BHP

LOCH ARD-1, VIC/P31
Well Completion Report
Basic

DEPT. NAT. RES & ENV
PE900438

LOCH ARD-1, VIC/P31

BASIC WELL COMPLETION REPORT

VOL. 1

PREPARED BY: E.SMITH
OPERATIONS T.A.

70354_1.WCR

DATE: August, 1994

BHP PETROLEUM PTY. LTD.
A.C.N. 006 918 832

PETROLEUM DIVISION

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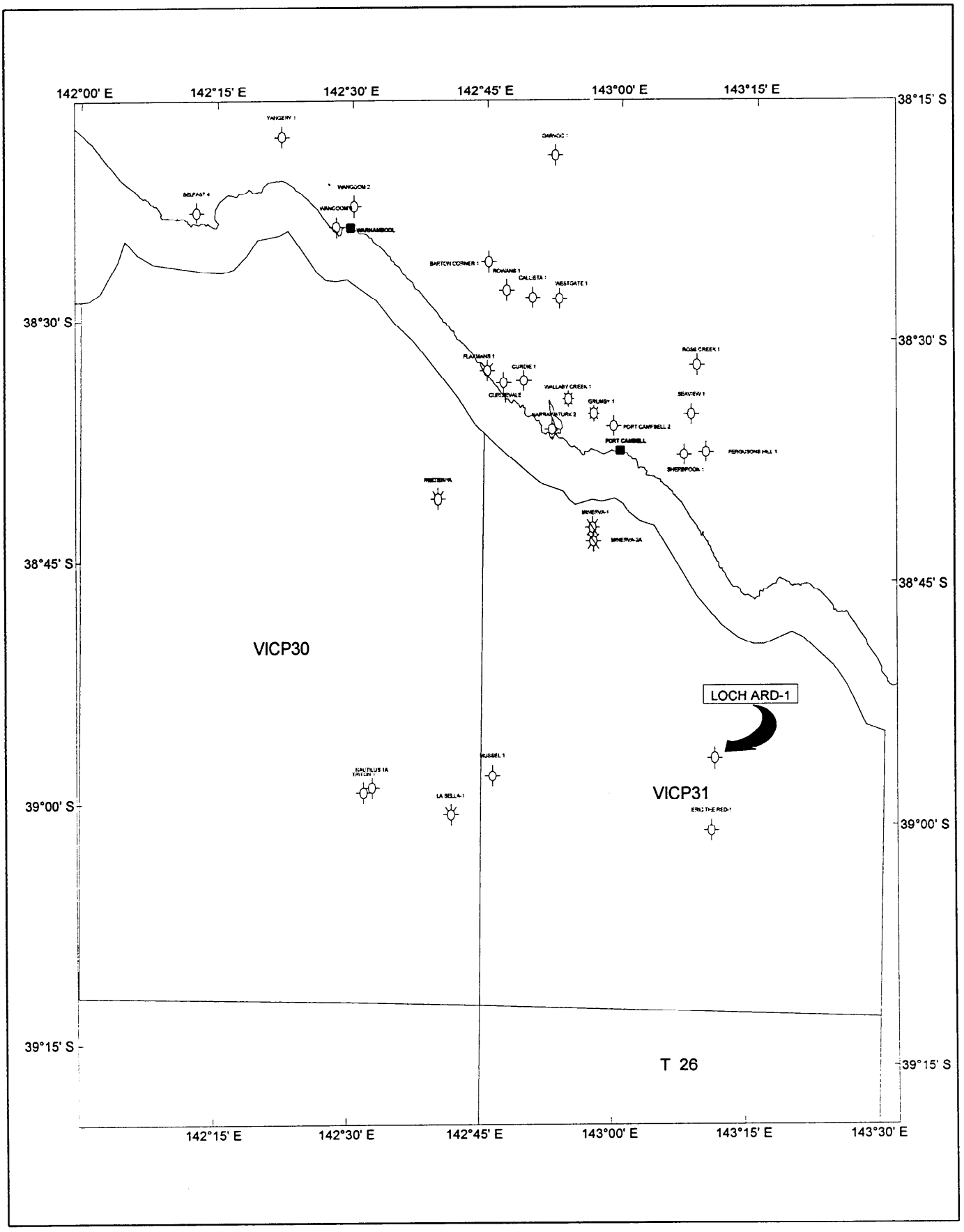
Loch Ard - 1
Location Map



PETROLEUM DIVISION

1

1. WELL SUMMARY SHEET

Well:	Loch Ard-1
Permit:	VIC/P31
Well Path:	Vertical
Planned Location:	Lat: 38^0 55' 54.66" South Long: 143^0 10' 55.16" East
Actual Location:	Lat: 38^0 55' 54.717" South Long: 143^0 10' 55.156" East East: 689 133.62 North: 5 688 505.6 AGD 84, CM 141^0 East
Seismic Reference:	Line:OH91-205 SP: 1490
Elevation:	RT to MSL 25.3 m
Water Depth:	74.7 (MSL to Seabed)
Total Depth	Driller: 1397 mRT 1397 mTVD
Rig on Location:	17 October 1993, 1400 hours
Spud Date:	19 October 1993, 0015 hours
Reached TD:	27 October 1993, 0830 hours
Rig Released:	1 November 1993, 0830 hours
Total Rig Days:	15 days 00.0 hours
Well Status:	Dry Hole - Plugged and Abandoned
Operator:	BHP Petroleum Pty Ltd
Rig Name:	Byford Dolphin
Drilling Contractor:	Dolphin Drilling
Actual Well Cost:	$2.958M (from cost control)

PETROLEUM DIVISION

2. FINAL DRILLING REPORT

PETROLEUM DIVISION

FINAL DRILLING REPORT

BHP PETROLEUM PTY. LTD.

PERMIT: VIC/P31

LOCH ARD-1

FEBRUARY 1994

BHP Petroleum

DISTRIBUTION LIST

LOCH ARD-1

Exploration	2 copies (1 copy unbound for distribution to partners and government)
Drilling - Well File	1 copy Original
Exploration Information Centre	1 copy

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SECTION 1

1.0 WELL DATA

LOCH ARD-1

Well	:	LOCH ARD-1
Permit	:	VIC P31
Designation	:	EXPLORATION
Operator	:	BHP PETROLEUM PTY. LTD.
Rig	:	BYFORD DOLPHIN
Type	:	SEMISUBMERSIBLE
Drilling Contractor	:	DOLPHIN DRILLING
Water Depth	:	74.7m
RT Elevation	:	25.3m
Total Depth	:	1397mMD
		1397mTVD
Final Surface Location	:	Lat S 38° 55' 54.717"
		Long E 143° 10' 55.156"
		Easting 689 133.6
		Northing 5 688 505.6
Location Reference Datum	:	AMG ZONE 54, C.M. 141°E.
Commencement Date	:	0830 hrs, 17 October 1993
Rig on Location	:	1400 hrs, 17 October 1993
Well Spudded	:	0015 hrs, 19 October 1993
TD Date	:	0830 hrs, 27 October 1993
Drilling Days to TD	:	8 Days, 8.25 hours
Rig Released	:	0830 hrs, 1 November 1993
Total Well Duration	:	15 Days, 0 hours
Status	:	ABANDONED

SERVICE	CONTRACTOR
CASING RUNNING	WEATHERFORD
CEMENTING	HALLIBURTON
CORING	DIAMANT BOART
DIRECTIONAL	HALLIBURTON
DIVING/ROV	DRILL SUPPORT
DRILLING FLUIDS	INTEQ
ELECTRIC LOGGING	SCHLUMBERGER
HELICOPTERS	LLOYD HELICOPTERS
JARS & SHOCK SUBS	MARETECH
MUD LOGGERS	INTEQ
MWD	INTEQ
ROLLER REAMERS	GEARHART UNITED
SOLIDS CONTROL	OILTOOLS
STANDBY VESSEL	SWIRE PACIFIC
SUPPLY VESSEL	AOS
SUPPLY VESSEL	TIDEWATER
WEATHER	OCEAN ROUTES
WELL TESTING	HALLIBURTON RESERV
WELLHEAD	DRILQUIP
WELLHEAD SEVERANCE	AUSTOIL

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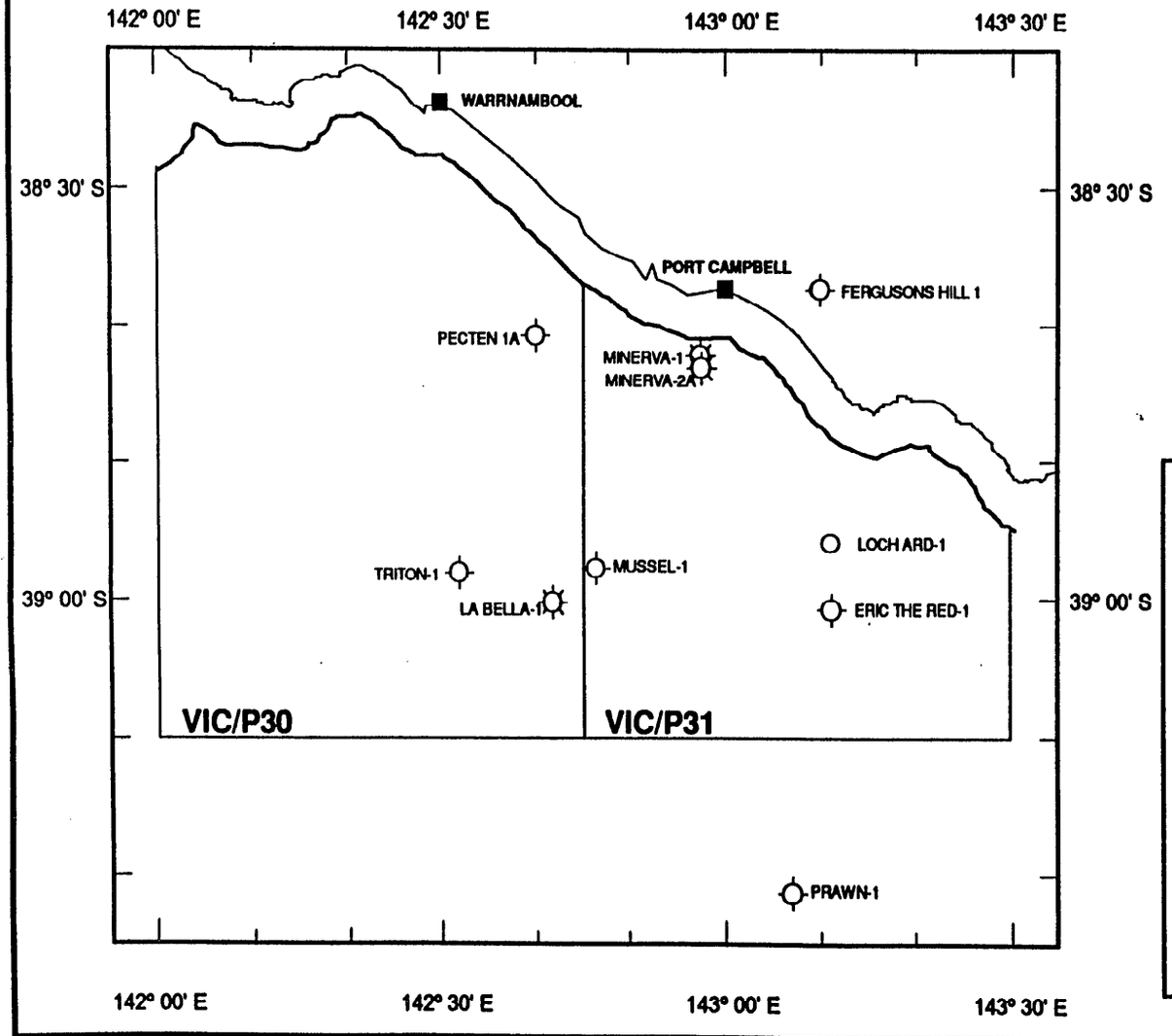
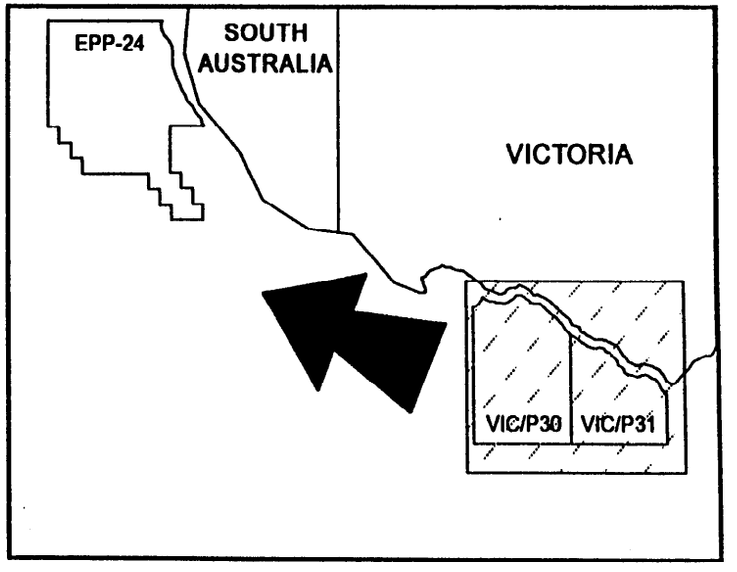
FINAL DRILLING REPORT

1.2 LOCATION MAP

LOCH ARD-1



Permit No.	:	VIC/P31
Rig	:	BYFORD DOLPHIN
Latitude	:	38° 55' 54.717" S
Longitude	:	143° 10' 55.156" E



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LCHD1 / PE900438 / P16

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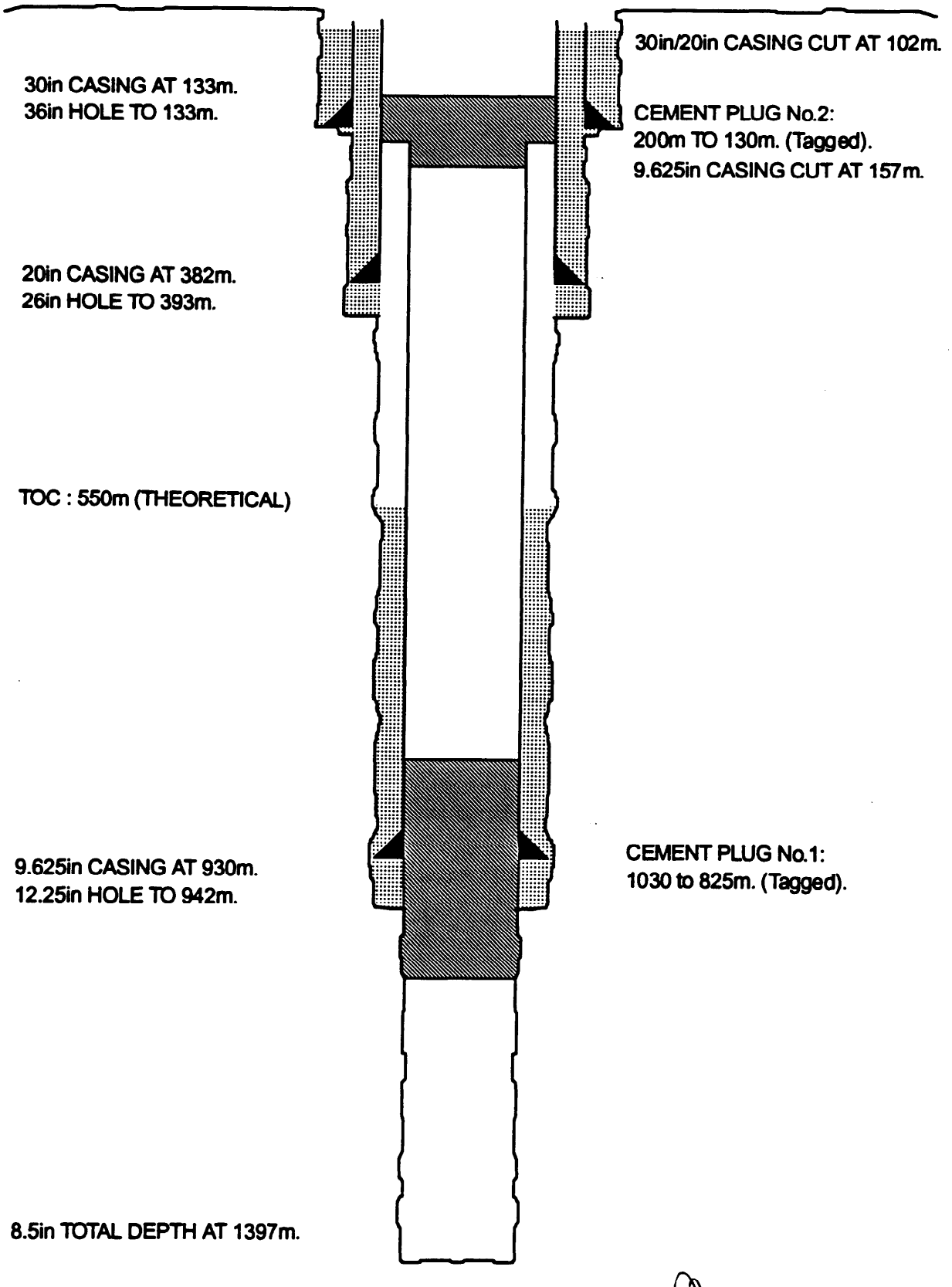
FINAL DRILLING REPORT

1.3 WELL SCHEMATIC

LOCH ARD-1

ALL DEPTHS RT BYFORD DOLPHIN



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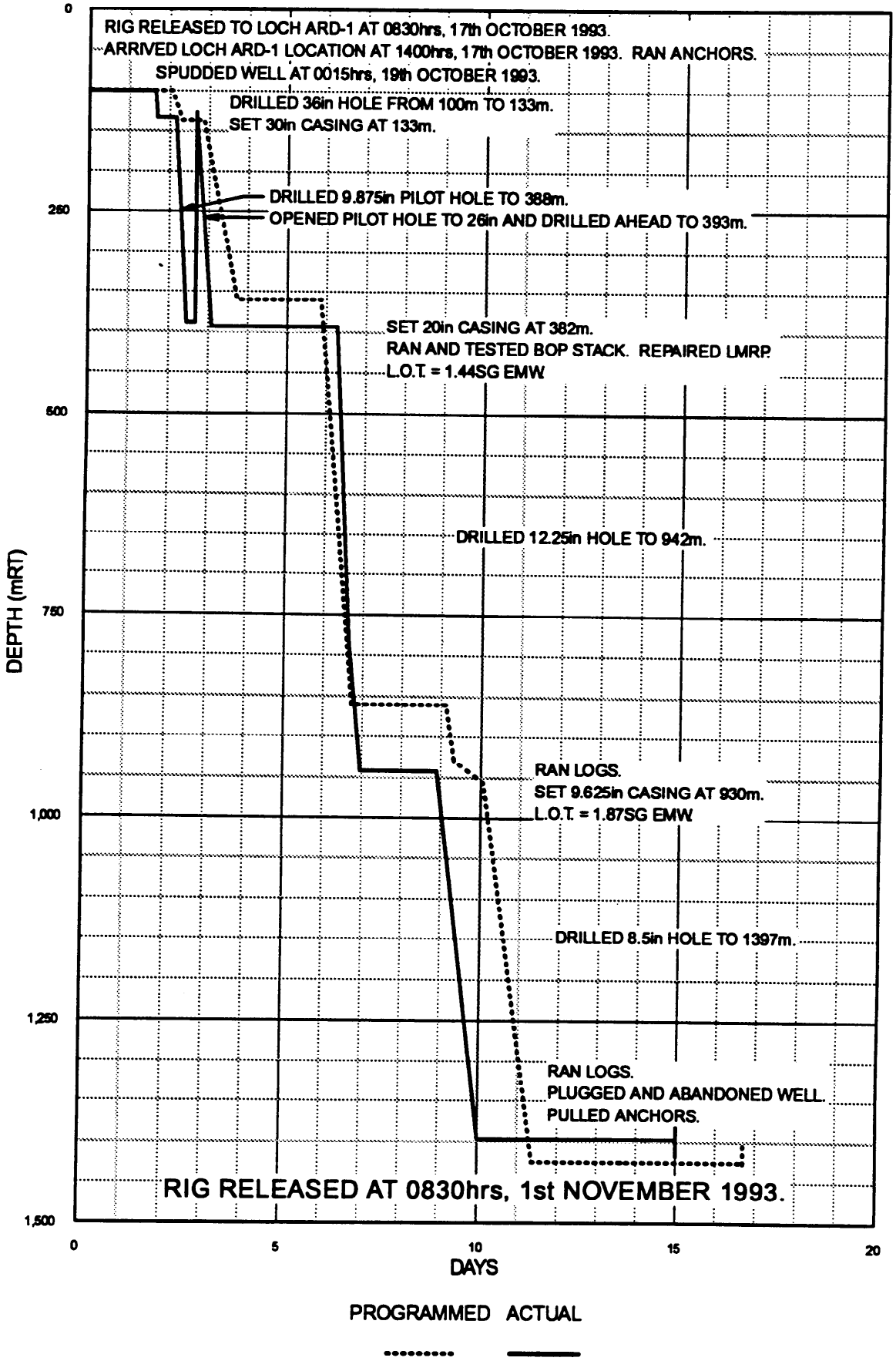
FINAL DRILLING REPORT

1.4 TIME vs DEPTH CURVE

LOCH ARD-1



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SECTION 2

The Byford Dolphin was released from Minerva-2A at 0830hrs, 17th October 1993 and the first anchor was dropped at Loch Ard-1 at 1400hrs on the same day. All anchors were run and pretensioned to 150 tonne.

Loch Ard-1 was spudded at 0015hrs, 19th October 1993 and the 36in hole was drilled from 100m to 133m. The 30in casing was set at 133m and cemented back to the seafloor. A 9.875in shallow gas pilot hole was drilled to a depth of 388m. No gas indications were observed and the hole was opened to 26in to a depth of 393m.

The 20in casing was run, set at 382m and cemented back to the seafloor. The BOP stack was run and pressure tested. During testing, a leak was detected at the LMRP connector and the LMRP was pulled to surface. The AX gasket was changed and the LMRP rerun, however the leak was still present and the ROV was used to install a double resilient gasket. The BOP stack was subsequently successfully pressure tested.

The 12.25" hole was drilled from 393m to 396m and a LOT was conducted to 1.44SG EMW. The 12.25" hole was drilled from 396m to 942m. On completion of Suite No.1 wireline logs, the 9.625in casing was run and cemented at 930m.

The BOP stack was pressure tested and 8.5in hole was drilled from 942m to 945m. A LOT was conducted to 1.87SG EMW. The 8.5in hole was drilled from 945m to a final total depth of 1397m and Suite No.2 wireline logs were run. On completion of logging, the well was plugged and abandoned and the rig released at 0830hrs, 1st November 1993.

Date	Day No.	Days From Spud	From	To	Hours	Daily Operations
17/10/93	1	0.00	08:30	14:00	5.50	ON TOW FROM MINERVA-2A TO LOCH ARD-1.
			14:00	24:00	10.00	RAN ANCHORS AS FOLLOWS: RIG: No.6 : ON BOTTOM AT 1400hrs. BONAVISTA: No.10: PENNANT PASSED AT 1545hrs, ON BOTTOM AT 1903hrs. CHANGED OUT DAMAGED SHACKLE. No.7 : PENNANT PASSED AT 2100hrs, ON BOTTOM AT 2220hrs. DAMAGED SHACKLE.
18/10/93	2		00:00	15:00	15.00	RAN ANCHORS AS FOLLOWS: BONAVISTA: No.1 : PENNANT PASSED AT 2335hrs,(17/10). ON BOTTOM AT 0018hrs. No.2 : PENNANT PASSED AT 0100hrs, ON BOTTOM AT 0155hrs. No.5 : PENNANT PASSED AT 0243hrs, ON BOTTOM AT 0325hrs. No.4 : PENNANT PASSED AT 0413hrs, ON BOTTOM AT 0518hrs. No.3 : PENNANT PASSED AT 0554hrs, ON BOTTOM AT 0649hrs. No.11: PENNANT PASSED AT 0800hrs, ON BOTTOM AT 0855hrs. FAR SWORD: OFF TOW BRIDLE AT 0052hrs. No.8 : PENNANT PASSED AT 0123hrs, ON BOTTOM ON BOTTOM AT 0226hrs. ANCHOR SLIPPING. No.1 : (RERUN) PENNANT PASSED AT 0630hrs, ON BOTTOM AT 0715hrs. No.9 : PENNANT PASSED AT 0717hrs, ON BOTTOM AT 0810hrs. No.12: PENNANT PASSED AT 1015hrs, ON BOTTOM AT 1422hrs. CHANGED OUT PENNANT.
			15:00	16:00	1.00	POSITIONED RIG 32m ON A BEARING OF 20° FROM INTENDED LOCATION.
			16:00	18:30	2.50	PRE-TENSIONED ANCHORS TO 150t.
			18:30	22:30	4.00	BALLASTED DOWN.
			22:30	24:00	1.50	COMPLETED MIXING SPUD MUD, JUMPED ROV AND RIH WITH 36in BHA.
19/10/93	3	1.00	00:00	00:15	0.25	CONTINUED RIH WITH 36in BHA.
			00:15	01:30	1.25	TAGGED SEABED AT 100m. DRILLED 36in HOLE FROM 100m TO 133m. PUMPED 50bbl GUAR GUM PILLS EVERY HALF STAND.
			01:30	02:00	0.50	SWEPT HOLE WITH 75bbl GUAR GUM AND 150bbl SEAWATER. DISPLACED HOLE TO 145bbl GUAR GUM.

Date	Day No.	Days From Spud	From	To	Hours	Daily Operations
19/10/93	3	1.00	02:00	02:30	0.50	DROPPED TOTCO AND POH TO 125m. RETRIEVED TOTCO - MISRUN. RIH TO BOTTOM.
			02:30	02:45	0.25	TAGGED BOTTOM AT 133m. NO FILL. CIRCULATED 150bbl SEAWATER AND DISPLACED HOLE TO 220bbl HI-VIS.
			02:45	03:00	0.25	DROPPED TOTCO.
			03:00	04:00	1.00	POH TO SURFACE. RETRIEVED TOTCO 0°.
			04:00	06:00	2.00	RIGGED AND RAN 3 JOINTS, GRADE 'B' 30in CASING. MOVED PGB TO BEAMS. RIH AND LATCHED 30in HOUSING INTO PGB. FILLED CASING AT SEALEVEL. STABBED INTO 36in HOLE WITH ROV ASSISTANCE AND LANDED CASING AT 133m.
			06:00	07:00	1.00	MADE UP CEMENT HOSE AND TESTED LINES TO 2000psi. CIRCULATED CASING. CEMENTED CASING WITH 672sx, 1.9 SG CLASS 'G' CEMENT WITH 2% CaCl2 BWOC. DISPLACED SLURRY WITH 34bbl
			07:00	09:00	2.00	WAITED ON CEMENT.
			09:00	10:00	1.00	BACKED OUT 30in RUNNING TOOL. POH AND LAID OUT SAME.
			10:00	12:00	2.00	RIH WITH 9.875in BHA. TAGGED CEMENT AT 127m.
			12:00	12:45	0.75	DRILLED CEMENT, SHOE AND RAT HOLE TO 134m.
			12:45	13:00	0.25	DRILLED 9.875in PILOT HOLE FROM 134m TO 136m.
			13:00	14:00	1.00	TORQUE WRENCH ON PIPE HANDLER NOT OPERATING. CHANGED OUT SHUTTLE VALVE.
			14:00	19:30	5.50	CONTINUED DRILLING 9.875in PILOT HOLE FROM 136m TO 388m. PUMPED 20bbl MUD EVERY HALF STAND. HOLE TIGHT FROM 330m TO 380m. (MAX. OVERPULL 15kips).
			19:30	20:00	0.50	SWEPT 50bbl GUAR GUM AND CIRCULATED BOTTOMS UP.
			20:00	21:00	1.00	POH TO SURFACE.
			21:00	24:00	3.00	LAID OUT 36in HOLE OPENER. MADE UP 26in HOLE OPENER AND RIH TO WELLHEAD. (PICKED UP 2x8in DRILL COLLARS, JARS AND PONY DRILL COLLAR). ATTEMPTED TO STAB INTO WELLHEAD. TWO GUIDE ROPES BROKEN - RIGGED UP TO RUN TWO ARM GUIDE.
20/10/93	4	2.00	00:00	01:00	1.00	INSTALLED TWO ARM GUIDE. STABBED IN WITH ROV ASSISTANCE AND RIH TO TOP OF CEMENT AT 127m.
			01:00	11:00	10.00	CLEANED OUT SHOE AND DRILLED 26in HOLE FROM 133m TO 393m. SWEPT HOLE WITH 40bbl GUAR GUM EVERY HALF STAND.
			11:00	11:45	0.75	SWEPT HOLE WITH 350bbl SEAWATER AND 375bbl GUAR GUM. SPOTTED 325bbl HI-VIS GEL MUD.
			11:45	12:00	0.25	DROPPED TOTCO SURVEY.
			12:00	13:00	1.00	POH TO SHOE. HOLE CONDITION GOOD. NO DRAG.
			13:00	14:00	1.00	RIH TO 393m.

Date	Day No.	Days From Spud	From	To	Hours	Daily Operations
20/10/93	4	2.00	14:00	15:00	1.00	SWEPT HOLE WITH 350bbl SEAWATER, 750bbl HI-VIS AND SPOTTED 300bbl KCL.
			15:00	16:45	1.75	POH AND RECOVERED SURVEY (0.5°) AT SURFACE AND LAID OUT 26in HOLE OPENER.
			16:45	21:00	4.25	RIGGED UP AND RAN 25 JOINTS OF 20in, 94lb/ft X-52 CASING.
			21:00	22:00	1.00	PICKED UP 18.75in WELLHEAD AND RIH WITH LANDING STRING. LANDED AND APPLIED 50kips OVERPULL. WELLHEAD AT 96.1m. SHOE AT 382m.
			22:00	22:30	0.50	CIRCULATED HOLE WITH 350bbl SEAWATER AT 100gpm AND 500psi.
			22:30	23:00	0.50	RIGGED UP HALLIBURTON AND TESTED LINE TO 2000psi. PROBLEM WITH VALVE ACTUATOR ON LIQUID ADDITIVE SYSTEM. CONTINUED CIRCULATING WITH RIG PUMP.
			23:00	24:00	1.00	TESTED LINES TO 2000psi. MIXED AND PUMPED LEAD: 638sx 1.5SG, CLASS 'G' CEMENT WITH 190bbl MIXWATER AND 0.45gps ECONOLITE. TAIL: 756sx 1.9SG, CLASS 'G' CEMENT WITH 90bbl MIXWATER. SLURRY DISPLACED WITH 323bbl SEAWATER.
21/10/93	5	3.00	00:00	01:00	1.00	CONTINUED CEMENTING 20in CASING.
			01:00	02:00	1.00	RIGGED OUT CEMENT HOSE. BACKED OUT RUNNING TOOL AND POH (STRAPPED OUT - WELLHEAD AT 96m). LAID OUT RUNNING TOOL.
			02:00	04:30	2.50	RIGGED UP AND RAN BOP STACK.
			04:30	05:00	0.50	RECTIFIED ELECTRICAL PROBLEM WITH BOP CRANE.
			05:00	13:30	8.50	CONTINUED RUNNING BOP STACK. TESTED CHOKE AND KILL LINES TO 500/5000psi PRIOR TO RUNNING SLIP JOINT.
			13:30	16:45	3.25	SECURED CHOKE AND KILL LINES. LANDED BOP's AT 1435hrs. APPLIED 50kips OVERPULL AND TESTED CONNECTOR TO 500psi. NIPPLED UP DIVERTER AND RIGGED DOWN.
			16:45	17:30	0.75	RIH WITH TEST TOOL.
			17:30	19:30	2.00	PRESSURE TESTED BOP'S: CHOKE AND KILL LINES, KILL VALVES AND MIDDLE AND UPPER PIPE RAMS TO 500/5000psi.
			19:30	22:30	3.00	ATTEMPTED TO TEST BOTH ANNULARS. NOT ABLE TO HOLD PRESSURE. VERIFIED TEST PLUG AGAINST MIDDLE PIPE RAMS - OK. SUSPECTED LEAK AT LMRP. JUMPED ROV. DISPLACED 30bbl MUD. MONITORED ANNULAR INTEGRITY WITH TRIP TANK AND RETESTED LOWER ANNULAR. VISIBLE LEAK AT LMRP CONNECTOR.
			22:30	23:00	0.50	POH WITH TEST PLUG. (FLUSHED RISER WHILE POH)
			23:00	24:00	1.00	RIGGED UP TO PULL LMRP. UNLATCHED AT 2355hrs.

Date	Day No.	Days From Spud	From	To	Hours	Daily Operations
22/10/93	6	4.00	00:00	06:30	6.50	PULLED LMRP FOR SUSPECTED LEAKING AX GASKET. ROV INSPECTED SEALING FACE WHILE PULLING TO SURFACE - APPEARED TO BE IN GOOD CONDITION.
			06:30	08:00	1.50	REMOVED AX GASKET FROM LMRP. VISIBLE EVIDENCE OF WASHING ON UPPER LIP OF GASKET. SEALING FACE ON LMRP APPEARED TO BE OK.
			08:00	09:30	1.50	INSTALLED NEW AX GASKET AND TESTED ON SURFACE STUMP TO 500/5000psi - OK.
			09:30	10:00	0.50	REMOVED TEST AX GASKET AND INSTALLED NEW ONE.
			10:00	13:30	3.50	RIH WITH LMRP. CHECKED AX RING WITH ROV AND LANDED LMRP AT 1245hrs. TESTED LATCH WITH 30 kips OVERPULL AND RIGGED DOWN.
			13:30	16:00	2.50	RIH WITH TEST PLUG. TESTED CHOKE LINE/MPR/IK -OK. TESTED LOWER ANNULAR/IK - TEST FAILED. PUMPED 30bbl MUD AND RETESTED ANNULAR. VISIBLE LEAK OBSERVED WITH ROV. POH WITH TEST TOOL AND DISPLACED MUD FROM RISER.
			16:00	17:30	1.50	RIGGED UP AND PULLED LMRP ABOVE BOP. MOVED RIG 3m AND RELEASED AX RING. ROV CHECKED SEALING SURFACE - OK.
			17:30	19:30	2.00	PULLED ROV TO SURFACE AND PREPARED TO RUN DOUBLE RESILIENT SEAL. PICKED UP SAME AND JUMPED ROV.
			19:30	21:30	2.00	INSTALLED SEAL AND REPOSITIONED RIG. LANDED LMRP AT 2050hrs. TESTED LATCH WITH 30kips. RIGGED DOWN.
			21:30	22:30	1.00	RIH WITH TEST PLUG AND TESTED CHOKE LINE/MPR/IK TO 500/5000psi-OK. TESTED LOWER ANNULAR AND CONNECTOR TO 500/3500psi - OK.
			22:30	24:00	1.50	TESTED BOP's; VALVES AND LPR TO 500/5000psi, AND LOWER ANNULARS TO 500/3500psi.
23/10/93	7	5.00	00:00	01:30	1.50	CONTINUED TESTING BOP's. VALVES AND RAMS TO 500/5000psi; UPPER ANNULAR TO 500/3500psi. TESTED ON YELLOW POD, REMOTE TEST ON BLUE POD.
			01:30	02:00	0.50	POH WITH TEST PLUG. LAID OUT SAME.
			02:00	02:30	0.50	PICKED UP AND RIH WITH NOMINAL SEAT PROTECTOR. TESTED SHEAR RAMS WHILE RIH TO 500/1000psi. (1.5bbl). SET SEAT PROTECTOR AND POH.
			02:30	04:30	2.00	RIH WITH 17.5in BHA. TAGGED SOFT CEMENT AT 366m, FIRM CEMENT AT 371m.
			04:30	07:00	2.50	DRILLED OUT CEMENT AND SHOE. CLEANED OUT RAT HOLE TO 393m. CIRCULATED TO KCl MUD WHILE DRILLING OUT SHOE.
			07:00	08:00	1.00	CIRCULATED BOTTOMS UP AND CLEANED HOLE. SLUGGED PIPE.

Date	Day No.	Days From Spud	From	To	Hours	Daily Operations
23/10/93	7	5.00	08:00	10:00	2.00	POH. LAID OUT 17.5in BIT AND 9.5in DRILL COLLARS.
			10:00	11:00	1.00	MADE UP 12.25in BHA AND RIH.
			11:00	11:30	0.50	CALIBRATED MWD.
			11:30	15:00	3.50	CONTINUED RIH WITH 12.25in BHA. PICKED UP STRING REAMER, STABILISER AND 5 x 8in DRILL COLLARS. (TESTED MWD AT SURFACE)
			15:00	15:30	0.50	DRILLED 12.25in HOLE FROM 393m TO 396m. CIRCULATED HOLE CLEAN.
			15:30	16:30	1.00	PULLED BACK INTO SHOE AND CONDUCTED LOT TO 210psi WITH 1.06SG MW. EMW = 1.44SG. RIH TO 396m.
			16:30	24:00	7.50	DRILLED 12.25in HOLE FROM 396m TO 786m. FLOW CHECKED ON CONNECTIONS.
24/10/93	8	6.00	00:00	03:00	3.00	DRILLED 12.25in HOLE FROM 786m TO 860m. FLOW CHECKED ON CONNECTIONS.
			03:00	04:00	1.00	CIRCULATED BOTTOMS UP AT PROGNOSED CASING DEPTH. FORMATION PREDOMINANTLY SANDSTONE WITH CLAYSTONE STRINGERS.
			04:00	07:30	3.50	DRILLED 12.25in HOLE FROM 860m TO 942m. FLOW CHECKED ON CONNECTIONS.
			07:30	08:30	1.00	CIRCULATED BOTTOMS UP.
			08:30	09:00	0.50	FLOW CHECKED. SLUGGED PIPE AND PULLED 6 STANDS TO 770m. MAXIMUM DRAG 50kip. HOLE SWABBING. FLOW CHECKED - OK. PIPE HELD UP ATTEMPTING TO RIH. WORKED FREE.
			09:00	10:00	1.00	REAMED BACK TO BOTTOM FROM 770m TO 942m.
			10:00	11:00	1.00	CIRCULATED BOTTOMS UP. MAXIMUM GAS 0.04%.
			11:00	12:30	1.50	FLOW CHECKED. POH WET TO 645m, MAXIMUM DRAG 30 kip. HOLE TAKING CORRECT VOLUME. SLUGGED PIPE AND CONTINUED POH TO 600m - MAXIMUM DRAG 30kip. HOLE SWABBING. CIRCULATED BOTTOMS UP AT 600m. NO GAS.
			12:30	13:00	0.50	PUMPED OUT OF HOLE FROM 600m TO 20in SHOE. (TIGHT AT 506m. HOLE PACKED OFF.)
			13:00	14:30	1.50	FLOW CHECKED AT SHOE FOR 10mins AND POH. DUMPED MWD MEMORY AND RACKED BACK SAME.
			14:30	19:00	4.50	RIGGED UP SCHLUMBERGER FOR SUITE No.1 LOGS. RUN No.1: SONIC-MSFL-DLT-GR-AMS-TCC.
			19:00	22:30	3.50	RUN No.2: FMS-GPIT-GR.
			22:30	24:00	1.50	RUN No.3: 30 SHOT CST.
25/10/93	9	7.00	00:00	01:00	1.00	RUN No.3: 30 SHOT CST - 100% RECOVERY. RIGGED DOWN SCHLUMBERGER.
			01:00	02:30	1.50	MADE UP HANGER, PACKOFF AND PLUGS AND RACKED IN DERRICK.
			02:30	05:00	2.50	RIH FOR WIPER TRIP. HELD UP AT 587m. WORKED

Date	Day No.	Days From Spud	From	To	Hours	Daily Operations
25/10/93	9	7.00				TIGHT HOLE TO 596m. CONTINUED RIH TO TOTAL DEPTH. NO FILL.
			05:00	06:30	1.50	CIRCULATED BOTTOMS UP.
			06:30	08:30	2.00	FLOWCHECKED AND POH.
			08:30	09:00	0.50	MADE UP CEMENT HEAD TO STAND OF DRILLPIPE AND RACKED BACK.
			09:00	09:30	0.50	RIH AND RECOVERED BORE PROTECTOR.
			09:30	13:30	4.00	RIGGED UP AND RAN 70 JOINTS 9.625in 47lb/ft P110 NEW VAM CASING, PLUS HANGER. LANDED CASING SHOE AT 930m.
			13:30	14:00	0.50	CIRCULATED 250bbl MUD.
			14:00	15:30	1.50	RIGGED UP AND PRESSURE TESTED CEMENT LINES TO 3000psi. PUMPED 20bbl DRILLWATER SPACER AHEAD. DROPPED BALL AND SHEARED AT 1500psi. MIXED AND PUMPED CEMENT AS FOLLOWS: LEAD SLURRY: 100sx AT 1.5SG WITH 0.45gal/sx ECONOLITE IN 30bbl MIXWATER. TAIL SLURRY: 300sx AT 1.9SG NEAT IN 36bbl MIXWATER. DROPPED DART AND SHEARED AT 1500psi. DISPLACED WITH 17.5bbl DRILLWATER AND 184bbl MUD. PLUG DID NOT BUMP.
			15:30	16:00	0.50	SET PACKOFF AND PRESSURE TESTED TO 3500psi.
			16:00	17:00	1.00	PRESSURE TESTED BOPs TO 500/2500psi.
			17:00	18:00	1.00	SHEARED RUNNING TOOL WITH 50kips OVERPULL AND POH. TESTED SHEAR RAMS TO 500/1500psi. LAID OUT RUNNING TOOL AND CEMENT HEAD.
			18:00	18:30	0.50	SET 9.625in WEAR BUSHING.
			18:30	21:00	2.50	LAID OUT 12.25in BHA.
			21:00	24:00	3.00	MADE UP 8.5in BHA,TESTED MWD AND RIH.
26/10/93	10	8.00	00:00	02:00	2.00	CONTINUED TO MAKE UP 8.5in BHA AND RIH.
			02:00	05:45	3.75	TAGGED CEMENT AT 897m. DRILLED PLUGS AND SHOETRACK CEMENT WITH SEAWATER AND DISPLACED TO MUD AT SHOE. CLEANED OUT RATHOLE AND SURGED FOR JUNK AT TOTAL DEPTH. DIFFICULTY IN DRILLING BOTH PLUGS (1.5hrs+).
			05:45	06:00	0.25	DRILLED 8.5in HOLE FROM 942m TO 945m.
			06:00	07:00	1.00	CIRCULATED HOLE CLEAN.
			07:00	07:30	0.50	POH INTO SHOE AND PERFORMED LOT TO 1.87SG EMW (1050psi, 1.08SG MUD).
			07:30	24:00	16.50	DRILLED 8.5in HOLE FROM 945m TO 1223m. HOLE CONDITION GOOD.
27/10/93	11	9.00	00:00	08:30	8.50	DRILLED 8.5in HOLE FROM 1223m TO 1397m.
			08:30	10:30	2.00	CIRCULATED HOLE CLEAN.
			10:30	12:30	2.00	FLOWCHECKED. PULLED 5 STANDS AND PUMPED SLUG.CONTINUED TO POH; 50kips OVERPULL AT 1197m. HOLE NOT TAKING CORRECT VOLUME. PUMPED OUT OF HOLE FROM 1197m (MAXIMUM OVERPULL OF

Date	Day No.	Days From Spud	From	To	Hours	Daily Operations
27/10/93	11	9.00				20kips) TO SHOE.
			12:30	13:30	1.00	RIH. WASHED AND REAMED FROM 1042m TO 1057m AND FROM 1386m TO 1397m.
			13:30	14:00	0.50	CIRCULATED HOLE CLEAN.
			14:00	17:30	3.50	PUMPED SLUG. POH. FLOWCHECKED AT CASING SHOE AND BOP. LAID OUT BIT AND BHA.
			17:30	18:00	0.50	RIGGED UP SCHLUMBERGER FOR SUITE No.2 LOGS.
			18:00	22:00	4.00	RUN No.1: AS-DLL-MSFL-GR-AMS LOGGERS DEPTH = 1394.5m. BHST = 49°C.
			22:00	24:00	2.00	RUN No.2 : FMS-LDT-CNL-GR-AMS BHST = 52°C.
28/10/93	12	10.00	00:00	01:00	1.00	CONTINUED RUN No.2: FMS-LDT-CNT-GR-AMS
			01:00	11:00	10.00	RUN No.3: VSP.
			11:00	15:00	4.00	RUN No.4: CST (100% RECOVERY). HOLE TOOK TOTAL OF 8bbl.
			15:00	15:30	0.50	RIGGED DOWN SCHLUMBERGER.
			15:30	16:45	1.25	RIH WITH MULESHOE ON DRILLPIPE TO 1030m.
			16:45	17:00	0.25	CIRCULATED.
			17:00	17:30	0.50	RIGGED UP CEMENT LINES AND PRESSURE TESTED LINES TO 2000psi. PUMPED 20bbl SEAWATER. MIXED AND PUMPED PLUG No.1 FROM 1030m TO 830m, WITH 336sx CEMENT SLURRY AT 1.9SG IN 40bbl MIX SEAWATER. DISPLACED WITH 5bbl SEAWATER AND 40bbl MUD.
			17:30	18:00	0.50	POH TO 830m.
			18:00	19:00	1.00	REVERSE CIRCULATED TWICE DRILLPIPE VOLUME.
			19:00	23:00	4.00	POH AND LAID OUT EXCESS DRILLPIPE AND 6.5in DRILL COLLARS.
			23:00	24:00	1.00	RIH WITH DRILLPIPE TO TAG CEMENT.
29/10/93	13	11.00	00:00	01:00	1.00	TAGGED CEMENT AT 825m. POH.
			01:00	01:30	0.50	RECOVERED WEARBUSHING.
			01:30	03:30	2.00	MADE UP 9.625in CASING CUTTER ASSEMBLY AND RIH. CUTTER HANGING UP IN WELLHEAD.
			03:30	04:00	0.50	POH TO CHECK CUTTER.
			04:00	04:30	0.50	FOUND KNIVES EXTENDED. SERVICED CUTTER.
			04:30	05:00	0.50	RIH WITH CUT AND PULL ASSY.
			05:00	07:00	2.00	CUT 9.625in CASING AT 157m (20min). POH AND LAID OUT RECOVERED CASING.
			07:00	07:30	0.50	RIH WITH JETTING SUB TO 200m.
			07:30	08:30	1.00	PUMPED BALANCED PLUG No.2 FROM 200m TO 125m.
			08:30	09:00	0.50	POH TO 125m AND CIRCULATED. JETTED BOP, DISPLACED RISER TO SEAWATER AND FLUSHED
			09:00	09:30	0.50	POH LAYING DOWN PIPE.
			09:30	10:30	1.00	SERVICED AND LAID OUT 9.625in CASING CUTTER.
			10:30	12:00	1.50	LAID OUT EXCESS DRILLPIPE.
			12:00	13:00	1.00	RIH AND TAGGED CEMENT AT 130m, CIRCULATED PIPE CLEAN. POH. LAID OUT EXCESS DRILLPIPE.

Date	Day No.	Days From Spud	From	To	Hours	Daily Operations
29/10/93	13	11.00	13:00	16:00	3.00	RIGGED UP, PULLED AND LAID OUT DIVERTER
			16:00	18:30	2.50	UNLATCHED BOP AND RIGGED DOWN SLIP JOINT.
			18:30	20:00	1.50	LAID OUT SLIP JOINT. PULLED BOP AND LAID OUT RISER JOINTS. BOP ON BEAMS AT 2000hrs.
			20:00	23:00	3.00	LANDED BOP ON TEST STUMP.
			23:00	23:30	0.50	RIGGED DOWN RISER RUNNING GEAR.
			23:30	24:00	0.50	MADE UP 20in AND 30in CUT AND PULL ASSEMBLY.
30/10/93	14	12.00	00:00	02:00	2.00	MADE UP 20in/30in CUT AND PULL ASSEMBLY AND RIH.
			02:00	06:00	4.00	CUT 20in AND 30in CASING AT 102m.
			06:00	08:30	2.50	PULLED CASING FREE WITH 30kips OVERPULL. POH AND LAID OUT WELLHEAD. NOTE: HAD TO WELD PAD EYE TO 30in CASING TO LAY OUT. COULD NOT FIND 18.75in RUNNING TOOL IN CONTAINER.
			08:30	10:00	1.50	LAID OUT 20in/30in CUT AND PULL ASSEMBLY.
			10:00	13:30	3.50	LAID OUT EXCESS DRILLPIPE.
			13:30	14:30	1.00	COMMENCED DEBALLASTING.
			14:30	24:00	9.50	COMPLETED DEBALLASTING RIG AT 1710hrs. COMMENCED ANCHOR HANDLING AS FOLLOWS: BONAVISTA: No.7 : PENNANT PASSED AT 1435hrs, RACKED AT 2355hrs. FARSWORD: No.4 : PENNANT PASSED AT 2000hrs, RACKED AT 2207hrs. No.5 : PENNANT PASSED AT 2215hrs, RACKED AT 0015hrs, 31-OCT-93.
31/10/93	15	13.00	00:00	24:00	24.00	PULLED ANCHORS AS FOLLOWS: BONAVISTA: No.10: PENNANT PASSED AT 0006hrs. ANCHOR RACKED AT 0330hrs. No.11: PENNANT PASSED AT 0346hrs. ANCHOR RACKED AT 0837hrs. No.9 : PENNANT PASSED AT 0844hrs. ANCHOR RACKED AT 1045hrs. No.8 : PENNANT PASSED AT 1144hrs. ANCHOR RACKED AT 1510hrs. No.12: PENNANT PASSED AT 1400hrs. FARSWORD: No.3 : PENNANT PASSED AT 0906hrs. ANCHOR RACKED AT 1100hrs. No.2 : PENNANT PASSED AT 1150hrs. ANCHOR RACKED AT 1412hrs. No.1 : PENNANT PASSED AT 1426hrs. ANCHOR RACKED AT 1935hrs. TOW LINE CONNECTED AT 2045hrs.

Date	Day No.	Days From Spud	From	To	Hours	Daily Operations
01/11/93	16	14.00	00:00	08:30	8.50	COMPLETED PULLING ANCHORS AS FOLLOWS: BONAVISTA: No.12: RACKED AT 0429hrs. BACKLOADED REMAINING BHPP EQUIPMENT. ANCHOR No.6 STILL ON BOTTOM AT 0830hrs. BACKLOADED DOLPHIN EQUIPMENT. RIG RELEASED AT 0830hrs.

SECTION 3

BHP Petroleum

FINAL DRILLING REPORT

3.0 MUD SUMMARY BY HOLE SECTION

LOCH ARD-1

Hole Size (in)	Interval (mRT)	Type	Density (S.G.)		Viscosity (sec/l)		PV (cp)		YP (lbs/100ft^2)		Gels				KCl (%)	Fluid Loss (cc)
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.0	Max.0	Min.10	Max.10		
36"	100 - 133	SEAWATER & HI-VIS	1.07	1.07	80	100	15	20	42	60	35	35	45	50		
9.625"	133 - 388	SEAWATER & HI-VIS	1.07	1.07	80	100	15	20	42	60	35	35	45	50		
26"	133 - 393	SEAWATER & HI-VIS	1.07	1.07	80	100	15	20	42	60	35	35	45	50		
12.25"	393 - 942	KCL PHPA/POLYMER	1.06	1.10	52	52	12	18	22	24	5	7	6	9	7.1-8.6	5.4-7.8
8.5"	942 - 1397	KCL PHPA/POLYMER	1.08	1.10	48	49	12	14	16	25	5	6	5	9	8.2-8.9	4.6-4.8

File: BWM:ESH: LA1_FDRL/2

Checked:

Date: 05-JAN-94

LCHD1 / PE900438 / P31

BHP Petroleum

FINAL DRILLING REPORT

3.1 MUD PROPERTIES RECORD

LOCH ARD-1

Date	Mud Type	Depth (mRT)	Temp. (C°)	Density (S.G.)	Viscosity (sec/l)	PV (cp)	YP (lb/100 ft²)	6 RPM	Gels 0	Gels 10	API WL (ml/30min)	MBT (lb/bbl)	pH	%Solid	%H2O	HGS	LGS	%Sand	Ca+ (mg/L)	Cl- (mg/L)	K+ (mg/L)	%KCl
18/10/93	SEAWATER+HI-VIS	100		1.07	80	15	42	30	35	45		30.0	10.0									
19/10/93		388		1.07	100	20	60	45	35	50		32.0	10.0									
20/10/93		393		1.07	100	20	60		35	50		32.0	10.0									
21/10/93	KCl PHPA POLY.	393		1.06	52	13	24	9	7	9	7.2	8.0	9.5	3.7	96.3	0.90	0.90		260	47000	44000	8.5
22/10/93		393		1.06	52	12	24	7	5	6	7.8	7.0	9.2	3.4	96.6	0.90			280	44000	47000	8.5
23/10/93		520	34	1.08	52	18	24	8	6	8	7	7.0	9.8	5.0	95	0.50	1.50	3.75	360	46000	37000	7.1
23/10/93		786	38	1.10	52	16	22	7	6	8	6.4	7.5	9.4	5.6	94.4	1.00	1.00	1.25	280	50000	44600	8.6
24/10/93		942	37	1.10	52	14	22	7	5	6	5.4	7.5	9.6	6.2	93.8	0.40	2.20	2.50	400	50000	44400	8.5
25/10/93		942		1.08	48	14	25	7	5	6		7.0	9.5	5.0	95	0.40	1.10		380	50000	44400	8.5
26/10/93		995	27	1.10	48	12	16	5	5	5	4.8	7.0	8.6	6.2	93.8	0.40	2.70	0.10	380	47000	36200	7.0
26/10/93		1207	35	1.09	48	14	22	7	6	9	4.8	7.0	9.5	5.6	94.4	0.40	1.30	0.10	260	55000	46500	8.9
27/10/93		1397	36	1.10	49	14	22	7	5	9	4.6	6.5	9.5	6.2	93.8			0.25	280	49000	42600	8.2
28/10/93		1397	25	1.10	49	14	22	7	5	9	4.6	6.5	9.5	6.2	93.8	0.40	2.50	0.25	280	49000	42600	8.2

3.2 MATERIALS CONSUMPTION

LOCH ARD-1

PRODUCT	UNIT SIZE		QUANTITY
ALCOMER 120	25.00	KG	81
BARITE (Bulk)	100.00	LB	574
BENTONITE (Blk)	100.00	LB	527
BIO-LOSE	50.00	LB	32
BIOZAN	50.00	LB	34
CAUSTIC SODA	25.00	KG	7
CITRIC ACID	25.00	KG	5
LIME	20.00	KG	12
MIL-BIO	5.00	GAL	17
MIL-GUAR	25.00	KG	145
MIL-GUAR C	2.00	LB	40
MIL-PAC	25.00	KG	30
MILPARK MD	55.00	GAL	4
NOXYGEN	25.00	KG	1
NOXYGEN L	25.00	KG	37
POT CHLORIDE	1.00	MT	36
POT HYDROXIDE	25.00	KG	10
SODA ASH	25.00	KG	6
SODA BICARB.	25.00	KG	29
WO DEFOAM	20.00	LT	7
XCD POLYMER	25.00	KG	18

ADJUSTED PRODUCT TOTALS

PRODUCT	UNIT SIZE		QUANTITY
ALCOMER 120	25.00	KG	-44
BARITE (Bulk)	100.00	LB	540
BENTONITE	25.00	KG	6
BENTONITE (Blk)	100.00	LB	29
CAUSTIC SODA	25.00	KG	9
KWIK SEAL	18.00	KG	37
LIME	20.00	KG	-5
LIME	25.00	KG	1
MIL-BIO	5.00	GAL	6
MIL-PAC	25.00	KG	8
NOXYGEN L	25.00	KG	-10
POT CHLORIDE	25.00	KG	560
SODA ASH	25.00	KG	34
SODA BICARB.	25.00	KG	-14
WO DEFOAM	20.00	LT	3
XCD POLYMER	25.00	KG	4

36" / 26" HOLE SECTIONS

PRODUCT	UNIT SIZE		QUANTITY
ALCOMER 120	25.00	KG	5
BARITE (Bulk)	100.00	LB	486
BENTONITE	25.00	KG	6
BENTONITE (Blk)	100.00	LB	556
CAUSTIC SODA	25.00	KG	16
CITRIC ACID	25.00	KG	5
MIL-GUAR	25.00	KG	145
MIL-GUAR C	2.00	LB	40
POT CHLORIDE	1.00	MT	3
SODA ASH	25.00	KG	23
WO DEFOAM	20.00	LT	4
XCD POLYMER	25.00	KG	2

12.25" HOLE SECTION

PRODUCT	UNIT SIZE		QUANTITY
ALCOMER 120	25.00	KG	22
BIO-LOSE	50.00	LB	32
BIOZAN	50.00	LB	29
KWIK SEAL	18.00	KG	37
LIME	20.00	KG	5
MIL-BIO	5.00	GAL	10
MIL-PAC	25.00	KG	38
MILPARK MD	55.00	GAL	4
NOXYGEN L	25.00	KG	14
POT CHLORIDE	1.00	MT	22
POT CHLORIDE	25.00	KG	560
SODA ASH	25.00	KG	17
SODA BICARB.	25.00	KG	11
WO DEFOAM	20.00	LT	4

8.5" HOLE SECTION

PRODUCT	UNIT SIZE		QUANTITY
ALCOMER 120	25.00	KG	10
BARITE (Bulk)	100.00	LB	628
BIOZAN	50.00	LB	5
LIME	20.00	KG	2
LIME	25.00	KG	1
MIL-BIO	5.00	GAL	13
NOXYGEN	25.00	KG	1
NOXYGEN L	25.00	KG	13
POT CHLORIDE	1.00	MT	11
POT HYDROXIDE	25.00	KG	10
SODA BICARB.	25.00	KG	4
WO DEFOAM	20.00	LT	2
XCD POLYMER	25.00	KG	20

SECTION 4

BHP Petroleum

FINAL DRILLING REPORT

4.0 BIT RECORD

LOCH ARD-1

Bit No	Run No	Size / Make	Bit Type / Serial No.	Jets / TFA	Depth In / Out	Total Metres	Total Hours	ROP (m/hr)	WOB (klbs)	RPM	Pump gpm / psi	IADC Bit Grading / Comments
1RR1	1	17.5	SS44G	18 18 20 - - -	100	33.0	1.15	28.7	5.0 / 15.0	40 / 100	1050 / 1350	2.2.WT.A.2.I.NO.TD
		SECURITY	500510	0.8	133							WITH 36in BHA
2	2	9.875	S33SF	16 16 16 - - -	134	254.0	5.75	44.2	2.0 / 5.0	100 / 120	530 / 850	2.2.WT.A.2.I.NO.TD
		SECURITY	556792	0.59	388							PILOT HOLE
1RR2	3	17.5	SS44G	18 18 20 - - -	133	260.0	10.00	26.0	5.0 / 20.0	80 / 100	850 / 2200	3.2.WT.A.2.2.NO.TD
		SECURITY	500510	0.8	393							WITH 26in BHA
1RR3	4	17.5	SS44G	18 18 20 - - -	393	0.0	0.00	0.0	5.0 / 15.0	40 / 90	1050 / 1875	2.2.WT.A.3.1.NO.BHA
		SECURITY	500510	0.8	393							DRILLED OUT 20in CASING.
3	5	12.25	ATM11G	16 16 15 - - -	393	549.0	14.00	39.2	5.0 / 35.0	80 / 110	750 / 2600	2.1.WT.A.E.2.NO.LOG
		HUGHES	K185Y	0.57	942							
4	6	8.5	ATM11HG	12 12 12 - - -	942	455.0	25.25	18.0	25.0 / 30.0	120 / 120	400 / 1950	3.3.WT.A.E.1.EC.TD
		HUGHES	M64BG	0.33	1397							

File: LOC1_BIT		Checked:	Date: 30-Dec-93

LCHD1 / PE900438 / P39

BHP Petroleum

FINAL DRILLING REPORT

4.1 BHA SUMMARY — LOCH ARD-1

BHA Name: 1. 36in ROTARY — Depth In: 100 m. — Depth Out: 134 m.

Purpose: DRILL 36in HOLE

Joints	BHA Item	O.D.	Length
1	BIT	17.500	0.42
1	HOLE OPENER	36.000	3.02
1	FLOAT SUB	9.000	0.91
2	DRILL COLLAR	9.500	18.33
1	CROSS OVER	8.000	0.87
7	DRILL COLLAR	8.000	64.48
1	CROSS OVER	6.500	1.52
9	HEVI-WATE DRL PIPE	5.000	80.13
		Total BHA Length :	169.68

BHA Name: 2. 9.875in ROTARY — Depth In: 134 m. — Depth Out: 388 m.

Purpose: DRILL PILOT HOLE

Joints	BHA Item	O.D.	Length
1	BIT	9.875	0.26
1	FLOAT SUB	8.000	1.09
7	DRILL COLLAR	8.000	55.11
1	CROSS OVER	6.500	1.52
9	HEVI-WATE DRL PIPE	5.000	80.13
		Total BHA Length :	138.11

BHA Name: 3. 26in ROTARY — Depth In: 134 m. — Depth Out: 393 m.

Purpose: DRILL 26in HOLE

Joints	BHA Item	O.D.	Length
1	BIT	17.500	0.42
1	HOLE OPENER	26.000	2.41
1	FLOAT SUB	8.000	1.09
2	DRILL COLLAR	9.500	18.33
1	CROSS OVER	8.000	0.87
8	DRILL COLLAR	8.000	73.85
1	DRILLING JARS	8.000	5.62
1	PONY COLLAR	8.000	3.07
2	DRILL COLLAR	8.000	17.92
1	CROSS OVER	6.500	1.52
9	HEVI-WATE DRL PIPE	5.000	80.13
		Total BHA Length :	205.23

BHA Name: 4. 17.5in ROTARY — Depth In: 393 m. — Depth Out: 393 m.

Purpose: DRILL OUT 20in CSG

Joints	BHA Item	O.D.	Length
1	BIT	17.500	0.42
1	FLOAT SUB	8.000	1.09
2	DRILL COLLAR	9.500	18.33
1	CROSS OVER	8.000	0.87
8	DRILL COLLAR	8.000	73.85
1	DRILLING JARS	8.000	5.62
1	PONY COLLAR	8.000	3.07
2	DRILL COLLAR	8.000	17.92
1	CROSS OVER	6.500	1.52
9	HEVI-WATE DRL PIPE	5.000	80.13

File: LOC1_BHA | Checked: | Date: 30-Dec-93

BHP Petroleum

FINAL DRILLING REPORT

4.1 BHA SUMMARY — LOCH ARD-1

Total BHA Length : 202.82

BHA Name: 5. 12.25in ROTARY — Depth In: 393 m. — Depth Out: 942 m.

Purpose: DRILL 12.25in HOLE

Joints	BHA Item	O.D.	Length
1	BIT	12.250	0.32
1	NEAR BIT ROLLER REAMER	12.250	2.44
1	CROSS OVER	7.875	0.53
1	MWD TOOL	8.250	12.35
1	STRING ROLLER REAMER	7.875	2.33
2	DRILL COLLAR	8.000	18.51
1	STRING STABILIZER	12.250	2.10
11	DRILL COLLAR	7.875	101.24
1	DRILLING JARS	8.000	5.62
1	PONY COLLAR	8.000	3.07
2	DRILL COLLAR	8.000	17.92
1	CROSS OVER	6.500	1.52
9	HEVI-WATE DRL PIPE	5.000	80.13
	Total BHA Length :		**248.08**

BHA Name: 6. 8.5in ROTARY — Depth In: 942 m. — Depth Out: 1397 m.

Purpose: DRILL 8.5in HOLE

Joints	BHA Item	O.D.	Length
1	BIT	8.500	0.24
1	JUNK SUB	6.500	0.80
1	NEAR BIT ROLLER REAMER	6.500	1.86
1	CROSS OVER	6.500	0.70
1	MWD TOOL	6.750	12.16
1	STRING ROLLER REAMER	6.500	1.61
2	DRILL COLLAR 6.5IN	6.500	18.21
1	STRING STABILIZER	6.500	1.77
14	DRILL COLLAR 6.5IN	6.500	129.17
1	DRILLING JARS	6.500	5.20
1	PONY COLLAR	6.500	2.70
2	DRILL COLLAR 6.5IN	6.500	18.42
9	HEVI-WATE DRL PIPE	5.000	80.13
	Total BHA Length :		**272.97**

4.2 DEVIATION SURVEYS

LOCH ARD-1

Depth	Angle	Azimuth	Method	Missrun	
134.0	0.00	0.0	Totco Punch	Yes	
134.0	0.00	0.0	Totco Punch		
393.0	0.50	0.0	Totco Punch		
410.0	1.00	298.2	MWD		
557.0	1.00	307.7	MWD		
701.0	0.30	30.0	MWD		
846.5	1.40	155.1	MWD		
929.5	1.50	158.7	MWD		
1046.0	1.20	153.7	MWD		
1161.0	2.10	113.3	MWD		
1279.0	2.50	95.0	MWD		
1397.0	2.90	76.6	MWD		

SECTION 5

BHP Petroleum

FINAL DRILLING REPORT

5.0 CASING REPORT - 30" CONDUCTOR

LOCH ARD-1

Hole Size	: 36 in	Total Depth	: 133 m	Casing Flange / Wellhead	
Weight in Slips	: 40000 lbs	Casing Shoe at	: 132.7 m	Manufacturer	: DRILQUIP
R.T. to Wellhead	: 97.5 m	Top of Casing	: 97.5 m	Model	: SS-10C
		Liner Overlap	: m	Size	: 30 in
				Rating	: 2100 psi

PIPE INFORMATION

Description	Manufacturer	Size	Weight	Grade	Cnd	Threads	Joints	Length	Interval
WELLHEAD	DRILLQUIP	30	456	B-56		SF-60	1	11.98	109.48 - 97.50
INTERMEDIATE CASING	SUMITOMO	30	310	B-56		SF-60	1	11.61	121.09 - 109.48
SHOE JOINT	DAVIS LYNCH	30	310	B-56		SF-60	1	11.61	132.70 - 121.09

HOLE / RUNNING CONDITIONS

Mud Type	: SEAWATER+HI-VIS	Avg. Make Up Torque	:	ft.lbs.	Avg. Drag	:	lbs.
Density	: 1.07 S.G.	RPM	:		Max. Drag	:	lbs.
Viscosity	: 100	Avg. Torque Rot.	:	ft.lbs.	Volume Lost	:	0 bbl
PV / YP	: 20 / 60	Max. Torque Rot.	:	ft.lbs.			

Remarks :

BHP Petroleum

FINAL DRILLING REPORT

5.0 CASING REPORT - 9.625" INTERMEDIATE CASING

LOCH ARD-1

Hole Size	: 12.25 in	Total Depth	: 942 m	Casing Flange / Wellhead	
Weight in Slips	: 110000 lbs	Casing Shoe at	: 929.66 m	Manufacturer	: DRILQUIP
R.T. to Wellhead	: 96.1 m	Top of Casing	: 96.6 m	Model	: SS-10C
		Liner Overlap	: m	Size	: 18.75 in
				Rating	: 10000 psi

PIPE INFORMATION

Description	Manufacturer	Size	Weight	Grade	Cnd	Threads	Joints	Length	Interval
HANGER	DRILQUIP	9.625	47	P-110		NEW VAM	1	6.08	102.68 - 96.60
INTERMEDIATE CASING	SUMITOMO	9.625	47	P-110		NEW VAM	65	766.76	869.44 - 102.68
THREAD LOCKED JOINT	SUMITOMO	9.625	47	P-110		NEW VAM	2	23.93	893.37 - 869.44
FLOAT COLLAR JT	SUMITOMO	9.625	47	P-110		NEW VAM	1	12.16	905.53 - 893.37
THREAD LOCKED JOINT	SUMITOMO	9.625	47	P-110		NEW VAM	1	11.9	917.43 - 905.53
SHOE JOINT	WEATHERFORD	9.625	47	P-110		NEW VAM	1	12.23	929.66 - 917.43

ACCESSORIES INFORMATION

Item	Manufacturer	Number	Spacing	Interval	How Fixed
CENTRALIZER	HALLIBURTON	2	4	917.43 - 929.66	COLLAR
CENTRALIZER	HALLIBURTON	1	6	905.53 - 917.43	COLLAR
CENTRALIZER	HALLIBURTON	1	6	893.37 - 905.53	COLLAR

HOLE / RUNNING CONDITIONS

Mud Type	: KCl PHPA POLY.	Avg. Make Up Torque	: 15000 ft.lbs.	Avg. Drag	:	lbs.
Density	: 1.08 S.G.	RPM	:	Max. Drag	:	lbs.
Viscosity	: 48	Avg. Torque Rot.	: ft.lbs.	Volume Lost	:	0 bbl
PV / YP	: 14 / 25	Max. Torque Rot.	: ft.lbs.			

Remarks : CASING MEASUREMENTS INDICATE LARGER ID AT 8.75" AS COMPARED TO 8.681".
RUNNING STRING:R/T,2XDP,1XPUP DP,3 STANDS HWDP.
NO LOCK RING INSTALLED ON PACKOFF.

5.1 CEMENTING REPORT - 30" CONDUCTOR

LOCH ARD-1

Stage Number	001 OF 001
Slurry Number	001 OF 001
Slurry Type	TAIL SLURRY
Slurry Class	CLASS G
Slurry Description	LOW WATER LOSS
Amount (sacks)	672
Volume (bbl)	138
Yield (ft^3/sx)	1.15
Excess (%)	100
From / To (m)	100 / 133
Density	1.9
Thickening Time (hrs)	3.5
Temp. (°C)	
Free Water (%)	
Temp. (°C)	
Fluid Loss (cc)	
Temp. (°C)	
Water Used (gal/sack)	5
Water Source	SEAWATER
Comp. Strength (psi)	
Time (hrs)	
Temp (°C)	
Comp. Strength 2. (psi)	
Time (hrs)	
Temp (°C)	
BHST (°C)	
BHCT (°C)	

Additives: of 2 % bwoc CACL2

Stage Number	001 OF 001
Slurry Number	001 OF 002
Slurry Type	LEAD SLURRY
Slurry Class	CLASS G
Slurry Description	HIGH WATER LOSS
Amount (sacks)	638
Volume (bbl)	247
Yield (ft^3/sx)	2.17
Excess (%)	50
From / To (m)	100 / 264
Density	1.5
Thickening Time (hrs)	
Temp. (°C)	
Free Water (%)	
Temp. (°C)	
Fluid Loss (cc)	
Temp. (°C)	
Water Used (gal/sack)	12.4
Water Source	SEAWATER
Comp. Strength (psi)	
Time (hrs)	
Temp (°C)	
Comp. Strength 2. (psi)	
Time (hrs)	
Temp (°C)	
BHST (°C)	
BHCT (°C)	

Additives: 0 of .45 gps ECONOLITE

Stage Number	001 OF 001
Slurry Number	002 OF 002
Slurry Type	TAIL SLURRY
Slurry Class	CLASS G
Slurry Description	NEAT
Amount (sacks)	756
Volume (bbl)	155
Yield (ft^3/sx)	1.15
Excess (%)	50
From / To (m)	264 / 382
Density	1.9
Thickening Time (hrs)	
Temp. (°C)	
Free Water (%)	
Temp. (°C)	
Fluid Loss (cc)	
Temp. (°C)	
Water Used (gal/sack)	5
Water Source	SEAWATER
Comp. Strength (psi)	
Time (hrs)	
Temp (°C)	
Comp. Strength 2. (psi)	
Time (hrs)	
Temp (°C)	
BHST (°C)	
BHCT (°C)	

Additives

Stage Number	001 OF 001
Slurry Number	001 OF 002
Slurry Type	LEAD SLURRY
Slurry Class	CLASS G
Slurry Description	HIGH WATER LOSS
Amount (sacks)	100
Volume (bbl)	39
Yield (ft^3/sx)	2.17
Excess (%)	20
From / To (m)	550 / 630
Density	1.5
Thickening Time (hrs)	
Temp. (°C)	
Free Water (%)	
Temp. (°C)	
Fluid Loss (cc)	
Temp. (°C)	
Water Used (gal/sack)	12.2
Water Source	DRILLWATER
Comp. Strength (psi)	
Time (hrs)	
Temp (°C)	
Comp. Strength 2. (psi)	
Time (hrs)	
Temp (°C)	
BHST (°C)	46
BHCT (°C)	

Additives: GAL of .45 gps ECONOLITE-L

Stage Number	001 OF 001
Slurry Number	002 OF 002
Slurry Type	TAIL SLURRY
Slurry Class	CLASS G
Slurry Description	NEAT
Amount (sacks)	300
Volume (bbl)	61
Yield (ft^3/sx)	1.15
Excess (%)	20
From / To (m)	630 / 930
Density	1.9
Thickening Time (hrs)	
Temp. (°C)	
Free Water (%)	
Temp. (°C)	
Fluid Loss (cc)	
Temp. (°C)	
Water Used (gal/sack)	5
Water Source	DRILLWATER
Comp. Strength (psi)	
Time (hrs)	
Temp (°C)	
Comp. Strength 2. (psi)	
Time (hrs)	
Temp (°C)	
BHST (°C)	46
BHCT (°C)	

Additives

BHP Petroleum

FINAL DRILLING REPORT

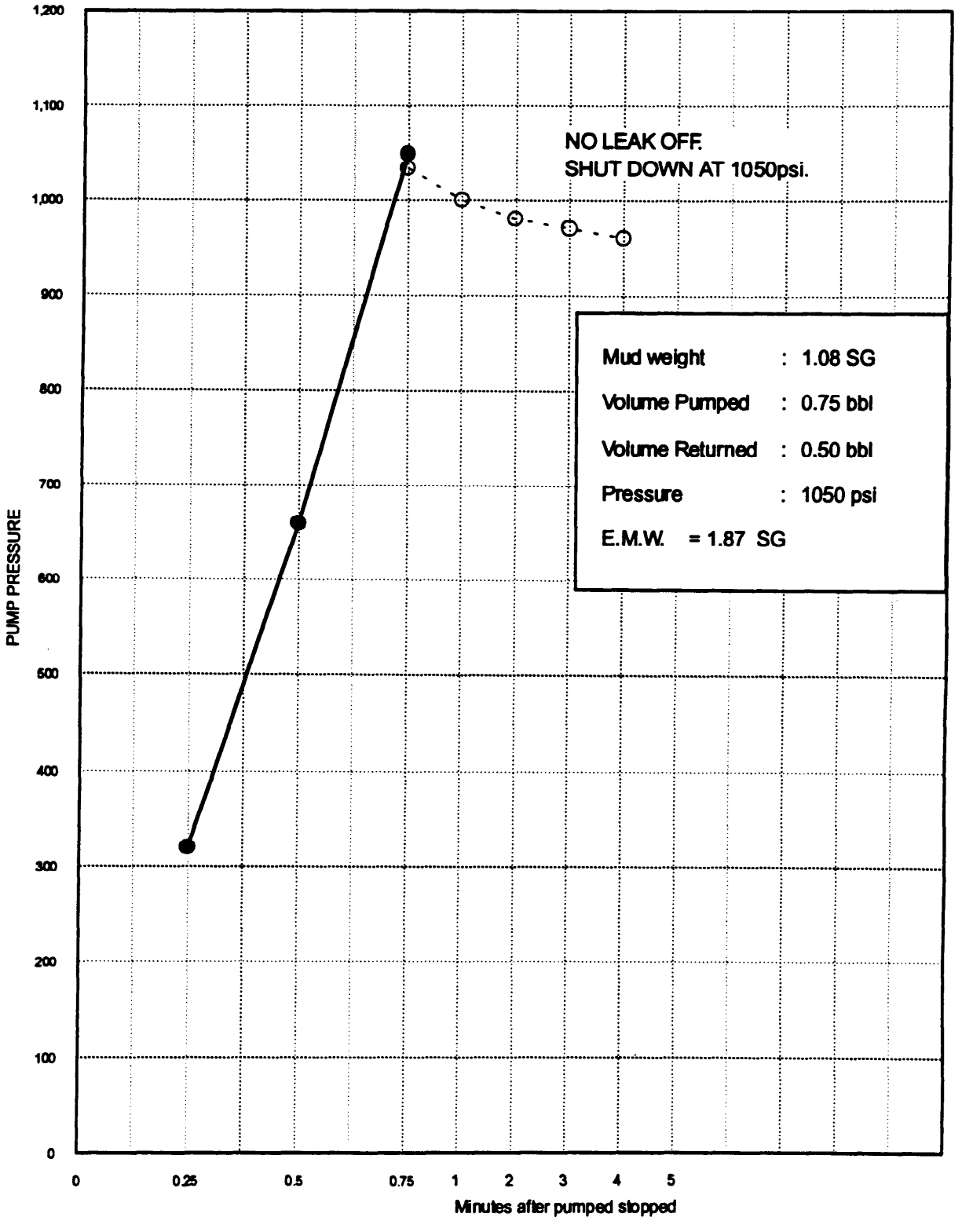
5.2 LEAK OFF TEST DIAGRAM

LOCH ARD-1

TVD : 945m

Casing Diameter : 9.625" 47 lb/ft

Shoe TVD : 930m



PUMPED VOLUME (bbl)

File: BM:ESH LA1_FDR.PRE/4		Checked:	Date: 04-JAN-94

SECTION 6

BHP Petroleum

FINAL DRILLING REPORT

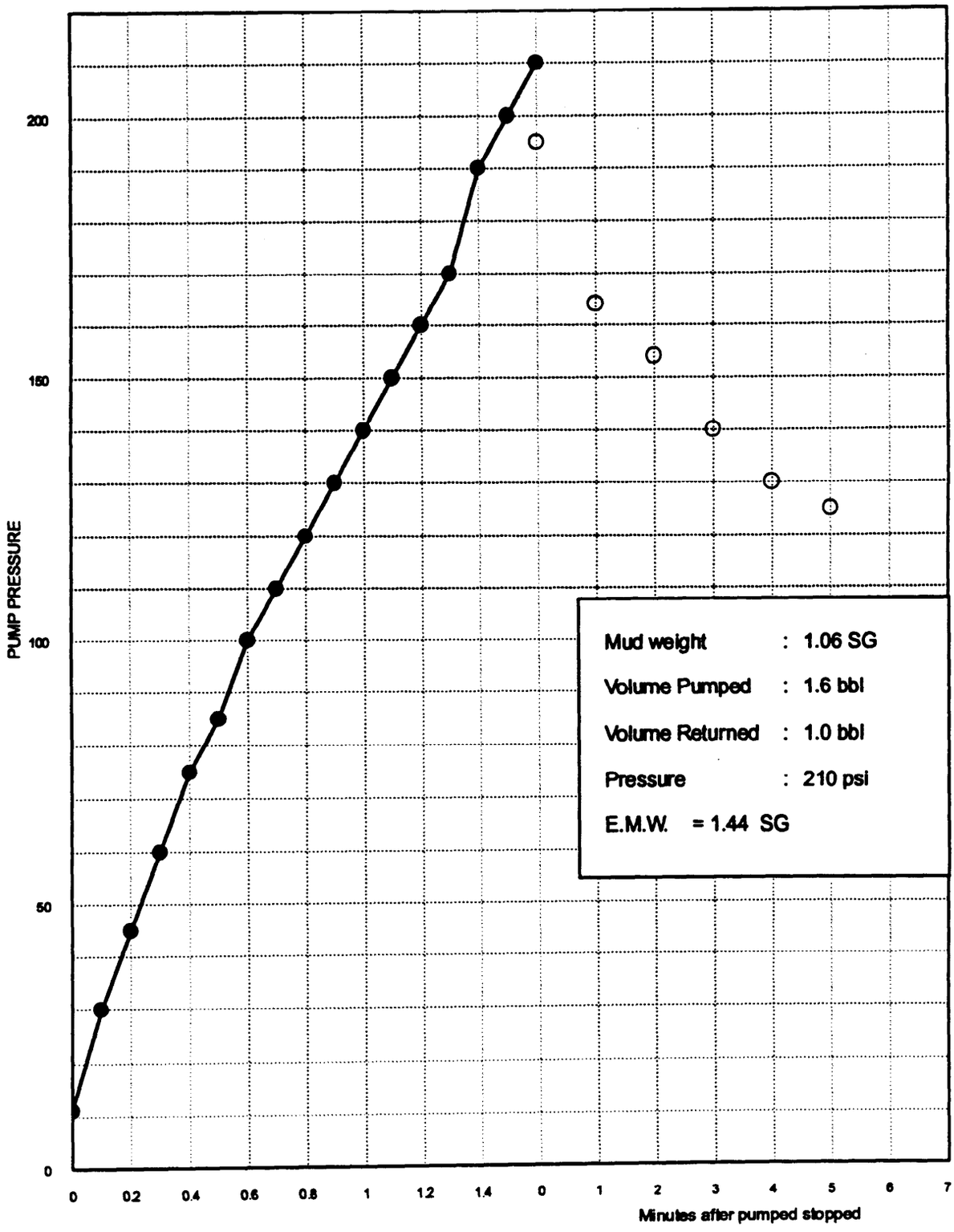
5.2 LEAK OFF TEST DIAGRAM

LOCH ARD-1

TVD : 396m

Casing Diameter : 20" 94 lb/ft

Shoe TVD : 382m



PUMPED VOLUME (bbl)

File: BM:ESH LA1_FDR.PRE/3		Checked:	Date: 05-JAN-94

BHP Petroleum

FINAL DRILLING REPORT

5.1 CEMENTING REPORT - 9.625" INTERMEDIATE CASING — LOCH ARD-1

Date	: 25/10/93	Report No.	: 9	Job Type	: PRIMARY
Cementer	: HALLIBURTON			Total Stages	: 01
Supervisor	: D.WINN			Cemented Interval	: 550 - 930 m.

STAGE NUMBER : 001 of 001

Mixing Method	: RCM	Displacement Fluid	: DRILLWATER/	Top Plug	: Yes		
Density Measured By	: DENSOMETER	Fluid Density	: 1.08 S.G.	Bottom Plug	: Yes		
Start Mix Cement	: 13:55 hrs	Fluid Volume	: 201.5 bbls	Bump Plug	: No		
Start Slurry Disp.	: 14:47 hrs	Displac't Avg. Rate	: 10 bpm				
Start Fluid Disp.	: hrs	Displac't Max. Rate	: bpm	Returns	: YES		
End Pumping	: 15:30 hrs			Total Mud Lost	: 0 bbl		
End Pumping Date	: 25/10/93						

Type	: KCl PHPA POLY.	Gels (10 sec)	: 5	Circ. Prior to Cementing	: 0.50 hrs
Density	: 1.08 S.G.	Gels (10 min)	: 6	Mud Circ. Rate	: 500 gpm
Viscosity	: 48 s/qt			Mud Circ. Press	: 650 psi
PV / YP	: 14 / 25				

CBL Run	: No	Top of Cement	: 550 m.	Casing Pressure Test	: 1500 psi
CET Run	: No	Top of Cement Determined by	: THEORETICAL	Pressure Held For	: 5 min
Bond Quality	:				
Hours Prior to Log	:			Shoetrack Cement	: Yes
BHT Run	: No				

BHP Petroleum

FINAL DRILLING REPORT

5.1 CEMENTING REPORT - 20" CONDUCTOR — LOCH ARD-1

Date	: 20/10/93	**Report No.**	: 2	**Job Type**	: PRIMARY
Cementer	: HALLIBURTON			**Total Stages**	: 01
Supervisor	: J. HARGRAEVES			**Cemented Interval**	: 100 - 382 m.

STAGE NUMBER : 001 of 001

Mixing Method	: RCM		**Displacement Fluid**	: SEAWATER	**Top Plug**	: No	
Density Measured By	: DENSOMETER		**Fluid Density**	: 1.03 S.G.	**Bottom Plug**	: No	
Start Mix Cement	: 22:40	hrs	**Fluid Volume**	: 323 bbls	**Bump Plug**	: No	
Start Slurry Disp.	: 23:05	hrs	**Displac't Avg. Rate**	: 10 bpm			
Start Fluid Disp.	: 23:20	hrs	**Displac't Max. Rate**	: 11 bpm	**Returns**	: YES	
End Pumping	: 23:55	hrs			**Total Mud Lost**	: 0 bbl	
End Pumping Date	: 20/10/93						

Type	: SEAWATER+HI-VIS	**Gels (10 sec)**	: 35	**Circ. Prior to Cementing**	: 0.50 hrs
Density	: 1.07 S.G.	**Gels (10 min)**	: 50	**Mud Circ. Rate**	: 540 gpm
Viscosity	: 100 s/qt			**Mud Circ. Press**	: 500 psi
PV / YP	: 20 / 60				

CBL Run	: No	**Top of Cement**	: 100 m.	**Casing Pressure Test**	: 1000 psi
CET Run	: No	**Top of Cement Determined by**	: RETURNS	**Pressure Held For**	: 10 min
Bond Quality	:				
Hours Prior to Log	:			**Shoetrack Cement**	: Yes
BHT Run	: No				

BHP Petroleum

FINAL DRILLING REPORT

5.1 CEMENTING REPORT - 30" CONDUCTOR — LOCH ARD-1

Date	19/10/93	**Report No.**	1	**Job Type**	PRIMARY
Cementer	HALLIBURTON			**Total Stages**	01
Supervisor	J. HARGRAEVES			**Cemented Interval**	100 - 133 m.

STAGE NUMBER : 001 of 001

Mixing Method	: RCM		**Displacement Fluid**	: SEAWATER	**Top Plug**	: No	
Density Measured By	: DENSOMETER		**Fluid Density**	: 1.03 S.G.	**Bottom Plug**	: No	
Start Mix Cement	: 06:25	hrs	**Fluid Volume**	: 34 bbls	**Bump Plug**	: No	
Start Slurry Disp.	: 06:35	hrs	**Displac't Avg. Rate**	: 7 bpm			
Start Fluid Disp.	: 07:00	hrs	**Displac't Max. Rate**	: 7.5 bpm	**Returns**	: YES	
End Pumping	: 07:05	hrs			**Total Mud Lost**	: 0 bbl	
End Pumping Date	: 19/10/93						

Type	: SEAWATER+HI-VIS		**Gels (10 sec)**	: 35	**Circ. Prior to Cementing**	: 0.50 hrs	
Density	: 1.07	S.G.	**Gels (10 min)**	: 50			
Viscosity	: 100	s/qt			**Mud Circ. Rate**	:	gpm
PV / YP	: 20	/ 60			**Mud Circ. Press**	:	psi

CBL Run	: No	**Top of Cement**	: 100	m.	**Casing Pressure Test**	:	psi
CET Run	: No						
Bond Quality	:	**Top of Cement Determined by**	: MUDLINE RETURNS		**Pressure Held For**	:	min
Hours Prior to Log	:						
BHT Run	: No				**Shoetrack Cement**	: Yes	

BHP Petroleum

FINAL DRILLING REPORT

5.0 CASING REPORT - 20" CONDUCTOR

LOCH ARD-1

Hole Size	: 26 in	Total Depth	: 393 m		
Weight in Slips	: 85500 lbs	Casing Shoe at	: 381.78 m		
R.T. to Wellhead	: 96.1 m	Top of Casing	: 96.1 m		
		Liner Overlap	: m		

Casing Flange / Wellhead

Manufacturer	:	DRILQUIP
Model	:	SS-10C
Size	:	18.75 in
Rating	:	10000 psi

PIPE INFORMATION

Description	Manufacturer	Size	Weight	Grade	Cnd	Threads	Joints	Length	Interval
WELLHEAD	DRILLQUIP	20	134	X-52		HD-90	1	7.06	103.16 - 96.10
CROSS OVER	SUMITOMO	20	94	X-52		HD-90 DW	1	11.49	114.65 - 103.16
INTERMEDIATE CASING	SUMITOMO	20	94	X-52		DW	21	254.08	368.73 - 114.65
SHOE JOINT	WEATHERFORD	20	94	X-52		DW	1	13.05	381.78 - 368.73

HOLE / RUNNING CONDITIONS

Mud Type	: SEAWATER+HI-VIS	Avg. Make Up Torque	: 21000	ft.lbs.	Avg. Drag	:		lbs.
Density	: 1.07 S.G.	RPM	:		Max. Drag	:		lbs.
Viscosity	: 100	Avg. Torque Rot.	:	ft.lbs.	Volume Lost	:	0	bbl
PV / YP	: 20 / 60	Max. Torque Rot.	:	ft.lbs.				

Remarks :

File: LOC1_CSG		Checked:	Date: 01-Feb-94

BHP Petroleum

FINAL DRILLING REPORT

6.0 CEMENTING REPORT - ABANDONMENT #1 PLUG — LOCH ARD-1

Date	: 28/10/93	**Report No.**	: 12	**Plug Type**	: ABANDONMENT #1
Cementer	: HALLIBURTON			**Total Stages**	: 01
Supervisor	: D.WINN			**Cemented Interval**	: 825 - 1030 m.

STAGE NUMBER : 001 of 001

Mixing Method	: RCM	**Displacement Fluid**	: SEAWATER	**Top Plug**	: No		
Density Measured By	: DENSOMETER	**Fluid Density**	: 1.03 S.G.	**Bottom Plug**	: No		
Start Mix Cement	: 17:22 hrs	**Fluid Volume**	: 47 bbls	**Bump Plug**	: No		
Start Slurry Disp.	: 17:37 hrs	**Displac't Avg. Rate**	: 6.5 bpm				
Start Fluid Disp.	: hrs	**Displac't Max. Rate**	: bpm	**Returns**	: YES		
End Pumping	: 17:47 hrs			**Total Mud Lost**	: 0 bbl		
End Pumping Date	: 28/10/93						

Type	: KCl PHPA POLY.	**Gels (10 sec)**	: 4	**Circ. Prior to Cementing**	: 0.50 hrs
Density	: 1.10 S.G.	**Gels (10 min)**	: 9	**Mud Circ. Rate**	: 10 gpm
Viscosity	: 48 s/qt			**Mud Circ. Press**	: 600 psi
PV / YP	: 14 / 22				

CBL Run	: No	**Top of Cement**	: 825 m.	**Casing Pressure Test**	: psi
CET Run	: No	**Top of Cement Determined by**	: TAGGED	**Pressure Held For**	: min
Bond Quality	:				
Hours Prior to Log	:			**Shoetrack Cement**	: N/A
BHT Run	: No				

File: LOC1_PLG		Checked:	Date: 01-Feb-94

Stage Number	001
Slurry Number	001
Slurry Type	TAIL SLURRY
Slurry Class	CLASS G
Slurry Description	NEAT
Amount (sacks)	336
Volume (bbl)	69
Yield (ft^3/sx)	1.15
Excess (%)	20
From / To (m)	825 / 1030
Density	1.9
Thickening Time (hrs)	
Temp. (°C)	
Free Water (%)	
Temp. (°C)	
Fluid Loss (cc)	
Temp. (°C)	
Water Used (gal/sack)	5
Water Source	SEAWATER
Comp. Strength (psi)	
Time (hrs)	
Temp (°C)	
Comp. Strength 2 (psi)	
Time (hrs)	
Temp (°C)	
BHST (°C)	46
BHCT (°C)	

Additives

BHP Petroleum

FINAL DRILLING REPORT

6.0 CEMENTING REPORT - ABANDONMENT #2 PLUG — LOCH ARD-1

Date	: 29/10/93	**Report No.**	: 13	**Plug Type**	: ABANDONMENT #2
Cementer	: HALLIBURTON			**Total Stages**	: 01
Supervisor	: D.WINN			**Cemented Interval**	: 130 - 200 m.

STAGE NUMBER : 001 of 001

Mixing Method	: RCM	**Displacement Fluid**	: SEAWATER	**Top Plug**	: No		
Density Measured By	: DENSOMETER	**Fluid Density**	: 1.10 S.G.	**Bottom Plug**	: No		
Start Mix Cement	: 08:06 hrs	**Fluid Volume**	: 6 bbls	**Bump Plug**	: No		
Start Slurry Disp.	: 08:07 hrs	**Displac't Avg. Rate**	: 6 bpm				
Start Fluid Disp.	: hrs	**Displac't Max. Rate**	: 400 bpm	**Returns**	: YES		
End Pumping	: 08:20 hrs			**Total Mud Lost**	: 0 bbl		
End Pumping Date	: 29/10/93						

Type	: KCl PHPA POLY.	**Gels (10 sec)**	: 4	**Circ. Prior to Cementing**	: 0.10 hrs
Density	: 1.10 S.G.	**Gels (10 min)**	: 9	**Mud Circ. Rate**	: 10 gpm
Viscosity	: 48 s/qt			**Mud Circ. Press**	: 200 psi
PV / YP	: 14 / 22				

CBL Run	: No	**Top of Cement**	: 130 m.	**Casing Pressure Test**	: psi
CET Run	: No	**Top of Cement Determined by**	: TAGGED	**Pressure Held For**	: min
Bond Quality	:				
Hours Prior to Log	:			**Shoetrack Cement**	: N/A
BHT Run	: No				

Stage Number	001
Slurry Number	001
Slurry Type	TAIL SLURRY
Slurry Class	CLASS G
Slurry Description	NEAT
Amount (sacks)	225
Volume (bbl)	46
Yield (ft^3/sx)	1.15
Excess (%)	
From / To (m)	130 / 200
Density	1.9
Thickening Time (hrs)	
Temp. (°C)	
Free Water (%)	
Temp. (°C)	
Fluid Loss (cc)	
Temp. (°C)	
Water Used (gal/sack)	5
Water Source	SEAWATER
Comp. Strength (psi)	
Time (hrs)	
Temp (°C)	
Comp. Strength 2 (psi)	
Time (hrs)	
Temp (°C)	
BHST (°C)	
BHCT (°C)	

Additives

SECTION 7

BHP Petroleum

FINAL DRILLING REPORT

7.0 WEATHER DATA

LOCH ARD-1

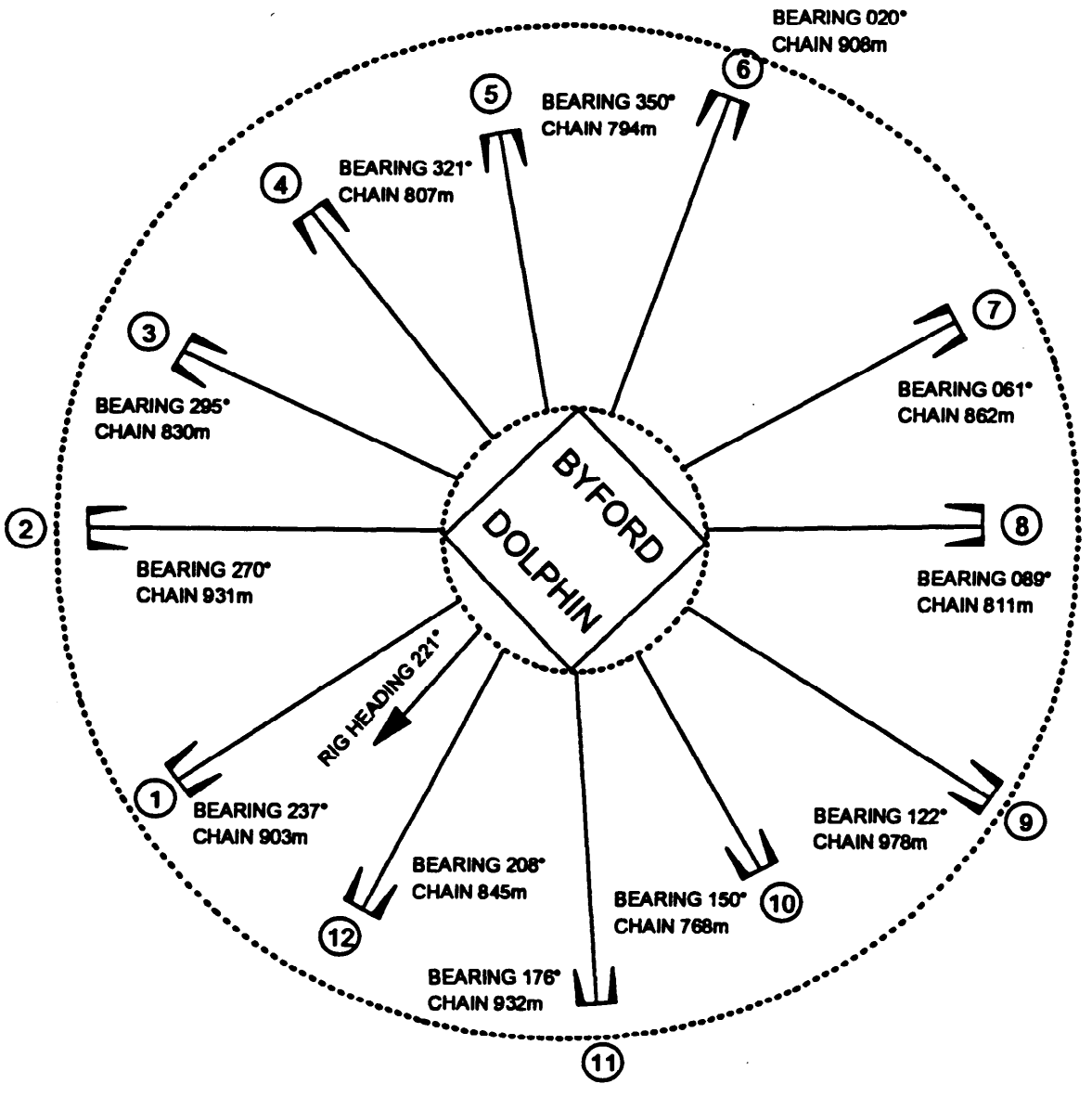
Date	Day	Wind Vel (Knots)	Wind Dir	Temp High (degC)	Visibility (Nm)	Weather State	Swell Height (m)	Swell Per (sec)	Swell Dir	Wave Height (m)	Wave Per (sec)	Wave Dir	Heave (m)	Pitch (deg)	Roll (deg)	Bar Pressure (HPa)
17/10/93	1	18	340	18	15	FINE	2	12	240	0.5	3	340		0.8	0.8	1011
18/10/93	2	40	240	16	15	STORMS	4	12	240	3	4	240		3	2	1003
19/10/93	3	38	250	18	15	OVERCAST	5	12	250	3	4	250		1.4	1.2	1011
20/10/93	4			16	15	OVERCAST	4	12	250	3	4	250		1	1	1018
21/10/93	5	6	200	16	15	FINE	3	12	240	1	3	225	0.8	0.6	0.5	16
22/10/93	6	14	50	17	15	FINE	3.2	12	240	0.5	3	50	0.8	0.5	0.4	1023
23/10/93	7	42	40	18	15	OVERCAST	4	12	240	1.5	4	40	1	0.8	0.5	1020
24/10/93	8	35	390	20	10	FINE	3.5	12	240	2	4	360	1.4	0.9	0.9	1006
25/10/93	9	55	230	14	10	RAIN/WINDY	3.5	12	240	4	4	230	1.8	1	2	1011
26/10/93	10	40	250	17	10	RAIN/WINDY	4	12	240	3.5	4	250	1.8	1	1.5	1019
27/10/93	11	45	10	17	10	CLOUDY/WINDY	2.7	12	250	3	4	10	1	0.6	0.3	1017
28/10/93	12	40	10	18	10	CLOUDY	3	12	250	3	4	10	1.4	0.8	0.4	1010
29/10/93	13	40	10	18	10	CLOUDY	3	12	250	3	4	10	1.4	0.8	0.4	1010
30/10/93	14	40	10	18	10	CLOUDY	3	12	250	3	4	10	1.4	0.8	0.4	1010
31/10/93	15	40	10	18	10	CLOUDY	3	12	250	3	4	10	1.4	0.8	0.4	1010
01/11/93	16	20	245	12	10	CLOUDY	2	12	245	2	4	245	1	0.6	0.4	1010

BHP Petroleum

FINAL DRILLING REPORT

7.1 MOORING DIAGRAM

LOCH ARD-1



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BHP Petroleum

FINAL DRILLING REPORT

LOCH ARD-1

Compiled By:

Technical Assistant ERIC HOCKING — Date 4/1/94

Reviewed By:

Senior Drilling Engineer — Date 5/2/94

Drilling Superintendent — Date 14-2-94.

Approved By:

Manager Drilling — Date 14/2/94

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3. SAMPLES, SIDEWALL CORES, CONVENTIONAL CORES

3.1 Cuttings

Collection Interval	Treatment
393-1397	Cuttings Samples - 2 sets of unwashed - 5 sets of washed and air dried

Cuttings Lithological Description - Appendix 1

3.2 Sidewall Cores

CST:

Interval	Shot	Recovered	Lost
402.5-1329	60	60	0

MSCT:

No MSCT's were cut in Loch Ard-1.

CST Lithological Descriptions - Appendix 2

3.3 Conventional Cores:

No conventional cores were cut in Loch Ard-1.

3.4 Micropalaeontology

Micropalaeontology analysis was not performed for Loch Ard-1.

3.5 Palynology

Collection Interval	Sample Type
402.5-1359 m	Sidewall cores & Ditch cuttings

Range Charts - Appendix 3

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3.6 Geochem

Geochem Vitrinite data and extract data generated from the following intervals at the time of compilation of this report:

Depth	Sample Type
548.5-1326 m	Sidewall Cores

Basic Geochem Data - Appendix 4

4 LOGGING AND SURVEYS

4.1 Mudlogging

Mudlogging was provided by Baker Hughes Inteq. Interval: 100-1397 m

Final Well Report - Appendix 5
(includes Mudlog/Formation Evaluation Log)

4.2 Measurement While Drilling

Measurement by drilling (MWD) was provided by Eastman Teleco Measurement While Drilling Services. Interval: 393-1397 m

End of Well Report - Appendix 6
(includes MWD Log)

4.3 Wireline Logs

Suite No.	Run No.	Log Type	Interval	Date
1	1	DLL-MSFL-AS-GR-SP-CAL-AMS	942-100 (GR to seafloor, 175)	24/10/93
1	1	FMS-GR-GPIT-AMS	942-383	24/10/93
1	1	CST-GR(30 shots)	927-402.5	24/10/93
2	1	DLL-MSFL-SDT-GR-SP-CAL-AMS	1395-929	27/10/93
2	1	LDL-CNL-FMS-GR-CAL-AMS	1395-929	28/10/93
2	1	Zero offset VSP	1380-480	28/10/93
2	1	CST-GR (30 shots)	1329-954	28/10/93

4.4 Processed Logs

No Processed Logs were run for Loch Ard-1.

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4.5 Velocity Surveys

The Well Seismic Processing report has been forwarded previously for Loch Ard-1.

4.6 Rig Location Survey

Survey was conducted By Racal Survey Australia Limited

Rig Positioning Report - Appendix 7

5 FORMATION TESTING

5.1 RFT

No RFT runs were performed in Loch Ard-1.

5.2 DST

No DST runs were performed in Loch Ard-1.

5.3 Production Tests

No Production Tests were performed in Loch Ard-1.

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6 APPENDICES

6.1 APPENDIX 1 Cutting Lithological Descriptions
6.2 APPENDIX 2 CST Lithological Descriptions
6.3 APPENDIX 3 Palynology
6.4 APPENDIX 4 Geochem Basic Data
6.5 APPENDIX 5 Mudloggers Final Well Report
6.6 APPENDIX 6 MWD End of Well Report
6.7 APPENDIX 7 Rig Positioning Report

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6.1 APPENDIX 1 Cuttings lithological descriptions

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Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): C.Menhennitt Page: 1
20" Casing shoe set at 383 mRT. LOT @ 396 mRT = 1.44 SG MWE Sample interval 5m					
395	100	-	r	-	**SANDSTONE:** white to very light grey, clear to translucent grains, trace iron stained grains, friable with abundant loose grains, fine to coarse grained, predominantly fine to medium grained, angular to sub angular, occasionally rounded, low sphericity, moderately to well sorted quartz, trace moderately weak quartz overgrowth cementation, trace moderately strong microcrystalline pyrite cement, rare very light grey argillaceous matrix, rare glauconite, rare limonitic grains, very rare mineral (?tourmaline) grains, rare pyritised wood fragments, good inferred porosity. No shows.
400	100	-	r	-	**SANDSTONE:** generally as above, occasional very coarse grains.
405	95	-	-	-	**SANDSTONE:** white to very light grey, clear to translucent grains, trace iron stained grains, friable with abundant loose grains, fine to very coarse grained, predominantly fine to medium grained, angular to sub angular, occasionally rounded, low sphericity, moderately sorted quartz, trace moderately weak quartz overgrowth cementation, trace moderately strong microcrystalline pyrite cement, rare very light grey argillaceous matrix, rare pyritised wood fragments, good inferred porosity. No shows.
	5	-	-	tr	**CLAYSTONE:** medium grey to medium dark grey, soft, moderately firm in part, rare quartz silt, rare very fine grained quartz, trace finely disseminated carbonaceous matter, non calcareous.
410	100	-	-	-	**SANDSTONE:** white to very light grey, clear to translucent grains, trace iron stained grains, friable with abundant loose grains, fine to very coarse grained, predominantly fine to medium grained, angular to sub angular, occasionally rounded, low sphericity, moderately sorted quartz, trace moderately weak quartz overgrowth cementation, trace moderately strong microcrystalline pyrite cement, rare very light grey argillaceous matrix, good inferred porosity. No shows.
415	70	-	-	-	**SANDSTONE:** as above.
	30	-	-	tr	**CLAYSTONE:** medium grey to medium dark grey, predominantly soft, hard in part, blocky where hard, rare quartz silt, rare very fine grained quartz, trace finely disseminated carbonaceous matter, non calcareous.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): C.Menhennitt Page: 2
420	80	-	-	tr	**CLAYSTONE:** as above.
	20	-	-	-	**SANDSTONE:** generally as above, predominantly coarse to very coarse grained.
425	90	-	-	c	**CLAYSTONE:** as above, becoming medium dark grey to dark grey.
	10	-	-	-	**SANDSTONE:** as above.
430	90	-	-	c	**CLAYSTONE:** medium grey to medium dark grey, predominantly soft, hard in part, blocky where hard, rare quartz silt, rare very fine grained quartz, rare finely disseminated carbonaceous matter, non calcareous.
	10	-	-	-	**SANDSTONE:** white to very light grey, clear to translucent grains, trace iron stained grains, friable with abundant loose grains, fine to very coarse grained, predominantly fine to medium grained, angular to sub angular, occasionally rounded, low sphericity, moderately sorted quartz, trace moderately weak quartz overgrowth cementation, trace moderately strong microcrystalline pyrite cement, rare very light grey argillaceous matrix, good inferred porosity. No shows.
435	80	-	-	c	**CLAYSTONE:** generally as above, trace pyrite.
	20	-	-	-	**SANDSTONE:** as above.
440	90	-	-	c	**CLAYSTONE:** generally as above, rare pyrite, rare pyritised wood fragments.
	10	-	-	-	**SANDSTONE:** as above.
445	90	-	-	c	**CLAYSTONE:** as above.
	10	-	-	-	**SANDSTONE:** as above
450	100	-	-	ab	**CLAYSTONE:** medium dark grey to dark grey, soft, trace quartz silt, trace very fine to fine grained quartz, abundant carbonaceous flecks, trace coaly fragments, non calcareous.
455	100	-	-	ab	**CLAYSTONE:** as above.
460	90	-	-	ab	**CLAYSTONE:** as above.
	10	-	-	-	**SANDSTONE:** as above

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): C.Menhennitt Page: 3
465	70	-	-	-	**SANDSTONE:** very light grey to light greenish grey, friable with abundant loose grains, predominantly fine to medium grained, occasional coarse and very coarse grains, sub angular to sub rounded, occasionally angular, low to moderate sphericity, well sorted quartz, trace moderately strong quartz overgrowth cementation, trace light greenish grey argillaceous matrix, trace glauconite, trace coaly fragments, good inferred porosity. No shows.
	30	-	-	ab	**CLAYSTONE:** as above.
470	70	-	-	-	**SANDSTONE:** as above.
	30	-	-	c	**CLAYSTONE:** as above.
475	100	-	tr	c	**CLAYSTONE:** medium dark grey to dark grey, soft, trace quartz silt, trace very fine to fine grained quartz, abundant carbonaceous flecks, trace coaly fragments, trace glauconite, non calcareous.
480	100	-	tr	c	**CLAYSTONE:** as above.
485	100	-	tr	c	**CLAYSTONE:** as above.
490	100	-	tr	ab	**CLAYSTONE:** generally as above, trace carbonaceous laminae.
495	100	-	tr	ab	**CLAYSTONE:** as above.
500	100	-	tr	ab	**CLAYSTONE:** as above.
505	90	-	tr	ab	**CLAYSTONE:** as above.
	10	-	-	tr	**SANDSTONE:** very light grey to light greenish grey, friable with abundant loose grains, fine to very coarse grained, predominantly medium to coarse grained, sub angular to sub rounded, occasionally angular, low to moderate sphericity, moderately to well sorted quartz, trace moderately strong quartz overgrowth cementation, trace light greenish grey argillaceous matrix, trace crystalline and microcrystalline pyrite, trace coaly fragments, good inferred porosity. No shows.
510	80	-	tr	ab	**CLAYSTONE:** as above.
	20	-	-	tr	**SANDSTONE:** as above.
515	90	-	tr	ab	**CLAYSTONE:** as above.
	10	-	-	tr	**SANDSTONE:** as above.
520	100	-	tr	c	**CLAYSTONE:** medium dark grey to dark grey, soft, trace quartz silt, trace very fine to fine grained quartz, common carbonaceous flecks, trace coaly fragments, trace glauconite, non calcareous.
525	100	-	tr	c	**CLAYSTONE:** as above.
530	100	-	tr	c	**CLAYSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	**CUTTINGS DESCRIPTION SHEET** Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): C.Menhennitt Page: 4
535	100	-	tr	c	**CLAYSTONE:** as above.
540	90	-	tr	tr	**SANDSTONE:** very light grey to light greenish grey, clear to translucent grains, friable with abundant loose grains, fine to coarse grained, predominantly fine to medium grained, sub rounded to rounded, moderate to high sphericity, well sorted quartz, trace moderately weak quartz overgrowth cementation, trace patchy moderately strong dolomite cement, rare light greenish grey argillaceous matrix, trace to rare glauconite, trace microcrystalline pyrite, trace carbonaceous fragments, excellent inferred porosity. No shows.
	10	-	tr	c	**CLAYSTONE:** as above.
545	70	-	tr	c	**CLAYSTONE:** medium dark grey to dark grey, soft, trace quartz silt, trace very fine to fine grained quartz, common carbonaceous flecks, trace coaly fragments, trace glauconite, non calcareous.
	30	-	tr	tr	**SANDSTONE:** very light grey to light greenish grey, clear to translucent grains, friable with abundant loose grains, fine to very coarse grained, predominantly medium to coarse grained, sub angular to sub rounded, moderate sphericity, moderately sorted quartz, trace moderately weak quartz overgrowth cementation, trace patchy moderately strong dolomite cement, rare light greenish grey argillaceous matrix, trace to rare glauconite, trace microcrystalline pyrite, trace carbonaceous fragments, excellent inferred porosity. No shows.
550	70	-	tr	tr	**SANDSTONE:** very light grey to light greenish grey, clear to translucent grains, friable with abundant loose grains, fine to medium grained, sub rounded to rounded, moderate to high sphericity, well sorted quartz, trace moderately weak quartz overgrowth cementation, rare light greenish grey argillaceous matrix, trace to rare glauconite, trace microcrystalline pyrite, trace carbonaceous fragments, excellent inferred porosity. No shows.
	30	-	tr	c	**CLAYSTONE:** as above.
555	70	-	tr	c	**CLAYSTONE:** generally as above, trace pyritised wood fragments.
	30	-	tr	tr	**SANDSTONE:** as above.
560	100	-	tr	c	**CLAYSTONE:** medium dark grey, soft, trace quartz silt, trace very fine to fine grained quartz, common carbonaceous flecks, trace coaly fragments, trace glauconite, trace pyritised wood, non calcareous.
565	90	-	tr	c	**CLAYSTONE:** as above.
	10	-	tr	tr	**SANDSTONE:** as above.
570	90	-	tr	c	**CLAYSTONE:** as above.
	10	-	tr	tr	**SANDSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): C.Menhennitt Page: 5
575	80	-	tr	c	**CLAYSTONE:** as above.
	20	-	tr	tr	**SANDSTONE:** as above.
580	80	-	tr	c	**CLAYSTONE:** as above.
	20	-	tr	tr	**SANDSTONE:** as above.
585	100	-	-	-	**SANDSTONE:** white to very light grey, clear to translucent grains, medium to coarse grained, predominantly medium grained, sub angular to sub rounded, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
590	100	-	-	-	**SANDSTONE:** generally as above, occasional very coarse grains.
595	100	-	-	-	**SANDSTONE:** as above.
600	100	-	-	tr	**SANDSTONE:** white to very light grey, clear to translucent grains, fine to medium grained, sub angular to sub rounded, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
605	100	-	-	tr	**SANDSTONE:** as above.
610	100	-	-	tr	**SANDSTONE:** generally as above, trace coarse to very coarse grains.
15	100	-	-	tr	**SANDSTONE:** as above.
620	100	-	-	tr	**SANDSTONE:** as above.
625	100	-	-	tr	**SANDSTONE:** as above.
630	100	-	-	tr	**SANDSTONE:** generally as above, trace coarse to very coarse grains.
635	100	-	-	tr	**SANDSTONE:** generally as above, trace coarse to very coarse grains.
640	100	-	-	tr	**SANDSTONE:** generally as above, trace coarse to very coarse grains.
645	100	-	-	tr	**SANDSTONE:** generally as above, trace coarse to very coarse grains.
650	100	-	-	tr	**SANDSTONE:** white to very light grey, clear to translucent grains, fine to medium grained, trace coarse to very coarse grains, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): C.Menhennitt Page: 6
655	100	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, trace light brown to light yellowish orange granules, fine to medium grained, trace coarse to very coarse grains, trace granules, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
660	60	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, trace light brown to light yellowish orange granules, fine to medium grained, trace coarse to very coarse grains, trace granules, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
	40	-	c	tr	**GLAUCONITIC CLAYSTONE:** dark greenish grey to medium dark grey, soft, common glauconite, trace very fine grained quartz, trace carbonaceous flecks, non calcareous.
665	50	-	-	tr	**SANDSTONE:** as above.
	50	-	c	tr	**GLAUCONITIC CLAYSTONE:** as above.
670	100	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, fine to coarse grained, predominantly medium to coarse grains, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
675	100	-	-	tr	**SANDSTONE:** generally as above, trace very coarse grains.
680	100	-	-	tr	**SANDSTONE:** generally as above, trace very coarse grains.
685	100	-	-	tr	**SANDSTONE:** generally as above, trace very coarse grains.
690	100	-	-	tr	**SANDSTONE:** generally as above, trace very coarse grains.
695	100	-	-	tr	**SANDSTONE:** generally as above, trace very coarse grains.
700	100	-	-	tr	**SANDSTONE:** generally as above, trace very coarse grains.
705	100	-	-	tr	**SANDSTONE:** generally as above, trace very coarse grains.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): C.Menhennitt Page: 7
710	100	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, fine to coarse grained, minor granules, predominantly medium to coarse grains, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
715	100	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, trace light brown to light yellowish orange granules, fine to medium grained, trace coarse to very coarse grains, trace granules, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
720	100	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, fine to coarse grained, predominantly medium to coarse grains, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
725	100	-	-	tr	**SANDSTONE:** as above.
730	100	-	-	tr	**SANDSTONE:** generally as above, trace very coarse grains.
35	100	-	-	tr	**SANDSTONE:** as above.
740	100	-	-	tr	**SANDSTONE:** as above.
745	100	-	-	tr	**SANDSTONE:** as above.
750	100	-	-	tr	**SANDSTONE:** as above.
755	100	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, fine to coarse grained, predominantly medium grains, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
760	100	-	-	tr	**SANDSTONE:** as above.
765	60	-	tr	tr	**CLAYSTONE:** medium dark grey to brownish grey, soft, trace quartz silt, trace finely disseminated carbonaceous material, trace pyrite, trace glauconite, non calcareous.
	40	-	-	tr	**SANDSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): C.Menhennitt Page: 8
770	60	-	tr	tr	**CLAYSTONE:** as above.
	40	-	-	tr	**SANDSTONE:** as above.
775	70	-	tr	tr	**CLAYSTONE:** as above.
	30	-	-	tr	**SANDSTONE:** as above.
780	60	-	tr	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, fine to coarse grained, predominantly medium grains, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
	40	-	-	tr	**CLAYSTONE:** medium dark grey to brownish grey, soft, trace quartz silt, trace finely disseminated carbonaceous material, trace pyrite, trace glauconite, non calcareous.
785	70	-	tr	tr	**CLAYSTONE:** as above.
	30	-	-	tr	**SANDSTONE:** as above.
790	80	-	-	tr	**SANDSTONE:** as above.
	20	-	tr	tr	**CLAYSTONE:** as above.
795	80	-	-	tr	**SANDSTONE:** as above.
	20	-	tr	tr	**CLAYSTONE:** as above.
800	100	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, fine to coarse grained, predominantly fine to medium grains, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
805	100	-	-	tr	**SANDSTONE:** as above.
810	100	-	-	tr	**SANDSTONE:** as above.
815	100	-	-	tr	**SANDSTONE:** as above.
820	60	-	tr	tr	**CLAYSTONE:** medium dark grey to brownish grey, soft, trace quartz silt, trace finely disseminated carbonaceous material, trace pyrite, trace glauconite, non calcareous.
	40	-	-	tr	**SANDSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): C.Menhennitt Page: 9
825	70	-	tr	tr	**CLAYSTONE:** as above.
	30	-	-	tr	**SANDSTONE:** as above.
830	80	-	tr	tr	**CLAYSTONE:** as above.
	20	-	-	tr	**SANDSTONE:** as above.
835	60	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, fine to coarse grained, predominantly fine to medium grains, sub angular to sub rounded, rounded in part, angular in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace weak calcite cement, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, excellent inferred porosity. No shows.
	40	-	tr	c	**CLAYSTONE:** medium dark grey to brownish grey, soft, trace quartz silt, trace finely disseminated carbonaceous material, trace pyrite, trace glauconite, non calcareous.
840	60	-	tr	c	**CLAYSTONE:** as above.
	40	-	-	tr	**SANDSTONE:** as above.
845	60	-	tr	c	**CLAYSTONE:** as above.
	40	-	-	tr	**SANDSTONE:** as above.
850	50	-	tr	c	**CLAYSTONE:** as above.
	50	-	-	tr	**SANDSTONE:** as above.
855	80	-	tr	c	**CLAYSTONE:** as above.
	20	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, very fine to coarse grained, predominantly very fine to fine grains, sub angular to sub rounded, rounded in part, angular in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, common moderately weak calcite cement, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, fair to good inferred porosity. No shows.
860	80	-	tr	c	**CLAYSTONE:** as above.
	20	-	-	tr	**SANDSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): C.Menhennitt Page: 10
865	50	-	tr	c	**CLAYSTONE:** as above.
	50	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, very fine to coarse grained, predominantly very fine to fine grains, sub angular to sub rounded, rounded in part, angular in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace weak calcite cement, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, fair to good inferred porosity. No shows.
870	70	-	-	tr	**SANDSTONE:** white to very light grey, predominantly clear to translucent grains, very fine to coarse grained, predominantly very fine to fine grains, sub angular to sub rounded, rounded in part, angular in part, moderate to high sphericity, well sorted quartz, trace quartz overgrowth cementation, trace weak calcite cement, trace greenish grey argillaceous matrix (Mostly washed away), trace greyish black lithic grains, trace coaly fragments, fair to good inferred porosity. No shows.
	30	-	tr	tr	**CLAYSTONE:** medium dark grey to brownish grey, soft, trace quartz silt, trace finely disseminated carbonaceous material, trace pyrite, trace glauconite, non calcareous.
875	60	-	-	tr	**SANDSTONE:** as above.
	40	-	tr	tr	**CLAYSTONE:** as above.
880	50	-	-	tr	**SANDSTONE:** as above.
	50	-	tr	tr	**CLAYSTONE:** as above.
885	60	-	-	tr	**SANDSTONE:** white to very light grey, clear to translucent grains, very fine to fine grained, grading to siltstone in part, sub angular to sub rounded, rounded in part, high sphericity, well sorted quartz, common moderately strong calcite cement, trace moderately strong microcrystalline pyrite cement, trace light grey argillaceous matrix, trace greyish black lithic grains, trace coaly fragments, trace mica, poor visual porosity. No shows.
	40	-	tr	tr	**CLAYSTONE:** grading to siltstone in part, medium light grey to brownish grey, predominantly soft, becoming moderately firm where silty, trace glauconite, trace carbonaceous flecks and fragments, non calcareous.
890	80	-	-	tr	**SANDSTONE:** as above.
	20	-	tr	tr	**CLAYSTONE:** as above.
895	80	-	-	tr	**SANDSTONE:** as above.
	20	-	tr	tr	**CLAYSTONE:** as above.

CUTTINGS DESCRIPTION SHEET

Well: **LOCH ARD-1**
Permit: **VIC/P 31**
Geologist(s): C.Menhennitt

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	
900	70	-	-	tr	**SANDSTONE:** as above.
	30	-	tr	tr	**CLAYSTONE:** as above.
905	70	-	-	tr	**SANDSTONE:** as above.
	30	-	tr	tr	**CLAYSTONE:** as above.
910	60	-	-	tr	**SANDSTONE:** white to very light grey, clear to translucent grains, very fine to fine grained, grading to siltstone in part, sub angular to sub rounded, rounded in part, high sphericity, well sorted quartz, common moderately strong calcite cement, trace moderately strong microcrystalline pyrite cement, trace light grey argillaceous matrix, trace greyish black lithic grains, trace coaly fragments, trace mica, poor visual porosity. No shows.
	40	-	tr	tr	**CLAYSTONE:** grading to siltstone in part, light grey to light brownish grey, predominantly soft, becoming moderately firm where silty, trace glauconite, trace carbonaceous flecks and coal fragments, non calcareous.
915	70	-	tr	tr	**CLAYSTONE:** as above.
	30	-	-	tr	**SANDSTONE:** as above.
920	80	-	tr	tr	**CLAYSTONE:** as above.
	20	-	-	tr	**SANDSTONE:** as above.
925	70	-	tr	tr	**CLAYSTONE:** as above.
	30	-	-	tr	**SANDSTONE:** as above.
930	50	-	tr	tr	**CLAYSTONE:** as above.
	50	-	-	tr	**SANDSTONE:** as above.
935	60	-	tr	tr	**CLAYSTONE:** as above.
	40	-	-	tr	**SANDSTONE:** as above.
940	60	-	tr	tr	**CLAYSTONE:** as above.
	40	-	-	tr	**SANDSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): A.TABASSI/C.MENHENNITT Page: 12
12-1/4" HOLE WAS DRILLED TO 942.0 mRT. 9-5/8" CASING SHOE WAS SET @ 929.7 mRT. LOT WAS PERFORMED @ 945.5 mRT = 1.87 SG MWE(no leak off). SAMPLE INTERVAL = 3M.					
945	90	-	-	tr	**CLAYSTONE:** light grey, light brownish grey and light greenish grey in part, dominantly soft, rarely firm to moderately hard in part, dominantly massive, non calcareous, slightly silty, trace micromica, trace to common carbonaceous flecks, laminae and coaly material (partially replaced by pyrite), rare lithics and very fine quartz sand grains.
	10	-	tr	tr	**SANDSTONE:** very light grey, clear to translucent grains, friable with common loose grains, moderately hard in part, very fine to fine grained, medium grained in part, sub angular to sub rounded, rounded in part, high sphericity, well sorted quartz, trace light grey argillaceous matrix, trace moderately strong calcite and occasionally dolomite cement, trace moderately strong microcrystalline pyrite cement, trace greyish black and light green lithic grains, trace coaly fragments, trace mica, nil to trace glauconite, poor visual porosity. No shows. **NOTE:** Sample is heavily contaminated with cement.
948	90	-	-	tr	**CLAYSTONE:** as above.
	10	-	tr	tr	**SANDSTONE:** as above.
951	90	-	-	tr	**CLAYSTONE:** as above.
	10	-	tr	tr	**SANDSTONE:** as above, nil to trace coarse grained in part.
954	95	-	-	tr	**CLAYSTONE:** as above.
	5	-	tr	tr	**SANDSTONE:** as above, dominantly very fine, occasionally fine to medium grained.
957	100	-	-	tr	**CLAYSTONE:** as above.
	tr	-	tr	tr	**SANDSTONE:** as above.
960	100	-	-	tr	**CLAYSTONE:** as above.
	tr	-	tr	tr	**SANDSTONE:** as above.
963	100	-	-	tr	**CLAYSTONE:** generally as above, trace to occasionally common silt to very fine quartz sand grains.
966	100	-	-	tr	**CLAYSTONE:** as above.
969	100	-	-	tr	**CLAYSTONE:** as above.
972	100	-	-	tr	**CLAYSTONE:** as above.
975	100	-	-	tr	**CLAYSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): A.TABASSI/C.MENHENNITT Page: 13
978	100	-	-	tr	**CLAYSTONE:** as above.
981	100	-	-	tr	**CLAYSTONE:** generally as above, light grey to very light greenish grey, light brownish grey in part, soft, very rarely firm in part, massive, non calcareous, trace micromica, trace to rarely common carbonaceous flecks, laminae and coaly fragments, trace silt and very fine quartz sand grains, very rarely grading to very fine Argillaceous Sandstone in part, rare lithics, nil to trace hard, medium brown dolomite bands in part.
984	95	-	-	tr	**CLAYSTONE:** as above.
	5	-	tr	tr	**SANDSTONE:** generally as above, clear to very light grey, friable with common loose grains to occasionally moderately hard in part, very fine to fine grained, rarely medium grained in part, subangular to dominantly subrounded, moderately well sorted clear quartz, trace to common light grey, dispersive argillaceous matrix, trace moderately weak to occasionally moderately strong calcareous cement(including dolomite), nil to trace, moderately strong pyrite cement, rare lithics, trace glauconite, poor to rarely fair visual/inferred porosity. No shows.
987	95	-	-	tr	**CLAYSTONE:** as above.
	5	-	tr	tr	**SANDSTONE:** as above.
990	95	-	-	tr	**CLAYSTONE:** as above, dominantly light greenish grey.
	5	-	tr	tr	**SANDSTONE:** as above, trace dull orange brown mineral fluorescence.
993	95	-	-	tr	**CLAYSTONE:** as above.
	5	-	tr	tr	**SANDSTONE:** as above.
996	95	-	-	tr	**CLAYSTONE:** as above.
	5	-	tr	tr	**SANDSTONE:** as above.
999	95	-	-	tr	**CLAYSTONE:** as above, light greenish grey to light brownish grey.
	5	-	-	-	**SANDSTONE:** light grey to light greenish grey, speckled, friable to rarely moderately hard, fine to dominantly medium grained, occasionally coarse in part, subangular to subrounded, moderately sorted clear quartz and light green, grey and brown lithics, trace white kaolinitic and light grey argillaceous matrix, trace to common moderately weak calcareous (dominantly calcite) cement, rare mica and pyrite nodules, poor visual porosity. No shows.
1002	100	-	-	tr	**CLAYSTONE:** generally as above, dominantly light brownish grey.
	tr	-	-	-	**SANDSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): A.TABASSI/C.MENHENNITT Page: 14
1005	100	-	-	tr	**CLAYSTONE:** generally as above, light to medium brown to brownish grey, rarely light grey and white in part, soft, very rarely firm in part, massive, non calcareous, trace micromica, trace to rarely common carbonaceous flecks, laminae and coaly fragments, trace silt and very fine quartz sand grains, very rarely grading to very fine Argillaceous Sandstone in part, rare lithics, nil to trace hard, medium brown dolomite bands in part.
1008	100	-	-	tr	**CLAYSTONE:** as above.
1011	100	-	-	tr	**CLAYSTONE:** as above, dominantly medium brown to brownish grey.
1014	100	-	-	tr	**CLAYSTONE:** as above.
1017	100	-	-	tr	**CLAYSTONE:** as above.
1020	95	-	-	tr	**CLAYSTONE:** as above.
	5	-	-	-	**SANDSTONE:** as above, light grey to light greenish grey, speckled, friable to rarely moderately hard, fine to dominantly medium grained, occasionally coarse in part, subangular to subrounded, moderately sorted clear quartz and light green, grey and brown lithics, trace white kaolinitic and light grey argillaceous matrix, trace to common moderately weak calcareous (dominantly calcite) cement, rare mica and pyrite nodules, trace partially altered feldspar, poor visual porosity. No shows.
1023	100	-	-	tr	**CLAYSTONE:** as above.
	tr	-	-	-	**SANDSTONE:** as above, trace coarse to very coarse clear, frosted and smoky quartz overgrowths.
1026	100	-	-	tr	**CLAYSTONE:** as above.
	tr	-	-	-	**SANDSTONE:** as above.
1029	60	-	-	tr	**CLAYSTONE:** as above.
	40	-	-	-	**SANDSTONE:** clear to very light grey, friable with common to abundant loose grains, rarely moderately hard in part, dominantly medium to coarse, occasionally very coarse, rarely fine in part, subangular to dominantly subrounded, poorly to moderately sorted dominantly clear quartz, trace to common light grey to white/kaolinitic, dispersive argillaceous matrix, trace moderately weak calcareous cement, nil to trace moderately strong pyrite cement, trace mica, light green lithics and coaly detritus, nil to trace pyrite nodules, trace ?slickensides, trace very coarse to occasionally granule quartz overgrowths, trace calcite crystals, dominantly fair to occasionally good inferred/visual porosity. No shows.
1032	60	-	-	tr	**CLAYSTONE:** as above.
	40	-	-	-	**SANDSTONE:** as above.

CUTTINGS DESCRIPTION SHEET

BHP Petroleum

Well: **LOCH ARD-1**
Permit: **VIC/P 31**
Geologist(s): A.TABASSI/C.MENHENNITT

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	
1035	30	-	-	tr	**SANDSTONE:** generally as above, clear to very light grey, friable with common to abundant loose grains, rarely moderately hard in part, dominantly medium to coarse, occasionally very coarse, rarely fine in part, subangular to dominantly subrounded, poorly to moderately sorted dominantly clear quartz, trace to common light grey to white/kaolinitic, dispersive argillaceous matrix, trace moderately weak calcareous cement, nil to trace moderately strong pyrite cement, trace mica, light green lithics and coaly detritus, nil to trace pyrite nodules, trace coaly detritus, trace very coarse to occasionally granule quartz overgrowths, trace calcite crystals, dominantly fair to occasionally good inferred/visual porosity. No shows.
	70	-	-	tr	**CLAYSTONE:** as above.
1038	100	-	-	tr	**SANDSTONE:** generally as above, clear to very light grey, friable with common to abundant loose grains, rarely moderately hard in part, dominantly coarse to very coarse, occasionally medium grained, rarely granule in part, subangular to subrounded, poorly to moderately sorted dominantly clear, occasionally frosted to very light grey quartz, trace light grey to white/kaolinitic, dispersive argillaceous matrix (mostly washed away), trace moderately weak calcareous cement, nil to trace moderately strong pyrite cement, trace mica, light green lithics and coaly detritus, nil to trace pyrite nodules, trace coaly detritus, trace very coarse to occasionally granule quartz overgrowths, trace calcite crystals, nil to trace medium brown, hard dolomite band, dominantly fair to good inferred/visual porosity. No shows.
	tr	-	-	tr	**CLAYSTONE:** as above.
1041	100	-	-	tr	**SANDSTONE:** as above.
1044	100	-	-	tr	**SANDSTONE:** as above, dominantly very coarse to granule grained.
1047	100	-	-	tr	**SANDSTONE:** as above, dominantly coarse grained.
1050	70	-	-	tr	**SANDSTONE:** as above, dominantly coarse to very coarse grained.
	30	-	-	tr	**CLAYSTONE:** as above.
1053	80	-	-	tr	**SANDSTONE:** as above, dominantly very coarse to granule grained.
	20	-	-	tr	**CLAYSTONE:** as above.
1056	100	-	-	-	**SANDSTONE:** as above, dominantly coarse grained.
1059	100	-	-	-	**SANDSTONE:** as above, dominantly very coarse to granule grained.
1062	85	-	-	tr	**SANDSTONE:** as above, dominantly very coarse to granule grained.
	15	-	-	tr	**CLAYSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: LOCH ARD-1 Permit: VIC/P 31 Geologist(s): A.TABASSI/C.MENHENNITT Page: 16
1065	70	-	-	-	SANDSTONE: generally as above, clear to very light grey, friable with common to abundant loose grains, rarely moderately hard in part, dominantly very coarse to granule, occasionally medium to coarse grained in part, dominantly subangular to occasionally subrounded, rarely angular (due to bit action), poorly to moderately sorted dominantly clear, occasionally frosted to very light grey quartz, trace light grey to white/kaolinitic, dispersive argillaceous matrix (mostly washed away), trace moderately weak calcareous cement, nil to trace moderately strong pyrite cement, trace mica, light green lithics, nil to trace pyrite nodules, trace coaly detritus, trace very coarse to occasionally granule quartz overgrowths, trace calcite crystals, nil to trace medium brown, hard dolomite band, trace to common rock fluor, dominantly fair to good inferred/visual porosity. No shows.
	30	-	-	tr	CLAYSTONE: generally as above, medium brown to brownish grey, rarely light grey and white in part, soft, very rarely firm in part, massive, non calcareous, trace micromica, trace to rarely common carbonaceous flecks, laminae and coaly fragments, trace silt and very fine quartz sand grains, rare lithics, nil to trace hard, medium brown dolomite bands in part.
1068	80	-	-	-	SANDSTONE: as above.
	20	-	-	tr	CLAYSTONE: as above.
1071	80	-	-	-	SANDSTONE: as above.
	20	-	-	tr	CLAYSTONE: as above.
1074	80	-	-	-	SANDSTONE: as above.
	20	-	-	tr	CLAYSTONE: as above.
1077	90	-	-	-	SANDSTONE: as above.
	10	-	-	tr	CLAYSTONE: as above.
1080	95	-	-	-	SANDSTONE: as above.
	5	-	-	tr	CLAYSTONE: as above.
1083	90	-	-	-	SANDSTONE: as above.
	10	-	-	tr	CLAYSTONE: as above.
1086	100	-	-	-	SANDSTONE: as above, dominantly coarse, occasionally very coarse to granule.
1089	90	-	-	-	SANDSTONE: as above, dominantly very coarse to granule.
	10	-	-	tr	CLAYSTONE: as above.

CUTTINGS DESCRIPTION SHEET

BHP Petroleum

Well: **LOCH ARD-1**
Permit: **VIC/P 31**
Geologist(s): A.TABASSI/C.MENHENNITT

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	
1092	80	-	-	-	**SANDSTONE:** generally as above, clear to very light grey, friable with common to abundant loose grains, rarely moderately hard in part, dominantly very coarse to granule, occasionally medium to coarse grained in part, dominantly subangular to occasionally subrounded, rarely angular (due to bit action), poorly to moderately sorted dominantly clear, occasionally frosted to very light grey quartz, trace light grey to white/kaolinitic, dispersive argillaceous matrix (mostly washed away), trace moderately weak calcareous cement, nil to trace moderately strong pyrite cement, trace mica, light green lithics, nil to trace pyrite nodules, trace coaly detritus, trace very coarse to occasionally granule quartz overgrowths, trace calcite crystals, nil to trace medium brown, hard dolomite band, trace mica, dominantly fair to good inferred/visual porosity. No shows. **CLAYSTONE:** generally as above, dominantly medium brown to brownish grey, rarely light grey and white in part, soft, very rarely firm in part, massive, non calcareous, trace micromica, trace to rarely common carbonaceous flecks, laminae and coaly fragments, trace silt, rare lithics, nil to trace hard, medium brown dolomite bands in part.
1095	60	-	-	-	**SANDSTONE:** as above, dominantly medium to coarse grained.
	40	-	-	tr	**CLAYSTONE:** as above.
1098	40	-	-	-	**SANDSTONE:** as above.
	60	-	-	tr	**CLAYSTONE:** as above.
'01	60	-	-	-	**SANDSTONE:** as above.
	40	-	-	tr	**CLAYSTONE:** as above.
1104	60	-	-	-	**SANDSTONE:** as above.
	40	-	-	tr	**CLAYSTONE:** as above.
1107	70	-	-	-	**SANDSTONE:** as above, dominantly coarse grained.
	30	-	-	tr	**CLAYSTONE:** as above.
1110	80	-	-	tr	**SANDSTONE:** as above, trace coaly detritus.
	20	-	-	tr	**CLAYSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): A.TABASSI/C.MENHENNITT Page: 18
1113	100	-	-	tr	**SANDSTONE:** generally as above, clear to very light grey, friable with common to abundant loose grains, rarely moderately hard in part, dominantly very coarse, occasionally coarse and rarely granule grained in part, dominantly subangular to occasionally subrounded, rarely angular (due to bit action), poorly to moderately sorted dominantly clear, occasionally frosted to very light grey quartz, trace light grey, dispersive argillaceous matrix (mostly washed away), trace moderately weak calcareous cement, nil to trace moderately strong pyrite cement, trace mica, light green lithics, nil to trace pyrite nodules, trace coaly detritus, trace very coarse to occasionally granule quartz overgrowths, trace rock fluor, trace calcite crystals, nil to trace medium brown, hard dolomite band, trace mica, fair to good inferred/visual porosity. No shows.
1116	100	-	-	tr	**SANDSTONE:** as above, dominantly very coarse to granule grained.
1119	90	-	-	tr	**SANDSTONE:** as above.
	10	-	-	tr	**CLAYSTONE:** generally as above, dominantly medium brown to brownish grey, rarely light grey and white in part, soft, very rarely firm in part, massive, non calcareous, trace micromica, trace to rarely common carbonaceous flecks, laminae and coaly fragments, trace silt, rare lithics, nil to trace hard, medium brown dolomite bands in part.
1122	80	-	-	tr	**SANDSTONE:** as above.
	20	-	-	tr	**CLAYSTONE:** as above.
1125	50	-	-	tr	**SANDSTONE:** as above.
	50	-	-	tr	**CLAYSTONE:** as above.
1128	70	-	-	tr	**SANDSTONE:** as above.
	30	-	-	tr	**CLAYSTONE:** as above.
1131	40	-	-	tr	**SANDSTONE:** as above.
	60	-	-	tr	**CLAYSTONE:** as above.
1134	40	-	-	tr	**SANDSTONE:** as above.
	60	-	-	tr	**CLAYSTONE:** as above.
1137	40	-	-	tr	**SANDSTONE:** as above.
	60	-	-	tr	**CLAYSTONE:** as above.
1140	20	-	-	tr	**SANDSTONE:** as above.
	80	-	-	tr	**CLAYSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: LOCH ARD-1 Permit: VIC/P 31 Geologist(s): A.TABASSI/C.MENHENNITT Page: 19
1143	80	-	-	tr	CLAYSTONE: generally as above, dominantly medium brown to brownish grey, rarely light grey and white in part, soft, very rarely firm in part, massive, non calcareous, trace micromica, trace to rarely common carbonaceous flecks, laminae and coaly fragments, trace silt, rare lithics, nil to trace hard, medium brown dolomite bands in part.
	20	-	-	tr	SANDSTONE: generally as above, clear to very light grey, friable with common to abundant loose grains, rarely moderately hard in part, dominantly very coarse, occasionally coarse and rarely granule grained in part, dominantly subangular to occasionally subrounded, rarely angular (due to bit action), poorly to moderately sorted dominantly clear, occasionally frosted to very light grey quartz, trace light grey, dispersive argillaceous matrix (mostly washed away), trace moderately weak calcareous cement, nil to trace moderately strong pyrite cement, trace mica, light green lithics, nil to trace pyrite nodules, trace coaly detritus, trace very coarse to occasionally granule quartz overgrowths, trace rock fluor, trace calcite crystals, nil to trace medium brown, hard dolomite band, trace mica, fair to good inferred/visual porosity. No shows.
1146	90	-	-	tr	CLAYSTONE: as above.
	10	-	-	tr	SANDSTONE: as above.
1149	80	-	-	tr	SANDSTONE: as above.
	20	-	-	tr	CLAYSTONE: as above.
1152	70	-	-	tr	SANDSTONE: as above.
	30	-	-		CLAYSTONE: as above.
1155	70	-	-	tr	SANDSTONE: as above.
	30	-	-	tr	CLAYSTONE: as above.
1158	60	-	-	tr	SANDSTONE: as above.
	40	-	-	tr	CLAYSTONE: as above.
1161	50	-	-	tr	SANDSTONE: as above.
	50	-	-	tr	CLAYSTONE: as above.
1164	80	-	-	tr	SANDSTONE: as above.
	20	-	-	tr	CLAYSTONE: as above.
1167	50	-	-	tr	SANDSTONE: as above.
	50	-	-	tr	CLAYSTONE: as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): A.TABASSI/C.MENHENNITT Page: 20
1170	80	-	-	tr	**SANDSTONE:** generally as above, clear to very light grey, friable with common to abundant loose grains, rarely moderately hard in part, dominantly medium to coarse, occasionally very coarse and rarely granule grained in part, dominantly subangular to occasionally subrounded, rarely angular (due to bit action), poorly to moderately sorted dominantly clear, occasionally frosted to very light grey quartz, trace light grey, dispersive argillaceous matrix (mostly washed away), trace moderately weak calcareous cement, nil to trace moderately strong pyrite cement, trace mica, light green lithics, nil to trace pyrite nodules, trace coaly detritus, trace very coarse to occasionally granule quartz overgrowths, trace rock fluor, trace calcite crystals, nil to trace medium brown, hard dolomite band, trace mica, fair to good inferred/visual porosity. No shows.
	20	-	-	tr	**CLAYSTONE:** generally as above, dominantly medium brown to brownish grey, rarely light grey and white in part, soft, very rarely firm in part, massive, non calcareous, trace micromica, trace to rarely common carbonaceous flecks, laminae and coaly fragments, trace silt, rare lithics, nil to trace hard, medium brown dolomite bands in part.
1173	70	-	-	tr	**SANDSTONE:** generally as above, becoming dominantly fine to coarse grained.
	30	-	-	tr	**CLAYSTONE:** as above.
1176	60	-	-	tr	**SANDSTONE:** clear to very light grey, friable with common to abundant loose grains, rarely moderately hard in part, dominantly fine to coarse, occasionally very coarse and rarely granule grained in part, dominantly subangular to occasionally subrounded, rarely angular (due to bit action on larger grains), moderately sorted dominantly clear, occasionally frosted to very light grey quartz, trace light grey, dispersive argillaceous matrix (mostly washed away), minor moderately weak calcareous cement, nil to trace moderately strong pyrite cement, trace mica, light green lithics, nil to trace pyrite nodules, trace coaly detritus, trace very coarse to occasionally granule quartz overgrowths, trace rock fluor, trace calcite crystals, nil to trace medium brown, hard dolomite band, trace mica, fair to good inferred/visual porosity. No shows.
	40	-	-	tr	**CLAYSTONE:** generally as above, dominantly medium brown to brownish grey, rarely light grey and white in part, soft, very rarely firm in part, massive, non calcareous, trace micromica, trace to rarely common carbonaceous flecks, laminae and coaly fragments, trace silt, rare lithics, nil to trace hard, medium brown dolomite bands in part.
1179	70	-	-	tr	**CLAYSTONE:** as above.
	30	-	-	tr	**SANDSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): A.TABASSI/C.MENHENNITT Page: 21
1182	60	-	-	tr	**CLAYSTONE:** generally as above, dominantly medium brown to brownish grey, rarely light grey and white in part, soft, very rarely firm in part, massive, non calcareous, trace micromica, trace to rarely common carbonaceous flecks and laminae, trace coaly fragments, trace silt, rare lithics, nil to trace hard, medium brown dolomite bands in part.
	40	-	-	tr	**SANDSTONE:** clear to very light grey, friable with common to abundant loose grains, rarely moderately hard in part, dominantly fine to coarse, occasionally very coarse and rarely granule grained in part, dominantly subangular to occasionally subrounded, rarely angular (due to bit action on larger grains), poorly to moderately sorted dominantly clear, occasionally frosted to very light grey quartz, trace light grey, dispersive argillaceous matrix (mostly washed away), minor moderately weak calcareous cement, nil to trace moderately strong pyrite cement, trace mica, light green lithics, nil to trace pyrite nodules, trace coaly detritus, trace very coarse to occasionally granule quartz overgrowths, trace rock fluor, trace calcite crystals, nil to trace medium brown, hard dolomite band, trace mica, fair to good inferred/visual porosity. No shows.
1185	80	-	-	tr	**CLAYSTONE:** as above.
	20	-	-	tr	**SANDSTONE:** as above.
1188	90	-	-	tr	**CLAYSTONE:** as above.
	10	-	-	tr	**SANDSTONE:** as above.
1191	100	-	-	tr	**CLAYSTONE:** as above.
1194	100	-	-	tr	**CLAYSTONE:** as above.
	tr	-	-	-	**COAL:** greyish black to black, moderately firm to firm, brittle, earthy to sub vitreous lustre, sub conchoidal fracture in part.
1197	100	-	-	tr	**CLAYSTONE:** as above.
1200	100	-	-	tr	**CLAYSTONE:** as above.
1203	100	-	-	tr	**CLAYSTONE:** as above.
1206	100	-	-	tr	**ARENACEOUS CLAYSTONE:** pale greenish grey (Non glauconitic), rarely very light grey to white, soft to occasionally firm, slightly sticky in part, dominantly massive, common to abundant fine to medium quartz and green, red, brown and grey volcanogenic lithics, slightly silty in part, slightly to occasionally moderately calcareous, trace partially altered feldspar/kaolinite, trace carbonaceous detritus in part, nil to trace pyrite nodules, in part grading to argillaceous lithic sandstone.
1209	100	-	-	tr	**ARENACEOUS CLAYSTONE:** as above.
1212	100	-	-	tr	**ARENACEOUS CLAYSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): A.TABASSI/C.MENHENNITT Page: 22
1215	100	-	-	tr	**ARENACEOUS CLAYSTONE:** pale greenish grey (Non glauconitic), rarely very light grey to white, soft to occasionally firm, slightly sticky in part, dominantly massive, common to abundant fine to medium quartz and green, red, brown and grey volcanogenic lithics, slightly silty in part, slightly to occasionally moderately calcareous, trace partially altered feldspar/kaolinite, trace carbonaceous detritus in part, nil to trace pyrite nodules, grading to Argillaceous Lithic Sandstone.
1218	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** pale greenish grey to greenish grey, rarely very light grey to white, friable to occasionally moderately hard, fine to medium grained, occasional coarse grains, angular to sub angular, moderately sorted clear to translucent quartz and green, red, brown, and grey volcanogenic lithics, trace moderately strong siliceous cement in part, common light greenish grey to greenish grey argillaceous matrix, trace calcite crystals, trace partially altered feldspar/kaolinite, trace carbonaceous detritus in part, poor visual porosity. Grading to arenaceous claystone as above.
1221	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1224	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1227	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1230	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1233	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1236	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1239	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1242	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** generally as above, trace weak pyrite cement.
1245	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1248	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1251	100	-	-	tr	**ARENACEOUS CLAYSTONE:** pale greenish grey (Non glauconitic), rarely very light grey to white, soft to occasionally firm, slightly sticky in part, dominantly massive, common to abundant fine to medium quartz and green, red, brown and grey volcanogenic lithics, slightly silty in part, slightly to occasionally moderately calcareous, trace partially altered feldspar/kaolinite, trace carbonaceous detritus in part, grading to Argillaceous Lithic Sandstone.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): A.TABASSI/C.MENHENNITT Page: 23
1254	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: pale greenish grey to greenish grey, rarely very light grey to white, friable to occasionally moderately hard, fine to medium grained, occasional coarse grains, angular to sub angular, moderately well sorted clear to translucent quartz and green, red, brown, and grey volcanogenic lithics, trace moderately strong siliceous cement in part, common light greenish grey to greenish grey argillaceous matrix, trace calcite crystals, trace partially altered feldspar/kaolinite, trace chert, trace carbonaceous detritus in part, poor visual porosity. Grading to arenaceous claystone as above. No shows.
1257	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1260	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1263	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1266	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1269	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1272	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1275	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1278	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1281	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1284	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1287	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: pale greenish grey to greenish grey, rarely very light grey to white, friable to occasionally moderately hard, medium to coarse grained, occasional very coarse grains, angular to sub angular, moderately well sorted clear to translucent quartz and green, red, brown, and grey volcanogenic lithics, trace moderately strong siliceous cement in part, common light greenish grey to greenish grey argillaceous matrix, trace calcite crystals, trace partially altered feldspar/kaolinite, trace chert, trace carbonaceous detritus in part, poor visual porosity. Grading to arenaceous claystone as above.
1290	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1293	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.
1296	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: generally as above, becoming more argillaceous.
1299	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: generally as above, becoming more argillaceous.
1302	100	-	-	tr	ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE: as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): A.TABASSI/C.MENHENNITT Page: 24
1305	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** pale greenish grey to greenish grey, rarely very light grey to white, friable to occasionally moderately hard, predominantly medium grained, occasional coarse grains, angular to sub angular, well sorted clear to translucent quartz and green, red, brown, and grey volcanogenic lithics, trace moderately strong siliceous cement in part, common light greenish grey to greenish grey argillaceous matrix, trace calcite crystals, trace partially altered feldspar/kaolinite, trace chert, trace carbonaceous detritus in part, poor visual porosity. Grading to arenaceous claystone as above.
1308	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1311	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1314	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1317	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1320	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1323	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1326	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
1329	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** generally as above, trace mica.
1332	95	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** generally as above, pale greenish grey to greenish grey, rarely very light grey to white, friable to occasionally moderately hard, predominantly fine to medium grained, occasional coarse grains, angular to sub angular, moderately sorted clear to translucent quartz and green, red, brown, and grey volcanogenic lithics, trace moderately strong siliceous cement in part, common light greenish grey to greenish grey argillaceous matrix, dark greenish grey in part, trace calcite crystals, trace partially altered feldspar/kaolinite, trace chert, trace carbonaceous detritus in part, poor visual porosity. Grading to arenaceous claystone as above. No shows.
	5	-	-	-	**CLAYSTONE:** (1) medium light grey to greenish grey, moderately firm to firm, amorphous, sub blocky to blocky in part, non calcareous. (2) brownish grey to brownish black, moderately firm, commonly silty, occasionally sub blocky, non calcareous.
1335	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** generally as above, becoming more argillaceous.
	tr	-	-	-	**CLAYSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET Well: **LOCH ARD-1** Permit: **VIC/P 31** Geologist(s): A.TABASSI/C.MENHENNITT Page: 25
1338	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** generally as above, becoming more argillaceous.
	tr	-	-	-	**CLAYSTONE:** as above.
1341	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** pale greenish grey to greenish grey, rarely very light grey to white, friable to occasionally moderately hard, slightly sticky in part, predominantly fine to medium grained, occasional coarse grains, angular to sub angular, moderately sorted clear to translucent quartz and green, red, brown, and grey volcanogenic lithics, trace moderately strong siliceous cement in part, common light greenish grey to greenish grey argillaceous matrix, dark greenish grey in part, trace calcite crystals, trace partially altered feldspar/kaolinite, trace chert, trace carbonaceous detritus in part, poor visual porosity. No shows. Grading to arenaceous claystone as above.
	tr	-	-	-	**CLAYSTONE:** (1) medium light grey to greenish grey, occasionally light brownish grey, moderately firm to firm, amorphous, sub blocky to blocky in part, non calcareous. (2) brownish grey to brownish black, moderately firm, commonly silty, occasionally sub blocky, non calcareous.
1344	95	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
	5	-	-	-	**CLAYSTONE:** as above
1347	95	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
	5	-	-	-	**CLAYSTONE:** as above
1350	90	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
	10	-	-	-	**CLAYSTONE:** as above
1353	90	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE:** as above.
	10	-	-	-	**CLAYSTONE:** as above
1356	100	-	-	tr	**ARENACEOUS CLAYSTONE:** generally as above, pale greenish grey (Non glauconitic), rarely very light grey to white, soft to occasionally firm, slightly sticky in part, dominantly massive, common to abundant fine to medium quartz and green red brown and grey volcanogenic lithics, slightly silty in part, slightly to occasionally moderately calcareous, trace partially altered feldspar/kaolinite, trace carbonaceous detritus in part, grading to Argillaceous Quartzose/Lithic Sandstone.
	tr	-	-	-	
1359	100	-	-	tr	**ARENACEOUS CLAYSTONE:** as above.
1362	100	-	-	tr	**ARGILLACEOUS QUARTZOSE/LITHIC SANDSTONE GRADING TO ARENACEOUS CLAYSTONE:** as above.

Depth (mRT)	Lithology (%)	%Fluor	Glauconite	Carb Matter	CUTTINGS DESCRIPTION SHEET BHP Petroleum Well: LOCH ARD-1 Permit: VIC/P 31 Geologist(s): A.TABASSI/C.MENHENNITT Page: 26
1365	100	-	-	tr	ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE GRADING TO ARENACEOUS CLAYSTONE: generally as above, pale greenish grey to greenish grey, rarely very light grey to white, very light brown to beige in part, friable with trace to common loose grains to occasionally moderately hard, fine to coarse grained, dominantly medium grains, angular to sub angular, moderately sorted volcanolithics (green, red, brown, grey and occasionally yellow and orange) and clear to translucent to frosted quarts, trace moderately strong siliceous and occasionally moderately weak calcareous cement in part, common light greenish grey to greenish grey, occasionally beige argillaceous matrix, dark greenish grey in part, trace calcite crystals, trace partially altered feldspar/kaolinite, trace mica, trace carbonaceous detritus in part, grading to Arenaceous Claystone as above, poor visual porosity. No shows.
1368	100	-	-	tr	ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE GRADING TO ARENACEOUS CLAYSTONE: as above.
1371	100	-	-	tr	ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE GRADING TO ARENACEOUS CLAYSTONE: as above.
1374	100	-	-	tr	ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE GRADING TO ARENACEOUS CLAYSTONE: as above.
1377	100	-	-	tr	ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE GRADING TO ARENACEOUS CLAYSTONE: as above.
1380	100	-	-	tr	ARENACEOUS CLAYSTONE GRADING TO ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE: as above.
1383	100	-	-	tr	ARENACEOUS CLAYSTONE GRADING TO ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE: as above.
1386	100	-	-	tr	ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE GRADING TO ARENACEOUS CLAYSTONE: as above.
1389	100	-	-	tr	ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE GRADING TO ARENACEOUS CLAYSTONE: as above.
1392	100	-	-	tr	ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE GRADING TO ARENACEOUS CLAYSTONE: as above.
1395	100	-	-	tr	ARENACEOUS CLAYSTONE GRADING TO ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE: as above, dominantly soft and dispersive.
1397 T.D.	100	-	-	tr	ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE GRADING TO ARENACEOUS CLAYSTONE: as above, occasionally very coarse lithics as above.
TOTAL DEPTH OF 1397 mRT WAS REACHED @ 08:40 HRS ON WED. 27TH OCTOBER, 1993.					

6.2 APPENDIX 2 CST Descriptions

PETROLEUM DIVISION

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 01/11/93 Geologist(s): A.Tabassi/C.Menhennitt Logging Suite No: 2 Page: 1 of 7
31	1329.0	50	**CLAYSTONE:** medium greenish grey to green, firm to moderately hard in part, non calcareous, blocky to sub blocky appearance, nil to rare micromica and very fine carbonaceous flecks, nil to trace very fine partially altered feldspar. **SHOWS:** nil
32	1326.0	40	**ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE:** medium to occasionally dark greenish grey to green, speckled, friable to very rarely moderately hard in part, fine to dominantly medium grained, subangular to dominantly subrounded, moderately well sorted green, brown, red and grey volcanolithics, clear to translucent quartz and partially altered feldspar/kaolinite, abundant medium greenish grey, ?chloritic, moderately dispersive, moderately silty argillaceous matrix, nil to trace white kaolinitic argillaceous matrix in part, rare to dominantly common carbonaceous and coaly detritus, trace micromica, poor visual porosity. Interlaminated with minor: **COAL:** black to very dark brown, soft, rarely firm and brittle in part, slightly argillaceous in part, earthy lustre. **SHOWS:** nil
33	1320.0	38	**ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE:** medium to occasionally dark greenish grey, speckled, friable to moderately hard in part, fine to dominantly medium grained, subangular to dominantly subrounded, moderately well sorted green, brown, rarely red and grey volcanolithics, clear to translucent quartz and partially altered feldspar/kaolinite, abundant medium greenish grey, ?chloritic, moderately dispersive, moderately silty argillaceous matrix, nil to trace white kaolinitic argillaceous matrix in part, rare to common carbonaceous and coaly detritus, trace micromica, poor to very poor visual porosity. **SHOWS:** nil
34	1312.0	30	**ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE:** generally as per SWC No 33, medium to occasionally dark greenish grey, speckled, friable to moderately hard in part, fine to dominantly medium grained, subangular to dominantly subrounded, moderately well sorted green, brown, rarely red and grey volcanolithics, clear to translucent quartz and partially altered feldspar/kaolinite, abundant medium greenish grey, ?chloritic, moderately dispersive, moderately silty argillaceous matrix, nil to trace white kaolinitic argillaceous matrix in part, nil to trace moderately weak to occasionally moderately strong siliceous cement in part, rare to common carbonaceous and coaly detritus, trace micromica, poor to very poor visual porosity. **SHOWS:** nil

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 01/11/93 Geologist(s): A.Tabassi/C.Menhennitt Logging Suite No: 2 Page: 2 of .
35	1291.0	35	**ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE:** as per SWC No. 33. **SHOWS:** nil
36	1278.0	35	**ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE GRADING TO ARENACEOUS CLAYSTONE:** medium to occasionally dark greenish grey, speckled, friable to moderately hard in part, fine to dominantly medium grained, rarely medium to coarse grained in part, subangular to dominantly subrounded, moderately sorted green, brown and grey volcanolithics, clear to translucent quartz and partially altered feldspar/kaolinite, abundant medium greenish grey, ?chloritic, moderately dispersive, moderately silty argillaceous matrix, in part grades to Arenaceous Claystone, nil to trace white kaolinitic argillaceous matrix in part, rare to common carbonaceous and coaly detritus, trace micromica, poor to very poor visual porosity **SHOWS:** nil
37	1251.0	40	**ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE:** medium greenish grey to rarely green in part, speckled, friable to very rarely moderately hard in part, fine to dominantly medium grained, occasionally coarse grained in part, subangular to dominantly subrounded, moderately sorted green, brown, red, grey and rarely yellow volcanolithics, clear to translucent quartz and partially altered feldspar/kaolinite, abundant medium greenish grey, ?chloritic, moderately dispersive, moderately silty argillaceous matrix, nil to trace white kaolinitic argillaceous matrix in part, rare carbonaceous and coaly detritus, trace mica, nil to trace medium greenish grey clay clast(?), poor visual porosity. **SHOWS:** nil
38	1228.0	40	**ARGILLACEOUS LITHIC/QUARTZOSE SANDSTONE:** medium greenish grey to rarely green in part, speckled, friable to very rarely moderately hard in part, fine to dominantly medium grained, occasionally coarse grained in part, subangular to dominantly subrounded, moderately sorted green, brown, and grey volcanolithics, clear to translucent quartz and partially altered feldspar/kaolinite, abundant medium greenish grey, ?chloritic, moderately dispersive, moderately silty argillaceous matrix, nil to trace white kaolinitic argillaceous matrix in part, rare carbonaceous and coaly detritus, trace mica, poor visual porosity. **SHOWS:** nil
39	1208.0	28	**CLAYSTONE:** light olive grey to beige, very light grey in part, soft to dominantly firm, massive, non calcareous, rare quartzose and lithic silt, trace micromica and carbonaceous flecks, nil to trace very fine partially altered feldspar. **SHOWS:** nil

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 01/11/93 Geologist(s): A.Tabassi/C.Menhennitt Logging Suite No: 2 Page: 3 of 7
40	1205.0	45	<u>COAL:</u> black, very dark brown to black in part, firm to moderately hard in part, dull lustre, block to sub blocky appearance, abundantly argillaceous, in part grading to: <u>CARBONACEOUS CLAYSTONE:</u> very dark brown to black, firm to moderately hard, non calcareous, trace micromica and silt, abundant carbonaceous flecks. <u>SHOWS:</u> nil
41	1200.0	38	<u>CLAYSTONE:</u> light olive grey to light greenish grey, soft to dominantly firm, non calcareous, slightly to moderately micromicaceous, very slightly silty, trace carbonaceous flecks, slightly bioturbated in part. <u>SHOWS:</u> nil
42	1194.0	40 *	<u>COAL:</u> black, firm to moderately hard, rarely brittle in part, rarely soft in part, commonly argillaceous, slightly earthy lustre, platy in part. <u>SHOWS:</u> nil * Recovery measurement is approximate as the core is extremely crumbly.
43	1188.0	35	<u>CLAYSTONE:</u> medium olive grey to medium greenish grey, firm, moderately hard in part, non calcareous, trace to rare micromica, trace carbonaceous flecks, trace silt. <u>SHOWS:</u> nil
44	1186.0	35 *	<u>COAL:</u> black, firm, rarely moderately hard in part, rarely brittle in part, sub conchoidal fracture in part, trace to common disseminated and nodular pyrite, trace to common, light to medium translucent yellow amber, interlaminated with: <u>CARBONACEOUS CLAYSTONE:</u> very dark brown to black, firm to moderately hard, non calcareous, sub fissile in part, trace micromica and silt, abundant carbonaceous flecks, trace to common, light to medium translucent yellow amber. <u>SHOWS:</u> - Amber has bright milky white fluorescence with no cut, crush cut or residual ring. - Coal and Carbonaceous Claystone have no direct, cut or crush cut fluorescence, very weak, very dull, patchy to broken/moderately thin, yellowish green residual ring. * Recovery measurement is approximate as the core is extremely crumbly.

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 01/11/93 Geologist(s): A.Tabassi/C.Menhennitt Logging Suite No: 2 Page: 4 of .
45	1173.0	20	**SANDSTONE:** light grey to translucent, light yellowish grey in part, friable in part, moderately hard to hard in part, fine to coarse grained, dominantly medium grained, subangular to subrounded, moderately sorted dominantly clear quartz, common to rarely abundant light grey to light yellowish grey argillaceous matrix, common to rarely abundant, moderately weak to dominantly moderately strong calcareous cement, trace partially altered feldspar, nil to trace grey and brown lithics, trace carbonaceous detritus, poor to rarely fair (in friable portion) visual porosity. **SHOWS:** nil
46	1155.5	35	**INTERLAMINATED SILTY CLAYSTONE:** medium to occasionally dark grey interlaminated with minor white to light grey, dominantly firm, occasionally moderately hard in part, non calcareous, commonly silty, occasionally grading to Argillaceous Siltstone, trace to common micromica, trace partially altered feldspar and other lithics, rare to occasionally common carbonaceous laminae and flecks, rare to occasionally common fine quartz sand grains and nil to trace very coarse quartz overgrowths in the white to light grey laminae, in part grading to white to light grey Argillaceous Sandstone with very poor visual porosity. **SHOWS:** nil
47	1154.0	30	**ARGILLACEOUS SANDSTONE INTERLAMINATED WITH CLAYSTONE:** **ARGILLACEOUS SANDSTONE:** white to light grey, friable, rarely moderately hard in part, very fine to dominantly fine grained, subangular to dominantly subrounded, well sorted clear quartz, common to abundant, light grey to occasionally white/kaolinitic argillaceous matrix, slightly silty in part, nil to trace very fine glauconite, mica, partially altered feldspar, grey lithics and carbonaceous detritus, poor visual porosity. Interlaminated with: **CLAYSTONE:** medium grey to brownish grey, soft to firm, moderately hard in part, non calcareous, commonly silty and micromicaceous, grading to Argillaceous Siltstone in part, trace to occasionally common partially altered felspar and other lithics, trace to common carbonaceous flecks and minor laminae. **SHOWS:** nil
48	1150.0	40	**CLAYSTONE:** medium to dominantly dark grey, rarely brownish grey in part, firm to moderately hard, non calcareous, trace to common silt and micromica, common to occasionally abundant carbonaceous flecks and laminae, grading to Carbonaceous Claystone in part, common large, black, firm coal fragments. **SHOWS:** nil

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 01/11/93 Geologist(s): A.Tabassi/C.Menhennitt Logging Suite No: 2 Page: 5 of 7
49	1137.0	35	**INTERLAMINATED ARGILLACEOUS SILTSTONE:** medium to dark grey interlaminated with light grey to occasionally white, firm, rarely moderately hard in part, non calcareous, abundantly argillaceous, grading to Silty Claystone in part, common micromica, carbonaceous flecks, partially altered feldspar and lithics, trace to common very fine quartz sand grains in part, the light grey to white laminae grading to very fine Argillaceous Silty Sandstone in part. **SHOWS:** nil
50	1113.0	30 *	**SANDSTONE:** white to very light grey, translucent in part, friable, fine to very coarse grained, dominantly medium to coarse grained, subangular to dominantly subrounded, poorly sorted clear quartz, rare to common light grey to dominantly white kaolinitic argillaceous matrix, trace grey lithics and coaly fragments, nil to trace mica and very coarse grained quartz overgrowths, fair to rarely good visual porosity. **SHOWS:** nil * Recovery measurement is approximate as the core is extremely crumbly.
51	1107.0	35	**SILTY CLAYSTONE:** medium to dark grey to medium brownish grey, firm to rarely moderately hard, non calcareous, massive, commonly to abundantly silty, in part grading to Argillaceous Siltstone, trace to rare micromica, rare to common carbonaceous flecks and microlaminae. **SHOWS:** nil
52	1065.0	30 *	**ARGILLACEOUS SANDSTONE:** very light grey to white, friable, fine to very coarse grained, dominantly medium to coarse grained, subangular to dominantly subrounded, poorly to moderately sorted, dominantly clear quartz, common to abundant white to very light grey, dominantly kaolinitic argillaceous matrix, trace coaly detritus, nil to trace grey and brown lithics, mica and partially altered feldspar, dominantly fair to occasionally good visual porosity. **SHOWS:** nil * Recovery measurement is approximate as the core is extremely crumbly.
53	1050.0	25 *	**SANDSTONE:** very light grey to white, occasionally light yellow (?rust colour probably introduced during CST's operations), friable, fine to very coarse grained, dominantly medium to coarse grained, subangular to dominantly subrounded, poorly to moderately sorted, dominantly clear quartz, trace to dominantly common white to very light grey, dominantly kaolinitic argillaceous matrix, nil to trace coaly detritus, nil to trace grey and brown lithics, mica and partially altered feldspar, fair to good visual porosity. **SHOWS:** nil * Recovery measurement is approximate as the core is extremely crumbly.

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 01/11/93 Geologist(s): A.Tabassi/C.Menhennitt Logging Suite No: 2 Page: 6 of
54	1048.0	50	**ARGILLACEOUS SANDSTONE:** light to medium grey, speckled in part, friable, fine to coarse grained, dominantly medium grained, subangular to subrounded, moderately sorted, dominantly clear quartz, common to abundant light grey to white/kaolinitic argillaceous matrix, common fine to medium grained, beige altered feldspar/kaolin, trace to common grey and rare brown lithics, trace to occasionally common, medium grained, black coal fragments, trace mica, poor to dominantly fair visual porosity. **SHOWS:** nil
55	1027.0	40	**SILTY CLAYSTONE INTERLAMINATED WITH MINOR SANDSTONE:** **SILTY CLAYSTONE:** medium to dark grey, firm to rarely moderately hard in part, non calcareous, common to occasionally abundantly silty, in part grading to Argillaceous Siltstone, trace micromica, trace to common carbonaceous flecks and very fine laminae, grading to/interlaminated (less than 2 mm) with minor: **SANDSTONE:** light grey to white, friable, very fine to fine grained, subangular to subrounded, well sorted clear quartz, trace to common light grey to white/kaolinitic argillaceous matrix, trace lithics, carbonaceous detritus and fine mica, poor visual porosity. **SHOWS:** nil
56	1022.0	50	**CLAYSTONE:** medium brownish grey, medium grey in part, firm to moderately hard in part, non calcareous, trace micromica, rare to trace silt, common carbonaceous laminae and flecks. **SHOWS:** nil
57	1003.0	40	**ARGILLACEOUS SANDSTONE:** light greenish grey to light grey, friable to rarely moderately hard in part, fine to dominantly medium grained, occasionally coarse grained in part, dominantly subangular to occasionally subrounded, moderately well sorted, dominantly clear quartz and minor light greenish grey lithics, common to occasionally abundant light greenish grey to light grey, rarely white kaolinitic argillaceous matrix, trace brown lithics and partially altered feldspar/kaolin, trace muscovite and biotite, trace carbonaceous detritus, poor visual porosity. **SHOWS:** nil
58	988.0	40	**CLAYSTONE:** medium olive grey, firm to moderately hard in part, non to slightly calcareous in part, slightly to occasionally commonly silty, trace micromica, trace fine carbonaceous flecks and coal fragments. **SHOWS:** nil

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 01/11/93 Geologist(s): A.Tabassi/C.Menhennitt Logging Suite No: 2 Page: 7 of 7
59	970.0	42	**CLAYSTONE:** light to medium olive grey, firm to moderately hard in part, non calcareous, trace micromica and silt, trace to common carbonaceous laminae and flecks, nil to trace coal fragments. **SHOWS:** nil
60	954.0	40	**CLAYSTONE:** light to medium grey and olive grey, light to medium olive brown in part, firm to moderately hard, non calcareous, trace to common silt and very fine carbonaceous flecks and laminae, trace large, black coaly fragments with nil to trace cryptocrystalline pyrite, nil to trace very fine partially altered feldspar. **SHOWS:** nil

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 25/10/93 Geologist(s): C.Menhennitt Logging Suite No: 1 Page: 1
1	927	40	**ARENACEOUS CLAYSTONE:** light grey to medium light grey, firm to moderately hard, dispersive, common very fine to occasionally medium grained clear to translucent quartz, angular to sub angular, common white and light greenish grey to greenish grey weathered feldspar grains, trace greyish black lithics, trace microcrystalline pyrite, trace carbonaceous flecks, non calcareous. **SHOWS:** Nil.
2	912.5	38	**SANDSTONE:** very light grey to light grey, predominantly translucent grains, moderately firm, very fine to fine grained, sub angular to sub rounded, moderate to high sphericity, well sorted quartz, trace patchy weak calcite cement, common light grey dispersive argillaceous matrix, abundant very fine grain sized carbonaceous flecks, faint millimetre scale laminae, poor visual porosity. **SHOWS:** Nil.
3	906.5	33	**SANDSTONE:** very light grey to light grey, predominantly translucent grains, moderately firm to firm, very fine to fine grained, sub angular to sub rounded, moderate to high sphericity, well sorted quartz, trace patchy weak calcite cement, trace patchy weak microcrystalline pyrite cement, common light grey dispersive argillaceous matrix, minor very fine grain sized carbonaceous flecks and fragments, trace mica, poor visual porosity. **SHOWS:** Nil.
4	896.5	25	**SANDSTONE:** white to medium light grey, clear to translucent grains, trace light bluish grey and greyish yellow grains, friable to moderately firm, fine to coarse grained, predominantly medium to coarse grains, trace very coarse to granules, sub angular to sub rounded, moderate to high sphericity, moderately to well sorted quartz, trace moderately weak silica cement, minor light grey argillaceous matrix, rare carbonaceous flecks and fragments, trace lithic grains, poor to fair visual porosity. **SHOWS:** Nil.

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 25/10/93 Geologist(s): C.Menhennitt Logging Suite No: 1 Page: 2
5	884	14	**SANDSTONE:** medium light grey to medium grey, clear to translucent grains, trace iron stained grains, moderately hard, very fine to fine grained, sub angular to sub rounded, angular in part, moderate to high sphericity, well sorted quartz, abundant strong calcite cement, trace light grey argillaceous matrix, trace carbonaceous flecks, trace microcrystalline pyrite, trace greyish black lithic grains, nil visual porosity. **SHOWS:** Nil.
6	882	20	**SANDSTONE:** medium light grey to medium grey, clear to translucent grains, trace iron stained grains, moderately hard, very fine to fine grained, sub angular to sub rounded, angular in part, moderate to high sphericity, well sorted quartz, abundant strong calcite cement, minor light grey argillaceous matrix, minor carbonaceous flecks, trace microcrystalline pyrite, trace greyish black lithic grains, trace feldspathic grains, nil visual porosity. **SHOWS:** Nil.
7	877.5	20	**CONGLOMERATIC SANDSTONE:** white to dark grey, moderately hard to hard, predominantly pebble to granule sized quartz grains and minor similar sized claystone clasts, quartz grains are clear to milky, claystone clasts are dark grey to greyish black, angular to sub rounded, low sphericity, minor moderately strong to strong silica cement, trace weak calcite cement, common very light grey dispersive matrix, common fine to medium quartz grains throughout supporting matrix, trace microcrystalline pyrite, poor visual porosity. **SHOWS:** Nil.
8	869.5	30	**SANDSTONE:** medium light grey to medium grey, clear to translucent grain: moderately firm, very fine to fine grained, sub angular to sub rounded, moderate to high sphericity, well sorted quartz, trace moderately weak silica cement, minor medium grey argillaceous matrix, rare to minor carbonaceous flecks and fragments, trace amber, trace microcrystalline pyrite, trace greyish black lithic grains, trace dark grey to greyish black claystone clasts, poor visual porosity. **SHOWS:** Nil.
9	856.5	23	**SANDSTONE:** very light grey to light grey, clear to translucent grains, predominantly very fine to fine grained, trace granules, sub angular to sub rounded, angular in part, moderate sphericity, well sorted quartz, trace weak silica cement, minor light grey dispersive argillaceous matrix, minor carbonaceous flecks and fragments, trace lithic grains, trace microcrystalline pyrite, poor visual porosity. **SHOWS:** Nil.

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 25/10/93 Geologist(s): C.Menhennitt Logging Suite No: 1 Page: 3
10	837	40	**ARENACEOUS CLAYSTONE:** dark grey to greyish black, medium grey in part, moderately firm to firm, common quartz grains throughout, predominantly very fine grained, trace very coarse grains, slightly dispersive, trace carbonaceous fragments, non calcareous. **SHOWS:** Nil.
11	820	40	**CLAYSTONE:** medium dark grey to dark grey, moderately firm to firm, slightly dispersive, minor fine to very fine grained quartz throughout, trace amber, trace carbonaceous fragments, non calcareous. **SHOWS:** Nil.
12	796.5	40	**SANDSTONE:** light greenish grey to greenish grey, clear to translucent grains, friable to moderately firm, fine to predominantly medium grained, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, rare light greenish grey argillaceous matrix throughout, trace greyish black and moderate reddish brown lithic grains, trace carbonaceous flecks, excellent visual porosity. **SHOWS:** Nil.
13	788	50	**CLAYSTONE:** medium dark grey to dark grey, moderately firm to firm, slightly dispersive, trace fine to very fine grained quartz throughout, trace amber, trace carbonaceous fragments, trace mica, non calcareous. **SHOWS:** Nil.
14	770	54	**CLAYSTONE WITH INTERLAMINATED SANDSTONE:** medium dark grey to dark grey, moderately firm to firm, slightly dispersive, trace fine to very fine grained quartz throughout, minor quartz silt, trace carbonaceous fragments, trace mica, non calcareous, with interlaminated; **SANDSTONE:** very light grey to light grey, moderately firm, clear to translucent grained, very fine grained, angular to sub angular, sub rounded in part, low to moderate sphericity, well sorted quartz, trace very light grey argillaceous matrix, trace lithic and feldspathic grains, trace carbonaceous fragments, minor silt, grading in part to arenaceous siltstone, poor visual porosity. **SHOWS:** Nil.

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 25/10/93 Geologist(s): C.Menhennitt Logging Suite No: 1 Page: 4
15	762	45	**CLAYSTONE WITH INTERLAMINATED SANDSTONE:** medium dark grey to dark grey, moderately firm to firm, slightly dispersive, trace fine to very fine grained quartz throughout, minor quartz silt, trace carbonaceous fragments, trace mica, non calcareous, with interlaminated; **SANDSTONE:** very light grey to light grey, moderately firm, clear to translucent grains, very fine grained, angular to sub angular, sub rounded in part, low to moderate sphericity, well sorted quartz, trace very light grey argillaceous matrix, trace lithic and feldspathic grains, trace carbonaceous fragments, grading in part to arenaceous siltstone, poor visual porosity. **SHOWS:** Nil.
16	711.5	37	**SANDSTONE:** light greenish grey to greenish grey, clear to translucent grains, friable, medium to coarse grained, trace very coarse to granules, sub angular to sub rounded, rounded in part, moderate to high sphericity, moderately to well sorted quartz, rare light greenish grey argillaceous matrix throughout, trace dark grey claystone clasts (4-10mm), trace greyish black and moderate reddish brown lithic grains, trace carbonaceous flecks, excellent visual porosity. **SHOWS:** Nil.
17	670.5	55	**ARGILLACEOUS SANDSTONE:** medium grey to dark greenish grey, clear to translucent grains, friable to moderately firm, medium to coarse grained, trace very coarse to granules, sub angular to sub rounded, rounded in part, moderate to high sphericity, moderately to well sorted quartz, common dark greenish grey dispersive argillaceous matrix throughout, trace greyish black and moderate reddish brown lithic grains, trace carbonaceous flecks, excellent visual porosity. **SHOWS:** Nil.
18	668	60	**GLAUCONITIC CLAYSTONE:** dark grey to dark greenish grey, moderately firm, common glauconite throughout, minor fine to medium grained quartz grains, trace quartz silt, rare carbonaceous fragments, trace mica, non calcareous. **SHOWS:** Nil.
19	660	55	**SILTY CLAYSTONE:** medium grey to medium dark grey, moderately firm, 20-40% quartz silt, rare glauconite, trace carbonaceous fragments, trace very fine to fine quartz grains, non calcareous. **SHOWS:** Nil.

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 25/10/93 Geologist(s): C.Menhennitt Logging Suite No: 1 Page: 5
20	625	47	**SANDSTONE:** light greenish grey to greenish grey, clear to translucent grains, friable, medium to coarse grained, trace very coarse to granules, sub angular to sub rounded, rounded in part, trace angular, moderate to high sphericity, moderately to well sorted quartz, rare light greenish grey argillaceous matrix throughout, trace greyish black and moderate reddish brown lithic grains, trace carbonaceous flecks, excellent visual porosity. **SHOWS:** Nil.
21	585	60	**SANDSTONE:** light greenish grey to greenish grey, clear to translucent grains, friable, medium to coarse grained, trace very coarse to granules, sub angular to sub rounded, rounded in part, trace angular, moderate to high sphericity, moderately to well sorted quartz, minor light greenish grey argillaceous matrix throughout, trace greyish black and moderate reddish brown lithic grains, trace carbonaceous flecks, good visual porosity. **SHOWS:** Nil.
22	575	38	**CLAYSTONE WITH INTERLAMINATED SANDSTONE:** medium dark grey to dark grey, moderately firm to firm, slightly dispersive, trace fine to very fine grained quartz throughout, minor quartz silt, trace carbonaceous fragments, trace mica, non calcareous, with interlaminated; **SANDSTONE:** very light grey to light grey, moderately firm, clear to translucent grains, very fine grained, angular to sub angular, sub rounded in part, low to moderate sphericity, well sorted quartz, trace very light grey argillaceous matrix, trace lithic and feldspathic grains, trace carbonaceous fragments, grading in part to arenaceous siltstone, poor visual porosity. **SHOWS:** Nil.
23	548.5	40	**CLAYSTONE WITH INTERLAMINATED SANDSTONE:** medium dark grey to dark grey, moderately firm to firm, slightly dispersive, trace fine to very fine grained quartz throughout, minor quartz silt, trace carbonaceous fragments, trace glauconite, trace mica, non calcareous, with minor interlaminae of; **SANDSTONE:** very light grey to light grey, moderately firm, clear to translucent grains, very fine grained, angular to sub angular, sub rounded in part, low to moderate sphericity, well sorted quartz, trace very light grey argillaceous matrix, trace lithic and feldspathic grains, trace carbonaceous fragments, grading in part to arenaceous siltstone, poor visual porosity. **SHOWS:** Nil.
24	534.5	58	**CLAYSTONE:** medium dark grey to dark grey, firm, minor pyritised wood fragments, rare glauconite, trace wisps of very fine to fine grained quartz, trace carbonaceous fragments, trace quartz silt throughout, non calcareous. **SHOWS:** Nil.

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 25/10/93 Geologist(s): C.Menhennitt Logging Suite No: 1 Page: 6
25	515	50	**CLAYSTONE WITH INTERLAMINATED SANDSTONE:** medium dark grey to dark grey, moderately firm to firm, slightly dispersive, trace fine to very fine grained quartz throughout, minor quartz silt, trace carbonaceous fragments, trace mica, non calcareous, with interlaminated; **SANDSTONE:** very light grey to light grey, moderately firm, clear to translucent grains, very fine grained, angular to sub angular, sub rounded in part, low to moderate sphericity, well sorted quartz, trace very light grey argillaceous matrix, trace lithic and feldspathic grains, trace carbonaceous fragments, grading in part to arenaceous siltstone, poor visual porosity. **SHOWS:** Nil.
26	489	52	**CLAYSTONE WITH INTERLAMINATED SANDSTONE:** medium dark grey to dark grey, moderately firm to firm, slightly dispersive, trace fine to very fine grained quartz throughout, minor quartz silt, trace carbonaceous fragments, pyrite nodule (5mm), trace mica, trace fine grained quartz filled burrows, non calcareous, with interlaminated; **SANDSTONE:** very light grey to light grey, moderately firm, clear to translucent grains, very fine grained, angular to sub angular, sub rounded in part, low to moderate sphericity, well sorted quartz, minor medium grey argillaceous matrix, trace lithic and feldspathic grains, trace carbonaceous fragments, grading in part to arenaceous siltstone, poor visual porosity. **SHOWS:** Nil.
27	451	60	**ARENACEOUS CLAYSTONE:** medium dark grey to dark grey, moderately firm to firm, slightly dispersive, common very fine grained quartz grains throughout, grading to silty claystone in part, trace carbonaceous flecks, trace mica, non calcareous. **SHOWS:** Nil.
28	430	55	**CLAYSTONE:** medium dark grey to dark grey, firm, slightly dispersive, trace very fine to fine grained quartz, trace quartz silt, trace microcrystalline pyrite, trace glauconite, non calcareous. **SHOWS:** Nil.
29	415	60	**ARGILLACEOUS SANDSTONE:** medium grey to medium dark grey, clear to translucent grains, friable to moderately firm, very fine to fine grained, sub angular to sub rounded, rounded in part, moderate to high sphericity, well sorted quartz, trace moderately weak patchy microcrystalline pyrite cement, abundant medium grey to medium dark grey argillaceous matrix, grading to arenaceous claystone in part, minor carbonaceous grains and fragments, trace feldspathic grains, poor visual porosity. **SHOWS:** Nil.

Core No.	Depth (mRT)	Recovery (mm)	SIDEWALL CORE DESCRIPTION SHEET BHP Petroleum Well: **LOCH ARD-1** Permit: **VIC/P 31** Date: 25/10/93 Geologist(s): C.Menhennitt Logging Suite No: 1 Page: 7
30	402.5	50	**CLAYSTONE:** medium dark grey to dark grey, firm, slightly dispersive, trace very fine to fine grained quartz, trace quartz silt, trace microcrystalline pyrite, trace carbonaceous fragments, non calcareous. The core has a single 2mm thick laminae of featureless brownish black claystone and an associated lens (<1mm) of argillaceous, very fine grained quartz sand. **SHOWS:** Nil.

6.3 APPENDIX 3 Palynology Range Charts

PETROLEUM DIVISION

LOCH ARD #1

MORGAN PALAEO ASSOCIATES ... Palynological Consultants
Box 161, Maitland, South Australia, 5573.
phone (088) 32 2795 ... fax (088) 32 2798

C L I E N T: BHP PETROLEUM
W E L L: LOCH ARD #1
F I E L D / A R E A: OFFSHORE OTWAY BASIN

A N A L Y S T: ROGER MORGAN DATE : APRIL 1994
N O T E S: ALL DEPTHS ARE IN METRES
ALL FIGURES ARE PERCENTAGES BASED ON 100 SPECIMEN COUNT
"X" REPRESENTS RARE PRESENCE OUTSIDE THE COUNT
"A"= ABUNDANT, "C"= COMMON, "F"= FEW, "R" = RARE

RANGE CHART OF OCCURRENCES BY LOWEST APPEARANCE WITHIN GROUP

| | | |

		0402.5 SWC	0430.0 SWC	0451.0 SWC	0489.0 SWC	0534.5 SWC	0575.0 SWC	0650-70 CUTTS	0762.0 SWC	0788.0 SWC	0820.0 SWC	0837.0 SWC	0875-90 CUTTS	0915-25 CUTTS	0927.0 SWC	0954.0 SWC	1022.0 SWC	1048.0 SWC	1107.0 SWC	1150.0 SWC	1186.0 SWC	1188.0 SWC	1200.0 SWC	1208.0 SWC	1329.0 SWC	1344-59 CUTTS
39	TRITHYRODINIUM THICK RETIC	.	.	.	.	.	1	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
40	AMPHIDIADEMA DENTICULATA	.	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
41	CANNINGIA SP	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
42	EURYDINIUM INGRAMII	.	.	X	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
43	HETEROSPHAERIDIUM CF LATEROBRACHIUS	.	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
44	MADURADINIUM PENTAGONUM	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
45	EUCLADINIUM MADURENSE	.	1	2	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
46	NELSONIELLA PSILATE	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
47	ODONTOCHITINA OBESA	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
48	ODONTOCHITINA OBESOPORIFERA	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
49	AREOSPHAERIDIUM SUGGESTIUM	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
50	XENIKOON AUSTRALIS	X	2	3	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
51	PTEROSPERMELLA AUREOLATA	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
52	GILLINIA HYMENOPHORA	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
53	MILLIOUDIDINIUM TENUITABULATUS	1	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
54	OLIGOSPHAERIDIUM PULCHERRIMUM	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
55	NELSONIELLA SEMIRETICULATA	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
56	SUBTILISPHAERA SP	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
57	AEQUITRIRADITES VERRUCOSUS	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	X	.	.	.	.	.
58	ARAUCARIACITES AUSTRALIS	1	3	1	1	.	1	1	2	.	.	1	2	1	.	5	X	X	X	2	2	3	1	.	.	.	.
59	BALMEISPORITES HOLODICTYUS	X	X	X	X	X	.	X	.	.	.	.	X	.	.	X	.	.	.	.	.	.	.	.	.	.	.
60	CALLIALASPORITES DAMPIERI	X	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	X	.	.	.	.	.
61	CERATOSPORITES EQUALIS	1	X	1	1	1	2	3	3	2	2	3	1	1	.	1	.	.	.	2	1	3	1	.	.	.	.
62	CICATRICOSISPORITES AUSTRALIENSIS	7	.	2	.	1	1	2	1	1	1	1	1	1	.	1	X	X	X	X	2	4	.	.	.	.	.
63	CONTIGNISPORITES COOKSONIAE	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
64	COPTOSPORA PARADOXA	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
65	COROLLINA TOROSUS	2	1	1	.	1	2	1	3	2	3	1	2	2	X	1	X	X	X	2	2	1	2	.	.	.	.
66	CRYBELOSPORITES STRIATUS	X	.	.	.	.	.	.	X	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
67	CYATHIDITES AUSTRALIS	3	1	1	2	1	1	1	8	3	1	1	1	3	.	4	1	1	X	X	1	4	1	.	.	.	.
68	CYATHIDITES MINOR	26	X	7	4	.	12	8	7	.	10	13	11	10	.	12	8	X	X	14	8	16	11	X	.	.	.
69	DICTYOTOSPORITES SPECIOSUS	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
70	FALCISPORITES GRANDIS	2	3	4	2	3	6	3	5	3	2	4	5	3	X	6	1	1	.	1	1	8	4	.	.	.	.
71	FALCISPORITES SIMILIS	23	14	16	17	19	20	25	17	22	20	19	16	25	X	18	10	X	.	14	8	36	19	X	.	.	.
72	FORAMINISPORIS ASYMMETRICUS	X	X	1	2	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
73	GLEICHENIIDITES	2	4	2	4	2	2	3	9	2	7	2	3	3	.	3	.	.	.	35	.	5	1	.	.	.	.
74	ISCHYOSPORITES PUNCTATUS	1	.	.	1	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
75	KUYLISPORITES "ZIPPERI"	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
76	MICROCACHRYIDITES ANTARCTICUS	16	8	7	8	7	6	8	9	8	6	14	8	8	.	11	5	9	5	16	3	7	.	.	.	.	.

| | | |

0402.5 SWC	0430.0 SWC	0451.0 SWC	0489.0 SWC	0534.5 SWC	0575.0 SWC	0650-70 CUTTS	0762.0 SWC	0788.0 SWC	0820.0 SWC	0837.0 SWC	0875-90 CUTTS	0915-25 CUTTS	0927.0 SWC	0954.0 SWC	1022.0 SWC	1048.0 SWC	1107.0 SWC	1150.0 SWC	1186.0 SWC	1188.0 SWC	1200.0 SWC	1208.0 SWC	1329.0 SWC	1344-59 CUTTS		
1	X	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	X	.	.	.	.	.	.	115	TRIPOROLETES RETICULATUS
.	.	1	X	1	2	1	4	4	7	16	6	5	.	4	7	.	1	.	.	.	.	.	.	.	116	AMOSOPOLLIS CRUCIFORMIS
.	.	.	.	X	.	.	.	.	.	.	.	1	.	.	.	X	.	1	.	.	.	.	.	.	117	LEPTOLEPIDITES VERRUCATUS
X	1	3	9	1	5	2	.	.	.	X	.	.	.	3	.	.	.	.	.	.	.	.	.	.	118	AUSTRALOPOLLIS OBSCURIS
.	.	.	.	X	2	2	1	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	119	PHIMOPOLLENITES PANNOSUS
1	.	1	X	X	2	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	120	CAMEROZONOSPORITES OHAIENSIS
.	.	.	.	.	.	.	.	.	.	X	1	X	.	.	.	.	.	.	.	.	.	.	.	.	121	FOVEOTRILETES PARVIRETUS
.	.	.	.	.	.	.	.	.	.	.	1	X	.	.	.	.	.	.	.	.	.	.	.	.	122	MUROSPORA FLORIDA
13	11	12	7	12	5	6	.	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	123	PROTEACIDITES
.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	124	CYATHEACIDITES TECTIFERA
.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	125	APPENDICISPORITES CF DISTOCARINATUS
.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	126	RETITRILETES FACETUS
.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	127	RETITRILETES NODOSUS
.	.	.	X	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	128	ORNAMENTIFERA MINIMA
X	.	.	X	X	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	129	ORNAMENTIFERA SENTOSA
X	X	1	X	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	130	PROTEACIDITES LARGE
.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	131	AEQUITRIRADITES SPINULOSUS
1	1	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	132	NEORAISTRICKIA
.	.	.	.	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	133	TRICOLPORITES APOXYEXINUS
5	1	1	1	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	134	NOTHOFAGIDITES ENDURUS
.	.	.	2	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	135	NOTHOFAGIDITES PROTOSENECTUS
.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	136	ERICIPITES SCABRATUS
1	1	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	137	LYGISTIPOLLENITES FLORINII
.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	138	PHYLLOCLADIDITES VERRUCATUS
.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	139	ANAPICULATISPORIS PRISTIDENTATUS
.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	140	PERIPOROPOLLENITES POLYORATUS
X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	141	GAMBIERINA RUDATA
3	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	142	NOTHOFAGIDITES SENECTUS
.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	143	STERIESPORITES REGIUM
1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	144	TRICOLPITES
1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	145	TRICOLPITES CONFESSUS
X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	146	TRICOLPITES RENMARKENSIS
?	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	147	TRICOLPORITES LILLIEI
2	.	2	8	X	8	1	.	.	4	.	3	.	8	3	2	8	X	8	1	10	3	.	.	1	148	BOTRYOCOCCUS
.	.	.	.	X	X	.	.	.	X	.	.	.	X	.	.	X	.	.	.	.	.	.	.	.	149	SCHIZOSPORIS RETICULATUS
.	.	.	X	.	.	1	.	.	X	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	150	NUMMUS MONOCULATUS
X	X	X	X	.	1	1	X	X	.	.	1	1	3	1	X	.	.	X	.	.	1	1	.	.	151	REWORKING PERMIAN
.	.	.	.	.	.	.	.	.	X	.	.	.	X	.	.	.	.	.	.	.	1	1	.	.	152	REWORKING TRIASSIC

INDEX NUMBER	SPECIES
131	AEQUITRIRADITES SPINULOSUS
57	AEQUITRIRADITES VERRUCOSUS
116	AMOSOPOLLIS CRUCIFORMIS
40	AMPHIDIADEMA DENTICULATA
139	ANAPICULATISPORIS PRISTIDENTATUS
125	APPENDICISPORITES CF DISTOCARINATUS
89	APPENDICISPORITES DISTOCARINATUS
15	APTEA SP
58	ARAUCARIACITES AUSTRALIS
49	AREOSPHAERIDIUM SUGGESTIUM
118	AUSTRALOPOLLIS OBSCURIS
59	BALMEISPORITES HOLODICTYUS
148	BOTRYOCOCCUS
22	CALLAOISPHAERIDIUM ASYMMETRICUM
60	CALLIALASPORITES DAMPIERI
100	CALLIALASPORITES TURBATUS
120	CAMEROZONOSPORITES OHAIENSIS
110	CAMEROZONOSPORITES SOLIDA
41	CANNINGIA SP
61	CERATOSPORITES EQUALIS
19	CHATANGIELLA MICROCANTHA
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62	CICATRICOSISPORITES AUSTRALIENSIS
90	CICATRICOSISPORITES HUGHESI
108	CINGUTRILETES CLAVUS
16	CIRCULODINIUM DEFLANDREI
10	CIRCULODINIUM SOLIDA
91	CLAVIFERA TRIPLEX
63	CONTIGNISPORITES COOKSONIAE
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6	CRIBROPERIDINIUM EDWARDSII
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12	HETEROSPHAERIDIUM SOLIDA
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97	KUYLISPORITES LUNARIS
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46	NELSONIELLA PSILATE
55	NELSONIELLA SEMIRETICULATA

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47 ODONTOCHITINA OBESA
48 ODONTOCHITINA OBESOPORIFERA
5 ODONTOCHITINA OPERCULATA
21 ODONTOCHITINA PORIFERA
38 ODONTOCHITINA STUBBY
[illegible] OLIGOSPHAERIDIUM COMPLEX
OLIGOSPHAERIDIUM PULCHERRIMUM
128 ORNAMENTIFERA MINIMA
129 ORNAMENTIFERA SENTOSA
77 OSMUNDACIDITES WELLMANII
24 PALAEOHYSTRICHOSPHORA INFUSORIOIDES
140 PERIPOROPOLLENITES POLYORATUS
78 PEROTRILETES JUBATUS/MORGANII
119 PHIMOPOLLENITES PANNOSUS
113 PHYLLOCLADIDITES EUNUCHUS
114 PHYLLOCLADIDITES MAWSONII
138 PHYLLOCLADIDITES VERRUCATUS
104 PILOSISPORITES GRANDIS
105 PILOSISPORITES NOTENSIS
79 PODOSPORITES MICROSACCATUS
123 PROTEACIDITES
130 PROTEACIDITES LARGE
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1[illegible] TRICOLPORITES APOXYEXINUS
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6.4 APPENDIX 4 Geochem Basic Data

PETROLEUM DIVISION

TABLE 1

Summary of Extraction and Liquid Chromatography

LOCH ARD 1 Dec-93

A. Concentrations of Extracted Material

				-------Hydrocarbons-------			----Nonhydrocarbons----		
	Weight of	Total	Loss on			HC			NonHC
	Rock Extd	Extract	Column	Saturates	Aromatics	Total	NSO's	Asphalt	Total
DEPTH(m)	(grams)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
1050.0	13.5	66.9	nd	nd	nd	nd	nd	nd	nd
1154.0	14.5	414.4	nd	nd	nd	nd	nd	nd	nd

TABLE 1

Summary of Extraction and Liquid Chromatography

LC ARD 1 Dec-93

B. Compositional Data

	---Hydrocarbons----			---Nonhydrocarbons-----			EOM(mg)	SAT(mg)	SAT	ASPH	HC
							-------	-------	-------	-------	-------
DEPTH(m)	%SAT	%AROM	%HC's	%NSO	%ASPH	%Non HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
1050.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1154.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

nd = no data

TABLE 2

LOCH ARD 1 Summary of Gas Chromatography Data

A. Alkane Compositional Data

DEPTH(m)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21 + C22)/(C28 + C29)
1050.0	nd	nd	nd	nd	nd	nd
1154.0	nd	nd	nd	nd	nd	nd

TABLE 2

LOCH ARD 1 Summary of Gas Chromatography Data

B. n-Alkane Distributions

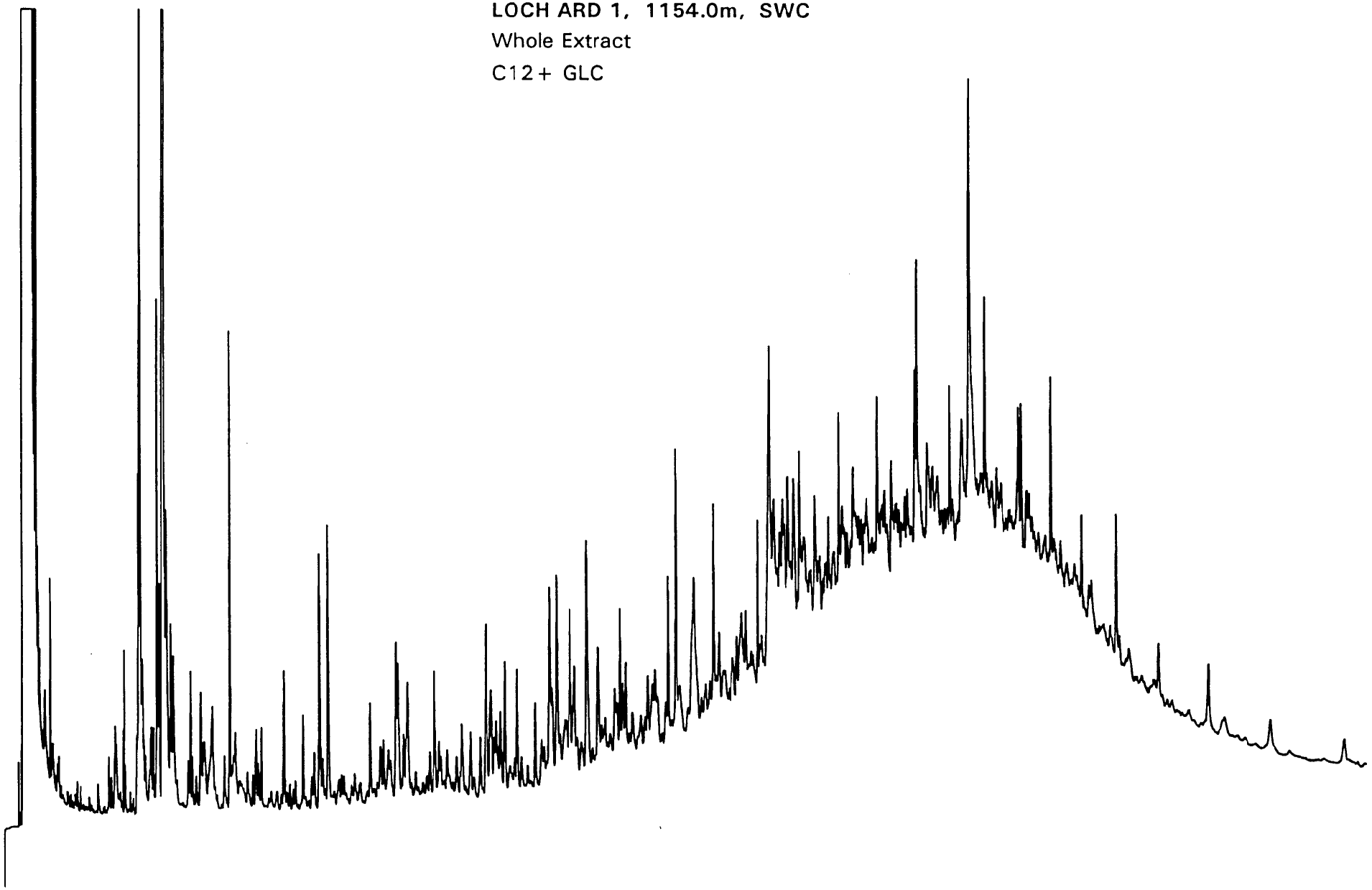
DEPTH(m)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC3
1050.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1154.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

nd = no data

LOCH ARD 1, 1154.0m, SWC

Whole Extract

C12+ GLC



GEOTECHNICAL SERVICES PTY LTD

JOB No.# 2030A, LOCH ARD-1, OTWAY BASIN.

KK/Ref. No.	Depth(m) Type	$\bar{R}_v$ max	Range	N	Description Including Liptinite (Exinite) Fluorescence
v9199 SWC23	548.5	0.35	0.29-0.43	26	Sparse cutinite, resinite and liptodetrinite, yellow to orange, rare sporinite, yellow to orange. (Sandstone>>Coal. Coal sparse, I>V>>L, inertite>vitrite. Dom abundant, I>V>>L. Inertinite abundant, vitrinite common, liptinite sparse. Mineral fluorescence pervasive, faint green to weak orange. Iron oxides common. Pyrite abundant.)
v9200 SWC18	668.0	0.42	0.31-0.52	26	Sparse sporinite, yellow to orange, rare cutinite, resinite, lamalginite and liptodetrinite, yellow to orange. (Clayey siltstone>sandstone>>carbonate. Dom abundant, I>>V>L. Inertinite common, vitrinite and liptinite sparse. Mineral fluorescence pervasive, faint green to weak orange. Iron oxides common. Glauconite abundant. Pyrite abundant.)
v9201 SWC15	762	0.40	0.30-0.52	26	Sparse cutinite and liptodetrinite, yellow to dull orange, rare sporinite, resinite and lamalginite, yellow to dull orange. (Calcareous siltstone>carbonate>coal. Coal rare, V>>I>L, vitrite. Dom abundant, I>V>L. Inertinite abundant, vitrinite common, liptinite sparse. Shell fragments sparse. Mineral fluorescence pervasive, faint green. Iron oxides abundant. Pyrite abundant.)
v9202 SWC10	837	0.38	0.31-0.48	25	Sparse cutinite and liptodetrinite, yellow to dull orange, rare resinite, sporinite and lamalginite, yellow to dull orange. (Sandstone>carbonate>>coal. Coal rare, V>I>>L, vitrite>inertite. Dom abundant, I>V>>L. Inertinite abundant, vitrinite common, liptinite sparse. Shell fragments rare. Mineral fluorescence pervasive, faint green. Iron oxide common. Glauconite rare. Pyrite abundant.)
v9203	954 SWC60	0.44	0.36-0.50	28	Sparse lamalginite, bright yellow to orange, rare liptodetrinite yellow to orange. (Calcareous clayey siltstone>>coal. Coal sparse, V only. Vitrite. Texturally, the coal is immature to moderately mature ulminite with cell structures and some remnant cell lumens. Dom common, V>L>I. All three maceral groups sparse. Oil drops rare, bright greenish yellow. Mineral fluorescence pervasive, dull orange. Iron oxides common. Pyrite rare.)
v9204	1027 SWC55	0.42	0.36-0.48	26	Common cutinite, yellow to dull orange, sparse lamalginite, and liptodetrinite, yellow to orange, rare resinite, greenish yellow, rare sporinite, yellow to orange. (Calcareous clayey siltstone>>coal. Coal rare, V>>I. Inertite>vitrite. Dom abundant, I>V>L. Inertinite and vitrinite abundant, liptinite common. Bitumen rare, orange. Mineral fluorescence pervasive, dull orange. Iron oxides abundant. Pyrite sparse.)

JOB # 2030A, LOCH ARD-1, OTWAY BASIN

KK/Ref. No.	Depth(m) Type	$\bar{R}_v$ max	Range	N	Description Including Liptinite (Exinite) Fluorescence
v9205	1150 SWC48	0.46	0.42-0.52	25	Common cutinite, yellow to orange, sparse sporinite and liptodetrinite, yellow to orange, sparse resinite, yellow, sparse suberinite, weak brown. (Clayey siltstone>>coal. Coal common, V>I>L. Vitrite>inertite. Dom abundant, V>I>L. Vitrinite abundant, inertinite and liptinite common. Mineral fluorescence pervasive, dull orange. Iron oxides common. Pyrite sparse.)
v9206	1186 SWC44	0.47	0.42-0.53	26	Abundant cutinite and liptodetrinite, yellow to dull orange, abundant resinite, greenish yellow, abundant sporinite, yellow to orange. (Coal>shaly coal. Coal dominant, V>L>>I. Vitrite>clarite. Mineral-free maceral group composition of the coal: vitrinite - 89.5%, inertinite - <0.1%, liptinite - 10.5%. Shaly coal dominant, V>L>>I. Clarite. Some open lumens present within telovitrinite, but coal is early mature in textural terms. Mineral-free maceral group composition of the shaly coal: vitrinite - 53.8%, inertinite - <0.1%, liptinite - 46.2%. Exsudatinite rare, yellow to orange. Iron oxides sparse. Pyrite sparse.)
v9207	1205 SWC40	0.54	0.48-0.65	28	Common cutinite, yellow to dull orange, common sporinite, yellow to orange, sparse resinite, greenish yellow, sparse liptodetrinite, greenish yellow to dull orange. (Clayey siltstone>>coal. Coal common, V>>I>L. Vitrite>clarite. Dom abundant, I>V>L. All three maceral groups abundant. Bitumen sparse, dull orange. Mineral fluorescence pervasive, weak brown. Iron oxides sparse. Pyrite abundant.)
v9208	1228 SWC38	- $\bar{R}_I$ max 1.51	- 1.07-2.02	- 5	Fluorescing liptinite absent. (Sandstone. Dom rare, I only. Mineral fluorescence patchy, weak orange. Iron oxides common. Pyrite sparse.)
v9209	1326 SWC32	0.41	0.35-0.48	28	Rare cutinite, sporinite and liptodetrinite, yellow to orange, rare resinite, greenish yellow. (Sandstone>>coal. Coal sparse, V only. Vitrite. Dom sparse, V>L>I. Vitrinite sparse, liptinite and inertinite rare. Mineral fluorescence pervasive, dull green. Iron oxides abundant. Pyrite sparse.)

The causes for low reflectances from SWC 32 are not clear. The vitrinite populations in samples v9207 and v9209 are both well defined. v9207 contains leaf tissue that would be expected to yield below average reflectances. Some leaf tissue is present in v9209 but the presence of mesophyll does not seem to be the cause of the low values for v9209. If a sample has been incorrectly labelled, this may be clear from the lithology as SWC 32 is a much more sandy lithology than most of the other SWC samples. It is also possible that v9207 is anomalously high, the sample containing a high proportion of inertinite compared with v9209 and v9206.

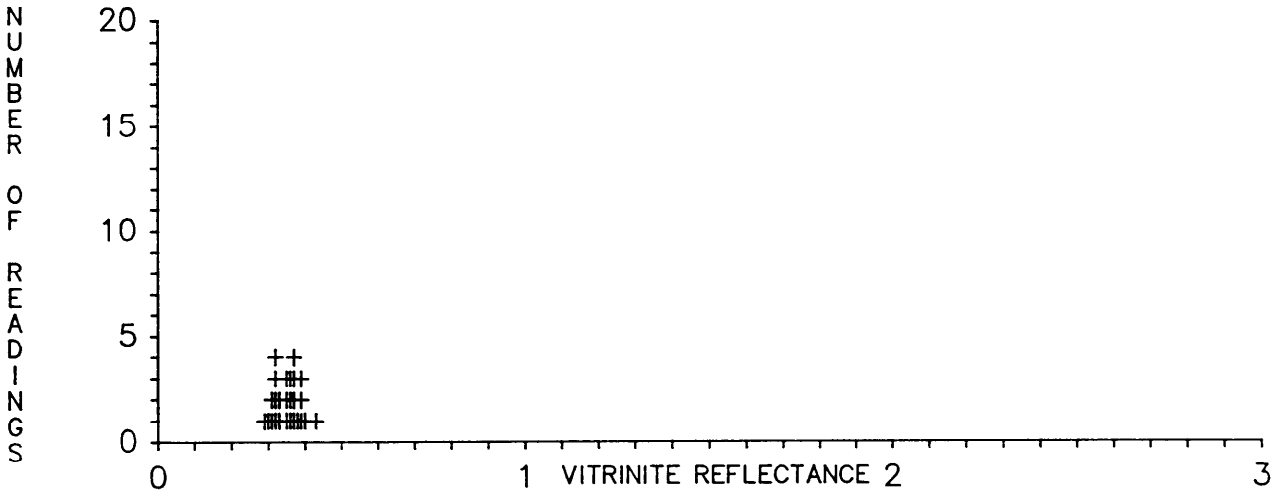
FIGURE 1a

VITRINITE REFLECTANCE AND COAL MACERAL INDENTIFICATION

WELL: LOCH ARD-1 CLIENT: BHP PETROLEUM PTY LTD SAMPLE TYPE: SWC
SAMPLE ID: 548.5 METRES DATE: APRIL 1994

(Total No. of Readings=26) 0.29 0.30 0.31 0.31 0.32 0.32 0.32 0.32 0.33 0.33 0.35 0.35 0.35 0.36 0.36 0.36 0.37 0.37 0.37 0.37 0.38 0.39 0.39 0.39 0.40 0.43

VITRINITE REFLECTANCE								MACERAL IDENTIFICATION			
POPULATION Number	%	No. of Readings	Mean Ro (%)	Min Ro (%)	Max Ro (%)	STD Dev (%)	Comments	% Vitrinite	% Inertinite	% Liptinite	% Bitumen
1	100.0	26	0.35	0.29	0.43	0.03	INDIGENOUS(+)	32.88	63.01	4.11	0.00



SAMPLE ID: 668.0 METRES SAMPLE TYPE: SWC

(Total No. of Readings=26) 0.31 0.33 0.34 0.36 0.37 0.38 0.39 0.39 0.39 0.39 0.40 0.41 0.41 0.43 0.43 0.43 0.44 0.45 0.45 0.45 0.46 0.47 0.47 0.48 0.48 0.52

VITRINITE REFLECTANCE								MACERAL IDENTIFICATION			
POPULATION Number	%	No. of Readings	Mean Ro (%)	Min Ro (%)	Max Ro (%)	STD Dev (%)	Comments	% Vitrinite	% Inertinite	% Liptinite	% Bitumen
1	100.0	26	0.42	0.31	0.52	0.05	INDIGENOUS(+)	9.52	85.72	4.76	0.00

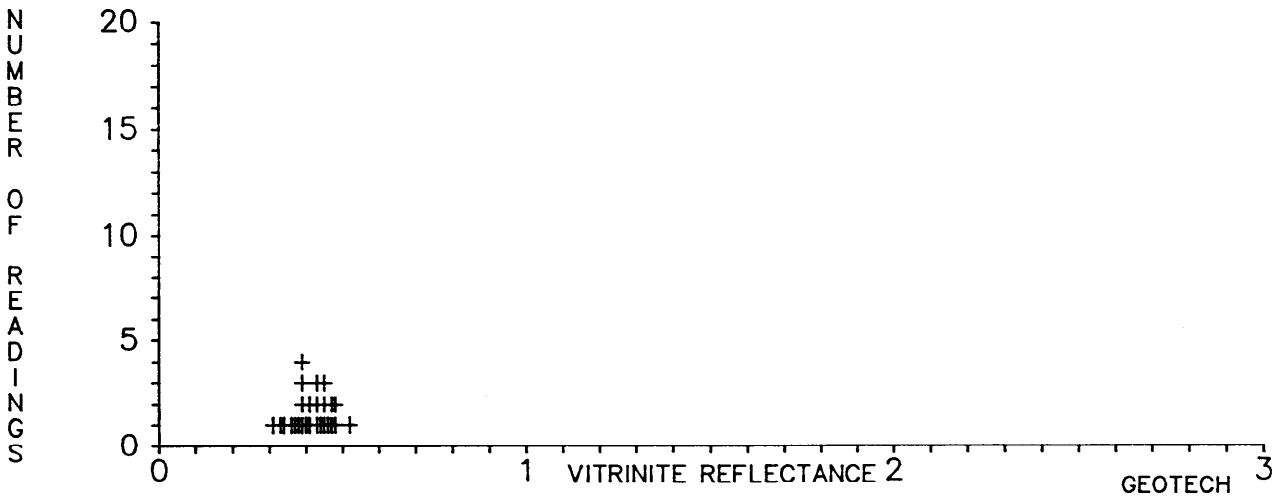


FIGURE 1b

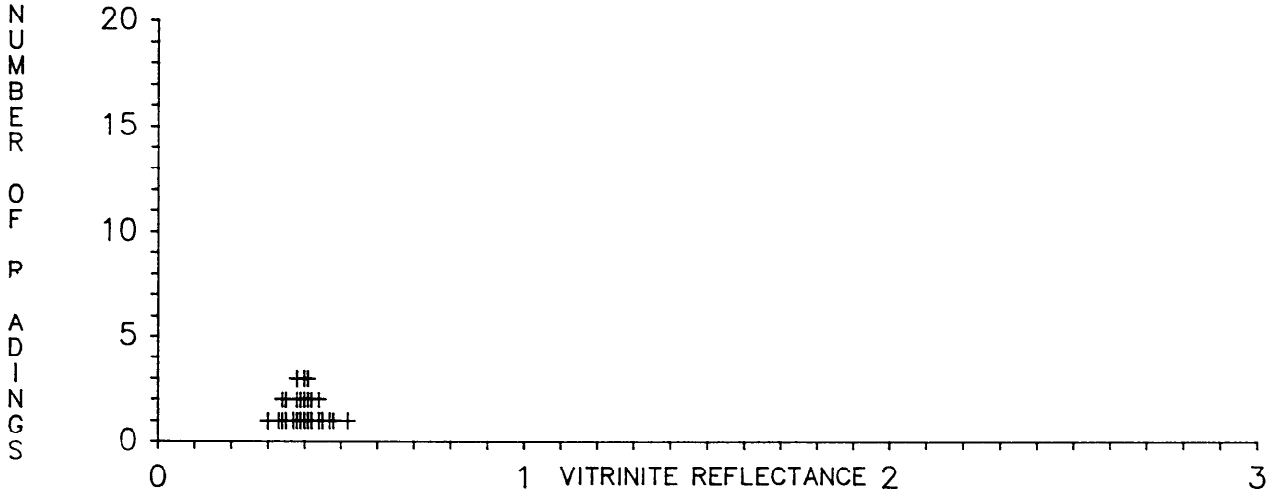
VITRINITE REFLECTANCE AND COAL MACERAL INDENTIFICATION

WELL: LOCH ARD-1 CLIENT: BHP PETROLEUM PTY LTD SAMPLE TYPE: SWC
SAMPLE ID: 762.0 METRES DATE: APRIL 1994

(Total No. of Readings=26) 0.30 0.33 0.34 0.34 0.35 0.35 0.37 0.38 0.38 0.38 0.39 0.39 0.40 0.40 0.40 0.41 0.41 0.41 0.42 0.42 0.44 0.44 0.45 0.47 0.48 0.52

VITRINITE REFLECTANCE — MACERAL IDENTIFICATION

POPULATION Number	%	No. of Readings	Mean Ro (%)	Min Ro (%)	Max Ro (%)	STD Dev (%)	Comments	% Vitrinite	% Inertinite	% Liptinite	% Bitumen
1	100.0	26	0.40	0.30	0.52	0.05	INDIGENOUS(+)	21.88	68.74	9.38	0.00



SAMPLE ID: 837.0 METRES SAMPLE TYPE: SWC

(Total No. of Readings=25) 0.31 0.31 0.32 0.34 0.34 0.35 0.36 0.37 0.37 0.38 0.38 0.39 0.39 0.40 0.40 0.40 0.40 0.41 0.41 0.41 0.41 0.41 0.43 0.45 0.48

VITRINITE REFLECTANCE — MACERAL IDENTIFICATION

POPULATION Number	%	No. of Readings	Mean Ro (%)	Min Ro (%)	Max Ro (%)	STD Dev (%)	Comments	% Vitrinite	% Inertinite	% Liptinite	% Bitumen
1	100.0	25	0.38	0.31	0.48	0.04	INDIGENOUS(+)	40.00	55.56	4.44	0.00

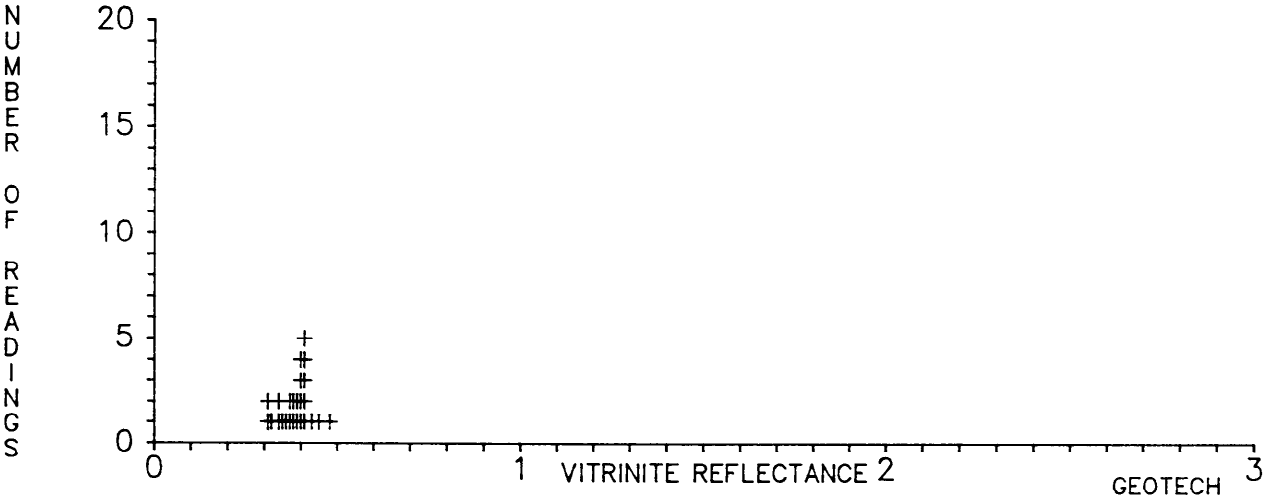


FIGURE 1c

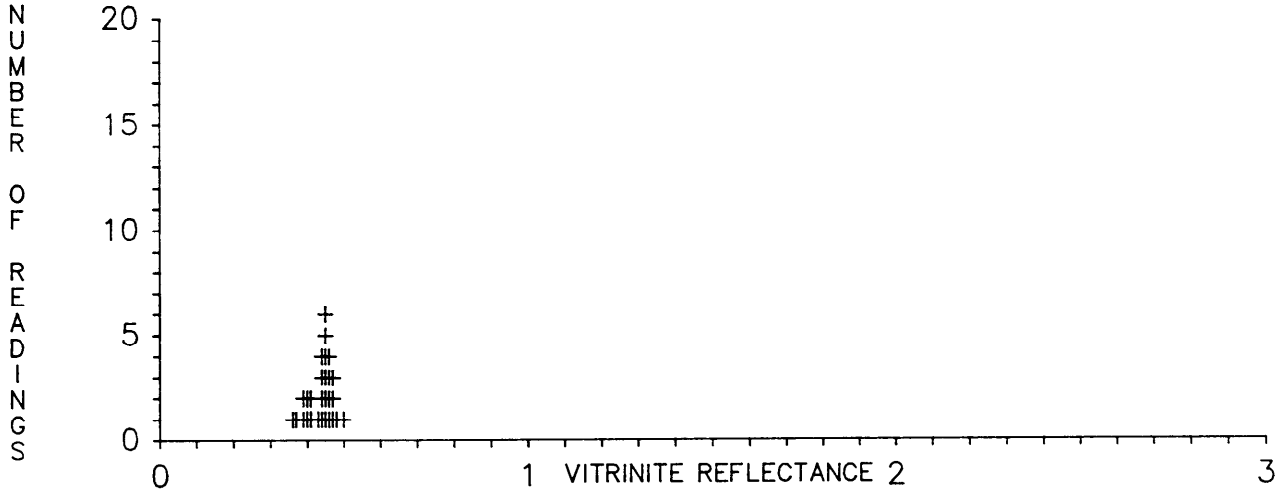
VITRINITE REFLECTANCE AND COAL MACERAL INDENTIFICATION

WELL: LOCH ARD-1 CLIENT: BHP PETROLEUM PTY LTD SAMPLE TYPE: SWC
SAMPLE ID: 954.0 METRES DATE: APRIL 1994

(Total No. of Readings=28) 0.36 0.37 0.39 0.39 0.40 0.40 0.41 0.41 0.43 0.44 0.44 0.44 0.44 0.45 0.45 0.45 0.45 0.45 0.45 0.46 0.46 0.46 0.46 0.47 0.47 0.47 0.48 0.50

VITRINITE REFLECTANCE — MACERAL IDENTIFICATION

POPULATION Number	%	No. of Readings	Mean Ro (%)	Min Ro (%)	Max Ro (%)	STD Dev (%)	Comments	% Vitrinite	% Inertinite	% Liptinite	% Oil Drops
1	100.0	28	0.44	0.36	0.50	0.03	INDIGENOUS(+)	50.00	16.67	25.00	8.33



SAMPLE ID: 1027.0 METRES SAMPLE TYPE: SWC

(Total No. of Readings=26) 0.36 0.36 0.38 0.38 0.38 0.40 0.40 0.40 0.40 0.40 0.42 0.42 0.42 0.42 0.42 0.42 0.42 0.42 0.43 0.43 0.45 0.45 0.45 0.46 0.47 0.48

VITRINITE REFLECTANCE — MACERAL IDENTIFICATION

POPULATION Number	%	No. of Readings	Mean Ro (%)	Min Ro (%)	Max Ro (%)	STD Dev (%)	Comments	% Vitrinite	% Inertinite	% Liptinite	% Bitumen
1	100.0	26	0.42	0.36	0.48	0.03	INDIGENOUS(+)	35.21	42.25	21.13	1.41

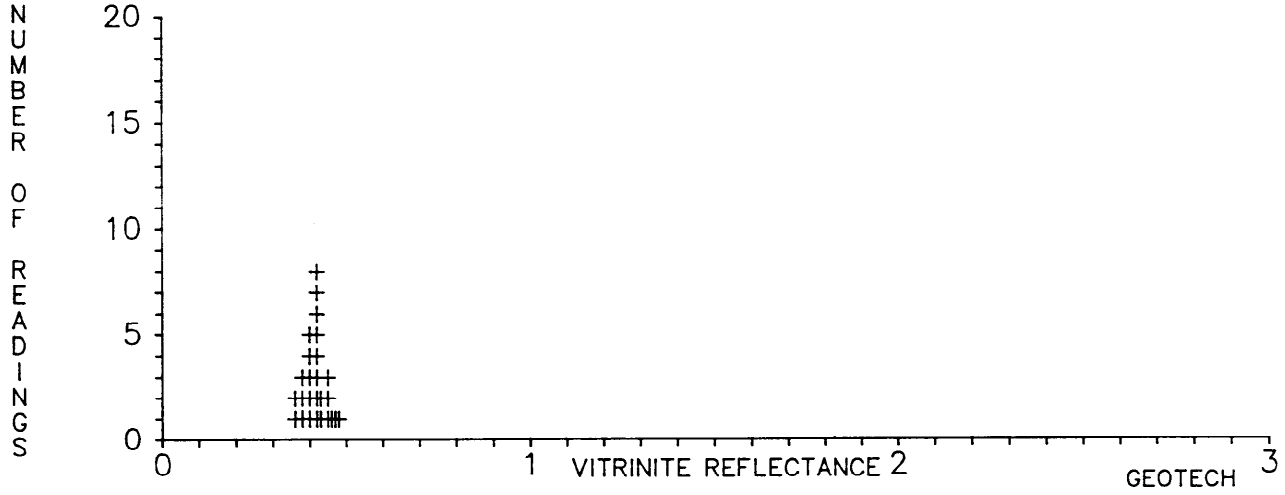


FIGURE 1d

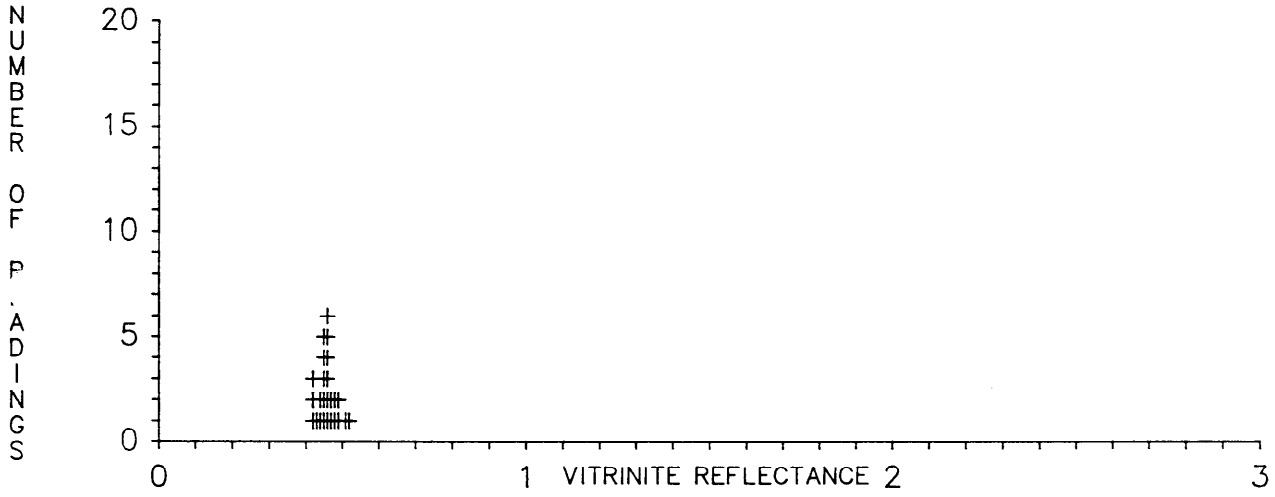
VITRINITE REFLECTANCE AND COAL MACERAL INDENTIFICATION

WELL: LOCH ARD-1 CLIENT: BHP PETROLEUM PTY LTD SAMPLE TYPE: SWC
SAMPLE ID: 1150.0 METRES DATE: APRIL 1994

(Total No. of Readings=25) 0.42 0.42 0.42 0.43 0.44 0.44 0.45 0.45 0.45 0.45 0.45 0.46 0.46 0.46 0.46 0.46 0.46 0.47 0.47 0.48 0.48 0.49 0.49 0.51 0.52

VITRINITE REFLECTANCE — MACERAL IDENTIFICATION

POPULATION Number	%	No. of Readings	Mean Ro (%)	Min Ro (%)	Max Ro (%)	STD Dev (%)	Comments	% Vitrinite	% Inertinite	% Liptinite	% Bitumen
1	100.0	25	0.46	0.42	0.52	0.03	INDIGENOUS(+)	50.00	27.94	22.06	0.00



SAMPLE ID: 1186.0 METRES SAMPLE TYPE: SWC

(Total No. of Readings=26) 0.42 0.42 0.43 0.43 0.44 0.44 0.44 0.45 0.45 0.45 0.46 0.46 0.47 0.47 0.48 0.48 0.48 0.49 0.49 0.49 0.50 0.50 0.51 0.52 0.52 0.53

VITRINITE REFLECTANCE — MACERAL IDENTIFICATION

POPULATION Number	%	No. of Readings	Mean Ro (%)	Min Ro (%)	Max Ro (%)	STD Dev (%)	Comments	% Vitrinite	% Inertinite	% Liptinite	% Bitumen
1	100.0	26	0.47	0.42	0.53	0.03	INDIGENOUS(+)	82.77	0.11	17.12	0.00

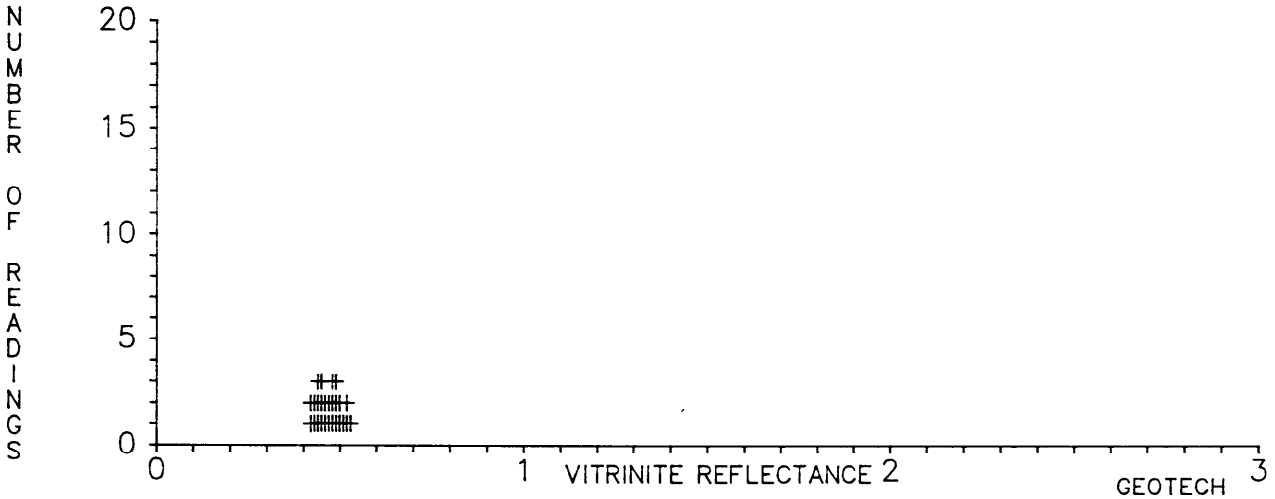


FIGURE 1e

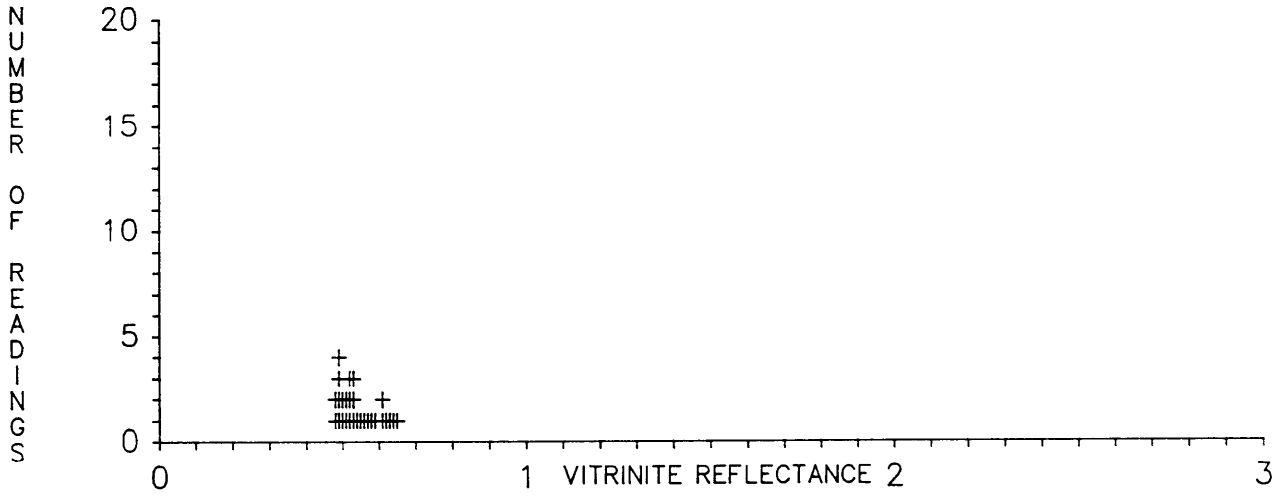
VITRINITE REFLECTANCE AND COAL MACERAL INDENTIFICATION

WELL: LOCH ARD-1 CLIENT: BHP PETROLEUM PTY LTD SAMPLE TYPE: SWC
SAMPLE ID: 1205.0 METRES DATE: APRIL 1994

(Total No. of Readings=28) 0.48 0.48 0.49 0.49 0.49 0.49 0.50 0.50 0.51 0.51 0.52 0.52 0.52 0.53 0.53 0.53 0.54 0.55 0.56 0.57 0.58 0.59 0.61 0.61 0.62 0.63 0.64 0.65

VITRINITE REFLECTANCE — MACERAL IDENTIFICATION

POPULATION Number	%	No. of Readings	Mean Ro (%)	Min Ro (%)	Max Ro (%)	STD Dev (%)	Comments	% Vitrinite	% Inertinite	% Liptinite	% Bitumen
1	100.0	28	0.54	0.48	0.65	0.05	INDIGENOUS(+)	34.40	36.80	28.00	0.80



SAMPLE ID: 1228.0 METRES SAMPLE TYPE: SWC

(Total No. of Readings=5) 1.07 1.10 1.67 1.69 2.02

VITRINITE REFLECTANCE — MACERAL IDENTIFICATION

POPULATION Number	%	No. of Readings	Mean Ro (%)	Min Ro (%)	Max Ro (%)	STD Dev (%)	Comments	% Vitrinite	% Inertinite	% Liptinite	% Bitumen
1	100.0	5	1.51	1.07	2.02	0.41	INERTINITE(X)	0.00	100.00	0.00	0.00

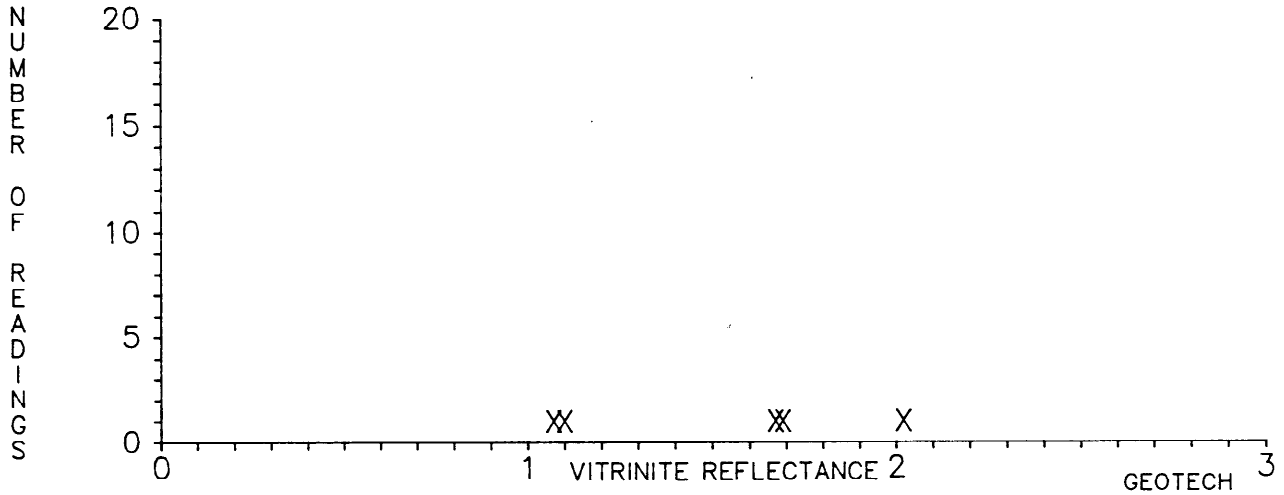


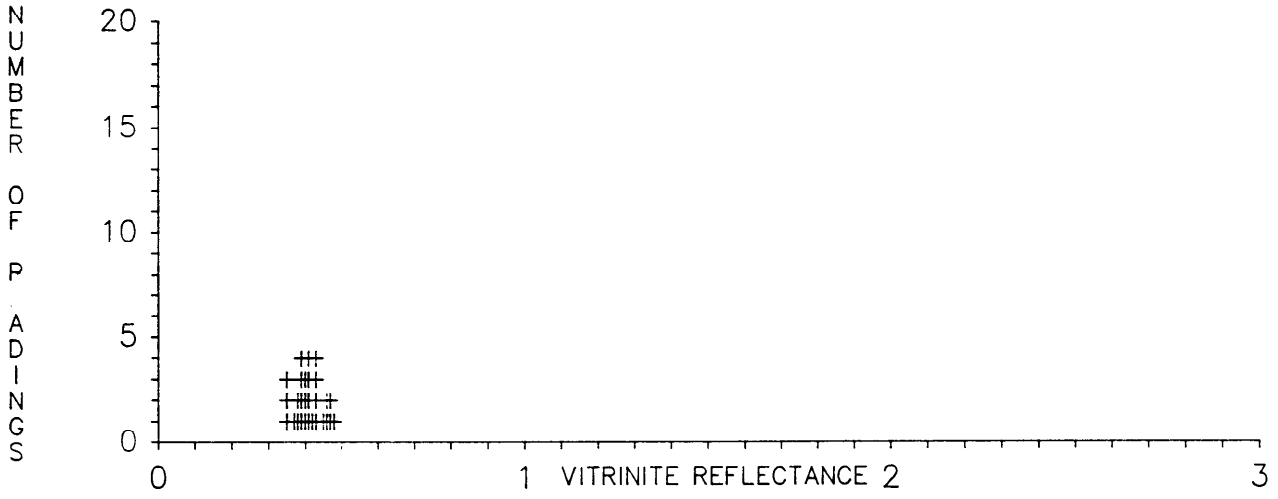
FIGURE 1f

VITRINITE REFLECTANCE AND COAL MACERAL INDENTIFICATION

WELL: LOCH ARD-1 CLIENT: BHP PETROLEUM PTY LTD SAMPLE TYPE: SWC
SAMPLE ID: 1326.0 METRES DATE: APRIL 1994

(Total No. of Readings=28) 0.35 0.35 0.35 0.37 0.38 0.38 0.39 0.39 0.39 0.39 0.40 0.40 0.40 0.41 0.41 0.41 0.41 0.42 0.43 0.43 0.43 0.43 0.45 0.46 0.46 0.47 0.47 0.48

VITRINITE REFLECTANCE								MACERAL IDENTIFICATION			
POPULATION Number	POPULATION %	No. of Readings	Mean Ro (%)	Min Ro (%)	Max Ro (%)	STD Dev (%)	Comments	% Vitrinite	% Inertinite	% Liptinite	% Bitumen
1	100.0	28	0.41	0.35	0.48	0.04	INDIGENOUS(+)	60.00	20.00	20.00	0.00



5

6.5 APPENDIX 5 Mudloggers Final Well Report

PETROLEUM DIVISION

FINAL WELL REPORT

BHP Petroleum Pty Ltd

Loch Ard-1

Otway Basin, Victoria

October - November 1993

by

BAKER HUGHES INTEQ

The information, interpretations, recommendations, or opinions contained herein are advisory only and may be rejected. Consultant does not warrant their accuracy or correctness. Nothing contained herein shall be deemed to be inconsistent with, nor expand, modify or alter Consultants obligation of performance as provided for in a written agreement between the parties, or, if none, in Consultant's most recent price list.

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1. INTRODUCTION

a. Well & Rig Data

Company	:	BHP Petroleum Pty Ltd
Well Name	:	Loch Ard-1
Location	:	Otway Basin, Victoria
Permit	:	VIC/P31
Latitude	:	38° 55' 54.717" South
Longitude	:	143° 10' 55.156" East
Field	:	Exploration
Rig	:	"Byford Dolphin" Semi-submersible
RT - MSL	:	25.00 metres
RT - Seabed	:	100.0 metres
Spud Date	:	18th October 1993
Total Depth	:	1397 metres
Total Depth Date	:	27th October 1993
Completion Status	:	Plugged and Abandoned
INTEQ Unit No	:	503
Crew, DrillByte	:	A. Thangam, G. Timmis
Crew, Logging	:	C. Dickinson, D. Alsop

b. Prognosis

Loch Ard-1 was located in the eastern part of Vic/P31, approximately 8 km north of Eric The Red-1. It was designed to test the primary Upper Shipwreck Group 'B' sand, secondary Upper Shipwreck Group 'A' sand and a tertiary target (the Sherbrook Group 'B' sand) in a faulted anticline structure.

The Loch Ard structure is defined by 1 by 1 km seismic grid. The structure formed during episodic structural inversion from the Late Campanian to Late Miocene times. Transpressional movement during this period saw selective reactivation of pre-existing normal faults in a complex pattern, resulting in a shallow but relatively high relief and robust structure. Closure is a fault dependant with top seals for each target being juxtaposed across faults as the lateral seal.

Loch Ard-1 was predicted to intersect a sedimentary sequence ranging in age from Recent to Early Cretaceous, similar to that seen at Eric The Red-1. The tertiary target (the Sherbrook Group 'B' sand) is predicted from 467-539 mSS, the Upper Shipwreck Group 'A' sand is expected from 635-740 mSS, while the primary target the Upper Shipwreck Group 'B' is expected from 904-1072 mSS.

Baker Hughes Inteq provided DrillByte Service on Lock Ard-1 from spud to a Total Depth of 2170 m. In addition to formation evaluation and conventional mud logging, real time data monitoring and recording as well as pressure and drilling analyses were carried out. The continuous evaluation of pressures and drilling progress provided an aid in optimizing drilling costs and ensured that drilling continued with the maximum safety to personnel, the well, and equipment. The operator was continuously advised as to the status of these analyses, with data and results stored on floppy disks for post-well evaluation. The printouts and plots of the results of these services are contained in the appendices to this report.

c. Sample Distribution

Formation evaluation services were provided from 100 - 1397 m TD.

Two sets of unwashed cuttings samples, two sets 100 m composite samples (200 gm) from 393 m to TD, one set 1 kg bulk AFT samples (20 m into each sand, plus 100 m thereafter), five sets of washed and dried cuttings samples (100 gm), one set of mud samples from the top and bottom of each hole section (3x1 ltr) and one set of Petrocraft sample vials were prepared for distribution as follows:

To: BHP Petroleum Pty Ltd	2 sets 200 gm unwashed
BHP Core Store	2 sets 100 gm washed and dried
C/- Kestrel Management	1 set 1 kg bulk sand samples
Unit 58	Charts
Slough Estate	
170 Forester Road	
Mt Waverley, Victoria 3149	

To: Mr. G. Roder Bridge Oil Ltd 255 Elizabeth Street Sydney, NSW 2000	1 set 100 gm washed and dried samples
To: Officer-in-charge BMR Core and Cuttings Laboratory (AGSO) 80 Collie Street Fyshwick, ACT 2609	1 set 100 gm washed and dried samples
To: Mr. V. Davoli VicDEM Corelab 196 Turner Street Port Melbourne, VIC 3207	1 set 100 gm washed and dried samples
To: Mr. J. Phipps BHP Petroleum 15th Floor 120 Collins Street Melbourne, VIC 3000	Petrocraft sample vials
To: Mr. M. Giraletti BHP-Melbourne Research Laboratories 245 Wellington Road Clayton, VIC 3168	1 set 100 gm composite samples (100 m) 1 set 1 ltr mud samples
To: Mr. K. Doolan BHP-Central Research Laboratories Off Vale Street Shortland, NSW 2307	1 set 100 gm composite samples (100 m) 1 set 1 ltr mud samples
To: Dr. S. Short ANSTO Building 34 New Illawara Road Lucas Heights, NSW 2232	1 set 1 ltr mud samples

Mud samples were collected at the following depths:

- 393 m, 942 m, 1397 m.

Samples were collected and processed from the 20" casing shoe over the following intervals:

- 393 - 942 m : 5 m samples
- 942- 1397 m : 3 m samples

2. DRILLING & ENGINEERING

a. Well History

The rig "Byford Dolphin" arrived at the Loch Ard-1 location on the 17th October 1993. The drill floor was 25 m above sea level and 100 m above the seabed (water depth of 75 m). Please note that all bit hours refer to rotating hours on-bottom, and all depths are referenced to the drill floor unless otherwise indicated.

After securing anchors and ballasting down, Loch Ard-1 was spudded at 00:28 hrs on the 19th October 1993.

36" Hole Section: 100 to 132 metres.

RRB#1, a 17.5" Security SS44G (18-18-20 jets), was run in tandem with a 36" hole-opener (4x20 jets). It drilled new hole from the seabed to 132 m in 0.97 hrs at an average ROP of 33.3 m/hr and was graded 2-2-WT-A-2-1-NO-TD. Hi-vis pills (50 bbls) were spotted after each single had been drilled, and all returns were to the sea floor. At 132 m, the hole was cleaned with a guar gum sweep and then displaced with 145 bbls of the same. The bit was then pulled to run 30" casing.

Three joints of casing (Drill Quip, 456/310 lbs/ft, B, 30.0") were run in the hole with no problems, and the shoe was set at 130 m. The casing was cemented with 672 sx class "G" cement at 2.03 sg, with 2% $CaCl_2$.

9.875" Pilot Hole Section: 132 to 388 metres.

Due to the possibility of encountering shallow gas, a small (9.875") diameter hole was first drilled, to be subsequently opened to 26" diameter.

NB#2, a 9.875" Security SS33SF (16-16-16 jets), drilled out the casing shoe and cement before progressing to a depth of 388 m in 3.17 hrs at an average ROP of 80.0 m/hr. Hi-vis pills (20 bbls) were spotted after each single had been drilled, and all returns were to the sea floor. Tight hole conditions were encountered at 369 m and required repeated reaming. The bit was graded 2-2-WT-A-2-2-NO-TD.

26.0" Hole Section: 132 to 393 metres.

RRB#1.2, a 17.5" Security SS44G (18-18-20 jets), was made up to a 26" hole-opener (18-18-18-20 jets) and run in the hole. The pilot hole was opened to 26" to a depth of 388 m, with 40 bbl hi-vis guar gum per half stand. An additional 5 m of new formation was drilled to a depth of 393 m, and the hole was swept with 350 bbl seawater, 375 bbl

guar gum, and 325 bbl hi-vis gel was spotted on bottom. A survey was dropped and the bit pulled to the shoe. The hole was in good condition with no drag, nevertheless the bit was run back in to bottom and swept with 350 bbl of seawater, 750 bbl of hi-vis and 300 bbls of KCl mud was spotted on bottom before pulling the bit out of the hole. This bit drilled 5 m in 0.17 hrs at an average ROP of 29 m/hr and was graded 3-2-WT-A-2-2-NO-TD.

Twenty four joints of casing (Swift, X52, 94 lb/ft, 20.0") were run, with the shoe set at 383 m. The casing was cemented with a lead slurry of 683 sx class "G" cement at 1.50 sg. This was followed by a tail slurry of 756 sx of class "G" cement at 1.90 sg which was displaced with 323 bbls of seawater.

The BOPs and riser were rigged up and run to the sea floor. The BOPs were then tested. The first two attempts at pressure-testing the annulus failed due to a leaking AX ring gasket. This was replaced and the BOPs were successfully pressure-tested.

12.25" Hole Section: 393 - 942 metres.

RR#1.3, a 17.5" Security SS44G (18-18-20 jets), drilled out the cement, shoe and rat-hole to 393 m whilst displacing the hole with a KCl/PHPA/Polymer mud system. Bottoms-up was then circulated and the bit was tripped.

NB#3, a 12.25" Hughes ATM 11HG (15-16-16 jets) was made up and run into the hole in conjunction with an MWD tool. Three metres of new hole were drilled from 393-396 m. After circulating and cleaning the hole, the bit was pulled back into the shoe and a Formation Integrity Test (FIT) was conducted. The results were as follows:

Depth (m)	Casing Shoe (m)	Hole Size (inches)	Mud σ (sg)	Integrity Press (sg EMD)
396	382.0	12.25	1.06	1.44

After the FIT, the bit was run back to bottom and new formation was drilled from 396 m. At 942 m it was decided that a suitable casing seat had been reached and drilling was halted. Bottoms-up was circulated, and the pipe slugged before attempting to pull out of the hole. The first few stands were very tight, especially in a claystone section from 765-775 m (15 klbs overpull) where swabbing occurred, and it was decided to ream back to bottom and circulate bottoms-up. After circulating and cleaning the hole, the bit was pulled out of the hole, though further circulating was required to counter problems with minor overpull. This bit drilled 549 m in 10.92 hrs at a rate of penetration of 50.3 m/hr. The bit was graded 2-1-WT-A-E-2-NO-TD.

The wireline unit was then rigged up and the following logs were run:

Run	Log Type	Interval
1	DLL-MSFL-AS-GR-SP-CAL-AMS	393 - 942 m
2	FMS-GR-AMS	n/a
3	CST-GR (30 shots)	

A wiper trip was then run on the completion of the E-Logs and **RR#3.1** was made up and run into the hole in conjunction with an MWD tool. There was 15 klb drag at 587 m, and the bit was worked through that tight spot before continuing to run in to bottom with neither resistance nor fill. No significant gas peak was recorded at bottoms-up and the bit was pulled without any problems.

Seventy-two joints of casing (47 lb/ft, P110, New Vam, 9.625") casing were then run with the shoe set at 929.66 m. The casing was cemented with a lead slurry of 100 sx Class 'G' cement at 1.50 sg with 15 gall/ton of Econolite, followed by a tail slurry of 300 sx Class 'G' cement at 1.89 sg neat. This was displaced with 17.5 bbls seawater, and 183 bbl of mud using the rig pumps.

8.5" Hole Section: 942 - 1397 metres.

NB#4, an 8.5" Hughes ATM11 HG (12-12-12 jets), was made up and run into the hole in conjunction with an MWD tool, drilling the float and cement, together with the shoe at 930 m. The 12.25" rat-hole was reamed to 942 m and new hole was drilled from 942-945 m. The hole was circulated clean and the bit was pulled back into the shoe to conduct an FIT. The results were as follows:

Depth (m)	Casing Shoe (m)	Hole Size (inches)	Mud σ (sg)	Fracture Grad. (sg EMD)
945	929.66	8.5	1.08	1.87

New hole was drilled from 945 m to a Total Depth of 1397 m. This bit had drilled 455 m in 21.15 hrs at an average rate of 21.5 m/hr (graded 3-3-WT-A-E-1-ER-TD).

After circulating the hole clean, tripping commenced however tight hole conditions were encountered. After reaching the shoe, the bit was run back to bottom and the hole circulated clean. The subsequent

trip out was trouble-free and after rigging up the wireline unit, the following logs were run:

Run	Log Type	Interval
1	DLL-MSFL-SDT-GR-SP-CAL-AMS	930 - 1397 m
2	LDL-CNL-GR-CAL-AMS	930 - 1397 m
3	VSP	100 - 1397 m
4	CST-GR 30 shots	

After completion and evaluation of the wireline logs, a plug and suspend program was undertaken for Loch Ard-1 well.

b. Bit Optimisation

Bit performance was continuously monitored and the operator advised of the rate of penetration, torque and formation changes. See Table-4 for a detailed breakdown of bit data.

Loch Ard-1 was drilled using a total of 3 new bits, and 1 re-run bit, in 36.38 hrs at an average rate of penetration of 35.7 m/hr.

36" Hole Section
This section was drilled using a 17.5" Security SS44G bit (IADC 135), run in tandem with a 36" hole-opener. The 32 m of 36" hole were drilled in 0.97 hrs at an average ROP of 33 m/hr. Typical drilling parameters used were: WOB 1-14 klbs, RPM 90, pump pressure 1380 psi at 1080 gpm. The bit was graded 2-2-WT-A-2-1-NO-TD.

9.875" Pilot Hole Section
A 9.875" Security SS33SF (IADC 116) was used to drill a pilot hole for the 26" hole section. This bit drilled a total of 256 m in 3.17 hrs at ROPs varying from 20-200 m/hr and averaging 80.7 m/hr. Typical drilling parameters were: WOB 0.5-14 klbs, RPM 120, pump pressure of 790-850 psi at 530-540 gpm. The bit was graded 2-2-WT-A-2-1-NO-TD.

26" Hole Section
The pilot hole was opened to 26" with a 17.5" Security SS44G (IADC 135), in tandem with a 26" hole-opener. This bit opened 256 m in 9.1 hrs, and then drilled a further 5 m in 0.17 hrs at an average ROP of 28.0 m/hr. Typical drilling parameters were: WOB 12-20 klb, RPM 102, pump pressure 2200 psi at 1100 gpm. It was graded 3-2-WT-A-2-2-NO-TD.

12.25" Hole Section
This section was drilled with a 12.25" Hughes ATM 11HG (IADC 437). It completed a total of 549 m in 10.92 hours, at an average rate of penetration 50.3 m/hr. The lithology through this section was dominantly sandstone in the upper part, with claystone becoming predominant in the lower section. The bit performed well in the sandstone sections and slower in the claystone sections. Variations in ROP within the sandstone were caused by lithological changes with regards to pyrite and the calcareous cementation of the sandstone. Typical drilling parameters were: WOB 0-38 klb, RPM 95-115, pump pressure of 2270-2695 psi at 736-774 gpm. The bit was graded 2-1-WT-A-E-2-NO-TD.

8.5" Hole Section
This section was also completed with a single bit run to Total Depth. An 8.5" Hughes ATM-11HG (IADC 437) drilled cement, float collar, shoe and rat-hole before drilling to TD, along with some reaming on the subsequent wiper trip. Typical parameters were: WOB 14-34 klb, RPM 82-121, pump pressure 2000 psi at 415 gpm. The bit was graded 3-3-WT-A-E-1-ER-TD.

c. Hydraulics Optimisation

Hydraulics analyses were provided for the operator on a daily basis. Results of these analyses were provided on the daily Geological - Engineering reports and on the Hydraulic data printouts in Appendices IX and X respectively. A summary is also provided in Table-5.

The rig was equipped with two NATIONAL 12P 160 triplex pumps with a pump output of 5.41 gal/stk at 97% efficiency.

36" Hole Section
This section was drilled using seawater and hi-vis sweeps. Flow rates of 1010-1100 gpm were used giving turbulent flow regimes in the open hole annular sections. The impact force and percentage pressure loss were 707 lbf and 24%, with the low percentage pressure loss due to the presence of the 36" hole-opener.

9.875" Pilot Hole Section
This section was also drilled with seawater as the drilling fluid at a flow rate of 540-560 gpm with 20 bbl hi-vis gel sweeps at every half stand, producing excellent cuttings transport properties but turbulent flow regimes within the 9.875" annular section.

26" Hole Section
Opening of the hole to 26" was also made with seawater and hi-vis sweeps with flow rates of 1080-1120 gpm giving turbulent flow regimes within all annular sections. The impact force and percentage loss were 707 lbf and 67%.

12.25" Hole Section
This section was drilled with an MWD tool in the BHA using a KCl/PHPA mud. The mud density was kept stable at 1.09-1.10 sg, along with PV/YP of 15/27 and Gels of 6/10. A configuration of 2x16,1x15 jets were used with a flow rate of 736-774 gpm. This provided good hydraulic and hole cleaning capabilities while maintaining laminar flow regimes through the annulus with an annular velocities in the largest annular section (the riser) of 16 m/min. The hydraulic power at the bit was 695 hhp with an impact force of 1581 lbf. The pressure loss at the bit was 1550 psi, 58 % of the total pressure loss of 2270-2695 psi with the MWD tool accounting for a pressure drop of 150-320 psi.

8.5" Hole Section
This section was drilled with an MWD tool in the BHA using a KCl/PHPA mud. A combination of 3x12 jets and a flow rate of 400 gpm was used. With mud properties of: Density 1.09 sg, and PV/YP 14/22 remaining consistent, this produced bit hydraulics of; Impact force 750 lbf, 295 hhp. The pressure loss at the bit was 1250 psi, which was 72% of the total. Flow through the annulus was laminar within all hole sections.

d. Borehole Condition.

Borehole condition was monitored by observing rotary torque, overpull on connections and during trips, hole fill after trips and cavings. Carbide checks were run on a regular basis to check the lag and obtain an estimate of the average hole size.

36" Hole Section
This section was drilled without problems, as was the 30" casing run.

9.875" Pilot Hole and 26" Hole Section
This section was drilled without problems except at 369 m where, while making a connection, tight hole with 15 klb overpull was encountered and this required repeated reaming to remedy. No further hole problems were recorded within this interval and no drag was recorded on the way out of the hole. No hole problems were noted while opening the 9.875" pilot hole to 26", and the 20" casing was run and cemented without problems.

12.25" Hole Section
This section was drilled with minor hole problems. The occasional decrease in penetration rates were mainly associated with well cemented sandstone sections. One carbide check was made at 798 m while drilling this section. The result from this indicated that the hole had an average diameter of 14". This was corroborated by the caliper log which indicated an average hole size of 13". No severe hole problems were encountered while drilling, however, during the trip out, tight hole conditions were encountered at 765-775 m. The bit was then reamed to bottom and full returns were circulated up before attempting to come out of the hole once again. During the trip out at this depth, tight hole conditions were still encountered with a maximum overpull of 30 klb at 600 m. It appeared that the hole could have been falling in, which required the bit to be pumped out from 600 m to the shoe. No problems were encountered while running wireline, however a wiper trip before running 9.625" casing indicated a slight drag of 15 klb from 587-596 m which required the bit to work through. No fill was encountered and no problems were encountered while pulling out of the hole. The 9.625" casing was then run in without any problems.

8.5" Hole Section
No major torque or overpull on connections occurred while drilling this section. However, while attempting to pull out at TD, 20-30 klb overpull and swabbing of the hole took place. This was the result of thick mud cake build-up through a large distance in this section, as detected by the caliper log. A carbide was run at 1200 m and this gave an average hole size of 10.36". The caliper log indicated an average hole size of 9".

3. PRESSURE EVALUATION

a. Formation Fracture Pressure

Fracture pressures were calculated using the "Constant Effective Stress Ratio" method. This utilized leak-off data and allowed for lithological and pore pressure variations. It should be noted that this method assumes uniform tectonic stress, and any unconformities may place the section on either side in a different stress regime (See Appendix IV, Pressure Gradient Analysis Plot).

Two Formation Integrity Tests were conducted during the drilling of Loch Ard-1 and the results are as follows:

Depth (m)	Casing Shoe (m)	Hole Size (inches)	Mud σ (sg)	Fracture Press (sg EMD)
396	382.0	12.25	1.06	1.44
945	930.0	8.5	1.09	1.87

No losses to the formation were noted during the drilling of the 12.25" and the 8.5" hole. It is unlikely that any hydraulic fracturing would have occurred as the minimum fracture gradients of 1.44 and 1.87 sg EMD were not exceeded at any time by the maximum circulating density of 1.18 sg. While running wireline logs, losses of up to 1.3 bbl/hour were noted, and it is believed to be due to seepage within the porous sandstone.

b. Formation Pore Pressure

Pore pressure indicators, including Dxc, flowline temperature, mud resistivity, hole condition, cavings and gas values, were monitored on a continuous basis while drilling and pore pressure estimates were reported to the operator on a daily basis. When the MWD tool was run, these results were used in the estimation of pore pressures. Plots of the relevant pressure indicators and pressure estimates are detailed in the Drilling Data Pressure Plot in Appendix II, Composite Pressure Data Plot in Appendix III and the Pressure Gradient Analysis Plot in Appendix IV. Based on off-set data a normal pore pressure gradient of 1.03 sg EMD was assumed for initial section of Lock Ard-1.

9.875" pilot hole, 36" and 26" Hole Sections
It was not possible to accurately monitor pore pressure through these sections as there were no returns to surface and drilling was generally controlled by using a very low weight on bit. The absence of any major hole problems while drilling or running casing suggests that pore pressure remained normal at 1.03 sg EMD through these intervals.

12.25" Hole Section
The pore pressure was estimated to be normal at 1.03 sg EMD from the casing shoe down to 942 m. Tight hole problems, including swabbing, occurred while tripping out off the hole at 770 m and 600 m. A thick filter cake build-up around these depths, as measured when the hole was later logged provides a reasonable explanation. All other abnormal pressure indicators confirm that the pressure remained normal throughout this section, though Dxc trend was a poor indicator due to the predominance of Sandstone within this section.

8.5" Hole Section
The pore pressure was estimated to be normal at 1.03 sg EMD throughout this section. A normal Dxc trend, joining the Claystone sections was achievable within this interval. The trend line did show shifts towards the left within several intervals, but these all corresponded to lithology changes from Claystone to Sandstone. The same problem with tight hole while tripping out that occurred in the 12.25" section took place in this interval. Again, the logs detected a thick build-up of filter cake.

4. GEOLOGY AND SHOWS

Cuttings samples were collected at 5 metre intervals from the 20" casing shoe to the base of the 12.25" hole section (393 - 942 m).

Cuttings samples were also collected at 3 metre intervals from the 9.625" casing shoe to Total Depth (942 - 1397 m).

Geology Summary

DEPTH INTERVAL (mRT)	ROP (m/hr)			TOTAL GAS (%)		CHROMATOGRAPH ANALYSIS (%)									
						C1		C2		C3		C4		C5	
	Min	Max	Avg	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
393 - 660	14	355	85	0	0.0158	0	0.013	-	-	-	-	-	-		-
660 - 1208	3	209	40	0.008	0.0761	0.005	0.068	0	0.007	-	-	-	-	-	-
1208 - 1397	9	47	21	0.010	0.0583	0.007	0.056	-	-	-	-	-	-	-	-

The lithologies seen in Loch Ard-1 are described below. For further descriptions see Appendix XI (Formation Evaluation Log).

Spud to 393 m

Returns to the sea floor

393 - 660 mRT: CLAYSTONE with interbedded SANDSTONE grading into SANDSTONE with interbedded CLAYSTONE

CLAYSTONE: generally medium grey to moderately dark grey, and medium to dark brown grading to olive black in part. It was dominantly soft and only occasionally firm, and moderately to very dispersive. The claystone was often very arenaceous and massive to sub-blocky in part and was occasionally silty. Accessory minerals include trace fine pyrite aggregates, common carbonaceous material, traces of brown crystalline dolomite fragments and trace to common glauconite grains.

SANDSTONE: light to very light grey, occasionally green grey. It was generally friable with abundant loose grains, and was occasionally hard in parts, bound by a moderately hard silicas cement. It was fine to coarse, occasionally very coarse, but dominantly medium grained. It was well sorted and occasionally poorly sorted near the top. The grain shape was subangular to rounded, and grains were generally

transparent to translucent. A trace green grey to light grey argillaceous matrix was present. Accessory minerals seen included trace to common pyritic grains and aggregates as well as trace to common glauconite in parts. Trace green, black and yellow lithics were noted and although fairly rare, iron staining on some quartz grains was also present. Visible porosity was generally good to excellent. No oil shows were seen.

There were no oil or gas shows. Gas was first recorded from 481 mRT.

660-918 mRT: SANDSTONE with interbedded CLAYSTONE

SANDSTONE: white to light grey and occasionally green grey consisted of a very fine to coarse grain size, dominantly medium. The sand was dominantly friable and consisted of loose grains. The grains were dominantly subrounded to subangular although they were often seen to be rounded to angular in parts, translucent to transparent, and the sandstone was very well to moderately sort. A green grey dispersive argillaceous matrix was noted throughout the section. Accessory minerals include fragments and aggregates of pyrite, trace to common glauconite, trace fine black carbonaceous specks, trace iron stained quartz. Trace to rare dull to sub-vitreous brittle black coal was also recognized in the formation. Visible porosity ranged from fair to excellent in the upper sections to mid sections of the sand and poor lower down the formation. No shows were seen in this interval.

CLAYSTONE: light grey to light grey brown grey. It was dominantly soft, silty to finely arenaceous throughout the section, and moderately dispersive. It was sub-blocky, sticky in part and massive. Accessory minerals include trace to common fine black carbonaceous specks throughout the formation, traces of fossils, trace to common glauconite.

GLAUCONITIC CLAYSTONE: it occurred at the top of the interval as a dusky grey, soft, sticky claystone with abundant fine to medium glauconite. It was sub-blocky and contained traces of pyrite, black lithics and black coal.

918-1035 mRT: CLAYSTONE

CLAYSTONE: light grey to occasionally grey brown and becoming medium grey brown with depth and generally dispersive in part. It was soft to firm and was massive and occasionally sub-blocky. Accessories included trace to common sand, traces of light brown crystalline dolomite, pyrite, rare glauconite and traces of black, moderately dull, brittle coal and carbonaceous fragments.

1035-1208 mRT: SANDSTONE with interbedded CLAYSTONE

SANDSTONE: very light grey to light grey with translucent to transparent friable and loose quartz grains. It consisted of fine to coarse grains, dominantly medium, subrounded to angular and poorly sorted. There were traces of silica cement and trace to common light grey to occasionally white argillaceous matrix. Accessories included traces of pyrite, carbonaceous material, coal, glauconite and trace to rare calcite. Visual porosity was fair to good. There were no oil shows.

CLAYSTONE: medium gray brown to occasionally dark grey brown and becoming light grey towards the base of the section. It was soft to firm, sub-blocky, massive in part, moderately dispersive and sticky in part. Traces of pyrite, dull to subvitreous brittle black coal and carbonaceous material were observed.

There were no shows in this section

1208-1397 mRT: SANDSTONE with minor CLAYSTONE

ARGILLACEOUS LITHIC SANDSTONE: green grey to light grey green and pale green in part and was friable with mostly loose grains. The grains were medium to coarse grained, dominantly medium, rounded siliceous to angular vulcanogenic grains and moderately to poorly sorted. There was a common to abundant pale green to grey green argillaceous matrix that graded to light grey in part. The green clay was probably chloritic. Accessories included abundant green lithics which were mostly siliceous in nature, trace to common yellow, black red and orange lithics, trace pyrite, trace carbonaceous material and traces of light grey to black chert. Inferred porosity was poor.

CLAYSTONE 1: medium brown, soft to sub-blocky, dispersive in part, massive and had traces of carbonaceous fragments.

CLAYSTONE 2: light grey, soft to sub-blocky, dispersive in part and massive.

CLAYSTONE 3: bright red brown, firm to moderately hard, sub-blocky and massive.

There were no shows in this section.

5. TESTING AND EVALUATION

a. Hydrocarbon Evaluation and Gas Ratio Analysis

Standard mud logging techniques were utilized while drilling the Loch Ard-1 well. Total combustible gas levels in the mud were monitored continuously using an FID Total Gas Detector. The gas was also analyzed for its components (methane through pentane) using an FID Chromatograph. Carbon dioxide and hydrogen sulfide detectors were also run for the duration of the well. Mud returns, unwashed and washed cuttings were observed under ultra-violet light and cut with solvent to check for the presence of liquid hydrocarbons.

Due to the fact that over the reservoir zone very little gas was recorded, it was regarded as unnecessary to perform a gas ratio analysis over this section.

b. Wireline Logging

Depth (m)	Hole Diameter (inch)	LOGS
942	12.25	DLL-MSFL-AS-GR-SP-CAL-AMS FMS-GR-AMS CST-GR (30 shots)
1397	8.50	DLL-MSFL-SDT-GR-SP-CAL-AMS LDL-CNL-FML-GR-CAL-AMS VSP CST-GR (30 shots)

c. Coring

No conventional cores were cut in Loch Ard-1.

d. Measurement while Drilling.

Measurement while drilling services were provided by Baker Hughes INTEQ INFORMATION TECHNOLOGY (Eastman Teleco). Data was regularly transferred to the Drillbyte computer and data plots were submitted to BHPP on a daily basis (See Appendix V: MWD data plot). This data was also plotted in a composite plot with Dxc and used for pressure evaluation (See Appendix III). The range of MWD data obtained was 390-1392 m, while the RWD data ranged from 387.25-1386 m.

e. Formation Testing

No RFT or DST measurements were taken on Loch Ard-1

6. DATA INVENTORY

The following were supplied to BHPP on a daily basis or as required:

1 copy	Morning Report
1 copy	Hydraulics Printout
1 copy	Formation Evaluation Log
1 copy	Drilling Data Plot
1 copy	Drilling Data Pressure Plot

On completion of Loch Ard-1, all charts, work sheets, raw data and data disks were forwarded to BHPP Australia. Four (4) copies of the Final Well Report were compiled, with Baker Hughes INTEQ Australia retaining one (1) copy, as well as a copy of all relevant data.

Baker Hughes INTEQ Australia will use all reasonable diligence to maintain and store the listed items in a manner to reasonably prevent damage or loss. Provided, however, Baker Hughes INTEQ Australia assumes no responsibility for the loss, damage or theft of these items or information contained herein, and shall not be liable to the Operator in any such event irrespective of cause, fault, or the active or passive negligence of Baker Hughes INTEQ Australia and its employees.

TABLES

1. Deviation Survey Record
2. Drilling Fluid Properties
3. Casing and Cementing Details
4. Bit Record
5. Bit Hydraulics Record

TABLES

TABLE 1.

Measured Depth m	Incl deg	Azimuth (corr) deg quad	Tool Type	Course Length m	Dogleg deg/10m	Vertical Depth m	Position North m	Position East m	Calc Method
410.0	1.00	298.20 N61.80E	MWD	310.0	0.097	410.0	1.3	-2.4	MIN CURV
557.3	1.00	307.70 N52.30E	MWD	147.3	0.034	557.3	2.7	-4.5	MIN CURV
701.8	0.30	30.00 N30.00E	MWD	144.5	0.209	701.7	3.8	-5.3	MIN CURV
846.5	1.40	155.10 S24.90E	MWD	144.7	0.330	846.4	2.5	-4.4	MIN CURV
929.0	1.50	158.70 S21.30E	MWD	82.5	0.049	928.9	0.6	-3.6	MIN CURV
1046.2	1.20	153.70 S26.30E	MWD	117.2	0.082	1046.1	-1.9	-2.5	MIN CURV
1161.7	2.10	113.30 S66.70E	MWD	115.5	0.368	1161.6	-3.9	-0.0	MIN CURV
1279.0	2.50	95.00 S85.00E	MWD	117.3	0.213	1278.7	-4.9	4.5	MIN CURV

Table 2.

Mud Properties

Depth m	MW sg	Vis sec/qt	PV cp	YP lb/cft²	Gels lb/cft² 10s/10m	F cc	FC 1/32"	SOL %	OIL %	SD %	MBT	pH	Cl kppm	Ca mg/l	K+ kmg/l	KCl %	PHPA lb/bbl
393.0	1.03	Seawater with Guar Gum Hi-Vis sweeps used for the 36.0", 26.0", 9.875" hole sections															
KCl/PHPA																	
393	1.055	50	13	19	5/5	8.0	1.0	3.7	-	-	7.0	11.5	47.0	360	44.0	8.5	1.29
520	1.08	52	18	24	6/8	7.6	1.0	5.0	-	3.75	7.0	9.8	46.0	360	37.0	7.1	1.15
719	1.09	54	15	27	6/10	6.4	1.0	5.6	-	1.25	7.5	9.5	50.0	260	45.0	8.7	1.20
786	1.10	52	16	22	6/8	6.4	1.0	5.6	-	3.00	7.5	9.4	50.0	260	44.6	8.6	1.20
942	1.08	48	14	25	5/6	5.2	1.0	5.0	-	TR	7.0	9.5	50.0	260	44.0	8.5	0.96
1223	1.09	48	14	22	6/9	4.8	1.0	5.6	-	0.10	7.0	9.5	55.0	260	46.5	8.9	0.60
1397	1.10	49	14	22	5/9	4.6	1.0	6.2	-	0.25	6.5	9.5	49.0	280	42.6	8.2	0.50

Table 3.

Casing and Cementing Summary

Hole Depth m	Hole Size in	Casing Size Nom in	Casing Size ID in	Weight ppf	Shoe Depth m	Joints Run	Cement Details
132.0	36.00	30.000	29.000	310	130	3	672sx 'G' cement @ 1.90 sg (15.9 ppg) Displaced with 138 bbl seawater
393.0	26.00	20.000	19.130	94	383	24	Lead: 683 sx Class 'G' cement @ 1.50 sg (12.5 ppg) + 190 bbl mix seawater Tail: 756 sx Class 'G' cement @ 1.90 sg (15.8 ppg) + 90 bbl mix water. Displaced with 323 bbl seawater
942.0	12.25	9.625	8.681	47	929.7	71	Lead: 100 sx Class 'G' cement @ 1.50 sg (12.5 ppg) + 15 GPT Econolite Tail: 300 sx Class 'G' cement @ 1.89 sg (15.8 ppg) neat. Displaced with 17.5 bbls seawater

Table 4. Bit Record

Run #	Bit #	Vendor	Type	Size in	IADC	Jets 1/32"	Depth In (m)	Metres run	Hours	Avg ROP	WOB klb	RPM	Torque amps	Pump psi	GPM	Grade IOBLBGOR
1	RR1.1	Security H/O	SS44G	17.50 36.00	135	18,18,20 20,20,20,20	100.0	32.0	0.97	33.00	1-14	23-89	41-441	1350	1080	2-2-WT-A-2-1-NO-TD
2	NB1.0	Security	SS33SF	9.875	116	16,16,16	132.0	256.0	3.17	80.80	0-14	111-121	45-224	850	540	2-2-WT-A-2-2-1-NO-TD
3	RR1.2	Security H/O	SS44G	17.50 26.00	135	18,18,20 18,18,18,20	388.0	5.0	0.17	29.0	12-20	102	140-337	2200	1100	3-2-WT-A-2-2-NO-TD
4	NB3	Hughes	ATM11HG	12.25	437	16,16,15	393.0	549.0	10.92	50.3	0-38	95-115	56-525	2270-2695	736-774	2-1-WT-A-E 2-NO-TD
5	RR3.1	Hughes	ATM11HG	12.25	437	16,16,15	942.0		WIPER TRIP BEFORE CASING RUN.							2-1-WT-A-E 2-NO-TD
6	NB4.0	Hughes	ATM11HG	8.5	437	12,12,12	942.0	455.0	21.15	21.5	8-34	82-121	99-444	1732-2031	403-417	3-3-WT-A-E 1-ER-TD

Table 5.
Hydraulics Summary

Bit #	Depth m	Hole Size in	Jets	MW sg	PV/YP	Flow Rate gpm	ECD sg	Annular Velocities Min ¦ DP ¦ DC ¦ Crit m/min	Jet Vel m/sec	HHP hp	Impact Force lbf	Loss Bit psi	Pump Pres psi	%Bit Loss
NB2	388	9.875	16,16,16	1.03	1/1	540	1.03	5 ¦ - ¦120 ¦ 22	90	209	707	665	862	67
RR1.2	393	26.000	5x18,2x20	1.03	1/1	1102	1.03	10 ¦ 13 ¦ 14 ¦ 9	134	955	2158	1487	2280	68
NB3	786	12.25	16,16,15	1.09	15/27	770	1.11	16 ¦ 46 ¦ 67 ¦ 147	133	698	1586	1554	2496	67
	942	12.25	16,16,15	1.09	15/27	769	1.11	16 ¦ 34 ¦ 44 ¦ 133	133	695	1582	1550	2690	65
NB4	1223	8.5	12,12,12	1.09	14/22	406	1.12	8 ¦ 37 ¦ 101¦ 163	120	298	752	1257	1750	72
	1397	8.5	12, 12,12	1.09	14/22	406	1.13	8 ¦ 37 ¦ 101¦ 164	120	298	752	1257	1758	72

APPENDICES

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APPENDIX VIII: Drilling Data Printout

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	BIT DIST	BIT HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
Spud LOCH ARD - 1 at 0028 hours on the 19th of October 1993																				
RIH with NB#1 SEC SS44G																				
00:29:50	101.3	101.3	0.1	1	0	0	0	0	0	0.00	0.00	-0.0	-0.0	100.0	859	1.3	0:00	1.03	2.56	0.00
00:30:37	102.2	102.2	0.6	3	14	31	281	265	0	1.03	1.03	14.8	13.0	100.0	847	2.2	0:01	1.03	1.43	0.00
00:31:39	103.0	103.0	57.3	6	24	48	285	268	0	1.03	1.03	14.8	13.0	100.0	838	3.0	0:02	1.03	0.31	0.00
00:32:40	104.0	104.0	59.0	3	40	55	403	286	0	1.03	1.03	14.8	13.0	100.0	828	4.0	0:03	1.03	0.37	0.00
00:33:37	105.1	105.1	77.1	3	54	59	624	597	0	1.03	1.03	14.8	13.0	100.0	815	5.1	0:04	1.03	0.37	0.00
00:34:24	106.0	106.0	75.6	3	62	58	778	775	0	1.03	1.03	14.8	13.0	100.0	802	6.0	0:05	1.03	0.39	0.00
00:35:20	107.1	107.1	69.5	2	79	73	1092	974	0	1.03	1.03	14.8	13.0	100.0	796	7.1	0:05	1.03	0.40	0.00
00:36:02	108.1	108.1	97.7	2	81	75	1118	1048	0	1.03	1.03	14.8	13.0	100.0	794	8.1	0:06	1.03	0.37	0.00
0:36:43	109.1	109.1	87.8	2	84	74	1119	1061	0	1.03	1.03	14.8	13.0	100.0	794	9.1	0:07	1.03	0.40	0.00
00:37:50	110.1	110.1	53.6	4	88	104	1120	1064	0	1.03	1.03	14.8	13.0	100.0	795	10.1	0:08	1.03	0.53	0.00
00:39:11	111.0	111.0	44.1	10	88	141	1120	1066	0	1.03	1.03	14.7	13.0	100.0	797	11.0	0:09	1.03	0.64	0.00
00:41:10	112.0	112.0	30.2	14	88	235	1126	1068	0	1.03	1.03	14.7	13.0	100.0	802	12.0	0:11	1.03	0.74	0.00
00:54:35	113.0	113.0	14.4	12	88	195	1118	1070	0	1.03	1.03	14.7	13.0	104.2	875	13.0	0:15	1.03	0.97	0.00
00:56:08	114.0	114.0	38.7	12	86	277	1740	1063	0	1.03	1.03	14.6	13.0	105.0	862	14.0	0:17	1.03	0.68	0.00
00:57:39	115.0	115.0	39.3	16	86	274	1748	1070	0	1.03	1.03	14.6	13.0	105.8	857	15.0	0:18	1.03	0.71	0.00
00:59:28	116.0	116.0	34.8	14	86	258	1752	1072	0	1.03	1.03	14.6	13.0	106.7	850	16.0	0:20	1.03	0.71	0.00
01:01:43	117.0	117.0	26.6	12	89	277	1750	1075	0	1.03	1.03	14.6	13.0	107.9	843	17.0	0:22	1.03	0.77	0.00
01:03:36	118.0	118.0	33.4	13	89	234	1750	1075	0	1.03	1.03	14.6	13.0	108.9	843	18.0	0:24	1.03	0.71	0.00
01:05:16	119.0	119.0	35.8	14	89	247	1750	1076	0	1.03	1.03	14.6	13.0	109.8	848	19.0	0:26	1.03	0.71	0.00
01:07:15	120.1	120.1	31.8	12	90	238	1751	1077	0	1.03	1.03	14.6	13.0	110.8	852	20.1	0:28	1.03	0.72	0.00
01:09:08	121.0	121.0	31.6	11	89	213	1745	1078	0	1.03	1.03	14.6	13.0	111.9	856	21.0	0:30	1.03	0.70	0.00
01:11:32	122.0	122.0	26.0	10	89	205	1397	1079	0	1.03	1.03	14.6	12.9	113.0	860	22.0	0:32	1.03	0.72	0.00
01:13:37	123.0	123.0	28.7	13	89	241	1376	1080	0	1.03	1.03	14.6	12.9	114.0	865	23.0	0:34	1.03	0.74	0.00
01:15:42	124.0	124.0	29.3	12	89	239	1374	1080	0	1.03	1.03	14.5	12.9	115.1	871	24.0	0:36	1.03	0.73	0.00
01:17:47	125.0	125.0	28.8	12	89	227	1377	1081	0	1.03	1.03	14.5	12.9	116.2	874	25.0	0:38	1.03	0.74	0.00
01:19:51	126.1	126.1	31.0	14	89	228	1371	1080	0	1.03	1.03	14.5	12.8	116.8	879	26.1	0:40	1.03	0.74	0.00
01:23:10	127.0	127.0	17.9	11	89	207	1373	1080	0	1.03	1.03	14.5	12.8	118.4	887	27.0	0:44	1.03	0.80	0.00
01:26:21	128.0	128.0	19.1	12	89	223	1040	1082	0	1.03	1.03	14.5	12.8	119.9	915	28.0	0:47	1.03	0.81	0.00
01:29:07	129.0	129.0	22.9	13	89	214	1215	1082	0	1.03	1.03	14.5	12.8	121.0	899	29.0	0:50	1.03	0.78	0.00
01:32:02	130.0	130.0	20.5	11	89	203	1367	1080	0	1.03	1.03	14.5	12.8	122.0	886	30.0	0:53	1.03	0.78	0.00
1:34:51	131.0	131.0	22.6	11	89	209	1375	1081	0	1.03	1.03	14.5	12.8	123.2	860	31.0	0:55	1.03	0.76	0.00
Drill to 132m. Set 30" casing with shoe at 130m.																				
RIH w/NB#2 Security SS33SF 3x16 jets and drill 9.875" Pilot-hole																				
12:33:51	134.0	134.0	2.6	1	85	109	765	533	0	1.03	1.03	14.5	12.8	123.2	810	2.0	0:00	1.03	0.56	0.00
12:34:22	135.0	135.0	13.7	1	89	110	780	533	0	1.03	1.03	14.5	12.8	124.1	855	3.0	0:00	1.03	0.56	0.00
12:35:50	136.0	136.0	5.0	0	72	121	777	532	0	1.03	1.03	14.8	12.3	129.8	905	4.0	0:00	1.03	0.47	0.00
12:36:41	137.0	137.0	27.9	3	76	44	740	512	0	1.03	1.03	14.6	11.4	130.0	906	5.0	0:00	1.03	0.40	0.00
Work on Top Drive																				
14:21:13	138.0	138.0	51.1	3	95	120	790	493	0	1.03	1.03	14.6	11.5	131.4	964	6.0	0:01	1.03	0.36	0.00
14:22:01	139.0	139.0	75.3	3	101	58	790	542	0	1.03	1.03	14.6	12.5	131.7	967	7.0	0:01	1.03	0.56	0.00
14:22:58	140.1	140.1	76.6	5	105	72	790	542	0	1.03	1.03	14.5	12.6	131.9	970	8.1	0:02	1.03	0.64	0.00
14:24:19	141.1	141.1	44.4	4	110	70	789	542	0	1.03	1.03	14.5	12.6	132.4	970	9.1	0:03	1.03	0.71	0.00
14:25:09	142.0	142.0	71.4	3	111	61	790	541	0	1.03	1.03	14.5	12.6	132.6	972	10.0	0:04	1.03	0.58	0.00
14:25:59	143.0	143.0	71.3	3	111	61	790	542	0	1.03	1.03	14.5	12.6	132.9	970	11.0	0:05	1.03	0.57	0.00
14:26:40	144.0	144.0	92.6	2	111	61	790	542	0	1.03	1.03	14.5	12.6	133.1	973	12.0	0:06	1.03	0.54	0.00
14:27:27	145.1	145.1	93.0	2	112	61	790	542	0	1.03	1.03	14.5	12.6	133.3	972	13.1	0:06	1.03	0.53	0.00
14:28:01	146.0	146.0	105.1	3	119	66	790	542	0	1.03	1.03	14.5	12.6	133.5	971	14.0	0:07	1.03	0.54	0.00
14:28:39	147.0	147.0	102.9	2	121	55	790	542	0	1.03	1.03	14.5	12.6	133.7	972	15.0	0:08	1.03	0.49	0.00
14:29:30	148.0	148.0	116.1	2	121	54	790	542	0	1.03	1.03	14.5	12.6	133.9	973	16.0	0:08	1.03	0.46	0.00
14:30:13	149.0	149.0	105.6	2	121	54	790	541	0	1.03	1.03	14.5	12.6	134.1	970	17.0	0:09	1.03	0.48	0.00
14:30:54	150.1	150.1	101.1	2	121	52	790	542	0	1.03	1.03	14.5	12.6	134.3	971	18.1	0:09	1.03	0.49	0.00

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
14:31:48	151.5	151.5	179.9	2	121	51	790	542	0	1.03	1.03	14.6	12.7	134.6	973	19.5	0:09	1.03	0.38	0.00
14:33:10	153.5	153.5	179.9	2	121	60	740	542	0	1.03	1.03	14.5	12.6	135.0	981	21.5	0:10	1.03	0.44	0.00
14:33:46	154.0	154.0	99.4	2	121	57	661	543	0	1.03	1.03	14.5	12.6	135.2	981	22.0	0:10	1.03	0.52	0.00
14:34:30	155.0	155.0	81.8	2	121	55	706	543	0	1.03	1.03	14.5	12.6	135.4	980	23.0	0:11	1.03	0.55	0.00
14:35:23	156.1	156.1	72.6	2	121	59	725	543	0	1.03	1.03	14.5	12.7	135.7	978	24.1	0:12	1.03	0.58	0.00
14:36:10	157.1	157.1	80.5	4	121	61	762	543	0	1.03	1.03	14.5	12.7	135.9	975	25.1	0:12	1.03	0.61	0.00
14:36:41	158.1	158.1	115.2	5	121	64	770	543	0	1.03	1.03	14.5	12.7	136.1	974	26.1	0:13	1.03	0.58	0.00
14:37:28	159.1	159.1	80.4	3	121	58	782	543	0	1.03	1.03	14.5	12.7	136.4	973	27.1	0:14	1.03	0.61	0.00
14:38:09	160.1	160.1	87.8	5	121	64	789	543	0	1.03	1.03	14.5	12.7	136.5	974	28.1	0:14	1.03	0.62	0.00
14:38:40	161.0	161.0	114.3	5	121	70	788	543	0	1.03	1.03	14.5	12.7	136.7	972	29.0	0:15	1.03	0.58	0.00
14:39:24	162.0	162.0	81.8	5	121	62	783	543	0	1.03	1.03	14.5	12.6	136.9	972	30.0	0:16	1.03	0.64	0.00
14:40:20	163.0	163.0	63.7	3	121	57	789	544	0	1.03	1.03	14.5	12.6	137.2	972	31.0	0:17	1.03	0.64	0.00
14:41:26	164.0	164.0	54.5	4	121	65	719	544	0	1.03	1.03	14.5	12.6	137.6	980	32.0	0:18	1.03	0.69	0.00
14:49:31	165.5	165.5	194.4	6	120	76	741	539	0	1.03	1.03	14.5	12.6	140.6	972	33.5	0:19	1.03	0.48	0.00
14:50:05	166.0	166.0	100.4	3	121	76	763	536	0	1.03	1.03	14.5	12.5	140.9	970	34.0	0:20	1.03	0.58	0.00
14:51:17	167.1	167.1	60.0	3	121	69	773	538	0	1.03	1.03	14.5	12.5	142.3	968	35.1	0:21	1.03	0.65	0.00
14:51:51	168.0	168.0	104.9	4	121	80	780	538	0	1.03	1.03	14.5	12.5	143.0	968	36.0	0:22	1.03	0.58	0.00
14:52:44	169.1	169.1	72.0	5	120	80	780	539	0	1.03	1.03	14.5	12.4	143.9	966	37.1	0:23	1.03	0.68	0.00
14:53:28	170.0	170.0	80.9	4	120	62	780	539	0	1.03	1.03	14.5	12.4	144.8	964	38.0	0:23	1.03	0.61	0.00
14:54:27	171.1	171.1	72.5	4	121	67	780	539	0	1.03	1.03	14.5	12.4	146.4	965	39.1	0:24	1.03	0.64	0.00
14:55:04	172.0	172.0	113.9	2	121	52	780	539	0	1.03	1.03	14.5	12.4	147.2	964	40.0	0:25	1.03	0.49	0.00
14:55:57	173.1	173.1	84.7	3	121	70	780	539	0	1.03	1.03	14.5	12.4	148.1	963	41.1	0:26	1.03	0.58	0.00
14:56:44	174.0	174.0	75.4	3	121	64	780	539	0	1.03	1.03	14.5	12.4	149.3	962	42.0	0:26	1.03	0.60	0.00
14:57:44	175.1	175.1	70.8	4	121	72	780	540	0	1.03	1.03	14.5	12.4	150.5	963	43.1	0:27	1.03	0.65	0.00
14:58:43	176.5	176.5	209.9	3	121	53	780	540	0	1.03	1.03	14.5	12.4	151.5	964	44.5	0:28	1.03	0.41	0.00
14:59:02	177.0	177.0	181.1	3	121	47	780	539	0	1.03	1.03	14.6	12.3	151.6	963	45.0	0:28	1.03	0.44	0.00
15:00:02	178.0	178.0	121.4	2	121	58	727	540	0	1.03	1.03	14.5	12.4	153.6	970	46.0	0:29	1.03	0.46	0.00
15:00:29	179.1	179.1	157.7	2	121	48	686	540	0	1.03	1.03	14.5	12.3	154.0	977	47.1	0:29	1.03	0.44	0.00
15:01:01	180.0	180.0	120.0	2	121	44	673	540	0	1.03	1.03	14.5	12.3	154.4	974	48.0	0:30	1.03	0.46	0.00
15:01:45	181.1	181.1	128.6	2	121	44	712	540	0	1.03	1.03	14.6	12.3	155.4	972	49.1	0:30	1.03	0.47	0.00
15:02:23	182.0	182.0	93.5	3	121	41	743	540	0	1.03	1.03	14.5	12.3	156.1	971	50.0	0:31	1.03	0.55	0.00
15:03:06	183.0	183.0	88.7	2	121	47	775	540	0	1.03	1.03	14.5	12.3	157.0	968	51.0	0:32	1.03	0.54	0.00
15:03:44	184.0	184.0	93.1	2	121	72	792	539	0	1.03	1.03	14.5	12.3	157.8	970	52.0	0:32	1.03	0.53	0.00
15:04:25	185.0	185.0	87.8	2	121	75	800	539	0	1.03	1.03	14.5	12.3	158.7	969	53.0	0:33	1.03	0.54	0.00
15:05:02	186.0	186.0	96.4	2	120	54	803	539	0	1.03	1.03	14.5	12.3	159.5	969	54.0	0:34	1.03	0.52	0.00
15:05:40	187.1	187.1	100.0	2	121	46	807	539	0	1.03	1.03	14.5	12.3	160.5	968	55.1	0:34	1.03	0.51	0.00
15:06:17	188.1	188.1	97.3	2	121	62	810	539	0	1.03	1.03	14.5	12.3	161.4	966	56.1	0:35	1.03	0.52	0.00
15:06:49	189.0	189.0	109.9	2	121	45	810	539	0	1.03	1.03	14.5	12.3	162.1	967	57.0	0:35	1.03	0.50	0.00
15:07:26	190.0	190.0	103.4	2	121	42	810	539	0	1.03	1.03	14.6	12.3	162.6	965	58.0	0:36	1.03	0.52	0.00
15:08:07	191.0	191.0	87.8	3	121	43	810	538	0	1.03	1.03	14.5	12.3	163.3	967	59.0	0:37	1.03	0.57	0.00
15:08:51	192.0	192.0	81.8	2	121	56	798	539	0	1.03	1.03	14.5	12.3	163.9	968	60.0	0:37	1.03	0.57	0.00
15:09:44	193.0	193.0	67.3	2	121	52	699	539	0	1.03	1.03	14.5	12.3	164.2	978	61.0	0:38	1.03	0.61	0.00
15:18:08	195.5	195.5	77.5	5	119	66	827	527	0	1.03	1.03	14.5	12.3	166.0	972	63.5	0:39	1.03	0.62	0.00
15:18:29	196.0	196.0	161.5	4	120	60	779	533	0	1.03	1.03	14.5	12.3	166.3	972	64.0	0:39	1.03	0.49	0.00
15:19:31	197.0	197.0	57.8	4	120	61	783	537	0	1.03	1.03	14.5	12.3	167.3	969	65.0	0:40	1.03	0.69	0.00
15:20:25	198.0	198.0	66.7	5	120	68	788	548	0	1.03	1.03	14.5	12.3	168.3	970	66.0	0:41	1.03	0.70	0.00
15:21:43	199.0	199.0	49.5	8	120	127	790	540	0	1.03	1.03	14.5	12.3	169.7	968	67.0	0:43	1.03	0.83	0.00
15:22:02	200.0	200.0	187.0	7	120	118	791	537	0	1.03	1.03	14.5	12.3	170.0	968	68.0	0:43	1.03	0.50	0.00
15:22:36	201.1	201.1	114.5	5	120	111	788	536	0	1.03	1.03	14.5	12.3	170.8	968	69.1	0:43	1.03	0.58	0.00
15:23:32	202.1	202.1	64.1	3	120	105	790	536	0	1.03	1.03	14.6	12.3	172.0	966	70.1	0:44	1.03	0.62	0.00

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
15:24:16	203.0	203.0	80.4	3	120	113	793	536	0	1.03	1.03	14.5	12.3	172.7	965	71.0	0:45	1.03	0.60	0.00
15:24:51	204.1	204.1	112.5	2	120	102	798	536	0	1.03	1.03	14.5	12.4	173.5	966	72.1	0:46	1.03	0.50	0.00
15:25:54	205.4	205.4	211.8	2	120	93	793	536	0	1.03	1.03	14.5	12.4	174.5	965	73.4	0:46	1.03	0.37	0.00
15:26:25	206.0	206.0	117.7	2	120	104	796	536	0	1.03	1.03	14.6	12.4	175.0	964	74.0	0:47	1.03	0.51	0.00
15:27:09	207.1	207.1	92.7	2	120	99	799	536	0	1.03	1.03	14.6	12.4	176.0	965	75.1	0:48	1.03	0.54	0.00
15:27:43	208.0	208.0	104.7	2	120	103	800	536	0	1.03	1.03	14.5	12.4	176.8	964	76.0	0:48	1.03	0.52	0.00
15:28:27	209.0	209.0	86.1	2	120	102	800	536	0	1.03	1.03	14.5	12.4	177.4	963	77.0	0:49	1.03	0.56	0.00
15:29:17	210.0	210.0	71.7	3	120	94	801	536	0	1.03	1.03	14.5	12.4	178.8	963	78.0	0:50	1.03	0.61	0.00
15:30:07	211.1	211.1	76.2	3	120	97	750	536	0	1.03	1.03	14.5	12.4	180.0	973	79.1	0:50	1.03	0.60	0.00
15:31:10	212.0	212.0	56.8	3	120	108	694	537	0	1.03	1.03	14.5	12.5	181.4	979	80.0	0:52	1.03	0.68	0.00
:32:12	213.0	213.0	58.1	6	120	127	728	537	0	1.03	1.03	14.5	12.5	182.9	975	81.0	0:53	1.03	0.77	0.00
15:33:24	214.1	214.1	52.2	9	120	96	759	537	0	1.03	1.03	14.5	12.5	184.6	972	82.1	0:54	1.03	0.82	0.00
15:33:52	215.1	215.1	128.6	6	120	52	789	538	0	1.03	1.03	14.5	12.5	185.2	969	83.1	0:54	1.03	0.56	0.00
15:34:30	216.0	216.0	93.3	4	120	55	790	537	0	1.03	1.03	14.5	12.5	186.1	969	84.0	0:55	1.03	0.58	0.00
15:35:11	217.0	217.0	88.0	3	120	76	800	537	0	1.03	1.03	14.5	12.5	187.0	969	85.0	0:56	1.03	0.59	0.00
15:36:01	218.1	218.1	75.3	4	120	94	800	538	0	1.03	1.03	14.5	12.5	188.3	968	86.1	0:56	1.03	0.64	0.00
15:36:54	219.0	219.0	67.1	4	120	96	798	537	0	1.03	1.03	14.5	12.5	189.8	967	87.0	0:57	1.03	0.65	0.00
15:37:41	220.0	220.0	80.7	3	120	98	800	537	0	1.03	1.03	14.5	12.5	190.8	967	88.0	0:58	1.03	0.58	0.00
15:38:12	221.0	221.0	114.3	3	120	107	800	537	0	1.03	1.03	14.6	12.5	191.5	966	89.0	0:59	1.03	0.53	0.00
15:38:47	222.0	222.0	109.8	3	120	112	797	537	0	1.03	1.03	14.5	12.6	192.2	967	90.0	0:59	1.03	0.53	0.00
15:49:09	223.1	223.1	33.8	3	120	105	691	538	0	1.03	1.03	14.5	12.6	193.7	972	91.1	1:01	1.03	0.28	0.00
15:49:37	224.0	224.0	127.1	3	123	98	802	538	0	1.03	1.03	14.5	12.6	193.7	971	92.0	1:01	1.03	0.52	0.00
15:50:08	225.1	225.1	139.5	3	123	103	810	539	0	1.03	1.03	14.5	12.6	193.7	970	93.1	1:02	1.03	0.51	0.00
15:50:36	226.1	226.1	127.3	4	123	103	810	539	0	1.03	1.03	14.6	12.6	194.4	968	94.1	1:02	1.03	0.54	0.00
15:51:08	227.1	227.1	112.5	4	123	110	806	540	0	1.03	1.03	14.5	12.7	195.5	969	95.1	1:03	1.03	0.58	0.00
15:51:42	228.0	228.0	104.7	6	123	119	801	540	0	1.03	1.03	14.5	12.7	196.3	965	96.0	1:04	1.03	0.63	0.00
15:52:20	229.0	229.0	100.7	7	123	117	800	540	0	1.03	1.03	14.6	12.7	196.9	967	97.0	1:04	1.03	0.64	0.00
15:52:51	230.1	230.1	141.2	4	123	98	808	540	0	1.03	1.03	14.5	12.7	197.3	967	98.1	1:05	1.03	0.52	0.00
15:53:16	231.0	231.0	140.5	3	123	96	809	540	0	1.03	1.03	14.6	12.7	197.7	968	99.0	1:05	1.03	0.48	0.00
15:53:54	232.1	232.1	110.2	2	123	94	810	540	0	1.03	1.03	14.5	12.7	198.3	966	100.1	1:06	1.03	0.48	0.00
15:54:25	233.1	233.1	114.7	1	123	86	810	540	0	1.03	1.03	14.5	12.7	198.7	965	101.1	1:06	1.03	0.46	0.00
15:54:59	234.0	234.0	104.4	1	123	82	814	539	0	1.03	1.03	14.5	12.7	199.1	964	102.0	1:07	1.03	0.46	0.00
:55:31	235.0	235.0	111.3	2	123	94	810	539	0	1.03	1.03	14.5	12.8	199.9	965	103.0	1:07	1.03	0.52	0.00
15:56:11	236.0	236.0	95.5	2	123	103	810	539	0	1.03	1.03	14.5	12.7	201.3	962	104.0	1:08	1.03	0.52	0.00
15:56:43	237.1	237.1	112.5	2	122	116	779	540	0	1.03	1.03	14.5	12.7	201.8	969	105.1	1:09	1.03	0.50	0.00
15:57:26	238.0	238.0	83.2	3	123	127	689	540	0	1.03	1.03	14.5	12.7	202.6	972	106.0	1:09	1.03	0.58	0.00
15:58:14	239.1	239.1	81.4	3	123	117	660	541	0	1.03	1.03	14.5	12.8	203.6	976	107.1	1:10	1.03	0.60	0.00
15:58:41	240.1	240.1	132.4	4	123	107	754	540	0	1.03	1.03	14.6	12.8	204.2	977	108.1	1:10	1.03	0.52	0.00
15:59:22	241.1	241.1	96.3	3	123	94	746	540	0	1.03	1.03	14.5	12.8	205.2	974	109.1	1:11	1.03	0.56	0.00
15:59:54	242.1	242.1	111.3	3	123	88	750	539	0	1.03	1.03	14.5	12.8	205.8	972	110.1	1:12	1.03	0.54	0.00
16:00:25	243.1	243.1	124.9	2	123	72	800	539	0	1.03	1.03	14.5	12.8	206.4	971	111.1	1:12	1.03	0.48	0.00
16:00:56	244.0	244.0	113.2	2	123	63	809	539	0	1.03	1.03	14.5	12.8	207.2	968	112.0	1:13	1.03	0.49	0.00
16:01:34	245.0	245.0	94.7	1	123	51	816	539	0	1.03	1.03	14.5	12.8	208.0	967	113.0	1:13	1.03	0.48	0.00
16:02:08	246.1	246.1	115.2	1	123	62	820	539	0	1.03	1.03	14.5	12.8	208.8	968	114.1	1:14	1.03	0.44	0.00
16:02:40	247.0	247.0	110.4	1	123	82	820	539	0	1.03	1.03	14.5	12.8	209.4	968	115.0	1:14	1.03	0.45	0.00
16:03:17	248.0	248.0	103.6	1	123	81	820	539	0	1.03	1.03	14.6	12.8	210.1	966	116.0	1:15	1.03	0.47	0.00
16:03:55	249.0	249.0	94.7	1	123	94	827	538	0	1.03	1.03	14.5	12.8	210.8	966	117.0	1:16	1.03	0.47	0.00
16:04:41	250.1	250.1	82.3	2	123	103	787	539	0	1.03	1.03	14.5	12.8	211.5	973	118.1	1:16	1.03	0.54	0.00
16:13:08	251.1	251.1	54.6	2	122	95	778	539	0	1.03	1.03	14.5	12.8	216.2	968	119.1	1:17	1.03	0.44	0.00
16:13:39	252.1	252.1	226.6	2	124	74	817	537	0	1.03	1.03	14.6	12.9	216.9	966	120.1	1:17	1.03	0.38	0.00
16:14:07	253.1	253.1	139.5	3	123	89	820	537	0	1.03	1.03	14.6	12.9	217.6	965	121.1	1:18	1.03	0.50	0.00
16:14:32	254.0	254.0	140.8	3	123	99	820	537	0	1.03	1.03	14.6	12.9	218.2	962	122.0	1:18	1.03	0.49	0.00
16:15:00	255.1	255.1	142.9	2	124	80	828	537	0	1.03	1.03	14.5	12.9	218.8	961	123.1	1:19	1.03	0.47	0.00
16:15:29	256.1	256.1	124.1	2	123	81	826	537	0	1.03	1.03	14.5	12.9	219.5	960	124.1	1:19	1.03	0.48	0.00

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
16:16:00	257.0	257.0	114.0	2	123	100	830	538	0	1.03	1.03	14.5	12.9	220.2	960	125.0	1:20	1.03	0.50	0.00
16:16:36	258.1	258.1	110.8	2	124	96	830	538	0	1.03	1.03	14.6	12.9	221.0	961	126.1	1:20	1.03	0.50	0.00
16:17:06	259.1	259.1	115.4	2	124	91	837	538	0	1.03	1.03	14.5	12.9	221.7	962	127.1	1:21	1.03	0.49	0.00
16:17:37	260.0	260.0	114.3	2	123	94	840	538	0	1.03	1.03	14.6	12.9	222.6	961	128.0	1:21	1.03	0.50	0.00
16:18:12	261.0	261.0	110.8	2	124	100	845	538	0	1.03	1.03	14.5	13.0	223.4	963	129.0	1:22	1.03	0.51	0.00
16:18:49	262.1	262.1	105.9	3	123	114	851	538	0	1.03	1.03	14.6	13.0	224.2	963	130.1	1:22	1.03	0.54	0.00
16:19:20	263.0	263.0	113.1	3	124	114	855	538	0	1.03	1.03	14.5	13.0	224.9	964	131.0	1:23	1.03	0.51	0.00
16:20:07	264.1	264.1	83.2	3	124	105	856	538	0	1.03	1.03	14.6	13.0	226.1	966	132.1	1:24	1.03	0.59	0.00
16:20:51	265.0	265.0	81.1	3	124	110	775	539	0	1.03	1.03	14.6	13.0	227.1	975	133.0	1:24	1.03	0.59	0.00
16:21:29	266.1	266.1	102.9	3	123	118	766	538	0	1.03	1.03	14.6	13.0	228.0	981	134.1	1:25	1.03	0.58	0.00
16:22:06	267.1	267.1	103.6	4	123	121	774	538	0	1.03	1.03	14.6	13.0	228.8	977	135.1	1:26	1.03	0.58	0.00
16:22:47	268.0	268.0	86.3	5	123	132	777	538	0	1.03	1.03	14.6	13.0	229.7	975	136.0	1:26	1.03	0.64	0.00
16:23:21	269.1	269.1	114.7	5	123	105	774	539	0	1.03	1.03	14.6	13.0	230.6	974	137.1	1:27	1.03	0.59	0.00
16:24:02	270.0	270.0	87.0	4	123	96	807	539	0	1.03	1.03	14.6	13.0	231.5	974	138.0	1:28	1.03	0.61	0.00
16:25:11	271.0	271.0	54.3	4	124	97	832	539	0	1.03	1.03	14.6	13.0	233.2	972	139.0	1:29	1.03	0.70	0.00
16:25:55	272.1	272.1	86.4	5	124	104	840	540	0	1.03	1.03	14.6	13.0	234.3	972	140.1	1:30	1.03	0.63	0.00
16:26:33	273.1	273.1	109.8	6	123	105	840	539	0	1.03	1.03	14.6	13.0	235.1	970	141.1	1:30	1.03	0.63	0.00
16:27:17	274.0	274.0	82.4	8	123	114	841	539	0	1.03	1.03	14.6	13.0	236.1	970	142.0	1:31	1.03	0.67	0.00
16:27:51	275.1	275.1	127.9	7	124	103	847	539	0	1.03	1.03	14.6	13.0	237.0	972	143.1	1:31	1.03	0.59	0.00
16:28:16	276.1	276.1	141.5	5	124	114	849	539	0	1.03	1.03	14.6	13.0	237.6	971	144.1	1:32	1.03	0.54	0.00
16:29:09	277.0	277.0	67.5	4	124	112	844	539	0	1.03	1.03	14.6	13.0	238.7	972	145.0	1:33	1.03	0.66	0.00
16:29:59	278.1	278.1	75.5	3	124	108	718	539	0	1.03	1.03	14.6	13.0	239.9	981	146.1	1:34	1.03	0.62	0.00
16:37:48	279.0	279.0	42.4	5	123	120	810	537	0	1.03	1.03	14.6	12.9	246.8	975	147.0	1:35	1.03	0.80	0.00
16:39:00	280.0	280.0	56.4	3	124	119	819	539	0	1.03	1.03	14.6	12.9	248.4	972	148.0	1:37	1.03	0.66	0.00
16:39:28	281.1	281.1	141.6	3	124	103	820	539	0	1.03	1.03	14.6	12.9	249.0	971	149.1	1:37	1.03	0.49	0.00
16:39:59	282.0	282.0	114.0	3	124	105	820	539	0	1.03	1.03	14.6	12.9	249.6	972	150.0	1:38	1.03	0.54	0.00
16:40:24	283.0	283.0	143.4	3	124	106	820	538	0	1.03	1.03	14.6	12.9	250.2	971	151.0	1:38	1.03	0.48	0.00
16:41:49	284.1	284.1	43.9	3	124	127	815	538	0	1.03	1.03	14.6	12.9	252.1	971	152.1	1:39	1.03	0.72	0.00
16:42:29	285.0	285.0	88.5	4	125	108	815	539	0	1.03	1.03	14.6	12.9	253.0	968	153.0	1:40	1.03	0.60	0.00
16:43:07	286.0	286.0	94.7	1	125	96	817	539	0	1.03	1.03	14.6	12.8	253.8	972	154.0	1:41	1.03	0.49	0.00
16:43:57	287.0	287.0	73.0	2	124	105	819	539	0	1.03	1.03	14.7	12.8	254.9	969	155.0	1:41	1.03	0.57	0.00
16:44:28	288.1	288.1	124.1	2	124	100	820	539	0	1.03	1.03	14.6	12.8	255.6	971	156.1	1:42	1.03	0.48	0.00
16:46:34	289.1	289.1	29.4	4	124	113	818	539	0	1.03	1.03	14.7	12.8	258.4	970	157.1	1:44	1.03	0.84	0.00
16:47:11	290.1	290.1	96.9	5	124	91	813	539	0	1.03	1.03	14.7	12.8	259.2	970	158.1	1:45	1.03	0.60	0.00
16:47:49	291.0	291.0	93.5	3	124	92	819	538	0	1.03	1.03	14.6	12.7	260.0	970	159.0	1:45	1.03	0.56	0.00
16:48:39	292.0	292.0	67.3	2	124	101	759	538	0	1.03	1.03	14.6	12.7	261.1	975	160.0	1:46	1.03	0.59	0.00
16:49:50	293.0	293.0	45.8	5	125	112	738	539	0	1.03	1.03	14.6	12.7	262.3	980	161.0	1:47	1.03	0.70	0.00
16:50:28	294.1	294.1	97.3	5	124	116	773	539	0	1.03	1.03	14.7	12.7	263.0	977	162.1	1:48	1.03	0.59	0.00
16:50:43	295.0	295.0	105.2	5	124	119	783	539	0	1.03	1.03	14.7	12.7	263.3	977	163.0	1:48	1.03	0.60	0.00
16:51:25	296.0	296.0	83.7	6	124	108	751	539	0	1.03	1.03	14.6	12.7	264.4	973	164.0	1:49	1.03	0.66	0.00
16:52:43	297.0	297.0	48.0	6	124	83	816	538	0	1.03	1.03	14.7	12.6	266.1	972	165.0	1:50	1.03	0.76	0.00
16:53:21	298.0	298.0	94.1	2	124	78	831	538	0	1.03	1.03	14.6	12.6	266.9	970	166.0	1:51	1.03	0.52	0.00
16:54:11	299.0	299.0	72.0	1	124	76	830	537	0	1.03	1.03	14.7	12.6	267.9	971	167.0	1:52	1.03	0.54	0.00
16:54:55	300.0	300.0	81.8	2	125	76	830	538	0	1.03	1.03	14.6	12.6	268.9	970	168.0	1:52	1.03	0.59	0.00
16:55:51	301.0	301.0	64.3	3	124	83	830	538	0	1.03	1.03	14.7	12.6	270.1	970	169.0	1:53	1.03	0.65	0.00
16:57:03	302.1	302.1	56.8	4	124	102	824	538	0	1.03	1.03	14.7	12.6	271.6	969	170.1	1:55	1.03	0.71	0.00
16:57:56	303.1	303.1	67.7	5	124	115	823	538	0	1.03	1.03	14.7	12.6	272.8	970	171.1	1:55	1.03	0.69	0.00
16:58:53	304.0	304.0	62.5	6	124	111	820	537	0	1.03	1.03	14.6	12.6	274.0	970	172.0	1:56	1.03	0.73	0.00
16:59:32	305.0	305.0	55.2	7	124	106	820	537	0	1.03	1.03	14.7	12.6	274.8	971	173.0	1:57	1.03	0.75	0.00
17:00:27	306.0	306.0	64.3	7	124	116	820	537	0	1.03	1.03	14.7	12.6	275.7	970	174.0	1:58	1.03	0.76	0.00

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
17:01:23	307.0	307.0	64.3	8	124	111	822	538	0	1.03	1.03	14.7	12.6	276.9	971	175.0	1:59	1.03	0.77	0.00
17:02:19	308.0	308.0	50.6	7	125	110	804	537	0	1.03	1.03	14.7	12.6	277.8	974	176.0	1:60	1.03	0.78	0.00
17:10:10	309.2	309.2	62.4	4	105	74	759	523	0	1.03	1.03	14.7	12.6	284.1	979	177.2	2:02	1.03	0.72	0.00
17:10:37	310.1	310.1	107.1	3	107	79	796	511	0	1.03	1.03	14.7	12.6	284.5	977	178.1	2:02	1.03	0.72	0.00
17:11:33	311.0	311.0	63.7	7	110	88	813	526	0	1.03	1.03	14.7	12.5	285.4	974	179.0	2:03	1.03	0.76	0.00
17:12:55	312.0	312.0	44.4	8	118	86	818	530	0	1.03	1.03	14.7	12.5	286.8	974	180.0	2:05	1.03	0.83	0.00
17:14:48	313.0	313.0	31.8	7	119	108	814	532	0	1.03	1.03	14.7	12.5	288.6	970	181.0	2:07	1.03	0.89	0.00
17:16:12	314.0	314.0	42.9	9	120	114	817	532	0	1.03	1.03	14.7	12.5	290.0	971	182.0	2:08	1.03	0.87	0.00
17:17:27	315.0	315.0	48.3	10	120	119	822	533	0	1.03	1.03	14.7	12.5	291.2	970	183.0	2:09	1.03	0.86	0.00
17:18:36	316.0	316.0	52.9	9	120	105	822	534	0	1.03	1.03	14.7	12.5	292.4	970	184.0	2:10	1.03	0.83	0.00
17:19:43	317.0	317.0	53.4	8	120	110	820	535	0	1.03	1.03	14.7	12.5	293.6	970	185.0	2:11	1.03	0.81	0.00
17:21:00	318.0	318.0	51.4	9	120	109	820	536	0	1.03	1.03	14.7	12.5	294.9	968	186.0	2:13	1.03	0.84	0.00
17:21:46	319.0	319.0	82.4	8	120	106	820	536	0	1.03	1.03	14.6	12.5	295.6	970	187.0	2:14	1.03	0.72	0.00
17:22:56	320.0	320.0	51.4	10	120	125	820	536	0	1.03	1.03	14.7	12.6	296.8	969	188.0	2:15	1.03	0.86	0.00
17:24:21	321.0	321.0	42.0	10	120	113	820	536	0	1.03	1.03	14.7	12.6	298.2	969	189.0	2:16	1.03	0.88	0.00
17:25:30	322.1	322.1	54.0	9	120	121	829	536	0	1.03	1.03	14.7	12.6	299.4	970	190.1	2:17	1.03	0.82	0.00
17:26:29	323.0	323.0	60.7	10	120	138	822	536	0	1.03	1.03	14.7	12.6	300.4	972	191.0	2:18	1.03	0.83	0.00
17:27:38	324.1	324.1	52.6	12	120	152	782	536	0	1.03	1.03	14.7	12.6	301.5	982	192.1	2:19	1.03	0.89	0.00
17:28:38	325.1	325.1	60.0	13	120	147	743	536	0	1.03	1.03	14.7	12.6	302.5	983	193.1	2:20	1.03	0.86	0.00
17:29:47	326.0	326.0	59.4	13	120	122	744	537	0	1.03	1.03	14.7	12.6	303.7	978	194.0	2:22	1.03	0.87	0.00
17:30:59	327.0	327.0	44.4	12	120	115	761	536	0	1.03	1.03	14.7	12.6	304.8	974	195.0	2:23	1.03	0.92	0.00
17:32:04	328.0	328.0	55.4	12	120	118	810	536	0	1.03	1.03	14.7	12.6	305.9	972	196.0	2:24	1.03	0.87	0.00
17:33:06	329.0	329.0	58.1	12	120	122	824	536	0	1.03	1.03	14.7	12.6	307.0	972	197.0	2:25	1.03	0.85	0.00
17:34:15	330.0	330.0	52.2	12	120	103	830	536	0	1.03	1.03	14.7	12.7	308.2	971	198.0	2:26	1.03	0.87	0.00
17:35:39	331.0	331.0	43.4	9	120	106	830	536	0	1.03	1.03	14.6	12.7	309.3	968	199.0	2:27	1.03	0.87	0.00
17:37:10	332.0	332.0	39.3	8	120	95	830	536	0	1.03	1.03	14.7	12.7	310.7	968	200.0	2:29	1.03	0.88	0.00
17:38:17	333.1	333.1	57.1	10	120	101	837	535	0	1.03	1.03	14.7	12.7	311.4	970	201.1	2:30	1.03	0.82	0.00
17:39:15	334.0	334.0	61.3	9	120	106	844	536	0	1.03	1.03	14.7	12.7	312.1	968	202.0	2:31	1.03	0.80	0.00
17:40:16	335.0	335.0	59.0	8	120	103	849	536	0	1.03	1.03	14.7	12.7	312.6	969	203.0	2:32	1.03	0.80	0.00
17:41:12	336.0	336.0	64.3	10	120	110	850	535	0	1.03	1.03	14.7	12.7	313.1	970	204.0	2:33	1.03	0.79	0.00
17:42:12	337.0	337.0	60.0	12	120	134	844	535	0	1.03	1.03	14.7	12.8	313.7	969	205.0	2:34	1.03	0.86	0.00
17:43:14	338.1	338.1	60.7	14	120	133	840	535	0	1.03	1.03	14.7	12.8	314.5	968	206.1	2:35	1.03	0.87	0.00
17:43:57	339.1	339.1	83.7	12	120	113	838	535	0	1.03	1.03	14.7	12.8	315.0	970	207.1	2:36	1.03	0.77	0.00
17:57:17	340.1	340.1	56.9	6	119	13	827	535	0	1.03	1.03	14.7	12.8	324.7	976	208.1	2:37	1.03	0.79	0.00
17:57:45	341.0	341.0	122.9	4	120	73	818	529	0	1.03	1.03	14.7	12.7	325.1	974	209.0	2:37	1.03	0.54	0.00
17:58:25	342.6	342.6	71.9	2	121	63	828	529	0	1.03	1.03	14.7	12.7	325.8	974	210.6	2:38	1.03	0.41	0.00
17:58:46	343.1	343.1	116.9	1	122	77	848	533	0	1.03	1.03	14.7	12.7	326.1	971	211.1	2:38	1.03	0.37	0.00
17:59:27	344.1	344.1	90.0	2	121	75	845	536	0	1.03	1.03	14.6	12.7	326.8	972	212.1	2:39	1.03	0.54	0.00
17:59:57	345.0	345.0	141.6	2	122	97	849	536	0	1.03	1.03	14.7	12.7	327.2	970	213.0	2:39	1.03	0.44	0.00
18:01:23	346.1	346.1	42.4	4	122	81	846	537	0	1.03	1.03	14.7	12.7	328.5	971	214.1	2:40	1.03	0.76	0.00
18:01:53	347.1	347.1	128.5	5	122	68	852	537	0	1.03	1.03	14.7	12.7	329.0	969	215.1	2:41	1.03	0.55	0.00
18:02:18	348.0	348.0	141.2	3	122	67	859	537	0	1.03	1.03	14.7	12.7	329.4	970	216.0	2:41	1.03	0.48	0.00
18:03:11	349.1	349.1	78.8	2	121	70	854	537	0	1.03	1.03	14.7	12.7	330.2	970	217.1	2:42	1.03	0.57	0.00
18:03:48	350.1	350.1	104.2	2	121	88	858	538	0	1.03	1.03	14.7	12.7	330.8	969	218.1	2:43	1.03	0.23	0.00
18:04:37	351.0	351.0	91.8	2	122	96	856	538	0	1.03	1.03	14.7	12.6	331.6	970	219.0	2:43	1.03	0.51	0.00
18:05:22	352.0	352.0	80.9	2	122	92	856	538	0	1.03	1.03	14.7	12.6	332.3	968	220.0	2:44	1.03	0.56	0.00
18:06:25	353.9	353.9	24.2	2	122	90	856	538	0	1.03	1.03	14.7	12.7	333.2	970	221.9	2:44	1.03	0.26	0.00
18:06:34	354.2	354.2	167.3	2	121	75	860	539	0	1.03	1.03	14.7	12.6	333.4	970	222.2	2:44	1.03	0.33	0.00
18:07:10	355.1	355.1	166.1	2	121	84	860	539	0	1.03	1.03	14.7	12.6	333.9	969	223.1	2:45	1.03	0.39	0.00
18:08:22	356.5	356.5	157.5	0	122	65	859	538	0	1.03	1.03	14.7	12.6	335.1	969	224.5	2:45	1.03	0.26	0.00
18:08:47	357.1	357.1	127.0	1	122	69	803	538	0	1.03	1.03	14.7	12.6	335.5	975	225.1	2:45	1.03	0.32	0.00

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	BIT DIST	BIT HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
18:09:22	358.0	358.0	100.7	2	122	104	700	539	0	1.03	1.03	14.7	12.6	336.0	979	226.0	2:46	1.03	0.54	0.00
18:10:06	359.1	359.1	86.7	2	122	60	810	539	0	1.03	1.03	14.7	12.6	336.7	979	227.1	2:47	1.03	0.53	0.00
18:10:59	360.0	360.0	67.6	2	122	57	777	539	0	1.03	1.03	14.7	12.6	337.5	976	228.0	2:47	1.03	0.58	0.00
18:12:11	361.0	361.0	51.1	4	123	67	807	539	0	1.03	1.03	14.7	12.6	338.7	973	229.0	2:49	1.03	0.72	0.00
18:12:42	362.0	362.0	114.6	3	122	52	847	539	0	1.03	1.03	14.7	12.5	339.1	970	230.0	2:49	1.03	0.51	0.00
18:13:16	363.0	363.0	113.9	2	122	52	851	538	0	1.03	1.03	14.7	12.5	339.7	972	231.0	2:50	1.03	0.46	0.00
18:13:45	364.0	364.0	123.6	1	122	49	858	539	0	1.03	1.03	14.7	12.5	339.9	971	232.0	2:50	1.03	0.45	0.00
18:14:32	365.1	365.1	81.4	2	122	68	856	539	0	1.03	1.03	14.7	12.5	339.9	970	233.1	2:51	1.03	0.56	0.00
18:15:12	366.1	366.1	89.4	2	122	54	857	539	0	1.03	1.03	14.7	12.5	339.9	966	234.1	2:52	1.03	0.54	0.00
18:15:44	367.1	367.1	111.9	1	122	45	856	539	0	1.03	1.03	14.7	12.5	339.9	966	235.1	2:52	1.03	0.46	0.00
18:16:27	368.0	368.0	82.8	2	122	58	855	539	0	1.03	1.03	14.7	12.5	339.9	963	236.0	2:53	1.03	0.54	0.00
18:17:08	369.0	369.0	133.3	1	122	45	862	539	0	1.03	1.03	14.7	12.5	339.9	962	237.0	2:53	1.03	0.42	0.00
Tight Hole, ream to bottom.																				
19:18:40	371.9	371.9	24.2	0	120	55	668	522	0	1.03	1.03	14.7	12.5	364.6	973	239.9	2:54	1.03	0.28	0.00
19:18:42	372.1	372.1	71.9	0	120	68	839	527	0	1.03	1.03	14.7	12.3	364.6	973	240.1	2:54	1.03	0.32	0.00
19:19:00	373.1	373.1	122.0	1	120	65	842	527	0	1.03	1.03	14.7	12.3	364.7	974	241.1	2:54	1.03	0.35	0.00
19:19:25	374.0	374.0	141.2	3	120	78	845	527	0	1.03	1.03	14.7	12.4	364.7	972	242.0	2:55	1.03	0.49	0.00
19:20:00	375.0	375.0	116.1	2	120	62	850	527	0	1.03	1.03	14.7	12.4	364.8	973	243.0	2:55	1.03	0.49	0.00
19:20:38	376.0	376.0	94.3	2	121	86	850	527	0	1.03	1.03	14.7	12.4	365.0	972	244.0	2:56	1.03	0.52	0.00
19:21:46	377.0	377.0	54.8	1	121	62	757	528	0	1.03	1.03	14.7	12.4	365.2	978	245.0	2:57	1.03	0.59	0.00
19:22:58	378.0	378.0	49.7	1	121	66	775	530	0	1.03	1.03	14.7	12.4	365.4	982	246.0	2:58	1.03	0.58	0.00
19:24:10	379.0	379.0	70.6	1	120	64	782	531	0	1.03	1.03	14.7	12.4	365.6	979	247.0	2:59	1.03	0.49	0.00
19:24:45	380.0	380.0	102.9	2	120	67	772	531	0	1.03	1.03	14.7	12.4	365.7	978	248.0	2:60	1.03	0.51	0.00
19:25:54	381.1	381.1	53.9	2	121	60	836	530	0	1.03	1.03	14.7	12.4	365.9	974	249.1	3:01	1.03	0.59	0.00
19:26:54	382.0	382.0	91.1	1	121	53	848	530	0	1.03	1.03	14.7	12.4	366.1	976	250.0	3:02	1.03	0.42	0.00
19:28:00	384.0	384.0	167.3	0	121	50	853	530	0	1.03	1.03	14.7	12.4	366.3	975	252.0	3:02	1.03	0.41	0.00
19:31:03	385.0	385.0	20.3	5	121	76	854	530	0	1.03	1.03	14.7	12.4	366.8	972	253.0	3:05	1.03	0.93	0.00
19:32:09	386.1	386.1	77.7	7	121	71	851	530	0	1.03	1.03	14.7	12.4	367.0	968	254.1	3:06	1.03	0.70	0.00
19:33:06	387.1	387.1	65.5	2	120	57	851	530	0	1.03	1.03	14.7	12.4	367.2	969	255.1	3:07	1.03	0.58	0.00
19:47:19	388.0	388.0	30.4	1	119	48	689	471	0	1.03	1.03	14.7	12.4	376.1	988	256.0	3:10	1.03	0.55	0.00
Circulate cuttings out of the hole, POOH																				
RIH with 17.5" RR1.2 Security SS44G 2x18,1x20 jets, with 26" Hole Opener with 3x18,1x20 jets.																				
10:41:28	389.0	389.0	61.4	16	102	257	2202	1100	0	1.03	1.03	14.5	11.3	374.4	956	1.0	0:00	1.03	0.40	0.00
10:43:14	390.0	390.0	34.7	13	102	203	2199	1101	0	1.03	1.03	14.5	11.3	375.3	956	2.0	0:02	1.03	0.50	0.00
10:45:54	391.0	391.0	22.3	14	102	196	1969	1100	0	1.03	1.03	14.5	11.3	376.5	973	3.0	0:05	1.03	0.88	0.00
10:48:43	392.0	392.0	21.4	14	100	169	2083	1099	0	1.03	1.03	14.5	11.3	377.7	964	4.0	0:08	1.03	0.89	0.00
10:51:35	393.1	393.1	23.8	19	77	240	2199	1102	0	1.03	1.03	14.5	11.3	379.0	939	5.1	0:10	1.03	0.92	0.00
Sweep hole with 350bbl seawater, 375bbl guar gum, and spot 325bbl,																				
Short Wiper trip to shoe and back to bottom. Spot KCL on bottom.																				
POOH to run 20" casing.																				

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
NB#3, HTC ATM 11HG 2x16,1x15 12.25"																				
RIH, Drill 3m.																				
15:03:42	394.0	394.0	28.2	2	79	115	1990	714	715	1.06	1.06	28.1	20.9	393.0	613	1.0	0:00	1.06	0.37	0.00
15:17:45	395.0	395.0	18.9	2	82	121	1990	714	715	1.06	1.06	28.0	20.8	393.0	613	2.0	0:01	1.06	0.39	0.00
15:42:32	396.0	396.0	63.7	2	82	56	2300	714	715	1.06	1.06	28.0	20.8	393.0	613	3.0	0:03	1.06	0.45	0.00
Perform L.O.T., Drill ahead.																				
15:37:44	397.0	397.0	63.7	2	80	92	2300	779	760	1.06	1.06	29.1	27.9	395.7	616	4.0	0:02	1.06	0.59	0.00
15:39:40	398.0	398.0	96.6	9	81	111	2300	758	755	1.06	1.06	29.1	27.0	395.8	608	5.0	0:04	1.06	0.91	0.00
16:41:13	399.0	399.0	15.5	18	97	121	2270	758	765	1.06	1.06	28.9	26.4	395.8	605	6.0	0:06	1.06	0.88	0.00
16:41:55	400.0	400.0	35.6	15	98	134	2260	764	769	1.06	1.06	28.9	26.5	395.8	604	7.0	0:06	1.06	0.72	0.00
16:42:40	401.0	401.0	45.6	12	98	104	2260	763	755	1.06	1.06	28.8	26.6	395.8	603	8.0	0:08	1.06	0.70	0.00
16:43:08	402.0	402.0	38.3	9	101	100	2270	763	764	1.06	1.06	28.8	26.7	395.9	604	9.0	0:10	1.06	0.53	0.00
16:43:33	403.0	403.0	122.4	6	100	78	2270	764	764	1.06	1.06	28.8	26.8	395.9	603	10.0	0:11	1.06	0.48	0.00
16:43:57	404.0	404.0	133.4	4	100	71	2270	764	759	1.06	1.06	28.8	26.9	395.9	604	11.0	0:13	1.06	0.43	0.00
16:44:19	405.0	405.0	91.1	3	100	69	2210	764	758	1.06	1.06	28.7	27.0	395.9	603	12.0	0:13	1.06	0.41	0.00
16:44:41	406.0	406.0	104.0	3	100	69	2290	764	771	1.06	1.06	28.7	27.2	395.9	603	13.0	0:13	1.06	0.39	0.00
16:45:00	407.0	407.0	90.9	5	100	77	2230	764	762	1.06	1.06	28.7	27.3	395.9	603	14.0	0:15	1.06	0.38	0.00
16:45:15	408.0	408.0	158.0	5	100	71	2260	764	769	1.06	1.06	28.6	27.3	395.9	602	15.0	0:16	1.06	0.37	0.00
16:45:39	409.0	409.0	38.5	4	100	71	2240	764	759	1.06	1.06	28.6	27.5	395.9	602	16.0	0:18	1.06	0.37	0.00
16:46:04	410.0	410.0	84.0	8	100	91	2060	764	763	1.06	1.06	28.6	27.6	395.9	600	17.0	0:18	1.06	0.44	0.00
16:46:42	411.0	411.0	54.9	16	100	112	2280	764	769	1.06	1.06	28.5	27.8	395.9	598	18.0	0:19	1.06	0.50	0.00
16:49:46	412.0	412.0	44.3	17	100	112	2100	764	752	1.06	1.06	28.3	28.7	396.0	594	19.0	0:19	1.06	0.66	0.00
16:50:48	413.0	413.0	47.4	16	100	118	2300	764	759	1.06	1.06	28.2	29.0	396.1	593	20.0	0:20	1.06	1.09	0.00
16:51:43	414.0	414.0	33.2	20	100	133	2290	764	768	1.06	1.06	28.2	29.3	396.1	590	21.0	0:21	1.06	0.81	0.00
16:52:49	415.0	415.0	41.6	24	100	153	2201	764	763	1.06	1.06	28.2	29.5	396.1	590	22.0	0:23	1.06	0.80	0.00
16:54:51	417.0	417.0	67.5	24	100	144	2262	764	774	1.06	1.06	28.2	29.8	396.2	589	24.0	0:26	1.07	0.85	0.00
16:55:54	418.0	418.0	56.5	24	100	147	2270	761	783	1.06	1.06	28.3	29.9	396.2	589	25.0	0:27	1.07	0.90	0.00
17:06:56	419.0	419.0	22.9	26	99	140	2280	765	783	1.06	1.06	28.5	29.6	398.6	584	26.0	0:29	1.07	1.03	0.00
17:07:31	420.0	420.0	34.4	24	99	161	2217	761	772	1.06	1.06	28.7	29.4	398.8	584	27.0	0:30	1.07	1.07	0.00
17:08:11	421.1	421.1	93.7	24	99	162	2295	761	784	1.06	1.06	28.8	29.4	399.4	583	28.1	0:30	1.07	0.77	0.00
17:08:51	422.1	422.1	90.0	24	98	154	2296	766	803	1.06	1.06	28.8	29.4	400.1	582	29.1	0:31	1.07	0.78	0.00
17:09:48	423.0	423.0	62.3	26	99	154	2290	766	807	1.06	1.06	28.8	29.4	401.0	580	30.0	0:32	1.07	0.89	0.00
17:10:54	424.0	424.0	54.5	22	99	129	2253	762	829	1.06	1.06	28.8	29.5	402.0	579	31.0	0:33	1.07	0.88	0.00
17:12:03	425.0	425.0	54.1	24	100	166	2286	766	823	1.06	1.06	28.9	29.6	403.1	574	32.0	0:34	1.07	0.91	0.00
17:13:12	426.0	426.0	52.1	26	100	154	2278	767	858	1.06	1.06	28.9	29.6	404.2	569	33.0	0:36	1.07	0.94	0.00
17:14:30	427.0	427.0	46.2	25	109	153	2250	763	873	1.06	1.06	29.0	29.6	405.4	563	34.0	0:37	1.07	0.98	0.00
17:15:35	428.0	428.0	55.0	24	110	165	2293	765	941	1.06	1.06	29.0	29.6	406.4	565	35.0	0:38	1.07	0.93	0.00
17:16:49	429.0	429.0	50.3	23	109	158	2300	767	1155	1.06	1.06	29.0	29.7	407.6	566	36.0	0:39	1.07	0.94	0.00
17:17:58	430.0	430.0	51.9	23	109	170	2284	768	1100	1.06	1.06	29.0	29.7	408.7	572	37.0	0:40	1.07	0.93	0.00
17:19:03	431.0	431.0	60.3	24	110	175	2283	767	745	1.06	1.06	29.1	29.6	409.7	582	38.0	0:41	1.07	0.91	0.00
17:19:50	432.1	432.1	78.3	23	109	161	2313	765	558	1.06	1.06	29.1	29.4	410.4	586	39.1	0:42	1.07	0.82	0.00
17:20:15	433.0	433.0	140.6	20	105	149	2305	762	562	1.06	1.06	29.1	29.4	410.8	587	40.0	0:43	1.07	0.64	0.00
17:20:54	434.3	434.3	122.0	19	108	135	2290	764	580	1.06	1.06	29.1	29.5	411.4	588	41.3	0:43	1.07	0.67	0.00
17:21:25	435.0	435.0	112.8	18	109	129	2271	764	695	1.06	1.06	29.1	29.7	411.9	589	42.0	0:44	1.07	0.69	0.00
17:23:18	436.1	436.1	34.5	24	109	152	2250	763	744	1.06	1.06	29.1	30.2	413.7	590	43.1	0:46	1.07	1.05	0.00
17:24:08	437.1	437.1	72.0	21	109	151	2279	764	738	1.06	1.06	29.1	30.4	414.5	588	44.1	0:46	1.07	0.82	0.00
17:24:43	438.0	438.0	101.4	20	109	155	2280	764	725	1.06	1.06	29.2	30.5	415.0	588	45.0	0:47	1.07	0.73	0.00
17:25:19	439.0	439.0	100.0	19	110	139	2229	763	736	1.06	1.06	29.2	30.5	415.6	588	46.0	0:48	1.07	0.73	0.00
17:26:01	440.1	440.1	98.0	17	110	128	2272	764	736	1.06	1.06	29.2	30.6	416.3	588	47.1	0:48	1.07	0.71	0.00
17:26:42	441.0	441.0	86.7	17	109	140	2279	764	705	1.06	1.06	29.2	30.6	416.9	586	48.0	0:49	1.07	0.74	0.00

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
17:27:26	442.0	442.0	81.8	17	110	137	2277	763	704	1.06	1.06	29.2	30.6	417.6	585	49.0	0:50	1.07	0.75	0.00
17:28:22	443.0	443.0	67.5	18	109	161	2274	764	706	1.06	1.06	29.3	30.6	418.5	586	50.0	0:51	1.07	0.81	0.00
17:29:14	444.0	444.0	68.9	19	109	187	2235	764	716	1.06	1.06	29.3	30.6	419.3	586	51.0	0:52	1.07	0.82	0.00
17:30:01	445.0	445.0	76.0	21	109	206	2287	764	711	1.06	1.06	29.4	30.6	420.1	585	52.0	0:52	1.07	0.81	0.00
17:30:51	446.0	446.0	77.1	21	109	175	2289	765	710	1.06	1.06	29.4	30.7	420.3	584	53.0	0:53	1.07	0.81	0.00
17:31:53	447.0	447.0	58.1	22	109	181	2232	763	699	1.06	1.06	29.5	30.7	421.7	584	54.0	0:54	1.07	0.89	0.00
17:39:07	448.1	448.1	27.8	21	108	156	2289	760	686	1.06	1.06	29.5	30.8	425.5	589	55.1	0:56	1.07	1.06	0.00
17:39:45	449.0	449.0	30.9	20	101	185	2184	757	690	1.06	1.06	29.8	30.9	426.0	586	56.0	0:57	1.07	1.04	0.00
17:40:24	450.0	450.0	53.9	23	101	189	2278	758	697	1.06	1.06	29.8	30.9	425.7	584	57.0	0:58	1.07	0.89	0.00
17:41:02	451.1	451.1	63.6	24	101	191	2292	759	712	1.06	1.06	29.8	30.8	426.1	584	58.1	0:58	1.07	0.88	0.00
17:41:38	452.1	452.1	107.5	26	101	209	2275	759	698	1.06	1.06	29.9	30.8	426.7	583	59.1	0:59	1.07	0.74	0.00
17:42:10	453.1	453.1	111.1	25	101	209	2272	759	697	1.06	1.06	29.9	30.7	427.3	583	60.1	0:59	1.07	0.73	0.00
17:43:30	454.0	454.0	44.8	25	100	179	2226	759	723	1.06	1.06	29.9	30.7	428.7	582	61.0	1:01	1.07	0.97	0.00
17:43:52	455.1	455.1	183.0	21	101	154	2274	758	725	1.06	1.06	29.9	30.7	429.1	581	62.1	1:01	1.07	0.57	0.00
17:44:14	456.1	456.1	163.6	18	100	152	2268	758	706	1.06	1.06	30.0	30.7	429.5	579	63.1	1:02	1.07	0.57	0.00
17:44:32	457.1	457.1	200.0	15	99	125	2268	757	694	1.06	1.06	30.0	30.7	429.8	581	64.1	1:02	1.07	0.50	0.00
17:44:55	458.0	458.0	153.2	11	101	125	2280	757	687	1.06	1.06	30.0	30.7	430.2	580	65.0	1:02	1.07	0.53	0.00
17:45:18	459.0	459.0	164.6	10	101	110	2268	757	686	1.06	1.06	30.0	30.7	430.6	580	66.0	1:03	1.07	0.50	0.00
17:45:46	460.0	460.0	133.3	8	101	182	2280	756	703	1.06	1.06	30.0	30.8	431.1	580	67.0	1:03	1.07	0.53	0.00
17:46:13	461.1	461.1	145.2	7	101	112	2284	757	725	1.06	1.06	30.0	30.8	431.6	579	68.1	1:03	1.07	0.49	0.00
17:46:35	462.1	462.1	181.1	6	102	110	2266	757	725	1.06	1.06	30.0	30.8	432.0	579	69.1	1:04	1.07	0.43	0.00
17:47:03	463.2	463.2	141.6	5	101	96	2212	757	721	1.06	1.06	30.0	30.8	432.5	578	70.2	1:04	1.07	0.45	0.00
17:47:30	464.1	464.1	132.1	4	101	93	2214	756	722	1.06	1.06	30.1	30.8	432.9	577	71.1	1:05	1.07	0.46	0.00
17:47:57	465.0	465.0	130.3	4	101	103	2261	757	726	1.06	1.06	30.1	30.8	433.4	575	72.0	1:05	1.07	0.46	0.00
17:48:24	466.0	466.0	141.2	4	101	105	2280	757	735	1.06	1.06	30.1	30.9	433.9	575	73.0	1:06	1.07	0.45	0.00
17:48:49	467.1	467.1	157.4	4	101	109	2282	756	759	1.06	1.06	30.1	30.9	434.4	575	74.1	1:06	1.07	0.42	0.00
17:49:17	468.2	468.2	141.7	2	101	94	2270	756	779	1.06	1.06	30.1	30.9	434.9	574	75.2	1:07	1.07	0.39	0.00
17:50:24	469.2	469.2	110.8	1	101	69	2255	756	789	1.06	1.06	30.2	31.0	436.0	573	76.2	1:07	1.07	0.40	0.00
17:51:01	470.0	470.0	93.6	2	102	92	2213	757	793	1.06	1.06	30.2	31.0	436.7	573	77.0	1:08	1.07	0.48	0.00
17:51:42	471.1	471.1	93.5	6	101	109	2280	756	807	1.06	1.06	30.2	31.0	437.5	574	78.1	1:08	1.07	0.56	0.00
17:52:16	472.1	472.1	113.4	8	101	115	2263	757	756	1.06	1.06	30.2	31.1	438.0	571	79.1	1:09	1.07	0.55	0.00
17:52:51	473.1	473.1	102.3	9	101	132	2270	757	737	1.06	1.06	30.2	31.1	438.7	573	80.1	1:10	1.07	0.60	0.00
17:53:27	474.0	474.0	98.2	11	101	110	2287	757	748	1.06	1.06	30.2	31.1	439.3	573	81.0	1:10	1.07	0.63	0.00
17:54:01	475.0	475.0	114.3	11	101	125	2296	757	736	1.06	1.06	30.3	31.2	439.9	571	82.0	1:11	1.07	0.60	0.00
17:54:42	476.0	476.0	87.4	12	101	115	2218	757	729	1.06	1.06	30.3	31.2	440.6	570	83.0	1:11	1.07	0.66	0.00
17:55:53	477.1	477.1	52.9	13	101	123	2261	757	739	1.06	1.06	30.3	31.3	441.9	568	84.1	1:13	1.07	0.79	0.01
18:04:15	478.1	478.1	17.7	19	101	144	2262	756	729	1.06	1.06	30.5	31.4	448.0	566	85.1	1:16	1.07	0.94	0.00
18:05:10	479.1	479.1	34.8	26	102	199	2227	755	731	1.06	1.06	30.6	31.2	448.5	564	86.1	1:17	1.07	1.01	0.00
18:05:59	480.0	480.0	72.4	28	102	191	2290	756	742	1.06	1.06	30.6	31.2	449.6	562	87.0	1:17	1.07	0.87	0.00
18:06:47	481.1	481.1	81.8	29	102	192	2298	757	718	1.06	1.06	30.6	31.2	450.5	562	88.1	1:18	1.07	0.84	0.00
18:07:28	482.0	482.0	88.9	28	102	188	2323	757	730	1.06	1.06	30.6	31.2	451.4	560	89.0	1:19	1.07	0.83	0.00
18:08:14	483.1	483.1	86.2	28	102	185	2296	757	765	1.06	1.06	30.7	31.3	452.4	560	90.1	1:20	1.07	0.82	0.00
18:08:59	484.0	484.0	78.8	28	102	173	2244	757	750	1.06	1.06	30.7	31.3	453.3	559	91.0	1:20	1.07	0.85	0.00
18:09:56	485.0	485.0	67.3	28	102	183	2302	757	730	1.06	1.06	30.7	31.4	454.5	559	92.0	1:21	1.07	0.90	0.00
18:10:48	486.0	486.0	68.9	30	102	195	2296	757	717	1.06	1.06	30.7	31.5	455.6	559	93.0	1:22	1.07	0.90	0.00
18:11:47	487.0	487.0	60.5	32	101	197	2305	757	713	1.06	1.06	30.7	31.5	456.9	558	94.0	1:23	1.07	0.95	0.00
18:12:56	488.0	488.0	52.2	34	103	206	2281	758	709	1.06	1.06	30.8	31.6	458.3	557	95.0	1:24	1.07	1.02	0.00
18:13:55	489.1	489.1	65.1	36	102	209	2309	758	746	1.06	1.06	30.8	31.6	459.5	556	96.1	1:25	1.07	1.00	0.00
18:14:35	490.1	490.1	87.8	32	101	202	2313	758	754	1.06	1.06	30.8	31.6	460.4	555	97.1	1:26	1.07	0.85	0.00
18:15:21	491.0	491.0	77.6	30	101	206	2297	758	759	1.06	1.06	30.8	31.6	461.4	554	98.0	1:27	1.07	0.87	0.00

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW		MUD WEIGHT		MUD TEMP		RETNS	PVT	---BIT---		ECD	DXC	GAS
								IN	OUT	IN	OUT	IN	OUT	DEPTH		DIST	HRS			
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
18:16:08	492.0	492.0	76.0	31	102	214	2260	759	767	1.06	1.06	30.9	31.6	462.3	552	99.0	1:28	1.07	0.88	0.00
18:17:17	493.0	493.0	54.1	33	102	222	2312	759	792	1.06	1.06	30.9	31.7	463.8	550	100.0	1:29	1.07	1.00	0.00
18:18:21	494.0	494.0	56.2	35	102	220	2307	758	774	1.06	1.06	30.9	31.8	465.1	548	101.0	1:30	1.07	1.00	0.00
18:19:32	495.0	495.0	50.5	37	102	229	2295	758	785	1.06	1.06	30.9	31.9	466.7	544	102.0	1:31	1.07	1.04	0.00
18:20:50	496.0	496.0	46.2	36	102	208	2305	759	758	1.06	1.06	31.0	32.0	468.3	544	103.0	1:32	1.07	1.07	0.00
18:22:12	497.0	497.0	43.9	33	102	192	2325	759	726	1.06	1.06	31.0	32.2	470.0	543	104.0	1:34	1.07	1.05	0.00
18:23:32	498.0	498.0	45.0	36	105	207	2301	759	797	1.06	1.06	31.1	32.3	471.7	545	105.0	1:35	1.07	1.08	0.00
18:24:27	499.0	499.0	65.5	35	105	211	2315	758	743	1.06	1.06	31.1	32.3	472.9	542	106.0	1:36	1.07	0.96	0.00
18:25:11	500.0	500.0	81.8	32	105	198	2312	754	696	1.06	1.06	31.1	32.4	473.8	542	107.0	1:37	1.07	0.88	0.00
18:26:17	501.0	501.0	56.7	32	105	194	2328	757	727	1.06	1.06	31.1	32.4	475.2	542	108.0	1:38	1.07	0.98	0.00
18:27:34	502.0	502.0	46.6	35	105	198	2284	758	703	1.06	1.06	31.2	32.5	476.8	543	109.0	1:39	1.07	1.06	0.00
18:28:49	503.1	503.1	51.7	34	105	208	2331	758	678	1.06	1.06	31.2	32.5	478.4	542	110.1	1:40	1.07	1.02	0.00
18:30:00	504.0	504.0	50.5	35	105	211	2312	759	679	1.06	1.06	31.3	32.6	479.2	542	111.0	1:41	1.07	1.04	0.00
18:31:12	505.0	505.0	49.5	35	105	202	2345	759	690	1.06	1.06	31.3	32.7	480.5	543	112.0	1:43	1.07	1.04	0.00
18:32:51	506.0	506.0	36.4	32	105	176	2351	759	688	1.06	1.06	31.4	32.7	482.6	540	113.0	1:44	1.07	1.10	0.00
18:46:28	507.0	507.0	14.5	36	104	169	2322	760	685	1.06	1.06	31.5	32.7	491.4	523	114.0	1:48	1.07	1.39	0.00
18:47:19	508.0	508.0	16.1	31	93	182	2351	763	714	1.06	1.06	31.9	31.5	492.2	519	115.0	1:49	1.07	1.35	0.00
18:48:42	509.0	509.0	44.4	32	98	206	2367	763	703	1.06	1.06	31.9	31.7	492.8	516	116.0	1:51	1.07	1.03	0.00
18:50:06	510.1	510.1	43.4	35	100	216	2359	764	708	1.06	1.06	31.9	32.0	493.8	516	117.1	1:52	1.07	1.07	0.00
18:51:31	511.0	511.0	42.0	33	101	199	2378	764	713	1.06	1.06	31.9	32.1	494.7	513	118.0	1:53	1.07	1.06	0.00
18:53:11	512.0	512.0	36.0	30	101	175	2342	764	719	1.06	1.06	31.9	32.2	495.8	514	119.0	1:55	1.07	1.07	0.00
18:54:41	513.0	513.0	40.0	36	100	217	2400	765	737	1.06	1.06	31.9	32.4	496.8	512	120.0	1:57	1.07	1.10	0.00
18:56:23	514.0	514.0	37.5	35	101	200	2383	765	744	1.06	1.06	31.9	32.6	497.9	511	121.0	1:58	1.07	1.11	0.00
18:57:41	515.0	515.0	45.8	36	101	220	2383	766	733	1.06	1.06	32.0	32.8	498.7	512	122.0	1:60	1.07	1.07	0.00
18:59:15	516.0	516.0	38.3	36	100	198	2375	766	717	1.06	1.06	32.0	33.0	499.7	511	123.0	2:01	1.07	1.11	0.00
19:00:49	517.0	517.0	39.6	35	101	206	2376	766	705	1.06	1.06	32.0	33.1	500.8	509	124.0	2:03	1.07	1.10	0.00
19:02:18	518.0	518.0	40.5	37	105	200	2366	766	713	1.06	1.06	32.1	33.2	501.7	510	125.0	2:04	1.07	1.12	0.00
19:03:45	519.0	519.0	41.2	36	106	212	2349	765	709	1.06	1.06	32.1	33.3	502.7	509	126.0	2:06	1.07	1.10	0.00
19:04:57	520.0	520.0	53.7	34	105	219	2388	764	711	1.06	1.06	32.1	33.4	503.5	508	127.0	2:07	1.07	1.01	0.00
19:05:45	521.0	521.0	75.0	34	106	230	2368	764	718	1.06	1.06	32.2	33.4	504.0	508	128.0	2:08	1.07	0.92	0.00
19:06:18	522.0	522.0	109.1	34	106	225	2380	763	715	1.06	1.06	32.2	33.4	504.4	508	129.0	2:08	1.07	0.81	0.00
19:07:02	523.0	523.0	86.1	34	106	219	2384	762	709	1.06	1.06	32.2	33.4	504.8	507	130.0	2:09	1.07	0.88	0.00
19:07:51	524.1	524.1	73.5	34	107	232	2335	761	704	1.06	1.06	32.2	33.4	505.3	509	131.1	2:10	1.07	0.93	0.00
19:08:50	525.0	525.0	60.7	36	107	233	2385	762	713	1.06	1.06	32.3	33.4	506.0	509	132.0	2:11	1.07	1.00	0.00
19:10:11	526.0	526.0	44.4	34	107	200	2359	761	739	1.06	1.06	32.3	33.3	506.9	508	133.0	2:12	1.07	1.07	0.00
19:11:32	527.0	527.0	46.2	34	107	221	2381	761	713	1.06	1.06	32.4	33.3	507.7	505	134.0	2:13	1.07	1.06	0.00
19:12:44	528.0	528.0	49.5	37	107	230	2385	762	726	1.06	1.06	32.4	33.4	508.2	506	135.0	2:15	1.07	1.07	0.00
19:14:01	529.0	529.0	46.8	37	107	211	2335	761	754	1.06	1.06	32.4	33.4	509.0	504	136.0	2:16	1.07	1.08	0.00
19:15:19	530.0	530.0	46.2	37	107	220	2375	759	693	1.06	1.06	32.3	33.5	510.0	507	137.0	2:17	1.07	1.09	0.00
19:16:56	531.0	531.0	39.8	37	107	198	2376	759	692	1.06	1.06	31.9	33.6	510.9	506	138.0	2:19	1.07	1.12	0.00
19:18:20	532.0	532.0	42.9	36	107	203	2351	758	689	1.06	1.06	31.9	33.7	511.7	506	139.0	2:20	1.07	1.10	0.00
19:19:38	533.0	533.0	47.7	37	107	223	2375	759	700	1.06	1.06	32.0	33.8	512.4	504	140.0	2:22	1.07	1.07	0.00
19:20:18	534.0	534.0	89.3	33	107	207	2392	759	698	1.06	1.06	32.1	33.8	512.9	505	141.0	2:22	1.07	0.86	0.00
19:20:49	535.0	535.0	116.1	31	107	187	2382	758	694	1.06	1.06	32.0	33.8	513.1	505	142.0	2:23	1.07	0.77	0.00
19:21:14	536.0	536.0	157.5	26	107	172	2290	758	705	1.06	1.06	32.0	33.8	513.3	506	143.0	2:23	1.07	0.65	0.00
19:28:19	537.1	537.1	71.3	21	105	131	2391	755	696	1.06	1.06	32.1	33.8	515.3	500	144.1	2:24	1.07	0.80	0.00
19:28:47	538.0	538.0	126.9	17	104	143	2382	752	728	1.06	1.06	32.2	33.9	515.5	499	145.0	2:25	1.07	0.62	0.00
19:29:33	539.0	539.0	78.3	14	107	146	2389	755	683	1.06	1.06	32.2	33.9	516.0	499	146.0	2:25	1.07	0.72	0.00
19:30:06	540.0	540.0	108.4	14	108	130	2297	756	680	1.06	1.06	32.3	33.9	516.3	497	147.0	2:26	1.07	0.65	0.00
19:30:40	541.1	541.1	114.7	13	108	128	2416	757	686	1.06	1.06	32.3	33.9	516.7	496	148.1	2:26	1.07	0.63	0.00

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
19:31:18	542.0	542.0	92.8	14	107	143	2403	757	704	1.06	1.06	32.4	33.8	517.0	494	149.0	2:27	1.07	0.69	0.00
19:31:52	543.0	543.0	105.9	17	108	171	2415	758	711	1.06	1.06	32.4	33.8	517.3	493	150.0	2:28	1.07	0.69	0.00
19:32:35	544.2	544.2	107.5	21	108	191	2412	758	726	1.06	1.06	32.3	33.8	517.7	493	151.2	2:28	1.07	0.72	0.00
19:33:06	545.0	545.0	112.9	22	108	194	2410	757	739	1.06	1.06	32.3	33.8	518.3	493	152.0	2:29	1.07	0.72	0.00
19:34:21	546.0	546.0	48.0	26	108	189	2363	757	734	1.06	1.06	32.4	33.8	518.9	489	153.0	2:30	1.07	0.98	0.00
19:35:43	547.0	547.0	43.9	31	108	216	2392	757	765	1.06	1.06	32.4	33.8	519.9	488	154.0	2:31	1.07	1.05	0.00
19:37:03	548.1	548.1	46.8	30	108	216	2396	758	855	1.06	1.06	32.4	33.7	521.6	486	155.1	2:33	1.07	1.02	0.00
19:37:55	549.1	549.1	69.2	29	108	239	2363	758	812	1.06	1.06	32.2	33.7	522.6	487	156.1	2:34	1.07	0.90	0.00
19:38:36	550.0	550.0	87.4	29	108	220	2405	758	788	1.06	1.06	32.1	33.7	523.4	486	157.0	2:34	1.07	0.84	0.00
19:39:20	551.0	551.0	81.4	31	107	239	2408	758	803	1.06	1.06	32.0	33.7	524.2	483	158.0	2:35	1.07	0.88	0.00
19:40:00	552.1	552.1	103.3	31	107	239	2413	758	807	1.06	1.06	31.9	33.7	524.8	482	159.1	2:36	1.07	0.81	0.00
19:40:25	553.1	553.1	143.0	29	108	209	2439	758	851	1.06	1.06	31.9	33.7	525.2	482	160.1	2:36	1.07	0.70	0.00
19:40:49	554.0	554.0	147.5	26	108	188	2362	758	877	1.06	1.06	31.9	33.7	525.4	482	161.0	2:37	1.07	0.68	0.00
19:41:21	555.0	555.0	111.9	25	108	186	2418	758	938	1.06	1.06	31.9	33.7	525.8	481	162.0	2:37	1.07	0.74	0.00
19:42:03	556.0	556.0	85.7	25	108	188	2420	758	917	1.06	1.06	31.8	33.7	526.2	481	163.0	2:38	1.07	0.81	0.00
19:43:10	557.0	557.0	54.5	29	108	216	2420	758	925	1.06	1.06	31.8	33.7	527.0	481	164.0	2:39	1.07	0.89	0.00
19:44:15	558.0	558.0	57.1	34	108	240	2436	758	937	1.06	1.06	32.0	33.7	527.8	478	165.0	2:40	1.07	1.00	0.00
19:45:14	559.0	559.0	61.4	35	107	249	2382	758	923	1.06	1.06	32.1	33.7	528.5	478	166.0	2:41	1.07	1.00	0.00
19:46:19	560.0	560.0	57.1	34	108	216	2428	758	803	1.06	1.06	32.2	33.7	529.3	476	167.0	2:42	1.07	1.00	0.00
19:47:28	561.0	561.0	51.8	35	107	224	2419	758	778	1.06	1.06	32.3	33.7	530.1	473	168.0	2:43	1.07	1.04	0.00
19:48:46	562.0	562.0	48.0	36	107	242	2405	759	704	1.06	1.06	32.4	33.7	530.8	472	169.0	2:44	1.07	1.07	0.00
19:50:08	563.0	563.0	43.6	37	108	254	2454	759	697	1.06	1.06	32.5	33.7	531.7	474	170.0	2:46	1.07	1.10	0.00
19:51:38	564.0	564.0	40.4	38	108	248	2433	759	808	1.06	1.06	32.1	33.7	532.7	471	171.0	2:47	1.07	1.13	0.01
19:52:23	565.1	565.1	81.8	35	108	236	2421	759	773	1.06	1.06	31.9	33.7	533.5	470	172.1	2:48	1.07	0.90	0.01
20:01:44	566.0	566.0	42.8	24	108	171	2445	760	825	1.06	1.06	31.5	33.2	539.3	439	173.0	2:50	1.07	0.97	0.00
20:02:53	567.0	567.0	52.0	22	109	204	2472	762	781	1.06	1.06	31.0	33.0	541.2	437	174.0	2:51	1.07	0.93	0.01
20:03:40	568.0	568.0	75.8	28	110	207	2421	764	759	1.06	1.06	31.1	33.2	542.3	437	175.0	2:51	1.07	0.87	0.01
20:04:37	569.0	569.0	68.8	31	110	217	2480	763	753	1.06	1.06	31.3	33.4	543.8	436	176.0	2:52	1.07	0.93	0.01
20:05:33	570.0	570.0	63.9	35	110	244	2473	761	782	1.06	1.06	31.3	33.5	545.0	436	177.0	2:53	1.07	0.98	0.01
20:06:39	571.0	571.0	57.4	37	109	233	2457	761	787	1.06	1.06	31.4	33.6	545.8	435	178.0	2:54	1.07	1.03	0.01
20:08:09	572.0	572.0	39.9	38	109	229	2457	760	772	1.06	1.06	31.6	33.8	547.0	436	179.0	2:56	1.07	1.14	0.01
20:09:49	573.0	573.0	36.0	36	110	227	2476	761	703	1.06	1.06	31.8	33.9	548.2	433	180.0	2:58	1.07	1.16	0.01
20:11:09	574.0	574.0	44.7	37	109	232	2452	760	701	1.06	1.06	31.9	34.1	549.6	436	181.0	2:59	1.07	1.10	0.01
20:12:33	575.0	575.0	42.9	36	109	240	2441	759	706	1.06	1.06	32.1	34.2	551.4	438	182.0	3:00	1.07	1.11	0.01
20:13:23	576.0	576.0	86.2	35	109	260	2420	758	721	1.06	1.06	32.3	34.2	552.8	438	183.0	3:01	1.07	0.90	0.01
20:14:22	577.1	577.1	61.0	36	109	256	2403	759	720	1.06	1.06	32.4	34.2	554.7	436	184.1	3:02	1.07	1.00	0.01
20:15:00	578.1	578.1	94.7	35	109	276	2484	760	721	1.06	1.06	32.4	34.2	555.7	436	185.1	3:03	1.07	0.87	0.01
20:15:27	579.1	579.1	146.9	35	110	261	2478	760	717	1.06	1.06	32.5	34.2	556.2	436	186.1	3:03	1.07	0.74	0.01
20:16:02	580.0	580.0	100.9	35	109	258	2462	760	715	1.06	1.06	32.6	34.2	556.7	436	187.0	3:04	1.07	0.85	0.01
20:16:51	581.0	581.0	74.2	33	110	279	2462	760	724	1.06	1.06	32.6	34.2	557.3	438	188.0	3:05	1.07	0.93	0.01
20:17:18	582.0	582.0	141.2	28	110	242	2478	760	713	1.06	1.06	32.6	34.2	557.7	438	189.0	3:05	1.07	0.70	0.01
20:17:31	583.1	583.1	329.2	22	111	188	2488	760	710	1.06	1.06	32.6	34.2	557.9	438	190.1	3:05	1.07	0.44	0.01
20:17:45	584.1	584.1	304.7	18	110	224	2478	760	712	1.06	1.06	32.6	34.2	558.1	438	191.1	3:06	1.07	0.43	0.01
20:17:55	585.0	585.0	355.2	13	110	211	2370	760	704	1.06	1.06	32.7	34.2	558.3	438	192.0	3:06	1.07	0.37	0.01
20:18:10	586.2	586.2	300.0	9	111	142	2386	759	694	1.06	1.06	32.7	34.3	558.5	438	193.2	3:06	1.07	0.37	0.01
20:18:23	587.0	587.0	260.0	5	109	107	2478	759	683	1.06	1.06	32.7	34.3	558.7	438	194.0	3:06	1.07	0.35	0.01
20:18:48	588.0	588.0	143.4	2	110	99	2481	759	677	1.06	1.06	32.7	34.3	559.1	438	195.0	3:07	1.07	0.38	0.01
20:19:22	589.0	589.0	156.9	0	110	96	2458	760	700	1.06	1.06	32.7	34.3	559.6	441	196.0	3:07	1.07	0.38	0.01
20:19:46	590.1	590.1	172.8	1	110	130	2491	760	709	1.06	1.06	32.7	34.3	559.9	438	197.1	3:07	1.07	0.33	0.01
20:20:11	591.0	591.0	141.7	2	110	132	2482	760	713	1.06	1.06	32.7	34.3	560.2	439	198.0	3:07	1.07	0.42	0.01
20:20:39	592.1	592.1	139.4	2	110	122	2485	761	714	1.06	1.06	32.8	34.3	560.6	439	199.1	3:08	1.07	0.43	0.01

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TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
20:21:23	593.1	593.1	81.8	7	110	154	2477	761	701	1.06	1.06	32.8	34.3	561.2	440	200.1	3:09	1.07	0.64	0.00
20:21:43	594.0	594.0	174.8	6	110	111	2414	761	693	1.06	1.06	32.9	34.3	561.4	439	201.0	3:09	1.07	0.43	0.01
20:30:36	595.1	595.1	51.9	4	108	105	2461	757	680	1.07	1.06	32.8	33.3	565.5	405	202.1	3:10	1.07	0.63	0.00
20:31:23	596.1	596.1	81.4	6	107	151	2439	756	679	1.08	1.08	32.8	32.7	565.5	408	203.1	3:11	1.07	0.59	0.00
20:31:41	597.1	597.1	198.4	3	108	119	2327	757	680	1.08	1.08	32.8	32.9	565.5	407	204.1	3:11	1.07	0.37	0.00
20:32:00	598.0	598.0	184.6	2	107	126	2433	757	680	1.08	1.08	32.8	33.1	565.5	407	205.0	3:12	1.07	0.35	0.00
20:32:26	599.3	599.3	156.5	2	107	126	2452	757	687	1.08	1.08	32.8	33.2	565.5	408	206.3	3:12	1.07	0.41	0.00
20:32:42	600.1	600.1	134.8	5	107	134	2471	758	702	1.08	1.08	32.8	33.3	565.6	408	207.1	3:12	1.07	0.43	0.00
20:33:24	601.1	601.1	91.0	9	109	166	2461	758	697	1.08	1.08	32.8	33.4	566.4	408	208.1	3:13	1.07	0.62	0.00
20:33:43	602.2	602.2	214.9	7	109	109	2469	758	697	1.08	1.08	32.8	33.4	566.9	409	209.2	3:13	1.07	0.42	0.00
20:34:02	603.1	603.1	188.3	4	109	144	2472	759	691	1.08	1.08	32.8	33.4	567.3	409	210.1	3:14	1.07	0.41	0.00
20:34:26	604.0	604.0	147.0	4	110	135	2469	759	689	1.08	1.08	32.8	33.5	567.8	407	211.0	3:14	1.07	0.43	0.00
20:34:57	605.1	605.1	127.1	4	109	132	2472	759	694	1.08	1.08	32.8	33.5	568.4	407	212.1	3:15	1.07	0.46	0.00
20:35:32	606.0	606.0	100.8	4	109	134	2365	758	697	1.08	1.08	32.8	33.6	569.2	410	213.0	3:15	1.07	0.53	0.00
20:36:03	607.1	607.1	127.4	5	110	121	2462	758	693	1.08	1.08	32.8	33.7	569.8	408	214.1	3:16	1.07	0.50	0.00
20:36:25	608.2	608.2	184.1	4	110	116	2462	758	682	1.08	1.08	32.8	33.7	570.4	407	215.2	3:16	1.07	0.41	0.00
20:36:46	609.1	609.1	169.9	3	110	110	2468	758	675	1.08	1.08	32.8	33.8	570.8	410	216.1	3:16	1.07	0.40	0.00
20:37:13	610.2	610.2	149.0	2	110	107	2456	758	676	1.08	1.08	32.8	33.8	571.3	409	217.2	3:17	1.07	0.38	0.00
20:37:44	611.0	611.0	114.5	3	109	131	2456	758	679	1.08	1.08	32.8	33.9	572.1	408	218.0	3:17	1.08	0.49	0.00
20:38:31	612.0	612.0	76.1	8	109	161	2439	759	685	1.08	1.08	32.8	33.9	573.0	410	219.0	3:18	1.08	0.65	0.00
20:38:52	613.0	613.0	171.4	8	110	140	2335	759	687	1.08	1.08	32.8	33.9	573.5	410	220.0	3:18	1.08	0.48	0.00
20:39:10	614.1	614.1	206.5	4	110	129	2446	758	674	1.08	1.08	32.8	34.0	573.9	410	221.1	3:19	1.08	0.38	0.00
20:40:15	616.3	616.3	246.5	2	110	112	2441	758	668	1.08	1.08	32.8	34.0	575.3	409	223.3	3:19	1.08	0.42	0.00
20:41:28	618.6	618.6	254.9	0	109	125	2439	758	673	1.08	1.08	32.8	34.0	576.8	410	225.6	3:19	1.08	0.38	0.01
20:41:41	619.1	619.1	246.5	0	109	182	2455	758	671	1.08	1.08	32.7	34.1	577.1	411	226.1	3:19	1.08	0.38	0.00
20:42:14	620.0	620.0	145.4	0	109	147	2438	759	676	1.08	1.08	32.8	34.1	577.8	412	227.0	3:20	1.08	0.38	0.00
20:42:57	621.0	621.0	97.9	0	109	196	2404	758	677	1.08	1.08	32.8	34.1	578.7	413	228.0	3:20	1.08	0.41	0.00
20:43:31	622.1	622.1	116.2	3	109	182	2467	758	670	1.08	1.08	32.8	34.2	579.5	413	229.1	3:21	1.08	0.49	0.01
20:44:23	623.2	623.2	187.8	0	109	209	2446	757	677	1.08	1.08	32.8	34.2	580.5	412	230.2	3:21	1.08	0.36	0.00
20:53:52	624.0	624.0	62.8	0	110	129	2436	757	681	1.08	1.08	32.8	34.2	588.9	391	231.0	3:22	1.08	0.37	0.00
20:54:16	625.0	625.0	148.2	1	104	117	2431	751	706	1.08	1.08	32.7	31.3	589.4	385	232.0	3:22	1.09	0.36	0.00
20:54:42	626.1	626.1	141.7	3	108	120	2447	754	718	1.08	1.08	32.7	31.7	590.0	382	233.1	3:23	1.09	0.45	0.00
20:55:07	627.0	627.0	141.6	5	110	142	2452	755	726	1.08	1.08	32.7	32.1	590.5	380	234.0	3:23	1.09	0.48	0.00
20:55:36	628.0	628.0	124.1	8	110	178	2367	756	738	1.08	1.08	32.7	32.4	591.1	381	235.0	3:24	1.09	0.55	0.00
20:56:00	629.0	629.0	163.6	6	110	174	2465	756	741	1.08	1.08	32.6	32.7	591.6	378	236.0	3:24	1.09	0.46	0.00
20:56:27	630.0	630.0	133.3	5	110	171	2482	757	761	1.08	1.08	32.6	32.9	592.2	378	237.0	3:24	1.09	0.48	0.00
20:56:55	631.1	631.1	142.4	5	110	128	2447	757	777	1.08	1.08	32.6	33.0	592.7	379	238.1	3:25	1.09	0.47	0.01
20:57:23	632.1	632.1	140.0	5	110	169	2476	757	739	1.08	1.08	32.6	33.1	593.4	375	239.1	3:25	1.09	0.48	0.01
20:57:57	633.1	633.1	104.7	5	110	157	2456	758	712	1.08	1.08	32.6	33.2	594.1	376	240.1	3:26	1.09	0.51	0.01
20:58:40	634.0	634.0	82.2	2	110	139	2465	758	706	1.08	1.08	32.6	33.3	595.1	376	241.0	3:27	1.09	0.46	0.01
20:59:11	635.0	635.0	125.9	2	110	187	2363	758	703	1.08	1.08	32.6	33.4	595.7	376	242.0	3:27	1.09	0.41	0.01
20:59:38	636.0	636.0	131.7	2	110	143	2476	758	692	1.08	1.08	32.6	33.5	596.3	376	243.0	3:28	1.09	0.42	0.01
21:00:03	637.1	637.1	148.0	2	110	117	2454	758	723	1.08	1.08	32.6	33.6	596.8	376	244.1	3:28	1.09	0.38	0.01
21:00:28	638.1	638.1	143.3	1	110	141	2453	758	716	1.08	1.08	32.6	33.6	597.3	375	245.1	3:28	1.09	0.37	0.01
21:00:55	639.1	639.1	133.3	1	110	123	2455	758	713	1.08	1.08	32.6	33.7	597.9	376	246.1	3:29	1.09	0.39	0.01
21:01:24	640.1	640.1	139.6	1	110	138	2462	758	737	1.08	1.08	32.5	33.8	598.5	374	247.1	3:29	1.09	0.38	0.01
21:01:58	641.0	641.0	103.8	2	110	126	2461	758	735	1.08	1.08	32.6	33.8	599.2	375	248.0	3:30	1.09	0.46	0.01
21:02:32	642.1	642.1	115.2	3	110	139	2466	758	726	1.08	1.08	32.5	33.9	600.0	374	249.1	3:31	1.09	0.46	0.00
21:03:00	643.0	643.0	125.9	3	110	144	2373	758	726	1.08	1.08	32.6	34.0	600.3	376	250.0	3:31	1.09	0.44	0.00
21:03:37	644.1	644.1	107.5	3	110	161	2454	758	720	1.08	1.08	32.5	34.1	600.9	378	251.1	3:32	1.09	0.47	0.01
21:04:07	645.1	645.1	119.2	1	110	124	2425	759	706	1.08	1.08	32.5	34.1	602.2	373	252.1	3:32	1.09	0.41	0.01

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
21:04:38	646.1	646.1	116.1	1	110	185	2452	758	695	1.08	1.08	32.5	34.1	603.6	374	253.1	3:33	1.09	0.40	0.01
21:05:13	647.0	647.0	101.1	2	110	130	2455	759	720	1.08	1.08	32.5	34.2	604.7	373	254.0	3:33	1.09	0.45	0.01
21:05:50	648.0	648.0	103.8	3	110	124	2459	759	707	1.08	1.08	32.5	34.3	605.7	373	255.0	3:34	1.09	0.48	0.01
21:06:23	649.0	649.0	109.1	3	110	158	2366	758	714	1.08	1.08	32.5	34.3	606.5	370	256.0	3:34	1.09	0.47	0.01
21:06:57	650.0	650.0	105.9	3	110	129	2457	758	714	1.08	1.08	32.5	34.3	607.6	371	257.0	3:35	1.09	0.48	0.01
21:07:28	651.0	651.0	115.2	3	110	112	2451	759	720	1.08	1.08	32.6	34.4	609.1	368	258.0	3:35	1.09	0.45	0.01
21:08:09	652.1	652.1	94.7	2	110	109	2474	760	711	1.08	1.08	32.6	34.4	610.2	369	259.1	3:36	1.09	0.47	0.01
21:19:30	653.0	653.0	24.5	9	109	143	2437	760	708	1.08	1.08	32.5	33.8	622.7	335	260.0	3:39	1.09	0.89	0.00
21:20:03	654.1	654.1	138.5	14	109	135	2466	760	700	1.08	1.08	32.3	33.2	623.4	334	261.1	3:39	1.09	0.58	0.00
21:20:38	655.0	655.0	101.9	11	110	138	2451	760	704	1.08	1.08	32.3	33.4	623.7	332	262.0	3:40	1.09	0.61	0.00
21:21:40	656.0	656.0	57.8	11	110	138	2450	760	709	1.08	1.08	32.3	33.7	623.9	335	263.0	3:41	1.09	0.74	0.00
21:24:08	657.0	657.0	24.6	13	110	135	2444	760	701	1.08	1.08	32.4	33.9	623.9	339	264.0	3:43	1.09	0.95	0.00
21:25:26	658.0	658.0	46.2	20	109	178	2445	761	693	1.08	1.08	32.4	34.2	623.9	349	265.0	3:45	1.09	0.91	0.00
21:26:14	659.0	659.0	75.0	19	110	182	2434	761	693	1.08	1.08	32.4	34.2	623.9	351	266.0	3:45	1.09	0.78	0.00
21:28:19	660.0	660.0	28.7	25	110	181	2416	761	704	1.08	1.08	32.5	34.3	626.6	366	267.0	3:47	1.09	1.08	0.00
21:29:53	661.0	661.0	40.9	27	110	218	2400	761	700	1.08	1.08	32.6	34.5	629.6	374	268.0	3:49	1.09	1.01	0.00
21:30:53	662.0	662.0	59.0	28	109	230	2339	761	706	1.08	1.08	32.6	34.5	631.7	380	269.0	3:50	1.09	0.88	0.00
21:32:34	663.1	663.1	38.5	34	109	263	2403	761	718	1.08	1.08	32.7	34.6	634.1	381	270.1	3:52	1.09	1.09	0.00
21:34:28	664.0	664.0	31.4	36	109	274	2401	761	707	1.08	1.08	32.8	34.7	638.0	381	271.0	3:54	1.09	1.17	0.00
21:37:07	665.0	665.0	22.9	34	109	224	2427	761	702	1.08	1.08	33.0	34.7	642.6	379	272.0	3:56	1.09	1.24	0.00
21:39:40	666.0	666.0	23.5	31	109	225	2401	761	720	1.08	1.08	33.1	34.7	646.8	380	273.0	3:59	1.09	1.20	0.01
21:41:32	667.0	667.0	33.6	32	109	233	2411	761	701	1.08	1.08	33.2	34.7	649.8	379	274.0	4:01	1.09	1.12	0.01
21:42:06	668.0	668.0	113.7	28	109	213	2453	761	703	1.08	1.08	33.3	34.7	650.7	379	275.0	4:01	1.09	0.74	0.01
21:42:27	669.1	669.1	192.8	22	110	193	2438	761	685	1.08	1.08	33.3	34.7	651.2	380	276.1	4:02	1.09	0.56	0.00
21:42:44	670.1	670.1	209.0	15	109	191	2417	761	680	1.08	1.08	33.3	34.7	651.6	382	277.1	4:02	1.09	0.50	0.00
21:43:06	671.0	671.0	162.4	9	110	108	2431	761	689	1.08	1.08	33.3	34.7	652.0	381	278.0	4:02	1.09	0.48	0.00
21:43:41	672.0	672.0	102.9	3	110	106	2421	760	693	1.08	1.08	33.3	34.7	652.3	384	279.0	4:03	1.09	0.47	0.00
21:44:12	673.1	673.1	125.4	1	110	96	2331	760	684	1.08	1.08	33.4	34.7	652.6	386	280.1	4:03	1.09	0.36	0.00
21:44:39	674.0	674.0	131.0	1	110	119	2408	760	671	1.08	1.08	33.4	34.7	652.6	388	281.0	4:04	1.09	0.36	0.00
21:45:07	675.1	675.1	141.7	1	110	157	2413	760	676	1.08	1.08	33.4	34.7	652.6	390	282.1	4:04	1.09	0.36	0.00
21:45:48	676.0	676.0	107.5	0	110	222	2419	761	668	1.08	1.08	33.4	34.7	652.6	394	283.0	4:05	1.09	0.35	0.00
21:46:35	677.1	677.1	90.4	-0	110	217	2416	761	671	1.08	1.08	33.4	34.7	652.6	398	284.1	4:05	1.09	0.34	0.00
21:47:16	678.0	678.0	87.3	0	110	140	2411	761	671	1.08	1.08	33.4	34.7	652.6	402	285.0	4:06	1.09	0.29	0.00
21:47:46	679.0	679.0	118.7	1	110	208	2296	760	671	1.08	1.08	33.4	34.7	652.6	405	286.0	4:07	1.09	0.36	0.00
21:48:20	680.1	680.1	115.4	1	109	202	2424	761	669	1.08	1.08	33.5	34.7	652.6	405	287.1	4:07	1.09	0.37	0.00
21:48:59	681.0	681.0	92.9	2	110	198	2412	761	674	1.08	1.08	33.5	34.7	652.6	408	288.0	4:08	1.09	0.41	0.00
21:57:45	682.0	682.0	74.2	3	107	146	2403	759	704	1.08	1.08	33.4	33.6	656.5	434	289.0	4:09	1.09	0.53	0.00
21:58:22	683.1	683.1	105.9	4	109	131	2411	759	761	1.08	1.08	33.3	32.0	656.7	429	290.1	4:09	1.09	0.50	0.00
21:59:11	684.1	684.1	115.4	1	110	98	2381	760	753	1.08	1.08	33.3	32.8	657.0	433	291.1	4:10	1.09	0.36	0.00
21:59:52	685.1	685.1	87.4	3	111	113	2397	760	747	1.08	1.08	33.3	33.4	657.5	432	292.1	4:10	1.09	0.51	0.00
22:00:39	686.0	686.0	75.5	4	111	117	2423	762	748	1.08	1.08	33.3	33.7	658.3	432	293.0	4:11	1.09	0.57	0.00
22:01:19	687.1	687.1	104.9	8	111	145	2428	763	745	1.08	1.08	33.3	33.9	658.8	440	294.1	4:12	1.09	0.59	0.00
22:01:47	688.0	688.0	126.0	11	111	152	2434	763	757	1.08	1.08	33.3	34.0	659.1	440	295.0	4:12	1.09	0.57	0.00
22:02:21	689.1	689.1	119.2	8	111	131	2441	761	756	1.08	1.08	33.4	34.0	659.3	442	296.1	4:13	1.09	0.54	0.00
22:02:52	690.0	690.0	114.3	6	110	153	2354	761	748	1.08	1.08	33.4	34.0	659.4	440	297.0	4:13	1.09	0.51	0.00
22:04:01	691.0	691.0	81.3	1	109	118	2410	761	741	1.08	1.08	33.3	34.0	660.1	440	298.0	4:14	1.09	0.42	0.00
22:04:48	692.0	692.0	76.2	6	109	137	2414	762	746	1.08	1.08	33.3	34.1	660.6	439	299.0	4:15	1.09	0.60	0.00
22:05:25	693.1	693.1	105.3	8	110	144	2419	762	752	1.08	1.08	33.3	34.1	661.1	441	300.1	4:16	1.09	0.57	0.00
22:05:54	694.0	694.0	112.5	8	110	128	2435	763	760	1.08	1.08	33.4	34.1	661.6	441	301.0	4:16	1.09	0.57	0.00
22:06:23	695.1	695.1	135.5	7	110	128	2384	763	759	1.08	1.08	33.3	34.1	662.0	444	302.1	4:17	1.09	0.51	0.00
22:06:48	696.1	696.1	157.4	6	110	139	2344	763	750	1.08	1.08	33.3	34.1	662.2	442	303.1	4:17	1.09	0.47	0.00

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
22:07:13	697.0	697.0	143.0	6	110	124	2402	763	746	1.08	1.08	33.3	34.1	662.5	442	304.0	4:17	1.09	0.48	0.00
22:07:47	698.1	698.1	113.9	4	110	106	2405	762	757	1.08	1.08	33.3	34.1	662.8	446	305.1	4:18	1.09	0.48	0.00
22:08:45	699.1	699.1	61.9	1	110	117	2405	762	753	1.08	1.08	33.3	34.1	663.3	445	306.1	4:19	1.09	0.51	0.00
22:09:17	700.1	700.1	111.6	4	110	131	2423	762	741	1.08	1.08	33.3	34.1	663.5	444	307.1	4:19	1.09	0.49	0.00
22:09:48	701.0	701.0	114.3	4	110	120	2416	762	754	1.08	1.08	33.3	34.2	663.8	445	308.0	4:20	1.09	0.49	0.00
22:10:22	702.0	702.0	105.9	6	110	127	2332	762	751	1.08	1.08	33.3	34.2	664.0	446	309.0	4:21	1.09	0.54	0.00
?:10:58	703.0	703.0	104.3	6	110	124	2422	761	745	1.08	1.08	33.3	34.2	664.3	448	310.0	4:21	1.09	0.54	0.00
2:11:30	704.0	704.0	109.1	5	110	125	2424	761	745	1.08	1.08	33.3	34.2	664.5	448	311.0	4:22	1.09	0.52	0.00
22:12:04	705.0	705.0	105.3	6	109	183	2419	763	756	1.08	1.08	33.3	34.2	664.7	448	312.0	4:22	1.09	0.55	0.00
22:12:39	706.1	706.1	125.6	8	110	145	2427	763	761	1.08	1.08	33.3	34.2	664.8	448	313.1	4:23	1.09	0.53	0.00
22:13:03	707.0	707.0	145.9	8	110	133	2416	763	753	1.08	1.08	33.3	34.2	665.0	448	314.0	4:23	1.09	0.51	0.00
22:13:32	708.0	708.0	124.1	8	110	124	2434	762	740	1.08	1.08	33.3	34.2	665.1	449	315.0	4:24	1.09	0.54	0.00
22:14:15	709.0	709.0	83.4	9	110	133	2380	762	743	1.08	1.08	33.3	34.2	665.4	450	316.0	4:24	1.09	0.63	0.00
22:14:46	710.0	710.0	116.1	7	110	133	2425	762	738	1.08	1.08	33.3	34.2	665.5	451	317.0	4:25	1.09	0.54	0.00
22:25:19	711.0	711.0	158.8	2	106	170	2449	761	765	1.08	1.08	33.2	33.4	677.3	441	318.0	4:25	1.09	0.37	0.00
22:25:54	712.1	712.1	93.7	2	108	202	2446	761	769	1.08	1.08	33.2	33.2	677.7	442	319.1	4:26	1.09	0.40	0.00
22:26:20	713.0	713.0	106.9	4	108	185	2455	762	763	1.08	1.08	33.2	33.3	678.2	440	320.0	4:26	1.07	0.51	0.00
22:26:46	714.0	714.0	133.3	6	108	132	2443	762	769	1.08	1.08	33.2	33.4	678.5	440	321.0	4:27	1.07	0.47	0.01
22:27:45	715.0	715.0	63.3	12	109	152	2392	762	767	1.08	1.08	33.2	33.5	679.6	438	322.0	4:28	1.07	0.76	0.00
22:28:47	716.0	716.0	58.1	20	108	184	2447	762	765	1.08	1.08	33.1	33.6	680.8	440	323.0	4:29	1.07	0.86	0.00
22:29:24	717.1	717.1	98.6	17	109	160	2451	763	763	1.08	1.08	33.1	33.7	681.6	440	324.1	4:29	1.07	0.70	0.00
22:29:49	718.1	718.1	144.0	15	109	155	2461	763	758	1.08	1.08	33.1	33.8	682.1	440	325.1	4:30	1.07	0.58	0.00
22:30:16	719.1	719.1	152.1	10	109	133	2445	763	749	1.08	1.08	33.1	33.8	682.6	442	326.1	4:30	1.07	0.52	0.00
22:30:57	720.0	720.0	86.4	8	109	148	2402	763	753	1.08	1.08	33.1	33.9	683.5	441	327.0	4:31	1.07	0.62	0.01
22:31:53	721.1	721.1	75.5	13	109	151	2439	762	755	1.08	1.08	33.1	34.0	684.5	444	328.1	4:32	1.08	0.71	0.01
22:32:18	722.0	722.0	139.8	11	109	151	2439	762	758	1.08	1.08	33.1	34.0	685.0	447	329.0	4:32	1.08	0.55	0.01
22:32:50	723.1	723.1	126.3	9	109	165	2459	763	745	1.08	1.08	33.1	34.0	685.7	447	330.1	4:33	1.08	0.56	0.01
22:33:22	724.1	724.1	112.5	10	109	148	2456	762	739	1.08	1.08	33.0	34.1	686.3	448	331.1	4:33	1.08	0.59	0.01
:33:53	725.0	725.0	115.4	11	108	168	2433	763	744	1.08	1.08	33.1	34.1	686.9	449	332.0	4:34	1.08	0.59	0.01
22:34:24	726.1	726.1	125.9	10	108	158	2404	763	737	1.08	1.08	33.0	34.1	687.6	450	333.1	4:34	1.08	0.57	0.01
22:34:56	727.0	727.0	110.8	11	108	176	2377	763	748	1.08	1.08	33.1	34.1	688.2	452	334.0	4:35	1.08	0.61	0.01
22:35:24	728.0	728.0	140.3	11	108	158	2395	763	752	1.08	1.08	33.1	34.2	688.8	455	335.0	4:35	1.08	0.55	0.01
22:36:16	729.1	729.1	72.6	13	108	181	2428	762	747	1.08	1.08	33.1	34.2	689.8	456	336.1	4:36	1.08	0.73	0.01
22:36:44	730.0	730.0	126.3	14	108	185	2430	763	744	1.08	1.08	33.1	34.2	690.3	460	337.0	4:37	1.08	0.61	0.01
22:37:18	731.1	731.1	114.9	14	109	180	2419	762	748	1.08	1.08	33.1	34.2	691.0	461	338.1	4:37	1.08	0.63	0.01
22:37:58	732.0	732.0	89.7	14	108	193	2435	763	744	1.08	1.08	33.1	34.2	691.8	462	339.0	4:38	1.08	0.69	0.01
22:38:33	733.0	733.0	102.1	14	109	206	2376	763	755	1.08	1.08	33.1	34.3	692.5	465	340.0	4:39	1.08	0.67	0.01
22:38:59	734.0	734.0	138.4	13	108	172	2421	763	752	1.08	1.08	33.1	34.3	693.1	464	341.0	4:39	1.08	0.58	0.01
22:39:28	735.1	735.1	141.2	12	109	146	2418	762	748	1.08	1.08	33.1	34.3	693.6	464	342.1	4:40	1.08	0.56	0.01
22:39:56	736.0	736.0	125.9	10	109	152	2420	763	752	1.08	1.08	33.1	34.3	694.2	466	343.0	4:40	1.08	0.57	0.01
22:40:27	737.0	737.0	124.8	10	109	155	2410	762	762	1.08	1.08	33.1	34.3	694.8	466	344.0	4:41	1.08	0.57	0.01
22:40:55	738.0	738.0	128.6	9	109	143	2408	763	754	1.08	1.08	33.1	34.3	695.4	468	345.0	4:41	1.08	0.55	0.01
22:41:29	739.0	739.0	105.9	10	109	160	2418	763	754	1.08	1.08	33.1	34.3	696.1	470	346.0	4:42	1.08	0.60	0.01
22:50:21	740.1	740.1	64.6	5	108	124	2324	759	744	1.08	1.08	33.1	34.4	703.2	496	347.1	4:43	1.09	0.61	0.00
22:50:52	741.1	741.1	126.3	6	109	152	2381	758	743	1.08	1.08	33.1	34.5	703.9	495	348.1	4:43	1.09	0.51	0.00
22:51:20	742.1	742.1	128.6	8	109	158	2329	759	743	1.08	1.08	33.1	34.5	704.4	496	349.1	4:44	1.09	0.53	0.01
22:51:51	743.1	743.1	115.7	9	109	146	2375	759	746	1.08	1.08	33.1	34.5	705.0	495	350.1	4:44	1.09	0.57	0.01
22:52:21	744.0	744.0	119.0	10	109	150	2404	760	742	1.08	1.08	33.1	34.4	705.7	495	351.0	4:45	1.09	0.58	0.01
22:52:55	745.1	745.1	114.9	10	109	152	2396	761	744	1.08	1.08	33.1	34.4	706.2	496	352.1	4:45	1.09	0.59	0.01
22:53:35	746.1	746.1	89.5	13	109	164	2385	761	741	1.08	1.08	33.1	34.3	707.1	497	353.1	4:46	1.09	0.61	0.01
22:54:19	747.0	747.0	80.4	15	109	173	2405	762	732	1.08	1.08	33.1	34.3	708.0	499	354.0	4:46	1.09	0.72	0.01

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
22:54:50	748.0	748.0	125.9	15	109	181	2404	763	735	1.08	1.08	33.1	34.3	708.6	500	355.0	4:47	1.09	0.62	0.01
22:55:24	749.1	749.1	116.8	15	109	172	2353	762	729	1.08	1.08	33.2	34.2	709.2	500	356.1	4:48	1.09	0.63	0.01
22:56:01	750.0	750.0	96.0	16	109	194	2414	762	738	1.08	1.08	33.1	34.3	710.0	501	357.0	4:48	1.09	0.69	0.01
22:56:42	751.0	751.0	93.1	17	109	170	2403	762	729	1.08	1.08	33.1	34.3	710.8	502	358.0	4:49	1.09	0.71	0.01
22:57:25	752.0	752.0	83.1	14	109	145	2422	762	731	1.08	1.08	33.2	34.4	711.7	505	359.0	4:50	1.09	0.69	0.01
22:57:56	753.0	753.0	115.2	12	109	188	2422	762	724	1.08	1.08	33.2	34.4	712.3	508	360.0	4:50	1.09	0.61	0.01
22:58:29	754.0	754.0	109.1	13	109	211	2394	762	731	1.08	1.08	33.1	34.5	712.9	509	361.0	4:51	1.09	0.63	0.01
22:58:58	755.0	755.0	124.1	14	109	211	2349	762	728	1.08	1.08	33.1	34.5	713.6	508	362.0	4:51	1.09	0.61	0.01
22:59:32	756.1	756.1	126.3	14	109	170	2405	762	735	1.08	1.08	33.2	34.6	714.3	510	363.1	4:52	1.09	0.60	0.01
23:00:00	757.1	757.1	127.4	13	109	170	2420	763	734	1.09	1.08	33.2	34.6	714.7	511	364.1	4:52	1.09	0.59	0.01
23:00:41	758.0	758.0	86.5	14	109	170	2403	763	724	1.10	1.10	33.2	34.7	715.2	514	365.0	4:53	1.09	0.69	0.01
23:03:32	759.0	759.0	21.0	22	109	168	2396	763	729	1.10	1.10	33.2	34.8	719.5	521	366.0	4:56	1.10	1.12	0.01
23:06:47	760.0	760.0	19.6	22	109	169	2381	763	746	1.10	1.10	33.3	35.0	724.6	522	367.0	4:59	1.10	1.13	0.01
23:08:10	761.0	761.0	43.1	20	109	182	2403	763	753	1.10	1.10	33.3	35.0	727.0	520	368.0	5:00	1.10	0.91	0.01
23:09:07	762.0	762.0	65.8	15	109	174	2416	763	757	1.10	1.10	33.4	35.0	728.3	518	369.0	5:01	1.10	0.75	0.01
23:10:43	763.0	763.0	37.5	19	109	172	2382	763	766	1.10	1.10	33.4	35.0	730.8	516	370.0	5:03	1.10	0.94	0.01
23:13:27	764.0	764.0	22.0	24	109	183	2400	763	758	1.10	1.10	33.5	35.0	735.5	510	371.0	5:06	1.10	1.12	0.01
23:15:49	765.0	765.0	25.6	25	109	205	2451	763	770	1.10	1.10	33.6	35.1	739.0	506	372.0	5:08	1.10	1.10	0.01
23:18:27	766.0	766.0	22.7	29	109	227	2451	763	757	1.10	1.10	33.6	35.0	739.4	502	373.0	5:11	1.11	1.17	0.01
23:20:51	767.0	767.0	25.0	32	109	224	2455	763	758	1.10	1.10	33.7	35.0	739.4	505	374.0	5:13	1.11	1.18	0.01
23:22:53	768.0	768.0	29.5	31	109	225	2473	763	736	1.09	1.10	33.8	35.1	741.8	503	375.0	5:15	1.11	1.12	0.01
23:35:41	769.0	769.0	17.3	31	110	213	2398	758	751	1.09	1.09	33.9	35.1	757.4	497	376.0	5:19	1.11	1.26	0.01
23:37:25	770.0	770.0	34.6	30	111	257	2463	758	737	1.09	1.09	33.9	34.9	758.5	494	377.0	5:20	1.11	1.07	0.01
23:39:06	771.0	771.0	37.7	32	111	253	2429	758	741	1.09	1.09	33.9	34.9	759.0	493	378.0	5:22	1.11	1.07	0.01
23:40:36	772.0	772.0	35.0	31	111	221	2463	758	714	1.09	1.09	34.0	35.0	759.5	491	379.0	5:23	1.07	1.11	0.01
23:42:03	773.0	773.0	31.8	30	111	221	2436	758	713	1.09	1.09	34.0	35.0	760.0	492	380.0	5:25	1.07	1.12	0.01
23:43:39	774.0	774.0	35.3	31	111	231	2466	758	709	1.09	1.09	34.0	35.2	760.7	494	381.0	5:26	1.08	1.11	0.01
23:45:37	775.0	775.0	32.3	31	111	230	2431	758	714	1.09	1.09	34.1	35.2	761.5	493	382.0	5:28	1.08	1.13	0.01
23:47:30	776.0	776.0	31.8	28	111	224	2465	759	708	1.09	1.09	34.1	35.4	762.3	495	383.0	5:30	1.08	1.10	0.01
23:48:23	777.0	777.0	70.9	26	111	249	2459	759	728	1.09	1.09	34.1	35.4	762.6	496	384.0	5:31	1.08	0.87	0.01
23:49:35	778.0	778.0	50.0	27	111	242	2422	758	709	1.09	1.09	34.1	35.5	763.2	496	385.0	5:32	1.08	0.97	0.01
23:50:27	779.0	779.0	69.2	24	111	225	2473	758	719	1.09	1.09	34.2	35.5	763.5	498	386.0	5:33	1.08	0.86	0.01
23:51:11	780.1	780.1	87.8	25	111	206	2417	758	717	1.09	1.09	34.2	35.5	763.8	502	387.1	5:34	1.08	0.81	0.01
23:52:17	781.0	781.0	54.0	26	111	216	2442	759	722	1.09	1.09	34.2	35.6	764.3	504	388.0	5:35	1.08	0.94	0.01
23:53:25	782.0	782.0	52.6	29	111	241	2431	759	714	1.09	1.09	34.2	35.6	764.7	506	389.0	5:36	1.09	0.97	0.01
23:55:30	783.0	783.0	29.5	30	111	232	2478	760	715	1.09	1.09	34.2	35.7	765.6	508	390.0	5:38	1.09	1.14	0.01
23:57:20	784.0	784.0	32.7	31	111	240	2455	760	749	1.09	1.09	34.3	35.8	766.4	514	391.0	5:40	1.09	1.12	0.01
23:58:48	785.0	785.0	40.9	31	111	253	2496	760	838	1.09	1.09	34.3	35.8	766.9	506	392.0	5:42	1.09	1.06	0.01
Sunday 24th October																				
00:00:33	786.0	786.0	37.3	28	111	251	2457	760	760	1.09	1.09	34.2	35.8	767.7	486	393.0	5:43	1.09	1.05	0.01
00:03:07	787.0	787.0	23.4	28	111	232	2468	761	713	1.09	1.09	34.2	35.8	768.7	490	394.0	5:46	1.09	1.17	0.01
00:05:37	788.0	788.0	23.9	29	111	232	2489	760	723	1.09	1.09	34.3	35.8	769.8	499	395.0	5:48	1.10	1.17	0.01
00:07:54	789.0	789.0	26.8	27	111	238	2462	761	723	1.09	1.09	34.4	35.9	770.7	505	396.0	5:51	1.10	1.12	0.01
00:09:23	790.0	790.0	40.4	26	111	235	2502	761	722	1.09	1.09	34.4	35.9	771.3	506	397.0	5:52	1.10	0.99	0.01
00:10:45	791.0	791.0	43.9	24	111	207	2471	762	732	1.09	1.09	34.5	36.0	771.9	509	398.0	5:54	1.10	0.95	0.01
00:11:25	792.0	792.0	90.0	26	111	216	2494	762	727	1.09	1.09	34.5	36.0	772.2	509	399.0	5:54	1.10	0.79	0.01
00:12:19	793.0	793.0	70.8	25	110	221	2502	762	749	1.09	1.09	34.5	36.0	772.7	510	400.0	5:55	1.10	0.84	0.01
00:12:55	794.0	794.0	100.0	20	111	214	2501	762	744	1.09	1.09	34.6	36.1	773.0	512	401.0	5:56	1.10	0.71	0.01
00:13:39	795.0	795.0	81.8	19	111	265	2439	762	743	1.09	1.09	34.6	36.0	773.3	511	402.0	5:56	1.10	0.75	0.01
00:14:32	796.1	796.1	67.9	18	109	263	2462	762	740	1.09	1.09	34.6	36.0	773.8	513	403.1	5:57	1.10	0.77	0.01

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
00:20:19	797.5	797.5	182.3	6	95	270	2456	762	745	1.09	1.09	34.7	36.1	777.2	518	404.5	5:58	1.10	0.34	0.01
00:28:40	798.0	798.0	18.2	1	102	85	2477	763	750	1.09	1.09	34.7	36.2	781.3	520	405.0	6:00	1.10	0.65	0.01
00:29:07	799.0	799.0	145.9	9	106	143	2343	736	743	1.09	1.09	34.8	32.1	781.6	516	406.0	6:00	1.10	0.52	0.01
00:29:32	800.1	800.1	160.0	8	106	151	2329	736	755	1.09	1.09	34.9	32.5	781.9	517	407.1	6:01	1.10	0.49	0.01
00:40:58	801.0	801.0	101.2	9	102	121	2337	737	752	1.09	1.09	34.8	33.2	783.4	526	408.0	6:01	1.10	0.55	0.00
00:41:20	802.0	802.0	163.6	11	99	199	2403	748	745	1.09	1.09	34.7	34.8	783.5	525	409.0	6:02	1.10	0.51	0.00
00:41:45	803.1	803.1	157.9	21	96	168	2435	751	736	1.09	1.09	34.7	34.9	783.8	524	410.1	6:02	1.10	0.57	0.00
00:51:23	804.0	804.0	75.8	10	103	152	2419	733	703	1.09	1.09	34.6	34.2	785.2	534	411.0	6:03	1.10	0.64	0.00
00:52:35	805.1	805.1	51.9	19	110	186	2416	743	706	1.09	1.09	34.5	33.9	786.0	533	412.1	6:04	1.10	0.87	0.00
00:53:02	806.0	806.0	130.4	24	111	200	2352	748	723	1.09	1.09	34.5	34.0	786.4	531	413.0	6:05	1.10	0.68	0.00
00:53:33	807.1	807.1	139.4	23	111	204	2372	748	732	1.09	1.09	34.5	34.0	786.6	530	414.1	6:05	1.10	0.65	0.00
00:56:07	808.1	808.1	23.3	26	111	167	2449	752	729	1.09	1.09	34.5	33.9	787.2	526	415.1	6:08	1.10	1.14	0.00
00:56:40	809.1	809.1	109.1	26	111	213	2468	766	740	1.09	1.09	34.4	34.0	787.4	526	416.1	6:08	1.10	0.74	0.00
00:57:15	810.1	810.1	104.4	25	111	208	2478	767	762	1.09	1.09	34.3	34.1	787.6	523	417.1	6:09	1.10	0.74	0.01
00:57:40	811.1	811.1	144.0	22	111	172	2536	767	744	1.09	1.09	34.3	34.2	787.7	524	418.1	6:09	1.10	0.64	0.01
00:58:11	812.0	812.0	113.9	20	111	166	2518	767	750	1.09	1.09	34.3	34.3	787.9	525	419.0	6:10	1.10	0.68	0.01
00:58:52	813.0	813.0	87.8	22	111	177	2508	767	754	1.09	1.09	34.3	34.5	788.3	523	420.0	6:11	1.10	0.76	0.01
00:59:38	814.0	814.0	78.3	25	111	212	2503	768	780	1.09	1.09	34.2	34.6	788.6	523	421.0	6:11	1.10	0.82	0.01
01:01:18	815.0	815.0	36.9	28	111	188	2502	769	778	1.09	1.09	34.2	34.9	789.2	523	422.0	6:13	1.10	1.04	0.01
01:02:45	816.0	816.0	41.2	30	111	193	2516	769	738	1.09	1.09	34.1	35.3	790.4	522	423.0	6:14	1.10	1.03	0.01
01:05:40	817.0	817.0	21.4	29	111	185	2500	769	750	1.09	1.09	34.1	35.8	793.4	523	424.0	6:17	1.10	1.19	0.01
01:08:17	818.0	818.0	22.9	29	111	193	2492	769	761	1.09	1.09	34.2	36.0	796.1	520	425.0	6:20	1.10	1.18	0.01
01:11:11	819.0	819.0	20.7	30	111	188	2504	769	761	1.09	1.09	34.4	36.1	796.6	518	426.0	6:23	1.10	1.22	0.01
01:12:59	820.0	820.0	33.3	29	111	191	2519	770	751	1.09	1.09	34.5	36.1	796.9	512	427.0	6:25	1.10	1.07	0.01
01:14:17	821.0	821.0	46.2	27	111	195	2526	771	751	1.09	1.09	34.6	36.1	797.7	511	428.0	6:26	1.10	0.97	0.01
01:16:21	822.0	822.0	29.0	27	111	185	2492	770	750	1.09	1.09	34.7	36.2	798.0	497	429.0	6:28	1.10	1.09	0.01
01:19:33	823.0	823.0	19.6	27	111	180	2528	771	753	1.09	1.09	34.9	36.2	800.4	496	430.0	6:31	1.10	1.20	0.03
01:26:12	824.0	824.0	9.0	26	111	148	2512	771	764	1.09	1.09	35.1	36.2	804.2	486	431.0	6:38	1.10	1.37	0.02
01:27:48	825.0	825.0	44.4	26	111	192	2528	773	757	1.09	1.09	35.3	36.3	806.3	487	432.0	6:39	1.10	0.97	0.02
01:29:02	826.0	826.0	48.4	24	111	170	2513	772	752	1.09	1.09	35.4	36.4	807.7	485	433.0	6:41	1.10	0.92	0.02
01:40:58	827.0	827.0	14.8	22	108	169	2530	770	767	1.09	1.09	35.5	36.1	814.8	501	434.0	6:45	1.10	1.21	0.01
01:42:05	828.0	828.0	53.6	33	110	237	2568	771	790	1.09	1.09	35.6	35.7	815.4	498	435.0	6:46	1.10	0.99	0.01
01:42:59	829.0	829.0	66.7	33	111	219	2577	773	782	1.09	1.09	35.6	35.7	815.9	498	436.0	6:47	1.10	0.93	0.01
01:44:40	830.0	830.0	35.5	34	111	233	2554	773	770	1.09	1.09	35.6	35.8	816.5	497	437.0	6:49	1.10	1.12	0.01
01:46:05	831.0	831.0	44.2	34	111	213	2584	774	789	1.09	1.09	35.6	35.9	817.0	496	438.0	6:50	1.10	1.05	0.01
01:47:30	832.0	832.0	43.9	31	111	235	2587	774	785	1.09	1.09	35.6	36.1	817.5	496	439.0	6:51	1.10	1.03	0.01
01:48:26	833.0	833.0	63.7	29	111	203	2494	772	767	1.09	1.09	35.5	36.1	817.8	496	440.0	6:52	1.10	0.91	0.01
01:50:07	834.0	834.0	35.6	32	111	215	2565	770	768	1.09	1.09	35.5	36.3	818.4	494	441.0	6:54	1.10	1.09	0.01
01:51:11	835.0	835.0	57.1	35	111	215	2566	770	780	1.09	1.09	35.5	36.4	818.7	495	442.0	6:55	1.10	0.99	0.01
01:52:04	836.0	836.0	67.9	31	111	221	2531	770	800	1.09	1.09	35.5	36.5	819.0	496	443.0	6:56	1.10	0.91	0.01
01:53:07	837.0	837.0	59.5	33	111	224	2579	770	803	1.09	1.09	35.6	36.5	819.5	496	444.0	6:57	1.10	0.96	0.01
01:54:38	838.0	838.0	39.3	34	111	211	2583	771	808	1.09	1.09	35.6	36.5	820.4	496	445.0	6:59	1.10	1.09	0.02
01:55:58	839.0	839.0	47.4	35	111	229	2555	770	786	1.09	1.09	35.6	36.6	821.7	497	446.0	6:60	1.10	1.10	0.02
01:56:44	840.0	840.0	75.8	29	111	212	2577	770	754	1.09	1.09	35.6	36.6	822.0	498	447.0	7:01	1.10	0.86	0.02
01:57:43	841.0	841.0	61.0	31	111	209	2584	769	769	1.09	1.09	35.6	36.7	822.0	496	448.0	7:02	1.10	0.94	0.02
02:00:07	842.1	842.1	26.6	35	111	189	2577	768	772	1.09	1.09	35.7	36.7	822.7	496	449.1	7:04	1.10	1.20	0.02
02:01:07	843.0	843.0	59.7	32	111	204	2582	768	767	1.09	1.09	35.8	36.7	823.0	498	450.0	7:05	1.10	0.95	0.01
02:02:24	844.1	844.1	48.3	31	111	193	2537	768	778	1.09	1.09	35.8	36.8	823.3	496	451.1	7:06	1.10	1.01	0.01
02:03:26	845.0	845.0	57.4	33	111	231	2594	768	788	1.09	1.09	35.8	36.7	823.5	496	452.0	7:07	1.10	0.97	0.01
02:04:54	846.0	846.0	42.1	33	111	229	2576	767	758	1.09	1.09	35.8	36.8	823.7	496	453.0	7:09	1.10	1.06	0.01

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
02:06:09	847.0	847.0	50.0	32	105	297	2547	766	778	1.09	1.09	35.9	36.8	823.8	496	454.0	7:10	1.10	0.99	0.01
02:07:31	848.0	848.0	43.5	34	110	261	2597	767	775	1.09	1.09	35.9	36.8	824.0	496	455.0	7:11	1.10	1.06	0.01
02:09:13	849.0	849.0	36.1	34	111	242	2561	767	765	1.09	1.09	35.9	36.9	824.6	495	456.0	7:13	1.10	1.11	0.02
02:10:40	850.0	850.0	41.4	36	111	213	2585	766	762	1.09	1.09	36.0	36.9	825.8	496	457.0	7:15	1.10	1.08	0.02
02:11:54	851.0	851.0	48.4	32	111	206	2598	766	774	1.09	1.09	36.0	37.0	826.3	495	458.0	7:16	1.10	1.01	0.02
02:13:03	852.0	852.0	51.8	30	111	198	2536	765	779	1.09	1.09	36.0	37.0	826.5	495	459.0	7:17	1.10	0.97	0.02
02:15:55	853.0	853.0	21.3	30	111	190	2593	765	759	1.09	1.09	36.1	37.0	826.5	494	460.0	7:20	1.10	1.22	0.02
02:21:11	854.0	854.0	11.4	30	111	173	2569	764	775	1.09	1.09	36.2	37.1	829.0	492	461.0	7:25	1.10	1.37	0.02
02:25:23	855.0	855.0	14.5	26	111	173	2573	765	784	1.09	1.09	36.3	37.1	831.8	491	462.0	7:29	1.10	1.27	0.02
02:47:23	856.0	856.0	9.7	32	115	202	2554	758	770	1.09	1.09	36.4	36.1	841.4	469	463.0	7:36	1.10	1.45	0.01
02:50:00	857.0	857.0	22.8	33	115	221	2556	758	772	1.09	1.09	36.3	36.5	843.3	470	464.0	7:38	1.10	1.24	0.01
02:51:19	858.0	858.0	49.7	33	115	227	2567	758	774	1.09	1.09	36.3	36.8	844.3	468	465.0	7:39	1.10	1.13	0.01
02:52:48	859.0	859.0	39.8	33	115	196	2560	758	760	1.09	1.09	36.2	37.0	845.5	468	466.0	7:41	1.10	1.08	0.01
03:53:02	860.0	860.0	28.1	29	107	180	2543	763	738	1.09	1.09	37.3	38.2	859.4	461	467.0	7:42	1.10	1.14	0.01
03:54:45	861.0	861.0	34.6	27	107	209	2599	766	724	1.09	1.09	38.0	38.9	859.4	461	468.0	7:44	1.07	1.07	0.01
03:57:43	862.0	862.0	20.8	32	108	210	2582	767	724	1.09	1.09	37.9	38.8	859.5	465	469.0	7:47	1.07	1.26	0.01
03:59:42	863.0	863.0	30.1	30	108	200	2578	768	724	1.09	1.09	37.9	38.7	859.5	469	470.0	7:49	1.07	1.13	0.01
04:01:24	864.0	864.0	35.3	32	108	202	2588	767	724	1.09	1.09	37.8	38.7	859.5	469	471.0	7:51	1.07	1.12	0.01
04:02:48	865.0	865.0	44.2	32	108	206	2538	767	720	1.09	1.09	37.7	38.6	859.6	467	472.0	7:52	1.07	1.04	0.01
04:03:48	866.1	866.1	62.6	30	108	220	2588	767	726	1.09	1.09	37.8	38.6	859.6	466	473.1	7:53	1.08	0.94	0.01
04:04:41	867.0	867.0	67.9	33	108	217	2582	767	731	1.09	1.09	37.8	38.6	859.6	468	474.0	7:54	1.08	0.94	0.01
04:05:25	868.0	868.0	80.9	35	108	215	2581	767	732	1.09	1.09	37.8	38.6	859.6	467	475.0	7:55	1.08	0.91	0.01
04:06:17	869.0	869.0	73.5	36	108	233	2582	767	724	1.09	1.09	37.8	38.6	859.6	467	476.0	7:56	1.08	0.94	0.01
04:07:07	870.0	870.0	71.3	36	108	217	2526	767	727	1.09	1.09	37.8	38.6	859.6	468	477.0	7:56	1.08	0.95	0.01
04:08:06	871.0	871.0	63.7	32	108	225	2572	767	723	1.09	1.09	37.7	38.7	859.7	470	478.0	7:57	1.08	0.94	0.01
04:08:59	872.0	872.0	67.5	30	108	200	2568	767	734	1.09	1.09	37.7	38.7	859.7	469	479.0	7:58	1.08	0.91	0.01
04:10:19	873.0	873.0	45.0	30	108	198	2545	767	728	1.09	1.09	37.7	38.8	859.7	473	480.0	7:60	1.08	1.02	0.01
04:11:47	874.0	874.0	40.9	31	108	213	2568	766	720	1.09	1.09	37.7	38.8	859.7	471	481.0	8:01	1.08	1.06	0.01
04:13:15	875.0	875.0	40.9	33	108	235	2537	766	719	1.09	1.09	37.7	38.7	859.7	472	482.0	8:03	1.08	1.07	0.01
04:14:08	876.1	876.1	71.3	29	108	200	2570	766	726	1.09	1.09	37.7	38.7	859.8	471	483.1	8:03	1.08	0.88	0.01
04:15:05	877.0	877.0	62.9	29	108	191	2582	765	733	1.09	1.09	37.7	38.7	859.8	470	484.0	8:04	1.09	0.92	0.01
04:15:58	878.0	878.0	67.9	30	108	200	2584	765	731	1.09	1.09	37.7	38.7	859.8	472	485.0	8:05	1.09	0.91	0.01
04:16:53	879.0	879.0	65.1	33	108	223	2530	765	727	1.09	1.09	37.8	38.7	859.8	474	486.0	8:06	1.09	0.94	0.01
04:22:35	880.0	880.0	10.5	33	108	194	2564	764	720	1.09	1.09	37.7	38.7	859.9	478	487.0	8:12	1.09	1.44	0.01
04:36:44	881.0	881.0	4.2	35	110	148	2543	761	718	1.09	1.09	37.5	39.0	863.1	485	488.0	8:26	1.10	1.71	0.02
04:53:22	882.0	882.0	3.6	33	111	139	2525	760	742	1.09	1.09	37.7	38.9	877.0	465	489.0	8:43	1.10	1.73	0.02
05:06:09	883.0	883.0	4.7	32	111	157	2514	762	746	1.09	1.09	37.9	39.0	880.4	475	490.0	8:55	1.10	1.65	0.01
05:07:30	884.0	884.0	45.8	27	111	204	2537	762	734	1.09	1.09	37.8	39.1	880.5	476	491.0	8:57	1.10	0.97	0.01
05:27:28	885.0	885.0	22.6	26	109	164	2524	763	746	1.09	1.09	37.3	38.4	881.0	502	492.0	8:59	1.10	1.00	0.01
05:29:03	886.1	886.1	41.9	28	109	213	2581	767	750	1.09	1.09	36.8	37.9	881.1	501	493.1	9:01	1.10	1.00	0.01
05:30:09	887.0	887.0	54.1	28	109	217	2552	765	754	1.09	1.09	36.7	37.8	881.1	502	494.0	9:02	1.10	0.95	0.01
05:31:24	888.0	888.0	52.2	29	110	206	2511	764	749	1.09	1.09	36.6	37.9	881.2	503	495.0	9:03	1.10	0.97	0.01
05:32:30	889.0	889.0	54.3	32	110	222	2550	765	755	1.09	1.09	36.5	37.9	881.3	503	496.0	9:05	1.10	0.97	0.01
05:34:28	890.0	890.0	30.4	28	110	182	2556	765	762	1.09	1.09	36.5	38.1	881.4	509	497.0	9:06	1.10	1.10	0.01
05:35:55	891.0	891.0	41.4	29	110	201	2552	761	767	1.09	1.09	36.4	38.3	881.5	512	498.0	9:08	1.10	1.02	0.01
05:37:12	892.0	892.0	49.0	30	110	217	2544	765	778	1.09	1.09	36.4	38.4	881.5	513	499.0	9:09	1.10	0.99	0.01
05:37:58	893.1	893.1	80.0	27	110	194	2486	765	767	1.09	1.09	36.4	38.4	881.6	514	500.1	9:10	1.10	0.83	0.01
05:38:40	894.0	894.0	85.0	26	110	198	2528	765	768	1.09	1.09	36.4	38.4	881.6	515	501.0	9:11	1.10	0.80	0.01
05:39:33	895.0	895.0	67.9	24	110	173	2547	765	771	1.09	1.09	36.4	38.5	881.6	516	502.0	9:12	1.10	0.85	0.01
05:40:45	896.0	896.0	50.0	25	110	194	2535	766	773	1.09	1.09	36.4	38.5	881.7	519	503.0	9:13	1.10	0.94	0.01

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
05:41:45	897.0	897.0	59.5	26	110	190	2481	765	778	1.09	1.09	36.4	38.6	881.7	521	504.0	9:14	1.10	0.90	0.01
05:42:45	898.0	898.0	62.4	26	110	176	2543	765	782	1.09	1.09	36.4	38.7	881.8	521	505.0	9:15	1.10	0.88	0.01
05:43:46	899.0	899.0	62.1	28	110	200	2544	765	781	1.09	1.09	36.4	38.7	881.9	524	506.0	9:16	1.10	0.90	0.01
05:44:45	900.0	900.0	60.3	24	110	185	2549	765	772	1.09	1.09	36.4	38.7	881.9	524	507.0	9:17	1.10	0.87	0.01
05:45:39	901.0	901.0	66.7	25	110	196	2491	765	774	1.09	1.09	36.4	38.8	882.0	525	508.0	9:18	1.10	0.86	0.01
05:47:25	902.0	902.0	35.0	30	110	197	2551	766	777	1.09	1.09	36.5	38.8	882.1	532	509.0	9:19	1.10	1.08	0.01
5:48:59	903.0	903.0	38.2	32	110	203	2493	766	776	1.09	1.09	36.5	38.9	882.2	531	510.0	9:21	1.10	1.07	0.01
05:49:48	904.0	904.0	73.5	30	110	194	2544	765	767	1.09	1.09	36.5	38.9	882.3	531	511.0	9:22	1.10	0.87	0.01
05:50:32	905.0	905.0	85.7	27	110	198	2556	766	777	1.09	1.09	36.6	38.9	882.3	533	512.0	9:23	1.10	0.81	0.01
05:51:16	906.1	906.1	86.7	25	110	179	2553	765	774	1.09	1.09	36.6	38.9	882.4	536	513.1	9:23	1.10	0.79	0.01
05:56:29	907.0	907.0	11.5	30	110	166	2510	765	766	1.09	1.09	36.6	38.9	882.7	541	514.0	9:28	1.10	1.38	0.01
05:57:25	908.0	908.0	71.3	31	110	211	2542	764	751	1.09	1.09	36.7	39.0	882.8	542	515.0	9:29	1.10	0.89	0.01
05:59:00	909.0	909.0	37.6	29	110	188	2553	760	757	1.09	1.09	36.8	39.0	883.2	543	516.0	9:31	1.10	1.05	0.01
06:02:00	910.0	910.0	21.2	30	110	215	2546	764	743	1.09	1.09	37.1	39.0	884.4	543	517.0	9:34	1.10	1.20	0.01
06:02:46	911.0	911.0	82.4	24	110	204	2496	764	733	1.09	1.09	37.1	38.9	884.4	543	518.0	9:35	1.10	0.79	0.01
06:03:46	912.0	912.0	60.0	22	110	191	2553	764	756	1.09	1.09	37.1	38.9	884.4	544	519.0	9:36	1.10	0.86	0.01
06:04:39	913.0	913.0	67.6	25	110	205	2566	764	727	1.09	1.09	37.1	38.9	884.4	545	520.0	9:37	1.10	0.86	0.01
06:15:56	914.0	914.0	25.6	24	107	179	2489	757	745	1.09	1.09	37.1	36.1	885.8	536	521.0	9:39	1.10	1.08	0.01
06:17:21	915.0	915.0	42.0	25	105	185	2522	752	741	1.09	1.09	37.1	35.6	886.6	531	522.0	9:40	1.07	0.99	0.02
06:18:38	916.0	916.0	45.7	28	105	192	2576	753	736	1.09	1.09	37.1	37.2	887.3	528	523.0	9:42	1.07	1.00	0.02
06:19:44	917.1	917.1	56.8	29	105	194	2474	753	756	1.09	1.09	37.1	37.4	888.1	525	524.1	9:43	1.07	0.96	0.02
06:21:18	918.0	918.0	38.0	32	105	214	2543	755	737	1.09	1.09	37.1	37.8	889.3	524	525.0	9:44	1.07	1.10	0.02
06:23:37	919.0	919.0	26.3	33	107	209	2551	762	748	1.09	1.09	37.0	37.9	891.0	529	526.0	9:47	1.07	1.21	0.02
06:26:16	920.0	920.0	22.6	31	107	202	2577	763	771	1.09	1.09	36.9	37.9	893.0	533	527.0	9:49	1.07	1.22	0.02
06:28:24	921.0	921.0	28.1	31	107	220	2549	763	768	1.09	1.09	36.8	37.9	894.6	532	528.0	9:52	1.07	1.16	0.02
06:30:50	922.0	922.0	24.7	32	107	240	2554	763	779	1.09	1.09	36.7	38.1	896.4	534	529.0	9:54	1.08	1.21	0.02
06:32:56	923.0	923.0	29.0	34	107	242	2568	763	795	1.09	1.09	36.6	38.3	898.0	534	530.0	9:56	1.08	1.17	0.02
06:35:51	924.0	924.0	20.6	32	107	241	2560	763	785	1.09	1.09	36.5	38.3	900.2	539	531.0	9:59	1.08	1.25	0.02
06:39:34	925.0	925.0	16.1	33	107	231	2575	764	789	1.09	1.09	36.5	38.4	903.0	544	532.0	10:03	1.08	1.33	0.02
06:42:26	926.0	926.0	20.9	33	107	227	2558	764	777	1.09	1.09	36.6	38.4	905.2	546	533.0	10:06	1.09	1.25	0.02
06:45:08	927.0	927.0	22.2	32	107	209	2559	764	788	1.09	1.09	36.7	38.5	907.2	546	534.0	10:08	1.09	1.22	0.03
06:47:47	928.0	928.0	22.6	31	107	245	2557	764	788	1.09	1.09	36.9	38.4	909.2	546	535.0	10:11	1.09	1.20	0.03
06:50:07	929.0	929.0	25.7	32	107	246	2587	763	779	1.09	1.09	37.0	38.4	911.0	550	536.0	10:13	1.09	1.18	0.02
06:52:55	930.0	930.0	21.4	30	107	222	2568	764	783	1.09	1.09	37.1	38.4	913.1	549	537.0	10:16	1.09	1.20	0.03
06:56:09	931.0	931.0	19.8	31	107	259	2610	765	783	1.09	1.09	37.2	38.4	915.5	551	538.0	10:19	1.10	1.24	0.03
06:59:51	932.0	932.0	16.2	32	107	239	2607	764	794	1.09	1.09	37.3	38.3	918.1	548	539.0	10:23	1.10	1.29	0.03
07:02:49	933.0	933.0	20.8	30	107	224	2584	764	789	1.09	1.09	37.3	38.3	919.3	549	540.0	10:26	1.10	1.24	0.02
07:05:24	934.0	934.0	23.2	32	109	247	2603	764	785	1.09	1.09	37.3	38.4	920.3	550	541.0	10:29	1.10	1.21	0.02
07:08:47	935.0	935.0	18.0	32	109	245	2652	765	779	1.09	1.09	37.4	38.4	921.7	550	542.0	10:32	1.10	1.27	0.02
07:12:41	936.0	936.0	15.4	32	109	248	2695	767	783	1.09	1.09	37.4	38.6	923.3	550	543.0	10:36	1.10	1.32	0.02
07:15:15	937.0	937.0	23.3	32	109	236	2666	767	760	1.09	1.09	37.4	38.7	924.1	550	544.0	10:38	1.10	1.20	0.02
07:18:26	938.0	938.0	18.8	30	109	249	2687	767	774	1.09	1.09	37.5	38.7	924.9	549	545.0	10:42	1.10	1.24	0.02
07:21:24	939.0	939.0	20.2	30	109	234	2635	768	770	1.09	1.09	37.6	38.7	925.7	546	546.0	10:45	1.10	1.22	0.02
07:25:39	940.0	839.9	20.8	31	108	173	2603	768	777	1.09	1.09	37.7	38.7	926.9	548	547.0	10:47	1.10	1.22	0.02
07:28:55	941.0	840.9	18.4	28	107	189	2638	768	795	1.09	1.09	37.7	38.7	928.0	546	548.0	10:51	1.10	1.22	0.02
07:32:45	942.0	841.7	16.3	29	108	188	2640	767	796	1.09	1.09	37.7	38.7	929.0	546	549.0	10:55	1.10	1.22	0.02

9.625" Casing TD.

Circulate Bottom's Up.

Pull six stands wiper trip, ream to bottom.

POOH.

Run E-Logs.

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
RIH w/NB#4 Hughes ATM 11HG 3x12 jets 8.5"																				
05:59:34	943.1	943.0	33.4	13	81	120	1449	330	251	1.08	1.08	22.7	14.5	922.1	655	1.1	0:02	1.16	1.08	0.00
06:04:29	944.0	943.9	12.2	14	84	104	1477	363	304	1.08	1.08	22.1	13.5	926.2	680	2.0	0:07	1.16	1.11	0.00
07:29:42	945.0	944.9	8.1	15	84	99	1556	378	308	1.08	1.08	22.4	15.1	944.6	632	3.0	0:14	1.16	1.19	0.00
Perform L.O.T. 1.87sg EMD																				
07:36:58	946.1	946.0	8.8	14	82	100	1732	406	399	1.08	1.08	22.9	20.5	944.6	629	4.1	0:21	1.16	1.16	0.00
07:44:02	947.0	947.0	8.5	18	82	102	1732	406	389	1.08	1.08	23.0	22.3	944.6	632	5.0	0:28	1.16	1.24	0.00
07:49:35	948.0	947.9	10.8	22	82	113	1746	406	368	1.08	1.08	22.9	23.7	944.6	637	6.0	0:34	1.16	1.25	0.00
07:54:17	949.0	948.9	12.8	22	82	112	1755	406	342	1.08	1.08	23.0	24.4	944.6	635	7.0	0:39	1.16	1.22	0.00
07:59:06	950.0	949.9	13.0	24	82	116	1769	406	372	1.08	1.08	23.1	24.7	945.3	636	8.0	0:43	1.16	1.24	0.00
08:03:55	951.0	950.9	12.4	25	82	121	1773	406	368	1.08	1.08	23.3	24.8	945.8	637	9.0	0:48	1.16	1.27	0.00
08:07:38	952.0	951.9	16.1	25	82	114	1773	406	388	1.08	1.08	23.4	24.9	946.2	638	10.0	0:52	1.16	1.20	0.00
08:11:57	953.0	952.9	13.9	26	82	124	1778	406	391	1.08	1.08	23.6	24.9	946.8	637	11.0	0:56	1.16	1.25	0.00
08:15:08	954.0	953.9	18.8	24	82	125	1771	406	396	1.08	1.08	23.8	24.9	947.4	638	12.0	0:60	1.16	1.15	0.00
08:20:32	955.0	954.9	11.9	27	82	123	1785	406	413	1.08	1.08	23.9	25.0	948.4	637	13.0	1:05	1.16	1.31	0.00
08:25:12	956.0	956.0	12.9	26	82	127	1814	405	406	1.08	1.08	24.1	24.9	949.4	636	14.0	1:10	1.16	1.27	0.00
08:30:09	957.0	956.9	12.1	26	82	125	1796	407	341	1.08	1.08	24.3	25.0	950.1	637	15.0	1:15	1.16	1.29	0.00
08:34:15	958.0	957.9	14.6	26	82	119	1796	407	358	1.08	1.08	24.4	25.1	951.2	636	16.0	1:19	1.16	1.24	0.00
08:39:19	959.0	958.9	11.8	27	82	124	1788	407	389	1.08	1.08	24.5	25.2	952.4	637	17.0	1:24	1.16	1.31	0.00
08:44:38	960.0	959.9	12.9	27	82	124	1787	407	356	1.08	1.08	24.6	25.3	953.8	639	18.0	1:29	1.16	1.29	0.01
08:50:04	961.1	961.0	11.8	27	82	126	1818	407	383	1.08	1.08	24.7	25.5	954.8	641	19.1	1:34	1.16	1.31	0.00
08:54:33	962.0	961.9	13.3	27	82	124	1806	408	381	1.08	1.08	24.8	25.5	955.5	643	20.0	1:39	1.16	1.28	0.28
08:59:03	963.0	962.9	13.4	27	82	117	1820	408	406	1.08	1.08	24.9	25.5	956.5	642	21.0	1:43	1.16	1.28	0.16
09:03:48	964.0	963.9	12.6	26	82	122	1805	406	386	1.08	1.08	25.0	25.6	957.5	645	22.0	1:48	1.16	1.29	0.01
09:07:43	965.0	964.9	15.9	27	82	124	1795	403	418	1.08	1.08	25.1	25.7	958.4	645	23.0	1:52	1.16	1.23	0.01
09:11:53	966.0	965.9	14.4	26	82	124	1834	408	429	1.08	1.08	25.1	25.8	959.1	642	24.0	1:56	1.16	1.25	0.01
09:17:30	967.0	966.9	10.7	26	82	130	1876	408	398	1.08	1.08	25.2	25.8	960.0	642	25.0	2:02	1.16	1.33	0.00
09:22:11	968.0	967.9	12.8	26	82	128	1796	403	362	1.08	1.08	25.3	25.9	960.9	648	26.0	2:07	1.16	1.27	0.00
09:46:58	969.0	968.9	10.6	24	94	114	1824	413	410	1.08	1.08	25.7	25.3	963.8	649	27.0	2:12	1.16	1.33	0.00
09:50:18	970.0	969.9	18.2	25	103	118	1772	407	381	1.08	1.08	25.7	25.0	964.6	648	28.0	2:16	1.16	1.24	0.01
09:53:40	971.0	970.9	17.8	27	117	129	1785	407	408	1.08	1.08	25.7	25.3	965.4	649	29.0	2:19	1.16	1.31	0.01
09:56:56	972.0	971.9	18.3	26	119	140	1780	407	374	1.08	1.08	25.7	25.7	966.1	650	30.0	2:22	1.16	1.28	0.01
10:00:48	973.0	972.9	15.5	28	119	135	1777	406	368	1.08	1.08	25.7	26.0	966.7	650	31.0	2:26	1.16	1.36	0.01
10:05:51	974.1	974.0	13.0	28	119	132	1761	405	360	1.08	1.08	25.7	26.2	967.7	651	32.1	2:31	1.16	1.39	0.01
10:09:30	975.0	974.9	16.4	28	119	138	1764	405	338	1.08	1.08	25.8	26.3	968.2	650	33.0	2:35	1.16	1.34	0.01
10:13:06	976.0	975.9	16.6	28	119	140	1782	405	340	1.08	1.08	25.8	26.4	968.2	654	34.0	2:38	1.16	1.34	0.01
10:15:36	977.0	976.9	27.6	27	119	142	1765	404	361	1.08	1.08	25.8	26.5	968.2	651	35.0	2:41	1.16	1.18	0.01
10:18:19	978.1	978.0	23.9	27	119	132	1768	405	375	1.08	1.08	25.9	26.5	968.2	653	36.1	2:44	1.16	1.22	0.01
10:21:41	979.0	978.9	17.8	28	119	145	1774	405	396	1.08	1.08	25.9	26.5	968.9	653	37.0	2:47	1.16	1.31	0.01
10:24:23	980.0	979.9	22.2	27	118	144	1778	405	384	1.08	1.08	26.0	26.6	969.4	654	38.0	2:50	1.16	1.24	0.01
10:28:00	981.0	980.9	16.6	28	118	145	1836	405	360	1.08	1.08	26.0	26.6	970.8	654	39.0	2:53	1.16	1.34	0.01
10:32:02	982.0	981.9	14.9	25	119	136	1786	405	370	1.08	1.08	26.1	26.7	971.5	654	40.0	2:57	1.16	1.32	0.01
10:35:47	983.0	982.9	16.0	26	119	140	1835	405	349	1.08	1.08	26.2	26.7	972.5	658	41.0	3:01	1.16	1.31	0.01
10:39:44	984.0	983.9	15.2	25	118	137	1802	405	351	1.08	1.08	26.2	26.8	973.4	656	42.0	3:05	1.16	1.31	0.01
10:42:52	985.0	984.9	19.1	25	119	140	1787	405	372	1.08	1.08	26.3	26.9	974.0	657	43.0	3:08	1.16	1.26	0.01
10:45:28	986.0	985.9	23.2	26	119	143	1794	405	374	1.08	1.08	26.3	27.0	974.5	654	44.0	3:11	1.16	1.21	0.01
10:48:38	987.0	986.9	18.9	24	119	135	1801	405	351	1.08	1.08	26.4	27.0	975.4	654	45.0	3:14	1.16	1.25	0.01
10:52:18	988.0	987.9	16.4	25	119	131	1778	405	370	1.08	1.08	26.4	27.1	976.7	653	46.0	3:18	1.16	1.30	0.01
10:56:47	989.0	988.9	13.4	26	119	126	1768	405	330	1.08	1.08	26.5	27.1	978.2	654	47.0	3:22	1.16	1.36	0.01
11:00:38	990.0	989.9	15.6	26	118	142	1782	405	360	1.08	1.08	26.6	27.2	979.4	654	48.0	3:26	1.16	1.32	0.01

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW		MUD WEIGHT		MUD TEMP		RETNS	PVT	---BIT---		ECD	DXC	GAS
								IN	OUT	IN	OUT	IN	OUT	DEPTH		DIST	HRS			
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
11:04:18	991.0	990.9	16.4	24	119	142	1780	405	323	1.08	1.08	26.7	27.3	980.4	657	49.0	3:30	1.16	1.33	0.01
11:07:09	992.0	991.9	22.0	24	119	143	1781	405	364	1.08	1.08	26.7	27.4	981.1	658	50.0	3:32	1.16	1.20	0.01
11:09:26	993.0	992.9	26.3	24	119	140	1786	406	380	1.08	1.08	26.7	27.4	981.7	657	51.0	3:35	1.16	1.16	0.01
11:11:20	994.0	993.9	31.4	24	119	143	1772	405	351	1.08	1.08	26.7	27.4	982.2	656	52.0	3:37	1.16	1.10	0.01
11:15:11	995.0	994.9	15.6	25	119	124	1768	405	357	1.08	1.08	26.7	27.5	983.1	656	53.0	3:40	1.16	1.31	0.01
11:19:00	996.0	995.9	16.3	22	119	134	1795	405	368	1.08	1.08	26.8	27.5	984.1	661	54.0	3:44	1.16	1.24	0.01
1:23:05	997.0	996.9	14.7	23	119	129	1792	406	339	1.08	1.08	26.8	27.5	985.5	661	55.0	3:48	1.16	1.30	0.01
11:42:10	998.1	998.0	6.8	24	118	122	1753	406	348	1.08	1.08	26.9	27.4	989.4	661	56.1	3:58	1.16	1.50	0.01
11:44:45	999.1	999.0	23.2	21	116	131	1764	409	351	1.08	1.08	27.1	26.9	989.8	664	57.1	4:00	1.16	1.13	0.02
11:47:56	1000.0	999.9	18.8	21	116	142	1808	409	393	1.08	1.08	27.1	27.0	990.6	667	58.0	4:04	1.16	1.20	0.02
11:50:24	1001.0	1000.9	24.4	21	116	141	1795	409	366	1.08	1.08	27.0	27.2	991.5	674	59.0	4:06	1.16	1.13	0.02
11:54:11	1002.0	1001.9	15.9	23	116	144	1853	409	341	1.08	1.08	27.0	27.4	993.0	672	60.0	4:10	1.16	1.26	0.01
11:58:05	1003.0	1002.9	15.4	22	116	143	1875	409	371	1.08	1.08	26.9	27.6	994.5	671	61.0	4:14	1.16	1.26	0.01
12:02:21	1004.1	1003.9	14.2	22	116	128	1887	410	378	1.08	1.08	26.9	27.7	995.6	675	62.1	4:18	1.16	1.27	0.01
12:06:51	1005.0	1004.9	13.3	21	116	124	1885	410	378	1.08	1.08	26.9	27.7	996.6	677	63.0	4:22	1.16	1.28	0.01
12:10:56	1006.1	1006.0	15.7	21	117	136	1884	409	340	1.08	1.08	26.9	27.7	997.5	677	64.1	4:27	1.16	1.24	0.01
12:14:03	1007.0	1006.9	19.2	22	116	127	1847	409	338	1.08	1.08	27.0	27.7	997.7	679	65.0	4:30	1.16	1.20	0.01
12:16:24	1008.0	1007.9	25.5	21	116	134	1835	409	358	1.08	1.08	27.0	27.6	997.7	680	66.0	4:32	1.16	1.11	0.01
12:20:10	1009.0	1008.9	15.9	22	116	132	1835	409	385	1.08	1.08	27.0	27.7	997.7	681	67.0	4:36	1.16	1.26	0.01
12:24:03	1010.0	1009.9	15.6	22	116	141	1847	409	403	1.08	1.08	27.1	27.8	998.2	680	68.0	4:40	1.16	1.25	0.01
12:26:43	1011.0	1010.9	22.5	24	117	142	1880	409	412	1.08	1.08	27.1	27.9	999.0	682	69.0	4:42	1.16	1.20	0.01
12:30:08	1012.0	1011.9	17.5	24	119	147	1893	405	330	1.08	1.08	27.1	27.9	1000.2	683	70.0	4:46	1.16	1.26	0.01
12:33:51	1013.0	1012.9	16.1	23	120	141	1881	405	364	1.08	1.08	27.2	27.9	1001.4	683	71.0	4:49	1.16	1.27	0.01
12:36:32	1014.0	1013.9	22.4	23	119	130	1848	406	409	1.08	1.08	27.2	27.9	1002.2	683	72.0	4:52	1.16	1.18	0.01
12:40:11	1015.0	1014.9	16.4	22	120	125	1817	406	371	1.08	1.08	27.3	27.9	1002.9	681	73.0	4:56	1.16	1.25	0.01
12:42:29	1016.0	1015.9	26.3	23	119	147	1860	406	356	1.08	1.08	27.3	27.9	1003.4	683	74.0	4:58	1.16	1.14	0.01
12:44:50	1017.0	1016.9	25.8	23	119	145	1897	406	363	1.08	1.08	27.4	27.9	1003.9	682	75.0	5:00	1.16	1.14	0.02
12:47:07	1018.0	1017.9	26.2	22	120	131	1892	406	399	1.08	1.08	27.4	27.9	1004.4	683	76.0	5:03	1.16	1.13	0.02
2:49:48	1019.0	1018.9	23.7	24	120	143	1878	406	418	1.08	1.08	27.4	27.9	1005.1	684	77.0	5:05	1.16	1.18	0.02
12:51:45	1020.0	1019.9	30.6	23	120	132	1873	407	375	1.08	1.08	27.4	27.9	1005.8	684	78.0	5:07	1.16	1.11	0.02
12:54:04	1021.0	1020.9	26.1	24	120	147	1874	407	411	1.08	1.08	27.5	28.0	1006.5	682	79.0	5:10	1.16	1.13	0.02
12:56:40	1022.0	1021.9	22.9	23	120	145	1866	407	381	1.08	1.08	27.5	28.0	1006.9	682	80.0	5:12	1.16	1.18	0.02
13:00:02	1023.1	1023.0	18.8	23	119	131	1833	407	393	1.08	1.08	27.5	28.1	1008.0	680	81.1	5:16	1.16	1.23	0.02
13:02:05	1024.0	1023.9	29.2	21	120	126	1838	407	383	1.08	1.08	27.5	28.2	1008.5	679	82.0	5:18	1.16	1.09	0.02
13:05:05	1025.1	1025.0	20.1	24	120	141	1859	407	389	1.08	1.08	27.6	28.2	1009.2	678	83.1	5:21	1.16	1.24	0.02
13:07:44	1026.0	1025.9	22.6	23	119	142	1871	408	401	1.08	1.08	27.6	28.3	1009.9	679	84.0	5:23	1.16	1.17	0.02
13:24:40	1027.0	1026.9	19.2	22	120	140	1857	410	387	1.08	1.08	27.7	28.4	1014.3	674	85.0	5:27	1.16	1.22	0.01
13:28:10	1028.1	1027.9	17.3	24	121	129	1835	412	372	1.08	1.08	27.9	28.5	1015.2	672	86.1	5:30	1.16	1.27	0.03
13:32:00	1029.0	1028.9	15.7	25	121	130	1826	413	391	1.08	1.08	27.9	28.3	1016.9	674	87.0	5:34	1.16	1.30	0.03
13:33:09	1030.1	1030.0	53.7	23	121	157	1843	413	386	1.08	1.08	28.0	28.4	1017.3	673	88.1	5:35	1.16	0.97	0.03
13:35:47	1031.0	1030.9	22.7	25	121	154	1832	413	401	1.08	1.08	28.0	28.4	1018.5	672	89.0	5:38	1.16	1.21	0.03
13:38:09	1032.1	1032.0	27.6	24	121	140	1808	410	374	1.08	1.08	28.0	28.5	1019.4	675	90.1	5:40	1.16	1.16	0.03
13:40:05	1033.1	1033.0	31.0	26	121	147	1817	410	381	1.08	1.08	28.0	28.6	1020.3	672	91.1	5:42	1.16	1.15	0.03
13:41:45	1034.0	1033.9	35.7	26	121	147	1811	410	389	1.08	1.08	28.0	28.6	1021.0	671	92.0	5:44	1.16	1.11	0.03
13:43:54	1035.0	1034.9	28.1	25	121	161	1824	410	388	1.08	1.08	28.1	28.7	1021.8	673	93.0	5:46	1.16	1.16	0.03
13:44:57	1036.0	1035.9	57.1	24	121	160	1821	410	391	1.08	1.08	28.1	28.7	1022.1	674	94.0	5:47	1.16	0.95	0.03
Flow check @ 1036.6m STATIC																				
14:06:58	1037.0	1036.9	72.5	14	119	128	1809	411	420	1.08	1.08	28.2	27.7	1023.5	681	95.0	5:48	1.16	0.74	0.00
14:09:40	1038.0	1037.9	22.2	9	120	129	1844	413	402	1.08	1.08	28.3	26.8	1024.5	678	96.0	5:50	1.16	0.94	0.01
14:11:01	1039.0	1038.9	44.3	18	120	143	1860	414	416	1.08	1.08	28.3	27.1	1024.9	679	97.0	5:52	1.16	0.94	0.01

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TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
14:12:37	1040.1	1039.9	41.1	17	120	126	1839	414	378	1.08	1.08	28.3	26.6	1025.4	679	98.1	5:53	1.16	0.95	0.01
14:14:11	1041.0	1040.9	38.0	17	120	137	1869	414	373	1.08	1.08	28.3	26.4	1025.9	678	99.0	5:55	1.16	0.96	0.01
14:16:09	1042.0	1041.9	30.9	17	120	142	1844	414	333	1.08	1.08	28.2	26.6	1026.4	678	100.0	5:57	1.16	1.02	0.01
14:17:46	1043.0	1042.9	36.9	16	120	149	1861	414	361	1.08	1.08	28.1	26.8	1026.4	677	101.0	5:59	1.16	0.96	0.01
14:19:45	1044.1	1043.9	30.5	15	121	143	1847	414	355	1.08	1.08	28.1	27.2	1026.4	676	102.1	6:01	1.16	0.99	0.01
14:23:07	1045.0	1044.9	17.8	18	120	135	1853	414	431	1.08	1.08	28.0	27.8	1026.4	677	103.0	6:04	1.16	1.17	0.01
14:26:09	1046.0	1045.9	19.8	21	120	142	1872	414	364	1.08	1.08	27.9	28.2	1026.4	677	104.0	6:07	1.16	1.18	0.01
14:28:04	1047.0	1046.9	31.2	20	120	126	1857	414	440	1.08	1.08	27.9	28.5	1026.8	674	105.0	6:09	1.16	1.05	0.01
14:29:14	1048.0	1047.9	51.4	16	120	156	1857	414	431	1.08	1.08	27.9	28.6	1027.4	675	106.0	6:10	1.16	0.88	0.02
14:30:24	1049.0	1048.9	51.4	16	121	165	1848	414	419	1.08	1.08	27.9	28.6	1028.0	675	107.0	6:11	1.16	0.89	0.02
14:31:34	1050.0	1049.9	51.4	15	120	136	1859	414	398	1.08	1.08	27.9	28.6	1028.2	675	108.0	6:12	1.16	0.86	0.02
14:33:13	1051.0	1050.9	40.9	12	120	129	1825	414	436	1.08	1.08	27.9	28.7	1028.3	673	109.0	6:14	1.16	0.87	0.02
14:34:43	1052.0	1051.9	39.8	11	120	115	1859	415	399	1.08	1.08	27.9	28.9	1028.4	673	110.0	6:16	1.16	0.85	0.02
Flow check @ 1052m STATIC																				
14:46:04	1053.1	1053.0	43.9	12	121	118	1823	413	403	1.08	1.08	28.0	27.8	1030.8	677	111.1	6:18	1.16	0.87	0.01
14:47:15	1054.0	1053.9	50.3	18	120	145	1840	413	404	1.08	1.08	28.0	28.3	1031.2	677	112.0	6:19	1.16	0.93	0.01
14:48:19	1055.0	1054.9	55.8	21	120	137	1844	414	344	1.08	1.08	28.0	28.4	1031.7	676	113.0	6:20	1.16	0.93	0.02
15:06:52	1056.0	1055.9	33.8	18	117	148	1825	414	425	1.09	1.09	28.0	28.6	1037.9	674	114.0	6:22	1.15	1.02	0.01
15:08:15	1057.0	1056.9	43.4	21	116	167	1808	414	422	1.09	1.09	28.1	28.8	1038.8	676	115.0	6:23	1.15	1.00	0.01
15:09:22	1058.1	1058.0	54.4	22	116	171	1838	414	454	1.09	1.09	28.1	28.9	1039.4	677	116.1	6:24	1.15	0.95	0.01
15:10:39	1059.1	1058.9	46.4	21	116	151	1836	414	455	1.09	1.09	28.1	29.0	1040.2	674	117.1	6:25	1.15	0.97	0.01
15:11:37	1060.0	1059.9	61.4	20	117	138	1817	415	330	1.09	1.09	28.1	29.1	1040.8	673	118.0	6:26	1.15	0.90	0.01
15:12:53	1061.1	1061.0	48.6	21	116	143	1837	415	391	1.09	1.09	28.1	29.2	1041.5	675	119.1	6:28	1.16	0.96	0.01
15:14:00	1062.0	1061.9	53.3	21	119	132	1842	415	411	1.09	1.09	28.1	29.2	1042.1	675	120.0	6:29	1.16	0.95	0.01
15:15:16	1063.0	1062.9	47.1	20	119	154	1830	415	434	1.09	1.09	28.1	29.3	1042.8	675	121.0	6:30	1.16	0.97	0.01
15:16:23	1064.0	1063.9	61.3	22	119	144	1840	415	399	1.09	1.09	28.2	29.3	1043.4	675	122.0	6:31	1.16	0.92	0.01
15:17:27	1065.0	1064.9	56.3	21	119	155	1848	415	388	1.09	1.09	28.2	29.3	1043.9	675	123.0	6:32	1.16	0.93	0.01
15:18:22	1066.1	1066.0	67.9	21	118	164	1870	415	426	1.09	1.09	28.2	29.3	1044.2	674	124.1	6:33	1.16	0.89	0.01
15:19:54	1067.0	1066.9	38.8	19	119	142	1829	415	437	1.09	1.09	28.2	29.4	1044.7	673	125.0	6:35	1.16	1.00	0.01
15:21:06	1068.0	1067.9	51.1	22	119	166	1856	415	406	1.09	1.09	28.2	29.4	1045.0	674	126.0	6:36	1.16	0.97	0.01
15:22:13	1069.0	1068.9	53.7	22	118	160	1847	415	393	1.09	1.09	28.3	29.3	1045.3	674	127.0	6:37	1.16	0.96	0.01
15:23:13	1070.0	1069.9	60.0	20	118	144	1848	415	405	1.09	1.09	28.3	29.3	1045.7	675	128.0	6:38	1.16	0.90	0.01
15:24:27	1071.0	1070.9	53.1	20	119	142	1868	416	359	1.09	1.09	28.3	29.3	1046.1	674	129.0	6:39	1.16	0.93	0.01
15:25:47	1072.0	1071.9	44.8	21	119	156	1855	416	406	1.09	1.09	28.3	29.4	1046.7	673	130.0	6:41	1.16	0.99	0.01
15:27:07	1073.1	1073.0	51.8	22	119	195	1865	415	414	1.09	1.09	28.4	29.5	1047.7	674	131.1	6:42	1.16	0.96	0.01
15:28:24	1074.0	1073.9	46.4	22	118	171	1867	416	432	1.09	1.09	28.4	29.5	1048.7	674	132.0	6:43	1.16	0.99	0.01
15:29:11	1075.0	1074.9	76.1	21	118	180	1869	416	408	1.09	1.09	28.4	29.5	1049.4	673	133.0	6:44	1.15	0.86	0.01
15:30:04	1076.0	1075.9	67.9	22	119	153	1829	416	415	1.09	1.09	28.4	29.6	1050.0	674	134.0	6:45	1.15	0.89	0.00
15:31:03	1077.1	1076.9	68.8	23	118	190	1871	416	424	1.09	1.09	28.5	29.6	1050.6	673	135.1	6:46	1.15	0.90	0.00
15:32:40	1078.0	1077.9	36.9	22	119	147	1852	416	371	1.09	1.09	28.5	29.6	1051.5	673	136.0	6:48	1.15	1.05	0.00
15:33:57	1079.0	1078.9	48.0	20	119	169	1874	416	356	1.09	1.09	28.6	29.5	1052.0	676	137.0	6:49	1.15	0.96	0.00
15:35:12	1080.0	1079.9	48.0	20	119	168	1873	415	404	1.09	1.09	28.6	29.4	1052.0	673	138.0	6:50	1.15	0.96	0.00
15:36:39	1081.0	1080.9	40.9	22	119	196	1850	415	400	1.09	1.09	28.6	29.4	1052.3	674	139.0	6:52	1.15	1.02	0.00
15:38:10	1082.0	1081.9	39.8	24	119	152	1859	416	415	1.09	1.09	28.6	29.3	1053.1	675	140.0	6:53	1.15	1.05	0.01
15:39:23	1083.0	1082.9	49.3	21	119	138	1866	416	386	1.09	1.09	28.7	29.3	1053.9	673	141.0	6:54	1.15	0.96	0.01
15:40:38	1084.0	1083.9	48.0	21	119	191	1842	416	344	1.09	1.09	28.7	29.3	1055.1	672	142.0	6:55	1.15	0.97	0.01
15:53:30	1085.0	1084.9	31.8	20	119	173	1879	419	373	1.09	1.09	28.8	29.4	1055.3	669	143.0	6:57	1.15	1.06	0.01
15:54:35	1086.1	1085.9	56.3	24	119	188	1878	420	382	1.09	1.09	28.9	29.4	1055.3	669	144.1	6:58	1.15	0.97	0.01
15:55:38	1087.0	1086.9	56.6	24	119	167	1882	420	429	1.09	1.09	28.9	29.4	1055.3	666	145.0	6:60	1.15	0.96	0.01
15:56:59	1088.1	1088.0	52.2	21	120	157	1863	420	404	1.09	1.09	28.9	29.3	1055.4	665	146.1	7:01	1.15	0.95	0.01
15:58:02	1089.0	1088.9	56.4	21	119	140	1878	420	386	1.09	1.09	28.9	29.2	1055.6	668	147.0	7:02	1.15	0.93	0.02

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW		MUD WEIGHT		MUD TEMP		RETNS DEPTH	PVT	---BIT---		ECD	DXC	GAS
								IN	OUT	IN	OUT	IN	OUT			DIST	HRS			
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
15:59:42	1090.1	1089.9	40.1	20	119	164	1870	420	425	1.09	1.09	28.9	29.2	1056.7	664	148.1	7:04	1.15	0.98	0.02
16:00:40	1091.0	1090.9	61.5	20	119	160	1866	420	374	1.09	1.09	28.9	29.2	1057.4	663	149.0	7:05	1.15	0.90	0.01
16:02:03	1092.0	1091.9	43.4	22	119	186	1879	420	399	1.09	1.09	28.9	29.3	1058.4	666	150.0	7:06	1.15	1.00	0.01
16:03:15	1093.1	1092.9	55.4	20	119	197	1878	420	383	1.09	1.09	29.0	29.3	1059.6	666	151.1	7:07	1.15	0.91	0.02
16:04:33	1094.0	1093.9	45.8	19	119	232	1862	420	402	1.09	1.09	28.9	29.3	1060.6	665	152.0	7:08	1.15	0.95	0.02
16:05:56	1095.0	1094.9	43.4	19	119	174	1880	421	448	1.09	1.09	29.0	29.4	1062.0	663	153.0	7:10	1.15	0.97	0.01
5:07:30	1096.0	1095.9	39.6	20	119	239	1861	421	398	1.09	1.09	29.0	29.5	1064.7	664	154.0	7:11	1.15	1.00	0.01
.6:09:00	1097.0	1096.9	39.9	20	119	224	1885	421	424	1.09	1.09	29.0	29.6	1066.2	662	155.0	7:13	1.15	0.99	0.01
16:10:01	1098.0	1097.9	68.2	23	119	246	1891	421	379	1.09	1.09	29.0	29.6	1066.8	663	156.0	7:14	1.15	0.91	0.01
16:11:44	1099.1	1098.9	39.1	24	119	206	1882	421	435	1.09	1.09	29.0	29.7	1067.3	664	157.1	7:16	1.15	1.05	0.01
16:12:56	1100.0	1099.9	49.8	24	118	248	1883	420	355	1.09	1.09	29.0	29.8	1067.5	663	158.0	7:17	1.15	0.99	0.01
16:13:59	1101.0	1100.9	59.3	24	119	198	1886	420	349	1.09	1.09	29.0	29.9	1068.4	664	159.0	7:18	1.15	0.94	0.01
16:15:08	1102.0	1101.9	52.0	23	117	290	1873	420	389	1.09	1.09	29.0	29.9	1069.4	663	160.0	7:19	1.15	0.98	0.01
16:17:08	1103.0	1102.9	29.9	26	119	234	1885	420	427	1.09	1.09	29.1	30.0	1071.1	662	161.0	7:21	1.15	1.16	0.01
16:19:47	1104.0	1103.9	22.6	23	118	219	1892	419	379	1.09	1.09	29.1	30.1	1073.1	663	162.0	7:24	1.15	1.20	0.01
16:23:05	1105.0	1104.9	18.2	25	118	199	1911	419	396	1.09	1.09	29.2	30.2	1076.2	664	163.0	7:27	1.15	1.28	0.01
16:30:23	1106.0	1105.9	10.9	24	117	215	1906	412	357	1.09	1.09	29.2	30.1	1081.3	661	164.0	7:32	1.15	1.39	0.01
16:33:02	1107.0	1106.9	22.8	25	116	236	1883	411	351	1.09	1.09	29.3	30.2	1083.3	660	165.0	7:35	1.15	1.21	0.01
16:35:16	1108.0	1107.9	26.9	21	113	361	1890	411	371	1.09	1.09	29.4	30.2	1084.3	660	166.0	7:37	1.15	1.11	0.01
16:37:22	1109.1	1108.9	31.7	20	114	232	1884	411	399	1.09	1.09	29.4	30.3	1084.4	661	167.1	7:39	1.15	1.05	0.01
16:39:40	1110.0	1109.9	25.9	21	115	252	1899	412	361	1.09	1.09	29.4	30.3	1084.4	658	168.0	7:42	1.15	1.12	0.01
16:41:43	1111.0	1110.9	29.3	24	118	167	1902	412	370	1.09	1.09	29.4	30.3	1084.4	658	169.0	7:44	1.15	1.11	0.01
16:44:01	1112.0	1111.9	26.5	25	118	175	1896	412	383	1.09	1.09	29.5	30.4	1085.2	656	170.0	7:46	1.15	1.17	0.03
16:56:00	1113.1	1112.9	31.9	23	118	173	1893	412	401	1.09	1.09	29.5	30.4	1092.1	649	171.1	7:48	1.15	1.09	0.03
16:57:23	1114.1	1114.0	49.8	23	117	190	1871	413	399	1.09	1.09	29.7	27.9	1093.3	638	172.1	7:49	1.15	0.97	0.00
16:58:53	1115.1	1115.0	40.9	19	117	248	1881	410	409	1.09	1.09	29.7	29.2	1094.4	636	173.1	7:51	1.15	0.98	0.01
16:59:49	1116.0	1115.9	63.5	22	116	282	1886	410	399	1.09	1.09	29.7	29.9	1095.1	638	174.0	7:52	1.15	0.91	0.01
17:01:11	1117.0	1116.9	43.9	23	118	244	1874	410	445	1.09	1.09	29.7	30.1	1095.7	633	175.0	7:53	1.15	1.01	0.01
7:02:29	1118.0	1117.9	46.0	23	113	302	1883	410	440	1.09	1.09	29.8	30.2	1096.5	637	176.0	7:54	1.15	0.99	0.01
17:03:57	1119.0	1118.9	42.6	23	116	270	1890	411	410	1.09	1.09	29.8	30.3	1097.5	634	177.0	7:56	1.15	1.01	0.02
17:05:12	1120.0	1119.9	47.9	21	114	282	1873	410	403	1.09	1.09	29.8	30.3	1098.4	634	178.0	7:57	1.15	0.96	0.02
17:06:35	1121.0	1120.9	43.4	22	114	304	1882	410	379	1.09	1.09	29.8	30.4	1099.5	632	179.0	7:59	1.15	1.01	0.02
17:08:01	1122.0	1121.9	42.9	22	117	250	1873	410	408	1.09	1.09	29.8	30.5	1100.5	632	180.0	8:00	1.15	1.00	0.02
17:09:24	1123.0	1122.9	43.0	21	117	267	1892	411	334	1.09	1.09	29.8	30.5	1101.6	632	181.0	8:01	1.15	0.99	0.02
17:10:44	1124.0	1123.9	45.0	23	117	257	1889	411	355	1.09	1.09	29.9	30.5	1102.6	630	182.0	8:03	1.15	1.01	0.02
17:12:43	1125.1	1124.9	33.0	23	118	279	1875	411	400	1.09	1.09	29.9	30.6	1103.3	630	183.1	8:05	1.15	1.09	0.02
17:14:55	1126.0	1125.9	27.1	25	117	233	1893	411	365	1.09	1.09	29.9	30.7	1104.1	630	184.0	8:07	1.15	1.17	0.02
17:16:16	1127.1	1126.9	48.2	25	116	242	1886	411	384	1.09	1.09	29.9	30.7	1104.5	629	185.1	8:08	1.15	1.01	0.02
17:17:44	1128.0	1127.9	40.6	23	117	232	1899	411	433	1.09	1.09	29.9	30.8	1104.9	628	186.0	8:10	1.15	1.03	0.02
17:19:52	1129.0	1128.9	28.8	23	117	243	1878	411	412	1.09	1.09	29.9	30.9	1105.0	628	187.0	8:12	1.15	1.12	0.02
17:21:54	1130.0	1129.9	29.5	23	110	378	1876	412	351	1.09	1.09	30.0	31.0	1105.1	629	188.0	8:14	1.15	1.11	0.02
17:23:40	1131.0	1130.9	33.8	22	111	370	1888	412	370	1.09	1.09	30.0	31.1	1105.4	631	189.0	8:16	1.15	1.05	0.02
17:25:39	1132.0	1131.9	30.6	24	115	189	1875	411	441	1.09	1.09	30.0	31.1	1106.0	628	190.0	8:18	1.15	1.13	0.01
17:28:15	1133.0	1132.9	23.4	26	117	239	1898	412	394	1.09	1.09	30.1	31.2	1107.0	627	191.0	8:20	1.15	1.22	0.02
17:31:43	1134.0	1133.9	17.3	26	115	302	1905	411	381	1.09	1.09	30.1	31.3	1108.5	624	192.0	8:24	1.15	1.29	0.03
17:34:27	1135.0	1134.9	21.9	27	116	222	1906	412	369	1.09	1.09	30.2	31.3	1109.6	622	193.0	8:26	1.15	1.25	0.03
17:36:47	1136.0	1135.9	25.7	23	110	307	1885	412	420	1.09	1.09	30.2	31.3	1110.6	619	194.0	8:29	1.15	1.13	0.04
17:42:56	1137.0	1136.9	18.2	16	100	444	1866	411	409	1.09	1.09	30.3	31.4	1113.0	619	195.0	8:32	1.15	1.09	0.03
17:47:36	1138.0	1137.9	12.9	14	112	295	1865	411	405	1.09	1.09	30.4	31.4	1113.0	616	196.0	8:37	1.15	1.16	0.03
17:52:10	1139.0	1138.8	13.1	24	119	174	1869	411	392	1.09	1.09	30.5	31.6	1115.1	619	197.0	8:41	1.15	1.36	0.03
17:53:10	1140.0	1139.9	46.2	24	119	217	1879	411	304	1.09	1.09	30.5	31.6	1115.9	617	198.0	8:42	1.15	0.92	0.03

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
17:54:30	1141.0	1140.9	44.8	22	119	157	1880	411	391	1.09	1.09	30.5	31.6	1117.1	617	199.0	8:44	1.15	0.99	0.03
17:56:10	1142.0	1141.9	36.9	20	119	181	1873	411	388	1.09	1.09	30.6	31.7	1118.3	616	200.0	8:45	1.15	1.02	0.03
18:17:15	1143.0	1142.9	14.7	19	117	269	1918	414	361	1.09	1.09	30.8	31.8	1129.0	620	201.0	8:49	1.15	1.23	0.02
18:19:50	1144.0	1143.9	23.2	23	119	206	1917	414	416	1.09	1.09	30.8	32.1	1130.3	618	202.0	8:52	1.15	1.18	0.02
18:22:48	1145.1	1145.0	20.6	24	119	195	1929	415	353	1.09	1.09	30.9	32.0	1131.8	620	203.1	8:55	1.15	1.23	0.02
18:25:24	1146.0	1145.9	23.0	22	118	211	1941	415	382	1.09	1.09	31.0	31.9	1132.9	616	204.0	8:58	1.15	1.17	0.02
18:28:57	1147.0	1146.9	16.9	25	118	242	1962	415	409	1.09	1.09	31.1	31.9	1133.9	618	205.0	9:01	1.15	1.30	0.04
18:31:56	1148.0	1147.9	20.2	24	117	295	1947	415	426	1.09	1.09	31.2	32.0	1134.8	616	206.0	9:04	1.15	1.23	0.04
18:37:50	1149.0	1148.9	17.8	13	114	210	1928	416	394	1.09	1.09	31.2	32.1	1136.6	615	207.0	9:07	1.15	1.06	0.02
18:39:28	1150.0	1149.9	36.7	18	113	222	1941	416	422	1.09	1.09	31.3	32.2	1136.7	618	208.0	9:09	1.15	1.00	0.02
18:41:37	1151.0	1150.9	27.9	20	113	228	1920	416	436	1.09	1.09	31.3	32.3	1137.2	618	209.0	9:11	1.15	1.08	0.01
18:44:00	1152.0	1151.9	25.2	21	116	186	1946	416	359	1.09	1.09	31.3	32.3	1137.8	617	210.0	9:14	1.15	1.13	0.01
18:45:35	1153.1	1152.9	39.3	22	116	175	1908	412	408	1.09	1.09	31.3	32.4	1137.9	619	211.1	9:15	1.15	1.03	0.01
18:47:13	1154.0	1153.9	36.5	21	115	195	1917	411	424	1.09	1.09	31.4	32.3	1138.1	617	212.0	9:17	1.15	1.03	0.01
18:48:52	1155.0	1154.9	36.7	21	109	300	1902	411	434	1.09	1.09	31.4	32.3	1138.3	617	213.0	9:18	1.15	1.01	0.02
18:53:19	1156.0	1155.9	20.3	17	105	255	1910	411	406	1.09	1.09	31.4	32.3	1141.2	620	214.0	9:21	1.15	1.09	0.04
18:55:55	1157.0	1156.9	23.2	11	111	246	1917	410	392	1.09	1.09	31.6	32.4	1142.1	620	215.0	9:24	1.15	0.96	0.04
18:57:30	1158.0	1157.9	37.9	16	109	259	1926	409	371	1.09	1.09	31.6	32.5	1142.1	620	216.0	9:26	1.15	0.95	0.04
18:59:22	1159.0	1158.9	32.1	15	112	236	1910	410	429	1.09	1.09	31.6	32.5	1142.1	620	217.0	9:27	1.15	0.96	0.04
19:01:02	1160.0	1159.8	35.9	15	112	231	1921	410	344	1.09	1.09	31.6	32.6	1142.1	621	218.0	9:29	1.15	0.94	0.04
19:03:09	1161.0	1160.8	28.3	16	113	207	1930	410	373	1.09	1.09	31.7	32.7	1142.1	619	219.0	9:31	1.15	1.01	0.04
19:05:06	1162.0	1161.9	30.8	17	113	212	1930	409	380	1.09	1.09	31.7	32.6	1142.1	621	220.0	9:33	1.15	1.01	0.04
19:07:22	1163.0	1162.9	27.6	19	112	236	1899	410	401	1.09	1.09	31.7	32.6	1142.1	622	221.0	9:35	1.15	1.07	0.04
19:09:15	1164.0	1163.9	31.9	18	112	254	1915	410	403	1.09	1.09	31.7	32.7	1142.1	623	222.0	9:37	1.15	1.02	0.04
19:10:59	1165.0	1164.9	34.6	18	113	225	1925	410	408	1.09	1.09	31.7	32.7	1142.5	622	223.0	9:39	1.15	1.00	0.04
19:12:55	1166.0	1165.8	30.9	20	112	213	1920	409	392	1.09	1.09	31.7	32.7	1143.0	621	224.0	9:41	1.15	1.06	0.05
19:15:05	1167.0	1166.8	27.7	20	114	154	1931	410	379	1.09	1.09	31.8	32.8	1143.8	619	225.0	9:43	1.15	1.09	0.05
19:20:32	1168.0	1167.8	11.0	21	114	178	1922	410	374	1.09	1.09	31.8	32.8	1146.2	619	226.0	9:49	1.15	1.34	0.06
19:22:51	1169.0	1168.8	25.9	20	112	229	1920	409	397	1.09	1.09	31.9	32.9	1146.5	617	227.0	9:51	1.15	1.09	0.05
19:30:45	1170.0	1169.8	7.6	20	113	180	1905	409	361	1.09	1.09	31.9	32.8	1148.2	616	228.0	9:59	1.15	1.40	0.04
19:50:20	1171.0	1170.8	16.7	22	119	143	1980	415	412	1.09	1.09	32.0	33.0	1154.8	618	229.0	10:03	1.15	1.24	0.04
19:57:13	1172.0	1171.9	8.9	28	119	140	1952	414	388	1.09	1.09	32.1	33.0	1158.9	616	230.0	10:10	1.15	1.12	0.03
20:01:54	1173.0	1172.9	12.8	28	118	178	1948	414	398	1.09	1.09	32.2	33.0	1161.8	617	231.0	10:15	1.15	1.42	0.02
20:05:21	1174.0	1173.8	17.4	28	119	160	1962	415	410	1.09	1.09	32.2	33.0	1163.9	618	232.0	10:18	1.15	1.33	0.01
20:16:33	1175.0	1174.8	5.4	29	120	123	1958	414	346	1.09	1.09	32.3	33.2	1170.8	619	233.0	10:29	1.15	1.68	0.01
20:22:26	1176.0	1175.8	10.2	27	120	169	1958	415	398	1.09	1.09	32.4	33.4	1171.6	619	234.0	10:35	1.15	1.64	0.01
20:27:53	1177.0	1176.8	11.0	26	121	163	1990	415	382	1.09	1.09	32.5	33.2	1172.6	617	235.0	10:41	1.15	1.44	0.01
20:32:28	1178.0	1177.9	13.1	26	120	129	1972	415	406	1.09	1.09	32.5	33.2	1174.0	621	236.0	10:45	1.15	1.38	0.02
20:38:29	1179.0	1178.8	10.0	25	121	132	1973	414	389	1.09	1.09	32.5	33.1	1174.5	619	237.0	10:51	1.15	1.44	0.02
20:43:31	1180.1	1179.9	12.4	26	120	138	1978	414	374	1.09	1.09	32.6	33.4	1174.9	620	238.1	10:56	1.15	1.40	0.02
20:46:14	1181.0	1180.8	22.0	26	120	181	1971	415	351	1.09	1.09	32.6	33.5	1175.0	620	239.0	10:59	1.15	1.25	0.01
20:48:17	1182.0	1181.8	29.4	29	120	204	1990	415	360	1.09	1.09	32.6	33.5	1175.2	621	240.0	11:01	1.15	1.20	0.01
20:50:30	1183.1	1182.9	30.0	27	120	191	2002	415	387	1.09	1.09	32.7	33.5	1175.5	621	241.1	11:03	1.15	1.17	0.01
Flow check @ 1183.1m STATIC																				
21:08:16	1184.0	1183.8	11.0	25	119	141	1943	409	381	1.09	1.09	32.8	31.8	1177.0	621	242.0	11:09	1.15	1.41	0.01
21:12:32	1185.0	1184.8	14.2	27	120	143	1941	409	351	1.09	1.09	32.7	32.0	1177.9	621	243.0	11:13	1.15	1.38	0.01
21:17:21	1186.0	1185.8	12.5	26	120	158	1953	410	359	1.09	1.09	32.6	32.4	1178.8	620	244.0	11:18	1.15	1.39	0.02
21:22:00	1187.0	1186.8	12.9	25	120	140	1962	411	379	1.09	1.09	32.5	32.9	1179.3	621	245.0	11:22	1.15	1.38	0.02
21:28:04	1188.0	1187.8	9.9	26	120	142	1952	412	393	1.09	1.09	32.5	33.3	1181.1	621	246.0	11:28	1.15	1.45	0.03
21:33:02	1189.0	1188.8	12.1	24	119	144	1965	412	398	1.09	1.09	32.5	33.5	1183.1	618	247.0	11:33	1.15	1.38	0.07
21:38:02	1190.1	1189.9	12.5	26	120	141	1965	413	382	1.09	1.09	32.5	33.7	1183.5	620	248.1	11:38	1.15	1.39	0.05

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
21:42:11	1191.0	1190.8	14.4	24	119	173	1969	413	392	1.09	1.09	32.6	33.9	1184.5	618	249.0	11:43	1.15	1.33	0.03
21:45:20	1192.0	1191.8	19.0	25	119	177	1988	414	379	1.09	1.09	32.7	33.8	1185.2	617	250.0	11:46	1.15	1.28	0.02
21:48:50	1193.0	1192.8	17.1	29	119	205	1993	415	391	1.09	1.09	32.8	33.9	1186.1	619	251.0	11:49	1.15	1.35	0.01
21:52:21	1194.0	1193.8	17.1	28	120	188	1981	415	388	1.09	1.09	32.8	33.9	1186.6	620	252.0	11:53	1.15	1.34	0.01
21:55:55	1195.0	1194.8	16.9	28	119	182	1978	415	399	1.09	1.09	32.9	33.9	1187.1	617	253.0	11:56	1.15	1.35	0.01
22:00:03	1196.0	1195.8	14.5	28	120	156	1975	416	423	1.09	1.09	32.9	33.9	1187.9	619	254.0	12:00	1.15	1.39	0.01
22:05:07	1197.0	1196.8	11.8	28	122	174	2006	417	392	1.09	1.09	33.0	33.9	1188.9	618	255.0	12:05	1.15	1.46	0.01
22:10:05	1198.0	1197.8	12.5	27	121	146	1983	417	397	1.09	1.09	33.0	33.8	1189.8	618	256.0	12:10	1.15	1.42	0.01
22:14:57	1199.0	1198.8	12.3	28	118	152	1975	417	405	1.09	1.09	33.1	33.9	1190.8	620	257.0	12:15	1.15	1.44	0.03
22:18:06	1200.0	1199.8	19.0	28	118	142	1982	418	387	1.09	1.09	33.1	34.0	1191.8	618	258.0	12:18	1.15	1.32	0.03
22:37:51	1201.0	1200.8	10.6	26	121	159	1942	410	362	1.09	1.09	33.2	33.8	1195.9	621	259.0	12:24	1.15	1.38	0.02
22:42:29	1202.0	1201.8	12.9	27	122	140	1956	407	366	1.09	1.09	33.2	33.7	1196.8	622	260.0	12:29	1.15	1.36	0.02
22:49:25	1203.0	1202.8	8.7	27	117	134	1918	408	407	1.09	1.09	33.2	33.8	1198.1	626	261.0	12:36	1.15	1.50	0.02
22:54:02	1204.0	1203.8	13.0	29	118	156	1961	408	369	1.09	1.09	33.2	34.0	1199.3	625	262.0	12:40	1.15	1.44	0.02
2:56:55	1205.0	1204.8	20.8	32	118	183	1956	408	371	1.09	1.09	33.2	34.1	1200.0	626	263.0	12:43	1.15	1.35	0.02
23:01:22	1206.1	1205.8	13.5	32	117	166	1951	408	417	1.09	1.09	33.3	34.1	1200.2	624	264.1	12:48	1.15	1.46	0.02
23:07:09	1207.0	1206.8	10.4	32	118	142	1924	408	395	1.09	1.09	33.3	34.3	1200.2	626	265.0	12:53	1.15	1.55	0.02
23:12:18	1208.0	1207.8	11.7	32	118	172	1934	409	385	1.09	1.09	33.3	34.4	1200.5	624	266.0	12:59	1.15	1.50	0.04
23:16:16	1209.0	1208.8	15.5	31	118	189	1953	409	344	1.09	1.09	33.4	34.4	1201.4	626	267.0	13:03	1.15	1.41	0.04
23:20:02	1210.0	1209.8	15.9	30	118	177	1968	409	377	1.09	1.09	33.4	34.3	1202.0	626	268.0	13:06	1.15	1.39	0.02
23:23:11	1211.0	1210.8	19.0	29	118	157	1948	410	387	1.09	1.09	33.5	34.3	1202.5	628	269.0	13:09	1.12	1.37	0.02
23:26:25	1212.0	1211.8	18.6	30	118	166	1944	409	405	1.09	1.09	33.5	34.4	1202.9	628	270.0	13:13	1.12	1.39	0.01
23:30:02	1213.0	1212.8	17.4	30	117	199	1950	410	366	1.09	1.09	33.5	34.3	1203.6	628	271.0	13:16	1.12	1.40	0.01
23:32:45	1214.1	1213.8	22.2	30	117	215	1955	410	381	1.09	1.09	33.6	34.4	1204.3	628	272.1	13:19	1.12	1.33	0.01
23:36:11	1215.0	1214.8	17.4	31	118	185	1961	409	380	1.09	1.09	33.6	34.4	1205.3	630	273.0	13:22	1.12	1.42	0.01
23:40:17	1216.0	1215.8	14.6	30	118	210	1958	409	388	1.09	1.09	33.7	34.5	1206.1	630	274.0	13:27	1.12	1.46	0.01
23:44:10	1217.0	1216.8	16.1	30	118	181	1960	408	363	1.09	1.09	33.6	34.4	1206.7	629	275.0	13:30	1.12	1.42	0.01
23:47:57	1218.0	1217.8	15.8	29	118	162	1963	408	425	1.09	1.09	33.7	34.4	1207.6	630	276.0	13:34	1.12	1.42	0.01
23:50:36	1219.0	1218.8	22.6	32	118	196	1963	407	362	1.09	1.09	33.7	34.2	1207.9	630	277.0	13:37	1.12	1.35	0.01
23:52:43	1220.0	1219.8	28.3	32	117	210	1961	407	383	1.09	1.09	33.7	34.2	1208.5	629	278.0	13:39	1.12	1.28	0.01
23:55:01	1221.0	1220.8	26.5	31	118	202	1948	408	426	1.09	1.09	33.6	34.3	1209.1	630	279.0	13:41	1.12	1.29	0.01
23:57:30	1222.0	1221.8	24.0	30	118	191	1965	408	385	1.09	1.09	33.6	34.4	1209.7	633	280.0	13:44	1.12	1.31	0.01
23:59:30	1223.0	1222.8	29.9	32	118	194	1965	408	378	1.09	1.09	33.6	34.5	1210.2	630	281.0	13:46	1.12	1.27	0.01
00:01:47	1224.0	1223.8	28.2	31	118	196	1948	408	426	1.09	1.09	33.6	34.6	1211.0	630	282.0	13:48	1.12	1.27	0.02
00:03:16	1225.0	1224.8	39.8	30	118	184	1952	408	427	1.09	1.09	33.6	34.6	1211.7	632	283.0	13:50	1.12	1.21	0.02
00:05:24	1226.0	1225.8	28.5	31	118	208	1952	408	414	1.09	1.09	33.6	34.6	1212.3	630	284.0	13:52	1.12	1.27	0.02
00:06:55	1227.0	1226.8	39.3	30	117	219	1960	407	435	1.09	1.09	33.6	34.6	1212.7	631	285.0	13:53	1.12	1.16	0.02
00:08:25	1228.0	1227.8	41.1	30	118	183	1938	408	416	1.09	1.09	33.6	34.6	1212.9	629	286.0	13:55	1.12	1.16	0.02
00:11:04	1229.0	1228.8	22.6	32	118	176	1940	408	430	1.09	1.09	33.6	34.7	1213.6	630	287.0	13:57	1.12	1.36	0.02
00:22:27	1230.0	1229.8	41.4	32	119	161	1896	406	400	1.09	1.09	33.7	32.7	1216.0	620	288.0	13:59	1.12	1.18	0.00
00:24:27	1231.0	1230.8	30.1	34	120	181	1919	406	430	1.09	1.09	33.7	33.5	1216.4	619	289.0	14:01	1.12	1.29	0.00
00:25:57	1232.0	1231.8	39.8	32	120	165	1893	406	402	1.09	1.09	33.8	34.1	1216.8	618	290.0	14:02	1.12	1.19	0.01
00:27:18	1233.1	1232.8	46.2	30	120	166	1918	407	434	1.09	1.09	33.8	34.2	1217.2	617	291.1	14:04	1.12	1.13	0.02
00:29:13	1234.0	1233.8	31.1	32	120	168	1919	407	433	1.09	1.09	33.8	34.2	1217.6	617	292.0	14:06	1.12	1.26	0.02
00:34:51	1235.1	1234.8	11.4	34	120	145	1892	407	438	1.09	1.09	33.8	34.4	1219.7	615	293.1	14:11	1.12	1.58	0.02
00:36:47	1236.0	1235.8	30.8	33	120	162	1883	406	402	1.09	1.09	33.8	34.5	1220.5	616	294.0	14:13	1.12	1.28	0.02
00:38:20	1237.1	1236.8	44.6	31	120	162	1893	406	435	1.09	1.09	33.8	34.5	1221.1	616	295.1	14:15	1.12	1.14	0.02
00:39:38	1238.0	1237.8	46.0	30	120	163	1903	407	431	1.09	1.09	33.8	34.5	1221.7	618	296.0	14:16	1.12	1.13	0.02
00:41:12	1239.0	1238.8	38.2	30	120	169	1894	407	452	1.09	1.09	33.8	34.5	1222.3	617	297.0	14:18	1.12	1.19	0.02
00:42:34	1240.0	1239.8	43.6	32	120	163	1909	406	406	1.09	1.09	33.8	34.5	1222.9	614	298.0	14:19	1.12	1.17	0.02
00:44:09	1241.0	1240.8	37.9	33	120	172	1886	407	401	1.09	1.09	33.8	34.5	1223.6	616	299.0	14:21	1.12	1.21	0.02

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
00:46:16	1242.0	1241.8	28.3	32	120	155	1909	407	442	1.09	1.09	33.8	34.4	1224.8	616	300.0	14:23	1.12	1.29	0.02
00:47:33	1243.0	1242.8	46.8	31	120	149	1887	407	430	1.09	1.09	33.8	34.4	1225.4	615	301.0	14:24	1.12	1.13	0.02
00:49:14	1244.0	1243.8	38.9	33	120	159	1904	407	434	1.09	1.09	33.8	34.5	1226.4	614	302.0	14:26	1.12	1.17	0.02
00:51:04	1245.0	1244.7	32.7	33	120	169	1896	407	440	1.09	1.09	33.8	34.6	1227.5	614	303.0	14:27	1.12	1.27	0.02
00:52:41	1246.0	1245.8	39.3	31	120	165	1915	407	427	1.09	1.09	33.8	34.6	1228.3	616	304.0	14:29	1.12	1.18	0.01
00:54:41	1247.0	1246.8	29.9	32	120	198	1936	407	441	1.09	1.09	33.8	34.6	1228.9	614	305.0	14:31	1.12	1.27	0.01
00:56:31	1248.0	1247.7	32.7	32	120	180	1940	407	463	1.09	1.09	33.9	34.6	1229.1	615	306.0	14:33	1.12	1.25	0.02
00:58:48	1249.0	1248.8	28.2	33	120	199	1962	407	445	1.09	1.09	33.9	34.5	1229.1	613	307.0	14:35	1.12	1.30	0.02
01:01:02	1250.0	1249.7	26.8	33	120	178	1958	407	447	1.09	1.09	33.9	34.5	1229.1	614	308.0	14:37	1.12	1.32	0.02
01:02:37	1251.0	1250.7	37.9	34	120	209	1941	407	431	1.09	1.09	33.9	34.6	1229.3	615	309.0	14:39	1.12	1.22	0.02
01:04:33	1252.0	1251.7	31.0	33	120	198	1938	406	452	1.09	1.09	33.9	34.6	1230.0	615	310.0	14:41	1.12	1.27	0.01
01:06:32	1253.0	1252.7	30.3	32	120	197	1921	406	447	1.09	1.09	33.9	34.6	1231.1	615	311.0	14:43	1.12	1.26	0.01
01:08:08	1254.1	1253.8	43.5	33	120	185	1924	406	416	1.09	1.09	33.9	34.6	1232.1	614	312.1	14:44	1.12	1.18	0.01
01:09:51	1255.0	1254.8	34.8	32	120	171	1906	406	441	1.09	1.09	34.0	34.6	1233.2	615	313.0	14:46	1.12	1.22	0.02
01:11:21	1256.0	1255.7	39.8	30	120	168	1918	406	461	1.09	1.09	34.0	34.6	1233.9	614	314.0	14:48	1.12	1.17	0.02
01:12:49	1257.0	1256.8	42.9	29	120	157	1921	405	430	1.09	1.09	34.0	34.6	1234.2	616	315.0	14:49	1.12	1.13	0.02
01:14:29	1258.0	1257.7	35.8	29	120	162	1930	405	423	1.09	1.09	34.0	34.6	1234.6	615	316.0	14:51	1.12	1.19	0.02
01:27:21	1259.1	1258.8	27.9	31	118	159	1907	406	455	1.09	1.09	34.0	34.7	1240.5	618	317.1	14:53	1.12	1.28	0.01
01:28:39	1260.0	1259.7	45.7	34	118	160	1945	407	428	1.09	1.09	34.0	34.7	1240.6	618	318.0	14:54	1.12	1.16	0.01
01:31:23	1261.0	1260.8	22.1	32	118	171	1936	406	419	1.09	1.09	33.9	34.7	1242.0	619	319.0	14:57	1.12	1.35	0.02
01:33:36	1262.0	1261.7	27.0	32	119	181	1925	405	411	1.09	1.09	33.9	34.6	1243.5	622	320.0	14:59	1.12	1.30	0.02
01:35:26	1263.0	1262.7	33.2	33	119	180	1917	404	399	1.09	1.09	33.9	34.6	1244.4	622	321.0	15:01	1.12	1.25	0.02
01:37:23	1264.0	1263.8	30.8	33	119	170	1904	405	413	1.09	1.09	33.9	34.6	1245.5	622	322.0	15:03	1.12	1.28	0.02
01:38:47	1265.0	1264.7	42.7	33	119	172	1905	405	432	1.09	1.09	33.9	34.7	1246.3	622	323.0	15:05	1.12	1.18	0.02
01:40:39	1266.0	1265.7	34.7	34	119	161	1920	405	420	1.09	1.09	34.0	34.7	1247.2	626	324.0	15:06	1.12	1.25	0.02
01:43:13	1267.0	1266.7	23.4	34	119	158	1917	405	413	1.09	1.09	33.9	34.7	1248.5	627	325.0	15:09	1.12	1.36	0.02
01:44:44	1268.0	1267.7	39.3	32	120	171	1931	405	412	1.09	1.09	33.9	34.8	1249.1	628	326.0	15:11	1.12	1.18	0.02
01:46:26	1269.1	1268.8	35.9	33	120	181	1912	405	450	1.09	1.09	33.9	34.8	1249.8	628	327.1	15:12	1.12	1.23	0.03
01:48:03	1270.0	1269.7	36.8	33	120	172	1951	406	395	1.09	1.09	33.9	34.8	1250.7	627	328.0	15:14	1.12	1.22	0.04
01:49:57	1271.0	1270.8	31.9	32	120	160	1922	406	416	1.09	1.09	33.9	34.9	1251.7	628	329.0	15:16	1.12	1.25	0.04
01:51:36	1272.0	1271.7	36.1	32	120	159	1936	406	378	1.09	1.09	33.9	35.0	1252.6	629	330.0	15:17	1.12	1.22	0.04
01:53:18	1273.0	1272.7	35.3	33	120	169	1928	406	386	1.09	1.09	33.9	35.1	1253.4	631	331.0	15:19	1.12	1.24	0.03
01:54:58	1274.0	1273.7	36.0	33	120	157	1930	406	431	1.09	1.09	33.9	35.3	1254.4	631	332.0	15:21	1.12	1.22	0.03
01:57:27	1275.0	1274.7	24.4	32	120	147	1925	406	418	1.09	1.09	33.9	35.3	1256.0	633	333.0	15:23	1.12	1.33	0.03
01:59:28	1276.0	1275.7	29.7	32	120	172	1925	407	458	1.09	1.09	34.0	35.3	1257.2	635	334.0	15:25	1.12	1.28	0.03
02:01:47	1277.0	1276.7	25.9	34	120	160	1930	406	412	1.09	1.09	34.0	35.3	1258.3	636	335.0	15:28	1.12	1.34	0.03
02:04:35	1278.0	1277.7	22.5	32	120	159	1917	407	436	1.09	1.09	34.0	35.2	1258.4	637	336.0	15:30	1.12	1.36	0.03
02:06:42	1279.0	1278.7	28.2	31	120	157	1915	407	431	1.09	1.09	34.0	35.2	1258.4	638	337.0	15:33	1.12	1.28	0.03
02:08:28	1280.0	1279.7	34.0	32	120	156	1932	406	442	1.09	1.09	34.0	35.1	1258.4	642	338.0	15:34	1.12	1.23	0.03
02:10:09	1281.0	1280.7	35.6	31	120	153	1922	406	385	1.09	1.09	34.1	35.1	1258.5	641	339.0	15:36	1.12	1.21	0.03
02:12:17	1282.0	1281.7	28.1	32	120	148	1933	406	397	1.09	1.09	34.1	35.1	1259.3	645	340.0	15:38	1.12	1.29	0.03
02:14:06	1283.0	1282.7	34.0	30	120	155	1913	406	411	1.09	1.09	34.1	35.2	1260.3	644	341.0	15:40	1.12	1.21	0.03
02:15:30	1284.0	1283.7	42.6	32	120	167	1937	406	394	1.09	1.09	34.1	35.3	1260.8	645	342.0	15:41	1.12	1.16	0.03
02:17:15	1285.0	1284.7	34.3	32	120	174	1942	405	401	1.09	1.09	34.1	35.3	1261.5	646	343.0	15:43	1.12	1.23	0.02
02:18:45	1286.0	1285.7	40.0	31	120	156	1934	405	416	1.09	1.09	34.1	35.3	1262.2	648	344.0	15:45	1.12	1.18	0.02
02:20:20	1287.0	1286.7	38.1	32	120	179	1926	405	441	1.09	1.09	34.1	35.3	1263.0	646	345.0	15:46	1.12	1.20	0.02
02:32:52	1288.1	1287.8	17.5	31	117	154	1946	405	374	1.09	1.09	34.2	34.6	1268.4	632	346.1	15:50	1.12	1.40	0.00
02:34:28	1289.0	1288.7	37.3	31	120	181	1942	406	371	1.09	1.09	34.2	33.3	1269.3	630	347.0	15:51	1.12	1.20	0.01
02:36:02	1290.0	1289.7	38.2	31	120	173	1949	406	392	1.09	1.09	34.2	34.3	1270.2	630	348.0	15:53	1.12	1.19	0.02
02:37:47	1291.1	1290.8	37.3	30	120	163	1944	407	391	1.09	1.09	34.2	34.7	1271.2	631	349.1	15:55	1.12	1.18	0.02
02:39:25	1292.1	1291.8	36.6	30	120	164	1938	407	402	1.09	1.09	34.2	35.0	1272.1	632	350.1	15:56	1.12	1.18	0.02

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
02:41:54	1293.0	1292.7	24.0	31	120	167	1929	407	408	1.09	1.09	34.2	35.0	1273.5	634	351.0	15:59	1.12	1.33	0.02
02:44:24	1294.0	1293.7	24.0	32	121	161	1946	408	411	1.09	1.09	34.2	35.0	1274.7	635	352.0	16:01	1.12	1.33	0.02
02:46:43	1295.0	1294.7	28.8	31	120	164	1935	407	432	1.09	1.09	34.2	35.1	1276.5	636	353.0	16:03	1.12	1.26	0.02
02:48:45	1296.0	1295.7	29.4	29	121	147	1939	408	441	1.09	1.09	34.2	35.1	1277.3	640	354.0	16:05	1.12	1.24	0.02
02:51:42	1297.1	1296.8	20.7	29	120	156	1941	408	394	1.09	1.09	34.2	35.0	1277.7	643	355.1	16:08	1.12	1.34	0.02
02:53:33	1298.0	1297.7	32.2	30	120	164	1938	408	426	1.09	1.09	34.1	35.0	1278.3	643	356.0	16:10	1.12	1.22	0.02
02:56:06	1299.0	1298.7	24.9	30	120	160	1939	408	423	1.09	1.09	34.2	35.0	1279.7	642	357.0	16:13	1.12	1.30	0.03
02:58:47	1300.0	1299.7	22.3	30	120	156	1940	408	403	1.09	1.09	34.2	35.0	1281.2	643	358.0	16:16	1.12	1.33	0.03
03:01:02	1301.0	1300.7	28.1	33	120	168	1951	408	397	1.09	1.09	34.1	35.1	1282.2	645	359.0	16:18	1.12	1.31	0.02
03:04:15	1302.0	1301.7	18.7	34	120	164	1944	408	402	1.09	1.09	34.1	35.2	1284.2	650	360.0	16:21	1.13	1.43	0.02
03:06:34	1303.1	1302.8	28.2	32	120	178	1936	408	414	1.09	1.09	34.1	35.2	1285.6	651	361.1	16:23	1.13	1.29	0.02
03:07:58	1304.0	1303.7	42.5	31	120	174	1958	407	429	1.09	1.09	34.2	35.1	1286.5	653	362.0	16:25	1.13	1.16	0.02
03:09:39	1305.0	1304.7	35.6	32	120	170	1951	407	410	1.09	1.09	34.2	35.1	1287.3	652	363.0	16:26	1.13	1.22	0.02
03:13:03	1306.0	1305.7	17.6	31	121	157	1945	407	394	1.09	1.09	34.2	35.1	1287.8	654	364.0	16:30	1.13	1.41	0.02
3:14:34	1307.0	1306.7	39.6	31	120	170	1937	406	414	1.09	1.09	34.2	35.1	1287.8	656	365.0	16:31	1.13	1.17	0.02
03:16:14	1308.0	1307.7	36.9	31	120	180	1957	406	399	1.09	1.09	34.2	35.1	1287.8	654	366.0	16:33	1.13	1.16	0.02
03:20:08	1309.0	1308.7	15.4	32	120	175	1946	406	399	1.09	1.09	34.2	35.1	1288.2	655	367.0	16:37	1.13	1.47	0.02
03:21:32	1310.0	1309.7	43.6	29	120	170	1937	406	409	1.09	1.09	34.2	35.1	1289.0	656	368.0	16:38	1.13	1.12	0.01
03:23:03	1311.0	1310.7	39.6	29	120	169	1955	405	409	1.09	1.09	34.2	35.1	1289.9	657	369.0	16:40	1.13	1.15	0.01
03:24:46	1312.0	1311.7	34.8	34	120	172	1940	405	392	1.09	1.09	34.2	35.1	1291.0	659	370.0	16:41	1.13	1.25	0.01
03:26:57	1313.0	1312.7	27.5	32	120	171	1939	404	394	1.09	1.09	34.2	35.2	1292.1	659	371.0	16:44	1.13	1.29	0.01
03:29:05	1314.0	1313.7	31.0	32	120	169	1928	403	424	1.09	1.09	34.2	35.2	1292.9	663	372.0	16:46	1.13	1.26	0.01
03:31:59	1315.0	1314.7	20.6	33	120	175	1934	403	368	1.09	1.09	34.2	35.2	1293.9	662	373.0	16:49	1.13	1.40	0.02
03:34:05	1316.0	1315.7	28.6	32	120	169	1936	403	414	1.09	1.09	34.3	35.2	1294.9	665	374.0	16:51	1.13	1.28	0.02
03:54:55	1317.1	1316.8	15.1	31	120	155	1920	405	404	1.09	1.09	34.2	35.1	1300.4	639	375.1	16:55	1.13	1.46	0.01
03:57:36	1318.0	1317.7	22.3	32	119	151	1892	409	385	1.09	1.09	34.0	34.7	1301.4	638	376.0	16:57	1.13	1.35	0.01
04:01:05	1319.1	1318.8	19.8	33	119	169	1898	409	410	1.09	1.09	33.9	34.5	1302.5	640	377.1	17:01	1.13	1.39	0.01
04:02:56	1320.0	1319.7	32.3	31	119	161	1903	409	412	1.09	1.09	33.9	34.5	1303.6	641	378.0	17:03	1.13	1.23	0.01
04:06:47	1321.0	1320.7	15.6	32	119	156	1896	409	383	1.09	1.09	33.9	34.6	1305.4	646	379.0	17:07	1.13	1.47	0.02
04:08:36	1322.0	1321.7	33.0	31	119	174	1906	409	373	1.09	1.09	33.8	34.7	1306.0	644	380.0	17:08	1.13	1.22	0.02
04:10:49	1323.0	1322.7	27.5	31	119	178	1895	409	436	1.09	1.09	33.8	34.7	1307.3	644	381.0	17:11	1.13	1.28	0.01
04:12:24	1324.0	1323.7	37.7	30	119	178	1915	409	433	1.09	1.09	33.8	34.8	1308.1	645	382.0	17:12	1.13	1.18	0.01
04:14:34	1325.0	1324.7	27.9	30	119	180	1910	409	436	1.09	1.09	33.8	34.8	1308.4	646	383.0	17:14	1.13	1.26	0.01
04:15:51	1326.0	1325.7	46.5	30	119	193	1936	409	448	1.09	1.09	33.8	34.9	1308.9	648	384.0	17:16	1.13	1.11	0.01
04:17:11	1327.0	1326.7	45.0	30	119	205	1974	409	395	1.09	1.09	33.8	34.9	1310.5	648	385.0	17:17	1.13	1.12	0.01
04:18:42	1328.0	1327.7	39.8	30	119	189	2000	406	386	1.09	1.09	33.8	35.0	1311.8	648	386.0	17:19	1.13	1.16	0.01
04:20:52	1329.0	1328.7	27.6	31	119	199	2016	406	437	1.09	1.09	33.8	35.0	1312.8	648	387.0	17:21	1.13	1.28	0.01
04:23:21	1330.0	1329.7	24.2	31	119	171	2027	406	397	1.09	1.09	33.8	35.0	1313.1	651	388.0	17:23	1.13	1.32	0.01
04:26:37	1331.0	1330.7	18.4	32	120	186	1939	406	391	1.09	1.09	33.8	34.9	1314.5	648	389.0	17:26	1.13	1.41	0.01
04:29:12	1332.1	1331.8	25.4	32	120	192	1917	406	383	1.09	1.09	33.8	34.9	1315.5	649	390.1	17:29	1.13	1.31	0.01
04:31:58	1333.0	1332.7	21.6	31	121	166	1903	406	395	1.09	1.09	33.8	34.9	1316.6	651	391.0	17:32	1.13	1.36	0.01
04:34:48	1334.0	1333.7	21.2	32	121	170	1898	406	406	1.09	1.09	33.8	34.9	1316.8	654	392.0	17:35	1.13	1.37	0.01
04:37:21	1335.0	1334.7	23.5	32	121	176	1884	407	424	1.09	1.09	33.7	34.9	1316.8	657	393.0	17:37	1.13	1.33	0.01
04:40:00	1336.0	1335.7	22.9	31	121	169	1895	407	413	1.09	1.09	33.7	34.8	1316.8	658	394.0	17:40	1.13	1.33	0.01
04:43:09	1337.0	1336.7	19.0	30	121	162	1886	407	404	1.09	1.09	33.6	34.8	1316.8	661	395.0	17:43	1.13	1.37	0.01
04:45:33	1338.0	1337.7	25.1	31	121	177	1904	408	393	1.09	1.09	33.6	34.7	1317.5	663	396.0	17:45	1.13	1.31	0.01
04:48:30	1339.0	1338.7	20.3	31	121	159	1906	408	425	1.09	1.09	33.6	34.7	1318.2	665	397.0	17:48	1.13	1.37	0.01
04:52:49	1340.0	1339.7	14.5	31	121	159	1898	408	403	1.09	1.09	33.5	34.8	1319.7	668	398.0	17:53	1.13	1.47	0.01
04:56:20	1341.0	1340.7	17.0	31	121	165	1899	407	393	1.09	1.09	33.5	34.9	1320.8	675	399.0	17:56	1.13	1.42	0.01

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW		MUD WEIGHT		MUD TEMP		RETNS DEPTH	PVT	---BIT---		ECD	DXC	GAS
								IN	OUT	IN	OUT	IN	OUT			DIST	HRS			
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
04:59:33	1342.0	1341.7	18.9	31	121	167	1909	407	425	1.09	1.09	33.4	35.0	1322.3	683	400.0	17:59	1.13	1.39	0.01
05:02:19	1343.0	1342.7	21.6	32	121	173	1902	407	445	1.09	1.09	33.2	35.0	1323.6	691	401.0	18:02	1.13	1.36	0.01
05:04:41	1344.0	1343.7	25.4	32	121	175	1915	407	421	1.09	1.09	33.1	34.9	1324.7	696	402.0	18:05	1.13	1.31	0.01
05:07:21	1345.0	1344.7	24.0	28	121	175	1920	407	435	1.09	1.09	32.9	34.9	1326.6	705	403.0	18:07	1.13	1.28	0.01
05:26:40	1346.0	1345.7	19.1	28	119	174	1899	405	415	1.09	1.09	32.7	34.9	1332.2	754	404.0	18:10	1.13	1.34	0.01
05:29:22	1347.0	1346.7	23.5	29	118	176	1900	403	423	1.09	1.09	32.4	34.8	1333.1	755	405.0	18:13	1.13	1.29	0.01
05:33:44	1348.0	1347.7	13.7	30	118	148	1881	404	396	1.09	1.09	32.5	34.6	1334.8	757	406.0	18:17	1.13	1.46	0.01
05:39:10	1349.0	1348.7	11.0	30	118	157	1879	404	434	1.09	1.09	32.6	34.5	1336.5	759	407.0	18:23	1.13	1.53	0.01
05:44:24	1350.0	1349.7	11.5	30	118	147	1876	404	408	1.09	1.09	32.8	34.6	1338.3	758	408.0	18:28	1.13	1.51	0.01
05:49:41	1351.0	1350.7	11.4	31	118	152	1872	404	394	1.09	1.09	33.0	34.7	1339.8	759	409.0	18:33	1.13	1.53	0.01
05:52:00	1352.0	1351.7	25.9	29	118	196	1923	404	378	1.09	1.09	33.1	34.9	1340.3	759	410.0	18:36	1.13	1.27	0.01
05:54:15	1353.0	1352.7	26.7	29	118	179	1888	404	380	1.09	1.09	33.2	35.0	1341.5	759	411.0	18:38	1.13	1.25	0.01
05:56:11	1354.0	1353.7	31.6	29	118	177	1922	404	360	1.09	1.09	33.2	35.0	1342.1	760	412.0	18:40	1.13	1.20	0.01
05:58:16	1355.0	1354.7	28.8	29	118	193	1923	404	387	1.09	1.09	33.3	34.9	1342.7	757	413.0	18:42	1.13	1.24	0.01
06:00:38	1356.0	1355.7	25.3	32	118	209	1955	404	368	1.09	1.09	33.3	34.9	1342.9	756	414.0	18:44	1.13	1.31	0.01
06:03:21	1357.0	1356.7	22.1	31	118	194	1940	404	348	1.09	1.09	33.4	34.8	1344.0	757	415.0	18:47	1.13	1.33	0.01
06:06:16	1358.0	1357.7	20.9	30	118	198	1919	403	341	1.09	1.09	33.5	34.8	1345.0	757	416.0	18:50	1.13	1.34	0.01
06:07:49	1359.0	1358.7	38.7	31	120	209	1928	404	402	1.09	1.09	33.5	34.9	1345.4	757	417.0	18:52	1.13	1.17	0.01
06:09:50	1360.0	1359.7	29.8	30	120	200	1924	404	370	1.09	1.09	33.5	34.9	1345.5	758	418.0	18:54	1.13	1.25	0.01
06:14:02	1361.0	1360.7	14.3	32	120	176	1949	404	362	1.09	1.09	33.6	34.9	1345.5	757	419.0	18:58	1.13	1.49	0.01
06:19:29	1362.0	1361.7	11.0	32	120	166	2022	405	368	1.09	1.09	33.7	34.8	1345.8	758	420.0	19:03	1.13	1.56	0.01
06:25:18	1363.0	1362.7	11.4	32	120	171	1986	406	382	1.09	1.09	33.8	34.7	1347.6	757	421.0	19:09	1.13	1.55	0.01
06:30:37	1364.0	1363.7	11.3	31	120	171	2007	406	350	1.09	1.09	33.8	34.7	1348.5	756	422.0	19:14	1.13	1.54	0.01
06:36:17	1365.0	1364.7	10.6	31	120	170	2056	406	359	1.09	1.09	33.9	34.7	1349.6	754	423.0	19:20	1.13	1.56	0.01
06:44:49	1366.0	1365.7	9.4	27	120	164	2031	406	369	1.09	1.09	34.0	34.8	1351.5	753	424.0	19:26	1.13	1.53	0.01
06:48:33	1367.0	1366.7	17.7	32	121	193	1974	406	378	1.09	1.09	34.0	34.9	1353.1	753	425.0	19:30	1.13	1.42	0.01
06:52:15	1368.0	1367.7	16.2	31	121	184	1972	405	392	1.09	1.09	34.1	35.0	1354.9	752	426.0	19:34	1.13	1.43	0.01
06:55:55	1369.0	1368.7	17.4	30	121	190	1963	405	394	1.09	1.09	34.1	35.1	1356.4	752	427.0	19:37	1.13	1.41	0.01
06:59:24	1370.0	1369.7	17.1	31	121	193	1996	405	392	1.09	1.09	34.1	35.1	1357.5	755	428.0	19:41	1.13	1.42	0.01
07:03:04	1371.0	1370.7	16.4	31	121	190	1940	405	373	1.09	1.09	34.2	35.1	1359.4	753	429.0	19:45	1.13	1.43	0.01
07:05:41	1372.1	1371.8	24.6	31	121	199	1995	405	360	1.09	1.09	34.2	35.1	1360.3	756	430.1	19:47	1.13	1.32	0.01
07:09:10	1373.0	1372.7	17.2	31	121	189	1979	405	344	1.09	1.09	34.2	35.1	1361.1	752	431.0	19:51	1.13	1.41	0.01
07:12:28	1374.0	1373.7	18.4	29	121	198	1986	405	385	1.09	1.09	34.3	35.1	1361.7	754	432.0	19:54	1.13	1.37	0.01
07:31:20	1375.0	1374.7	14.3	29	119	199	1971	406	362	1.09	1.09	34.3	35.1	1364.0	752	433.0	19:58	1.13	1.42	0.01
07:33:34	1376.0	1375.7	27.0	28	118	226	1989	407	373	1.09	1.09	34.4	35.1	1364.4	750	434.0	20:00	1.13	1.24	0.01
07:35:45	1377.0	1376.7	27.4	28	117	213	2013	407	359	1.09	1.09	34.4	35.0	1365.2	748	435.0	20:03	1.13	1.22	0.01
07:38:37	1378.0	1377.7	21.0	28	121	205	1988	406	374	1.09	1.09	34.4	34.8	1365.4	741	436.0	20:06	1.13	1.31	0.01
07:41:23	1379.0	1378.7	21.7	28	120	186	1960	405	387	1.09	1.09	34.4	34.8	1365.4	738	437.0	20:08	1.13	1.31	0.01
07:44:44	1380.0	1379.7	17.9	29	120	183	1948	404	390	1.09	1.09	34.4	34.8	1365.8	737	438.0	20:12	1.13	1.37	0.01
07:48:52	1381.0	1380.7	14.5	28	120	184	1943	405	403	1.09	1.09	34.4	35.0	1366.8	736	439.0	20:16	1.13	1.42	0.01
07:53:03	1382.0	1381.7	14.3	28	120	169	1934	405	396	1.09	1.09	34.4	35.1	1368.0	736	440.0	20:20	1.13	1.42	0.01
07:57:12	1383.0	1382.7	14.5	29	120	148	1930	405	400	1.09	1.09	34.4	35.2	1369.1	735	441.0	20:24	1.13	1.43	0.01
08:01:21	1384.0	1383.7	14.5	29	120	166	1918	406	378	1.09	1.09	34.4	35.3	1370.2	738	442.0	20:28	1.13	1.43	0.01
08:05:29	1385.1	1384.8	14.6	30	120	159	1922	406	375	1.09	1.09	34.4	35.4	1371.4	739	443.1	20:32	1.13	1.45	0.01
08:09:43	1386.0	1385.7	14.1	30	120	165	1932	407	350	1.09	1.09	34.5	35.4	1372.8	737	444.0	20:37	1.13	1.46	0.01
08:14:46	1387.0	1386.7	12.6	31	120	157	1928	407	417	1.09	1.09	34.5	35.4	1374.3	738	445.0	20:42	1.13	1.51	0.01
08:19:21	1388.0	1387.7	13.1	32	120	159	1925	407	428	1.09	1.09	34.6	35.4	1374.7	740	446.0	20:46	1.13	1.52	0.01
08:23:18	1389.0	1388.7	15.2	32	120	162	1936	407	416	1.09	1.09	34.7	35.5	1374.7	739	447.0	20:50	1.13	1.47	0.01
08:26:51	1390.0	1389.7	17.0	32	120	175	1928	407	390	1.09	1.09	34.7	35.5	1374.7	737	448.0	20:54	1.13	1.42	0.01
08:29:19	1391.0	1390.7	24.3	30	120	184	1951	407	394	1.09	1.09	34.7	35.5	1375.3	736	449.0	20:56	1.13	1.30	0.01

DrillByte Drilling Data Printout COMPANY: BHP PETROLEUM WELL: LOCH ARD-1

TIME	DEPTH	VERT. DEPTH	ROP	WOB	RPM	TRQ	SPP	FLOW IN	FLOW OUT	MUD WEIGHT IN	MUD WEIGHT OUT	MUD TEMP IN	MUD TEMP OUT	RETNS DEPTH	PVT	---BIT--- DIST	---BIT--- HRS	ECD	DXC	GAS
h:mm:sec	m	m	m/hr	klb		amp	psi	gpm		sg		deg C		m	bbl	m	hh:mm	sg		%
08:30:49	1392.0	1391.7	40.2	30	120	206	1971	407	400	1.09	1.09	34.7	35.5	1376.1	736	450.0	20:58	1.13	1.16	0.01
08:32:58	1393.0	1392.7	27.9	32	120	201	2004	407	393	1.09	1.09	34.7	35.5	1376.9	737	451.0	20:60	1.13	1.28	0.01
08:35:53	1394.0	1393.7	20.6	32	120	191	1961	406	384	1.09	1.09	34.7	35.6	1378.0	736	452.0	21:03	1.13	1.37	0.01
08:37:36	1395.0	1394.7	35.0	32	120	197	1970	406	403	1.09	1.09	34.8	35.6	1378.5	736	453.0	21:04	1.13	1.21	0.01
08:39:14	1396.0	1395.7	36.5	31	120	201	1969	406	408	1.09	1.09	34.8	35.6	1379.1	736	454.0	21:06	1.13	1.19	0.01

TD Loch Ard-1 @ 1397m

APPENDIX IX: Geological-Engineering Morning Reports

BAKER HUGHES INTEQ

DRILLBYTE MORNING REPORT NO 1

COMPANY BHP PETROLEUM WELL LOCH ARD - 1

DATE 19.10.93 TIME 24:00

DEPTH 388 m LAST REPORT DEPTH -

RIG OPERATIONS RIH with hole opener

ENGINEERS A. Thangam / G. Timmis REPORT RECEIVED BY G. Blunt / J. Bowman (OPTR)

DRILLING REPORT

Bit No. NB#2 Type SEC SS33SF Size 9.875 in Jets 3x16

On Bit: Distance 256.0 m Hours 3:10 hh:mm ROP 80.8 m/hr WOB 0.5-14 RPM 111-121

Pump Press 661-862 SPM 99-101 Torque 45-224 TBR 24481 CP I:@ - CP B:@ -

HYDRAULICS REPORT

Mud Density In 1.03 sg Mud Density out 0.00 sg ECD sg PV/YP 1/1

Gels - Salinity - PPM Cl Solids -

Hole Volume 150 bbl Annular Volume 120 bbl Tubing Volume 7 bbl Displaced Volume 29.3 bbl

Carbide Lag-Calculated Lag 933 stk Flowrate 540 gpm

DrillPipe Annular Vel (Max. Dia. Sec.) 5.3 m/min DrillPipe Annular Vel (Open Hole) -

Drill Collar Annular Vel (Open Hole) 120 m/min Critical Vel 22 m/min

Pressure Loss System 995 psi Pressure Loss Bit 665 psi % Pressure Loss 66.8 %

Nozzle Vel 89.6 m/sec Jet Impact Force 707 lbf HHP 209 hhp

PRESSURE PARAMETERS

Drilling Exponent 0.23-0.93 Flowline Temp -

Shale Density - Shale Factor -

Background Gas - Max. Formation Gas - @ - Trip Gas - @ -

Other Gas -

Fill - Tight Hole -

Cavings Est % - Average Size -

ESTIMATED PORE AND FRACTURE PRESSURE

Kick Tolerance - Min. Estimated Fracture Pressure (Open Hole) -

Estimated Pore Pressure 1.03 sg EMW @TD* Min. Estimated Pore Pressure (Open Hole) - @ -

Max. Estimated Pore Pressure (Open Hole) - @ - Estimated Fracture Pressure at TD -

COMMENTS

RIH, tag bottom @ 100m. Drill 36" hole to 132m. Sweep hole w/ 75 bbl guar gum and 150 bbl s/w, displace hole to 145bbl guar gum. Drop totco, pull back to 125m. Retrieve totco RIH. Tag bottom @ 132m. No fill, circ 150 bbl s/w. Displace hole to 220 bbl w/ Hi vis gel. POOH. R/u + run 30" csg. M/u PGB. RIH, land out shoe-132m. M/u cmt hose, test 2000 psi, cmt csg. WOC. Back out R/T. POOH, L/o same. Drill cmt, shoe & cmt f/ 127m to 134m. Drill 9.875" pilot hole f/ 134m to 136m. Work on torque wrench. Cont drill pilot hole from 136m to 388m.

BAKER HUGHES INTEQ

DRILLBYTE MORNING REPORT NO 2

COMPANY BHP PETROLEUM WELL LOCH ARD - 1

DATE 20.10.93 TIME 24:00

DEPTH 393 m LAST REPORT DEPTH 388m

RIG OPERATIONS WOC

ENGINEERS A. Thangam / G. Timmis REPORT RECEIVED BY G. Blunt / J. Bowman (OPTR)

DRILLING REPORT

Bit No. RR#1.1 w/ 26" H/o Type SEC SS44G Size 17.5 in Jets 1x20,2x18 w/ 3x18,1x20

On Bit: Distance 5 m Hours 00:10 hh:mm ROP 29 m/hr WOB 12-20 RPM 102

Pump Press 2280 SPM 204 Torque 141-337 TBR 42568 CP I:@ - CP B:@ -

HYDRAULICS REPORT

Mud Density In 1.03 sg Mud Density out 0.00 sg ECD 1.03 sg PV/YP 1/1

Gels - Salinity - PPM Cl Solids -

Hole Volume 641.6 bbl Annular Volume 600.4 bbl Tubing Volume 16 bbl Displaced Volume 32.9 bbl

Carbide Lag-Calculated Lag 4670 stk Flowrate 1102 gpm

DrillPipe Annular Vel (Max. Dia. Sec.) 10.1 m/min DrillPipe Annular Vel (Open Hole) 12.7 m/min

Drill Collar Annular Vel (Open Hole) 14 m/min Critical Vel 8.8 m/min

Pressure Loss System 2186 psi Pressure Loss Bit 1487 psi % Pressure Loss 68 %

Nozzle Vel 134 m/sec Jet Impact Force 2158 lbf HHP 955 hhp

PRESSURE PARAMETERS

Drilling Exponent 0.3-0.82 Flowline Temp -

Shale Density - Shale Factor -

Background Gas - Max. Formation Gas - @ - Trip Gas - @ -

Other Gas -

Fill - Tight Hole -

Cavings Est % - Average Size -

ESTIMATED PORE AND FRACTURE PRESSURE

Kick Tolerance - Min. Estimated Fracture Pressure (Open Hole) -

Estimated Pore Pressure 1.03 sg EMW @TD* Min. Estimated Pore Pressure (Open Hole) - @

Max. Estimated Pore Pressure (Open Hole) - @ - Estimated Fracture Pressure at TD -

COMMENTS

RIH, tag cmt @ 127m. Open 9.875" pilot hole to 17.5" + then to 26" from 127m to 393m. Sweep w/ 40 bbl hi vis guar gum per 1/2 std. Sweep hole w/ 350 bbl s/w - 375 bbl guar gum Spot 325 bbl Hi vis Gel. Drop survey. POOH to shoe. Hole Good. No drag. RIH to 393m. Swept 350 bbl s/w. 750 bbl hi vis + spot 300 bbl KCL on btm. POOH (no drag). Recover survey (390m = 0.5deg). R/u + RIH w/ landing string. Land out + overpull 50k. Circ 350 bbl s/w. Rig Howco.

BAKER HUGHES INTEQ

DRILLBYTE MORNING REPORT NO 3

COMPANY BHP PETROLEUM WELL LOCH ARD - 1

DATE 21.10.93 TIME 24:00

DEPTH 393 m LAST REPORT DEPTH 393m

RIG OPERATIONS Testing BOP

ENGINEERS A. Thangam / G. Timmis REPORT RECEIVED BY G. Blunt / J. Bowman (OPTR)

DRILLING REPORT

Bit No. - Type - Size 0.000 in Jets -

On Bit: Distance 0.0 m Hours - hh:mm ROP - WOB - RPM -

Pump Press - SPM - Torque - TBR - CP I:$ - CP B:$ -

HYDRAULICS REPORT

Mud Density In 1.03 sg Mud Density out - sg ECD - PV/YP -

Gels - Salinity - PPM Cl Solids -

Hole Volume 461 bbl Annular Volume - Tubing Volume - Displaced Volume -

Carbide Lag-Calculated Lag 3577 stk Flowrate -

DrillPipe Annular Vel (Max. Dia. Sec.) - DrillPipe Annular Vel (Open Hole) -

Drill Collar Annular Vel (Open Hole) - Critical Vel -

Pressure Loss System - Pressure Loss Bit - % Pressure Loss -

Nozzle Vel - Jet Impact Force - HHP -

PRESSURE PARAMETERS

Drilling Exponent - Flowline Temp -

Shale Density - Shale Factor -

Background Gas - Max. Formation Gas - @ - Trip Gas - @ -

Other Gas -

Fill - Tight Hole -

Cavings Est % - Average Size -

ESTIMATED PORE AND FRACTURE PRESSURE

Kick Tolerance - Min. Estimated Fracture Pressure (Open Hole) -

Estimated Pore Pressure 1.03 sg EMW @TD* Min. Estimated Pore Pressure (Open Hole) - @

Max. Estimated Pore Pressure (Open Hole) - @ - Estimated Fracture Pressure at TD -

COMMENTS

Cont to mix + pump cmt. Back up R/T. POOH. Rig up + run BOP.
Test choke + kill line, hook up C + K line. RIH w/ test tool, test BOP valves + rams.
Jump ROV. DIsplace BOP to mud. Monitor annulus on trip tank + test annulus.
Visible leak @ LMRP conn. POOH w/ test tool.

BAKER HUGHES INTEQ

DRILLBYTE MORNING REPORT NO 4

COMPANY BHP PETROLEUM WELL LOCH ARD - 1

DATE 22.10.93 TIME 24:00

DEPTH 393 m LAST REPORT DEPTH 393m

RIG OPERATIONS Testing BOP

ENGINEERS A. Thangam / G. Timmis REPORT RECEIVED BY G. Blunt / J. Bowman (OPTR)

DRILLING REPORT

Bit No. - Type - Size 0.000 in Jets -

On Bit: Distance 0.0 m Hours 1:00 hh:mm ROP - WOB - RPM -

Pump Press - SPM - Torque - TBR - CP 1:@ - CP 2:@ -

HYDRAULICS REPORT

Mud Density In 1.03 sg Mud Density out 0.00 sg ECD - PV/YP -

Gels - Salinity - PPM Cl Solids -

Hole Volume 461 bbl Annular Volume - Tubing Volume - Displaced Volume -

Carbide Lag-Calculated Lag 3577 stk Flowrate -

DrillPipe Annular Vel (Max. Dia. Sec.) - DrillPipe Annular Vel (Open Hole) -

Drill Collar Annular Vel (Open Hole) - Critical Vel -

Pressure Loss System - Pressure Loss Bit - % Pressure Loss -

Nozzle Vel - Jet Impact Force - HHP -

PRESSURE PARAMETERS

Drilling Exponent - Flowline Temp -

Shale Density - Shale Factor -

Background Gas - Max. Formation Gas - @ - Trip Gas - @ -

Other Gas -

Fill - Tight Hole -

Cavings Est % - Average Size -

ESTIMATED PORE AND FRACTURE PRESSURE

Kick Tolerance - Min. Estimated Fracture Pressure (Open Hole) -

Estimated Pore Pressure 1.03 sg EMW @TD* Min. Estimated Pore Pressure (Open Hole) - @

Max. Estimated Pore Pressure (Open Hole) - @ - Estimated Fracture Pressure at TD -

COMMENTS

Pulled LMRP for suspected leading ax ring gasket. Remove ax gasket from LMRP.
Install new ax ring & test against annular.
Remove test ax ring & install new ax ring. Run in w/ LMRP. Test failed.
Unlatch and change out ax ring w/ ROV.
Succeed in pressure testing.
Cont to test BOP.

BAKER HUGHES INTEQ

DRILLBYTE MORNING REPORT NO 5

COMPANY BHP PETROLEUM WELL LOCH ARD - 1

DATE 23.10.93 TIME 24:00

DEPTH 786 m LAST REPORT DEPTH 393m

RIG OPERATIONS Drilling ahead.

ENGINEERS A. Thangam / G. Timmis REPORT RECEIVED BY G. Blunt / J. Bowman (OPTR)

DRILLING REPORT

Bit No. NB#3 Type HTC ATM11 GH Size 12.25 in Jets 2x16 1x15

On Bit: Distance 393 m Hours 5:45 hh:mm ROP 68.3 m/hr WOB 0-38 m/hr RPM 98-111

Pump Press 2270-2496 SPM 140-141 Torque 56-399 TBR 36404 CP I:@ - CP B:@ -

HYDRAULICS REPORT

Mud Density In 1.09 sg Mud Density out 1.10 sg ECD 1.11 PV/YP 15/27

Gels 6/10 Salinity 50000 PPM Cl Solids 5%

Hole Volume 652 bbl Annular Volume 568 bbl Tubing Volume 38 bbl Displaced Volume 46.7 bbl

Carbide Lag-Calculated Lag 4900 stk (Carbide) Flowrate 770 gpm

DrillPipe Annular Vel (Max. Dia. Sec.) 15.8 m/min DrillPipe Annular Vel (Open Hole) 46.2 m/min

Drill Collar Annular Vel (Open Hole) 66.8 m/min Critical Vel 147.2 m/min

Pressure Loss System 2335 psi Pressure Loss Bit 1554 psi % Pressure Loss 66.6 %

Nozzle Vel 133 m/sec Jet Impact Force 1586 lbf HHP 698 hhp

PRESSURE PARAMETERS

Drilling Exponent 0.37-1.26 Flowline Temp 36.6 deg C

Shale Density - Shale Factor -

Background Gas 0.01% Max. Formation Gas - @ - Trip Gas - @ -

Other Gas -

Fill - Tight Hole -

Cavings Est % - Average Size -

ESTIMATED PORE AND FRACTURE PRESSURE

Kick Tolerance 0.17 sg Min. Estimated Fracture Pressure (Open Hole) 1.44 sg EMW @ 383

Estimated Pore Pressure 1.03 sg EMW @TD* Min. Estimated Pore Pressure (Open Hole) 1.03 sg @ TD

Max. Estimated Pore Pressure (Open Hole) 1.03 sg @ TD Estimated Fracture Pressure at TD 1.64 sg

COMMENTS

Cont. test BOP valves + rams. POOH w/ test plug.
RIH w/ 17.5" BHA. Tag cmt @ 366m. Drill out cmt + shoe @ 382m. Clean rathole.
Change over to KCL mud. Circ BU. + clean hole, slug pipe. POOH. L/o 17.5" bit
M/u 12.25" BHA + RIH. Drill 12.25" hole to 396m. CIrc. Pull back to shoe + perform LOT. (1.44sg EMW)
RIH to 396m. Drill to 786m. FLC @ conn.

Carbide check indicates that the average hole size @ 798m was 14".

BAKER HUGHES INTEQ

DRILLBYTE MORNING REPORT NO 6

COMPANY BHP PETROLEUM | WELL LOCH ARD - 1

DATE 24.10.93 | TIME 24:00

DEPTH 942 m | LAST REPORT DEPTH 786 m

RIG OPERATIONS Running E-Logs

ENGINEERS A. Thangam / G. Timmis | REPORT RECEIVED BY G. Blunt / J. Bowman (OPTR)

DRILLING REPORT

Bit No. NB#3 | Type HTC ATM11 GH | Size 12.250 in | Jets 2x16 1x15

On Bit: Distance 549.0 m | Hours 10:55 hh:mm | ROP 50.3 m/hr | WOB 0-38 m/hr | RPM 95-115

Pump Press 2270-2695 | SPM 136-143 | Torque 56-525 | TBR 70375 | CP I:@ - | CP B:@ -

HYDRAULICS REPORT

Mud Density In 1.09 sg | Mud Density out 1.10 sg | ECD 1.11 | PV/YP 14/25

Gels 5/6 | Salinity 50000 | PPM Cl | Solids 5%

Hole Volume 807 bbl | Annular Volume 710 bbl | Tubing Volume 47 bbl | Displaced Volume 50.3 bbl

Carbide Lag-Calculated Lag 5511 stk (Carbide) | Flowrate 770 gpm

DrillPipe Annular Vel (Max. Dia. Sec.) 15.8 m/min | DrillPipe Annular Vel (Open Hole) 33.7 m/min

Drill Collar Annular Vel (Open Hole) 43.5 m/min | Critical Vel 133.3 m/min

Pressure Loss System 2373 psi | Pressure Loss Bit 1550 psi | % Pressure Loss 65 %

Nozzle Vel 133 m/sec | Jet Impact Force 1582 lbf | HHP 695 hhp

PRESSURE PARAMETERS

Drilling Exponent 0.29-1.73 | Flowline Temp 38.8 deg C

Shale Density - | Shale Factor -

Background Gas 0.02% | Max. Formation Gas - @ - | Trip Gas - @ -

Other Gas -

Fill - | Tight Hole -

Cavings Est % - | Average Size -

ESTIMATED PORE AND FRACTURE PRESSURE

Kick Tolerance 0.137 sg | Min. Estimated Fracture Pressure (Open Hole) 1.44 sg EMW @ 383

Estimated Pore Pressure 1.03 sg EMW @TD* | Min. Estimated Pore Pressure (Open Hole) 1.03 sg @ TD

Max. Estimated Pore Pressure (Open Hole) 1.03 sg @ TD | Estimated Fracture Pressure at TD 1.67 sg

COMMENTS

Drill 12.25" hole f/786 to 860m, FLC conn,Circ BU. Drill f/860 to 942m FLC, Circ BU. FLC. Slug pipe, pull 6 std, 50klb drag at 770m, swabbing,FLC (ok). Attempt RIH, resistance, work free. Ream back to bottom (770-942m). Circ BU. Max gas 004%. FLC. POOH wet @ 654m, max drag 30klb. Taking good mud. Slug pipe cont POOH to 600m, max drag 30k, not taking mud in this section of hol Circ BU @ 600m, no gas. Pump out of hole f/ 600m to shoe. (tight @ 506m hole packed off) FLC 10 min @ shoe + POOH. Took good mud. R/u + run E-logs.

Mud loss of 1.3 bbl/hr while logging.

BAKER HUGHES INTEQ

DRILLBYTE MORNING REPORT NO 7

COMPANY BHP PETROLEUM WELL LOCH ARD - 1

DATE 25.10.93 TIME 24:00

DEPTH 942 m LAST REPORT DEPTH 942 m

RIG OPERATIONS Making Up 8.5" BHA.

ENGINEERS A. Thangam / G. Timmis REPORT RECEIVED BY G. Blunt / T. How (OPTR)

DRILLING REPORT

Bit No. NB#4 Type HTC ATM11 GH Size 8.5 in Jets 12,12,12

On Bit: Distance - m Hours - hh:mm ROP - WOB - RPM -

Pump Press - SPM - Torque - TBR - CP I:# - CP B:# -

HYDRAULICS REPORT

Mud Density In 1.09 sg Mud Density out 1.10 sg ECD 1.11 FV/YP 14/25

Gels 5/6 Salinity 50000 PPM Cl Solids 5%

Hole Volume 322 bbl Annular Volume 237 bbl Tubing Volume 45.8 bbl Displaced Volume 39 bbl

Carbide Lag-Calculated Lag 1841 stk Flowrate -

DrillPipe Annular Vel (Max. Dia. Sec.) - DrillPipe Annular Vel (Open Hole) -

Drill Collar Annular Vel (Open Hole) - Critical Vel -

Pressure Loss System - Pressure Loss Bit - % Pressure Loss -

Nozzle Vel - Jet Impact Force - HHP -

PRESSURE PARAMETERS

Drilling Exponent - Flowline Temp -

Shale Density - Shale Factor -

Background Gas - Max. Formation Gas - @ - Trip Gas - @ -

Other Gas -

Fill - Tight Hole -

Cavings Est % - Average Size -

ESTIMATED PORE AND FRACTURE PRESSURE

Kick Tolerance 0.137 sg Min. Estimated Fracture Pressure (Open Hole) 1.44 sg EMW @ 383

Estimated Pore Pressure 1.03 sg EMW @TD* Min. Estimated Pore Pressure (Open Hole) 1.03 sg @ TD

Max. Estimated Pore Pressure (Open Hole) 1.03 sg @ TD Estimated Fracture Pressure at TD 1.67 sg

COMMENTS

Log w/ Schlumberger-CST 30 shots-100% recovery. M/u hanger, R/tool + plug assy.
RIH w/ 12.25 BHA @ 587m, 15klb drag, work thru tight hole to 596m. Cont RIH @ 942m.
No resistance, no fill. CIrc BU. No gas. Flow check, slug pipe, POOH to run 9.625".
R/u + RIH 9.625" casing, fill every 5 jnts. Circ 250 bbl mud. Test cmt lines, mix+pump cmt+disp.
Plug did not bump. Set seal assy + test same, test BOPs'. Set 9.625" wear bushing.
L/o 12.25" BHA.

BAKER HUGHES INTEQ

DRILLBYTE MORNING REPORT NO 8

COMPANY BHP PETROLEUM WELL LOCH ARD - 1

DATE 26.10.93 TIME 24:00

DEPTH 1223 m LAST REPORT DEPTH 942 m

RIG OPERATIONS Drill Ahead.

ENGINEERS A. Thangam / G. Timmis REPORT RECEIVED BY G. Howard / T. How (OPTR)

DRILLING REPORT

Bit No. NB#4 Type HTC ATM11 GH Size 8.500 in Jets 12,12,12

On Bit: Distance 281 m Hours 13:46 hh:mm ROP 20.42 m/hr WOB 14-34 klb RPM 82-121

Pump Press 1450-2002 SPM 67-78 Torque 100-614 TBR 102084 CP I:# - CP S:# -

HYDRAULICS REPORT

Mud Density In 1.09 sg Mud Density out 1.10 sg ECD 1.12 PV/YP 14/22

Gels 6/9 Salinity 55000 PPM Cl Solids 5.6%

Hole Volume 474 bbl Annular Volume 364 bbl Tubing Volume 62.4 bbl Displaced Volume 48 bbl

Carbide Lag-Calculated Lag 2825 stk Flowrate 406 gpm

DrillPipe Annular Vel (Max. Dia. Sec.) 8.3 m/min DrillPipe Annular Vel (Open Hole) 37 m/min

Drill Collar Annular Vel (Open Hole) 101 m/min Critical Vel 164 m/min

Pressure Loss System 1745 psi Pressure Loss Bit 1257 psi % Pressure Loss 72 %

Nozzle Vel 120 m/sec Jet Impact Force 752 lbf HHP 298 hhp

PRESSURE PARAMETERS

Drilling Exponent 0.74-1.68 Flowline Temp 34.5 deg C

Shale Density - Shale Factor -

Background Gas 0.02% Max. Formation Gas 0.05% @ 1143m Trip Gas - @ -

Other Gas -

Fill - Tight Hole -

Cavings Est % - Average Size -

ESTIMATED PORE AND FRACTURE PRESSURE

Kick Tolerance 0.59 sg Min. Estimated Fracture Pressure (Open Hole) 1.87 sg EMW @ 930m

Estimated Pore Pressure 1.03 sg EMW @TD* Min. Estimated Pore Pressure (Open Hole) 1.03 sg @ TD

Max. Estimated Pore Pressure (Open Hole) 1.03 sg @ TD Estimated Fracture Pressure at TD 1.90 sg

COMMENTS M/u 8.5" BHA + RIH. Break circ + tag cmt @ 897m. Drill plugs, float + cmt with seawater. Change to KCL mud, drill shoe @ 930m, clean out rathole to 942m. Surge for junk, drill 3m new hole. Surge for junk. Circ hole clean, balance mud prior to break off test. Perform LOT=1.87 sg EMW. Drill 8.5" hole from 945-1003m. Flow check conn, No drag. Cont to drill ahead.

APPENDIX X: Bit Hydraulics Printouts

EXLOG DRILLBYTE EAP : MUD HYDRAULICS ANALYSIS

Data Printed on : Thu Oct 28 04:02:15 1993

INPUT DATA

Hydraulics Model	POWER LAW	Casing Shoe Depth	1200.0 m	Jet 1	12 in/32
Depth	1397.0 m	Weakest Fmtn Depth	1526.0 m	Jet 2	12 in/32
Vertical Depth	1397.0 m	Mud Density	1.09 sg	Jet 3	12 in/32
Flow Rate	406 gpm	300 rpm viscometer	36	Total Fluid Area	0.3313 in^2
Average ROP	15.0 m/hr	600 rpm viscometer	50		
Cuttings Density	2.25 sg	Plastic Viscosity	14.00 cP		
Cuttings Diameter	0.100 in	Yield Point	22.00 #/100ft^2		
Cuttings Shape	SPHERICAL	Power Law k	1.93367 #sec^n/100ft^2		
Cuttings Thickness	0.000 in	Power Law n	0.47393		

CALCULATED RESULTS

Section Top m	Section Length m	Hole Size in	Pipe OD in	Pipe ID in	Volumes & Capacities Hole bbl	Pipe bbl	Annulus bbl	Mud Velocity Pipe m/min	Annulus m/min	Critical m/min	Flow Regime
Surface	98.5	19.750	5.000	4.276	122.5	5.7	114.4	165.9	8.3	86.7	LAMINAR
100.0	293.0	8.681	5.000	4.276	70.4	17.1	46.5	165.9	60.9	135.9	LAMINAR
393.0	731.1	10.360	5.000	4.276	250.1	42.6	190.6	165.9	37.1	120.5	LAMINAR
1124.1	75.9	10.360	5.000	2.750	26.0	1.8	19.6	401.1	37.5	121.1	LAMINAR
1200.0	4.2	8.500	5.000	2.750	1.0	0.1	0.6	401.1	66.1	139.2	LAMINAR
1204.2	192.8	8.500	6.500	2.813	44.4	4.9	18.4	383.3	101.1	163.8	LAMINAR

Hydrostatic Pressure	2163 psi		
Annular Volume	390.2 bbl	3029 strokes	40 mins
Pipe Capacity	72.2 bbl	561 strokes	7 mins
Circulating Volume	462.4 bbl	3590 strokes	48 mins
Pipe Displacement	51.8 bbl		
Total Hole Volume	514.2 bbl		

HYDRAULICS RESULTS AT VARIOUS FLOW RATES

Flow Rate	gpm :	356	366	376	386	396	406	416	426	436	446	456
Flow Regime at TD	:	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM
Jet Velocity	m/sec :	105.1	108.0	111.0	113.9	116.9	119.8	122.8	125.7	128.7	131.6	134.6
Impact Force	lbf :	578.3	611.2	645.1	679.8	715.5	752.1	789.6	828.0	867.4	907.6	948.8
Hydraulic Power	hhp :	200.6	218.0	236.4	255.8	276.1	297.6	320.1	343.8	368.6	394.5	421.7
Bit Loss	psi :	967	1022	1078	1136	1196	1257	1320	1384	1450	1517	1586
% Bit Loss	:	69.4	69.9	70.3	70.7	71.1	71.5	71.9	72.2	72.5	72.8	73.1
Pipe Loss	psi :	289	301	314	327	341	354	368	381	395	409	424
Annular Loss	psi :	81	82	83	84	85	86	87	88	89	90	91
Cuttings Loss	psi :	26	25	24	24	23	23	22	21	21	20	20
Surface Loss	psi :	30	32	34	35	37	39	41	42	44	46	48
Total Loss	psi :	1392	1462	1533	1607	1682	1758	1837	1917	1999	2083	2168
Circ Pressure	psi :	2269	2270	2270	2270	2271	2271	2272	2272	2273	2273	2274
ECD @ TD	sg :	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.14	1.14
ECD @ Shoe	sg :	1.11	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
ECD @ Weakest Depth	sg :	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
ECD @ TD (cuttings)	sg :	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.15	1.15	1.15	1.15

Recommended Minimum Flow to maintain cuttings transport in top section is 15 gpm
Recommended Maximum Flow to maintain laminar flow in lowest section is 658 gpm

EXLOG DRILLBYTE EAP : MUD HYDRAULICS ANALYSIS

Data Printed on : Wed Oct 20 00:46:43 1993

INPUT DATA

Hydraulics Model	POWER LAW	Casing Shoe Depth	130.0 m	Jet 1	16 in/32
Depth	388.0 m	Weakest Fmtn Depth	1526.0 m	Jet 2	16 in/32
Vertical Depth	388.0 m	Mud Density	1.03 sg	Jet 3	16 in/32
Flow Rate	540 gpm	300 rpm viscometer	2	Total Fluid Area	0.5890 in^2
Average ROP	80.0 m/hr	600 rpm viscometer	3		
Cuttings Density	2.25 sg	Plastic Viscosity	1.00 cP		
Cuttings Diameter	0.100 in	Yield Point	1.00 #/100ft^2		
Cuttings Shape	SPHERICAL	Power Law k	0.05412 #sec^n/100ft^2		
Cuttings Thickness	0.000 in	Power Law n	0.58496		

CALCULATED RESULTS

Section Top	Section Length	Hole Size	Pipe OD	Pipe ID	Volumes & Capacities Hole	Pipe	Annulus	Mud Velocity Pipe	Annulus	Critical	Flow Regime
m	m	in	in	in	bbl	bbl	bbl	m/min	m/min	m/min	
Surface	128.5	28.000	5.000	2.750	321.1	3.1	310.5	533.4	5.3	7.6	LAMINAR
130.0	120.0	9.875	5.000	2.750	37.3	2.9	27.4	533.4	56.2	14.8	TURBULENT
250.0	82.0	9.875	5.000	2.750	25.5	2.0	18.6	533.4	56.7	14.9	TURBULENT
332.0	56.0	9.875	8.000	2.875	17.4	1.5	6.0	488.1	120.4	22.0	TURBULENT

Hydrostatic Pressure	566 psi		
Annular Volume	362.5 bbl	2814 strokes	28 mins
Pipe Capacity	9.4 bbl	73 strokes	1 mins
Circulating Volume	372.0 bbl	2888 strokes	29 mins
Pipe Displacement	29.3 bbl		
Total Hole Volume	401.3 bbl		

HYDRAULICS RESULTS AT VARIOUS FLOW RATES

Flow Rate	gpm :	490	500	510	520	530	540	550	560	570	580	590
Flow Regime at TD	:	TURB	TURB	TURB	TURB	TURB	TURB	TURB	TURB	TURB	TURB	TURB
Jet Velocity	m/sec :	81.3	83.0	84.7	86.3	88.0	89.6	91.3	93.0	94.6	96.3	97.9
Impact Force	lbf :	582.3	606.3	630.8	655.8	681.3	707.2	733.6	760.6	788.0	815.9	844.2
Hydraulic Power	hhp :	156.4	166.2	176.4	186.9	197.9	209.4	221.2	233.5	246.2	259.4	273.1
Bit Loss	psi :	548	570	593	617	641	665	690	715	741	767	794
% Bit Loss	:	65.7	65.9	66.2	66.4	66.6	66.8	55.1	55.6	56.1	56.5	56.9
Pipe Loss	psi :	209	216	223	230	237	244	251	259	266	274	281
Annular Loss	psi :	6	6	6	6	7	7	7	7	7	8	8
Cuttings Loss	psi :	19	19	18	18	17	17	239	238	238	238	238
Surface Loss	psi :	52	54	56	58	60	62	64	67	69	71	73
Total Loss	psi :	834	865	897	929	962	995	1252	1286	1322	1358	1394
Circ Pressure	psi :	591	591	591	590	590	590	812	812	812	812	812
ECD @ TD	sg :	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
ECD @ Shoe	sg :	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
ECD @ Weakest Depth	sg :	1.07	1.07	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.09	1.09
ECD @ TD (cuttings)	sg :	1.08	1.08	1.07	1.07	1.07	1.07	1.48	1.48	1.48	1.48	1.48

Recommended Minimum Flow to maintain cuttings transport in top section is 543 gpm
Recommended Maximum Flow to maintain laminar flow in lowest section is 99 gpm

EXLOG DRILLBYTE EAP : MUD HYDRAULICS ANALYSIS

Data Printed on : Wed Oct 20 12:07:51 1993

INPUT DATA

Hydraulics Model	POWER LAW	Casing Shoe Depth	130.0 m	Jet 1	20 in/32
Depth	393.0 m	Weakest Fmtn Depth	1526.0 m	Jet 2	18 in/32
Vertical Depth	393.0 m	Mud Density	1.03 sg	Jet 3	18 in/32
Flow Rate	1102 gpm	300 rpm viscometer	2	Total Fluid Area	0.8038 in^2
Average ROP	20.0 m/hr	600 rpm viscometer	3		
Cuttings Density	2.25 sg	Plastic Viscosity	1.00 cP		
Cuttings Diameter	0.100 in	Yield Point	1.00 #/100ft^2		
Cuttings Shape	SPHERICAL	Power Law k	0.05412 #sec^n/100ft^2		
Cuttings Thickness	0.000 in	Power Law n	0.58496		

CALCULATED RESULTS

Section Top m	Section Length m	Hole Size in	Pipe OD in	Pipe ID in	Volumes & Capacities Hole bbl	Pipe bbl	Annulus bbl	Mud Velocity Pipe m/min	Annulus m/min	Critical m/min	Flow Regime
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
110.0	52.8	26.000	5.000	4.276	124.5	3.4	119.8	450.3	12.2	7.9	TURBULENT
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
269.9	100.0	26.000	8.000	2.875	215.4	2.6	195.0	996.0	13.5	8.5	TURBULENT
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Hydrostatic Pressure	573 psi		
Annular Volume	856.5 bbl	6649 strokes	33 mins
Pipe Capacity	16.2 bbl	125 strokes	1 mins
Circulating Volume	872.7 bbl	6775 strokes	33 mins
Pipe Displacement	32.9 bbl		
Total Hole Volume	905.6 bbl		

HYDRAULICS RESULTS AT VARIOUS FLOW RATES

Flow Rate	gpm :	1052	1062	1072	1082	1092	1102	1112	1122	1132	1142	1152
Flow Regime at TD	:	TURB	TURB	TURB	TURB	TURB	TURB	TURB	TURB	TURB	TURB	TURB
Jet Velocity	m/sec :	128.0	129.2	130.4	131.6	132.9	134.1	135.3	136.5	137.7	138.9	140.2
Impact Force	lbf :	1966.9	2004.5	2042.4	2080.7	2119.3	2158.3	2197.7	2237.4	2277.5	2317.9	2358.6
Hydraulic Power	hhp :	831.3	855.2	879.6	904.5	929.8	955.6	981.8	1008.5	1035.7	1063.4	1091.6
Bit Loss	psi :	1355	1381	1407	1434	1460	1487	1514	1542	1569	1597	1625
% Bit Loss	:	67.5	67.6	67.7	67.8	67.9	68.0	68.2	68.3	68.4	68.5	68.6
Pipe Loss	psi :	388	394	400	406	412	418	424	430	436	442	449
Annular Loss	psi :	0	0	0	0	0	0	0	0	0	0	0
Cuttings Loss	psi :	50	49	48	47	46	46	45	44	43	42	42
Surface Loss	psi :	215	219	223	227	231	235	239	243	247	251	255
Total Loss	psi :	2009	2044	2079	2114	2150	2186	2222	2259	2296	2333	2371
Circ Pressure	psi :	624	623	622	621	620	619	618	617	617	616	615
ECD @ TD	sg :	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
ECD @ Shoe	sg :	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
ECD @ Weakest Depth	sg :	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
ECD @ TD (cuttings)	sg :	1.12	1.12	1.12	1.12	1.11	1.11	1.11	1.11	1.11	1.11	1.11

Recommended Minimum Flow to maintain cuttings transport in top section is 680 gpm
Recommended Maximum Flow to maintain laminar flow in lowest section is 694 gpm

EXLOG DRILLBYTE EAP : MUD HYDRAULICS ANALYSIS

Data Printed on : Sun Oct 24 01:08:36 1993

INPUT DATA

Hydraulics Model	POWER LAW	Casing Shoe Depth	393.0 m	Jet 1	16 in/32
Depth	786.0 m	Weakest Fmtn Depth	1526.0 m	Jet 2	16 in/32
Vertical Depth	786.0 m	Mud Density	1.09 sg	Jet 3	15 in/32
Flow Rate	770 gpm	300 rpm viscometer	42	Total Fluid Area	0.5653 in^2
Average ROP	24.1 m/hr	600 rpm viscometer	57		
Cuttings Density	2.25 sg	Plastic Viscosity	15.00 cP		
Cuttings Diameter	0.100 in	Yield Point	27.00 #/100ft^2		
Cuttings Shape	SPHERICAL	Power Law k	2.77197 #sec^n/100ft^2		
Cuttings Thickness	0.000 in	Power Law n	0.44057		

CALCULATED RESULTS

Section Top	Section Length	Hole Size	Pipe OD	Pipe ID	Volumes & Capacities Hole	Volumes & Capacities Pipe	Volumes & Capacities Annulus	Mud Velocity Pipe	Mud Velocity Annulus	Mud Velocity Critical	Flow Regime
m	m	in	in	in	bbl	bbl	bbl	m/min	m/min	m/min	
Surface	98.5	19.750	5.000	4.276	122.5	5.7	114.4	314.6	15.8	102.1	LAMINAR
100.0	293.0	19.130	5.000	4.276	341.7	17.1	317.9	314.6	16.9	103.5	LAMINAR
393.0	144.9	12.250	5.000	4.276	69.3	8.4	57.5	314.6	46.2	126.1	LAMINAR
537.9	80.1	12.250	5.000	3.000	38.3	2.3	31.6	639.2	46.5	126.6	LAMINAR
618.0	168.0	12.250	8.000	2.875	80.3	4.4	46.1	695.9	66.8	147.2	LAMINAR

Hydrostatic Pressure	1216 psi		
Annular Volume	567.5 bbl	4406 strokes	31 mins
Pipe Capacity	38.0 bbl	295 strokes	2 mins
Circulating Volume	605.5 bbl	4701 strokes	33 mins
Pipe Displacement	46.7 bbl		
Total Hole Volume	652.1 bbl		

HYDRAULICS RESULTS AT VARIOUS FLOW RATES

Flow Rate	gpm :	670	690	710	730	750	770	790	810	830	850	870
Flow Regime at TD	:	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM
Jet Velocity	m/sec :	115.9	119.4	122.8	126.3	129.7	133.2	136.7	140.1	143.6	147.0	150.5
Impact Force	lbf :	1200.6	1273.3	1348.2	1425.2	1504.4	1585.7	1669.1	1754.7	1842.5	1932.3	2024.3
Hydraulic Power	hhp :	459.5	501.9	546.8	594.4	644.6	697.5	753.3	812.0	873.6	938.3	1006.1
Bit Loss	psi :	1176	1248	1321	1396	1474	1554	1635	1719	1805	1893	1983
% Bit Loss	:	64.9	65.2	65.6	65.9	66.2	66.6	66.8	67.1	67.4	67.7	67.9
Pipe Loss	psi :	492	515	538	561	585	609	633	658	683	708	734
Annular Loss	psi :	19	19	20	20	20	20	21	21	21	21	22
Cuttings Loss	psi :	28	27	26	25	25	24	23	23	22	22	21
Surface Loss	psi :	98	104	110	116	121	128	134	140	147	153	160
Total Loss	psi :	1814	1913	2014	2118	2225	2335	2447	2561	2678	2798	2920
Circ Pressure	psi :	1263	1262	1262	1261	1261	1260	1260	1260	1259	1259	1259
ECD @ TD	sg :	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
ECD @ Shoe	sg :	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
ECD @ Weakest Depth	sg :	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
ECD @ TD (cuttings)	sg :	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13

Recommended Minimum Flow to maintain cuttings transport in top section is 15 gpm
Recommended Maximum Flow to maintain laminar flow in lowest section is 1695 gpm

EXLOG DRILLBYTE EAP : MUD HYDRAULICS ANALYSIS

Data Printed on : Sun Oct 24 08:00:15 1993

INPUT DATA

Hydraulics Model	POWER LAW	Casing Shoe Depth	393.0 m	Jet 1	16 in/32
Depth	942.0 m	Weakest Fmtn Depth	1526.0 m	Jet 2	16 in/32
Vertical Depth	841.9 m	Mud Density	1.09 sg	Jet 3	15 in/32
Flow Rate	769 gpm	300 rpm viscometer	42	Total Fluid Area	0.5653 in^2
Average ROP	16.4 m/hr	600 rpm viscometer	57		
Cuttings Density	2.25 sg	Plastic Viscosity	15.00 cP		
Cuttings Diameter	0.100 in	Yield Point	27.00 #/100ft^2		
Cuttings Shape	SPHERICAL	Power Law k	2.77197 #sec^n/100ft^2		
Cuttings Thickness	0.000 in	Power Law n	0.44057		

CALCULATED RESULTS

Section Top	Section Length	Hole Size	Pipe OD	Pipe ID	Volumes & Capacities Hole	Pipe	Annulus	Mud Velocity Pipe	Annulus	Critical	Flow Regime
m	m	in	in	in	bbl	bbl	bbl	m/min	m/min	m/min	
Surface	98.5	19.750	5.000	4.276	122.5	5.7	114.4	314.2	15.8	102.1	LAMINAR
100.0	293.0	19.130	5.000	4.276	341.7	17.1	317.9	314.2	16.9	103.5	LAMINAR
393.0	300.9	14.000	5.000	4.276	188.0	17.5	163.5	314.2	33.7	118.3	LAMINAR
693.9	80.1	14.000	5.000	3.000	50.1	2.3	43.3	638.3	33.9	118.7	LAMINAR
774.0	168.0	14.000	8.000	2.875	104.9	4.4	70.7	695.0	43.5	133.3	LAMINAR

Hydrostatic Pressure	1303 psi		
Annular Volume	709.8 bbl	5511 strokes	39 mins
Pipe Capacity	47.1 bbl	365 strokes	3 mins
Circulating Volume	756.9 bbl	5876 strokes	41 mins
Pipe Displacement	50.3 bbl		
Total Hole Volume	807.1 bbl		

HYDRAULICS RESULTS AT VARIOUS FLOW RATES

Flow Rate	gpm :	719	729	739	749	759	769	779	789	799	809	819
Flow Regime at TD	:	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM
Jet Velocity	m/sec :	124.4	126.1	127.8	129.6	131.3	133.0	134.8	136.5	138.2	140.0	141.7
Impact Force	lbf :	1382.6	1421.3	1460.6	1500.4	1540.7	1581.6	1623.0	1664.9	1707.4	1750.4	1793.9
Hydraulic Power	hhp :	567.9	591.9	616.6	642.0	668.1	694.8	722.3	750.5	779.3	809.0	839.3
Bit Loss	psi :	1355	1393	1431	1470	1510	1550	1590	1631	1673	1715	1758
% Bit Loss	:	64.5	64.7	64.8	65.0	65.1	65.3	65.4	65.6	65.7	65.9	66.0
Pipe Loss	psi :	596	609	622	635	648	661	674	688	701	714	728
Annular Loss	psi :	15	15	15	15	15	15	15	15	15	15	15
Cuttings Loss	psi :	22	21	21	21	20	20	20	20	19	19	19
Surface Loss	psi :	112	115	118	121	124	127	130	133	137	140	143
Total Loss	psi :	2100	2153	2207	2262	2317	2373	2430	2487	2545	2604	2663
Circ Pressure	psi :	1339	1339	1338	1338	1338	1338	1338	1337	1337	1337	1337
ECD @ TD	sg :	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
ECD @ Shoe	sg :	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
ECD @ Weakest Depth	sg :	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
ECD @ TD (cuttings)	sg :	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12

Recommended Minimum Flow to maintain cuttings transport in top section is 15 gpm
Recommended Maximum Flow to maintain laminar flow in lowest section is 2356 gpm

EXLOG DRILLBYTE EAP : MUD HYDRAULICS ANALYSIS

Data Printed on : Wed Oct 27 02:05:00 1993

INPUT DATA

Hydraulics Model	POWER LAW	Casing Shoe Depth	1200.0 m	Jet 1	12 in/32
Depth	1223.0 m	Weakest Fmtn Depth	1526.0 m	Jet 2	12 in/32
Vertical Depth	1122.9 m	Mud Density	1.09 sg	Jet 3	12 in/32
Flow Rate	406 gpm	300 rpm viscometer	36	Total Fluid Area	0.3313 in^2
Average ROP	59.8 m/hr	600 rpm viscometer	50		
Cuttings Density	2.25 sg	Plastic Viscosity	14.00 cP		
Cuttings Diameter	0.100 in	Yield Point	22.00 #/100ft^2		
Cuttings Shape	SPHERICAL	Power Law k	1.93367 #sec^n/100ft^2		
Cuttings Thickness	0.000 in	Power Law n	0.47393		

CALCULATED RESULTS

Section Top	Section Length	Hole Size	Pipe OD	Pipe ID	Volumes & Capacities Hole	Pipe	Annulus	Mud Velocity Pipe	Annulus	Critical	Flow Regime
m	m	in	in	in	bbl	bbl	bbl	m/min	m/min	m/min	
Surface	98.5	19.750	5.000	4.276	122.5	5.7	114.4	165.9	8.3	86.8	LAMINAR
100.0	293.0	8.681	5.000	4.276	70.4	17.1	46.4	165.9	61.0	136.0	LAMINAR
393.0	557.1	10.360	5.000	4.276	190.6	32.5	145.0	165.9	37.1	120.6	LAMINAR
950.1	80.1	10.360	5.000	3.000	27.4	2.3	20.7	337.0	37.5	121.1	LAMINAR
1030.2	169.8	10.360	6.500	2.813	58.1	4.3	35.2	383.3	46.6	133.4	LAMINAR
1200.0	23.0	8.500	6.500	2.813	5.3	0.6	2.2	383.3	101.1	163.8	LAMINAR

Hydrostatic Pressure	1738 psi		
Annular Volume	363.9 bbl	2825 strokes	38 mins
Pipe Capacity	62.4 bbl	485 strokes	6 mins
Circulating Volume	426.3 bbl	3310 strokes	44 mins
Pipe Displacement	47.8 bbl		
Total Hole Volume	474.2 bbl		

HYDRAULICS RESULTS AT VARIOUS FLOW RATES

Flow Rate	gpm :	356	366	376	386	396	406	416	426	436	446	456
Flow Regime at TD	:	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM	LAM
Jet Velocity	m/sec :	105.1	108.0	111.0	113.9	116.9	119.8	122.8	125.7	128.7	131.6	134.6
Impact Force	lbf :	578.3	611.2	645.1	679.8	715.5	752.1	789.6	828.0	867.4	907.6	948.8
Hydraulic Power	hhp :	200.6	218.0	236.4	255.8	276.1	297.6	320.1	343.8	368.6	394.5	421.7
Bit Loss	psi :	967	1022	1078	1136	1196	1257	1320	1384	1450	1517	1586
% Bit Loss	:	69.2	69.9	70.5	71.0	71.6	72.1	72.5	73.0	73.4	73.8	74.2
Pipe Loss	psi :	254	265	277	288	300	311	323	335	348	360	373
Annular Loss	psi :	51	52	52	53	54	54	55	56	56	57	57
Cuttings Loss	psi :	95	92	90	87	85	83	81	79	77	75	74
Surface Loss	psi :	30	32	34	35	37	39	41	42	44	46	48
Total Loss	psi :	1397	1463	1530	1600	1671	1745	1820	1896	1975	2056	2138
Circ Pressure	psi :	1884	1882	1880	1878	1877	1875	1874	1873	1871	1870	1869
ECD @ TD	sg :	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.13	1.13	1.13
ECD @ Shoe	sg :	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
ECD @ Weakest Depth	sg :	1.14	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
ECD @ TD (cuttings)	sg :	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.17	1.17	1.17	1.17

Recommended Minimum Flow to maintain cuttings transport in top section is 15 gpm
Recommended Maximum Flow to maintain laminar flow in lowest section is 658 gpm

PE600313

This is an enclosure indicator page.
The enclosure PE600313 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600313 has the following characteristics:

ITEM_BARCODE	= PE600313
CONTAINER_BARCODE	= PE900438
NAME	= Loch Ard 1 Drilling Data Plot, 1:2500
BASIN	= OTWAY
PERMIT	= VIC/P31
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Loch Ard 1 Drilling Data Plot, 1:2500, Vol 1, Appendix 5 Appendix I (colour)
REMARKS	=
DATE_CREATED	= *
DATE_RECEIVED	= *
W_NO	= W1090
WELL_NAME	= Loch Ard 1
CONTRACTOR	= Backer Hughes Inteq
CLIENT_OP_CO	= BHP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600609

This is an enclosure indicator page.
The enclosure PE600609 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600609 has the following characteristics:

ITEM_BARCODE	= PE600609
CONTAINER_BARCODE	= PE900438
NAME	= Loch Ard 1 Pressure Data Plot, 1:2500
BASIN	= OTWAY
PERMIT	= VIC/P31
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Loch Ard 1 Pressure Data Plot, 1:2500, Vol 1, Appendix 5 Appendix II (colour)
REMARKS	=
DATE_CREATED	= *
DATE_RECEIVED	= *
W_NO	= W1090
WELL_NAME	= Loch Ard 1
CONTRACTOR	= Backer Hughes Inteq
CLIENT_OP_CO	= BHP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600608

This is an enclosure indicator page.
The enclosure PE600608 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600608 has the following characteristics:

ITEM_BARCODE	= PE600608
CONTAINER_BARCODE	= PE900438
NAME	= Loch Ard 1 Composite Data Pressure Plot, 1:2500
BASIN	= OTWAY
PERMIT	= VIC/P31
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Loch Ard 1 Composite Data Pressure Plot, 1:2500, Vol 1, Appendix 5 Appendix III (colour)
REMARKS	=
DATE_CREATED	= *
DATE_RECEIVED	= *
W_NO	= W1090
WELL_NAME	= Loch Ard 1
CONTRACTOR	= Backer Hughes Inteq
CLIENT_OP_CO	= BHP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600611

This is an enclosure indicator page.
The enclosure PE600611 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600611 has the following characteristics:

ITEM_BARCODE	= PE600611
CONTAINER_BARCODE	= PE900438
NAME	= Loch Ard 1 Pressure Gradient Analysis Plot, 1:5000
BASIN	= OTWAY
PERMIT	= VIC/P31
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Loch Ard 1 Pressure Gradient Analysis Plot, 1:5000, Vol 1, Appendix 5 Appendix IV (colour)
REMARKS	=
DATE_CREATED	= *
DATE_RECEIVED	= *
W_NO	= W1090
WELL_NAME	= Loch Ard 1
CONTRACTOR	= Backer Hughes Inteq
CLIENT_OP_CO	= BHP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600312

This is an enclosure indicator page.
The enclosure PE600312 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600312 has the following characteristics:

ITEM_BARCODE	= PE600312
CONTAINER_BARCODE	= PE900438
NAME	= Loch Ard 1 Drillbyte MWD Log, 1:500
BASIN	= OTWAY
PERMIT	= VIC/P31
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Loch Ard 1 Drillbyte MWD Log, 1:500 Vol 1, Appendix 5 Appendix V (colour)
REMARKS	=
DATE_CREATED	= *
DATE_RECEIVED	= *
W_NO	= W1090
WELL_NAME	= Loch Ard 1
CONTRACTOR	= Backer Hughes Inteq
CLIENT_OP_CO	= BHP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600314

This is an enclosure indicator page.
The enclosure PE600314 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600314 has the following characteristics:

ITEM_BARCODE	= PE600314
CONTAINER_BARCODE	= PE900438
NAME	= Loch Ard 1 Drillbyte MWD Time Log, 1:500
BASIN	= OTWAY
PERMIT	= VIC/P31
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Loch Ard 1 Drillbyte MWD Time Log, 1:500, Appendix 5 Appendix VI (colour)
REMARKS	=
DATE_CREATED	= *
DATE_RECEIVED	= *
W_NO	= W1090
WELL_NAME	= Loch Ard 1
CONTRACTOR	= Backer Hughes Inteq
CLIENT_OP_CO	= BHP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600610

This is an enclosure indicator page.
The enclosure PE600610 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600610 has the following characteristics:

ITEM_BARCODE	= PE600610
CONTAINER_BARCODE	= PE900438
NAME	= Loch Ard 1 Well Progress Plot, 1:20000
BASIN	= OTWAY
PERMIT	= VIC/P31
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Loch Ard 1 Well Progress Plot, vol 1, Appendix 5 Appendix VII, 1:20000 (colour)
REMARKS	=
DATE_CREATED	= *
DATE_RECEIVED	= *
W_NO	= W1090
WELL_NAME	= Loch Ard 1
CONTRACTOR	= Backer Hughes Inteq
CLIENT_OP_CO	= BHP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600346

This is an enclosure indicator page.
The enclosure PE600346 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600346 has the following characteristics:

ITEM_BARCODE	PE600346
CONTAINER_BARCODE	PE900438
NAME	Loch Ard 1 Drillbyte Formation Evaluation Log, 1:500
BASIN	OTWAY
PERMIT	VIC/P31
TYPE	WELL
SUBTYPE	WELL_LOG
DESCRIPTION	Loch Ard 1 Drillbyte Formation Evaluation Log, 1:500, Vol 1 Appendix 5 Appendix XI (B&W)
REMARKS	
DATE_CREATED	*
DATE_RECEIVED	*
W_NO	W1090
WELL_NAME	Loch Ard 1
CONTRACTOR	Backer Hughes Inteq
CLIENT_OP_CO	BHP

(Inserted by DNRE - Vic Govt Mines Dept)

6.6 APPENDIX 6 MWD End of Well Report

BHP PETROLEUM
LOCH ARD-1
VICTORIA - OTWAY BASIN
OCTOBER 1993

END OF WELL REPORT

EASTMAN TELECO

FIELD SERVICE ENGINEERS

M. SALE

A. SOMOFF

DISCLAIMER

Eastman Teleco does not guarantee the accuracy or correctness of interpretations provided in or from this report. Since all interpretations are opinions based on measurements Eastman Teleco shall, under no circumstances, be responsible for consequential damages or any other loss, costs, damages or expenses incurred or expressed and implied warranties related to its service which is governed by Eastman Teleco's terms and conditions.

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Section 10.	BOTTOM HOLE ASSEMBLY RECORDS
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Section 12.	MUD RECORD

Section 1

INTRODUCTION

1. INTRODUCTION

Eastman Teleco's Dual Propagation Resistivity Measurement While Drilling services were utilized onboard the BYFORD DOLPHIN for the drilling of BHP Petroleum's LOCH ARD-1 well in the VIC/P31 Permit, offshore Victoria.

LOCH ARD-1 was spudded on October 19th, 1993 and Eastman Teleco's MWD services were utilized on the well from October 23rd from a depth of 393m.

The 12 1/4" hole section was drilled from 393m to 942m.
The 8 1/2" hole section was drilled from 942m to 1397m.

Eastman Teleco services were completed on October 27th, 1993. Eastman Teleco depths were measured in meters below the Drill Floor and were based on the drillers pipe tally.

Section 2

GENERAL WELL INFORMATION

2. GENERAL WELL INFORMATION

Oil Company	: BHP PETROLEUM
Oil Company Personnel	: G. BLUNT / G. HOWARD
Well Name	: LOCH ARD-1
Well Type	: EXPLORATION
Well Permit	: VIC/P31
Area	: OTWAY BASIN
D.F. Elevation	: 25.0 m
Water Depth	: 75.0 m
Spud Date	: 19th OCTOBER 1993
Teleco Commencement Date	: 23rd OCTOBER 1993
Teleco Completion Date	: 27th OCTOBER 1993
Completion Depth	: 1397 m
Drilling Contractor	: DOLPHIN DRILLING
Rig Name	: BYFORD DOLPHIN
Rig Type	: SEMI-SUBMERSIBLE
Teleco Services	: DPR
Teleco Job Number	: ETAU 253
Teleco Personnel	: A. SOMOFF M. SALE

Section 3

TOOL SUMMARY

3. MWD TOOL SUMMARY

2 tools were used over 3 runs to drill from 393m to 1425m.

Run #	Tool Size	Serial No	Tool Type	DPR Hours	Drilled Interval	Failure Type
1	8 1/4"	2280-02	DPR	16.00	393.0 - 942	-
2	8 1/4"	2280-02	DPR	1.50	942.0 - 942	-
3	6 3/4"	1674-10	DPR	32.00	942.0 - 1397	-

Interval Drilled: 393 - 1397m - 1004m
Interval Logged: Gamma Ray - 100%
Resistivity - 100%

Failure Statistics

Total DPR hours	49.50
DPR failures	0
Mean Time Between Failures	none

Section 4

MWD RUN SUMMARIES

RUN SUMMARY
No.1

Hole Size:	12 1/4"
Tool Type & No:	DPR TF4 B2280-02
Time & Date in the Hole:	12:00 hrs 23rd October 1993
Time & Date out of Hole:	14:15 hrs 24th October 1993
Depth Range:	393m - 942m
Circulating Hours for Run:	16.00
Operating Hours for Run:	16.00

Comments.

The Teleco tool was run in an assembly with a HUGHES ATM11H bit. The assembly was locked up with a near bit roller reamer, X/O, a 12 3/8" sleeve stabiliser on the MWD tool, a string roller reamer located above the Teleco tool and a string stabilizer two collars above that.

Drilling commenced at 393m with very high ROP's being achieved through out the run, particularly in the sandstones with an average of over 100 m/hr. At 942m the bit was pulled to run 9 5/8" casing after a suitable formation to set it in was intersected.

During this run the inclination built slightly from 1.0 degree to 1.5 degrees while the azimuth turned from 298.2 degrees to 158.70 degrees over the corresponding interval.

Drilling parameters throughout the run were:-WOB 1 to 35 klbs, RPM 100 to 110 , Flow rates of 755 to 760 gpm giving a Pump Pressure of 2300 to 2700 Psi. Rates of penetration ranged from 20 to 300 m/hr.

RUN SUMMARY
No.2

Hole Size:	12 1/4"
Tool Type & No:	DPR TF4 B1674-10
Time & Date in the Hole:	02:30 hrs 25th October 1993
Time & Date out of Hole:	08:30 hrs 25th October 1993
Depth Range:	942m - 942m
Circulating Hours for Run:	1.50
Operating Hours for Run:	1.50

Comments.

The same assembly as used in the previous run was utilized in a wiper trip prior to running 9 5/8" casing.

RUN SUMMARY

No.3

Hole Size:	8 1/2"
Tool Type & No:	DPR TF4 E1674-10
Time & Date in the Hole:	22:30 hrs 25rd October 1993
Time & Date out of Hole:	17:00 hrs 27th October 1993
Depth Range:	942m - 1397m
Circulating Hours for Run:	32.00
Operating Hours for Run:	32.00

Comments.

The Teleco tool was run in an assembly with a HUGHES ATM11H bit. The assembly was locked up with a junk sub, near bit roller reamer, X/O, an 8 3/8" integral blade stabiliser on the MWD tool and a string roller reamer located above the Teleco tool and a string stabilizer two collars above that.

After drilling out the cement, float and shoe, drilling of new hole commenced at 942m with rates of penetration ranging between 15 and 60 m/hr. At 1397m the bit was pulled at TD for the well.

During this run the inclination built from 1.2 degrees to 2.5 degrees while the azimuth turned from 153.7 degrees to 95.0 degrees over the corresponding interval.

Drilling parameters throughout the run were:-WOB 10 to 35 klbs, RPM 100 to 120 , Flow rates of 400 to 420 gpm giving a Pump Pressure of 1800 t 2000 Psi.

Section 5

MWD TOOL PERFORMANCE REPORT

PERFORMANCE REPORT NO.1

TOOL DHB 8442-01

Equipment Description:	8 1/4" DPR
	Serial No. B2280-02 TF4 X4 Split Phase
Teleco Run No.:	1
Total Circulating Hours:	16.0
Non Operating Hours:	
Resistivity:	00.00
Gamma Ray:	00.00
Directional:	00.00
Interval Drilled:	393m - 942m

Operational Problems

The tool performed to specification throughout the run.

PERFORMANCE REPORT NO.2

TOOL DHE 8442-02

Equipment Description:	8 1/4" DPR
	Serial No. E1674-10 TF4 X4 Split Phase
Teleco Run No.:	2
Total Circulating Hours:	1.50
Non Operating Hours:	
Resistivity:	00.00
Gamma Ray:	00.00
Directional:	00.00
Interval Drilled:	WIPER TRIP

Operational Problems

The tool performed to specification throughout the run.

PERFORMANCE REPORT NO.3

TOOL DHE 1674-10

Equipment Description:	6 3/4" DPR
	Serial No. B1670-10 TF4 X4 Split Phase
Teleco Run No.:	3
Total Circulating Hours:	32.00
Non Operating Hours:	
Resistivity:	00.00
Gamma Ray:	00.00
Directional:	00.00
Interval Drilled:	942.0 - 1397.0m

Operational Problems

While drilling out the cement the tools pulse showed signs of being interfered with by some external noise source. This noise was observable on the MWD decoder strip chart as well as on the TR 2300 threshoscope as a wave form with a frequency of approximately 0.5 Hz. As a result of this noise which persisted throughout the run, decoding problems were experienced resulting in an intermittent MWD log. The source of this noise is believed to be the rig pumps although no hard evidence supporting this could be established.

During the run numerous actions were taken to rectify the situation, these included changing pumps and flow rates as well as using various frequency filters available on the TR 2300. The noise was evident on both pumps and due to the high noise to signal ratio the filters were not completely effective.

The memory log produced from this run was not affected at all indicating that this was solely a telemetry problem.

Section 6

SENSOR VERIFICATION DATA

6.1 FORMATION EVALUATION SENSOR VERIFICATION DATA

Teleco Run No:	Pre 1	Post 1	Pre 3	Post 3
DPR Sub No:	8105	8105	6124	6124
PDBV deg:	7.778	7.778	10.404	10.404
PDOV deg:	7.942	7.753	10.604	10.213
PDCV +/- deg:	-0.164	0.025	-0.200	0.191
ATBV dB:	5.866	5.866	6.033	6.033
ATOV dB:	5.789	6.271	6.649	7.277
ATCV +/- dB:	0.077	-0.405	-0.616	-1.239
STEEL m:	1.5	1.5	1.5	1.5
TCDV deg C:	16.1	35.2	13.2	28.5
GR Detector No:	581-14	581-14	444-1	444-1
Background cps:	3.2	4.1	3.8	4.1

6.2 VERIFICATION MNEMONICS

MNEMONIC		EXPLANATION
PDBV	=	Phase Difference - Shop air-hang calibration temperature corrected for rig verification temperature.
PDOV	=	Phase Difference - Wellsite air-hang verification.
PDCV	=	Phase Difference - Variance.
ATBV	=	Attenuation - Shop air-hang calibration temperature corrected for rig verification temperature.
ATOV	=	Attenuation - Wellsite air-hang verification.
ATCV	=	Attenuation - Variance.
STEEL	=	Distance to nearest steel during wellsite air-hang.
TCDV	=	Teleco Tool Temperature during air-hang verification.

Section 7

SENSOR OFFSETS
and
ENVIRONMENTAL CORRECTIONS

7.1 SENSOR TO BIT DISTANCE (M)

Teleco Run No	1	2	3
Resistivity	3.79	3.79	4.18
Gamma Ray	5.13	5.13	5.96
Directional	7.79	7.79	8.15

7.2 LOG ENVIRONMENTAL CORRECTIONS:

Gamma Ray: Normalised for Tool Size, Borehole Size, Sensor Type and mud Potassium

Resistivity: Normalised for Tool Size, Borehole Size, Mud Resistivity, Temperature. No correction has been applied for formation dielectric properties.

7.3 LOG CORRECTIONS

Date	Time	Depth m	Chloride ppm	Resist.(Rm) ohm.m / deg C	KCL %	M.W. sg
23-10-93	14:35	393	47000	0.0773 / 32	8.38	1.03
23-10-93	20:22	595	52000	0.0712 / 32	7.62	1.08
23-10-93	22:49	739	48000	0.0721 / 34	8.49	1.08
24-10-93	02:00	845	50000	0.0674 / 37	8.53	1.09
24-10-93	07:00	933	50000	0.0652 / 39	8.53	1.10
26-10-93	00:15	943	49000	0.0855 / 25	8.28	1.08
26-10-93	09:50	971	49000	0.0821 / 27	8.28	1.08
26-10-93	10:50	988	47000	0.0833 / 28	6.91	1.08
26-10-93	14:30	1049	47000	0.0787 / 31	6.91	1.08
26-10-93	15:07	1055	52000	0.0725 / 31	8.38	1.09
26-10-93	20:28	1175	57000	0.0638 / 34	9.33	1.09
27-10-93	01:00	1250	55000	0.0614 / 38	9.14	1.09

Section 8

LOG MNEMONICS

8. TELECO FORMATION EVALUATION LOG INFORMATION

8.1 LOG MNEMONICS

GRAM = Natural Gamma Ray [RWD] (MWD-API)
GRAX = Natural Gamma Ray [MWD] (MWD-API)
TCDM = MWD Tool Temperature [RWD] (Deg C)
TCDX = MWD Tool Temperature [MWD] (Deg C)
RPCX = Resistivity Phase Difference, Corrected [MWD] (Ohmm)
RACX = Resistivity Amplitude Ratio, Corrected [MWD] (Ohmm)
RPCM = Resistivity Phase Difference, Corrected [RWD] (Ohmm)
RACM = Resistivity Amplitude Ratio, Corrected [RWD] (Ohmm)
RPDM = Resistivity Phase Difference, Dielectric Corrected [MWD]
RADM = Resistivity Amplitude Ratio, Dielectric Corrected [RWD]
PDEM = Phase Difference, Elapsed Time Since Drilled [RWD] (Min)
PDDM = Phase Difference, Data Density Integrated.
WBCS = Surface Weight On Bit (1000 Lbs)
ROPS = Rate of Penetration (m/hr)
RPMS = Surface Revolutions Per Minute.

8.2 SUB ASSEMBLY MNEMONICS:

DPR = Dual Propagation Resistivity Sub
DIR = Directional MWD Collar

Section 9

MWD SURVEY LISTING

DIRECTIONAL SURVEYS

COMPANY	BHP PETROLEUM
WELL	LOCH ARD-1
FIELD	OTWAY BASIN
COUNTY	VIC/P31
STATE	VICTORIA
COUNTRY	AUSTRALIA

WELL LOCATION : LATITUDE LONGITUDE
38° 55′ 54.66" SOUTH 143° 10′ 55.16" EAST

DRILLING COMPANY : DOLPHIN DRILLING RIG : BYFORD

PERMANENT DEPTH DATUM : MSLT ELEV. : 25.0M
SURVEYS MEAS. FROM : ROTARY TABLE, LOCATED 25.0M ABOVE PERM. DATUM.

SPUD DATE 19-10-93	PROP. AZIMUTH ..... N.A.
MWD STARTED .. 23-10-93	TOTAL DEPTH 1397.0M
MWD ENDED 27-10-93	TELECO JOB ID .. ETAU 253

COORD. GRID SYSTEM :
GRID ORIGIN : GRID CORR. : 0
MAGNETIC DECL. CORR. : 11 GRID DECL. CORR. : 11

MINIMUM CURVATURE METHOD USED FOR SURVEY CALCULATIONS.
VERTICAL WELL : CLOSURE CALCULATED AT EACH SURVEY STATION.
INITIAL TIE-IN TO SEABED.

COMPANY PERSONNEL ..... G. BLUNT/G.HOWARD

DIRECTIONAL COMPANY ...
DIRECTIONAL DRILLER ...
TELECO PERSONNEL ..... A. SOMOFF
M. SALE

REMARKS :

TELECO DIRECTIONAL SURVEY LISTING

Company..... BHP PETROLEUM
Well..... LOCH ARD-1
Survey Calc. Method..... Minimum Curvature
Vert. Sect. Calc. Method..... Vertical well: Closure calculated at each survey station.
Proposed Azimuth..... N.A.

Teleco Job ID.: ETAU 253
Grid Correction: 0
Mag. Decl. Corr.: 11
Grid Decl. Corr.: 11

MEPTH meters	CRS LEN meters	INCLINATION degrees	AZIMUTH degrees	T.V.D. meters	CLOSURE meters	NORTH/SOUTH meters	EAST/WEST meters	DOGLEG SEV. deg/30m
			INITIAL TIE-IN COORDINATES					
100.0		0.000	0.000	100.00	0.00	0.00	0.00	
410.0	310.0	1.000	298.200	409.98	2.71	1.28	-2.38	0.097
557.3	147.3	1.000	307.700	557.26	5.26	2.57	-4.53	0.034
701.8	144.5	0.300	30.000	701.75	6.54	3.77	-5.34	0.269
846.5	144.7	1.400	155.100	846.44	5.07	2.50	-4.41	0.330
928.0	82.5	1.500	158.700	928.91	3.64	0.57	-3.59	0.049
1046.2	117.2	1.200	153.700	1046.08	3.17	-1.55	-2.49	0.082
1161.7	115.5	2.100	113.300	1161.54	3.88	-3.88	-0.01	0.368
1279.0	117.3	2.500	95.000	1278.74	6.70	-4.55	4.51	0.213
			PROJECTED BOTTOM-HOLE LOCATION					
			(Extrapolated from last two survey stations)					
1397.0	118.0	2.902	76.591	1396.61	10.94	-4.48	9.98	

CLOSURE AZIMUTH = 114.175

BAKER HUGHES INTEQ

Section 10

BOTTOM HOLE ASSEMBLY RECORDS

MWD Run #1

ITEM	OD (ins.)	ID (ins.)	LENGTH (m)	REMARKS
BIT	12 1/4	-	0.32	HTC ATM11HG
N.B ROLLER REAMER	12 1/4	2 7/8	2.44	
X / O	7 7/8	2 7/8	0.53	TSI 50
TELECO MWD	8 1/4	-	12.35	B2280-02 DPR
ROLLER REAMER	12 1/4	2 3/4	2.33	
DC	8	2 7/8	9.37	
DC	7 7/8	2 15/16	9.14	
STRING STAB	7 7/8	2 7/8	2.10	
DC	7 7/8	2 7/8	9.03	
DC	8	2 13/16	9.37	
DC	7 13/16	2 7/8	9.40	
DC	7 7/8	2 7/8	8.98	
DC	7 15/16	2 15/16	9.36	
DC	7 7/8	2 3/4	9.13	
DC	7 15/16	2 15/16	9.03	
DC	8	3	9.16	
DC	7 13/16	2 7/8	9.20	
DC	7 7/8	2 13/16	9.21	
DC	7 7/8	2 7/8	9.37	
JARS	8	2 7/8	5.78	
PONY DC	8	2 15/16	3.07	
DC	8	2 7/8	8.99	
DC	7 13/16	2 7/8	8.93	
X/O	6 7/16	2 7/8	1.52	
9 X HWDP	5	3	80.13	
TOTAL BHA			257.45	

BIT RUN #5 HUGHES ATM 11HG, 12 1/4" 16,16,15 JETS.
DRILLED FROM 393m TO 942m. BIT GRADED 2-1-WT-A-E-2-NO-TD.

TELECO MWD DHB 2280-02 DPR TF4, DATA RATE X4SP
TURBINE FLOW RANGE 425 - 900 gpm. VALVE GAP 1.00".
TELECO MWD TOOL HAD A 12 1/4" SLEEVE STABILISER, SN 8520.

MWD Run #2

ITEM	OD (ins.)	ID (ins.)	LENGTH (m)	REMARKS
BIT	12 1/4	-	0.32	HTC ATM11HG
N.B ROLLER REAMER	12 1/4	2 7/8	2.44	
X / O	7 7/8	2 7/8	0.53	TSI 50
TELECO MWD	8 1/4	-	12.35	B2280-02 DPR
ROLLER REAMER	12 1/4	2 3/4	2.33	
DC	8	2 7/8	9.37	
DC	7 7/8	2 15/16	9.14	
STRING STAB	7 7/8	2 7/8	2.10	
DC	7 7/8	2 7/8	9.03	
DC	8	2 13/16	9.37	
DC	7 13/16	2 7/8	9.40	
DC	7 7/8	2 7/8	8.98	
C	7 15/16	2 15/16	9.36	
DC	7 7/8	2 3/4	9.13	
DC	7 15/16	2 15/16	9.03	
DC	8	3	9.16	
DC	7 13/16	2 7/8	9.20	
DC	7 7/8	2 13/16	9.21	
DC	7 7/8	2 7/8	9.37	
JARS	8	2 7/8	5.78	
PONY DC	8	2 15/16	3.07	
DC	8	2 7/8	8.99	
DC	7 13/16	2 7/8	8.93	
X/O	6 7/16	2 7/8	1.52	
9 X HWDP	5	3	80.13	
TOTAL BHA			257.45	

BIT RUN #6 HUGHES ATM 11HG, 12 1/4" 16,16,15 JETS. WIPER TRIP.

TELECO MWD DHB 2280-02 DPR TF4, DATA RATE X4SP TURBINE FLOW RANGE 425 - 900 gpm. VALVE GAP 1.00". TELECO MWD TOOL HAD A 12 1/4" SLEEVE STABILISER, SN 8520.

MWD Run #3

ITEM	OD (ins.)	ID (ins.)	LENGTH (m)	REMARKS
BIT	8 1/2	-	0.24	HTC ATM11HG
JUNK SUB	5 1/2	2 1/4	0.80	
N.B ROLLER REAMER	6 3/8	1 7/8	1.86	
X / O	6 13/16	2 7/8	0.70	TSI 50
TELECO MWD	6 5/8	-	12.16	B2280-02 DPR
STR ROLLER REAMER	6 3/8	1 7/8	1.61	
DC	6 5/16	3	9.23	
DC	6 5/16	2 3/4	8.98	
STRING STAB	6 1/2	2 7/8	1.76	
DC	6 5/16	2 7/8	9.21	
DC	6 5/16	2 7/8	9.03	
DC	6 1/2	2 3/4	9.16	
DC	6 5/16	2 3/4	9.30	
DC	6 5/16	2 3/4	9.03	
DC	6 5/16	2 7/8	9.36	
DC	6 5/16	2 7/8	9.13	
DC	6 5/16	2 7/8	9.30	
DC	6 5/16	2 7/8	9.09	
DC	6 5/16	2 7/8	9.38	
DC	6 5/16	2 7/8	9.39	
DC	6 5/16	2 7/8	9.18	
DC	6 1/2	2 7/8	9.39	
DC	6 1/2	2 7/8	9.22	
JARS	6 3/8	2 1/2	5.20	
PONY DC	6 1/2	2 7/8	2.70	
DC	6 5/16	2 3/4	9.24	
DC	6 5/16	2 3/4	9.18	
9 X HWDP	5	3	80.13	
TOTAL BHA			272.96	

BIT RUN #7 HUGHES ATM 11HG, 8 1/2" 12,12,12 JETS.
DRILLED FROM 942m TO 1397m. BIT GRADED 3-3-WT-A-E-I-ER-TD.

TELECO MWD DHE 1674-10 DPR TF4, DATA RATE X4SP
TURBINE FLOW RANGE 250 - 500 gpm. VALVE GAP 0.90".
TELECO MWD TOOL HAD A 8 3/8" BLADE STABILISER.

Section 11

DRILLING DIARY

DRILLING DIARY

Date	Time	Operation
		Teleco Run #1
23-10-93	10:00	M/up 12 1/4" BHA & RIH.
	11:00	Calibrate MWD.
	12:00	Cont RIH w/ BHA. P/up str R/R, stab & 5 x 8" DC's. Test MWD @ surface.
	15:00	Drill f/ 393 - 396m & CBU.
	15:30	Pull back inside shoe & perform LOT. EMW = 1.44sg. RIH to 396m.
	16:30	Drill f/ 396 - 786m. FLC on connxs.
24-10-93	00:00	Drill 786 - 860m. FLC connxs.
	03:00	CBU for sample.
	04:00	Drill 860 - 942m. FLC connxs.
	07:30	CBU.
	08:30	FLC. Pump slug. Pull 6 stds @ 770m. 50Klbs o/pull - swabbing. FLC - ok. Attempt RIH - resistance. Work free.
	09:00	Ream back to btm f/ 770 - 942m.
	10:00	CBU - max gas 0.045%.
	11:00	FLC. POOH wet @ 654m, max o/pull 30 Klbs, taking good mud. Slug pipe & cont POOH @ 600m. Max o/pull 30 Klbs -not taking good mud in this section of hole.
	12:00	CBU @ 600m - no gas.
	12:30	Pump out of hole f/ 600 - shoe. Tight @ 506m - hole packed off.
	13:00	FLC 10 mins @ shoe & POOH. Hole took good mud. Dump memory on MWD & rack back same.
	14:30	R/up Schlumberger. Prepare & run Log #1 - SONIC-MSFL-DLT-GR-AMS-TCC.
	19:00	Prepare & run Log #2 - FMS-GR-AMS.
	22:00	Prepare & run Log #3 - 30 shot CST.
25-10-93	00:00	R/dwn Schlumberger.
	01:00	M/up hanger, r/tool & plug assy on jt DP & rack in derrick.
		Teleco Run #2
	02:30	RIH w/ 12 1/4" BHA @ 587m - 15 klbs drag. Work through tight hole to 596m. Cont RIH to 942m. No fill.
	05:00	CBU. No gas.
	06:30	FLC, slug pipe. POOH to run 9 5/8" csg.
	08:30	M/up cmt head to std DP & rack in derrick.
	09:00	Retrieve nominal bore protector.
	09:30	R/up & run 9 5/8" csg. Fill every 5 jts.
	12:00	Cont run 9 5/8" csg. Land same w/ shoe @ 930m.
	13:30	Circ 250 bbls mud.
	14:00	Test cmt lines to 3000psi. Mix & pump cmt. Plug did not bump.
	15:30	Set seal assy & test same to 3500psi.
	16:00	Test BOP's.
	18:00	Set 9 5/8" wear bushing.
	18:30	L/out 12 1/4" BHA.

Teleco Run #3

26-10-93	00:00	M/up 8 1/2" BHA & RIH.
	02:00	Brk circ & tag cmt @ 897m. Drill out plugs, float & cmt w/ seawater. Change to KCl mud. Drill shoe, clean out rathole to 942m. Surge for junk. Drill 3m new hole to 945m. Surge for junk.
	06:00	Circ hole clean.
	07:00	Perform LOT. EMW = 1.87sg.
	07:30	Drill 8 1/2" hole f/ 945 - 1223m. FLC connxs. No drag.
27-10-93	00:00	Drill 8 1/2" hole f/. 1223 - 1397m. FLC & ream connxs.
	08:30	Circ hole clean & boost riser through choke & kill lines.
	10:30	FLC, pull 5 stds & pump slug (hole good). Cont POOH. At 1197m, 50klbs o/pull. Hole not taking mud.
	11:30	Pump out of hole f/ 1197m - max o/pull 20 klbs.
	12:30	RIH to 1042m. Wash/ream to 1057m & cont to RIH.
	13:00	Wash/ream f/ 1386 - 1397m.
	13:30	Circ hole clean.
	14:00	Pump slug, POOH. FLC @ shoe & BOP's. L/out pony DC, jars, stab, MWD, junk sub & bit.
	17:30	R/up Schlumberger. Prepare to run logs.

SECTION 12

MUD RECORD

MUD REPORTS

TELECO RUN #	1	1	1	1	1	1
HOLE SIZE ins	12.25	12.25	12.25	12.25	12.25	12.25
DATE	23-10	23-10	23-10	23-10	24-10	24-10
TIME	08:00	19:00	22:00	24:00	02:30	08:00
DEPTH m	393	520	719	786	860	942
WEIGHT sg	1.05+	1.08	1.09	1.10	1.09	1.10
VISCOSITY sec	50	52	54	52	54	52
PV cp	13	18	15	16	15	14
YP lb/100 sq ft	19	24	27	22	25	22
GELS 10s/10min	5/5	6/8	6/10	6/8	5/7	5/6
FILTRATE cc/30 min	8.0	7.6	6.4	6.4	5.8	5.4
HTHP FILTRATE cc/30 min	-	-	-	-	-	-
CAKE 32nd	1.0	1.0	1.0	1.0	1.0	1.0
SOLIDS % by vol	3.7	5.0	5.6	5.6	5.6	6.2
WATER CONTENT % by volume	96.3	95.0	94.4	94.4	94.4	93.8
SAND % by vol	Nil	3.75	1.25	3.00	1.00	2.50
pH	11.5	9.8	9.5	9.4	9.3	9.6
CHLORIDE Kppm	47.0	46.0	50.0	50.0	50.0	50.0
CALCIUM mg/l	360	360	260	260	260	280
POTASSIUM Kmg/l % WT KCl	44.00 8.50	37.00 7.10	45.00 8.70	44.60 8.60	44.80 8.60	44.40 8.50

TELECO RUN #	1	2	2	3	3	3
HOLE SIZE ins	12.25	12.25	12.25	8.5	8.5	8.5
DATE	24-10	25-10	25-10	26-10	26-10	26-10
TIME	23:30	06:00	22:30	10:30	11:15	21:30
DEPTH m	942	942	942	986	995	1188
WEIGHT sg	1.08	1.10	1.08	1.08+	1.10	1.08+
VISCOSITY sec	48	58	48	49	48	48
PV cp	14	18	14	13	12	13
YP lb/100 sq ft	25	24	25	18	16	22
GELS 10s/10min	5/6	5/8	5/6	5/5	5/5	7/9
FILTRATE cc/30 min	5.2	5.2	5.2	4.8	4.8	4.8
HTHP FILTRATE cc/30 min	-	-	-	-	-	-
CAKE 32nd	1.0	1.0	1.0	1.0	1.0	1.0
SOLIDS % by vol	5.0	6.3	5.0	5.3	6.2	5.4
WATER CONTENT % by volume	95.0	93.8	95.0	94.7	93.8	94.6
SAND % by vol	Tr	2.75	Tr	Tr	0.10	Tr
pH	9.5	9.3	9.5	8.6	8.6	9.6
CHLORIDE Kppm	50.0	49.0	50.0	47.0	47.0	55.0
CALCIUM mg/l	260	360	260	360	380	260
POTASSIUM Kmg/l % WT KCl	44.40 8.50	43.90 8.40	44.40 8.50	36.30 7.00	36.20 7.00	46.50 8.50

TELECO RUN #	3	3	3	3
HOLE SIZE ins	8.5	8.5	8.5	8.5
DATE	26-10	27-10	27-10	27-10
TIME	23:00	05:00	07:30	09:30
DEPTH m	1207	1340	1375	1397
WEIGHT sg	1.09	1.09	1.09	1.09
VISCOSITY sec	48	49	49	49
PV cp	14	14	13	14
YP lb/100 sq ft	22	22	24	22
GELS 10s/10min	6/9	5/9	6/9	5/9
FILTRATE cc/30 min	4.8	4.6	4.6	4.6
HTHP FILTRATE cc/30 min	-	-	-	-
CAKE 32nd	1.0	1.0	1.0	1.0
SOLIDS % by vol	5.6	5.6	5.6	6.2
WATER CONTENT % by volume	94.4	94.4	94.4	93.8
SAND % by vol.	0.10	0.20	Tr	0.25
pH	9.5	9.5	9.4	9.5
CHLORIDE Kppm	55.0	49.0	49.0	49.0
CALCIUM mg/l	260	280	280	280
POTASSIUM Kmg/l % WT KCl	46.50 8.90	43.20 8.30	44.50 8.60	42.60 8.20

PE600315

This is an enclosure indicator page.
The enclosure PE600315 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600315 has the following characteristics:

ITEM_BARCODE	= PE600315
CONTAINER_BARCODE	= PE900438
NAME	= Loch Ard 1 Dual Propagation Resistivity, Gamma Ray, 1:200
BASIN	= OTWAY
PERMIT	= VIC/P31
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Loch Ard 1 Dual Propagation Resistivity, Gamma Ray, 1:200, Vol 1, Appendix 6
REMARKS	=
DATE_CREATED	= *
DATE_RECEIVED	= *
W_NO	= W1090
WELL_NAME	= Loch Ard 1
CONTRACTOR	= Backer Hughes Inteq
CLIENT_OP_CO	= BHP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600316

This is an enclosure indicator page.
The enclosure PE600316 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600316 has the following characteristics:

ITEM_BARCODE	= PE600316
CONTAINER_BARCODE	= PE900438
NAME	= Loch Ard 1 Dual Propagation Resistivity, Gamma Ray, 1:500
BASIN	= OTWAY
PERMIT	= VIC/P31
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Loch Ard 1 Dual Propagation Resistivity, Gamma Ray, 1:500, Vol 1, Appendix 6
REMARKS	=
DATE_CREATED	= *
DATE_RECEIVED	= *
W_NO	= W1090
WELL_NAME	= Loch Ard 1
CONTRACTOR	= Backer Hughes Inteq
CLIENT_OP_CO	= BHP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600317

This is an enclosure indicator page.
The enclosure PE600317 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600317 has the following characteristics:

ITEM_BARCODE	= PE600317
CONTAINER_BARCODE	= PE900438
NAME	= Loch Ard 1 Dual Propagation Resistivity, Gamma Ray, 1:1000
BASIN	= OTWAY
PERMIT	= VIC/P31
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Loch Ard 1 Dual Propagation Resistivity, Gamma Ray, 1:1000, Vol 1, Appendix 6
REMARKS	=
DATE_CREATED	= *
DATE_RECEIVED	= *
W_NO	= W1090
WELL_NAME	= Loch Ard 1
CONTRACTOR	= Backer Hughes Inteq
CLIENT_OP_CO	= BHP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600318

This is an enclosure indicator page.
The enclosure PE600318 is enclosed within the container PE900438 at this location in this document.

The enclosure PE600318 has the following characteristics:

ITEM_BARCODE	PE600318
CONTAINER_BARCODE	PE900438
NAME	Loch Ard 1 Dielectrically Correlated Resistivity, 1:500
BASIN	OTWAY
PERMIT	VIC/P31
TYPE	WELL
SUBTYPE	WELL_LOG
DESCRIPTION	Loch Ard 1 Dielectrically Correlated Resistivity, 1:500, Vol 1, Appendix 6
REMARKS	
DATE_CREATED	*
DATE_RECEIVED	*
W_NO	W1090
WELL_NAME	Loch Ard 1
CONTRACTOR	Backer Hughes Inteq
CLIENT_OP_CO	BHP

(Inserted by DNRE - Vic Govt Mines Dept)

6.7 APPENDIX 7 Rig Positioning Report

PETROLEUM DIVISION

POSITIONING REPORT

FOR

BHP PETROLEUM LTD

RIG MOVE OF THE

DRILLING RIG BYFORD DOLPHIN

LOCATION	:	**LOCH ARD-1**
BLOCK / PERMIT	:	**OTWAY BASIN/VIC-P-31**
DATED	:	**13th of OCTOBER - 19th of OCTOBER, 1993**
REPORT REF	:	**A2150**

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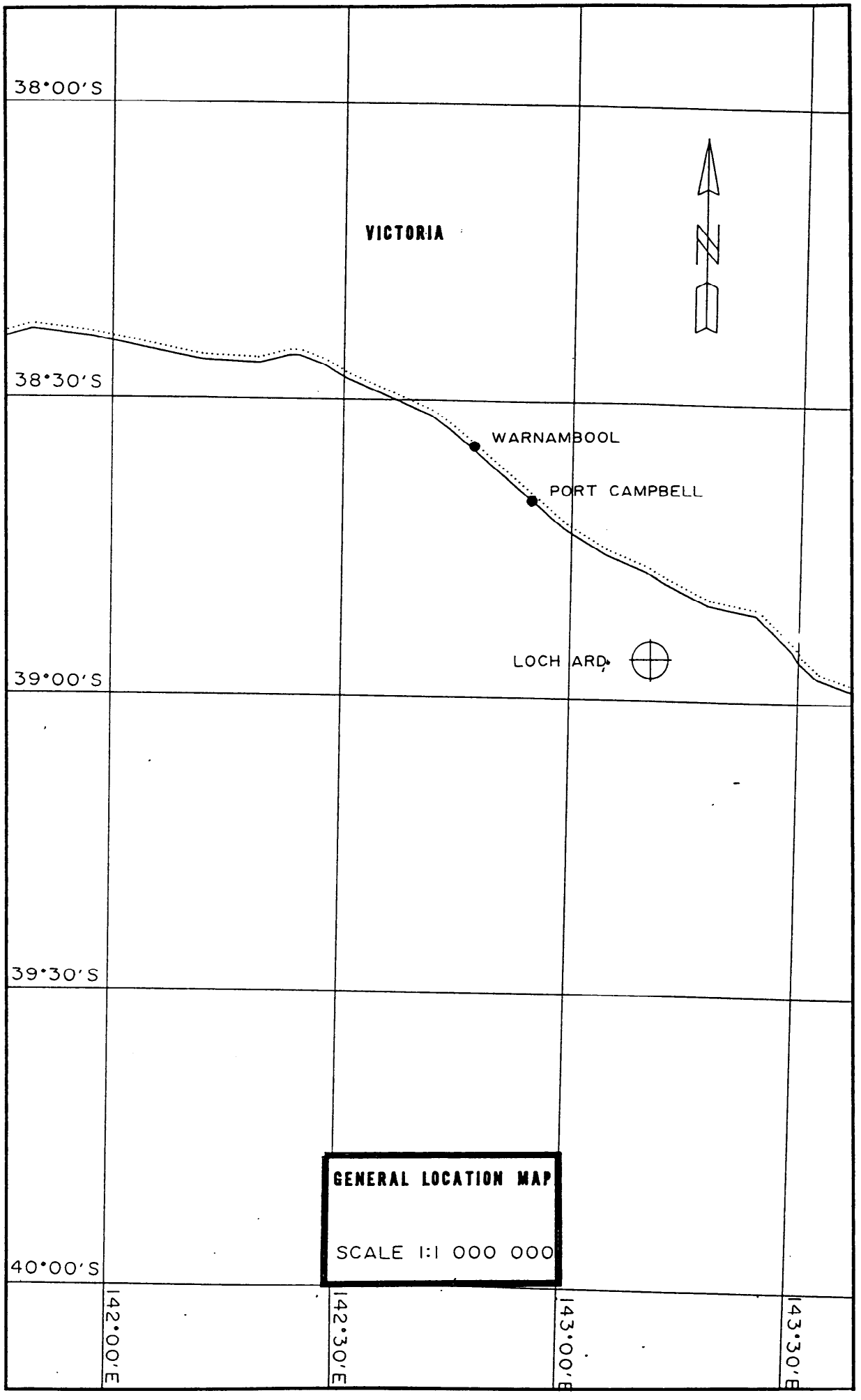
(Note: Appendices have only been included in BHP-E Wollongong and Racal Reports).



GENERAL LOCATION MAP

SCALE 1:1 000 000

1 ABSTRACT

This report details the services provided by Racal Survey Australia Limited (Racal), during the positioning of the semi-submersible drilling rig "Byford Dolphin" over the Loch Ard-1 location in the Otway Basin, offshore Victoria, for BHP Petroleum Limited (BHPP).

Personnel and equipment mobilised to Portland on the 13th of October, 1993 and transferred to the "Byford Dolphin" on the 14th of October. Positioning equipment was set up on the "Byford Dolphin" on the 15th of October, 1993.

The "Byford Dolphin" was positioned over the Loch Ard-1 location, between the 17th and 18th of October, 1993.

A final Differential GPS position was obtained for the Loch Ard-1 location after the "Byford Dolphin" had ballasted down to drilling draught, during the evening of the 18th of October, 1993.

Proposed Location

The co-ordinates of the proposed location, Loch Ard-1, were provided by BHPP as follows:

Datum AGD 84

Latitude	:	38° 55' 54.639" South
Longitude	:	143° 10' 55.169" East

AMG Zone 54 C.M. 141° E

Easting	:	689 134m
Northing	:	5 688 508m

Rig Heading : 225°

Final Differential GPS Position -LOCH ARD-1

The final DGPS position of the "Byford Dolphin" at Loch Ard-1 was derived between 2257 on the 18th of October and 0030 hours on the 19th of October, 1993. The final DGPS position was as follows:

Datum AGD 84

Latitude	:	38° 55' 54.717" South
Longitude	:	143° 10' 55.156" East

AMG Zone 54 C.M. 141° E

Easting	:	689 133.62m
Northing	:	5 688 505.60m

Rig Heading : 221.3°

The final position is 2.4 metres on a bearing of 187.7° (T) from the intended Loch Ard-1 location.

2 REQUIREMENTS

Racal Survey Australia Limited were contracted by BHPP to provide personnel and positioning equipment consisting of a 4 transponder Sonardyne net and interfacing to BHPE's Del Norte 1008 GPS receivers for the rig move of the "Byford Dolphin" onto the Loch Ard-1 location. Racal's GNS software was used to provide real-time navigation facilities. In addition to the acoustic system, Racal's SkyFix Differential GPS was provided. Racal's SkyFix system was used as the primary navigation system.

The requirements were as follows:

a. To provide real-time positioning for the semi-submersible drilling rig "Byford Dolphin" during the tow and onto the Loch Ard-1 location.

b. To track, using a Golf II Laser system the Anchor Handling Vessels, during anchor deployment operations.

c. To provide a final Differential GPS position of the Loch Ard-1 well.

3 SUMMARY OF EVENTS

Racal personnel K. Eddy, B. Slevin and K. Perry departed Perth for Melbourne during the morning of the 13th of October, 1993 and drove to Portland that evening arriving at 2300.

At 1230 on the 14th of October, Racal personnel and BHP Client Representative, B. Edmonds departed Portland by helicopter for the "Byford Dolphin", arriving at 1315.

Survey equipment was set up and operational in the Pilot House of the "Byford Dolphin" by 1030 in the 15th of October, 1993.

Anchor recovery at the Minerva-2A location commenced at 1030 on the 16th of October and was completed at 0830 on the 17th of October when the tow to Loch Ard-1 commenced.

The approach to the Loch Ard-1 location commenced at 1239 on the 17th of October with the "Byford Dolphin" 3 nautical miles from anchor 6 drop point. Anchor 6 was dropped and on the seabed at 1400 on the 17th of October and the rig continued its run into the location.

Anchor running operations continued until 1423 on the 18th of October when the last anchor was placed on the seabed. Anchor pre-tensioning was carried out between 1623 and 1830 on the 18th of October.

On completion of ballasting down the final DGPS position for Loch Ard-1 was observed between 2257 on the 18th and 0030 on the 19th of October, 1993.

During the morning of the 19th of October all Racal equipment on the "Byford Dolphin" was demobilised and packed into a container for shipping to Perth, this being the last rig move of the "Byford Dolphin" for BHPP.

Racal personnel K. Eddy and B. Slevin departed the "Byford Dolphin" on the crew change helicopter on the 19th of October for Portland and Perth. Personnel arrived in Perth during the evening of the 19th of October.

Racal engineer, K. Perry remained on the "Byford Dolphin" to transfer to the MV "Pacific Marlin" to recover the Loch Ard-1 acoustic array and demobilise all survey equipment on the "Pacific Marlin". K. Perry arrived in Perth during the evening of the 22nd of October, 1993.

4 GEODETIC PARAMETERS

The Geodetic parameters used during the project were as follows:

- The location co-ordinates and the acoustic positioning systems are defined on Australian Geodetic Datum 84 (AGD 84).
- The Global Positioning System (G.P.S.) is referenced to World Geodetic System 1984 (WGS 84).

4.1 DATUMS

DATUM	:	**AGD 1984**
Spheroid	:	Australian National
Semi-major Axis (a)	:	6 378 160.000m
Semi-minor Axis (b)	:	6 356 774.719m
Eccentricity Squared (e^2)	:	0.006 694 542
Flattening ($^1/_f$)	:	298.25
DATUM	:	**WGS-84**
Spheroid	:	WGS-84
Semi-major Axis (a)	:	6 378 137.0000m
Semi-minor Axis (b)	:	6 356 752.3142
Eccentricity Squared (e^2)	:	0.006 694 380
Flattening ($^1/_f$)	:	298.257 223 563

4.2 PROJECTION : U.T.M.

AMG Zone	:	54
Central Meridian (C.M.)	:	141° East
Scale factor on the C.M.:	:	0.9996
False Easting	:	500 000m
False Northing	:	10 000 000m
Latitude of Origin	:	0° (Equator)
Unit of Measure	:	International Metre

4.3 DATUM TRANSFORMATION PARAMETERS

The datum transformation parameters used in Racal software to convert WGS 84 co-ordinates to AGD 84 co-ordinates were as follows:

Dx	=	+	116.00m
Dy	=	+	50.47m
Dz	=	–	141.69m
Rx	=	+	0.230"
Ry	=	+	0.390"
Rz	=	+	0.344"
Scale(k)	=	–	0.0983

4.4 GEOID/SPHEROID SEPARATION

The computed WGS 84 Geoid/Spheroid separation value (N) at the Loch Ard-1 location is –1.46m. This value was computed using the Ohio State University OSU91A Geoid Interpretation Program.

5 GLOBAL POSITION SYSTEM (GPS)

5.1 SYSTEM DESCRIPTION

The NAVSTAR GPS (Navigational Satellite Timing and Ranging Global Positioning System) is an USA Military all weather, space based positioning system that transmits signals from a constellation of satellites orbiting the Earth. It is capable of providing suitably equipped users worldwide with accurate three dimensional positions on or near the Earth's surface. The accuracy of the determined positions can vary from a few millimetres to 100 metres depending on the method of data acquisition and processing. System design consists of three integrated parts: the Ground Control Segment, the Space Segment and the User Segment. The Space Segment is still in the process of being installed and as such is not completely operational.

When completed, the operational space segment will consist of 21 production satellites and 3 active spares; the term Space Vehicle (SV) is used as a synonym for satellite. The satellites will be in high orbits, at approximately 20,200km, having an orbit period of 12 hours. They will be arranged in 6 orbital planes, inclined at 55 degrees with near circular orbits.

The final configuration will provide complete 4 satellite (3D) coverage worldwide. With the present launch schedule, 24 hour 3 dimensional coverage will not be available until late 1993.

The current configuration consists of both Block I (testing) and Block II satellites orbiting and transmitting healthy data. The Block I's are SV's 3, 12, and 13. The current Block II satellites are SV's 1, 2, 5, 7, 9, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29 and 31. The amount of coverage that the satellite configuration provides, depends upon the geographical position of the user.

It should be noted that available coverage does not represent actual usable working periods, as the satellites will at times combine to produce poor geometry and therefore poor positioning. This can happen for short periods during the middle of multi-satellite coverage and is a result of the limited satellite constellations presently available. It is essential to ascertain the periods of good coverage prior to commencing any project involving GPS. Predicted satellite availability printouts are contained in Appendix E.

Individual satellites can be set 'unhealthy' from time to time whilst they are manoeuvred into new orbital planes or due to other operational circumstances which are usually predicted. The status of GPS and individual satellites can be obtained from one of the USA based GPS Bulletin Board Services. Prior to a project commencing Racal Australia download by modem the current status and almanac file, usually from the US Coast Guard Bulletin Board. In addition the Racal Survey Ltd office in Great Yarmouth, England monitor the GPS status daily and fax to all Racal operating companies any Notice Advisory to NAVSTAR Users (NANU's) that may affect the operational capabilities of the system.

5.2 OBSERVATIONS

There are two important types of GPS observations (observables):

Pseudo-range and Carrier phase.

Carrier phase is sometimes also referred to as carrier beat phase. Pseudo-range techniques are generally used for navigation e.g. Deltanav. In high-precision baseline surveying the carrier phase is used. Although the (undifferenced) phase can be used directly, it has become common practice, at least in surveying applications, to process certain linear combinations of the original carrier phase observations (double differences and triple differences).

5.2.1 Pseudo-ranges

The pseudo-range is a measure of the distance between the satellite and the receiver at the epochs of transmission and reception of the signals. The transit time of the signals is measured by comparing (correlating) identical pseudo-random noise (PRN) codes generated by the satellite and by the receiver. A code-tracking loop within the receiver shifts the internal replica of the PRN code in time until maximum correlation occurs. The codes generated at the receiver are derived from the receiver's own clock, and the codes of the satellite transmissions are generated by the satellite system of clocks. It follows that unavoidable timing errors in both the satellite and the receiver clock will cause the measured quantity (pseudo-range) to differ from the geometric distance.

In applications offshore where instantaneous positions are required, the Pseudo-range is the preferred observable. Given the satellite ephemeris (i.e. the position of the satellite at the epoch of transmission), there are seven unknowns: two clock errors, three receiver co-ordinates and the ionospheric and tropospheric delays. The effect of the satellite clock error is negligible for the typical navigation solution, particularly considering that the time errors are indistinguishable from the ionospheric and tropospheric delays. The satellite clocks are constantly monitored and synchronized with GPS time as maintained by the control centre. Actual offsets of the satellite clocks are approximated by polynomials in time and transmitted as part of the navigation message to the user for the correction of the measured pseudo-ranges. The ionospheric and tropospheric delays can be computed on the basis of ionospheric and tropospheric models, thus there are four unknowns left X, Y, Z and receiver clock error. These can be determined from four pseudo-ranges measured simultaneously to four GPS satellites.

5.2.2 Carrier Phase

The phase observable is the difference between the phase of the carrier signal of the satellite, measured at the receiver, and the phase of the local oscillator within the receiver at the epoch of measurement. This can be regarded as a biased range measurement of the satellite-receiver distance with the integer number of carrier waves being unknown. The wavelength of the L1 carrier is about 19cm. Because of the fraction of the carrier phase is measured, the term "interferometry" is often used to describe carrier phase techniques.

5.3 DIFFERENTIAL GPS (DGPS)

As the GPS is primarily a USA Defence system it can be expected that the navigation accuracy to the civil user will be degraded to about 100 metres standard deviation (Standard Position Service -SPS) as specified in the USA 1990 Federal Radio Navigation Plan. The means by which the USA Military degrade GPS is with the use of Selective Availability (SA) to control the accuracy of Pseudo-range measurements. Essentially, the user is given a false Pseudo-range for each satellite so that the resulting measurement is in error by a controlled amount.

DGPS is a means by which the civil user can overcome Selective Availability. It requires a receiver be located at a precisely known point from which Pseudo-range corrections for each satellite can be determined and monitored. These Pseudo-range corrections are then communicated by means of a telecommunications link to users at unknown locations. The DGPS technique has proven to be particularly effective and can improve the accuracy figure to 5 metres or better with or without Selective Availability activated. In the relative mode most of the important systematic errors common to the known station and at the unknown location cancel out to improve the accuracy of the computed position.

5.4 SKYFIX DIFFERENTIAL LINK

Racal Survey Australia Limited introduced its SkyFix Differential GPS System in Australia in January 1991, using the Inmarsat Pacific and Indian Ocean marine communications satellites as the differential data broadcast link. Extensive performance trials and projects undertaken to date have shown SkyFix to meet the best industry expectations in terms of quality of service and accuracy.

The system embodies the successful combination of data capacity, range and coverage with a flexible networked approach that lends itself to comprehensive performance and quality monitoring.

The link capacity of 1200 bits per second allows data from a number of networked reference stations to be sent simultaneously without introducing unacceptable delays between reference station and user. With four reference stations each generating correction data for ranges from eight satellites, an update rate of better than three seconds is achieved by the SkyFix system.

Satellite communications systems, particularly at the Inmarsat L-band frequencies of 1.5 GHz are reliable and free of the interference associated with the crowded M.F./H.F. bands. This high data integrity gives users confidence that the corrections will be continuously received without interference.

The SkyFix Australian network commenced operation in January 1991, and now comprises reference stations at Dampier, Broome, Perth, Adelaide, Sydney, Cairns and Darwin.

The differential corrections generated at each reference station are brought via landline links to the data hub and control centre in Singapore where the system is monitored for performance and quality. From there a composite message containing full RTCM 104 version 2 formatted data from all reference stations is sent via dual redundant links to satellite earth stations at Sentosa Island, Singapore and O.T.C. Perth, Western Australia for uplink and broadcast over the Inmarsat Pacific and Indian Ocean Region satellites.

The design of reference station networks provides a high quality service to major offshore hydrocarbons prospect areas, each of which, ideally will be within coverage of more than one reference station.

The system is easily expandable to provide new areas of coverage by the addition of further networked reference stations, with the correction data from these automatically included in the system performance and quality control function at the control centres.

Whilst the DGPS service provider has no control over the operation of the GPS system itself, performance can be monitored, quantified and reported to users. The functions of the SkyFix data hub and control centre in Singapore are of fundamental importance as its role is to guarantee the best possible system performance.

The SkyFix system includes a 24 hour monitoring facility to ensure the validity of data received at the control centre from the DGPS reference stations and that the same data is received over the SkyFix satellite data link.

The monitor system that has been developed by Racal Survey is designed to provide maximum system performance information availability whilst providing a rapid indication of performance or fault problems should they occur.

Monitoring and control functions therefore include extensive analysis and archiving of the reference corrections and the comparison of range rate corrections - arriving from different stations within the network. The system also receives the broadcast message from the satellite data link and applies this data to a monitor receiver at the control centre to verify positioning performance. Time series plots of this performance, in latitude, longitude, height, together with PDOP and HDOP figures are generated.

Monitoring the data on the link in this way also allows link performance to be appraised in terms of message success rate and in terms of overall system message delay.

Other functions include satellite status information, data recording, and a procedural approach to providing client information.

The SkyFix combination of the Inmarsat satellite communications links using the RTCM 104 Version 2 DGPS data protocol, the reference station, monitoring and user infrastructure has been shown through a growing body of project trials experience to provide a Differentially GPS operating environment consistently capable or providing position accuracy's of 5 metres or better.

The SkyFix scheme is a homogeneous network within the WGS 84 geodetic reference frame. The original network, prior to the Australian extension included ten primary triangulation stations for which the WGS 84 values were supplied. The vectors established during this build up create a network between the Far East, Australia and Europe. Purely for the purposes of testing the strength and internal consistency the network has been subjected to a least squares adjustment by variation of co-ordinates. In the final analysis two of the primary triangulation stations, Dongara 38 (W.A.) and Matera (Italy), were held fixed. The residual errors pertaining to the remaining eight primaries are listed below. For all stations included in the final analysis the mean semi-major axis of the twenty-nine 95% error ellipsoids is just over 0.6 metres. The total variation about this mean is contained within plus or minus 0.6 metres.

Station	Latitude	Longitude	Height	Misclosure
Port Stanley (Hong Kong)	0.53m	- 1.56m	- 0.53m	1.73m
TC 58 (Abu Dhabi)	0.76m	- 0.97m	0.83m	1.49m
Station Hill(Broome W.A)	0.35m	0.50m	- 1.23m	1.95m
Gnangara (Perth W.A.)	1.04m	1.00m	- 1.82m	2.32m
Bologna (Italy)	- 0.14m	0.02m	0.39m	0.41m
Brimmond Hill (Scotland)	- 2.85m	0.32m	1.16m	3.09m
Dunnet Head (Scotland)	- 1.59m	1.50m	0.81m	2.04m
Tromso (Norway)	- 1.11m	2.25m	- 0.81m	2.64m

For the Australian extension to the network, two primary geodetic points were used at each site, together with the transportable laser ranging site, Gnangara 73 in Perth. Trimble 4000 SST geodetic receivers were used to simultaneously obtain phase data which was then post processed to derive the vectors between sites. The vector results were entered into "Geolab" 3D adjustment software, to obtain adjusted values for the reference stations.

5.5 TRIMBLE 4000DL GPS RECEIVER

The Trimble 4000DL GPS receiver is designed for moderate precision static and dynamic positioning applications. The GPS receiver provides time and three-dimensional station co-ordinates at a once-per-second update rate.

The receiver receives the civilian coded signal (C/A) from the GPS NAVSTAR satellites. The receiver automatically acquires and simultaneously tracks GPS satellites and precisely measures carrier and code phase and computes position and velocity.

Latitude, longitude and height values are output on the World Geodetic System (WGS 84) Earth-centred, Earth-fixed co-ordinate system.

The receiver is designed to measure the following observables:

- Coarse/Acquisition (C/A) code Pseudo-ranges
- Rate of change of Pseudo-range
- Integrated Carrier

C/A code correlation techniques measure the propagation time of the signal from the satellite to the antenna. Latitude, longitude, height and time can be determined from measurements made from at least 4 satellites, by a process similar to triangulation.

To determine speed and heading, the receiver calculates the rate of change of Range (the range-rate) by measuring the Doppler shift of the carrier.

It is capable of receiving and processing differential corrections from other reference sources using the standard format of the Radio Technical Commission for Maritime Services, Special Committee 104 (RTCM SC-104), Version 1.0 or 2.0 protocols.

The 4000DL has several options available, including internal data logging memory, event marker logging etc. and therefore may be used alone or as part of a more extensive navigation system.

5.6 DGPS OPERATION

During the rig move operations the DGPS was operated using Trimble's DeltaNavN (DNAVN) 2.71 software in conjunction with a Toshiba T5200/100 computer. DNAVN controlled the Trimble GPS receiver and applied the RTCM 104 Version 2 differential corrections received from the SkyFix system to the observed GPS data. The computed DGPS position in WGS 84 was then output to the navigation computer and converted to AGD 84.

6 ACOUSTIC POSITIONING SYSTEM

6.1 SYSTEM DESCRIPTION

Sonardyne high precision acoustic technology incorporates COMPATT (Computing and Telemetering Transponder) and PAN (Programmable Acoustic Navigator). The system is available in low, medium and high frequency versions. This allows selection of the optimum frequency band to suit each requirement. Medium frequency equipment was used during rig move operations.

The microprocessor-controlled intelligent COMPATT makes direct measurements on the seabed to other Sonardyne transponders, and transmits this baseline data back to a ship or submersible via fast acoustic telemetry in order to calculate the relative position of each transponder.

In its interrogator mode the COMPATT will measure ranges to 8 individual transponders with just one single interrogation. This speeds up 'mobile' COMPATT operations such as ROV tracking and pipelaying.

The reply frequency of the COMPATT is selectable from 15 channels by acoustic command. This feature reduces the need for a large transponder stock and increases immunity to 'rogue' frequencies.

Other commands instruct sensors to measure parameters such as water temperature and pressure, and at the end of the mission another command will effect recovery. An automatic 'self-test' facility can be performed without opening the transponder.

The medium frequency version can give an optimum combination of 3km ranges and 20cm accuracy. This suits most sub-sea engineering operations including rig moves, pipelaying, jacket emplacement and ROV positioning.

6.2 TRANSPONDER DEPLOYMENT AND CALIBRATION

Sonardyne acoustic transponders were deployed and calibrated at the Loch Ard-1 location from the M.V. "Pacific Marlin" on the 19th of September, 1993. See Racal Report A2134 for details of calibrations.

6.3 TRANSPONDER CO-ORDINATES

The transponder co-ordinates at Loch Ard-1 were as follows:

Datum AGD 84
AMG Zone 54 C.M. 141° East

Tp	Code	Reply Channel	Easting (m)	Northing (m)	Depth (m)
1	601	1	688 562.17	5 689 085.18	68.51
2	602	2	689 620.64	5 688 955.49	68.50
3	604	4	689 664.82	5 687 966.85	67.55
4	701	5	688 696.01	5 688 068.28	68.64

7 FINAL DRILLSTEM POSITION

The final differential GPS position of the drillstem over the Loch Ard-1 location was determined using Racal's SkyFix/Trimble/DNAVN DGPS. A check was also carried out using BHPE's Del Norte 1008 GPS receiver with differential corrections from Racal's Adelaide reference station.

Observations from both DGPS systems were made simultaneously between 2257 on the 18th and 0030 on the 19th of October, 1993. The final fix analysis in the GNS Rigmove software was used to collect the DGPS observations and calculate the position of the drillstem.

7.1 FINAL DIFFERENTIAL GPS POSITION - LOCH ARD-1

The final co-ordinates for the Loch Ard-1 location were determined from observations made by Racal's SkyFix/Trimble/DNAVN DGPS, and are as follows :

Constellation	Samples	Satellites
A	33	28, 22, 23, 26, 03, 17, 21
B	98	28, 22, 23, 26, 17, 21
C	44	28, 22, 23, 26, 01, 17, 21
D	101	28, 03, 22, 23, 26, 01, 17, 21
E	95	28, 03, 23, 26, 01, 17, 21
F	31	28, 03, 23, 26, 01, 17, 21, 31
G	10	28, 23, 26, 01, 17, 21
H	97	28, 03, 23, 01, 17, 21
I	92	28, 03, 31, 23, 01, 17, 21

Total number of samples used = 601

The computed antenna position, with constellations given equal weights, was as follows:

Datum WGS 84

Latitude	:	38° 55' 49.927" South	(s.d. 0.47m)
Longitude	:	143° 10' 58.785" East	(s.d 0.38m)
Spheroidal Height	:	21.78m	(s.d. 0.54m)

Transforming the above WGS 84 co-ordinates to AGD 84 using the parameters in Section 4, gives the following antenna co-ordinates:

Datum AGD 84

Latitude	:	38° 55' 55.247" South
Longitude	:	143° 10' 53.838" East
Spheroidal Height	:	38.76m

Applying the antenna to datum offsets to the above co-ordinates gives the following drillstem position, over the Loch Ard-1 location.

Datum AGD 84

Latitude	:	38° 55' 54.717" South
Longitude	:	143° 10' 55.156" East

AMG Zone 54 C.M. 141° East

Easting	:	689 133.62m
Northing	:	5 688 505.60m

Rig Heading	:	221.3° (T)

This position is 2.4 metres on a bearing of 187.7° (T) from the intended Loch Ard-1 location.

7.2 DIFFERENTIAL GPS POSITION CHECK - LOCH ARD-1

A check on the final drillstrem derived position was carried out using BHPE's Del Norte GPS receiver.

The following data was observed : Total number of samples used = 601

Constellation	Samples	Satellites
A	48	28, 21, 23, 22, 03, 17, 26
B	83	28, 21, 23, 22, 17, 26
C	62	28, 01, 21, 23, 22, 17, 26
D	4	28, 01, 21, 23, 17, 26
E	145	28, 01, 21, 23, 22, 03, 17, 26
F	10	28, 01, 21, 23, 03, 17, 26
G	6	28, 01, 21, 23, 31, 03, 17, 26
H	52	28, 01, 21, 23, 31, 03, 17
I	37	28, 01, 21, 23, 31, 03, 17, 22
J	14	28, 01, 21, 23, 31, 17, 22
K	140	28, 01, 21, 23, 31, 17

The computed antenna position, with constellations given equal weights, was as follows:

Datum WGS 84

Latitude	:	38° 55' 50.027" South	(s.d. 0.42m)
Longitude	:	143° 10' 58.892" East	(s.d. 0.32m)
Spheroidal Height	:	21.64m	(s.d. 0.93m)

Transforming the above WGS 84 co-ordinates to AGD 84 using the parameters in section 4, gives the following antenna co-ordinates:

Datum AGD 84

Latitude	:	38° 55' 55.347" South
Longitude	:	143° 10' 53.945" East
Spheroidal Height	:	38.62m

Applying the antenna to datum offsets to the above co-ordinates gives the following position, over the Loch Ard-1 location.

Datum AGD 84

Latitude	:	38° 55' 54.777" South
Longitude	:	143° 10' 55.203" East

AMG Zone 54 C.M. 141° East

Easting	:	689 134.72m
Northing	:	5 688 503.72m

Rig Heading : 221.3° (T)

This position is 4.3 metres on a bearing of 169° (T) from the intended Loch Ard-1 location.

The difference in position between the DNAVN and Del Norte derived co-ordinates are as follows :

ΔEasting = +1.1m ΔNorthing = -1.88m

8 PERSONNEL AND EQUIPMENT

8.1 PERSONNEL

The following personnel were employed on this project:

For : Racal Survey (Australia)

K. Eddy	-	Surveyor/Party Chief	13th - 19th October
B. Slevin	-	Laser Operator	13th - 19th October
K. Perry	-	Navigation/Acoustic Engineer	13th - 22nd October

For : BHPP Limited

B. Edmonds	-	Client Representative

8.2 EQUIPMENT

The following equipment was supplied for use on this project:

1 x Trimble 4000DL MkII GPS Receiver, Cable and Antenna

2 x SkyFix Demodulators with Decoders

1 x SkyFix Rig Portable

1 x Toshiba T5200/100 Computer (for DNAV-N)

2 x Sonardyne Pan Units

4 x Sonardyne Compatt Transponders

1 x Sonardyne Tow Fish

1 x Sonardyne Deck Winch

1 x Sonardyne Dunking Transducer

2 x HP 9000/320 Series Desktop Computers

1 x HP 9122D Dual Disk Drive

1 x HP 9122C Dual Disk Drive

2 x HP 35731B VDU's

2 x Barco Monitors

2 x HP Thinkjet Printers

1 x HP 2673A Thermal Printer

2 x Toshiba T5200/100 Computers (for GNS PC Software)

2 x VGA Monitors

1 x STD-12 Velocity Probe

1 x Arma Brown Gyro Compass

1 x SG Brown 1000A Gyro Compass

3 x Interface 80 Units

1 x Star LC-20 Printer

1 x Toshiba 1200 Computer (Velocity Probe)

2 x AC Voltage Stabilisers

1 x Golf Laser

plus all associated software (GNS Ver R2.06S, GNS Ver R2.06S PC), cables, manuals, etc.

9 DISTRIBUTION

Copies of this report have been distributed as follows:

BHP Engineering - Wollongong Attn: Mr. S. Dykes	: 1 copy
BHP Petroleum - Melbourne Attn: Mr. R. Willmore	: 2 copies
Racal Survey - Perth	: 1 copy

Ken Eddy
Surveyor

Gareth Jones
Area Surveyor

APPENDIX A

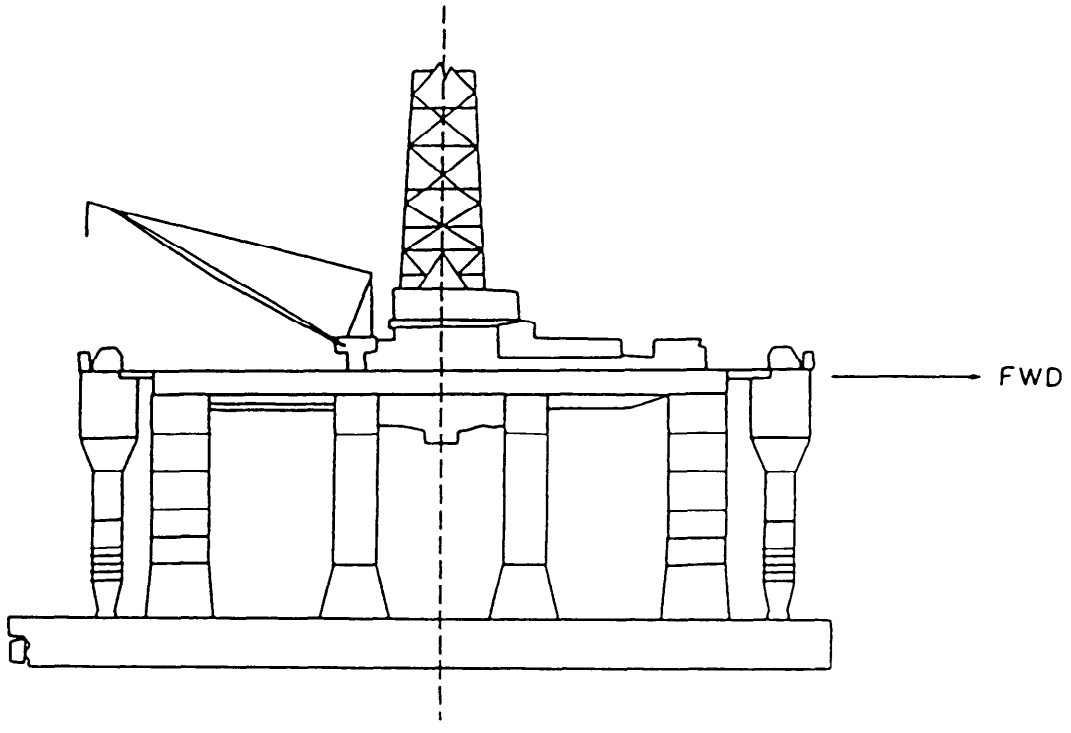
OFFSET DIAGRAM - BYFORD DOLPHIN

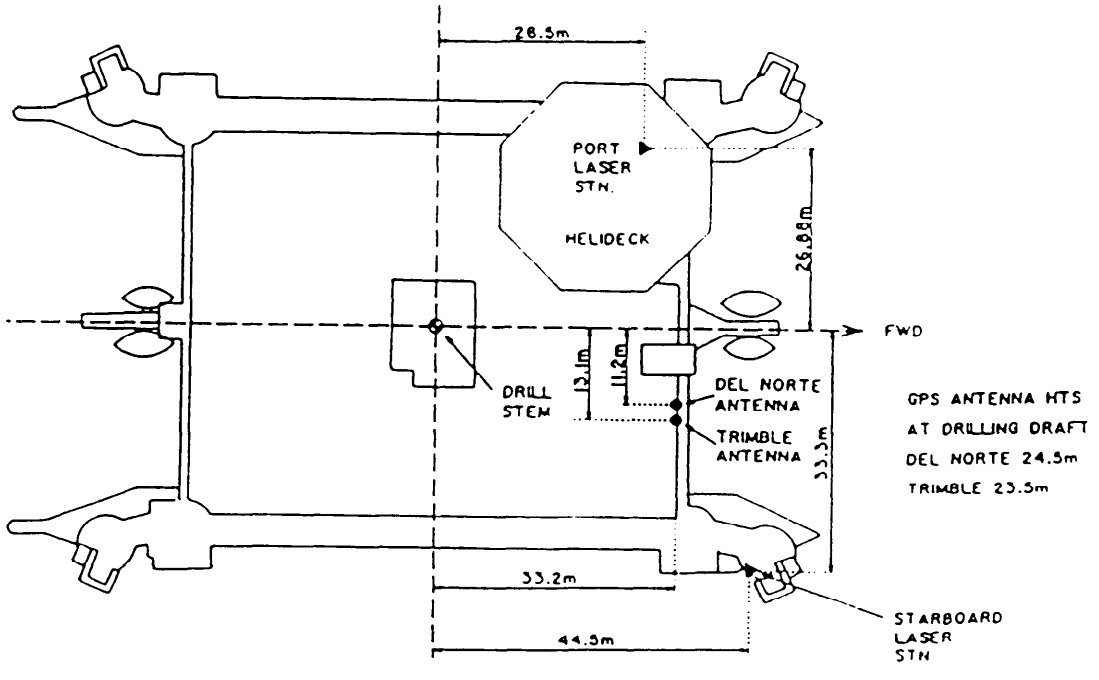
OFFSET DIAGRAM

APPENDIX A

BYFORD DOLPHIN

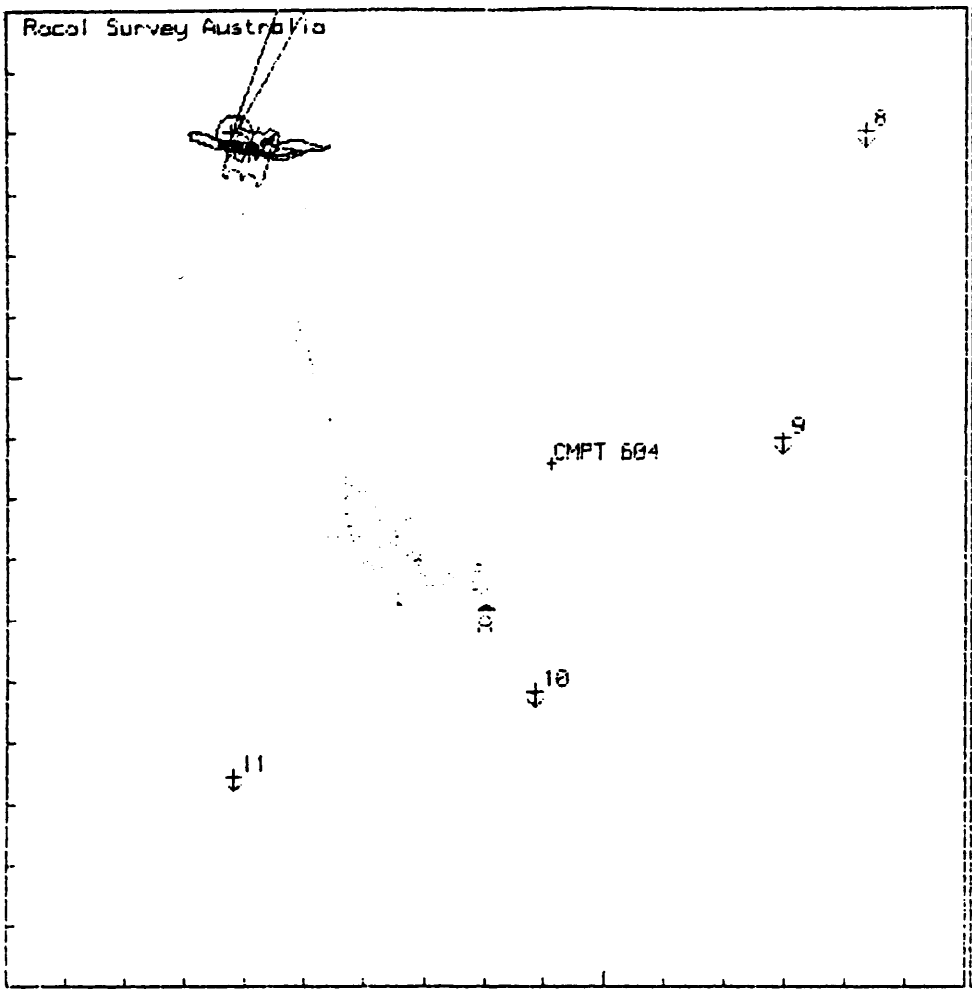
(NOT TO SCALE)





APPENDIX B

GOLF LASER TRACKING PRINTOUTS



19 02 04
17 Oct 1993
DATUM
Hdg 193.4 T
CMG 78 9 T
Spd 3 Kt
Track Guid
Thru Am#6
Brg 320 6 T
DOfL -36 1 M
Waypoint
LOCH ARD-1
Rng 38 8 M
Brg 320.6 T
GPS

#	R(M)	B(T)
5	938	020
10	165	150
12	1085	212

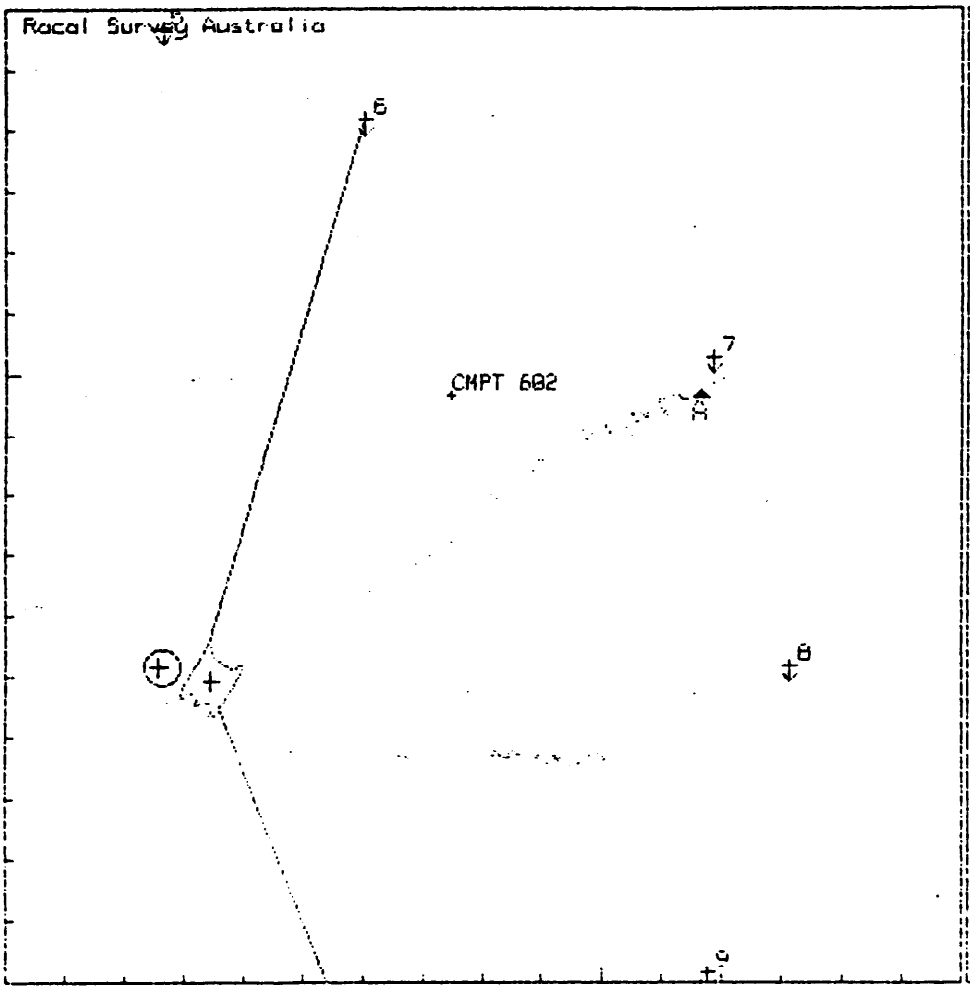
SW Corner
E 588759 00
N 5487[illegible]0 00
Sc 1 8000
Pitch 100M

RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Off	Off
2	Off	Off
3	Off	Off
4	Off	Off
5	Off	Off
6	Actual Drop 6	Winch Offset 6
7	Off	Off
8	Off	Off
9	Off	Off
10	Actual Drop 10	Winch Offset 10
11	Off	Off
12	Intended Drop 12	Winch Offset 12

RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Off	Off
2	Off	Off
3	Off	Off
4	Off	Off
5	Off	Off
6	Actual Drop 6	Winch Offset 6
7	Intended Drop 7	Winch Offset 7
8	Off	Off



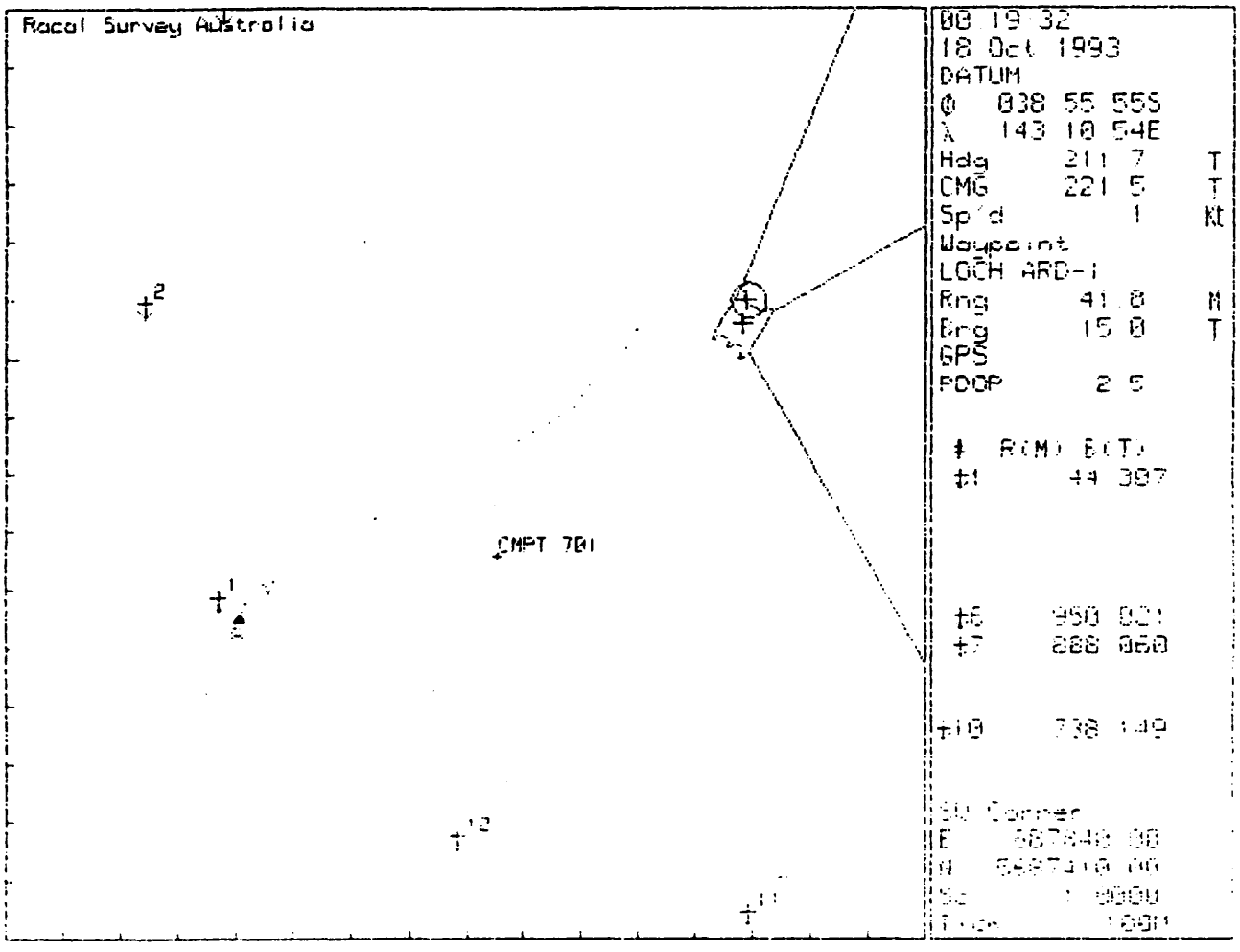
RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Off	Off
2	Off	Off
3	Off	Off
4	Off	Off
5	Off	Off
6	Actual Drop	Winch Offset 6
7	Actual Drop	Winch Offset 7
8	Off	Off
9	Off	Off
10	Actual Drop	Winch Offset 10
11	Off	Off
12	Off	Off

RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Intended Drop	Winch Offset
2	Off	Off
3	Off	Off
4	Off	Off
5	Off	Off
6	Actual Drop	Winch Offset 6
7	Actual Drop	Winch Offset 7
8	Off	Off

Current Anchor # 1 Int. Location 689211E, 5686000N
Vessel Datum : 689122.87E, 5688469.89N Gyro : 212.70½T
Laser : HELIP 689132.81E, 5688428.76N
Range 995.00 metres Bearing 28.80 Relative to Vessel Head
Tug Posn 688247E, 5687977N
Rng & Brg to Intended drop 12.0 metres 301.2 deg. True



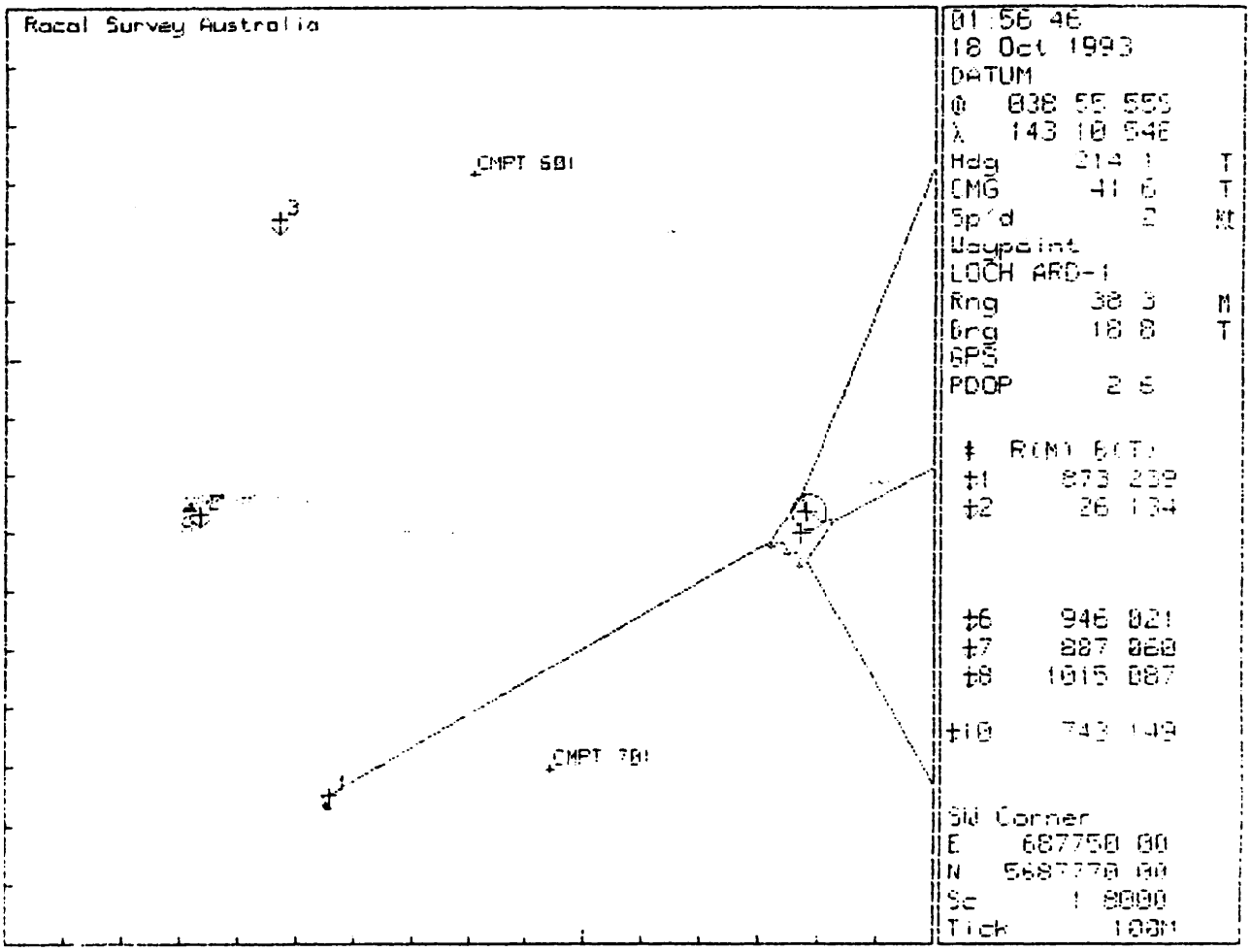
RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Actual Drop	Winch Offset 1
2	OFF	OFF
3	OFF	OFF
4	OFF	OFF
5	OFF	OFF
6	Actual Drop	Winch Offset 6
7	Actual Drop	Winch Offset 7
8	OFF	OFF
9	OFF	OFF
10	Actual Drop	Winch Offset 10
11	OFF	OFF
12	OFF	OFF

RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Actual Drop	Winch Offset 1
2	Intended Drop 2	Winch Offset 2

Laser : STARB 689073.87E, 5688456.36N
Range 1005.00 metres Bearing 58.70 Relative to Vessel Head
Tug Posn 688071E, 5688524N
Rng & Brg to Intended drop 22.2 metres 143.0 deg. True



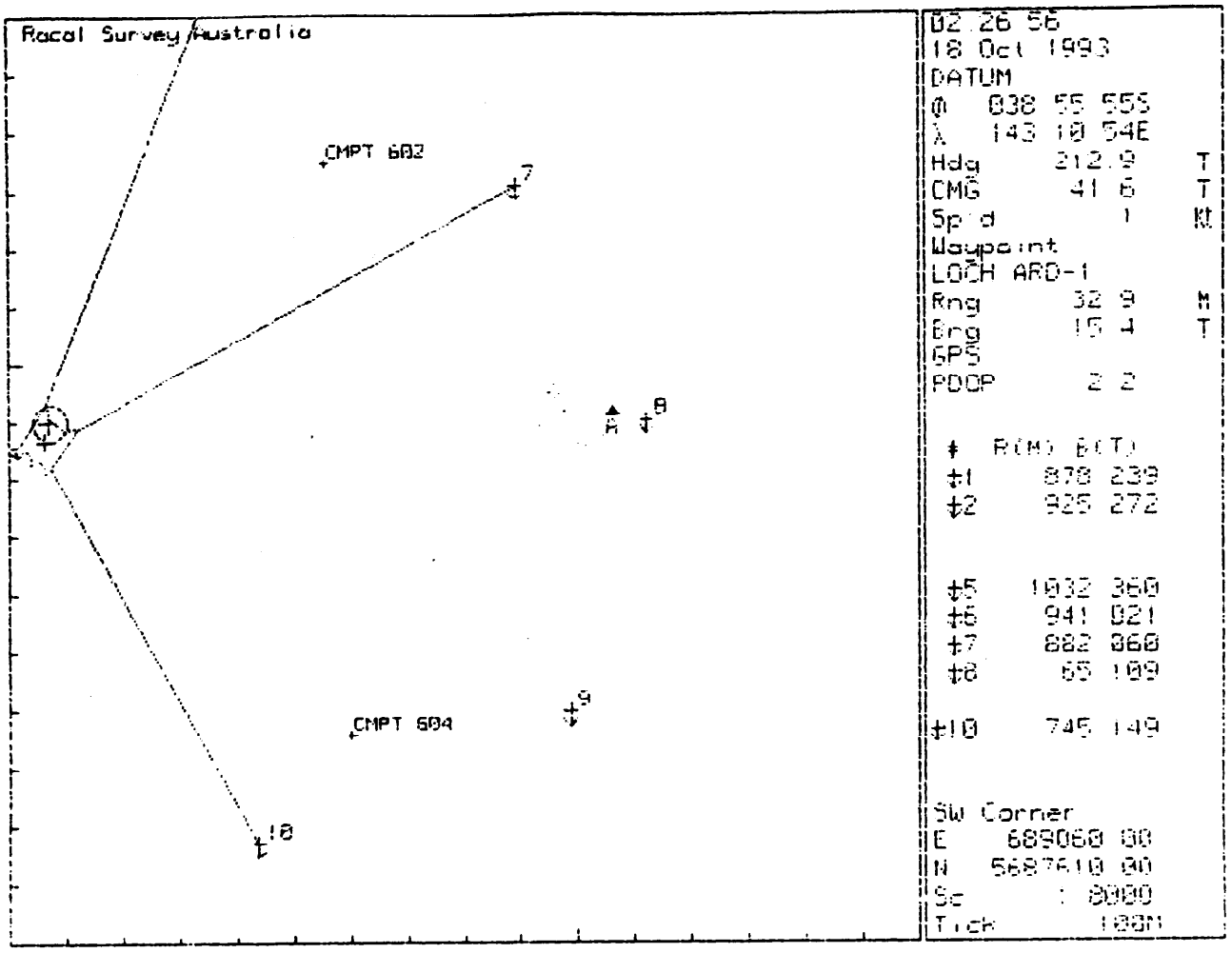
RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Actual Drop 1	Winch Offset 1
2	Actual Drop 2	Winch Offset 2
3	OFF	OFF
4	OFF	OFF
5	Intended Drop 5	Winch Offset 5
6	Actual Drop 6	Winch Offset 6
7	Actual Drop 7	Winch Offset 7
8	Intended Drop 8	Winch Offset 8
9	OFF	OFF
10	Actual Drop 10	Winch Offset 10
11	OFF	OFF
12	OFF	OFF

RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Actual Drop 1	Winch Offset 1
2	Actual Drop 2	Winch Offset 2
3	OFF	OFF
4	OFF	OFF

5	Intended Drop 5	Winch Offset 5



RANGE & BEARING DISPLAY TABLE

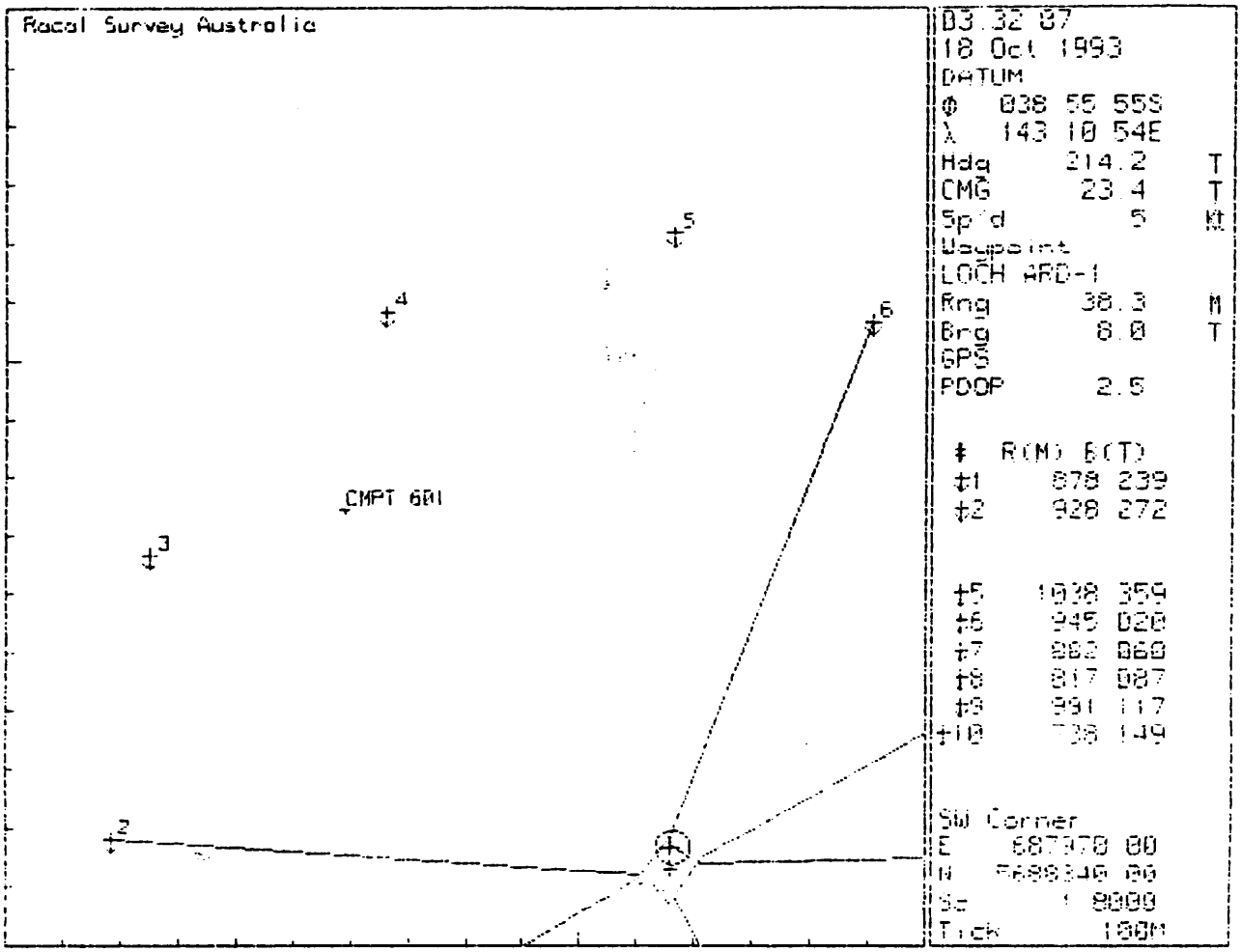
Slot	To	From
1	Actual Drop 1	Winch Offset 1
2	Actual Drop 2	Winch Offset 2
3	Off	Off
4	Off	Off
5	Intended Drop 5	Winch Offset 5
6	Actual Drop 6	Winch Offset 6
7	Actual Drop 7	Winch Offset 7
8	Actual Drop 8	Winch Offset 8
9	Intended Drop 9	Winch Offset 9
10	Actual Drop 10	Winch Offset 10
11	Off	Off
12	Off	Off

106 TRACKING Fix @ TIME 03:07:47 Ident ! A
Current Anchor # 5 Int. Location 689136E, 5689550N
Vessel Datum : 689128.20E, 5688469.00N Gyro : 214.20[illegible]
Laser : STARB 689075.23E, 5688452.17N
Range 995.00 metres Bearing 141.20 Relative to Vessel Head
Tug Posn 689055E, 5688848N
Rng & Brg to Intended drop 714.8 metres 5.2 deg. True

106 TRACKING Fix @ TIME 03:08:12 Ident ! A
Current Anchor # 5 Int. Location 689136E, 5689550N
Vessel Datum : 689128.25E, 5688471.52N Gyro : 213.50[illegible]

↓ Running Anchor #5

Laser : STARB 689075.49E, 5688454.05N



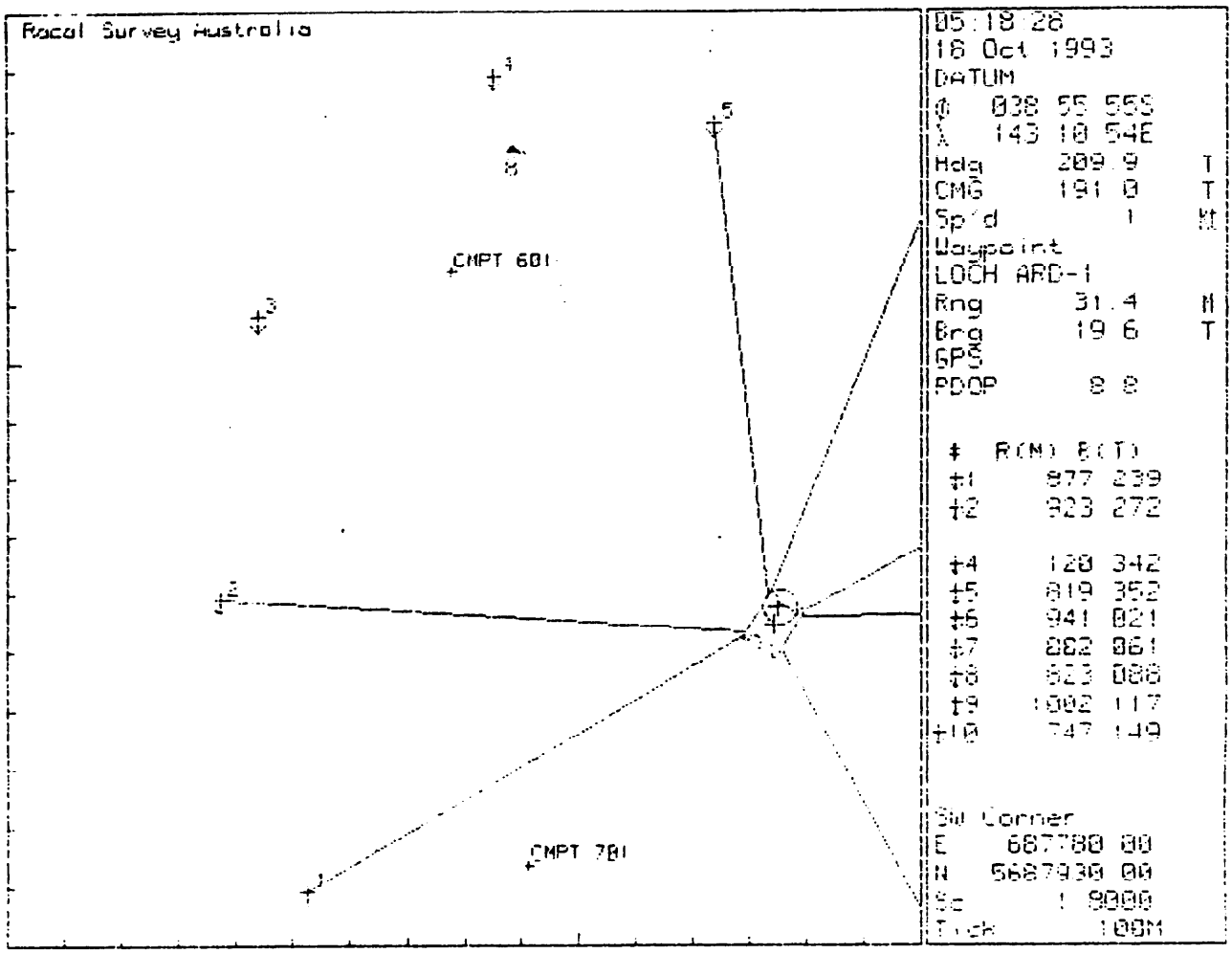
RANGE & BEARING DISPLAY TABLE

Slot	To		From	
1	Actual Drop	1	Winch Offset	1
2	Actual Drop	2	Winch Offset	2
3	OFF		OFF	
4	Intended Drop	4	Winch Offset	4
5	Actual Drop	5	Winch Offset	5
6	Actual Drop	6	Winch Offset	6
7	Actual Drop	7	Winch Offset	7
8	Actual Drop	8	Winch Offset	8
9	Intended Drop	9	Winch Offset	9
10	Actual Drop	10	Winch Offset	10
11	OFF		OFF	
12	OFF		OFF	

RANGE & BEARING DISPLAY TABLE

Slot	To		From	
1	Actual Drop	1	Winch Offset	1
2	Actual Drop	2	Winch Offset	2
3	OFF		OFF	
4	Intended Drop	4	Winch Offset	4
5	Actual Drop	5	Winch Offset	5
6	Actual Drop	6	Winch Offset	6
7	Actual Drop	7	Winch Offset	7
8	Intended Drop	8	Laser Target	1A

Range 940.00 metres Bearing 123.10 Relative to Vessel Head
Tug Posn 688667E, 5689306N
Rng & Brg to Intended drop 120.2 metres 342.3 deg. True



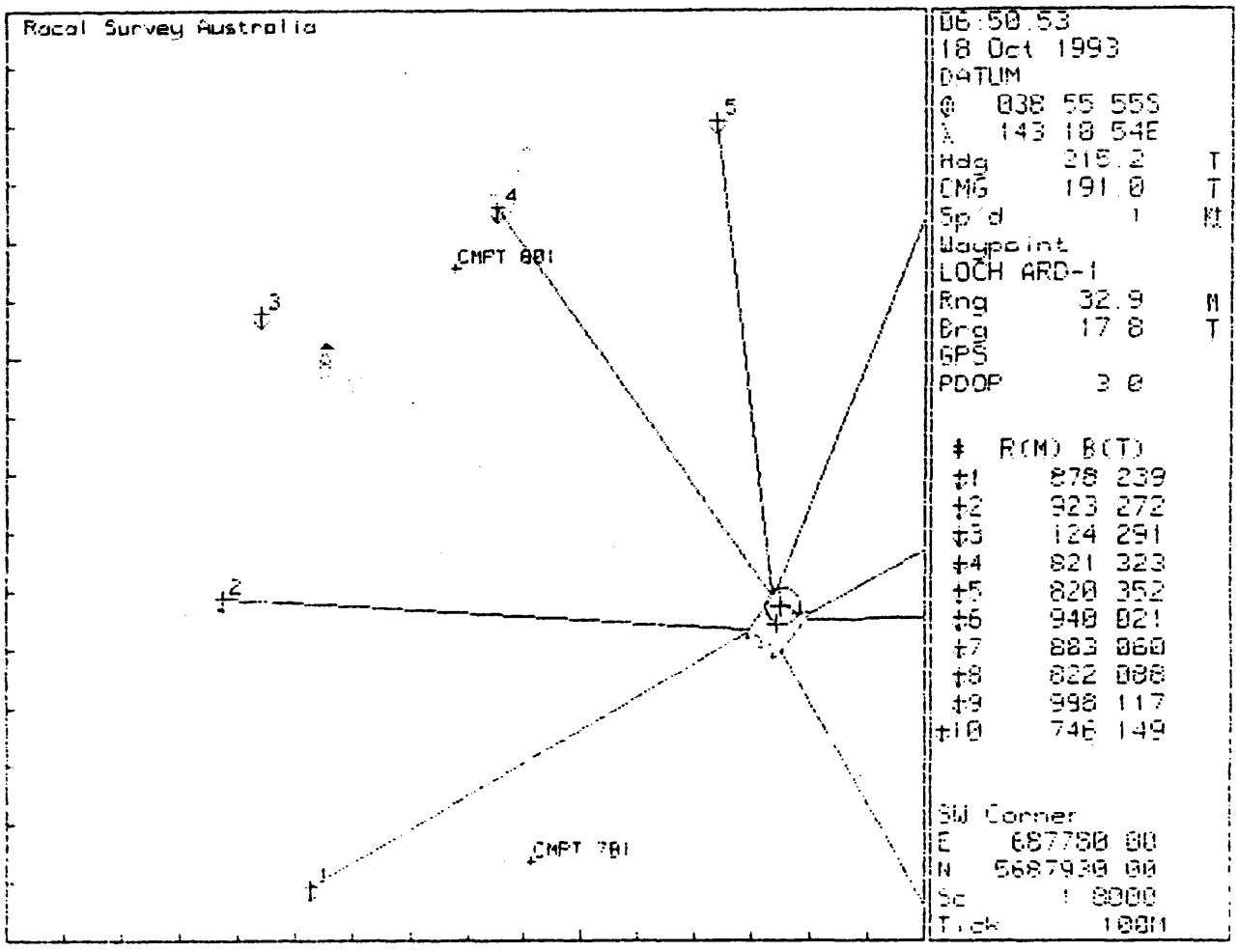
RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Actual Drop	Winch Offset
2	Actual Drop	Winch Offset
3	Intended Drop	Winch Offset
4	Actual Drop	Winch Offset
5	Actual Drop	Winch Offset
6	Actual Drop	Winch Offset
7	Actual Drop	Winch Offset
8	Actual Drop	Winch Offset
9	Intended Drop	Winch Offset
10	Actual Drop	Winch Offset
11	OFF	OFF
12	OFF	OFF

RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Actual Drop	Winch Offset
2	Actual Drop	Winch Offset
3	Intended Drop	Laser Target
4	Actual Drop	Winch Offset
5	Actual Drop	Winch Offset

Laser : STARB 689069.88E, 5688458.87N
Range 890.00 metres Bearing 87.60 Relative to Vessel Head
Tug Posn 688334E, 5686959N
Rng & Brg to Intended drop 123.3 metres 292.7 deg. True

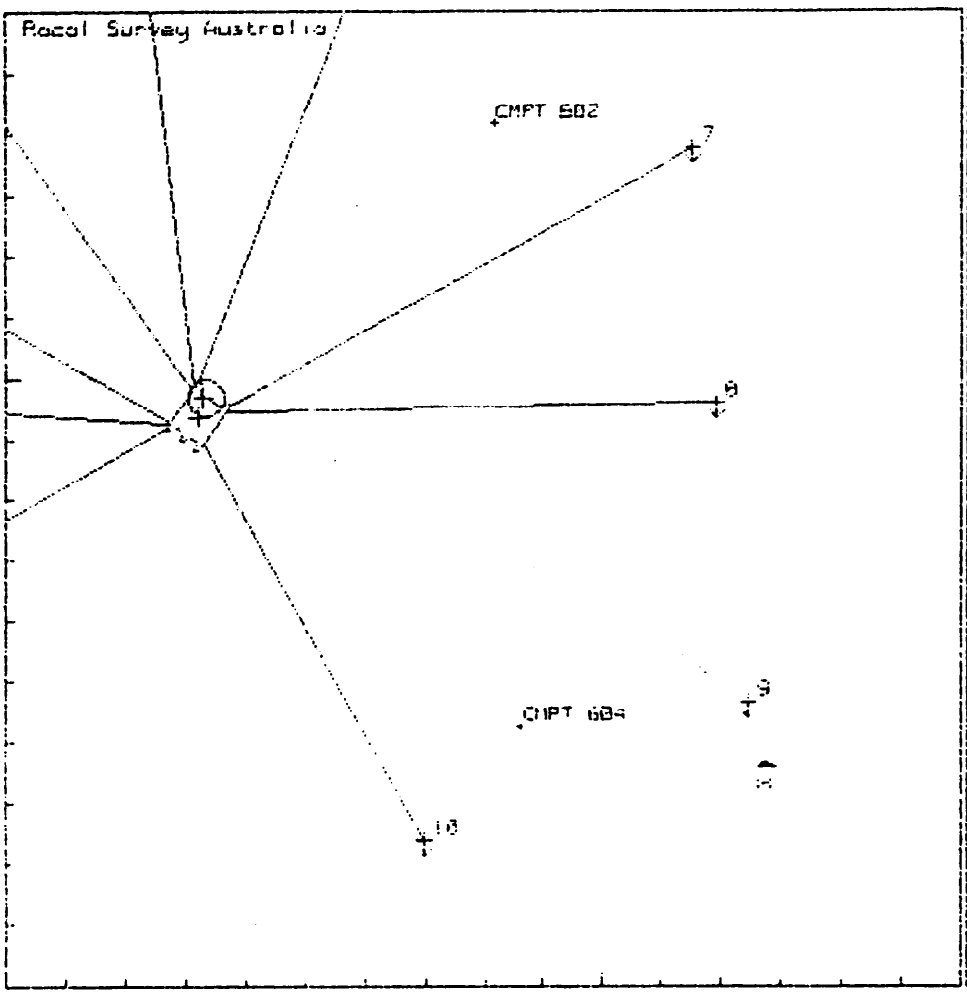


RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Actual Drop 1	Winch Offset 1
2	Actual Drop 2	Winch Offset 2
3	Actual Drop 3	Winch Offset 3
4	Actual Drop 4	Winch Offset 4
5	Actual Drop 5	Winch Offset 5
6	Actual Drop 6	Winch Offset 6
7	Actual Drop 7	Winch Offset 7
8	Actual Drop 8	Winch Offset 8
9	Intended Drop 9	Winch Offset 9
10	Actual Drop 10	Winch Offset 10
11	Intended Drop 11	Winch Offset 11
12	Intended Drop 12	Winch Offset 12

↓ Running Anchor #9

USE TRACKING File # TIME 07:48:47 Ident 1 N
Current Anchor # 9 Ini. Location 690047E, 5688007N
Vessel Datum : 689121.86E, 5688477.53N Gyro : 214.10T
Laser : HELIDECK 689127.22E, 5688436.72N
Range 175.00 metres Bearing 237.00 Relative to Vessel Head
Tug Posn 689302E, 5688431N
Rng & Brg to Intended drop 857.2 metres 118.3 deg. True



08 10 37
18 Oct 1993
DATUM
φ 038 55 55S
λ 143 10 54E
Hdg 214.2 T
CMG 329.1 T
Sp'd 1 Kt
Waypoint
LOCH ARD-1
Rng 33.8 M
Brg 21 8 T
GPS
PDOP 2.5

#	R(M)	B(T)
#1	875	239
#2	920	272
#3	836	297
#4	819	323
#5	820	352
#6	941	021
#7	885	060
#8	824	088
#9	59	342
#10	747	149
#11	959	178
#12	971	209

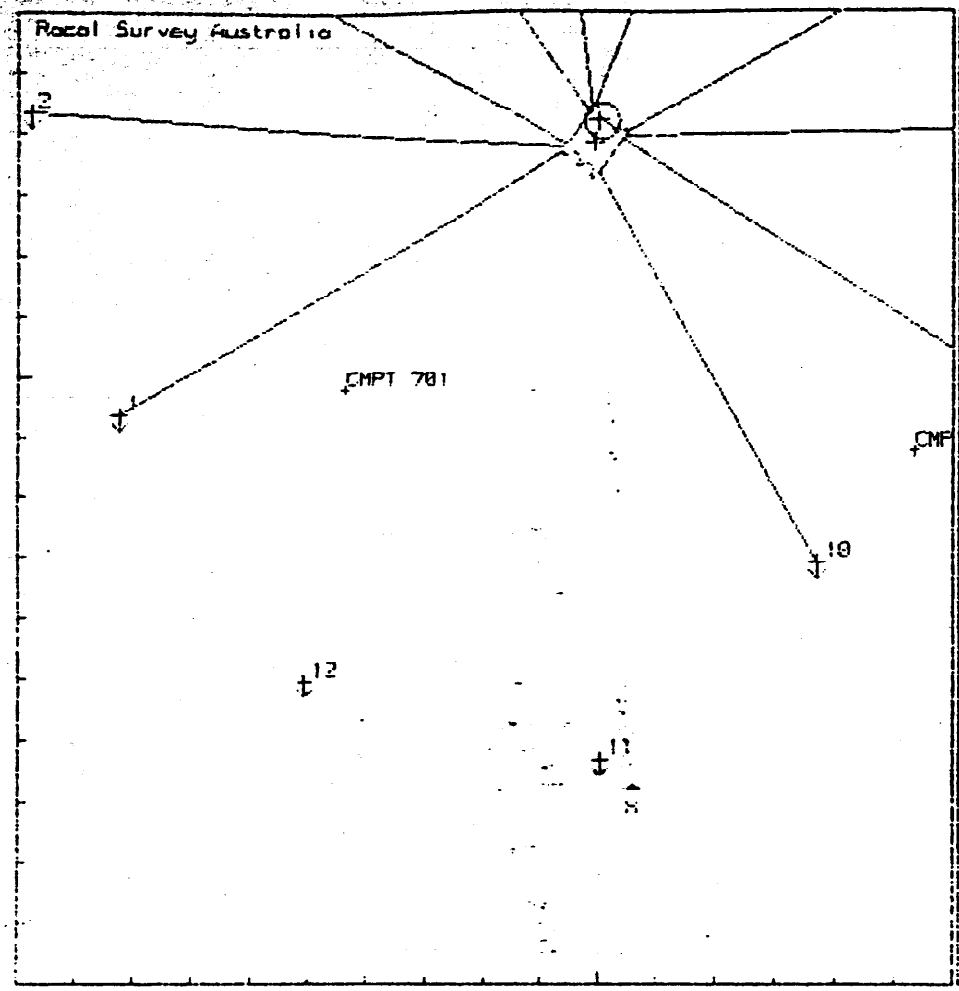
SW Corner
E 688800 00
N 5687540 00
Sc 1 5000
T.OF 100M

RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Actual Drop 1	Winch Offset 1
2	Actual Drop 2	Winch Offset 2
3	Actual Drop 3	Winch Offset 3
4	Actual Drop 4	Winch Offset 4
5	Actual Drop 5	Winch Offset 5
6	Actual Drop 6	Winch Offset 6
7	Actual Drop 7	Winch Offset 7
8	Actual Drop 8	Winch Offset 8
9	Actual Drop 9	Winch Offset 9
10	Actual Drop 10	Winch Offset 10
11	Intended Drop 11	Winch Offset 11
12	Intended Drop 12	Winch Offset 12

RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Actual Drop 1	Winch Offset 1
2	Actual Drop 2	Winch Offset 2
3	Actual Drop 3	Winch Offset 3
4	Actual Drop 4	Winch Offset 4
5	Actual Drop 5	Winch Offset 5
6	Actual Drop 6	Winch Offset 6
7	Actual Drop 7	Winch Offset 7
8	Actual Drop 8	Winch Offset 8



RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Actual Drop 1	Winch Offset 1
2	Actual Drop 2	Winch Offset 2
3	Actual Drop 3	Winch Offset 3
4	Actual Drop 4	Winch Offset 4
5	Actual Drop 5	Winch Offset 5
6	Actual Drop 6	Winch Offset 6
7	Actual Drop 7	Winch Offset 7
8	Actual Drop 8	Winch Offset 8
9	Actual Drop 9	Winch Offset 9
10	Actual Drop 10	Winch Offset 10
11	Actual Drop 11	Winch Offset 11
12	Intended Drop 12	Winch Offset 12

TUG TRACKING FIX @ TIME 14:23:39 Ident 1 A

Current Anchor # 12 Ini. Location 688626E, 5687585N

Vessel Datum : 689126.42E, 5688479.34N Gyro : 217.50½T

Laser : HELIDECK 689129.46E, 5688440.28N

Range 920.00 metres Bearing 349.20 Relative to Vessel Head

Tug Posn 688692E, 5687630N

Rng & Brg to Intended drop 80.0 metres 234.8 deg. True

TUG TRACKING FIX @ TIME 14:24:38 Ident 1 A

Current Anchor # 12 Ini. Location 688626E, 5687585N

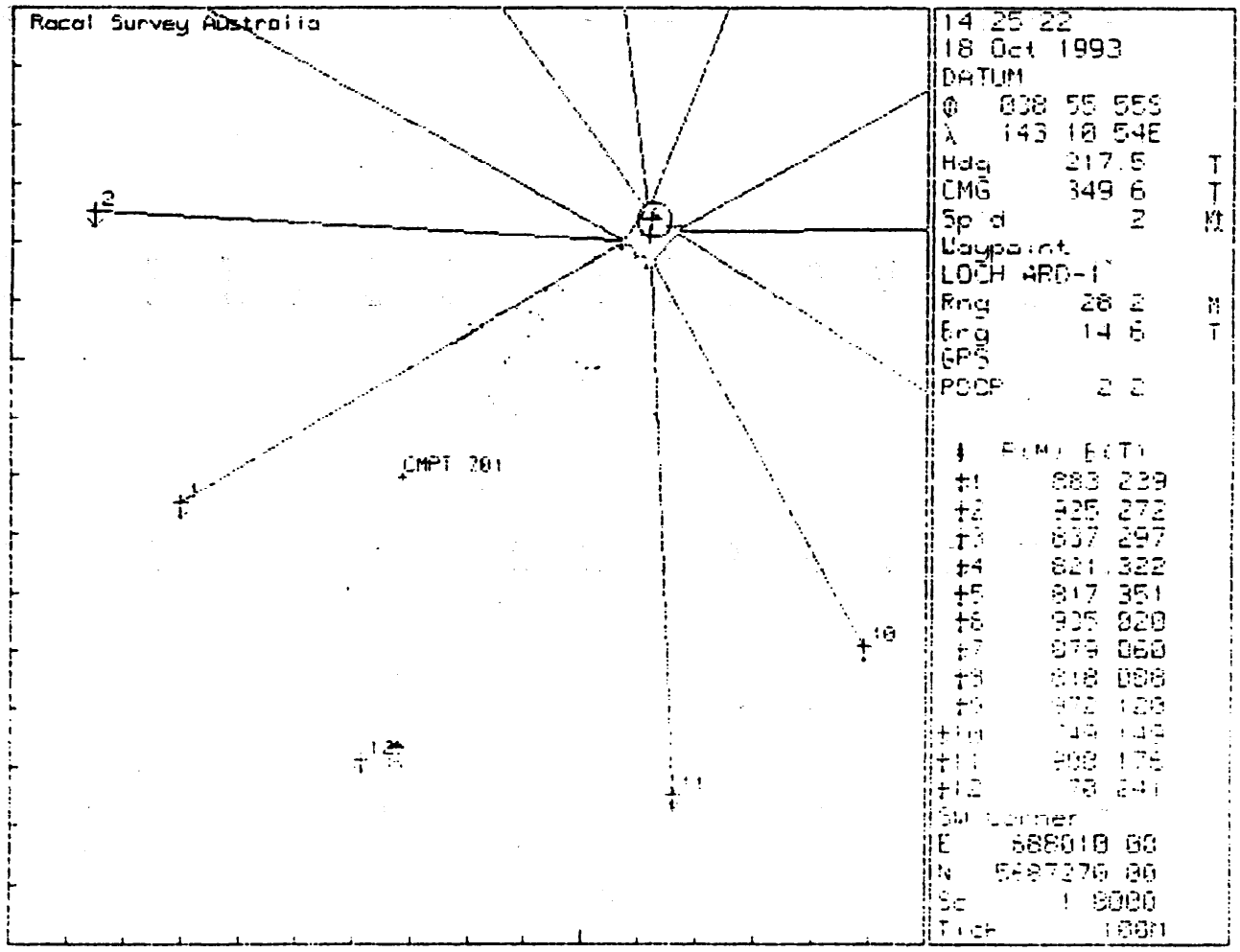
Vessel Datum : 689127.13E, 5688479.44N Gyro : 216.70½T

Laser : HELIDECK 689130.72E, 5688440.43N

Range 935.00 metres Bearing 350.00 Relative to Vessel Head

Tug Posn 688687E, 5687618N

Rng & Brg to Intended drop 69.9 metres 240.7 deg. True



RANGE & BEARING DISPLAY TABLE

Slot	To	From
1	Actual Drop 1	Winch Offset 1
2	Actual Drop 2	Winch Offset 2
3	Actual Drop 3	Winch Offset 3
4	Actual Drop 4	Winch Offset 4
5	Actual Drop 5	Winch Offset 5
6	Actual Drop 6	Winch Offset 6
7	Actual Drop 7	Winch Offset 7
8	Actual Drop 8	Winch Offset 8
9	Actual Drop 9	Winch Offset 9
10	Actual Drop 10	Winch Offset 10

APPENDIX C

ANCHOR PATTERN DIAGRAM

FINAL POSITION ANALYSIS: BYFROD DOLPHIN R/M LOCH ARD-1
GNS v R2.06 22:56:32 18 Oct 1993 to 00:29:21 19 Oct 1993
GPS Weighting Option - Constellations given equal weights
Mean Corrected Gyro...221.3 Gyro Correction... -.6
Mean Grid Heading.....222.6 Convergence..... -1.371

SECONDARY COMPUTATION - Del Norte

CONSTELLATIONS USED

Const.	# Samples	S.V.s
A	44	28,21,23,22,03,17,26
B	33	28,21,23,22,17,26
C	4	28,21,23,22,03,17,26
D	50	28,21,23,22,17,26
E	42	28,01,21,23,22,17,26
F	4	28,01,21,23,17,26
G	20	28,01,21,23,22,17,26
H	145	28,01,21,23,22,03,17,26
I	10	28,01,21,23,03,17,26
J	4	28,01,21,23,31,03,17,26
K	4	28,01,21,23,31,03,17
L	2	28,01,21,23,31,03,17,26
M	37	28,01,21,23,31,03,17,22
N	14	28,01,21,23,31,17,22
O	77	28,01,21,23,31,17
P	25	28,01,21,23,31,03,17
Q	63	28,01,21,23,31,17
R	23	28,01,21,23,31,03,17

Total number of samples used = 601

COMPUTED FINAL ANTENNA POSITION
WGS 84 Spheroid
Latitude 38 DEG 55 MIN 50.027 SEC S (S.D. .42 Metres)
Longitude 143 DEG 10 MIN 58.892 SEC E (S.D. .32 Metres)
Height 21.64 Metres (S.D. .93 Metres)

AUSTRALIAN NAT 1984 Spheroid
Latitude 38 DEG 55 MIN 55.347 SEC S
Longitude 143 DEG 10 MIN 53.945 SEC E
Height 38.62 Metres
UTM-IM
Eastings 689104.00 Metres
Northings 5688486.88 Metres

COMPUTED FINAL DATUM POSITION
AUSTRALIAN NAT 1984 Spheroid
Latitude 38 DEG 55 MIN 54.777 SEC S
Longitude 143 DEG 10 MIN 55.203 SEC E
UTM-IM
Eastings 689134.72 Metres
Northings 5688503.72 Metres

INTENDED FINAL DATUM LOCATION
AUSTRALIAN NAT 1984 Spheroid
Latitude 38 DEG 55 MIN 54.639 SEC S
Longitude 143 DEG 10 MIN 55.169 SEC E

GDA/TM
Eastings 689134.00 Metres
Northings 5688500.00 Metres

Final Datum Position is 4.34 Metres (spheroidal distance) bearing 169.03 T from the Intended Loc.

TERTIARY COMPUTATION - Tau

CONSTELLATIONS USED

Const.	# Samples	S.V.s
A	33	28,22,23,26,03,17,21
B	98 (93)	28,22,23,26,17,21
C	38 (36)	28,22,23,26,01,17,21
D	2	28,03,22,23,26,01,17,21
E	6 (5)	28,22,23,26,01,17,21
F	22 (21)	28,03,22,23,26,01,17,21
G	4	28,03,23,26,01,17,21
H	77 (72)	28,03,22,23,26,01,17,21
I	22 (21)	28,03,23,26,01,17,21,31
J	52 (46)	28,03,23,26,01,17,21
K	10 (9)	28,23,26,01,17,21
L	39 (38)	28,03,23,26,01,17,21
M	1	28,03,23,01,17,21
N	9	28,03,23,26,01,17,21
O	96 (91)	28,03,23,01,17,21
P	92 (85)	28,03,31,23,01,17,21

Total number of samples used = 601 (566)
() denotes # of height samples used after adjustment for altitude aiding

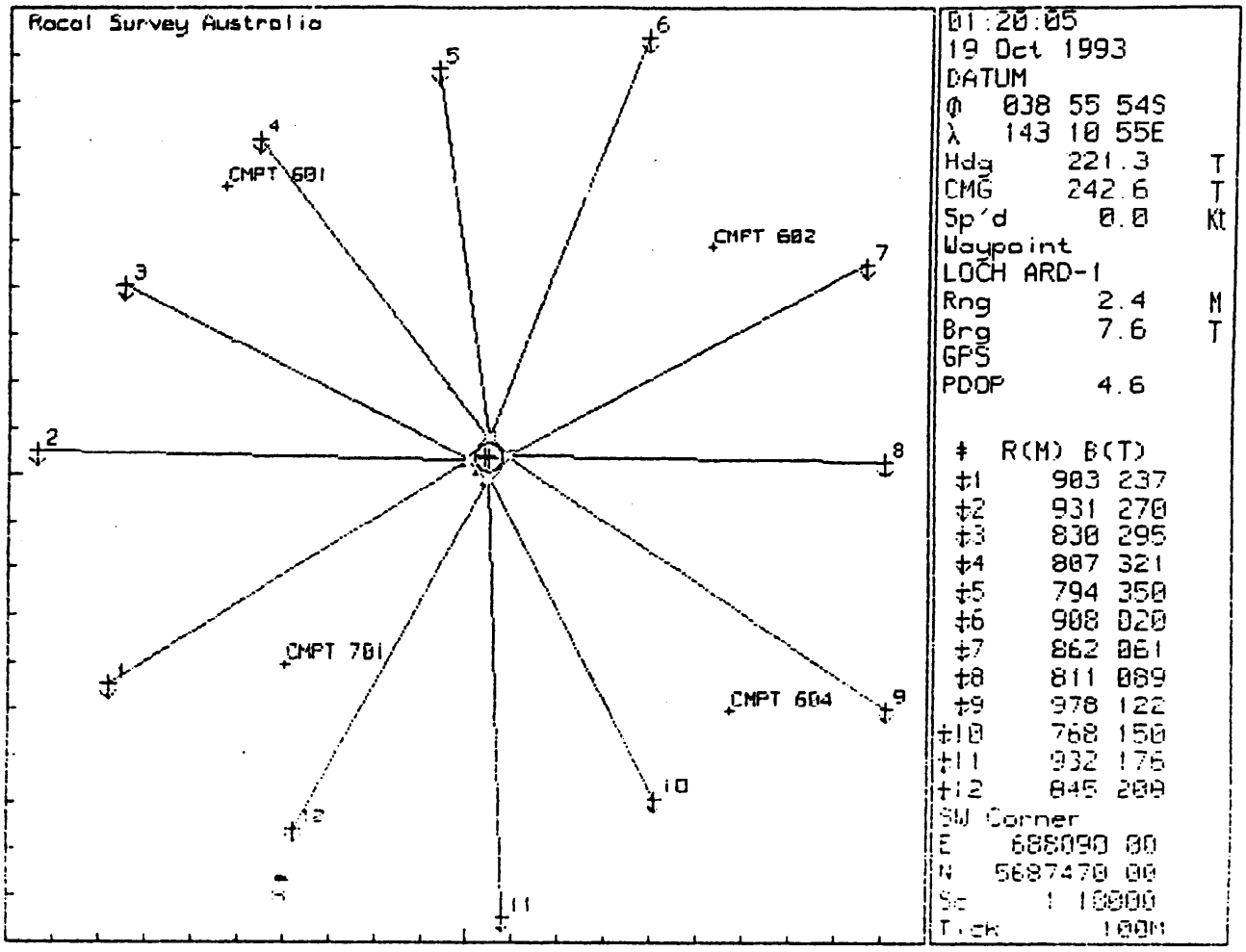
COMPUTED FINAL ANTENNA POSITION
WGS 84 Spheroid
Latitude 38 DEG 55 MIN 49.927 SEC S (S.D. .47 Metres)
Longitude 143 DEG 10 MIN 58.785 SEC E (S.D. .38 Metres)
Height 21.78 Metres (S.D. .54 Metres)

AUSTRALIAN AHD 1984 Spheroid
Latitude 38 DEG 55 MIN 55.247 SEC S
Longitude 143 DEG 10 MIN 53.832 SEC E
Height 58.76 Metres
GDA/TM
Eastings 689101.49 Metres
Northings 5688490.05 Metres

COMPUTED FINAL DATUM POSITION
AUSTRALIAN AHD 1984 Spheroid
Latitude 38 DEG 55 MIN 54.717 SEC S
Longitude 143 DEG 10 MIN 55.156 SEC E
GDA/TM
Eastings 689163.62 Metres
Northings 5688505.60 Metres

INTENDED FINAL DATUM LOCATION
AUSTRALIAN AHD 1984 Spheroid
Latitude 38 DEG 55 MIN 54.639 SEC S
Longitude 143 DEG 10 MIN 55.169 SEC E
GDA/TM

Eastings 689134.00 Metres



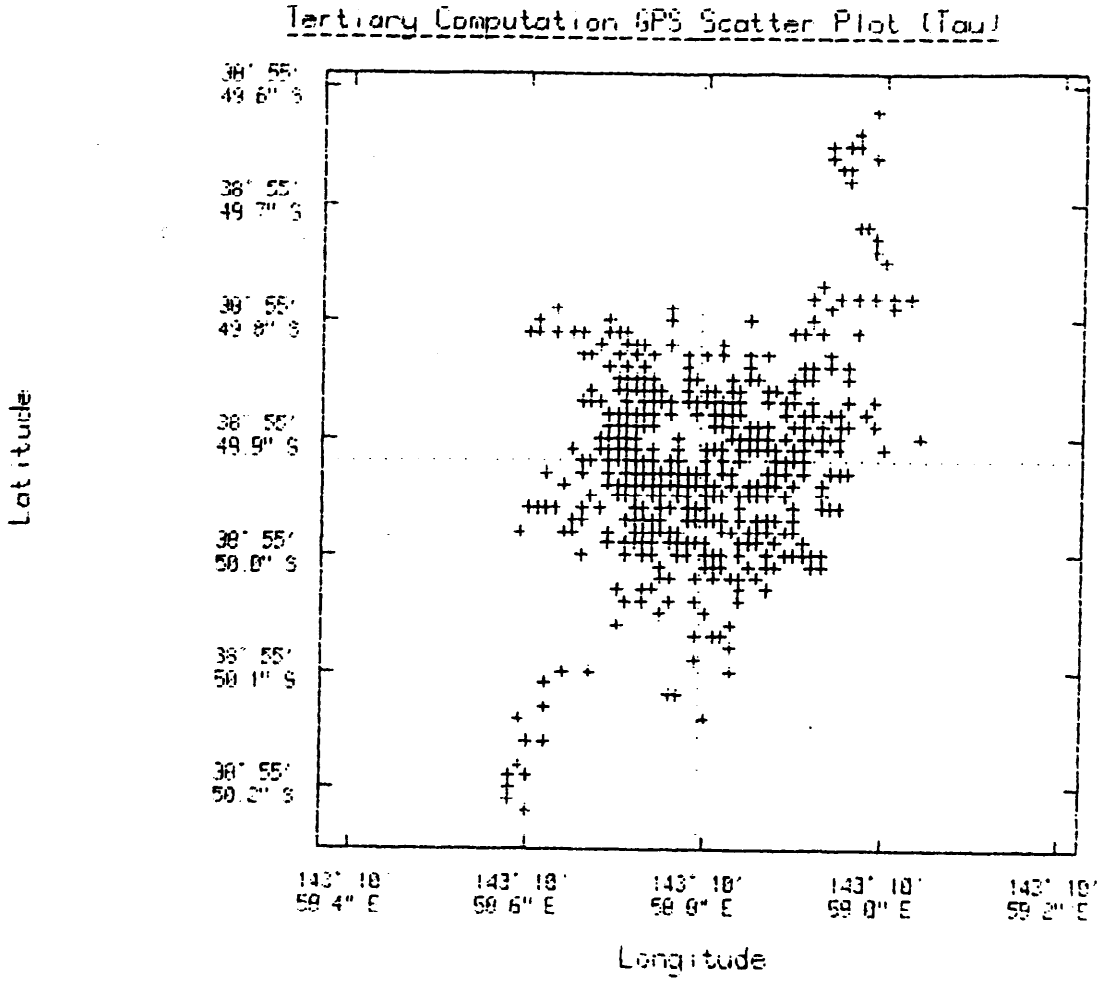
Anch#	INTENDED (E,N)	DROP Loca (E,N)
1	688211.4, 5687999.5	688307.0, 5688024.0
2	688084.1, 5688506.2	688153.0, 5688522.0
3	688220.9, 5689009.0	688342.0, 5689072.0
4	688633.0, 5689421.1	688633.0, 5689189.0
5	689135.8, 5689557.9	689020.0, 5689341.0
6	689643.2, 5689431.3	689475.0, 5689406.7
7	690057.3, 5689017.2	689954.0, 5688917.0
8	690183.9, 5688509.8	689994.0, 5688498.0
9	690047.1, 5689007.0	690000.0, 5687973.0
10	689635.0, 5687594.9	689499.0, 5687701.0
11	689132.2, 5687458.1	689169.0, 5687524.0
12	688625.5, 5687585.4	688711.0, 5687714.0

APPENDIX D

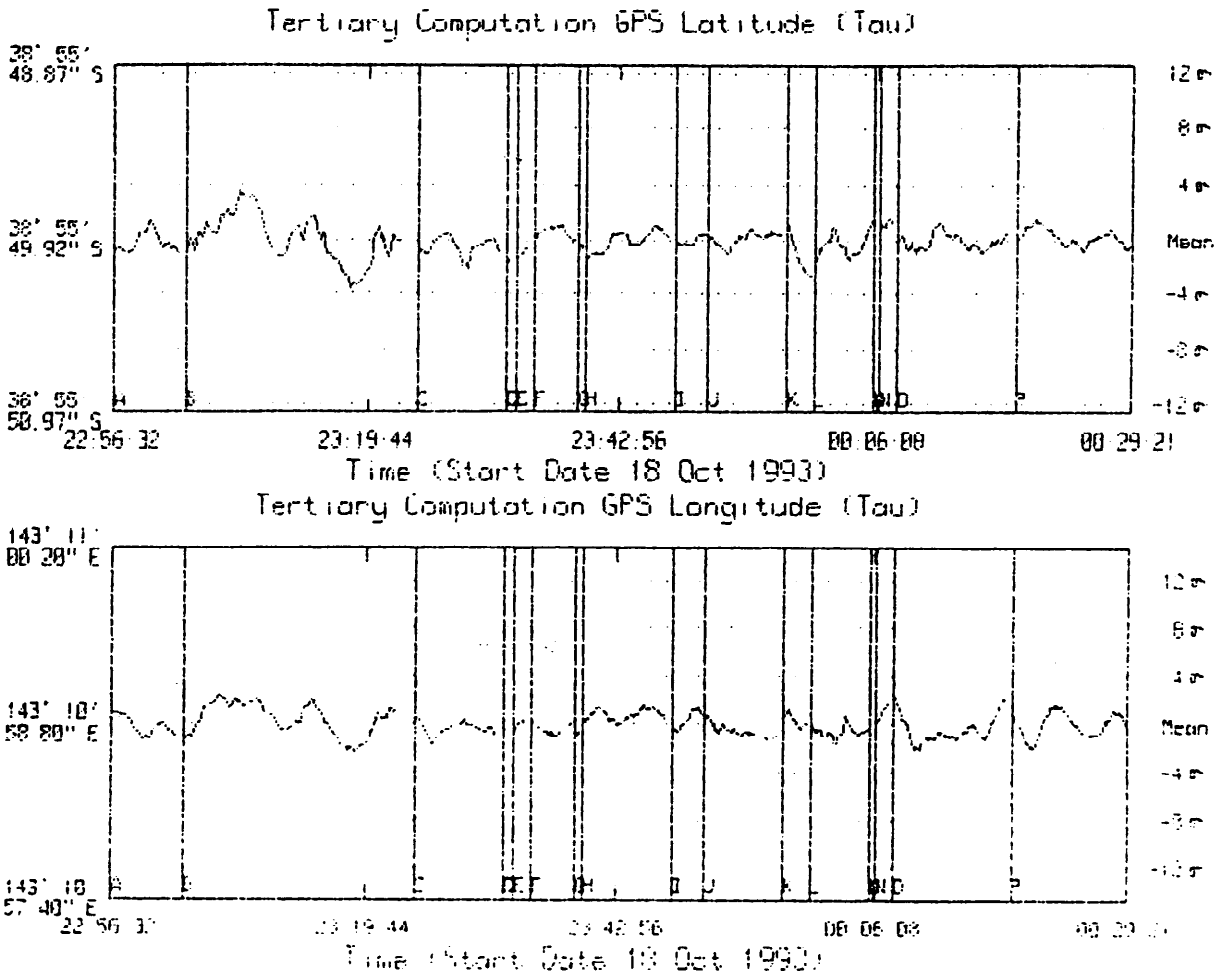
DGPS FINAL POSITION ANALYSIS PRINTOUTS - LOCH ARD-1

Eastings 689134.00 Metres
Northings 5688508.00 Metres

Final Datum Position is 2.43 Metres (spheroidal distance) bearing 187.70 T from the intended Loc.



Centred on mean antenna position (passes 1 to 601).
WGS 84 Spheroid
Latitude 38 DEG 55 MIN 49.920 SEC S
Longitude 143 DEG 10 MIN 58.795 SEC E



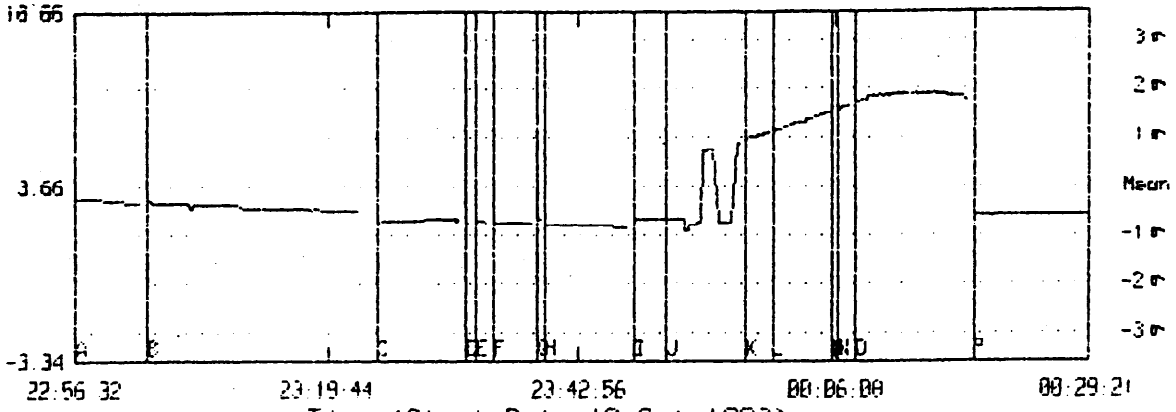
Tertiary Computation (DOS 84 - Tau)

Centred on mean of antenna position (passes 1 to 60).

Latitude 38 DEG 55 MIN 49.920 SEC S Sd 2.581 Metres

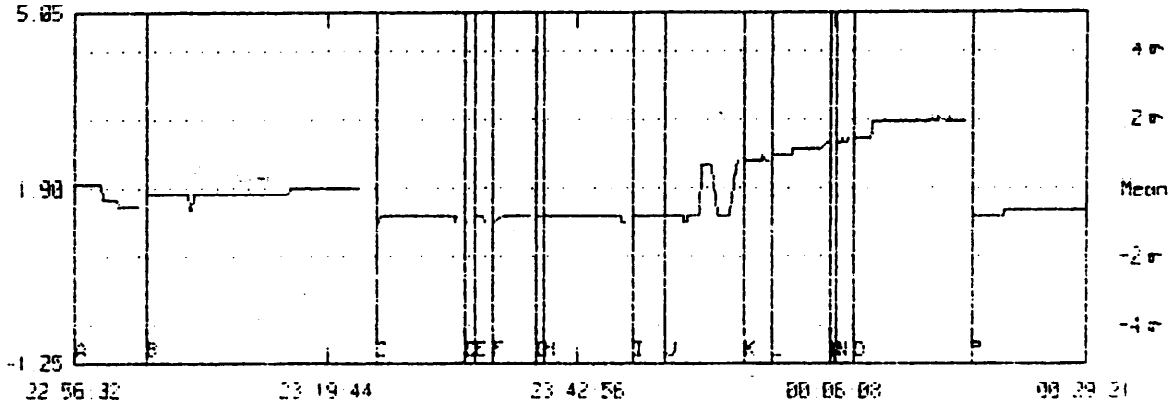
Longitude 143 DEG 10 MIN 58.795 SEC E Sd 2.297 Metres

Tertiary Computation GPS PDOP (Tau)



Time (Start Date 18 Oct 1993)

Tertiary Computation GPS HDOP (Tau)



Time (Start Date 18 Oct 1993)

Tertiary Computation (UDS 84 - Tau)

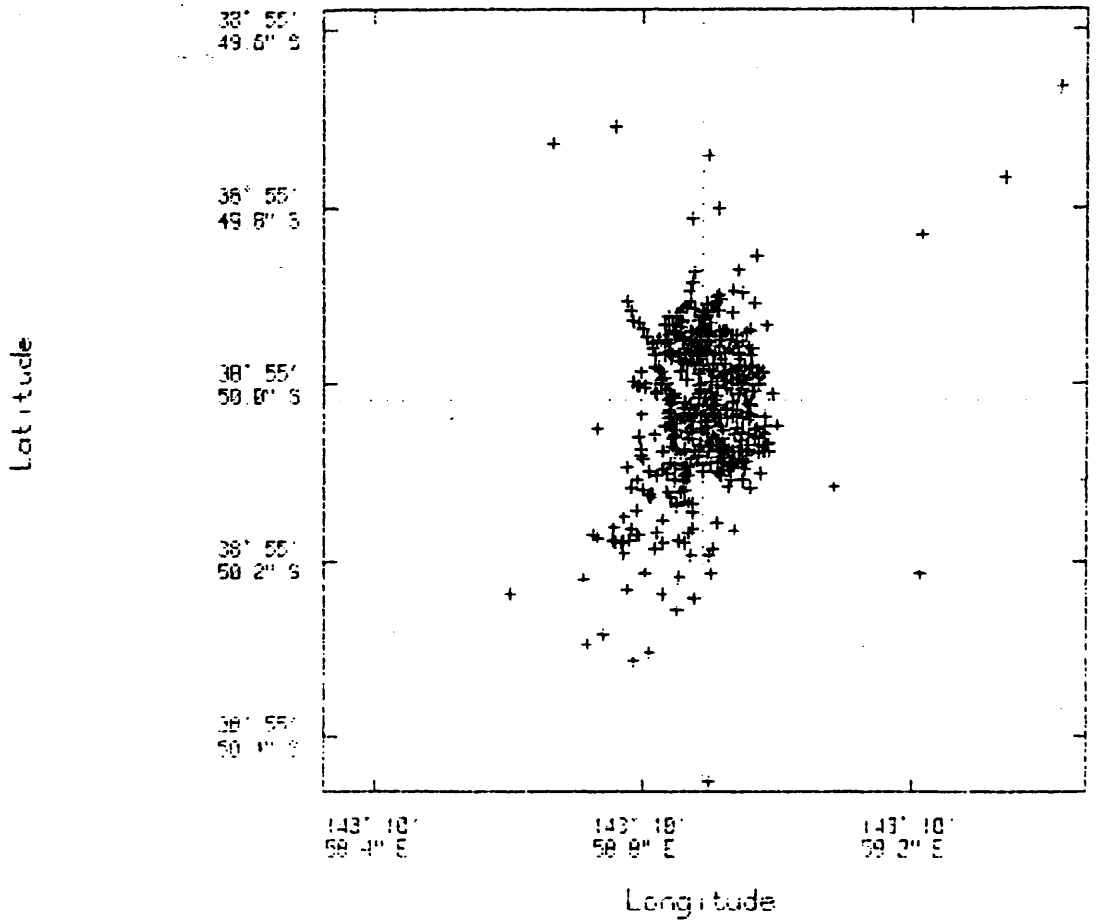
Centred on mean of antenna position (passes 1 to 60).

PDOP 3.7 Sd 1.952

HDOP 1.9 Sd .620

Secondary Computation GPS Scatter Plot (Del Norte)

Secondary Computation GPS Scatter Plot (Del Norte)

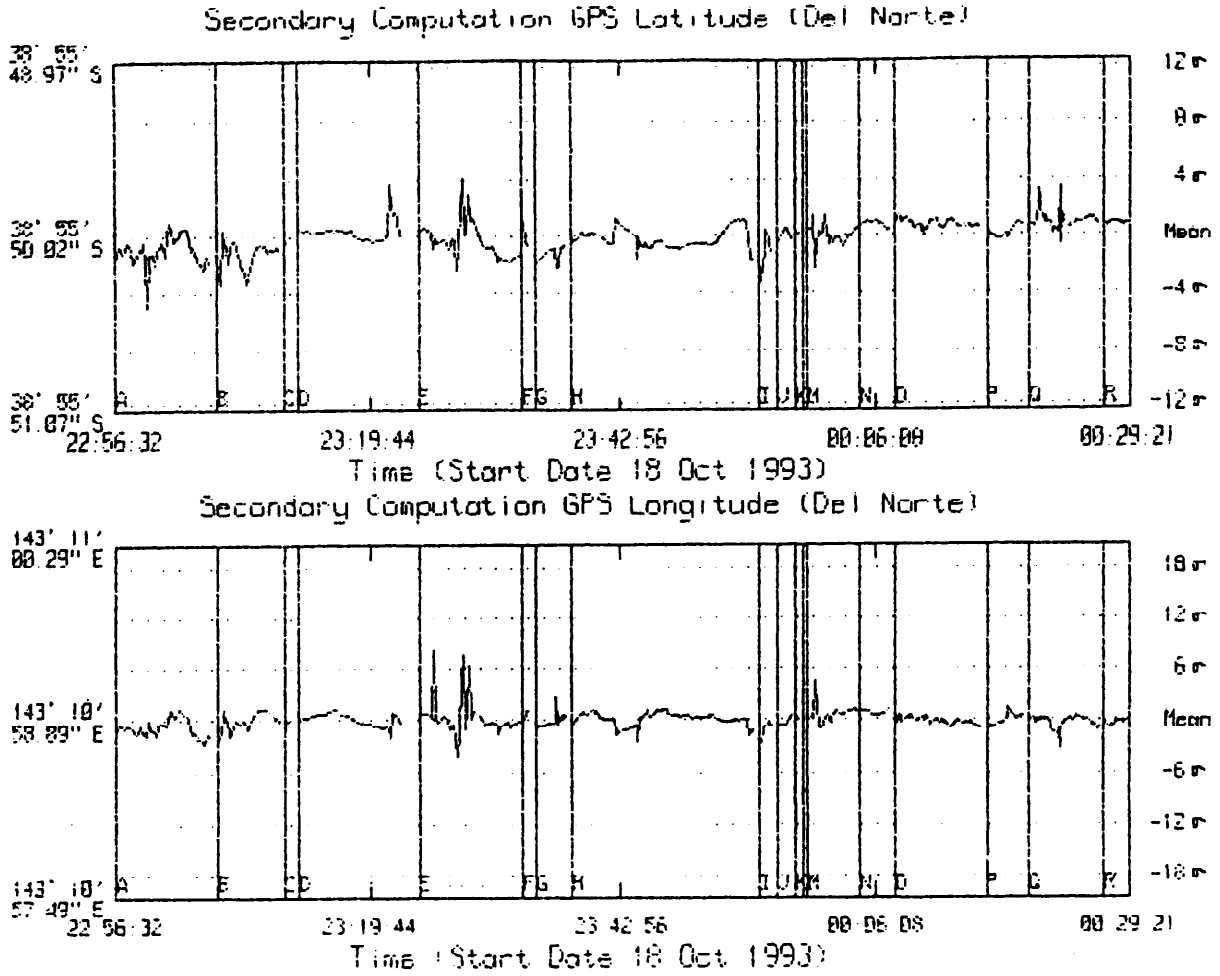


Centred on mean antenna position (passes 1 to 601).

GDS 84 Spheroid

Latitude 38 DEG 55 MIN 50.019 SEC S

Longitude 143 DEG 10 MIN 58.851 SEC E

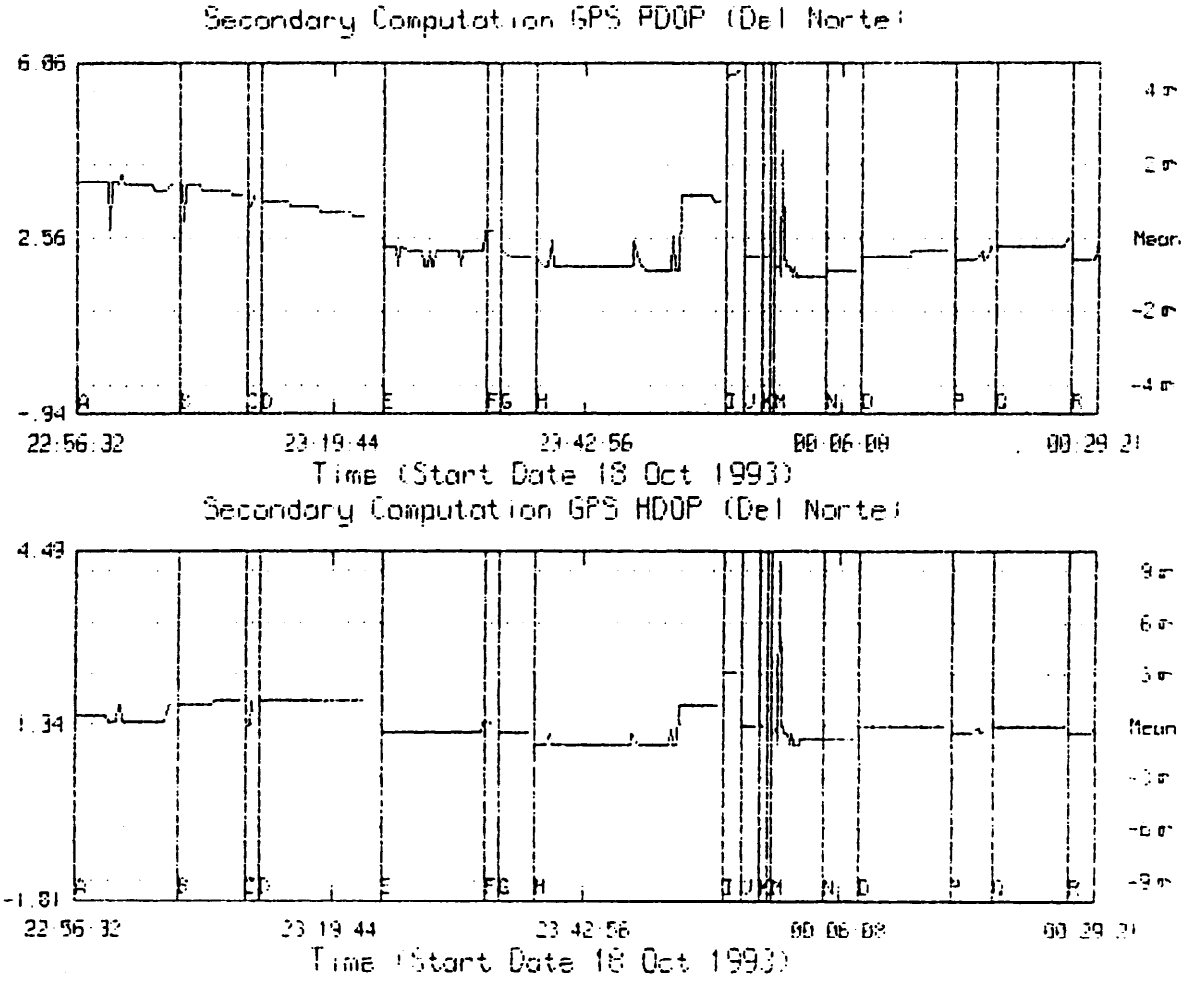


econdary Computation (WGS 84 - Del Norte)

Centred on mean of antenna position (passes 1 to 601).

Latitude 38 DEG 55 MIN 50.018 SEC S Sd 2.613 Metres

Longitude 143 DEG 10 MIN 58.892 SEC E Sd 1.631 Metres



Secondary Computation (WGS 84 - Del Norte)

Centred on mean of antenna position (passes 1 to 601).

PDOP 2.6 Sd .730

HDOP 1.3 Sd .309

Spheroidal Data

Spheroid :- AUSTRALIAN NAT 1984
Eccentricity **2= 0.006694542
Semi-major axis= 6378160.000 Metres

Projection Parameters UTM/TM

Grid scale const = 0.9996000
Unit Conv. Factor = 1.0000000
False Easting = 500000.00 Metres
False Northing = 10000000.00 Metres
Central Meridian =141 DEG 00 MIN 00.000 SEC E
Lat of Origin = 00 DEG 00 MIN 00.000 SEC

Station Data :- System 1 Sonardyne LOCH ARU-1 Chain

!CMPT 601	! 601!	688562.17!	5689085.18!	68.51!	S !	Y	! 1 !	2 !
!CMPT 602	! 602!	689620.64!	5688955.49!	68.50!	S !	Y	! 2 !	2 !
!CMPT 604	! 604!	689661.82!	5687966.85!	67.55!	S !	Y	! 4 !	2 !
!CMPT 701	! 701!	688696.01!	5688068.28!	68.64!	S !	Y	! 5 !	2 !

Spheroid Data :- System 2 Del Norte
Name : WGS 84
Semi Axis : 6378137.00 metres
Eccentr**2 : .00669438
Parameter Shifts :- to AUSTRALIAN NAT 1984 Spheroid
DX : +116.00 in Metres
DY : +50.47 -"-
DZ : -141.69 -"-
Rotation (X) : +.2300 in seconds
(Y) : +.3900 in seconds
(Z) : +.3440 in seconds
Scaling (ppm) : -.0993

Spheroid Data :- System 3 Tau
Name : WGS 84
Semi Axis : 6378137.00 metres
Eccentr**2 : .00669438
Parameter Shifts :- to AUSTRALIAN NAT 1984 Spheroid
DX : +116.00 in Metres
DY : +50.47 -"-
DZ : -141.69 -"-
Rotation (X) : +.2300 in seconds
(Y) : +.3900 in seconds
(Z) : +.3440 in seconds
Scaling (ppm) : -.0993

Station Data :- System 4 Not defined No Station Data

Receiver Pattern Codes

System 1	System 2	System 3	System 4	
Sonardyne	Del Norte	Tau	Not defined	
Receiver1	Receiver1	Receiver1	Receiver1	Receiver2
ON	ON	ON	OFF	OFF
0601 R	Geogs 1	Geogs 1		

0602 R

0604 R
0701 R

Pattern Corrections and Standard Deviations

System 1 Sonardyne				System 2 Del Norte	System 3 Tau
Compatt	C-O	St.Dev	HRB	C-O Corrections :-	C-O Corrections :-
0601	+0.00	3.00	Rng	Latit. +0.000 Secs	Latit. +0.000 Secs
0602	+0.00	3.00	Rng	Long. +0.000 Secs	Long. +0.000 Secs
0604	+0.00	3.00	Rng	Height +0.000 M	Height +0.000 M
0701	+0.00	3.00	Rng		

Pattern Corrections and Standard Deviations

System 4 Not defined
No Data

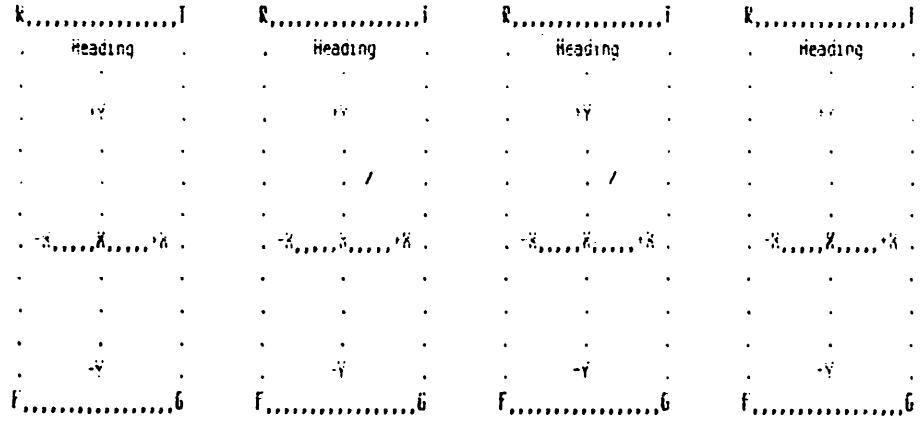
Computation Pattern Codes

Primary(OFF)				Secondary(ON)				Tertiary(ON)[TRACKING]				Quaternary(OFF)
LOP	Patt Code	SRC	HRB	LOP	Patt Code	SRC	HRB	LOP	Patt Code	SRC	HRB	No Data
1	0601	111	R	1	Geogs	211	1	1	Geogs	311	1	
2	0602	112	R									
3	0604	114	R									
4	0701	115	R									

S=System R=Receiver C=Channel *=Pattern temporarily not used in computation

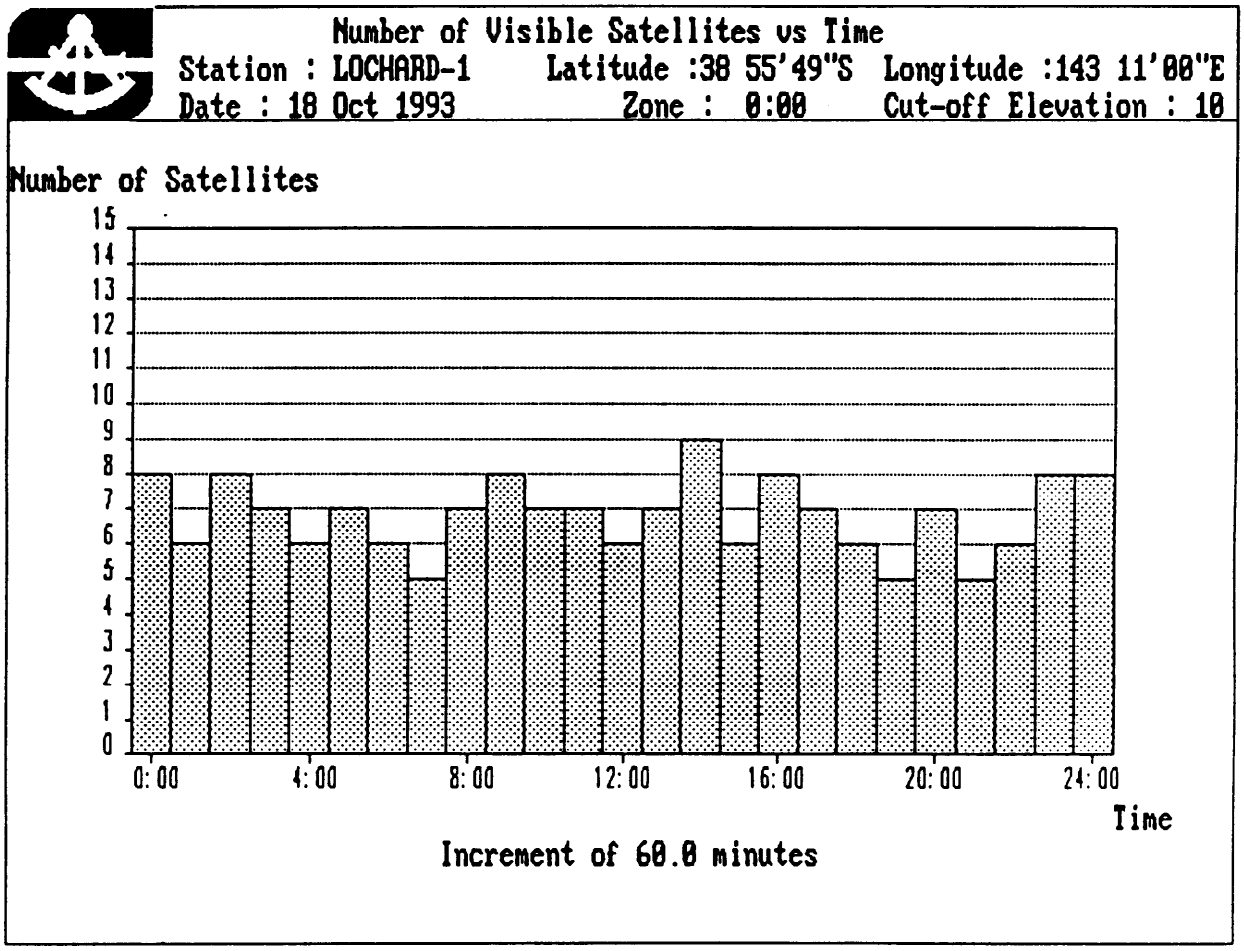
Antennae/Transducer Offsets

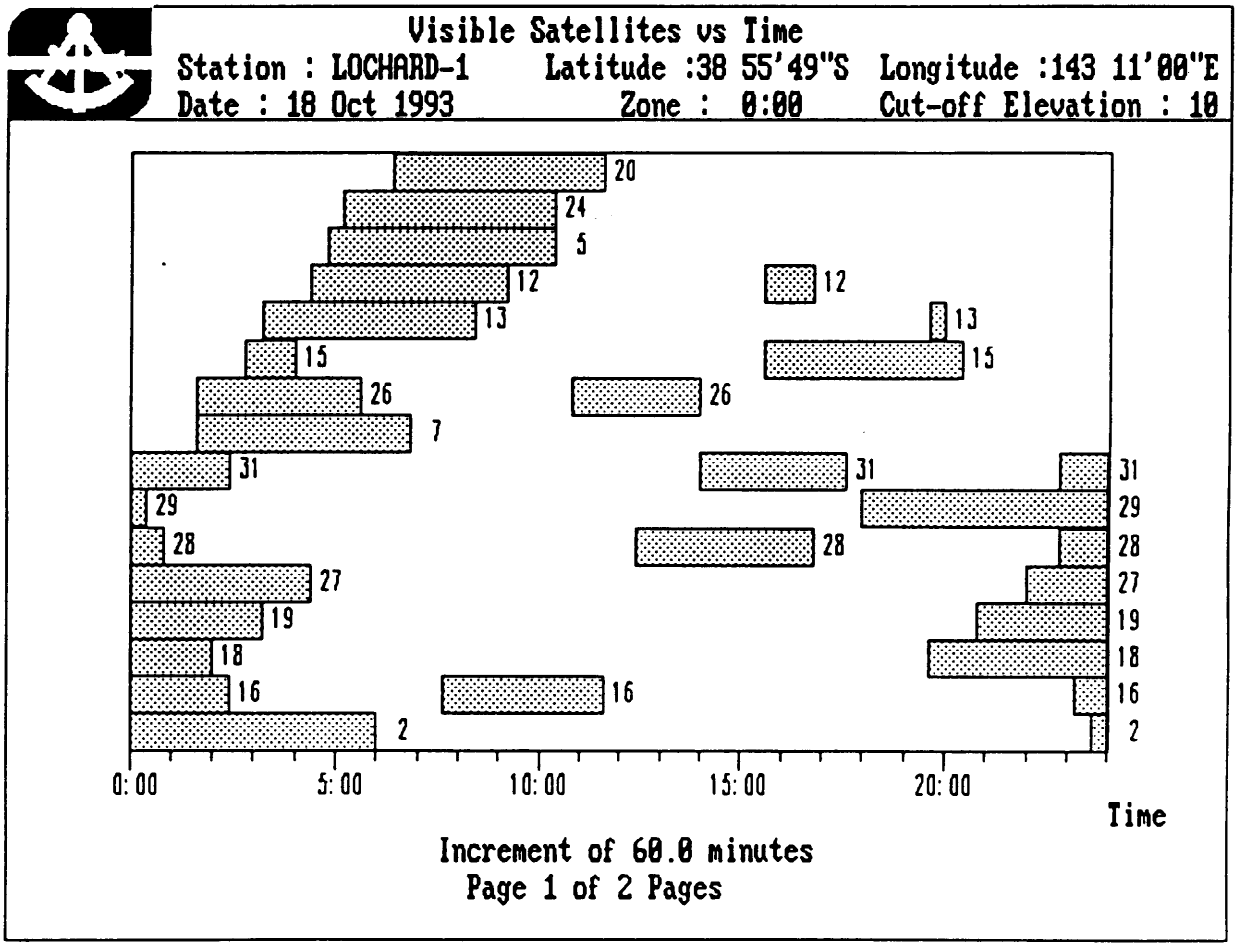
System 1 Sonardyne			System 2 Del Norte			System 3 Tau			System 4 Not defined		
Transducer 1			Receiver 1			Receiver 1			Receiver 1		
X	Y	Depth	X	Y	Height	X	Y	Height	X	Y	Height
+0.00	+0.00	+0.00	+11.20	+33.20	+32.00	+13.10	+33.20	+31.00	+0.00	+0.00	+0.00
Transducer 2			Receiver 2			Receiver 2			Receiver 2		
X	Y	Depth	X	Y	Height	X	Y	Height	X	Y	Height
+0.00	+0.00	+0.00	+0.00	+0.00	+0.00	+0.00	+0.00	+0.00	+0.00	+0.00	+0.00



APPENDIX E

SATELLITE AVAILABILITY PREDICTIONS

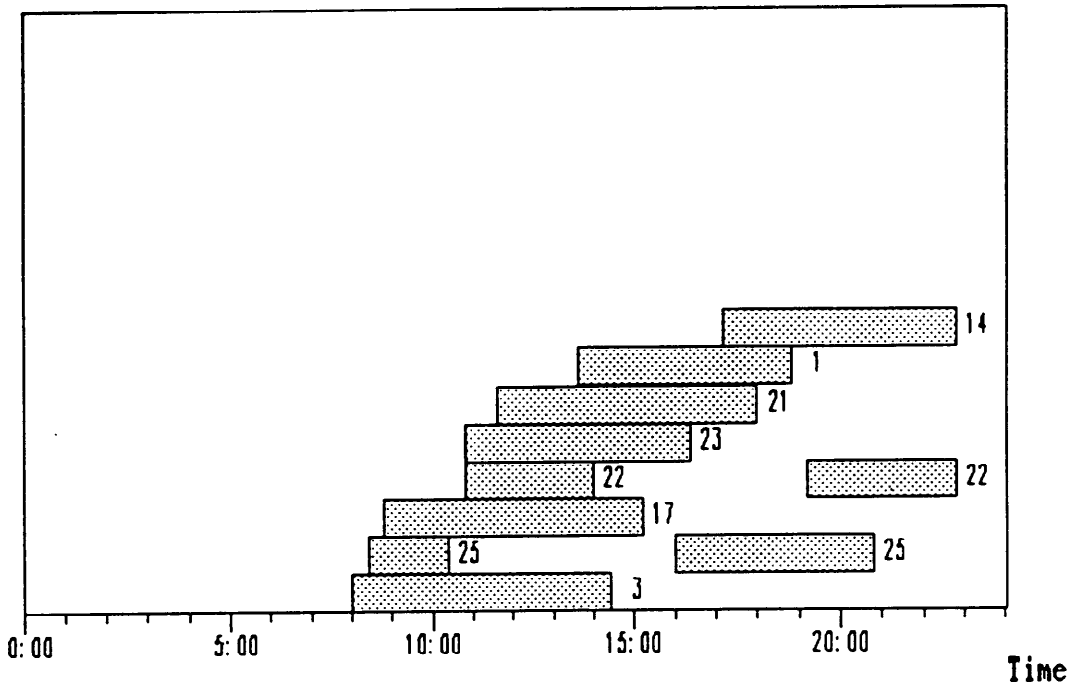

Number of Visible Satellites vs Time
Station : LOCHARD-1 Latitude :38 55'49"S Longitude :143 11'00"E
Date : 18 Oct 1993 Zone : 0:00 Cut-off Elevation : 10
Number of Satellites
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0:00
4:00
8:00
12:00
16:00
20:00
24:00
Time
Increment of 60.0 minutes


Visible Satellites vs Time
Station : LOCHARD-1 Latitude :38 55'49"S Longitude :143 11'00"E
Date : 18 Oct 1993 Zone : 0:00 Cut-off Elevation : 10
20
24
5
12
13
15
26
7
31
29
28
27
19
18
16
2
12
13
15
26
31
28
16
31
29
28
27
19
18
16
2
0:00
5:00
10:00
15:00
20:00
Time
Increment of 60.0 minutes
Page 1 of 2 Pages

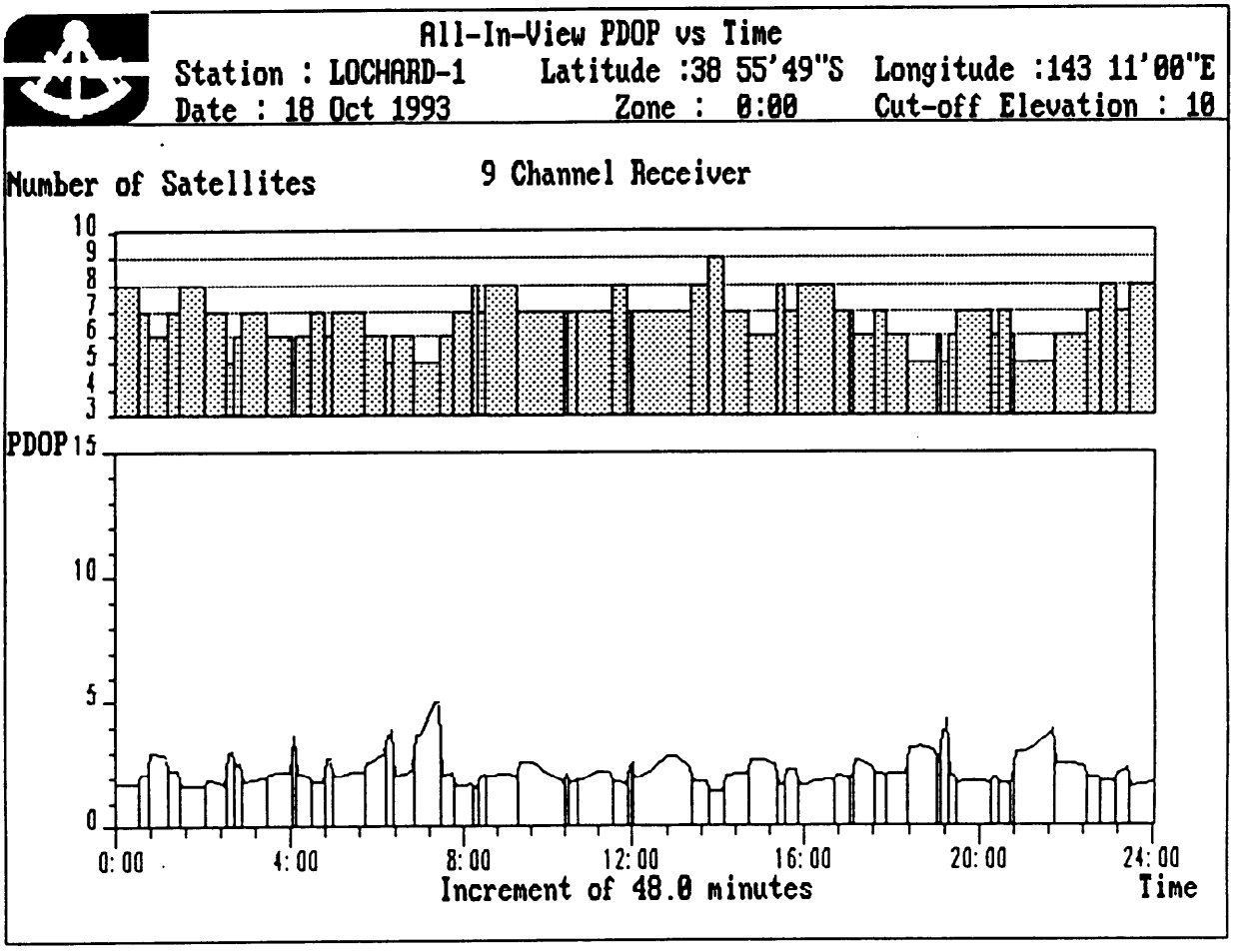
Visible Satellites vs Time

Station : LOCHARD-1 Latitude :38 55'49"S Longitude :143 11'00"E

Date : 18 Oct 1993 Zone : 0:00 Cut-off Elevation : 10



Increment of 60.0 minutes


All-In-View PDOP vs Time
Station : LOCHARD-1
Latitude :38 55'49"S
Longitude :143 11'00"E
Date : 18 Oct 1993
Zone : 0:00
Cut-off Elevation : 10
Number of Satellites
9 Channel Receiver
10
9
8
7
6
5
4
3
PDOP 15
10
5
0
0:00
4:00
8:00
12:00
16:00
20:00
24:00
Increment of 48.0 minutes
Time

All-In-View PDOP for LOCHARD-1

Date : 18 Oct 1993
Time : 0:00 -> 24:00
Cut-off Elevation : 10°

Latitude : 38° 55' 49" S
Longitude : 143° 11' 00" E
Zone : 0:00

Satellite Constellation	Time Rise	Time Set	dT	PDOP Rise	PDOP Set
2 16 18 19 27 28 29 31	0:00	0:32	0:32	1.8	1.7
2 16 18 19 27 28 31	0:32	0:47	0:15	2.1	2.1
2 16 18 19 27 31	0:47	1:12	0:25	3.0	2.7
2 7 16 18 19 27 31	1:12	1:27	0:15	2.3	2.3
2 7 16 18 19 26 27 31	1:27	2:02	0:35	1.7	1.6
2 7 16 19 26 27 31	2:02	2:32	0:30	1.9	1.7
2 7 19 26 27	2:32	2:42	0:10	3.0	3.1
2 7 15 19 26 27	2:42	2:52	0:10	2.6	2.6
2 7 13 15 19 26 27	2:52	3:27	0:35	1.8	2.0
2 7 13 15 26 27	3:27	4:02	0:35	2.2	2.2
2 7 13 26 27	4:02	4:07	0:05	3.7	3.7
2 7 12 13 26 27	4:07	4:27	0:20	2.1	2.0
2 5 7 12 13 26 27	4:27	4:47	0:20	1.9	1.8
2 5 7 12 13 26	4:47	4:57	0:10	2.8	2.6
2 5 7 12 13 24 26	4:57	5:42	0:45	2.0	2.2
2 5 7 12 13 24	5:42	6:12	0:30	2.6	3.1
5 7 12 13 24	6:12	6:22	0:10	3.7	3.9
5 7 12 13 20 24	6:22	6:52	0:30	2.1	2.4
5 12 13 20 24	6:52	7:27	0:35	3.7	4.9
5 12 13 16 20 24	7:27	7:47	0:20	2.1	2.2
3 5 12 13 16 20 24	7:47	8:12	0:25	1.7	1.7
3 5 12 13 16 20 24 25	8:12	8:22	0:10	1.6	1.6
3 5 12 16 20 24 25	8:22	8:32	0:10	2.1	2.1
3 5 12 16 17 20 24 25	8:32	9:17	0:45	2.1	2.0
3 5 16 17 20 24 25	9:17	10:22	1:05	2.6	1.8
3 5 16 17 20 25	10:22	10:27	0:05	2.1	2.1
3 5 16 17 20 22 23	10:27	10:42	0:15	1.8	1.9
3 16 17 20 22 23 26	10:42	11:32	0:50	1.9	2.1
3 16 17 20 21 22 23 26	11:32	11:52	0:20	1.8	1.7
3 17 20 21 22 23 26	11:52	11:57	0:05	2.5	2.5
3 17 21 22 23 26	11:57	12:02	0:05	2.6	2.6
3 17 21 22 23 26 28	12:02	13:22	1:20	2.0	2.3
1 3 17 21 22 23 26 28	13:22	13:47	0:25	1.9	1.8
1 3 17 21 22 23 26 28 31	13:47	14:07	0:20	1.5	1.4
1 3 17 21 23 28 31	14:07	14:42	0:35	2.1	2.1
1 17 21 23 28 31	14:42	15:22	0:40	2.7	2.5
1 12 15 17 21 23 28 31	15:22	15:32	0:10	1.7	1.7
1 12 15 21 23 28 31	15:32	15:52	0:20	2.3	2.3
1 12 15 21 23 25 28 31	15:52	16:42	0:50	1.7	1.9
1 12 15 21 25 28 31	16:42	17:02	0:20	2.1	1.9
1 12 14 15 21 25 31	17:02	17:07	0:05	2.0	2.0
1 14 15 21 25 31	17:07	17:37	0:30	2.7	2.3
1 14 15 21 25 29 31	17:37	17:52	0:15	2.1	2.0
1 14 15 21 25 29	17:52	18:22	0:30	2.2	2.2
1 14 15 25 29	18:22	19:02	0:40	3.1	3.0

All-In-View PDOP for LOCHARD-1

Date : 18 Oct 1993
Time : 0:00 -> 24:00
Cut-off Elevation : 10°

Latitude : 38° 55' 49" S
Longitude : 143° 11' 00" E
Zone : 0:00

Satellite Constellation	Time Rise	Time Set	dT	PDOP Rise	PDOP Set
1 14 15 22 25 29	19:02	19:07	0:05	2.6	2.6
14 15 22 25 29	19:07	19:17	0:10	3.9	4.4
13 14 15 22 25 29	19:17	19:27	0:10	2.0	2.1
13 14 15 18 22 25 29	19:27	20:17	0:50	1.8	1.7
14 15 18 22 25 29	20:17	20:27	0:10	2.0	1.9
14 15 18 19 22 25 29	20:27	20:42	0:15	1.7	1.7
14 18 19 22 25 29	20:42	20:47	0:05	1.9	1.9
14 18 19 22 29	20:47	21:42	0:55	3.0	3.9
14 18 19 22 27 29	21:42	22:27	0:45	2.6	2.3
14 18 19 22 27 28 29	22:27	22:47	0:20	2.0	2.0
14 18 19 22 27 28 29 31	22:47	23:07	0:20	1.9	1.8
16 18 19 27 28 29 31	23:07	23:27	0:20	2.2	2.4
2 16 18 19 27 28 29 31	23:27	24:00	0:33	1.6	1.8

APPENDIX F

DAILY LOG SHEETS

RACAL SURVEY AUSTRALIA LIMITED

RACAL

DAILY RECORD SHEET

WX	Date	S...	Wind Dir.
0000			
0600			
1200			
1800			

Client : BHP			Job No : A2150			Date : 13-10-93	Vessel : BYFORD DOLPHIN.			Anchors / Tpdrs	
RACAL Equipment on Board	Op	NonOp	RACAL Equipment on Board	Op	NonOp	RACAL Personnel	Consummables			Laid	Recovered
SKYFIX			STD 12 / VELOCITY PROBE			K. EDDY	ITEM	USED	REMAIN		
SYLEDIS			ECHO SOUNDER (20/25)			B. SLEVIN	SIDESCAN PAPER				
MICROFIX			SIDESCAN (595/531/PINGER)			K. PERRY	E/SOUNDER PAPER				
ARGO			BOOMER (DELPH / EPC)				ELICS PAPER				
GNS			SPARKER (DELPH/EPC)				DISKS				
GYRO			CORING (GRAVITY / GRAB)				PRINTER CART.				
TRIMBLE SST'S			THEODOLITE / EDM			CLIENT Personnel	EPC ROLLS				
TELEMETRY			UNDERWATER TRACKING								
SONARDYNE COMPATTS											
SONARDYNE PAN											
SONARDYNE (Dunker/Winch/Fish)											

DIARY OF OPERATIONS :

1120- K. Eddy, B. Slevin & K. Perry depart Perth for Melbourne.

1645- Personnel arrive Melbourne Airport.

1840- Pick up Freight Melbourne Airport.

1850- K. Eddy, B. Slevin & K. Perry depart Melbourne Airport by hire car for Portland.

2300- Personnel arrive Portland, Richmond Henty Motel.

Forms are to be completed daily in duplicate on all vessels. Each form should be countersigned by the Clients Representative, the original being retained on board until the next crew change or at the end of job, whichever is the earlier, when they should be returned to the PERTH office.

Transponders to be listed by type and serial numbers. Following codes to be used : L - Laid, R - Recovered, FR - Failed to Reply, FS - Failed to Surface.

Signature K Eddy
SURVEYOR/ENGINEER

WHITE : Commercial Office
BLUE : Operations
YELLOW : Clients Representative

Signature N. Edwards.
CLIENTS REPRESENTATIVE

RACAL SURVEY AUSTRALIA LIMITED

DAILY RECORD SHEET

RACAL

Client : BHP | Job No : A2150 | Date : 14-10-93 | Vessel : BYFORD DOLPHIN.

RACAL Equipment on Board	Op	NonOp
SKYFIX		
SYLEDIS		
MICROFIX		
ARGO		
GNS		
GYRO		
TRIMBLE SST'S		
TELEMETRY		
SONARDYNE COMPATTS		
SONARDYNE PAN		
SONARDYNE (Dunker / Winch / Fish)		

RACAL Equipment on Board	Op	NonOp
STD 12 / VELOCITY PROBE		
ECHO SOUNDER (20/25)		
SIDESCAN (595/531/PINGER)		
BOOMER (DELPH / EPC)		
SPARKER (DELPH / EPC)		
CORING (GRAVITY / GRAB)		
THEODOLITE / EDM		
UNDERWATER TRACKING		

RACAL Personnel
K. EDDY
B. SLEVIN
K. PIERRY.

CLIENT Personnel
B. EDMONDS.

Consummables	USED	REMAIN
ITEM		
SIDESCAN PAPER		
E/SOUNDER PAPER		
ELICS PAPER		
DISKS		
PRINTER CART		
EPC ROLLS		

Anchors / Tpdrs	Laid	Recovered

WX	Sea State		
0000			
0600			
1200			
1800			

DIARY OF OPERATIONS :

1105 - Racal Personel arrive Portland Airport.
1230 - K. Eddy, B. Slevin, K. Perry & B. Edmonds departed Portland by helicopter for Byford Dolphin.
1315 - Arrive Byford Dolphin
1320 - Byford Dolphin O.I.M. requested that no equipment be set up in the Pilot House today.
Set up Trimble Antenna and Rig Portable Dish.

Forms to be completed daily in duplicate on all vessels. Each should be countersigned by the Clients Representative, the original being retained on board until the next crew change or at the end of job, when they should be returned to the PERTH office.

Following codes to be used : L - Laid - Recovered, FR - Failed to Reply, FS - Failed to Surface.

Sig ire

W. Edmonds.

CLIENTS REPRESENTATIVE

RACAL SURVEY AUSTRALIA LIMITED

RACAL

DAILY RECORD SHEET

WX	Sea State	Swell	Wind Dir.
0000	2-3	2m	050-10 kts
0600	1	1-2m	LT AIRS
1200	3	2-3m	110-20 kts
1800	3	2-3m	120-20 kts

Client : BHP			Job No : A2150			Date : 16-10-93	Vessel : BYFORD DOLPHIN			Anchors / ~~Rods~~	
RACAL Equipment on Board	Op	NonOp	RACAL Equipment on Board	Op	NonOp	RACAL Personnel	Consummables	USED	REMAIN	Laid	Recovered
SKYFIX RIG PORT	✓		STD 12 / VELOCITY PROBE			K. EDDY	ITEM				9
SYLEDIS			ECHO SOUNDER (20/25)			B. SLEVIN	SIDESCAN PAPER				3
MICROFIX			SIDESCAN (595/531/PINGER)			K. PERRY	E/SOUNDER PAPER				10
ARGO			BOOMER (DELPH / EPC)				ELICS PAPER				4
GNS PC	✓		SPARKER (DELPH / EPC)				DISKS				8
GYRO SGB 100A	✓		CORING (GRAVITY / GRAB)				PRINTER CART				2
TRIMBLE ~~SST's~~ DL II	✓		THEODOLITE / EDM			CLIENT Personnel	EPC ROLLS				
TELEMETRY			UNDERWATER TRACKING			B. EDMONDS					
SONARDYNE COMPATTS x4	S		GOLF LASER	S							
SONARDYNE PAN x1	S										
SONARDYNE (Dunker/~~Winch~~/Fish)	S										

DIARY OF OPERATIONS :

0556 - Byford Dolphin commenced de-ballasting.
1000 - Byford Dolphin completed de-ballasting.
1030 - Byford Dolphin commenced anchor recovery
1245 - Anchor #9 recovered and racked.
1420 - Anchor #3 recovered and racked
1535 - Anchor #10 recovered and racked
1725 - Anchor #4 recovered and racked
2052 - Anchor #8 recovered and racked
2136 - Anchor #2 recovered and racked.

Forms are to be completed daily in duplicate on all vessels. Each form should be countersigned by the Clients Representative, the original being retained on board until the next crew change or at the end of job, whichever is the earlier, when they should be returned to the PERTH office.

Transponders to be listed by type and serial numbers. Following codes to be used : L - Laid, R - Recovered, FR - Failed to Reply, FS - Failed to Surface.

Signature K. Eddy
SURVEYOR/ENGINEER

WHITE : Commercial Office
BLUE : Operations

Signature W. Edmonds.
CLIENTS REPRESENTATIVE

RACAL SURVEY AUSTRALIA LIMITED

RACAL

DAILY RECORD SHEET

WX	Sea State	Swell	Wind Dir.
0000			
0600			
1200			
1800			

Client : BHP			Job No : A2150			Date : 17-10-93	Vessel : BUFORD DOLPHIN			Anchors / Tpdrs	
RACAL Equipment on Board	Op	NonOp	RACAL Equipment on Board	Op	NonOp	RACAL Personnel	Consummables	USED	REMAIN	Laid	Recovered
SKYFIX RIG PORT	✓		STD 12 / VELOCITY PROBE			K. EDDY	ITEM			10	
SYLEDIS			ECHO SOUNDER (20/25)			B. SLEVIN	SIDESCAN PAPER			7	
MICROFIX			SIDESCAN (595/531/PINGER)			K. PERRY	E/SOUNDER PAPER				
ARGO			BOOMER (DELPH / EPC)				ELICS PAPER				
GNS PC	✓		SPARKER (DELPH/EPC)				DISKS				
GYRO SGB 1000A	✓		CORING (GRAVITY / GRAB)				PRINTER CART.				
TRIMBLE ~~SST's~~ DL II	✓		THEODOLITE / EDM			CLIENT Personnel	EPC ROLLS				
TELEMETRY			UNDERWATER TRACKING			B. EDMONDS					
SONARDYNE COMPATTS x 4	S		GOLF LASER	✓							
SONARDYNE PAN x 1	S										
SONARDYNE (Dunker/~~Winch~~/Pkg)	S										

DIARY OF OPERATIONS :

1711 - Bona Vista stopped running anchor #10, trying to turn anchor.

1901 - Anchor #10 on the seabed. ~~E 689 512m N 5687 778m~~ E 689 499m N 5687 781m

2100 - Laser Station 4 on edge of Helideck Port Side X - 31.28m Y 28.50m.

2105 - Bona Vista trying to turn anchor #7.

2145 - Bona Vista commenced running anchor #7

2220 - Anchor #7 on the seabed. E 689 954m N 5688917m

2351 - Bona Vista commenced running anchor #1.

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ature _____ SURVEYOR/ENGINEER

WHITE : Commercial Office
BLUE : Operations

Sig re _____ CLIENTS REPRESENTATIVE

RAC^L SURVEY AUSTRALIA 'IMITED

RACAL

DAILY RECORD SHEET

WX	Date	Swell	Wind Dir.
0000			
0600			
1200			
1800			

Client : BHP			Job No : A2150			Date : 18-10-93	Vessel : BUFORD DOLPHIN			Anchors / ~~Tails~~	
RACAL Equipment on Board	Op	NonOp	RACAL Equipment on Board	Op	NonOp	RACAL Personnel	Consummables			Laid	Recovered
SKYFIX RIG PORT	✓		STD 12 / VELOCITY PROBE			K. EDDY	ITEM	USED	REMAIN	3	
SYLEDIS			ECHO SOUNDER (20/25)			B. SLEVIN	SIDESCAN PAPER			9	
MICROFIX			SIDESCAN (595/531/PINGER)			K. PERRY	E/SOUNDER PAPER			11	
ARGO			BOOMER (DELPH / EPC)				ELICS PAPER				
GNS PC	✓		SPARKER (DELPH / EPC)				DISKS				
GYRO SGB 1000A	✓		CORING (GRAVITY / GRAB)				PRINTER CART.				
TRIMBLE ~~SST's~~ DL II	✓		THEODOLITE / EDM			CLIENT Personnel	EPC ROLLS				
TELEMETRY			UNDERWATER TRACKING			B. EDMONDS					
SONARDYNE COMPATTS x4	S		GOLF LASER	✓							
SONARDYNE PAN x1	S										
SONARDYNE (Dunker / ~~Winch~~ / ~~Pinger~~)	S										

DIARY OF OPERATIONS :

0615 - Bona Vista commenced running anchor #3

0650 - Anchor #3 on the seabed E 688 342m N 5688812m

0748 - Far Sword commenced running anchor #9.

0804 - Lowering anchor #9

0910 - Anchor #9 on the seabed. E 690000m, N 5687973m

0925 - Bona Vista commenced running anchor #11.

0853 - Anchor #11 on the seabed. E 689 169m N 5687524m

0930-1100 Problems with SkyFix Signal dropping off. Checked all cables and fittings.

1100 Signal strength improved, for reasons not known.

1105 - Far Sword endeavouring to set up to run anchor #12, Laser packed away, helicopter arriving, strong winds 25-30 knots, rain, heavy at times.

1200 - Telecom Ops RSA re SkyFix There are problems with the Inmarsat P.O.R. Satellite

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Signature _____ SURVEYOR/ENGINEER

WHITE : Commercial Office
BLUE : Operations

Signature M. Edmonds CLIENTS REPRESENTATIVE

RAC .L SURVEY AUSTRALIA .IMITED

RACAL

DAILY RECORD SHEET

WX	Sea State	Si	Wind Dir.
0000			
0600			
1200			
1800			

Client : BHP			Job No : A2150			Date : 18-10-93	Vessel : BYFORD DOLPHIN			Anchors / ~~Tpdes~~	
RACAL Equipment on Board	Op	NonOp	RACAL Equipment on Board	Op	NonOp	RACAL Personnel	Consummables			Laid	Recovered
SKYFIX RIG POST	✓		STD 12 / VELOCITY PROBE			K. EDDY	ITEM	USED	REMAIN	12	
SYLEDIS			ECHO SOUNDER (20/25)			B. SLEVIN	SIDESCAN PAPER				
MICROFIX			SIDESCAN (595/531/PINGER)			K. PERRY	E/SOUNDER PAPER				
ARGO			BOOMER (DELPH / EPC)				ELICS PAPER				
GNS PC	✓		SPARKER (DELPH / EPC)				DISKS				
GYRO SGB 1000A	✓		CORING (GRAVITY / GRAB)				PRINTER CART.				
TRIMBLE ~~SST's~~ DL II	✓		THEODOLITE / EDM			CLIENT Personnel	EPC ROLLS				
TELEMETRY			UNDERWATER TRACKING			B EDMONDS					
SONARDYNE COMPATTS x4	S		GOLF LASER	✓							
SONARDYNE PAN x1	S										
SONARDYNE (Dunker/~~Winch~~/~~Fish~~)	S										

DIARY OF OPERATIONS :

1300 - Far Sword having problems with anchor #12 pennant wire, over starboard side of vessel.
1403 - Far Sword commenced running anchor #12
1423 - Anchor #12 on the seabed. E 688 711m N 5697 714m
1510 - Byford Dolphin preparing to move over Loch Ard-1 location.
1515 - Byford Dolphin moving towards Loch Ard-1 location.
1555 - Byford Dolphin over Loch Ard-1 location
1623 - Byford Dolphin commenced pre-tensioning anchors.
1330 - Byford Dolphin completed pre-tensioning anchors
1331 - Byford Dolphin commenced ballasting down to drilling draught.
2217 - Byford Dolphin completed ballasting down to drilling draught
2257 - Commenced collecting DGPS data (Tow & Dol North) for final DGPS position of Byford Dolphin at Loch Ard-1 location.

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Signature K Eddy
SURVEYOR/ENGINEER

WHITE : Commercial Office
BLUE : Operations

Signature N Edmonds
CLIENTS REPRESENTATIVE

RAC L SURVEY AUSTRALIA iMITED

RACAL

DAILY RECORD SHEET

WX	Rate	Si	Wind Dir.
0000	3	1-2m	300-10 kts
0600	4	2-3m	340-20 kts
1200	6-8	3-4m	220-40 kts
1800	6-7	3-4m	250-45 kts

Client : BHP			Job No : A2150			Date : 18-10-93	Vessel : BYFORD DOLPHIN			Anchors / Tpdrs	
RACAL Equipment on Board	Op	NonOp	RACAL Equipment on Board	Op	NonOp	RACAL Personnel	Consummables	USED	REMAIN	Laid	Recovered
SKYFIX RIG PORT	✓		STD 12 / VELOCITY PROBE			K. EDDY	ITEM			1	
SYLEDIS			ECHO SOUNDER (20/25)			B. SLEVIN	SIDESCAN PAPER			2	
MICROFIX			SIDESCAN (595/531/PINGER)			K. PERRY	E/SOUNDER PAPER			8	
ARGO			BOOMER (DELPH / EPC)				ELICS PAPER			5	
GNS PC	✓		SPARKER (DELPH / EPC)				DISKS			4	
GYRO SGB 1000A	✓		CORING (GRAVITY / GRAB)				PRINTER CART.				
TRIMBLE ~~337's~~ DL II	✓		THEODOLITE / EDM			CLIENT Personnel	EPC ROLLS				
TELEMETRY			UNDERWATER TRACKING			B. EDMONDS					
SONARDYNE COMPATTS x 4	S		GAP LASER	✓							
SONARDYNE PAN x 1	S										
SONARDYNE (Dunker / Winch / Pinger)	S										

DIARY OF OPERATIONS :

2019 - Anchor #1 on the seabed. E 688 307m N 5688 024m
0125 - Bona Vista commenced running anchor #2
0153 - Anchor #1 on the seabed. E 688 153m N 5688 522m
0209 - Far Sword commenced running anchor #8
0226 - Anchor #8 on the seabed E 689 994m N 5688 498m
0305 - Bona Vista commenced running anchor #5
0330 - Anchor #5 on the seabed E 689 020m N 5689 341m
0340 - Far Sword chasing out anchor #8, unable to return to rig
0410 - Anchor #8 on roller of Far Sword.
0419 - Anchor #8 on the seabed.
0447 - Bona Vista commenced running anchor #4
0518 - Anchor #4 on the seabed. E 688 633m N 5689 188m

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Signature K. Eddy
SURVEYOR/ENGINEER

WHITE : Commercial Office
BLUE : Operations

Signature M. Edmonds.
CLIENTS REPRESENTATIVE

RACAL SURVEY AUSTRALIA LIMITED

DAILY RECORD SHEET

RACAL

WX	Sea State	Swell	Wind Dir.
0000	7	4-5	250-60 kts
0600			
1200			
1800			

Client : BHP | Job No : A2150 | Date : 19-10-93 | Vessel : BYFORD DOLPHIN

RACAL Equipment on Board	Op	NonOp
SKYFIX RICS PORT	✓	
SYLEDIS		
MICROFIX		
ARGO		
GNS PC	✓	
GYRO SG3 1000A	✓	
TRIMBLE ~~SST's~~ DI- II	✓	
TELEMETRY		
SONARDYNE COMPATTS x 4	S	
SONARDYNE PAN x 1	S	
SONARDYNE (Dunker/Winch/Fish)	S	

RACAL Equipment on Board	Op	NonOp
STD 12 / VELOCITY PROBE		
ECHO SOUNDER (20/25)		
SIDESCAN (595/531/PINGER)		
BOOMER (DELPH / EPC)		
SPARKER (DELPH / EPC)		
CORING (GRAVITY / GRAB)		
THEODOLITE / EDM		
UNDERWATER TRACKING		
C of LASER	S	

RACAL Personnel
K. EDDY
B. SLEVIN
K. PERRY

CLIENT Personnel
B EDMONDS.

Consummables	USED	REMAIN
SIDESCAN PAPER		
E/SOUNDER PAPER		
ELICS PAPER		
DISKS		
PRINTER CART		
EPC ROLLS		

Anchors / Tpdrs	Laid	Recovered

DIARY OF OPERATIONS :

0030. Completed collecting DGPS data for Final DGPS position of Byford Dolphin at Loch Ard-.

Final Position of Drillstem at Loch Ard-. (SkyFix/Trimble/DNAVN)

Lat 38° 55' 54.717" S Long 143° 10' 55.156" E

E-ing 689 133.62 m N-ing 5 688 505.60 m

This places the drillstem 2.43 miles on a bearing of 191.7° (T) from the intended location.

Heading 221.3° (T)

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... listed by type and serial numbers. Following codes to be used L - Laid, R - ...vered, FR - Failed to Reply, ... - Failed to Surface

Signature W. Edmonds.

... REPRESENTATIVE

RACAL SURVEY AUSTRALIA LIMITED

RACAL

DAILY RECORD SHEET

WX	Note	Swell	Wind Dir.
0000	1	4-5	250-60 kts
0600			
1200			
1800			

Client : BHP			Job No : A2150			Date : 19-10-93	Vessel : BYFORD DOLPHIN			Anchors / Tpdrs	
RACAL Equipment on Board	Op	NonOp	RACAL Equipment on Board	Op	NonOp	RACAL Personnel	Consummables	USED	REMAIN	Laid	Recovered
SKYFIX BIG PORT	✓		STD 12 / VELOCITY PROBE			K. EDDY	ITEM				
SYLEDIS			ECHO SOUNDER (20/25)			B SLEJIN	SIDESCAN PAPER				
MICROFIX			SIDESCAN (595/531/PINGER)			K. PERRY	E/SOUNDER PAPER				
ARGO			BOOMER (DELPH / EPC)				ELICS PAPER				
GNS PC	✓		SPARKER (DELPH/EPC)				DISKS				
GYRO SGB 1000A	✓		CORING (GRAVITY / GRAB)				PRINTER CART				
TRIMBLE ~~SST's~~ DI-II	✓		THEODOLITE / EDM			CLIENT Personnel	EPC ROLLS				
TELEMETRY			UNDERWATER TRACKING			B. EDMONDS.					
SONARDYNE COMPATTS x 4	S		GOF LASER	S							
SONARDYNE PAN x 1	S										
SONARDYNE (Dunker/Winch/Fish)	S										

DIARY OF OPERATIONS :

0230- Completed collecting DGPS data for Final DGPS position of Byford Dolphin at Loch Ard-1.
Final Position of Drillstem at Loch Ard-1. (SkyFix/Trimble/DNAVN)
Lat 38° 55' 54.717" S Long 143° 10' 55.156" E
Eing 689 133.62 m Ning 5 688 505.60 m
This places the drillstem 2.43 metres on a bearing of 197.7° (T) from the intended location.
Heading 221.3° (T)

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Signature K. Eddy
SURVEYOR/ENGINEER

WHITE : Commerial Office
BLUE : Operations

Signature W. Edmonds.
CLIENTS REPRESENTATIVE