1. ENGINEERING DATA

1.1 Engineering Summary

Balmain 1 is located in Northern Territory Exploration Permit 18 (EP18) approximately 20km east-north east of the Wayside Inn, Dunmarra (Plan PetNTcw4882). **Balmain 1** was drilled by Pacific Oil & Gas Pty. Limited as operator on behalf of the EP18 Joint Venture, using Rockdril Rig 23.

Prior to the arrival of the rig a $9^5/_8$ inch conductor was set at 9m below ground level by Gorey and Cole.

Drilling commenced at 1430 hours, 8th October 1992. An 8½ inch hole was drilled to 58m (Driller) using water and native clays as the drilling medium. A resistivity log was acquired and the travel time to the seismic reference datum (200m AHD) was determined. Seven inch surface casing was set at 56.5m (Driller) and cemented to surface with 6 barrels of class A cement.

A 6 inch hole was drilled to 604m (Driller) using water with occasional high vis gel sweeps as the drilling medium. Total loss of circulation occurred after 65m and no attempt was made to regain circulation. Intermediate logs and a velocity survey were recorded using open-ended drillpipe to guide the tools through the cavernous limestone sequence in which circulation was lost. The interval 573m to 106m was successfully logged. A 5 inch casing string was set at 601m (Driller) and cemented with 22 barrels of class A cement. Three barrels of cement were pumped down the annulus into a cement basket at 46m such that the string was cemented above the lost circulation zone. A BOP stack was installed and satisfactorily tested. A formation integrity test indicated adequate formation strength (1200 psi, EMW 20 ppg). A CHD 101 coring assembly was made up and the casing shoe drilled out with water. The bit was then changed and the drilling medium circulated over to a Newdrill polymer mud system.

The hole was continuously cored from the casing shoe to TD at 1050m. Two drill stem tests were performed with the recovery of oil and water cut rat-hole mud from DST 1, and formation water from DST 2. A suite of logs was recorded and a velocity survey conducted at TD.

The well was suspended by setting a bottom-hole plug and running 4 inch casing to 990.5m. The casing string was cemented to 650m with 4.9 barrels of class G cement displaced with 39.1 barrels of inhibited water. The rig was released at 1900 hours, 7th November 1992. A drilling progress chart is included in this report (Plan PetNTcw4884).

The drilling operation at **Balmain 1** lasted 31 days and 4.5 hours and cost $783,895.

1.2 General Data

Well Name:	**Balmain 1**
CRAE Drillhole No:	RDDD92MB23
Well Type:	Exploration well
Operator:	Pacific Oil & Gas Pty. Limited
Title Holders:	Pacific Oil & Gas Pty. Limited - 90% Omega Oil N.L. - 10%
Location:	16° 37' 13.6" South 133° 34' 38.5" East AMG Zone 53, 348 256m E, 8 161 886m N SP 1725, Line MC92-100
Elevation:	Ground level (GL) 227m AHD Slip Bowl (DF) 230.5m AHD (Datum)
Well Spudded:	8th October 1992 @ 1430 hours
At Total Depth:	4th November 1992 @ 0315 hours
Rig Released:	7th November 1992 @ 1900 hours
Status:	Cased and suspended pending further evaluation.
Drilling Rig:	Walker-Neer Apache Model 228-38-4 Rockdril Rig 23
Hole Size:	12¼ inch to 12.5m (Driller) 8½ inch to 58m (Driller) 6 inch to 604m (Driller) 4.35 inch to 1050m (Driller)
Casing:	9⅝ inch to 12.5m (Driller) 7 inch to 56.5m (Driller) 5 inch to 601m (Driller) 4 inch to 990.5m (Driller)
Wireline Logs:	Dual Focused Resistivity (RR2) 55-14m, 573-106m, 1048-600m Microguard Resistivity (MG1) 1049-600m, Dual Neutron (NN1) 1048m to surface

Gamma Ray (MG1, NN1) 570-112m,
1048m to surface
Dual Density (DD3) 1047-600m
Depth Compensated Sonic (MS1) 570-317m
Depth Compensated Sonic (MS2), 565-107m,
1047-600m

Velocity Survey: 26 levels recorded in three separate runs (surface, intermediate, total depth.)

1.3 Drilling Rig

Rockdril Contractors Rig 23, a Walker-Neer "Apache", was used to drill **Balmain 1**. Specifications for this rig and associated plant are given in Appendix 1.

1.4 Service Companies

The following service companies were employed:

Milpark:	Mud supply
Halliburton SDL:	Mudlogging
Australian DST:	Testing
Dowell Schlumberger:	Nitrogen, cementing
BPB Slimline Services:	Wireline logging
Velocity Data:	Velocity survey

1.5 Hole Size

12¼ inch to 12.5m (Driller):
Pre-drilled by Gorey and Cole (water-bore drilling contractor).

8½ inch to 58.0m (Driller):
Rotary drilled using water and native clays as the drilling medium.

6 inch to 604m (Driller):
Rotary drilled to 65m (Driller) where there was total loss of circulation. The hole was drilled on to 604m without returns, using water with occasional high vis gel sweeps as the drilling medium.

4.35 inch to 1050m (Driller):
Continuously cored using a Newdrill polymer mud as the drilling medium.

1.6 Drilling Problems

Two problems occurred in the continuously cored section of the hole.

1. In the first 60m of continuously cored hole the bit erratically cut undersized core resulting in poor core recoveries. The drill string was pulled at 665.5m and a bent drill collar and badly worn tube stabiliser were replaced. The teeth on the core catcher were also changed to a larger size. This improved the core gauge, however core recovery problems continued. The core tube appeared to be seating properly, but was becoming unseated as coring proceeded. The drill string was again pulled at 765m when 'dropped' core could not be dislodged from the core barrel. The core barrel latch assembly was changed and the 'wings' of the core tube were built up. Subsequent core recoveries were markedly improved (Appendix 15 contains a continuous record of core cut and recovered).

2. The BOPs were pressure tested after DST 1 before the drill string was run to the bottom of the hole. Circulation to the bit was not correctly established following the pressure test. The driller realised his mistake as he was running through fill near the bottom of the hole and attempted to establish circulation to the bit. Circulation could not be established and the string became stuck. The string was jarred for 6¼ hours without success. The overshot was then modified such that it could be released if the core tube could not be retrieved. The tube was retrieved without difficulty, circulation was immediately established and the drill string was freed. A large piece of rubber packer lodged in the core tube was believed to have blocked circulation. The entire operation lasted 12½ hours.

1.7 Casing

9⅝ inch at 12.5m (Driller)

Grade:	K55
Weight:	36 lb.ft
Thread:	LTC
Range:	3
No. of Joints:	1

7 inch at 56.5m (Driller)

Grade:	K55
Weight:	23 lb/ft
No. of Joints:	5
Accessories:	Guide shoe, float collar
Cement Used:	31 sacks A plus ½ sack CFR3
Cementation:	Mixed and pumped 6 barrels cement at 15.3 ppg; released top plug; displaced with 7 barrels water; bumped plug with 750 psi for 10 minutes.
Top of Cement:	Cellar floor
Leak-off test:	Not performed

5 inch at 601m (Driller)

Grade:	N80
Weight:	13 lb/ft
Thread:	FL45
Range:	3
No. of Joints:	60
Accessories:	Guide shoe, float collar
Cement Used:	132 sacks A plus 1 sack CFR 3
Cementation:	(i) Mixed and pumped. 22 barrels cement at 15.6 ppg; released top plug; displaced with water. (ii) Pumped 3 barrels cement at 15.6 ppg down annulus into cement basket at 46m.
Top of Cement:	(i) Unknown. (ii) Surface.
Formation Integrity Test:	1200 psi held for 10 minutes (EMW = 20 ppg)

4 inch at 990.5m

Grade:	N80
Weight:	11 lb/ft
Thread:	FL4S
Accessories:	Guide shoe, float collar.
Cement Used:	28 sacks G plus 2.6 gallons D080 and 0.24 gallons D047 additives.
Cementation:	Pumped 10 barrels of "Chemical Wash 100" as pre-flush; released bottom plug; mixed and pumped 4.9 barrels cement at 15.8 ppg; released top plug; displaced with 39.1 barrels inhibited water (8 gallons Amitec, 37 gallons diesel, 20 pounds caustic soda added); bumped plug to 1180 psi. Pressure drop to 800 psi over 10 minutes probably due to small leak where hose connected to the head ½ barrel returns to displacement tank when pressure released. Note: Casing string was rotated and reciprocated during pumping and displacement of cement. Rockdril mixed and pumped the cement, Dowell Schlumberger displaced the cement.
Top of Cement:	650m (calculated)
Leak-off test:	Not performed.

1.8 Drilling Fluids

An 8½ inch hole was rotary drilled using fresh water and native clays with occasional high viscosity Rapid Gel sweeps. A 7 inch casing string was run to 56.5m (Driller) and the casing shoe subsequently drilled out with water.

As had been planned, a 6 inch hole was drilled using fresh water with periodic high viscosity Rapid Gel sweeps, even after circulation was lost at 65m. No attempts were made to regain circulation. At 235m the pipe became stuck, but was freed by jarring for 1½ hours and back reaming to 178m. The hole was then drilled to 604m (Driller) without further incident although a break-down of the water bore pump delayed drilling for 6½ hours soon after the stuck pipe was freed.

The hole was then successfully logged through open ended drillpipe although back-filling and a wedge-off prevented acquisition over two small intervals. The hole was reamed and circulated clean, and a 5 inch casing string set at 601m (Driller).

A 4.35 inch hole was continuously cored using a light weight, low water-loss Newdrill Newvis fresh-water polymer mud. As reactive shales were not encountered, KCl was not added to the mud system. This enabled the distinction between fresh-water mud filtrate and salty formation water on resistivity logs, and possibly prevented some formation damage.

Minor mud property problems were encountered whilst continuously coring. Although the solids content of the mud was maintained as low as possible by replacing contaminated mud with fresh pre-mix, spinout was circulated from the pipe on two separate occasions between 799 and 881m. Mud filtrate losses also proved to be a problem and could not be reduced below 10.5 cc/30 minutes. Typical mud properties are shown in Table 1 below:

	PLANNED	ACTUAL
Mud Weight (ppg)	8.7	8.4
Viscosity (seconds)	35 - 40	31 - 43, average 35
PV (cps)	5 - 10	1 - 20, average 8
YP (lb/100 sqft)	5 - 10	0 - 10, average 4
Ph	8 - 9.5	8.5
Filtrate Loss (cc/30 min)		10.5-14, average 12

Table 1: Planned and Actual Mud Properties - **Balmain 1**.

NOTE: Ph was maintained below 9.5 to prevent formation damage by highly alkaline filtrate.

The caliper log shows that the cored hole generally remained in gauge, rarely washing out to a maximum of 6¼ inches in the Hayfield Mudstone.

1.9 Water Supply

It was anticipated that circulation would be lost in the Tindall Limestone and that the 6 inch hole would be drilled without returns. As there were no significant surface water supplies available the following system was constructed to supply the quantity of water necessary to ensure adequate hole cleaning.

(i) A bore was drilled into the Tindall Limestone which is an excellent aquifer. The bore was drilled to 114m; 8 inch casing, perforated between 97.5 and 108.5 metres, was run to bottom. The bore was equipped with a Mono pump capable of delivering 30,000 litres/hour, although the bore itself could deliver up to 55,000 litres/hour. Standing water level was 74m.

(ii) A plastic-lined turkey's nest was constructed. The bore could produce into this reservoir or directly to the rig tanks.

(iii) A 2 inch centifugal pump was used to transfer water from the turkey's nest to the rig tanks.

The water supply as described appeared to adequately clean the 6 inch hole as only minor problems were encountered during drilling and logging operations (see sections 1.6 and 2.2). Six and a half hours of rig time was lost when the bore pump broke down. The drill string was removed from the hole during this time to prevent cuttings falling down the static water column from packing around the pipe.

After normal circulation was established in the 4.35 inch hole the Mono pump was replaced with an electric submersible pump.

1.10 Drilling Bits

Appendix 2 contains details of all bits used in drilling **Balmain 1**.

1.11 Deviation Record

Survey results are presented in Table 2.

DEPTH	DEVIATION
58	¼°
169	1¼°
348	2°
526	2½°
707	1°
946	¾°

Table 2: Deviation Surveys - **Balmain 1**

1.12 Fishing Operations

High pump pressure was noted after attempting to seat the core tube at 1033.25m. The high pump pressure was attributed to a poorly seated tube, and it was retrieved and reseated. Attempts were made to resume coring however the string immediately torqued up and twisted off approximately seven stands below the drill floor. After two unsuccessful fishing attempts, the string was retrieved using an oversize fishing spear (the pipe had torn and smaller diameter spears were inadequate). The fishing operation lasted 8¾ hours.

1.13 Suspension

Balmain 1 was cased and suspended such that possible production testing/reservoir stimulation could be carried out in the future. The casing and suspension program is summarised below:

(i) A bottom-hole plug was set between 1050 and 1000m using 19 sacks of Class A cement. The top of hard cement was tagged at 1006m.

(ii) 4 inch casing was run to 990.5m
Sand-blasted casing was landed over the interval 792.2 to 757.35m.

(iii) the casing string was cemented to approximately 650m with 28 sacks of Class G cement plus 2.6 gallons D080 and 0.24 gallons D047

(iv) The liquid within the 4 inch casing contained corrosion inhibitors (Amitec, diesel and caustic soda)

(v) a Breda Fucine wellhead, rated to 5000 Psi, was installed.

The status of the well at the time of its suspension is shown on Plan PetNTcw4885. The wellhead fitted is shown on Plan PetNTcw4788.

1.14 Time Distribution

A full break-down of drilling operations can be found in Appendix 3. Drilling operations at **Balmain 1** commenced at 1430 hours, 8 October 1992 and ceased at 1900 hours, 7 November 1992, a period of 31 days 4½ hours. An analysis of the time spent is contained in Table 3 and shown diagrammatically on Plan PetNTcw4883.

OPERATION	HOURS	PERCENTAGE
Coring	217	30.0
Drilling	104½	14.4
Trips	86¼	11.9
Drill Stem Tests	60	8.3
Rig Repair	49½	6.9
Logging	46½	6.4
Cementing, WOC	34	4.7
Casing	23	3.2
Down Hole Trouble	18 ¾	2.6
Circulate and Condition	15 ¾	2.2
N.U. BOPs, Pressure Tests etc.	15¼	2.1
Wait on casing	14 ¾	2.0
Reaming	11 ¾	1.6
Fishing	8 ¾	1.2
Surface Trouble	4½	0.6
Deviation Surveys	3½	0.5
F.I.T.	¼	0.1
Miscellaneous	9½	1.3
TOTAL	**723½**	**100**

Table 3: Time Summary - **Balmain 1**

1.15 Well Costs

A summary of costs for the drilling of **Balmain 1** is given in Table 4.

ITEMS	COSTS ($)
Site Preparation/Rehabilitation	36,000
Water Supply	37,069
Mobilisation	97,656
Drilling	198,800
Casing	90,042
Cementing Services	16,527
Mud Supplies & Services	15,150
Geophysical logging	51,296
Camp	35,739
Mudlogging Services	27,303
Drill Stem Testing	68,744
Field Supplies	1,317
Communications	9,567
Freight	8,593
Travel & Accommodation	18,204
Vehicle Costs	3,613
Laboratory Analysis	21,489
Payroll & benefits	23,275
CRA Overheads	16,604
Office Supplies	573
Insurance	6,334
TOTAL	**783,895**

Table 4: Well Costs EP18 - **Balmain 1**.