

I N T R O D U C T I O N

The Johnny's Creek No. 1 well is the seventh well to be drilled in the Amadeus Basin by Exoil (N.T.) Pty. Ltd. and its partners. The well was drilled on Oil Permit 43 issued by the Northern Territory of Australia to Magellan Petroleum Corporation. The operation was conducted by Exoil (N.T.) Pty. Ltd. under a farmout agreement with Magellan Petroleum (N.T.) Pty. Ltd. Partners with Exoil were Transoil (N.T.) Pty. Ltd. & Farmout Drillers No Liability. The well was sited on the crest of the Johnny's Creek Anticline (approximately 12 miles south of the Mereenie field) as a petroleum test of the Lower Ordovician and Cambrian section of this part of the basin.

W E L L H I S T O R Y

GENERAL DATA:

Well Name and Number: Johnny's Creek No. 1

Location: 24°08'46"S; 131°29'41"E

National Grid Sheet SG 54-2 Lake Amadeus

Name and Address of Tenement Holder:

Magellan Petroleum (N.T.) Pty. Ltd.,
762 Edward Street,
BRISBANE.

Details of Petroleum Tenement: Permit No. 43, Northern Territory.

Area: 6,950 square miles

Permission to Drill: Agreement between Exoil (N.T.) Pty. Ltd. and Magellan Petroleum (N.T.) Pty. Ltd.

District: Alice Springs.

Total Depth: 877 feet Driller

Date Drilling Commenced: 8th February, 1965.

Date Drilling Completed: 2nd March, 1965.

Date Rig Released: 7th March, 1965.

Drilling Time in days to Total Depth: 23 days

Elevation: Ground 2200' a.s.l. (approximately only).

Kelly Bushing 2211' a.s.l.

Status: Plugged and abandoned

DRILLING DATA:

Name and Address of Drilling Contractor:

Oil Drilling and Exploration Ltd.,
93 York Street,
SYDNEY.
New South Wales.

Drilling Plant:

Make and Type: National T-32
Motors (2) : G.M.C. Twin Model 471, 225 h.p.

Mast: Make and Type: Emsco Serial 12
Rated Capacity: 416,000 lbs.

Pumps (2):

Make and Type: National C-250 Emsco D-300
Size: 7¼" x 15" 7¼" x 14"
Motors: 1 Twin G.M.C. 671 1 Twin G.M.C. 671
1 Twin G.M.C. 471

Air Drilling Equipment:

<u>Unit</u>	<u>Make</u>	<u>Type</u>	<u>Size</u>	<u>Motors</u>
Compressor	Ingersoll-Rand	HHE-2 Stage	1500 c.f.m. 300 p.s.i.	Waukesha 405 h.p.
Booster Compressor	Ingersoll-Rand	HHE-2 Stage	3000 c.f.m. 1500 p.s.i.	Waukesha 405 h.p.
Injection Pump	Aldrich	Triplex HS-3B	1" x 2½"	Wisconsin 30 h.p.

Blow-out Preventer Equipment:

Make:	Schaffer	Hydril	Schaffer
Model:	B	G.K.	Rotating
Size:	12" Series 900	12" Series 900	12" Series 900
Working Pressure	3000 p.s.i.	3000 p.s.i.	3000 p.s.i.

Hole Sizes and Depths:

20" hole from surface to 60 feet
17½" hole from 60 feet to 118 feet

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Hole Sizes and Depths: (cont.)

13 $\frac{1}{4}$ " hole from 118 feet to 739 feet

7 $\frac{7}{8}$ " hole from 739 feet to 877 feet

Casing and Cementing Details:

Size:	16"	10 $\frac{3}{4}$ "
Weight:	55 lb.	32.75 lb.
Grade:	Conductor pipe	H-40
Setting Depth:	94 feet	604 feet
Cement used:	35 sacks	310 sacks
Cemented to:	Surface	-
Method Used:	Rig Pumps	Rig Pumps, plug.

Drilling Fluid:

Air, mist and aerated water were used as circulating fluids. Air drilling proceeded from surface to 536 feet. Mist drilling was used below 536 feet. By 739 feet, water flow into the well bore had reached such a volume that the remaining drilling was, in effect, aerated water and mist drilling. A solution of foaming agent (Tolfoam) and corrosion inhibitors (Caustic Soda and Potassium Bichromate) were injected into the well while mist drilling. Mud additives and lost circulation material were used to combat the severe caving hole conditions, described in detail later, which forced abandonment of the well. The well was filled with gel, mud and lost circulation material before plugging and abandonment.

MUD AND ADDITIVES USED:

Gel	18,500 lbs.
Spersene	500 lbs.
Calcium Chloride	7,560 lbs.
XP-20	250 lbs.
Caustic Soda	663 lbs.
Sodium Bicarbonate	279 lbs.
Tolfoam	146 $\frac{1}{2}$ gallons

Potassium Bichromate	676 lbs.
Lost Circulation Material	192 bags
Cement plugs for Caving zone	3,320 sacks

The total weight of mud and additives used was 28,428 pounds, plus 146½ gallons of Tolfoam and 192 bags of lost circulation material.

Water Supply:

Water for the drilling operation was pumped from a bore one mile from the wellsite through a 2" water-line. The bore was drilled to 320 feet by Mercon Ltd. for Exoil using a Failing 1000 rotary rig. Initially the bore tested fresh water, but when the well was re-opened approximately one year later the water proved to be brackish. An adequate supply was maintained for drilling purposes, but limited supplies of fresh water for the camp was hauled 100 miles from the Areyonga Aboriginal Mission by water truck.

Fishing Operations:

One fishing operation was necessary on Johnny's Creek No.1. When cleaning out the hole before running plug No. 18. the rotating drive sleeve became stuck in the rotating B.O.P. The holding spring snapped and the kelly rotating drive fell through the B.O.P's. and lodged in the casing bowl. 2½ hours were required for the removal of the B.O.P's. and recovery of the rotating drive sleeve.

Ditch Cuttings:

Ditch cuttings were collected at ten foot intervals from surface to 877 feet. Three cuts of samples were made - one for the Northern Territory Administration, Alice Springs, one for Magellan Petroleum (N.T.) Pty. Ltd., and one for Exoil (N.T.) Pty. Ltd.

Coring:

Coring equipment used consisted of a 20 foot Hughes Tool Co. Type "J" conventional core barrel with hard

formation core heads. One core was cut from 514 feet to 536 feet for stratigraphic information in the Pacoota Sandstone. Recovery was two feet or 9.1% of the cored interval.

A Christensen 6 $\frac{1}{4}$ " x 60' Diamond core barrel was available on location.

Electrical and other Logging:

No logs were run due to bad hole conditions.

Drilling Time and Gas Log:

One foot drilling times were recorded on a geolograph and plotted on a composite log as penetration time per five foot interval.

Mud logging was not required as air and mist drilling provided continuous open hole evaluation. A Corelab hot-wire gas detector was on site. No hydrocarbon shows were recorded in the well.

Caving Hole:

Johnny's Creek No. 1 was abandoned at 877 feet after unsuccessfully attempting to overcome severe caving hole conditions below 600 feet. A total of 360.5 hours, or 57% of rig time was lost combating caving hole.

The hole conditions had been aggravated by severe lost circulation which prevented the supporting of the sands by drilling mud.

An attempt to drill with aerated mud proved unsuccessful due to lack of returns and, with a static water level 400 feet below surface it was impossible to achieve hydrostatic balance with the formation.

The rounded nature of the individual grains and resulting low angle of repose caused the sand to flow freely (Plate 1).

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The carbonate cemented lower Pacoota and Goyder formation being located in juxtaposition with a fluctuating

water table resulting in loose sands was an unfortunate occurrence. It is assumed that by moving down structure where the water table coincides with the more siliceous cemented part of the Pacoota loose sands will not be expected.

Forty-three cement plugs were set using 3320 sacks of cement. These are tabled below:-

<u>Plug No.</u>	<u>Setting Depth</u>	<u>Cement Used</u>	<u>Plaster Used</u>	<u>CaCl₂</u>	<u>Slurry</u>	<u>Felt Top</u>	<u>Remarks</u>	
1	640	255		4%	14.4		Failed	
2	550	45		4%	14.6	583	Failed	
3	400	40		4%	14.8		Lost to Formation	
4	528	50		3%	14.2	589	Failed	
5	445	40		3%	14.8		Lost to Formation	
6	580	75			14.4		Failed	
7	405	85		3%	14.0		Failed	
8	495	50		4%	14.0	548	Failed	
9	528	70	14		14.8	533	W.O.C. reamed 13 $\frac{3}{4}$ " hole out to 690', ran Plug No.10.	
10	645	70		4%	14.8	596	Failed	
11	595	550 lbs. AM-9, 22 lbs. DMAPN, 50 lbs. A.P., 0.2 lbs. K.F.C., 490 gallons water.						
12	590	70		4%	14.6	580	Failed	
13	580	80		4%	14.5	574	Failed	
14	570	70		4%	14.6	566	Reamed to 13 $\frac{3}{4}$ " to 739', ran 10 $\frac{3}{4}$ " casing to 604' - hole making water below casing shoe.	
15	616	70		4%	14.8		Failed	
16	631	70		4%	14.6	607	Drill out, run Plug No. 17.	
17	648	130		4%	14.5	626	Squeeze to 100 p.s.i. drill out, ran Plug No. 18.	
18	641	50		4%	14.6		Failed	
19	616	50		2%	14.5		Filled hole with gravel before running Plugs Nos. 18,19, 20,21 and 22.	

<u>Plug No.</u>	<u>Setting Depth</u>	<u>Cement Used</u>	<u>Plaster Used</u>	<u>CaCl₂</u>	<u>Slurry</u>	<u>Felt Top</u>	<u>Remarks</u>
20	618	50		2%	14.6		Failed
21	606	50		2%	14.5		Failed
22	550	30		2%	14.6		Squeezed to 1000 p.s.i. drill out cement, hole caving.
23	690	150		1%	14.8	650	Failed
24	650	120			14.5	649	25th hole making water and sand after drilling out.
25	646	70			14.6	615	Failed
26	616	50			14.6		Ran 20 barrels mud and L.C.M. ahead of plug - plug lost to formation.
27	538	70			14.5		Squeeze to 100 p.s.i. Hole still caving.
28	738	120		4%	14.5		Ran 15 barrels Gel and L.C.M. ahead of plug.
29	665	90		4%	14.5	678	Failed
30	678	70	13		14.7		Failed
31	640	80		4%	14.5		Failed
32	550	70	12		14.6		Ran 15 barrels Gel and L.C.M. ahead of plug.
33	665	70		3%	14.6	657	Failed
34	657	70		4%	14.6		Failed
35	655	70		4%	14.5		Failed
36	460	160	15	2%	14.6	602	Drill out plugs, clear hole with Gel and L.C.M. lost circulation at 656'.
37	592	120		3%	14.6		Ran 15 barrels mud and L.C.M. ahead of plugs.

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38	546	50		3%	14.6	597	Squeezed to 100 p.s.i. Drilled out. Making water at 660'.
39	709	120		3%	14.6		Failed
40	685	70		4%	14.6		Failed
41	658	50		4%	14.6		Failed
42	610	50		4%	14.6		Failed
43	550	100		2%	14.6	648	Hole still caving. Abandon well.

A total of 3320 sacks (139.3 tons) of cement was used in fighting the caving hole plus 622 lbs. of AM-9 chemical grout.

Formation Testing:

No formation tests were carried out at Johnny's Creek No. 1.

Deviation Surveys:

Deviation surveys were run on a wire line and recovered at surface in intervals during drilling operations.

Readings were:-

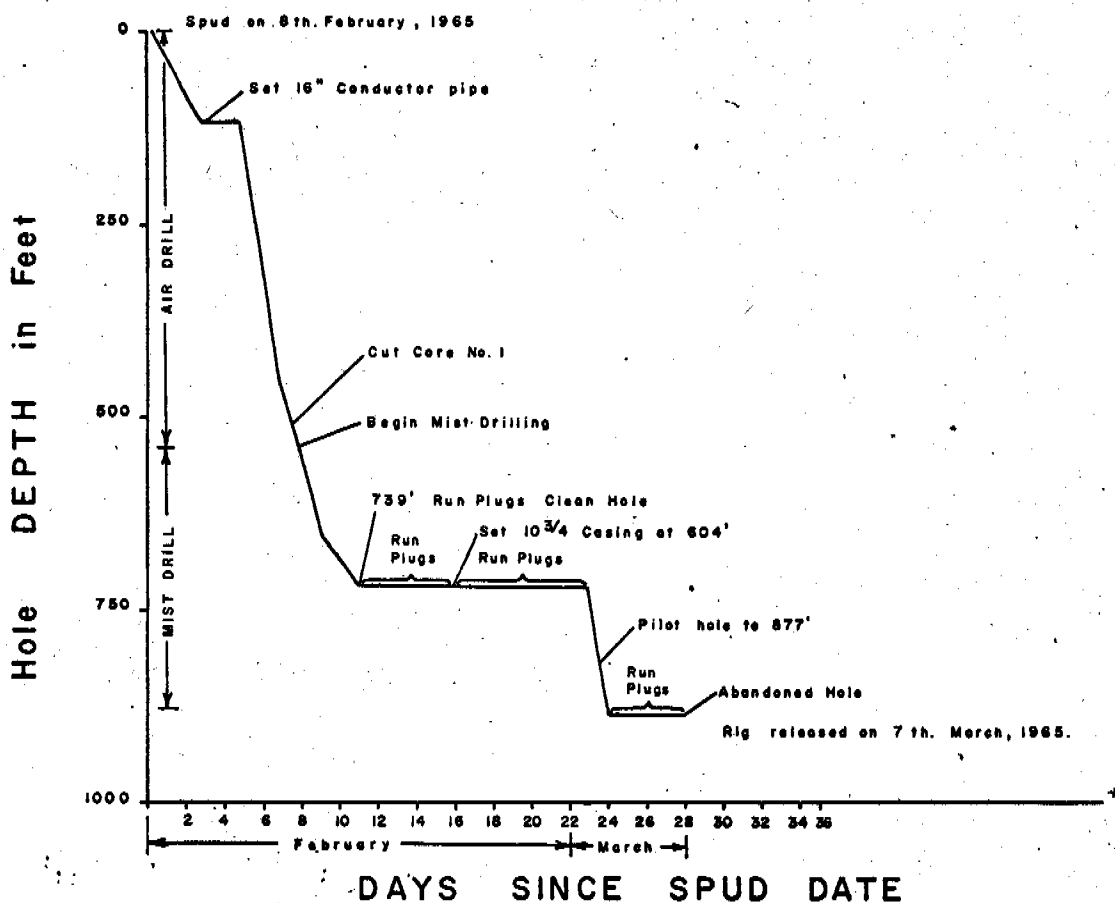
182'	$\frac{3}{4}^{\circ}$
273'	$\frac{1}{4}^{\circ}$
574'	$1\frac{3}{4}^{\circ}$
653'	$2\frac{1}{8}^{\circ}$
795'	1°

Drilling Observations:

Only 80½ rotating hours were used to drill Johnny's Creek No. 1 (13% of total time). Ten bits were used to drill 877 feet of hole and a further six bits were used in cleaning out hole and drilling up plugs. In addition one reamer was run on surface hole.

<u>Depth</u>	<u>No. of Bits</u>	<u>No. of Hours</u>	<u>Average Penetration Rate</u>	<u>Average Footage/Bit</u>
877'	10	80.5	10.9 ft./hr.	87.7 ft.

EXOIL N.L.
 TIME Versus DEPTH
 JOHNNY'S CREEK No. 1



Breakdown of Drilling Operation:

	<u>Footage</u>	<u>Hours Required</u>	<u>No. of Bits</u>	<u>Ft./hour</u>	<u>Footage/ Bit</u>
Surface Hole	118	19 $\frac{1}{4}$	2	6.1	59
Air Drilling 13 $\frac{1}{4}$ " hole	418	41 $\frac{1}{4}$	4	10.1	104
Mist Drilling 13 $\frac{1}{4}$ ", 9 $\frac{7}{8}$ " and 7 $\frac{7}{8}$ " hole	341	20	4	17.1	85

POROSITY AND PERMEABILITY OF SEDIMENTS

Porosity and permeability was determined visually from cuttings and core samples. Some solution porosity is noticeable in core No. 1 (above the top of the Water Table). This core and cuttings suggest that the general leached nature of the section and the high porosity in the Sandstones is due to the removing of the carbonate matrix by solution leaving unconsolidated insoluble sand in cavernous layers. In caving sections of the hole (below 550 feet) porosity and permeability is extremely high (as much as 30% was described from cuttings).

G E O L O G Y

Previous Work:

The Johnny's Creek Anticline is a large surface structure in the western part of the Amadeus Basin. Regional geological surveys have been carried out in the area by various workers, the most recent being by R. Hopkins of Magellan Petroleum Corporation, completed in August, 1964. No geophysical investigation has been conducted in the area. The nearest well is the East Mereenie No. 1 well some twelve miles to the north. As the anticline has obvious large surface closure, no effort was made to map closure at depth with seismic work. Limited stratigraphic control was interpolated from the Parana Hill and Gardiner Range areas some 20 miles east and 40 miles north respectively.