EAST MEREENIE NO 4

W E L L H I S T O R Y

GENERAL DATA:-

Well Name and Number: East Mereenie No 4

Location: 24°01'57" South, 131°37'48" East

Well spudded: 24th April, 1967

Rig Released from Drilling: 4th July, 1967

Drilling Time in Days to Total Depth: 70

Elevation: Ground 2352' asl Kelly Bushing 2368' asl

Total Depth: 8750' Driller, 8747' Welex.

DRILLING DATA:

Name and Address of Drilling Contractor:

Oil Drilling and Exploration Ltd
93 York Street
SYDNEY N S W

Drilling Plant:

Make : National

Type : 55

Motors (3) : Caterpillar Type D-375 V-8, 334 HP

Mast: Make : Ideco

Type : FM-136-450 Full view

Rated Capacity : 700,000 lb

Pumps: (2)

Make : Gardner - Denver

Type : GR - GXP

Size : $7\frac{3}{4}$" x 16"

Blow Out Preventor Equipment:

Make :	Shaffer	Hydril	Shaffer
Model:	"B"	GK	Rotating

Size :	12"	12"	12"
Series:	900	900	900

Working Pressure:

3,000 psi	3,000 psi	3,000 psi

Gas Drilling Equipment:

Unit	Make	Type	Size	Motor
Separator	Rolo	Wellchecker	1000 psi wp	-
Injection Pump	Aldrich	Triplex HS-3B	1"x2½"	Wisconsin 30 HP

Casing & Cementing Details:

Size	:	15½"	$10\frac{3}{4}$"	$8\frac{5}{8}$"
Weight	:	Conductor	40.5 lb	32 lb
Grade	:	Pipe	J-55	J-55
Setting Depth	:	134'	2203'	5265'
Cement Used	:	150 sax	450 sax	555 sax
Cemented to	:	Surface	-	3390'
Method used	:	O.D.E. (B.J. Auger type)	H.O.W.C.O. T-400	H.O.W.C.O. T-400

Drilling Fluid:

The following table shows the circulating fluid used to drill the East Mereenie No 4 Well

Circulating Fluid Type	Hole Size	Depth Range From	To	Remarks
Air	17½"	Surf	134'	Set 15½" Conductor Pipe 134'
Gas	$13\frac{3}{4}$"	134'	442'	Top Water Table 430'
Gas Mist	$13\frac{3}{4}$"	442'	2205'	Reduce Hole Size
Gas Mist	$9\frac{7}{8}$"	2205'	2256'	Set $10\frac{3}{4}$" Casing 2203'
Gas	$9\frac{7}{8}$"	2256'	4117'	Kill Well with 10.2 lb/barrel Salt Water 4117'

Salt Water (saturated)	$9\frac{7}{8}$"	4117'	4585'	Change to Gel Mud 4585'
Mud	$9\frac{7}{8}$"	4585'	5265'	Set $8\frac{5}{8}$" Casing 5265'
Gas	$7\frac{7}{8}$"	5265'	5283'	Hole making 5 bbls/hr Water below Shoe
Gas Mist	$7\frac{7}{8}$"	5283'	8484'	Increase Water Flow below 8412'
Gas Water	$7\frac{7}{8}$"	8484'	8656'	Well "Surging" strongly
Water	$7\frac{7}{8}$"	8656	8750'	Well TD 8750'

Choke size Supply Wellhead and East Mereenie No 4

Interval	Choke East Mereenie No 2	Choke East Mereenie No 4	Supply Well Flowing on
134' - 989'	$\frac{3}{4}$"	Open	Tubing only
989' - 2256'	$\frac{3}{4}$"	$\frac{3}{4}$"	Tubing & Annulus
2256' - 4117'	$\frac{3}{4}$"	Open	Tubing only
5265' - 5802'	$\frac{3}{4}$"	Open	Tubing only
5802' - 6294'	$\frac{3}{4}$"	$\frac{3}{4}$"	Tubing only
6294' - 8484'	$\frac{3}{4}$"	$\frac{3}{4}$"	Tubing & Annulus
8484' - 8656'	$\frac{3}{4}$"	$\frac{1}{2}$"	Tubing & Annulus

Separator on Line	Mist Pump on Line
134' - 442'	442' - 2256'
2256' - 4117'	5283' - 8484'
5265' - 5802'	

Injection Rate Whilst Mist Drilling:

442' - 1729'	10 Bbls/Hr	
1729' - 2030'	20 Bbls/Hr)	Using Gardner Denver
2030' - 2256'	30 Bbls/Hr)	4" x 6" Water Pump

5283' - 6530'	5 Bbls/Hr	
6530' - 6585'	10 Bbls/Hr	
6585' - 7053'	5 Bbls/Hr	
7053' - 7204'	8 Bbls/Hr	
7204' - 7512'	7 Bbls/Hr	
7512' - 8412'	4 Bbls/Hr	(Full Strength Comprox)
8412' - 8484'	12 Bbls/Hr	

Note on Interval 4117 - 5265': The well was killed with Salt water at 4117'. Salt water drilling was carried out to 4585'. Several problems were experienced during this time. The most particular being the results of D.S.T. 1. The saturated salt water reduced the permeability of the formation so that although 2-15 md of Permeability are shown over an interval of 47 ft in Core No 1. No flow at all was recorded on D.S.T. 1.

Lost Circulation:

There were no Lost Circulation zones in East Mereenie No 4. Some fluid was inevitably lost to the formation when killing the well at 4117' and whilst changing to gel mud at 4585'.

Circulating Fluid - Additives Used:

The following materials were used in the circulating Fluid.

Whilst Gas Drilling:

Surface - 4117'

Comprox	-	986 gallons
Sodium Bichromate	-	4920 lbs
Caustic	-	4340 lbs

5265' - 8656'

Comprox	-	704 gallons
Sodium Bichromate	-	1960 lbs
Caustic	-	2140 lbs

Total Used Whilst Gas Drilling

Comprox	-	1672 gallons
Sodium Bichromate	-	6880 lbs
Caustic	-	6480 lbs

Whilst Salt Water Drilling
4117' - 4585'

Sodium Bichromate	-	1120 lbs
Caustic	-	4900 lbs
Lime	-	1200 lbs
Calcium Chloride	-	55160 lbs
Gel	-	3000 lbs
Salt	-	88¼ tons

Whilst Mud Drilling
5485' - 5265'

Caustic	-	4480 lbs
Gel	-	61100 lbs
Barytes	-	153496 lbs
Spersene	-	3650 lbs
XP20	-	1250 lbs
Unical	-	2900 lbs
Milcon	-	1450 lbs
Myrtan	-	1650 lbs
Cellofas	-	1000 lbs
Driscose	-	850 lbs

Total weight of additives used was: 310,566 lbs (13,720 lbs whilst gas drilling) together with 1672 gallons of Foaming agent (used whilst gas drilling) and 88¼ tons of Salt (used whilst salt water drilling).

Water Supply:

Water was pumped to the rig through a 2" line from a water well approximately 1½ miles away. The Water supply was augmented during drilling operations by the recirculation of produced water. An earthern

dam was constructed prior to the commencement of drilling operations across a creek approximately ½ mile downstream of the rig. Water stored in this dam during gas water drilling was used to supply rig water for drilling operations.

Plugging Bake and Squeeze Jobs:

No squeeze jobs were carried out at East Mereenie No 4. after T.D. was reached the lower part of the hole below 4866' (inside $8\frac{5}{8}$" Casing) was plugged off. The following three plugs were run.

Plug No	Setting Depth	Cement Used	Slurry	%$CaCl_2$	Top Cement
1	8700'	150 sax	14.3	-	-
2	6400'	50 sax	14.3	-	-
3	5400'	160 sax	14.5	2	4866'

All plugs were cemented by H.O.W.C.O.

Fishing Operations:

Three Fishing jobs were carried out at East Mereenie No 4.

1. 131': Twisted off connection as base kelly saver sub Top of Fish 95' off bottom. Recovered fish first run with overshot.

2. 4246': Twisted off connection in small crossover sub at top No 4 8" Drill Collar. Top of Fish 120' off bottom. Recovered fish first run with overshot.

3. 4585': Whilst circulating and conditioning mud, pipe became stuck in hole 40' off bottom, work stuck pipe, spotted 150 bbl, Fresh water whilst working pipe, pipe became free after $5\frac{3}{4}$ hours. (Pipe stuck due to differential sticking).

A total of 17 hours were spent on fishing operations at East Mereenie No 4 (Approximately 1% of total time).

Ditch Cuttings:

Cutting samples were collected at 10 foot intervals from surface to T.D. except where prevented by drilling conditions. Samples in general were fairly good.

Three sample cuts were made. One for the Northern Territory Administration, one for Magellan Petroleum (NT) Pty Ltd and one for Exoil (NT) Pty ltd.

Coring:

Cores were cut at the discretion of the wellsite geologist. Cores Nos 1, 2 and 3 were cut using a Christensen $8\frac{11}{16}$" diamond Core Head, Cores Nos 4, 5 and 7 were cut using a Christensen $7\frac{13}{16}$" diamond Core Head. A Christensen 60' x 6½" O.D. x 3½" I.D. diamond core barrel was used for these cores. Core No 6 was cut using a Hughes "J" type Core barrel with a $7\frac{7}{8}$" hard formation Core Head. One Conventional and two diamond Core Heads were used during coring operations.

The following Core samples were taken at the depths indicated and forwarded to Corelab in Brisbane and the Bureau of Mineral REsources in Canberra as noted. Sample cuts from Cores consisted of approximately 4" each.

Core No	Corelab	B.M.R.
1	4194'	4196'
	4195'	4201'
	4196'	
	4197'	
	4198'	
	4199'	
	4200'	
	4201'	
2 *A1 (Exoil Code)	4604'	4608'
A2	4605'	4613'
A3	4606'	4618'
A4	4607'	
A5	4608'	
A6	4609'	
X1	4610'	
X2	4611'	
X3	4612'	
X4	4613'	
X5	4614'	
X6	4615'	
X7	4616'	
X8	4617'	
X9	4618'	
X10	4619'	

* Note: This Code refers to Core Samples dropped from Core Barrel during recovery of Core No 2. The depths are approximate only but are considered to be relatively correct for sample purposes.

Core No	Corelab	B.M.R.
3	4622'	4625'
	4623'	4630'
	4624'	4635'
	4625'	
	4626'	
	4627'	
	4628'	
	4629'	
	4630'	
	4631'	
	4632'	
	4633'	
	4634'	
	4635'	
	4636'	
4	4701'	4702'
	4702'	4710'
	4703'	4712'
	4705'	4718'
	4706'	4731'
	4707'	4742'
	4708'	4747'
	4709'	4752'
	4710'	
	4711'	
	4712'	
	4713'	
	4714'	
	4717'	
	4718'	
	4719'	
	4720'	
	4729'	
	4730'	

4731'
4732'
4733'
4734'
*4738'
4739'
4740'
4741'
4742'
4743'
4744'
4745'
4746'
4747'
4748'
4749'
4750'
4751'
4752'
4753'
4754'
4752'

* Note: Samples 4738 - 4755' incl from Core No 4 were sealed in Cans and sent to Corelab for Oil & Water Saturation analysis. All Core samples sent to the BMR were sealed in Cans and analysed for Oil & Water Saturation. The remainder of the Core samples were sealed in plastic and sent to Corelab in Brisbane for Porosity and Permeability analysis.

In addition to the above sampling, 1' core chips from cores 2-3-4 were taken by Magellan (NT) Pty Ltd and selected chips were taken by Exoil (NT) Pty Ltd for thin section analysis. See Appendix A (i) for Core Descriptions; Appendix A (ii) and A (iii) for Core Analysis results by Corelab and BMR respectively. Selected Pectrographic descriptions by Cundill-Meyers and Associates are in Appendix B.

The remainder of the cores were boxed and sent to Alice Springs for storage. 135 hours, approximately 8% of total time, was spent on coring operations (Including Trips).

Core No	Interval	Cored	Recovered	% Recovered
1	4190' - 4215'	25'	20' 7"	82
2	4585' - 4620'	35'	33' 7"	96
3	4621' - 4646'	25'	23' 0"	92
4	4700' - 4760'	60'	60' 0"	100
5	6456' - 6477'	21'	13' 7"	65
6	6948' - 6957'	9'	6'11"	77
7	8577' - 8584'	7'	7' 0"	100

Total Footage Cored : 182'
Total Footage Recovered : 164'6"
Percentage Recovered : 90%

Cores No 1 - 4 were cut in Pacoota Formation
Core No 5 was cut in Deception Formation
Core No 6 was cut in Illara Formation
Core No 7 was cut in Bitter Springs Formation

Electrical & Other Logs:

Two complete Logging runs and one correlation run with the Gamma-Ray were made by Welex. The two major runs were made at 5265' and 8750' and the correlation run was made at 4532'.

Corelab

4720'
4729'
4730'
4731'
4732'
4733'

* 4738'
4739'
4740'
4741'
4742'
4743'
4745'
4746'
4747'
4748'
4749'
4750'
4751'
4752'
4753'
4754'
4755'

* Note: Samples 4738 - 4755' Incl from Core No 4 were sealed in Cans and sent to Corelab for Oil & Water Saturation analysis. All Core samples sent to BMR were sealed in Cans and analysed for Oil & Water saturation. The remainder of the Core samples were sealed in plastic and sent to Corelab in Brisbane for Porosity and Permeability analysis.

Run	Type	Interval Logged
1	Gamma-Ray	Surface - 4522'
2	Gamma-Ray	2180' - 5256'
3	Gamma-Ray	5000' - 8729'
1	Guard	2180' - 5258'
2	Guard	5250' - 8742'
1	Acoustic-Velocity	2180' - 5256'
2	Acoustic-Velocity	5000' - 8729'
1	Forxo-Caliper	2180' - 5262'
1	Microseismic	3000' - 5257'

Logs were run on scales of 2" = 100' and 5" = 100'.

Drilling Time and Hydrocarbon Log:

One foot drilling times were recorded on a Geolograph. Open hole evaluation and mud logging was carried out by the Exoil wellsite geologist using a Core Laboratories gas detector where applicable. Five foot drilling times and hydrocarbon log are shown on the composite log. Figure 2 shows the time versus depth graph.

Formation Testing:

Open hole evaluation was continuous during gas drilling operations. The Upper Stairway Sandstone flowed initially at rates of 76 m.c.f.d. Two sandstone zones in the lower Stairway flowed gas. The Upper zone was intersected at 3512' and flowed initially at rates of 300 m.c.f.d.; the lower zone was intersected at approximately 3600' and total flows initially measured inexcess of 439 m.c.f.d. Gas was flaring intermittently on connections below 3125' and continuously on connections below 3512'.

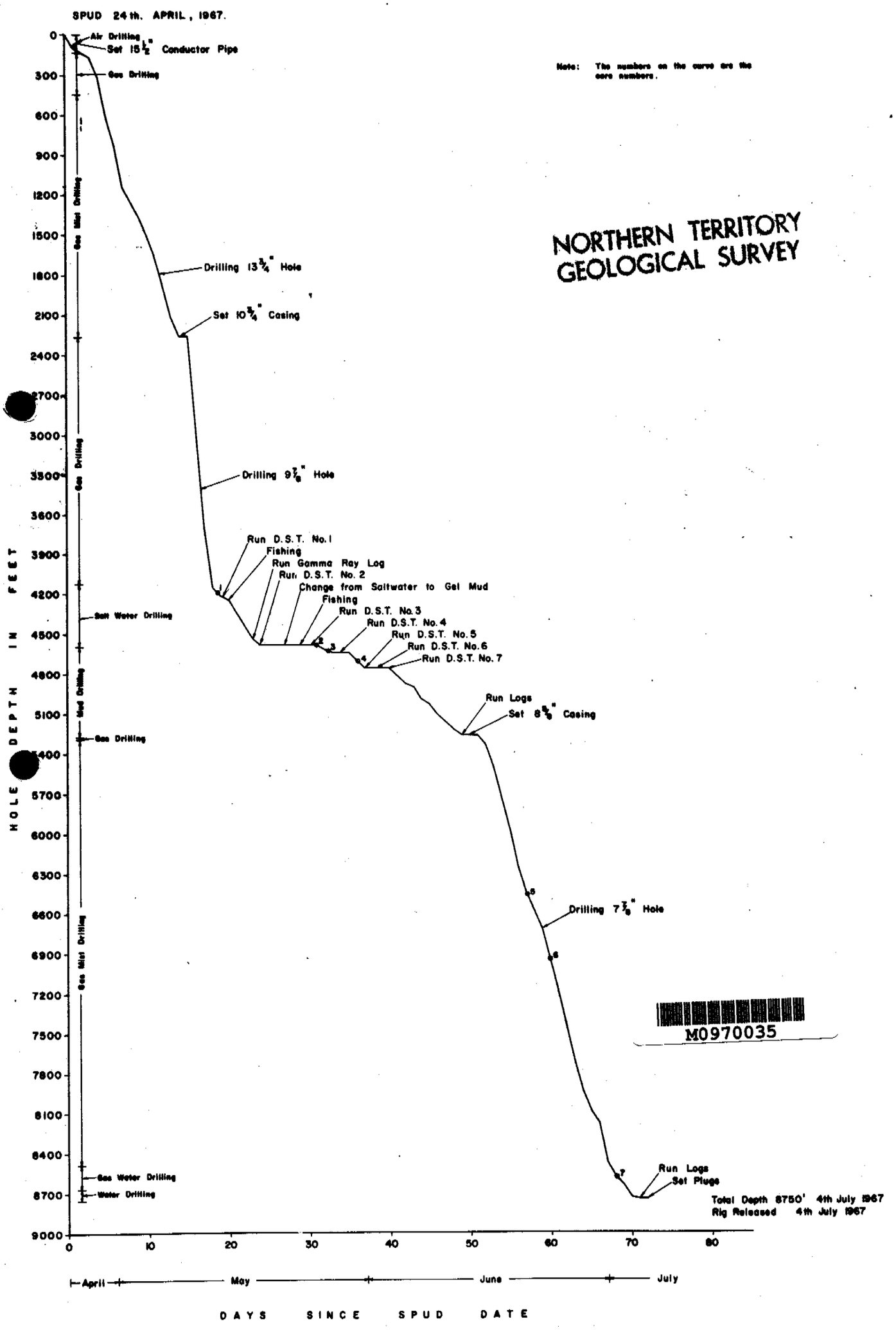
The top gas sand in the Upper Pacoota was intersected at 3992' and was open hole tested at 4117'. Maximum stabilised flow from this sand was

EXOIL (N.T.) PTY. LTD.

FIG. 2

EAST MEREENIE No. 4

TIME VERSUS DEPTH



5.5. Mm.c.f.d. The well was killed with salt water at 4117' and salt water drilling was continued to 4585', two D.S.T.'s were run during this period. At 4584' the hole was filled with gel mud and mud drilling was continued to 5265'. D.S.T.'s 3 - 7 (Inc) were run during this period. After setting $8\frac{5}{8}$" Casing at 5265'. Gas drilling was used to T.D. No shows of Oil of Gas were encountered during this period. An influx of water was recorded after the Intersection of Bitter Springs Formation; this flow (associated with pinpoint vuggy porosity) was below 8412'.

Open Hole Tests:

The following table shows the results of Open Hole tests carried out at East Mereenie No 4. All gas flows except Open hole Test No 8 were recorded using a pitot tube of manometer. Flows on Test No 8 were recorded using a 4" Critical Flow Prover.

OPEN HOLE TESTS

Date	Test No	Formation	Depth	Stabilised Flow
10th	1	Upper Stairway	3155'	0.3" H_2O - 76 m.c.f.d.
11th	2	Upper Stairway	3399'	0.1" H_2O - 44 m.c.f.d.
11th	3	Lower Stairway	3526'	Initial 4.8" H_2O - 300 m.c.f.d. After 10 mins 1.0" - 139 m.c.f.d.
11th	4	Lower Stairway	3670'	10.0" H_2O - 439 m.c.f.d.
11th	5	Lower Stairway	3729'	10.0" H_2O - 439 m.c.f.d.
11th	6	Lower Stairway	3936'	6.6" H_2O - 362 m.c.f.d.
11th	7	Lower Stairway	3936'	3.0" H_2O - 240 m.c.f.d.

Note: * Test No 4 Flow not stabilised. Still building up after 20 min Flowing.

** Test No 7 taken 6 hours after Test No 6. Both flow stabilised.

All above measurements made with Pitot tube and manometer through 2" Riser.

OPEN HOLE TEST

UPPER PACOOTA SANDSTONE

Top gas sand in Upper Pacoota 3992'.
Measurement made with Pressure gauge and 1½" plate in 4" Critical Flow Prover.

Open Hole Test No 8 at 4117' (12th May)

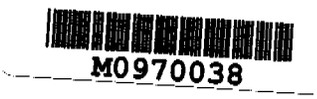
Time	Measurement (psi)	Rate of Flow (m.c.f.d.)
1.00 am	30	2,197
1.02 am	65	3,929
1.05 am	83	4,804
1.08 am	93	5,296
1.10 am	98	5,542
1.13 am	98	5,542
1.15 am	98	5,542

Maximum Stabilised Flow 5.5 m.c.f.d.

Drill Stem Tests:

Seven drill stem tests were run at East Mereenie No 4. All measurements of gas flows were made using a pitot tube and manometer.

Test No	Interval	Recovery	Remarks
1	4184' - 4215'	50' Drilling Fluid	Test mechanically effective but failed to evaluate interval due to Formation damage.
2	4483' - 4585'	120' Slightly oil cut drilling fluid	Test pulled after 10 min of I.S.I. due gas cut salt water kicking in annulus.
3	4483' - 4585'	300' Oil cut drilling fluid	Rerun of Test No 2 after changeover to mud. Formation appears porous but has low Permeability.
4	4587' - 4646'	45 Bbls free Oil	Gas to surface 6 mins Stab flow 88 m.c.f.d. Rec indicates flow rate of 149 B.O.P.D. Formation appears to have reasonable Porosity and Permeability.
5	4695' - 4760'	36 bbls free oil 2 bbls mud cut oil	Gas to surface 5 mins. Stab flow 88 m.c.f.d. Rec indicates flow rate of 151 B.O.P.D. Formation appears to have reasonable Porosity and Permeability.
6	4589' - 4761'	45 bbls free oil 2 bbls mud cut oil	Gas to surface 11 mins. Stab flow 44 m.c.f.d. Rec indicates flow rate of 91 B.O.P.D. Test indicates reduction in Permeability of Interval due formation damage.



Test No	Interval	Recovery	Remarks
7	4695' - 4761'	300' Oil cut mud	Gas to surface at commencement of flow period. T.S.T.M. re-evaluation of D.S.T. 5 formation appears tight due formation damage from mud.

D.S.T. 1 - 7

Were run in the Upper Pacoota Formation. D.S.T. 1 was within the Gas Column. The other D.S.T.'s were in the Oil Column. No surface chokes were run during the tests, I.D. of the Johnston 4 Stage Shut in tool ($\frac{5}{8}$") provides an effective bottom hole choke. All pressures were recorded using Johnston Type T-1 pressure recorders. Details of D.S.T.'s appear in Appendix E.

A total of $123\frac{3}{4}$ hours approximately 7% of total time was spent Testing East Mereenie No 4.

Deviation Surveys:

Deviation Surveys were run on a sand line during drilling operations using a "Totco" double shot deviation recorder. Readings are tabulated below:

Depth (ft)	Deviation (Deg°)
70	$\frac{3}{4}$
109	1
205	$\frac{3}{4}$
410	½
672	1
940	$\frac{3}{4}$
1135	$1\frac{1}{8}$
1400	1¼
1690	1
1920	1½
2185	2

Depth (ft)	Deviation (Deg°)
2890	$1\frac{7}{8}$
3925	4¼
4175	4½
4401	4½
4670	3
5081	$1\frac{3}{4}$
6250	2
6700	3
7300	3
7800	8+
8120	8+
8600	10

Increase in Deviation below 7300' is probably associated with change in formation at top of Tempe.

Drilling Observations:

A total of 1707½ hours were required to drill East Mereenie No 4. Total rotating hours on bottom (excluding coring) were 768½; approximately 45% of total time. A total of 43 bits drilled 8568 feet of hole. These bits were used as follows:

Fluid	No of bits	Footage Drilled	Hours Required	Average Penetration (Ft/hr)	Ft/Bit
Air & Gas (Inc Water)	33	7565	549.0	13.8	230
Salt Water	3	443	63.5	7.0	148
Mud	8	560	166.0	3.4	70

Note: Bit Number 15 drilled 181 feet in 5 hours (gas) and 73 feet in 9 hours (salt water).

Average penetration rate for the hole (excluding coring) was 11.1 ft/hour. fifteen (15) conventional and twenty-eight (28) button bits were used in

drilling operations. Penetration averaged 199 ft/Bits. Average penetration rate for the 182 feet of hole core was 2.1 ft/hr.

Breakdown of Drilling Operations:

	Footage	Hours Required	Ft/Hr	No of Bits	Ft/Bit
Surface Hole	134	22.75	5.9	2	67
Gas Drill $13\frac{3}{4}$" Hole	308	35.25	8.7	2	154
Gas Mist Drill $13\frac{3}{4}$" Hole	1763	175.00	10.1	8	220
Gas Drill $9\frac{7}{8}$" Hole	1912	45.5	42.0	3	637
Salt Water Drill $9\frac{7}{8}$" Hole	443	63.5	7.0	3	148
Mud Drill $9\frac{7}{8}$" Hole	560	166.0	3.4	8	70
Gas Mist Drill $7\frac{7}{8}$" Hole	3189	228.25	14.0	15	213
Gas Water Drill $7\frac{7}{8}$" Hole	165	16.5	10.0	1	165
Water Drill $7\frac{7}{8}$" Hole	94	15.75	6.0	1	94