DRILLING COMPLETION REPORT

WELL - NORMANBY-1

OFFSHORE VICTORIA, AUSTRALIA

MARCH - APRIL 1986

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BP PETROLEUM DEVELOPMENT LIMITED

DRILLING DEPARTMENT

AUSTRALIA

DRILLING COMPLETION REPORT

WELL - NORMANBY-1

OFFSHORE VICTORIA, AUSTRALIA

Prepared By: G.H. JACKSON.....
DRILLING ENGINEER

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DRILLING ENGINEER

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OPERATIONS MANAGER

DATE.....21. 5. 86.....

NORMANBY-1

CONTENTS

WELL RESUME - NORMANBY-1

Normanby-1 was the first BP operated well to be drilled in licence block VIC/P14 offshore south-west Victoria, Australia. The well was drilled by Zapata Offshore Company's semi-submersible drilling rig 'Zapata Arctic'.

Spudded on the 7th March, 1986, the well was drilled to a total depth of 3306m with no significant hydrocarbon indications. After TD logging, the well was plugged and abandoned and the rig left location on the 29th April, 1986.

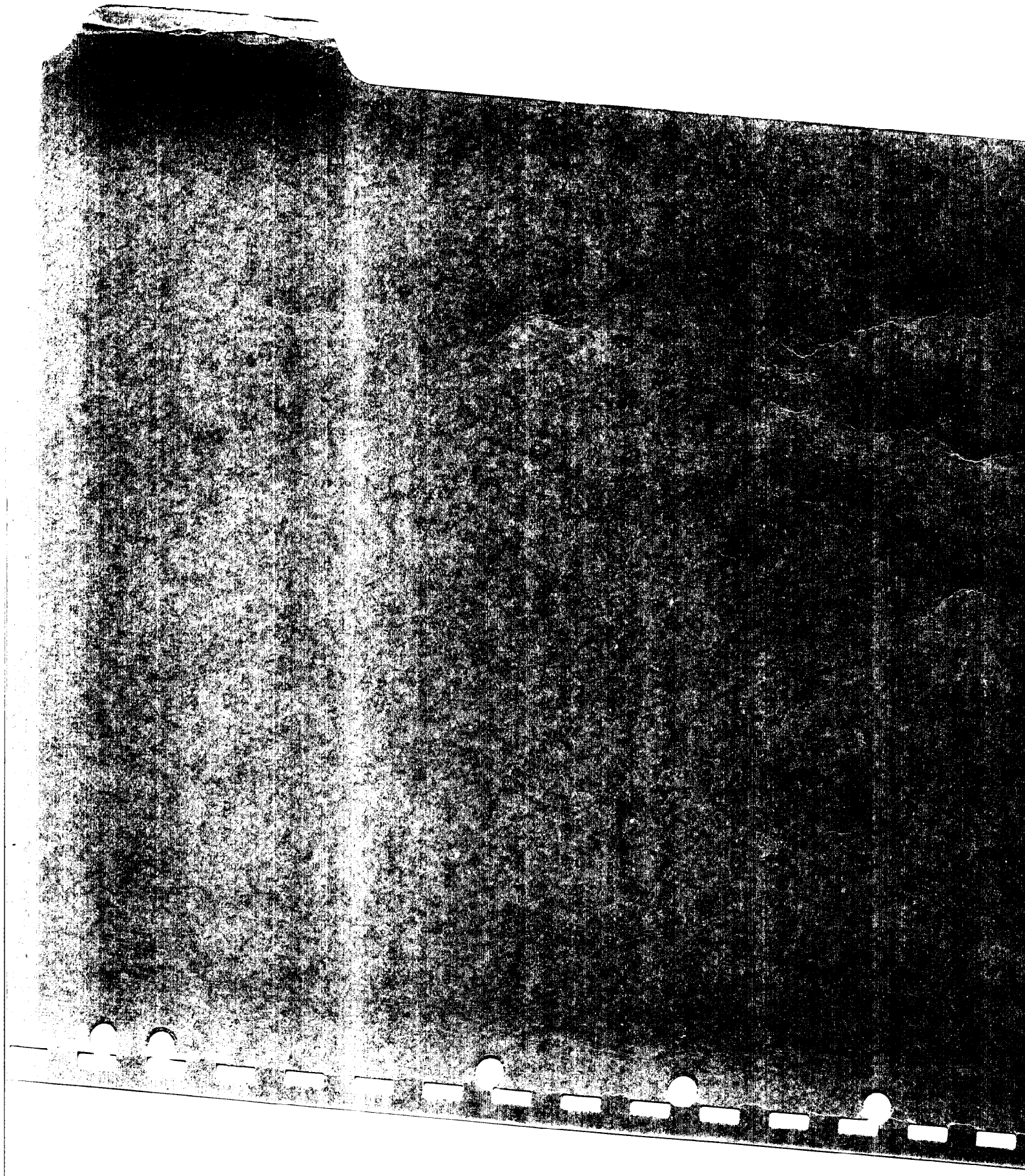
The well penetrated the Cenomian primary target Waare Formation at 3084m. This was found to be overpressured. A number of influxes were taken that required the mud weight to be raised to 1.43 SG by 3306m and the decision was made to run logs at this depth. On the log results, the well was terminated as it was not considered worthwhile drilling on to penetrate the secondary target and potential source of the Aptian-Albian Eumeralla Formation.

Normanby-1 was drilled virtually trouble free with the following exceptions. Intermittent mud losses were encountered in the 26" hole section and in the 17½" hole section down to the 13-3/8" casing depth. In the 12¼" hole section, the hole angle built up to 7-3/4 degrees. This required BHA change and controlled drilling to bring the hole angle back to an acceptable level. In the 8½" section pressure control problems were encountered requiring remedial action.

The well was programmed to take 56 days from first anchor down to tight tow from location. The work actually took 56 days.

Normanby-1 was AFE'd without drill-stem testing for A$12.695 million. The final estimated cost was A$11.426 million.

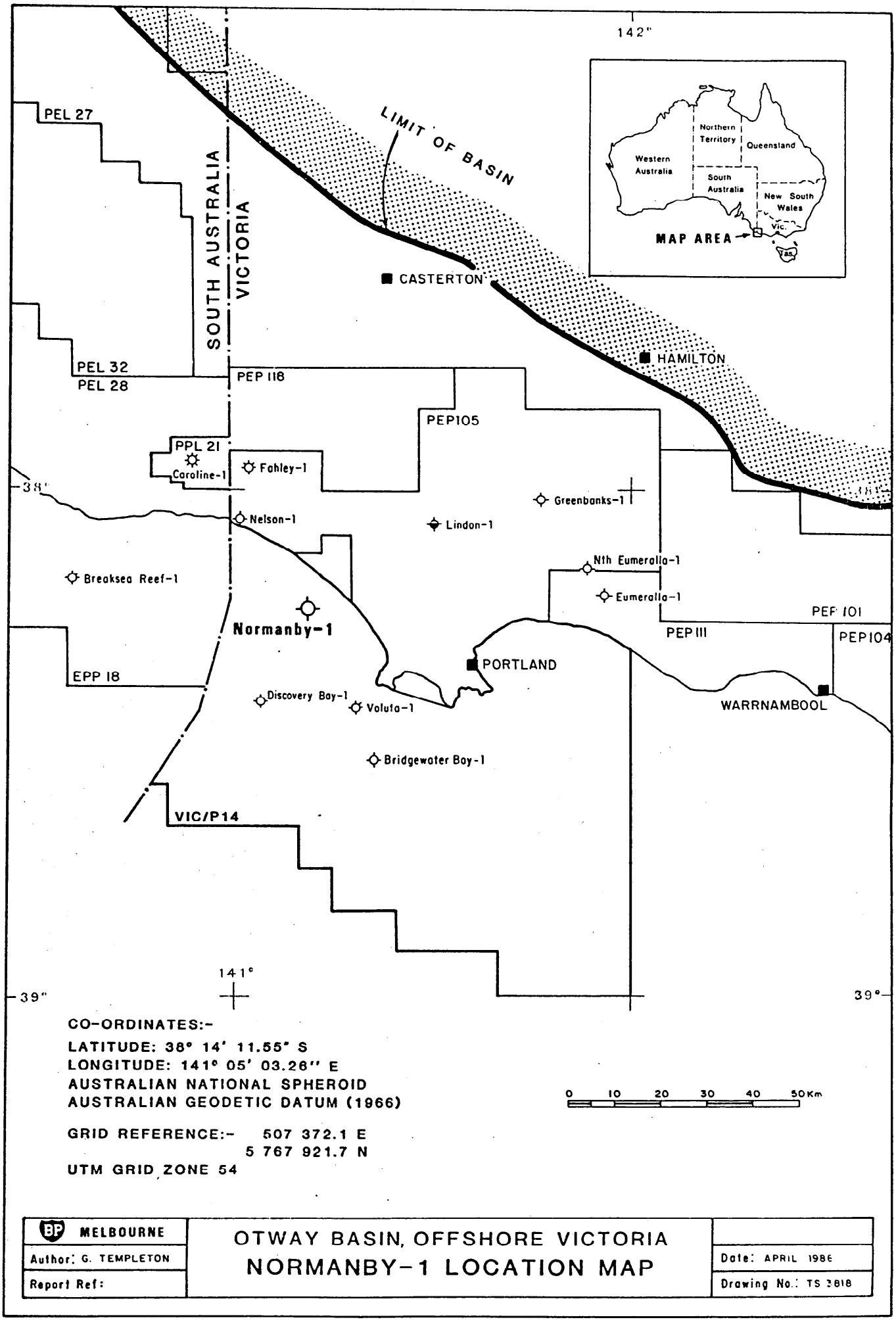
Two anchor handling tug supply vessels were used to support the drilling operation from the Supply Base at Portland, Victoria. The Operations Base was also at Portland and the helicopters were operated from Portland Airport.



SECTION 1

General Data

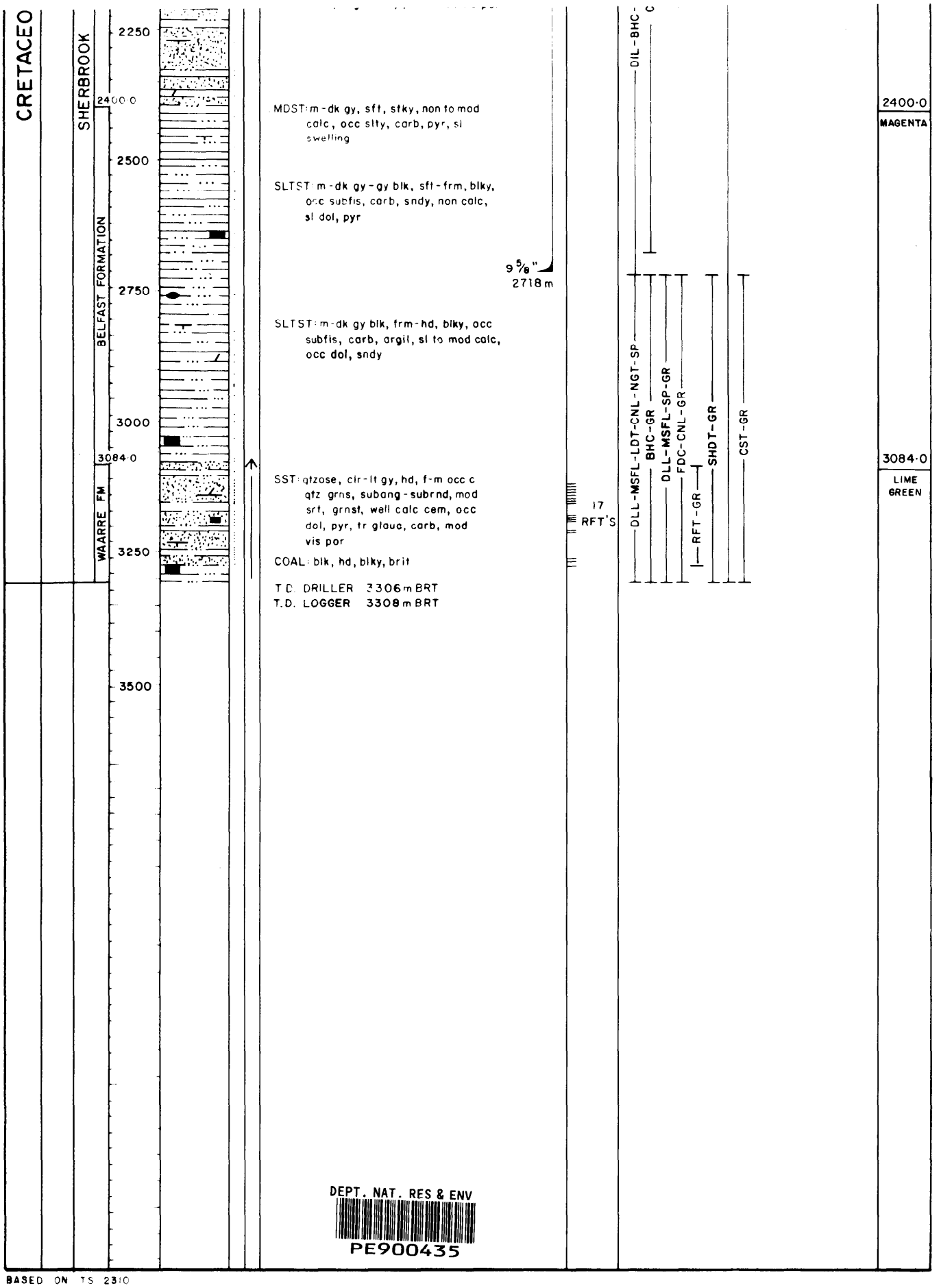
1.1 LOCATION DIAGRAM



CO-ORDINATES:-
LATITUDE: 38° 14' 11.55" S
LONGITUDE: 141° 05' 03.26" E
AUSTRALIAN NATIONAL SPHEROID
AUSTRALIAN GEODETIC DATUM (1966)

GRID REFERENCE:- 507 372.1 E
5 767 921.7 N
UTM GRID ZONE 54

BP MELBOURNE	OTWAY BASIN, OFFSHORE VICTORIA NORMANBY-1 LOCATION MAP	
Author: G. TEMPLETON		Date: APRIL 1986
Report Ref:		Drawing No.: TS 3818



BASED ON TS 2310

Provisional: Formation tops picked from wireline logs

BP MELBOURNE	**OTWAY BASIN, OFFSHORE VICTORIA**	
Author: G. TEMPLETON	SUMMARIZED WELL LOG (1:10,000)	Date: APRIL 1986
Ref.:		Drawing No.: TS 3822

1.2 Geological Summary

Exploration Well NORMANBY-1 was drilled at 38° 14' 11.55" S, 141° 05' 03.26" E, 140m N300° from shotpoint 1455 on seismic line OP80-09 located in licence area VIC/P14 in the Otway Basin, offshore Victoria.

The Well was drilled to test the hydrocarbon potential of the Waarre Formation sandstone reservoir, within a large rotated fault block, the Normanby Prospect. The secondary target was the underlying Eumeralla Formation.

The stratigraphy above the Waarre Formation was similar to the forecast with all the formation tops coming in within the predicted error bars except that the Pebble Point Formation was absent.

The Waarre succession consisted of a massively bedded grey, carbonaceous, fine to medium grained, calcareous and dolomite cemented quartzose sandstone. Mudstone and siltstone interbeds occurred in the upper part. This sequence passed downwards into an interbedded sandstone, mustone and siltstone section with minor coal in the lower part of the formation.

The Well was terminated in the Waarre Formation.

No significant shows were encountered - all sandstones were water wet. However, minor amounts of gas occurred within the Waarre Formation. The coals within the Waarre Formation showed a cut fluorescence.

Ninety (90) sidewall cores were attempted in the Waarre, Belfast and Paaratte Formations of which 65 were recovered.

1.3 General Well Data

Name :	Normanby-1
Type:	Exploration
Location:	Offshore Victoria, Australia
Coordinates	LAT 38° 14' 11.564" SOUTH LONG 141° 05' 03.120" EAST
Rig Heading:	202°
Rig:	Zapata Arctic
Contractor:	Zapata Offshore

Dates:

Tight tow from previous location	03/03/86
First anchor down on location	05/03/86
Well spudded	07/03/86
Well plugged and abandoned	22/04/86
Tight tow to next location	29/04/86

Depths:

Water depth	48.8	m
Rotary table elevation	26.8	m amsl
Total depth	3306	m BRT

Casing:

Size	Depth m BRT	Cement Tops m BRT
30"	148	Seabed
20"	666	181
13-3/8"	1555	1180
9-5/8"	2718	1368

Wellhead System: Cameron 18-3/4" 10,000 psi Weight Set I system

Well Completion Status: Plugged and abandoned. No significant hydrocarbon indications.

Mud Programme:

Hole Size	Interval m BRT	Mud SG	Mud Type
36"	75 - 157	1.03	Sea water and visc slugs
26"	157 - 675	1.03	Sea water and visc slugs
17½"	675 - 1562	1.12	Sea water/gel/polymer
12¼"	1562 - 2724	1.20	KCL/polymer/gel
8½"	2724 - 3306	1.20 - 1.46	KCL/polymer/gel

Coring: No coring was carried out.

Side Wall Cores:

Hole Size	Interval m BRT	Recovery	Accepted
12¼"	2683 - 1614	25 from 30	23
8½"	3293 - 2737	51 from 60	42

Wireline Logging:

Hole Section	Type of Log
17½"	DIL/SLS/GR/SP/CAL
12¼"	MSFL/DIL/BHC/SP/GR/CAL CST/GR
8½"	LDT/CNL/DLL/MSFL/NGT/SP BHC/GR DLL/MSFL/SP/GR FDC/CNL/GR RFT/GR SHDT CVL CST/GR

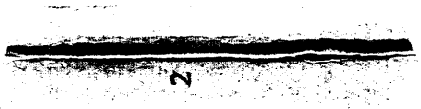
Testing: No tests were carried out.

Leak Off Tests:

Hole Section	Depth m BRT	Equiv. Mud Weight
17½"	680	1.31 SG
12¼"	1565	1.31 SG
8½"	2727	1.92 SG

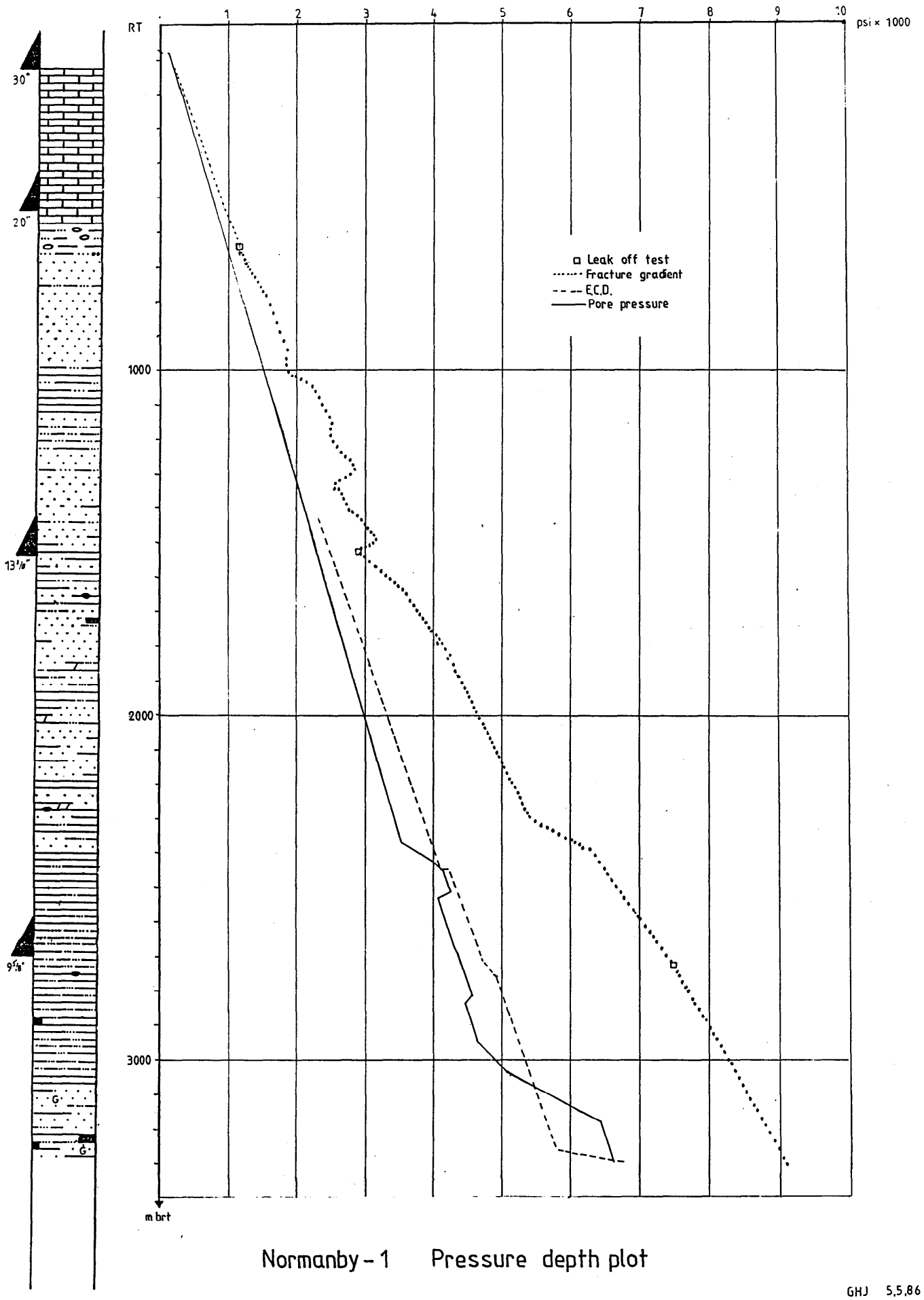
Abandonment:

Plug No.	Type	Interval m BRT
1	Cement	3300 - 3200
2	Cement	3200 - 3050
3	Cement	2768 - 2668
4	Bridge	2654
5	Cement	210 - 110



SECTION 2

Pressure and Temperature Data



Normanby - 1 Pressure depth plot

GHJ 5.5.86

2.2 Pore Pressure (Basis of pressure depth plot)

Two positive indications of the formation pressure were taken. One was a pressure build-up after closing in the Well in the 8½" section and the second was from an RFT run during the TD Logging suite. The remainder of the formation pressure estimation was based on dxc exponent, evidence of connection gas, temperature and lithology. The interpretations were made by Gearhart.

2.2.1 Pressure build-up

(History of prior events in 4.1 Drilling Evaluation)

Drilled depth was 3306m brt, the pressure control problems had started after 3181m brt, and previous attempts to record a pressure build-up had failed. This time the annulus was pressured up to 100 psi requiring two strokes on the rig pumps (0.23 of a barrel). The pressure then built up to 395 psi in 1½ hours.

A Horner plot interpretation was not feasible because the initial flow period could not be realistically assumed. The pressure was therefore plotted against the log of time and the final pressure estimated by the rigsite personnel. This was approximately 500 psi which equated well to the subsequent RFT reading.

Depth	psi		EMW (SG)
3306	500 over	1.32 SG mud	1.426
3178	500	"	1.430

2.2.2 RFT run

(Results in section 4.8 wireline logging and perforation)

Only one pressure reading was achieved.

3178m brt -- Formation pressure 6409 psi EMW = 1.42 SG

2.3 Fracture Pressure (Basis of pressure depth plot)

Actual indications of fracture pressure came from losses in the top hole and leak off tests. The remaining estimation was from the Gearhart interpretation of overburden gradient and lithological properties adjusted in line with the actual fracture pressures.

2.3.1 Leak-off Tests

See results in section 1.3. General Well Data

2.3.2 Lost Circulation

Hole Size (ins)	Depth (m brt)	Mud	Weight (SG)
17½/26	187	Seawater/visc. pills	1.04
	187-675		1.06
17½"	720-780		1.07
	780-1162		1.10
	1162-1562		1.12 (some losses)

2.4 Temperature Data

2.4.1 Summary of Temperatures Recorded

Suite	Run	Log	Depth of Thermometor mBRT	Max. Recorded Temperature °C
1	1	DIL/SLS	1536	46.7
2	2	DIL/BHC	2700	75.6
2	2	CST/GR*	-	-
3	1	LDT/DLL	3279	91.1
3	2	BHC/GR	3299	96.7
3	3	DLL/MSFL	3284	97.2
3	4	FDC/CNL*	-	-
3	5	RFT/GR	3285	104.4
3	6	SHDT/GR	3299	105
3	7	CNL	3300	105.6
3	8	DST/GR*	-	-

*Thermometers were not run with these logging tools

2.4.2 Circulation History and Horner Plot Data

Data from logging Run at T.D.

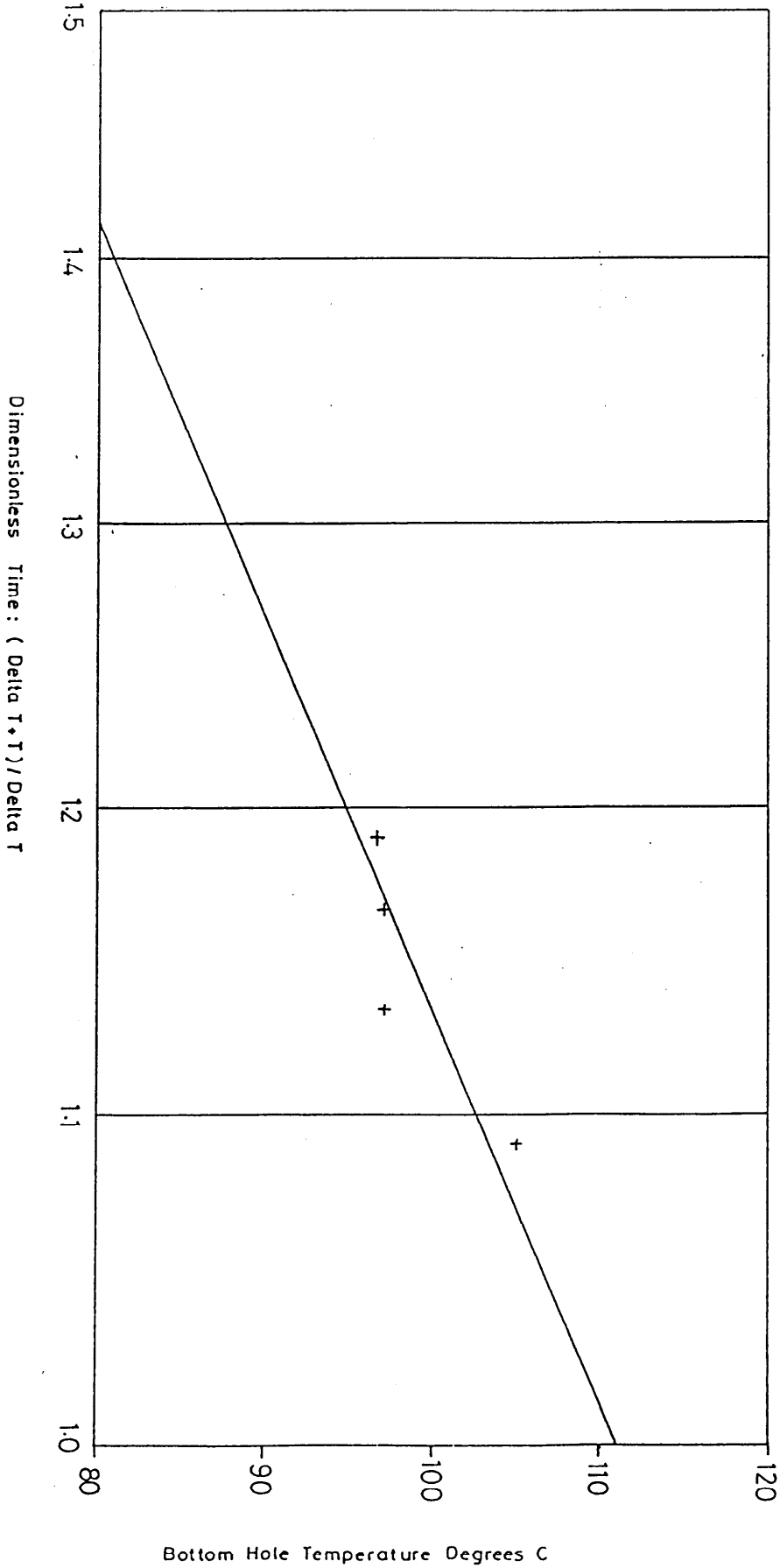
Last Circulation before Logging Run was from 23:00 hrs 15 Apr 86
to 01:45 hrs 16 Apr 86

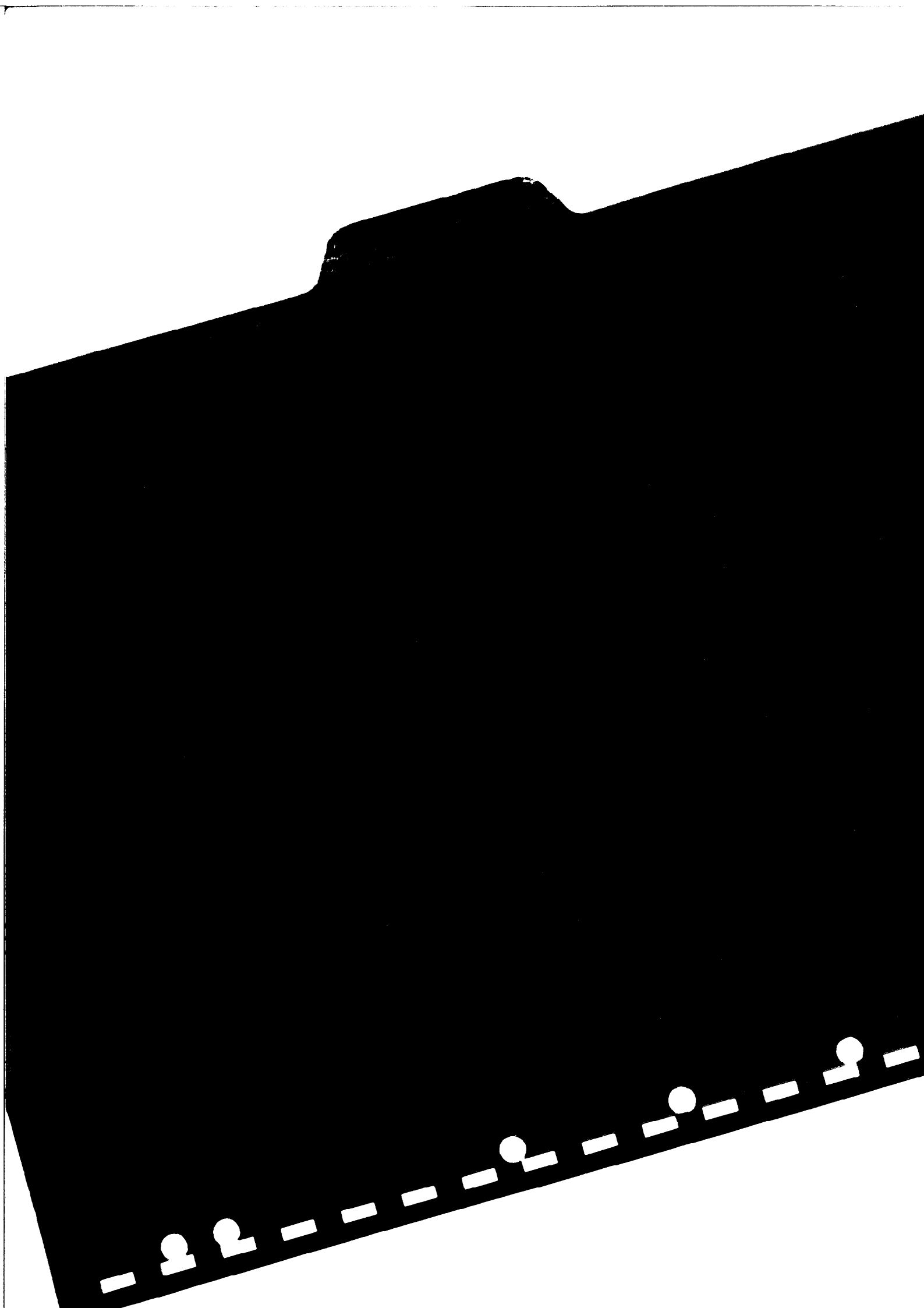
Time on Bottom for Tools 16:24 16 Apr 86 B.H.T. 96.7 °C
19:06 16 Apr 86 B.H.T. 97.2 °C
23:20 16 Apr 86 B.H.T. 97.2 °C
09:08 17 Apr 86 B.H.T. 105.0 °C

Depth	Max. Temp °C	Time Since Circulation(hrs)	Length of Circulation(hrs)	Dimensionless Time
3305m	96.7	14.65	2.75	1.188
3305m	97.2	17.35	2.75	1.159
3305m	97.2	21.58	2.75	1.127
3305m	105.0	31.38	2.75	1.088

Bottom Hole Temperature = 110.82 °C at 3305m (231.47 °F)

2.4.3 HORNER PLOT

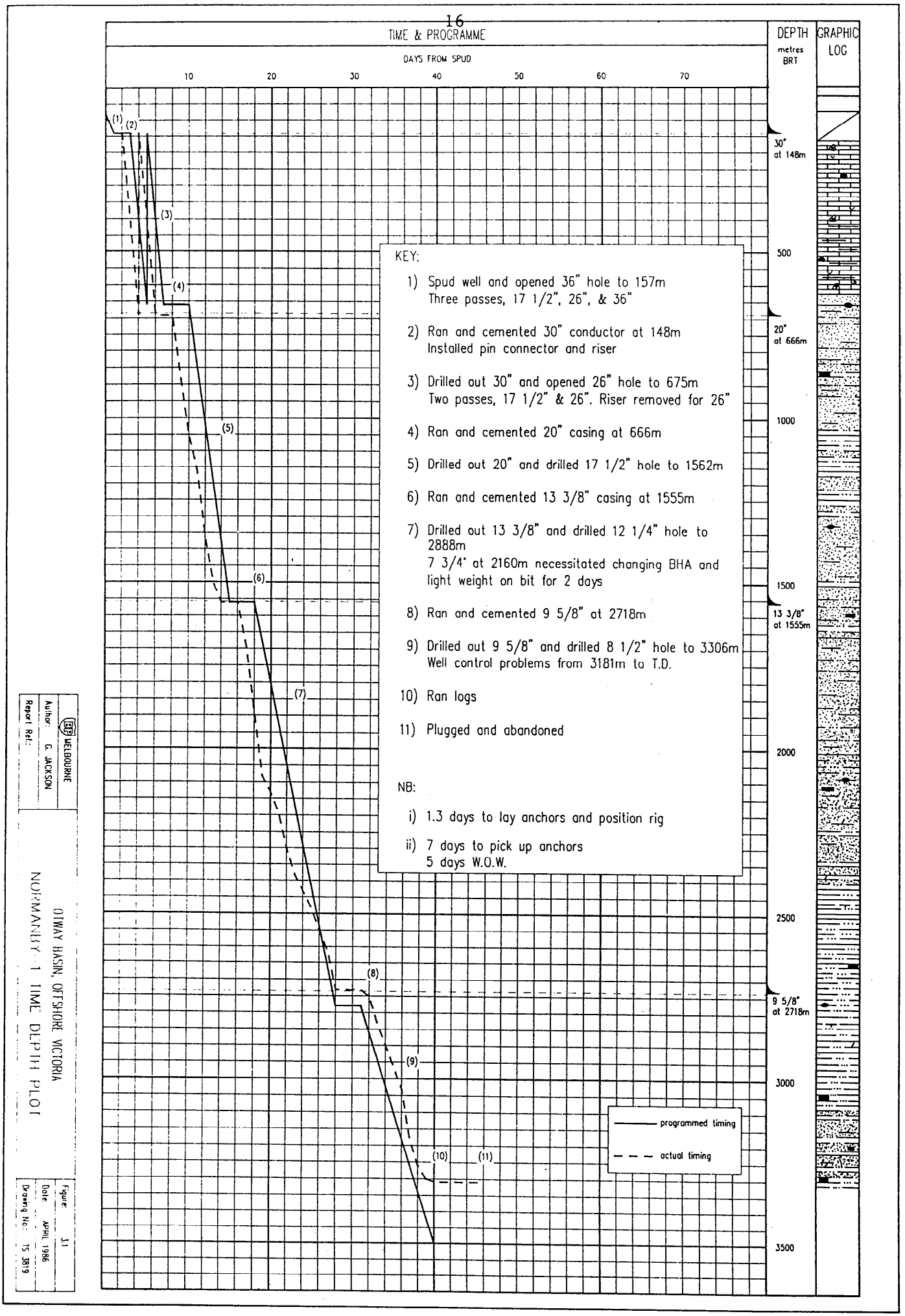




SECTION 3

Time Utilisation

3.1 TIME DEPTH PLOT



3.2 Time Utilisation/Variation Report

3.2.1 SUMMARY

The Well was programmed to take 56 days from first anchor to tight tow. W.O.W. was estimated at 2 days. The actual number of days taken was 56 days and included 5 days W.O.W. Actual anchoring took 1-1/3 days although it spanned two reporting days.

Demobilisation back to New Zealand was programmed for 13 days. This was converted to a fixed 8 day demobilisation set of costs payable to Shell BP Todd.

The time variance is discussed in the following report.

3.2.2 Drilling Operations

36" Hole/30" Casing Section - 76 - 157 m BRT - 81m

The estimated time for this section was 3 days and took 2½ days. No problems were encountered in this section.

Average R.O.P. was 17m/hour.

26" Hole/20" Casing Section - 157 - 675 m BRT - 518m

The estimated time for this section was 7 days and took 5½ days. It took 2 days to drill/hole open to 26" and a further 3½ days to pull the riser and run the casing and BOP.

The estimate for this section was based on the Duntroon-1 well. Time was saved because of the following factors. The drilled interval was 82m shorter and a hole opener was used rather than an underreamer (as was the case on Duntroon-1). The running and cementing of the 20" also took less time than Duntroon-1 although the running of 17 joints of Buttress was very slow.

Average ROP was 19m/hr for the pilot hole
21m/hr for the hole opening.

17½" Hole/13-3/8" Casing Section - 675 - 1562m BRT - 887m

The estimated time for this section was 8 days and took 7 days. This is broken down into 5 1/3 days drilling, 1/3 of a day logging, 1/3 of a day on lost circulation, and 1 day for casing and cementing.

The drilling rate averaged out at 9m/hour but was slowed down by the lost circulation problems. The main time saving was on the casing and cementing which was run and cemented without problems.

12¼" Hole/9-5/8" Casing Section - 1562 - 2724 m BRT - 1162m

The estimated time for these operations was 13 days and took 16 days. This is broken down into 14½ days drilling, ½ day logging and 1 day casing and cementing.

The time lost against the estimate was in drilling. The average ROP was 5½ m/hour. The ROP was less than that possible because of measures taken to control angle build up. The angle built after crossing a prognosed fault at c. 2000m BRT necessitating three extra trips for BHA and bit changes as well as controlled weight on bit and higher RPM.

Average ROP prior to the fault was 9m/hour and after 4½m/hour. If no angle build up had occurred at least 3 days could have been saved over the actual time.

8½" Hole Section (Including T.D. logs) 2724 - 3306 m BRT - 582 m

The estimated time for these operations was 14 days and took 11 days. The time was broken down into 7 days drilling, 2 days logging and 2 days spent on well control. (see section 4.1 Drilling Evaluation)

The average drilling rate was 5m/hour and no coring was undertaken. Time was saved due to this higher ROP as well as only drilling to a reduced depth of 3300m BRT and not to programmed depth of 3500m BRT.

Time was also saved during logging, despite having to make two re-runs of the first logging suite*. A trip to condition the mud from 1.43SG to 1.46 SG was made prior to the CST run. This time being costed to well control.

* No problems were encountered except on the first run, where an extra long (25m) set of tools were being run. No wiper trip was necessary to condition the hole.

3.2.3 Other Non-Productive Operations

Rig Equipment and Drill Unit Repairs

The drilling unit did not require any repair time. Rig equipment repair time was 3½ hours. This was broken down into 1½ hours spent on repairing two pads on the draw works brake bands and 2 hours spent repairing the transmission on the rig floor wireline unit.

In addition a 7¼ hours lost time round trip was required to recover the survey tool after the wire broke whilst pulling the survey tool on wireline. This time was costed as a fishing run.

Marine Operations

No time was allocated to the moving/site prep. This was because it had already been included in the Duntroon-1 demobilisation.

Rig positioning and anchoring took 1-1/3 days. This was nearly 3 days quicker than estimated. The saving in time was due to an efficient anchoring job by the boats and rig and no problems being encountered in taking up tension. The anchors were laid at full scope and pretensioned to 360 kips because of the shallow depth. All held satisfactorily despite an extensive seabed survey suggesting difficult anchoring conditions.

Three piggybacks were run on the weather side anchors for additional back up. A further piggyback was run during the well.

Actual time taken to prepare to move/recover anchors was 2¼ days. This was close to the estimated time of 2 days for this operation.

It was during this time that approximately 5 days WOW time was incurred. It should be noted that this weather was not bad enough to have stopped any other operation. Only 2 days were allowed for WOW which would in general be sufficient for this type of rig at this time of year.

The demobilising to New Zealand was estimated at 13 days based on the move to Australia. This was converted to an 8 day period agreed between BP and Shell BP Todd (SBPT), the next operator, with SBPT taking control of the move when the rig reached international waters.

Subsea Operations

Subsea operations took up a small percentage of the total time. This was due to the shallow nature of the water needing only two joints of riser, thus saving on running time. No subsea repairs were required except to the pin connector which had to be pulled when one of the hydraulic lines was observed, by the ROV, to have broken free prior to connecting. An extra trip was therefore required.

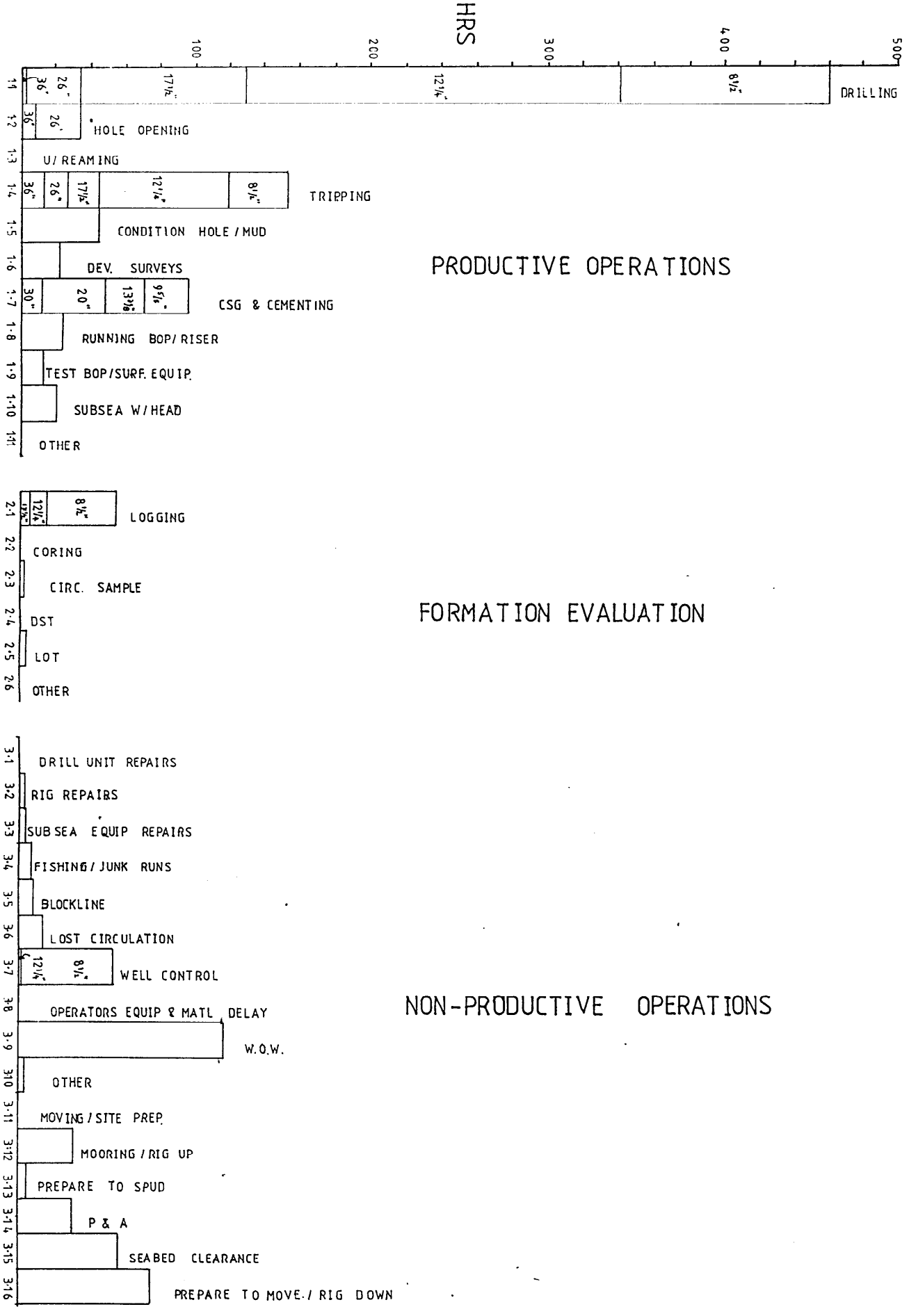
Plug and Abandon

This operation was programmed for 3 days and took 3 days. If no problems had been encountered it would have been completed in 2 days. The cutting of the 30" took 2 attempts and the rig had to be repositioned several times as the rig moved when some of the anchors were pulled during the abandonment programme.

TIME ANALYSIS BY HOLE SECTION

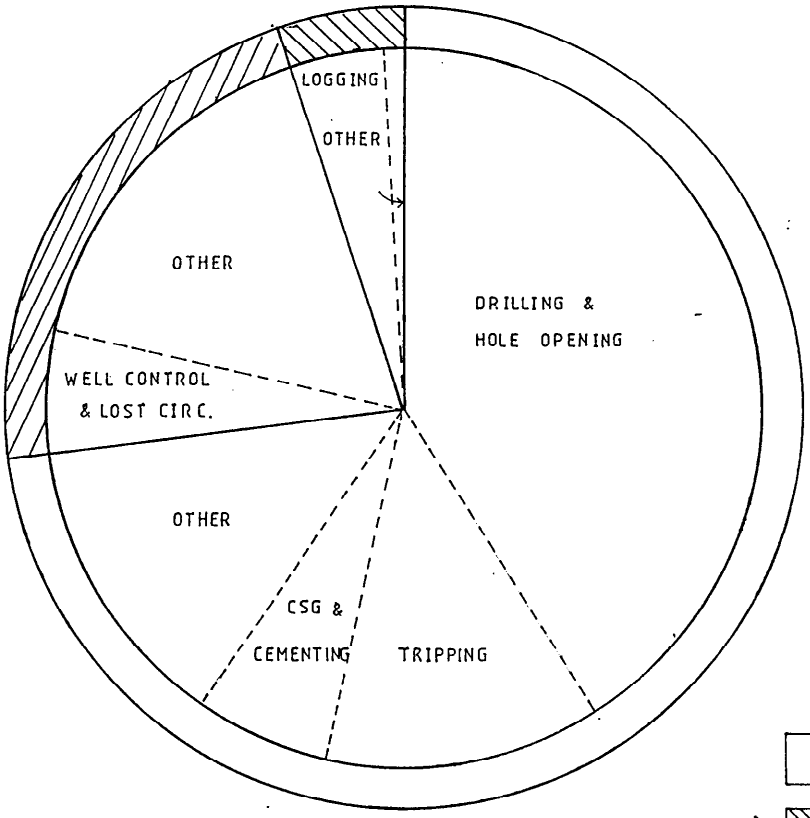
ACTIVITY	CODE	36" HOLE 30" CONDUCTOR		26" HOLE 20" CSG		17 1/2" HOLE 13 3/8" CSG		12 1/4" HOLE 9 5/8" CSG		8 1/2" HOLE TO TIGHT TOW		TOTAL FOR ACTIVITY	
		HRS	%	HRS	%	HRS	%	HRS	%	HRS	%	HRS	%
DRILLING	1.1	4.75	9.90	27.75	21.72	96.25	63.53	212.00	56.87	119.25	64.11	460.00	38.06
HOLE OPENING	1.2	7.50	15.63	25.00	19.57	0.00	0.00	0.00	0.00	0.00	0.00	32.50	2.69
UNDER REAMING	1.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TRIPPING	1.4	13.50	28.13	12.00	9.39	18.00	11.88	73.50	19.72	34.75	18.68	151.75	12.55
CONDITION HOLE/MUD	1.5	3.00	6.25	3.75	2.94	10.25	6.77	21.50	5.77	5.75	3.09	44.25	3.66
DEVIATION SURVEYS	1.6	1.00	2.08	1.00	0.78	24.75	16.34	14.75	3.96	3.25	1.75	44.75	3.70
CASING & CEMENTING	1.7	11.50	23.96	36.75	28.77	0.00	0.00	24.25	6.51	0.00	0.00	72.50	6.00
RUN BOP OR RISER	1.8	6.00	12.50	13.75	10.76	0.00	0.00	4.50	1.21	21.50	11.56	45.75	3.78
TEST BOP/SURF EQUIP	1.9	0.75	1.56	6.00	4.70	0.00	0.00	6.00	1.61	0.00	0.00	12.75	1.05
SUBSEA WELLHEAD	1.10	0.00	0.00	1.75	1.37	2.25	1.49	16.25	4.36	1.50	0.81	21.75	1.80
OTHER	1.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SECTION 1 TOTAL		48.00	100.00	127.75	100.00	151.50	100.00	372.75	100.00	186.00	100.00	886.00	73.30
LOGGING	2.1					6.00	77.42	9.50	92.68	38.75	91.18	54.25	4.49
CORING	2.2					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CIRCULATE SAMPLE	2.3					0.00	0.00	0.00	0.00	2.50	5.88	2.50	0.21
DST	2.4					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEAK OFF TEST	2.5					1.75	22.58	0.75	7.32	1.25	2.94	3.75	0.31
OTHER	2.6					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SECTION 2 TOTAL		0.00	0.00	0.00	0.00	7.75	100.00	10.25	100.00	42.50	100.00	60.50	5.01
DRILL UNIT REPAIRS	3.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RIG REPAIRS	3.2	0.00	0.00	1.50	20.00	0.00	0.00	0.00	0.00	2.00	1.02	3.50	0.29
SUBSEA EQUIP REPAIRS	3.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FISHING / JUNK RUNS	3.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BLOCKLINE	3.5	0.00	0.00	1.00	13.33	1.00	11.43	4.00	76.19	3.75	1.91	9.75	0.81
LOST CIRCULATION	3.6	0.00	0.00	5.00	66.67	7.75	88.57	0.00	0.00	0.00	0.00	12.75	1.05
WELL CONTROL	3.7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	19.05	51.75	26.34	52.75	4.36
OPERATOR EQUIP & MATL DELAY	3.8	4.75	10.73	0.00	0.00	0.00	0.00	0.00	0.00	7.25	3.69	12.00	0.99
WAIT ON WEATHER	3.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
OTHER	3.10	2.75	6.21	0.00	0.00	0.00	0.00	0.25	4.76	0.75	0.38	3.75	0.31
MOVING / SITE PREP	3.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOORING / RIG UP	3.12	31.25	70.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.25	2.59
PREPARE TO SPUD	3.13	5.50	12.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.50	0.46
PLUG & ABANDON / SUSPEND	3.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.25	15.39	30.25	2.50
SEABED / SITE CLEARANCE	3.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.75	23.79	46.75	3.87
PREPARE TO MOVE / RIG DOWN	3.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.00	27.48	54.00	4.47
SECTION 3 TOTAL		44.25	100.00	7.50	100.00	8.75	100.00	5.25	100.00	196.50	100.00	262.25	21.70
TOTAL FOR EACH HOLE SECTION		92.25	7.63	135.25	11.19	168.00	13.90	388.25	32.12	425.00	35.16	1208.75	100.00

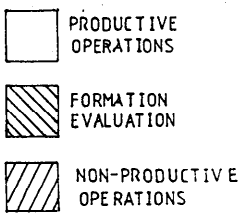
3·4 Normanby-1 Time Distribution Graph



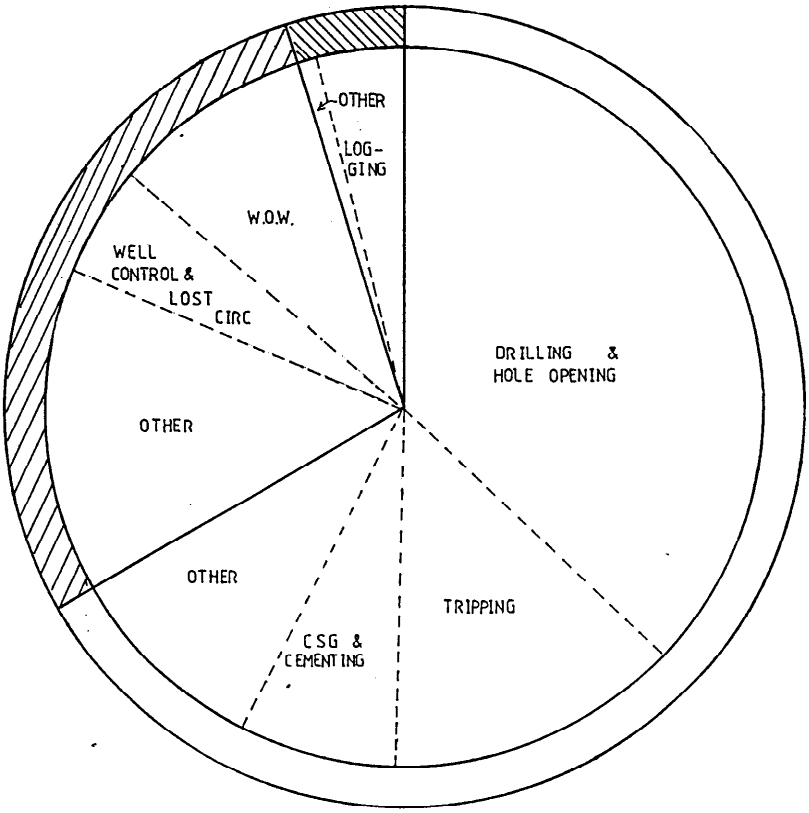
3·5 Normanby-1 Relative Time Chart

a) WOW excluded.





b) WOW included.



3.6 Daily Drilling Diary

WELL: NORMANBY-1

DAY	DATE	DEPTH (mBRT)	PROG (m)	DAILY ACTIVITY DIARY
-1	05.03.86	-	-	Commenced run onto location. Dropped No. 6 anchor (chain only). Continued run onto location. Ran Nos. 10, 9, 3, 8, 5 and 2 anchors to full scope. Re-ran No. 6 anchor to full scope. Ran No. 1 anchor.
-2	06.03.86	-	-	Ran Nos. 11, 12, 4 and 7 anchors. Ballasted rig to drilling draught. Pretensioned all anchors to 360 kips. Precautionary piggy backed Nos. 1, 2 and 12 primary anchors. R/U and ran TGB to seabed. Recovered running tool. M/U 17½" BHA.
1	07.03.86	157	81	Continued M/U 17½" BHA. RIH. Spudded well at 0230 hours. Drilled 17½" pilot hole from 76m to 157m with surveys at 81m, 91m (misruns) and 110m. Circulated hole clean with 50 bbls 'hi-vis' mud. Surveyed at 157m. POH. L/O 17½" BHA. RIH with 26" hole opener assembly. Opened hole to 26" from 76m to 157m. Circulated 100 bbls 'hi-vis' mud. Surveyed. POH. L/O 26" BHA. RIH with 36" hole opener BHA. Opened hole to 36" from 76m to 145m.
2	08.03.86	157	-	Continued opening hole to 36" from 145m to 157m. Circulated 50 bbls 'hi-vis' mud and spotted 150 bbls on bottom. Surveyed (misrun). POH to 86m. Waited one hour for hole to stabilise. RIH to 157m - 1m fill. Circulated hole to 350 bbl 'hi-vis' mud at 1.15 SG. Dropped survey tool. POH. Retrieved survey tool. R/U and ran 30" casing and PGB. Continued RIH casing on HWDP. Landed 30" casing with shoe at 148m. Set down 30,000 lbs and observed slope indicator -1°. Pressure tested cement lines to 1000 psi. Cemented 30" casing displacing cement to 10m inside shoe. W.O.C. Slacked off casing weight - observed slope indicator 1°. Backed out and recovered 30" running tool. R/U and ran 30" pin connector and riser.

Daily Drilling Diary

WELL: NORMANBY-1

DAY	DATE	DEPTH (mBRT)	PROG (m)	DAILY ACTIVITY DIARY
3	09.03.86	370	213	Latched pin connector and applied 30,000 lbs test pull. Installed divertor. RIH with 17½" BHA to 130m. Flushed divertor lines. RIH. Tagged cement at 138m. Drilled cement to 156m and washed down to 157m. Drilled 17½" pilot hole from 157m to 181m - lost returns. Displaced to 'hi-vis' mud system and reduced circulation rate - no returns. Pumped 40 bbl LCM pill and displaced with 'hi-vis' mud - regained returns. Drilled from 181m - 265m with 100 bbl/hour losses. Spotted 50 bbl very 'hi-vis' mud - reduced losses to 35 bbl/hour.
4	10.03.86	675	305	Drilled 17½" pilot hole from 370m to 675m with approximately 40/60 bbls/hour losses. Pumped 50 bbl LCM slug on bottom. Dropped survey tool. Recovered same. POH - hole tight at 446m. Displaced conductor and riser to seawater. Continued POH.
5	11.03.86	500 (675)	(343)	Finished POH. Racked back 17½" BHA. Pulled pin connector and riser. M/U 26" hole opening assembly. RIH. Cleaned out cement from 137m to 148m. Opened hole to 26" from 156m to 500m.
6	12.03.86	675	(175)	Continued opening hole to 26" from 500m to 675m. Pumped 500 bbls 'hi-vis' mud. Spotted 1.15 SG mud on bottom. Dropped survey tool. POH to 30" shoe. Recovered survey tool (misrun). RIH to 675m washing last 5m to bottom. Pumped 1300 bbls 1.15 SG mud. Dropped survey tool. POH. Recovered survey tool. Racked back BHA. R/U and ran 20" casing.
7	13.03.86	675	-	Continued running 20" casing. Landed same with shoe at 666m. Circulated casing contents. Mixed and pumped lead and tail cement slurries. Displaced cement with 1.15 SG mud. Bumped plug with 1000 psi. Backed out running tool and POH. Rigged up to run BOP's.

Daily Drilling Diary

WELL: NORMANBY-1

DAY	DATE	DEPTH (mBRT)	PROG (m)	DAILY ACTIVITY DIARY
8	14.03.86	675	-	Ran BOP stack and riser. Moved rig prior to landing BOP's. Landed and latched BOP's. Applied 50,000 lbs. test pull. Installed divertor. Attempted to test BOP's against casing. Leaked off at 1000 psi back to 500 psi. No leak traced. Ran test plug. Attempted pressure test. Leaked past test plug. POH test plug. Re-ran same. Tested upper rams to 1200 psi and upper annular to 1200 psi. RIH and set bore protector. RIH with 17½" BHA. Tagged plug at 652m. Drilled plug and float collar.
9	15.03.86	883	208	Drilled out cement/shoe and sump to 675m. Drilled new formation to 680m. Circulated and conditioned mud prior to leak off test. Carried out L.O.T. - EMW 1.31 SG. Drilled 17½" hole from 680m to 787m with mud losses. (10/15 bbls/hour at 720m increasing to 100/150 bbls/hour at 780m). Spotted 40 bbls LCM on bottom. Pulled back to 720m. Spotted 50 bbls LCM at 720m. Pulled back to shoe. Observed well. RIH to 787m and drilled to 820m. Lost circulation. Mixed and pumped 'hi-vis' LCM pill. Pulled back to shoe. Observed losses reduced to 60 bbls/hour. RIH to 820m. Drilled 17½" hole from 820m to 883m.
10	16.03.86	1055	172	Drilled 17½" hole from 883m to 1003m with losses of 30/40 bbls/hr. Dropped survey tool. POH to shoe. Recovered survey tool (misrun). RIH to 1003m. Surveyed. Drilled from 1003m to 1050m. (Losses stopped after drilling into mudstone). Dropped survey tool. POH for bit change. Recovered survey tool. RIH. Drilled from 1050m to 1055m.
11	17.03.86	1164	109	Drilled 17½" hole from 1055m to 1162m with losses of 10/40 bbl/hr. Dropped survey tool. POH for bit change. Recovered survey tool. RIH. Held up at 1147m. Washed and reamed to 1162m. Drilled from 1147m to 1164m.
12	18.03.86	1367	203	Drilled 17½" hole from 1164m to 1367m.
13	19.03.86	1503	136	Drilled from 1367m to 1448m. Dropped survey tool. POH for bit change. Hole tight from 1194m to 1156m. Recovered survey tool. RIH. Washed/reamed from 1310m to 1338m and 1425m to 1448m. Drilled 17½" hole from 1448m to 1503m.

Daily Drilling Diary

WELL: NORMANBY-1

DAY	DATE	DEPTH (mBRT)	PROG (m)	DAILY ACTIVITY DIARY
14	20.03.86	1562	59	Drilled 17½" hole from 1503m to 1562m. Circulated hole clean. POH to 1000m. Hole tight from 1415m to 1332m. RIH to 1554m. Washed/reamed to 1562m. Circulated hole clean. Dropped survey tool. POH. Recovered survey tool. R/U and ran 17½" hole logs.
15	21.03.86	1562	-	Recovered wearbushings. 180,000 lbs overpull on pulling wellhead wear bushing. RIH and jetted wellhead area. POH. R/U and ran 13-3/8" casing. Landed same with shoe at 1555m BRT. Circulated casing contents. Carried out 13-3/8" lead and tail cement jobs. Lost 340 bbls whilst displacing cement. Bumped SSR plug with 1500 psi - no backflow.
16	22.03.86	1565	3	Ran and set 13-3/8" seal assembly. Tested seal assembly, BOP's, K & C valves, and choke manifold to 3000 psi. Installed wellhead and flex joint wear bushings. Made up 12¼" BHA. RIH and tagged cement at 1526m. Tested standpipe manifold and kelly to 3000 psi. Drilled out 13-3/8" casing and cleaned out sump to 1562m. Drilled 3m of new hole to 1565m. Circulated prior to leak off test.
17	23.03.86	1708	143	Carried out L.O.T. (EMW 1.31 SG). Drilled 12¼" hole from 1565m to 1672m. Dropped survey tool. POH for bit change. Recovered survey tool. RIH. Drilled 12¼" hole from 1672m to 1708m.
18	24.03.86	1911	203	Drilled 12¼" hole from 1708m to 1911m.
19	25.03.86	2069	158	Drilled 12¼" hole from 1911m to 2069m.
20	26.03.86	2130	61	Drilled 12¼" hole from 2069m to 2097m. Dropped survey tool. POH for bit change. Recovered survey tool. RIH to 2071m. Washed/reamed to 2097m. Drilled 12¼" hole to 2130m.
21	27.03.86	2191	61	Drilled 12¼" hole from 2130m to 2160m. Surveyed (7-3/4°). POH for BHA change. RIH with pendulum BHA to 2154m. Washed/reamed to 2160m. Drilled 12¼" hole to 2188m. Surveyed (6°). Drilled to 2191m.
22	28.03.86	2311	120	Drilled 12¼" hole from 2191m to 2252m. Surveyed (6°). Drilled to 2299m. Surveyed (5-3/4°). Drilled to 2311m. Surveyed (6°). POH for bit change.

Daily Drilling Diary

WELL: NORMANBY-1

DAY	DATE	DEPTH (mBRT)	PROG (m)	DAILY ACTIVITY DIARY
23	29.03.86	2374	63	RIH to 2284m. Washed to 2311m. Drilled 12¼" hole from 2311m to 2365m. Surveyed (5°). Drilled to 2374m. Surveyed (4°). POH for BOP tests. Carried out BOP tests to 3000 psi.
24	30.03.86	2439	65	Completed BOP tests. RIH to 2350m. Washed/reamed to 2374m. Drilled 12¼" hole from 2374m to 2439m.
25	31.03.86	2468	29	Drilled 12¼" hole from 2439m to 2468m. Surveyed (3°). POH for BHA change. RIH with packed hole BHA to 2097m. Washed/reamed from 2097m to 2188m. RIH to 2355m. Washed/reamed from 2355m to 2393m. RIH to 2434m.
26	01.04.86	2547	79	Reamed from 2434m to 2468m. Drilled 12¼" hole from 2468m to 2514m. Pulled back to 2300m. Hole tight at 2331m. RIH to 2514m. Drilled 12¼" hole from 2514m to 2547m.
27	02.04.86	2609	62	Drilled 12¼" hole from 2547m to 2579m. Dropped survey tool. POH for bit change. Recovered survey tool. RIH to 2554m. Light reamed from 2554m to 2579m. Drilled from 2579m to 2609m.
28	03.04.86	2701	92	Drilled 12¼" hole from 2609m to 2629m. Circulated and surveyed on wireline. Drilled from 2629m to 2701m.
29	04.04.86	2724	23	Drilled 12¼" hole from 2701m to 2724m. Circulated. Check tripped to 2489m - 50,000 lbs drag from 2724m to 2703m. RIH clean to 2724m. Circulated and conditioned mud. Dropped survey tool. POH clean. Recovered survey tool. R/U and ran 12¼" open hole logs. R/D logging equipment. M/U 9-5/8" casing hanger and SSR plug and stood back in derrick.
30	05.04.86	2724	-	RIH with junk sub in BHA to 13-3/8" shoe. Slipped and cut blockline. Continued RIH to 2713m. Washed/light reamed from 2713m to 2724m. Circulated and conditioned mud whilst working junk sub. POH to 2572m. Hole tight - 100,000 lbs overpull from 2712m to 2700m. RIH to 2724m. POH - hole clean. Recovered 2-3/4 kg junk (CST bullets). Retreived flex joint and wellhead wear bushings. R/U and ran 9-5/8" casing. Retensioned Nos. 2 and 3 anchors after tension lost. Continued running 9-5/8" casing.

Daily Drilling Diary

WELL: NORMANBY-1

DAY	DATE	DEPTH (mBRT)	PROG (m)	DAILY ACTIVITY DIARY
31	06.04.86	2724	-	Continued running 9-5/8" casing to hanger joint. Tripped float equipment with 800 psi. M/U hanger joint and RIH casing on HWDP. Held up at 2671m. Washed down in singles to 2718m. Landed casing and circulated casing contents. Pressure tested cement lines to 3000 psi. Mixed, pumped and displaced lead and tail cement slurries. Bumped plug with 2000 psi - float equipment held - no back flow. No losses observed. Recovered casing running string. M/U jet sub and RIH to wellhead. Jetted wellhead area. POH. Repositioned rig to reduce riser angle to 1½°. RIH and set 9-5/8" seal assembly. Pressure tested BOP's and choke manifold to 5,500 psi. Carried out accumulator drill. POH seal assembly running tool. L/O 8" DC's. Set wellhead and flex joint wear bushings. B/D 12¼" BHA. M/U 8½" BHA and RIH. (Laid piggyback anchor to No. 3 anchor).
32	07.04.86	2750	26	Continued RIH. Tagged cement at 2690m. Established SCR's and held BOP drill. Pressure tested casing to 3000 psi. Drilled out float collar, cement and float shoe to 2718m. Washed down to 2724m. Drilled 8½" hole to 2727m. Circulated. Carried out leak-off test to 1.92 SG EMW. Drilled 8½" hole from 2727m to 2750m with low ROP and high torque. Dropped survey tool and POH. Recovered survey tool, M/U new bit and RIH. Slipped and cut blockline.
33	08.04.86	2823	73	Continued RIH to 2740m. Reamed/washed to 2750m. Drilled 8½" hole from 2750m to 2823m. Dropped survey tool. POH. Recovered survey tool (misrun). M/U new 8½" bit and RIH.
34	09.04.86	2888	65	Continued RIH to 2718m. Lubricated rig whilst servicing compensator. Continued RIH to 2823m. Circulated. Dropped and retrieved survey tool. Drilled 8½" hole from 2823m to 2888m. Dropped survey tool. POH. Retrieved survey tool (misrun). M/U new bit and RIH to 2888m. Circulated prior to surveying. Dropped survey tool. Worked pipe - max. o/pull 100,000 lbs. Repaired wireline survey unit transmission. Retrieved survey tool - wire broke when survey tool just below surface. POH to retrieve survey tool.

Daily Drilling Diary

WELL: NORMANBY-1

DAY	DATE	DEPTH (mBRT)	PROG (m)	DAILY ACTIVITY DIARY
35	10.04.86	2960	72	Continued POH. Recovered survey tool. RIH. Slipped and cut blockline. Continued RIH to 2888m - no fill. Drilled 8½" hole from 2888m to 2960m.
36	11.04.86	3030	70	Drilled 8½" hole from 2960m to 2980m. Dropped survey tool. POH for bit change. Recovered survey tool. RIH. Drilled from 2980m to 3030m.
37	12.04.86	3181	151	Drilled 8½" hole from 3030m to 3113m. Flow checked at 3111m and 3113m. Circulated up sample. Drilled to 3181m.
38	13.04.86	3267	86	Gas in riser unloaded mud. Shut well in (#2 annular) SIDP = 0 SICP = 0. Filled riser and drillpipe. Checked for pressure - none. Opened well and observed. Circulated round 1.22 SG mud thro' chokes. Flow checked - negative. Drilled 8½" hole from 3181m to 3267m. Circulated bottoms up. Dropped survey tool. POH. Flow checked at shoe - negative.
39	14.04.86	3293	26	Finished POH. Retrieved survey tool. Closed blind rams. Gained 3½ bbls whilst closing rams. Monitored well through choke. SIP = 50 psi rising to 160 psi. Closed DP float valve and made up new bit. RIH. Bled off pressure. Opened rams. RIH 10 stds DP and BHA. Monitored hole via trip tank. Well flowed 4 bbl/hr. Closed in well and stripped into hole. Hung off string at 3267m. Circulated out influx and conditioned mud to 1.24 SG. Flow checked - negative. POH to shoe. Well flowed 3½ bbls/hr. RIH. Circulated and conditioned mud to 1.26 SG. Flow checked - negative. Drilled 8½" hole from 3267m to 3293m. Flow checked drilling breaks at 3289m and 3290m. Circulated up sample.
40	15.04.86	3306	13	Drilled 8½" hole from 3293m to 3306m. Observed pit gain on connection. Circulated and conditioned mud to 1.32 SG. Flowchecked - 10 bbl/hr. Circulated out influx. Shut well in - zero pressure. POH to shoe. Flow checked - 3 bbl/hr. RIH to bottom. Installed kelly cock. Shut in well (# 3 rams). Pressured up annulus to 100 psi. Pressure built up to 395 psi. Extrapolated to 500 psi - EMW = 1.43 SG. Bled off pressure - gained 1½ bbl. Observed well flowing at 10 bbl/hr. Circulated well to 1.43 SG mud.

Daily Drilling Diary

WELL: NORMANBY-1

DAY	DATE	DEPTH (mBRT)	PROG (m)	DAILY ACTIVITY DIARY
41	16.04.86	3306	0	Completed circulating well to 1.43 SG mud. Flow checked - 1 bbl gain. POH to shoe. Flow checked - 1 bbl gain. POH. Flow checked prior to pulling BHA. Hole static. Rigged up Schlumberger. Ran logs monitoring well via trip tank.
42	17.04.86	3306	0	Continued 8½" hole logs. Observed well flowing during run No. 7. Gained 10 bbls in 4 hours. R/D logging equipment and closed shear rams. Applied 100 psi to annulus and observed pressure build-up. RIH to 3296m. Gained 15 bbls whilst RIH. Washed/reamed from 3287m to 3302m. Closed well in and displaced hole to 1.46 SG mud circulating through chokes.
43	18.04.86	3306	0	Finished displacing hole to 1.46 SG mud. Opened BOP's. Circulated and conditioned mud. Flow checked - negative. POH to 9-5/8" shoe. Flow checked - negative. POH. R/U and completed 8½" hole logs. RIH with OEDP to 3300m (slipped and cut blockline). Circulated and conditioned mud. Set cement plug No. 1 from 3300m to 3200m. POH to 3200m. Broke circulation. Set cement plug No. 2 from 3200m to 3050m. POH to 3027m and reverse circulated. POH to 2768m. Set cement plug No. 3 from 2768m to 2668m. POH to 2653m. Commenced reverse circulation.
44	19.04.86	3306	0	Finished reverse circulation. POH breaking down drillpipe. Broke down excess drillpipe, HWDP and 6½" DC's. R/U Schlumberger. RIH and set bridge plug at 2654m. POH. R/D Schlumberger. RIH with OEDP to 210m. Set cement plug No. 4 from 210m to 110m. POH to 100m. Reverse circulated. POH breaking down drillpipe. Retrieved flex joint and wellhead wear bushings. RIH with 9-5/8" cutting assembly and cut 9-5/8" casing at 92.3m (16.7m b.s.b.). POH and L/D 9-5/8" cutting assembly. R/U to pull BOP's and riser.

Daily Drilling Diary

WELL: NORMANBY-1

DAY	DATE	DEPTH (mBRT)	PKOG (m)	DAILY ACTIVITY DIARY
45	20.04.86	-	-	Pulled riser and BOP's. Racked riser double in derrick. R/D riser handling equipment and riser tension ring. RIH with 9-5/8" casing spear and retrieved 9-5/8" casing stub. Backed out 9-5/8" seal assembly and L/D 9-5/8" casing stub. RIH with 13-3/8" cutting assembly and cut 13-3/8" casing at 89.2m (13.6m b.s.b.). POH. RIH with 13-3/8" casing spear and retrieved 13-3/8" casing stub. Attempted to break out 13-3/8" seal assembly - no success. L/D 13-3/8" casing stub. R/U riser handling equipment. P/U riser double and M/U to BOP's. (Recovered 4 piggyback anchors and standby vessel mooring buoy and anchor).
46	21.04.86	-	-	Changed out BOP stack wellhead connector. L/D riser double and R/D riser handling equipment. RIH with 20" casing cutting assembly and cut 20" casing at 84.4m (8.8m b.s.b.). POH and L/D 20" cutting assembly. RIH with wellhead running tool and attempted to M/U to wellhead - no success (very poor visibility). POH. RIH with 20" casing spear and retrieved 20" casing stub/wellhead. L/D 20" stub/wellhead. RIH with 30" casing cutting assembly. Attempted to stab into wellhead. Guideropes parted. POH and renewed guideropes. RIH. Observed guideropes again parted and rig off location to stern. POH and renewed guideropes. RIH. Repositioned rig. Stabbed into 30" wellhead. Cut 30" casing at 81.8m (6.2m b.s.b.) (Recovered Nos. 11 and 5 anchors).
47	22.04.86	-	-	Continued cutting 30" casing. Attempted to pull 30" casing stub/PGB/TGB on guidelines - no success. POH. RIH with 30" wellhead running tool. Attempted to stab into wellhead - guideropes parted. POH. Renewed guideropes. Repositioned rig. RIH. Stabbed into wellhead and M/U running tool. Attempted to pull 30" casing - no success with 300,000 lbs overpull. POH. RIH with 30" cutting assembly. Continued cutting 30" casing at 81.8m (6.2m b.s.b.). Attempted to recover 30" casing stub/PGB/TGB on guidelines - no success. POH. RIH with 30" running tool and M/U to wellhead. Pulled and recovered 30" casing stub/PGB/TGB. Deballasted rig to 56 ft. draft. WOW to pull anchors.

Daily Drilling Diary

WELL: NORMANBY-1

DAY	DATE	DEPTH (mBRT)	PROG (m)	DAILY ACTIVITY DIARY
48	23.04.86	-	-	Continued WOW to pull anchors. Recovered anchor Nos. 2, 8, 4 and 10. Pennant parted on No. 3 anchor. Observed pulled anchors crossed over deployed anchors. Deballasted rig to 35' draft to observe crossed anchors. WOW to work anchors.
49	24.04.86	-	-	Continued WOW to pull anchors. Ballasted rig to 66' draft.
50	25.04.86	-	-	WOW to pull anchors.
51	26.04.86	-	-	WOW to pull anchors.
52	27.04.86	-	-	WOW to pull anchors.
53	28.04.86	-	-	Continued WOW. Deballasted rig to 28' draft. Grappled and commenced pulling No. 7 anchor. Unfouled lines on anchor Nos. 5 and 2. Dropped anchor No. 7 (parted wire strop). Racked No. 2 anchor. Deballasted rig to 24'6". Racked anchor Nos. 8, 10, 4 and 11. Recovered and racked No. 7 anchor. Attached pendant to No. 5 anchor and pulled same onto rig.
54	29.04.86	-	-	Recovered and racked anchor Nos. 6 and 9. Walked rig over to anchor Nos. 1 and 3 whilst recovered and racked anchor No. 12. Recovered and racked No. 3 anchor. Ballasted rig to 50' for backloading supply vessel. Completed backload and deballasted rig. Recovered and racked anchor No. 1. Completed anchor work at 18.30 hours. Rig underway at 19.14 hours.

SECTION 4

Drilling Data

4.1 Drilling Evaluation

4.1.1 36" Section Hole 75.3 - 157m BRT (81.7m)

The 36" section was drilled in three passes, 17½", 26" and 36" using two bits and two hole openers.

A TGB was run and used with no problems.

The seabed tag was at 75.6m BRT giving a water depth of 48.8m. The seabed was soft and the initial drilling required little weight on bit.

The section was drilled with returns to seabed but the formation was assumed to be an unconsolidated limestone.

The initial pilot hole was drilled at 23m/hr. The bit used being a Smith SDS. A Varel L3A bit was used to guide the 36" hole opener. Neither exhibited any signs of wear. The SDS was graded T1.

4.1.2 26" Section 157 - 675m BRT (518m)

The 26" section was drilled in two passes 17½" and 26" using a bit and hole opener. The riser was installed for the pilot hole with returns to surface but was removed for the hole opening after checking that no signs of surface gas had been noted.

The formation was a moderately hard calcareous limestone with some mudstone bands towards the bottom of the section.

After drilling approximately 30m of new hole returns were lost and the hole converted to a 'hi-vis' bentonite system. Returns were recovered but with losses initially of 100 bbls/hr. An extra 'hi-vis' pill reduced losses to 35 bbls/hr. The pilot hole was continued with losses of between 40-60 bbls/hr controlled by LCM pills.

The riser was then displaced to seawater and removed and the hole opened with returns to seabed.

The bit was a re-run of the Smith SDS used in the 36" section. It drilled at approximately 30m/hr with a final tooth grading of T4.

4.1.3 17½" Section 675m - 1562m BRT (887m)

The 17½" section was drilled with four bits. One SDT, one R3, and two X3A's.

The formation drilled was an unconsolidated sandstone between 675m - 1015m (340m) grading to a mudstone with interbedded sandstone and siltstone at 1275m (260m). The hole from 1275m - 1562 (287m) was a sandstone with siltsone and mudstone with a trace of pyritic sandstone. This pyritic sandstone was probably also present in the mudstone section as evidenced by bit tooth damage.

The R3 bit was run because it was the closest bit type to that required. A longer tooth bit would have been more suitable.

The prefered bits, X3A's were run behind the R3 and increased the ROP from 8m/hr to 10m/hr. The second X3A was pulled at casing depth but came out T7. Both the X3A's and the R3 had broken teeth indicating the presence of hard bands, most likely pyritic sand present from the start of the mudstone.

The leak-off EMW at the 20" shoe was 1.31 SG but losses occurred with 1.05 SG mud at 720m BRT starting at 10/15 bbls/hr increasing to 100/150 bbls/hr at 780m BRT. A 40 bbl LCM pill was spotted at 780m BRT and a further 50 bbls spotted at 720m BRT. Drilling was then continued to 820m BRT where circulation was lost. Using 'hi-vis' LCM pills reduced losses to circa 60 bbl/hr and drilling continued with average losses of 30/40 bbls/hr. After 1162m BRT losses became intermittent and casing point was reached without further LCM pills. The loss zones corresponded to the sandstone intervals drilled.

The curing of the lost circulation was attributed to the increased amount of mudstone in the formation. This increased the gel content of the mud helping seal off the loss zones.

Future drilling of this section should be aware of the potential lost circulation and plan accordingly.

4.1.4 <u>12¼" Hole Section</u> 1562m - 2724m BRT (1162m)

The 12¼" section was drilled with 9 bits. There were three J22's, two R1's, two JD3's and two FDT's. The use of the R1's was necessitated by measures taken to drop the angle off when it built to 7-3/4° after crossing a fault.

The formation drilled was sandstone with mudstone and siltstone interbeds and minor traces of coal and dolomite. This continued in varying percentages until 2330m BRT below which it graded to dominantly mudstone and siltstone. This was the top of the Belfast formation. (2329m BRT from wireline logs). None of the possible pressure and hole problems occurred. The estimated pore pressure rose from 1.03 SG to 1.18 SG at the top of the formation reducing to 1.12 SG at casing point.

As the Belfast formation did not present any problems the casing point was brought up from its original setting depth just inside the prognosed reservoir. This ensured a secure casing seat set in mudstone allowing safe penetration of the target.

The leak-off at the 13-3/8" shoe had been a low 1.31 SG.

The 13-3/8" casing was drilled out with an FDT bit and made 110m outside the shoe. Hole angle was 2° when it was pulled. The next bit, a J22, made a good run of 425m but the hole angle had risen to 6°. The next bit, another J22, was pulled after 64 metres after the angle had risen to 7-3/4°.

A pendulum assembly with an R1 bit was then run. Low weight and high rotation slowed the ROP down to 4½m/hr from 9m/hr but the angle held rather than built. The bit was pulled when it quit drilling. The second R1 was run at a faster speed, 150 as opposed to 95 rpm, but at a higher weight of 35 as against 15 k lb. This returned the ROP to 9m/hr and the angle dropped from 6° to 4° though the bit only lasted 63m. The final pendulum assembly run was with an FDT bit and the angle dropped to 3°.

The remainder of the section was drilled with a locked assembly, a high W.O.B. and high rpm (100). The angle held steady at circa 3° to casing setting depth despite the high weight on bit required to maintain 4 - 5 m/hr. The bits used were a JD3 and a J22.

The problem with angle build up complicates ROP analysis but it can basically be split into two sections. One, the Paaratte and Transitional Formations should expect to be drilled at 9m/hr, and two, the Belfast Formation at 4½m/hr. The J22 TCI bit in both formation sections proved to be equivalent in penetration rate to the mill tooth bits but capable of longer runs.

4.1.5 <u>8½" Section</u> 2724 - 3306m BRT (582m)

The 8½" section was drilled with 6 bits. They were one JD3, two SVH's, one JD4, one J22 and one F2.

The formation was similar to the 12¼" section. From 2724m - 3084m BRT was the remainder of the Belfast Formation, predominantly mudstone and siltstone. The top of the Waare formation was at 3084m, differing from the Belfast by an increased number of sandstone intervals and traces of coal. The Waare also proved to be higher pressured than normal with some 250m being drilled under balance.

The penetration rates in the Belfast Formation were 4-5m/hr and in the Waare 6-7m/hr. There were traces of pyrite which led to some tooth damage. Best bit run was run No. 19, a J22, TCI bit.

8½" Section - Pressure Control Problems

SUMMARY (See next page for log of events)

The logs run at 3306m showed the sandstones in the 8½" section to have high porosities but low permeability. Only the one R.F.T. point at 3178m brt produced a sample, the other zones being too tight. This showed our 1.43 SG mud weight to be just on balance. It also indicated that the well had been drilled under balance for up to 250m. The underbalance could have been as much as 900 psi.

The probability is that the whole of the Waarre is higher pressured than normal and only because of a higher permeability in the sand at 3175m was it to cause problems.

Although underbalanced, the well did not flow as the sand was drilled due to the low permeability of the formation. No warning of the gas coming to surface could be seen because of the dissolved nature of the gas and the small volumes involved.

The influx was formation water with gas dissolved in it. Little free gas was evident despite an estimated water saturation level of 75%, a figure derived from the wireline logs.

In future, care should be taken when drilling through the Waarre formation noting that normal 'kick' procedures and indicators are not applicable due to the intermittent or limited nature of the flow.

LOG OF EVENTS

13/04/86 Drilled through a coarse sand at 3175m with 1.12 SG mud (connection at 3175m). Drilling break 2½ mins. per metre (24m/hr). When drilling at 3181m there was a sudden surge in flow and expanding gas in the riser unloaded a quantity of mud. There was a corresponding decrease in pump pressure at the same time, but no pit gain warning whilst drilling. The well was shut in with the No. 2 annular and the diverter. Prior to closing in pit gain was 44 bbls.

Shut in pressures were zero on the drillpipe and casing. The well was opened and observed. No flow. Hung off pipe and circulated round to 1.22 SG mud across the choke. Flowcheck proved negative. Drilled on to 3267m, a further 92m, taking 15-3/4 hours, where the bit quit drilling. No gain was recorded during this time.

14/04/86 POH flow checking at the shoe. No flow. Indications of slight flow while pulling BHA. Gained 3½ bbls prior to closing the blind rams with bit above BOP's. Shut in pressure was 50 psi rising to 250 psi after 9 bbls of mud was pumped to the well. The pressure was then bled off before rising again to 25 psi. A further 3 bbls were pumped to the well and the pressure bled off. No increase in pressure was observed. The well was then opened and observed for flow. No flow.

RIH to HWDP. Observed well. Flowing at 6 bbls/hr. RIH to first stand D.P. Well flowing 12 bbls/hr. RIH first stand D.P. No flow. RIH 10 Stds D.P. Well flowing 4 bbls/hr +. Closed annular and stripped into the well bleeding off 2¼ bbls/stand.

Hung off on #3 rams at 3267m and circulated out influx with 1.24 SG mud.

Flow checked on bottom, no flow. Pipe grabbed while reciprocating during flow check. Came free while circulating at 2000 psi . Pulled back to shoe. Flow checked. Well flowing 3½ bbls/hr. RIH to bottom and circulated to 1.26 SG mud. Flow checked, no flow. Drilled ahead to 3306m.

15/04/86 Well flowed. Circulated and conditioned mud to 1.32 SG. Flow checked - 10 bbls/hr. Circulated out influx, shut in and monitored pressure. No build up. POH to shoe. Well was still flowing. RIH. Pressured up annulus to 100 psi and monitored pressure build up. Pressure built to 395 psi. Extrapolated to a final pressure of 500 psi. EMW - 1.43 SG. Circulated well to 1.43 SG mud. Well static. POH to log.

17/04/86 Well remained dead for 36 hours, it commenced to flow after 7 logging runs. The drillpipe was run in the hole and the hole circulated to 1.46 SG mud. Thereafter there was no further flow.

BIT RECORD — AREA: OTWAY BASIN, OFFSHORE VICTORIA, AUSTRALIA — Page 1 of 3

WELL NO.	NORMANBY-1	RIG RATE US$/HR	3,900	PUMP MAKE/TYPE	EMSCO 1600FB
RIG	ZAPATA ARCTIC	TRIP TIME/1000M	2 HOURS	OPERATOR	BP PET. DEV. LTD.

RUN NUMBER	1	2	3	4	5	6	7	8	9	10
Bit Number	1	1RR	2	1RR2	1RR3	3	4	5	6	7
Size (inches)	17½"	17½"	26"	17½"	17½"	17½"	17½"	17½"	17½"	12¼"
Make	SMITH	SMITH	VAREL	SMITH	SMITH	SMITH	HTC	HTC	HTC	SMITH
Type	SDS	SDS	L3A	SDS	SDS	SDT	R3	X3A	X3A	FDT
Serial No.	XE1121	XE1121	89521	XE1121	XE1121	XE2559	HP291	BC884	464XL	XB4876
IADC Code	1.1.4	1.1.4	1.2.1	1.1.4	1.1.4	1.2.4	1.3.1	1.1.4	1.1.4	1.2.6
Bear. (J) (R) Lub. (N) (S)	R S	R S	R N	R S	R S	R S	R N	R S	R S	J S
Weight on Bit (k lbs)	5-10			5-30	5-30	5-30	20-40	40-46	45	8-40
RPM	100			100	100	50-130	110-140	90-110	95-120	60-100
Depth Out (m)	157	157	157	675	675	1050	1162	1448	1562	1672
Hours	3.5			18	17.1	22.3	14.1	27.4	14.3	12.2
Metres	81			518	518	375	112	286	114	110
R.O.P. (m/hr)	23			28.7	30.2	16.8	7.9	10.4	8.0	9.0
Teeth Cone / Row / Wear	3 3 1			3 3 4	3 3 4	3 3 7	3 3 6	3 3 7	3 2 7	3 2 7
Bearing Seal / Clearance / Wear	E 1/32 1			E 1/32 4	E 1/32 4	E 1/32 4	1/16 6	I 1/8 6	E 1/32 4	E 1/32 2
Cost/m (US$/m)	258			156		295	696	478	766	695
Broken Teeth/Inserts (%)	-					-	YES*	YES*	YES*	YES*
Gauge	1N			¼"	¼"	¼"	IN	3/8"	3/8"	¼"
% HHP Bit/HHP/in²				12.4		13.7/ 0.1	13.8/ 0.1	13.3/ 0.2	12.1 0.2	42.2 2.1
Nozzles 1 / 2 / 3 / 4	28 28				28 28	28 28	28 28	28 28	28 28	18 18
	28 -				28 -	28 -	28 -	28 -	28 -	18 -
Flow Rate (G.P.M.)	1000			535	800	600	600	650	650	650
Pump Pressure (PSI)	600			600	1000	900	1000	1150	1180	1760
Overbalance (PSI)				97		92	138	175	238	270
Pore Pressure (S.G.)						1.03	1.03	1.03	1.03	1.03
Mud Type	S/WATER WITH VIS SWEEPS				SPUD MUD	SPUD MUD	S/WATER GEL	S/WATER GEL	S/WATER GEL	S/WATER GEL
Mud Weight (S.G.)						1.10	1.10	1.11	1.12	1.10
P.V. / Y.P.						6 16	7 16	7 18	7 18	6 15
Solids (%) / Sand (%)						- -	6 TR	6 ¼	6 ¼	5 TR
Lithology	UNCONSOLIDATED LIMESTONE					COARSE LOOSE SST	MDST W/ INTER-BEDDED SST & MINOR SLTST	MDST & SST W/ MINOR SLTST. TR LST	SST WITH SLTST & MDST	SST WITH SLST & MDST (TR PYRITIC SAND)
Completed By	GHJ	GHJ	GHJ	GHJ	GHJ	GHJ	GHJ	GHJ	GHJ	GHJ
Comments	SPUD & PILOT HOLE FOR 36" HOLE SECTION	26" HOLE OPENING RUN	36" HOLE OPENING RUN	17½" HOLE FOR 26" SECTION	26" HOLE OPENING RUN	DRILLED OUT 20". 325M SST, 50M MDST(BIT BALLED). 2.1 HRS DRILLING CEMENT.	LONGER TOOTH BIT NOT AVAILABLE	* EVIDENCE OF TOOTH BREAKAGE BUT % DIFFICULT TO ESTIMATE BECAUSE OF TOOTH WEAR. MOST BREAKAGE WAS IN MIDDLE ROWS	DRILLED TO CSG POINT	DRILLED OUT 13-3/8" CSG 2.2 HRS ON CEMENT ROP DROPPED TO 1M/HR.

BIT RECORD — AREA: OTWAY BASIN, OFFSHORE VICTORIA, AUSTRALIA — Page 2 of 3

WELL NO.	NORMANBY-1	RIG RATE US$/HR	3,900
RIG	ZAPATA ARCTIC	TRIP TIME/1000M	2 HOURS
PUMP MAKE/TYPE	EMSCO 1600FB		
OPERATOR	BP PET. DEV. LTD.		

RUN NUMBER	11	12	13	14	15	16	17	18	19	20
Bit Number	8	9	10	11	12	13	14	13RR	15	16
Size (inches)	12¼"	12¼"	12¼"	12¼"	12¼"	12¼"	12¼"	12¼"	8½"	8½"
Make	HTC	HTC	HTC	HTC	SMITH	HTC	HTC	HTC	HTC	SMITH
Type	J22	J22	R1	R1	FDT	JD3	J22	JD3	JD3	SVH
Serial No.	259BA	825JG	939ML	997ML	XB4847	645NL	753EA	645NL	970NL	XD5881
IADC Code	5.1.7	5.1.7	1.1.1	1.1.1	1.2.6	1.3.7	5.1.7	1.3.7	1.3.7	2.1.5
Bear. (J) (R) / Lub. (N) (S)	J S	J S	R N	R N	J S	J S	J S	J S	J S	R S
Weight on Bit (k lbs)	10-15	10-20	30-45	20-35	35-40	35-45	45-50	-	40	45
RPM	75-95	70-95	80-150	150	100	90-100	100	-	80-90	75-85
Depth Out (m)	2097	2161	2311	2374	2468	2579	2724	-	2750	2823
Hours	48.4	14.3	15.1	11.0	23.0	27.2	31.8	-	8.8	13.9
Metres	425	64	150	63	94	111	145	-	26	73
R.O.P. (m/hr)	8.8	4.5	9.9	5.7	4.1	4.1	4.6	-	3.0	5.3
Teeth: Cone / Row / Wear	3 3 3	3 3 1	3 3 8	3 3 7	3 3 5	2 1 5	1 1 2	2 7 5	3 1 5	2 1 4
Bearing: Seal / Clearance / Wear	D - 4	E 1/32 1	- - 7	- - 7	E 1/32 3	E 1/32 3	E - 2	E 1/32 3	E - 2	I ½ 8
Cost/m (US$/m)	540	1527	652	1313	1394	1344	1205	-	3030	1367
Broken Teeth/Inserts (%)	-	-	-	-	-	-	-	YES*	YES*	-
Gauge	1/8"	1/32"	1/8"	1/16"	1/32"	1/8"	IN	1/32"	IN	IN
% HHP Bit/HHP/in²	51.3/ 3.3	48.9/ 2.8	47.9/ 3.4	47.5/ 3.4	46.8/ 3.5	45.0/ 3.5	52.9/ 4.7	-	39.8/ 2.4	39.1/ 2.5
Nozzles	18 15	18 15	18 15	18 15	18 15	18 15	15 15	18 18	14 14	14 14
1 2 3 4	15 -	15 -	15 -	15 -	15 -	15 -	15 -	18 -	14 -	14 -
Flow Rate (G.P.M.)	650	660	650	650	650	650	650	-	375	375
Pump Pressure (PSI)	1850	1850	1900	2200	2300	2400	2750	-	1600	1700
Overbalance (PSI)	337	376	401	444	253	*	342	-	436	485
Pore Pressure (S.G.)	1.03	1.03	1.03	1.03	1.14	1.18*	1.13	-	1.13	1.13
Mud Type	KCL/POL	KCL/POL	KCL/POL	KCL/POL	KCL/POL	KCL/POL	KCL/POL	KCL/POL	KCL/POL	KCL/POL
Mud Weight (S.G.)	1.13	1.14	1.14	1.15	1.18	1.20	1.20	1.20	1.20	1.20
P.V. / Y.P.	7 10	10 12	11 13	11 14	12 13	11 12	12 13	- -	13 14	14 13
Solids (%) / Sand (%)	6 TR	6 TR	6 TR	7 TR	8 TR	8 TR	8 TR	- -	8 TR	8.5 TR
Lithology	SST W/ MDST & TR SLTST, COAL & DOL.	SST WITH INTER-BEDED SLTST & TR DOL.	SST INTER-BEDED WITH MDST & SLTST	MDST WITH SLTST INTER-BEDS. SOME SST	MDST WITH SLTST INTER-BEDS	MDST GRADING TO SLTST	SLTST WITH MDST INTER-BEDS	N/A	INTER-BEDDED SLTST/ MDST	INTER-BEDED SLTST/ MDST
Completed By	GHJ	GHJ	GHJ	GHJ	GHJ	GHJ	GHJ	ACE	ACE	ACE
Comments		PULLED TO CHANGE BHA. HOLE ANGLE 7-3/4°				*1.18SG PORE PRESS POSS. HIGH.O/ BALANCE POSS AS HIGH AS 450 PSI	PULLED AT 9-5/8" CASING DEPTH	WIPER TRIP & JUNK SUB RUN. *TEETH RECOVERED IN JUNK SUB	*BIT SHOWED SIGNS OF JUNK DAMAGE. PULLED DUE TO LOW ROP	ROP DROPPED FROM 5 TO 3M/HR

BIT RECORD — AREA: OTWAY BASIN, OFFSHORE VICTORIA, AUSTRALIA — Page 3 of 3

WELL NO.	DUNTROON-1	RIG RATE US$/HR	3,900	PUMP MAKE/TYPE	EMSCO 1600FB
RIG	ZAPATA ARCTIC	TRIP TIME/1000M	2 HOURS	OPERATOR	BP PET. DEV. LTD.

RUN NUMBER	21	22	23	24	25	26	27	28	29	30
Bit Number	17	18	19	20	20RR					
Size (inches)	8½"	8½"	8½"	8½"	8½"					
Make	SMITH	HTC	HTC	SMITH	SMITH					
Type	SVH	JD4	J22	F2	F2					
Serial No.	XD5759	729NL	406WL	XD5856	XD5856					
IADC Code	2.1.5	1.3.7	5.1.7	5.1.7	5.1.7					
(R) Bear. (J) (S) Lub. (N)	R S	J S	J S	J S	J S					
Weight on Bit (k lbs)	45	45	45	45	-					
RPM	80	90	83	80	-					
Depth Out (m)	2888	2980	3267	3306	-					
Hours	9.8	21.1	40.7	5.9	-					
Metres	65	92	287	39	-					
R.O.P. (m/hr)	6.6	4.4	7.1	6.6	-					
Teeth: Cone / Row / Wear	1 1 3	3 3 5	3 2 3	1 1 1	1 1 1					
Bearing: Seal / Clearance / Wear	I ¼ 8	E 1/32 3	I 1" 8	E - 1	E - 1					
Cost/m (US$/m)	1305	1417	745	2022	-					
Broken Teeth/Inserts (%)	-	-	SOME CHIPPED	-	-					
Gauge	IN	IN	N/A	IN	IN					
% HHP Bit/HHP/in²	36.8/ 2.4	37.6/ 2.5	38.1/ 2.4	37.9/ 2.6	-					
Nozzles	14 14	14 14	14 14	14 14	14 14					
1 2 3 4	14 -	14 -	14 -	14 -	14 -					
Flow Rate (G.P.M.)	375	375	375	375	-					
Pump Pressure (PSI)	1730	1650	1745	1850	-					
Overbalance (PSI)	488	593	* U/B	* U/B	-					
Pore Pressure (S.G.)	1.13	1.10	1.18 -1.43	1.43	-					
Mud Type	KCL/ POLY	KCL/ POLY	KCL/ POLY	KCL/ POLY	KCL/ POLY					
Mud Weight (S.G.)	1.20	1.20	1.22	1.22 -1.46	1.46					
P.V. / Y.P.	13 12	13 12	14 13	12 14	- -					
Solids (%) / Sand (%)	9 TR	9 0.1	10 0.2	14 0.25	- -					
Lithology	INTER-BEDDED SLTST/ MDST	INTER-BEDDED SLTST/ MDST	INTER-BEDDED SLTST/ MDST SST	INTER-BEDDED SST/ SLTST	N/A					
Completed By	ACE	ACE	GHJ	ACE	ACE					
Comments	PULLED DUE TO INCREASE IN TORQUE	ROP DROPPED to 1.5M/ HR FROM 6M/HR NOZZLES PLUGGING DRILLED PYRITE	* UNDER BALANCE UP TO 900 PSI	PULLED AT LOGGING DEPTH	WIPER TRIP DURING 8½" HOLE LOGS					

4.3 BHA Record and Survey Data

B.H.A. RECORD

WELL: NORMANBY - 1

HOLE SIZE	INTERVAL (m)	BIT RUN NO.	B.H.A.	REMARKS
17½"	76-157	1	B-NBS-9½" DC-SS-9½" DC-SS-4 X 9½" DC-X/O-HWDP	17½" Pilot hole. 36" hole section. 1½° at 157m.
26"	76-157	2	17½" B-H/O-BS-9½" DC-SS-9½" DC-17½" SS-4 X 9½" DC-X/O-HWDP	26" Pilot hole. 36" hole section. 2° at 157m.
36"	76-157	3	26" B-H/O-BS-9½" DC-SS-9½" DC-17½" SS-4 X 9½" DC-X/O-HWDP	36" Hole opener assembly 2° at 157m.
17½"	157-675	4	B-NBS-9½" DC-SS-9½" DC-SS-4 X 9½" DC-X/O-6 X 8" DC-X/O-9 X HWDP	17½" Pilot hole.26" section. 1° at 675m.
26"	157-675	5	17½" B-H/O-BS-9½"-DC-SS-9½"-DC-17½" SS-4 X 9½" DC-X/O-6 X 8" DC's -X/O-9 X HWDP	26" Hole opening run. 1° at 675m.
17½"	675-1050	6	B-NBS-9½" DC-SS-9½" DC-SS-4 X 9½" DC's -X/O-9 X 8" DC-X/O-3 X HWDP-6¼" JAR-14 X HWDP	1° at 1003m 1¼° at 1050m.
17½"	1050-1162	7	"	1¼° at 1162m.
17½"	1162-1448	8	"	1¼° at 1448m.
17½"	1448-1562	9	"	1¼° at 1562m.
12¼"	1562-1672	10	B-NBS-8" DC-SS- 8" DC-SS-13 X 8" DC-X/O-3 X HWDP-6¼" JAR-17 X HWDP	2° at 1672m.
12¼"	1672-2097	11	"	6° at 2097m.
12¼"	2097-2161	12	"	7-3/4° at 2160m.
12¼"	2161-2311	13	B-2 X 8" DC-SS- 8" DC-SS-12 X 8" DC-X/O-3 X HWDP-6¼" JAR-17 X HWDP	Pendulum Assy. 6° at 2188m. 6° at 2252m. 5-3/4° at 2299m. 6° at 2133m.

B.H.A. RECORD

WELL: NORMANBY - 1

HOLE SIZE	INTERVAL (m)	BIT RUN NO.	B.H.A.	REMARKS
12¼"	2311-2374	14	B-2 X 8" DC-SS- 8" DC-SS- 12 X 8" DC-X/O-3 X HWDP-6¼" JAR-17 X HWDP	Pendulum Assy. 5° at 2365m 4° at 2374m
12¼"	2374-2468	15	"	4° at 2412m 3° at 2468m
12¼"	2468-2579	16	B-NBS-8" DC-SS-8" DC-SS- 13 X 8" DC-X/O-3 X HWDP-6¼" JAR-17 X HWDP	2¼° at 2514m 3° at 2579m
12¼"	2579-2724	17	"	3¼° at 2629m 3° at 2724m
12¼"	1562-2724	18	"	Wiper trip before running 9-5/8" casing.
8½"	2724-2750	19	B-NBS-6½" DC-SS-6½" DC-SS- 19 X 6½" DC-X/O-3 X HWDP-6¼" JAR-17 X HWDP	3¼° at 2750m.
8½"	2750-2823	20	"	3-3/4° at 2823m.
8½"	2823-2888	21	"	4° at 2888m.
8½"	2888-2980	22	"	3½° at 2980m.
8½"	2980-3267	23	"	6° at 3267m
8½"	3267-3306	24	"	
8½"	2724-3306	25	"	Wiper trip during 8½" hole logs.

TOTCO SURVEY RECORD

Well: Normanby-1

Survey No.	Depth m BRT	Angle Deg	Remarks
1.	110	1½	17½" pilot hole BHA.
2.	157	1½	17½" pilot hole BHA.
3.	157	2	36" BHA.
4.	157	2	36" BHA.
5.	675	1	17½" pilot hole BHA.
6.	1050	1¼	17½" hole. Packed hole BHA.
7.	1162	1¼	17½" hole. Packed hole BHA.
8.	1448	1¼	17½" hole. Packed hole BHA.
9.	1562	1¼	TD 17½" hole section.
10.	1672	2	12¼" hole. Packed hole BHA.
11.	2097	6	12¼" hole. Packed hole BHA.
12.	2160	7-3/4	12¼" hole. Packed hole BHA.
13.	2188	6	Pendulum BHA.
14.	2252	6	Pendulum BHA.
15.	2299	5-3/4	Pendulum BHA.
16.	2311	6	Pendulum BHA.
17.	2365	5	Pendulum BHA.
18.	2374	4	Pendulum BHA.
19.	2412	4	Pendulum BHA.
20.	2468	3	Pendulum BHA.
21.	2514	2¼	Packed hole BHA.
22.	2579	3	Packed hole BHA.
23.	2629	3¼	Packed hole BHA.
24.	2724	3	Packed hole BHA.
25.	2750	3¼	8½" hole. Packed hole BHA.
26.	2823	3-3/4	8½" hole. Packed hole BHA.
27.	2888	4	8½" hole. Packed hole BHA.
28.	2980	3½	8½" hole. Packed hole BHA.
29.	3267	6	8½" hole. Packed hole BHA.

NOTES: (1) In addition to the above surveys, there were also 9 misruns not shown above.

(2) Totco 'Hot Well' 7° and 14° survey instruments were used as both the 'Standard' 8° and 16° instruments malfunctioned .

Well: Normanby-1 Rig: Zapata Arctic Mud Pumps: EMSCO 1600FB Liners: 2 X 6½"

DATE	HOLE SIZE Ins	DPTH mBRT	BIT No.	PUMP DATA NO.1 SPM	NO.2 SPM	CIRC RATE GPM	CIRC PRES psi	BIT DATA NOZZLES	P psi	NOZ VEL m/s	% HHP	ANNULAR VELOCITIES IMP FORCE Kgf	OH/ DC m/min	OH/ DP m/min	CSG DP m/min	Rsr DP m/min	MUD DATA WT SG	ECD SG
1986																		
07/03	17½/ 26	157	1	100	100	1000	600	3 X 28	-	-	-	-	12	-	-	-	S/W with viscous sweeps	
08/03	36	157	2	80	80	800	800	3 X 22 4 X 16	-	-	-	-	6	-	-	-		
	30" CONDUCTOR																	
09/03	17½	370	1RR	55	55	550	750	3 X 28	73	30	8	109	19	15	5	11	S/W with	
10/03	17½	675	1RR	54	54	540	600	3 X 28	71	29	12	105	19	15	5	11	viscous sweeps	
11/03	26	500	2RR	80	80	800	1000	3 X 22 4 X 16	-	-	-	-	-	-	-	-		
12/03	26	675	2RR	80	80	800	1000	3 X 22 4 X 16	-	-	-	-	-	-	-	-		
	20" Casing																	
15/03	17½	883	3	100	-	500	650	3 X 28	63	27	9	94	17	13	11	10	1.08	1.08
16/03	17½	1055	4	54	54	540	740	3 X 28	76	29	10	112	19	14	12	11	1.10	1.10
17/03	17½	1164	5	60	60	600	850	3 X 28	93	32	11	138	21	16	13	12	1.10	1.10
18/03	17½	1367	5	65	65	650	1120	3 X 28	111	35	9	164	22	17	14	13	1.11	1.11
19/03	17½	1503	6	65	65	650	1140	3 X 28	112	35	9	165	22	17	14	13	1.12	1.12
20/03	17½	1562	6	65	65	650	1180	3 X 28	112	35	9	165	22	17	14	13	1.12	1.12
	13-3/8" Casing																	
22/03	12¼	1565	7	65	65	650	1780	3 X 18	660	85	37	403	56	-	38	13	1.13	1.14
23/03	12¼	1708	8	65	65	650	2100	18,15,15	1031	107	49	502	56	-	38	13	1.12	1.13
24/03	12¼	1911	8	65	65	650	2100	18,15,15	1031	107	49	502	56	39	38	13	1.12	1.13
25/03	12¼	2069	8	65	65	650	2100	18,15,15	1040	107	49	506	56	39	38	13	1.13	1.14
26/03	12¼	2130	9	60	60	600	1900	18,15,15	894	99	47	435	52	36	36	12	1.14	1.15
27/03	12¼	2191	10	65	65	650	2000	18,15,15	1049	107	52	511	56	39	38	13	1.14	1.15
28/03	12¼	2311	10	65	65	650	2200	18,15,15	1058	107	48	515	56	39	38	13	1.15	1.16
29/03	12¼	2374	11	65	65	650	2200	18,15,15	1067	107	49	520	56	39	38	13	1.16	1.17
30/03	12¼	2439	12	65	65	650	2220	18,15,15	1095	107	49	533	56	39	38	13	1.19	1.20
31/03	12¼	2468	12	65	65	650	2400	18,15,15	1104	107	46	538	56	39	38	13	1.20	1.21
01/04	12¼	2547	13	65	65	650	2460	18,15,15	1104	107	45	538	56	39	38	13	1.20	1.21
02/04	12¼	2609	13	65	65	650	2700	3 X 15	1452	123	54	617	56	39	38	13	1.20	1.21
03/04	12¼	2701	14	65	65	650	2780	3 X 15	1452	123	52	617	56	39	38	13	1.20	1.21
04/04	12¼	2724	14	65	65	650	2800	3 X 15	1452	123	52	617	56	39	38	13	1.20	1.21
	9-5/8" Casing																	
07/04	8½	2750	15	75	-	375	1710	3 X 14	637	81	37	236	94	-	56	7	1.20	1.23
08/04	8½	2823	16	75	-	375	1750	3 X 14	637	81	36	236	94	-	56	7	1.20	1.23
09/04	8½	2888	17	75	-	375	1790	3 X 14	637	81	35	236	94	-	56	7	1.20	1.23
10/04	8½	2960	18	75	-	375	1780	3 X 14	637	81	36	236	94	59	56	7	1.20	1.23
11/04	8½	3030	19	75	-	375	1740	3 X 14	637	81	37	236	94	59	56	7	1.20	1.23
12/04	8½	3181	19	75	-	375	1780	3 X 14	637	81	36	236	94	59	56	7	1.20	1.23
13/04	8½	3267	19	75	-	375	1780	3 X 14	645	81	36	239	94	59	56	7	1.22	1.25
14/04	8½	3293	20	75	-	375	2100	3 X 14	674	81	32	249	94	59	56	7	1.27	1.30
15/04	8½	3306	20	75	-	375	1780	3 X 14	759	81	43	281	94	59	56	7	1.43	1.46

WELL HISTORY

Magcobar
DRILLING FLUID SERVICES

PAGE 1 OF 2

OPERATOR: B.P. PETROLEUM DEVELOPMENT LTD.	SECTION: O F F S H O R E	TOWNSHIP	RANGE	MUD TYPE 1) SEAWATER/GEL 2) KCL POLYMER	
WELL: NORMANBY #1	FIELD: VIC - PI4			SPUD DATE: 7/3/86	
CONTRACTOR: ZAPATA	COUNTY/PARISH: SOUTHERN OCEAN			T.D. DATE: 15/4/86	
ENGINEERS: BACZKOWSKI/GUYTONBECK/ONN	STATE: VICTORIA			DAYS TO T.D: 40	

	SIZE	DEPTH	BIT SIZE	N RITS	ROTATING HOURS	DEGASSER	DESANDER	DESILTER	CENTRIFUGE	SHAKER SCREENS
CONDUCTOR	30"	148M		2	4.3/4					
SURFACE	20"	666M	17½"+HO.	1	54					40 40 OPEN OPEN
INTERMEDIATE	13.3/8"	1555	17.1/2"	4	97½					40 40 OPEN OPEN
LINER(S)	9.5/8"	2718	12.1/4	8	214	16HRS	136HRS	221HRS	47HRS	60 60 40 OPEN
PRODUCTION		3306	8.1/2"	6	118. 3/4	35HRS	NIL	117½HRS	66¼HRS	

DATE 1986	MEASURED DEPTH M	Ø200/Ø100	MUD WT.	VIS. SEC.	ANGLE AND DIRECTION	FLOW RATE (gpm)	FLOW LINE TEMP. °F °C	PV.	YP.	GELS 0/10	PH	API FLUID LOSS	H.T.H.P. FLUID LOSS	Pf	Mf	Pm	SALT OR CHLORIDE ppm mg/l	CALCIUM (ppm)	SOL %	OIL %	M/T BARITE	BENTONITE M/TONS	CAUSTIC	XC POLYMER	CELPOL	LIME	K.SEAL	N.PLUG	$CaCl_2$	GEL(Sx)	SODA ASH	CAUSTILIG	POLYSAL	KCL	FLOCGEL	MAXFLOC AER 23						MUD COST
07.03						S P U D	W E L L	V S	I N G	H I	V I S	S W E E P S									1.25	27.7	11			15		50	22															
08.03	157		1.15	75						/												10.9	12					36	22															
OPEN HOLE TO 36" & SPOT WEIGHTED HI VIS PILL (350BBL'S) & RUN & CMT 30" CSG @ 148M.																																											
09.03	370		1.06	58						/												6.3	14	3		33	30	10		100														
RUN RISER & RIG DIVERTER LINKS & FUNCTION TEST SAME. DRILLING OUT CMT & SHOE & DRLG AHEAD, ENCOUNTER LOSSES, LOWER PUMP RATES & SPOT PILLS (LCM).																																											
10.03	675		1.11	45						/												2.26	10	11																			
DRLG 17.1/2 TO 675M & P.O.H. RECOVER MUD FROM RISER & CONT. P.O.H.																																											
11.03	675		S E A		H20					/											21.5	7.9	13	13		8				1													
PULL RISER & OPEN HOLE TO 26" USING SEA H2O WITH VISCOUS PILLS																																											
12.03	675		S E A		H20					/												2.0	6	9							1												
CIRC 50BBL PILL. SPOT 100BBL PILL, WIPE TO SHOE. DISPLACE HOLE WITH 1500BBL'S @ 1.15 S.G. & P.O.H. TO RUN 20" CSG.																																											
13.03	675		P R E P A R I N G		S P U D	M U D	W I T H	B A L A N C E	O F	M A T E R I A L.																																		
RUN & CMT 20" CSG & PREPARE TO RUN B.O.P'S.																																											
14.03	675		1.07	45						/												4.0	7	7		16			48	3												
TEST BOP'S & ALL LINKS & CSG. M.U. B.H.A. & R.I.H. & TAG FLOAT & DRILLING SAME.																																											
15.03	883		1.09	42			7	14	/	9.5							18,500					3.5	11	10	30	21	30	27		1												
DRILLING 17.1/2 HOLE. CONDUCT LEAKOFF TO 1.31 S.G. EQU. DRILLING TO 780 & LOSING MUD (60/HR). SPOT 2X50 BBL PILLS & CONT. DRILLING WITH 60/80 LOSSES.																																											
16.03	1055		1.10	40			6	16	1/4	9.5	12.6						19,500						4	5	15																		
DRILLING 17.1/2" HOLE WITH 20/30 BBL LOSSES. TRIP FOR NEW BIT. LOST 100 BBL ON TRIP. CONT DRILLING 17.1/2" HOLE.																																											
17.03	1164		1.10	40		644	7	16	1/3	9.5	12.4		.1				19,500		6				4	5	15																		
DRILLING 17.1/2" HOLE WITH LOSSES OF 10/40 BBL HR. TRIP FOR BIT & DRILLING 17.1/2" HOLE.																																											
18.03	1367		1.11	43		650	7	18	1/5		13.4		.1				17,500		6		9.08	6	4																				
DRILLING 17.1/2" HOLE.																																											
19.03	1503		1.12	40		650	8	16	1/3	9.5	13.6		.1				16,500				3.99	6	4							28												
DRILLING 17.1/2" HOLE TRIP FOR NEW BIT. TIGHT HOLE 1194-1156M. R.I.H. REAM 1310-1338M & CONT IN HOLE.																																											
20.03	1562		1.12	40		650	7	18	1/3	9.5	13.6		.1				18,000				2.25					10																	
DRILLING 17.1/2" HOLE. MAKE WIPER TRIP. CIRC & COND. P.O.H. TO LOG.																																											
21.03	1562		1.12	40						/										1.8																						
LOG & RUN & CMT 13.3/8" CASING.																																											
22.03	1565		1.13	40		T R E A T I N G	F/O	C M T	C O N T A M I N A T I O N.																																		
INSTALL & TEST SEAL ASSEMBLY. TEST BOP'S & SURFACE EQUIPMENT, P/U NEW B.H.A. R.I.H. SLIP & CUT LINE. TAG CMT. TEST CSG & DRILLING CMT & SHOE & FORMATION.																																											
23.03	1708		1.12	38		650	6	15	1/3	9.8	12.6		.1	.25	.2		18,000	280	5				12	4	5						7		15	30									
DRILLING 12.1/4" TO 1672M & P.O.H. FOR NEW BIT. R.I.H. & DRILLING 12.1/4" HOLE.																																											
24.03	1910		1.12	38		650	9	15	4/9	9.5	14.4		.15	.2	.2		31,000	320	8				15	6	5								60	30									
DRILL 12.1/4" HOLE TO 1910M.																																											
25.03	2069	11/7	1.13	35		650	40	7	11	3/6	9.0	8.0		.1	.2	.35		35,000	600	6				32	8	26								20	30	20								
DRILL 12.1/4" HOLE TO 2069M.																																											
26.03	2130	17/2	1.14	37	6°	600	39	10	12	4/7	10.5	6.8		.35	.6	1.3		33,000	280	6				10	10	10								60	30									
DRILL 12.1/4" HOLE TO 2097M. P.O.H. M/U NEW BIT. R.I.H. WASH & REAM 2071-2097M. NO FILL. DRILL 12.1/4" HOLE TO 2130M.																																											
27.03	2191	18/12	1.14	37	6°	650	33	11	12	4/6	10.5	6.4		.3	.6	1.2		35,000	240	6				10	5	7								40	10									
DRILL 12.1/4" HOLE TO 2161M. P.O.H. CHANGE BHA. R.I.H. DRILL TO 2191M.																																											
28.03	2311	18/13	1.15	38	5.3/4°	650	38	11	13	3/5	10.0	5.8		.25	.5	.85		42,500	280	6				7	4	22								250	7									
DRILL 12.1/4" HOLE TO 2311M. P.O.H. M/U NEW BIT. R.I.H.																																											
29.03	2374	19/4	1.16	38	4°	650	42	11	14	4/5	10.0	6.8		.3	.6	.9		47,500	180	7		5.3		12	6									110										
DRILL 12.1/4" HOLE TO 2374M. P.O.H. TEST BOP'S.																																											
30.03	2439	18/11	1.19	38	4°	650	42	12	13	3/4	10.2	5.2		.3	.6	1.0		51,000	120	8		3.2		12		5								100	15	1								
TEST BOP'S. M/U NEW BIT. R.I.H. NO FILL. DRILL 12.1/4" HOLE TO 2439M.																																											

WELL HISTORY

Magcobar
DRILLING FLUID SERVICES

OPERATOR: B.P. PETROLEUM DEVELOPMENT LTD	SECTION: OFFSHORE	TOWNSHIP	RANGE	MUD TYPE: KCL POLYMER	
WELL: NORMANBY #1	FIELD: VIC PI4			SPUD DATE: 7/3/86	
CONTRACTOR: ZAPATA O/S	COUNTY/PARISH: OTWAY BASIN			T.D. DATE: 15/4/86	
ENGINEERS: GUYTONBECK/ BACZKOWSKI/ONN	STATE: VICTORIA			DAYS TO T.D: 40	

	SIZE	DEPTH M	BIT SIZE	N. BITS	ROTATING HOURS RUN	DEGASSER	DESANDER	DESILTER	CENTRIFUGE	SHAKER SCREENS
CONDUCTOR										
SURFACE										
INTERMEDIATE	9.5/8"	2718	12.1/4"	8	214	16 HRS	136 HRS	221HRS	47 HRS	S40 S40 OPEN OPEN
LINER(S)	-	3306	8.1/2"	6	118. 3/4	35 HRS	NIL	117½HRS	66½HRS	60 60 40 OPEN
PRODUCTION										

DATE 1986	MEASURED DEPTH	T.V.D.	MUD WT.	VIS. SEC.	ANGLE AND DIRECTION	FLOW RATE (spm)	FLOW LINE TEMP. °F °C	PV.	YP.	GELS 0 / 10	PH	API FLUID LOSS	H.T.H.P. FLUID LOSS	P_f	M_f	P_m	SALT OR CHLORIDE ppm mg/l	CALCIUM (ppm)	SOL %	OIL %	KCL %	CAUSTIC	XCD-POLYMER	KCL	FLOCEL	MONPAC	M.T. BARITE	HAITOC AE33	MAGCONOL	GEL-MT	SOD BICARB	SODA ASH NITRATE	LIME	POLYSAL	MUD COST
31.03	2468	21/14	1.20	39	3°	650	41	13	14	3/5	10	5.4		.25	.55	.75	51,000	200	8	-	9	10		40		6	14.4		1						
DRILL 12.1/4" HOLE TO 2468M. P.O.O.H. M/U NEW BHA & BIT. RIH. REAM & WASH 2099 TO 2188M. RIH TO 2359M. REAM & WASH TO 2393M.																																			
01.04	2547	17/11	1.20	38	2.1/4°	650	43	11	12	3/4	9.5	5.6		.2	.5	.6	53,000	280	8	-	9.5	12		80	14	7		1								
REAM & WASH 2434 TO 2468M. DRILL 12.1/4" HOLE TO 2514M. CHECK TRIP TO 2300M. DRILL TO 2547M.																																			
02.04	2609	19/13	1.20	42	3°	650	46	12	13	4/6	10.5	6.4		.3	.7	.8	55,500	140	8		10	14	7	80		2										
DRILL 12.1/4" HOLE TO 2579M. P.O.O.H. M/U NEW BIT. RIH. REAM & WASH 2554 TO 2579M. HOLE CONDITION GOOD. DRILL 12.1/4" HOLE TO 2609M.																																			
03.04	2701	17/12	1.20	38	3°	650	47	11	12	4/6	10.8	6.4		.5	1.2	.85	52,500	120	8	-	9	24		180	14	7										
DRILL 12.1/4" HOLE FROM 2609 TO 2701M.																																			
04.04	2724	19/13	1.20	38	3°	650	50	12	13	4/6	10.5	6.4		.5	1.4	.8	54,000	160	8	-	9.5	5		40	7	7										
DRILL 12.1/4" HOLE TO 2724M. WIPER TRIP TO 2489M. CIRC. P.O.O.H. LOG & SCHLUMBERGER.																																			
05.04	2724	19/13	1.20	38				12	13	4/6	10.5	6.6		.45	1.2	.75	54,000	160	8	-	9.5								1.5							
RIH & JUNK SUB. CIRC. P.O.O.H. RIG UP & RUN 9.5/8" CASING.																																			
06.04	2724	22/15	1.20	40				14	14	4/6	10.5	6.4		.5	1.2	.8	54,000	180	8	-	9.5															
RUN & CMT 9.5/8" CSG. TEST BOP'S. LAY DOWN 8" DCS. M/U 8.1/2" BHA. P/U 6.1/2" DCS & RIH.																																			
07.04	2750	20/13	1.20	41		375	39	13	14	3/4	10.5	6.0		0.5	1.2	1.2	62,000	160	8.5	-	11.5			90		8				8	6				
RIH. DRILL CMT & SHOE. RUN L.O.T. - EQUIV TO 1.92 S.G. DRILL TO 2750M P.O.O.H. RIH W/NEW BIT.																																			
08.04	2823	19/12	1.20	38		-	-	13	12	2/4	10.5	6.4		0.55	1.4	1.0	80,000	120	9	-	13			200	20			1							
RIH. DRILL AHEAD TO 2823M. RAISE KCL% WHILE DRILLING. P.O.O.H. RIH W/NEW BIT.																																			
09.04	2888	19/12	1.20	39		-	-	13	12	2/4	10.5	5.8		0.6	1.5	1.0	79,000	120	9		13	2		50	35	6	4.9								
RIH. DRILL TO 2888M. P.O.O.H. RIH W/NEW BIT. DROP SURVEY (MISRUN) DROP 2ND SURVEY. WIRELINE PARTED. P.O.O.H.																																			
10.04	2960	17/10	1.20	38		375	38	12	12	2/4	10.5	6.2		0.7	1.8	1.0	74,000	120	9	-	12	14		220	11	7						4	2	3	
P.O.O.H. RETR. SURVEY (4°) RIH TO 2888M. NO FILL. DRILL AHEAD.																																			
11.01	3030	20/14	1.20	41		375	39	13	14	2/4	10.5	5.8		0.6	1.6	1.0	72,000	120	9	-	11.5	5			19	9	3.6								
DRILL TO 2980M. P.O.O.H. SURVEY 3.1/2°. RIH W/NEW BIT. HOLE GOOD. DRILL AHEAD.																																			
12.04	3081	19/12	1.20	38		375	42	13	12	2/4	10.5	6.0		0.7	1.9	0.9	69,000	100	9	-	11		5			9								10	
DRILL TO 3113M. CIRC SAMPLE. DRILL TO 3081M. SUSPECT WELL FLOWING. SHUT WELL IN. WAITING FOR PRESSURES TO STABILIZE.																																			
13.04	3267	20/14	1.22	40		-	40	14	13	2/6	10.5	6.2		0.5	1.7	0.6	68,000	140	10	-	12	3	4	40		7	5							11	
CIRC THRO' CHOKE. OPEN CHOKE. NIL PRESSURE. CIRC. 1.22 S.G. MUD INCR. IN FLOW. SHUT IN. NIL PRESSURE. OPEN HYDRIL. NIL FLOW. DRILL TO 3267M. P.O.O.H. FOR BIT.																																			
14.04	3293	20/13	1.27	39		375	40	14	12	2/5	10.5	6.4		0.5	1.9	0.6	68,000	120	11	-	11.5	4	1	5		4	21.1							4	
P.O.O.H. WELL FLOWING. RIH. OPEN RAMS. HOLE OK. CIRC RAISE MW TO 1.24+ NIL FLOW. WASH & REAM TO 3267M. P.O.O.H. TO SHOE. WELL FLOWING. RIH. CIRC. INCR. MW TO 1.27+. NIL FLOW. DRILL AHEAD.																																			
15.04	3306	32/31	1.43	46		300	40	20	20	4/16	10.5	6.0		0.5	1.7	0.6	69,000	100	17		10	1	5			3							8	
DRILL TO 3300M. WELL FLOWING. SHUT IN WELL. CIRC. INCR. MW TO 1.28. HOLE STABLE. INCR. MW TO 1.29. DRILL TO 3306M. INCR MW TO 1.32. THEN TO 1.35. SHUT IN WELL. CIRC. INCR. MW TO 1.43+.																																			
16.04	3306	28/17	1.44	44		-	-	20	16	3/9	10.5	6.0		0.5	1.8	0.6	69,000	100	17		10						65.5					//	NIL FLOW. CIRC.		
CIRC. & SMOOTH OUT MUD TO 1.43+ ALL ROUND. P.O.O.H. RIG UP SCHLUMBERGER. RUN LOGS.																																			
17.04	3306		1.46	45						/																									
CONTINUE TO RUN LOGS. HOLE STARTED FLOWING. RIG DOWN SCHLUMBERGER. RIH W/BIT TO 3296M WASH & REAM TO 3303M. CIRC. RAISE MW TO 1.46 S.G.																																			
18.04	3306		1.46	44						/																									
CONT. CIRCULATE UNTIL MW 1.46 ALL ROUND. FLOW CHECK-NIL. P.O.O.H. RUN SCHLUMBERGER CST. RIH OEDP TO 3300M. COMMENCE P & A PROGRAM.																																			
19.04	3306		-	-						/																									
CONTINUE P & A PROGRAM. SET FINAL CMT PLUG. DUMP & CLEAN ALL MUD PITS. END OF NORMANBY #1.																																			

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

OPERATOR: B.P. PETROLEUM DEVELOPMENT LTD. WELLSITE REP: C. ALLPORT
J. LIEBNITZ

CONTRACTOR: ZAPATA O/S CONTRACTOR REP: M. FORDE
J. HIRD

RIG: NO. 36 ARCTIC

WELL NORMANBY NO. 1.

TOTAL DRILLING DAYS: 40 SPUD DATE: 7 MARCH, 1986

TOTAL DAYS ON WELL: 43 TOTAL DEPTH DATE: 15 APRIL, 1986

DRILLING FLUID BY INTERVAL			MUD COST BY INTERVAL
SPUD MUD	36"	RKB - 157 METERS	A$17,561.78
SPUD MUD	26"	157 - 675 METERS	24,925.16
SEAWATER/GEL	17.1/2"	675 - 1562 METERS	28,253.59
KCl POLYMER	12.1/4"	1562 - 2724 METERS	65,942.27
KCl POLYMER	8.1/2"	2724 - 3306 METERS	43,414.87

TOTAL MUD COST A$180,096.93

DRESSER MAGCOBAR ENGINEERS V. GUYTONBECK
A. BACZKOWSKI
B. ONN

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

T A B L E O F C O N T E N T S

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

WELL SUMMARY

Interval: RKB - 157 Meters 36 Hole 30" Casing

The Dresser Magcobar Engineer arrived on location in the evening of March 8, 1986. 30" casing had been successfully run without problems and the hole displaced to 1.15 S.G. mud, prior to the engineer arriving on location.

Interval: 157 - 675 Meters 26" Hole 20" Casing

After running the riser and function testing the diverter lines, drilled out cement and then continued ahead with a 17.1/2" bit. Prehydrated bentonite, flocculated with Lime, was being used in high viscosity sweeps to ensure a clean hole. Severe losses were encountered and the hole was displaced to mud. Several high-viscosity LCM pills of 50 bbls (slug tank vol) were spotted and the pipe pulled to the shoe allowing the formation time to heal. Drilling was resumed with losses of 60 or more bbl/hr.
At 370 meters all the drill water had been used and due to weather no more could be taken onboard. XC-Polymer was therfore utilized for viscosity. This continued to a depth of 675 meters with continuous losses of 60+ bbl/hr. The riser was pulled and the hole opened to 26" using seawater with high-viscosity pills. At 675 meters a 50 bbl high-viscosity sweep was circulated through the hole and a 100 bbl high-viscosity pill spotted on bottom prior to pulling out to the shoe. 12 meters of fill was logged when back on bottom. The hole was then displaced with 1500 bbls of 1.15 S.G. high-viscosity mud and the 20" casing run and cemented.

Interval: 675 - 1562 Meters 17.1/2" Hole 13.3/8" Casing

The B.O.P.'s were run and tested and a new B.H.A. made up and run in the hole. The float was tagged and drilling resumed to 680 meters whereupon a leak off to 1.31 S.G. was performed. Drilling 17.1/2" hole was then resumed. At 780 meters losses of 60 - 70 bbl/hr were encountered. A 50 bbl LCM pill was spotted and the B.H.A. pulled up to the top of the pill, a second 50 bbl LCM pill was spotted and the B.H.A then pulled up to the 20" shoe and the pills waited on. Drilling was resumed with 40 - 60 bbl/hr losses, however, 100+ bbls were lost at 883 meters and a 50 bbl pill spotted. Losses continued varying from 20 - 100 bbls/hr with constant 20 - 30 bbl/hr losses. No bentonite was available from 880 meters to 1350 meters. A Seawater/XC Polymer/Celpol system was utilized over this interval. Prehydrated bentonite was again utilized to 1562 meters, the hole circulated, logged and 13.3/8" casing run and cemented. While bumping the plug 340 bbls of fluid was lost.

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

Interval: 1562 - 2724 Meters 12.1/4" Hole 9.5/8" Casing

The 13.3/8" seal assembly was installed and then the seal assembly, B.O.P.'s and surface lines were tested. A new B.H.A. was run in the hole, tagged cement and the float and shoe were drilled out to 1565 meters. When new formation was drilled a leak off test was performed to 1.31 S.G. Drilling of the 12.1/4" hole was then resumed. It was decided after discussions with the company representative onboard to run a lower percent of KCl (4%) until the expected top of the transitional unit. This was decided prior to reaching 1800 meters. Premix was bled into the active system on a continuous basis breaking the system over to KCl/Polymer at approximately 1800 Meters.

While drilling ahead the mud properties were brought into line by direct additions to the active system. This was principally to reduce the fluid loss to the 6 - 8 cc range and to maintain the yield point at 11-14 lb/100 sq. ft. This was sufficient for hole cleaning considering the flow rate of 650 gpm.

A survey at 2161 meters showed the hole deviation to be 7.3/4 degrees and so the pipe was pulled and a change made to a pendulum assembly to reduce the angle of deviation. As drilling progressed the KCl content was increased to 8% just prior to entering the Belfast formation. At 2468 meters the hole deviation had come back to 3 degrees where the pipe pulled out to change to a conventional B.H.A. When running back in some tight hole was encountered, probably due to a combination of factors including the changing angle of the hole, a new B.H.A, and possible swelling of the clay formation. The latter case was relevant as the cuttings coming off the shakers were slightly sticky. It should be stated however, that the deviation was most probably the major factor at this stage. As a result the KCl content was raised to 10% to help alleviate this problem. There was also a possibility of overpressure which necessitated raising the mud weight up to 1.20 S.G.

A bit trip was made at 2579 meters with no hole problems either on the way out or while going back in. The hole was drilled without any difficulties to 2724 meters where a short wiper trip was made, the hole was circulated clean and the pipe was pulled out in order to log with Schlumberger. Logging was completed without any problems.

After logging a wiper trip was made, prior to running 9.5/8" casing. A tight spot encountered at 2712 to 2700 meters, while pulling out, required 100,000 lbs overpull. The pipe was run back through the tight spot and pulled out without drag. When running casing the hole was tight from 2500 meters with the casing having to be worked and washed from 2671 to 2718 meters. As stated, this may well be the result of the earlier hole deviations. The 9.5/8" casing was then set and the cement job completed without further hitches.

Interval: 2724 - 3306 Meters 8.1/2" Hole

After drilling out the cement and three meters of new formation, a leak off test was conducted with a 1.92 S.G. mud weight equivalent. The hole was drilled to 2750 meters before the pipe was pulled to make a bit change. While drilling, the cuttings at the shakers were very sticky. It was decided to raise the KCl content to 12% and then again, during the next bit run, to 13%. The hole remained stable, as did the consistency of the cuttings, and the KCl percent was not raised further.

Drilling continued with no significant problem to 3181 meters where the well was shut in due to a suspected flow. There was no SICP and the mud weight was increased from 1.20+ S.G. to 1.22 S.G. and circulated. The hole continued to flow and was again shut in. No SICP was recorded. One full circulation was made through the choke, the hydril was opened, and the hole remained stable. Drilling continued to 3267 meters where the bit was pulled. When out of the hole with the drillstring, the hole again started to flow. The hole was shut in and the SICP rose from 50 psi to 160 psi. A new bit was run into the hole, casing pressure was bled off and the hole was opened. After 10 stands of DP had been run, the hole flow was monitored at 4 bbl/hr. The hydril was closed and the bit was run to 3241 meters. The mud weight was increased to 1.24+ S.G. and was circulated through the choke. The SIDPP was maintained at 1260 to 1300 psi and the SICP fell steadily from 220 psi to zero. An analysis of the bottoms-up mud showed the influx to be water. After establishing 1.24+ S.G. mud density consistently through the system the hole continued to flow at $\pm$ 2 bbl/hr and the mud weight was consequently increased to 1.27 S.G. The hole remained stable and drilling went ahead to 3300 meters where the well again started to flow. The hole was shut in and the mud weight was increased, in two stages, to 1.28 S.G. and 1.29 S.G. At 1.29 S.G. the flow stopped and drilling continued to 3306 meters (T.D.) where the mud weight was further increased to 1.32 S.G. and then (after experiencing a flow of $\pm$ 10 bbl/hr) to 1.35 S.G. The hole then stopped flowing and the bit was pulled to the 9.5/8" shoe. A flow check at this point showed that the hole was flowing at $\pm$ 3 bbl/hr. The bit was run back to bottom and the hole was shut in for approximately 1 hour 40 minutes allowing the SICP to stabilize at 395 psi. A plot of the rise in SICP showed that a mud weight of 1.43 S.G. should kill the flow. The mud weight was raised to 1.43 S.G. and while circulating, XCD Polymer was added to the mud system to assist in barite suspension during logging operations. After establishing a 1.43 S.G. mud weight the hole remained stable. The drillstring was pulled and electric logs were run.

Despite the necessary mud density increases, the mud properties remained very stable and well within program specifications. The hole remained in good condition and did not give any problems of overpull, drag, fill etc. while tripping.

With one logging run still to be completed the hole again showed signs of flowing. This was after five successfull logging runs and an RFT. The bit and drillstring were run in the hole to 3303 meters and the total volume gain was measured at 30 bbls. The mud weight was increased to 1.46 S.G. and circulated until the mud was a consistent 1.46 S.G. A flow check proved negative and the drillstring was pulled.

Logs were then completed and the plug and abandon program for Normanby No. 1. was initiated and subsequently completed one day later.

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

OBSERVATIONS AND RECOMMENDATIONS :

Although there were some possible overpressures in the Belfast formation, and the mud weight was raised to compensate, the tight hole experienced was probably more the result of reactive clays and earlier hole deviations. The reasons for this are several i.e. although there were good cuttings being received at the shakers they were slightly sticky and there was some tight spots encountered on trips. The tightness was encountered when running the 9.5/8" casing after the hole had been exposed to the drilling fluid for some time. The initial tight hole was noticed at 2500 Meters which is just below the area where the hole angle returned to 3 degrees. It is quite possible that if there were some further delays while running the casing that it may not have got to bottom. Although the KCl content was run at 9-10% (which was above the specification of 8%) a content of at least 12% may be necessary as further "insurance" to overcome any problems associated with the reactive clays when further holes are drilled in this area.

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

OPERATOR: B.P. PETROLEUM DEVELOPMENT LTD WELL: NORMANBY NO. 1.

HOLE SIZE 36"

INTERVAL RKB - 157 METERS CASING SIZE 30"

PRODUCT	UNIT SIZE	QUANTITY	COST
Barite*	100 lb sx	61	325.13
Barite	1.25 MT	4	588.00
Caustic	25 kg sx	23	495.88
Lime	25 kg sx	15	81.00
Gel	1 MT	38.6	14,088.23
Gel	100 lb sx	44	697.84
Calcium Chloride	25 kg sx	86	1,285.70
			$17,561.78

*Ex N.Z. Stock
Remaining chemicals charged at Pt. Lincoln prices.

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

OPERATOR: B.P. PETROLEUM DEVELOPMENT LTD. WELL: NORMANBY NO. 1.

HOLE SIZE 26"

INTERVAL 157 - 675 METERS CASING SIZE 20"

PRODUCT	UNIT SIZE	QUANTITY	COST
Gel	1 MT	18.47	6,741.18
Gel	100 lb sx	100	1,586.00
Caustic	25 kg sx	43	927.08
XCD-Polymer	25 kg sx	36	11,592.00
Lime	25 kg sx	41	221.40
Kwik Seal	40 lb sx	30	1,140.00
Nut Plug	50 lb sx	10	170.00
Soda Ash	40 kg sx	2	32.00
Barite*	1 MT	21.5	2,515.50
			$24,925.16
	From 36" Interval		17,561.78
			$42,486.94

*Ex N.Z. Stock
Remaining chemicals charged at Pt. Lincoln prices.

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

OPERATOR: B.P. PETROLEUM DEVELOPMENT LTD. WELL: NORMANBY NO. 1.

HOLE SIZE 17.1/2"

INTERVAL 675 - 1562 METERS CASING SIZE 13.3/8"

PRODUCT	UNIT SIZE	QUANTITY	COST
Gel	1 MT	19.5	7,194.33
Gel	100 lb sx	88	1,475.76
XCD-Polymer	25 kg sx	27	8,697.24
Kwik Seal	40 lb sx	30	1,142.70
Nut Plug	50 lb sx	27	461.97
Caustic	25 kg sx	34	737.12
Lime	25 kg sx	47	261.79
Soda Ash	40 kg sx	4	64.60
Barite	50 kg sx	300	1,839.00
Caustilig	50 lb sx	28	619.08
Celpol*	25 kg sx	60	5,760.00
			$28,253.59
	From 26" Interval		42,486.94
			$70,740.53

*Charged off at Pt. Lincoln price.

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

OPERATOR: B.P. PETROLEUM DEVELOPMENT LTD. WELL: NORMANBY NO. 1.

HOLE SIZE 12.1/4"

INTERVAL 1562 - 2724 METERS CASING SIZE 9.5/8"

PRODUCT	UNIT SIZE	QUANTITY	COST
Caustic	25 kg sx	175	3,794.00
XCD-Polymer	25 kg sx	50	16,106.00
Celpol	25 kg sx	55	5,289.90
Monpac	25 kg sx	54	5,193.72
Polysal	25 kg sx	95	3,811.40
KCl	50 kg sx	1270	21,209.00
Barite	1 MT	22.9	2,807.54
Maxfloc AE823	55 gl dr	2	1,590.00
Magconol	55 gl dr	1	794.25
Soda Ash	40 kg sx	7	113.05
Flocgel*	25 kg sx	117	4,680.00
Gel	1 MT	1.5	553.41
			$65,942.27
	From 17.1/2" Interval		70,740.53
			$136,682.80

*Ex N.Z. Stock

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

OPERATOR: B.P. PETROLEUM DEVELOPMENT LTD. WELL: NORMANBY NO. 1.

HOLE SIZE 8.1/2"

INTERVAL 2724 - 3306 METERS CASING SIZE NO CASING

PRODUCT	UNIT SIZE	QUANTITY	COST
Magcobar	1 MT	135.4	16,600.04
Magcopolysal	25 kg sx	33	1,323.96
Caustic Soda	25 kg sx	29	628.72
Soda Ash	40 kg sx	2	32.30
Sodium Bicarbonate	49 kg sx	8	152.80
Monpac	25 kg sx	53	5,097.54
Potassium Chloride	50 kg sx	605	10,103.50
XCD-Polymer	25 kg sx	15	4,831.80
Maxfloc AE823	205 lt dr	1	795.00
Lime	25 kg sx	3	16.71
Flocgel*	25 kg sx	85	3,400.00
Sodium Nitrate	50 kg sx	10	432.50
			$ 43,414.87
	From 12.1/4" Interval		136,682.80
			$180,097.67

*Ex N.Z. Stock

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

TOTAL MATERIAL CONSUMPTION

OPERATOR:B.P. PETROLEUM DEVELOPMENT LTD

WELL: NORMANBY NO. 1.

Ex. N.Z. Stock Usage

LOCATION: OTWAY BASIN, VICTORIA

PRODUCT	UNIT SIZE	UNIT	COST	%
Magcobar	1 MT	26.5	3,103.50	1.72
Magcobar	100 lb sx	61	325.13	0.18
Flocgel	25 kg sx	202	8,080.00	4.49
			$11,508.63	

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

TOTAL MATERIAL CONSUMPTION

OPERATOR: B.P. PETROLEUM DEVELOPMENT LTD

WELL: NORMANBY NO. 1.

Ex - Pt. Lincoln Stock Usage

LOCATION: OTWAY BASIN. VICTORIA

PRODUCT	UNIT SIZE	UNIT	COST	%
Caustic Soda	25 kg sx	66	1,422.96	0.79
Lime	25 kg sx	56	302.40	0.17
Magcogel	1 MT	57.07	20,829.41	11.57
Magcogel	100 lb sx	144	2,283.84	1.27
Calcium Chloride	25 kg sx	86	1,285.70	0.71
XCD-Polymer	25 kg sx	36	11,592.00	6.44
Kwik Seal	40 lb sx	30	1,140.00	0.63
Nut Plug	50 lb sx	10	170.00	0.09
Soda Ash	40 kg sx	2	32.00	0.02
Celpol	25 kg sx	60	5,760.00	3.20
			$44,818.31	
	B/F from previous page		11,508.63	
			$56,326.94	

Dresser Magcobar

DIVISION OF DRESSER INDUSTRIES, INC.

TOTAL MATERIAL CONSUMPTION

OPERATOR:B.P. PETROLEUM DEVELOPMENT LTD

WELL: NORMANBY NO. 1.

Ex - Portland Stock Usage

LOCATION: OTWAY BASIN, VICTORIA

PRODUCT	UNIT SIZE	UNIT	COST	%
Magcobar	1 MT	173.3	21,246.58	11.80
Magcogel	1 MT	21	7,747.74	4.30
Magcogel	100 lb sx	88	1,475.76	0.82
XCD-Polymer	25 kg sx	92	29,635.04	16.45
Kwik Seal	40 lb sx	30	1,142.70	0.63
Nut Plug	50 lb sx	27	461.97	0.26
Caustic Soda	25 kg sx	238	5,159.84	2.87
Lime	25 kg sx	50	278.50	0.15
Soda Ash	40 kg sx	13	209.95	0.12
Caustilig	50 lb sx	28	619.08	0.34
Celpol/Monpac	25 kg sx	162	15,581.16	8.65
Magcopolysal	25 kg sx	128	5,135.36	2.85
Potassium Chloride	50 kg sx	1875	31,312.50	17.39
Maxfloc AE823	205 lt dr	3	2,385.00	1.32
Magconol	205 lt dr	1	794.25	0.44
Sodium Bicarbonate	40 kg sx	8	152.80	0.08
Sodium Nitrate	50 kg sx	10	432.50	0.24
			$123,770.73	
	B/F from previous page		56,316.94	
			$180,097.67	

Note: Discrepancy of $0.74 compared to mud report total is due to using marginally different formulae when calculating MT price of Magcogel in 26" section.

4.6 Casing and Cementing Evaluation

4.6.1 30" Casing and Cementing

30" Casing Job:

The 30" conductor consisted of 3 joints 1½" W.T. and 3 joints 1" W.T. Vetco X-52 grade casing. The casing was obtained from BP Australia and had C.I.W. 'CC' connectors welded on instead of the more usually run Vetco "ALT-2' connectors.

No problems were encountered running the conductor. Compared to the more usually run 'ALT-2' connectors, only a few extra minutes were required to unscrew the snap-ring release bolts of the 'CC' connectors to complete the connector make-up.

Due to the shallow water depth of 48.8m the conductor was stabbed through the TGB and run a few metres into the hole before the PGB could be made up to the 30" wellhead housing in the moonpool. No problems were encountered and the conductor was run until the PGB was positioned just above the TGB.

30" Cement Job:

The first batch of lead cement mixwater was contaminated by accidental transfer to another mud pit. This was dumped and another batch mixed quickly. The lead and tail cement slurries were then mixed, pumped and displaced using the cement unit without any problems. The required slurry weights were maintained and 200% excess on calculated open hole volume was pumped.

Volumes:	Lead	777 SX class 'G' 185 bbls seawater with 2.5% gel Plus 2.0% calcium chloride 1.58 SG slurry
	Tail	336SX 'G' neat 40 bbls seawater Plus 2.0% calcium chloride 1.90 SG slurry

4.6.2 20" Casing and Cementing

20" Casing Job:

The 20" casing string was a composite string utilising 17 joints of Buttress casing and 32 joints Vetco 'LS' casing. The overall time taken to run the casing was 17½ hours.

Difficulties were encountered running the buttress casing but the 32 joints of 'LS' casing were run in 4 hours (to casing hanger), 7 minutes per joint or 8 joints/hour. The landing of the casing took 1½ hours from the casing hanger. No hole problems were encountered running in and the contents of the casing were circulated prior to the cement job.

The float shoe and float collar were modified for differential fill. The Halliburton shoe was fitted with an adaptor to allow 80-90% fill whilst the collar was wedged open. This system worked until the collar shut (assumed wedge lost) necessitating filling the casing after 24 joints.

20" Cement Job:

The 20" casing was cemented in a single stage using a Halliburton SSR top plug system. The open hole volume pumped was 50% over gauge, less than normal, due to the presence of known loss zones. The worst zone was at 181m brt.

The lead and tail cement slurries were mixed and pumped at the required weights 1.58 SG and 1.90 SG although the tail rose to 1.92 SG in places. No problems were encountered during the mixing and pumping. A pre-flush of 10 bbls seawater was pumped ahead of the cement and the cement unit was also used to displace the SSR wiper dart. The plug was launched with 1650 psi (calculated displacement 666 bbls). A pressure of 300 psi was held on the plug whilst W.O.C. to prevent collapse of the light weight 20" casing used.

Volumes:	Lead	1366 SX class 'G'
		325 bbls seawater with 2.5% gel
	Tail	1030 SX 'G' neat
		1125 bbls seawater
		1.90 SG slurry

Times: Lead - 50 minutes, slurry rate 9 bbls/minute
Tail - 28 minutes, slurry rate 7½ bbls/minute

4.6.3 13-3/8" Casing and Cementing

13-3/8" Casing Job:

The 13-3/8" casing string was run and landed with no problems. One joint was laid out as its pin was damaged being brought through the 'V' door. The time taken to run the casing from first joint to casing landed was 12 hours 20 minutes. The casing was run at 12.5 joints/hour taking 10 hours between the first joint and picking up the hanger. Weatherford differential float shoe and collar equipment gave an average 95% fill until they were tripped prior to making up the casing hanger.

13-3/8" Cement Job:

The 13-3/8" casing was cemented in a single stage using a Halliburton SSR top plug system. Open hole volumes pumped were caliper plus 20%.

The lead and tail cement slurries were mixed and pumped at the required weights of 1.58 SG and 1.90 SG. No problems were encountered during the pumping. A 10 bbl pre-flush of seawater was pumped ahead of the cement. The SSR wiper dart was displaced using the cement unit and the SSR plug released with 3250 psi. The plug was bumped with 1500 psi after being displaced with 716 bbls of 1.12 SG mud. No backflow was observed after release of pressure.

A total of 340 bbls were lost during the cement job. This puts 260 bbls of cement outside the casing leaving the calculated T.O.C. at 1050m brt. Approximately 180-200 bbls of cement had been pumped outside the casing before returns were lost equating to a T.O.C. depth of 1180m brt. Returns were recovered intermittently until the end of the cement job. Annular volumes used were based on the caliper log.

Volumes:	Lead	1890 SX class 'G'
		450 bbls seawater with 2.5% gel
		Plus 0.5% CFR-2, 0.1% HR-4
		1.58 SG slurry
	Tail	462 SX 'G' neat
		55 bbls seawater
		Plus 0.5% CFR-2, 0.1% HR-4
		1.90 SG slurry

Times: Lead - 79 minutes, slurry rate 8 bbls/minute
Tail - 16 minutes, slurry rate 6 bbls/minute

4.6.4 9-5/8" Casing and Cementing

9-5/8" Casing Job:

The 9-5/8" casing was run to the hanger joint (244 joints) with no problems. one joint was laid out (damaged pin) and a total of 160 joints N-80 casing and 64 joints C-95 casing were run.

The job was shut down for 15 minutes after 6 joints had been run because No. 3 anchor lost tension and had to be heaved in until tension was regained.

The differential fill float equipment (Weatherford) worked successfully with the casing running weight indicating approximately 95% fill.

Prior to making up the hanger joint, the float equipment was tripped (900 psi) and it took 2000 psi to establish circulation. The casing was then run on HWDP of which the last 5 singles had to be washed down to land the hanger.

The total time taken to run and land the casing was 15 hours including 4-3/4 hours for running in on HWDP, changing out elevators and delays. The actual running time for 224 joints of casing was 10¼ hours giving an average running speed of 22 joints/hour.

The Weatherford casing crew performed satisfactorily although a number of joints were cross-threaded during the early part of the job, possibly attributable to the 'stabbers' performance.

9-5/8" Cement Job:

The 9-5/8" casing was cemented in a single stage using a Halliburton SSR top plug system. The excess on the open hole volume was cut back to 10% (from 20%) on caliper volume to avoid the possibility of fracturing the formation at the 13-3/8" shoe (L.O. = 1.31 SG EMW) should the excess cement be displaced into the 9-5/8" / 13-3/8" casings annulus.

Both lead and tail cement slurries were mixed and pumped at the required weights of 1.58 SG and 1.90 SG respectively. No problems were encountered. Ten bbls 'scavenger' slurry at 1.30 SG were pumped as a preflush.

The SSR drillpipe wiper dart was displaced with the cement unit and the SSR plug launched with 3200 psi. The cement was displaced with 625.9 bbls of 1.20 SG mud (calculated displacement = 628.8 bbls) and the plug was bumped with 2000 psi. The float equipment held after the pressure was released giving no backflow. Average displacement rate was 8.7 bbl/minute.

Volumes:	Lead	1100 SX class 'G' 262 bbls freshwater with 2.5% gel Plus 0.5% CFR-2, 0.2% HR-4 1.58 SG slurry
	Tail	336 SX 'G' neat 40 bbls freshwater Plus 0.5% CFR-2, 0.2% HR-4 1.90 SG slurry
Times:	Lead - 58 minutes, slurry rate 6½ bbls/min. Tail - 11 minutes, slurry rate 6¼ bbls/min.	

4.7 Casing and Cementing Record

Well - Normanby-1

CASING

Casing Size	30"		20"		13-3/8"	9-5/8"	
Weight (lb/ft)	350	460	94	91.5	68	47	
Grade	X-52	X-52	J55	X-56	N80	N80	C95
Connection Type	CIW'CC'	CIW'CC'	BUTT	VETCO 'LS'	BUTT	VAM	VAM
Number of Joints	3	3	17	32	126	160	64
Shoe Depth (m B.R.T.)	148		666		1555	2718	
Hanger Depth (m B.R.T.)	30" WHD 73.78		18-3/4" WHD 73.42		74.74	74.37	

CEMENTING

Casing Size	30"	20"	13-3/8"	9-5/8"
Top of Cement (Annulii) (m B.R.T.)	Seabed	181	1180	1368
1st Stage Vol (ft^3)	1414	2487	3440	2003
S.G.	1.58	1.58	1.58	1.58
Additives (b.w.o.c.) (Gel b.w.o.w.)	2.5% Gel 2% $CaCl_2$	2.5% Gel	2.5% Gel 0.5% CFR-2 0.1% HR-4	2.5% Gel 0.5% CFR-2 0.2% HR-4
Tail In Vol (ft^3)	386	1185	531	386
S.G.	1.90	1.90	1.90	1.90
Additives (b.w.o.c.)	2% $CaCl_2$	-	0.5% CFR-2 0.1% HR-4	0.5% CFR-2 0.2% HR-4
2nd Stage Vol (ft^3)	N/A	N/A	N/A	N/A

NOTES

1. All cement tops are estimated except for 30" cementation. T.O.C. for 20" cementation estimated at lost circulation zone. T.O.C. for 13-3/8" cementation estimated from losses observed whilst the cement was displaced.

2. All cement was Class 'G' manufactured by Adelaide Brighton.

ABANDONMENT/SUSPENSION PLUGS

	Depth (m BRT)	Slurry Volumes (ft^3)	Additives (b.w.o.c.)	S.G.
Plug No. 1	3200-3300	145	0.5% CFR-2 0.7% HR-4	1.90
Plug No. 2	3050-3200	290	0.5% CFR-2 0.7% HR-4	1.90
Plug No. 3	2668-2768	232	0.5% CFR-2 0.2% HR-4	1.90
Plug No. 4	110-210	135	-	1.90

4.8 Wireline Logging

Logs Run

DATE	HOLE SIZE INS	INTERVAL m BRT	LOGS RUN	COMMENTS
20/03/86	17½"	1558-665 GR to 75	DIL/SLS/GR/SP/CAL	Run OK.
04/04/86	12¼"	2724-1553	DIL/BHC/GR/SP/CAL/MSFL	Run OK. Induction readings affected by large borehole signal due to KCl mud.
		2683-1614	CST/GR	30 shot 25 recovered 23 accepted
16/04/86	8½"	3304-2718 NGT to 2631	LDT/CNL/DLL/MSFL/NGT/SP	*Poor quality log due to sticking. LDT failed at 3000m. MSFL pad damaged.
		3306-2718	BHC/GR	Run OK.
		3301-2718	DLL/MSFL/SP/GR	Run OK.
		3303-2718	FDC/CNL/GR	Run OK.
17/04/86	8½"	3278-3113	RFT/GR	One sample taken and 17 pressure readings attempted. Seal failures due to washed out hole.
		3300-2718	SHDT	Run OK. Some sticking.
		3300-600	CVL	Noise in open hole interval.
18/04/86	8½"	3293-2737	CST/GR	60 shot 51 recovered 42 accepted.

NOTES: (1) * The sticking of the LDT/CNL/DLL/MSFL/NGT/SP tool on run 1 of the 8½" hole logs was caused by the long length of the tool and the large number of pads in contact with the borehole wall.

(2) The well started flowing towards the end of run 7 of the 8½" hole logs (CVL). A round trip was thus made to increase the mud weight in the hole from 1.43 SG to 1.46 SG.

RFT RESULTS

TEST NO.	DEPTH (m)	HYDROSTATIC PRESSURE BEFORE (psig)	HYDROSTATIC PRESSURE AFTER (psig)	FORMATION PRESSURE (psig)	REMARKS
1.	3112.5	6308	6308	-	Tight
2.	3113.5	6310	6310	-	Seal failure
3.	3115.5	6314	6314	-	Seal failure
4.	3116.5	6316	-	-	Seal failure
5.	3117.5	6317	6317	-	Tight
6.	3121.0	6322	6322	-	Seal failure
7.	3123.0	6326	6326	-	Tight
8.	3124.5	6328	6328	-	Seal failure
9.	3177.0	6426	6425	-	Tight
10.	3178.0	6426	6424	6409	Low flowrate 15 mins. flow
11.	3178.5	6423	6424	-	Tight
12.	3179.0	6424	6424	-	Tight
13.	3212.0	6489	6490	-	Tight
14.	3219.0	6502	6503	-	Tight
15.	3265.0	6594	6594	-	Tight
16.	3268.0	6599	6604	-	Tight
17.	3277.5	6622	6618	-	Tight

RFT Sample Analysis (No. 10)

There were two sample bladders filled. This comprised of approximately 1.3 litres of fluid and 1 cu. ft. of gas. After analysis the sample was summarised as filtrate contaminated formation fluid with a trace of gas after analysis.

Liquid Analysis

	SAMPLE	FILTRATE (for comparison)
Wt	1.05 SG	1.07 SG
ph	7.0	10.5
P/Mf	0/1.6	0.5/1.8
Cl^-	45,000 mg/l	69,000 mg/l
Ca++	200 mg	100 mg/l
NO_3	Tr	50 ppm

SECTION 5

Well Cost Analysis

5.1 Cost Variance Report

5.1.1 Cost Variance

Normanby-1 was AFE'd without drill stem testing for A$12.695 million and was drilled without being tested for an estimated A$11.426 million.

The cost variance table (section 5.1.2) shows the differences between AFE'd figures and the estimated actual costs, broken down by function code. It must be noted that the actual costs shown are estimates only and are subject to change after all invoices have been settled.

The reasons for any major differences between AFE'd figures and actual costs are given in the remarks column of the cost variance table. The main areas responsible for cost variance are summarised as follows:

1. A 3% contingency was added to the AFE which increased the value by A$0.370 million. In the event, this contingency fund was not required even though 5 days were spent W.O.W. at the end of the Well.

2. Savings were made on rig rate and various other time dependent items due to the Well taking 64 'costed days' as opposed to the 67 days AFE'd.

3. Savings amounting to a total of A$0.255 million were effected by purchasing surplus equipment from the previous Well (Duntroon-1) and by re-using certain equipment recovered from that Well.

4. A saving of A$0.278 million was effected on Supply Boats mainly due to the full demobilization charges for the 'Ravensturm' not being incurred.

5. A$0.128 million was saved on wireline logging and velocity survey as less logging runs were made than AFE'd for.

6. Overspends occurred on BP owned tools due to the necessity of purchasing back-up anchors, pennants and shackles from Duntroon-1 Well. Also, supply base and local office costs were continued until the end of May 1986. This extra period after the end of the Well was not included in the AFE.

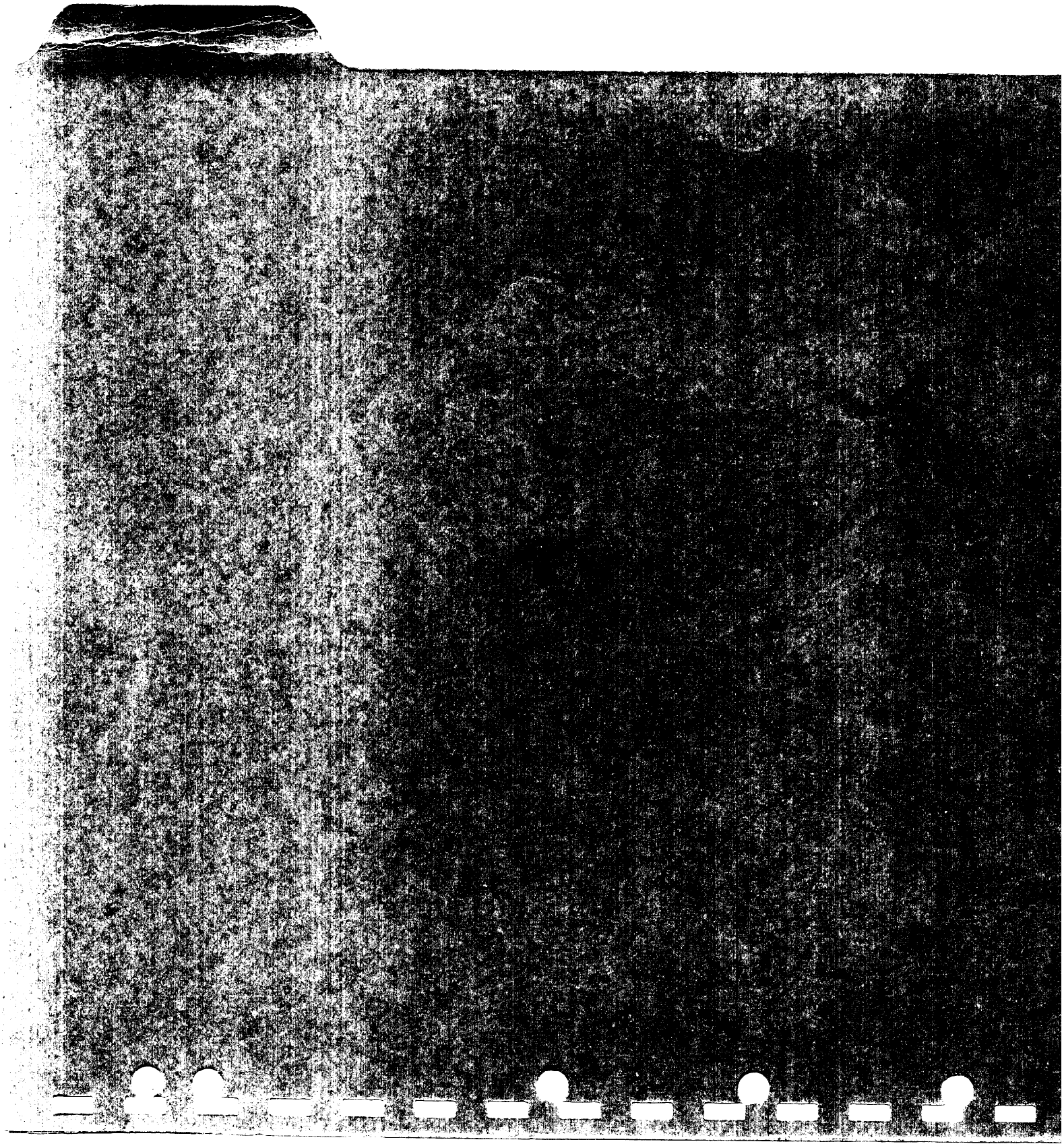
5.1.2 Cost Variance Table

VIC/P14 JOINT VENTURE NORMANBY-1 A.F.E / FINAL ESTIMATE COMPARISON		A$ TOTAL A.F.E. $ x 1000	A$ TOTAL ESTIMATE $ x 1000	A$ TOTAL DIFF $ x 1000	% DIFF	REMARKS
Function Code	Description Days	67	64	-3		
100	Rig Rate	4498.9	4375.0	-123.9	-3	3 days rig rate less
101	Rig Site Survey	222.5	213.2	-9.3	-4	
106	Rig Positioning	44.8	29.7	-15.1	-34	2 days reqd., 4 AFE 'd
110	Guide Bases	97.1	51.5	-45.6	-47	} Savings effected by purchase of
111	30" Wellhead Equipment	70.1	33.6	-36.5	-52	} equipment from previous well
112	18 3/4" Wellhead Equipment	83.5	54.1	-29.4	-35	} (Duntroon-1) and re-use of casing
113	13 3/8" Wellhead Equipment	57.1	37.3	-19.8	-35	} hangers and seal assemblies
114	9 5/8" Wellhead Equipment	46.3	31.3	-15.0	-32	}
120	30" Conductor	135.9	128.9	-7.0	-5	Primary string bought from Duntroon-1
121	20" Casing	269.8	212.3	-57.5	-21	B/up string bought from Duntroon-1
122	13 3/8" Casing	207.8	191.6	-16.2	-8	
123	9 5/8" Casing	289.8	267.6	-22.2	-8	Part string purchased from BP(OE)NZ
124	7" Liner	80.5	0.0	-80.5	-100	7" liner not required
126	20" Casing Accessories	16.0	14.3	-1.7	-11	
127	13 3/8" Casing Accessories	14.1	12.4	-1.7	-12	
128	9 5/8" Casing Accessories	39.2	28.9	-10.3	-26	No stage collar used
129	7" Liner Accessories	4.4	3.0	-1.4	-32	
130	Rock Bits	183.5	168.0	-15.5	-8	Less bits reqd. than AFE'd
132	Core Heads	40.5	0.0	-40.5	-100	No coring carried out
134	Drilling Consumables	8.1	19.5	11.4	141	Slings etc. not included in AFE
135	Mud Chemicals	298.5	179.8	-118.7	-40	Contingency chemicals not required
136	Cement and Additives	90.9	80.9	-10.0	-11	Contingency additives not required
137	Fuel Oil	878.0	867.5	-10.5	-1	
	Contract Payments					
140	Mud Engineering	13.0	11.6	-1.4	-11	
141	Casing Running	32.2	23.1	-9.1	-28	
142	Cement Services	58.0	41.2	-16.8	-29	No bulk plant or test chgs incurred
143	Mud & Drlg Data Logging	75.1	67.0	-8.1	-11	Unit demobbed early
145	Dir. Drill & Survey	0.0	0.0	0.0	0	
147	ROV & Diving	242.4	268.5	26.1	11	Required for 64 days, AFE'd for 54
148	Wireline Logging	1035.0	940.3	-94.7	-9	Less runs performed than AFE'd
149	Velocity Survey	33.4	0.0	-33.4	-100	Included in wireline logging cost
150	Drillstem / Prod. Test.	76.8	90.5	13.7	18	Demob chgs incurred but not AFE'd
151	Coring Services	3.2	3.1	-0.1	-3	
152	Core Analysis	26.1	0.0	-26.1	-100	No cores taken
153	Sampling & Fluid Anal.	65.2	0.0	-65.2	-100	No costs available yet
154	Inspection Services	29.0	0.0	-29.0	-100	Not required
155	Rig Telecommunications	49.2	50.5	1.3	3	
156	Sedimentology	30.0	27.7	-2.3	-8	} Melbourne Estimate
157	Biostratigraphy	20.0	18.4	-1.6	-8	}
159	Drill String Tool Rental	72.6	55.4	-17.2	-24	Eqpt. reqd for less time than AFE'd
160	3 1/2" VAM Tubing	114.0	85.5	-28.5	-25	Purchased from Duntroon-1
169	Abandon / Site Clearance	62.0	48.2	-13.8	-22	Contingency items returned for credit
174	Helicopters	320.4	345.5	25.1	8	Used for 64 days, AFE'd for 56
175	Supply Boats	1314.1	1036.3	-277.8	-21	Ravensturm demob charge not incurred
178	BP Owned Tools	61.7	203.7	142.0	230	Anchors, pennants etc not AFE'd
179	Insurance	144.6	118.2	-26.4	-18	
182	Waste Disposal	20.0	0.0	-20.0	-100	Not required
189	Meteorology		12.2	12.2	100	Ommitted from AFE
	TOTAL DIRECT	11575.3	10447.3	-1128.0	-10	
	INDIRECT					
170	Supply Base Operations	350.0	456.7	106.7	30	} Supply base and office kept running
172	Local Office Cost	400.0	522.0	122.0	31	} for 1 month after rig left. This } period not included in AFE.
	TOTAL INDIRECT	750.0	978.7	228.7	30	
	TOTAL : DIRECT AND INDIRECT	12325.3	11426.0	-899.3	-7	
	Contingency (3% AFE only)	369.8	0.0	-369.8	-100	} Contingency not required (although } 5 days spent W.O.W.)
	GRAND TOTAL	12695.1	11426.0	-1269.1	-10	

VIC/P14 JOINT VENTURE NORMANBY-1 A.F.E.			Site Prep Move On and Anchor	Drill To TD Inc TD Logs	Test Inc 7" Liner/ Complete	Abandon Suspend	A$ TOTAL A.F.E. $ x 1000
First Three Digits	Function Code Description	Days	12	43	0	10	65
		Phase	1	2	3	4	
100	Rig Rate		269.6	3114.1		1115.2	4498.9
101	Rig Site Survey		222.5				222.5
106	Rig Positioning		44.8				44.8
110	Guide Bases			97.1			97.1
111	30" Wellhead Equipment			70.1			70.1
112	18 3/4" Wellhead Equipment			83.5			83.5
113	13 3/8" Wellhead Equipment			57.1			57.1
114	9 5/8" Wellhead Equipment			46.3			46.3
120	30" Conductor			135.9			135.9
121	20" Casing			269.8			269.8
122	13 3/8" Casing			207.8			207.8
123	9 5/8" Casing			289.8			289.8
124	7" Liner		80.5				80.5
126	20" Casing Accessories			16.0			16.0
127	13 3/8" Casing Accessories			14.1			14.1
128	9 5/8" Casing Accessories			39.2			39.2
129	7" Liner Accessories		4.4				4.4
130	Rock Bits			183.5			183.5
132	Core Heads			40.5			40.5
134	Drilling Consumables			8.1			8.1
135	Mud Chemicals			298.5			298.5
136	Cement and Additives			90.9			90.9
137	Fuel Oil		52.4	576.6		249.0	878.0
	Contract Payments						
140	Mud Engineering		1.0	11.2		0.8	13.0
141	Casing Running			32.2			32.2
142	Cement Services			50.0		8.0	58.0
143	Mud & Drilling Data Logging		6.1	69.0			75.1
145	Directional Drill & Survey						0.0
147	ROV & Diving		18.0	202.0		22.4	242.4
148	Wireline Logging			1035.0			1035.0
149	Velocity Survey			33.4			33.4
150	Drillstem / Prod. Testing		76.8				76.8
151	Coring Services			3.2			3.2
152	Core Analysis			26.1			26.1
153	Sampling & Fluid Analysis			65.2			65.2
154	Inspection Services			29.0			29.0
155	Rig Telecommunications		3.7	41.7		3.8	49.2
156	Sedimentology			30.0			30.0
157	Biostratigraphy			20.0			20.0
159	Drill String Tool Rental			72.6			72.6
160	3 1/2" VAM Tubing		114.0				114.0
169	Abandon / Suspend / Site Clearance					62.0	62.0
174	Helicopters		23.8	267.7		28.9	320.4
175	Supply Boats		61.7	693.9		558.5	1314.1
178	BP Owned Tools		61.7				61.7
179	Insurance		8.4	94.3		41.9	144.6
182	Waste Disposal			20.0			20.0
189	Meteorology						0.0
	TOTAL DIRECT		1049.4	8435.4		2090.5	11575.3
	INDIRECT						
170	Supply Base Operations		20.9	235.1		94.0	350.0
172	Local Office Cost		23.9	268.6		107.5	400.0
	TOTAL INDIRECT		44.8	503.7		201.5	750.0
	TOTAL : DIRECT AND INDIRECT		1094.2	8939.1		2292.0	12325.3
	Contingency 3%		32.8	268.2		68.8	369.8
	GRAND TOTAL		1127.0	9207.3		2360.8	12695.1

5.3 Estimated Final Well Cost in AFE Format

VIC/P14 JOINT VENTURE NORMANBY-1 ESTIMATED FINAL WELL COST		Site Prep Move On and Anchor	Drill To TD Inc TD Logs	Test Inc 7" Liner/ Complete	Abandon Suspend Inc Demob to N.Z.	A$ TOTAL A.F.E. $ x 1000
First Three Digits	Function Code Description — Days	2	43	0	19	64
	Phase	1	2	3	4	
100	Rig Rate	113.2	3018.3		1243.5	4375.0
101	Rig Site Survey	213.2				213.2
106	Rig Positioning	29.7				29.7
110	Guide Bases		51.5			51.5
111	30" Wellhead Equipment		33.6			33.6
112	18 3/4" Wellhead Equipment		54.1			54.1
113	13 3/8" Wellhead Equipment		37.3			37.3
114	9 5/8" Wellhead Equipment		31.3			31.3
120	30" Conductor		128.9			128.9
121	20" Casing		212.3			212.3
122	13 3/8" Casing		191.6			191.6
123	9 5/8" Casing		267.6			267.6
124	7" Liner					0.0
126	20" Casing Accessories		14.3			14.3
127	13 3/8" Casing Accessories		12.4			12.4
128	9 5/8" Casing Accessories		28.9			28.9
129	7" Liner Accessories	3.0				3.0
130	Rock Bits		168.0			168.0
132	Core Heads					0.0
134	Drilling Consumables		18.9		0.6	19.5
135	Mud Chemicals		179.8			179.8
136	Cement and Additives		79.8		1.1	80.9
137	Fuel Oil	18.9	563.5		285.1	867.5
	Contract Payments					
140	Mud Engineering	0.4	10.7		0.5	11.6
141	Casing Running	0.4	21.6		1.1	23.1
142	Cement Services	0.6	31.0		9.6	41.2
143	Mud & Drilling Data Logging	2.1	62.0		2.9	67.0
145	Directional Drill & Survey					0.0
147	ROV & Diving	6.5	193.1		68.9	268.5
148	Wireline Logging	6.2	854.0		80.1	940.3
149	Velocity Survey					0.0
150	Drillstem / Prod. Testing	2.1	63.5		24.9	90.5
151	Coring Services	0.1	2.7		0.3	3.1
152	Core Analysis					0.0
153	Sampling & Fluid Analysis					0.0
154	Inspection Services	0.0	0.0		0.0	0.0
155	Rig Telecommunications	1.3	39.9		9.3	50.5
156	Sedimentology		24.8		2.9	27.7
157	Biostratigraphy		16.5		1.9	18.4
159	Drill String Tool Rental	0.8	52.0		2.6	55.4
160	3 1/2" VAM Tubing	85.5				85.5
169	Abandon / Suspend / Site Clearance	0.1	2.2		45.9	48.2
174	Helicopters	8.6	255.8		81.1	345.5
175	Supply Boats	22.2	663.6		350.5	1036.3
178	BP Owned Tools	203.7				203.7
179	Insurance	3.0	90.1		25.1	118.2
182	Waste Disposal	0.0	0.0		0.0	0.0
189	Meteorology	0.3	9.3		2.6	12.2
	TOTAL DIRECT	721.9	7484.9		2240.5	10447.3
	INDIRECT					
170	Supply Base Operations	7.5	224.6		224.6	456.7
172	Local Office Cost	8.6	256.7		256.7	522.0
	TOTAL INDIRECT	16.1	481.3		481.3	978.7
	TOTAL : DIRECT AND INDIRECT	738.0	7966.2		2721.8	11426.0
	Contingency 3%	0.0	0.0		0.0	0.0
	GRAND TOTAL	738.0	7966.2		2721.8	11426.0



SECTION 6

Materials, Logistics and Weather Data

6.1 Materials and Logistics Summary

6.1.1 Summary

Portland was used as the supply base for Normanby-1. There were problems associated with operations in Portland. These were mainly caused by shortage of supply of plant and equipment (due to the Alcoa Smelter construction), and labour disputes. Unions in Australia have a powerful influence and many of the problems encountered were caused by their intransigence.

Major items of equipment such as casing and wellhead equipment took 2-3 months to deliver (seafreight ex Singapore).

6.1.2 Supply Base: Portland

Located midway between Melbourne and Adelaide on the south east coast of Victoria, Portland port was well suited for use as an offshore supply base. The port has ample draught (10.5m), plenty of water (100 mt/hr) and a fuel supply by pipeline (30 mt/hr) but on a separate wharf to that used for cargo. The Victoria Customs has an office in Portland.

Melbourne, the capital of Victoria, was one hour away by air and 6 hours by truck. Most oilfield backup was received from Adelaide/Perth. Links with Adelaide by overnight truck were good.

6.1.3 General Logistics

The primary method of supply was by road. Australia has a good and well co-ordinated system of road transport links. It is recommended however, that a well established and nationwide company such as Comet or T.N.T. be used. These may be slightly more expensive than smaller companies, but are well worth it in terms of reliability. Roadfreight times to Portland were 4 days and 1 day to Perth and Adelaide respectively.

The Australian local and public holidays were days to note. Services and support invariably shut down on the afternoon preceding a holiday and nothing moved until the next normal working weekday.

Plant and equipment were at a premium in Portland due to the huge demand created by the Alcoa Smelter construction project. Also a volatile labour force made it difficult to maintain work experience and continuity. These points may be overcome in the future by giving consideration to full time hire of crane and labour.

6.1.4 Materials Supply

The main centres for the supply of offshore oil well materials and services within Australia are Perth (W.A.), Adelaide (S.A.), and Sale (Vic.). In general, offshore support was less developed and tended to be the poor second cousin to onshore activities.

Major items of equipment such as casing or wellhead equipment were usually sourced in Singapore (2 - 3 months delivery). However, great care should be taken re Customs duty on imports. Duty was levied (at 10 - 15%) on Squnch connectors (ref 30" casing) and wellhead equipment. This was due to equipment of this nature being manufactured in Australia. (Huntings 0 Lynx connectors, and Cameron wellhead equipment). In future it may be better to order and purchase equipment on a delivered to BP yard basis and ensure duty and freight is paid by supplier and included in quote.

Supply of bulk chemicals to the supply vessels was achieved by use of bulk cement trucks. No bulk system was mobilized to Portland. The supply by bulk truck worked well. Overnight delivery, 25mt loads per truck, with approximately 1 hour to discharge each vehicle. All the cement required was delivered by bulk truck. The balance of bulk chemicals including all bentonite was supplied in bulk bags. This system was possible because the rig was loaded with excess bulk supplies on its previous well Duntroon-1.

6.1.5 Supply Vessels

The vessels working with the rig on its previous well were used on Normanby-1. Minimum technical criteria of 8000 BHP and 100mt bollard pull were set to govern the choice of Anchor Handling Tug and Supply vessels. This standard was reduced slightly to allow the choice of an Australian flag vessel "Forsayth Creek" which was available and deemed politically advisable. The second vessel chosen was the "Ravensturm".

Voyage time to location was 4 hours (economical speed) and during the well 14 sailings were made.

Initially both vessels worked well, but towards the end of the well, (and the end of the vessels contract), several problems were encountered and delays incurred. The following problems were also encountered.

1. Standby Duty

   Both vessels were equipped and qualified as standby vessels. However, the seamen on board refused to carry out standby duties unless a mooring system was provided. This was done using a piggyback anchor (15 mt) and a hired buoy.

2. Anchor Handling

Seamen on board would only work continuously for limited periods. Our experience was the crew would work an initial 18 hour period then demand 12 hours off, thereafter they worked 12 on, 12 off. These timings depended very much on the individual crews concerned.

3. Watchmen

The Miscellaneous Workers' Union who represent vessel watchmen, made claims that while the vessels were in port, they were obliged to take on a watchman to monitor the gangway. These claims were resisted and no industrial trouble resulted. However, future operations would benefit by a 'no watchman' clause in the Charter Party.

4. Waterside Workers

A normal gang of workers consisted of 9 men, one man in lieu of the crane driver, plus a foreman and a supervisor, ie. total of 12 persons. Cargo and water could be loaded simultaneously on the same wharf, with the same gang. Cargo and bulk chemicals could not be loaded simultaneously, and fuel supply by pipeline required movement to another berth.

Patricks Agencies, the Stevedore Agency, performed poorly. Supervisors and occasionally foremen were employed from Melbourne, with resultant additional costs, due to union pressure. Patricks did not represent our interests and gave in repeatedly to union pressure. Two cases reflected this.

Firstly, Patricks originally tendered on the basis of a basic gang of 5 men. This subsequently was increased (without BP prior agreement), to 9 men, due to union pressure.

Secondly, the W.W.F. Union demanded that BP employ a forklift on the wharf to load and unload the trucks. This effectively meant double handling the cargo. This claim was accepted by Patricks without argument, even though similar operations in Port Lincoln where Patricks were also our agents, had been carried out without a forklift. Only occasionally was the forklift used to handle cargo.

Overall, the waterside workers proved difficult to work with, and our representatives Patricks Agencies did not carry out their duties satisfactorily.

6.1.6 Helicopters

The Contract for Helicopter Services was awarded to Mayne Bristows Helicopters, who also provided this service on the previous well, Duntroon-1, with two Bell 212 aircraft operating from Portland Airport. Flight time to location was 15 minutes with a payload of 13 passengers. Approximately 60 flights were made to the rig during the well.

No problems were encountered with the helicopters.

Security checks on crew change personnel were not possible as the Unions would not permit body or baggage searches. During the well, one of the roustabouts on board the rig had in his possession a handgun which had been modified by plugging the barrel. This alarming incident was reported to the Australian Mines and Metals Association (AMMA).

Due to the difficulty in obtaining short term rented accommodation in Portland (because of the Alcoa Smelter construction), the helicopters and their crews were forced to base their operations from Nelson. From there flight time to the rig was only 5 minutes, which facilitated emergency call outs. All crew changes were however accomplished from Portland Airport.

DATE & TIME	WIND		SWELL			WAVE		TEMP.	PRESSURE	VISIBILITY	WEATHER STATE	HEAVE	PITCH	ROLL	RISER POSITION
	SPEED (knots)	DIRECTION (deg)	HEIGHT (m)	PERIOD (secs)	DIRECTION (deg)	HEIGHT (m)	PERIOD (secs)	(°c)	(mbar)	(km)		(m)	(deg)	(deg)	(deg)
05/03/86															
0600	22	110	1.5	7	230	0.3	3	17.0	1015.1	20	O'CAST	1.5	1.0	3.0	-
1200	10	170	2.0	7	220	0.1	2	21.0	1014.6	20+	CLEAR	1.5	1.0	3.0	-
1800	8	160	1.5	7	220	0.3	3	21.0	1013.0	20	SC'TRD CLOUD	1.0	1.0	1.5	-
2400	10	120	1.2	7	220	0.3	3	18.0	1013.0	20	SC'TRD CLOUD	1.0	1.0	1.5	-
06/03/86															
0600	10	060	1.0	7	230	RIPPLED	-	20.0	1010.8	15+	F & C	0.5	0.5	2.3	-
1200	10	070	1.0	7	230	0.1	2	26.0	1009.7	20+	F & C	0.5	0.5	2.0	-
1800	CALM	-	1.0	7	230	-	-	27.0	1005.0	20	CLOUDY	0.2	0.2	0.5	-
2400	CALM	-	1.0	7	230	-	-	22.0	1005.2	15+	CLOUDY	0.2	0.4	0.5	-
07/03/86															
0600	13	230	1.0	7	230	0.1	2	18.6	1007.5	15+	CLOUDY	0.2	0.2	0.5	-
1200	18	230	1.5	7	230	0.7	3	15.2	1012.2	15+	CLOUDY	0.2	0.2	0.5	-
1800	25	230	1.7	7	230	1.0	3	14.9	1014.3	15+	CLOUDY	0.2	0.3	0.5	-
2400	19	245	2.0	6	230	0.1	3	13.5	1017.9	15+	CLOUDY	0.8	0.6	1.0	-
08/03/86															
0600	12	195	3.0	9	240	0.5	3	15.0	1019.1	20	CLEAR	1.3	1.0	3.0	-
1200	9	215	3.5	8	240	0.3	3	16.8	1020.1	20	F & C	1.0	1.0	2.0	-
1800	12	230	2.5	8	235	0.3	3	14.7	1016.5	15	RAIN	0.7	0.7	0.7	-
2400	17	271	2.0	8	235	0.5	3	14.2	1013.9	15	O'CAST	0.6	0.5	1.5	-
09/03/86															
0600	17	248	3.0	9	235	0.7	3	15.8	1013.5	15	O'CAST	1.0	0.5	1.0	-
1200	28	250	3.0	9	235	1.2	3	15.2	1015.2	10	O'CAST	1.0	0.5	1.0	-
1800	25	200	3.7	9	235	1.5	4	16.0	1017.9	10	O'CAST	1.0	0.5	1.0	-
2400	25	190	3.5	9	235	1.5	4	15.2	1019.1	10	O'CAST	1.0	0.5	1.0	-
10/03/86															
0600	12	210	3.0	10	230	0.4	4	12.7	1020.2	5+	RAIN	2.0	1.0	2.0	-
1200	17	180	2.5	10	230	0.4	4	13.9	1020.6	15	O'CAST	1.5	1.0	2.0	-
1800	15	190	3.0	10	230	0.7	4	13.0	1020.2	15	O'CAST	1.5	0.5	0.7	-
2400	12	160	3.0	10	230	0.7	4	12.8	1022.1	15	O'CAST	1.5	0.5	0.7	-
11/03/86															
0600	12	150	3.0	9	210	0.5	3	12.9	1019.3	15	O'CAST	1.0	0.5	1.0	-
1200	6	150	3.0	8	200	0.5	3	17.2	1020.2	15	O'CAST	1.0	0.5	0.1	-
1800	15	160	2.5	8	190	0.5	3	19.0	1018.4	20	CLEAR	0.7	0.3	0.7	-
2400	11	110	2.0	9	190	0.3	3	14.1	1018.0	20	CLEAR	0.6	0.3	0.5	-
12/03/86															
0600	6	046	1.0	7	140	0.2	2	13.0	1015.9	20+	F & C	0.1	0.1	0.2	-
1200	11	015	2.0	9	160	0.2	2	19.0	1016.6	20+	F & C	0.1	0.2	0.3	-
1800	CALM	-	1.8	9	180	SMOOTH	-	18.0	1014.0	15	O'CAST	0.1	0.1	0.1	-
2400	CALM	-	1.5	6	180	SMOOTH	-	17.7	1015.0	20	FINE	0.1	0.1	0.1	-
13/03/86															
0600	9	030	1.5	10	180	0.2	03	16.5	1014.5	20+	F & C	0.3	0.3	0.5	-
1200	11	010	1.0	10	180	0.2	03	23.0	1013.9	25	F & C	0.2	0.2	0.5	-
1800	CALM	-	1.0	9	240	SMOOTH	-	23.6	1011.5	20+	F & C	0.1	-	-	-
2400	CALM	-	1.0	9	180	SMOOTH	-	19.3	1009.2	20+	F & C	0.1	0.2	0.5	-
14/03/86															
0600	CALM	-	1.0	9	180	-	-	19.2	1009.8	10+	O'CAST/RAIN	0.2	0.5	0.5	-
1200	13	250	1.2	8	240	0.3	4	15.6	1011.7	15	CLEAR	0.2	0.2	0.2	-
1800	5	240	1.8	8	235	0.2	4	15.6	1011.5	10	CLDY/SHOWERS	0.3	0.2	0.2	-
2400	10	289	1.8	8	235	0.2	3	14.3	1012.7	15+	O'CAST	1.5	0.5	0.1	1.5
15/03/86															
0600	18	285	2.0	8	250	0.7	3	14.7	1012.3	15+	O'CAST	2.0	1.0	2.0	1.5
1200	20	290	3.0	8	240	0.7	4	15.3	1013.5	15+	O'CAST	2.0	1.0	1.0	1.5
1800	15	205	3.0	8	230	0.8	4	15.0	1016.2	12+	SCT CLOUD	2.0	1.0	1.0	1.5
2400	13	240	2.5	8	230	0.6	3	14.1	1017.9	15	O'CAST	2.0	1.0	1.0	2.0

DATE & TIME	WIND		SWELL			WAVE		TEMP.	PRESSURE	VISIBILITY	WEATHER STATE	HEAVE	PITCH	ROLL	RISER POSITION
	SPEED (knots)	DIRECTION (deg)	HEIGHT (m)	PERIOD (secs)	DIRECTION (deg)	HEIGHT (m)	PERIOD (secs)	(°c)	(mbar)	(km)		(m)	(deg)	(deg)	(deg)
08/04/85															
0600	15	302	1.7	8	230	0.5	3.0	14.5	1018.6	15	FINE	0.7	0.5	0.5	1.25 STBD ½
1200	15	270	1.7	8	240	0.6	3.0	14.5	1019.7	10+	SHOWER	0.7	0.5	0.5	1.25 STBD ½
1800	12	260	1.7	8	250	0.3	3.0	15.5	1020.3	10+	CLOUDY	0.7	0.5	0.5	1.25 STBD ½
2400	12	155	1.7	8	250	0.3	3.0	15.0	1022.2	10+	CLOUDY	0.7	0.5	0.5	1.5 STBD ½
09/04/86															
0600	10	105	1.5	8	230	0.1	3.0	13.0	1022.4	15	FINE	0.3	0.5	0.5	1.5 STBD ½
1200	6	100	2.2	7	200	0.1	3.0	14.5	1020.1	15	FINE	1.2	0.75	0.5	1.5 STBD ½
1800	12	100	2.0	7	200	0.2	3.0	15.5	1018.0	15	FINE	1.2	0.5	0.5	1.5 STBD ½
2400	15	060	1.5	7	200	0.2	3.0	15.0	1015.5	15+	FINE	1.2	0.5	0.5	1.5 STBD ½
10/04/86															
0600	20	014	1.5	8	200	0.3	3.0	14.0	1012.3	15	FINE	1.2	0.5	0.5	1.5 STBD ½
1200	20	350	1.5	8	200	0.3	3.0	22.0	1011.4	15+	FINE	1.2	0.5	0.5	1.5 STBD ½
1800	20	225	1.0	7	230	0.3	3.0	17.0	1015.6	15+	CLOUDY	1.2	0.5	0.5	1.5 AFT
2400	15	210	1.2	7	230	0.3	3.0	14.5	1017.7	15+	CLOUDY	1.6	0.75	0.5	1.5 AFT
11/04/86															
0600	14	200	2.0	9	220	0.6	3.0	14.0	1020.2	15+	FINE	1.2	0.75	0.5	1.5/2.5 AFT
1200	12	220	1.8	9	220	0.4	3.0	14.0	1021.9	15+	FINE	1.0	0.5	0.5	1.5 STBD AFT
1800	10	210	2.0	8	210	0.3	3.0	14.5	1022.0	10+	CLOUDY	1.2	0.5	0.5	1.5/2 STBD AFT
2400	8	190	2.0	8	210	0.3	3.0	15.0	1022.4	10+	CLOUDY	1.2	0.5	0.5	1.5/2 STBD AFT
12/04/86															
0600	10	197	1.5	8	210	0.3	3.0	13.0	1022.7	15+	FINE	1.0	0.5	0.5	1.5 STBD ½
1200	6	195	1.3	8	210	0.2	3.0	14.0	1023.5	15+	FINE	0.9	0.5	0.5	1.5 STBD ½
1800	10	190	2.5	8	210	0.3	3.0	15.0	1022.9	15+	FINE	1.0	0.5	0.5	1.5 STBD ½
2400	10	130	2.5	8	210	0.3	3.0	14.5	1022.9	15+	FINE	1.0	0.5	0.5	1.5 STBD ½
13/04/86															
0600	11	110	1.2	8	210	0.2	3.0	13.5	1022.1	15	FINE	0.7	0.5	0.5	1.5 STBD AFT
1200	6	110	2.0	8	210	0.2	3.0	16.0	1021.2	15+	FINE	0.7	0.5	0.5	1.5 STBD AFT
1800	12	110	2.0	8	210	0.2	3.0	17.0	1020.3	15+	FINE	0.7	0.5	0.5	1.5 STBD AFT
2400	16	025	2.0	8	210	0.2	3.0	15.5	1017.3	15+	FINE	0.7	0.5	0.5	1.5 AFT
14/04/86															
0600	5	028	1.0	9	210	0.1	-	16.0	1015.8	15+	FINE	0.4	0.5	0.5	1.5 AFT
1200	5	000	1.2	9	210	0.2	-	21.0	1014.6	15+	FINE	0.4	0.5	0.5	1.5 AFT
1800	CALM	000	1.2	8	210	-	-	24.0	1011.2	15+	O'CAST	0.5	0.75	0.5	1.5 AFT
2400	CALM	000	CONFUSED			-	-	21.0	1010.1	15+	F & C	0.5	0.75	0.75	1.5 AFT
15/04/86															
0600	12	340	CONFUSED			0.2	3.0	18.5	1009.2	15+	FINE	0.3	0.75	0.75	1.5 AFT
1200	15	LT AIRS	0.7	10	220	-	3.0	17.5	1010.8	10	O'CAST	0.3	0.75	0.75	1.5 AFT
1800	20	310	1.0	8	240	0.5	4.0	16.0	1010.9	10	O'CAST/DRZL	0.3	0.75	0.75	1.5 AFT
2400	15	070	1.0	8	240	0.2	3.0	14.0	1007.7	5+	RAIN	0.3	0.75	0.75	1.5 AFT
16/04/86															
0600	12	-	1.8	8	260	0.3	3.0	11.5	1008.0	15	SHOWERS	0.5	0.75	0.5	1.5 AFT
1200	10	-	1.2	8	260	0.3	3.0	14.0	1008.0	15	FINE	0.5	0.75	0.5	1.5 AFT
1800	8	140	2.5	7	220	0.3	3.0	14.0	1008.9	10+	CLOUDY	0.5	0.75	0.5	1.75 AFT
2400	15	180	2.5	7	220	0.3	3.0	15.0	1012.1	10+	CLOUDY	0.7	0.5	0.5	1.75 AFT
17/04/86															
0600	20	180	2.0	7	210	1.2	4.0	15.5	1015.0	10	SHOWERS	1.0	0.75	0.75	1.5/2.5 STBD AFT
1200	10/15	193	1.8	7	220	0.8	4.0	15.5	1018.3	15	FINE	0.8	0.75	0.75	2. STBD ½
1800	20	195	2.3	6	210	1.2	3.0	14.5	1020.8	5+	RAIN	1.0	0.75	0.75	
2400	20/25	195	2.5	6	210	1.2	3.0	14.5	1022.2	10+	O'CAST	1.0	0.75	0.75	
18/04/86															
0600	15	190	2.0	8	210	1.5	3.0	14.0	1023.8	10	CLOUDY	0.8	0.75	0.75	2 AFT
1200	15	200	2.0	8	200	1.0	3.0	14.0	1025.3	10+	CLOUDY	0.8	0.75	0.75	2 AFT
1800	12	200	2.0	8	200	1.0	3.0	14.0	1024.9	10	CLOUDY	0.7	0.5	0.5	2 AFT
2400	9	200	1.6	8	200	0.5	3.0	14.0	1025.4	10	CLOUDY	0.6	0.5	0.5	2 AFT

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DATE & TIME	WIND		SWELL			WAVE		TEMP.	PRESSURE	VISIBILITY	WEATHER STATE	HEAVE	PITCH	ROLL	RISER POSITION
	SPEED (knots)	DIRECTION (deg)	HEIGHT (m)	PERIOD (secs)	DIRECTION (deg)	HEIGHT (m)	PERIOD (secs)	(°c)	(mbar)	(km)		(m)	(deg)	(deg)	(deg)
19/04/85															
0600	7	270	1.8	7	200	0.4	3.0	14	1021.6	15+	FINE	1.0	0.5	0.5	1.5 AFT
1200	8	317	1.6	7	200	0.2	3.0	15.5	1020.0	10	O'CAST/FINE	0.7	0.5	0.5	1.5 AFT
1800	15	317	1.7	7	200	0.3	3.0	15	1016.1	10	O'CAST	0.7	0.5	0.5	2.0 AFT
2400	18	340	1.7	7	220	0.3	3.0	14	1011.8	10	FINE	0.7	0.5	0.5	2.0 AFT
20/04/86															
0600	18/20	281	2.2	9	240	1.0	3.0	15	1010.6	15	FINE	0.7	0.5	0.5	N/A
1200	14	246	2.0	9	240	1.0	4.0	13	1013.3	10	O'CAST/FINE	0.6	0.5	0.5	N/A
1800	16	290	2.0	8	240	0.7	3.0	14.5	1012.5	10+	CLOUDY	0.6	0.5	0.5	N/A
2400	12	300	2.0	8	240	0.5	3.0	14.5	1012.5	10+	CLOUDY	0.6	0.5	0.5	N/A
21/04/86															
0600	9	344	2.0	8	240	0.2	3.0	14	1012.4	15+	FINE	0.7	0.5	0.5	N/A
1200	10	299	2.2	9	260	0.2	3.0	15	1012.8	5/10	SHOWERS	0.2	0.5	0.5	N/A
1800	12	350	2.5	9	260	0.2	3.0	14.5	1012.8	10+	O'CAST	-	0.5	0.5	N/A
2400	13	350	2.5	9	260	0.2	3.0	15	1012.2	10	O'CAST	-	0.5	0.5	N/A
22/04/86															
0600	12	350	2.5	10	220	0.3	3.0	14	1011.2	10	FINE	1.2	1.0	1.0	N/A
1200	15	355	2.5	10	220	0.3	3.0	14.5	1009.5	10	SHOWERS	1.2	1.0	1.0	N/A
1800	10	280	3.0	10	220	0.3	3.0	13	1006.7	10	SHOWERS	1.5	1.0	1.0	N/A
2400	18	280	3.0	8	230	0.5	3.0	14	1008.6	10+	F & C	1.5	1.0	1.0	N/A
23/04/86															
0600	15/20	355	2.0	9	220	0.3	3.0	12.5	1009.3	15+	FINE	1.0	1.0	1.0	N/A
1200	20/25	330	3.0	8	230	0.5	3.0	15.5	1008.0	15+	F & C	1.0	0.5	0.75	N/A
1800	30/35	330	3.0	8	235	0.6	3.0	16	1002.1	10+	CLOUDY	1.0	1.0	1.5	N/A
2400	30/35	330	3.2	8	230	0.6	3.0	16.5	998.5	10+	CLOUDY	1.0	1.0	2.0	N/A
24/04/86															
0600	25/30	271	3.2	8	210	1.2	3.0	13.5	999.1	15	FINE	1.5	2.0	3/5	N/A
1200	35/40	290	3.5/4.0	8	240	1.5	3.0	14	1001.7	10+	CLOUDY/DRZL	1.5	1.5/2.0	2/3	N/A
1800	35/40	330	3.8	8	240	1.5	3.0	13	1001.4	10	CLOUDY	1.5	1.5	2.5	N/A
2400	35/40	340	3.8	8	240	1.5	3.0	13	997.8	10	CLOUDY	1.5	1/2	2/3	N/A
25/04/86															
0600	45/50	275	5/6	7	230	1.5	3.0	13	994.2	5+	O'CAST	1.5	1/1.5	2/3	N/A
1200	40/45	280	5/6	7	230	2.0	3.0	14	997.3	10	O'CAST	2.0	1/1.5	2/3	N/A
1800	35/40	275	7.0	7	230	2.0	3.0	11	1000.1	10	O'CAST	2.0	1.0	2.0	N/A
2400	40/45	250	7.0	7	230	2.0	3.0	11.5	1005.1	10	O'CAST	2.0	1.0	2.0	N/A
26/04/86															
0600	38	250	7.0	8	240	1.5	3.0	11.5	1008.2	10+	CLOUDY	1.5	1.0	2.0	N/A
1200	29	240	6.5	8	220	1.5	3.0	10	1012.5	10+	O'CAST/RAIN	1.5	1.0	2.0	N/A
1800	24	294	6.0	8	230	1.5	3.0	10.8	1011.1	5+	O'CAST/RAIN	0.5	1.0	2.0	N/A
2400	30	300	6.0	8	230	1.5	3.0	13	1008.4	10+	CLOUDY	0.5	1.0	2.0	N/A
27/04/86															
0600	35	240	6.0	8	230	1.5	3.0	11.5	1010.2	10+	CLOUDY	1.5	1.0	2/3	N/A
1200	28	230	5/6	8	230	1.0	3.0	12.5	1014.7	10+	CLOUDY	1.5	1.0	2.0	N/A
1800	20	200	4/5	8	220	1.0	3.0	11.7	1018.4	10+	CLOUDY	1.5	1.0	1.5	N/A
2400	20	180	4.0	8	220	1.0	3.0	10.2	1022.7	10	CLOUDY	1.5	1.0	1.5	N/A
28/04/86															
0600	18	170	3.5	8	210	1.0	3.0	11.5	1024.3	10+	CLOUDY/F & C	1.0	1.0	2.0	N/A
1200	17	170	3.0	8	210	0.5	3.0	12.5	1025.6	10+	CLOUDY/F & C	0.7	1.0	1.5	N/A
1800	20	170	3.0	7	230	1.2	3.0	11.0	1025.7	15+	CLOUDY	0.7	0.5	1.0	N/A
2400	18	175	3.0	7	230	1.0	3.0	11.5	1026.9	15	CLOUDY	0.7	1.0	1.0	N/A

DATE & TIME	WIND		SWELL			WAVE		TEMP.	PRESSURE	VISIBILITY	WEATHER STATE	HEAVE	PITCH	ROLL	RISER POSITION
	SPEED (knots)	DIRECTION (deg)	HEIGHT (m)	PERIOD (secs)	DIRECTION (deg)	HEIGHT (m)	PERIOD (secs)	(°c)	(mbar)	(km)		(m)	(deg)	(deg)	(deg)
16/03/86								14.6	1021.5	20	O'CAST	1.5	1.0	1.5	1.6
0600	7	250	3.0	10	230	0.2	3	16.3	1022.0	20+	F & C	1.5	1.0	1.5	2.0
1200	6	190	3.5	10	230	0.2	3	15.3	1018.0	20+	F & C	2.0	1.0	1.0	1.5
1800	8	180	3.0	9	230	0.3	4	14.2	1021.5	20	F & C	2.0	1.0	1.0	1.0
2400	8	120	3.0	9	230	0.3	4								
17/03/86								13.8	1020.3	20+	F & C	1.5	0.5	1.0	1
0600	6	100	3.5	8	190	RIPPLED	-	14.9	1019.3	20+	F & C	1.0	0.5	1.0	0.7
1200	7	153	3.5	8	190	0.1	2	14.8	1017.9	20+	F & C	1.0	0.7	0.7	1.5
1800	10	155	3.0	8	210	0.3	4	14.0	1018.0	20+	F & C	1.0	0.5	0.5	1.0
2400	7	113	2.0	7	210	0.2	4								
18/03/86								13.9	1016.4	15+	O'CAST	1.0	0.5	0.5	1.2
0600	8	140	1.5	7	220	0.1	2	16.3	1014.9	15+	O'CAST	1.0	0.5	0.5	1.7
1200	8	130	1.5	7	220	0.1	2	15.2	1013.6	10	O'CAST	1.0	0.5	0.5	1.7
1800	13	150	1.5	7	CONFUSED	1.0	3	14.2	1014.9	15	O'CAST	0.5	0.3	0.5	1.2
2400	6	160	1.0	7	CONFUSED	RIPPLED	-								
19/03/86								16.4	1012.7	15+	F & C	0.5	0.5	1.0	1.0
0600	9	120	2.5	9	210	0.3	2	17.8	1011.5	15+	F & C	0.5	0.5	0.5	1.0
1200	5	135	1.5	8	210	0.2	2	21.0	1009.2	8	HAZE	0.7	0.5	0.5	1.5
1800	17	125	2.0	8	200	0.5	3	16.9	1006.5	10	HAZE	0.7	0.5	0.5	1.2
2400	25	040	2.0	8	200	1.0	4								
20/03/86								20.4	1004.7	20	F & C	1.0	0.5	0.5	1.5
0600	15	033	2.0	9	220	0.4	3	30.2	1005.1	20	O'CAST	0.5	0.2	0.2	2.2
1200	27	340	2.0	9	220	0.4	3	16.8	1009.5	5	O'CAST	0.5	0.2	0.2	1.5
1800	10	275	2.0	9	210	0.3	3	15.6	1014.0	10	CLOUDY	0.5	0.2	0.2	-
2400	11	020	2.0	9	210	0.2	3								
21/03/86								13.7	1014.0	15+	FINE/HAZE	1.0	0.7	1.0	1.1
0600	7	150	3.5	8	240	0.1	3	15.1	1016.2	15+	F & C	1.0	1.0	1.0	1.5
1200	11	160	3.5	8	240	0.2	3	14.6	1013.5	10+	RAIN IN VICINITY	1.5	1.5	1.2	1.4
1800	12	140	4.0	9	240	0.3	3	14.1	1012.1	10+	O'CAST	1.5	1.5	2.0	1.5
2400	3	130	3.0	9	240	RIPPLED	-								
23/03/86								14.4	1023.2	15	CLOUDY/CLEAR	1.0	0.2	0.2	1.0
0600	12	155	2.0	9	230	0.3	4	15.0	1025.6	20	CLOUDY/CLEAR	1.0	0.2	0.2	1.0
1200	14	160	2.0	9	210	0.7	4	14.3	1022.0	20	CLOUDY/CLEAR	0.7	0.2	0.4	1.2
1800	15	165	2.0	9	210	0.5	3	14.1	1021.2	15	CLOUDY/CLEAR	0.6	0.2	0.4	1.2
2400	15	170	2.0	9	210	0.7	3								
24/03/86								12.9	1022.7	15	CLEAR	0.7	0.2	0.2	-
0600	15	160	2.0	9	210	0.6	4	14.2	1022.1	15	O'CAST/CLEAR	0.7	0.2	0.2	-
1200	17	150	2.0	9	CONFUSED	0.8	4	13.6	1015.9	15	O'CAST/CLEAR	0.7	0.2	0.2	1.5
1800	13	300	2.0	9	210	0.5	3	13.2	1014.3	15	O'CAST/CLEAR	0.8	0.2	0.2	1.5
2400	14	320	2.0	9	210	0.6	3								
25/03/86								13.1	1014.2	15	O'CAST/CLEAR	1.0	0.2	0.2	1.0
0600	4	170	2.0	9	210	0.2	4	14.9	1013.6	20	CLEAR	1.0	0.2	0.2	1.0
1200	2	160	2.5	9	220	RIPPLED	-	14.5	1010.1	20	CLEAR	1.0	0.2	0.2	1.2
1800	2	VAR	2.5	9	220	RIPPLED	-	13.0	1009.2	15	CLEAR	1.0	0.2	0.2	1.1
2400	3	VAR	2.5	9	220	RIPPLED	-								
26/03/86								12.8	1008.0	15	CLEAR	1.0	0.2	0.2	1.5
0600	12	340	2.0	9	210	0.3	4	16.3	1008.7	20	CLEAR	1.0	0.2	0.2	1.3
1200	16	330	2.0	9	210	1.0	4	16.6	1006.5	15	O'CAST/HAZE	1.2	0.5	0.5	1.5
1800	25	310	2.0	9	230	1.0	5	15.8	1006.9	15	O'CAST	1.7	1.0	1.5	1.1
2400	20	300	3.0	10	240	1.5	5								
27/03/86								16.7	1010.5	20	CLEAR	1.7	0.7	1.5	1.5
0600	25	290	4.2	10	230	1.7	4	15.2	1016.5	10	CLOUDY	1.7	0.7	1.5	1.2
1200	18	240	4.5	10	230	1.0	4	14.2	1016.1	10	HAZE	2.0	1.0	1.7	1.2
1800	9	020	5.0	12	230	0.7	4	13.6	1017.9	10	HAZE	2.0	1.0	1.7	1.2
2400	6	307	4.5	12	230	0.2	3								

DATE & TIME	WIND		SWELL			WAVE		TEMP.	PRESSURE	VISIBILITY	WEATHER STATE	HEAVE	PITCH	ROLL	RISER POSITION
	SPEED (knots)	DIRECTION (deg)	HEIGHT (m)	PERIOD (secs)	DIRECTION (deg)	HEIGHT (m)	PERIOD (secs)	(°c)	(mbar)	(km)		(m)	(deg)	(deg)	(deg)
16/03/86								14.6	1021.5	20	O'CAST	1.5	1.0	1.5	1.6
0600	7	250	3.0	10	230	0.2	3	16.3	1022.0	20+	F & C	1.5	1.0	1.5	2.0
1200	6	190	3.5	10	230	0.2	3	15.3	1018.0	20+	F & C	2.0	1.0	1.0	1.5
1800	8	180	3.0	9	230	0.3	4	14.2	1021.5	20	F & C	2.0	1.0	1.0	1.0
2400	8	120	3.0	9	230	0.3	4,								
17/03/86								13.8	1020.3	20+	F & C	1.5	0.5	1.0	1
0600	6	100	3.5	8	190	RIPPLED	-	14.9	1019.3	20+	F & C	1.0	0.5	1.0	0.7
1200	7	153	3.5	8	190	0.1	2	14.8	1017.9	20+	F & C	1.0	0.7	0.7	1.5
1800	10	155	3.0	8	210	0.3	4	14.0	1018.0	20+	F & C	1.0	0.5	0.5	1.0
2400	7	113	2.0	7	210	0.2	4								
18/03/86								13.9	1016.4	15+	O'CAST	1.0	0.5	0.5	1.2
0600	8	140	1.5	7	220	0.1	2	16.3	1014.9	15+	O'CAST	1.0	0.5	0.5	1.7
1200	8	130	1.5	7	220	0.1	2	15.2	1013.6	10	O'CAST	1.0	0.5	0.5	1.7
1800	13	150	1.5	7	CONFUSED	1.0	3	14.2	1014.9	15	O'CAST	0.5	0.3	0.5	1.2
2400	6	160	1.0	7	CONFUSED	RIPPLED	-								
19/03/86								16.4	1012.7	15+	F & C	0.5	0.5	1.0	1.0
0600	9	120	2.5	9	210	0.3	2	17.8	1011.5	15+	F & C	0.5	0.5	0.5	1.0
1200	5	135	1.5	8	210	0.2	2	21.0	1009.2	8	HAZE	0.7	0.5	0.5	1.5
1800	17	125	2.0	8	200	0.5	3	16.9	1006.5	10	HAZE	0.7	0.5	0.5	1.2
2400	25	040	2.0	8	200	1.0	4								
20/03/86								20.4	1004.7	20	F & C	1.0	0.5	0.5	1.5
0600	15	033	2.0	9	220	0.4	3	30.2	1005.1	20	O'CAST	0.5	0.2	0.2	2.2
1200	27	340	2.0	9	220	0.4	3	16.8	1009.5	5	O'CAST	0.5	0.2	0.2	1.5
1800	10	275	2.0	9	210	0.3	3	15.6	1014.0	10	CLOUDY	0.5	0.2	0.2	-
2400	11	020	2.0	9	210	0.2	3								
21/03/86								13.7	1014.0	15+	FINE/HAZE	1.0	0.7	1.0	1.1
0600	7	150	3.5	8	240	0.1	3	15.1	1016.2	15+	F & C	1.0	1.0	1.0	1.5
1200	11	160	3.5	8	240	0.2	3	14.6	1013.5	10+	RAIN IN VICINITY	1.5	1.5	1.2	1.4
1800	12	140	4.0	9	240	0.3	3	14.1	1012.1	10+	O'CAST	1.5	1.5	2.0	1.5
2400	3	130	3.0	9	240	RIPPLED	-								
23/03/86								14.4	1023.2	15	CLOUDY/CLEAR	1.0	0.2	0.2	1.0
0600	12	155	2.0	9	230	0.3	4	15.0	1025.6	20	CLOUDY/CLEAR	1.0	0.2	0.2	1.0
1200	14	160	2.0	9	210	0.7	4	14.3	1022.0	20	CLOUDY/CLEAR	0.7	0.2	0.4	1.2
1800	15	165	2.0	9	210	0.5	3	14.1	1021.2	15	CLOUDY/CLEAR	0.6	0.2	0.4	1.2
2400	15	170	2.0	9	210	0.7	3								
24/03/86								12.9	1022.7	15	CLEAR	0.7	0.2	0.2	-
0600	15	160	2.0	9	210	0.6	4	14.2	1022.1	15	O'CAST/CLEAR	0.7	0.2	0.2	-
1200	17	150	2.0	9	CONFUSED	0.8	4	13.6	1015.9	15	O'CAST/CLEAR	0.7	0.2	0.2	1.5
1800	13	300	2.0	9	210	0.5	3	13.2	1014.3	15	O'CAST/CLEAR	0.8	0.2	0.2	1.5
2400	14	320	2.0	9	210	0.6	3								
25/03/86								13.1	1014.2	15	O'CAST/CLEAR	1.0	0.2	0.2	1.0
0600	4	170	2.0	9	210	0.2	4	14.9	1013.6	20	CLEAR	1.0	0.2	0.2	1.0
1200	2	160	2.5	9	220	RIPPLED	-	14.5	1010.1	20	CLEAR	1.0	0.2	0.2	1.2
1800	2	VAR	2.5	9	220	RIPPLED	-	13.0	1009.2	15	CLEAR	1.0	0.2	0.2	1.1
2400	3	VAR	2.5	9	220	RIPPLED	-								
26/03/86								12.8	1008.0	15	CLEAR	1.0	0.2	0.2	1.5
0600	12	340	2.0	9	210	0.3	4	16.3	1008.7	20	CLEAR	1.0	0.2	0.2	1.3
1200	16	330	2.0	9	210	1.0	4	16.6	1006.5	15	O'CAST/HAZE	1.2	0.5	0.5	1.5
1800	25	310	2.0	9	230	1.0	5	15.8	1006.9	15	O'CAST	1.7	1.0	1.5	1.1
2400	20	300	3.0	10	240	1.5	5								
27/03/86								16.7	1010.5	20	CLEAR	1.7	0.7	1.5	1.5
0600	25	290	4.2	10	230	1.7	4	15.2	1016.5	10	CLOUDY	1.7	0.7	1.5	1.2
1200	18	240	4.5	10	230	1.0	4	14.2	1016.1	10	HAZE	2.0	1.0	1.7	1.2
1800	9	020	5.0	12	230	0.7	4	13.6	1017.9	10	HAZE	2.0	1.0	1.7	1.2
2400	6	307	4.5	12	230	0.2	3								

SECTION 7

Lessons Learned and Equipment Failures

7.1 Lessons Learned

No serious problems were encountered drilling Normanby-1 but the following occurrences should be noted.

7.1.1 Pressure Control Problems 8½" Section

Problems were encountered in determing the formation over-pressure. The impermeability of the formation limited flow and hence there was no pressure build up and no shut in pressures were seen (see 4.1 Drilling Evaluation). Little can be done in these circumstances but pressuring up the annulus/the well should hasten the pressure build up assuming a pressure is chosen less than the over pressure.

7.1.2 Anchors

As on Duntroon-1 no reliable strain gauges were installed and this meant tension readings on the anchors were always suspect. It should be noted that the system installed did pick up the lost tension when anchors did slip.

7.1.3 Recovering Anchors

In order to save time it was decided to recover some of the anchors during the abandonment programme. These were to be the middle anchors of the groups of three.

Two lessons were learned here. Firstly, in this shallow depth of water the loss of even one anchor's tension will alter the rigs position. This meant time spent moving the rig back over the wellhead to allow the cutting tools to re-enter.

Secondly, the choice of pulling the middle anchor allowed greater chance of entaglement with the other two anchor cables. Selecting one of the outside anchors would allow the work boat to come in on a path wide of the two remaining anchor cables.

7.1.4 Stabilisers

Normanby-1 suffered the same stabiliser failure as occurred on Duntroon-1. The stabilisers had been sent to Gearhart Ltd. for re-dressing but despite knowing the history, it seemed not possible to prevent a recurrence of the failure.

For the future, stabilisers should be sourced from a well known stablliliser company with proven quality control.

7.1.5 20" Casing Cross-Over

The cross-over for the 20" buttress to Vetco 'LS" casing string had the buttress thread cut at an angle. This meant time was lost on makeup as it was difficult to differentiate between cross-threading and true makeup.

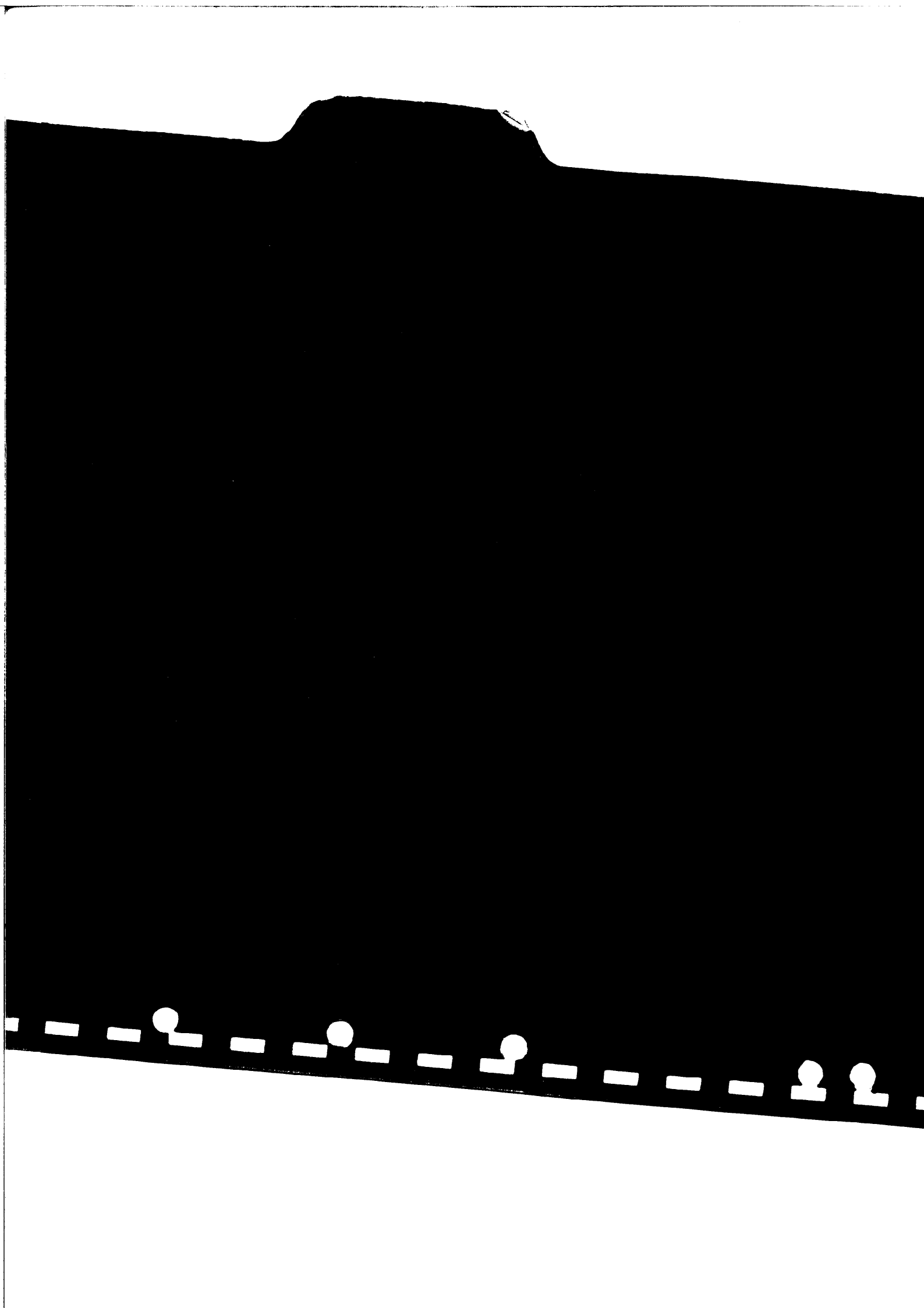
Gearhart Ltd. were the firm used for thread cutting. For the future, it would be worthwhile finding a proven quality machine shop.

There was also only one cross-over available and if it had failed there would not have been enough Vetco casing to case the 26" section to TD. If a composite string is to be run then two cross-overs should be available.

7.2 Equipment Failure Reports

The one major failure was one that also occurred on Duntroon-1, that of the string stabilisers.

Again, the problem was that of matrix eroding and the TC pads falling off. No explanation other than substandard material is available. The stabilisers falling apart also exacerbated the angle build up that occurred in the 12¼" section. This consequently lost rig time.



SECTION 8

Service Companies

8.1 Service Company List

SERVICE	COMPANY	ADDRESS
Drilling Unit	Zapata Offshore Co.	Houston, Texas
Mud Engineering	Dresser Magcobar	11th Floor National Westminster House 251 Adelaide Terrace PERTH, W.A. 6000
Cementing Service	Halliburton Aust. P/L	9th Floor, Da Costa Building 68 Grenfell Street ADELAIDE, S.A. 5000
Site Survey	Geomex	47 Forrest Street SUBIACO, W.A. 6008
Rig Positioning	Geomex	47 Forrest Street SUBIACO, W.A. 6008
Casing Running	Weatherford	Unit 14 2 Powell Street OSBORNE PARK, W.A. 6017
Mud Logging	Gearhart P/L	Unit 2 13B Musgrave Avenue WELLAND S.A. 5007
Remote Operating Vehicle	Wharton Williams Taylor	19 Tuas Crescent SINGAPORE 2263
Wireline Logging	Schlumberger Seaco Inc	4th Floor 220 St. George Terrace PERTH, W.A. 6000
Velocity Calibration	Schlumberger Seaco Inc	4th Floor 220 St. George Terrace PERTH, W.A. 6000
Testing: Downhole Tools	Halliburton Aust. P/L	9th Floor Da Costa Building 68 Grenfell Street ADELAIDE, S.A. 5000
Testing: Surface Equipment	Otis Engineering Corp	PO Box 97 Newtown Post Office SINGAPORE 9122
Testing: Gauges	Sperry Sun International	Unit #7 Terrace Warehouse Block 3 Loyang Offshore Supply Base SINGAPORE 1750
Helicopters	Mayne Bristow	Jandakot Airport JANDAKOT W.A. 6164

SERVICE	COMPANY	ADDRESS
Supply Boats	Lombardo Marine Pty	7th Floor Colonial Mutual Building 55 St. George Terrace PERTH, W.A. 6000
Supply Boats	Australian Offshore Services	GPO Box 88A 45 William Street MELBOURNE, VIC. 3000
Drill String Tools	Tasman Oil Tools	8 Ballantyne Road KEWDALE, W.A. 6105
Coring	Diamant Boart Petroleum & Mining Services	4 Forge Street WELSHPOOL, W.A. 6106
Mechanical Casing Cutting	Austoil Drilling Services P/L	3 Rawlinson Street O'CONNOR, W.A. 6163
Communications	Telecom Australia	11th Floor Collins Towers 35 Collins Street MELBOURNE, VIC. 3000
Weather Forecasting	Oceanroutes (Aust) P/L	384 Rokeby Road SUBIACO, W.A. 6008

8.2 Service Company Performance Report

The performance of the Service Companies was good, apart from the following points:

1. No tests were carried out, therefore the above comment does not apply to the testing contractors.

2. The performance of Tasman Oil Tools was not satisfactory and for the following reasons it is recommended they are not used on future wells.

   Logistically they were unco-operative and on one occasion failed to deliver equipment.

   Technically their jars, hole openers and underreamers were satisfactory but their stabilisers were not (see equipment failure reports in Section 7.2).

3. Gearhart United, a machine shop in Adelaide, was used to redress the above mentioned stabilisers and cut 20" buttress thread on a cross-over (see lessons learned report in Section 7.2).

   In both cases, there were problems and it is recommended that in future a better proven company is used.

4. The stevedoring agency was Patricks Agencies and their performance was not satisfactory (see Section 6.1 Materials and Logistics Summary). It is recommended that they are not used again.

SECTION 9

Abandonment/Suspension

Water Depth : 48·8 m
Draught : 23·5 m

RIG : **ZAPATA ARCTIC**
R.T.E. (asb): 75·6 m
ABANDONMENT/SEA BED CLEARANCE CERTIFICATE ISSUED

NORMANBY - 1
ABANDONMENT DIAGRAM

CASING CUT

30" : 6·2 mbsb
20" : 8·8 mbsb
13 3/8" : 13·6 mbsb
9 5/8" : 16·7 mbsb

CEMENT PLUGS

1 3300 - 3200 m
2 3200 - 3050 m
3 2768 - 2668 m
4 210 - 110 m
5
6

BRIDGE PLUGS

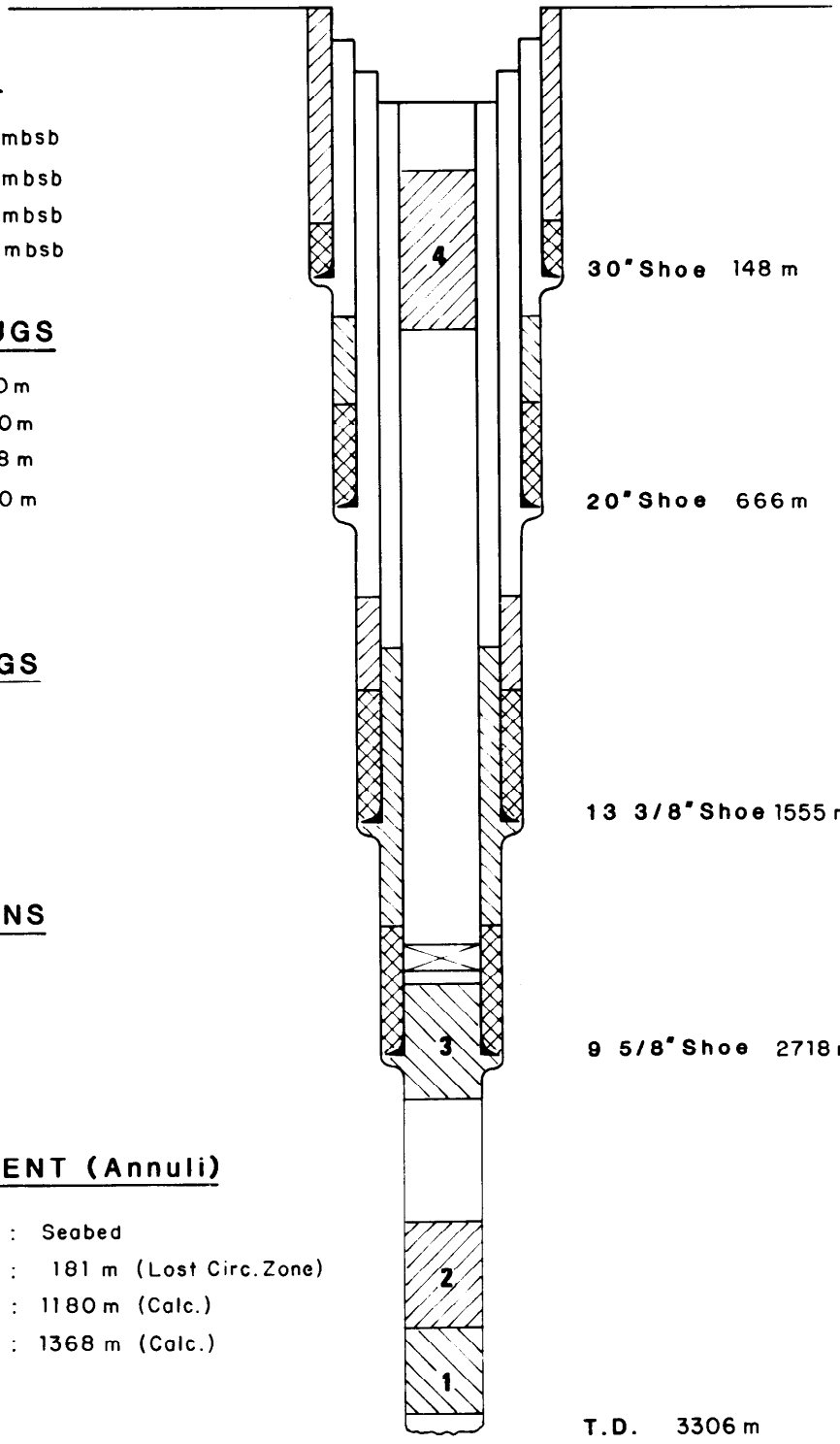
1 2654 m
2
3
4

PERFORATIONS

1
2
3
4

TOP OF CEMENT (Annuli)

30" Conductor : Seabed
20" Casing : 181 m (Lost Circ. Zone)
13 3/8" Casing : 1180 m (Calc.)
9 5/8" Casing : 1368 m (Calc.)



MUD LEFT IN HOLE

Type : KCL/POLYMER
S.G. : 1·46

NB. All Depths are metres BRT

BP MELBOURNE	OTWAY BASIN, OFFSHORE VICTORIA	Figure 9.1
Author: A.C.E	NORMANBY-1 ABANDONMENT DIAGRAM	Date: MAY 1986
Report Ref: -		Drawing No.: TS 3820