones showed fair permeability on drill stem testing with gas flared to surface during DST 1 and DST 2.

Dingo No. 2 was completed as a gas well with 7" production casing run to 3084.3 metres. 2-7/8" tubing was hung and the production casing was perforated with a tubing conveyed perforating gun. The well was flow tested and a well head was installed.

3. WELL HISTORY

3.1 General Data

Well Name:	Dingo No. 2
Operator:	Pancontinental Petrolelum Limited, 9th Floor, FCA Building, 50 Margaret Street, Sydney N.S.W. 2000.
Tenement Holder:	Magellan Petroleum (N.T.) Pty. Limited, 420 George Street, Brisbane Qld. 4000.
Petroleum Tenement:	Oil Permit No. 175, N.T.
District:	Rodinga, Northern Territory
Location:	24 deg 13' 53.8''S, 133 deg 52' 26.0''E (shot point 520, line P80-16, Alice Survey)
Water Supply:	Rig Water was trucked from Dingo Bore, approximately 9 kilometres west of the exploration well. Camp water was hauled from Alice Springs.
Elevation:	Ground - 540.545 metres above sea level Kelly Bushing- 547.345 metres above sea level
Total Depth:	Driller - 3085.19 metres Logger - 3088.0 metres
Well Spudded:	0120 hours, April 20, 1984

T.D. Reached:	1830 hours, July 3, 1984
Rig Released:	2230 hours, July 13, 1984
Total Time Drilling:	75 days
Spud to Rig Release:	85 days
Well Status:	7" production casing was run to 3084.3 metres, and a well-head installed. The well was completed as an Arumbera A1 gas well.

3.2 Drilling Plant

Drilling Contractor:	Richter Drilling Pty. Limited, 1st Floor, 14 Cribb Street, Milton Qld. 4064.
Drilling Rig:	Richter Rig 8
Make:	National 80B
Rated Depth:	3650 metres
Power:	3 each Superior PTD56, each rated at 600 HP at 900 RPM.
Mast:	Lee C. Moore, 142 ft. 860,000 lbs, capacity. Six 48" sheaves in crown.

Pumps:	a) National 9-p-100 Triplex 1000 HP 6-3/4" x 9-1/4" with hydril K20-5000 pulsation dampeners. Driven off compound. b) National G700 Duplex 8" x 14" with Hydril K20-5000 pulsation dampeners. Driven off compound.
Rotary Table:	National C275, 27-1/2"
Drill Pipe:	10000 ft 4-1/2"OD, 20 lb/ft, Grade E, Range 2
Drill Collars:	3 x 10" OD, 8-5/8" API Reg 10 x 8" OD, 6-5/8" API Reg 24 x 6-1/2" OD, 4-1/2" x H
BOPs and Accumulators:	- 20" x 2000 psi Shaffer Spherical - Spherical, Stamco 13-5/8" 5000 psi - 2 - Cameron 13-5/8" x 5000 psi U Type - Accumulator, koomey 35120-35, 12 bottles - Hydril 10000 psi Upper Kelly Cock - Gray inside BOP, 4-1/2" x H - 2 x Hydril Lower Kelly Cock - 13-5/8" x 5000 psi dbl flanged drilling spool with 4" x 5000 psi flanged side outlet - 1 - 4" 5000 psi hydraulic valve - 1 - 4" 5000 psi manual valve on choke side of spool
Airdrilling Equipment:	2 Gardner WEN 860 cfm Compressors powered by GMC 12V-71 diesel engines. 1 Gardner Denver RLD 1000 psi Booster powered by 8V-71 diesel engine.

3.3 Drilling Data

3.3.1 Well Configuration

Hole Size	Depth	Casing & Cementing Details
26"	125.9m	Ran 11 joints of 20" 94 lb/ft buttress casing to 125.0 metres. Cemented with 210 sacks Class A cement plus 2.5% gel slurry, tail in with 300 sacks Class A neat. No returns.
17-1/2"	1025m	Ran 88 joints of 13-3/8" casing: 25 joints of 68 lb/ft, 21 joints of 61 lb/ft, 40 joints of 54 lb/ft and 2 joints of 68 lb/ft. Landed at 1025 metres. Cemented with 515 sacks Class A with 2.1% gel and 0.5% CFR-2 and 250 sacks Class A with 0.5% CFR-2.
12-1/4"	2701m	Ran 229 joints of 9-5/8" casing: 71 joints of 47 lb/ft N80 LTC, 82 joints of 43-1/2 lb/ft N80 LTC, 51 joints of 40 lb/ft N80 LTC, 23 joints of 47 lb/ft P110 Buttress and 2 damaged 43-1/2 lb/ft joints. Cemented first stage with 655 sacks Class G cement, saturated salt water with 0.5% CFR-2. Cemented second stage with 690 sacks Class G cement,

		mixed water with 0.5% gel and 0.5% CFR-2.
8-1/2"	3085m	Ran 260 joints 7" casing: 129 joints 29 lb/ft N80 BTC, 1 cross over 29 x 26, 132 joints 26 lb/ft, 1 cross over, 7 joints 29 lb/ft. Cemented with 600 sacks Class G cement, mix water, 0.5% CF2, 0.75% Halad 22A. Ran 2-7/8" tubing (Figure 3).

3.3.2 Completion Programme

The well was cased and completed as a gas well in the Arumbera 1 Sandstone. 2-7/8" tubing was run and the following intervals were perforated:

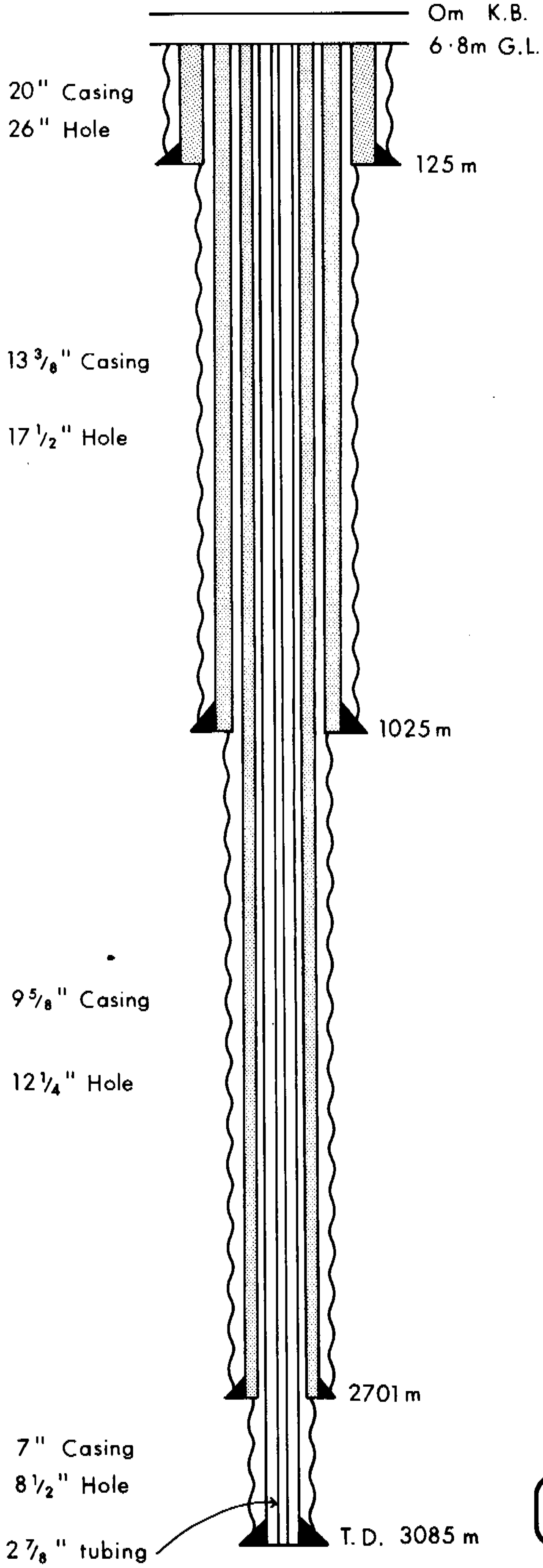
2954.0 - 2958.1 m KB	4 shots per foot
2961.0 - 2966.2 m KB	4 shots per foot
2980.7 - 2987.7 m KB	12 shots per foot
2987.7 - 3001.5 m KB	4 shots per foot

A well-head was installed on this well after the rig was moved out (Figure 4).

3.3.3 Drilling Fluid

Drilling fluid materials and services for this well were supplied by Geofluids. Drilling commenced using a Gel-Benex spud mud. 17-1/2" hole was drilled to 125.9 metres then opened to 26". 20" casing was run and cemented with the shoe being set at 125 metres.

WELL SCHEMATIC
DINGO – 2

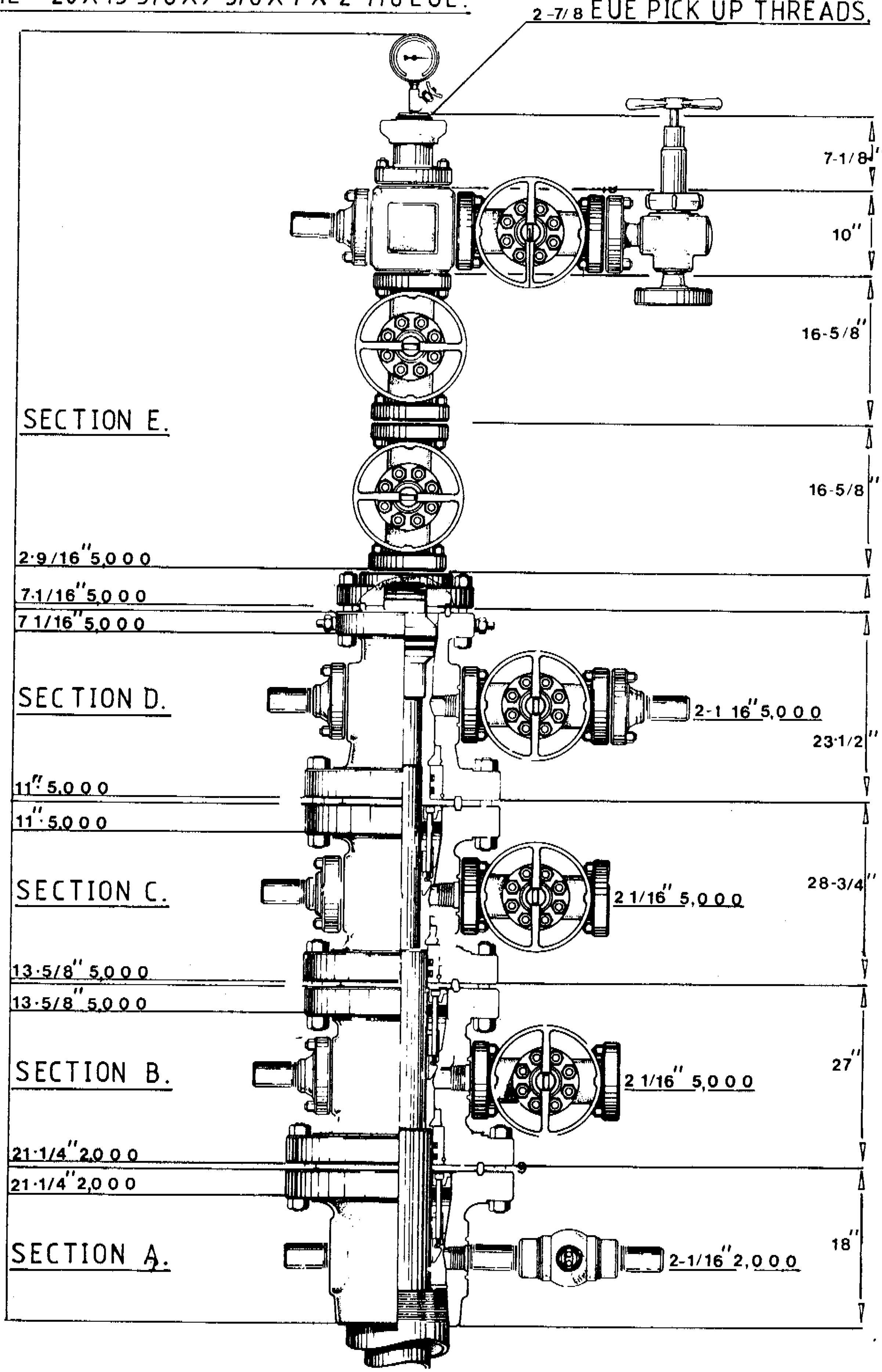


PANCONTINENTAL PETROLEUM LIMITED

FIG. 3

ASSEMBLY DRAWING NO 5.
WELLHEAD AND XMAS TREE TYPE. C.
PROGRAMME - 20" X 13-3/8" X 9-5/8" X 7" X 2-7/8" EUE.

PANCONTINENTAL PETROLEUM LIMITED



WELL HEAD DIAGRAM

DINGO - 2

FIG: 4

The 20" casing shoe and cement were drilled out with water, the hole was then unloaded with air and the blooie line installed. 17-1/2" hole was drilled with air/foam to 722 metres, where a valve in the blooie line blew out and it became necessary to revert to mud drilling. Severe foaming problems were experienced, due to the incorporation of some foaming agent from the air drilling phase finding its way into the mud. The foaming was reduced to manageable proportions with additions of defoamer and diesel. The 17-1/2" hole was drilled with no other problems to 1025 metres, where 13-3/8" casing was run and cemented.

12-1/4" hole was drilled with air/foam to 2405 metres, while a salt (NaCl) - polymer fluid was prepared on surface. At 2405 metres the displacement was made from air to mud. A water spacer was pumped ahead of the mud to flush any remaining vestiges of foam, in order to prevent any recurrence of the foaming problems experienced in the 17-1/2" hole. The 12-1/4" hole was drilled ahead with the salt mud which initially had a Cl concentration of around 140,000 mg/ltr. As drilling proceeded, the Cl concentration rose from 145,000 mg/ltr at 2517 metres to 170,000 mg/ltr at 2556 metres in a 12 hour period. After a further 12 hours, at 2583 metres, the Cl concentration was 188,000 mg/ltr (i.e. saturation point).

Drilling proceeded to 2701 metres where 9-5/8" casing was run and cemented with the shoe being set at 2699 metres.

The 9-5/8" casing shoe and cement were drilled out, and 8-1/2" hole drilled to 2704 metres with the saturated salt mud. Drilling air/foam proceeded to 2952 metres, where displacement to a KCl - polymer mud was made. The mud was pumped into the hole behind a 110 barrel water spacer.

After a small drilling break at 3015 metres the gas levels began to increase. The pumps were stopped with no flow being observed.

The mud weight was raised from 9.7 to 9.8 lb/gal and a twelve stand wiper trip made. Gas was then recorded at 2640 units. Fluid density was raised to 9.9lb/gal. 8-1/2" hole was then drilled to 3035.8 metres, where, in response to increasing gas levels, the mud weight was increased to 10.5 lb/gal with calcium carbonate and barytes. Although flow checks were negative, gas levels continued to rise, and gas cutting was evident in mud weights recorded at the shakers. The mud weight was raised to 11.4 lb/gal. 8-1/2" hole was then drilled to a total depth of 3085 metres with 11.3lb/gal mud.

Chemicals used on Dingo No. 2:

Applied 3280	1200 litres
Barytes	49850 kilograms
Benex	31 kilograms
Calstop	27500 kilograms
Caustic Soda	2040 kilograms
C1 100	200 kilograms
Diesel	5000 litres
Geofoam	6400 litres
Milben	30119 kilograms
Milpac	2223 kilograms
Oxygen	700 kilograms
Permalose	4975 kilograms
Potassium Chloride	54250 kilograms
Potassium Hydroxide	400 kilograms
Salt	78000 kilograms
Soda Ash	800 kilograms
Soda Bicarb	240 kilograms
Sodium Nitrate	400 kilograms
W.O. Defoam	500 litres
L.D. 8	275 litres
X.C. Polymer	1406 kilograms

3.3.4 Deviation Surveys

Depth	Angle	Depth	Angle
30	1/2 deg	1531	4 deg
98	3/4 deg	1569	3-1/2 deg
126	3/4 deg	1635	2-3/4 deg
171	1/4 deg	1780	2-1/4 deg
216	1/2 deg	1932	2-1/2 deg
313	1/2 deg	2075	1-3/4 deg
475	1/4 deg	2218	1-1/2 deg
625	1/4 deg	2409	1-1/2 deg
789	1/4 deg	2562	1-1/4 deg
935	0 deg	2701	1-1/2 deg
1019	3/4 deg	2853	2 deg
1152	1-1/2 deg	3019	1-3/4 deg
1267	1-3/4 deg	3085	2 deg
1344	1-1/4 deg		

3.3.5 Formation Sampling

Drill cuttings were collected every ten metres from the surface to 140 metres. From 140 metres to T.D. cutting samples were collected every five metres. Sample distribution was as follows:

Northern Territory Department of Mines	1
Bureau of Mineral Resources	1
Pancontinental Petroleum Limited	1
Magellan Petroleum (N.T.) Pty. Limited	1

3.3.6 Conventional Coring

Core No:	1
Size:	8-1/2"
Interval:	2985.6 - 2993.5 metres
Formation:	Arumbera 1 Sandstone
Recovery:	99%

Core No:	2
Size:	8-1/2"
Interval:	2993.5 - 2995.9 metres
Formation:	Arumbera 1 Sandstone
Recovery:	0%

Core No:	3
Size:	8-1/2"
Interval:	3021.79 - 3022.55 metres
Formation:	Julie Formation Equivalent
Recovery:	29%

Core No:	4
Size:	8-15/22"
Interval:	3035.8 - 3044.9 metres
Formation:	Julie Formation Equivalent
Recovery:	72%

Cores 1, 3 and 4 are described in Appendix 8.

3.3.7 Sidewall Coring

Nil

3.3.8 Wireline Logging

17-1/2" hole:	Run by Geoscience	
Sonic	1023 to 125m	
Neutron	1023 to 125m	
Caliper	1023 to 125m	
Gamma Ray	1023 to surface	

12-1/4" hole: Run by Schlumberger

Dual Laterolog - Microsperically Focused Log - Gamma Ray - Caliper	2698-1025m
Compensated Neutron - Formation Density - Gamma Ray - Caliper	2697-1025m
Borehole Compensated Sonic - Gamma Ray	2701-1025m

8-1/2" hole: Run by Schlumberger

Dual Laterolog - Microspherically Focused Log - Gamma Ray - Caliper	3087-2698m
Compensated Neutron - Litho-density Tool - Gamma Ray - Caliper	3087-2698m
Natural Gamma Ray Spectroscopy Tool - Borehole Compensated Sonic	3087-2698m
High Resolution Dipmeter	3087-2698m

In addition, the following computer processed logs were run:-

Cyberlook (Run 2)	2410-1690m
Cyberlook (Run 3)	3050-2850m
Cyberdip	3087-2698m

3.3.9 Drill Stem Testing

DST No. 1:

Date:	June 20, 1984
Testing Company:	Halliburton
Interval:	2947.4 - 2993.5m
Formation:	Arumbera 1
Type of Test:	Bottom hole conventional
Water Cushion:	351m
Time:	Preflow - 5 mins
	Initial Shut in - 37 mins
	Valve Open - 180 mins
	Final Shut in - 240 mins
Pressures:	(at 2993m)

IH	4904.9 psi	33,818 kPa
PF	1470.7 psi	10,140 kPa
ISI	4581.0 psi	31,585 kPa
VO (inital)	1019.5 psi	7,029 kPa
VO (final)	1208.0 psi	8,329 kPa
FSI	4536.4 psi	31,277 kPa
FH	4859.2 psi	33,503 kPa

Flow Description:	Preflow - weak air blow, increasing to moderate blow, decreasing to weak blow, increasing to strong blow, gas to surface in 23 minutes, water to surface in 83 minutes.
Recovery:	596m of gas cut muddy water (filtrate)
Gas Flow:	1.38 MMcfg/day.

DST No. 2:

Date:	July 1, 1984
Testing Company:	Halliburton
Interval:	3002.9 - 3044.6m
Formation:	Julie

Type of Test:	Bottom hole conventional
Water Cushion:	454m
Time:	Preflow - 5 mins
	Initial Shut in - 60 mins
	Valve open - 90 mins
	Final shut in - 124 mins
Pressures:	(at 3043.7m)

IH	5942.6 psi	40,973 kPa
PF	837.3 psi	5,773 kPa
ISI	5964.7 psi	41,125 kPa
VO (initial)	876.5 psi	6,043 kPa
VO (final)	881.9 psi	6,080 kPa
FSI	5416.7 psi	37,347 kPa
FH	5901.1 psi	40,687 kPa

Flow Description:	Preflow - weak air blow, increasing to moderate, no gas to surface. Valve open - strong blow decreasing to weak blow before increasing again to strong blow, gas to surface in 22 minutes.
Recovery:	520m of gas cut discoloured water.
Gas Flow:	144 Mcfg/day.

3.3.10 Velocity Survey

A well velocity survey was carried out by Velocity Data Pty. Limited and is incorporated within the appendices (Appendix L).

3.3.11 Temperature Survey

Schlumberger measured the following maximum temperatures at T.D. while logging:

Log	Temperature	Time Since Circulation
DLL-MSFL	72 deg. C	7 hours, 30 minutes
NGT-BHC	74 deg. C	11 hours, 15 minutes
LDT-CNL	75 deg. C	16 hours, 0 minutes
Dipmeter	76 deg. C	20 hours, 0 minutes

4. REGIONAL

The Amadeus Basin is an 800 kilometre long, east-west oriented intracratonic depression lying in the southern part of the Northern Territory and extending partly into Western Australia. Commencing with Late Proterozoic clastics, which rest on an older Precambrian basement of metamorphic and igneous rocks, the basin has had a long and diversified history of sedimentation (Figure 5). Following Late Proterozoic sedimentation, rocks of Cambrian, Ordovician, possibly Silurian, Devonian and Permian age were deposited. Depositional and climatic conditions varied greatly in space and time throughout this long history. The Late Proterozoic, Cambrian and Ordovician were largely times of marine sedimentation resulting in the accumulation of great thicknesses of sandstone, shale, limestone and dolomite, with periods of evaporite (salt) deposition in the Late Proterozoic and Cambrian. Two periods of glaciation also occurred in the Late Proterozoic. The Siluro - Devonian sandstones, which were deposited during a period of aridity, are partly fluviatile and aeolian. Mountain building movements along the northern rim of the basin provided material for a thick wedge of fluviatile sediments in the Late Devonian. Minor fluviatile and lacustrine deposition in the Permian and again in the Tertiary concluded the sedimentary history of the Amadeus Basin.

Sedimentation was modified by tectonic movements which occurred intermittently from Late Proterozoic to Late Devonian. Tectonic movements in the Proterozoic established the shape of the basin, and formed the structural framework within which subsequent movement took place (Figure 5).

Two major cycles of sedimentation associated with tectonism are evident. The older cycle began in the Proterozoic with mature orthoquartzite and carbonate rocks and finished with relatively immature fluviatile sandstone in the early Cambrian (Petermann

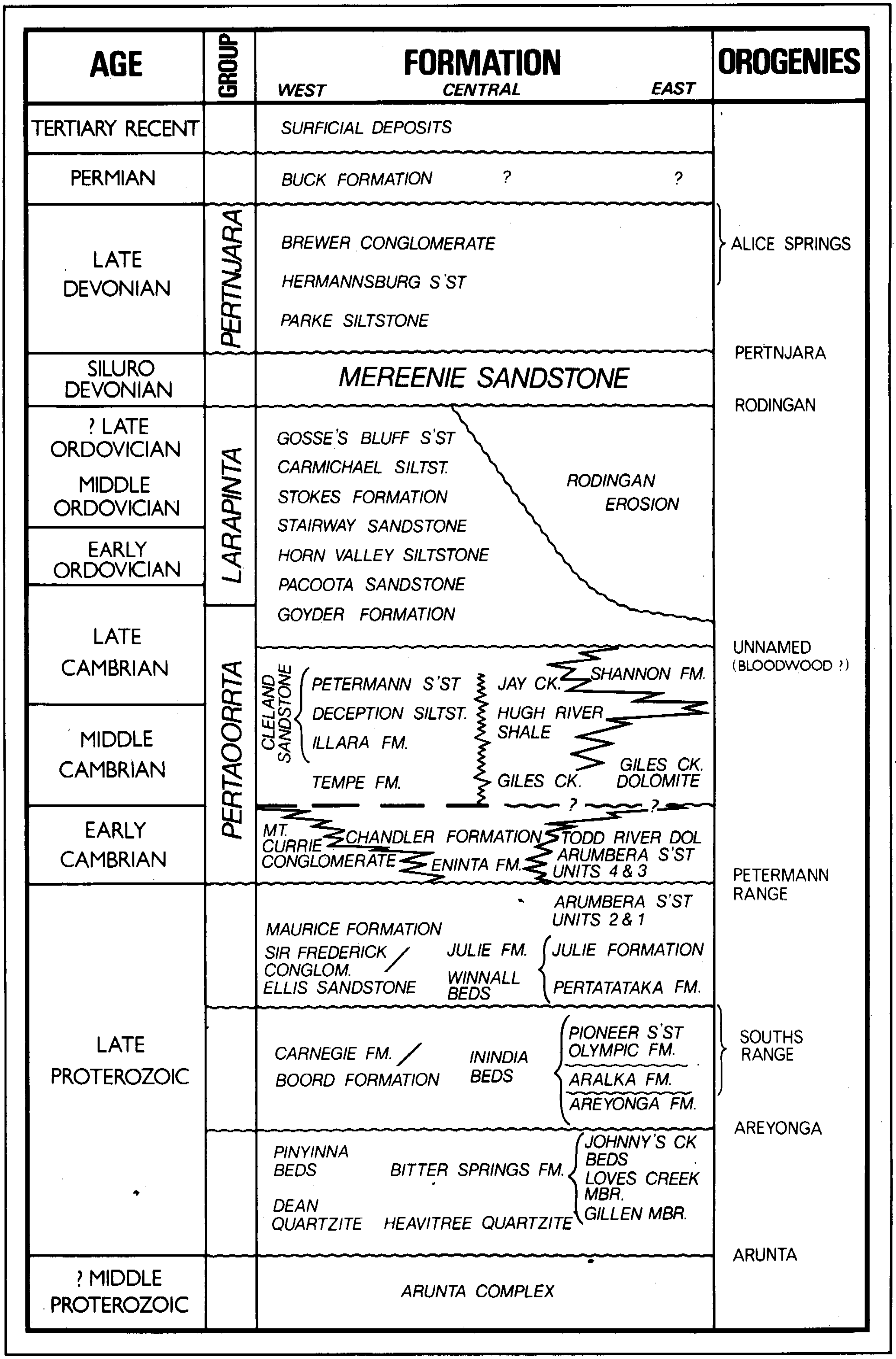

AGE
GROUP
FORMATION
WEST
CENTRAL
EAST
OROGENIES
TERTIARY RECENT
SURFICIAL DEPOSITS
PERMIAN
BUCK FORMATION
?
?
LATE DEVONIAN
PERTNJARA
BREWER CONGLOMERATE
HERMANNSBURG S'ST
PARKE SILTSTONE
ALICE SPRINGS
PERTNJARA
SILURO DEVONIAN
MEREENIE SANDSTONE
RODINGAN
? LATE ORDOVICIAN
MIDDLE ORDOVICIAN
EARLY ORDOVICIAN
LARAPINTA
GOSSE'S BLUFF S'ST
CARMICHAEL SILTST.
STOKES FORMATION
STAIRWAY SANDSTONE
HORN VALLEY SILTSTONE
PACOOTA SANDSTONE
GOYDER FORMATION
RODINGAN EROSION
LATE CAMBRIAN
MIDDLE CAMBRIAN
EARLY CAMBRIAN
PERTAOORRTA
CLELAND SANDSTONE
PETERMANN S'ST
DECEPTION SILTST.
ILLARA FM.
TEMPE FM.
JAY CK.
SHANNON FM.
HUGH RIVER SHALE
GILES CK.
GILES CK. DOLOMITE
UNNAMED (BLOODWOOD ?)
?
?
MT. CURRIE CONGLOMERATE
CHANDLER FORMATION
ENINTA FM.
TODD RIVER DOL
ARUMBERA S'ST UNITS 4 & 3
PETERMANN RANGE
LATE PROTEROZOIC
ARUMBERA S'ST UNITS 2 & 1
MAURICE FORMATION
SIR FREDERICK CONGLOM.
ELLIS SANDSTONE
JULIE FM.
WINNALL BEDS
JULIE FORMATION
PERTATATAKA FM.
CARNEGIE FM.
BOORD FORMATION
ININDIA BEDS
PIONEER S'ST
OLYMPIC FM.
ARALKA FM.
AREYONGA FM.
SOUTHS RANGE
AREYONGA
PINYINNA BEDS
DEAN QUARTZITE
BITTER SPRINGS FM.
HEAVITREE QUARTZITE
JOHNNY'S CK BEDS
LOVES CREEK MBR.
GILLEN MBR.
ARUNTA
? MIDDLE PROTEROZOIC
ARUNTA COMPLEX

FIG.5

Range Orogeny). The second cycle commenced later in the Cambrian with marine sedimentation predominating and ended in the Late Devonian with the Alice Springs Orogeny. Smaller local cycles associated with the movements have been named on Figure 5.

Folding and faulting in the southwestern area initiated in the Proterozoic, sometimes associated with salt tectonics, produced east-west striking anticlines, often faulted along the flanks and showing thinning of Late Proterozoic sediments over the crest. These structures were modified, and new ones created, by the Alice Springs Orogeny in Late Devonian time - the final major tectonism in the Amadeus Basin. An important precursor to the Alice Springs Orogeny was the Late Ordovician Rodingan Movement. The low angle unconformity that indicates this movement is best developed in the north and northeast, where the earlier deposited Ordovician sediments were progressively eroded eastwards. The total sediment thickness and the stratigraphy of sediments preserved over any structure depend on the amount of Rodingan erosion to which the structure has been subjected. Thus more western structures, such as Palm Valley and Mereenie are more likely to have a more complete sedimentary section preserved over them than eastern structures, such as the Dingo structure.

Structures may be further complicated by the occurrence of salt diapirs, emanating from the Bitter Springs Formation or Chandler Formation, flowing into the cores of structures. The Goyder Pass, Dingo and Orange structures have all had salt diapirism associated with their growth. The salt cored structures are known to have grown intermittently from Late Proterozoic to Devonian time, as shown by local thinning of units.

At least two generations of thrust faulting are present in the Amadeus Basin, with thrusting from both north and southwest. Thrusting events probably took place during the Petermann Range Orogeny in the southwest and during the Alice Springs Orogeny. These thrusting movements further complicate the geology and have led to thickened section, overthrust anticlines and possibly the development of fracture porosity.

Table 1

STRATIGRAPHIC AT DINGO NO. 2

Formation	Top (metres KB)	Thickness (metres)
Quaternary	6.8	7.2
Pertnjara Group	14	620
Mereenie Sandstone	634	346
Stairway Sandstone Equivalent	980	20.5
Horn Valley Siltstone	1000.5	31.5
Pacoota Sandstone P1	1032	131
Pacoota Sandstone P2	1163	83
Pacoota Sandstone P3	1246	94
Pacoota Sandstone P4	1340	47.5
Goyder Formation	1387.5	117.5
Upper Shannon Formation	1505	199
Lower Shannon Formation	1704	175.5
Hugh River Shale	1879.5	237.5
Upper Giles Creek Dolomite	2117	156.5
Middle Giles Creek Dolomite	2273.5	100.5
Lower Giles Creek Dolomite	2374	34
Dingo Member	2408	12.5
Chandler Formation	2420.5	263
Todd River Equivalent	2683.5	24.5
Arumbera Sandstone 4	2708	9
Arumbera Sandstone 3	2717	85
Arumbera Sandstone 2B	2802	40
Arumbera Sandstone 2A	2842	58
Arumbera Sandstone 1	2900	108.5
Julie Equivalent	3008.5	39.5
Pertatataka Formation	3048	37+
Total Depth	3085	

5. STRATIGRAPHY

The section penetrated by Dingo No. 2 is compared with the sections drilled by James Range No. 1, Dingo No. 1, Wallaby No. 1 and Ooraminna No. 1 in Enclosure 3. Table 1 shows the depth of the various formations penetrated in Dingo No. 2 relative to KB, and the thickness of each of those formations.

5.1 Quarternary: Surface to 14m (Thickness 7.2m)

The lithology of the Quaternary cover consists of unconsolidated red brown sand overlying a calcrete horizon that consists of highly porous conglomerate, containing angular to rounded pebbles up to three cm long in a calcareous sandy matrix. The pebbles are possibly lateritized.

5.2 Pertnjara Group: 14 - 634m (Thickness 620m) Age - Late Devonian

At Dingo No. 2 the Pertnjara Group consists predominantly of sandstone with traces of shale, gypsum and calcite.

The sandstone is clear to orange and red brown in colour, and is comprised of moderately poorly sorted, angular to rounded, medium to very coarse quartz and minor lithic grains moderately consolidated within an occasionally argillaceous matrix. Diagenetic alterations have introduced some secondary silica and minor calcite cement. In places the quartz grains are frosted. The shale is grey, micaceous, blocky and hard, while the gypsum is white and platey, and the calcite occurs as sparry veins.

The Pertnjara Group was deposited during and shortly after the Late Devonian Alice Springs Orogeny. As the areas to the north and east were uplifted, a thick wedge of molasse type sediment was deposited in the northern part of the basin.

5.3 Mereenie Sandstone: 634 - 980m (Thickness 346m)

Age - Silurian to Middle Devonian

The Mereenie Sandstone at Dingo No. 2 consists of 346 metres of sandstone with very minor siltstone and shale beds. The sandstone is clear, white, orange and brown, very fine to medium grained, well rounded to sub rounded and moderately well sorted. It is quartzose with occasional black lithic grains, minor calcareous cement in places and rare argillaceous matrix. The sandstone grades to silty in places, has poor to fair porosity and no shows. The siltstone is brown, hard, blocky and sandy in part, while the shale is reddish orange, siliceous and blocky to sub fissile.

Sedimentary structures evident in surface exposures indicate that the depositional environment of the Mereenie Sandstone included both aeolian and shallow marine influences. The sandstone was possibly deposited along an arid shoreline.

The Mereenie Sandstone was also encountered at Alice No. 1, Orange No. 1, Wallaby No. 1 and Dingo No. 1, and has a relatively uniform thickness in these wells.

5.4 Stairway Sandstone Equivalent: 980 - 1000.5m

(Thickness 20.5m)

Age - Early Ordovician

The Stairway Sandstone Equivalent unconformably underlies the Mereenie Sandstone at Dingo No. 2. The unit consists of clear to white, grey and orange sandstone with minor siltstone. The sandstone consists of very fine to medium and occasionally coarse, sub rounded to sub angular, quartz grains, moderately sorted and consolidated within a siliceous cement and occasional silty matrix. It has occasional black lithic grains and minor glauconite. The siltstone is red brown and pale green, firm, blocky and sandy in part.

The Stairway Sandstone is present at Orange No. 1 and absent at Alice No. 1 and Wallaby No. 1. The reduced thicknesses of Stairway Sandstone in the eastern part of the basin are due to erosion during the Rodingan Orogeny.

5.5 Horn Valley Siltstone: 1000.5 - 1032m (Thickness 31.5m) Age - Early Ordovician

The Horn Valley Siltstone conformably underlies the Stairway Sandstone Equivalent at Dingo No. 2. The unit consists of dark grey to black shale and siltstone with occasional limestones. The shale is micromicaceous, fissile, carbonaceous, slightly calcareous and silty, grading to argillaceous siltstone. The basal three metre thick dolomite limestone is white to cream, micritic to microcrystalline, hard, fossiliferous and tight. The limestone contains indeterminate Orthid brachiopods and possible ostracod casts. There is no porosity and no shows.

The Horn Valley Siltstone is present in Orange No. 1 and Dingo No. 1, where it is overlain by probable Stairway Sandstone. The Horn Valley Siltstone is absent at Alice No. 1 and Wallaby No. 1 due to erosion during the Rodingan Orogeny.

The Horn Valley Siltstone at Dingo No. 1 was dated as Early Ordovician (Arenig) on the presence of conodonts, acritarchs and chitinozoa (Gorter et al., 1982).

5.6 Pacoota Sandstone P1: 1032 - 1163m (Thickness 131m) Age - Early Ordovician

The Pacoota Sandstone PI at Dingo No. 2 consists of sandstone with interbedded siltstone and shale. The shale and siltstone increase towards the top of the unit.

The sandstone is clear to orange brown and frosted in part, very fine to coarse grained, moderately well sorted, sub rounded to sub angular and quartzose with an argillaceous to silty matrix and siliceous cement. The siltstone is brick red to red brown, firm, fissile to subfissile, argillaceous in part, arenaceous in part and micaceous.

5.7 Pacoota Sandstone P2: 1163 - 1246m (Thickness 83m) Age - Early Ordovician

At Dingo No. 2 the Pacoota Sandstone P2 consists predominantly of sandstone with siltstone occurring both at the top and base of the unit.

The sandstone is white, clear and frosted in part, fine to coarse grained, moderately sorted, sub rounded to angular and predominantly unconsolidated with occasional siliceous cement and argillaceous matrix. It is occasionally glauconitic and micaceous. The siltstone is red brown to orange brown, moderately hard, sub fissile to fissile, arenaceous and micaceous.

5.8 Pacoota Sandstone P3: 1246 - 1340m (Thickness 94m) Age - Early Ordovician to Late Cambrian (?)

The Pacoota Sandstone P3 at Dingo No. 2 consists predominantly of sandstone down to 1300 metres, from which depth siltstone is the dominant lithology.

The sandstone is clear to pale orange and frosted in part, fine to medium grained, moderately well sorted, sub angular to sub rounded and has silica cement and poor porosity. The siltstone is brick red to red brown, occasionally grey green, moderately hard, sub fissile arenaceous and non calcareous.

5.9 Pacoota Sandstone P4: 1340 - 1387.5m (Thickness 47.5m) Age - Late Cambrian

At Dingo No. 2, the Pacoota Sandstone P4 consists entirely of sandstone. It is clear, white, reddish brown and brown, fine to medium grained and occasionally coarse grained and moderately sorted with sub angular to sub rounded quartzose grains. The sandstone has silica cement and is hard, slightly micaceous and occasionally glauconitic, with poor porosity.

5.10 Goyder Formation: 1387.5 - 1505m (Thickness 117.5m) Age - Late Cambrian

Two shoaling upwards sequences in the Goyder Formation are apparent on the gamma ray log for Dingo No. 2, supporting the regional depositional cycles suggested by Gorter et al. (1982) in the well completion report for Wallaby No. 1. Shoaling upward sequences in the Goyder are also present at Alice No. 1, Orange No. 1 and Dingo No. 1.

The Upper Goyder Formation, 1387.5 - 1452m, consists of shale and siltstones, shoaling upwards into sandy dolomite and sandstone. The shale is dark grey to black, micromicaceous in part, fissile to sub fissile, brittle and slightly dolomitic. Occasionally the shale grades to argillaceous, dolomitic siltstone, medium grey, firm and micaceous. Above 1427m the sequence becomes more dolomitic. The dolomite is medium grey, occasionally dark grey, moderately hard, microcrystalline, moderately calcareous in part and occasionally sandy. The dolomite is gradational with dolomitic sandstone, which is light to medium grey, predominantly fine grained, sub angular to sub rounded, moderately sorted and slightly glauconitic in part.

The top of the Lower Goyder Formation, 1452 - 1505m, is readily defined by a sharp decrease in the gamma ray log and an increase in the sonic log at 1452m. This surface probably represents a slight unconformity or hiatus between the two shoaling upwards sequences of the Goyder Formation. The Lower Goyder Formation consists of a sequence of shale and siltstone, grading upwards into dolomite. Dolomite predominates above 1468 metres. It is medium grey to white, microcrystalline, moderately hard, brittle, sandy and occasionally slightly glauconitic. The shale is medium to dark grey brown, micaceous, dolomitic in part and moderately hard. The siltstone is grey to green to dark grey, micaceous, dolomitic in part, moderately hard to firm and rarely pyritic.

5.11 Upper Shannon Formation: 1505 - 1704m (Thickness 199m) Age - Middle to Late Cambrian

At Dingo No. 2 the Upper Shannon Formation consists mainly of interbedded limestone, dolomite, shale and minor sandstone. The dolomite and limestone lithologies are gradational. The limestone is white, light to medium dark grey, mottled, and microcrystalline to occasionally coarsely crystalline. It is moderately hard, occasionally brittle, occasionally dolomitic and oolitic in part, with poor porosity and no shows. The dolomite is white to light grey, microcrystalline, moderately hard, brittle, occasionally calcareous and sandy in part. The shale is dark grey, firm, blocky to sub fissile, micaceous and grades to siltstone in places. The sandstone is white to cream, very fine to fine grained, moderately sorted and sub angular to rounded with dolomitic in part, moderately hard to firm and rarely pyritic.

5.12 Lower Shannon Formation: 1704 - 1879.5m (Thickness 175.5m) Age - Middle Cambrian

The Lower Shannon Formation at Dingo No. 2 consists of interbedded shale, limestone and siltstone. The Lower Shannon is distinguished from the Upper Shannon by containing less carbonate rocks.

The shale is grey to reddish brown, firm, sub fissile to fissile, occasionally blocky, hard, brittle, very silty in part and micromicaceous. The reddish brown colouration increases with depth. The limestone is light brown to greyish white, finely crystalline to occasionally microcrystalline, hard, silty in part and occasionally oolitic. It has moderately bright uniform yellow mineral fluorescence. The siltstone is light to dark grey and red to brown, firm to hard, moderately argillaceous and micaceous.

5.13 Hugh River Shale: 1879.5 - 2117m (Thickness 237.5m) Age - Middle Cambrian

The Hugh River Shale at Dingo No. 2 is comprised of an interbedded sequence of siltstone and shale with minor limestone towards the top of the formation and minor sandstone towards the base. The siltstones of the Hugh River Shale are red-brown to brown, occasionally grey-green, and mottled. They are micaceous, slightly to non calcareous, hard to firm and argillaceous in part. The shales are red-brown to grey, firm to hard, micromicaceous and sub fissile. The limestone is off white, cream and grey, occasionally mottled, microcrystalline and silty, grading to calcareous siltstone in part. The sandstones penetrated towards the base of the formation are light grey to white, very fine to fine grained and moderately light grey to white, very fine to fine grained and poorly sorted within a siliceous cement and no visible porosity.

5.14 Upper Giles Creek Dolomite: 2117 - 2273.5m
(Thickness 156.5m)
Age - Middle Cambrian

The top of the Giles Creek Dolomite is marked by a change to dominantly carbonate matrix on the sonic log and an increase in the carbonate content of the cuttings. The Upper Giles Creek Dolomite consists of interbedded dolomite and siltstone with minor shale.

The dolomite is white to medium grey, crystalline to microcrystalline, occasionally micritic, hard to brittle and sandy in part. It has yellow mineral fluorescence and hydrocarbon shows. The siltstone is predominantly red brown and light grey in colour, micaceous, slightly to non calcareous and moderately hard to firm. The shale is medium grey to grey green, very hard, blocky to fissile, very slightly dolomitic, occasionally glauconitic and micromicaceous.

5.15 Middle Giles Creek Dolomite: 2273.5m - 2374m
(Thickness 100.5m)
Age - Middle Cambrian

The Middle Giles Creek Dolomite at Dingo No. 2 consists predominantly of dolomite with lesser amounts of interbedded siltstone. The dolomite is white to light grey, occasionally medium grey-brown, silty in part, crystalline to microcrystalline, hard, brittle and calcareous, grading to dolomitic limestone in part. The siltstone is red brown and grey green, micaceous, slightly to non calcareous, moderately hard to firm and sub fissile. The siltstone grades to silty shale in part and occurs as thin beds, averaging 1 to 3 metres thick.

The contact with the underlying Lower Giles Creek Dolomite is picked at a distinct lithological and gamma ray log break where dolomitic limestone overlies shale at 2374 metres.

The Middle Giles Creek Dolomite contained minor gas shows at Dingo No. 2 in a dolomitic limestone between 2366 and 2374 metres. Log interpretation indicates that the interval is tight, a conclusion supported by the lack of a flare while air-drilling this interval.

5.16 Lower Giles Creek Dolomite: 2374 - 2408m (Thickness 34m) Age - Middle Cambrian

At Dingo No. 2 the Lower Giles Creek Dolomite consists predominantly of shale with minor dolomite and limestone beds.

The shale is reddish brown, occasionally light grey to dark grey, micaceous to micromicaceous, sub fissile and moderately hard. It is non dolomitic to slightly dolomitic and silty. The dolomite is medium to light grey, microcrystalline, sandy in part, hard and tight. The limestone is white to medium grey, microcrystalline, dolomitic, sandy in part, hard and tight.

This unit contained a gas show at Orange No. 1 and can be readily correlated on gamma ray logs from Alice No. 1 and Wallaby No. 1 in the north east, and to Highway No. 1 in the south west.

5.17 Dingo Member: 2408 - 2420.5m (Thickness 12.5m) Age - Middle Cambrian

The Dingo Member at Dingo No. 2 consists of a thin coarsening upward shale and siltstone to sandstone unit at the base of the Lower Giles Creek Dolomite and overlying the Chandler Formation.

The shale is red brown, micromicaceous, sub fissile, soft to firm and silty in part. The siltstone is red brown to grey brown, hard to firm, micromicaceous in part and siliceous. The siltstone and shale are similar to the overlying unit, suggesting closer affinity with the Lower Giles Creek Dolomite than the underlying evaporites. The sandstone is white to grey, very fine to fine grained, sub angular to sub rounded and well consolidated with silica and calcite cements and poor porosity. The sonic log also indicates that the sandstone is tight with a carbonate cement.

The abrupt downward change to the evaporitic Chandler Formation may reflect an unconformity. If unconformable on the Chandler Formation, the Dingo Member may represent the initial deposits of the Giles Creek transgression.

5.18 Chandler Formation: 2420.5 - 2683.5m (Thickness 263m) Age - Early Cambrian

The Chandler Formation at Dingo No. 2 consists mainly of evaporites with minor silty claystone beds. The claystones occur at 2463 - 2467m, 2478 - 2482m and 2560 - 2598m.

The claystones are light grey to black and red-brown, firm, blocky, silty and slightly dolomitic in part. The evaporite sequence consists predominantly of halite, with minor sulphur, gypsum and anhydrite. The halite is clear, soft, firm, crystalline, exhibits 90 degree cleavage and has a salty taste.

The sulphur occurs mainly between 2540 and 2555 metres and is greenish yellow to yellow, crystalline and firm. A 4 metre thick limestone bed occurs from 2474 - 2478m and is dark grey-black, firm to brittle, microcrystalline to micritic and slightly dolomitic.

5.19 Todd River Equivalent: 2683.5 - 2708m (Thickness 24.5m) Age - Early Cambrian

In Dingo No. 2 the Todd River Equivalent consists predominantly of siltstone. There is a lateral facies change from the dolomitic Todd River sequence of Wallaby No. 1 to the silty Todd River of the Dingo area.

The siltstone is red brown to orange brown, blocky, firm to hard and slightly micaceous. It is argillaceous in part, non calcareous, slightly dolomitic and arenaceous, grading to very fine grained sandstone in part.

The unit is tight and has no shows at Dingo No. 2, although the Todd River Dolomite had a minor gas show at Wallaby No. 1.

5.20 Arumbera 4A Sandstone: 2708 - 2717m (Thickness 9m) Age - Early Cambrian

At Dingo No. 2 the Arumbera 4A Sandstone consists of a 9 metre thick sequence of sandstone with minor siltstone and shale.

The sandstone is clear to orange brown in colour, arkosic to quartzose and consists of well rounded, fine to medium grains. The sandstone is silicified to varying degrees from faint to very severe. The siltstone is reddish brown to orange brown, blocky, micaceous in part, hard and arenaceous, grading to silty sandstone in part. The shale is white to mottled brown and occasionally calcareous.

A minor gas show was encountered in the Arumbera 4A Sandstone at Wallaby No. 1, but no shows were present at Dingo No. 2.

5.21 Arumbera 3 Sandstone: 2717 - 2802m (Thickness 85m) Age - Early Cambrian

The Arumbera 3 Sandstone at Dingo No. 2 consists of interbedded sandstone, siltstone, shale and minor dolomite.

The sandstone is clear to orange brown, very fine to fine grained, occasionally medium grained, sub angular to sub rounded and moderately well sorted. It is micaceous in part with a silty matrix and siliceous cement. The siltstone is red brown and pale green, micaceous, sandy in part, occasionally glauconitic and siliceous. Minor medium grey micromicaceous shale is present. The dolomite is white to medium grey, microcrystalline and calcareous in part.

No shows were encountered in this unit at Dingo No. 2, however, minor gas shows were detected in the Arumbera 3 Sandstone at Wallaby No. 1.

5.22 Arumbera 2B Sandstone: 2082 - 2842m (Thickness 40m) Age - Late Proterozoic

At Dingo No. 2 the Arumbera 2B Sandstone consists of an interbedded sequence of sandstone and siltstone with minor shale and dolomite.

The sandstone is white to clear and orange-brown, very fine to fine grained, and occasionally medium to coarse grained. The grains are angular to rounded, moderately sorted and silica cemented within a silty matrix. The siltstone is red brown to orange brown, micaceous, sandy in part and occasionally argillaceous. The dolomite is light grey to black with a rare oolitic texture.

The sandstones of the Arumbera 2B have very poor to nil porosity at Dingo No. 2 because of the well silicified nature of the unit. No shows were encountered while drilling this unit at Dingo No. 2.

5.23 Arumbera 2A Sandstone: 2842 - 2900m (Thickness 58m) Age - Late Proterozoic

The Arumbera 2A Sandstone at Dingo No. 2 consists of very fine to fine grained sandstone with occasional interbedded siltstone.

The sandstone is white to clear and orange brown, predominantly very fine to fine grained, occasionally medium grained. It is moderately well sorted, angular to sub rounded, quartzose to slightly arkosic and occasionally micaceous with minor opaque grains and a siliceous cement. The siltstone is red brown to orange brown, micaceous and sandy in part.

5.24 Arumbera 1 Sandstone: 2900 - 3008.5m (Thickness 108.5m) Age - Late Proterozoic

As at Dingo No. 1, the Arumbera 1 Sandstone consists of interbedded siltstone and sandstone with minor shales at Dingo No. 2.

The sandstone is reddish brown, orange brown, greenish grey and occasionally white. It is fine to coarse grained, predominantly fine to medium grained. The grains are sub angular to rounded and poorly to moderately well sorted. The sandstone has an iron rich silty matrix in part, iron oxide cement in part and silica cement in part. Common black mineral grains and trace of mica, chlorite, chert and pyrite are present. The sandstone is friable in part, but is generally hard and has poor porosity when cemented. The siltstone is reddish brown to grey-green, blocky to sub fissile, argillaceous to arenaceous, micaceous in part, firm to hard and grades to very silty sandstone in part. The shale is dark reddish brown to green-grey, sub fissile to fissile, silty in part, very micaceous in part and hard.

Core No. 1 was cut in the basal part of the Arumbera 1 Sandstone. The core consists predominantly of silty to coarse grained sandstone with minor interbeds of siltstone and shale. Sedimentary structures present in the sandstone include climbing ripples, low angle cross-bedding, small scale scours, shale chips and graded bedding. Core porosities are in the range 10 to 14.8 percent, with water saturations in the range 42 to 48 percent. On drill stem test this interval flowed gas at a rate of 1.38 MMCF per day.

5.25 Julie Equivalent: 3008.5 - 3048m (Thickness 39.5m) Age - Late Proterozoic

The Julie Equivalent at Dingo No. 2 consists mainly of very hard sandstone with minor shale. The sandstone is clear to light grey and occasionally dark grey. It is very fine to medium grained and occasionally coarse grained. The grains are sub angular to well rounded and moderately well sorted, with siliceous cement and abundant dolomitic and pyritic cements in places. The sandstone is extremely hard with very poor to no porosity. The shale is greenish grey to dark red-brown, fissile, slightly calcareous, silty and hard.

Cores 3 and 4 were cut in the Julie Equivalent, and both consist of extremely tight sandstone. Sedimentary structures including planar crossbeds, trough crossbeds, ripple marks and slump structures are present. Both cores were fractured, but most fractures were quartz filled.

5.26 Pertatataka Formation: 3048 - 3085m T.D. (Thickness 37m+) Age - Late Proterozoic

The Pertatataka Formation at Dingo No. 2 consists predominantly of shale with minor interbedded sandstone and siltstone.

The shale is light to dark grey, firm to brittle and blocky to sub fissile. It is slightly to non calcareous, pyritic in part and occasionally silty.

The interbedded sandstone is white to very light grey, predominantly very fine to fine grained with minor medium grains. The grains are angular to sub rounded and well sorted, with a siliceous cement. The sandstone is hard to very hard with poor to nil porosity. The siltstone is light to medium grey, blocky to sub fissile, calcareous and argillaceous. It grades to very fine grained sandstone in part and is firm to hard.

Ooraminna No. 1, 38 kilometres northeast of Dingo No. 2, penetrated 547 metres of Pertatataka Formation from 591-1138m. The Pertatataka was not reached by either Wallaby No. 1, Alice No. 1 or Orange No. 1.

6. GEOPHYSICS

Two vintages of seismic were utilized to map the Dingo structure. These are the 1965/1968 Missionary Plains single fold dynamite sourced survey (Magellan Petroleum) and the 1980/1981 Alice twelve fold vibroseis programme (Pancontinental Petroleum Limited). Line spacing varies from 2-3 kilometres giving 2 x 3 kilometres and 2 x 2 kilometres grid spacing. The central part of the structure around the Dingo wells has a 2 x 2 kilometre grid. The seismic data are of good quality and approximately 120 kilometres of these data were used to map the Dingo structure.

The nearest wells used for seismic control are Dingo No. 1, 2.0 kilometres to the east and Orange No. 1, 23.7 kilometres to the north of Dingo No. 2. Direct ties from both wells, with the exception of the shallower horizons due to erosion over the highs, are possible with a high degree of confidence. The two evaporitic sequences, the Chandler Formation and Bitter Springs Formation, demonstrate salt flowage (as evidenced by obvious thickening and thinning) and are excellent seismic reference markers. The base of the Chandler reflector is a few cycles above the Arumbera pay zone. The top Bitter Springs marker, which can be a much thicker sequence than the Chandler, is about 400 milliseconds below the Arumbera pay zone at Dingo No. 2. The Bitter Springs Formation was not penetrated in Dingo No. 2.

Enclosure 5 shows the predicted versus actual formation tops at Dingo No. 2. In general the predicted tops were deeper than the actual depths penetrated in Dingo No. 2. The reason for these differences is that the pre-Dingo No. 2 depth conversion was made using velocities calculated from seismic stacking velocities. Although the two way time to the Arumbera pay zone at Dingo No. 2 is 5 milliseconds less (i.e. higher) than at Dingo No. 1, seismic stacking velocities suggested a velocity gradient increasing dramatically to the west. By applying a conversion factor to tie these velocities to Dingo No. 1, the resultant depth map generated using these velocities showed Dingo No. 2 50 metres lower at the Arumbera pay zone than Dingo No. 1. Results of Dingo No. 2 show that there is very little velocity gradient between Dingo No. 2 and Dingo No. 1.

Remapping of the Dingo structure using a revised velocity map which integrated velocity data from both wells with the seismic velocity data has changed both the shape and size of the structure. The revised maps are shown on Enclosure 3. The Dingo structure is now a fairly symmetrical east-west trending feature. The areal closure at the structural spill point near the top of the Arumbera pay zone has been increased from 38 square kilometres to 57 square kilometres.

7. STRUCTURAL GEOLOGY

Folding associated with the compressional tectonics during the Alice Springs Orogeny resulted in a series of east-north-east parallel-trending anticlines and synclines in the north-east Amadeus Basin. Salt movement triggered either by differential loading and/or density contrasts in the sediments overlying the salt initiated the growth of the Dingo Structure within one of the synclines.

Although there is some flowage of the Chandler salt seismic evidence indicates that most of the structural growth in the Dingo structure is due to movement of the Bitter Springs salt into the structural core.

Salt movement at both Bitter Springs Formation and Chandler Formation level, occurred during the Alice Springs Orogeny: There is no evidence of structural growth or movement of either salt section preceding the Late Devonian orogeny. Thinning within the unit bounded by the top Todd River Equivalent and top Julie Equivalent, in effect the Arumbera Sandstone, is regional. Neither the Cambrian nor Ordovician units show thinning onto the structure and seismic data show thick development of the Pertnjara Formation in the surrounding synclines, which thins onto the crest of the structure.

There is no evidence for faulting associated with the Dingo structure.

8. HYDROCARBON POTENTIAL

8.1 Reservoir Potential and Hydrocarbon Indications

Fair to good quality reservoir units were described both within the Pertnjara Group and the Mereenie Sandstone at Dingo No. 2, but no potential for hydrocarbons exists as no effective seal is present in the post-Devonian sequence.

Similarly within the Pacoota Sandstone no hydrocarbons were apparent. Air drilling of the Pacoota Sandstone produced no shows, although reservoir quality was fair. The maximum porosity was 5% calculated by crossplotting the density and neutron values. Water influx was recorded below 1125 metres confirming the calculated porosity and downgrading the hydrocarbon potential.

Minor poorly developed intergranular porosity was recorded within the Goyder Formation. Water influx continued thus discounting any chance of significant hydrocarbon deposits. A density neutron log crossover is apparent at 1500 metres, although no gas was detected while air drilling.

Poor porosity was reported from within the Shannon Formation, although minor mineral fluorescence was noted. After tripping at 1728m, a 500 unit gas peak was recorded, although no hydrocarbons had been detected while air drilling. The significance of this trip gas is unknown. The Hugh River Shale contained no hydrocarbon shows and minimal porosity.

The first significant liberated hydrocarbons were detected while air drilling at 2365 metres within the Lower Giles Creek Dolomite. Porosity was poor over the show interval, and the lack of a flare while air drilling presumes that permeability is limited. Downhole logs indicate minor gas saturation but poor porosity.

No reservoir potential is indicated within the Chandler Formation at Dingo No. 2. Minor gas only was liberated during drilling.

Porosity within the upper portion of the Arumbera Sandstone (Sub units 4, 3, 2B and 2A) was described as poor, and no hydrocarbons were liberated. Within the basal Arumbera, significant amounts of gas were detected at 2950 metres within the A1, and these shows continued to the base of the Arumbera Sandstone.

Core No. 1 was cut from 2985.6m to 2993.5m. Core analysis yielded a maximum porosity of 16.2%, with generally low permeability, although it ranged up to 11.9 millidarcies. The presence of porosity and significant gas shows led to the drill stem testing of the interval 2947 to 2993.5 metres. Dry gas was obtained from this interval at a rate of 1.38 MMcfgd through a 1/2" choke (DST No. 1).

Quantitative log analysis of the basal Arumbera sequence indicates a net pay of between 14.5 and 16.9 metres utilising an 8% porosity cutoff (Enclosures 4 and 6). Average porosity for the pay interval is 11.6% while gas saturation is approximately 61%.

High pressure gas was encountered within the Julie Formation, where Cores 3 and 4 were cut. Reservoir quality was very poor as shown by DST No. 2, where a maximum flow rate of 144 Mcfgd was measured. Average core porosity was 4.0%, while maximum permeability in the reservoir interval was 2.2 md.

Quantitative log analysis indicates no net pay in the Julie Formation due to poor porosity, although minor gas saturation is calculated from the density and neutron logs and dual laterolog.

8.2 Source Potential

Total Organic Carbon (TOC) determinations for the Horn Valley Siltstone at Dingo No. 2 indicate poor source potential. A maximum value of 0.22% within the five analysed samples best illustrates this limited potential. S2/S3 ratios from the Rock Eval pyrolysis method also indicate the low liquid potential of the Horn Valley Siltstone in the eastern Amadeus Basin, as proposed by Gorter (1984).

Two samples from the Julie Equivalent are also indicative of poor quality source rocks. An average TOC of 0.11% was measured, and no further work was deemed necessary due to the low levels of organic matter.

9. BIBLIOGRAPHY

Gorter, J.D., Bellis C.J, Dee C.N., Schroder R.J., (1982)
Wallaby No. 1 Well Completion Report, OP 175, Amadeus Basin, PPL Report No. 9 (Unpublished).

Gorter, J.D., Bellis C.J., Dee C.N., Fenton G.G., Schroder R.J., (1982)
Dingo No. 1 Well Completion Report, OP 175, Amadeus Basin, PPL Report No. 27 (Unpublished).

Gorter, J.D. (1984)
Source Potential of the Horn Valley Siltstone, Amadeus Basin. APEA J V24, Pt. 1, pp 66-90.