FINA EXPLORATION AUSTRALIA S. A.

ARCHER-1

WELL COMPLETION REPORT

VOLUME 2

(INTERPRETATIVE DATA)

PETROFINA EXPLORATION AUSTRALIA S.A.

WELL COMPLETION REPORT ARCHER-1

VOLUME II

INTERPRETATIVE DATA

GL/90/048
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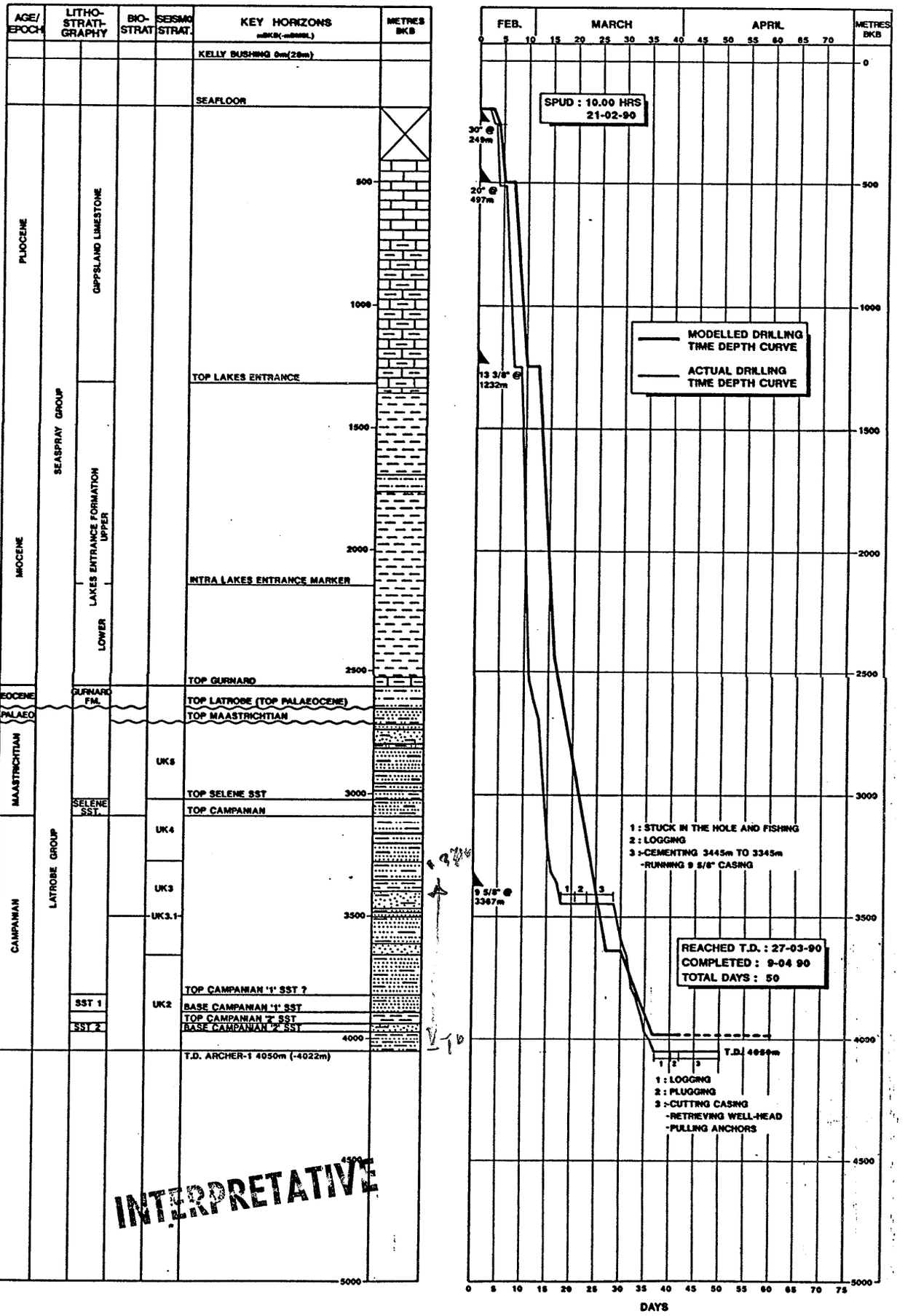
2 August 1990

ARCHER-1

STRATIGRAPHY AND DRILLING TIME DEPTH CURVE



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INTERPRETATIVE DATA

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APPENDIX 1

WELL COMPLETION REPORT

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A P P E N D I X 1

STRATIGRAPHY

PE902093

This is an enclosure indicator page.
The enclosure PE902093 is enclosed within the container PE902092 at this location in this document.

The enclosure PE902093 has the following characteristics:

ITEM_BARCODE	= PE902093
CONTAINER_BARCODE	= PE902092
NAME	= Stratigraphic Log
BASIN	= GIPPSLAND
PERMIT	= VIC/P20
TYPE	= WELL
SUBTYPE	= STRAT_COLUMN
DESCRIPTION	= Stratigraphic Log (enclosure from WCR vol.2) for Archer-1
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	= 4/09/90
W_NO	= W1021
WELL_NAME	= Archer-1
CONTRACTOR	= Petrofina Exploration
CLIENT_OP_CO	= Petrofina Exploration

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 2

WELL COMPLETION REPORT

ARCHER-1

INTERPRETATIVE DATA

A P P E N D I X 2

LOG EVALUATION OF THE LATROBE GROUP

PETROFINA EXPLORATION AUSTRALIA S.A.

Archer-1

Log Evaluation of the

Latrobe Group

GL/90/058

JMQ/kl

20 July 1990

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1. SUMMARY AND CONCLUSIONS

A total of 1500m of wireline logs over the entire Latrobe Group at Archer-1 have been evaluated. The analysis covers the interval 2550m (8.5m above Top Gurnard Formation) to 4050m (TD).

The conclusions are:

(i) Log quality is very good except over occasional small caved sections usually associated with coals.

(ii) Abundant sandstone reservoirs occur in the PL sequence (Palaeocene), and the UK5 and UK4 sequences (Maastrichtian; 2640-3242m), but none of these contained any hydrocarbons.

(iii) The first hydrocarbon bearing reservoirs occur at 3384m, directly below a 42m thick shale unit, within the middle UK3 Sequence (Campanian). Hydrocarbon indications persist down to 4050m (TD) through seven separate hydrocarbon zones.

(iv) The seven hydrocarbon zones comprise 16 independent accumulations. These zones and the 16 accumulations, together with their reservoir characteristics, are listed in Table 1.

(v) Both non-marine and marine shales act as good to excellent permeability barriers giving them a good seal potential. However, the lack of lateral continuity of non-marine shales as opposed to their marine counterparts gives them a moderate to poor caprock potential.

(vi) The lack of hydrocarbons in the UK5 and UK4 sequences may be attributable to the lack of extensive caprocks in this non-marine interval. Alternatively it may be due to the presence of regionally-sealing marine shales near the top of the UK3 Sequence, which are known to be very extensive in the VIC/P20 Permit and could act as a regional barrier to vertical migration of hydrocarbons generated in the UK2 and UK1 Sequences into the stratigraphically shallower UK5 and UK4 Sequences. This concept

is supported by the absence of any moveable hydrocarbons above the UK3 Marker in any of the VIC/P20 wells.

(vii) The excellent seal and caprock potential of the marine shales within the UK3 and UK2 interval is confirmed by the entrapment of hydrocarbons beneath marine shales less than 5m thick.

(viii) All reservoirs below 3384m interpreted as being water bearing on the basis of both log evaluation and RFT results have clear indications of irreducible hydrocarbon saturations. It has now been shown that these reservoirs with irreducible hydrocarbon saturations are juxtaposed to sandstones across the bounding faults allowing hydrocarbons to leak through the faults. This indicates that, during the growth of the Archer Structure, hydrocarbons have passed through the entire gross reservoir column from 3384m to 4050m (TD) and have, apparently, been retained below the more effective caprocks.

(ix) The porosity versus depth plot for Archer-1 (Fig. 1) shows that porosities decrease normally with depth, but that moderate porosities of 12% to 14% can be expected in clean sandstones down to 4000m.

2. INTRODUCTION

This report presents the results of a log analysis over the entire Latrobe Group drilled at Archer-1, a 1550m thick section. The aims of the analysis were to assess the reservoir potential of all the sandstones within the Latrobe Group, quantify the hydrocarbons discovered in reservoirs below 3384m and identify the main seal intervals.

Computations were performed by LOGCALC 2 software from Scientific Software Intercomp, using environmentally corrected wireline logs. As with previous Petrofina log evaluations on other wells of the VIC/P20 permit, a shaley sand model was used with water saturations derived from the Indonesian equation.

Reservoir parameters were selected separately for each zone and Rw values automatically corrected for changes in temperature with depth. Results are presented on a zone by zone basis in Table 2. Table 3 is a summary of the main reservoir and log analysis parameters, while Appendix 1 is a detailed listing of all parameters. Enclosure 1 is a graphic output of raw and environmentally corrected logs on a 1:500 scale; while Enclosure 2 is a display of log analysis results on a more detailed 1:200 scale. Also illustrated on Enclosure 2 are the hydrocarbon Zones 1 to 7, their individual reservoir units and the 16 independent accumulations (C1 to C16) identified over these seven zones.

3. INPUT LOGS AND LOG QUALITY

The following logs were used in the evaluation:

GR (Gamma Ray)
LLD (Deep Laterolog)
LLS (Shallow Laterolog)
MSFL (Micro-spherically focussed log)
RHOB (Bulk Density)
NPHI (Neutron Density)
CAL (Caliper)
DT (Sonic Transit Time)

Hole condition as seen on the caliper log is excellent throughout, except for the interval 2575m to 2620m in the upper-most section of the Latrobe (Encl. 2) where some significant caving is evident. Minor cavings occur scattered over the rest of the Latrobe but is essentially restricted to coal beds seldom more than 1m thick. Log quality is very good except of course in the caved hole sections where both the density and neutron logs are adversely affected. These caved intervals are flagged by the software as bad hole sections and the affected logs are ignored in computations. Appendix 1 gives the cutoffs used for accepting logs as valid.

4. METHOD

Listed below is the methodology employed in the log evaluation.

(i) The final edit logs received from Schlumberger at the end of the well were loaded into the LOGCALC 2 database and interactively depth matched. The GR and Sonic logs from the GR Laterolog Sonic Run were used as reference traces. (Note that all RFT depths were selected on the basis of this GR-Laterolog-Sonic Log.)

(ii) The GR, RHOB and NPHI logs were then corrected for borehole effects, and the resistivity corrected for invasion to give the true RT. Enclosure 1 displays the raw and corrected logs for Archer-1.

(iii) The upper section of the well, 2558.5m (Top Gurnard Formation) to 3384m, where no hydrocarbons were detected, was divided into six separate intervals on the basis of palynological age dating and wireline log breaks. The interval 3384m to 4050m (TD) which had excellent hydrocarbon shows was divided into seven zones (Zones 1 to 7) essentially on the basis of the hydrocarbon shows.

(iv) Reservoir parameters were selected for each interval or zone and by means of an iterative process modified until results became internally consistent (good match between various porosity curves computed from the separate logs, Sw = 100% in water bearing sandstone, etc.) and satisfied the constraints from the wellsite data (Vshale, mineralogy; Sw close to 100% opposite sandstones with no hydrocarbon shows; RFT results, etc.).

5. PARAMETERS, CUTOFFS AND ANALYSIS OPTIONS

Key reservoir parameters used in the log analysis are listed in Table 2 and the full list of parameters is contained in Appendix 1.

5.1 Formation Water Resistivity (Rw)

No formation water sample was obtained in Archer-1 and Rw had to be indirectly derived. The cleanest water bearing sandstones were identified and Rwa was computed. This first approximation of Rw was further refined until:

(a) the Ro and Rt curves overlaid one another in water bearing sandstones

(b) the various porosity curves yielded acceptable values and matched each other closely

(c) the computed Vshale was close to 0% opposite the cleanest sandstones

(d) Sw was close to 100% in the cleanest water bearing sandstones

This exercise was only possible in the Latrobe interval above 3884m where no hydrocarbons were detected. The presence of hydrocarbons in all reservoirs below 3384m down to 4050m (TD) precludes this method in that interval. Enclosure 1 shows the computed Rwa curve together with the raw and corrected logs. The Rw's determined in the water bearing reservoirs above 3384m yield a near constant formation water salinity of 27,000 ppm NaCl equivalent. Since there is no way of determining Rw below 3384m, this NaCl equivalent salinity has been retained for the entire interval 3384-4050m (TD).

The log analysis output plot (Encl. 2) shows Ro and Rt plotted in the same track. Both curves overlie one another in water-zones, with Rt increasing relative to Ro in hydrocarbon bearing reservoirs.

5.2 Matrix and Reservoir Parameters

Selected matrix parameters are listed on Table 2. Variations in the matrix reflect the variation in mineralogy within the sandstones. Preliminary petrographic results on cuttings below 3384m show a near constant matrix mineralogy of quartz 70%, potassium feldspars 25% to 30%, and 5% to trace mica (biotite and minor muscovite) reflecting a typical granitic source.

Shale and coal parameters were selected separately from the logs for each zone, while mud properties and temperatures were taken from the log headers. Bottom hole temperatures used in borehole corrections are the computed static borehole temperatures. Table 2 includes the shale parameters used in each zone.

5.3 Analysis

A shaley sand analysis was selected because of the complete gradation from sandstone to shale within the Latrobe Group. In all VShale determinations both the GR and Density Neutron cross-plots were used, with LOGCALC 2 automatically selecting the lowest computed Vshale. Porosities were calculated using the three standard porosity curves while the effective porosity (Phie) was computed from the density porosity. The three computed porosities together with Phie are displayed on the output log (Encl. 2).

The Indonesian formula was used for Sw determination, with the Humble parameters of:

$a = 0.62$

$m = 2.15$

$n = 2.0$

5.4 Cutoffs

Sandstones with effective porosities greater than 6% and Vshales less than 40% were considered as gross reservoirs.

6. LOG ANALYSIS RESULTS

Overall, the Latrobe Group at Archer-1 contains 531.9m of gross sandstone, representing a gross sandstone to gross interval ratio of 0.38. The average porosities range from 22.3% down to 11.7% (Table 3). Hydrocarbon bearing reservoirs occur below 3384m and persist down to 4050m (TD). This interval has been divided into seven zones. The top five zones are characterised by hydrocarbon bearing reservoirs at the top and a water zone at the base (Encl. 2), while the lower two zones (Zones 6 and 7) display hydrocarbons down to the base of reservoir, with no hydrocarbon water-contact intersected in either zone.

6.1 Gurnard Formation (Eocene; 2558.5-2640m)

The offshore marine sediments in this interval consist entirely of marine glauconitic siltstones with good seal potential. No reservoirs occur in this interval.

6.2 PL Sequence (Palaeocene; 2640-2707m)

Like the Gurnard Formation, this interval consists of glauconitic siltstones with good to moderate seal potential. Sandstones are almost entirely absent with only 1m of gross reservoir occurring in the whole interval (average porosity = 22.3%).

6.3 UK5 Sequence (Maastrichtian; 2707-3016m)

The upper 61m of this interval (Upper UK5 sequence) contains 46.2m of well developed coastal to marginally marine sandstones. Porosities are excellent, averaging 25.0%. Below 2768m (Top UK5.1 Marker) the depositional environment changes to lower coastal plain, resulting in an alternating sequence of point-bar sandstones, siltstones, claystones and coal beds. The gross reservoir thickness for this lower coastal plain sequence is

110.6m (gross reservoir to gross interval ratio of 0.45) with an average porosity of 20.4%. For the interval as a whole there is 156.8m of gross reservoir (gross reservoir to gross interval ratio = 0.51) with an average porosity of 21.8%. The caliper log shows mud-cake built over most sandstones, indicating good permeability. No hydrocarbons were detected during drilling, and the log evaluation shows 100% water saturations in the sandstones. The siltstone/claystone units are up to 10m thick with good vertical seal potential but due to their lack of lateral continuity have poor caprock potential. This lack of caprock potential in the non-marine sequence is a characteristic feature of the Permit and has been highlighted previously in all other wells drilled on the Permit.

6.4 Upper UK4 Sequence [Lower Maastrichtian (Selene Sandstone Equivalent); 3016-3094m]

The Selene Sandstone is named after the excellent massively bedded deltaic stream mouth-bar sandstones encountered at both Angler-1 and Selene-1. At Archer-1, the equivalent unit comprises non-marine, upward fining, point-bar sandstones, interbedded with siltstones/claystones and minor coal stringers. Total reservoir thickness is 26m (gross reservoir to gross interval ratio of 0.33), with an average porosity of 19.7%. No hydrocarbon shows were recorded while drilling and the log evaluation confirms these reservoirs as water bearing.

6.5 UK4.1 Sequence (Upper Campanian; 3094-3270m)

The lower coastal plain deposits in this interval contain abundant floodplain claystones and siltstones with subordinate amounts of upward fining to blocky fluvial sandstones. Coal seams up to 3m thick are common throughout. The total amount of sandstone reservoir is 52.9m (gross reservoir/gross interval thickness ratio = 0.30). Porosities are moderate to good, averaging 18.4%. Mud gas values recorded over this interval were very low, ranging from 0.1% to 0.3% (methane only), and were probably derived from in-situ generation of gas by the coals and carbonaceous material in the siltstones.

6.6 Top UK3 to Top Zone 1 (Campanian; 3270-3384m)

This marine interval contains essentially offshore to lower shoreface siltstones and shales with minor upper shoreface sandstones near the top of the interval. This sequence correlates well between Angler-1 and Anemone-1,1A, especially the 40m shale near the base of the interval which are now thought to act as a regional seal over most of the permit. Minor hydrocarbon shows were noted in some sandstone reservoirs above these shales at both Angler-1 and Anemone-1,1A, but these are most probably the result of small scale in-situ generation from coals. All moveable hydrocarbons discovered in the three discovery wells, Angler-1, Anemone-1,1A and Archer-1, occur below this level.

A total of 20.4m of reservoir sandstones is present in this interval, with the bulk concentrated in the upper half of the interval, giving a gross reservoir to gross interval thickness ratio of 0.18. Average porosities are 16.5%. No hydrocarbons were detected in these sandstones, nor indicated by the log evaluation.

6.7 Top Zone 1 to Base UK3 (Campanian; 3384-3651.4m)

This interval comprises abundant sandstone reservoirs deposited in upper to lower shoreface shallow marine environments, with interbeds of 6m to 1m of offshore marine shales deposited below wavebase. The gross sandstone reservoir thickness is 164.1m, equivalent to a gross reservoir to gross interval ratio of 0.61. Porosities vary but are generally good for reservoirs at that depth, averaging 14.6% for the whole interval, but with better porosities (1% to 2% higher than the average) preserved in hydrocarbon bearing reservoirs.

On the basis of the wireline logs, this interval can be divided into four independent hydrocarbon zones (Zones 1 to 4; Table 2 and Encl. 2), each with its own water leg. Reservoir properties for each zone are listed on Table 3. RFT measurements confirm this interpretation and indicate four hydrocarbon-water contacts at 3419m, 3501m, 3523m and 3602m respectively for Zones 1 to 4

(Encl. 2). The top of the interval (3384m) is also the top of the first reservoir where significant hydrocarbon shows were noted at Archer-1 and coincides with the base of the 40m thick marine shale described earlier. These hydrocarbon shows were in the form of high gas values (0.1% to 2.1% total gas) which included substantial amounts of heavier hydrocarbons (ethane to butane*) were recorded. The average dryness index (ethane/total gas) varied from 78% to 97%. Fluorescence and cut in the sandstone cuttings varied widely between the reservoirs, ranging from no cut and fluorescence in most of the reservoirs, to moderate dull-bright yellow fluorescence and rare to very slow yellow to white cut, or a residual fluorescing ring.

As evident from both the hydrocarbon shows recorded while drilling and the log evaluation, the water zones display irreducible hydrocarbon saturations, indicating that hydrocarbon has migrated into all the reservoirs at some time but has been retained only under the most effective caprocks.

Five segregated RFT samples were collected over this interval (Table 4), two from Zone 1 and one each from the other zones. PVT analyses on these samples showed oil as the hydrocarbon type, and this is confirmed by density-neutron cross-plots over the four zones which show no gas effect (Figs. 2, 3 and 4).

The offshore marine shales have excellent seal potential as illustrated by the 2m thick shale sealing Zone 3 (3509.5m, Encl. 2). This highlights the fact that shales need not be thick but only laterally extensive, such as is the case with marine or delta front shales, to be an effective caprock.

* [heaviest hydrocarbon detectable by FID at the wellsite]

6.8 Top UK2 to Top Campanian 1 Sandstone (3651.4-3815.5m)

This interval covers hydrocarbon Zone 5 (3655.5m to 3836.4m) and contains a lower coastal plain sequence of interbedded sandstones and siltstones/shales, the latter becoming predominant with depth. Minor coal beds are also present near the base. The interval as a whole is relatively poor in sandstone reservoirs, with 65m of gross reservoir (gross reservoir to gross interval thickness ratio of 0.40). The best and most massive reservoirs occur in the top 55m of this interval (Encl. 1) and comprise a total of 30m, with the balance of the reservoirs occurring below 3740m, as thinly bedded sandstones. As shown on Enclosure 2, the various hydrocarbon bearing reservoirs in Zone 5 belong to six independent accumulations each with its own hydrocarbon-water contact (C5 to C10; Encl. 2), and here illustrates that non-marine shales have a good seal potential even when only 2m thick. However, the average water saturations in the six accumulations in Zone 5 are relatively high (50% to 73%; Table 1), and are certainly higher than those recorded in the zones capped by marine shales, indicating that non-marine shales, at least in this part of the permit, are possibly less effective as permeability barriers than their marine counterpart. Also of note is that three of the six accumulations in Zone 5 have hydrocarbon water contacts higher than the 4-way dip closure, suggesting that these non-marine shales have a limited lateral extent.

As for the overlying Zones 1 to 4, all reservoirs in the water zones clearly show irreducible hydrocarbon saturations (Encl. 2), which is confirmed by the good gas shows (ethane to propane) noted during drilling those sections (Total gas = 0.1% to 1.5%; dryness index = 82% to 98%) and occasional fluorescence and cut recorded in the sandstones cuttings from this interval.

The neutron-density cross plot in the sandstone over this zone shows no apparent gas effect. However the PVT results from a segregated RFT sample at 3681m show the hydrocarbon type at this level to be an extremely rich gas condensate (Table 4). Notwithstanding the contradiction between the cross plot and the PVT results, it has been assumed for purposes of reserves calculations that gas is the hydrocarbon type reservoired in this interval.

6.9 Intra-UK2 Sequence (Top Campanian 1 Sandstone to Top Campanian 2 Sandstone; 3815.5-3933m)

The upper 74.5m of this interval (3815.5-3990m) consist of shallow marine (upper to lower shoreface) sandstones, interbedded with siltstones/shales, and correlate exactly with the Campanian 1 Sandstones discovered at Anemone-1/1A, where these were found to contain irreducible hydrocarbon saturations. The 43m (3890-3933m) of this interval consists of massive marine shales with excellent sealing potential and correlates to 59m (4140-4199m) of equivalent shales at Anemone-1,1A. As at Anemone-1,1A, this massive shale acts as a seal for the underlying Campanian 2 Sandstones which at Anemone-1,1A were found to be hydrocarbon bearing (gas-condensate).

The Campanian 1 Sandstones as a whole reflect an upward coarsening sedimentary cycle with the best quality sandstones concentrated in the upper part of the interval. Total reservoir thickness is 21m (gross reservoir/gross interval ratio = 0.28). Porosities are moderate, averaging 11.7%. All the sandstones which are grouped into Zone 6 show medium to high hydrocarbon saturations which correlate with excellent gas shows of 4% to 10% total gas with a dryness index of 78% to 94%. As for Zone 5, the reservoirs can be further subdivided into four independent accumulations on the basis of RFT results (C11, C12, C13 and C14; Encl. 2) with the hydrocarbon water contact for each accumulation determined from extrapolation of RFT pressure gradients. (No HWC was intersected in this interval.) The neutron-density cross plot over the sandstones of this zone shows a clear gas effect (Fig. 6). No RFT samples were collected in Zone 6 to confirm the hydrocarbon type

but in view of the evidence from the cross plot and the presence of gas in Zone 5 it can be assumed that gas is the hydrocarbon type present in these reservoirs.

6.10 Top Campanian 2 Sandstone to Total Depth (Campanian; 3933-4050m)

The Campanian 2 Sandstones, based on the correlation with Anemone-1,1A, occur only in the upper section of this interval from 3933m to 3992m. The lower shoreface marine sandstones which make up the Campanian 2 Sandstones are included in Zone 7, and have a gross thickness of 19.5m, giving a gross reservoir to gross interval thickness ratio of 0.33 for these sandstones. The average porosity is a moderate 13.5%. Average water saturation is 35%, which correlates with high mud gas values of 7% to 11% total gas (dryness index = 86% to 100%). Moderate pale yellow fluorescence and minor white cut was also noted in the better quality sandstones. Hydrocarbon type based on both neutron-density cross plot (Fig. 7) and PVT analysis on the segregated RFT sample at 3947.5m (Table 4) clearly show gas as the hydrocarbon type. The top seal for the Campanian 2 Sandstones is the massive marine shale (43m) at the base of the previous sequence discussed earlier.

As for the overlying Zones 5 and 6, the Campanian 2 Sandstones represent two separate accumulations (C15 and C16, Encl. 1) each with its own gas-water contact (extrapolated from RFT pressure gradient trends) and are by far the thickest hydrocarbon columns found in any wells in VIC/P20 (101.5m for C15 and 105.0m for C16). This stems from the fact that these two reservoirs contain the only fault-sealed accumulations in the Archer Structure, both accumulations being down-faulted against the very thick marine shales sequence (236m at Anemone-1,1A) which occurs below the Campanian 2 Sandstones.

A R C H E R - 1 S U M M A R Y O F H Y D R O C A R B O N Z O N E S

AVERAGE RESERVOIR PARAMETERS FOR INDIVIDUAL ACCUMULATIONS IN SEVEN HYDROCARBON ZONES

ZONE	HC COLUMN	TOP-HWC MBKB	GROSS RESERVOIR THICKNESS M	NET THICKNESS M	NET/GROSS	POROSITY (%)	SW (%)
1	C1	3384.0-3419.0	35.0	20.0	0.57	16	49
2	C2	3469.0-3501.0	32.0	21.8	0.68	16	49
3	C3	3509.5-3531.0	7.4	5.9	0.80	14	46
4	C4	3578.0-3602.0	24.0	19.8	0.82	14	48
5	C5	3655.5-3662.0	6.0	5.5	0.92	12	69
	C6	3673.6-3692.0	15.9	13.3	0.84	13	50
	C7	3692.2-3699.0	6.8	6.8	1.00	11	63
	C8	3705.4-3726.0	3.6	2.8	0.78	12	73
	C9	3740.0-3762.5	22.5	11.7	0.52	12	72
	C10	3763.5-3782.5	19.0	10.1	0.53	14	68
6	C11	3836.4-3861.0	4.0	4.0	1.00	11	64
	C12	3845.0-3884.5	10.4	5.1	0.49	12	48
	C13	3858.1-3893.0	9.8	8.4	0.86	12	48
	C14	3881.3-3916.0	8.7	5.1	0.59	11	49
7	C15	3933.0-4034.5	5.9	5.9	1.00	17	20
	C16	3944.7-4049.5	18.5	9.2	0.50	14	32

TABLE 1

TABLE 2

ARCHER-1 ZONATION AND KEY RESERVOIR PARAMETERS

ZONE	INTERVAL (m) Top	Bottom	PARAMETER SET NAME	Rw @ BOTTOM OF ZONE (ohm-m)	GR Matrix (API)	GR Shale (API)	Rho Shale (g/cc)	PhiN Shale (pu)	Δt Shale (µs/ft)	Res Shale (ohm-m)	Rho Matrix (g/cc)	Δt Matrix (µs/ft)	Cp	Rho Fluid (g/cc)
GURNARD	2558.5	2640.0	GURN	0.106	50	100	2.60	37	90	2.5	2.59	60	1.1	1.0
PALAEOCENE	2640.0	2707.0	PALEO	0.104	50	100	2.60	37	90	2.5	2.59	60	1.1	1.0
MAASTRICHTIAN	2707.0	3016.0	MAAS1	0.097	10	120	2.57	34	90	7.0	2.66	58	1.0	1.0
SELENE SST	3016.0	3094.0	MAAS2	0.095	20	120	2.50	29	75	8.0	2.66	58	1.0	1.0
TOP UK4.1-TOP UK3	3094.0	3270.0	MAAS2	0.091	20	120	2.50	29	75	8.0	2.66	58	1.0	1.0
UPPER UK3	3270.0	3384.0	MAAS2	0.091	20	120	2.50	29	75	8.0	2.66	58	1.0	1.0
ZONE 1	3384.0	3435.0	Z1	0.090	58	135	2.50	19	77	9.0	2.64	59	1.0	1.0
ZONE 1	3435.0	3469.0	Z1B	0.096	58	135	2.50	19	77	9.0	2.64	59	1.0	1.0
ZONE 2	3469.0	3509.5	Z2	0.095	50	150	2.60	24	77	18.0	2.64	58	1.0	1.0
ZONE 3	3509.5	3578.0	Z2	0.094	50	150	2.60	24	77	18.0	2.64	58	1.0	1.0
ZONE 4	3578.0	3655.5	Z2	0.092	50	150	2.60	24	77	18.0	2.64	58	1.0	1.0
ZONE 5	3655.5	3836.4	Z5	0.089	45	145	2.60	24	75	15.0	2.66	59	1.0	1.0
ZONE 6	3836.4	3932.5	Z6	0.087	45	145	2.60	24	75	16.0	2.66	59	1.0	0.9
ZONE 7	3933.0	4050.0	Z7	0.085	45	150	2.63	24	71	16.0	2.64	58	1.0	0.9

TABLE 3

ARCHER 1 SUMMARY OF LOG ANALYSIS RESULTS

ZONE	INTERVAL (m) Top	INTERVAL (m) Bottom	THICKNESS (m)	GROSS RESERVOIR THICKNESS (m)	GROSS RESERVOIR THICKNESS/GROSS INTERVAL THICKNESS (%)	AVERAGE PHIE (%)	AVERAGE Sw (%)
GURNARD	2558.5	2640.0	81.5	0	0	-	-
PALAEOCENE	2640.0	2707.0	67.0	1.0	1.5	22.3	100.0
MAASTRICHTIAN	2707.0	3016.0	309.0	156.8	51.0	21.8	99.0
SELENE SST	3016.0	3094.0	78.0	26.0	33.3	19.7	99.5
TOP UK4.1-TOP UK3	3094.0	3270.0	176.0	52.9	30.1	18.4	99.0
UPPER UK3	3270.0	3384.0	114.0	20.4	17.9	16.5	98.6
ZONE 1	3384.0	3469.0	85.0	45.0	52.9	15.0	74.5
ZONE 2	3469.0	3509.5	40.5	29.9	56.7	15.9	52.2
ZONE 3	3509.5	3578.0	68.5	43.1	62.8	14.3	86.5
ZONE 4	3578.0	3655.5	77.5	53.1	68.4	13.7	76.0
ZONE 5	3655.5	3836.4	180.9	70.0	38.7	12.4	69.8
ZONE 6	3836.4	3932.5	96.1	21.0	21.8	11.7	50.4
ZONE 7	3933.0	4050.0	117.5	19.5	16.6	13.5	35.0

Gross Reservoir Cut off = Phie > 6%; Vshale < 40%

SUMMARY OF PVT ANALYSES ON RFT SAMPLES

RFT SAMPLE	DEPTH mbkb	RESERVOIR PRESSURE	RESERVOIR TEMP (^{o}F)	BUBBLE POINT	API	DEW POINT	DENSITY (i)	DENSITY (ii)	Bo (i)	Bo (ii)	GOR	Bg (i)	Bg (ii)	COMMENTS
1	3390.2	4819.1	194	925	43.8	-	0.619	0.668	1.6929	1.5718	872	-	-	(i) Condition at Bubble or Dew Points
2	3403.5	4832.6	194	1310	46.9	-	0.597	0.640	2.1619	2.0149	1549	-	-	
3	3489.0	4866.9	199	1992	45.9	-	0.5233	0.5704	2.8669	2.6301	2233	-	-	(ii) Condition at Reservoir Pressure and Temperature
4	3514.2	5009.8	200	3040	46.2	-	0.4521	0.5014	4.6294	4.1739	5103	-	-	
5	3591.5	5117.7	205	3455	42.6	-	0.4227	0.4678	5.1209	4.6272	5740	-	-	Psia = Psig + 14.8 psi
6	3681.0	5250.0	210	-	-	5175	0.3605	0.3605	-	-	17088	3.6×10^{-3}	3.59×10^{-3}	
7	3947.5	5768.3	226	-	-	5835	0.3482	0.3482	-	-	21474	3.5×10^{-3}	3.5×10^{-3}	
	mbkb	Psia	^{o}F	Psig at Reservoir Temp.		Psig at Reservoir Temp.	g/cc	g/cc	$\frac{Rbbl}{STbbl}$	$\frac{Rbbl}{STbbl}$	$\frac{Scf}{bbl}$	$\frac{Rft^3}{STft^3}$	$\frac{Rft^3}{STft^3}$	

TABLE 4

PE603294

This is an enclosure indicator page.
The enclosure PE603294 is enclosed within the container PE902092 at this location in this document.

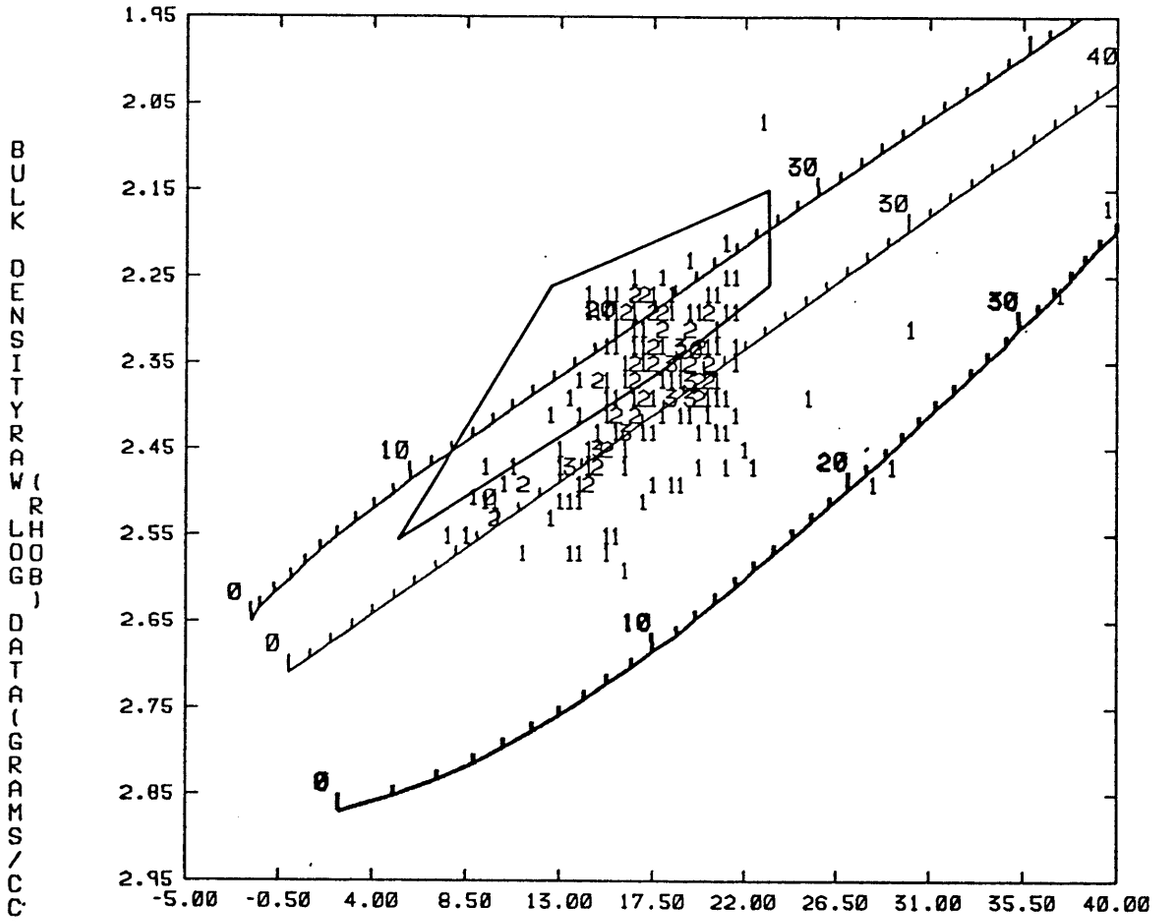
The enclosure PE603294 has the following characteristics:

ITEM_BARCODE	= PE603294
CONTAINER_BARCODE	= PE902092
NAME	= Depth vs Porosity Plot
BASIN	= GIPPSLAND
PERMIT	= VIC/P20
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Archer 1 Depth verses Porosity Plot, Latrobe Group (2550 - 4050 m). Appendix 2 Figure 2 of WCR volume 2.
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	= 4/09/90
W_NO	= W1021
WELL_NAME	= Archer-1
CONTRACTOR	=
CLIENT_OP_CO	= Petrofina Exploration Australia S.A.

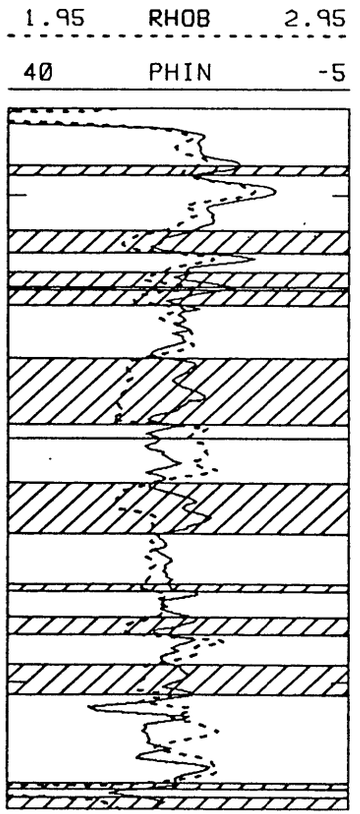
(Inserted by DNRE - Vic Govt Mines Dept)

ARCHER - 1
ZONE 1
(3383 - 3470m)

TOP - 3383.
BOTTOM - 3419.



POINTS INCLUDED IN POLYGON

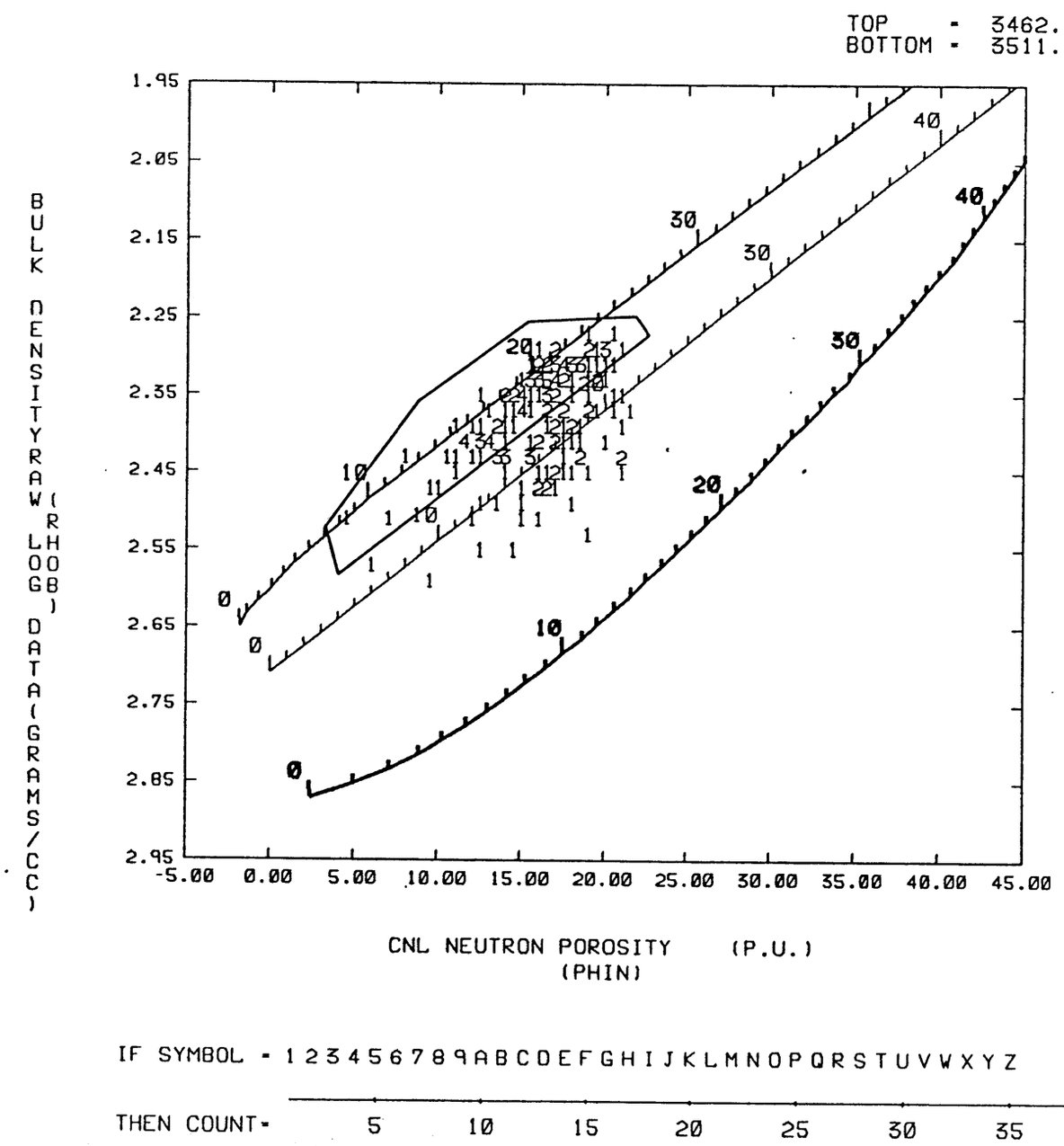


FIGURE

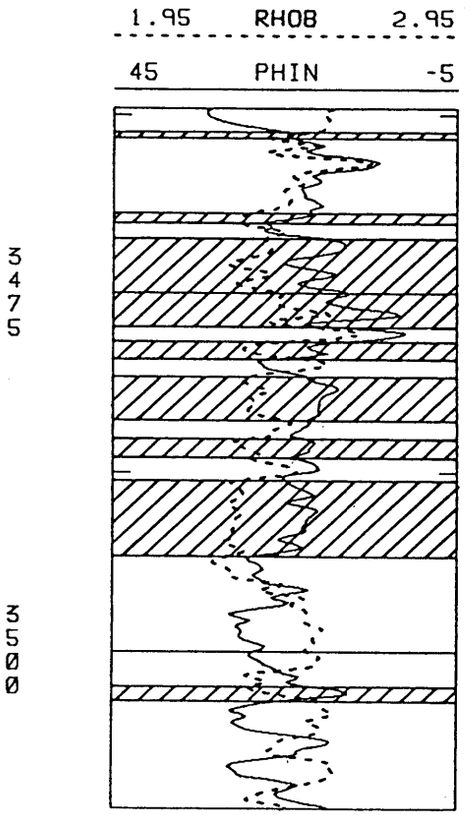
G 921

J-M. Q. June 1990

ARCHER - 1
ZONES 2 & 3
(3470 - 3578m)



POINTS INCLUDED IN POLYGON



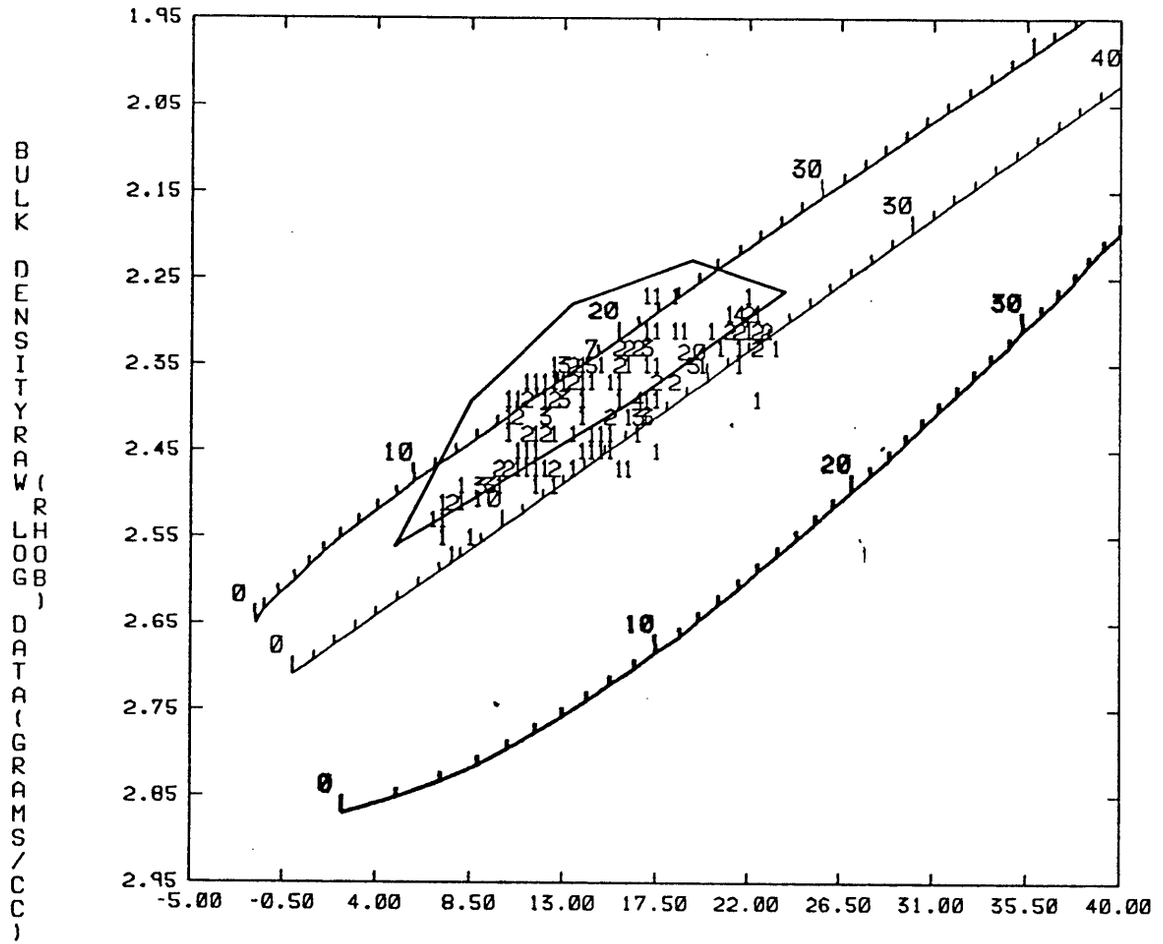
FIGURE

G 922

I-M.O. June 1990

ARCHER - 1
ZONE 4
(3578 - 3651m)

TOP - 3577.
BOTTOM - 3612.



POINTS INCLUDED IN POLYGON

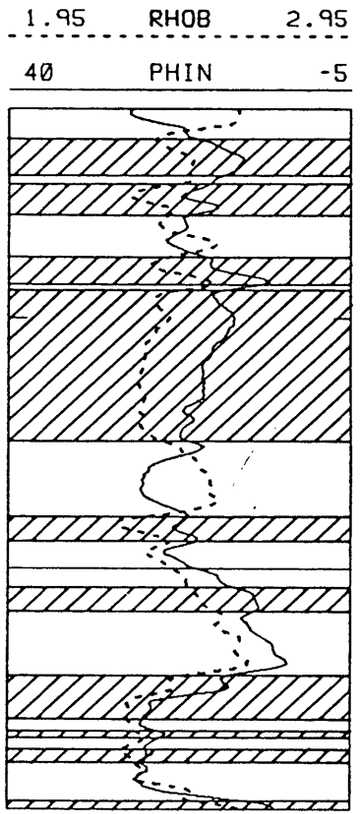
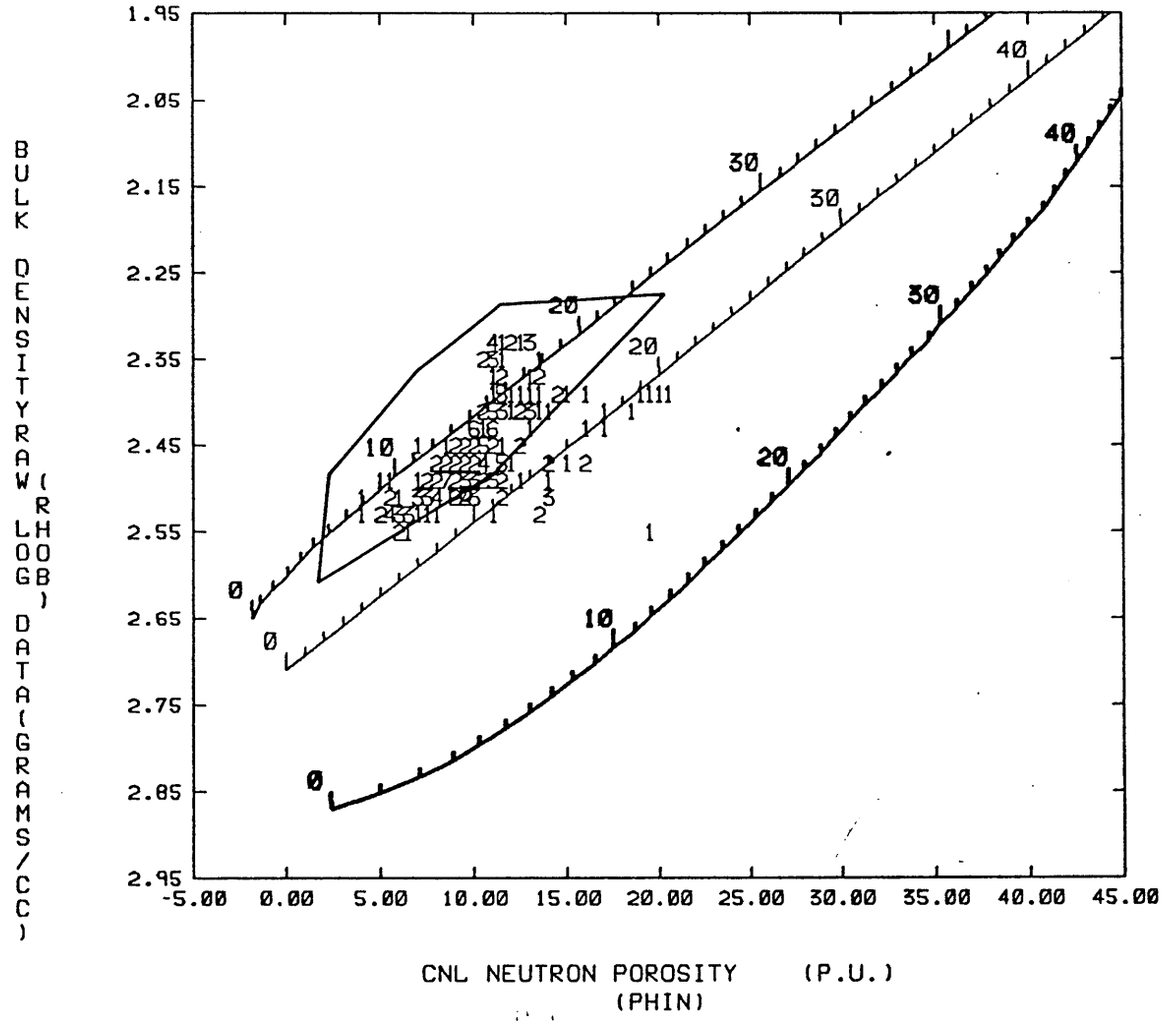


FIGURE 4

G 923

I-M-O June 1990

TOP = 3655.
BOTTOM = 3705.



ARCHER - 1
ZONE 5
(3651 - 3836m)

POINTS INCLUDED IN POLYGON

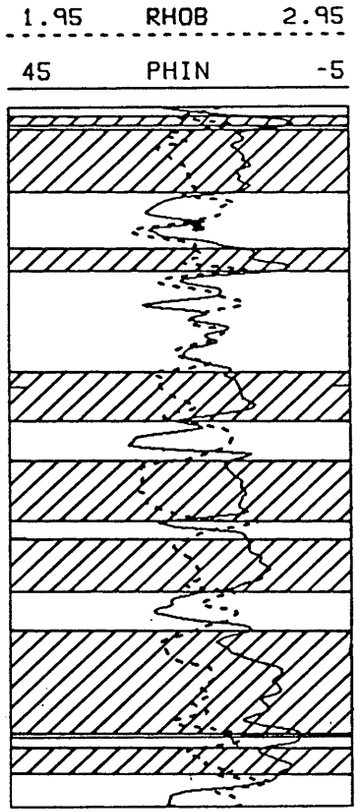
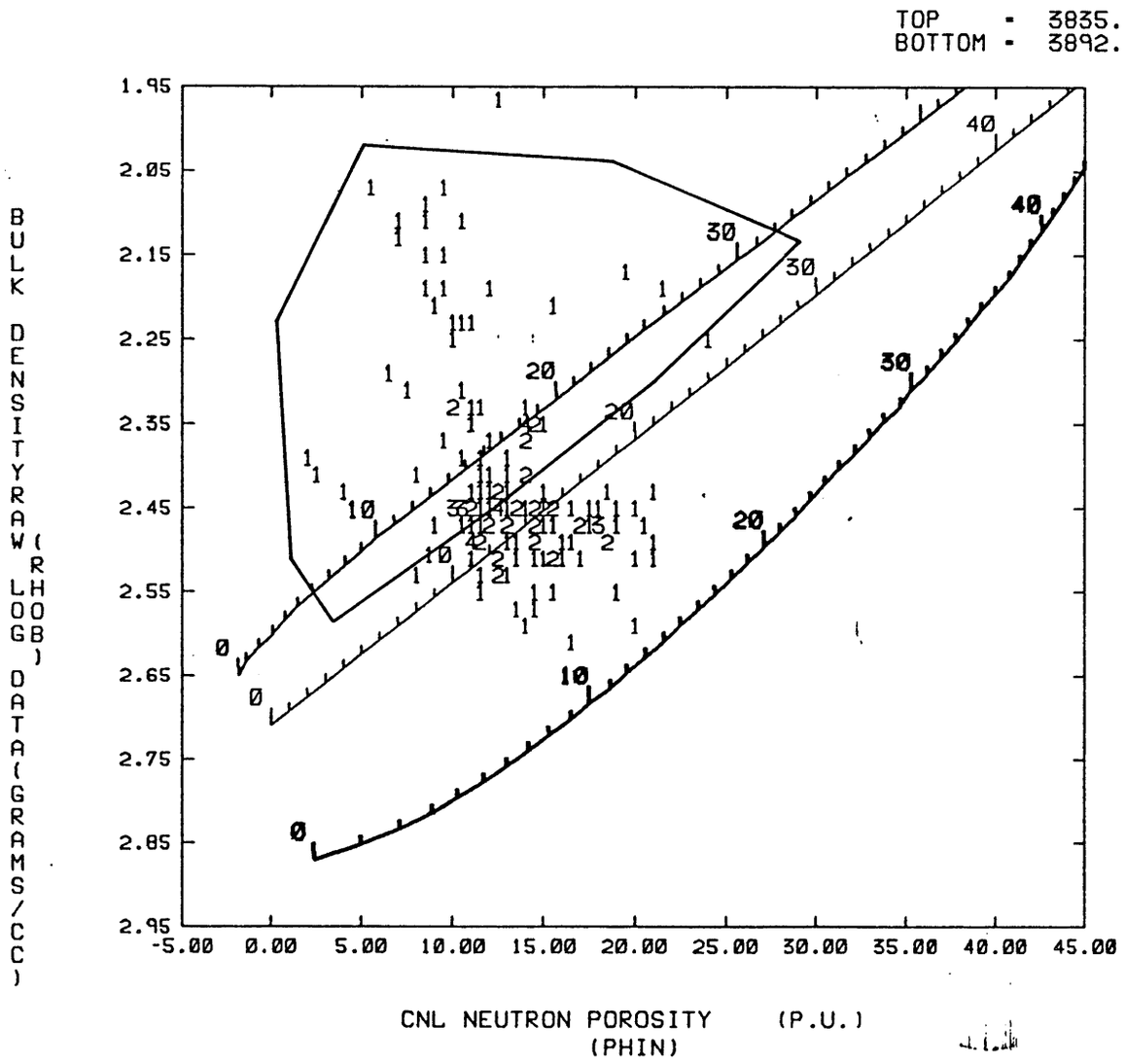


FIGURE 5

G 924

J-M. Q. June 1990

ARCHER - 1
ZONE 6
(3836 - 3889m)



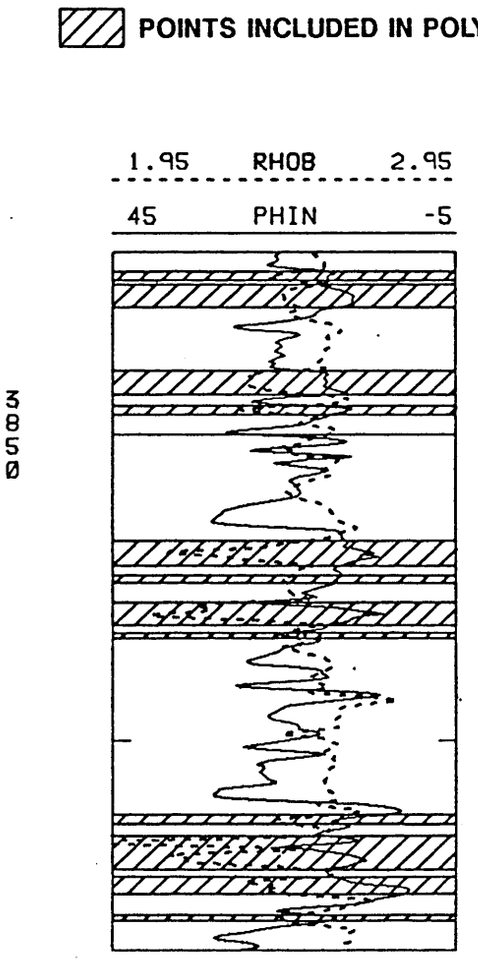


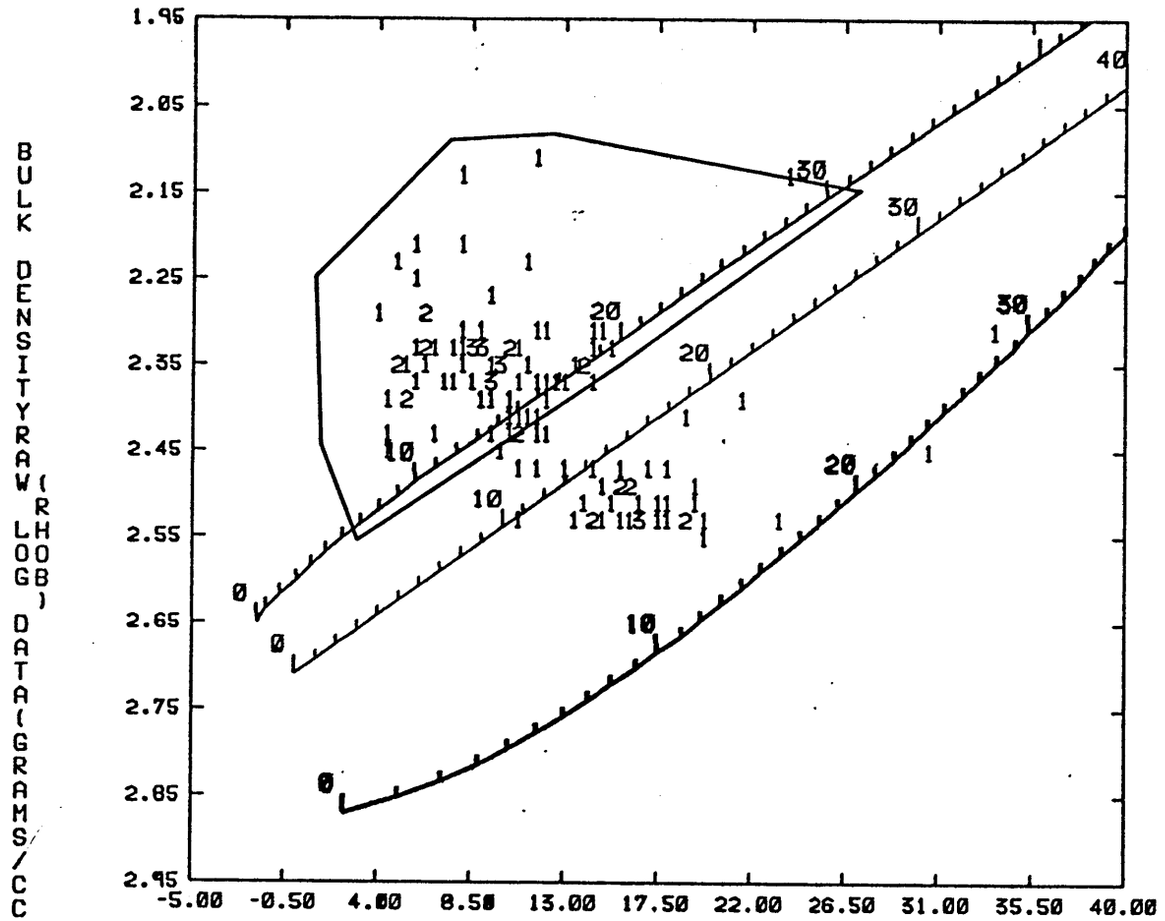
FIGURE 6

G 925

J-M. Q. June 1990

TOP - 3930.
BOTTOM - 4035.

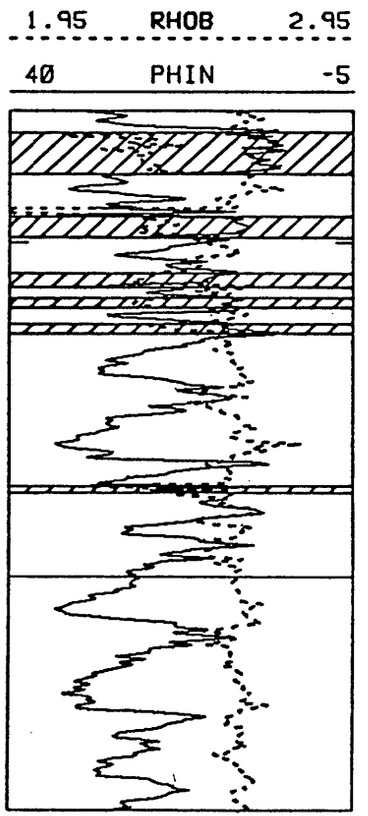
ARCHER - 1
ZONE 7
(3933 - 4050m)



IF SYMBOL - 1 2 3 4 5 6 7 8 9 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z *

THEN COUNT- 5 10 15 20 25 30 35

POINTS INCLUDED IN POLYGON



4000

FIGURE 7

G 926

J-M. Q. June 1990

APPENDIX 1

ARCHER-1 LOG ANALYSIS PARAMETERS

****

LISTING OF ENVIRON PARAMETERS

ZONE GURN WELL ARCHER-1

****

TOP DEPTH 2558.5000 METRES.
BASE DEPTH 2640.0000 METRES.

DESCRIPTION OF PARAMETERS : ARCHER-1. GURN 2558.5-2640M

****
********** FLUID VALUES **********
****

RHOFR	1.00	(KG/M3 OR GR/CC)RECORDED FLUID DENSITY
SALFM	27000.	(PPM) FORMATION SALINITY (NACL)
SALMD	20000.	(PPM) MUD SALINITY (NACL)
RMM	0.2850	(OHM-M) RM IF USING AN OIL BASED MUD SET TO > 100
RMMT	81.	(F) MEASURED TEMPERATURE FOR RM
RMFM	0.2830	(OHM-M) RMF
RMFMT	66.	(F) MEASURED TEMPERATURE FOR RMF
RMCM	0.3080	(OHM-M) RMC
RMCMT	65.	(F) MEASURED TEMPERATURE FOR RMC

****
********** HOLE AND MUD VALUES **********
****

MW	8.40	(KG/M3 LBS/GAL LBS/FT3 OR SP. GRAV) MUD WT ENTER 0 MW FOR AIR FILLED HOLE
BITSIZ	12.250	(MM OR INCHES) BIT SIZE
AMST	50.0	(F) ANNUAL MEAN SURFACE TEMP
BHT	195.0	(F) BOTTOM HOLE TEMPERATURE
TD	3435.	(METRES) TOTAL DEPTH OF BOREHOLE
RSTAND	1.500	(INCHES) STANDOFF SETTING ON INDUCTION

****
********** LIMITING VALUES **********
****

RHOMIN	1.95	(GR/CC) MIN. VALID BULK DENSITY
DLTMIN	40.	(USEC/FT) MIN. VALID SONIC ITT
DLTMAX	190.	(USEC/FT) MAX. VALID SONIC ITT
PHNMAX	45.	(PERCENT) MAXIMUM VALID NEUTRON POROSITY
RUGMAX	6.00	(INCHES) MAX. RUGOSITY TO ACCEPT NEUTRON
STOMAX	3.00	(INCHES) MAX. NEUT. STANDOFF
STOMIN	0.00	(INCHES) MIN. NEUT. STANDOFF TO CORRECT (SET TO STOMAX TO BYPASS STANDOFF LOGIC)
DROLIM	0.20	(GR/CC) MAXIMUM DENSITY CORRECTON TO ACCEPT (+ OR -)

```
**********************************************************
********   SWITCHES AND TOOL DESCRIPTIONS   ******************
**********************************************************

DUNIT          1          DEPTH MEASUREMENT UNITS FLAG
                                0 = DEPTH IN FEET
                                1 = DEPTH IN METERS
MSI            0          LOG MEASUREMENT UNITS FLAG
                                0 = MEASURED IN STANDARD UNITS
                                1 = MEASURED IN MSI UNITS
                                2 = STANDARD BUT DEGREES C
COMPEC         1          SPECTRALOG ENVIRONMENTAL CORRECTIONS
                                1 = SCHLUMBERGER, GO, OR WELEX
                                2 = DRESSER (USE WITH CAUTION)
GRSIZE         0          GAMMA RAY TOOL SIZE:
                                0 = 3 5/8 INCH TOOL
                                1 = 1 11/16 INCH TOOL
GRXC           1          GAMMA RAY CENTERING
                                0 = CENTERED
                                1 = NOT CENTERED
MOPOFF         0          MOVEABLE OIL PLOT SWITCH
                                0 = COMPUTE RXO CURVE
                                1 = DO NOT COMPUTE RXO CURVE
RXLOG          1          SELECT RESISTIVITY FOR LITH DETERMINATION
                                0 = USE RT AT 75 DEGREES F
                                1 = USE RXO AT 75 DEGREES F
AUTOCA         1          NEUTRON AUTOMATIC CALIPER COMPENSATION:
                                0 = NOT COMPENSATED
                                1 = COMPENSATED
PANEL        8.0          NEUTRON PANEL SETTING, NEEDED IF AUTOCA
                              IS EQUAL TO 0
NEWCNL         1          CNL VINTAGE
                                0 = BEFORE 1-1-76
                                1 = AFTER 1-1-76
NSCALE       100          SET TO 100 IF THE NEUTRON IS FRACTIONAL
KSCALE       100          SET TO 100 IF THE K LOG IS FRACTIONAL

TMUD           1          TYPE OF MUD SYSTEM (0=NATURAL & 1=BARITE )
```

****

LISTING OF CALC PARAMETERS

ZONE GURN WELL ARCHER-1

****

TOP DEPTH 2558.5000 METRES.
BASE DEPTH 2640.0000 METRES.

****
********** MATRIX VALUES **********
****

GRMA	50.	(API) GAMMA RAY MATRIX
SPMA	-40.	(MV) SP MATRIX (MV)
ATTMA	150.	(DB/M) ATTENUATIONOF THE MATRIX(DB/M)
DLTSS	60.00	(USEC/FT) DELTA T SANDSTONE
DLTLS	56.00	(USEC/FT) DELTA T LIMESTONE
DLTDOL	43.96	(USEC/FT) DELTA T DOLOMITE
DLTANH	50.00	(USEC/FT) DELTA T ANHYDRITE
RHOSS	2.59	(GR/CC) MATRIX DENS OF SANDSTONE
RHOLS	2.71	(GR/CC) MATRIX DENS OF LIMESTONE
RHODOL	2.87	(GR/CC) MATRIX DENS OF DOLOMITE
RHOANH	2.98	(GR/CC) MATRIX DENS OF ANHYDRITE
TPLSS	7.20	(NSEC/M) TPL OF SANDSTONE
TPLLS	9.10	(NSEC/M) TPL OF LIMESTONE
TPLDOL	8.70	(NSEC/M) TPL OF DOLOMITE
TPLANH	8.40	(NSEC/M) TPL OF ANHYDRITE

VALUES FOR SOLO TOOLS

RHOMAB	2.59	(GR/CC) MATRIX DENSITY
DLTMAB	60.	(GR/CC) TRANSIT TIME MATRIX
TPLMAB	8.50	(NSEC/M) TPL MATRIX
NEUMAB	0	NEUTRON MATRIX 0=LS 1=SS 2=DOL

VALUES FOR COAL DETECTION

GRCOAL	180.	(API) MAXIMUM GR IN COAL.
DLTCOL	86.	(USEC/FT) MINIMUM SONIC IN COAL.
UCOAL	8.00	(PPM) MINIMUM URANIUM IN COAL.
RHOCOL	2.30	(GR/CC) MAXIMUM DENSITY OF COAL.
PNCOL	27.	(PERCENT) MINIMUM LS. NEUTRON POR. IN COAL
PECOL	3.00	(BARNS/ELEC.) MAXIMUM PEF IN COAL.
COALCK	6	NUMBER OF POSITIVE COAL CHECKS NEEDED TO IDENTIFY COAL (COAL=1).

```
**********************************************************************
**********************     FLUID VALUES     **********************
**********************************************************************

RHOF       1.00          (GR/CC)     FLUID DENSITY
DLTF        189.         (USEC/FT) TRANSIT TIME OF FLUID
RHOH       0.60          (GR/CC)     HYDROCARBON DENSITY
ANEUT      1.00          NEUTRON GAS FACTOR(USUAL RANGE 1 TO 1.4)
                         1=HIGH DENSITY AND 1.5 LOW DENSITY
RHOMF      1.00          (GR/CC)     MUD FILTRATE DENSITY
TPLH       5.00          (NSEC/M)            HYDROCARBON TPL
SALMD     20000.         (PPM)       MUD SALINITY
RWM       0.090          (OHM-M)  RW AT MEASURED TEMPERATURE
RWMT       195.          (F) TEMPERATURE OF RW MEASUREMENT
RWBM       0.09          (OHM-M)  BOUND WATER RESISTIVITY
RWBMT      195.          (F) TEMPERATURE OF RWB MEASUREMENT

**********************************************************************
****************     SHALE AND CLAY VALUES     ***************
**********************************************************************
GRSH       100.          (API) GAMMA RAY VALUE IN SHALE
SPSH       -45.          (MV)  SP VALUE IN SHALE
ATTSH      600.          (DB/M) EPT ATTENUATION IN SHALE
RHOSH      2.60          (KG/M3 OR GR/CC) MATRIX DENSITY OF SHALE
PEFSH      2.90          (BARNS/ELECTRON) PEF IN SHALE
TPLSH      9.00          (NSEC/M)          TPL IN SHALE
PHINSH      37.          (PERCENT) NEUTRON LOG POROSITY OF SHALE
DLTSH       90.          (USEC/FT) TRANSIT TIME OF SHALE
RSH        2.50          (OHM-M) RESISTIVITY OF SHALE
PHIMAX    40.00          (PERCENT) MAX SHALE POROSITY IN INTERVAL

**********************************************************************
*******     LOG CALCULATION CONSTANTS AND EXPONENTS     *******
**********************************************************************

A          0.62          CONSTANT IN FORMATION FACTOR EQUATION
M          2.15          CEMENTATION EXPONENT
N          2.00          SATURATION EXPONENT
CP         1.10          COMPACTION FACTOR

**********************************************************************
*****  LIMITING VALUES FOR GROSS CALCULATIONS                  ****
**********************************************************************

PHILIM     6.00          (PERCENT) LOWER POROSITY LIMIT
VSHLIM     0.40          (FRACTION) VOLUME OF SHALE UPPER LIMIT

**********************************************************************
*********     LOG CALCULATION OPTIONS AND SWITCHES     ********
**********************************************************************

MSI           0          0=STANDARD UNITS  1=MSI
VSHCIN        3          GR TO VOL. OF SHALE CURVATURE INDEX
VSHOFF        0          0=CALC VOL. OF SHALE - 1=VOL.OF SH=0
GROFF         0          GR AS SHALE INDICATOR (0-USE ,1-NO)
KTHOFF        1          TH & K AS SHALE INDICATOR (0-USE ,1-NO)
NEUOFF        0          NEUTRON AS SHALE INDICATOR (0-USE ,1-NO)
DLTOFF        1          SONIC AS SHALE INDICATOR (0-USE ,1-NO)
ATTOFF        1          EPT AS SHALE INDICATOR (0-USE ,1-NO)
SPOFF         1          SP AS SHALE INDICATOR (0-USE ,1-NO)
```

PEOFF	0	USE PEF? (0-USE ,1-NO)
MINOPT	3	MINERAL OPTION SWITCH 0 = COMPLEX LITHOLOGY 1 = SANDSTONE AND DOLOMITE ONLY 2 = LIMESTONE AND DOLOMITE ONLY 3 = SANDSTONE AND SHALE ONLY (CLASSICAL) 4 = SANDSTONE AND SHALE ONLY (MODERN) 5 = SANDSTONE AND LIMESTONE ONLY
MOPOFF	0	MOVEABLE OIL PLOT SWITCH 0-USE RXO 1-NO RXO
QOPT	1	SW OPTION - 0=SW FROM PHIT AND Q 1=SW FROM PHIE AND VSH
NOPRT	0	PRINT OPTION - 0=PRINT ALL VALUES 1=SKIP SHALE ZONES
SWOPT	5	1 - ARCHIE; 2 - SIMANDOUX; 3 - SIMANDOUX LAMINAR; 4 - V2 SIMANDOUX; 5 - INDONESIAN 6 - DISPERSED CLAY 7 - DUAL WATER MODEL 8 - DUAL WATER Q=VSH MODEL 9 - NORMALIZED WAXMAN-SMITS 10 - WAXMAN-SMITS
SWIRR	10.00	(FRACTION)IRREDUCIBLE WATER SATURATION FOR PERMEABILITY EQUATION

****

LISTING OF ENVIRON PARAMETERS

ZONE PALEO WELL ARCHER-1

****

TOP DEPTH 2640.0000 (METRES) TOP OF INTERVAL
BASE DEPTH 2707.0000 (METRES) BOTTOM OF INTERVAL

DESCRIPTION OF PARAMETERS : ARCHER-1. PALEO 2640-2707M

****
********** FLUID VALUES **********
****

RHOFR	1.00	(KG/M3 OR GR/CC)RECORDED FLUID DENSITY
SALFM	27000.	(PPM) FORMATION SALINITY (NACL)
SALMD	20000.	(PPM) MUD SALINITY (NACL)
RMM	0.2850	(OHM-M) RM IF USING AN OIL BASED MUD SET TO > 100
RMMT	81.	(F) MEASURED TEMPERATURE FOR RM
RMFM	0.2830	(OHM-M) RMF
RMFMT	66.	(F) MEASURED TEMPERATURE FOR RMF
RMCM	0.3080	(OHM-M) RMC
RMCMT	65.	(F) MEASURED TEMPERATURE FOR RMC

****
********** HOLE AND MUD VALUES **********
****

M[redacted]	8.40	(KG/M3 LBS/GAL LBS/FT3 OR SP. GRAV) MUD WT ENTER 0 MW FOR AIR FILLED HOLE
BITSIZ	12.250	(INCHES) BIT SIZE
AMST	50.0	(F) ANNUAL MEAN SURFACE TEMP
BHT	195.0	(F) BOTTOM HOLE TEMPERATURE
TD	3435.	(METRES) TOTAL DEPTH OF BOREHOLE
RSTAND	1.500	(INCHES) STANDOFF SETTING ON INDUCTION

****
********** LIMITING VALUES **********
****

RHOMIN	1.95	(KG/M3 OR GR/CC) MIN. VALID BULK DENSITY
DLTMIN	40.	(USEC/FT) MIN. VALID SONIC ITT
DLTMAX	190.	(USEC/FT) MAX. VALID SONIC ITT
PHNMAX	45.	(PERCENT) MAXIMUM VALID NEUTRON POROSITY
RUGMAX	6.00	(INCHES) MAX. RUGOSITY TO ACCEPT NEUTRON
STOMAX	3.00	(INCHES) MAX. NEUT. STANDOFF
STOMIN	0.00	(INCHES) MIN. NEUT. STANDOFF TO CORRECT (SET TO STOMAX TO BYPASS STANDOFF LOGIC)
DROLIM	0.20	(KG/M3 OR GR/CC) MAXIMUM DENSITY CORRECTON TO ACCEPT (+ OR -)

```
**************************************************************
********   SWITCHES AND TOOL DESCRIPTIONS   ******************
**************************************************************

DUNIT          1          DEPTH MEASUREMENT UNITS FLAG
                                0 = DEPTH IN FEET
                                1 = DEPTH IN METERS
MSI            0          LOG MEASUREMENT UNITS FLAG
                                0 = MEASURED IN STANDARD UNITS
                                1 = MEASURED IN MSI UNITS
                                2 = STANDARD BUT DEGREES C
COMPEC         1          SPECTRALOG ENVIRONMENTAL CORRECTIONS
                                1 = SCHLUMBERGER, GO, OR WELEX
                                2 = DRESSER (USE WITH CAUTION)
GRSIZE         0          GAMMA RAY TOOL SIZE:
                                0 = 3 5/8 INCH TOOL
                                1 = 1 11/16 INCH TOOL
GRXC           1          GAMMA RAY CENTERING
                                0 = CENTERED
                                1 = NOT CENTERED
MOPOFF         0          MOVEABLE OIL PLOT SWITCH
                                0 = COMPUTE RXO CURVE
                                1 = DO NOT COMPUTE RXO CURVE
RXLOG          1          SELECT RESISTIVITY FOR LITH DETERMINATION
                                0 = USE RT AT 75 DEGREES F
                                1 = USE RXO AT 75 DEGREES F
AUTOCA         1          NEUTRON AUTOMATIC CALIPER COMPENSATION:
                                0 = NOT COMPENSATED
                                1 = COMPENSATED
PANEL        8.0          NEUTRON PANEL SETTING, NEEDED IF AUTOCA
                              IS EQUAL TO 0
NEWCNL         1          CNL VINTAGE
                                0 = BEFORE 1-1-76
                                1 = AFTER 1-1-76
NSCALE       100          SET TO 100 IF THE NEUTRON IS FRACTIONAL
KSCALE       100          SET TO 100 IF THE K LOG IS FRACTIONAL

TMUD           1          TYPE OF MUD SYSTEM (0=NATURAL & 1=BARITE )
```

****

LISTING OF CALC PARAMETERS

ZONE PALEO WELL ARCHER-1

****

TOP DEPTH 2640.0000 (METRES) TOP OF INTERVAL
BASE DEPTH 2707.0000 (METRES) BOTTOM OF INTERVAL

****
********** MATRIX VALUES **********
****

GRMA	50.	(API) GAMMA RAY MATRIX
SPMA	-40.	(MV) SP MATRIX (MV)
ATTMA	150.	(DB/M) ATTENUATIONOF THE MATRIX(DB/M)
DLTSS	60.00	(USEC/FT) DELTA T SANDSTONE
DLTLS	56.00	(USEC/FT) DELTA T LIMESTONE
DLTDOL	43.96	(USEC/FT) DELTA T DOLOMITE
DLTANH	50.00	(USEC/FT) DELTA T ANHYDRITE
RHOSS	2.59	(KG/M3 OR GR/CC) MATRIX DENS OF SANDSTONE
RHOLS	2.71	(KG/M3 OR GR/CC) MATRIX DENS OF LIMESTONE
RHODOL	2.87	(KG/M3 OR GR/CC) MATRIX DENS OF DOLOMITE
RHOANH	2.98	(KG/M3 OR GR/CC) MATRIX DENS OF ANHYDRITE
TPLSS	7.20	(NSEC/M) TPL OF SANDSTONE
TPLLS	9.10	(NSEC/M) TPL OF LIMESTONE
TPLDOL	8.70	(NSEC/M) TPL OF DOLOMITE
TPLANH	8.40	(NSEC/M) TPL OF ANHYDRITE

VALUES FOR SOLO TOOLS

RHOMAB	2.59	(KG/CM OR GR/CC) MATRIX DENSITY
DLTMAB	60.	(KG/M3 OR GR/CC) TRANSIT TIME MATRIX
TPLMAB	8.50	(NSEC/M) TPL MATRIX
NEUMAB	0	NEUTRON MATRIX 0=LS 1=SS 2=DOL

VALUES FOR COAL DETECTION

GRCOAL	180.	(API) MAXIMUM GR IN COAL.
DLTCOL	86.	(USEC/FT) MINIMUM SONIC IN COAL.
UCOAL	8.00	(PPM) MINIMUM URANIUM IN COAL.
RHOCOL	2.30	(KG/M3 OR GR/CC) MAXIMUM DENSITY OF COAL.
PNCOL	27.	(PERCENT) MINIMUM LS. NEUTRON POR. IN COAL
PECOL	3.00	(BARNS/ELEC.) MAXIMUM PEF IN COAL.
COALCK	6	NUMBER OF POSITIVE COAL CHECKS NEEDED TO IDENTIFY COAL (COAL=1).

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**********************************************************************
**********************     FLUID VALUES     **********************
**********************************************************************

RHOF       1.00          (KG/M3 OR GR/CC)     FLUID DENSITY
DLTF       189.          (USEC/FT) TRANSIT TIME OF FLUID
[redacted]H        0.60          (KG/M3 OR GR/CC)     HYDROCARBON DENSITY
ANEUT      1.00          NEUTRON GAS FACTOR(USUAL RANGE 1 TO 1.4)
                         1=HIGH DENSITY AND 1.5 LOW DENSITY
RHOMF      1.00          (KG/M3 OR GR/CC)     MUD FILTRATE DENSITY
TPLH       5.00          (NSEC/M)             HYDROCARBON TPL
SALMD    20000.          (PPM)       MUD SALINITY
RWM       0.090          (OHM-M)  RW AT MEASURED TEMPERATURE
RWMT       195.          (F) TEMPERATURE OF RW MEASUREMENT
RWBM       0.09          (OHM-M)  BOUND WATER RESISTIVITY
RWBMT      195.          (F) TEMPERATURE OF RWB MEASUREMENT

**********************************************************************
****************     SHALE AND CLAY VALUES     ***************
**********************************************************************
GRSH       100.          (API) GAMMA RAY VALUE IN SHALE
SPSH       -45.          (MV)  SP VALUE IN SHALE
ATTSH      600.          (DB/M) EPT ATTENUATION IN SHALE
RHOSH      2.60          (KG/M3 OR GR/CC) MATRIX DENSITY OF SHALE
PEFSH      2.90          (BARNS/ELECTRON) PEF IN SHALE
TPLSH      9.00          (NSEC/M)          TPL IN SHALE
PHINSH      37.          (PERCENT) NEUTRON LOG POROSITY OF SHALE
DLTSH       90.          (USEC/FT) TRANSIT TIME OF SHALE
RSH        2.50          (OHM-M) RESISTIVITY OF SHALE
PHIMAX    40.00          (PERCENT) MAX SHALE POROSITY IN INTERVAL

**********************************************************************
*******     LOG CALCULATION CONSTANTS AND EXPONENTS     *******
[redacted]**********************************************************************

A          0.62          CONSTANT IN FORMATION FACTOR EQUATION
M          2.15          CEMENTATION EXPONENT
N          2.00          SATURATION EXPONENT
CP         1.10          COMPACTION FACTOR

**********************************************************************
*****  LIMITING VALUES FOR NET AND GROSS PAY CALCULATIONS  ****
**********************************************************************

PHILIM     6.00          (PERCENT) LOWER POROSITY LIMIT
VSHLIM     0.40          (FRACTION) VOLUME OF SHALE UPPER LIMIT

**********************************************************************
*********     LOG CALCULATION OPTIONS AND SWITCHES     ********
**********************************************************************

MSI           0          0=STANDARD UNITS  1=MSI
VSHCIN        3          GR TO VOL. OF SHALE CURVATURE INDEX
VSHOFF        0          0=CALC VOL. OF SHALE - 1=VOL.OF SH=0
GROFF         0          GR AS SHALE INDICATOR (0-USE ,1-NO)
KTHOFF        1          TH & K AS SHALE INDICATOR (0-USE ,1-NO)
NEUOFF        0          NEUTRON AS SHALE INDICATOR (0-USE ,1-NO)
DLTOFF        1          SONIC AS SHALE INDICATOR (0-USE ,1-NO)
ATTOFF        1          EPT AS SHALE INDICATOR (0-USE ,1-NO)
[redacted]OFF         1          SP AS SHALE INDICATOR (0-USE ,1-NO)
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PEOFF	0	USE PEF? (0-USE ,1-NO)
MINOPT	3	MINERAL OPTION SWITCH 0 = COMPLEX LITHOLOGY 1 = SANDSTONE AND DOLOMITEONLY 2 = LIMESTONE AND DOLOMITE ONLY 3 = SANDSTONE AND SHALE ONLY (CLASSICAL) 4 = SANDSTONE AND SHALE ONLY (MODERN) 5 = SANDSTONE AND LIMESTONE ONLY
MOPOFF	0	MOVEABLE OIL PLOT SWITCH 0-USE RXO 1-NO RXO
QOPT	1	SW OPTION - 0=SW FROM PHIT AND Q 1=SW FROM PHIE AND VSH
NOPRT	0	PRINT OPTION - 0=PRINT ALL VALUES 1=SKIP SHALE ZONES
SWOPT	5	1 - ARCHIE; 2 - SIMANDOUX; 3 - SIMANDOUX LAMINAR; 4 - V2 SIMANDOUX; 5 - INDONESIAN 6 - DISPERSED CLAY 7 - DUAL WATER MODEL 8 - DUAL WATER Q=VSH MODEL 9 - NORMALIZED WAXMAN-SMITS 10 - WAXMAN-SMITS
SWIRR	10.00	(FRACTION)IRREDUCIBLE WATER SATURATION FOR PERMEABILITY EQUATION

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**************************************************************
            LISTING OF ENVIRON PARAMETERS

ZONE        MAAS1           WELL        ARCHER-1

**************************************************************

TOP DEPTH       2707.0000     (METRES) TOP OF INTERVAL
BASE DEPTH      3016.0000     (METRES) BOTTOM OF INTERVAL

DESCRIPTION OF PARAMETERS     : ARCHER-1. MAAS. 2707-3016M

**************************************************************
*********************     FLUID VALUES     *********************
**************************************************************

RHOFR      1.00          (KG/M3 OR GR/CC)RECORDED FLUID DENSITY
SALFM    27000.          (PPM) FORMATION SALINITY (NACL)
SALMD    20000.          (PPM) MUD SALINITY (NACL)
RMM      0.2850          (OHM-M) RM
                         IF USING AN OIL BASED MUD SET TO > 100
RMMT        81.          (F) MEASURED TEMPERATURE FOR RM
RMFM     0.2830          (OHM-M) RMF
RMFMT       66.          (F) MEASURED TEMPERATURE FOR RMF
RMCM     0.3080          (OHM-M) RMC
RMCMT       65.          (F) MEASURED TEMPERATURE FOR RMC


**************************************************************
*****************     HOLE AND MUD VALUES      ***************
**************************************************************

          8.40          (KG/M3 LBS/GAL LBS/FT3 OR SP. GRAV) MUD WT
                         ENTER 0 MW FOR AIR FILLED HOLE
BITSIZ   12.250          (INCHES) BIT SIZE
AMST        50.0         (F) ANNUAL MEAN SURFACE TEMP
BHT        195.0         (F) BOTTOM HOLE TEMPERATURE
TD        3435.          (METRES) TOTAL DEPTH OF BOREHOLE
RSTAND    1.500          ( INCHES ) STANDOFF SETTING ON INDUCTION

**************************************************************
******************     LIMITING VALUES     *******************
**************************************************************

RHOMIN     1.70          (KG/M3 OR GR/CC) MIN. VALID BULK DENSITY
DLTMIN      40.          (USEC/FT) MIN. VALID SONIC ITT
DLTMAX     190.          (USEC/FT) MAX. VALID SONIC ITT
PHNMAX      50.          (PERCENT) MAXIMUM VALID NEUTRON POROSITY
RUGMAX     6.00          (INCHES) MAX. RUGOSITY TO ACCEPT NEUTRON
STOMAX     3.00          (INCHES) MAX. NEUT. STANDOFF
STOMIN     0.00          (INCHES) MIN. NEUT. STANDOFF TO CORRECT
                         (SET TO STOMAX TO BYPASS STANDOFF LOGIC)
DROLIM     0.20          (KG/M3 OR GR/CC) MAXIMUM DENSITY CORRECTON
                            TO ACCEPT (+ OR -)
```

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**********************************************************************
********    SWITCHES AND TOOL DESCRIPTIONS    ********************
**********************************************************************

DUNIT          1          DEPTH MEASUREMENT UNITS FLAG
                                0 = DEPTH IN FEET
                                1 = DEPTH IN METERS
MSI            0          LOG MEASUREMENT UNITS FLAG
                                0 = MEASURED IN STANDARD UNITS
                                1 = MEASURED IN MSI UNITS
                                2 = STANDARD BUT DEGREES C
COMPEC         1          SPECTRALOG ENVIRONMENTAL CORRECTIONS
                                1 = SCHLUMBERGER, GO, OR WELEX
                                2 = DRESSER (USE WITH CAUTION)
GRSIZE         0          GAMMA RAY TOOL SIZE:
                                0 = 3 5/8 INCH TOOL
                                1 = 1 11/16 INCH TOOL
GRXC           1          GAMMA RAY CENTERING
                                0 = CENTERED
                                1 = NOT CENTERED
MOPOFF         0          MOVEABLE OIL PLOT SWITCH
                                0 = COMPUTE RXO CURVE
                                1 = DO NOT COMPUTE RXO CURVE
RXLOG          1          SELECT RESISTIVITY FOR LITH DETERMINATION
                                0 = USE RT AT 75 DEGREES F
                                1 = USE RXO AT 75 DEGREES F
AUTOCA         1          NEUTRON AUTOMATIC CALIPER COMPENSATION:
                                0 = NOT COMPENSATED
                                1 = COMPENSATED
PANEL        8.0          NEUTRON PANEL SETTING, NEEDED IF AUTOCA
                              IS EQUAL TO 0
NEWCNL         1          CNL VINTAGE
                                0 = BEFORE 1-1-76
                                1 = AFTER 1-1-76
NSCALE       100          SET TO 100 IF THE NEUTRON IS FRACTIONAL
KSCALE       100          SET TO 100 IF THE K LOG IS FRACTIONAL

TMUD           1          TYPE OF MUD SYSTEM (0=NATURAL & 1=BARITE )
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****

LISTING OF CALC PARAMETERS

ZONE MAAS1 WELL ARCHER-1

****

TOP DEPTH	2707.0000	(METRES) TOP OF INTERVAL
BASE DEPTH	3016.0000	(METRES) BOTTOM OF INTERVAL

****
********** MATRIX VALUES **********
****

GRMA	10.	(API) GAMMA RAY MATRIX
SPMA	-40.	(MV) SP MATRIX (MV)
ATTMA	150.	(DB/M) ATTENUATIONOF THE MATRIX(DB/M)
DLTSS	58.00	(USEC/FT) DELTA T SANDSTONE
DLTLS	56.00	(USEC/FT) DELTA T LIMESTONE
DLTDOL	43.96	(USEC/FT) DELTA T DOLOMITE
DLTANH	50.00	(USEC/FT) DELTA T ANHYDRITE
RHOSS	2.66	(KG/M3 OR GR/CC) MATRIX DENS OF SANDSTONE
RHOLS	2.71	(KG/M3 OR GR/CC) MATRIX DENS OF LIMESTONE
RHODOL	2.87	(KG/M3 OR GR/CC) MATRIX DENS OF DOLOMITE
RHOANH	2.98	(KG/M3 OR GR/CC) MATRIX DENS OF ANHYDRITE
TPLSS	7.20	(NSEC/M) TPL OF SANDSTONE
TPLLS	9.10	(NSEC/M) TPL OF LIMESTONE
TPLDOL	8.70	(NSEC/M) TPL OF DOLOMITE
TPLANH	8.40	(NSEC/M) TPL OF ANHYDRITE

VALUES FOR SOLO TOOLS

RHOMAB	2.66	(KG/CM OR GR/CC) MATRIX DENSITY
DLTMAB	58.	(KG/M3 OR GR/CC) TRANSIT TIME MATRIX
TPLMAB	8.50	(NSEC/M) TPL MATRIX
NEUMAB	0	NEUTRON MATRIX 0=LS 1=SS 2=DOL

VALUES FOR COAL DETECTION

GRCOAL	180.	(API) MAXIMUM GR IN COAL.
DLTCOL	100.	(USEC/FT) MINIMUM SONIC IN COAL.
UCOAL	8.00	(PPM) MINIMUM URANIUM IN COAL.
RHOCOL	2.22	(KG/M3 OR GR/CC) MAXIMUM DENSITY OF COAL.
PNCOL	33.	(PERCENT) MINIMUM LS. NEUTRON POR. IN COAL
PECOL	3.00	(BARNS/ELEC.) MAXIMUM PEF IN COAL.
COALCK	3	NUMBER OF POSITIVE COAL CHECKS NEEDED TO IDENTIFY COAL (COAL=1).

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**********************************************************************
**********************      FLUID VALUES     **********************
**********************************************************************

RHOF        1.00          (KG/M3 OR GR/CC)     FLUID DENSITY
[redacted]F       189.          (USEC/FT) TRANSIT TIME OF FLUID
[redacted]OH      0.60          (KG/M3 OR GR/CC)     HYDROCARBON DENSITY
ANEUT       1.00          NEUTRON GAS FACTOR(USUAL RANGE 1 TO 1.4)
                          1=HIGH DENSITY AND 1.5 LOW DENSITY
RHOMF       1.00          (KG/M3 OR GR/CC)     MUD FILTRATE DENSITY
TPLH        5.00          (NSEC/M)             HYDROCARBON TPL
SALMD   20000.            (PPM)       MUD SALINITY
RWM       0.090           (OHM-M)  RW AT MEASURED TEMPERATURE
RWMT       195.           (F) TEMPERATURE OF RW MEASUREMENT
RWBM       0.09           (OHM-M)  BOUND WATER RESISTIVITY
RWBMT      195.           (F) TEMPERATURE OF RWB MEASUREMENT

**********************************************************************
***************      SHALE AND CLAY VALUES      ***************
**********************************************************************
GRSH       120.           (API) GAMMA RAY VALUE IN SHALE
SPSH       -45.           (MV)  SP VALUE IN SHALE
ATTSH      600.           (DB/M) EPT ATTENUATION IN SHALE
RHOSH      2.57           (KG/M3 OR GR/CC) MATRIX DENSITY OF SHALE
PEFSH      2.90           (BARNS/ELECTRON) PEF IN SHALE
TPLSH      9.00           (NSEC/M)          TPL IN SHALE
PHINSH      34.           (PERCENT) NEUTRON LOG POROSITY OF SHALE
DLTSH       90.           (USEC/FT) TRANSIT TIME OF SHALE
RSH        7.00           (OHM-M) RESISTIVITY OF SHALE
PHIMAX    45.00           (PERCENT) MAX SHALE POROSITY IN INTERVAL

**********************************************************************
[redacted]*****      LOG CALCULATION CONSTANTS AND EXPONENTS      *******
**********************************************************************

A          0.62           CONSTANT IN FORMATION FACTOR EQUATION
M          2.15           CEMENTATION EXPONENT
N          2.00           SATURATION EXPONENT
CP         1.00           COMPACTION FACTOR

**********************************************************************
*****  LIMITING VALUES FOR NET AND GROSS PAY CALCULATIONS  ****
**********************************************************************

PHILIM     6.00           (PERCENT) LOWER POROSITY LIMIT
VSHLIM     0.40           (FRACTION) VOLUME OF SHALE UPPER LIMIT

**********************************************************************
*********      LOG CALCULATION OPTIONS AND SWITCHES      ********
**********************************************************************

MSI            0          0=STANDARD UNITS  1=MSI
VSHCIN         3          GR TO VOL. OF SHALE CURVATURE INDEX
VSHOFF         0          0=CALC VOL. OF SHALE - 1=VOL.OF SH=0
GROFF          0          GR AS SHALE INDICATOR (0-USE ,1-NO)
KTHOFF         1          TH & K AS SHALE INDICATOR (0-USE ,1-NO)
NEUOFF         0          NEUTRON AS SHALE INDICATOR (0-USE ,1-NO)
DLTOFF         1          SONIC AS SHALE INDICATOR (0-USE ,1-NO)
ATTOFF         1          EPT AS SHALE INDICATOR (0-USE ,1-NO)
[redacted]FF           1          SP AS SHALE INDICATOR (0-USE ,1-NO)
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PEOFF	0	USE PEF? (0-USE ,1-NO)
MINOPT	3	MINERAL OPTION SWITCH 0 = COMPLEX LITHOLOGY 1 = SANDSTONE AND DOLOMITEONLY 2 = LIMESTONE AND DOLOMITE ONLY 3 = SANDSTONE AND SHALE ONLY (CLASSICAL) 4 = SANDSTONE AND SHALE ONLY (MODERN) 5 = SANDSTONE AND LIMESTONE ONLY
MOPOFF	0	MOVEABLE OIL PLOT SWITCH 0-USE RXO 1-NO RXO
QOPT	1	SW OPTION - 0=SW FROM PHIT AND Q 1=SW FROM PHIE AND VSH
NOPRT	0	PRINT OPTION - 0=PRINT ALL VALUES 1=SKIP SHALE ZONES
SWOPT	5	1 - ARCHIE; 2 - SIMANDOUX; 3 - SIMANDOUX LAMINAR; 4 - V2 SIMANDOUX; 5 - INDONESIAN 6 - DISPERSED CLAY 7 - DUAL WATER MODEL 8 - DUAL WATER Q=VSH MODEL 9 - NORMALIZED WAXMAN-SMITS 10 - WAXMAN-SMITS
SWIRR	10.00	(FRACTION)IRREDUCIBLE WATER SATURATION FOR PERMEABILITY EQUATION

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**************************************************************
            LISTING OF ENVIRON PARAMETERS

ZONE        MAAS2           WELL        ARCHER-1

**************************************************************

TOP DEPTH       3016.0000     (METRES) TOP OF INTERVAL
BASE DEPTH      3384.0000     (METRES) BOTTOM OF INTERVAL

DESCRIPTION OF PARAMETERS     : ARCHER-1. SEL.SST +MAAS

**************************************************************
*********************     FLUID VALUES     *******************
**************************************************************

RHOFR      1.00          (KG/M3 OR GR/CC)RECORDED FLUID DENSITY
SALFM    27000.          (PPM) FORMATION SALINITY (NACL)
SALMD    20000.          (PPM) MUD SALINITY (NACL)
RMM      0.2850          (OHM-M) RM
                         IF USING AN OIL BASED MUD SET TO > 100
RMMT        81.          (F) MEASURED TEMPERATURE FOR RM
RMFM     0.2830          (OHM-M) RMF
RMFMT       66.          (F) MEASURED TEMPERATURE FOR RMF
RMCM     0.3080          (OHM-M) RMC
RMCMT       65.          (F) MEASURED TEMPERATURE FOR RMC


**************************************************************
*****************     HOLE AND MUD VALUES      ***************
**************************************************************

MW          8.40         (KG/M3 LBS/GAL LBS/FT3 OR SP. GRAV) MUD WT
                          ENTER 0 MW FOR AIR FILLED HOLE
BITSIZ   12.250          (INCHES) BIT SIZE
AMST        50.0         (F) ANNUAL MEAN SURFACE TEMP
BHT        195.0         (F) BOTTOM HOLE TEMPERATURE
TD         3435.         (METRES) TOTAL DEPTH OF BOREHOLE
RSTAND    1.500          ( INCHES ) STANDOFF SETTING ON INDUCTION

**************************************************************
******************     LIMITING VALUES     *******************
**************************************************************

RHOMIN     1.70          (KG/M3 OR GR/CC) MIN. VALID BULK DENSITY
DLTMIN      40.          (USEC/FT) MIN. VALID SONIC ITT
DLTMAX     190.          (USEC/FT) MAX. VALID SONIC ITT
PHNMAX      60.          (PERCENT) MAXIMUM VALID NEUTRON POROSITY
RUGMAX     6.00          (INCHES) MAX. RUGOSITY TO ACCEPT NEUTRON
STOMAX     3.00          (INCHES) MAX. NEUT. STANDOFF
STOMIN     0.00          (INCHES) MIN. NEUT. STANDOFF TO CORRECT
                         (SET TO STOMAX TO BYPASS STANDOFF LOGIC)
DROLIM     0.20          (KG/M3 OR GR/CC) MAXIMUM DENSITY CORRECTON
                            TO ACCEPT (+ OR -)
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************************************************************
********   SWITCHES AND TOOL DESCRIPTIONS   ******************
************************************************************

DUNIT          1          DEPTH MEASUREMENT UNITS FLAG
                                0 = DEPTH IN FEET
                                1 = DEPTH IN METERS
MSI            0          LOG MEASUREMENT UNITS FLAG
                                0 = MEASURED IN STANDARD UNITS
                                1 = MEASURED IN MSI UNITS
                                2 = STANDARD BUT DEGREES C
COMPEC         1          SPECTRALOG ENVIRONMENTAL CORRECTIONS
                                1 = SCHLUMBERGER, GO, OR WELEX
                                2 = DRESSER (USE WITH CAUTION)
GRSIZE         0          GAMMA RAY TOOL SIZE:
                                0 = 3 5/8 INCH TOOL
                                1 = 1 11/16 INCH TOOL
GRXC           1          GAMMA RAY CENTERING
                                0 = CENTERED
                                1 = NOT CENTERED
MOPOFF         0          MOVEABLE OIL PLOT SWITCH
                                0 = COMPUTE RXO CURVE
                                1 = DO NOT COMPUTE RXO CURVE
RXLOG          1          SELECT RESISTIVITY FOR LITH DETERMINATION
                                0 = USE RT AT 75 DEGREES F
                                1 = USE RXO AT 75 DEGREES F
AUTOCA         1          NEUTRON AUTOMATIC CALIPER COMPENSATION:
                                0 = NOT COMPENSATED
                                1 = COMPENSATED
PANEL        8.0          NEUTRON PANEL SETTING, NEEDED IF AUTOCA
                              IS EQUAL TO 0
NEWCNL         1          CNL VINTAGE
                                0 = BEFORE 1-1-76
                                1 = AFTER 1-1-76
NSCALE       100          SET TO 100 IF THE NEUTRON IS FRACTIONAL
KSCALE       100          SET TO 100 IF THE K LOG IS FRACTIONAL

TMUD           1          TYPE OF MUD SYSTEM (0=NATURAL & 1=BARITE )
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**************************************************************
            LISTING OF CALC PARAMETERS

ZONE        MAAS2           WELL        ARCHER-1

**************************************************************

TOP DEPTH       3016.0000     (METRES) TOP OF INTERVAL
BASE DEPTH      3384.0000     (METRES) BOTTOM OF INTERVAL

**************************************************************
********************     MATRIX VALUES    **********************
**************************************************************
GRMA         20.          (API) GAMMA RAY MATRIX
SPMA        -40.          (MV)  SP MATRIX (MV)
ATTMA       150.          (DB/M) ATTENUATIONOF THE MATRIX(DB/M)

DLTSS     58.00           (USEC/FT) DELTA T SANDSTONE
DLTLS     56.00           (USEC/FT) DELTA T LIMESTONE
DLTDOL    43.96           (USEC/FT) DELTA T DOLOMITE
DLTANH    50.00           (USEC/FT) DELTA T ANHYDRITE

RHOSS      2.66           (KG/M3 OR GR/CC) MATRIX DENS OF SANDSTONE
RHOLS      2.71           (KG/M3 OR GR/CC) MATRIX DENS OF LIMESTONE
RHODOL     2.87           (KG/M3 OR GR/CC) MATRIX DENS OF DOLOMITE
RHOANH     2.98           (KG/M3 OR GR/CC) MATRIX DENS OF ANHYDRITE

TPLSS      7.20           (NSEC/M) TPL OF SANDSTONE
TPLLS      9.10           (NSEC/M) TPL OF LIMESTONE
TPLDOL     8.70           (NSEC/M) TPL OF DOLOMITE
TPLANH     8.40           (NSEC/M) TPL OF ANHYDRITE

   VALUES FOR SOLO TOOLS

RHOMAB     2.66           (KG/CM OR GR/CC) MATRIX DENSITY
DLTMAB      58.           (KG/M3 OR GR/CC) TRANSIT TIME MATRIX
TPLMAB     8.50           (NSEC/M) TPL MATRIX
NEUMAB        0           NEUTRON MATRIX 0=LS 1=SS 2=DOL

    VALUES FOR COAL DETECTION

GRCOAL     180.           (API) MAXIMUM GR IN COAL.
DLTCOL      94.           (USEC/FT) MINIMUM SONIC IN COAL.
UCOAL      8.00           (PPM) MINIMUM URANIUM IN COAL.
RHOCOL     2.15           (KG/M3 OR GR/CC) MAXIMUM DENSITY OF COAL.
PNCOL       30.           (PERCENT) MINIMUM LS. NEUTRON POR. IN COAL
PECOL      3.00           (BARNS/ELEC.) MAXIMUM PEF IN COAL.
COALCK        3           NUMBER OF POSITIVE COAL CHECKS NEEDED TO
                          IDENTIFY COAL (COAL=1).
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**********************************************************
**********      FLUID VALUES      **********
**********************************************************

RHOF       1.00          (KG/M3 OR GR/CC)    FLUID DENSITY
DLTF       189.          (USEC/FT) TRANSIT TIME OF FLUID
[illegible]H       0.60          (KG/M3 OR GR/CC)    HYDROCARBON DENSITY
ANEUT      1.00          NEUTRON GAS FACTOR(USUAL RANGE 1 TO 1.4)
                         1=HIGH DENSITY AND 1.5 LOW DENSITY
RHOMF      1.00          (KG/M3 OR GR/CC)    MUD FILTRATE DENSITY
TPLH       5.00          (NSEC/M)            HYDROCARBON TPL
SALMD    20000.          (PPM)       MUD SALINITY
RWM       0.090          (OHM-M)  RW AT MEASURED TEMPERATURE
RWMT       195.          (F) TEMPERATURE OF RW MEASUREMENT
RWBM       0.09          (OHM-M)  BOUND WATER RESISTIVITY
RWBMT      195.          (F) TEMPERATURE OF RWB MEASUREMENT

**********************************************************
***********      SHALE AND CLAY VALUES      **********
**********************************************************
GRSH       120.          (API) GAMMA RAY VALUE IN SHALE
SPSH       -45.          (MV)  SP VALUE IN SHALE
ATTSH      600.          (DB/M) EPT ATTENUATION IN SHALE
RHOSH      2.50          (KG/M3 OR GR/CC) MATRIX DENSITY OF SHALE
PEFSH      2.90          (BARNS/ELECTRON) PEF IN SHALE
TPLSH      9.00          (NSEC/M)          TPL IN SHALE
PHINSH      29.          (PERCENT) NEUTRON LOG POROSITY OF SHALE
DLTSH       75.          (USEC/FT) TRANSIT TIME OF SHALE
RSH        8.00          (OHM-M) RESISTIVITY OF SHALE
PHIMAX    34.00          (PERCENT) MAX SHALE POROSITY IN INTERVAL

                         WAXMAN SMITS CONSTANTS

[illegible]CL      2.70          (KG/M3 OR GR/CC) DENS OF DRY CLAY
HICL      25.00          (PERCENT) HYDROGEN INDEX OF DRY CLAY
CEC       0.100          (MEQ/G) CATION EXCHANGE CAPACITY
                         NOTE: ALSO SUPPLY RSH, M (USED AS M*),
                               N (USED AS N*), RW, AND A.

**********************************************************
*******     LOG CALCULATION CONSTANTS AND EXPONENTS     *******
**********************************************************

A          0.62          CONSTANT IN FORMATION FACTOR EQUATION
M          2.15          CEMENTATION EXPONENT
N          2.00          SATURATION EXPONENT
CP         1.00          COMPACTION FACTOR

**********************************************************
*****  LIMITING VALUES FOR NET AND GROSS PAY CALCULATIONS  ****
**********************************************************

PHILIM     6.00          (PERCENT) LOWER POROSITY LIMIT
VSHLIM     0.40          (FRACTION) VOLUME OF SHALE UPPER LIMIT

**********************************************************
*********     LOG CALCULATION OPTIONS AND SWITCHES     ********
**********************************************************

M[illegible]           0          0=STANDARD UNITS  1=MSI
```

VSHCIN	3	GR TO VOL. OF SHALE CURVATURE INDEX
VSHOFF	0	0=CALC VOL. OF SHALE - 1=VOL.OF SH=0
GROFF	0	GR AS SHALE INDICATOR (0-USE ,1-NO)
KTHOFF	1	TH & K AS SHALE INDICATOR (0-USE ,1-NO)
NEUOFF	0	NEUTRON AS SHALE INDICATOR (0-USE ,1-NO)
DLTOFF	1	SONIC AS SHALE INDICATOR (0-USE ,1-NO)
[illegible]OFF	1	EPT AS SHALE INDICATOR (0-USE ,1-NO)
SPOFF	1	SP AS SHALE INDICATOR (0-USE ,1-NO)
PEOFF	0	USE PEF? (0-USE ,1-NO)
MINOPT	3	MINERAL OPTION SWITCH 0 = COMPLEX LITHOLOGY 1 = SANDSTONE AND DOLOMITEONLY 2 = LIMESTONE AND DOLOMITE ONLY 3 = SANDSTONE AND SHALE ONLY (CLASSICAL) 4 = SANDSTONE AND SHALE ONLY (MODERN) 5 = SANDSTONE AND LIMESTONE ONLY
MOPOFF	0	MOVEABLE OIL PLOT SWITCH 0-USE RXO 1-NO RXO
QOPT	1	SW OPTION - 0=SW FROM PHIT AND Q 1=SW FROM PHIE AND VSH
NOPRT	0	PRINT OPTION - 0=PRINT ALL VALUES 1=SKIP SHALE ZONES
SWOPT	5	1 - ARCHIE; 2 - SIMANDOUX; 3 - SIMANDOUX LAMINAR; 4 - V2 SIMANDOUX; 5 - INDONESIAN 6 - DISPERSED CLAY 7 - DUAL WATER MODEL 8 - DUAL WATER Q=VSH MODEL 9 - NORMALIZED WAXMAN-SMITS 10 - WAXMAN-SMITS
SWIRR	10.00	(FRACTION)IRREDUCIBLE WATER SATURATION FOR PERMEABILITY EQUATION

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**************************************************************
            LISTING OF ENVIRON PARAMETERS

ZONE        Z1              WELL        ARCHER-1

**************************************************************

TOP DEPTH       3384.0000     METRES.
BASE DEPTH      3435.0000     METRES.

DESCRIPTION OF PARAMETERS    : ARCHER-1 TOP Z1 3384-3435M

**************************************************************
*********************     FLUID VALUES     *******************
**************************************************************

RHOFR     1.00          (KG/M3 OR GR/CC)RECORDED FLUID DENSITY
SALFM    27000.         (PPM) FORMATION SALINITY (NACL)
SALMD    20000.         (PPM) MUD SALINITY (NACL)
RMM      0.2850         (OHM-M) RM
                        IF USING AN OIL BASED MUD SET TO > 100
RMMT       81.          (F) MEASURED TEMPERATURE FOR RM
RMFM     0.2830         (OHM-M) RMF
RMFMT      66.          (F) MEASURED TEMPERATURE FOR RMF
RMCM     0.3080         (OHM-M) RMC
RMCMT      65.          (F) MEASURED TEMPERATURE FOR RMC


**************************************************************
*****************     HOLE AND MUD VALUES      ***************
**************************************************************

MW         8.40         (KG/M3 LBS/GAL LBS/FT3 OR SP. GRAV) MUD WT
                         ENTER 0 MW FOR AIR FILLED HOLE
BITSIZ   12.250         (MM OR INCHES) BIT SIZE
AMST       50.0         (F) ANNUAL MEAN SURFACE TEMP
BHT       195.0         (F) BOTTOM HOLE TEMPERATURE
TD        3435.         (METRES) TOTAL DEPTH OF BOREHOLE
RSTAND    1.500         ( INCHES ) STANDOFF SETTING ON INDUCTION

**************************************************************
******************     LIMITING VALUES     *******************
**************************************************************

RHOMIN     1.25         (KG/M3 OR GR/CC) MIN. VALID BULK DENSITY
DLTMIN      40.         (USEC/M OR USEC/FT) MIN. VALID SONIC ITT
DLTMAX     190.         (USEC/M OR USEC/FT) MAX. VALID SONIC ITT
PHNMAX      70.         (PERCENT) MAXIMUM VALID NEUTRON POROSITY
RUGMAX     6.00         (INCHES) MAX. RUGOSITY TO ACCEPT NEUTRON
STOMAX     3.00         (INCHES) MAX. NEUT. STANDOFF
STOMIN     0.00         (INCHES) MIN. NEUT. STANDOFF TO CORRECT
                        (SET TO STOMAX TO BYPASS STANDOFF LOGIC)
DROLIM     0.20         (KG/M3 OR GR/CC) MAXIMUM DENSITY CORRECTON
                           TO ACCEPT (+ OR -)
```

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**********************************************************************
********    SWITCHES AND TOOL DESCRIPTIONS    ********************
**********************************************************************

DUNIT          1          DEPTH MEASUREMENT UNITS FLAG
                                  0 = DEPTH IN FEET
                                  1 = DEPTH IN METERS
MSI            0          LOG MEASUREMENT UNITS FLAG
                                  0 = MEASURED IN STANDARD UNITS
                                  1 = MEASURED IN MSI UNITS
                                  2 = STANDARD BUT DEGREES C
COMPEC         1          SPECTRALOG ENVIRONMENTAL CORRECTIONS
                                  1 = SCHLUMBERGER, GO, OR WELEX
                                  2 = DRESSER (USE WITH CAUTION)
GRSIZE         0          GAMMA RAY TOOL SIZE:
                                  0 = 3 5/8 INCH TOOL
                                  1 = 1 11/16 INCH TOOL
GRXC           1          GAMMA RAY CENTERING
                                  0 = CENTERED
                                  1 = NOT CENTERED
MOPOFF         0          MOVEABLE OIL PLOT SWITCH
                                  0 = COMPUTE RXO CURVE
                                  1 = DO NOT COMPUTE RXO CURVE
RXLOG          1          SELECT RESISTIVITY FOR LITH DETERMINATION
                                  0 = USE RT AT 75 DEGREES F
                                  1 = USE RXO AT 75 DEGREES F
AUTOCA         1          NEUTRON AUTOMATIC CALIPER COMPENSATION:
                                  0 = NOT COMPENSATED
                                  1 = COMPENSATED
PANEL        8.0          NEUTRON PANEL SETTING, NEEDED IF AUTOCA
                              IS EQUAL TO 0
NEWCNL         1          CNL VINTAGE
                                  0 = BEFORE 1-1-76
                                  1 = AFTER 1-1-76
NSCALE       100          SET TO 100 IF THE NEUTRON IS FRACTIONAL
KSCALE       100          SET TO 100 IF THE K LOG IS FRACTIONAL

TMUD           1          TYPE OF MUD SYSTEM (0=NATURAL & 1=BARITE )
```

****

LISTING OF CALC PARAMETERS

ZONE Z1 WELL ARCHER-1

****

TOP DEPTH 3384.0000 METRES.
BASE DEPTH 3435.0000 METRES.

****
********** MATRIX VALUES **********
****

GRMA	58.	(API) GAMMA RAY MATRIX
SPMA	-40.	(MV) SP MATRIX (MV)
ATTMA	150.	(DB/M) ATTENUATIONOF THE MATRIX(DB/M)
DLTSS	59.00	(USEC/M OR USEC/FT) DELTA T SANDSTONE
DLTLS	56.00	(USEC/M OR USEC/FT) DELTA T LIMESTONE
DLTDOL	43.96	(USEC/M OR USEC/FT) DELTA T DOLOMITE
DLTANH	50.00	(USEC/M OR USEC/FT) DELTA T ANHYDRITE
RHOSS	2.66	(KG/M3 OR GR/CC) MATRIX DENS OF SANDSTONE
RHOLS	2.71	(KG/M3 OR GR/CC) MATRIX DENS OF LIMESTONE
RHODOL	2.87	(KG/M3 OR GR/CC) MATRIX DENS OF DOLOMITE
RHOANH	2.98	(KG/M3 OR GR/CC) MATRIX DENS OF ANHYDRITE
TPLSS	7.20	(NSEC/M) TPL OF SANDSTONE
TPLLS	9.10	(NSEC/M) TPL OF LIMESTONE
TPLDOL	8.70	(NSEC/M) TPL OF DOLOMITE
TPLANH	8.40	(NSEC/M) TPL OF ANHYDRITE

VALUES FOR SOLO TOOLS

RHOMAB	2.66	(KG/CM OR GR/CC) MATRIX DENSITY
DLTMAB	59.	(KG/M3 OR GR/CC) TRANSIT TIME MATRIX
TPLMAB	8.50	(NSEC/M) TPL MATRIX
NEUMAB	0	NEUTRON MATRIX 0=LS 1=SS 2=DOL

VALUES FOR COAL DETECTION

GRCOAL	180.	(API) MAXIMUM GR IN COAL.
DLTCOL	86.	(USEC/M OR USEC/FT) MINIMUM SONIC IN COAL.
UCOAL	8.00	(PPM) MINIMUM URANIUM IN COAL.
RHOCOL	2.30	(KG/M3 OR GR/CC) MAXIMUM DENSITY OF COAL.
PNCOL	27.	(PERCENT) MINIMUM LS. NEUTRON POR. IN COAL
PECOL	3.00	(BARNS/ELEC.) MAXIMUM PEF IN COAL.
COALCK	6	NUMBER OF POSITIVE COAL CHECKS NEEDED TO IDENTIFY COAL (COAL=1).

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**************************************************************
**********************     FLUID VALUES    **********************
**************************************************************

RHOF       1.00          (KG/M3 OR GR/CC)     FLUID DENSITY
DTF        189.          (USEC/M OR USEC/FT) TRANSIT TIME OF FLUID
RHOH       0.60          (KG/M3 OR GR/CC)     HYDROCARBON DENSITY
ANEUT      1.00          NEUTRON GAS FACTOR(USUAL RANGE 1 TO 1.4)
                         1=HIGH DENSITY AND 1.5 LOW DENSITY
RHOMF      1.00          (KG/M3 OR GR/CC)     MUD FILTRATE DENSITY
TPLH       5.00          (NSEC/M)             HYDROCARBON TPL
SALMD    20000.          (PPM)       MUD SALINITY
RWM       0.090          (OHM-M)  RW AT MEASURED TEMPERATURE
RWMT       195.          (F) TEMPERATURE OF RW MEASUREMENT
RWBM       0.09          (OHM-M)  BOUND WATER RESISTIVITY
RWBMT      195.          (F) TEMPERATURE OF RWB MEASUREMENT

**************************************************************
***************     SHALE AND CLAY VALUES     ****************
**************************************************************
GRSH       135.          (API) GAMMA RAY VALUE IN SHALE
SPSH       -45.          (MV)  SP VALUE IN SHALE
ATTSH      600.          (DB/M) EPT ATTENUATION IN SHALE
RHOSH      2.50          (KG/M3 OR GR/CC) MATRIX DENSITY OF SHALE
PEFSH      2.90          (BARNS/ELECTRON) PEF IN SHALE
TPLSH      9.00          (NSEC/M)          TPL IN SHALE
PHINSH      19.          (PERCENT) NEUTRON LOG POROSITY OF SHALE
DLTSH       77.          (USEC/M OR USEC/FT) TRANSIT TIME OF SHALE
RSH        9.00          (OHM-M) RESISTIVITY OF SHALE
PHIMAX    30.00          (PERCENT) MAX SHALE POROSITY IN INTERVAL

**************************************************************
*******     LOG CALCULATION CONSTANTS AND EXPONENTS     *******
**************************************************************

A          0.62          CONSTANT IN FORMATION FACTOR EQUATION
M          2.15          CEMENTATION EXPONENT
N          2.00          SATURATION EXPONENT
CP         1.00          COMPACTION FACTOR

**************************************************************
*****  LIMITING VALUES FOR GROSS CALCULATIONS               ****
**************************************************************

PHILIM     6.00          (PERCENT) LOWER POROSITY LIMIT
VSHLIM     0.40          (FRACTION) VOLUME OF SHALE UPPER LIMIT

**************************************************************
*********     LOG CALCULATION OPTIONS AND SWITCHES     ********
**************************************************************

MSI           0          0=STANDARD UNITS  1=MSI
VSHCIN        3          GR TO VOL. OF SHALE CURVATURE INDEX
VSHOFF        0          0=CALC VOL. OF SHALE - 1=VOL.OF SH=0
GROFF         1          GR AS SHALE INDICATOR (0-USE ,1-NO)
KTHOFF        1          TH & K AS SHALE INDICATOR (0-USE ,1-NO)
NEUOFF        0          NEUTRON AS SHALE INDICATOR (0-USE ,1-NO)
DLTOFF        0          SONIC AS SHALE INDICATOR (0-USE ,1-NO)
ATTOFF        1          EPT AS SHALE INDICATOR (0-USE ,1-NO)
SPOFF         1          SP AS SHALE INDICATOR (0-USE ,1-NO)
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PEOFF	0	USE PEF? (0-USE ,1-NO)
MINOPT	3	MINERAL OPTION SWITCH 0 = COMPLEX LITHOLOGY 1 = SANDSTONE AND DOLOMITE ONLY 2 = LIMESTONE AND DOLOMITE ONLY 3 = SANDSTONE AND SHALE ONLY (CLASSICAL) 4 = SANDSTONE AND SHALE ONLY (MODERN) 5 = SANDSTONE AND LIMESTONE ONLY
MOPOFF	0	MOVEABLE OIL PLOT SWITCH 0-USE RXO 1-NO RXO
QOPT	1	SW OPTION - 0=SW FROM PHIT AND Q 1=SW FROM PHIE AND VSH
NOPRT	0	PRINT OPTION - 0=PRINT ALL VALUES 1=SKIP SHALE ZONES
SWOPT	5	1 - ARCHIE; 2 - SIMANDOUX; 3 - SIMANDOUX LAMINAR; 4 - V2 SIMANDOUX; 5 - INDONESIAN 6 - DISPERSED CLAY 7 - DUAL WATER MODEL 8 - DUAL WATER Q=VSH MODEL 9 - NORMALIZED WAXMAN-SMITS 10 - WAXMAN-SMITS
SWIRR	10.00	(FRACTION)IRREDUCIBLE WATER SATURATION FOR PERMEABILITY EQUATION

****

LISTING OF ENVIRON PARAMETERS

ZONE Z1B WELL ARCHER-1

****

TOP DEPTH 3435.0000 METRES.
BASE DEPTH 3469.0000 METRES.

DESCRIPTION OF PARAMETERS : ARCHER-1. BASE ZONE-1

****
********** FLUID VALUES **********
****

RHOFR	1.00	(KG/M3 OR GR/CC)RECORDED FLUID DENSITY
SALFM	27000.	(PPM) FORMATION SALINITY (NACL)
SALMD	14000.	(PPM) MUD SALINITY (NACL)
RMM	0.4190	(OHM-M) RM IF USING AN OIL BASED MUD SET TO > 100
RMMT	81.	(F) MEASURED TEMPERATURE FOR RM
RMFM	0.3610	(OHM-M) RMF
RMFMT	77.	(F) MEASURED TEMPERATURE FOR RMF
RMCM	0.5130	(OHM-M) RMC
RMCMT	77.	(F) MEASURED TEMPERATURE FOR RMC

****
********** HOLE AND MUD VALUES **********
****

MW	8.85	(KG/M3 LBS/GAL LBS/FT3 OR SP. GRAV) MUD WT ENTER 0 MW FOR AIR FILLED HOLE
BITSIZ	8.500	(MM OR INCHES) BIT SIZE
AMST	50.0	(F) ANNUAL MEAN SURFACE TEMP
BHT	233.0	(F) BOTTOM HOLE TEMPERATURE
TD	4050.	(METRES) TOTAL DEPTH OF BOREHOLE
RSTAND	1.500	(INCHES) STANDOFF SETTING ON INDUCTION

****
***** LIMITING VALUES FOR GROSS CALCULATIONS ****
****

RHOMIN	1.95	(KG/M3 OR GR/CC) MIN. VALID BULK DENSITY
DLTMIN	40.	(USEC/M OR USEC/FT) MIN. VALID SONIC ITT
DLTMAX	190.	(USEC/M OR USEC/FT) MAX. VALID SONIC ITT
PHNMAX	45.	(PERCENT) MAXIMUM VALID NEUTRON POROSITY
RUGMAX	6.00	(INCHES) MAX. RUGOSITY TO ACCEPT NEUTRON
STOMAX	3.00	(INCHES) MAX. NEUT. STANDOFF
STOMIN	0.00	(INCHES) MIN. NEUT. STANDOFF TO CORRECT (SET TO STOMAX TO BYPASS STANDOFF LOGIC)
DROLIM	0.20	(KG/M3 OR GR/CC) MAXIMUM DENSITY CORRECTON TO ACCEPT (+ OR -)

```
*****************************************************************
********   SWITCHES AND TOOL DESCRIPTIONS   ********************
*****************************************************************

DUNIT          1          DEPTH MEASUREMENT UNITS FLAG
                                0 = DEPTH IN FEET
                                1 = DEPTH IN METERS
MSI            0          LOG MEASUREMENT UNITS FLAG
                                0 = MEASURED IN STANDARD UNITS
                                1 = MEASURED IN MSI UNITS
                                2 = STANDARD BUT DEGREES C
COMPEC         1          SPECTRALOG ENVIRONMENTAL CORRECTIONS
                                1 = SCHLUMBERGER, GO, OR WELEX
                                2 = DRESSER (USE WITH CAUTION)
GRSIZE         0          GAMMA RAY TOOL SIZE:
                                0 = 3 5/8 INCH TOOL
                                1 = 1 11/16 INCH TOOL
GRXC           1          GAMMA RAY CENTERING
                                0 = CENTERED
                                1 = NOT CENTERED
MOPOFF         0          MOVEABLE OIL PLOT SWITCH
                                0 = COMPUTE RXO CURVE
                                1 = DO NOT COMPUTE RXO CURVE
RXLOG          1          SELECT RESISTIVITY FOR LITH DETERMINATION
                                0 = USE RT AT 75 DEGREES F
                                1 = USE RXO AT 75 DEGREES F
AUTOCA         1          NEUTRON AUTOMATIC CALIPER COMPENSATION:
                                0 = NOT COMPENSATED
                                1 = COMPENSATED
PANEL        8.0          NEUTRON PANEL SETTING, NEEDED IF AUTOCA
                              IS EQUAL TO 0
NEWCNL         1          CNL VINTAGE
                                0 = BEFORE 1-1-76
                                1 = AFTER 1-1-76
NSCALE       100          SET TO 100 IF THE NEUTRON IS FRACTIONAL
KSCALE       100          SET TO 100 IF THE K LOG IS FRACTIONAL

TMUD           1          TYPE OF MUD SYSTEM (0=NATURAL & 1=BARITE )
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****

LISTING OF CALC PARAMETERS

ZONE Z1B WELL ARCHER-1

****

TOP DEPTH 3435.0000 METRES.
BASE DEPTH 3469.0000 METRES.

****
********** MATRIX VALUES **********
****

GRMA	58.	(API) GAMMA RAY MATRIX
SPMA	-40.	(MV) SP MATRIX (MV)
ATTMA	150.	(DB/M) ATTENUATIONOF THE MATRIX(DB/M)
DLTSS	59.00	(USEC/M OR USEC/FT) DELTA T SANDSTONE
DLTLS	56.00	(USEC/M OR USEC/FT) DELTA T LIMESTONE
DLTDOL	43.96	(USEC/M OR USEC/FT) DELTA T DOLOMITE
DLTANH	50.00	(USEC/M OR USEC/FT) DELTA T ANHYDRITE
RHOSS	2.64	(KG/M3 OR GR/CC) MATRIX DENS OF SANDSTONE
RHOLS	2.71	(KG/M3 OR GR/CC) MATRIX DENS OF LIMESTONE
RHODOL	2.87	(KG/M3 OR GR/CC) MATRIX DENS OF DOLOMITE
RHOANH	2.98	(KG/M3 OR GR/CC) MATRIX DENS OF ANHYDRITE
TPLSS	7.20	(NSEC/M) TPL OF SANDSTONE
TPLLS	9.10	(NSEC/M) TPL OF LIMESTONE
TPLDOL	8.70	(NSEC/M) TPL OF DOLOMITE
TPLANH	8.40	(NSEC/M) TPL OF ANHYDRITE

VALUES FOR SOLO TOOLS

RHOMAB	2.64	(KG/CM OR GR/CC) MATRIX DENSITY
DLTMAB	59.	(KG/M3 OR GR/CC) TRANSIT TIME MATRIX
TPLMAB	8.50	(NSEC/M) TPL MATRIX
NEUMAB	0	NEUTRON MATRIX 0=LS 1=SS 2=DOL

VALUES FOR COAL DETECTION

GRCOAL	180.	(API) MAXIMUM GR IN COAL.
DLTCOL	90.	(USEC/M OR USEC/FT) MINIMUM SONIC IN COAL.
UCOAL	8.00	(PPM) MINIMUM URANIUM IN COAL.
RHOCOL	2.24	(KG/M3 OR GR/CC) MAXIMUM DENSITY OF COAL.
PNCOL	19.	(PERCENT) MINIMUM LS. NEUTRON POR. IN COAL
PECOL	3.00	(BARNS/ELEC.) MAXIMUM PEF IN COAL.
COALCK	4	NUMBER OF POSITIVE COAL CHECKS NEEDED TO IDENTIFY COAL (COAL=1).

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**********************************************************************
**********************     FLUID VALUES     **********************
**********************************************************************

RHOF       1.00          (KG/M3 OR GR/CC)     FLUID DENSITY
DLTF       189.          (USEC/M OR USEC/FT) TRANSIT TIME OF FLUID
RHOH       0.60          (KG/M3 OR GR/CC)     HYDROCARBON DENSITY
ANEUT      1.00          NEUTRON GAS FACTOR(USUAL RANGE 1 TO 1.4)
                         1=HIGH DENSITY AND 1.5 LOW DENSITY
RHOMF      1.00          (KG/M3 OR GR/CC)     MUD FILTRATE DENSITY
TPLH       5.00          (NSEC/M)             HYDROCARBON TPL
SALMD    14000.          (PPM)       MUD SALINITY
RWM        0.085         (OHM-M)   RW AT MEASURED TEMPERATURE
RWMT       233.          (F) TEMPERATURE OF RW MEASUREMENT
RWBM       0.09          (OHM-M)   BOUND WATER RESISTIVITY
RWBMT      233.          (F) TEMPERATURE OF RWB MEASUREMENT

**********************************************************************
****************     SHALE AND CLAY VALUES     ***************
**********************************************************************
GRSH       135.          (API) GAMMA RAY VALUE IN SHALE
SPSH       -45.          (MV)   SP VALUE IN SHALE
ATTSH      600.          (DB/M) EPT ATTENUATION IN SHALE
RHOSH      2.50          (KG/M3 OR GR/CC) MATRIX DENSITY OF SHALE
PEFSH      2.90          (BARNS/ELECTRON) PEF IN SHALE
TPLSH      9.00          (NSEC/M)          TPL IN SHALE
PHINSH      19.          (PERCENT) NEUTRON LOG POROSITY OF SHALE
DLTSH       77.          (USEC/M OR USEC/FT) TRANSIT TIME OF SHALE
RSH        9.00          (OHM-M) RESISTIVITY OF SHALE
PHIMAX    25.00          (PERCENT) MAX SHALE POROSITY IN INTERVAL

**********************************************************************
*******     LOG CALCULATION CONSTANTS AND EXPONENTS     *******
**********************************************************************

A          0.62          CONSTANT IN FORMATION FACTOR EQUATION
M          2.15          CEMENTATION EXPONENT
N          2.00          SATURATION EXPONENT
CP         1.00          COMPACTION FACTOR

**********************************************************************
*****  LIMITING VALUES FOR GROSS CALCULATIONS                  ****
**********************************************************************

PHILIM     6.00          (PERCENT) LOWER POROSITY LIMIT
VSHLIM     0.40          (FRACTION) VOLUME OF SHALE UPPER LIMIT

**********************************************************************
*********     LOG CALCULATION OPTIONS AND SWITCHES     ********
**********************************************************************

MSI            0         0=STANDARD UNITS  1=MSI
VSHCIN         3         GR TO VOL. OF SHALE CURVATURE INDEX
VSHOFF         0         0=CALC VOL. OF SHALE - 1=VOL.OF SH=0
GROFF          0         GR AS SHALE INDICATOR (0-USE ,1-NO)
KTHOFF         1         TH & K AS SHALE INDICATOR (0-USE ,1-NO)
NEUOFF         0         NEUTRON AS SHALE INDICATOR (0-USE ,1-NO)
DLTOFF         1         SONIC AS SHALE INDICATOR (0-USE ,1-NO)
ATTOFF         1         EPT AS SHALE INDICATOR (0-USE ,1-NO)
SPOFF          1         SP AS SHALE INDICATOR (0-USE ,1-NO)
```

PEOFF	0	USE PEF? (0-USE ,1-NO)
MINOPT	3	MINERAL OPTION SWITCH 0 = COMPLEX LITHOLOGY 1 = SANDSTONE AND DOLOMITE ONLY 2 = LIMESTONE AND DOLOMITE ONLY 3 = SANDSTONE AND SHALE ONLY (CLASSICAL) 4 = SANDSTONE AND SHALE ONLY (MODERN) 5 = SANDSTONE AND LIMESTONE ONLY
MOPOFF	0	MOVEABLE OIL PLOT SWITCH 0-USE RXO 1-NO RXO
QOPT	1	SW OPTION - 0=SW FROM PHIT AND Q 1=SW FROM PHIE AND VSH
NOPRT	0	PRINT OPTION - 0=PRINT ALL VALUES 1=SKIP SHALE ZONES
SWOPT	5	1 - ARCHIE; 2 - SIMANDOUX; 3 - SIMANDOUX LAMINAR; 4 - V2 SIMANDOUX; 5 - INDONESIAN 6 - DISPERSED CLAY 7 - DUAL WATER MODEL 8 - DUAL WATER Q=VSH MODEL 9 - NORMALIZED WAXMAN-SMITS 10 - WAXMAN-SMITS
SWIRR	10.00	(FRACTION)IRREDUCIBLE WATER SATURATION FOR PERMEABILITY EQUATION

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**************************************************************
            LISTING OF ENVIRON PARAMETERS

ZONE        Z2              WELL         ARCHER-1

**************************************************************

TOP DEPTH       3469.0000      METRES.
BASE DEPTH      3655.5000      METRES.

DESCRIPTION OF PARAMETERS     : ARCHER-1 ZONES 2 TO 4

**************************************************************
**********************     FLUID VALUES     ******************
**************************************************************

RHOFR      1.00          (KG/M3 OR GR/CC)RECORDED FLUID DENSITY
SALFM    27000.          (PPM) FORMATION SALINITY (NACL)
SALMD    14000.          (PPM) MUD SALINITY (NACL)
RMM      0.4190          (OHM-M) RM
                         IF USING AN OIL BASED MUD SET TO > 100
RMMT        81.          (F) MEASURED TEMPERATURE FOR RM
RMFM     0.3610          (OHM-M) RMF
RMFMT       77.          (F) MEASURED TEMPERATURE FOR RMF
RMCM     0.5130          (OHM-M) RMC
RMCMT       77.          (F) MEASURED TEMPERATURE FOR RMC


**************************************************************
*****************     HOLE AND MUD VALUES      ***************
**************************************************************

MW         8.85          (KG/M3 LBS/GAL LBS/FT3 OR SP. GRAV) MUD WT
                          ENTER 0 MW FOR AIR FILLED HOLE
BITSIZ    8.500          (MM OR INCHES) BIT SIZE
AMST       50.0          (F) ANNUAL MEAN SURFACE TEMP
BHT       233.0          (F) BOTTOM HOLE TEMPERATURE
TD        4050.          (METRES) TOTAL DEPTH OF BOREHOLE
RSTAND    1.500          ( INCHES ) STANDOFF SETTING ON INDUCTION

**************************************************************
******************     LIMITING VALUES     *******************
**************************************************************

RHOMIN     2.05          (KG/M3 OR GR/CC) MIN. VALID BULK DENSITY
DLTMIN      40.          (USEC/M OR USEC/FT) MIN. VALID SONIC ITT
DLTMAX     190.          (USEC/M OR USEC/FT) MAX. VALID SONIC ITT
PHNMAX      45.          (PERCENT) MAXIMUM VALID NEUTRON POROSITY
RUGMAX     6.00          (INCHES) MAX. RUGOSITY TO ACCEPT NEUTRON
STOMAX     3.00          (INCHES) MAX. NEUT. STANDOFF
STOMIN     0.00          (INCHES) MIN. NEUT. STANDOFF TO CORRECT
                         (SET TO STOMAX TO BYPASS STANDOFF LOGIC)
DROLIM     0.20          (KG/M3 OR GR/CC) MAXIMUM DENSITY CORRECTON
                            TO ACCEPT (+ OR -)
```

```
*****************************************************************
********    SWITCHES AND TOOL DESCRIPTIONS    ********************
*****************************************************************

DUNIT          1          DEPTH MEASUREMENT UNITS FLAG
                                0 = DEPTH IN FEET
                                1 = DEPTH IN METERS
MSI            0          LOG MEASUREMENT UNITS FLAG
                                0 = MEASURED IN STANDARD UNITS
                                1 = MEASURED IN MSI UNITS
                                2 = STANDARD BUT DEGREES C
COMPEC         1          SPECTRALOG ENVIRONMENTAL CORRECTIONS
                                1 = SCHLUMBERGER, GO, OR WELEX
                                2 = DRESSER (USE WITH CAUTION)
GRSIZE         0          GAMMA RAY TOOL SIZE:
                                0 = 3 5/8 INCH TOOL
                                1 = 1 11/16 INCH TOOL
GRXC           1          GAMMA RAY CENTERING
                                0 = CENTERED
                                1 = NOT CENTERED
MOPOFF         0          MOVEABLE OIL PLOT SWITCH
                                0 = COMPUTE RXO CURVE
                                1 = DO NOT COMPUTE RXO CURVE
RXLOG          1          SELECT RESISTIVITY FOR LITH DETERMINATION
                                0 = USE RT AT 75 DEGREES F
                                1 = USE RXO AT 75 DEGREES F
AUTOCA         1          NEUTRON AUTOMATIC CALIPER COMPENSATION:
                                0 = NOT COMPENSATED
                                1 = COMPENSATED
PANEL        8.0          NEUTRON PANEL SETTING, NEEDED IF AUTOCA
                              IS EQUAL TO 0
NEWCNL         1          CNL VINTAGE
                                0 = BEFORE 1-1-76
                                1 = AFTER 1-1-76
NSCALE       100          SET TO 100 IF THE NEUTRON IS FRACTIONAL
KSCALE       100          SET TO 100 IF THE K LOG IS FRACTIONAL

TMUD           1          TYPE OF MUD SYSTEM (0=NATURAL & 1=BARITE )
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****

LISTING OF CALC PARAMETERS

ZONE Z2 WELL ARCHER-1

****

TOP DEPTH 3469.0000 METRES.
BASE DEPTH 3655.5000 METRES.

****
********** MATRIX VALUES **********
****

GRMA	50.	(API) GAMMA RAY MATRIX
SPMA	-40.	(MV) SP MATRIX (MV)
ATTMA	150.	(DB/M) ATTENUATIONOF THE MATRIX(DB/M)
DLTSS	58.00	(USEC/M OR USEC/FT) DELTA T SANDSTONE
DLTLS	56.00	(USEC/M OR USEC/FT) DELTA T LIMESTONE
DLTDOL	43.96	(USEC/M OR USEC/FT) DELTA T DOLOMITE
DLTANH	50.00	(USEC/M OR USEC/FT) DELTA T ANHYDRITE
RHOSS	2.64	(KG/M3 OR GR/CC) MATRIX DENS OF SANDSTONE
RHOLS	2.71	(KG/M3 OR GR/CC) MATRIX DENS OF LIMESTONE
RHODOL	2.87	(KG/M3 OR GR/CC) MATRIX DENS OF DOLOMITE
RHOANH	2.98	(KG/M3 OR GR/CC) MATRIX DENS OF ANHYDRITE
TPLSS	7.20	(NSEC/M) TPL OF SANDSTONE
TPLLS	9.10	(NSEC/M) TPL OF LIMESTONE
TPLDOL	8.70	(NSEC/M) TPL OF DOLOMITE
TPLANH	8.40	(NSEC/M) TPL OF ANHYDRITE

VALUES FOR SOLO TOOLS

RHOMAB	2.64	(KG/CM OR GR/CC) MATRIX DENSITY
DLTMAB	58.	(KG/M3 OR GR/CC) TRANSIT TIME MATRIX
TPLMAB	8.50	(NSEC/M) TPL MATRIX
NEUMAB	0	NEUTRON MATRIX 0=LS 1=SS 2=DOL

VALUES FOR COAL DETECTION

GRCOAL	180.	(API) MAXIMUM GR IN COAL.
DLTCOL	120.	(USEC/M OR USEC/FT) MINIMUM SONIC IN COAL.
UCOAL	8.00	(PPM) MINIMUM URANIUM IN COAL.
RHOCOL	2.25	(KG/M3 OR GR/CC) MAXIMUM DENSITY OF COAL.
PNCOL	40.	(PERCENT) MINIMUM LS. NEUTRON POR. IN COAL
PECOL	3.00	(BARNS/ELEC.) MAXIMUM PEF IN COAL.
COALCK	2	NUMBER OF POSITIVE COAL CHECKS NEEDED TO IDENTIFY COAL (COAL=1).

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**********************************************************************
**********************     FLUID VALUES     **********************
**********************************************************************

RHOF       1.00          (KG/M3 OR GR/CC)     FLUID DENSITY
DLTF       189.          (USEC/M OR USEC/FT) TRANSIT TIME OF FLUID
RHOH       0.60          (KG/M3 OR GR/CC)     HYDROCARBON DENSITY
ANEUT      1.00          NEUTRON GAS FACTOR(USUAL RANGE 1 TO 1.4)
                         1=HIGH DENSITY AND 1.5 LOW DENSITY
RHOMF      1.00          (KG/M3 OR GR/CC)     MUD FILTRATE DENSITY
TPLH       5.00          (NSEC/M)             HYDROCARBON TPL
SALMD    14000.          (PPM)       MUD SALINITY
RWM       0.085          (OHM-M)  RW AT MEASURED TEMPERATURE
RWMT       233.          (F) TEMPERATURE OF RW MEASUREMENT
RWBM       0.09          (OHM-M)  BOUND WATER RESISTIVITY
RWBMT      233.          (F) TEMPERATURE OF RWB MEASUREMENT

**********************************************************************
****************     SHALE AND CLAY VALUES     ***************
**********************************************************************
GRSH       150.          (API) GAMMA RAY VALUE IN SHALE
SPSH       -45.          (MV)  SP VALUE IN SHALE
ATTSH      600.          (DB/M) EPT ATTENUATION IN SHALE
RHOSH      2.60          (KG/M3 OR GR/CC) MATRIX DENSITY OF SHALE
PEFSH      2.90          (BARNS/ELECTRON) PEF IN SHALE
TPLSH      9.00          (NSEC/M)          TPL IN SHALE
PHINSH      24.          (PERCENT) NEUTRON LOG POROSITY OF SHALE
DLTSH       77.          (USEC/M OR USEC/FT) TRANSIT TIME OF SHALE
RSH       18.00          (OHM-M) RESISTIVITY OF SHALE
PHIMAX    27.00          (PERCENT) MAX SHALE POROSITY IN INTERVAL

**********************************************************************
*******     LOG CALCULATION CONSTANTS AND EXPONENTS     *******
**********************************************************************

A          0.62          CONSTANT IN FORMATION FACTOR EQUATION
M          2.15          CEMENTATION EXPONENT
N          2.00          SATURATION EXPONENT
CP         1.00          COMPACTION FACTOR

**********************************************************************
*****  LIMITING VALUES FOR GROSS CALCULATIONS                  ****
**********************************************************************

PHILIM     6.00          (PERCENT) LOWER POROSITY LIMIT
VSHLIM     0.40          (FRACTION) VOLUME OF SHALE UPPER LIMIT

**********************************************************************
*********     LOG CALCULATION OPTIONS AND SWITCHES     ********
**********************************************************************

MSI           0          0=STANDARD UNITS  1=MSI
VSHCIN        3          GR TO VOL. OF SHALE CURVATURE INDEX
VSHOFF        0          0=CALC VOL. OF SHALE - 1=VOL.OF SH=0
GROFF         0          GR AS SHALE INDICATOR (0-USE ,1-NO)
KTHOFF        1          TH & K AS SHALE INDICATOR (0-USE ,1-NO)
NEUOFF        0          NEUTRON AS SHALE INDICATOR (0-USE ,1-NO)
DLTOFF        1          SONIC AS SHALE INDICATOR (0-USE ,1-NO)
ATTOFF        1          EPT AS SHALE INDICATOR (0-USE ,1-NO)
SPOFF         1          SP AS SHALE INDICATOR (0-USE ,1-NO)
```

PEOFF	0	USE PEF? (0-USE ,1-NO)
MINOPT	3	MINERAL OPTION SWITCH 0 = COMPLEX LITHOLOGY 1 = SANDSTONE AND DOLOMITE ONLY 2 = LIMESTONE AND DOLOMITE ONLY 3 = SANDSTONE AND SHALE ONLY (CLASSICAL) 4 = SANDSTONE AND SHALE ONLY (MODERN) 5 = SANDSTONE AND LIMESTONE ONLY
MOPOFF	0	MOVEABLE OIL PLOT SWITCH 0-USE RXO 1-NO RXO
QOPT	1	SW OPTION - 0=SW FROM PHIT AND Q 1=SW FROM PHIE AND VSH
NOPRT	0	PRINT OPTION - 0=PRINT ALL VALUES 1=SKIP SHALE ZONES
SWOPT	5	1 - ARCHIE; 2 - SIMANDOUX; 3 - SIMANDOUX LAMINAR; 4 - V2 SIMANDOUX; 5 - INDONESIAN 6 - DISPERSED CLAY 7 - DUAL WATER MODEL 8 - DUAL WATER Q=VSH MODEL 9 - NORMALIZED WAXMAN-SMITS 10 - WAXMAN-SMITS
SWIRR	10.00	(FRACTION)IRREDUCIBLE WATER SATURATION FOR PERMEABILITY EQUATION

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**************************************************************
            LISTING OF ENVIRON PARAMETERS

ZONE        Z4              WELL        ARCHER-1

**************************************************************

TOP DEPTH       3836.0000      METRES.
BASE DEPTH      3932.5000      METRES.

DESCRIPTION OF PARAMETERS    : ARCHER-1. ZONE 6

**************************************************************
*********************     FLUID VALUES     *******************
**************************************************************

RHOFR      1.00          (KG/M3 OR GR/CC)RECORDED FLUID DENSITY
SALFM    27000.          (PPM) FORMATION SALINITY (NACL)
SALMD    14000.          (PPM) MUD SALINITY (NACL)
RMM      0.4190          (OHM-M) RM
                         IF USING AN OIL BASED MUD SET TO > 100
RMMT        81.          (F) MEASURED TEMPERATURE FOR RM
RMFM     0.3610          (OHM-M) RMF
RMFMT       77.          (F) MEASURED TEMPERATURE FOR RMF
RMCM     0.5130          (OHM-M) RMC
RMCMT       77.          (F) MEASURED TEMPERATURE FOR RMC


**************************************************************
*****************     HOLE AND MUD VALUES      ***************
**************************************************************

MW          8.85         (KG/M3 LBS/GAL LBS/FT3 OR SP. GRAV) MUD WT
                          ENTER 0 MW FOR AIR FILLED HOLE
BITSIZ    8.500          (MM OR INCHES) BIT SIZE
AMST       50.0          (F) ANNUAL MEAN SURFACE TEMP
BHT       233.0          (F) BOTTOM HOLE TEMPERATURE
TD        4050.          (METRES) TOTAL DEPTH OF BOREHOLE
RSTAND    1.500          ( INCHES ) STANDOFF SETTING ON INDUCTION

**************************************************************
*******************     LIMITING VALUES     ******************
**************************************************************

RHOMIN     2.05          (KG/M3 OR GR/CC) MIN. VALID BULK DENSITY
DLTMIN      40.          (USEC/M OR USEC/FT) MIN. VALID SONIC ITT
DLTMAX     190.          (USEC/M OR USEC/FT) MAX. VALID SONIC ITT
PHNMAX      45.          (PERCENT) MAXIMUM VALID NEUTRON POROSITY
RUGMAX     6.00          (INCHES) MAX. RUGOSITY TO ACCEPT NEUTRON
STOMAX     3.00          (INCHES) MAX. NEUT. STANDOFF
STOMIN     0.00          (INCHES) MIN. NEUT. STANDOFF TO CORRECT
                         (SET TO STOMAX TO BYPASS STANDOFF LOGIC)
DROLIM     0.20          (KG/M3 OR GR/CC) MAXIMUM DENSITY CORRECTON
                            TO ACCEPT (+ OR -)
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**************************************************************
********   SWITCHES AND TOOL DESCRIPTIONS   ******************
**************************************************************

DUNIT          1          DEPTH MEASUREMENT UNITS FLAG
                                0 = DEPTH IN FEET
                                1 = DEPTH IN METERS
MSI            0          LOG MEASUREMENT UNITS FLAG
                                0 = MEASURED IN STANDARD UNITS
                                1 = MEASURED IN MSI UNITS
                                2 = STANDARD BUT DEGREES C
COMPEC         1          SPECTRALOG ENVIRONMENTAL CORRECTIONS
                                1 = SCHLUMBERGER, GO, OR WELEX
                                2 = DRESSER (USE WITH CAUTION)
GRSIZE         0          GAMMA RAY TOOL SIZE:
                                0 = 3 5/8 INCH TOOL
                                1 = 1 11/16 INCH TOOL
GRXC           1          GAMMA RAY CENTERING
                                0 = CENTERED
                                1 = NOT CENTERED
MOPOFF         0          MOVEABLE OIL PLOT SWITCH
                                0 = COMPUTE RXO CURVE
                                1 = DO NOT COMPUTE RXO CURVE
RXLOG          1          SELECT RESISTIVITY FOR LITH DETERMINATION
                                0 = USE RT AT 75 DEGREES F
                                1 = USE RXO AT 75 DEGREES F
AUTOCA         1          NEUTRON AUTOMATIC CALIPER COMPENSATION:
                                0 = NOT COMPENSATED
                                1 = COMPENSATED
PANEL        8.0          NEUTRON PANEL SETTING, NEEDED IF AUTOCA
                              IS EQUAL TO 0
NEWCNL         1          CNL VINTAGE
                                0 = BEFORE 1-1-76
                                1 = AFTER 1-1-76
NSCALE       100          SET TO 100 IF THE NEUTRON IS FRACTIONAL
KSCALE       100          SET TO 100 IF THE K LOG IS FRACTIONAL

TMUD           1          TYPE OF MUD SYSTEM (0=NATURAL & 1=BARITE )
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****

LISTING OF CALC PARAMETERS

ZONE Z4 WELL ARCHER-1

****

TOP DEPTH 3836.0000 METRES.
BASE DEPTH 3932.5000 METRES.

****
********** MATRIX VALUES **********
****

GRMA	45.	(API) GAMMA RAY MATRIX
SPMA	-40.	(MV) SP MATRIX (MV)
ATTMA	150.	(DB/M) ATTENUATIONOF THE MATRIX(DB/M)
DLTSS	59.00	(USEC/M OR USEC/FT) DELTA T SANDSTONE
DLTLS	56.00	(USEC/M OR USEC/FT) DELTA T LIMESTONE
DLTDOL	43.96	(USEC/M OR USEC/FT) DELTA T DOLOMITE
DLTANH	50.00	(USEC/M OR USEC/FT) DELTA T ANHYDRITE
RHOSS	2.66	(KG/M3 OR GR/CC) MATRIX DENS OF SANDSTONE
RHOLS	2.71	(KG/M3 OR GR/CC) MATRIX DENS OF LIMESTONE
RHODOL	2.87	(KG/M3 OR GR/CC) MATRIX DENS OF DOLOMITE
RHOANH	2.98	(KG/M3 OR GR/CC) MATRIX DENS OF ANHYDRITE
TPLSS	7.20	(NSEC/M) TPL OF SANDSTONE
TPLLS	9.10	(NSEC/M) TPL OF LIMESTONE
TPLDOL	8.70	(NSEC/M) TPL OF DOLOMITE
TPLANH	8.40	(NSEC/M) TPL OF ANHYDRITE

VALUES FOR SOLO TOOLS

RHOMAB	2.66	(KG/CM OR GR/CC) MATRIX DENSITY
DLTMAB	59.	(KG/M3 OR GR/CC) TRANSIT TIME MATRIX
TPLMAB	8.50	(NSEC/M) TPL MATRIX
NEUMAB	0	NEUTRON MATRIX 0=LS 1=SS 2=DOL

VALUES FOR COAL DETECTION

GRCOAL	180.	(API) MAXIMUM GR IN COAL.
DLTCOL	100.	(USEC/M OR USEC/FT) MINIMUM SONIC IN COAL.
UCOAL	8.00	(PPM) MINIMUM URANIUM IN COAL.
RHOCOL	2.22	(KG/M3 OR GR/CC) MAXIMUM DENSITY OF COAL.
PNCOL	45.	(PERCENT) MINIMUM LS. NEUTRON POR. IN COAL
PECOL	3.00	(BARNS/ELEC.) MAXIMUM PEF IN COAL.
COALCK	2	NUMBER OF POSITIVE COAL CHECKS NEEDED TO IDENTIFY COAL (COAL=1).

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**************************************************************
********************     FLUID VALUES    **********************
**************************************************************

RHOF       0.90          (KG/M3 OR GR/CC)     FLUID DENSITY
DLTF       189.          (USEC/M OR USEC/FT) TRANSIT TIME OF FLUID
RHOH       0.60          (KG/M3 OR GR/CC)     HYDROCARBON DENSITY
ANEUT      1.10          NEUTRON GAS FACTOR(USUAL RANGE 1 TO 1.4)
                         1=HIGH DENSITY AND 1.5 LOW DENSITY
RHOMF      1.00          (KG/M3 OR GR/CC)     MUD FILTRATE DENSITY
TPLH       5.00          (NSEC/M)             HYDROCARBON TPL
SALMD    14000.          (PPM)       MUD SALINITY
RWM       0.085          (OHM-M)  RW AT MEASURED TEMPERATURE
RWMT       233.          (F) TEMPERATURE OF RW MEASUREMENT
RWBM       0.09          (OHM-M)  BOUND WATER RESISTIVITY
RWBMT      230.          (F) TEMPERATURE OF RWB MEASUREMENT

**************************************************************
****************     SHALE AND CLAY VALUES     ***************
**************************************************************
GRSH       145.          (API) GAMMA RAY VALUE IN SHALE
SPSH       -45.          (MV)  SP VALUE IN SHALE
ATTSH      600.          (DB/M) EPT ATTENUATION IN SHALE
RHOSH      2.60          (KG/M3 OR GR/CC) MATRIX DENSITY OF SHALE
PEFSH      2.90          (BARNS/ELECTRON) PEF IN SHALE
TPLSH      9.00          (NSEC/M)          TPL IN SHALE
PHINSH      24.          (PERCENT) NEUTRON LOG POROSITY OF SHALE
DLTSH       75.          (USEC/M OR USEC/FT) TRANSIT TIME OF SHALE
RSH       16.00          (OHM-M) RESISTIVITY OF SHALE
PHIMAX    25.00          (PERCENT) MAX SHALE POROSITY IN INTERVAL

**************************************************************
*******     LOG CALCULATION CONSTANTS AND EXPONENTS     *******
**************************************************************

A          0.62          CONSTANT IN FORMATION FACTOR EQUATION
M          2.15          CEMENTATION EXPONENT
N          2.00          SATURATION EXPONENT
CP         1.00          COMPACTION FACTOR

**************************************************************
*****  LIMITING VALUES FOR GROSS CALCULATIONS               ****
**************************************************************

PHILIM     6.00          (PERCENT) LOWER POROSITY LIMIT
VSHLIM     0.40          (FRACTION) VOLUME OF SHALE UPPER LIMIT

**************************************************************
*********     LOG CALCULATION OPTIONS AND SWITCHES     ********
**************************************************************

MSI           0          0=STANDARD UNITS  1=MSI
VSHCIN        3          GR TO VOL. OF SHALE CURVATURE INDEX
VSHOFF        0          0=CALC VOL. OF SHALE - 1=VOL.OF SH=0
GROFF         0          GR AS SHALE INDICATOR (0-USE ,1-NO)
KTHOFF        1          TH & K AS SHALE INDICATOR (0-USE ,1-NO)
NEUOFF        0          NEUTRON AS SHALE INDICATOR (0-USE ,1-NO)
DLTOFF        1          SONIC AS SHALE INDICATOR (0-USE ,1-NO)
ATTOFF        1          EPT AS SHALE INDICATOR (0-USE ,1-NO)
SPOFF         1          SP AS SHALE INDICATOR (0-USE ,1-NO)
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PEOFF	0	USE PEF? (0-USE ,1-NO)
MINOPT	3	MINERAL OPTION SWITCH 0 = COMPLEX LITHOLOGY 1 = SANDSTONE AND DOLOMITE ONLY 2 = LIMESTONE AND DOLOMITE ONLY 3 = SANDSTONE AND SHALE ONLY (CLASSICAL) 4 = SANDSTONE AND SHALE ONLY (MODERN) 5 = SANDSTONE AND LIMESTONE ONLY
MOPOFF	0	MOVEABLE OIL PLOT SWITCH 0-USE RXO 1-NO RXO
QOPT	1	SW OPTION - 0=SW FROM PHIT AND Q 1=SW FROM PHIE AND VSH
NOPRT	0	PRINT OPTION - 0=PRINT ALL VALUES 1=SKIP SHALE ZONES
SWOPT	5	1 - ARCHIE; 2 - SIMANDOUX; 3 - SIMANDOUX LAMINAR; 4 - V2 SIMANDOUX; 5 - INDONESIAN 6 - DISPERSED CLAY 7 - DUAL WATER MODEL 8 - DUAL WATER Q=VSH MODEL 9 - NORMALIZED WAXMAN-SMITS 10 - WAXMAN-SMITS
SWIRR	10.00	(FRACTION)IRREDUCIBLE WATER SATURATION FOR PERMEABILITY EQUATION

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**************************************************************
            LISTING OF ENVIRON PARAMETERS

ZONE       Z5              WELL        ARCHER-1

**************************************************************

TOP DEPTH       3655.5000      METRES.
BASE DEPTH      3836.0000      METRES.

DESCRIPTION OF PARAMETERS    : ARCHER-1. ZONE 5

**************************************************************
*********************     FLUID VALUES     *******************
**************************************************************

RHOFR     1.00          (KG/M3 OR GR/CC)RECORDED FLUID DENSITY
SALFM    27000.         (PPM) FORMATION SALINITY (NACL)
SALMD    14000.         (PPM) MUD SALINITY (NACL)
RMM      0.4190         (OHM-M) RM
                        IF USING AN OIL BASED MUD SET TO > 100
RMMT       81.          (F) MEASURED TEMPERATURE FOR RM
RMFM     0.3610         (OHM-M) RMF
RMFMT      77.          (F) MEASURED TEMPERATURE FOR RMF
RMCM     0.5130         (OHM-M) RMC
RMCMT      77.          (F) MEASURED TEMPERATURE FOR RMC


**************************************************************
*****************     HOLE AND MUD VALUES     ****************
**************************************************************

MW         8.85         (KG/M3 LBS/GAL LBS/FT3 OR SP. GRAV) MUD WT
                         ENTER 0 MW FOR AIR FILLED HOLE
BITSIZ    8.500         (MM OR INCHES) BIT SIZE
AMST       50.0         (F) ANNUAL MEAN SURFACE TEMP
BHT       233.0         (F) BOTTOM HOLE TEMPERATURE
TD        4050.         (METRES) TOTAL DEPTH OF BOREHOLE
RSTAND    1.500         ( INCHES ) STANDOFF SETTING ON INDUCTION

**************************************************************
******************     LIMITING VALUES     *******************
**************************************************************

RHOMIN     2.05         (KG/M3 OR GR/CC) MIN. VALID BULK DENSITY
DLTMIN      40.         (USEC/M OR USEC/FT) MIN. VALID SONIC ITT
DLTMAX     190.         (USEC/M OR USEC/FT) MAX. VALID SONIC ITT
PHNMAX      45.         (PERCENT) MAXIMUM VALID NEUTRON POROSITY
RUGMAX     6.00         (INCHES) MAX. RUGOSITY TO ACCEPT NEUTRON
STOMAX     3.00         (INCHES) MAX. NEUT. STANDOFF
STOMIN     0.00         (INCHES) MIN. NEUT. STANDOFF TO CORRECT
                        (SET TO STOMAX TO BYPASS STANDOFF LOGIC)
DROLIM     0.20         (KG/M3 OR GR/CC) MAXIMUM DENSITY CORRECTON
                           TO ACCEPT (+ OR -)
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************************************************************
********   SWITCHES AND TOOL DESCRIPTIONS   ******************
************************************************************

DUNIT          1          DEPTH MEASUREMENT UNITS FLAG
                                0 = DEPTH IN FEET
                                1 = DEPTH IN METERS
MSI            0          LOG MEASUREMENT UNITS FLAG
                                0 = MEASURED IN STANDARD UNITS
                                1 = MEASURED IN MSI UNITS
                                2 = STANDARD BUT DEGREES C
COMPEC         1          SPECTRALOG ENVIRONMENTAL CORRECTIONS
                                1 = SCHLUMBERGER, GO, OR WELEX
                                2 = DRESSER (USE WITH CAUTION)
GRSIZE         0          GAMMA RAY TOOL SIZE:
                                0 = 3 5/8 INCH TOOL
                                1 = 1 11/16 INCH TOOL
GRXC           1          GAMMA RAY CENTERING
                                0 = CENTERED
                                1 = NOT CENTERED
MOPOFF         0          MOVEABLE OIL PLOT SWITCH
                                0 = COMPUTE RXO CURVE
                                1 = DO NOT COMPUTE RXO CURVE
RXLOG          1          SELECT RESISTIVITY FOR LITH DETERMINATION
                                0 = USE RT AT 75 DEGREES F
                                1 = USE RXO AT 75 DEGREES F
AUTOCA         1          NEUTRON AUTOMATIC CALIPER COMPENSATION:
                                0 = NOT COMPENSATED
                                1 = COMPENSATED
PANEL        8.0          NEUTRON PANEL SETTING, NEEDED IF AUTOCA
                                IS EQUAL TO 0
NEWCNL         1          CNL VINTAGE
                                0 = BEFORE 1-1-76
                                1 = AFTER 1-1-76
NSCALE       100          SET TO 100 IF THE NEUTRON IS FRACTIONAL
KSCALE       100          SET TO 100 IF THE K LOG IS FRACTIONAL

TMUD           1          TYPE OF MUD SYSTEM (0=NATURAL & 1=BARITE )
```

****

LISTING OF CALC PARAMETERS

ZONE Z5 WELL ARCHER-1

****

TOP DEPTH 3655.5000 METRES.
BASE DEPTH 3836.0000 METRES.

****
********** MATRIX VALUES **********
****

GRMA	45.	(API) GAMMA RAY MATRIX
SPMA	-40.	(MV) SP MATRIX (MV)
ATTMA	150.	(DB/M) ATTENUATIONOF THE MATRIX(DB/M)
DLTSS	59.00	(USEC/M OR USEC/FT) DELTA T SANDSTONE
DLTLS	56.00	(USEC/M OR USEC/FT) DELTA T LIMESTONE
DLTDOL	43.96	(USEC/M OR USEC/FT) DELTA T DOLOMITE
DLTANH	50.00	(USEC/M OR USEC/FT) DELTA T ANHYDRITE
RHOSS	2.66	(KG/M3 OR GR/CC) MATRIX DENS OF SANDSTONE
RHOLS	2.71	(KG/M3 OR GR/CC) MATRIX DENS OF LIMESTONE
RHODOL	2.87	(KG/M3 OR GR/CC) MATRIX DENS OF DOLOMITE
RHOANH	2.98	(KG/M3 OR GR/CC) MATRIX DENS OF ANHYDRITE
TPLSS	7.20	(NSEC/M) TPL OF SANDSTONE
TPLLS	9.10	(NSEC/M) TPL OF LIMESTONE
TPLDOL	8.70	(NSEC/M) TPL OF DOLOMITE
TPLANH	8.40	(NSEC/M) TPL OF ANHYDRITE

VALUES FOR SOLO TOOLS

RHOMAB	2.66	(KG/CM OR GR/CC) MATRIX DENSITY
DLTMAB	59.	(KG/M3 OR GR/CC) TRANSIT TIME MATRIX
TPLMAB	8.50	(NSEC/M) TPL MATRIX
NEUMAB	0	NEUTRON MATRIX 0=LS 1=SS 2=DOL

VALUES FOR COAL DETECTION

GRCOAL	180.	(API) MAXIMUM GR IN COAL.
DLTCOL	120.	(USEC/M OR USEC/FT) MINIMUM SONIC IN COAL.
UCOAL	8.00	(PPM) MINIMUM URANIUM IN COAL.
RHOCOL	2.17	(KG/M3 OR GR/CC) MAXIMUM DENSITY OF COAL.
PNCOL	32.	(PERCENT) MINIMUM LS. NEUTRON POR. IN COAL
PECOL	3.00	(BARNS/ELEC.) MAXIMUM PEF IN COAL.
COALCK	2	NUMBER OF POSITIVE COAL CHECKS NEEDED TO IDENTIFY COAL (COAL=1).

```
**********************************************************************
**********************     FLUID VALUES    **********************
**********************************************************************

RHOF       1.00          (KG/M3 OR GR/CC)     FLUID DENSITY
DLTF       189.          (USEC/M OR USEC/FT) TRANSIT TIME OF FLUID
RHOH       0.60          (KG/M3 OR GR/CC)     HYDROCARBON DENSITY
ANEUT      1.00          NEUTRON GAS FACTOR(USUAL RANGE 1 TO 1.4)
                         1=HIGH DENSITY AND 1.5 LOW DENSITY
RHOMF      1.00          (KG/M3 OR GR/CC)     MUD FILTRATE DENSITY
TPLH       5.00          (NSEC/M)             HYDROCARBON TPL
SALMD    14000.          (PPM)       MUD SALINITY
RWM       0.085          (OHM-M)  RW AT MEASURED TEMPERATURE
RWMT       233.          (F) TEMPERATURE OF RW MEASUREMENT
RWBM       0.09          (OHM-M)  BOUND WATER RESISTIVITY
RWBMT      233.          (F) TEMPERATURE OF RWB MEASUREMENT

**********************************************************************
****************     SHALE AND CLAY VALUES     ****************
**********************************************************************
GRSH       145.          (API) GAMMA RAY VALUE IN SHALE
SPSH       -45.          (MV)  SP VALUE IN SHALE
ATTSH      600.          (DB/M) EPT ATTENUATION IN SHALE
RHOSH      2.60          (KG/M3 OR GR/CC) MATRIX DENSITY OF SHALE
PEFSH      2.90          (BARNS/ELECTRON) PEF IN SHALE
TPLSH      9.00          (NSEC/M)          TPL IN SHALE
PHINSH      24.          (PERCENT) NEUTRON LOG POROSITY OF SHALE
DLTSH       75.          (USEC/M OR USEC/FT) TRANSIT TIME OF SHALE
RSH       15.00          (OHM-M) RESISTIVITY OF SHALE
PHIMAX    25.00          (PERCENT) MAX SHALE POROSITY IN INTERVAL

**********************************************************************
*******     LOG CALCULATION CONSTANTS AND EXPONENTS     *******
**********************************************************************

A          0.62          CONSTANT IN FORMATION FACTOR EQUATION
M          2.15          CEMENTATION EXPONENT
N          2.00          SATURATION EXPONENT
CP         1.00          COMPACTION FACTOR

**********************************************************************
*****  LIMITING VALUES FOR GROSS CALCULATIONS                  ****
**********************************************************************

PHILIM     6.00          (PERCENT) LOWER POROSITY LIMIT
VSHLIM     0.40          (FRACTION) VOLUME OF SHALE UPPER LIMIT

**********************************************************************
*********     LOG CALCULATION OPTIONS AND SWITCHES     ********
**********************************************************************

MSI           0          0=STANDARD UNITS  1=MSI
VSHCIN        3          GR TO VOL. OF SHALE CURVATURE INDEX
VSHOFF        0          0=CALC VOL. OF SHALE - 1=VOL.OF SH=0
GROFF         0          GR AS SHALE INDICATOR (0-USE ,1-NO)
KTHOFF        1          TH & K AS SHALE INDICATOR (0-USE ,1-NO)
NEUOFF        0          NEUTRON AS SHALE INDICATOR (0-USE ,1-NO)
DLTOFF        1          SONIC AS SHALE INDICATOR (0-USE ,1-NO)
ATTOFF        1          EPT AS SHALE INDICATOR (0-USE ,1-NO)
SPOFF         1          SP AS SHALE INDICATOR (0-USE ,1-NO)
```

PEOFF	0	USE PEF? (0-USE ,1-NO)
MINOPT	3	MINERAL OPTION SWITCH 0 = COMPLEX LITHOLOGY 1 = SANDSTONE AND DOLOMITE ONLY 2 = LIMESTONE AND DOLOMITE ONLY 3 = SANDSTONE AND SHALE ONLY (CLASSICAL) 4 = SANDSTONE AND SHALE ONLY (MODERN) 5 = SANDSTONE AND LIMESTONE ONLY
MOPOFF	0	MOVEABLE OIL PLOT SWITCH 0-USE RXO 1-NO RXO
QOPT	1	SW OPTION - 0=SW FROM PHIT AND Q 1=SW FROM PHIE AND VSH
NOPRT	0	PRINT OPTION - 0=PRINT ALL VALUES 1=SKIP SHALE ZONES
SWOPT	5	1 - ARCHIE; 2 - SIMANDOUX; 3 - SIMANDOUX LAMINAR; 4 - V2 SIMANDOUX; 5 - INDONESIAN 6 - DISPERSED CLAY 7 - DUAL WATER MODEL 8 - DUAL WATER Q=VSH MODEL 9 - NORMALIZED WAXMAN-SMITS 10 - WAXMAN-SMITS
SWIRR	10.00	(FRACTION)IRREDUCIBLE WATER SATURATION FOR PERMEABILITY EQUATION

```
**************************************************************
            LISTING OF ENVIRON PARAMETERS

ZONE       Z6              WELL        ARCHER-1

**************************************************************

TOP DEPTH       3836.0000      METRES.
BASE DEPTH      3932.5000      METRES.

DESCRIPTION OF PARAMETERS    : ARCHER-1. ZONE 6

**************************************************************
*********************     FLUID VALUES     *******************
**************************************************************

RHOFR     1.00          (KG/M3 OR GR/CC)RECORDED FLUID DENSITY
SALFM    27000.         (PPM) FORMATION SALINITY (NACL)
SALMD    14000.         (PPM) MUD SALINITY (NACL)
RMM      0.4190         (OHM-M) RM
                        IF USING AN OIL BASED MUD SET TO > 100
RMMT       81.          (F) MEASURED TEMPERATURE FOR RM
RMFM     0.3610         (OHM-M) RMF
RMFMT      77.          (F) MEASURED TEMPERATURE FOR RMF
RMCM     0.5130         (OHM-M) RMC
RMCMT      77.          (F) MEASURED TEMPERATURE FOR RMC


**************************************************************
*****************     HOLE AND MUD VALUES      ***************
**************************************************************

MW         8.85         (KG/M3 LBS/GAL LBS/FT3 OR SP. GRAV) MUD WT
                         ENTER 0 MW FOR AIR FILLED HOLE
BITSIZ    8.500         (MM OR INCHES) BIT SIZE
AMST       50.0         (F) ANNUAL MEAN SURFACE TEMP
BHT       233.0         (F) BOTTOM HOLE TEMPERATURE
TD        4050.         (METRES) TOTAL DEPTH OF BOREHOLE
RSTAND    1.500         ( INCHES ) STANDOFF SETTING ON INDUCTION

**************************************************************
******************     LIMITING VALUES     *******************
**************************************************************

RHOMIN     2.05         (KG/M3 OR GR/CC) MIN. VALID BULK DENSITY
DLTMIN      40.         (USEC/M OR USEC/FT) MIN. VALID SONIC ITT
DLTMAX     190.         (USEC/M OR USEC/FT) MAX. VALID SONIC ITT
PHNMAX      45.         (PERCENT) MAXIMUM VALID NEUTRON POROSITY
RUGMAX     6.00         (INCHES) MAX. RUGOSITY TO ACCEPT NEUTRON
STOMAX     3.00         (INCHES) MAX. NEUT. STANDOFF
STOMIN     0.00         (INCHES) MIN. NEUT. STANDOFF TO CORRECT
                        (SET TO STOMAX TO BYPASS STANDOFF LOGIC)
DROLIM     0.20         (KG/M3 OR GR/CC) MAXIMUM DENSITY CORRECTON
                           TO ACCEPT (+ OR -)
```

```
**********************************************************
********   SWITCHES AND TOOL DESCRIPTIONS   ******************
**********************************************************

DUNIT          1          DEPTH MEASUREMENT UNITS FLAG
                                0 = DEPTH IN FEET
                                1 = DEPTH IN METERS
MSI            0          LOG MEASUREMENT UNITS FLAG
                                0 = MEASURED IN STANDARD UNITS
                                1 = MEASURED IN MSI UNITS
                                2 = STANDARD BUT DEGREES C
COMPEC         1          SPECTRALOG ENVIRONMENTAL CORRECTIONS
                                1 = SCHLUMBERGER, GO, OR WELEX
                                2 = DRESSER (USE WITH CAUTION)
GRSIZE         0          GAMMA RAY TOOL SIZE:
                                0 = 3 5/8 INCH TOOL
                                1 = 1 11/16 INCH TOOL
GRXC           1          GAMMA RAY CENTERING
                                0 = CENTERED
                                1 = NOT CENTERED
MOPOFF         0          MOVEABLE OIL PLOT SWITCH
                                0 = COMPUTE RXO CURVE
                                1 = DO NOT COMPUTE RXO CURVE
RXLOG          1          SELECT RESISTIVITY FOR LITH DETERMINATION
                                0 = USE RT AT 75 DEGREES F
                                1 = USE RXO AT 75 DEGREES F
AUTOCA         1          NEUTRON AUTOMATIC CALIPER COMPENSATION:
                                0 = NOT COMPENSATED
                                1 = COMPENSATED
PANEL        8.0          NEUTRON PANEL SETTING, NEEDED IF AUTOCA
                              IS EQUAL TO 0
NEWCNL         1          CNL VINTAGE
                                0 = BEFORE 1-1-76
                                1 = AFTER 1-1-76
NSCALE       100          SET TO 100 IF THE NEUTRON IS FRACTIONAL
KSCALE       100          SET TO 100 IF THE K LOG IS FRACTIONAL

TMUD           1          TYPE OF MUD SYSTEM (0=NATURAL & 1=BARITE )
```

****

LISTING OF CALC PARAMETERS

ZONE Z6 WELL ARCHER-1

****

TOP DEPTH 3836.0000 METRES.
BASE DEPTH 3932.5000 METRES.

****
********** MATRIX VALUES **********
****

GRMA	45.	(API) GAMMA RAY MATRIX
SPMA	-40.	(MV) SP MATRIX (MV)
ATTMA	150.	(DB/M) ATTENUATIONOF THE MATRIX(DB/M)
DLTSS	59.00	(USEC/M OR USEC/FT) DELTA T SANDSTONE
DLTLS	56.00	(USEC/M OR USEC/FT) DELTA T LIMESTONE
DLTDOL	43.96	(USEC/M OR USEC/FT) DELTA T DOLOMITE
DLTANH	50.00	(USEC/M OR USEC/FT) DELTA T ANHYDRITE
RHOSS	2.66	(KG/M3 OR GR/CC) MATRIX DENS OF SANDSTONE
RHOLS	2.71	(KG/M3 OR GR/CC) MATRIX DENS OF LIMESTONE
RHODOL	2.87	(KG/M3 OR GR/CC) MATRIX DENS OF DOLOMITE
RHOANH	2.98	(KG/M3 OR GR/CC) MATRIX DENS OF ANHYDRITE
TPLSS	7.20	(NSEC/M) TPL OF SANDSTONE
TPLLS	9.10	(NSEC/M) TPL OF LIMESTONE
TPLDOL	8.70	(NSEC/M) TPL OF DOLOMITE
TPLANH	8.40	(NSEC/M) TPL OF ANHYDRITE

VALUES FOR SOLO TOOLS

RHOMAB	2.66	(KG/CM OR GR/CC) MATRIX DENSITY
DLTMAB	59.	(KG/M3 OR GR/CC) TRANSIT TIME MATRIX
TPLMAB	8.50	(NSEC/M) TPL MATRIX
NEUMAB	0	NEUTRON MATRIX 0=LS 1=SS 2=DOL

VALUES FOR COAL DETECTION

GRCOAL	180.	(API) MAXIMUM GR IN COAL.
DLTCOL	100.	(USEC/M OR USEC/FT) MINIMUM SONIC IN COAL.
UCOAL	8.00	(PPM) MINIMUM URANIUM IN COAL.
RHOCOL	2.22	(KG/M3 OR GR/CC) MAXIMUM DENSITY OF COAL.
PNCOL	45.	(PERCENT) MINIMUM LS. NEUTRON POR. IN COAL
PECOL	3.00	(BARNS/ELEC.) MAXIMUM PEF IN COAL.
COALCK	2	NUMBER OF POSITIVE COAL CHECKS NEEDED TO IDENTIFY COAL (COAL=1).

```
**************************************************************
*********************     FLUID VALUES     *********************
**************************************************************

RHOF       0.90          (KG/M3 OR GR/CC)     FLUID DENSITY
DTF        189.          (USEC/M OR USEC/FT) TRANSIT TIME OF FLUID
RHOH       0.60          (KG/M3 OR GR/CC)     HYDROCARBON DENSITY
ANEUT      1.10          NEUTRON GAS FACTOR(USUAL RANGE 1 TO 1.4)
                         1=HIGH DENSITY AND 1.5 LOW DENSITY
RHOMF      1.00          (KG/M3 OR GR/CC)     MUD FILTRATE DENSITY
TPLH       5.00          (NSEC/M)             HYDROCARBON TPL
SALMD    14000.          (PPM)       MUD SALINITY
RWM       0.085          (OHM-M)  RW AT MEASURED TEMPERATURE
RWMT       233.          (F) TEMPERATURE OF RW MEASUREMENT
RWBM       0.09          (OHM-M)  BOUND WATER RESISTIVITY
RWBMT      230.          (F) TEMPERATURE OF RWB MEASUREMENT

**************************************************************
***************     SHALE AND CLAY VALUES     ****************
**************************************************************
GRSH       145.          (API) GAMMA RAY VALUE IN SHALE
SPSH       -45.          (MV)  SP VALUE IN SHALE
ATTSH      600.          (DB/M) EPT ATTENUATION IN SHALE
RHOSH      2.60          (KG/M3 OR GR/CC) MATRIX DENSITY OF SHALE
PEFSH      2.90          (BARNS/ELECTRON) PEF IN SHALE
TPLSH      9.00          (NSEC/M)         TPL IN SHALE
PHINSH      24.          (PERCENT) NEUTRON LOG POROSITY OF SHALE
DLTSH       75.          (USEC/M OR USEC/FT) TRANSIT TIME OF SHALE
RSH       16.00          (OHM-M) RESISTIVITY OF SHALE
PHIMAX    25.00          (PERCENT) MAX SHALE POROSITY IN INTERVAL

**************************************************************
*******     LOG CALCULATION CONSTANTS AND EXPONENTS     *******
**************************************************************

A          0.62          CONSTANT IN FORMATION FACTOR EQUATION
M          2.15          CEMENTATION EXPONENT
N          2.00          SATURATION EXPONENT
CP         1.00          COMPACTION FACTOR

**************************************************************
*****  LIMITING VALUES FOR GROSS CALCULATIONS               ****
**************************************************************

PHILIM     6.00          (PERCENT) LOWER POROSITY LIMIT
VSHLIM     0.40          (FRACTION) VOLUME OF SHALE UPPER LIMIT

**************************************************************
*********     LOG CALCULATION OPTIONS AND SWITCHES     ********
**************************************************************

MSI            0         0=STANDARD UNITS  1=MSI
VSHCIN         3         GR TO VOL. OF SHALE CURVATURE INDEX
VSHOFF         0         0=CALC VOL. OF SHALE - 1=VOL.OF SH=0
GROFF          0         GR AS SHALE INDICATOR (0-USE ,1-NO)
KTHOFF         1         TH & K AS SHALE INDICATOR (0-USE ,1-NO)
NEUOFF         0         NEUTRON AS SHALE INDICATOR (0-USE ,1-NO)
DLTOFF         1         SONIC AS SHALE INDICATOR (0-USE ,1-NO)
ATTOFF         1         EPT AS SHALE INDICATOR (0-USE ,1-NO)
SPOFF          1         SP AS SHALE INDICATOR (0-USE ,1-NO)
```

PEOFF	0	USE PEF? (0-USE ,1-NO)
MINOPT	3	MINERAL OPTION SWITCH 0 = COMPLEX LITHOLOGY 1 = SANDSTONE AND DOLOMITE ONLY 2 = LIMESTONE AND DOLOMITE ONLY 3 = SANDSTONE AND SHALE ONLY (CLASSICAL) 4 = SANDSTONE AND SHALE ONLY (MODERN) 5 = SANDSTONE AND LIMESTONE ONLY
MOPOFF	0	MOVEABLE OIL PLOT SWITCH 0-USE RXO 1-NO RXO
QOPT	1	SW OPTION - 0=SW FROM PHIT AND Q 1=SW FROM PHIE AND VSH
NOPRT	0	PRINT OPTION - 0=PRINT ALL VALUES 1=SKIP SHALE ZONES
SWOPT	5	1 - ARCHIE; 2 - SIMANDOUX; 3 - SIMANDOUX LAMINAR; 4 - V2 SIMANDOUX; 5 - INDONESIAN 6 - DISPERSED CLAY 7 - DUAL WATER MODEL 8 - DUAL WATER Q=VSH MODEL 9 - NORMALIZED WAXMAN-SMITS 10 - WAXMAN-SMITS
SWIRR	10.00	(FRACTION)IRREDUCIBLE WATER SATURATION FOR PERMEABILITY EQUATION

```
**************************************************************
            LISTING OF ENVIRON PARAMETERS

ZONE       Z7              WELL        ARCHER-1

**************************************************************

TOP DEPTH       3932.5000      METRES.
BASE DEPTH      4050.0000      METRES.

DESCRIPTION OF PARAMETERS    : ARCHER-1. ZONE 7

**************************************************************
*********************     FLUID VALUES     *******************
**************************************************************

RHOFR      0.90          (KG/M3 OR GR/CC)RECORDED FLUID DENSITY
SALFM    27000.          (PPM) FORMATION SALINITY (NACL)
SALMD    14000.          (PPM) MUD SALINITY (NACL)
RMM      0.4190          (OHM-M) RM
                         IF USING AN OIL BASED MUD SET TO > 100
RMMT        81.          (F) MEASURED TEMPERATURE FOR RM
RMFM     0.3610          (OHM-M) RMF
RMFMT       77.          (F) MEASURED TEMPERATURE FOR RMF
RMCM     0.5130          (OHM-M) RMC
RMCMT       77.          (F) MEASURED TEMPERATURE FOR RMC


**************************************************************
*****************     HOLE AND MUD VALUES      ***************
**************************************************************

MW         8.85          (KG/M3 LBS/GAL LBS/FT3 OR SP. GRAV) MUD WT
                          ENTER 0 MW FOR AIR FILLED HOLE
BITSIZ    8.500          (MM OR INCHES) BIT SIZE
AMST       50.0          (F) ANNUAL MEAN SURFACE TEMP
BHT       233.0          (F) BOTTOM HOLE TEMPERATURE
TD        4050.          (METRES) TOTAL DEPTH OF BOREHOLE
RSTAND    1.500          ( INCHES ) STANDOFF SETTING ON INDUCTION

**************************************************************
******************     LIMITING VALUES     *******************
**************************************************************

RHOMIN     2.05          (KG/M3 OR GR/CC) MIN. VALID BULK DENSITY
DLTMIN      40.          (USEC/M OR USEC/FT) MIN. VALID SONIC ITT
DLTMAX     190.          (USEC/M OR USEC/FT) MAX. VALID SONIC ITT
PHNMAX      45.          (PERCENT) MAXIMUM VALID NEUTRON POROSITY
RUGMAX     6.00          (INCHES) MAX. RUGOSITY TO ACCEPT NEUTRON
STOMAX     3.00          (INCHES) MAX. NEUT. STANDOFF
STOMIN     0.00          (INCHES) MIN. NEUT. STANDOFF TO CORRECT
                         (SET TO STOMAX TO BYPASS STANDOFF LOGIC)
DROLIM     0.20          (KG/M3 OR GR/CC) MAXIMUM DENSITY CORRECTON
                            TO ACCEPT (+ OR -)
```

```
*****************************************************************
********   SWITCHES AND TOOL DESCRIPTIONS   *********************
*****************************************************************

DUNIT          1          DEPTH MEASUREMENT UNITS FLAG
                                0 = DEPTH IN FEET
                                1 = DEPTH IN METERS
MSI            0          LOG MEASUREMENT UNITS FLAG
                                0 = MEASURED IN STANDARD UNITS
                                1 = MEASURED IN MSI UNITS
                                2 = STANDARD BUT DEGREES C
COMPEC         1          SPECTRALOG ENVIRONMENTAL CORRECTIONS
                                1 = SCHLUMBERGER, GO, OR WELEX
                                2 = DRESSER (USE WITH CAUTION)
GRSIZE         0          GAMMA RAY TOOL SIZE:
                                0 = 3 5/8 INCH TOOL
                                1 = 1 11/16 INCH TOOL
GRXC           1          GAMMA RAY CENTERING
                                0 = CENTERED
                                1 = NOT CENTERED
MOPOFF         0          MOVEABLE OIL PLOT SWITCH
                                0 = COMPUTE RXO CURVE
                                1 = DO NOT COMPUTE RXO CURVE
RXLOG          1          SELECT RESISTIVITY FOR LITH DETERMINATION
                                0 = USE RT AT 75 DEGREES F
                                1 = USE RXO AT 75 DEGREES F
AUTOCA         1          NEUTRON AUTOMATIC CALIPER COMPENSATION:
                                0 = NOT COMPENSATED
                                1 = COMPENSATED
PANEL        8.0          NEUTRON PANEL SETTING, NEEDED IF AUTOCA
                              IS EQUAL TO 0
NEWCNL         1          CNL VINTAGE
                                0 = BEFORE 1-1-76
                                1 = AFTER 1-1-76
NSCALE       100          SET TO 100 IF THE NEUTRON IS FRACTIONAL
KSCALE       100          SET TO 100 IF THE K LOG IS FRACTIONAL

TMUD           1          TYPE OF MUD SYSTEM (0=NATURAL & 1=BARITE )
```

****

LISTING OF CALC PARAMETERS

ZONE Z7 WELL ARCHER-1

****

TOP DEPTH 3932.5000 METRES.
BASE DEPTH 4050.0000 METRES.

****
********** MATRIX VALUES **********
****

GRMA	45.	(API) GAMMA RAY MATRIX
SPMA	-40.	(MV) SP MATRIX (MV)
ATTMA	150.	(DB/M) ATTENUATIONOF THE MATRIX(DB/M)
DLTSS	58.00	(USEC/M OR USEC/FT) DELTA T SANDSTONE
DLTLS	56.00	(USEC/M OR USEC/FT) DELTA T LIMESTONE
DLTDOL	43.96	(USEC/M OR USEC/FT) DELTA T DOLOMITE
DLTANH	50.00	(USEC/M OR USEC/FT) DELTA T ANHYDRITE
RHOSS	2.64	(KG/M3 OR GR/CC) MATRIX DENS OF SANDSTONE
RHOLS	2.71	(KG/M3 OR GR/CC) MATRIX DENS OF LIMESTONE
RHODOL	2.87	(KG/M3 OR GR/CC) MATRIX DENS OF DOLOMITE
RHOANH	2.98	(KG/M3 OR GR/CC) MATRIX DENS OF ANHYDRITE
TPLSS	7.20	(NSEC/M) TPL OF SANDSTONE
TPLLS	9.10	(NSEC/M) TPL OF LIMESTONE
TPLDOL	8.70	(NSEC/M) TPL OF DOLOMITE
TPLANH	8.40	(NSEC/M) TPL OF ANHYDRITE

VALUES FOR SOLO TOOLS

RHOMAB	2.64	(KG/CM OR GR/CC) MATRIX DENSITY
DLTMAB	58.	(KG/M3 OR GR/CC) TRANSIT TIME MATRIX
TPLMAB	8.50	(NSEC/M) TPL MATRIX
NEUMAB	0	NEUTRON MATRIX 0=LS 1=SS 2=DOL

VALUES FOR COAL DETECTION

GRCOAL	180.	(API) MAXIMUM GR IN COAL.
DLTCOL	86.	(USEC/M OR USEC/FT) MINIMUM SONIC IN COAL.
UCOAL	8.00	(PPM) MINIMUM URANIUM IN COAL.
RHOCOL	2.30	(KG/M3 OR GR/CC) MAXIMUM DENSITY OF COAL.
PNCOL	27.	(PERCENT) MINIMUM LS. NEUTRON POR. IN COAL
PECOL	3.00	(BARNS/ELEC.) MAXIMUM PEF IN COAL.
COALCK	6	NUMBER OF POSITIVE COAL CHECKS NEEDED TO IDENTIFY COAL (COAL=1).

```
**********************************************************
**********      FLUID VALUES     **********
**********************************************************

RHOF      0.90          (KG/M3 OR GR/CC)     FLUID DENSITY
[redacted]F     189.          (USEC/M OR USEC/FT) TRANSIT TIME OF FLUID
[redacted]H     0.60          (KG/M3 OR GR/CC)     HYDROCARBON DENSITY
ANEUT     1.10          NEUTRON GAS FACTOR(USUAL RANGE 1 TO 1.4)
                        1=HIGH DENSITY AND 1.5 LOW DENSITY
RHOMF     1.00          (KG/M3 OR GR/CC)     MUD FILTRATE DENSITY
TPLH      5.00          (NSEC/M)             HYDROCARBON TPL
SALMD   14000.          (PPM)       MUD SALINITY
RWM       0.085         (OHM-M)  RW AT MEASURED TEMPERATURE
RWMT      233.          (F) TEMPERATURE OF RW MEASUREMENT
RWBM      0.09          (OHM-M)  BOUND WATER RESISTIVITY
RWBMT     233.          (F) TEMPERATURE OF RWB MEASUREMENT

**********************************************************
**********      SHALE AND CLAY VALUES     **********
**********************************************************
GRSH      150.          (API) GAMMA RAY VALUE IN SHALE
SPSH      -45.          (MV)  SP VALUE IN SHALE
ATTSH     600.          (DB/M) EPT ATTENUATION IN SHALE
RHOSH     2.63          (KG/M3 OR GR/CC) MATRIX DENSITY OF SHALE
PEFSH     2.90          (BARNS/ELECTRON) PEF IN SHALE
TPLSH     9.00          (NSEC/M)         TPL IN SHALE
PHINSH     24.          (PERCENT) NEUTRON LOG POROSITY OF SHALE
DLTSH      71.          (USEC/M OR USEC/FT) TRANSIT TIME OF SHALE
RSH      16.00          (OHM-M) RESISTIVITY OF SHALE
PHIMAX   25.00          (PERCENT) MAX SHALE POROSITY IN INTERVAL

**********************************************************
[redacted]*****     LOG CALCULATION CONSTANTS AND EXPONENTS     *******
[redacted]**********************************************************

A         0.62          CONSTANT IN FORMATION FACTOR EQUATION
M         2.15          CEMENTATION EXPONENT
N         2.00          SATURATION EXPONENT
CP        1.00          COMPACTION FACTOR

**********************************************************
*****  LIMITING VALUES FOR GROSS CALCULATIONS              ****
**********************************************************

PHILIM    6.00          (PERCENT) LOWER POROSITY LIMIT
VSHLIM    0.40          (FRACTION) VOLUME OF SHALE UPPER LIMIT

**********************************************************
*********     LOG CALCULATION OPTIONS AND SWITCHES     ********
**********************************************************

MSI          0          0=STANDARD UNITS  1=MSI
VSHCIN       3          GR TO VOL. OF SHALE CURVATURE INDEX
VSHOFF       0          0=CALC VOL. OF SHALE - 1=VOL.OF SH=0
GROFF        0          GR AS SHALE INDICATOR (0-USE ,1-NO)
KTHOFF       1          TH & K AS SHALE INDICATOR (0-USE ,1-NO)
NEUOFF       0          NEUTRON AS SHALE INDICATOR (0-USE ,1-NO)
DLTOFF       1          SONIC AS SHALE INDICATOR (0-USE ,1-NO)
ATTOFF       1          EPT AS SHALE INDICATOR (0-USE ,1-NO)
[redacted]FF         1          SP AS SHALE INDICATOR (0-USE ,1-NO)
```

PEOFF	0	USE PEF? (0-USE ,1-NO)
MINOPT	3	MINERAL OPTION SWITCH 0 = COMPLEX LITHOLOGY 1 = SANDSTONE AND DOLOMITE ONLY 2 = LIMESTONE AND DOLOMITE ONLY 3 = SANDSTONE AND SHALE ONLY (CLASSICAL) 4 = SANDSTONE AND SHALE ONLY (MODERN) 5 = SANDSTONE AND LIMESTONE ONLY
MOPOFF	0	MOVEABLE OIL PLOT SWITCH 0-USE RXO 1-NO RXO
QOPT	1	SW OPTION - 0=SW FROM PHIT AND Q 1=SW FROM PHIE AND VSH
NOPRT	0	PRINT OPTION - 0=PRINT ALL VALUES 1=SKIP SHALE ZONES
SWOPT	5	1 - ARCHIE; 2 - SIMANDOUX; 3 - SIMANDOUX LAMINAR; 4 - V2 SIMANDOUX; 5 - INDONESIAN 6 - DISPERSED CLAY 7 - DUAL WATER MODEL 8 - DUAL WATER Q=VSH MODEL 9 - NORMALIZED WAXMAN-SMITS 10 - WAXMAN-SMITS
SWIRR	10.00	(FRACTION)IRREDUCIBLE WATER SATURATION FOR PERMEABILITY EQUATION

PE600947

This is an enclosure indicator page.
The enclosure PE600947 is enclosed within the container PE902092 at this location in this document.

The enclosure PE600947 has the following characteristics:

ITEM_BARCODE	= PE600947
CONTAINER_BARCODE	= PE902092
NAME	= Environmentally corrected logs RWA log
BASIN	= GIPPSLAND
PERMIT	= VIC/P20
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Environmentally corrected logs RWA log (enclosure from WCR vol.2) for Archer-1
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	= 4/09/90
W_NO	= W1021
WELL_NAME	= Archer-1
CONTRACTOR	= Petrofina Exploration
CLIENT_OP_CO	= Petrofina Exploration

(Inserted by DNRE - Vic Govt Mines Dept)

PE600948

This is an enclosure indicator page.
The enclosure PE600948 is enclosed within the container PE902092 at this location in this document.

The enclosure PE600948 has the following characteristics:

ITEM_BARCODE	= PE600948
CONTAINER_BARCODE	= PE902092
NAME	= Shaly Sand Interpretation Log
BASIN	= GIPPSLAND
PERMIT	= VIC/P20
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Shaly Sand Interpretation Log (enclosure from WCR vol.2) for Archer-1
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	= 4/09/90
W_NO	= W1021
WELL_NAME	= Archer-1
CONTRACTOR	= Petrofina Exploration
CLIENT_OP_CO	= Petrofina Exploration

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 3

WELL COMPLETION REPORT

ARCHER-1

INTERPRETATIVE DATA

A P P E N D I X 3

RFT ANALYSIS

PETROFINA EXPLORATION AUSTRALIA S.A.

Archer-1

RFT Analysis Report

GL/90/050

JMQ/kl

25 May 1990

CONTENTS PAGE

LIST OF TABLES

LIST OF ENCLOSURES

1. SUMMARY AND CONCLUSIONS

A total of 81 RFT pressure tests were carried out in Archer-1, covering the interval 2755m to 4026m. Of these 63 were successful. In addition, seven segregated samples were recovered in hydrocarbon bearing reservoirs (Table 1).

PVT analyses have been carried out on these RFT samples (Table 2) and results integrated into the RFT interpretation.

The conclusions from these tests are:

(i) A normal water gradient of 0.4438 psi/ft (1.0251 g/cc) is present in the interval 2755m to 3810m (Encl. 1).

(ii) The interval below 3810m is slightly over-pressured with an inferred water gradient of 0.473 psi/ft, equivalent to the water gradient established in the similarly over-pressured UK2 interval at Anemone-1,1A.

(iii) The first hydrocarbon gradients occur below 3384m, and persist in the majority of sandstone reservoirs below that depth down to 4050m (TD). A total of 16 hydrocarbon accumulations with individual hydrocarbon water contacts have been identified (C1 to C16 on Encls. 1 to 6).

(iv) Both RFT and PVT results show a marked gradation in hydrocarbon type, starting with undersaturated oils at the top (3384m), becoming increasingly more volatile with depth and eventually turning to gas condensate below 3655.5m (Zone 5).

(v) The thicknesses of the hydrocarbon columns vary from a minimum of 6.8m in Zone 5 (C5 in Encl. 4) to a maximum of 105m in Zone 7 (C16 in Encl. 6).

(vi) Individual hydrocarbon column thicknesses are related to spill points across the two main bounding faults of the Archer structure.

(vii) The hydrostatic mud gradient is 0.418 psi/ft (1.0665 g/cc; 8.9 lb/gal) down to 3445 and 0.455 psi/ft (1.0506 g/cc; 8.77 lb/gal) below that depth reflecting the slightly heavier mud weight used in drilling the 12¼" hole section compared to the 8½" hole section.

(viii) Permeabilities are generally good varying from 0.3 md to 495 md with most values above 40 md (Table 1).

(ix) The hydrostatic mud overbalance ranges from a low of 213 psi at 3945.6m to a high of 418 psi at 3424.3m.

2. INTRODUCTION

A total of 81 pressure tests were attempted in Archer-1 with 63 successful tests. Twenty-six of these were taken in the first run within the 12½" hole section from 2755m to 3452.1m, with the balance coming from the 8½" hole section in the interval 3471.5m to 4026m. Of the total number of tests, three were dry, four had seal failures, four were from formation too tight to give a stabilized pressure reading, and seven were supercharged (Table 1). In addition, seven segregated samples were also successfully recovered. Summary of the recovered fluids in the pre-test chamber is included in Table 1. A summary of the PVT analyses results performed on the pressured samples is shown on Table 2.

Plotted pressure gradients are presented for the whole well on a 1:1000 scale display (Encl. 1) and in detail on 1:200 scale plots for the seven main hydrocarbon zones identified from the log analysis evaluation of the Latrobe Group. (Encls. 2 to 6.). Individual accumulations (C1 to C16) are shown on all enclosures.

The interpretations are discussed separately below for each of the seven zones.

3. ZONE 1 (3384-3469m)

This interval is characterised by interbedded sandstones and siltstones with sandstones displaying varying degrees of shaliness. As shown on Enclosure 2, the logs clearly show the presence of hydrocarbons down to 3419m, a feature confirmed by the high mud gas readings and fluorescence in the cuttings noted over this interval during drilling.

The RFT shows a gradient of 0.303 psi/ft over the hydrocarbon bearing reservoirs, intersecting the water gradient of 0.4438 psi/ft at 3419m (Encl. 2). This correlates well with the log analysis which shows a gradual increase in water saturation with depth from the top of the zone to the oil-water contact (Encl. 2).

Although the plotted RFT gradient seems to indicate a continuous reservoir or hydrocarbon column, the PVT results from the two samples collected in this zone show marked differences in their characteristics (Table 2). The reservoirs above 3400m contain a significantly less volatile oil than those below that depth. The two gradients determined by PVT are plotted on Enclosure 2 with the gradient for the oil above 3400m shown with a subscript T and the more volatile oil below 3400m shown with a subscript B. The respective oil-water contacts are shown with the same subscripts. As can be seen this effect on the interpretation is small, raising the oil-water contacts by only 2.5m. For practical reasons (Reserves calculations), the interpretation of a continuous reservoir with an oil-water contact at 3419m has been retained.

4. ZONE 2 (3469-3509.5m)

This interval is very sandy down to 3495m with only minor siltstone/shale interbeds. Below 3495m siltstones and shales become predominant, with only minor water-bearing sandstone interbeds. The sandstones above 3495m had excellent hydrocarbon shows whilst drilling, a feature confirmed by the wireline logs (Encl. 3). The RFT shows an oil gradient of 0.255 psi/ft intersecting the water line at 3501m. This oil gradient ties well with the PVT results (0.247 psi/ft), and show one continuous reservoir from 3469m (Top Zone 2) to 3501m. Furthermore, the oil-water contact

correlates well with a marked increase in Sw from 3490m to the oil-water contact at 3501m (Encl. 3).

5. ZONE 3 (3509.5-3578m)

This interval consists of sandstone beds 5m to 10m thick separated by generally thin siltstone/shale interbeds less than 3m thick. Hydrocarbons are restricted to the upper 10m of this interval.

These hydrocarbon bearing sandstones are sealed by the overlying shales present at the base of Zone 2. The RFT shows an oil gradient of 0.1995 psi/ft which compares well to the 0.2171 psi/ft established by the PVT analysis (Table 2). This oil gradient intersects the water-line at 3531m, 8m deeper than the top of the water-bearing sandstone between 3523m and 3528m, implying that the 2m thick shale bed separating the two sandstones acts as an effective barrier or seal between the two reservoirs (Encl. 3). The RFT pressures below the 3531m oil-water contact clearly show a water gradient of 0.4438 psi/ft. The logs over the same interval show minor hydrocarbon saturations reaching 30% opposite the more porous sandstones. These hydrocarbon saturations in a water zone are interpreted as residual or irreducible since they correlate with minor hydrocarbon shows noted whilst drilling this interval.

6. ZONE 4 (3578-3655.5m)

This is a very sandy interval with only minor siltstone/shale beds, none more than 2m thick (Encl. 3). Hydrocarbon shows are restricted to the upper 32m of the zone (3578m-3610m). The RFT shows a clear oil gradient of 0.1955 psi/ft which intersects the water-line at 3602m. This compares well to a gradient of 0.2026 psi/ft determined from the PVT analysis. The oil-water contact coincides with the top of a very tight sandstone which possibly reflects some diagenetic effects associated with the top of the water zone. The hydrocarbons in the sandstone 3605m to 3610m are interpreted as minor entrapment below the tight sandstone, which acts as a permeability barrier. Furthermore, the low oil saturation of 30% is probably irreducible.

Sandstones below 3610m display a water gradient of 0.4438 psi/ft, a feature confirmed both by the logs and the very low gas readings recorded whilst drilling this section.

7. ZONE 5 (3655.5-3836m)

This zone marks the transition from liquid hydrocarbon to gas in this well. As can be seen from the PVT results on the sample collected at 3681m the gas is an extremely rich condensate which in this zone is very close to its Dew Point.

Zone 5 is also the thickest of the seven hydrocarbon zones, and consists of interbedded sandstones and siltstones/shales, the latter becoming better developed with depth (Encl. 4). The shale units vary greatly in thickness ranging from one metre or less to 13 metres, with the thicker beds effectively sealing the underlying sandstones as individual reservoirs with their own gas-water contacts.

Only one interval, C6, (3673.6m-3692m; Encl. 3), shows a gas gradient (0.1361 psi/ft), which is 13% lower than that measured by the PVT analysis on the RFT sample at 3681m. The possible reason for this discrepancy is that the top C6 sandstone is independent of the lower ones and hence should not be plotted together with those. Using the slightly higher gas gradient determined by the PVT and plotting it through the measured RFT pressure points only lowers the gas-water contact by 1m which does not affect results markedly. It has therefore been decided to retain the 0.1361 psi/ft gas gradient established from the RFT plot and extrapolate it to all the other reservoirs where only one pressure measurement has been made. This has allowed identification of four additional accumulations (C7 to C10; Encl. 4). The very good correlation between the water saturation curve (Sw) and the gas-water contacts supports the validity of the extrapolation.

8. ZONE 6 (3836-3932m)

The upper 54 metres of this interval down to 3890m consist of thinly bedded sandstones, interbedded with shale units 2m to 15m thick. Below 3890m the lithology consists of a massive shale down to the base of the zone.

No water points were measured in this zone and no segregated samples were collected. The two water points measured in Zone 5 at 3824m and 3829.5m are the deepest water points in this well (Encls. 1 and 5). The pressures at these two points are significantly higher than those expected from the 0.4438 psi/ft gradient established in the overlying zones, and clearly indicate some overpressure. The equivalent zone (UK2) at Anemone-1,1A also showed slight over-pressure, with a water gradient of 0.473 psi/ft established in that well. Since it can now be demonstrated that there is communication across the bounding fault between the Anemone and Archer structures, the water gradient of 0.473 psi/ft has been extrapolated from the water points at 3824m and 3829.5m (Encl. 5) through both Zones 6 and 7 (Encls. 1, 5 and 6), and used for determining the gas-water contacts in these two zones.

A total of only four pressure measurements were made in hydrocarbon reservoirs within this zone. Two of these were taken in the same reservoir (3858m to 3862.5m), allowing a gas gradient of 0.1533 psi/ft to be established. This gradient was extrapolated to the two other reservoirs where RFT measurements were taken to establish the accumulations C11 and C12 (Encl. 5). The logs in this zone show no water saturation gradient and unlike the previous zones, the gas-water contacts for the three accumulation (C11 to C13) do not coincide with maximum water saturations. This implies that each individual sandstone within C12 could be a separate reservoir with its own gas-water contact. An additional accumulation C14 with the same vertical closure as C13 (35m) has been assumed for the argillaceous and coaly sandstones from 3881.3m to 3890.0m. For the purpose of reserves calculations therefore, Zone 6 has been sub-divided into four accumulations (C11 to C14) as shown on Enclosure 5.

9. ZONE 7 (3932.5-4050m)

This zone is equivalent to the Campanian 2 Sandstones at Anemone-1,1A where gas/condensate was discovered. As at Anemone-1,1A the reservoir sandstones occur in the upper 40m of the interval, grading down rapidly to a massive shale. The reservoirs themselves are separated by 2m to 5m thick shales (Encl. 6) while the zone as a whole is capped by 43m of shales.

The RFT clearly shows two separate reservoirs with gas gradients of 0.1475 psi/ft which compares well to the gradient 0.1508 psi/ft determined by the PVT analysis on RFT sample #7 at 3947.5m. It is interesting to note that the Measured Dew Point is 81.5 psi higher than the reservoir pressure, which PETROLAB (PVT contractor) interprets as indicating an oil leg not far below the sample depth. Alternatively this may indicate a gas/condensate reservoir that is extremely close to its Dew Point such that a slight underestimation of reservoir temperature could result in the PVT analysis yielding a Dew Point higher than the reservoir pressure. The gas gradients established in the two reservoir (C15 and C16) intersect the water-line at 4034.5m and 4049.5m respectively (Encl. 6) representing the thickest hydrocarbon columns encountered at Archer-1 (102m and 105m respectively).

TABLE 1

ARCHER-1 RFT DATA

RUN # 1, 2755m to 3452.1m

DEPTH BKB M	FORMATION PRESSURE PSIA	SURFACE GRADIENT PSI/FT	HYDROSTATIC PRESSURE PSIA	HYDROSTATIC GRADIENT PSI/FT	MUD WEIGHT OVERBALANCE PSI	PERMEABILITY	COMMENTS
2755.00	3885.56	0.434	4276.00	0.473	390	GOOD	GOOD TEST
2937.80	4167.40	0.437	4556.70	0.473	389	GOOD	GOOD TEST
3018.00	4289.20	0.437	4680.50	0.473	391	MOD/GOOD	GOOD TEST
3157.20	4475.95	0.436	4881.10	0.471	405	GOOD	GOOD TEST
3245.00	4606.14	0.436	5016.00	0.471	410	GOOD	GOOD TEST
3331.50	4734.80	0.437	5149.30	0.471	415	GOOD	GOOD TEST
3390.00	4833.40	0.438	5236.40	0.471	403	GOOD	GOOD TEST
3390.20							SEGR.SAMPLE 1
3393.00	4836.54	0.438	5240.80	0.471	404	GOOD	GOOD TEST
3396.50	4839.69	0.438	5245.80	0.471	406	GOOD	GOOD TEST
3398.60	4841.33	0.438	5249.00	0.471	408	GOOD	GOOD TEST
3403.50	4847.30	0.438	5256.00	0.471	409	VERY GOOD	SEGR.SAMPLE 2
3404.60			5257.30	0.471		TIGHT	DRY TEST
3405.00	4848.87	0.438	5258.10	0.471	409	MODERATE	GOOD TEST
3406.10	4849.40	0.438	5258.90	0.471	410	MODERATE	GOOD TEST
3407.00	4851.60	0.438	5261.10	0.471	410	MOD-POOR	GOOD TEST
3410.00	4852.80	0.437	5265.80	0.471	413	MODERATE	GOOD TEST
3412.80	4855.70	0.437	5270.00	0.471	414	MODERATE	GOOD TEST
3418.40			5278.60	0.471			SEAL FAILURE
3418.60			5279.00	0.471			DRY TEST
3419.00	4864.90	0.437	5278.80	0.471	414		SUPERCHARGED
3419.20	4864.90	0.437	5279.10	0.471	414		SUPERCHARGED
3422.00	4866.43	0.437	5283.80	0.471	417	GOOD	GOOD TEST
3424.30	4869.74	0.437	5287.30	0.471	418	GOOD	GOOD TEST
3424.50			5287.50	0.471			SEAL FAILURE
3426.00	4872.05	0.437	5289.80	0.471	418	POOR	GOOD TEST

RUN # 2, 3471.5m to 4026.0m

3471.50	4952.90	0.438	5273.50	0.463	321	15.60	GOOD TEST
3481.50	4960.84	0.438	5287.40	0.463	327	24.70	GOOD TEST
3489.00	4966.97	0.437	5300.00	0.463	333	34.00	SEG.SAMPLE 3
3491.00	4968.79	0.437	5301.80	0.463	333	14.80	GOOD TEST
3502.50	4979.30	0.437	5321.60	0.463	342	7.50	GOOD TEST
3506.60	4997.00	0.438	5325.60	0.463	329		SUPERCHARGED
3506.70	4993.30	0.438	5325.60	0.463	332		SUPERCHARGED
3513.50	5009.68	0.438	5337.10	0.463	327	6.00	GOOD TEST
3514.20							SEG.SAMPLE 4
3514.60	5010.40	0.438	5337.70	0.463	327	414.00	GOOD TEST
3526.00	5013.10	0.437	5353.80	0.463	341	24.00	GOOD TEST
3527.00	5014.70	0.437	5355.00	0.463	340	TIGHT	GOOD TEST
3535.30	5026.21	0.437	5370.30	0.463	344	20.20	GOOD TEST
3548.20	5044.80	0.437	5388.90	0.463	344	179.90	GOOD TEST
3554.00	5059.88	0.437	5396.00	0.463	336	7.00	SUPERCHARGED
3563.50	5070.40	0.437	5410.90	0.463	341	154.50	GOOD TEST
3569.80	5078.90	0.437	5419.90	0.463	341	352.00	GOOD TEST
3573.80	5084.60	0.437	5425.60	0.463	341	31.00	GOOD TEST

3578.20	5109.30	0.439	5432.30	0.463	323	90.00	GOOD TEST
3581.00	5111.43	0.438	5435.50	0.463	324	82.00	GOOD TEST
3584.50	5112.56	0.438	5442.00	0.463	329	69.00	GOOD TEST
3588.00	5115.50	0.438	5446.10	0.463	331	2.44	GOOD TEST
3591.50	5117.68	0.438	5452.90	0.463	335	495.00	SEG.SAMPLE 5
3597.40	5124.08	0.438	5461.90	0.463	338	115.00	SUPERCHARGED
3599.10	5126.99	0.438	5462.10	0.463	335	38.00	SUPERCHARGED
3614.20	5141.55	0.437	5488.70	0.463	347	30.00	GOOD TEST
3617.00	5146.75	0.437	5489.20	0.463	342	160.00	GOOD TEST
3630.40	5165.38	0.437	5512.10	0.463	347	25.31	GOOD TEST
3637.50	5175.48	0.437	5520.50	0.463	345	50.00	GOOD TEST
3643.00	5183.72	0.437	5529.10	0.463	345	73.00	GOOD TEST
3650.80	5198.87	0.437	5541.50	0.463	343	7.80	GOOD TEST
3657.50	5210.33	0.438	5550.40	0.463	340	191.00	GOOD TEST
3674.60	5248.11	0.439	5576.00	0.463	328	67.00	GOOD TEST
3681.00	5250.20	0.438	5584.80	0.462	335	125.00	SEG.SAMPLE 6
3683.00	5252.40	0.438	5586.90	0.462	335	0.27	GOOD TEST
3686.00	5253.30	0.438	5594.10	0.463	341	18.70	GOOD TEST
3693.00	5262.90	0.438	5605.20	0.463	342	38.40	GOOD TEST
3700.80	5268.00	0.437	5613.50	0.462	346	52.00	GOOD TEST
3708.00	5297.20	0.439	5627.60	0.463	330	1.10	GOOD TEST
3719.20	5294.10	0.437	5644.50	0.463	350	122.00	GOOD TEST
3726.10	5305.29	0.437	5654.80	0.463	350	257.00	GOOD TEST
3740.50	5349.01	0.439	5676.60	0.463	328	123.00	GOOD TEST
3761.00			5705.10	0.462			TIGHT
3770.50	5381.80	0.438	5722.40	0.463	341	59.00	GOOD TEST
3824.00	5467.12	0.439	5797.50	0.462	330	0.70	GOOD TEST
3829.50	5477.91	0.439	5808.00	0.462	330	0.58	GOOD TEST
3836.70			5816.00	0.462		DRY	DRY
3837.00	5514.60	0.441	5817.20	0.462	303	18.00	GOOD TEST
3845.50	5544.09	0.443	5830.50	0.462	286	75.00	GOOD TEST
3858.80	5559.28	0.442	5848.70	0.462	289	0.76	TIGHT
3865.00	5562.40	0.442	5858.50	0.462	296	0.40	TIGHT
3883.70			5887.20	0.462			SEAL FAILURE
3883.90			5887.30	0.462			SEAL FAILURE
3933.90	5745.10	0.448	5963.20	0.462	218	18.00	GOOD TEST
3936.50	5746.70	0.448	5967.00	0.462	220	13.00	GOOD TEST
3945.60	5767.25	0.449	5980.10	0.462	213	1.00	GOOD TEST
3947.40	5768.22	0.449	5984.40	0.462	216	15.50	GOOD TEST
3947.50							SEG.SAMPLE 7
3954.50	5772.00	0.448	5995.10	0.462	223	15.00	GOOD TEST
3958.50	5775.36	0.448	6000.00	0.462	225	25.00	GOOD TEST
3962.00	5776.92	0.448	6006.20	0.462	229	8.80	GOOD TEST
4026.00							TIGHT

SUMMARY OF PVT ANALYSES ON RFT SAMPLES

RFT SAMPLE	DEPTH mbkb	RESERVOIR PRESSURE	RESERVOIR TEMP (^{o}F)	BUBBLE POINT	API	DEW POINT	DENSITY (i)	DENSITY (ii)	Bo (i)	Bo (ii)	GOR	Bg (i)	Bg (ii)	COMMENTS
1	3390.2	4819.1	194	925	43.8	-	0.619	0.668	1.6929	1.5718	872	-	-	(i) Condition at Bubble or Dew Points
2	3403.5	4832.6	194	1310	46.9	-	0.597	0.640	2.1619	2.0149	1549	-	-	(ii) Condition at Reservoir Pressure and Temperature
3	3489.0	4866.9	199	1992	45.9	-	0.5233	0.5704	2.8669	2.6301	2233	-	-	
4	3514.2	5009.8	200	3040	46.2	-	0.4521	0.5014	4.6294	4.1739	5103	-	-	
5	3591.5	5117.7	205	3455	42.6	-	0.4227	0.4678	5.1209	4.6272	5740	-	-	Psia = Psig + 14.8 psi
6	3681.0	5250.0	210	-	-	5175	0.3605	0.3605	--	-	17088	3.6×10^{-3}	3.59×10^{-3}	
7	3947.5	5768.3	226	-	-	5835	0.3482	0.3482	-	-	21474	3.5×10^{-3}	3.5×10^{-3}	
	mbkb	Psia	^{o}F	Psig at Reservoir Temp.		Psig at Reservoir Temp.	g/cc	g/cc	$\frac{Rbbl}{STbbl}$	$\frac{Rbbl}{STbbl}$	$\frac{Scf}{bbl}$	$\frac{Rft^3}{STft^3}$	$\frac{Rft^3}{STft^3}$	

TABLE 2

PE600949

This is an enclosure indicator page.
The enclosure PE600949 is enclosed within the container PE902092 at this location in this document.

The enclosure PE600949 has the following characteristics:

ITEM_BARCODE	= PE600949
CONTAINER_BARCODE	= PE902092
NAME	= RFT Analysis Results
BASIN	= GIPPSLAND
PERMIT	= VIC/P20
TYPE	= WELL
SUBTYPE	= RFT
DESCRIPTION	= RFT Analysis results Zone 1 -7 (enclosure from WCR vol.2) for Archer-1
REMARKS	=
DATE_CREATED	= 31/05/90
DATE_RECEIVED	= 4/09/90
W_NO	= W1021
WELL_NAME	= Archer-1
CONTRACTOR	= Petrofina Exploration
CLIENT_OP_CO	= Petrofina Exploration

(Inserted by DNRE - Vic Govt Mines Dept)

PE600950

This is an enclosure indicator page.
The enclosure PE600950 is enclosed within the container PE902092 at this location in this document.

The enclosure PE600950 has the following characteristics:

ITEM_BARCODE	= PE600950
CONTAINER_BARCODE	= PE902092
NAME	= RFT Analysis Results
BASIN	= GIPPSLAND
PERMIT	= VIC/P20
TYPE	= WELL
SUBTYPE	= RFT
DESCRIPTION	= RFT Analysis results Zone 1 (enclosure from WCR vol.2) for Archer-1
REMARKS	=
DATE_CREATED	= 31/05/90
DATE_RECEIVED	= 4/09/90
W_NO	= W1021
WELL_NAME	= Archer-1
CONTRACTOR	= Petrofina Exploration
CLIENT_OP_CO	= Petrofina Exploration

(Inserted by DNRE - Vic Govt Mines Dept)

PE600951

This is an enclosure indicator page.
The enclosure PE500951 is enclosed within the container PE902092 at this location in this document.

The enclosure PE500951 has the following characteristics:

ITEM_BARCODE	= PE600951
CONTAINER_BARCODE	= PE902092
NAME	= RFT Analysis Results
BASIN	= GIPPSLAND
PERMIT	= VIC/P20
TYPE	= WELL
SUBTYPE	= RFT
DESCRIPTION	= RFT Analysis results Zone 2,3 & 4 (enclosure from WCR vol.2) for Archer-1
REMARKS	=
DATE_CREATED	= 31/05/90
DATE_RECEIVED	= 4/09/90
W_NO	= W1021
WELL_NAME	= Archer-1
CONTRACTOR	= Petrofina Exploration
CLIENT_OP_CO	= Petrofina Exploration

(Inserted by DNRE - Vic Govt Mines Dept)

PE600952

This is an enclosure indicator page.
The enclosure PE600952 is enclosed within the container PE902092 at this location in this document.

The enclosure PE600952 has the following characteristics:

ITEM_BARCODE	= PE600952
CONTAINER_BARCODE	= PE902092
NAME	= RFT Analysis Results
BASIN	= GIPPSLAND
PERMIT	= VIC/P20
TYPE	= WELL
SUBTYPE	= RFT
DESCRIPTION	= RFT Analysis results Zone 5 (enclosure from WCR vol.2) for Archer-1
REMARKS	=
DATE_CREATED	= 31/05/90
DATE_RECEIVED	= 4/09/90
W_NO	= W1021
WELL_NAME	= Archer-1
CONTRACTOR	= Petrofina Exploration
CLIENT_OP_CO	= Petrofina Exploration

(Inserted by DNRE - Vic Govt Mines Dept)

PE600953

This is an enclosure indicator page.
The enclosure PE600953 is enclosed within the container PE902092 at this location in this document.

The enclosure PE600953 has the following characteristics:

ITEM_BARCODE	= PE600953
CONTAINER_BARCODE	= PE902092
NAME	= RFT Analysis Results
BASIN	= GIPPSLAND
PERMIT	= VIC/P20
TYPE	= WELL
SUBTYPE	= RFT
DESCRIPTION	= RFT Analysis results Zone 7 (enclosure from WCR vol.2) for Archer-1
REMARKS	=
DATE_CREATED	= 31/05/90
DATE_RECEIVED	= 4/09/90
W_NO	= W1021
WELL_NAME	= Archer-1
CONTRACTOR	= Petrofina Exploration
CLIENT_OP_CO	= Petrofina Exploration

(Inserted by DNRE - Vic Govt Mines Dept)

PE600954

This is an enclosure indicator page.
The enclosure PE600954 is enclosed within the container PE902092 at this location in this document.

The enclosure PE600954 has the following characteristics:

ITEM_BARCODE	= PE600954
CONTAINER_BARCODE	= PE902092
NAME	= RFT Analysis Results
BASIN	= GIPPSLAND
PERMIT	= VIC/P20
TYPE	= WELL
SUBTYPE	= RFT
DESCRIPTION	= RFT Analysis results Zone 6 (enclosure from WCR vol.2) for Archer-1
REMARKS	=
DATE_CREATED	= 31/05/90
DATE_RECEIVED	= 4/09/90
W_NO	= W1021
WELL_NAME	= Archer-1
CONTRACTOR	= Petrofina Exploration
CLIENT_OP_CO	= Petrofina Exploration

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 4

WELL COMPLETION REPORT

ARCHER-1

INTERPRETATIVE DATA

A P P E N D I X 4

RESERVES CALCULATIONS

PETROFINA EXPLORATION AUSTRALIA S.A.

RESERVES CALCULATIONS FOR ZONES 1 TO 7

(UK3, UK3.1 AND UK2)

ARCHER-1

GL/90/051

PhL/JMQ/kl

1 June 1990

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1. SUMMARY AND CONCLUSIONS

(i) Hydrocarbons were discovered in the interval 3384m to 4050m (TD) at Archer-1. Seven main hydrocarbon zones have been identified over this interval, which between them comprise at least 16 independent hydrocarbon accumulations.

(ii) Hydrocarbon types include progressively more volatile oil from Zones 1 through to 4 (3384-3655.5mbkb), and very rich gas condensate in Zones 5, 6 and 7 (3655.5-4050mbkb [TD]).

(iii) A layer-cake reservoir model has been used in the reserves calculations due to the wide variations in reservoir characteristics. As such the reservoir parameters (bulk rock volume, net/gross ratio, porosity and hydrocarbon saturation) have been determined for each reservoir unit/layer and reserves computed individually on a unit by unit basis before summing up the results to obtain total hydrocarbons in place.

(iv) Formation volume factors (Bo) and gas expansion factors (Bg) were taken from PVT analysis results on seven RFT samples taken over the entire hydrocarbon interval.

(v) Total oil in place for Archer-1 is 7.56 MMBBL, with the bulk coming from Zones 1 and 2 (3.70 and 2.50 MMBBL respectively).

(vi) Total gas in place for Archer-1 is 73.0 BCF, with 52.3 BCF coming from Zone 7.

(vii) Recoverable reserves are difficult to determine in Archer due to the complex nature of both the reservoirs and the hydrocarbon types. Nevertheless, Recoverable Reserves are estimated at 5.0 MMBBL oil and condensate, with 1.48 MMBBL oil from Zone 1 and 1.7 MMBBL of condensate from Zone 7. Total Recoverable gas reserves are 53 BCF.

(viii) Since Archer-1 is situated at the crest of the structure, and as there is a high degree in confidence in both the reservoir model and the established hydrocarbon-water contacts, it is felt that the computed hydrocarbon in place is reliable and represents the hydrocarbon potential for the entire structure.

(ix) On the basis of point (viii) above, Archer-1 fully evaluated the hydrocarbon potential of the structure.

2. INTRODUCTION

Excellent gas shows with localised fluorescence and cut were encountered in the sandstones penetrated between 3384m and 4050m (TD) at Archer-1. The presence of hydrocarbons was confirmed by logs, which also showed that the interval could be divided into seven main hydrocarbon zones. When integrated with the RFT data, this zonation was further refined to 16 independent accumulations, each with its own hydrocarbon water contact (Encl. 1).

Hydrocarbon in place has been calculated at reservoir conditions (Reservoir Pressures and Temperatures), using a layer-cake reservoir model.

The significance of the various hydrocarbon water contacts and their relation to spill points is beyond the scope of this report, but will be covered in a separate post-drilling appraisal report.

3. DEPTH MAPS

Structural depth maps have been produced at the top of each hydrocarbon zone (Figs. A-0 to A-7) for the purpose of determining bulk rock volumes. These maps are derived from seismic depth maps for the Top UK3, Top UK3.1, Base UK3 and Top Campanian 2 Sandstones. The top of Zone 2 has been isopached to the Top UK3.1 which is 12m deeper; the top Zone 5 map isopached to the Base UK3 only 4.5m shallower, while the top Zone 7 map coincides exactly with the Top Campanian 2 Sandstone map. The depth maps for Zones 1, 3, 4 and 6 have been manually interpolated between these maps.

The maps for Zones 1, 2, 3 and 7 show spill points along the northeastern bounding fault, while the maps for Zones 5 and 6 show a spill point along the southwestern bounding fault (Figs. A-1 to A-7). The oil water contact (OWC) encountered in Zone 4 does not correlate to a spill point along either of these faults, and is thought to be the result of the disappearance of top seal to the west of the structure. Zone 7 is laterally sealed against the southwestern fault and contains the larger volume of closed reservoirs.

Some uncertainty remains both on the exact structural trend in the southeastern sector of the Archer structure, and on the updip area near the southwestern fault. This uncertainty has a minimal effect overall on the bulk rock volume determination, since closure is restricted to the crestal part of the structure.

4. BULK ROCK VOLUME

Each of the seven hydrocarbon zones has been sub-divided into individual reservoir units as shown on Enclosure 1 and tabulated for each zone on Tables 1 to 7. For the purpose of bulk rock volume computation, each reservoir unit within a zone has been assumed to be conformable to the structural top of the zone. The bulk rock volume for each reservoir unit was then computed using the Depth Map of the hydrocarbon zone in which it occurs and a depth-area plot for that zone. The depth-area plots for each zone together with the hydrocarbon water contacts for the various reservoir units are shown on Figures B-1 to B-7.

5. RESERVOIR PARAMETERS

Reservoir parameters vary widely between reservoir units, and for this reason it has been necessary to calculate reserves separately for each individual unit. Units with Vshale > 40% have not been considered as reservoirs and excluded from the calculations. In the remaining units, a cutoff of Phie > 6% has been applied to determine the net reservoir. Porosities and water saturations in the net reservoirs vary from 9% to 17% and 20% to 80% respectively over the entire interval: Top Zone 1 to Base Zone 7.

6. HYDROCARBON TYPE

Seven segregated RFT samples were collected in hydrocarbon bearing reservoirs, one in each of the seven zones except for Zone 6, while two samples were collected in Zone 1.

The PETROLAB PVT analysis results on these samples, show a wider variation in the type; composition, characteristics, and physical properties of hydrocarbons at Archer-1. There is nevertheless a clear trend for the hydrocarbons to become progressively more volatile with depth, passing from an undersaturated liquid oil in Zone 1 to a light volatile oil in Zone 4 before turning to a very rich gas condensate from Zone 5 (3655.5m) downwards.

A constant Bo at reservoir pressure and temperature as determined from the PVT analysis has been taken for each hydrocarbon zone, except in Zone 1 where two Bo's were determined (Tables 1 to 7). For the base of Zone 5 (hydrocarbon columns C9 and C10; Encl. 1) and for Zone 6, an

extrapolated Bg's of 0.00357 and 0.00353 respectively were assumed, on the basis of the Bg from RFT sample #6 (Top Zone 5) and RFT sample #7 (Zone 7) (0.00359 and 0.00350 respectively).

7. RESERVES CALCULATIONS

Hydrocarbons in place have been calculated using a layer-cake model. Bulk rock volumes were determined for each unit separately and hydrocarbon in place computed using the reservoir parameters determined from the log evaluation. The results and the reservoir parameters are listed in detail for individual units in Tables 1 to 7, and averaged over each of the 16 accumulations in Table 8.

Total oil in place computed for the Archer structure is 7.56 million barrels, the bulk of which is concentrated in Zones 1 and 2 (3.70 MMBBL and 2.5 MMBBL respectively). Total gas in place is 73.0 BCF of which 70% or 52.3 BCF is found in Zone 7.

The calculation of recoverable reserves has also been attempted, but must be considered as tenuous in view of the difficulty associated with establishing recovery factors in an extremely complex reservoir. The problem is further amplified by the difficulty in determining accurately the amount of gas produced from the volatile oils and the quantity of liquids from the gas condensate during depletion. Other factors which affect the computation of recoverable reserves are:

(i) The size of the accumulation. The smaller the reservoir the easier it is invaded by water.

(ii) The hydrocarbon type and the changes in characteristics during depletion (Bo, Bg, Gas Liquid Ratios, Composition, etc.).

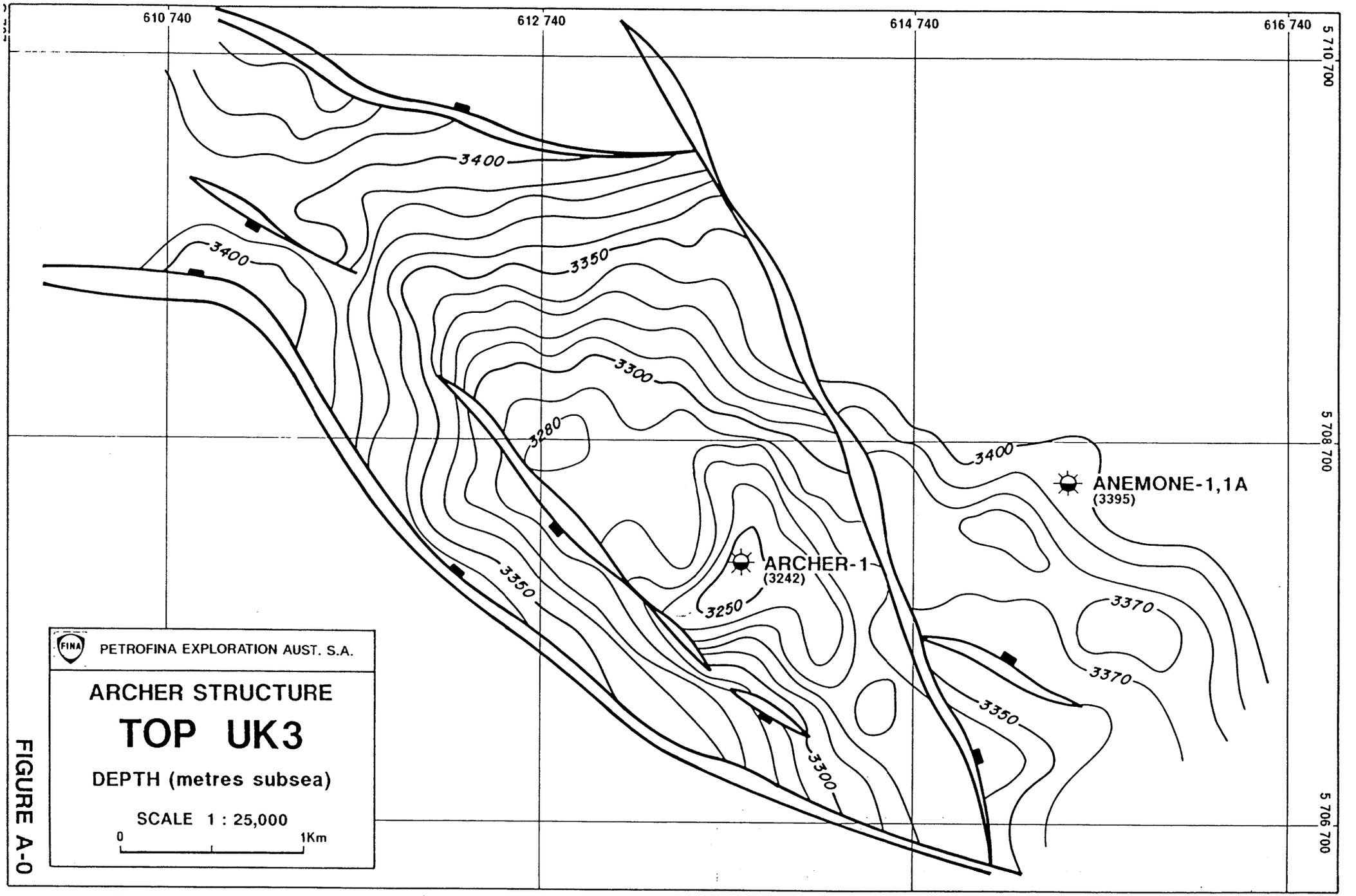
(iii) The type of production drive.

(iv) The type of surface installation.

Recoverable reserves have been computed by converting the hydrocarbons in place at reservoir conditions (Table 8) to hydrocarbons in place at standard conditions to estimate the quantity of gas disolved in the oils in Zones 1 to 4 and the quantity of liquids that can condensate from the gas reservoirs in Zones 5 to 7 (Table 9). The Gas Liquid Ratios (GLR) were taken from the PVT results, except for accumulations C9 and C10 in Zone 5 where these were extrapolated (Table 9).

The recovery factors used for determining recoverable reserves are standard estimates used in the oil industry for oil and gas fields, but modified here to account for both the size of the reservoir and its hydrocarbon saturation. Reservoirs with low hydrocarbon saturations are closer to their irreducible saturation and hence have lower recovery factors. Recovery factors of 20% to 40% have accordingly been selected in gas zones with water saturations above 60% and recovery factors of 50% to 70% in zones with water saturations below 50%.

The results on Table 9 show that 5.0 MMBBL of liquid hydrocarbons could be recovered at Archer with 1.48 MMBBL and 0.88 MMBBL of oil coming from Zone 1 and 2 respectively, and 2.25 MMBBL of condensate or nearly 50% of all liquids coming from the gas reservoirs in Zones 5 to 7. Zone 7 would in fact be the biggest source of liquid hydrocarbons in Archer with 1.7 MMBBL of condensate.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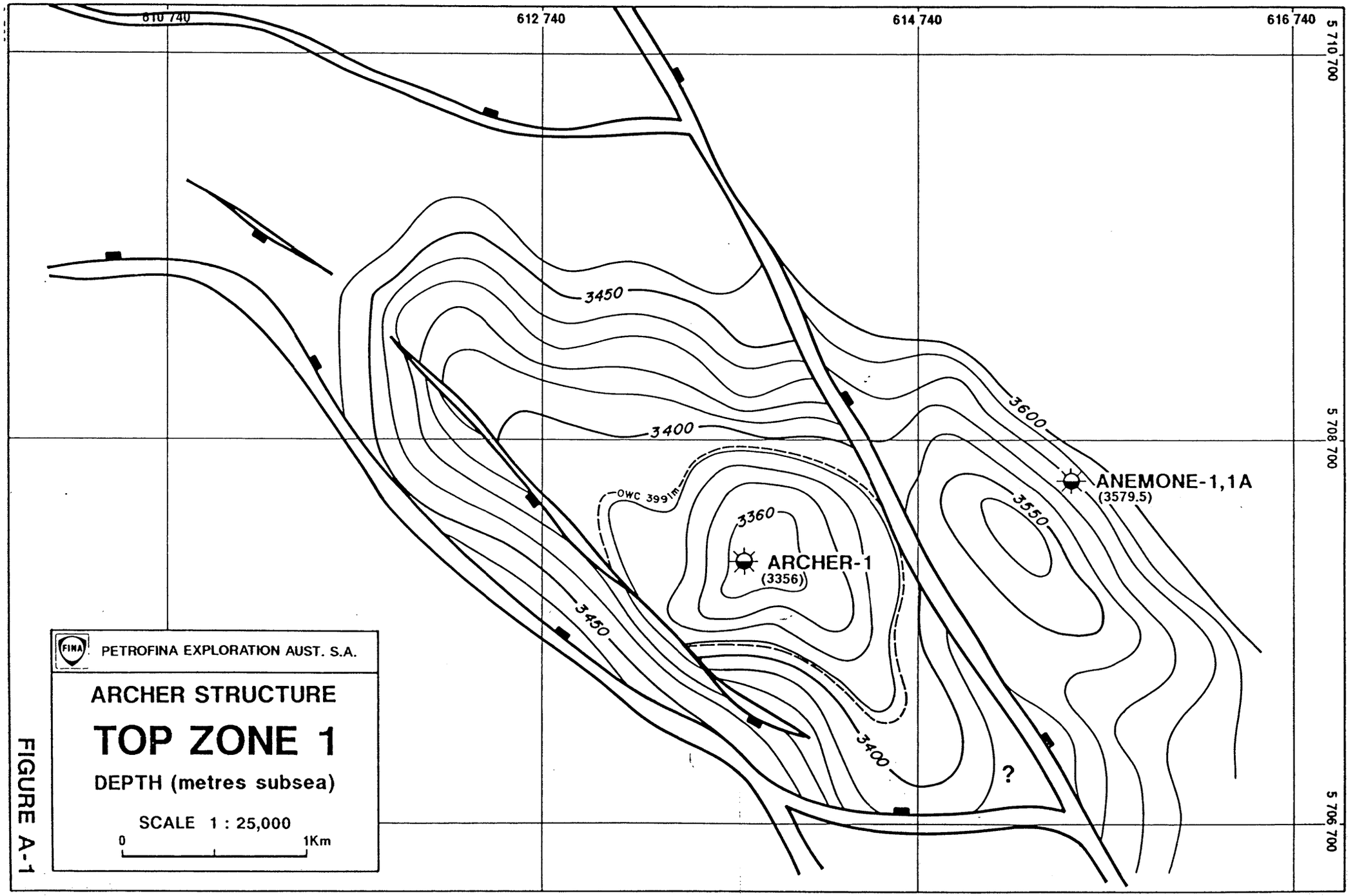
5 706 700
3400
3400
3350
3300
3280
3400
3350
3250
3370
3370
3350
3300
ANEMONE-1,1A
(3395)
ARCHER-1
(3242)
PETROFINA EXPLORATION AUST. S.A.
ARCHER STRUCTURE
TOP UK3
DEPTH (metres subsea)
SCALE 1 : 25,000
0
1Km

FIGURE A-0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612 740
614 740
616 740
5 710 700
5 708 700
5 706 700
3450
3400
3600
3550
3360
3450
3400
OWC 3991m
ARCHER-1
(3356)
ANEMONE-1,1A
(3579.5)
?
PETROFINA EXPLORATION AUST. S.A.
ARCHER STRUCTURE
TOP ZONE 1
DEPTH (metres subsea)
SCALE 1 : 25,000
0
1Km

FIGURE A-1

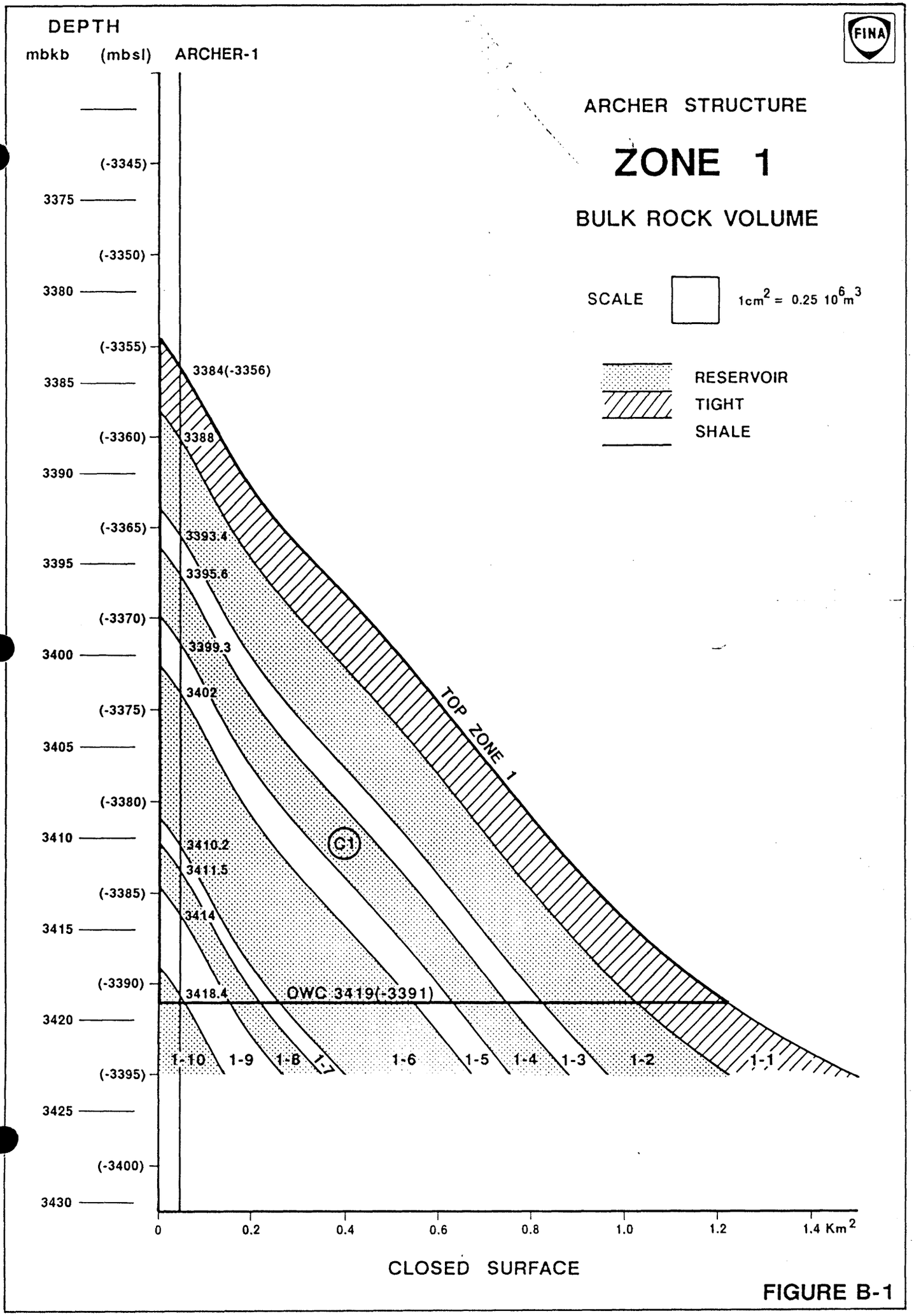

DEPTH
mbkb (mbsl) ARCHER-1
FINA
ARCHER STRUCTURE
ZONE 1
BULK ROCK VOLUME
SCALE
1cm² = 0.25 10⁶m³
RESERVOIR
TIGHT
SHALE
(-3345)
3375
(-3350)
3380
(-3355)
3384(-3356)
3385
(-3360)
3388
3390
(-3365)
3393.4
3395
3395.6
(-3370)
3399.3
3400
3402
(-3375)
3405
(-3380)
3410
3410.2
3411.5
C1
(-3385)
3414
3415
(-3390)
3418.4
OWC 3419(-3391)
3420
1-10
1-9
1-8
1-7
1-6
1-5
1-4
1-3
1-2
1-1
TOP ZONE 1
(-3395)
3425
(-3400)
3430
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4 Km²
CLOSED SURFACE

FIGURE B-1

ZONE 1: RESERVOIR PARAMETERS AND COMPUTED HYDROCARBON IN PLACE

TOP: 3384.0 mbkb (-3356.0 mbsl) TOTAL THICKNESS: 85.0m

OWC: 3419.0 mbkb (-3391.0 mbsl)

BASE: 3469.0 mbkb (-3441.0 mbsl)

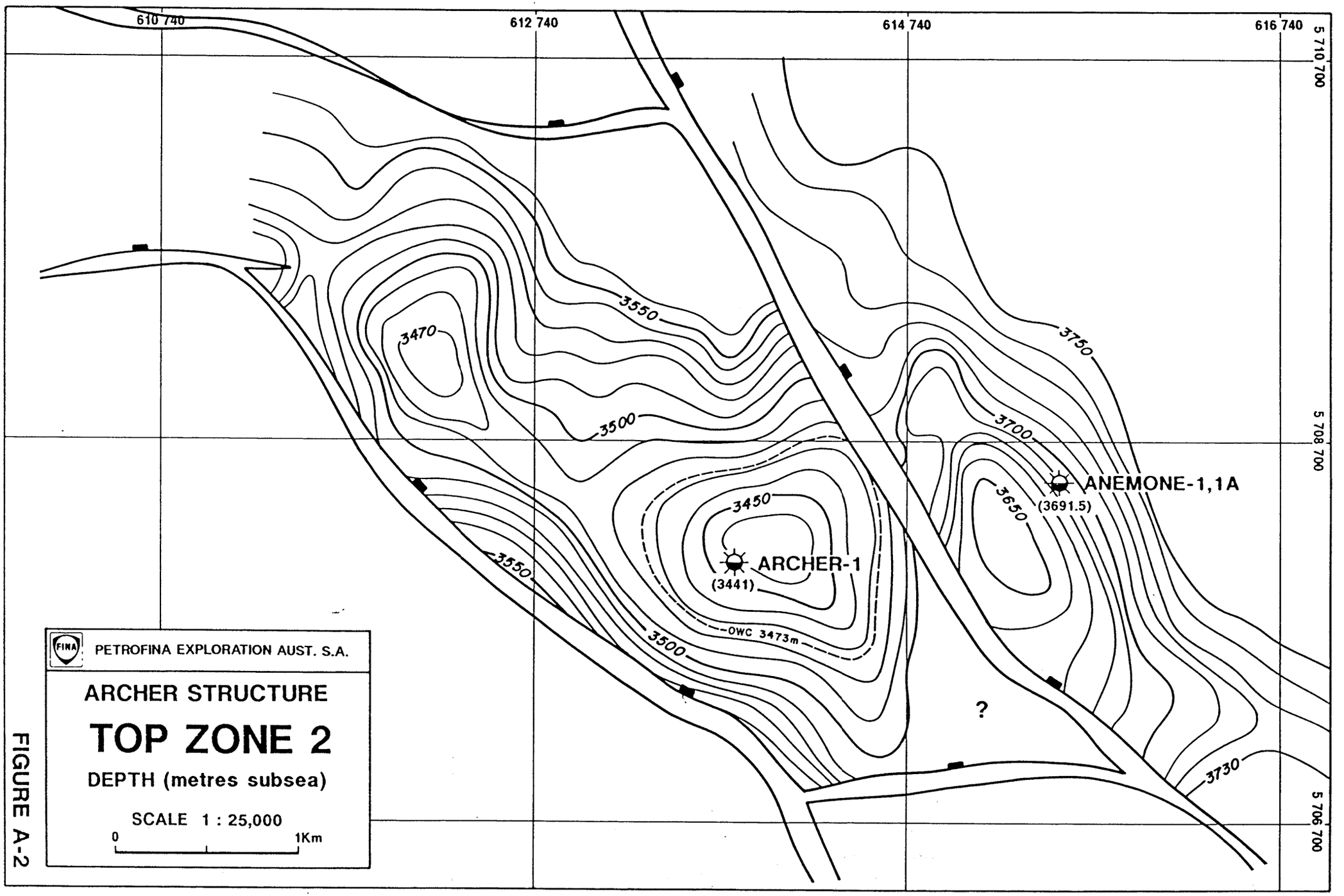
Bo based on RFT sample #1 taken at 3390.2 mbkb
#2 taken at 3403.5 mbkb

HYDROCARBON ZONE

HC COLUMN	RESERVOIR LAYERING	DEPTH (mbkb)	GROSS THICKNESS (m)	NET THICKNESS (m)	VOLUME CLOSED ($10^6 m^3$)	NET/GROSS RATIO (fraction)	POROSITY (fraction)	S H (fraction)	CONSTANT BBL/M^3	Bo	OIL IN PLACE ($10^6 m^3$)
	1-1	3384.0-3388.0	4.0	0.0	4.45	0.00	-	-	-	-	-
	1-2	3388.0-3393.4	5.4	5.0	5.15	0.93	0.14	0.56	6.29	1.5718	1.50
	1-3	3393.4-3395.6	2.2	0.0	1.77	0.00	-	-	-	-	-
	1-4	3395.6-3399.3	3.7	3.7	2.58	1.00	0.18	0.70	6.29	1.5718	1.30
C1	1-5	3399.3-3402.0	2.7	0.0	1.57	0.00	-	-	-	-	-
	1-6	3402.0-3410.2	8.2	8.2	3.30	1.00	0.16	0.49	6.29	2.0149	0.81
	1-7	3410.2-3411.5	1.3	0.0	0.30	0.00	-	-	-	-	-
	1-8	3411.5-3414.0	2.5	2.5	0.43	1.00	0.17	0.24	6.29	2.0149	0.05
	1-9	3414.0-3418.4	4.4	0.0	0.45	0.00	-	-	-	-	-
	1-10A	3418.4-3419.0	0.6	0.6	)						
	-OWC-	-3419-	*	*	} 0.10	1.00	0.18	0.06 (0.70)	6.29	2.0149	0.04
	1-10B	3419.0-3430.2	11.2	11.2	)						
	1-11	3430.2-3469.0*	38.8	13.0	-*	0.34	0.10	-	-	-	-
C1	TOTAL AVERAGE ON THE HC COLUMN	3384.0-3419.0	35.0	20.0	20.10	0.57	0.16	0.51	6.29	1.611	3.70

( ) = inferred
* = ignored

TABLE 1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612 740
614 740
616 740
5 710 700
5 708 700
5 706 700
3470
3500
3550
3450
3550
3500
3700
3750
3650
3730
ARCHER-1
(3441)
ANEMONE-1,1A
(3691.5)
OWC 3473m
?
PETROFINA EXPLORATION AUST. S.A.
ARCHER STRUCTURE
TOP ZONE 2
DEPTH (metres subsea)
SCALE 1 : 25,000
0
1Km

FIGURE A-2

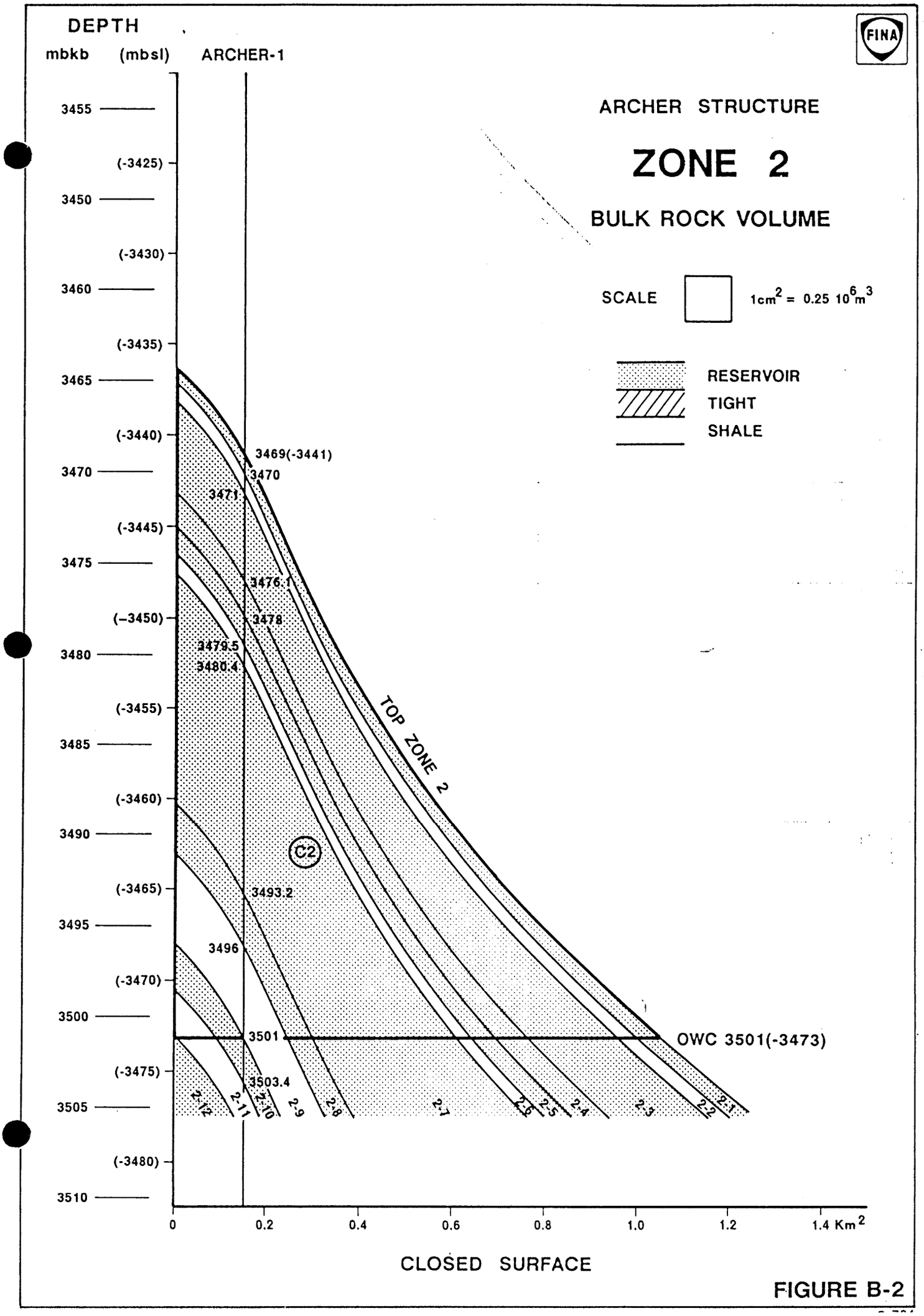
DEPTH
mbkb (mbsl)
ARCHER-1
FINA
ARCHER STRUCTURE
ZONE 2
BULK ROCK VOLUME
SCALE
1cm² = 0.25 10⁶m³
RESERVOIR
TIGHT
SHALE
3455
(-3425)
3450
(-3430)
3460
(-3435)
3465
(-3440)
3469(-3441)
3470
3471
(-3445)
3475
3476.1
(-3450)
3478
3479.5
3480.4
3480
(-3455)
3485
(-3460)
3490
C2
(-3465)
3493.2
3495
3496
(-3470)
3500
3501
OWC 3501(-3473)
(-3475)
3503.4
3505
TOP ZONE 2
2-12
2-11
2-10
2-9
2-8
2-7
2-6
2-5
2-4
2-3
2-2
2-1
(-3480)
3510
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4 Km²
CLOSED SURFACE

FIGURE B-2

ZONE 2: RESERVOIR PARAMETERS AND COMPUTED HYDROCARBON IN PLACE

TOP: 3469.0 mbkb (-3441.0 mbsl) TOTAL THICKNESS: 40.5m

HWC: 3501.0 mbkb (-3473.0 mbsl)

BASE: 3509.5 mbkb (-3481.5 mbsl)

Bo based on RFT sample #3 taken at 3489 mbkb

HYDROCARBON ZONE

HC COLUMN	RESERVOIR LAYERING	DEPTH (mbkb)	GROSS THICKNESS (m)	NET THICKNESS (m)	VOLUME CLOSED ($10^6 m^3$)	NET/GROSS RATIO (fraction)	POROSITY (fraction)	S H (fraction)	CONSTANT BBL/M^3	Bo	OIL IN PLACE ($10^6 m^3$)
	2-1	3469.0-3470.0	1.0	1.0	1.05	1.00	0.16	0.50	6.29	2.6301	0.20
	2-2	3470.0-3471.0	1.0	0.0	0.98	0.00	-	-	-	-	-
	2-3	3471.0-3476.1	5.1	5.1	4.35	1.00	0.15	0.54	6.29	2.6301	0.84
	2-4	3476.1-3478.0	1.9	0.8	1.40	0.42	0.11	0.46	6.29	2.6301	0.07
C2	2-5	3478.0-3479.5	1.5	1.5	1.07	1.00	0.15	0.44	6.29	2.6301	0.17
	2-6	3479.5-3480.4	0.9	0.0	0.63	0.00	-	-	-	-	-
	2-7	3480.4-3493.2	12.8	12.1	5.55	0.95	0.17	0.52	6.29	2.6301	1.11
	2-8	3493.2-3496.0	2.8	1.3	0.75	0.47	0.17	0.47	6.29	2.6301	0.07
	2-9	3496.0-3501.0	5.0	0.0	0.95	0.00	-	-	-	-	-
	-OWC-	3501.0									
	2-10	3501.0-3503.4	2.4*	1.8*	0.27	0.75	0.15	0.22 (0.50)	6.29	2.6301	0.04
	2-11	3503.4-3505.9	2.5*	0.0*	0.1	0.00	-	-	-	-	-
	2-12	3505.9-3507.5*	1.6	1.6	-*	1.00	0.14	0.14	6.29	-	-
	2-13	3507.5-3509.5*	2.0	0.0	-*	0.00	-	-	-	-	-
C2	TOTAL AVERAGE ON THE HC COLUMN	3469.0-3501.0	32.0	21.8	17.10	0.68	0.16	0.51	6.29	2.6301	2.50

( ) = inferred
* = ignored

TABLE 2

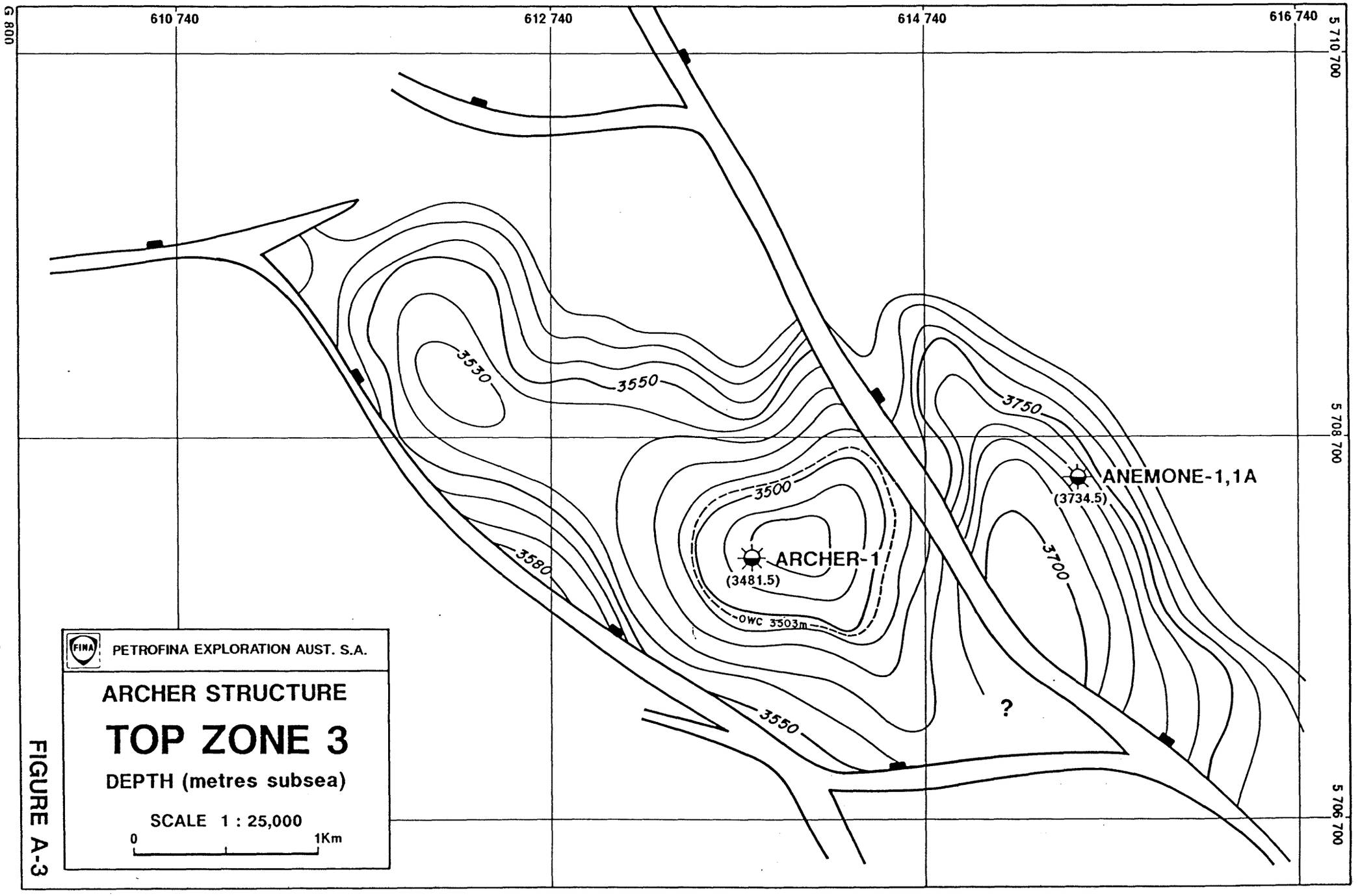
G 800
610 740
612 740
614 740
616 740
5 710 700
5 708 700
5 706 700
3530
3550
3580
3550
3500
3750
3700
ARCHER-1
(3481.5)
OWC 3503m
ANEMONE-1,1A
(3734.5)
?
PETROFINA EXPLORATION AUST. S.A.
ARCHER STRUCTURE
TOP ZONE 3
DEPTH (metres subsea)
SCALE 1 : 25,000
0
1Km

FIGURE A-3

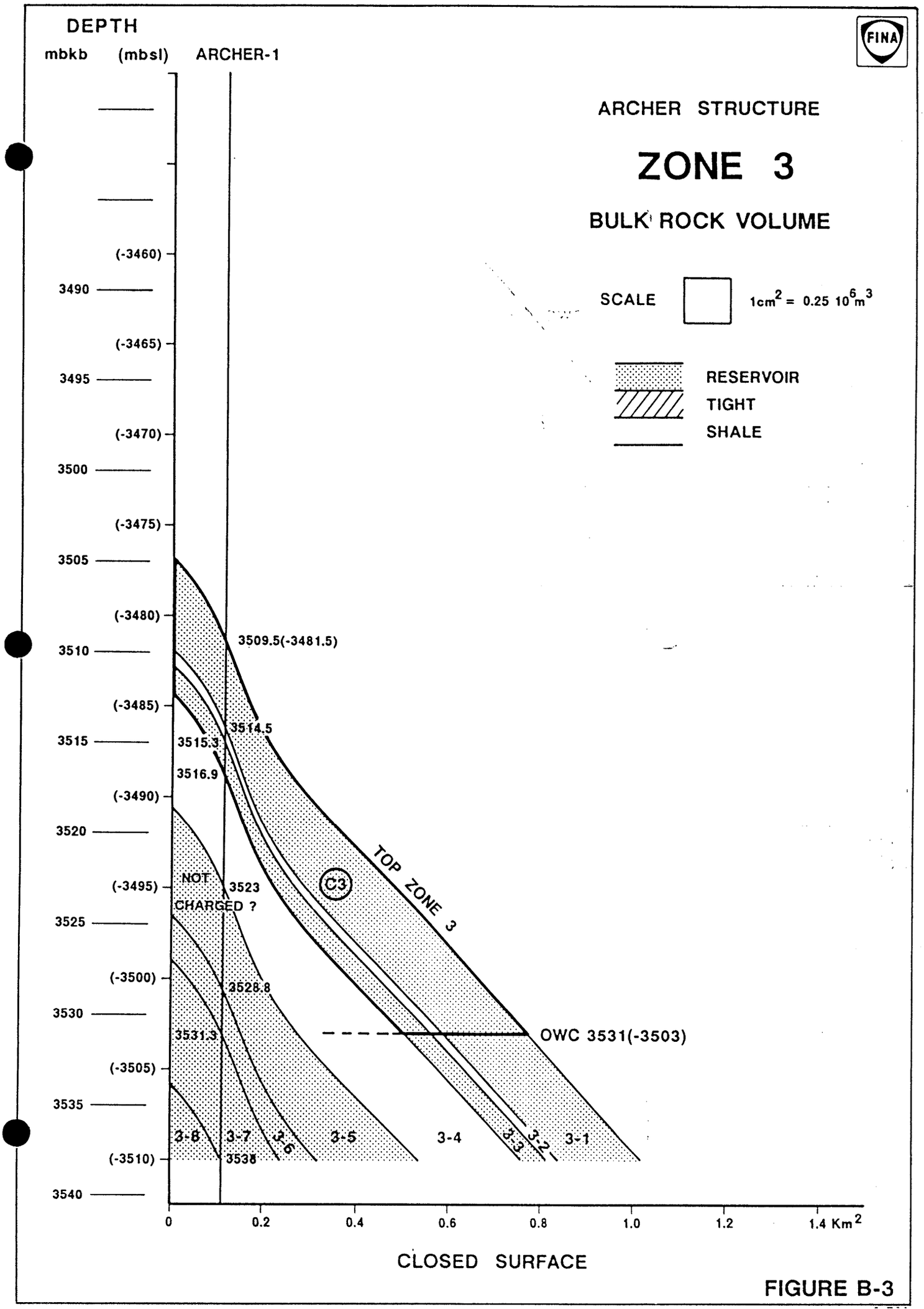
DEPTH
mbkb (mbsl) ARCHER-1
FINA
ARCHER STRUCTURE
ZONE 3
BULK ROCK VOLUME
SCALE 1cm² = 0.25 10⁶m³
RESERVOIR
TIGHT
SHALE
(-3460)
3490
(-3465)
3495
(-3470)
3500
(-3475)
3505
(-3480)
3510
(-3485)
3515
(-3490)
3520
(-3495)
3525
(-3500)
3530
(-3505)
3535
(-3510)
3540
3509.5(-3481.5)
3514.5
3515.3
3516.9
NOT CHARGED ?
3523
C3
TOP ZONE 3
3528.8
3531.3
OWC 3531(-3503)
3-8
3-7
3-6
3-5
3-4
3-3
3-2
3-1
3538
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4 Km²
CLOSED SURFACE

FIGURE B-3

ZONE 3: RESERVOIR PARAMETERS AND COMPUTED HYDROCARBON IN PLACE

TOP: 3509.5 mbkb (-3481.5 mbsl) TOTAL THICKNESS: 68.5m

OWC OF RESERVOIR 3-1 TO 3-3 AT: 3531.0 mbkb (-3503.0 mbsl)

BASE: 3578.0 mbkb (-3550.0 mbsl)

Bo based on RFT sample #4 taken at 3514.2 mbkb

HYDROCARBON ZONE

HC COLUMN	RESERVOIR LAYERING	DEPTH (mbkb)	GROSS THICKNESS (m)	NET THICKNESS (m)	VOLUME CLOSED ($10^6 m^3$)	NET/GROSS RATIO (fraction)	POROSITY (fraction)	S H (fraction)	CONSTANT BBL/M^3	Bo	OIL IN PLACE ($10^6 m^3$)
C3	3-1	3509.5-3514.5	5.0	4.3	3.48	0.86	0.13	0.46	6.29	4.1739	0.27
	3-2	3514.5-3515.3	0.8	0.0	0.45	0.00	-	-	-	-	-
	3-3	3515.3-3516.9	1.6	1.6	0.85	1.00	0.15	0.70	6.29	4.1739	0.13
	- -OWC- -	- - 3531.0- -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - -	- - - -	- - - -
	3-4	3516.9-3523.0*	6.1	1.0	2.35	0.16	0.10	0.15*	6.29	4.1739	0.01
	3-5	3523.0-3528.8*	5.8	5.8	1.20	1.00	0.11	0.03*	6.29	-	-
	3-6	3528.8-3531.3*	2.5	0.8	0.32	0.32	0.12	0.01*	6.29	-	-
	3-7	3531.3-3538.0*	6.7	6.1	0.25	0.91	0.11	0.07*	6.29	-	-
	3-8	3538.0-3578.0*	40.0	28.0	- *	0.70	0.16	-	-	-	-
C3	TOTAL AVERAGE ON THE HC COLUMN	3509.5-3516.9	7.4	5.9	4.78	0.80	0.14	0.54	6.29	4.1739	0.40

( ) = inferred
* = ignored

The reservoirs 3-4 to 3-7 seem to have not been charged.

TABLE 3

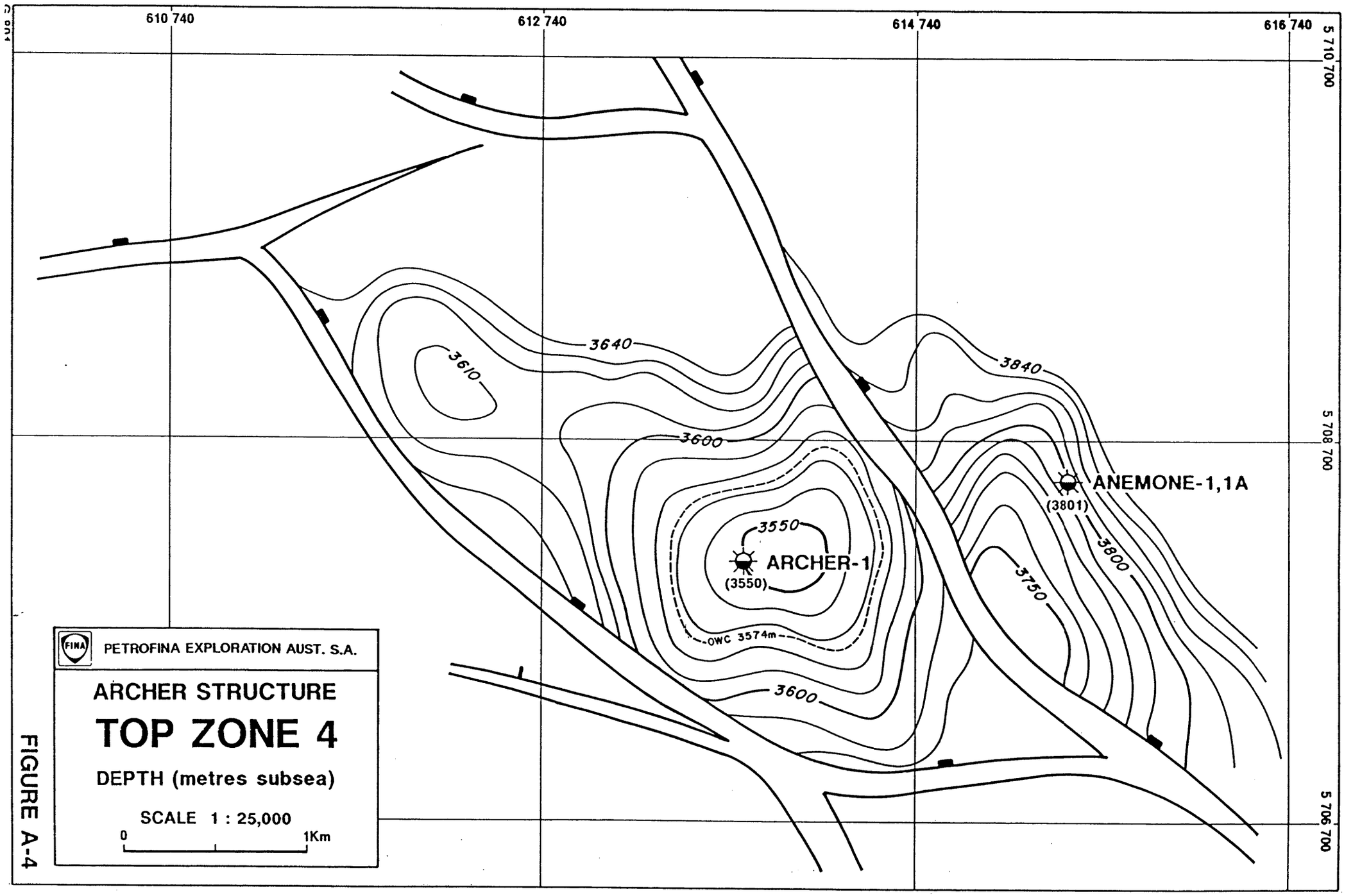
610 740
612 740
614 740
616 740
5 710 700
5 708 700
5 706 700
3640
3610
3600
3840
3550
ARCHER-1
(3550)
OWC 3574m
ANEMONE-1,1A
(3801)
3800
3750
3600
PETROFINA EXPLORATION AUST. S.A.
ARCHER STRUCTURE
TOP ZONE 4
DEPTH (metres subsea)
SCALE 1 : 25,000
0
1Km

FIGURE A-4

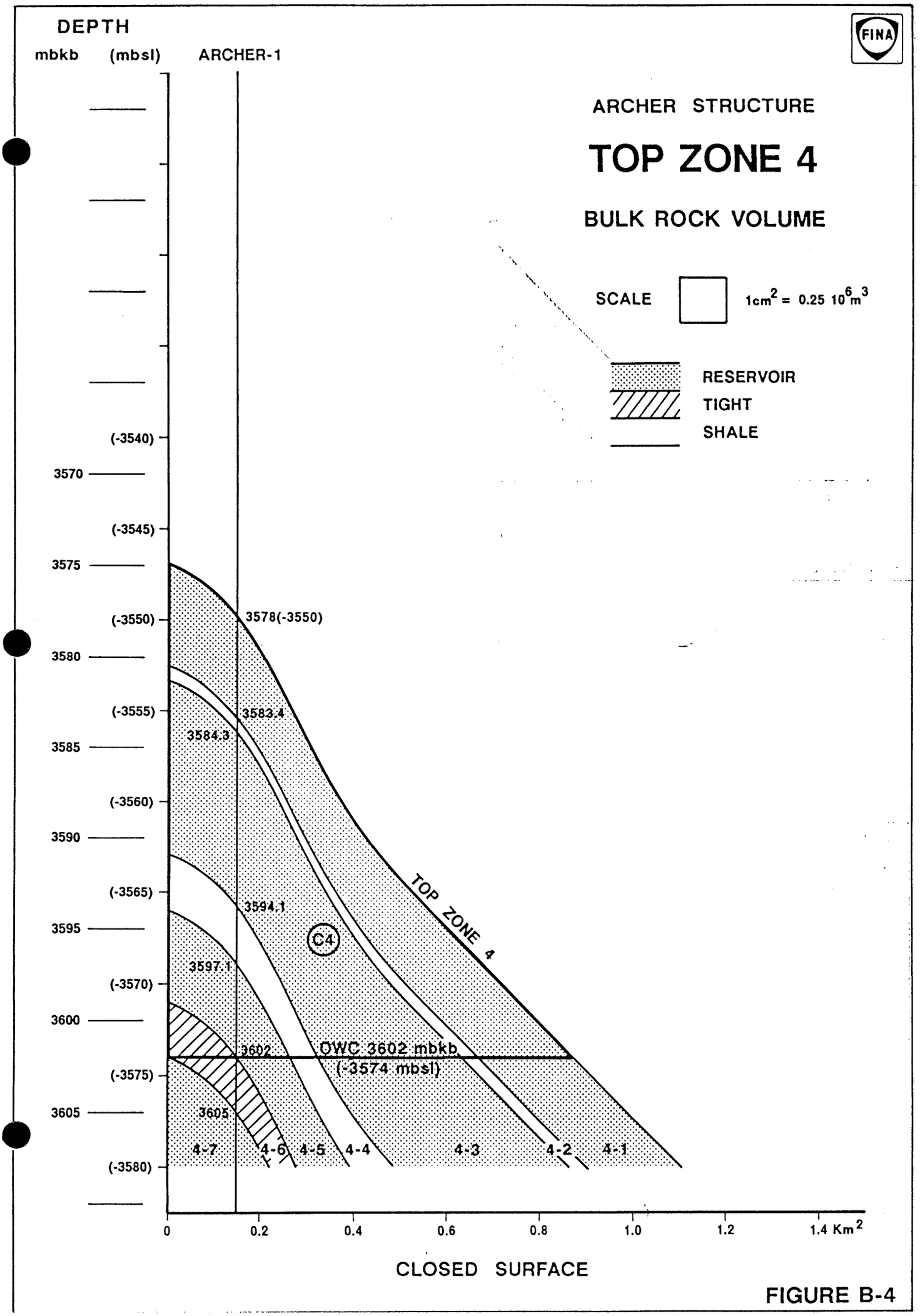
DEPTH
mbkb (mbsl)
ARCHER-1
ARCHER STRUCTURE
TOP ZONE 4
BULK ROCK VOLUME
SCALE
1cm² = 0.25 10⁶m³
RESERVOIR
TIGHT
SHALE
(-3540)
3570
(-3545)
3575
(-3550)
3578(-3550)
3580
(-3555)
3583.4
3584.3
3585
(-3560)
3590
(-3565)
3594.1
3595
C4
3597.1
(-3570)
3600
3602
OWC 3602 mbkb
(-3574 mbsl)
(-3575)
3605
4-7
4-6
4-5
4-4
4-3
4-2
4-1
(-3580)
TOP ZONE 4
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4 Km²
CLOSED SURFACE

FIGURE B-4

ZONE 4: RESERVOIR PARAMETERS AND COMPUTED HYDROCARBON IN PLACE

TOP: 3578.0 mbkb (-3550.0 mbsl) TOTAL THICKNESS: 77.5m

OWC: 3602.0 mbkb (-3574.0 mbsl)

BASE: 3655.5 mbkb (-3627.5 mbsl)

Bo based on RFT sample #5 taken at 3591.5 mbkb

HYDROCARBON ZONE

HC COLUMN	RESERVOIR LAYERING	DEPTH (mbkb)	GROSS THICKNESS (m)	NET THICKNESS (m)	VOLUME CLOSED ($10^6 m^3$)	NET/GROSS RATIO (fraction)	POROSITY (fraction)	S H (fraction)	CONSTANT BBL/M^3	Bo	OIL IN PLACE ($10^6 m^3$)
C4	4-1	3578.0-3583.4	5.4	5.4	4.28	1.00	0.13	0.44	6.29	4.6272	0.33
	4-2	3583.4-3584.3	0.9	0.0	0.60	0.00	-	-	-	-	-
	4-3	3584.3-3594.1	9.8	9.5	4.55	0.97	0.15	0.62	6.29	4.6272	0.56
	4-4	3594.1-3597.1	3.0	0.0	0.87	0.00	-	-	-	-	-
	4-5	3597.1-3602.0	4.9	4.9	1.05	1.00	0.13	0.37	6.29	4.6272	0.07
	-OWC-	3602.0-									
	4-6	3602.0-3605.0	3.0*	0.0*	0.20	0.00	-	-	-	-	-
	4-7	3605.0-3610.0*	5.0	5.0	-*	1.00	0.17	-	-	-	-
	4-8	3610.0-3612.5*	2.5	0.0	-*	0.00	-	-	-	-	-
	4-9	3612.5-3618.3*	5.8	5.8	-*	1.00	0.14	-	-	-	-
	4-10	3618.3-3655.5*	37.2	22.5	-*	0.60	0.13	-	-	-	-
C4	TOTAL AVERAGE ON THE HC COLUMN	3578.0-3602.0	24.0	19.8	11.35	0.82	0.14	0.52	6.29	4.6272	0.96

( ) = inferred

* = ignored

TABLE 4

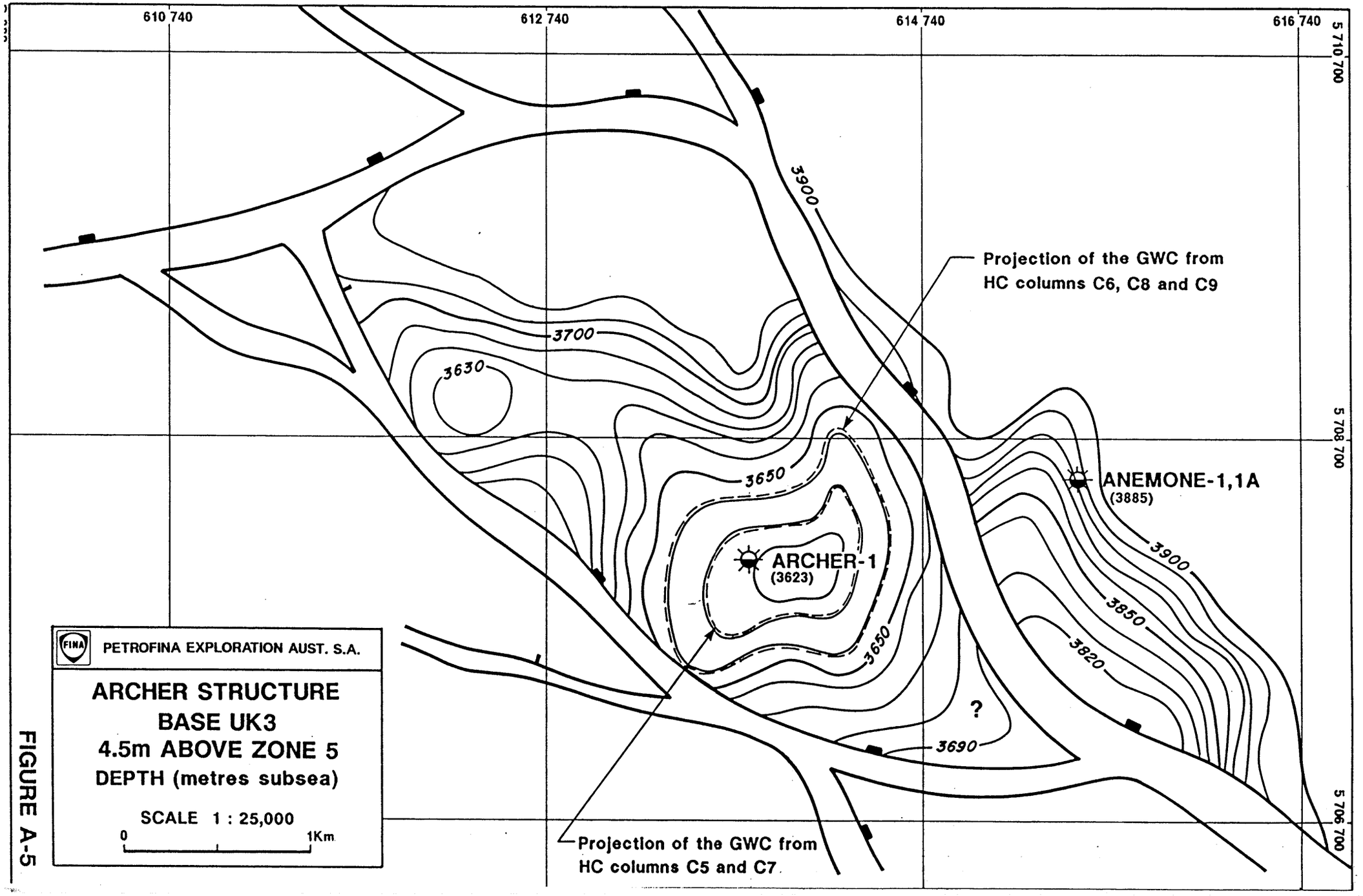
610 740
612 740
614 740
616 740
5 710 700
5 708 700
5 706 700
3900
3700
3630
3650
3650
3900
3850
3820
3690
?
Projection of the GWC from
HC columns C6, C8 and C9
ANEMONE-1,1A
(3885)
ARCHER-1
(3623)
Projection of the GWC from
HC columns C5 and C7
PETROFINA EXPLORATION AUST. S.A.
ARCHER STRUCTURE
BASE UK3
4.5m ABOVE ZONE 5
DEPTH (metres subsea)
SCALE 1 : 25,000
0
1Km

FIGURE A-5

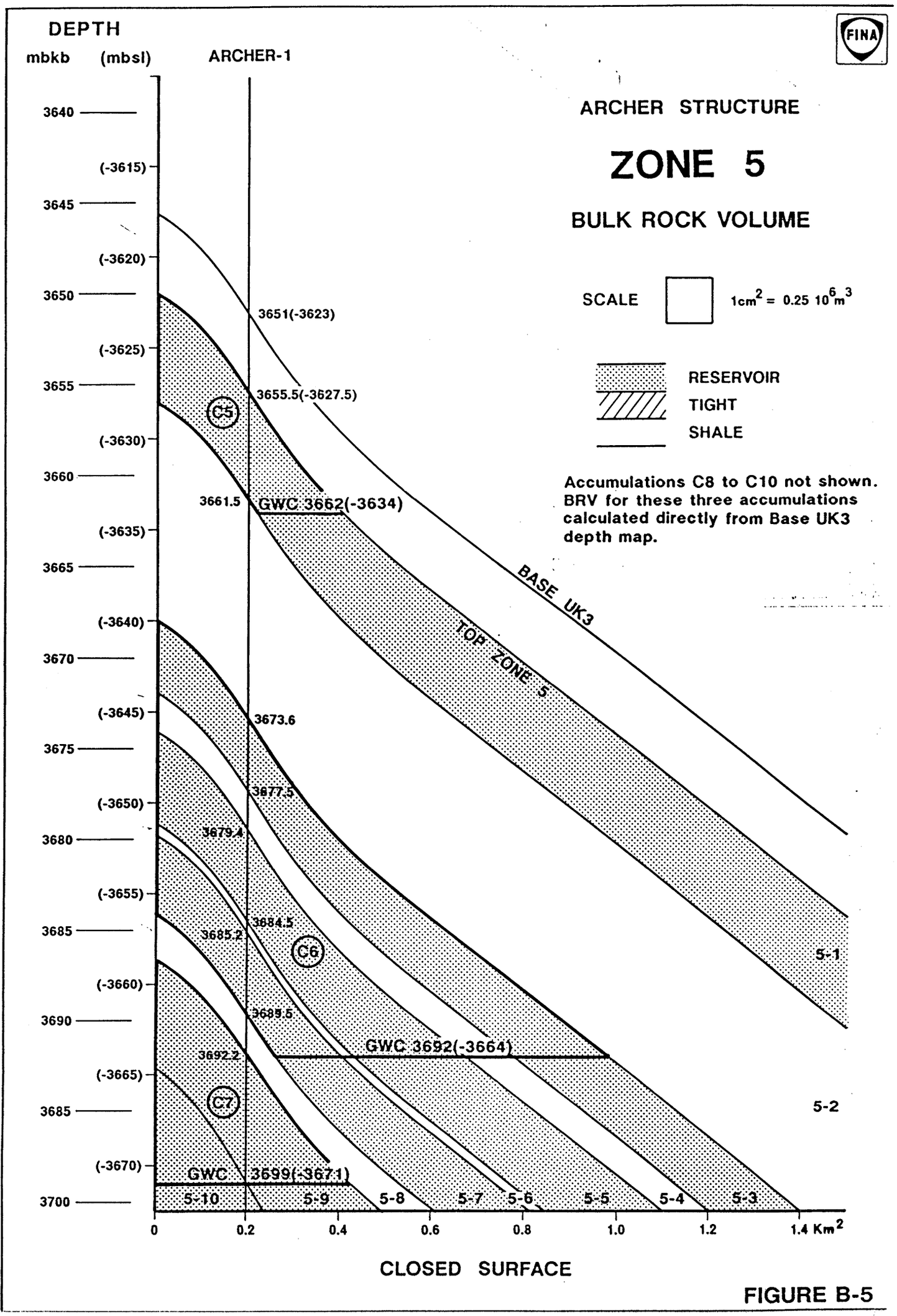
DEPTH
mbkb (mbsl)
ARCHER-1
3640
(-3615)
3645
(-3620)
3650
(-3625)
3655
(-3630)
3660
(-3635)
3665
(-3640)
3670
(-3645)
3675
(-3650)
3680
(-3655)
3685
(-3660)
3690
(-3665)
3685
(-3670)
3700
3651(-3623)
3655.5(-3627.5)
C5
3661.5
GWC 3662(-3634)
BASE UK3
TOP ZONE 5
3673.6
3677.5
3679.4
3684.5
3685.2
C6
3689.5
GWC 3692(-3664)
3692.2
C7
GWC 3699(-3671)
5-1
5-2
5-10
5-9
5-8
5-7
5-6
5-5
5-4
5-3
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4 Km2
CLOSED SURFACE
ARCHER STRUCTURE
ZONE 5
BULK ROCK VOLUME
SCALE
1cm2 = 0.25 10^6m^3
RESERVOIR
TIGHT
SHALE
Accumulations C8 to C10 not shown. BRV for these three accumulations calculated directly from Base UK3 depth map.

FIGURE B-5

ZONE 5: RESERVOIR PARAMETERS AND COMPUTED HYDROCARBON IN PLACE

TOP: 3655.5 mbkb (-3627.5 mbsl) TOTAL THICKNESS: 180.9m

GWC OF RESERVOIR 5-1 AT: 3662.0 mbkb (-3634.0 mbsl)
GWC OF RESERVOIR 5-3 TO 5-8 AT: 3695.0 mbkb (-3667.0 mbsl)
GWC OF RESERVOIR 5-9 AT: 3699.0 mbkb (-3671.0 mbsl)
GWC OF RESERVOIR 5-11 AT: 3726.0 mbkb (-3698.0 mbsl)
GWC OF RESERVOIR 5-13 AT: 3762.5 mbkb (-3734.5 mbsl)
GWC OF RESERVOIR 5-15 AT: 3782.5 mbkb (-3754.5 mbsl)

BASE: 3836.4 mbkb (-3808.4 mbsl)
Bg based on RFT sample #6 taken at 3681 mbkb

HYDROCARBON ZONE

HC COLUMN	RESERVOIR LAYERING	DEPTH (mbkb)	GROSS THICKNESS (m)	NET THICKNESS (m)	VOLUME CLOSED ($10^6 m^3$)	NET/GROSS RATIO (fraction)	POROSITY (fraction)	S H (fraction)	CONSTANT CU.FT/M^3	Bg	GAS IN PLACE (10^6CU.F
C5	5-1	3655.5-3661.5	6.0	5.5	1.80	0.92	0.12	0.31	35.3134	0.00359	606
	-GWC-	3662.0- *			*			*			
	5-2	3661.5-3673.6	12.1	3.2	-	0.26	0.11	0.12	-	-	-
C6	5-3	3673.6-3677.5	3.9	3.9	3.50	1.00	0.13	0.44	35.3134	0.00359	1969
	5-4	3677.5-3679.4	1.9	0.0	1.45	0.00	-	-	-	-	-
	5-5	3679.4-3684.5	5.1	5.1	2.80	1.00	0.15	0.63	35.3134	0.00359	2603
	5-6	3684.5-3685.2	0.7	0.0	0.32	0.00	-	-	-	-	-
	5-7	3685.2-3689.5	4.3	4.3	1.45	1.00	0.11	0.34	35.3134	0.00359	533
	-GWC-	3692.0- *			*						
	5-8	3689.5-3692.2	2.7	0.0	0.57	0.00	-	-	-	-	-
C7	5-9	3692.2-3699.0	6.8	6.8	2.17	1.00	0.11	0.37	35.3134	0.00359	869
	-GWC-	3699.0-	*	*							
	5-10	3699.0-3705.4	6.4	2.1	0.80	0.33	0.09	0.10 (0.40)	35.3134	0.00359	93
C8	5-11	3705.4-3709.0 *	3.6	2.8	3.20	0.78	0.12	0.27	35.3134	0.00358	798
	-GWC-	3726.0- *			*						
	5-12	3709.0-3740.0	131.0	45.7	-	0.36	-	-	-	-	-
C9	5-13	3740.0-3762.5	22.5	11.7	9.25	0.52	0.12	0.28	35.3134	0.00357	1599
	-GWC-	3762.5- *			*						
	5-14	3762.5-3763.5	1.0	0.0	-	0.00	-	-	-	-	-
C10	5-15	3763.5-3782.5	19.0	10.1	6.30	0.53	0.14	0.32	35.3134	0.00357	1480
	-GWC-	3782.5- *		*	*						
	5-16	3782.5-3836.4	53.9	-	-	-	-	-	-	-	-

( ) = inferred
* = ignored

TABLE 5

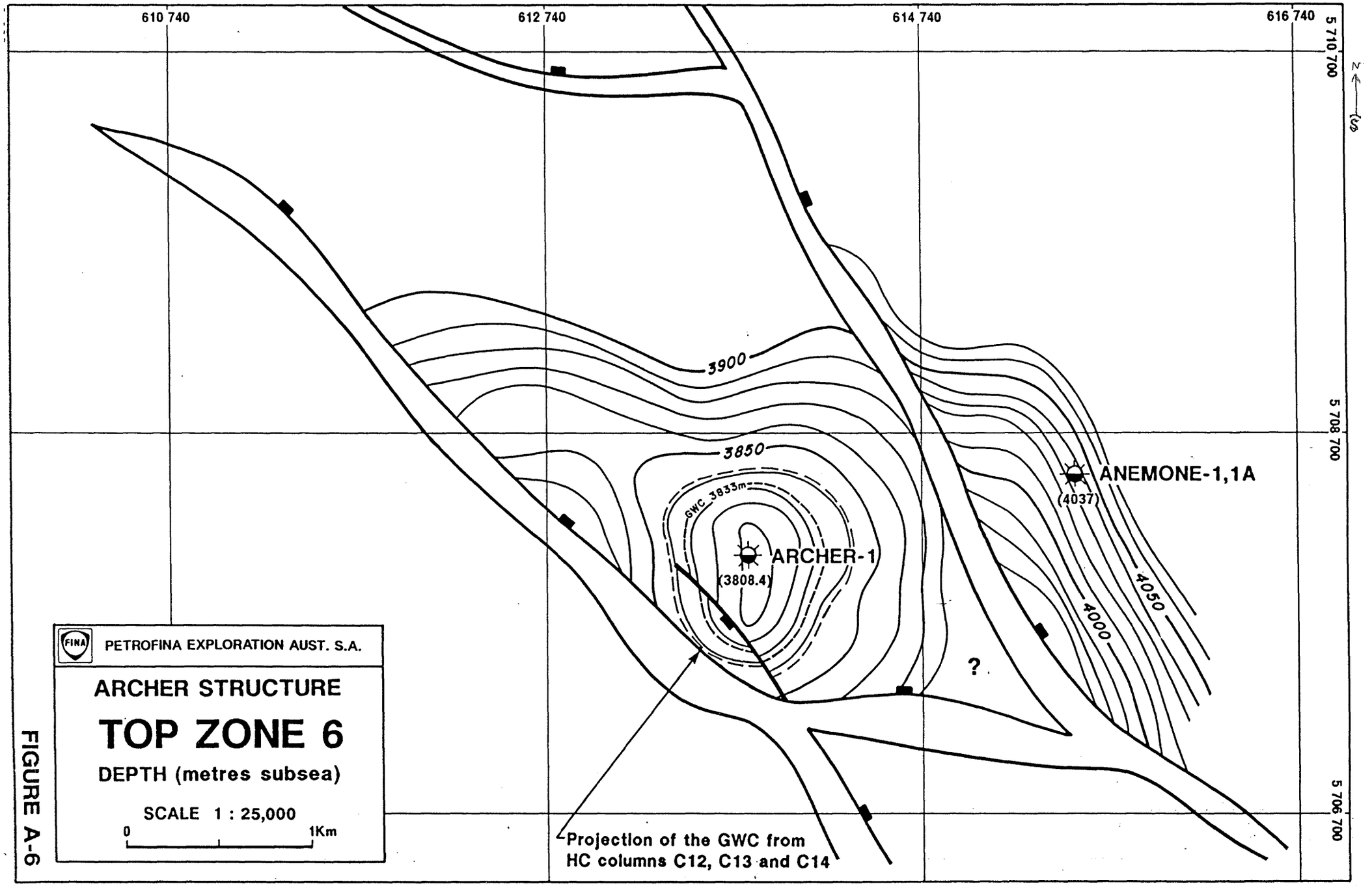
610 740
612 740
614 740
616 740
5 710 700
5 708 700
5 706 700
N
3900
3850
4000
4050
GWC 3833m
ARCHER-1
(3808.4)
ANEMONE-1,1A
(4037)
?
Projection of the GWC from
HC columns C12, C13 and C14
PETROFINA EXPLORATION AUST. S.A.
ARCHER STRUCTURE
TOP ZONE 6
DEPTH (metres subsea)
SCALE 1 : 25,000
0
1Km

FIGURE A-6

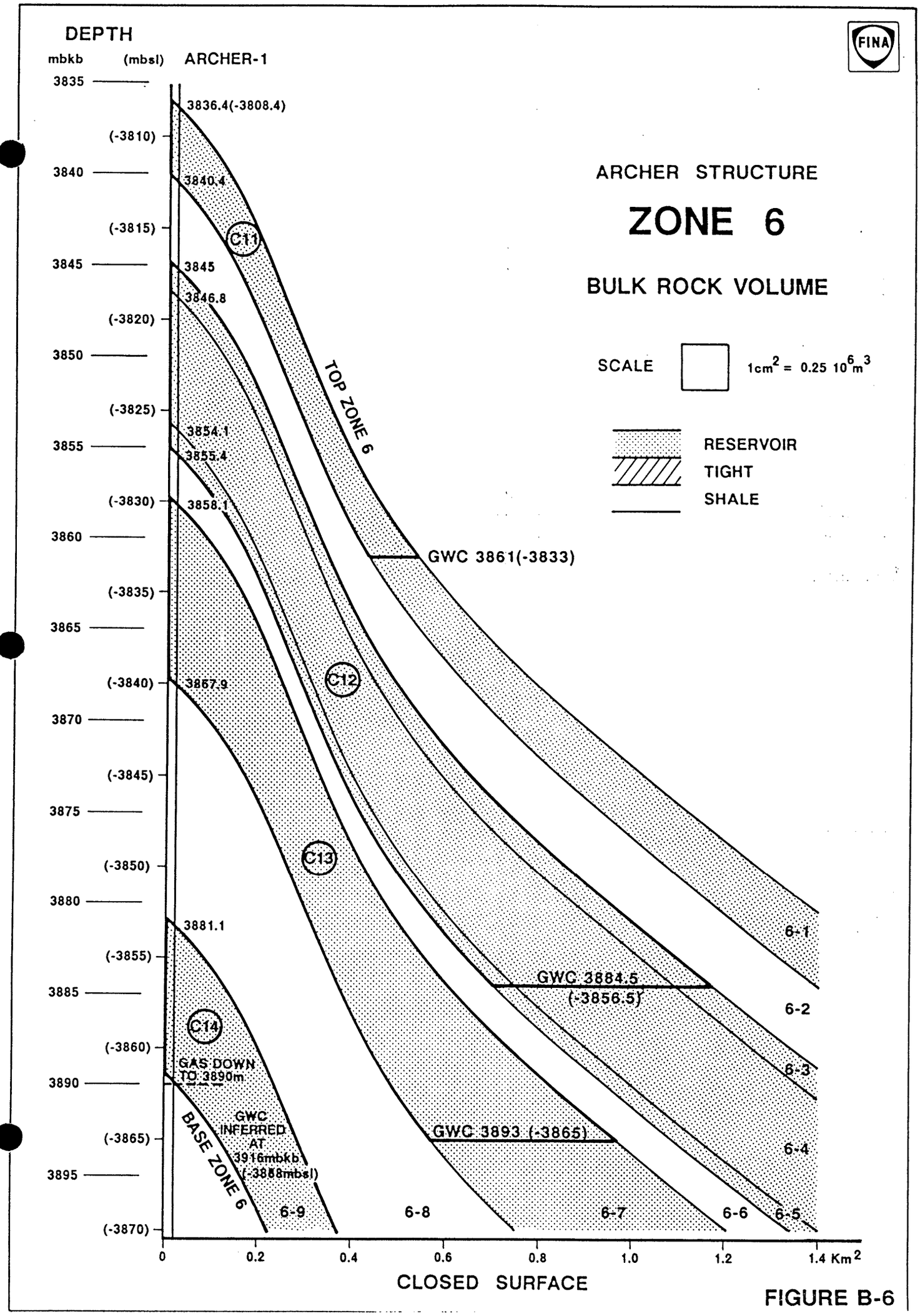
DEPTH
mbkb (mbsl) ARCHER-1
3835
3836.4(-3808.4)
(-3810)
3840
3840.4
(-3815)
3845
3845
3846.8
(-3820)
3850
(-3825)
3854.1
3855
3855.4
(-3830)
3858.1
3860
(-3835)
3865
(-3840)
3867.9
3870
(-3845)
3875
(-3850)
3880
3881.1
(-3855)
3885
(-3860)
3890
GAS DOWN TO 3890m
GWC INFERRED AT 3916mbkb (-3888mbsl)
(-3865)
3895
(-3870)
C11
C12
C13
C14
TOP ZONE 6
GWC 3861(-3833)
GWC 3884.5 (-3856.5)
GWC 3893 (-3865)
BASE ZONE 6
6-1
6-2
6-3
6-4
6-5
6-6
6-7
6-8
6-9
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4 Km2
CLOSED SURFACE
ARCHER STRUCTURE
ZONE 6
BULK ROCK VOLUME
SCALE
1cm2 = 0.25 10^6 m^3
RESERVOIR
TIGHT
SHALE

FIGURE B-6

ZONE 6: RESERVOIR PARAMETERS AND COMPUTED HYDROCARBON IN PLACE

TOP: 3836.4 mbkb (-3808.4 mbsl) TOTAL THICKNESS: 53.6m

GAS DOWN TO: 3890.0 mbkb (-3862.0 mbsl)

GWC OF RESERVOIR 6-1 AT: 3861.0 mbkb (-3833.0 mbsl)
GWC OF RESERVOIR 6-3 AT: 3884.5 mbkb (-3856.5 mbsl)
GWC OF RESERVOIR 6-7 AT: 3893.0 mbkb (-3865.0 mbsl)
GWC OF RESERVOIR 6-9 AT: 3916.0 mbkb (-3888.0 mbsl)

BASE: 3890.0 mbkb (-3862.0 mbsl)

Bg extrapolated from RFT samples #6 and #7

HYDROCARBON ZONE

HC COLUMN	RESERVOIR LAYERING	DEPTH (mbkb)	GROSS THICKNESS (m)	NET THICKNESS (m)	VOLUME CLOSED ($10^6 m^3$)	NET/GROSS RATIO (fraction)	POROSITY (fraction)	S H (fraction)	CONSTANT CU.FT/M^3	Bg	GAS IN PLACE (10^6CU.F
C11	6-1	3836.4-3840.4	4.0	4.0	(2.10)	1.00	0.11	0.36	35.3134	0.00353	832
	-GWC-	(3861.0)									
	6-2	3840.4-3845.0*	4.6	0.0	-*	0.00	-	-	-	-	-
C12	6-3	3845.0-3846.8	1.8	1.8	(2.02)	1.00	0.14	0.60	35.3134	0.00353	1702
	6-4	3846.8-3854.1	7.3	2.0	(6.68)	0.27	0.10	0.45	35.3134	0.00353	812
	6-5	3854.1-3855.4	1.3	1.3	(0.95)	1.00	0.12	0.45	35.3134	0.00353	513
	-GWC-	(3884.5)									
	6-6	3855.4-3858.1*	2.7	0.0	-*	0.00	-	-	-	-	-
C13	6-7	3858.1-3867.9	9.8	8.4	(7.50)	0.86	0.12	0.52	35.3134	0.00353	4026
	-GWC-	(3893.0)									
	6-8	3867.9-3881.3*	13.4	0.0	-*	0.00	-	-	-	-	-
C14	6-9	3881.3-3890.0	8.7	5.1	(6.70)	0.59	0.11	0.51	35.3134	0.00353	2218
	-GWC-	(3916.0)									
C11 to C14	TOTAL AVERAGE ON THE HC COLUMN	3836.4-3890.0	53.6	22.6	(25.95)	0.42	0.12	0.49	35.3134	0.00353	9434

( ) = inferred
* = ignored

TABLE 6

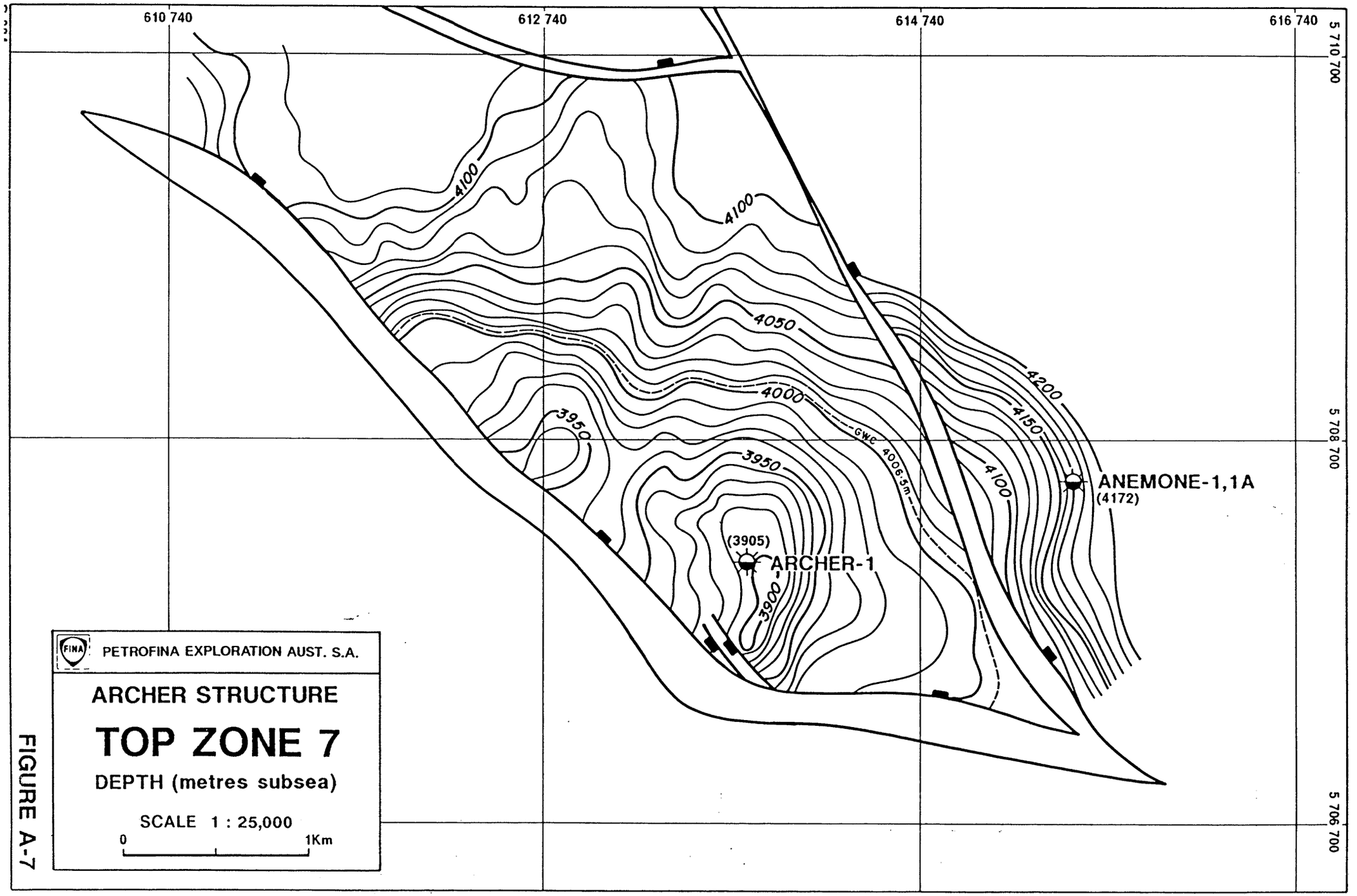
610 740
612 740
614 740
616 740
5 710 700
5 708 700
5 706 700
4100
4100
4050
4000
3950
3950
3900
4200
4150
4100
GWC 4006.5m
ANEMONE-1,1A
(4172)
(3905)
ARCHER-1
PETROFINA EXPLORATION AUST. S.A.
ARCHER STRUCTURE
TOP ZONE 7
DEPTH (metres subsea)
SCALE 1 : 25,000
0
1Km

FIGURE A-7

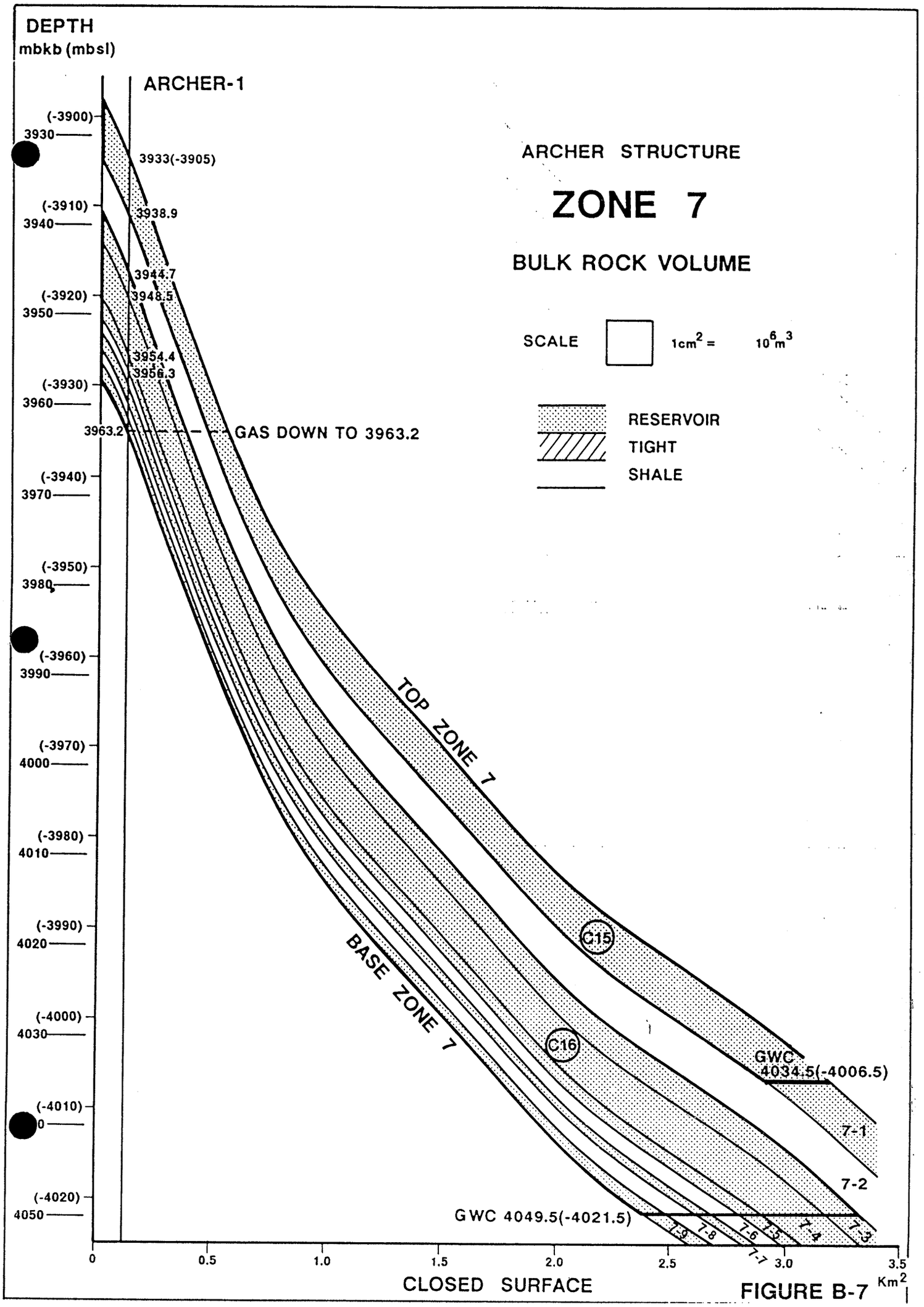
DEPTH
mbkb (mbsl)
ARCHER-1
(-3900)
3930
3933(-3905)
(-3910)
3940
3938.9
3944.7
3948.5
(-3920)
3950
3954.4
3956.3
(-3930)
3960
3963.2
GAS DOWN TO 3963.2
(-3940)
3970
(-3950)
3980
(-3960)
3990
(-3970)
4000
(-3980)
4010
(-3990)
4020
(-4000)
4030
(-4010)
0
(-4020)
4050
ARCHER STRUCTURE
ZONE 7
BULK ROCK VOLUME
SCALE
1cm2 = 10^6m^3
RESERVOIR
TIGHT
SHALE
TOP ZONE 7
BASE ZONE 7
C15
C16
GWC 4034.5(-4006.5)
GWC 4049.5(-4021.5)
7-1
7-2
7-3
7-4
7-5
7-6
7-7
7-8
7-9
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Km2
CLOSED SURFACE

FIGURE B-7

ZONE 7: RESERVOIR PARAMETERS AND COMPUTED HYDROCARBON IN PLACE

TOP: 3933.0 mbkb (-3905.0 mbsl) TOTAL THICKNESS: 30.2m

GAS DOWN TO: 3963.2 mbkb (-3935.2 mbsl)

GWC OF RESERVOIR 7-1 AT: 4034.5 mbkb (-4006.5 mbsl)

GWC OF RESERVOIR 7-3 TO 7-9 AT: 4049.5 mbkb (-4021.5 mbsl)

BASE: 3963.2 mbkb (-3935.2 mbsl)

Bg based on RFT sample #7 taken at 3947.5 mbkb

HYDROCARBON ZONE

HC COLUMN	RESERVOIR LAYERING	DEPTH (mbkb)	GROSS THICKNESS (m)	NET THICKNESS (m)	VOLUME CLOSED ($10^6 m^3$)	NET/GROSS RATIO (fraction)	POROSITY (fraction)	S H (fraction)	CONSTANT CU.FT/M^3	Bg	GAS IN PLACE (10^6CU.F
C15	7-1	3933.0-3938.9	5.9	5.9	(18.40)	1.00	0.17	0.80	35.3134	0.00350	25248
	-GWC-	-(4034.5)-									
	7-2	3938.9-3944.7*	5.8	0.0	-*	0.00	-	-	-	-	-
C16	7-3	3944.7-3948.5	3.8	3.8	(12.39)	1.00	0.15	0.75	35.3134	0.00350	14064
	7-4	3948.5-3954.4	5.9	0.5	(17.94)	0.08	0.09	0.45	35.3134	0.00350	586
	7-5	3954.4-3956.3	1.9	1.9	(5.42)	1.00	0.15	0.67	35.3134	0.00350	5496
	7-6	3956.3-3958.0	1.7	0.0	(4.67)	0.00	-	-	-	-	-
	7-7	3958.0-3959.2	1.2	1.2	(3.25)	1.00	0.14	0.71	35.3134	0.00350	3259
	7-8	3959.2-3961.4	2.2	0.0	(5.63)	0.00	-	-	-	-	-
	7-9	3961.4-3963.2	1.8	1.8	(4.40)	1.00	0.13	0.64	35.3134	0.00350	3694
	-GWC-	-(4049.5)-									
C15 to C16	TOTAL AVERAGE ON THE HC COLUMN	3933.0-3963.2	30.2	15.1	(72.10)	0.50	0.15	0.73	35.3134	0.00350	52347

( ) = inferred

* = ignored

TABLE 7

ARCHER STRUCTURE

AVERAGE RESERVOIR PARAMETERS AND COMPUTED HYDROCARBON IN PLACE FOR 16 INDEPENDENT ACCUMULATIONS

ZONE	HC COLUMN	TOP-HWC MBKB	GROSS RESERVOIR THICKNESS M	NET THICKNESS M	BULK ROCK VOLUME 10^6 M^3	NET/GROSS FRACTION	POROSITY FRACTION	S H FRACTION	CONSTANT 3 BBL/M	CONSTANT 3 CU.FT/M	Bo	Bg	OIL IN PLACE 10^6 BBL	GAS IN PLACE 10^9 CU.FT
1	C1	3384.0-3419.0	35.0	20.0	20.10	0.57	0.16	0.51	6.29	-	1.611	-	3.70	-
2	C2	3469.0-3501.0	32.0	21.8	17.10	0.68	0.16	0.51	6.29	-	2.6301	-	2.50	-
3	C3	3509.5-3531.0	7.4	5.9	4.78	0.80	0.14	0.54	6.29	-	4.1739	-	0.40	-
4	C4	3578.0-3602.0	24.0	19.8	11.35	0.82	0.14	0.52	6.29	-	4.6272	-	0.96	-
5	C5	3655.5-3662.0	6.0	5.5	1.80	0.92	0.12	0.31	-	35.3134	-	0.00359	-	0.606
	C6	3673.6-3692.0	15.9	13.3	9.52	0.84	0.13	0.50	-	35.3134	-	0.00359	-	5.105
	C7	3692.2-3699.0	6.8	6.8	2.97	1.00	0.11	0.37	-	35.3134	-	0.00359	-	0.962
	C8	3705.4-3726.0	3.6	2.8	3.20	0.78	0.12	0.27	-	35.3134	-	0.00358	-	0.798
	C9	3740.0-3762.5	22.5	11.7	9.25	0.52	0.12	0.28	-	35.3134	-	0.00357	-	1.599
	C10	3763.5-3782.5	19.0	10.1	6.30	0.53	0.14	0.32	-	35.3134	-	0.00357	-	1.480
6	C11	3836.4-3861.0	4.0	4.0	2.10	1.00	0.11	0.36	-	35.3134	-	0.00353	-	0.832
	C12	3845.0-3884.5	10.4	5.1	9.65	0.49	0.12	0.52	-	35.3134	-	0.00353	-	3.027
	C13	3858.1-3893.0	9.8	8.4	7.50	0.86	0.12	0.52	-	35.3134	-	0.00353	-	4.026
	C14	3881.3-3916.0	8.7	5.1	6.70	0.59	0.11	0.51	-	35.3134	-	0.00353	-	2.218
7	C15	3933.0-4034.5	5.9	5.9	18.40	1.00	0.17	0.80	-	35.3134	-	0.00350	-	25.248
	C16	3944.7-4049.5	18.5	9.2	53.70	0.50	0.14	0.68	-	35.3134	-	0.00350	-	27.099
TOTAL		3384.0-4049.5	229.5	155.4	184.42	0.68	0.13	0.47	6.29	35.3134	1.611 to 4.6272	0.00359 to 0.00350	7.56	73.000

TABLE 8

ARCHER STRUCTURE

RECOVERABLE RESERVES IN 16 INDEPENDENT ACCUMULATIONS

ZONE	HC COLUMN	RESERVES IN PLACE AT RESERVOIR PRESSURE AND TEMPERATURE		GLR @ SC SCF/BBL	RESERVES IN PLACE AT STANDARD CONDITIONS			RECOVERY FACTOR FRACTION	RECOVERABLE RESERVES		
		OIL MMBBL	GAS BCF		OIL MMBBL	CONDENSATE MMBBL	GAS @ SC BCF		OIL MMBBL	CONDENSATE MMBBL	GAS BCF
1	C1	3.70	-	1200	3.70	-	4.440	0.40	1.48	-	1.78
2	C2	2.50	-	2233	2.50	-	5.580	0.35	0.88	-	1.95
3	C3	0.40	-	5103	0.40	-	2.040	0.20	0.08	-	0.41
4	C4	0.96	-	5740	0.96	-	5.510	0.30	0.29	-	1.65
5	C5	-	0.606	17088	-	0.04	0.606	0.30	-	0.01	0.18
	C6	-	5.105	17088	-	0.30	5.105	0.60	-	0.18	3.06
	C7	-	0.962	17088	-	0.05	0.962	0.35	-	0.02	0.34
	C8	-	0.798	17088	-	0.05	0.798	0.30	-	0.01	0.24
	C9	-	1.599	18000	-	0.09	1.599	0.40	-	0.04	0.64
	C10	-	1.480	18000	-	0.08	1.480	0.40	-	0.03	0.59
6	C11	-	0.832	20800	-	0.04	0.832	0.30	-	0.01	0.25
	C12	-	3.027	20800	-	0.15	3.027	0.55	-	0.08	1.66
	C13	-	4.026	20800	-	0.19	4.026	0.60	-	0.12	2.42
	C14	-	2.218	20800	-	0.11	2.218	0.50	-	0.05	1.11
7	C15	-	25.248	21474	-	1.18	25.248	0.70	-	0.82	17.67
	C16	-	27.099	21474	-	1.26	27.099	0.70	-	0.88	18.97
		7.56	73.000	-	7.56	3.54	90.57	-	2.75	2.25	52.92

TABLE 9

PE600955

This is an enclosure indicator page.
The enclosure PE600955 is enclosed within the container PE902092 at this location in this document.

The enclosure PE600955 has the following characteristics:

ITEM_BARCODE	= PE600955
CONTAINER_BARCODE	= PE902092
NAME	= Reservoir Zonation & Subdivisions
BASIN	= GIPPSLAND
PERMIT	= VIC/P20
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Reservoir Zonation & Subdivisions (enclosure from WCR vol.2) for5 Archer-1
REMARKS	=
DATE_CREATED	= 31/05/90
DATE_RECEIVED	= 4/09/90
W_NO	= W1021
WELL_NAME	= Archer-1
CONTRACTOR	= Petrofina Exploration
CLIENT_OP_CO	= Petrofina Exploration

(Inserted by DNRE - Vic Govt Mines Dept)