

## 1. ENGINEERING DATA

### 1.1 Engineering Summary

**Ronald 1** is located on Nutwood Downs Station approximately 27km NNE of Amungee Mungee Homestead (Cooee Hill) and 83km east of Daly Waters (Plan PetNTcw9433).

Drilling operations began with the setting of a 13 $\frac{3}{8}$ " conductor at 8.1m on the 29th of July 1993.

**Ronald 1** spudded at 0230 hours, 30th July 1993. A 12 $\frac{1}{4}$ " hole was air-hammer drilled to 69m (Driller), using foam injection after 33m (Driller) to maintain hole lubrication in "sticky" clays. A 9 $\frac{3}{8}$ " deep conductor was set at 58.5m (Driller) and cemented to surface with 80 sacks class "A" cement at 15.6 ppg. The annulus was topped up with 10 sacks class "A" cement after cutting and centralising the casing.

An 8 $\frac{1}{2}$ " hole was air-rotary drilled to 289m. Returns were maintained throughout although a significant proportion appeared to be cavings. After spotting a hi-vis pill a 7" casing string was run to 279.59m and cemented with 45 sacks class "A" cement. 8 sacks of cement were also pumped down the annulus into two cement baskets to ensure an adequate cement bond with the 9 $\frac{3}{8}$ " casing. The BOP stack was installed and satisfactorily tested. After drilling out the casing shoe, a formation integrity test was performed to 450 psi (EMW = 17.7 ppg).

An attempt was made to air-hammer drill the 6" hole. However the hammer screen plugged twice with pipe scale and plastic pipe lining with very little hole made, and the hammer was abandoned.

The 6" hole was air-rotary drilled from 296 to 1150m (TD). Foam injection became necessary to maintain hole cleaning below 876m (Driller) following an influx of small volumes of formation water from the basal Jamison Sandstone. A stiff foam was used from 1067m to lift the large volumes of water produced from sands below 1045m. It also became necessary to use the mud pumps to help lift the water made during connections.

A suite of logs including a velocity survey was recorded at TD. A drill stem test was performed over the interval 1043.93 to 1069.91m, recovering 3108 litres of saline formation water and minor gas.

The well was plugged with three plugs; 1076-1016m (36 sacks class "A" cement), 395 to 250m (85 sacks class "A" cement) and 20m to surface (10 sacks class "A" cement). The rig was released at 2200 hours, 17th August 1993. A drilling progress chart is included in this report (Plan PetNTcw9436).

The drilling operation at **Ronald 1** lasted 18 days and 19 $\frac{1}{2}$  hours and cost \$688,370.

## 1.2 General Data

Well Name: **Ronald 1**

CRAE Drillhole No: RD93 MB26

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° 14' 57.0" South  
134° 09' 41.5" East

AMG Zone 53, 410 399m E, 8 202 313m N

Seismic Line and SP Number: Line MD92-55, SP 1780

Elevation: Ground level (GL) 249m AHD  
Kelly Bushing (KB) 254.3m AHD (Datum)

Well Spudded: 30th July 1993 @ 0230 hours

At Total Depth: 13th August 1993 @ 1530 hours

Rig Released: 17th August 1993 @ 2200 hours

Status: Plugged and Abandoned.

Drilling Rig: Rockdril Rig 22

Hole Size: 24 inch to 8.1m (Driller)  
12¼ inch to 69m (Driller)  
8½ inch to 289m (Driller)  
6 inch to 1150m (Driller)

Casing: 13⅜ inch to 8.1m (Driller)  
9⅝ inch to 58.5m (Driller)  
7 inch to 279.6m (Driller)

Wireline Logs: DLL-GR-SDT-SP (resistivity, gamma-ray, sonic, spontaneous potential), GR 1135.0m to surface, others 1135.0 to 280.0m.  
LDL-CNL-GR (density, neutron, gamma-ray), 1139.0 to 282.0m.  
SHDT-GR (dipmeter, gamma-ray), 1149.0 to 555.0m.  
SAT-B (velocity survey), 1130.0 to 54.3m, 20 levels.

### 1.3 Drilling Rig

Rockdril Contractors Rig 22 was used to drill **Ronald 1**. Specifications for this rig and associated plant are given in Appendix 1.

### 1.4 Service Companies

The following service companies were employed:

IDFS:	Mud engineer and PHPA supply
Milpark:	Mud supply
Australian DST:	Testing
Halliburton Drilling Systems:	Mudlogging
Schlumberger Seaco:	Electric logging and velocity survey
Oiltools:	Air package
Ozoil Production Services:	Drilling engineer

### 1.5 Hole Size

22 inch to 8.1m (Driller):

Pilot hole drilled with 12¼ inch air-hammer, opened up to 22 inches with auger.

12¼ inch to 69m (Driller):

Drilled with 12¼ inch air-hammer with foam injection below 33m.

8½ inch to 289m (Driller):

Air-rotary drilled.

6 inch to 1150m (Driller):

Drilled with overgauge 6 inch air-hammer to 296m, air-rotary to TD. "Dusting" to 876m, "misting" and "foaming" to 1045m, stiff-foam injection to TD.

### 1.6 Drilling Problems

Major difficulties were experienced when running casing into the 12¼" hole. 20 hours were spent working the 9⅝" casing down to 59.7m using hi-vis mud and foam to disperse "sticky" clays. The hole was blocked below this depth and the casing shoe was set at 58.5m.

The only other significant drilling problem encountered in **Ronald 1** was plugging of the screen in the 6" air-hammer. The 6" air-hammer was run twice from 291 to 296m achieving rates of 18-20m/hour in the basalt section. Each time the screen became blocked with pipe scale and plastic pipe liner after drilling only 2-3m. After the second attempt the 6" air-hammer was abandoned and the remaining hole was drilled air-rotary. Unfortunately penetration rates in the basalt section were significantly less drilling air-rotary (4-6m/hour).

## 1.7 Casing

### 9<sup>3</sup>/<sub>8</sub> inch at 58.5m (Driller)

Grade: K55  
 Weight: 36 ppf  
 Thread: 8 RND LTC  
 No. of Joints: 5  
 Accessories: Float shoe, top plug.  
 Cement Used: 80 sacks class "A", top up 10 sacks.  
 Cementation: (i) Mixed and pumped 80 sacks cement at 15.6 ppg.  
 (ii) Displaced with 14.8 bbls water and bumped plug.  
 Held at 1000 psi for 10 minutes. No back flow. Full returns during cement job.  
 (iii) Topped up annulus with 10 sacks cement after cutting and centralising casing.  
 Top of Cement: Surface.  
 FIT: Not performed.

### 7 inch at 279.6m (Driller)

Grade: N80  
 Weight: 29 ppf  
 Thread: BTC  
 No. of Joints: 24  
 Accessories: Float shoe, float collar, top and bottom plugs, 2 x cement baskets.  
 Cement Used: 45 sacks class "A", top up 8 sacks  
 Cementation: (i) Mixed and pumped 45 sacks cement at 15.6 ppg.  
 (ii) Displaced with 33 bbls water and bumped plug with 1000 psi.  
 (iii) Pumped 8 sacks cement down annulus into cement baskets at 50m and 40m.  
 Top of Cement: (i) At least 50m above casing shoe (230m)  
 (ii) Surface.

## 1.8 Drilling Fluids

**Ronald 1** was drilled entirely with air.

12<sup>1</sup>/<sub>4</sub>" hole: Foam was injected between 33m and 69m (Driller) to maintain hole lubrication in "sticky" clays.

8<sup>1</sup>/<sub>2</sub>" hole: A hi-vis pill was spotted at 289m (Driller) to clean the hole prior to running casing.

6" hole: Soap injection ("misting") commenced below 876m (Driller). Foam injection was necessary as returns were lost at approximately 873m (Driller) following an influx of formation water from the base of the Jamison Sandstone. A "stiff foam" was used to lift the large volumes of water produced below 1045m (Driller).

A kill mud was maintained whilst drilling the 6" hole to be used in the event of an uncontrolled fluid influx. A drilling fluids summary is included as Appendix 2.

## 1.9 Water Supply

- (i) A water bore was drilled into the Tindall Limestone a few hundred metres from the well-site. The bore was drilled to 138m and 155mm ID casing, perforated from 125 to 138m, was run to bottom. The bore was capable of producing an estimated 9000 litres per hour on completion and was equipped with an electric submersible pump.
- (ii) A plastic-lined turkey's nest was constructed at the well-site. Water was delivered from the bore to the turkey's nest/camp tanks via polypipe.
- (iii) A 3 inch centrifugal pump was used to transfer water from the turkey's nest to the rig tanks.

## 1.10 Drilling Bits

Appendix 3 contains details of all bits used in drilling **Ronald 1**.

## 1.11 Deviation Record

Survey results are presented in Table below:

DEPTH	DEVIATION
64m	1¼°
167m	¼°
280m	1°
348m	1°
782m	¾°
1140m	1°

**Table 1:** Deviation Surveys - **Ronald 1**

## 1.12 Fishing Operations

No fishing operations were conducted in the **Ronald 1** well.

## 1.13 Abandonment

As no potentially commercial hydrocarbons were encountered in **Ronald 1**, the well was abandoned in accordance with Northern Territory Department of Mines and Energy regulations. The abandonment program is summarised below:

- Plug No. 1: 1076 to 1016m (Driller)  
36 sacks class "A" cement
- Plug No. 2: 395 to 250m (Driller)  
85 sacks class "A" cement  
Plug tagged at 246m with 7000 lb weight
- Plug No. 3: 20 to 5m (Driller)  
10 sacks class "A" cement

After the surface plug had been set the well head was removed to below ground level and a permanent marker was fixed to the casing. The status of the well following abandonment is shown on Plan PetNTcw9434.

### 1.14 Time Distribution

A full break-down of drilling operations can be found in Appendix 4. Drilling operations at **Ronald 1** commenced at 0230 hours, 30th July 1993 and ceased at 2200 hours, 17th August 1993, a period of 18 days 19½ hours. An analysis of the time spent is contained in Table 2.

OPERATION	HOURS	PERCENTAGE
Drilling	180.5	39.9
Trips	72.0	15.9
N.U. BOPs, Pressure Tests etc.	54.0	12.0
Down Hole Trouble	22.0	4.9
Logging	20.5	4.5
Pick Up\Lay Down DP\DC\BHA	20.5	4.5
Drill Stem Test	19.0	4.2
N.U. BOPs, Set Surface Plug	10.0	2.2
Circulate and Condition	9.0	2.0
Rig Up and Run Casing	8.5	1.9
Wait on Schlumberger	7.5	1.7
Cementing	7.0	1.6
Reaming	4.0	0.9
Rig Maintenance	4.0	0.9
Set Plugs	3.0	0.7
Drill Out Shoe	2.5	0.6
Deviation Surveys	2.5	0.6
Surface Trouble	1.5	0.3
Repair Rig	1.5	0.3
Slip and Cut Line	1.0	0.2
Wait on Orders	0.5	0.1
Test Formation Shoe	0.5	0.1
<b>TOTAL</b>	<b>451.5</b>	<b>100.0</b>

**Table 2: Time Summary - Ronald 1**

## 1.15 Well Costs

A summary of costs for the drilling of **Ronald 1** is given in Table 3 below:

ITEMS	COSTS (\$)
Site Preparation/Rehabilitation	52,232
Water Supply	25,021
Mobilisation	61,500
Drilling	262,427
Casing	28,192
Cementing Services	1,722
Mud Supplies & Services	23,215
Geophysical logging	51,944
Camp	36,434
Mudlogging Services	23,215
Drill Stem Testing	16,326
Field Supplies	1,508
Communications	6,139
Freight	12,872
Travel & Accommodation	25,723
Vehicle Costs	2,096
Laboratory Analysis	5,338
Payroll & benefits	1,299
Consultants	42,503
Office Supplies	64
Insurance	4,257
Overheads	4,343
<b>TOTAL</b>	<b>688,370</b>

**Table 3: Well Costs EP18 - Ronald 1.**

## 2. FORMATION EVALUATION

Note: All depths are loggers depths unless otherwise stated.

### 2.1 Mudlogging

Mudlogging services were provided by Halliburton Drilling Systems. Rate of penetration, total gas, gas chromatography, pump strokes, pit level and H<sub>2</sub>S concentration were monitored and the appropriate parameters plotted on a continuous mudlog at a scale of 1:500. A copy of the mudlog is included in this report as Plan PetNTcw9490.

Cuttings samples were collected at 9m intervals from 109m to 289m, and 3m intervals from 289m to TD. The samples were not washed and dried until "misting" commenced at 876m. Each sample was divided into three with one portion being sent to the Northern Territory Department of Mines & Energy in Darwin and the other two stored at Pacific's office in Alice Springs. A small portion of each sample was also placed in a Samplex sample tray to be retained by Pacific.

All samples were examined under an ultra-violet light and fluorescing intervals were described. Fluorescing sandstones and siltstones were sampled, wrapped in foil, placed in a plastic 'Labtechnics' container and forwarded to Geotech in Perth for analysis.

## 2.2 Electric Logs

The following logs were recorded by Schlumberger Seaco Inc., and are included in this report as plans PetNTcw9484 to PetNTcw9489.

### Run 1 (6" hole)

DLL-GR-SDT-SP : 1135.0m to surface  
(Dual resistivity, gamma-ray, sonic, spontaneous potential)

### Run 2 (6 " hole)

LDL-CNL-GR : 1139.0 to 282.0m  
(Density, neutron, gamma-ray)

### Run 3 (6" hole)

SHDT-GR : 1149.0 to 555.0m  
(Dipmeter, gamma-ray)

### Run 4 (6" hole)

SAT-B : 1130.0 to 54.3m  
(Velocity survey) (20 levels)

The well was logged in saline formation water produced from the Moroak Sandstone. Runs 1 and 2 were not run to the bottom of the hole due to concerns regarding hole gauge and bottom-hole fill.

## 2.3 Formation Tests

One off-bottom straddle drill stem test was conducted with the packers set in the open hole. The closed chamber technique was used.

In summary, the results were:

### DST 1

Interval	:	1043.93 to 1069.91m
Unit	:	Moroak Sandstone
1st Flow	:	6½ minutes
1st Shut In	:	61½ minutes
2nd Flow	:	18 minutes
2nd Shut In	:	63½ minutes
Recovery	:	3108 litres of saline formation water and minor gas.

Full details of the testing operation and pressure data are included in this report as Appendix 5.



## **2.4 Geothermal Gradient**

A geothermal gradient of 44.3°C has been calculated using extrapolated bottom-hole temperatures recorded whilst logging.

A discussion of the method used, a table of temperature data and plots are given in Appendix 6.

## **2.5 Synthetic Seismogram**

Well velocity data were acquired by Schlumberger Seaco Inc. A total of 20 levels were recorded using dynamite as the energy source.

Synthetic seismograms were produced by Encom Technology and are included as Appendix 7.

## **2.6 Analyses**

### **2.6.1 Source Rock Geochemistry**

Ten cuttings samples were taken from the Kyalla Member and two from the Moroak Sandstone with a bias toward the darkest and apparently most organic rich units such that source rock potential and maturity levels could be assessed. All samples were submitted to Geotech for TOC determination followed by Rock Eval Pyrolysis where applicable. Results are provided in Appendix 8.

### **2.6.2 Water Analysis**

A sample each of the bore water and the formation water recovered during DST 1 were submitted for standard water analysis. Results are provided in Appendix 8.

### **2.6.3 Gas Analysis**

Two gas samples were collected whilst blowing down the chamber during the final shut-in period of DST 1. Results are presented in Appendix 8.

### **2.6.4 Oil Analysis**

Liquid hydrocarbons were extracted from two cuttings samples from the Jamison Sandstone and from the water recovered during DST1. Gas and liquid chromatography results are presented in Appendix 8.

### **2.6.5 Thermal extraction/pyrolysis-GC**

One sample each from the base of the Jamison Sandstone and the top of the Kyalla Member were submitted for thermal extraction/pyrolysis-GC analyses. Results of these analyses are presented in Appendix 8.