WCR VOL 1

ROWNDHEAD-1

(W984)

ESSO EXPLORATION AND PRODUCTION
AUSTRALIA INC.

WELL COMPLETION REPORT
ROUNDHEAD-1
VOLUME 1
BASIC DATA

GIPPSLAND BASIN
VICTORIA

ESSO AUSTRALIA LIMITED

COMPILED BY:
G. SMITH
E. GREWAR

JANUARY 1989

01890121

ROUNDHEAD-1

WELL COMPLETION REPORT

VOLUME 1: BASIC DATA

CONTENTS

FIGURES

APPENDICES

ESSO AUSTRALIA LTD

1. WELL DATA RECORD

ROUNDHEAD-1

LOCATION	:	Latitude : 38^0 37' 05.39" South Longitude : 148^0 13' 28.06" East X = 606600.5E Y = 5724879.0S Map Projection: UTM Zone 55 Geographical Location: Bass Strait, Victoria Field: Roundhead-1
PERMIT	:	Vic/L7
ELEVATION	:	21m
WATER DEPTH	:	80m
TOTAL DEPTH	:	3021m (Driller) 3023.5 (Logger)
PLUG BACK TYPE	:	Cement Plug
REASONS FOR PLUGGING BACK	:	Plug and Abandon
MOVE IN	:	05/12/88
SPUDDED	:	06/12/88
REACHED T.D.	:	29/12/88
RIG RELEASED	:	04/01/89
OPERATOR	:	Esso Exploration and Production Australia Inc.
PERMITTEE OR LICENCEE	:	BHP Petroleum (Australia) Pty. Ltd. and ESSO Exploration and Production Australia Inc.
ESSO INTEREST	:	50%
OTHER INTEREST	:	BHP Petroleum (Australia) Pty. Ltd.: 50%
CONTRACTOR	:	South Seas Drilling Company
RIG NAME	:	Southern Cross
EQUIPMENT TYPE	:	Semi Submersible
TOTAL RIG DAYS	:	30.6 Days
DRILLING AFE NO.	:	238001
TYPE COMPLETION	:	Plug and Abandon
WELL CLASSIFICATION	:	Before Drilling New Field Wildcat After Drilling Dry Hole

2. Roundhead-1

Operations Summary

1. MOVING/MOORING

Under tow by the MV Lady Penelope, the Southern Cross departed the Barracouta Soil Boring location at 0045 hours December 5, 1988 and arrived at the Roundhead-1 location at 1200 hours the same day. The 31 nm tow was completed in 11.25 hours at an average speed of 2.8 kts. After arriving at the Roundhead-1 location two separate approach runs were aborted due to misplaced location buoys and a fouled drop anchor pendant.

The rig was towed by the stern tow bridle in order to facilitate pulling anchors at the Barracouta location. Anchor No. 5 was dropped by the rig on approach to location and positioned with the MV Canning Tide. The remaining seven anchors were run by the MV Eastern Tide and MV Canning Tide in 5.25 hours. Damaged sections of chain were removed from anchor lines Nos. 6 and 3. After positioning the rig, all anchors were load tested to 200 kips. The rig was then ballasted down and the TGB was run and landed at a seafloor depth of 101m RKB.

The original rig position was given as 5m @ 240° from the called location. However, due to minor problems experienced with the positioning equipment, the position was later resurveyed and found to be 14.4m on a bearing of 206.6° from the called location.

2. DRILLING OPERATIONS

a) 26" Hole/20" Casing

After setting the TGB, a 26" bit was made up below a 26" hole opener and a slick BHA was picked up. The 26" BHA was stabbed into the TGB and the Roundhead-1 well was spudded at 1245 hours December 6, 1988. The 26" hole was drilled to 235m, at an average ROP of 16.2 mph, using seawater and high viscosity gel slugs to clean the hole. The hole was displaced in two stages with 350 bbls of gel mud, a Totco was dropped and the drillstring was recovered to the seabed. At this point 13 hours were consumed WOW and off loading the 20" casing onto the Southern Cross.

After making a wiper trip, seven joints of 20", 94 ppf, X-56, JV casing, plus a crossover joint (129 ppf, JV x CC) and the 24" pile joint/18 3/4" wellhead assembly were then run, with the 20" shoe at 219m. The casing was cemented to the seafloor, using a drill pipe stinger, with a lead slurry of 600sx of Class 'G' cement plus 2.2% prehydrated gel and a tail slurry of 350sx of Class 'G' neat cement. The BOP stack was run and the wellhead connector and casing were tested to 500 psi against the shear rams.

b) 17 1/2" Hole/13 3/8" Casing

A 17 1/2" centre jet bit and pendulum BHA were then picked up and RIH to the TOC at 207m. The cement and 20" casing shoe were drilled and the 17 1/2" hole was drilled from 235m to 832m, at an average ROP of 34.1 mph, using a seawater/gel mud system. Background gas, ranging from 40-138 units, was experienced while drilling this interval. After a wiper trip to the 20" casing shoe, 9m of fill was cleaned out and the BHC/GR/CAL log was run to TD.

The wear bushing was pulled and 59 joints of $13^{3/8}$", 54.5 ppf, K-55, BTC casing were run and landed with the shoe at 817m. The casing was cemented in place with 1200 sx of Class 'G' neat cement. The estimated TOC was calculated to be at 354m based on an average hole diameter of $18^{1/2}$" as per the caliper log. The top plug was bumped and the pressure was increased to 1500 psi to test the casing. The $13^{3/8}$" seal assembly was then set and tested, along with the BOP stack, to 200/2000 psi. A Phase I PIT was run against the shear rams to 1500 psi and the choke manifold was tested to 200/5000 psi.

c) <u>$12^{1/4}$" Hole</u>

A $12^{1/4}$" pendulum BHA and PD-11 stratapax bit were RIH and an attempt was made to drill the subsea release cement plugs and float equipment. After six hours and 7m progress the bit was POOH and the stratapax bit was observed to be heavily damaged. An HP11J bit and junk sub were then RIH and the remainder of the float equipment and cement were drilled out to 835m, where a Phase II PIT was conducted to leak-off at 910 psi (15.5 ppg EMW).

The $12^{1/4}$" hole was drilled from 835m to 1133m, at an average ROP of 22.3 mph, where a single shot survey was dropped. After four unsuccessful attempts to retrieve the survey, the drillstring was tripped and the damaged survey instrument was recovered. Drilling then continued in the mainly calcarenite lithology (Gippsland Limestone) until 1304m, where a twist off occurred in the box end of the first single of HWDP above the drill collar-to-HWDP crossover. A fishing assembly ($8^{1/8}$" overshot) was RIH and the fish was recovered. The $12^{1/4}$" hole was then drilled from 1304m to 1391m, where a 200 psi pressure drop was observed. The drillstring was POOH and a 5" circumferential crack was discovered in the box end of the drillcollar-to-HWDP crossover. Since it was believed that the Top of Latrobe could be penetrated on the next bit run, the MWD tool was picked up and the $12^{1/4}$" hole was drilled from 1391m to 1404m. At this point, however, the BHA twisted off in the box end of the first single of HWDP above the crossover. A fishing assembly ($8^{1/8}$" overshot) was RIH and the fish was recovered.

Prior to resuming drilling the rig floor tong torque gauge and hookload weight indicator were inspected and calibrated. The MWD tool was laid down and 3 each $6^{1/4}$" drill collars were added to provide a transition between the 8" drill collars and HWDP. The $12^{1/4}$" hole was then drilled from 1404m to 1461m, where a twist off again occurred in the box end of the fourth 8" drill collar below the crossover. A fishing assembly ($11^{3/4}$" overshot) was RIH and the fish was recovered. The BHA was then layed down for inspection and a BHA consisting of unused 8" drill collars, with a stabilizer installed at the top of the collars to help reduce lateral vibrations, was RIH. The $12^{1/4}$" hole was then drilled from 1461m to 1970m without incident.

While drilling this section, drilling detergent was added to the mud system to help control "gumbo" related problems seen on offset wells in the Lakes Entrance claystone/siltstone formation, which was topped at $\pm$1610m. Coincident with penetrating the Lakes Entrance, the ROP increased from an average of 6.5 mph in the firm calcarenite of the Gippsland Limestone to 10.3 mph. However, since the RPM was being limited to about 120 to reduce drillstring stress, actual drilling progress in both fomations was less than prognosed. As no additional drillstring failures occurred after penetrating the Lakes Entrance, it is believed that vibrations resulting from drilling the firm calcarenite limestone accelerated fatigue stress in the drillstring.

During the next trip into the hole the BHA was inspected. Two 8" drill collars, two $6^{1/4}$" drill collars and one crossover were laid down when cracks where observed in the box ends. The $12^{1/4}$" hole was then drilled to 2404m at an average ROP of 11.7 mph. While drilling this section, the mud weight was increased to 9.5 ppg and the mud was conditioned prior to entering the Top of Latrobe, which was picked at 2376m (about 20m low to revised prognosis).

An HP51A insert bit and the MWD tool were then RIH with a 60'/90' pendulum BHA and the $12^{1/4}$" hole was drilled from 2404m to 2472m. Excessive torque and low ROP (3.8 mph) were experienced during this bit run and it was determined that the upper stabilizer (full gauge) was causing the torque as it entered undergauge hole. Therefore, an unprogrammed trip was made in order to lay out the upper stabilizer.

Drilling resumed at 2472m and the $12^{1/4}$" hole was drilled to total depth at 3021m. This interval (549m) was drilled with two each HP51A insert bits, at an average ROP of 6.52 mph. The bits were recovered 1/4" and 5/16" undergauge, respectively, as a result of drilling the massive intra-Latrobe sandstone. The mud weight was maintained at 9.5 ppg throughout the interval and was raised to 9.8 ppg at TD prior to POOH for electrical logs.

Electric logs were run at total depth as follows:

Run No. 1	:	DLL/MSFL/LDL/CNL/BHC/GR/SP/CAL
Run No. 2	:	SHDT
Run No. 3	:	RFT (11 pressure pretests)
Run No. 4	:	WST (2 runs, tool malfunction on 1st run)
Run No. 5	:	CST (60 shots, 54 recovered, 6 missing)
Run No. 6	:	WSS

3. PLUG & ABANDONMENT

After completing final logs, open-ended drill pipe was RIH to 867m and a 100m balanced cement plug (P&A Plug No. 1) was set across the $13^{3/8}$" casing shoe, using 275sx of Class 'G' neat cement mixed in seawater. The plug was pressure tested to 1500 psi and tagged at 764m with 15 kips. Schlumberger was rigged up and the $13^{3/8}$" casing was cut at 190m with a Pengo explosive cutter. Schlumberger was rigged down, the wear bushing was retrieved and a $13^{3/8}$" spear was run. The $13^{3/8}$" hanger/seal assembly and 7 joints plus a stub of $13^{3/8}$" casing were pulled and laid down.

Open-ended drill pipe was then RIH to 220m and the hole was displaced to seawater. An 80m balanced cement plug (P&A Plug No. 2) was set across the $13^{3/8}$" casing stub, from 220m-140m, using 360sx of Class 'G' neat cement mixed in seawater. While laying down drill pipe, Plug No. 2 was pressure tested to 500 psi.

After laying down the diverter, the inner barrel of the slip joint was pinned closed and the BOP stack and riser were pulled.

A mechanical casing cutter was RIH and the 20" casing was cut at 111m RKB (1m below the pile joint assembly CC connector). An $18^{3/4}$" wellhead running tool was then run and the wellhead, PGB and TGB were retrieved.

A seabed survey was conducted with the RCV 150 vehicle. No hazards or obstructions were observed.

4. PULLING ANCHORS

The rig was deballasted from drilling draft (48') to transit draft (21') in 5 hours. The MV Lady Penelope retrieved anchors Nos. 3 and 7 prior to shutting down anchor retrieval operations due to adverse weather. When attempting to retrieve anchor No. 6 the pendant wire broke at the boats stern roller. After WOW for 11.25 hours the MV Eastern Tide retrieved anchor Nos. 5 and 2.

With four anchors still employed anchor pulling opeations were again ceased due to bad weather. After WOW for an additional 14.50 hours the MV Eastern Tide retrieved anchor Nos. 4, 8 and 1. The rig winched over anchor No. 6 and recovered this anchor to the bolster.

The anchor retrieval operation was completed in 23.75 hours (exclusive of WOW time). Numerous delays resulted from the fact that the buoy pendant wire was fouled on each of the eight anchors recovered.

Under tow by the MV Lady Penelope, the rig departed for the Harlequin-1 well location at 1530 hours January 4, 1989.

ESSO AUSTRALIA LTD.
ROUNDHEAD-1 FINAL WELL REPORT
CASING DATA

OD (In.)	WEIGHT (LB/FT)	GRADE	CONNECTION	LENGTH (M)	SHOE DEPTH (M-RKB)	CENTRALIZER POSITION	REMARKS
20	94	X-56	JV	14.27	219	NONE	FLOAT SHOE JOINT
20 =	94	X-56	JV	82.33		NONE	6 INTERMEDIATE JOINTS
20	129	X-52	JV x CC	12.25		NONE	CROSSOVER JOINT
24	670	----	CC	10.80		NONE	PILE JOINT: EP2-1-2-3-4
				119.65			
13-3/8	54.5	K-55	BTC	12.57	817	1 W/ STOP RING	FLOAT SHOE JOINT
	54.5	K-55	BTC	11.95		1 ACROSS COLLAR	FLOAT JOINT
	54.5	K-55	BTC	12.45		1 W/ STOP RING	FLOAT COLLAR JOINT
	54.5	K-55	BTC	676.67		1 ACROSS FIRST COLLAR	55 INTERMEDIATE JOINTS
	54.5	K-55	BTC	3.18		NONE	CASING HANGER PUP JOINT -CSG HANGER: EHW 38 -SEAL ASSY: ESW 33-1
				716.82			

ESSO AUSTRALIA LTD.
ROUNDHEAD-1 FINAL WELL REPORT
CEMENT DATA

DATE (1988)	TYPE JOB	INTERVAL (M-RKB)	TYPE CEMENT	VOLUME (SX)	SLURRY WEIGHT (PPG)	ADDITIVES	MIX WATER	REMARKS
07-Dec	20" PRIMARY LEAD	219-101	CLASS "G"	600	13.2	2.2% PHG	FW	CEMENT THROUGH DP STINGER. CMT VOLUME AS PER PROGRAM TO PROVIDE 150% EXCESS ABOVE GAUGE HOLE VOLUME W/ TOC @ SEAFLOOR.
07-Dec	20" PRIMARY TAIL		CLASS "G"	350	15.8	----	SW	
10-Dec	13-3/8" PRIMARY	817-354	CLASS "G"	1200	15.8	----	SW	CMT VOLUME BASED ON +/- 18.50" AVG HOLE DIAMETER PER THE CALIPER LOG. BUMPED PLUG W/ 1500 PSI.
31-Dec	P & A PLUG No.1	867-764	CLASS "G"	275	15.8	----	SW	SET ACROSS 13-3/8" CASING SHOE @ 817m. TESTED TO 1500 PSI, TAGGED WITH 15 KIPS.
31-Dec	P & A PLUG No.2	220-140	CLASS "G"	360	15.8	----	SW	SET ACROSS 13-3/8" CASING STUB @ 190m. TESTED TO 500 PSI.

5. SAMPLES, CONVENTIONAL CORES, SIDEWALL CORES

ROUNDHEAD-1

INTERVAL (m)	TYPE
832 - 3021	Cutting samples - 4 sets of washed and oven dried and 1 set of bagged air dried cuttings. Sampled from 832 - 2255m at 30m intervals. Sampled from 2255- 3021m at 5m intervals.
832 - 3021	Unwashed composite tinned samples for geochemistry collected at 30m/15m intervals.
2996.5-2373	CST, Shot 60, Recovered & Bought 56.

6. WIRELINE LOGS AND SURVEYS

ROUNDHEAD-1

TYPE AND SCALE		FROM	TO
	SUITE 1		
BHC-CAL-GR	1:200 1:500	831.5 -	70.0
	SUITE 2		
DLL-MSFL-GR-SP	1:200 1:500	3019.0 -	817.0
BHC-GR-CAL	1:200 1:500	2994.0 -	817.0
LDL-CNL-GR	1:200 1:500	3013.0 -	2310.0
SHDT-GR	1:200	3022.5 -	817.0
HP GAUGE PRETESTS	(13 Pretests)	2977.0 -	2383.5
WSS (CHECKSHOT)	(20 Levels)	3010.0 -	825.0
CST-GR (SIDEWALL CORES)	(60 Shots)	2996.5 -	2373.0

7. SUMMARY OF WIRELINE FORMATION TEST PROGRAMME - ROUNDHEAD-1

TEST & SEAT NO.	DEPTH (METRES) K.B.	RECOVERY (LITRES) CHAMBER Litres	OIL Litres	COND. Litres	GAS m^3	FORMATION WATER Litres	MUD FILTRATE Litres	HEWLETT-PACKARD FORMATION PRESSURE MPaa	Psia	HEWLETT-PACKARD HYDROSTATIC PRESSURE MPaa	Psia	REMARKS
1/1	2977.0	Pretest						28.87	4187.63	34.60	5017.65	Good
1/2	2964.5	Pretest						28.75	4169.25	34.46	4997.75	Good
1/3	2913.6	Pretest						-	-	-	-	Dry Test too Tight
1/4	2911.8	Pretest						28.26	4099.10	33.89	4914.63	Tight - Fair Test
1/5	2916.5	Pretest						27.17	3941.08	32.82	4759.67	Good
1/6	2779.0	Pretest						26.71	3874.06	32.37	4694.48	Good
1/7	2659.0	Pretest						25.55	3706.20	30.98	4492.62	Good
1/8	2562.0	Pretest						24.59	3566.89	29.85	4328.28	Good
1/9	2497.0	Pretest						23.93	3471.35	29.08	4217.81	Good
1/10	2436.0	Pretest						23.33	3383.47	28.36	4113.00	Good
1/11	2414.5	Pretest						23.10	3350.96	28.10	4075.53	Good
1/12	2388.0	Pretest						-	Too High	27.79	4030.43	Invalid, Possible Fracture
1/13	2383.5	Pretest						22.81	3308.39	27.74	4022.70	Good

8. TEMPERATURE RECORD - ROUNDHEAD-1

LOGGING RUN	THERMOMETER DEPTH (m)	MAX. RECORDED TEMPERATURE (C°)	CIRCULATION TIME (t_k) (hours)	TIME AFTER CIRCULATION STOPPED (t)	HORNER TEMPERATURE (C°)	GEOTHERMAL GRADIENT (C°/km)
Suite 1						
BHC-CAL-GR	831.5	35.5		5H 8M		
Suite 2						
DLL-MSFL-LDL-CNL-BHC-GR-SP	2988	87.2	1H 10M(1.17)	10H 25M(10.42))		
SHDT-GR	3022	98.0	1H 10M(1.17)	17H 59M(17.98))		
RFT-GR (PRE-TEST)	2977	99.2	1H 10M(1.17)	23H 47M(23.78))	112.9°C	35.2°C/Km
WSS	3010	104.0	1H 10M(1.17)	30H 43M(30.72))		
CST's	No Thermometer Run					

FIGURES

LOCALITY MAP

ROUNDHEAD - 1

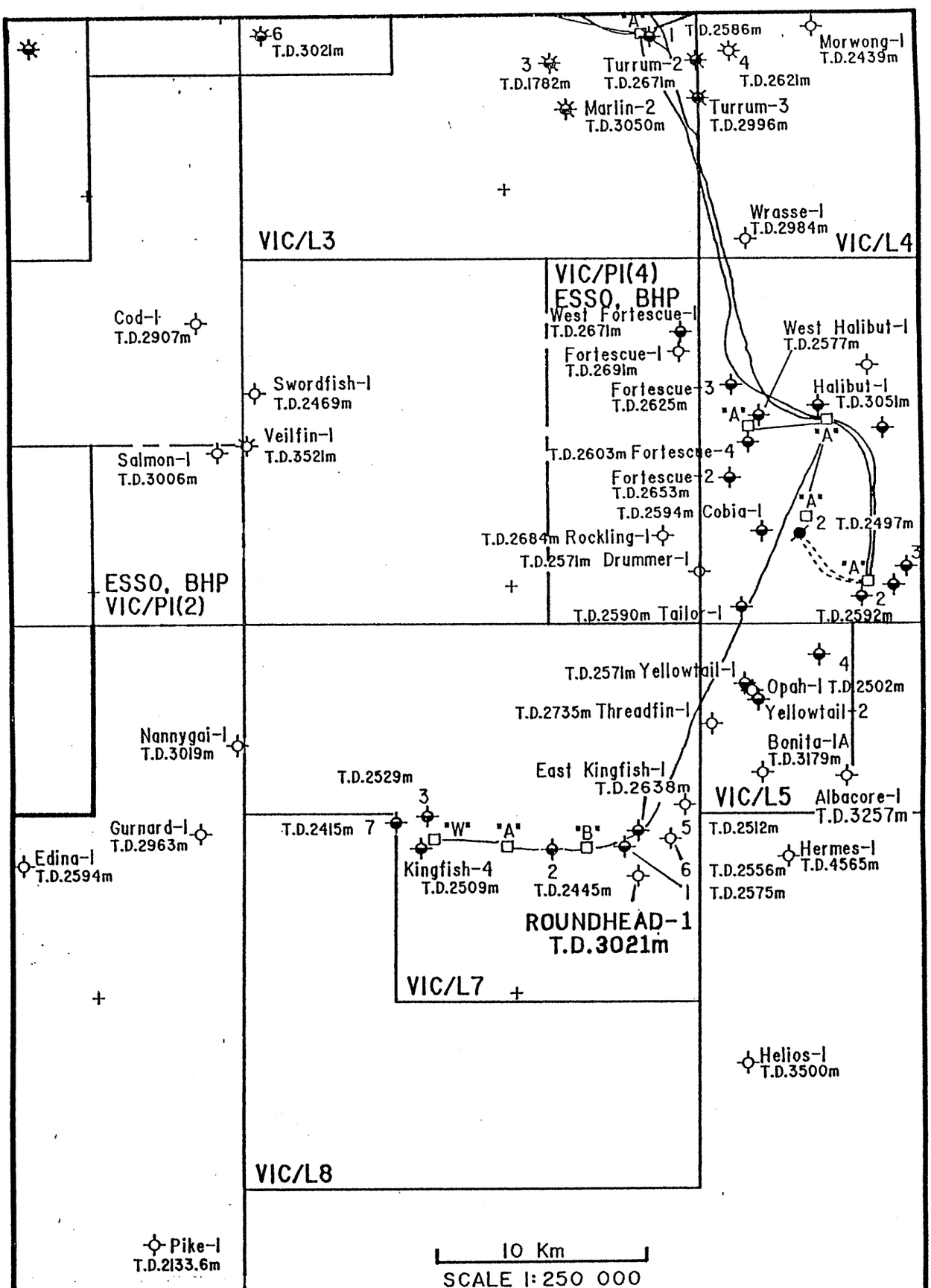


FIGURE 1

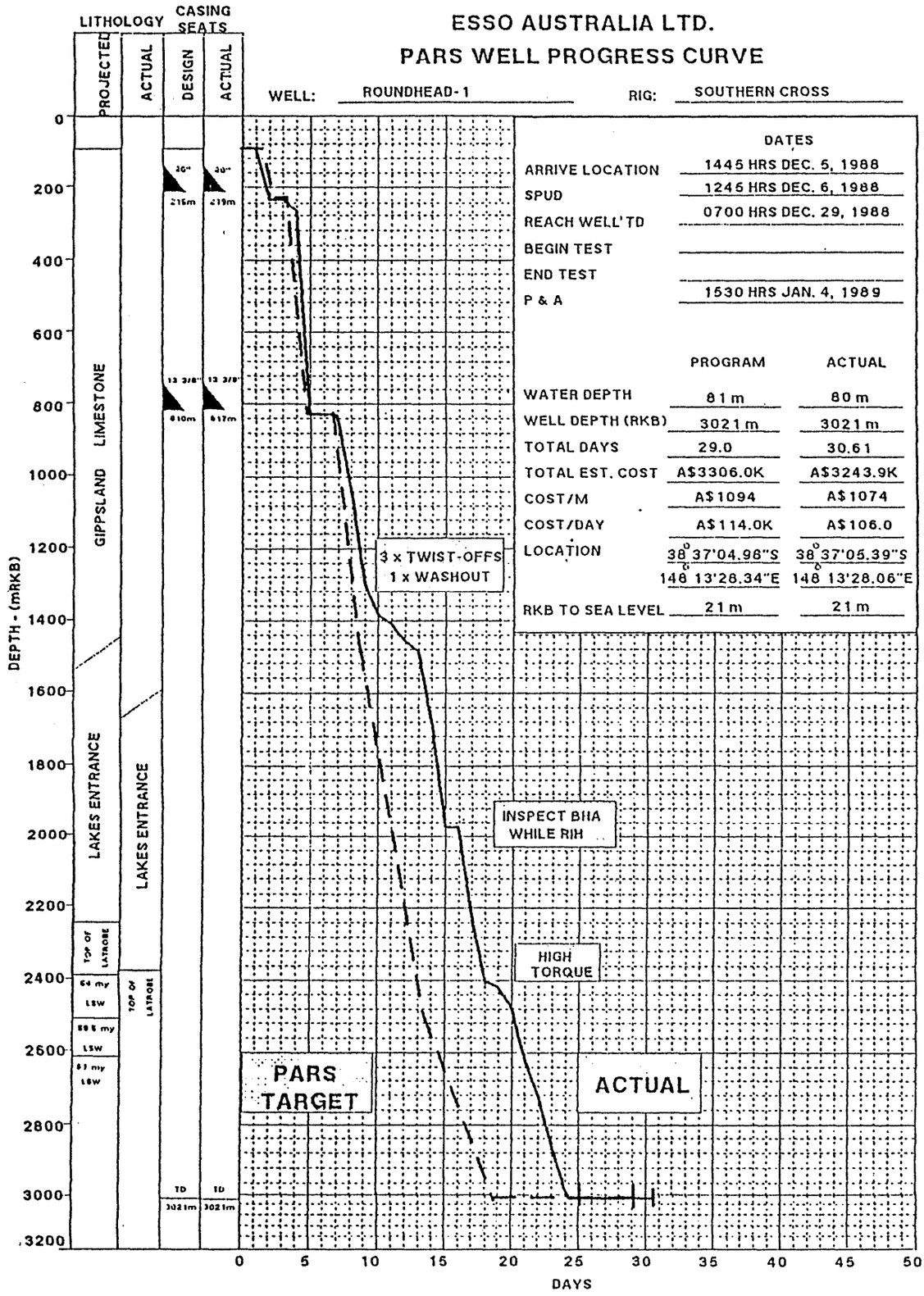

ESSO AUSTRALIA LTD.
PARS WELL PROGRESS CURVE
WELL: ROUNDHEAD-1
RIG: SOUTHERN CROSS
LITHOLOGY
CASING SEATS
PROJECTED
ACTUAL
DESIGN
ACTUAL
GIPPSLAND LIMESTONE
LAKES ENTRANCE
TOP OF LATROBE
DEPTH - (mRKB)
DATES
ARRIVE LOCATION 1445 HRS DEC. 5, 1988
SPUD 1245 HRS DEC. 6, 1988
REACH WELL TD 0700 HRS DEC. 29, 1988
BEGIN TEST
END TEST
P & A 1530 HRS JAN. 4, 1989
PROGRAM
ACTUAL
WATER DEPTH 81 m 80 m
WELL DEPTH (RKB) 3021 m 3021 m
TOTAL DAYS 29.0 30.61
TOTAL EST. COST A$3306.0K A$3243.9K
COST/M A$1094 A$1074
COST/DAY A$114.0K A$106.0
LOCATION 38° 37'04.98"S 38° 37'05.39"S
146° 13'28.34"E 146° 13'28.06"E
RKB TO SEA LEVEL 21 m 21 m
3 x TWIST-OFFS
1 x WASHOUT
INSPECT BHA
WHILE RIH
HIGH
TORQUE
PARS
TARGET
ACTUAL
DAYS

FIGURE 2.

ESSO AUSTRALIA LTD.
ROUNDHEAD-1 FINAL WELL REPORT
WELLBORE SCHEMATIC

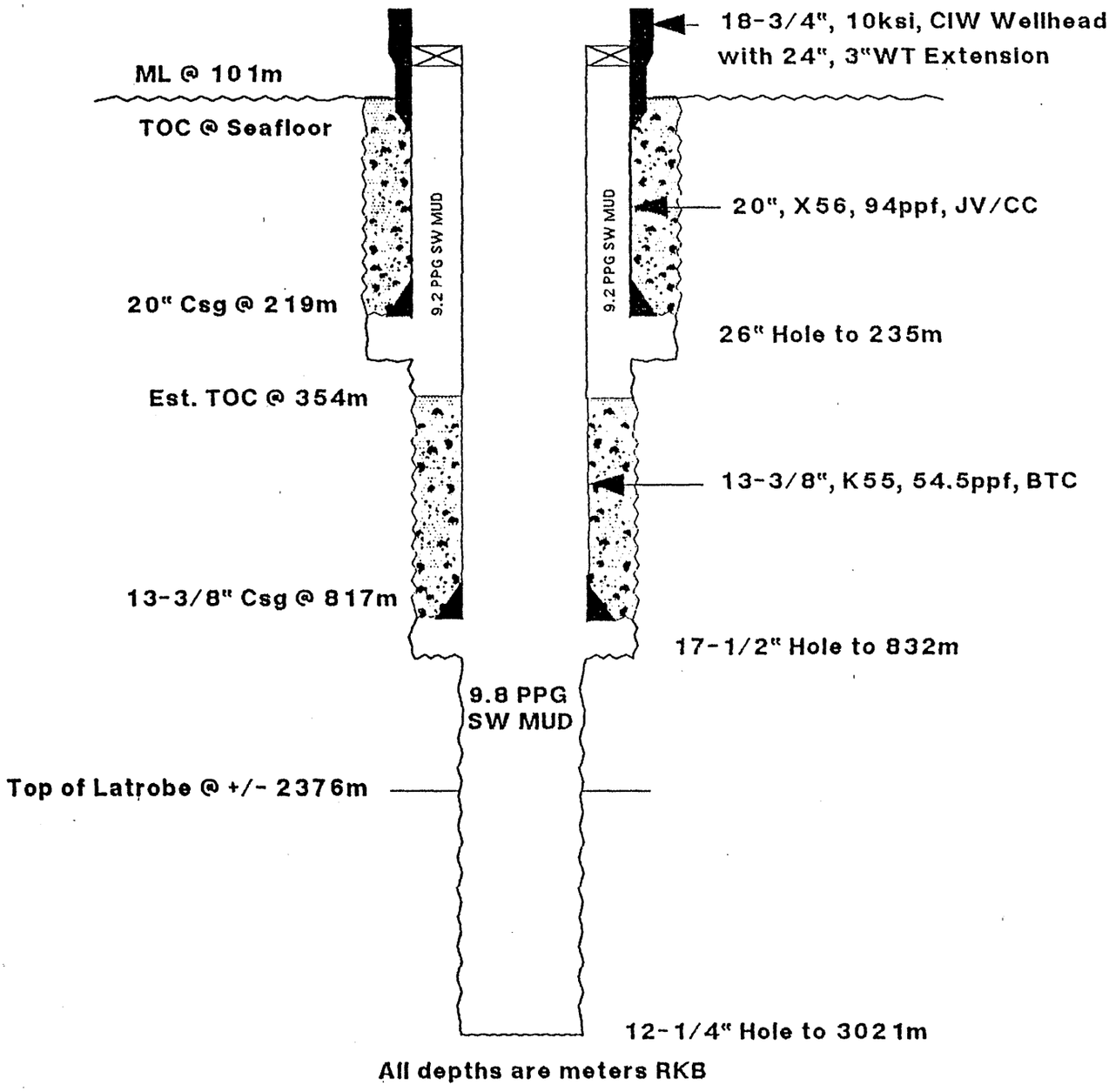


FIGURE 3.

ESSO AUSTRALIA LTD.
ROUNDHEAD-1 FINAL WELL REPORT
WELLBORE ABANDONMENT SCHEMATIC

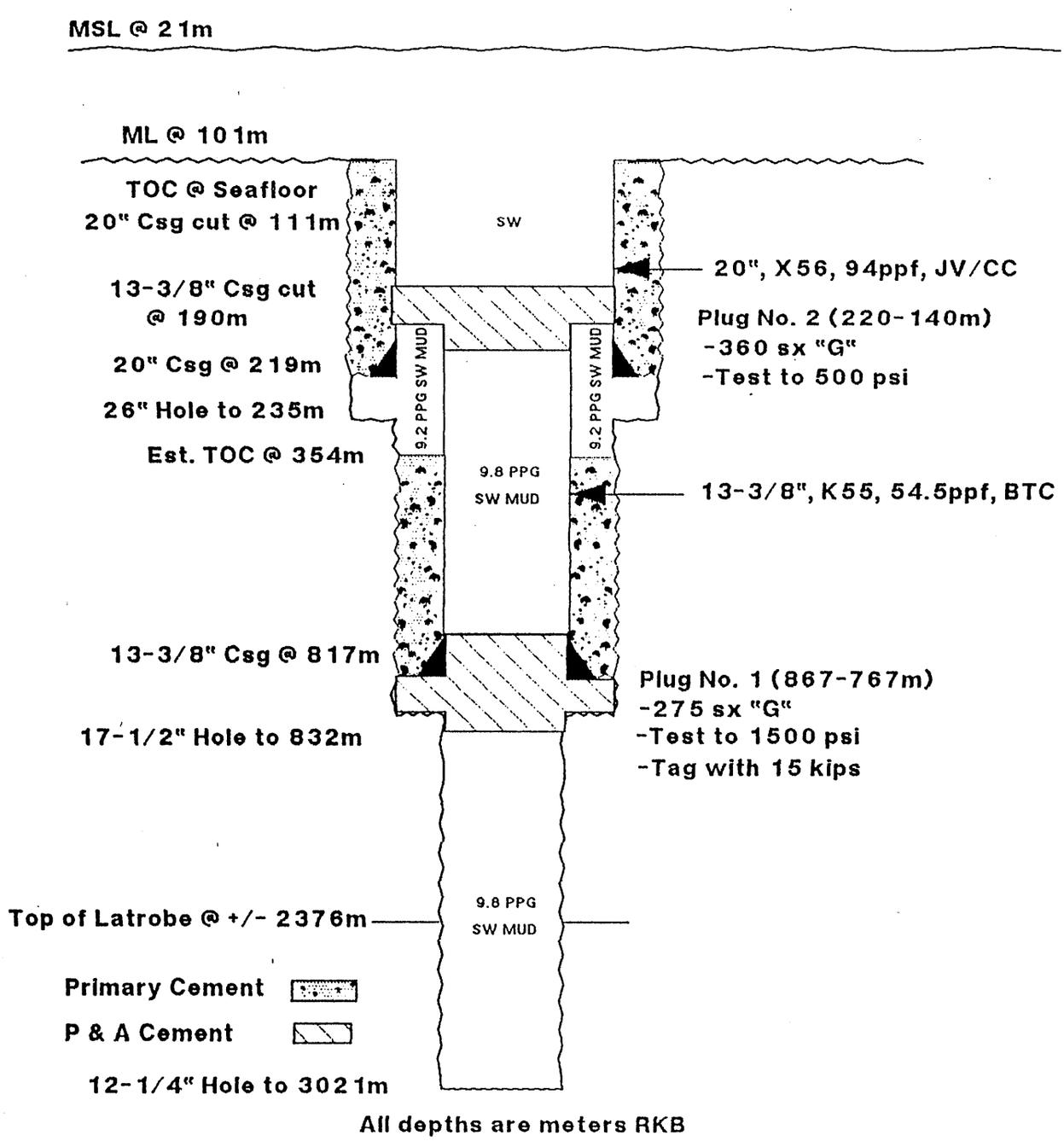


FIGURE 4.

ROUNDHEAD-1

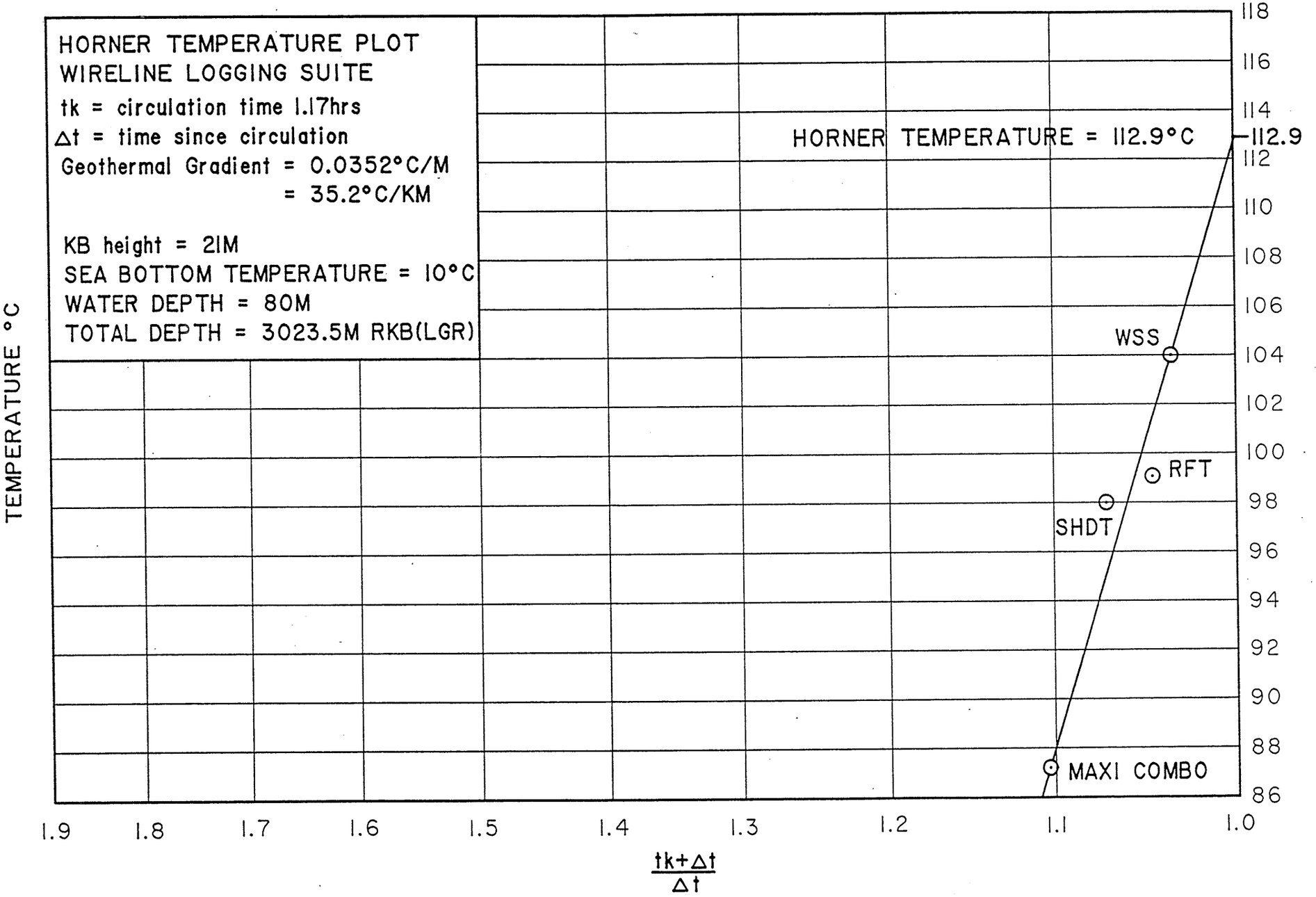


FIGURE 5.

APPENDIX 1

ROUNDHEAD-1

Lithology Descriptions

Depth	%	Description
832-860	100	CLAYSTONE: Light green grey, rare brown, amorphous, plastic, sticky, very calcareous (marly), very soft, abundant microfossils, trace glauconite.
	Tr	CEMENT: Light grey with black specks, Phenolpthalein reactive.
860-890	100	CLAYSTONE: As above with abundant disseminated silt & calcite grains, abundant microfossils.
	Tr	CEMENT: As above.
890-920	100	CLAYSTONE: As above, abundant very fine dark green glauconite nodules.
920-950	100	CLAYSTONE: As above, common glauconite nodules.
950-980	100	CLAYSTONE: As above.
980-1010	90	CLAYSTONE: As above.
	10	CALCILUTITE: Brownish grey, very argillaceous, silt size calcareous grains in argillaceous matrix, grading to calcareous claystone as above, blocky to sucrosic, soft to firm.
1010-1040	100	CLAYSTONE: As above.
	Tr	CALCILUTITE: As above.
1040-1071	100	CLAYSTONE: As above, rare dark grey lithic fragments.
1070-1100	80	CALCILUTITE: Light brown grey, silt size calcite grains in light brown argillaceous matrix, firm to hard, sucrosic to blocky, grading to calcarenite, abundant spherical calcareous forams, rare shell fragments.
	20	CLAYSTONE: As above.
1100-1130	100	CALCILUTITE: As above, abundant very fine glauconite nodules.
1130-1160	100	CALCILUTITE: As above.
1160-1190	100	CALCILUTITE: As above, rare forams.
1190-1220	100	CALCILUTITE: As above, abundant very fine glauconite nodules.
1220-1250	100	CALCILUTITE: As above, rare bryozoan fragments.
1250-1280	90	CALCILUTITE: As above, grading to calcarenite with depth.
	10	CLAYSTONE: Light grey, soft, sticky, very calcareous, trace common very fine glauconite nodules, trace spherical calcite forams, blocky to amorphous.

1280-1310	100	CALCARENITE: Light brown grey, very fine angular to subrounded grains of calcite in light brown argillaceous matrix as for calcite above, firm to moderately hard, blocky to sucrosic, common spherical calcite forams, rare shell fragments, trace very fine glauconite pellets, rare platey calcite vein infills, trace coal fragments.
1310-1340	100	CALCARENITE: As above, slight trace coal fragments.
	Tr	CLAYSTONE: As above.
1340-1370	100	CALCARENITE: As above, abundant spherical calcareous forams.
	Tr	CLAYSTONE: As above.
1370-1400	100	CALCARENITE: As above.
	Tr	CLAYSTONE: As above, cavings?
1400-1430	100	CALCARENITE: As above.
	Tr	CALCILUTITE: Light grey, silt size particles in argillaceous matrix, slightly silty homogeneous, blocky, firm.
1430-1460	100	CALCARENITE: As above, trace pyrite, less abundant but more varieties of microfauna.
1460-1490	100	CALCARENITE: As above.
1490-1520	100	CALCARENITE: As above, more argillaceous
1520-1550	90	CALCARENITE: As above.
	10	MICRITE/CALCAREOUS CLAYSTONE: Very light grey, soft, slightly sticky, amorphous, trace glauconite, trace forams.
1558 Spot for break	80	CALCARENITE: As above.
	20	MICRITE: As above, less glauconite
1550-1580	80	CALCARENITE: As above, with occasional glauconite rich laminae.
	20	MICRITE: As above, becoming light brown as per calcarenite above.
1580-1610	50	CALCARENITE: As above.
	50	MICRITE: Light to medium grey and light brown, as above.
1610-1640	90	MICRITE: Light to medium grey and light brown, very soft, slightly sticky, amorphous, no glauconite, trace forams.
	10	CALCARENITE: As above.
1640-1670	100	MICRITE: As above.
	Tr	CALCARENITE: As above.
1670-1700	100	MICRITE: Light to medium grey, homogeneous, soft, slightly sticky, amorphous to blocky, rare shaly lithics, rare forams.

1700-1730	100	MICRITE: As above, rare pyritized ?bryozoan fragments.
1730-1760	100	MICRITE/CALCAREOUS CLAYSTONE: As above, becoming firmer, trace pyritized fossil fragments, common and varied forams.
1760-1790	90	CALCAREOUS CLAYSTONE: Light to medium grey, as above, grading to calcareous siltstone as below.
	10	CALCISILTITE: Light brown, soft to firm, blocky, sucrosic, white calcite grains in brown argillaceous matrix, trace microfossils, rare granular pyrite.
1790-1820	70	CALCISILTITE: Light to medium brown, as above, common calcareous microfossils and fossil fragments.
	30	CALCAREOUS CLAYSTONE: Light to medium grey, as above, very sticky and soft.
1820-1850	90	CALCISILTITE: As above, rare blocky pyrite.
	10	CALCAREOUS CLAYSTONE: Light grey, as above.
1850-1880	80	CALCISILTITE: As above, grading to calcareous claystone as below.
	20	CALCAREOUS CLAYSTONE: As above.
1880-1910	90	CALCISILTITE: As above, rare pyrite, common fossil fragments.
	10	CALCAREOUS CLAYSTONE: As above.
1910-1940	90	CALCISILTITE: As above.
	10	CALCAREOUS CLAYSTONE: As above.
1940-1970	80	CALCISILTITE: As above.
	20	CALCAREOUS CLAYSTONE: As above.
1970-2000	80	CALCISILTITE: Light brown, white to light brown lutaceous calcite grains in light brown argillaceous matrix, firm, blocky, trace calcareous forams.
	20	CALCAREOUS CLAYSTONE: Light grey, soft, blocky to amorphous, sticky, trace calcareous forams.
2000-2030	50	CALCISILTITE: Light brown as above, common and varied calcareous forams, (very rare pyritized), rare granular pyrite.
	50	CALCAREOUS CLAYSTONE: As above.
2030-2060	90	CALCISILTITE: As above.
	10	CALCAREOUS CLAYSTONE: As above.
2060-2090	90	CALCISILTITE: As above, becoming blocky to subfissile, trace pyrite.
	10	CALCAREOUS CLAYSTONE: As above.
2090-2120	100	CALCISILTITE: As above, abundant and varied calcareous forams.
	Tr	CALCAREOUS CLAYSTONE: As above.

2120-2150	100	CALCISILTITE: As above, becoming medium grey, blocky to fissile, firm to moderately hard.
	Tr	CALCAREOUS CLAYSTONE: As above.
2150-2180	100	CALCISILTITE: As above, abundant calcareous forams (~10% of sample).
	Tr	CALCAREOUS CLAYSTONE: As above.
2180-2210	80	CALCISILTITE: As above.
	20	CALCAREOUS CLAYSTONE: As above.
2210-2240	70	CALCISILTITE: As above, abundant and varied calcareous pyritized microfossils and fragments (~30% of sample).
	30	CALCAREOUS CLAYSTONE: As above.
2240-2255	60	CALCISILTITE: As above, (microfossils ~10%).
	40	CALCAREOUS CLAYSTONE: AS above.

CHANGE TO 5 METRE SAMPLES.

2255-2260	70	CALCISILTITE: As above, (microfossils ~5%).
	30	CALCAREOUS CLAYSTONE: As above.
2260-2265	70	CALCISILTITE: As above
	30	CALCAREOUS CLAYSTONE: As above
2265-2270	70	CALCISILTITE: As above (Trace microfossils)
	30	CALCAREOUS CLAYSTONE: As above
2270-2275	80	CALCISILTITE: As above
	20	CALCAREOUS CLAYSTONE: As above
2275-2280	90	CALCISILTITE: As above
	10	CALCAREOUS CLAYSTONE: As above
2280-2285	90	CALCISILTITE: As above
	10	CALCAREOUS CLAYSTONE: As above
2285-2290	80	CALCISILTITE: As above, grading to calcareous claystone as below.
	20	CALCAREOUS CLAYSTONE: As above.
2290-2295	80	CALCISILTITE: As above grading to calcarenite.
	20	CALCAREOUS CLAYSTONE: As above.
2295-2300	70	CALCISILTITE: As above. Cuttings becoming smaller (due to milled tooth bit wear).
	30	CALCAREOUS CLAYSTONE: As above.
2300-2305	80	CALCISILTITE: As above. Trace grading to calcarenite.
	20	CALCAREOUS CLAYSTONE: Light grey to light brown, As above.
2305-2310	80	CALCISILTITE: Light brown to medium grey, soft to firm, rarely moderate hard, white silt sized calcite grains in brown to grey argillaceous matrix, blocky to fissile, common to abundant calcareous forams, trace pyrite.
	20	CALCAREOUS CLAYSTONE: As above.
2310-2315	80	CALCISILTITE: As above, rare light brown.
	20	CALCAREOUS CLAYSTONE: As above.

2315-2320	100	CALCISILTITE: As above, common forams, pyritized fossil fragments.
	Tr	CALCAREOUS CLAYSTONE: As above.
2320-2325	100	CALCISILTITE: As above.
	Tr	CALCAREOUS CLAYSTONE: As above.
2325-2330	90	CALCISILTITE: As above.
	10	CALCAREOUS CLAYSTONE: As above.
2330-2335	100	CALCISILTITE: As above, abundant calcareous forams (~20% of sample).
	Tr	CALCAREOUS CLAYSTONE: As above.
	Tr	CALCARENITE: White to light grey, moderate hard to hard, sucrosic to blocky, common light to medium green glauconite, common disseminated pyrite.
2335-2340	100	CALCISILTITE: As above, abundant forams.
2340-2345	100	CALCISILTITE: As above.
2345-2350	100	CALCISILTITE: As above.
2350-2355	100	CALCISILTITE: As above, abundant forams.
2355-2360	100	CALCISILTITE: As above, abundant forams, trace pyrite.
2360-2365	100	CALCISILTITE: As above, rare disseminated very fine to fine quartz grains.
2365-2370	100	CALCISILTITE: As above, rare light to medium green glauconite nodules.
2370-2375	100	CALCISILTITE: As above.
	Tr	SANDSTONE: Clear, fine to medium, loose quartz grains, subangular to rounded, poorly sorted green (?chloritic) and black metallic mineral inclusions, adhered pyrite, no fluorescence.
2376	90	CALCISILITITE: As above.
Spot sample	10	SANDSTONE: Clear to translucent quartz, very fine to medium, predominantly fine grained, poorly sorted, subangular to rounded, loose and predominantly clean, slight trace pyrite matrix, common micaceous chlorite, black minerallic inclusions, trace sutured grain aggregates,?quartzite lithics , fair to good inferred porosity, no fluorescence.
2375-2380	80	CALCISILTITE: As above. Probably cavings.
	20	SANDSTONE: Light grey, clear to translucent, very fine to coarse, predominantly medium grained, poorly sorted, subangular to rounded, trace pyrite matrix, predominantly clean and loose, trace micaceous chlorite, trace nodular glauconite, trace white to clear crystalline calcite with glauconite and pyrite microinclusions, good inferred porosity, no fluorescence.

2380-2385	80	SANDSTONE: As above, very fine to very coarse, common bit fractured grains, poorly to moderatley sorted, subangular to rounded, abundant well rounded grains, rare pyrite matrix, predominantly loose and clean, trace black metallic inclusions, good inferred porosity, no fluorescence.
	20	CALCISILTITE: Light to medium brown, as above, probably cavings.
2385-2390	90	SANDSTONE: As above, good to very good inferred porosity, no fluorescence.
	10	CALCISILTITE: As above, probably cavings.
2390-2395	90	SANDSTONE: As above, common well rounded grains, no fluorescence.
	10	CALCISILTITE: As above.
2395-2400	90	SANDSTONE: As above, medium to inferred very coarse bit fractured shards, no fluorescence.
	10	CALCISILTITE: As above.
2400-2404 Bottoms up	100	SANDSTONE: As above, predominantly shards, common well rounded quartz and rare well rounded lithic grains, good to very good inferred porosity.
	Tr	CALCISILTITE: As above.
2405-2410	50	SANDSTONE: As above, clear to translucent, medium to coarse, well rounded, flattened and asymmetric with 'frosted' surface texture, abundant shatter pits, very good to excellent inferred porosity, no fluorescence.
	50	CALCISILTITE: As above, cavings.
2410-2415	50	SANDSTONE: As above, excellent inferred porosity, no fluorescence.
	50	CALCISILTITE: As above, cavings.
2415-2420	60	SANDSTONE: As above, trace medium grained sutured grain aggregates with glauconite and crystalline pyrite inclusions, excellent inferred porosity, no fluorescence.
	40	CALCISILTITE: As above, cavings.
2420-2425	80	SANDSTONE: As above, common muscovite flakes, common green ?chlorite mica.
	20	CALCISILTITE: As above, cavings.
2425-2430	90	SANDSTONE: As above, common rounded lithic grains, common pyrite, rare coal fragments, trace glauconite, excellent inferred porosity, no fluorescence.
	10	CALCISILTITE: As above, cavings.
2430-2435	100	SANDSTONE: As above, trace mica flakes, rare to trace fine to medium grained aggregates with mica, glauconite and pyrite inclusions, aggregates have very poor visual porosity, no fluorescence.
2435-2440	100	SANDSTONE: Light grey, clear to translucent, fine to very coarse, predominantly bit fractured shards, trace medium grained silt cemented aggregates with pyrite and

		glauconite inclusions, predominantly loose and clean, trace pyrite matrix, trace muscovite flakes, trace to common glauconite, rare lithics, excellent inferred porosity, no fluorescence.
2440-2445	100	SANDSTONE: As above, trace fine to medium grain aggregates possibly forming matrix for very coarse quartz sand, common glauconite, good to very good inferred porosity, no fluorescence.
2445-2450	100	SANDSTONE: As above, medium to very coarse with trace very fine to fine grained quartz/glauconite/pyrite matrix, trace mica, good to very good inferred porosity, no fluorescence.
2450-2455	100	SANDSTONE: As above, very good to excellent inferred porosity, no fluorescence.
2455-2460	100	SANDSTONE: As above, medium to coarse quartz grains, excellent inferred porosity, no fluorescence.
2460-2465		Not circulated to surface.
2465-2472	100	SANDSTONE: As above, logged after trip.
2472-2475	100	SANDSTONE: As above, very good inferred porosity, no fluorescence.
2475-2480	100	SANDSTONE: As above, no fluorescence.
2480-2485	100	SANDSTONE: As above, no fluorescence.
2485-2490	100	SANDSTONE: As above, less glauconite, rare coal grains, very good inferred porosity, no fluorescence. 1) 90%, beach 2)10%, Fluvial.
2490-2495	100	SANDSTONE: As above, predominantly fair to moderate bit fractured shards, clean and loose, very good inferred porosity, no fluorescence. 1) 80% 2)20%
2495-2500	100	SANDSTONE: As above, no fluorescence. 1) 70% 2) 30%
2500-2505	100	SANDSTONE: As above, no fluorescence. 1) 60% 2) 40%
2505-2510	100	SANDSTONE: 1) 40% As above. 2) 60 % Light grey to clear, very fine to medium, moderately sorted angular to subrounded, trace siliceous cement, predominantly loose, trace to common white argillaceous (Kaolinitic) matrix, common micaceous flakes, very poor visual porosity in rare fragmented aggregates, no fluorescence.
2510-2515	100	SANDSTONE: 1) As above 30% - Beach 2) As above 70% - Fluvial
	Tr	SILTSTONE: Light grey arenaceous with dark grey micaceous (carbonaceous laminae, 0.1-0.3mm), blocky to fissile, firm to moderately hard.

2515-2520	100	SANDSTONE: 1) 10% As above, cavings, 2) 90% Light grey, as above, abundant mica, grading to arenaceous siltstone in parts, poor visual porosity, no fluorescence.
	Tr	SILTSTONE: Light brown to light grey, arenaceous, homogenous, abundant mica, blocky to sucrosic, firm to moderately hard.
2520-2525	100	SANDSTONE: 1) 10% As above, cavings or reworked. 2) 90% Light grey, clear to translucent, fair to medium, moderately sorted, trace siliceous cement, trace white to light brown argillaceous matrix, predominantly clean to loose, abundant mica, grading to arenaceous siltstone, rare coal fragments, friable to firm, poor visual porosity, no fluorescence.
2525-2530	100	SANDSTONE: 1) Tr As above. 2) 100% As above, poor to fair visual porosity, no fluorescence.
2530-2535	100	SANDSTONE: 1) Tr As above. 2) 100% As above becoming predominantly medium grained, clean and loose, fair to good inferred porosity, no fluorescence.
2535-2540	100	SANDSTONE: 1) Tr As above becoming predominantly medium grained with depth, ?reworked. 2) 100% As above, rare mica.
2540-2545	100	SANDSTONE: As above, moderate to well sorted, subrounded to subangular, good to very good inferred porosity, no fluorescence.
2545-2550	100	SANDSTONE: As above, very good inferred porosity, no fluorescence.
	Tr	SILTSTONE: Light brown, arenaceous, micaceous, friable to firm, blocky to sucrosic.
2550-2555	100	SANDSTONE: As above, no fluorescence.
	Tr	SILTSTONE: Light brown, as above, grades to very fine sandstone with disseminated medium grains.
2555-2560	100	SANDSTONE: As above (still predominantly bit fractured shards).
	Tr	SILTSTONE: Light brown arenaceous, as above.
2560-2565	100	SANDSTONE: As above, no fluorescence.
	Tr	SILTSTONE: As above, grading to very fine sandstone.
2565-2570	100	SANDSTONE: As above, clean and loose, very good inferred porosity, no fluorescence.
2570-2575	100	SANDSTONE: As above, rare bitumen stained grains, no fluorescence.
	Tr	SILTSTONE: Arenaceous as above, grading to very fine sandstone.

2575-2580	100	SANDSTONE: As above, rare bitumen stained grains, no fluorescence.
	Tr	SILTSTONE: As above, ?cavings.
2580-2585	100	SANDSTONE: As above, very good inferred porosity, trace bitumen stained grains, no fluorescence.
2585-2590	100	SANDSTONE: As above, trace bitumen staining, trace siliceous cement, good to very good inferred porosity, no fluorescence.
2590-2595	100	SANDSTONE: As above, slight trace bitumen staining, trace siliceous cement, rare buff to pink K Feldspar, good to very good inferred porosity, no fluorescence.
2595-2600	100	SANDSTONE: As above, bitumen staining decreasing (where it occurs the bitumen commonly acts as a moderate cement), good to very good inferred porosity, no fluorescence.
2600-2605	100	SANDSTONE: Light grey, clear to translucent, fine to coarse, predominantly medium, moderately sorted, subangular to subrounded, trace siliceous cement, predominantly clean and loose, trace lithics, good to very good inferred porosity, no fluorescence.
2605-2610	100	SANDSTONE: As above, rare to fine grained aggregates with poor visual porosity, trace muscovite flakes, no fluorescence (still fluvial).
2610-2615	100	SANDSTONE: As above, good to very good inferred porosity, no fluorescence.
2618.5 spot sample	100	SANDSTONE: As above, medium to coarse grained, very good inferred porosity, no fluorescence.
2615-2620	100	SANDSTONE: As above, medium to coarse, slight trace muscovite, very good inferred porosity, no fluorescence.
	Tr	SILTSTONE: Light and medium grey, mottled, arenaceous, micaceous, blocky to sucrosic, friable to firm.
2620-2625	100	SANDSTONE: As above, predominantly medium grained, clear to loose, very good inferred porosity, no fluorescence.
2625-2630	100	SANDSTONE: As above, good to very good inferred porosity, no fluorescence.
2630-2635	100	SANDSTONE: As above, medium to very coarse, predominantly coarse, trace mica, good inferred porosity, no fluorescence.
	Tr	SILTSTONE: Light grey to light brown, arenaceous with medium to dark brown argillaceous/micaceous matrix, blocky to sucrosic, firm.
2635-2640	100	SANDSTONE: As above, predominantly coarse, good visual porosity, no fluorescence.
	Tr	SILTSTONE: Arenaceous, as above, grading to very fine sandstone.
2640-2645	100	SANDSTONE: As above, no fluorescence.
	Tr	SILTSTONE: As above.

2645-2650	100	SANDSTONE: As above, good inferred porosity, no fluorescence.
	Tr	SILTSTONE: As above.
2650-2655	100	SANDSTONE: As above, fair to good inferred porosity, no fluorescence.
	Tr	SILTSTONE: As above.
2655-2660	100	SANDSTONE: 1) 100% As above. 2) Tr Light grey to light brown, clear to milky, very fine to fine, moderate to well sorted, subangular, weak to moderate siliceous cement, light brown argillaceous matrix, abundant mica, trace carbonaceous (kerogen), gradings from arenaceous siltstone as above, blocky to sucrosic, friable to firm, poor to fair visual porosity, no fluorescence.
	Tr	SILTSTONE: As above, grades to very fine grained sandstone, (2) as above.
2660-2665	100	SANDSTONE: 1) 100% As above, fair to good inferred porosity, no fluorescence. 2) Tr as above, poor to fair visual porosity, no fluorescence.
2665-2670	100	SANDSTONE: 1) 100% As above, predominantly medium grained, fair to good inferred porosity, no fluorescence. 2) Tr as above, light grey, poor visual porosity, no fluorescence.
	Tr	SILTSTONE: As above.
2670-2675	100	SANDSTONE: 1) 100% As above, no fluorescence. 2) Slight trace, as above.
	Tr	SILTSTONE: As above.
2678.5 **spot sample**	100	SANDSTONE: 1) 100% As above, no fluorescence. 2) Tr as above.
	Tr	SILTSTONE: As above.
2675-2680	100	SANDSTONE: 1) 90% As above, predominantly bit fractured shards, good inferred porosity, no fluorescence. 2) 10% Light grey to light brown, very fine to fine grained, moderately sorted, subangular, weak siliceous cement, white to light brown argillaceous/siliceous matrix, abundant brown micaceous/carbonaceous ?kerogen flecks, trace lithics, friable to firm, poor visual porosity, no fluorescence.
2680-2685	100	SANDSTONE: 1) 100% Light grey, clear to translucent, medium to very coarse, predominantly bit fractured shards, poor to moderately sorted, subangular to subrounded, clean and loose, trace mica, good inferred porosity, no fluorescence. 2) Tr As above.
2685-2690	100	SANDSTONE: 1) 90% Medium to coarse grained, moderately sorted, good inferred porosity, no fluorescence. 2) 10% Becoming light to medium brown, with abundant brown micaceous/carbonaceous material.
2690-2695	100	SANDSTONE: 1) 100% As above, good inferred porosity, no fluorescence. 2) Tr As above, poor visual porosity, no fluorescence.

2695-2700	100	SANDSTONE: 1) 100% As above, no fluorescence, common black metallic microinclusions. 2) Tr As above, no fluorescence.
2700-2705	100	SANDSTONE: 1) 100% As above, predominantly bit fractured shards, no fluorescence. 2) Tr As above, no fluorescence.
2705-2710	100	SANDSTONE: 1) 100% As above, good inferred porosity, no fluorescence. 2) Tr As above, no fluorescence.
2710-2715	100	SANDSTONE: 1) 100% As above, no fluorescence. 2) Tr As above, no fluorescence.
2715-2720 LAT	100	SANDSTONE: 1) 100% As above, good inferred porosity, no fluorescence.
2720-2725	100	SANDSTONE: 1) 100% As above, medium to very coarse, predominantly shards, good inferred porosity, no fluorescence. 2) Tr As above, grades to arenaceous siltstone, poor visual porosity, no fluorescence.
2725-2730	80	SANDSTONE: 1) 80% As above, predominantly medium, grading medium to very coarse. 2) Tr As above.
	20	SILTSTONE: Light to medium grey, very arenaceous, moderately calcareous, slightly argillaceous, grading to very fine grained dirty sandstone, firm, subfissile (cavings).
2730-2735	100	SANDSTONE: 1) 100% Light grey, clear to translucent, medium to very coarse, predominantly bit fractured shards, inferred moderately sorted, subangular to subrounded, clean and loose, trace mica (biotite?), good inferred porosity, no fluorescence. 2) Tr Mottled light brown, translucent to clear, very fine to fine, moderate to well sorted, subangular, trace siliceous cement, non calcareous, abundant brown argillaceous/micaceous matrix, firm to friable, very poor visual porosity, no fluorescence.
2735-2740	100	SANDSTONE: 1) 100% As above, good inferred porosity, no fluorescence.
2740-2745	100	SANDSTONE: 1) 100% As above, very clean, no mica, no fluorescence.
2745-2750	100	SANDSTONE: 1) 100% As above, rare muscovite mica, good inferred porosity, no fluorescence.
2750-2755	100	SANDSTONE: 1) 100% As above, more milky grains, rare mica, good inferred porosity, no fluorescence.
2755-2760	100	SANDSTONE: Light grey, clear to milky, fine to very coarse, predominantly medium, poorly sorted, subangular to predominantly subrounded, clean and loose, good inferred porosity, no fluorescence.
2760-2765	100	SANDSTONE: As above, slightly coarser, no fluorescence.

2765-2770	100	SANDSTONE: As above, grading to very coarse, predominantly bit fractured shards, rare quartz over growths, good inferred porosity, no fluorescence.
2770-2775	100	SANDSTONE: As for 2755-2760, fine to very coarse, predominantly medium, good inferred porosity, no fluorescence.
2775-2780	100	SANDSTONE: As above, predominantly medium to coarse, good inferred porosity, no fluorescence.
2780-2785	100	SANDSTONE: As above, predominantly coarse, no fluorescence, (the black mineralic microinclusions with the larger quartz grains appear to be predominantly biotite crystals (book)).
2785-2790	100	SANDSTONE: As above, predominantly shards, no fluorescence.
2790-2795	100	SANDSTONE: 1) 100% As above, no fluorescence. 2) Tr Light grey to light brown, clear to translucent, very fine to rarely fine, well sorted, subrounded, loose, slightly (bitumen) stained, abundant brown (?biotite) mica, very fine dark green glauconite nodules, common pyrite, poor inferred porosity, no fluorescence.
*		Abundant green glauconitic clay washing out at shakers.
2795-2800	100	SANDSTONE: 1) 100% As above. 2) Tr As above, mostly loose very fine quartz, pyrite and glauconite nodules.
2800-2805	100	SANDSTONE: 1) 60% Predominantly very coarse as above, ?cavings. 2) 40% As above, very fine to fine, loose bitumen stained quartz, loose pyrite and glauconite nodules, no aggregates, poor inferred porosity, no fluorescence.
2807 Spot sample	100	SANDSTONE: 1) 60% As above, no fluorescence. 2) 40% As above, common mica, no fluorescence.
2805-2810	100	SANDSTONE: 1) 60% As above. 2) 40% As above, abundant mica, very dark green glauconite nodules.
2810-2815	100	SANDSTONE: 1) 30% As above. 2) 70% Mottled light brown to dark green, clear to brown bitumen stained, very fine grained, moderate to well sorted, angular to subrounded, non calcareous, abundant medium to dark green argillaceous/glauconite matrix, very fine grained pyrite, approximately 40% dark green glauconite nodules, abundant mica, soft to friable, predominantly loose, no visual porosity (in very rare aggregates), no fluorescence.

2815-2820	100	SANDSTONE: 1) 10% As above. 2) 50% As above, very fine grained, clean (less bitumen staining), no fluorescence. 3) 40% Light grey, clear to translucent, medium to coarse, well sorted, well rounded, subspherical, loose and clean, good inferred porosity, no fluorescence.
2820-2825	100	SANDSTONE: 1) Tr As above. 2) 40% As above. 3) 60% As above, predominantly fine to medium, no fluorescence.
2825-2830	100	SANDSTONE: Light grey, clear to translucent, fine to medium, well sorted, subangular to subrounded, clean and loose (as in 3 above), good to very good inferred porosity, no fluorescence.
2830-2835	100	SANDSTONE: As above, medium to coarse grained, good to very good inferred porosity, no fluorescence, (common to abundant Kaolinite/rock fluorescence).
2835-2840	100	SANDSTONE: As above, moderately sorted, clean and loose, predominantly subangular, good inferred porosity, no fluorescence.
2840-2845	100	SANDSTONE: Translucent to white, occasionally clean, predominantly medium, common coarse to very coarse bit fractuered grains, poorly sorted, subangular to well rounded. loose, translucent quartz overgrowths, clean, very good inferred porosity, no fluorescence.
2845-2850	100	SANDSTONE: Generally as above, common smokey quartz grains, bit fractured quartz grains, very good to good inferred porosity, no fluorescence.
	Tr	COAL: (trace) black to very dark brown black, very silty grading to carbonaceous siltstone. dull to sub vitreous, brittle, hard, hackly fractured.
2850-2855	95	SANDSTONE: As above, dominantly medium to coarse, very good inferred porosity, no fluorescence.
	5	COAL: As above becoming more anthracitic, sub conchoidal fracture.
2855-2860	90	SANDSTONE: As above.
	5	SILTSTONE: Medium to dark grey, very argillaceous (partly washing out of sample), very carbonaceous and commonly grading to coal, slightly micromicaceous, non calcareous, firm, blocky to sub fissile.
	5	COAL: As above.
2860-2865	90	SANDSTONE: White to light grey, clear to translucent, coarse to very coarse, minor medium to fine grains, moderate to poorly sorted, subrounded, moderate sphericity, grains have a frosted surface, loose, clean, minor quartz overgrowth surfaces, very good inferred porosity, no fluorescence.

	10	SILTSTONE: As above, non calcareous, very slightly arenaceous.
	Tr	COAL: As above.
2865-2870	80	SANDSTONE: As above becoming very well rounded, frosted, moderate sphericity, common bit fractured grains, very good inferred porosity. no fluorescence.
	20	SILTSTONE: As above.
	Tr	COAL: As above.
2870-2875	80	SANDSTONE: 1) 50% Generally as above, coarse to very coarse, well rounded, loose, clean, very good inferred porosity. 2) 50% White to light grey, very fine to fine grained, occasionally medium, moderate to well sorted, subangular to subrounded, weak silica cement, common white to light grey argillaceous matrix, firm, brittle to friable, poor to fair visual porosity, no fluorescence.
	20	SILTSTONE: As above becoming arenaceous and grading to very fine sandstone.
2875-2880	80	SANDSTONE: 1) 60% As above. 2) 40% As above.
	20	SILTSTONE: Medium to dark grey and brown, very arenaceous, argillaceous, common micromicaceous, very carbonaceous grading to coal, firm to moderately hard, blocky to sub fissile.
	Tr	COAL: As above.
2880-2885	70	SILTSTONE: As above, very argillaceous, grading to claystone (washing from sample).
	30	SANDSTONE: Clear to translucent, fine to very coarse predominantly fine to medium (type 2), poor to moderately sorted, subrounded to subangular, very weak siliceous cement, trace argillaceous matrix, friable, dominantly loose, fair/visual inferred porosity, no fluorescence.
	Tr	COAL: As above. (siltstone grading to claystone, washing from samples).
2885-2890	60	SILTSTONE/CLAYSTONE: As above (claystone washing out).
	40	SANDSTONE: As above.
	Tr	COAL: As above.
2890-2895	50	SANDSTONE: 1) 60% Clear to translucent, light grey to white, very coarse to coarse grained, moderately sorted, subangular bit fractured grains, predominantly subrounded to rounded grains, loose and clean, trace pyrite cement on grains, good to very good inferred porosity, no fluorescence. 2) 40% Light grey to off white, very fine to fine, moderately well to well sorted, subangular to subrounded, weak siliceous cement, minor white argillaceous matrix, micromicaceous in part, trace lithic fragments and carbonaceous flecks, friable to brittle, firm, fair visual porosity, no fluorescence.

	50	SILTSTONE: Light to dark grey, medium brown, becoming very arenaceous, very argillaceous, grading in part to claystone, common carbonaceous flecks and microlaminae, slight trace pyrite, grading in part to very fine argillaceous sandstone, firm to moderately hard, blocky. (Claystone washing out of sample).
2895-2900	40	SANDSTONE: 1) 40% As above. 2) 60% As above.
	60	SILTSTONE: As above.
2900-2905	70	SANDSTONE: 1) 30% Clear to translucent, white to milky, coarse to very coarse quartz grains, dominantly bit fractured, subangular to rounded, loose, generally clean, good inferred porosity, no fluorescence. 2) 70% Light grey to white, occasionally very light brown, very fine to fine, rare medium grains, moderately well to well sorted, subangular to subrounded, weak to moderate siliceous cement, trace to common white to light grey argillaceous matrix, common carbonaceous and mica flakes, trace pyrite, grading in part to very fine grained arenaceous siltstone, firm to moderately hard, brittle, poor to fair visual porosity, no fluorescence.
	30	SILTSTONE: As above.
2905-2910	50	SANDSTONE: 1) 20% As above, decreasing. 2) 80% Very fine to fine grain, as above becoming very micromicaceous.
	50	SILTSTONE: As above, predominantly medium to dark brown, occasionally mottled white and dark grey.
2910-2915	60	SANDSTONE: Clear to translucent, dominantly fair to medium, rare coarse to very coarse loose grains, moderately well sorted, subangular to subrounded, loose and clean, with trace white argillaceous matrix, trace siliceous cement and quartz overgrowths, friable to firm grain aggregates, dominantly loose, fair visual/inferred porosity,common pyrite,no fluorescence.
	40	SILTSTONE: Medium to dark grey brown, very arenaceous, abundant micromicaceous, common carbonaceous flakes, grading in part to very fine argillaceous sandstone, trace lithic fragments, firm to moderately hard, blocky.
2915-2920	80	SANDSTONE: Generally as above, translucent to clear, light grey, fine to medium, predominantly medium, moderately well sorted, subangular to subrounded, weak siliceous cement in part with common quartz overgrowths, trace white argillaceous matrix in rare aggregates, generally loose, fair inferred porosity, no fluorescence, (trace bitumen staining).
	20	SILTSTONE: As above.
2920-2925	80	SANDSTONE: As above.
	20	SILTSTONE: As above.

2925-2930	90	SANDSTONE: Translucent to clear, fine to coarse grained, predominantly medium, poorly sorted, subangular to subrounded, generally loose with minor very fine to fine grain aggregates having weak to moderate siliceous cement and exhibiting quartz overgrowths, generally clean, aggregates are friable to brittle, trace pyrite, poor to fair visual and inferred porosity, no fluorescence.
	10	SILTSTONE: Medium to dark grey, very arenaceous, slightly argillaceous, trace micromicaceous, firm to moderately hard, subfissile.
2930-2935	80	SANDSTONE: As above, poor to fair visual and inferred porosity, no fluorescence.
	20	SILTSTONE: As above.
2935-2940	70	SANDSTONE: As above, fine to coarse, dominantly medium, trace pyrite, loose, fair inferred porosity, no fluorescence.
	30	SILTSTONE: Medium to dark grey, generally as above, with common carbonaceous laminae and specks grading to coal.
2940-2945	40	SANDSTONE: As above becoming white to light grey, occasionally translucent grains, very fine to fine grained, moderately well sorted, subangular to subrounded, very weak siliceous cement, minor white to light grey argillaceous matrix, common micaceous banding, trace altered feldspars, trace carbonaceous specks, friable, firm to moderately hard, poor to fair visual porosity, no fluorescence.
	60	SILTSTONE: Medium to dark brown, medium grey, becoming very arenaceous grading to very fine sandstone, abundant micromicaceous and mica flakes, common coal fragments and laminae, speckled texture, slightly argillaceous, moderately hard, subfissile to blocky.
	Tr	COAL: Black, very dark brown black, sub vitreous, sub conchoidal fracture, hard, brittle. *(siltstone shows no direct fluorescence, gives a moderate bright green yellow crush cut, moderate ring residue), abundant kerogen evident in dark brown argillaceous siltstones.
2945-2950	50	SANDSTONE: As above.
	50	SILTSTONE: As above.
2950-2955	60	SANDSTONE: Generally as above, predominantly loose, with occasional medium to coarse grains, fair inferred porosity, no fluorescence.
	40	SILTSTONE: As above.
	Tr	COAL: As above.
2955-2960	80	SANDSTONE: Translucent to clear, grading to fine to very coarse, predominantly medium, bit fractured grain, poorly sorted, subangular to sub rounded generally loose fractured grains with minor weak siliceous cemented aggregates, common quartz overgrowths, trace white argillaceous matrix, poor to fair inferred posrotiy, no fluorescence.

	20	SILTSTONE: Medium to dark grey brown, moderately argillaceous and arenaceous, trace pyrite, common carbonaceous flakes, firm to moderately hard, blocky to subfissile.
	Tr	COAL: As above.
2960-2965	70	SANDSTONE: As above becoming subrounded to rounded in part, fair inferred porosity, no fluorescence.
	30	SILTSTONE: As above, becoming very carbonaceous and grading to coal.
2965-2970	90	SANDSTONE: As above, fine to dominantly medium, moderately well to well sorted, subangular to subrounded, loose, clean, poor to occasionally fair inferred porosity, no fluorescence.
	10	SILTSTONE: As above.
2970-2975	80	SANDSTONE: As above, abundant quartz overgrowths, poor inferred porosity, no fluorescence.
	20	SILTSTONE: As above.
2975-2980	95	SANDSTONE: As above, subrounded, loose, clean, poor to fair inferred porosity, no fluorescence.
	5	SILTSTONE: As above.
	Tr	COAL: As above.
2980-2985	100	SANDSTONE: As above, fine to medium, dominantly medium.
	Tr	SILTSTONE: Trace as above.
2985-2990	100	SANDSTONE: As above, predominantly medium, common coarse loose bit fractured grains, moderately sorted, angular to sub rounded shards, loose, clean, poor to fair inferred porosity, no fluorescence.
2990-2995	100	SANDSTONE: As above.
2995-3000	100	SANDSTONE: As above, predominantly medium to coarse, occasionally fine grained, fair to poor inferred porosity.
	Tr	SILTSTONE: As above.
3000-3005	100	SANDSTONE: As above.
	Tr	SILTSTONE: Trace as above.
3005-3010	100	SANDSTONE: As above.
	Tr	COAL: As above.
	Tr	SILTSTONE: As above.
3010-3015	100	SANDSTONE: As above, predominantly medium to coarse, rare fine grains, fair to good inferred porosity, no fluorescence.
	Tr	SILTSTONE: As above.
3015-3021	100	SANDSTONE: As above.

APPENDIX 2

APPENDIX 2.

CORE DESCRIPTION

No full hole cores were cut at Roundhead-1

APPENDIX 3

ROUNDHEAD-1

SIDEWALL CORE DESCRIPTIONS

NO.	Depth (m)	Rec. (mm)	Rock Type	Description
1	2996.5	28	SANDSTONE	Light grey, very fine to fine grain, well sorted, subangular to subrounded, weak siliceous cement, moderate light grey argillaceous matrix, abundant muscovite mica flakes, minor carbonaceous flakes, friable, firm to soft, poor to fair visual porosity. No FLUORESCENCE. No GAS.
2	2986.1	18	SANDSTONE	Translucent to white, very fine to predominantly fine grain, subangular, very weak siliceous cement , minor white argillaceous matrix, friable, firm, trace mica, fair visual porosity. No FLUORESCENCE. No GAS.
3	2952.0	20	SILTSTONE	Dark brown, common very fine sand/arenaceous, slightly argillaceous, carbonaceous with coaly streaks and laminae, very well laminated, firm to moderately hard, fissile to sub fissile. No GAS.
4	2936.5	30	SILTSTONE/COAL	Very dark brown and black, very argillaceous, very carbonaceous with common coal laminations, slightly arenenaceous, slightly micromicaceous. GAS: 0.13/.01/.0096/.004,.004
5	2929	25	SILTSTONE/ CLAYSTONE	Dark grey, very argillaceous, commonly arenaceous with laminations of very fine and, trace carbonaceous specks, commonly micromicaceous, soft, blocky to crumbly. No GAS
6	2919.5	20	SANDSTONE	Light grey, very fine grain, moderately sorted, subangular to subrounded, very weak silica cement, common light grey argillaceous matrix, friable, soft, trace carbonaceous specks, poor to fair visual porosity. No FLUORESCENCE. GAS: No GAS.
7	2907.3	19	SANDSTONE	Mottled light grey/white, very fine to fine, silty, poorly sorted, subangular, very weak silica calcareous cement, abundant white and light grey argillaceous matrix, micromicaceous, laminated with dark grey siltstone, soft to firm, trace carbonaceous specks, poor visual porosity. No FLUORESCENCE. GAS: 0.02/0.016/0.0096/TR,TR
8	2900.5	35	SILTSTONE	Very dark brown, very argillaceous grading to claystone, abundant carbonaceous and coal laminae grading to carbonaceous siltstone in part, uniform texture, hard, splinter, fissile, FLUORESCENCE: Instant moderately fast streaming yellow cut, moderate ring residue. GAS: 0.013/.004/0.0043/TR,TR

9	2891	16	CLAYSTONE	Medium grey, silty with minor white silty laminations, soft, amorphous to crumbly. No GAS
10	2879.5	21	SILTSTONE	Medium to dark grey, commonly arenaceous with fine to very fine grained sand grains, common muscovite flakes, common carbonaceous flecks, firm to soft, blocky. FLUORESCENCE: Trace very dull yellow slow streaming cut, thin ring residue. GAS: 0.026/0.0096/0.008/.0024,.003
11	2871.5	28	SILTSTONE	Mottled light grey white, very arenaceous, very argillaceous, abundantly carbonaceous and coal detritus, grading to very fine argillaceous sandstone, soft to firm, blocky. No FLUORESCENCE. GAS: 0.09/0.032/0.024/.0048,.0052
12	2862.5	31	SANDSTONE	Light grey, very fine to fine, grading to siltstone , subangular to subrounded, poorly sorted, no cement, abundant light grey argillaceous matrix, very micromicaceous, common carbonaceous flecks, poor visual porosity. No FLUORESCENCE. No GAS
13	2855.5	21	SILTSTONE	Medium grey brown, white mottled, very arenaceous, common argillaceous, very calcareous, very minor carbonaceous flecks, moderately firm, blocky. FLUORESCENCE: Very dull to dull yellow green, slight streaming cut, thin ring residue. GAS: No GAS
14	2853.5	Missing		Lost Bullet
15	2850.0	Missing		Lost Bullet
16	2848.0	Missing		Lost Bullet
17	2812.0	40	SILTSTONE	Medium green, abundant glauconite, very argillaceous, slightly arenaceous, soft to firm, trace micromicaceous, blocky. No FLUORESCENCE. GAS: No GAS
18	2808.0	32	SILTSTONE	Medium grey green, abundant glauconite, common sand grains, slightly calcareous, slightly argillaceous, slightly micromicaceous, grading to very fine glauconite sandstone, hard, blocky. No FLUORESCENCE. GAS: Tr/Tr/Tr.
19	2804.5	34	SILTSTONE	As above, No FLUORESCENCE. GAS: No GAS.
20	2801.5	36	SILTSTONE	As above, grading to very fine grained glauconite sandstone. No FLUORESCENCE. GAS: No GAS.

21	2793.3	30	SANDSTONE	Light grey with mottled green, very fine to fine, moderate to well sorted, weak silica cement, common light grey argillaceous matrix, common glauconite grains, common mica flakes, friable, firm, poor visual porosity. No FLUORESCENCE. GAS: No GAS.
22	2789.0	29	SANDSTONE	Off white to light grey, very fine to fine grain, rarely medium grained, moderate sorting, subangular, weak silica cement, common light grey argillaceous matrix, mica flakes, trace glauconite, firm, friable, poor visual porosity. No FLUORESCENCE. GAS: no GAS.
23	2785.0	Missing		Lost Bullet.
24	2771.0	30	SANDSTONE	White, very fine to coarse, poorly sorted, subangular to angular, weak silica cement, common white argillaceous matrix, soft to firm, friable,trace to good inferred visible porosity. No FLUORESCENCE. GAS: No GAS
25	2747.0	20	SANDSTONE	Light grey to translucent, very fine to fine, silty in part, poorly sorted, subangular to subrounded, weak silica cement, abundant light grey argillaceous matrix, moderate hard to firm, poor visual porosity. No FLUORESCENCE. GAS: No GAS.
26	2746.0	32	SANDSTONE	Light to medium grey, fine to very coarse, poorly sorted, angular to subrounded, grains are fractured, moderate to weak silica cement, abundant light to medium grey argillaceous matrix, muscovite mica flakes, moderately hard, friable, poor to fair visual porosity. No FLUORESCENCE. GAS: No GAS.
27	2741.0	32	SANDSTONE	Translucent to light grey, medium to very coarse grain, occasionally fine, poorly to moderately sorted, subrounded, occasionally round, weak silica cement, weak calcareous cement, moderate light grey argillaceous matrix, friable, soft to firm, fair-good visual porosity. No FLUORESCENCE. GAS: No GAS.
28	2731.3	25	SANDSTONE	Light grey, very fine to predominantly fine, moderately to well sorted, subrounded, weak silica calcareous cement, minor light grey argillaceous matrix, friable, soft, fair inferred visual porosity. No FLUORESCENCE. GAS: No GAS
29	2729.5	25	SANDSTONE	Light grey white, fine to medium, moderate sorted, round to subangular, none to weak silica cement, trace calcareous cement, minor light grey argillaceous matrix, friable, firm, fair inferred porosity. No FLUORESCENCE. GAS: No GAS.

30	2726.0	20	SANDSTONE	Light grey to translucent, fine to very coarse, poorly sorted, subrounded, generally as above. No FLUORESCENCE. GAS: No GAS
GUN 2				
31	2719.0	17	SANDSTONE	As above, fair to good inferred porosity. No FLUORESCENCE. GAS: No GAS.
32	2713.0	Missing		Lost Bullet.
33	2701.0	20	SANDSTONE	Light grey, very fine to predominantly fine, moderately well sorted, subangular to subrounded, weak silica cement, moderate white to light grey argillaceous matrix, trace lithics, friable, soft to firm, fair visual porosity. No FLUORESCENCE. GAS: No GAS
34	2693.5	32	SANDSTONE	Generally as above, fine to occasionally coarse, predominantly fine to medium, poorly sorted. No FLUORESCENCE. GAS: No GAS
35	2687.2	28	SANDSTONE	As above. No FLUORESCENCE. GAS: No GAS.
36	2679.1	29	SILTSTONE	Medium to dark grey, very argillaceous, slightly arenaceous, common micromicaceous flakes, grading to very fine grain sandstone, firm to soft, blocky. GAS: No GAS.
37	2678.0	25	SILTSTONE	Dark grey, grading to claystone, very argillaceous, very sticky, very calcareous, slightly micromicaceous, soft and dispersive. GAS: No GAS.
38	2657.5	30	SANDSTONE	Light grey, fine to medium, predominantly fine, moderately well to well sorted, subangular, rounded in part, weak to no silica cement, minor light grey argillaceous matrix, trace mica flakes, friable, soft. No FLUORESCENCE. GAS: No GAS.
39	2643.0	25	SANDSTONE	As above. No FLUORESCENCE. GAS: No GAS.
40	2639.0	27	SANDSTONE	Light grey, very fine to fine, moderately well sorted, subangular to subrounded, weak calcareous cement, abundant argillaceous matrix, slightly sticky, common micromicaceous flakes, soft, poor to fair visual porosity. No FLUORESCENCE. GAS: No GAS:
41	2618.5	28	SILTSTONE	Medium to dark grey, very argillaceous grading to calystone, arenaceous, very calcareous, soft, slightly sticky, amorphous. GAS: 0.0058/0.0024/TR

42	2614.0	23	SANDSTONE	Light grey, very fine grain, moderately sorted, no cement, abundant light grey argillaceous matrix, silty, grading to siltstone, friable, soft, slightly sticky, poor to tight visual porosity. No FLUORESCENCE. GAS: TR.
43	2612.0	28	SILTSTONE	Mottled light to medium grey, very arenaceous, grading to very fine grain sandstone, common argillaceous, slightly calcareous, common mica flakes, soft. blocky. GAS: 0.0039/0.0016/TR
44	2606.8	24	SANDSTONE	Light grey, very fine to silty, poorly sorted, moderate calcareous cement, abundant light grey argillaceous matrix, sticky, grading to siltstone, soft, friable, poor visual porosity. No FLUORESCENCE. GAS: No GAS.
45	2546.8	10	SILTSTONE	Dark grey, very argillaceous, very calcareous, sticky, soft, blocky, crumbly. GAS: TR.
46	2540.0	35	SANDSTONE	Light grey, very fine to fine, moderately well sorted, subangular to subrounded, weak silica cement, minor light grey argillaceous matrix, abundant glauconite, common micromicaceous flakes, soft, friable, very poor to tight visual porosity. No FLUORESCENCE. GAS: TR
47	2535.8	27	SANDSTONE	Light grey, fine to very fine, predominantly fine, rare medium grains, moderately well to well sorted, subangular to subrounded, generally no cement, minor light grey argillaceous matrix, trace mica flakes, friable, soft, poor to fair inferred porosity. No FLUORESCENCE. GAS: No GAS.
48	2515.2	25	SANDSTONE	Light to medium grey, very fine, silty moderately well sorted to well sorted, no cement, abundant light to medium grey argillaceous matrix, micromicaceous, friable, soft, poor to tight visual porosity. No FLUORESCENCE. GAS: 0.0026/0.0008
49	2509.1	23	SILTSTONE	Medium grey, very arenaceous, very argillaceous, sticky, soft, amorphous. GAS: 0.0039/0.0024
50	2505.9	26	SILTSTONE	As above with minor mica, slightly calcareous. GAS: .0029/.0012
51	2487.1	32	SILTSTONE	Mottled light grey, slight to very arenaceous, moderately argillaceous, grading to claystone in part, soft, blocky. GAS: TR.

52	2484.0	31	SILTSTONE	Dark grey, moderately arenaceous, very argillaceous, common micromicaceous flakes, firm to moderately hard, blocky. GAS: No GAS.
53	2445.8	25	GLAUCONITIC SANDSTONE	Medium green, mottled with white, very fine grain quartz and glauconite, moderately sorted, subangular, weak calcareous cement, trace pyrite, trace mica flakes, soft to moderately firm, blocky, tight visual porosity. No FLUORESCENCE. GAS: TR.
54	2442.5	35	GLAUCONITIC SANDSTONE	As above. GAS: TR.
55	2418.1	20	SANDSTONE	Very light grey, very fine to silty, occasionally fine, moderately sorted, no cement, abundant light grey brown argillaceous matrix, trace altered feldspars, trace lithic fragments, common muscovite flakes, soft, slightly sticky, tight visual porosity. No FLUORESCENCE. GAS: 0.0026/0.0016/0.002/TR/TR
56	2407.1	18	SANDSTONE	White to light grey, very fine to predominantly fine, well sorted, subangular to subrounded, no cement, common white to light grey argillaceous matrix, trace glauconite and pyrite, soft, friable, poor to fair visual porosity. No FLUORESCENCE. GAS: TR.
57	2380.0	40	SANDSTONE	Glauconite sandstone, pale greenish white, fine to very coarse grain quartz, fine grain glauconite, poorly sorted, subrounded to subangular, no cement, abundant white argillaceous matrix, abundant glauconite, trace pyrite, trace mica, friable, firm, fair to good inferred porosity. No FLUORESCENCE. GAS: TR.
58	2378.5	13	GLAUCONITIC SANDSTONE	Generally as above. GAS: No GAS.
59	2377.0	Missing		Lost Bullet
60	2373.0	30	CLAYSTONE	Light grey, very calcareous, trace fossil fragments, slightly arenaceous, soft and dispersive, calcilutite. GAS: 0.0052/0.0015/0.0015/TR/TR.

APPENDIX 4

RFT PRESSURE DATA

WELL: ROUNDHEAD - 1

PAGE 1 OF 2

DATE: 30 - 12 - 88

GEOLOGIST-ENGINEER: VICTORIA BINNS

RFT NO. RUN-SEAT / RFT TYPE	DEPTH m MDKB	DEPTH m TVD ss KB= 21m	INITIAL HYDROSTATIC HP/RFT GAUGE psia psig / PPg	TIME SET	MINIMUM FLOWING PRESSURE psi (PRETEST)	FORMATION PRESSURE HP/RFT GAUGE psia psig / PPg	TEMP °C	TIME RETRACT	FINAL HYDROSTATIC HP/RFT GAUGE psia psig / PPg	COMMENTS (INCLUDE PROBE TYPES) LONG NOSE PROBE
1 - 1 P	2977	2956	5016.54 / 5002	07:57	4029.46	4187.63 / 4175	98	08:04	5017.65 / 5010	GOOD TEST
1 - 2 P	2964.5	2943.5	4997.62 / 4980	08:18	4006	4169.25 / 4154	99.2	08:23	4997.75 / 4980	GOOD TEST
1 - 3 P	2913.6	2892.6	4914.24 / 4894	08:44	-	-	-	-	-	TOO TIGHT
1 - 4 P	2911.8	2890.8	4911.73 / 4892	08:58	8	4099.10 / 4085	97.6	09:10	4914.63 / 4900	TIGHT. FAIR TEST
1 - 5 P	2816.5	2795.5	4757.88 / 4743	09:28	2930	3941.08 / 3928	95.2	09:35	4759.67 / 4745	GOOD TEST
1 - 6 P	2779.0	2758	4694.56 / 4680	09:51	3824	3874.06 / 3860	93.6	10:00	4694.48 / 4680	GOOD TEST
1 - 7 P	2659.0	2638	4491.15 / 4477	10:18	3663	3706.20 / 3692	91.1	10:27	4492.62 / 4478	GOOD TEST
1 - 8 P	2562.0	2541	4328.34 / 4314	10:44	3532	3566.89 / 3552	89.1	10:50	4328.28 / 4314	GOOD TEST
1 - 9 P	2497.0	2476	4214.13 / 4200	11:09	3439	3471.35 / 3457	87.6	11:14	4217.81 / 4213	GOOD TEST
1 - 10 P	2436.0	2415	4113.91 / 4105	11:25	3169	3383.47 / 3375	85.4	11:32	4113.0 / 4099	GOOD TEST

PT=PRETEST
SPT=SAMPLE

L=LONG NOSE PROBE
M=MARTINEAU PROBE

RFT PRESSURE DATA

WELL: ROUNDHEAD - 1

DATE: 30 - 12 - 88

GEOLOGIST-ENGINEER: VICTORIA BINNS

RFT NO. RUN-SEAT / RFT TYPE	DEPTH m MDKB	DEPTH m TVD ss KB = 21m	INITIAL HYDROSTATIC HP/RFT GAUGE psia psig / PPg	TIME SET	MINIMUM FLOWING PRESSURE psi (PRETEST)	FORMATION PRESSURE HP/RFT GAUGE psia psig / PPg	TEMP °C	TIME RETRACT	FINAL HYDROSTATIC HP/RFT GAUGE psia psig / PPg	COMMENTS (INCLUDE PROBE TYPES)
1 - 11 P	2414.5	2393.5	4075.82 / 4061	11:47	3316	3350.96 / 3337	84.3	11:52	4075.53 / 4060	GOOD TEST
1 - 12 P	2388.0	2367	4030.88 / 4016	12:01	3271	-	82.8	-	4030.43 / 4014	INVALID TEST. ANOMALOUSLY HIGH PRESSURE
1 - 13 P	2383.5	2362.5	4022.73 / 4005	12:18	3147	3308.39 / 3292	82.5	12:27	4022.70 / 4004	GOOD TEST

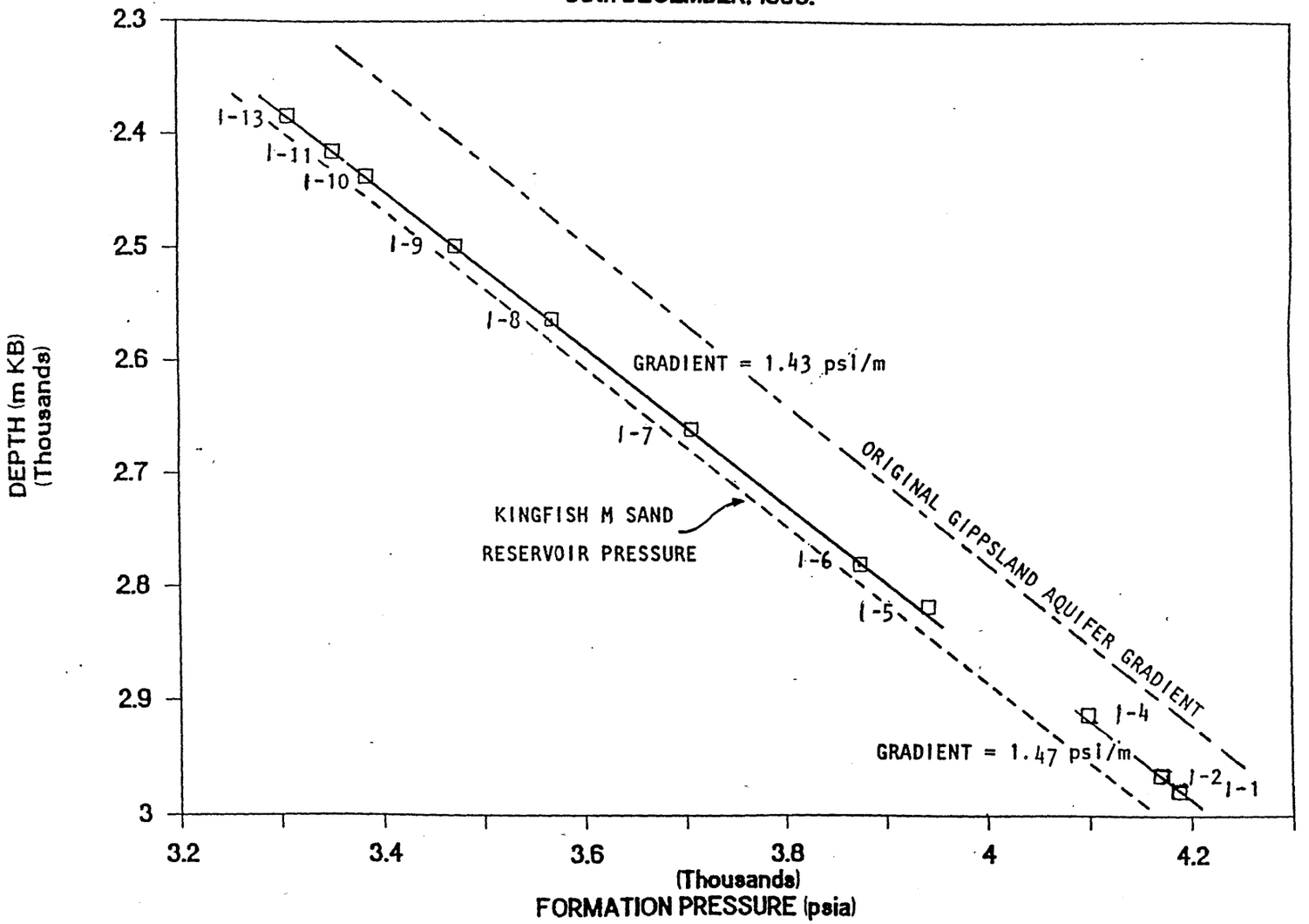
PT=PRETEST
SPT=SAMPLE

L=LONG NOSE PROBE
M=MARTINEAU PROBE

GRAPH 1

ROUNDHEAD – 1 RFT

30th DECEMBER, 1988.



APPENDIX 5

Schlumberger

ESSO AUSTRALIA LIMITED

SONIC CALIBRATION PROCESSING REPORT

ROUNDHEAD #1

FIELD	:	WILDCAT
STATE	:	VICTORIA
COUNTRY	:	AUSTRALIA
COORDINATES	:	038° 37' 04.98" S 148° 13' 28.34" E
DATE OF SURVEY	:	29-DECEMBER-1988
REFERENCE NO.	:	569285

Contents

List of Tables

List of Figures

1. Introduction

A checkshot survey was shot in the Roundhead #1 well on 29 December 1988. Data was acquired using a dynamite source located near the wellhead. Twenty levels were shot from 3010 metres to 825 metres below KB. All levels are used in the sonic calibration processing.

2. Data Acquisition

The data was acquired using the well seismic tool (WST). Recording was made on the Schlumberger Cyber Service Unit (CSU) using LIS format at a tape density of 800 BPI.

Table 1: Survey Parameters

Datum	0.0 metres AMSL
Elevation KB	21.0 metres AMSL
Elevation DF	20.7 metres AMSL
Elevation GL	-60.0 metres AMSL
Total Depth	3010 metres below KB
Energy Source	Airgun
Source Offset	40 metres
Source Depth	9.1 metres
Reference Sensor	Accelerometer
Sensor Offset	40 metres
Sensor Depth	9.1 metres
Downhole Geophone	Geospace HS-1
	High Temp. ($350°F$)
	Coil Resist. 225Ω ± 10 %
	Natural Freq. 8-12 hertz
	Sensitivity 0.45 V/in/sec
	Maximum tilt angle 60°

3. Sonic Calibration Processing

3.1 Sonic Calibration

A 'drift' curve is obtained using the sonic log and the vertical check level times. The term 'drift' is defined as the seismic time (from check shots) minus the sonic time (from integration of edited sonic). Commonly the word 'drift' is used to identify the above difference, or to identify the gradient of drift versus increasing depth, or to identify a difference of drift between two levels.

The gradient of drift, that is the slope of the drift curve, can be negative or positive.

For a negative drift $\frac{\Delta drift}{\Delta depth} < 0$, the sonic time is greater than the seismic time over a certain section of the log.

For a positive drift $\frac{\Delta drift}{\Delta depth} > 0$, the sonic time is less than the seismic time over a certain section of the log.

The drift curve, between two levels, is then an indication of the error on the integrated sonic or an indication of the amount of correction required on the sonic to have the TTI of the corrected sonic match the check shot times.

Two methods of correction to the sonic log are used.

1. **Uniform or block shift** This method applies a uniform correction to all the sonic values over the interval. This uniform correction is applied in the case of positive drift and is the average correction represented by the drift curve gradient expressed in μsec/ft.

2. ΔT **Minimum** In the case of negative drift a second method is used, called Δt minimum. This applies a differential correction to the sonic log, where it is assumed that the greatest amount of transit time error is caused by the lower velocity sections of the log. Over a given interval the method will correct only Δt values which are higher than a threshold, the Δt_{min}. Values of Δt which are lower than the threshold are not corrected. The correction is a reduction of the excess of Δt over Δt_{min}, Δt - Δt_{min}.

   $\Delta t - \Delta t_{min}$ is reduced through multiplication by a reduction coefficient which remains constant over the interval. This reduction coefficient, named G, can be be defined as:

$$G = 1 + \frac{drift}{\int (\Delta t - \Delta t_{min}) dZ}$$

   Where drift is the drift over the interval to be corrected and the value $\int (\Delta t - \Delta t_{min}) dZ$ is the time difference between the integrals of the two curves Δt and Δt_{min}, only over the intervals where $\Delta t > \Delta t_{min}$.

   Hence the corrected sonic: $\Delta t = G(\Delta t - \Delta t_{min}) + \Delta t_{min}$.

3.2 Checkshot Data

The accelerometer signal is used as the zero time reference. The checkshot data quality is good and is displayed in Figure 2.

3.3 Correction to Datum

A static correction is made for source depth from seismic datum by assuming as water velocity of 1480 metres/sec. Additional corrections are made for source offset from the well head.

3.4 Open Hole Logs

The sonic log was recorded from 3010 metres to the casing shoe at 225 metres below KB. Minor zones of cycle skipping have been removed.

The density, caliper and gamma ray curves are included as correlation curves.

3.5 Sonic Calibration Results

The top of the sonic log (225 metres below KB) is chosen as the origin for the calibration drift curve.

The drift curve indicates a number of corrections to be made to the sonic log. The adjusted sonic curve is considered to be the best result using the available data. A list of shifts used on the sonic data is given below.

Table 2: Sonic Drift

Depth Interval (metres below KB)	Block Shift μsec/ft	Δt_{min} μsec/ft	Equiv Block Shift μsec/ft
225-422	3.40	-	3.40
422-1153	3.25	-	3.25
1153-1614	1.98	-	1.98
1614-2377	3.40	-	3.40
2377-2846	-	70.55	-.97
2846-3010	0.00	-	0.00

A Summary of Geophysical Listings

Five geophysical data listings are appended to this report. Following is a brief description of the format of each listing.

A1 Geophysical Airgun Report

1. Level number : the level number starting from the top level (includes any imposed shots).
2. Measured depth from KB : *dkb*, the depth in metres from kelly bushing .
3. Vertical depth from SRD : *dsrd*, the depth in metres from seismic reference datum.
4. Vertical depth from GL : *dgl*, the depth in metres from ground level.
5. Observed travel time HYD to GEO : *tim*0, the transit time picked from the stacked data by subtracting the surface sensor first break time from the downhole sensor first break time.
6. Vertical travel time SRC to GEO : *timv*, is corrected for source to hydrophone distance and for source offset.
7. Vertical travel time SRD to GEO : *shtm*, is *timv* corrected for the vertical distance between source and datum.
8. Average velocity SRD to GEO : the average seismic velocity from datum to the corresponding checkshot level, $\frac{dsrd}{shtm}$.
9. Delta depth between shots : $\Delta depth$, the vertical distance between each level.
10. Delta time between shots : $\Delta time$, the difference in vertical travel time (*shtm*) between each level.
11. Interval velocity between shots : the average seismic velocity between each level, $\frac{\Delta depth}{\Delta time}$.

A2 Drift Computation Report

1. Level number : the level number starting from the top level (includes any imposed shots).
2. Vertical depth from KB : the depth in metres from kelly bushing .
3. Vertical depth from SRD : the depth in metres from seismic reference datum.
4. Vertical depth from GL : the depth in metres from ground level.
5. Vertical travel time SRD to GEO : the calculated vertical travel time from datum to downhole geophone (see column 7, Geophysical Airgun Report).

6. Integrated raw sonic time : the raw sonic log is integrated from top to bottom and listed at each level. An initial value at the top of the sonic log is set equal to the checkshot time at that level. This may be an imposed shot if a shot was not taken at the top of the sonic.

7. Computed drift at level : the checkshot time minus the integrated raw sonic time.

8. Computed blk-shft correction : the drift gradient between any two checkshot levels ($\frac{\Delta drift}{\Delta depth}$).

A3 Sonic Adjustment Parameter Report

1. Knee number : the knee number starting from the highest knee. (The first knees listed will generally be at SRD and the top of sonic. The drift imposed at these knees will normally be zero.)

2. Vertical depth from KB : the depth in metres from kelly bushing .

3. Vertical depth from SRD : the depth in metres from seismic reference datum.

4. Vertical depth from GL : the depth in metres from ground level.

5. Drift at knee : the value of drift imposed at each knee.

6. Blockshift used : the change in drift divided by the change in depth between any two levels.

7. Delta-T minimum used : see section 4 of report for an explanation of Δt_{min}.

8. Reduction factor : see section 4 of report.

9. Equivalent blockshift : the gradient of the imposed drift curve.

A4 Velocity Report

1. Level number : the level number starting from the top level (includes any imposed shots).

2. Vertical depth from KB : the depth in metres from kelly bushing .

3. Vertical depth from SRD : the depth in metres from seismic reference datum

4. Vertical depth from GL : the depth in metres from ground level

5. Vertical travel time SRD to GEOPH : the vertical travel time from SRD to downhole geophone (see column 7, Geophysical Airgun Report)

6. Integrated adjusted sonic time : the adjusted sonic log is integrated from top to bottom. An initial value at the the top of the sonic is set equal the checkshot time at that level. (The adjusted sonic log is the drift corrected sonic log.)

7. Drift=shot time-raw son : the check shot time minus the raw integrated sonic time.

8. Residual=shot time-adj son : the check shot time minus the adjusted integrated sonic time. This is the difference between calculated drift and the imposed drift.

9. Adjusted interval velocity : the interval velocity calculated from the integrated adjusted sonic time at each level.

A5 Time Converted Velocity Report

The data in this listing has been resampled in time.

1. Two way travel time from SRD : This is the index for the data in this listing. The first value is at SRD (0 millisecs) and the sampling rate is 2 millisecs.

2. Measured depth from KB : the depth from KB at each corresponding value of two way time.

3. Vertical depth from SRD : the vertical depth from SRD at each corresponding value of two way time.

4. Average velocity SRD to GEO : the vertical depth from SRD divided by half the two way time.

5. RMS velocity : the root mean square velocity from datum to the corresponding value of two way time.

$$v_{rms} = \sqrt{\Sigma_1^n v_i^2 t_i / \Sigma_1^n t_i}$$

where v_i is the velocity between each 2 millisecs interval.

6. First normal moveout : the correction time in millisecs to be applied to the two way travel time for a specified moveout distance (default = 3000 feet).

$$\Delta t = \sqrt{t^2 + (\frac{X}{v_{rms}})^2} - t$$

where:

Δt = normal moveout (secs)
X = moveout distance (metres)
t = two way time (secs)
v_{rms} = rms velocity (metres /sec)

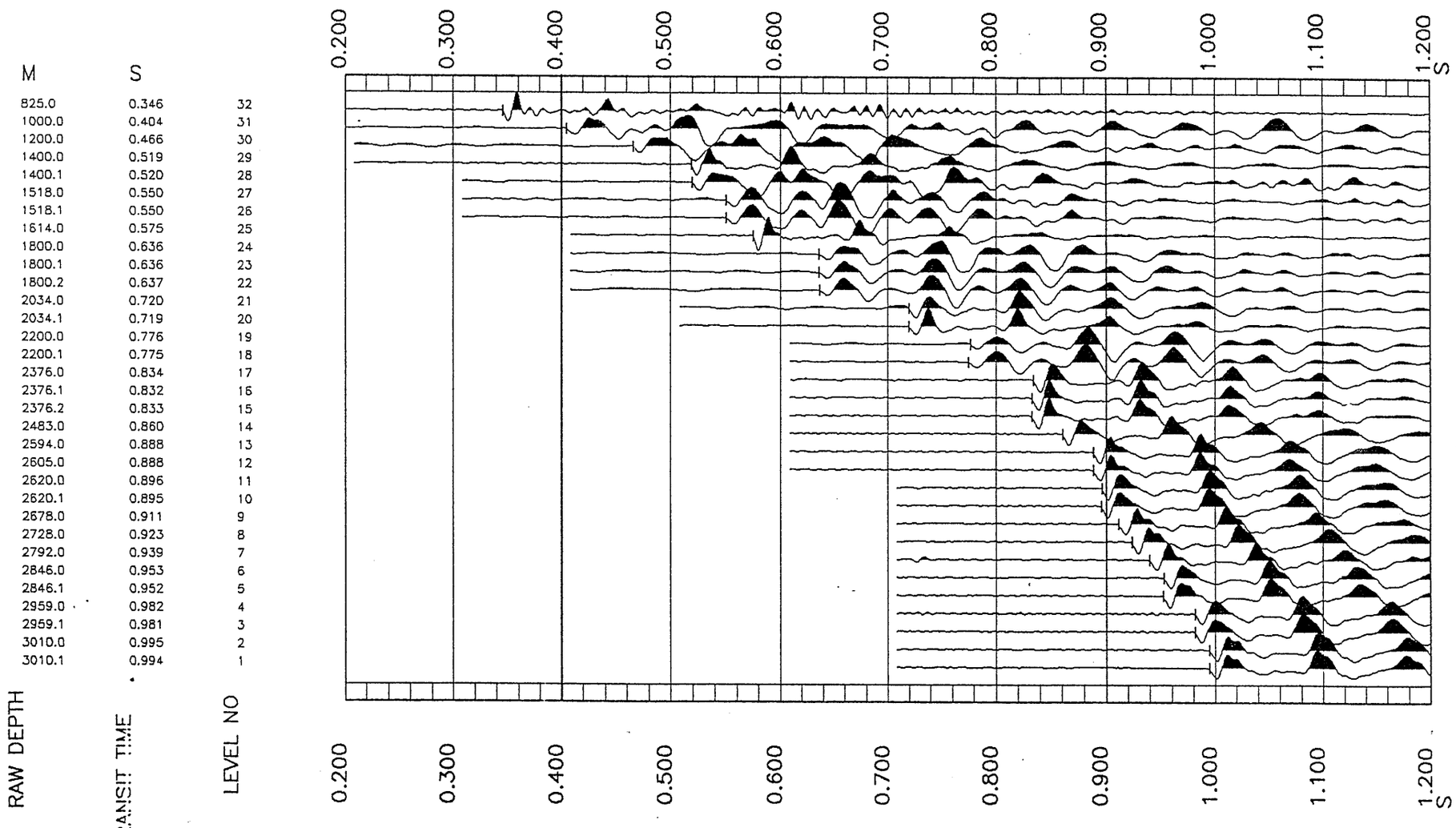
7. Second normal moveout : the correction time in millisecs to be applied to the two way travel time for a specified moveout distance (default = 4500 feet).

8. Third normal moveout : the correction time in millisecs to be applied to the two way travel time for a specified moveout distance (default = 6000 feet).

9. Interval velocity : the velocity between each sampled depth. Typically, the sampling rate is 2 millisecs two way time, (1 millisec one way time) therefore the interval velocity will be equal to the depth increment divided by 0.001. It is equivalent to column 9 from the the Velocity Report.

Figure 1

ROUNDHEAD #1
STACKED CHECKSHOT DATA



SHOTS

PE902170

This is an enclosure indicator page.
The enclosure PE902170 is enclosed within the container PE902169 at this location in this document.

The enclosure PE902170 has the following characteristics:

ITEM_BARCODE	= PE902170
CONTAINER_BARCODE	= PE902169
NAME	= Geophysical Airgun report - G shot
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= VELOCITY_CHART
DESCRIPTION	= Geophysical Airgun report - G shot
REMARKS	=
DATE_CREATED	= 6/01/89
DATE_RECEIVED	= 30/08/89
W_NO	= W984
WELL_NAME	= Roundhead-1
CONTRACTOR	= Schlumberger
CLIENT_OP_CO	= ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

DRIFT

PE902178

This is an enclosure indicator page.
The enclosure PE902178 is enclosed within the container PE902169 at this location in this document.

The enclosure PE902178 has the following characteristics:

ITEM_BARCODE	= PE902178
CONTAINER_BARCODE	= PE902169
NAME	= Drift Computation report - G drift
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= VELOCITY_CHART
DESCRIPTION	= Drift Computation report - G drift
REMARKS	=
DATE_CREATED	= 6/01/89
DATE_RECEIVED	= 30/08/89
W_NO	= W984
WELL_NAME	= Roundhead-1
CONTRACTOR	= Schlumberger
CLIENT_OP_CO	= ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

TIME / DEPTH

TIME/DEPTH

PE601011

This is an enclosure indicator page.
The enclosure PE601011 is enclosed within the container PE902169 at this location in this document.

The enclosure PE601011 has the following characteristics:

ITEM_BARCODE	= PE601011
CONTAINER_BARCODE	= PE902169
NAME	= Drift Corrected Sonic
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Drift Corrected Sonic
REMARKS	=
DATE_CREATED	= 8/01/89
DATE_RECEIVED	= 30/08/89
W_NO	= W984
WELL_NAME	= Roundhead-1
CONTRACTOR	= Schlumberger
CLIENT_OP_CO	= ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902171

This is an enclosure indicator page.
The enclosure PE902171 is enclosed within the container PE902169 at this location in this document.

The enclosure PE902171 has the following characteristics:

ITEM_BARCODE	= PE902171
CONTAINER_BARCODE	= PE902169
NAME	= Time Converted Velocity Report
BASIN	= GIPPSLAND
PERMIT	=
TYPE	= WELL
SUBTYPE	= VELOCITY_RPT
DESCRIPTION	= Time Converted Velocity Report
REMARKS	=
DATE_CREATED	= 6/01/89
DATE_RECEIVED	= 30/08/89
W_NO	= W984
WELL_NAME	= Roundhead-1
CONTRACTOR	= Schlumberger
CLIENT_OP_CO	= ESSO

(Inserted by DNRE - Vic Govt Mines Dept)