



HALIBUT A-1A

FINAL WELL REPORT

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Revision	Date	Issued by	Approved by	Remarks
1	15-12-2003	Geoservices Unit 137	Base Mud logging Coordinator	

Section 1
General Well Summary

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WELL DATA

Operator : Esso Australia Ltd
Platform : Halibut
Well name : Halibut A-1A
Country : Australia
Location : Gippsland Basin
Structure : Faulted Anticline
Field : Halibut
Permit : Vic/L11

Location AMG co-ordinates : 5 748 514.601m N 615 284.926m E

Location local co-ordinates : Lat: 38° 24' 15.015" S Long: 148° 19' 13.197" E

Surface co-ordinates : 20.36 E -4.50 N

Profile : Deviated
Reference depth : Rotary Table
RT to Seabed : 99.75 metres
RT above M.S.L. : 29.45 metres
Sea-water depth : 72.00 metres
Proposed total depth : 2991.0 metres
Actual total depth : 2952.0 metres
True vertical depth : 2459.9 metres
Spudded on : 20th November 2003
Total depth reached on : 30th November 2003

Drilling Contractor

Drilling Contractor : NABORS ISDL
Rig name : 453
Rig type : Platform

Drilling Phases

Diameter (inch)	From (m)	To (m)	Mud Type
8-1/2"	616.0	2952.0	KCl / Glycol / PHPA

Cased Hole

Casing Diameter (inch)	Casing Type	Shoe Depth (m)
20"	Conductor	178.0 MDRT
10-3/4"	Surface	616.0 MDRT
7"	Production	2944.5 MDRT

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MUD LOGGING

Logging Unit Number: 137

Engineers: P. Rady, L. Foreman, M. Boyd, R. Pereira

Sampling Interval**Halibut A-1A**

Sample Type	Number of sets	Quantity per set	Sampling interval	From (m)	To (m)
Washed and Dried	3	100 grams	10 metres	2550	2700
Washed and Dried	3	100 grams	5 metres	2700	2952

Cuttings Distribution

Company	Washed and Dried Sample Set
Esso Australia	1
Victorian Department of Energy and Minerals	1
Australian Bureau of Resources	1

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WELL SUMMARY

Halibut A-1A is an infill directional well designed to intersect the TCC target and the secondary targets M141, M148U, M151A zones. The well was drilled to a Total Depth of 2952.0m MDRT in 8½" hole and completed with a single oil completion string of 3½" tubing in 7" production casing.

Halibut A-1A was spudded at 08:30 hours on the 20th of November 2003 after setting a Kick off plug @ 569.0m.

After kicking off at 618.0m, 5 m of new formation was drilled from 622.0m to 627.0m and a Pressure Integrity Test (327 psi: 12.0 ppg EMW) was carried out with 8.9 ppg mud. An 8½" steerable / MWD drilling assembly was run with a Smith S75HPX fixed cutter bit and drilled, steered and rotated to 2527.0m where it was pulled due to a slow penetration rate. The second bit, a Reed TD53AKPRDH rock bit, was made up, run in hole and drilled, steered and rotated ahead from 2527.0m to 2781.0m. At this point, equipment failure with Geoservices made it impossible for them to safely monitor the well and to acquire any data. It was deemed necessary to pull the bit due to safety concerns as well as the cumulative rotating hours on the bit. The third bit was bit # 1 re-run, a Smith S75HPX fixed cutter bit. The bit was made up, as well as a new motor replaced in the bottom bole assembly. This final assembly was run in hole and drilled, steered and rotated ahead from 2781.0m to Total Depth at 2952.0m

A wiper trip was made to the casing shoe prior to running in hole with Reeves Logging tools with the shuttle conveyed memory system.

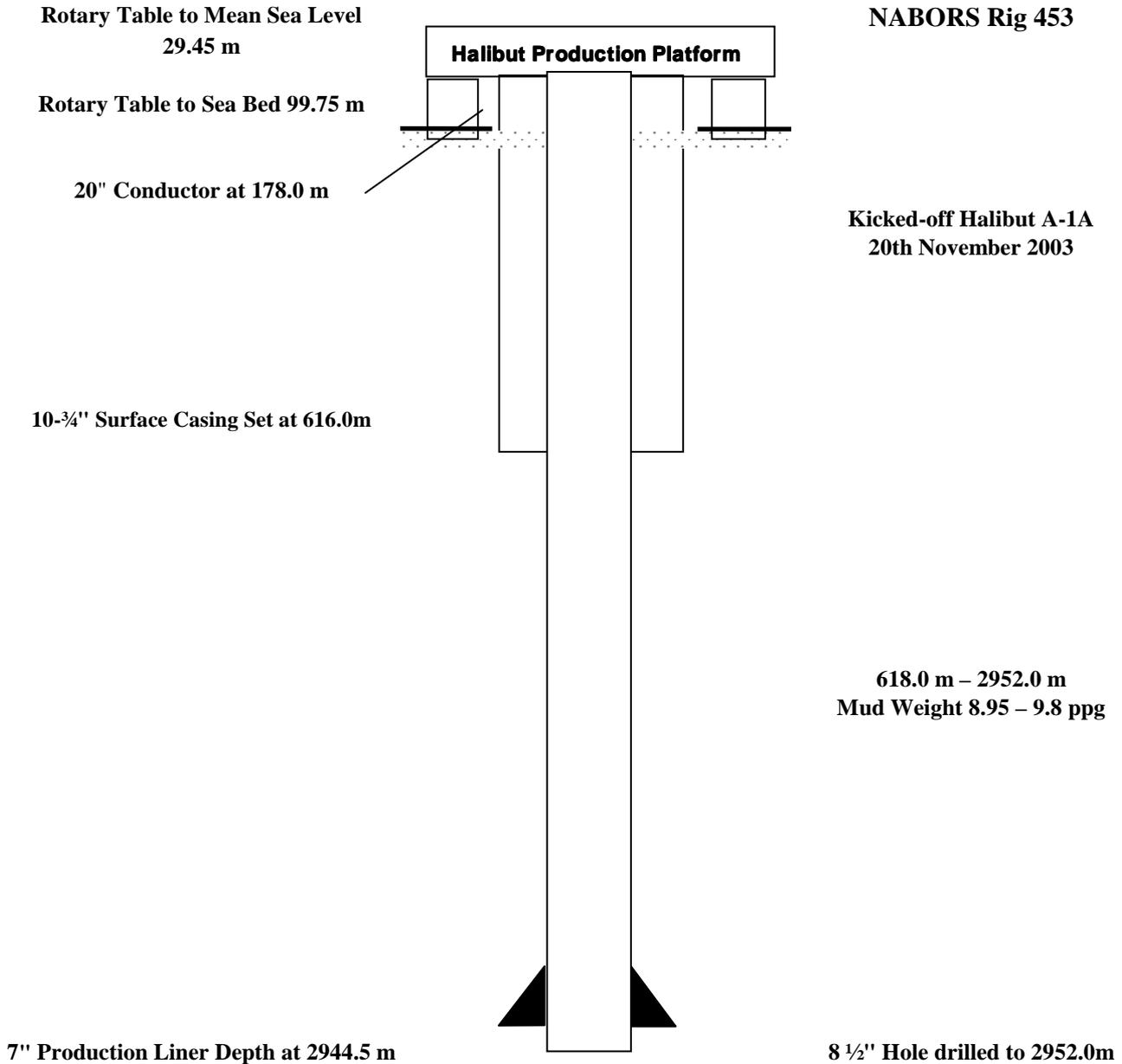
Throughout the Halibut A-1A drilling programme, there was no problematic tight hole / loses / gains encountered on any trip, or whilst drilling.

An initial mud weight of 8.95 ppg was used to drill out the well. A KCl / Polymer mud system was used for initial displacement during kick-off at 618.0m. Once out of cement and drilling new formation, PHPA, Glycol and Baracor-129 were added to the mud system to maintain mud rheology as per programmed concentrations. This mud weight was maintained until 2327.0m where it was gradually increased from 9.3 ppg to 9.6 ppg with Barite additions prior to drilling the Lakes Entrance formation. Baracarb 25 and 100 were added at 2672.0m as per programmed concentrations to bridge the pore throats and reduce the likelihood of differential sticking and seepage losses through the Latrobe Formation. Throughout the target sections to Total Depth, the mud weight was maintained from 9.6 ppg and increased to 9.8 ppg. Volumes and mud properties were maintained throughout with premix additions.

Halibut A-1A reached a Total Depth of 2952.0m MDRT (2459.9m TVDRT) at 05:00 hours on the 30th November 2003. The final survey at a depth of 2933.99 m had an inclination of 66.14° and an azimuth of 2.50°. The hole was logged, production casing run and the completion program executed.

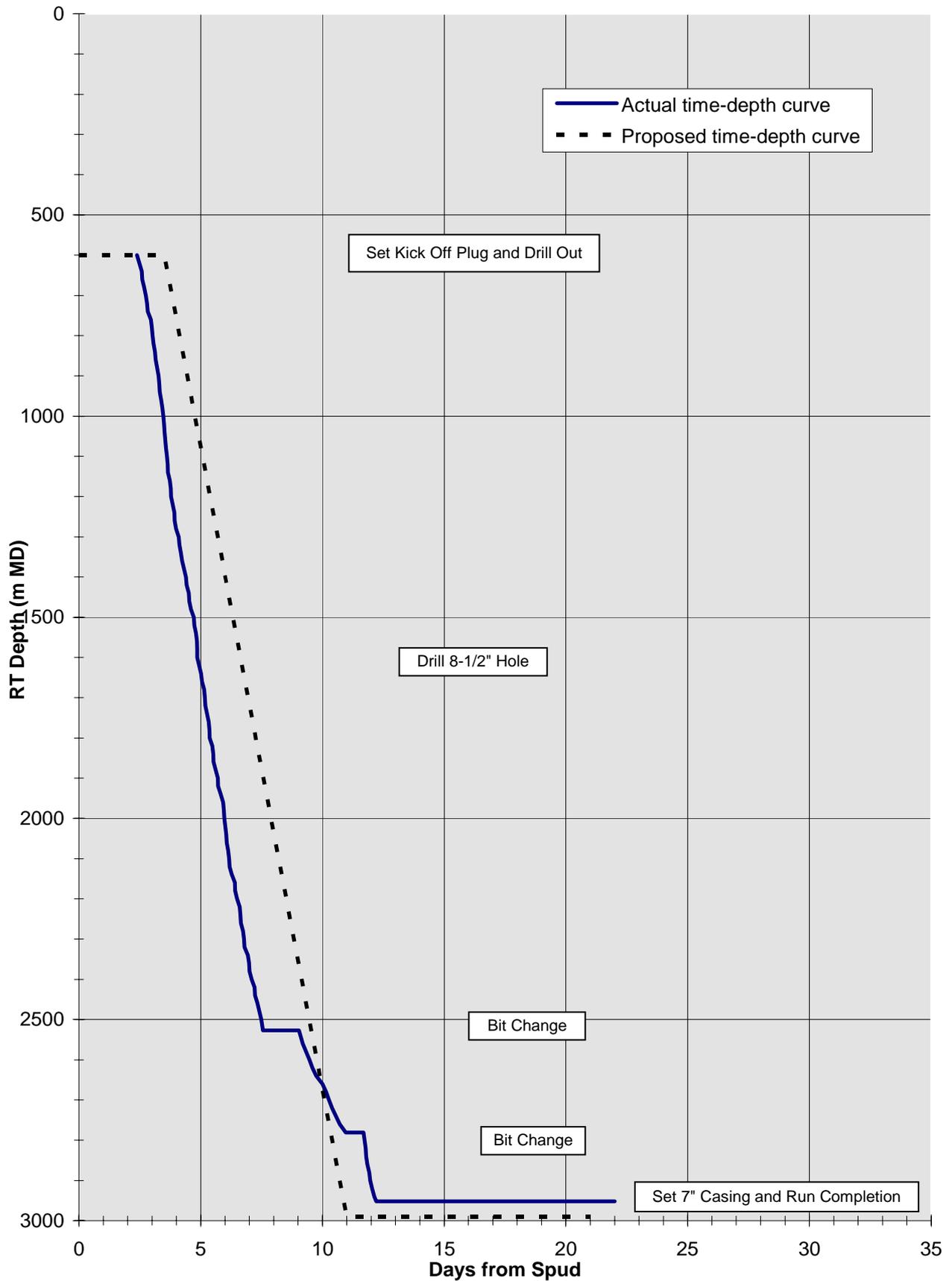
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WELL PROFILE



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TIME-DEPTH CURVE (measured depth)



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BIT RUN SUMMARY

Bit	Size (")	Type	Jets	In (m)	Out	Hours	Condition
1	8½	Smith S75HPX	7 x 16	616.0	1911.0	80.0	1-1-NO-A-X-I-ER-PR.
2	8½	Reed TD53AKPRDH	2 x 22 1 x Open	2527.0	2781.0	32.0	4-4-WT-A-E-E-E-1/16-PN-HR
3RR	8½	Smith S75HPX	7 x 18	2781.0	2952.0	9.3	1-1-WT-A-X-I-ER-TD

CASING DATA

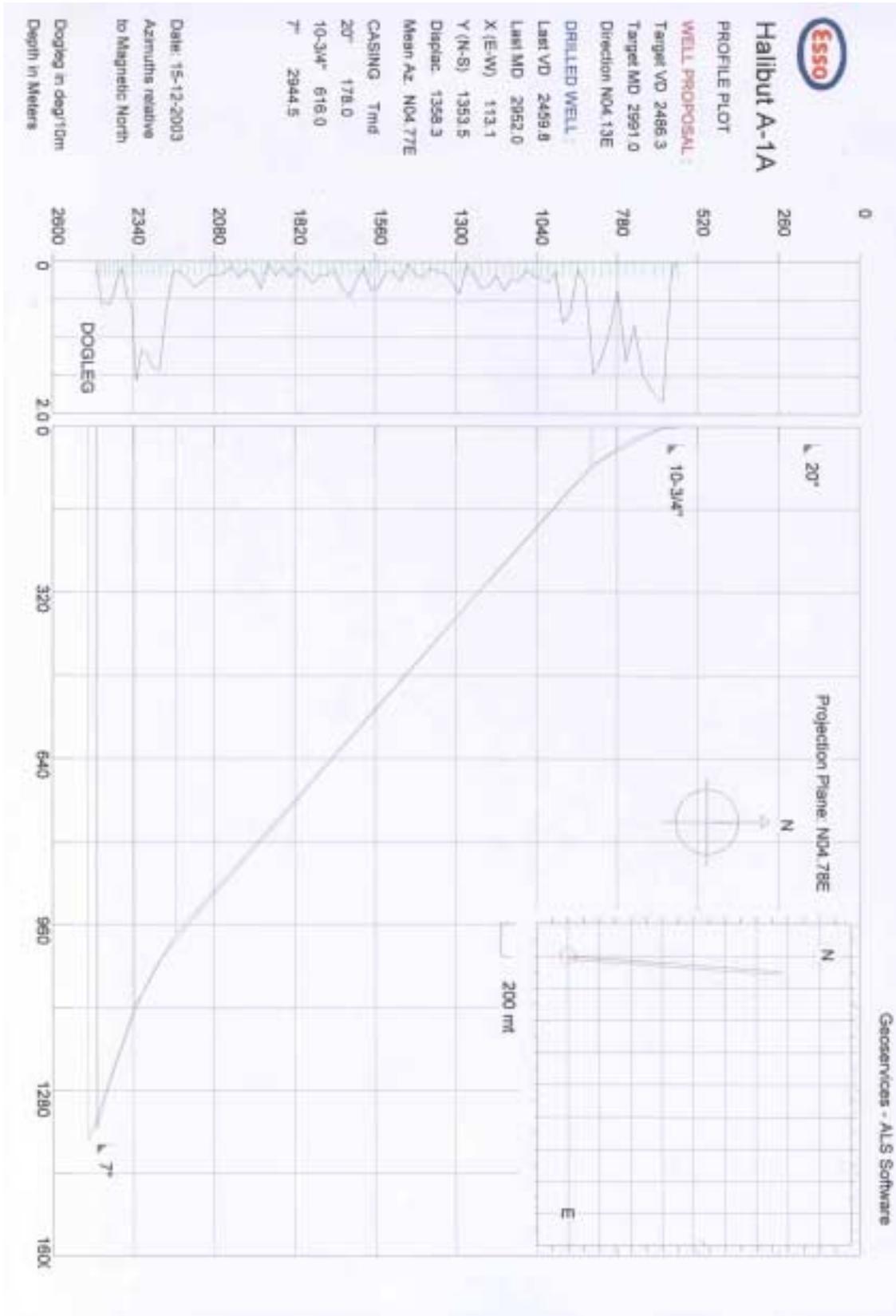
Type	Size (Inches)	Weight (lb/ft)	Grade	Thread	Depth (mMDRT)
Conductor	20	133	K-55	BTC	178.0
Surface	10- ³ / ₄	45	J-55	BTC	616.0
Production	7	26	L-80	LTC	2944.5

CEMENTING DATA

Casing Details	Cement Type	Dry Cement Volume (sx)	Cement Additives	Mix Water (bbls)	Slurry Volume (bbls)	Slurry Density (ppg)	Cement To / From (mMDRT)	Casing Pressure Test (psi)
7"	HTB	621	HALAD 413L 32 gal / 10 bbls SCR-100L 1 gal / 10 bbls CFR-3L 5 gal / 10 bbls NF-5 0.25 gal / 10 bbls	70	125	15.8	2208 m 2944.5 m	2500 psi

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WELL DIRECTIONAL PROFILE



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WELL DIARY

- 12th November 2003** Rig up HES to test tubing. Unable to obtain test on tubing, establish communication problem with annulus. Rig down hanger retrieval assembly, make up and run ported assembly. Test lines and Blow Out Preventer (BOP) 300 / 3000psi for 3 minutes. Rig up to circulate tubing, drop carbide to determine communications depth. Carbide gas returns at 1528 strokes and 2630 strokes. Wait on weather and rig up HES lubricator.
- 13th November 2003** Continue with P&A operations. Rig down HES wireline, free tubing from packer, circulate and pull out of hole with 3½" tubing.
- 14th November 2003** Continue to pull out of hole with and lay out 3½" tubing. Make up seal assembly and run in hole with cementing string. Sting into packer and attempt to establish integrity test. Un-sting from packer and space out. Make up cement head and lines. Test lines. Mix and pump cement plug. Pull out of hole, to 2180.0m and reverse circulate. Pull out of hole to 2116.0m. Displace well to inhibited sea water. Rig maintenance while waiting on cement. Run in hole and tag cement at 2180.0m. Pull out of hole with 4" drill pipe. Lay out seal assembly. Break down cement head and pressure test cement plug against blind rams.
- 15th November 2003** Nipple up BOP's and pressure test same. Pick up and make up casing cutter assembly. Run in hole with casing cutter Bottom Hole Assembly. Change out handling tools to 4" and run in hole on 4" drill pipe. Cut casing as per baker instructions. Flow check, shut in well and circulate hole clean. Rig service and pull out of hole with casing cutter assembly.
- 16th November 2003** Continue to pull out of hole with casing cutter assembly. Rack back heavy weight drill pipe and lay out casing cutter. Pick up and make up casing spear. Engage spear and pull to free casing. Circulate hole clean. Pick up casing to surface and release spear. Rig up 7⁵/₈" handling gear, pull casing and lay out. Lay out casing spear. Test BOPs to 300 / 3000 psi. Lay out 3½" heavy weight drill pipe. Run in hole with drill pipe to set kick off plug. Obstruction encountered, pull out of hole, remove centralisers and run in hole to set kick off plug. Pump and displace kick off plug as per program.
- 17th November 2003** Pull out of hole from 698.0m to 583.0m and reverse circulate. Pull out of hole from 583.0m to 520.0m. Circulate hole clean and wait on cement. Run in hole from 520.0m to top of cement at 627.0m. Make up cement assembly and high pressure lines and test same. Howco pump cement at 627.0m and displace with 18 bbls of seawater. Pull out of hole from 627.0m to 569.0m and reverse circulate until clean returns observed. Pull out of hole from 569.0m to 535.0m. Break down and lay out cement assembly and wait on cement. Run in hole from 535.0m to 569.0m and tag cement. Pull out of hole from 569.0m.
- 18th November 2003** Continue to pull out of hole to surface. Howco pressure test casing and cement plug to 1500 psi – no go. Reconfigure test lines. Howco attempt to pressure test casing and cement plug to 1500 psi. No go. Rig up to and retrieve wear bushing. Pick up and make up RTTS and run in hole on 5" heavy weight drill pipe to 144.0m. Change out handling gear to 4". Run in hole with 4" drill pipe from 144.0m to 507.0m. Set RTTS as per Howco's instructions. Test lines – OK. Howco attempt test below RTTS. No go. Howco attempt test above RTTS. No go. Release RTTS. Run in hole from 507.0m to 512.0m. Set RTTS and attempt tests on casing above and below. No go. Release RTTS. Pull out of hole from 507.0m to 363.0m. Set RTTS. Test below RTTS – OK. Attempt to test above RTTS. No go. Continue to pull out of hole from 363.0m and test casing every 30.0m interval to establish leak. Located leak between 66.0m and 68.0m. Pull out of hole from 68.0m to 32.0m. Break down and lay out RTTS and safety joint. Rig up 4" handling equipment and run in hole with 4" drill pipe and pup joints to 75.0m. Displace CST on depth. Pull out of hole from 75.0m to 73.0m and install cement assembly. Make up surface lines. Perform cement job at 73.0m. Pull out of hole to 57.0m and reverse circulate string volume, rig down surface lines and pull out of hole. Conduct Squeeze job.

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- 19th November 2003** Continue to squeeze cement. Bleed off pressure and monitor well. Rig up Howco and test casing. Break down high pressure lines. Run wear bushing and break down running tool. Rig up Howco and test casing – OK. Make up casing clean out bottom hole assembly. Run in hole to top of cement at 569.0m. Drill cement from 569.0m to 600.0m. Pump Hi-vis pill and displace well to 9.0 ppg mud, circulate and condition same. Rig up Howco and test casing. Pull out of hole from 600.0m to surface. Pick up and make up 8½" steerable assembly. Run in hole to 144.0m and shallow test MWD and motor.
- 20th November 2003** Run in hole with 4" drill pipe from 144.0m to 545.0m. Conduct super choke and BOP drills. Continue to run in hole from 545.0m to 594.0m. Wash and ream from 594.0m to 600.0m. Drill cement from 600.0m to 618.0m and work string whilst circulating hole clean. Rig up HES and SDI. Run in hole with Gyro to 584.0m and pull out of hole and down load Gyro. Orientate drill string and drill cement plug from 618.0m to 622.0m. Kick-off Halibut A-1A at 08:30 hours. Drill and steer 8½" hole of new formation from 622.0m to 627.0m. Work string whilst circulate hole clean and rig up Howco. Conduct PIT with 8.9 ppg mud to 327 psi (EMW 12.0ppg). Drill, steer and survey 8½" hole from 627.0m to 632.0m. Rig up and run in hole with Gyro to 604.0m. Pull out of hole and down load same. Drill, steer and survey 8½" hole from 632.0m to 689.0m. Rig up and run in hole with Gyro. Pull out of hole and download same. Drill, steer and survey 8½" from 689.0m to 745.0m. Change out mud pump # 1 suction hose. Drill, steer and survey 8½" hole from 745.0m to 785.0m.
- 21st November 2003** Drill, steer and survey 8½" hole from 785.0m to 889.0m. Condition mud and circulate whilst change shaker screens. Drill, steer and survey 8½" hole from 889.0m to 1234.0m. Circulate hole clean whilst change shaker screens. Drill, steer and survey 8½" hole from 1234.0m to 1262.0m. Circulate hole clean whilst conducting electrical work on shakers. Drill, steer and survey 8½" hole from 1262.0m to 1284.0m.
- 22nd November 2003** Drill, steer and survey 8½" hole from 1284.0m to 1639.0m.
- 23rd November 2003** Drill, steer and survey 8½" hole from 1639.0m to 1923.0m. Conduct rig service. Drill, steer and survey 8½" hole from 1923.0m to 2012.0m.
- 24th November 2003** Drill, steer and survey 8½" hole from 2012.0m to 2267.0m. Conduct rig service. Drill, steer and survey 8½" hole from 2267.0m to 2417.0m.
- 25th November 2003** Drill, steer and survey 8½" hole from 2376.0m to 2527.0m. Condition mud and circulate. Rotate, work string, rack back 1 stand and circulate hole clean from 2527.0m to 2412.0m. Flow check hole – hole static. Slug pipe and pull out of hole from 2412.0m to 616.0m. Conduct rig service. Continue to pull out of hole from 616.0m to 144.0m. Pick up and break down cement head. Change handling equipment to 5". Continue to pull out of hole from 144.0m, racking back heavy weight drill pipe and jars. Break and lay down non magnetic drill collar and UBHO sub. Pick up and break out bit and rack back Anadrill MWD and motor.
- 26th November 2003** Clear rig floor of excess equipment. Test BOP – make up and retrieve wear bushing. Make up test assembly, and seat same. Rig up high pressure lines, flush and test same. Function test remotes. Howco test BOP's and choke manifold 300 / 3000 psi for 5 minutes. Pick up, service and break test plug and seat same in well profile for blind ram test. Retrieve test plug, and break down test assembly. Make up and rig up wear bushing. Break down retrieving tool assembly. Make up bottom hole assembly as per Anadrill's instructions. Set motor bend to 1.5° and run in hole to 30.0m. Shallow test MWD and motor. Rig to and continue run in hole with 5" heavy weight drill pipe from 30.0m to 143.0m. Rig to and continue to run in hole with 4" drill pipe from 143.0m to 602.0m. Slip and cut 80m of drilling line. Conduct rig service. Continue to run in hole from 602.0m to 2468.0m, filling pipe every 15 stands. Pre-cautionary wash and ream stands down to total depth from 2468.0m to 2527.0m. Orientate tool face of directional assembly. Drill, steer and survey 8½" hole from 2527.0m to 2532.0m. Rotate, work string and circulate hole clean. Rack back 1 stand from 2532.0m to 2471.0m whilst change out #2 mud pump liner. Run in hole from 2471.0m to 2532.0m. Drill, steer and survey 8½" hole from 2532.0m to 2536.0m.

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- 27th November 2003** Drill, steer and survey 8½" hole from 2536.0m to 2645.0m. Condition mud and circulate. Rotate and reciprocate drill string whilst repair seat on # 2 mud pump. Drill, steer and survey 8½" hole from 2645.0m to 2650.0m. Conduct rig service. Drill, steer and survey 8½" hole from 2650.0m to 2660.0m.
- 28th November 2003** Drill, steer and survey 8½" hole from 2660.0m to 2781.0m. Rotate and reciprocate drill string from 2781.0m to 2697.0m whilst Geoservices attempt to repair well monitoring equipment. No success. Flow check hole – hole static. Pull out of hole with 4" drill pipe from 2781.0m to 2550.0m.
- 29th November 2003** Pull out of hole with 4" drill pipe from 2550.0m to 716.0m. Rotate and reciprocate drill string at 716.0m while circulate hole clean. Flow check hole – hole static. Continue to pull out of hole with 4" drill pipe to heavy weight drill pipe at 143.0m. Continue to pull out of hole with heavy weight drill pipe and rack back same to 31.0m. Pull out of hole with MWD and lay out motor. Break out bit and clear floor of excess equipment. Pick up and make up bit and new motor (bend 0°). Shallow test MWD and motor at 40.0m. Run in hole with bottom hole assembly to 142.0m. Run hole with 4" drill pipe from 142.0m to 572.0m. Conduct rig service, inspecting Top Drive torque beam and Top Drive unit. Continue to run in hole with 4" drill pipe from 572.0m to 2726.0m. Precautionary wash and ream from 2726.0m to 2781.0m. Drill, steer and survey 8½" hole from 2781.0m to 2913.0m.
- 30th November 2003** Drill, steer and survey 8½" hole from 2913.0m to 2952.0m. Total Depth Halibut A-1A reached at 05:00 hrs. Rotate, and reciprocate drill string. Rack back 1 stand. Pump 20 bbl super sweep. Circulate hole clean. Rack back 1 stand from 2927.0m to 2899.0m. Flow check hole – hole static. Pull out of hole from 2899.0m to 658.0m. Reciprocate and rotate whilst pump 20 bbl super sweep and clean hole. Pull out of hole from 658.0m to 602.0m. Conduct rig service. Reeves rig up block height sensor. Run in hole from 602.0m to Total Depth at 2952.0m, washing last 2 stands down. Reciprocate and rotate drill string and hole clean. Pump slug and pull out of hole to 1300.0m.
- 1st December 2003** Pull out of hole from 1300.0m to 717.0m. Work tight spots at 2695.0m, 2663.0m and 2647.0m. Pump 20 bbl sweep. Rotate and reciprocate drill string whilst cleaning hole. Flow check hole – hole static. Pull out of hole from 717.0m to 142.0m. Flow check hole – hole static. Rack back bottom hole assembly. Lay out jar, flush with sea water and break out bit from 142.0m. Clear rig floor of excess equipment. Reeves calibrate block height sensor. Make up and run in hole with Reeves Garage bottom hole assembly to 67.0m. Install radioactive source. Continue making up bottom hole assembly and run in hole from 67.0m until jar firing at 117.0m. Pull out of hole from 117.0m to 67.0m. Change out jars and inspect logging string. Change out memory sub. Run in hole with logging bottom hole assembly to 237.0m. Run in hole from 237.0m to 2952.0m, washing last 2 stands down. Filling pipe every 15 stands and drifting all tubulars. Pump down dart and extend logging tools outside of mule shoe. Pull out of hole logging.
- 2nd December 2003** Continue to pull out of hole with logging tools. Flow check at shoe, well static. Continue to pull out of hole. Rack back BHA and remove radioactive source. Lay out logging tools. Make up BHA for wiper trip. Run in hole to shoe and perform slip and cut of drill line. Continue to run in hole, precautionary wash last 2 stands to bottom and backream out of Latrobe.
- 3rd December 2003** Pump sweep and pull out of hole to shoe. Pump sweep and continue to pull out of hole. Rack back HWDP and lay out. Rig up to run 7" casing. Pressure test BOPs. Continue to prepare to run 7" casing. Run casing as per program.
- 4th December 2003** Continue to run in hole with 7" casing. Hang up and 2523 m, work casing and circulate though hang up. Continue to run in hole. Rig up cementing equipment and circulate hole clean. Pump cement as per program. Contaminated mixwater, circulate out 74 bbls of contaminated cement. Rig down cement head and circulate hole clean. Rig up cement head and pump cement. Displace cement.

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- 5th December 2003** Continue to displace cement with mud. Bump plug with 2000psi. Wait on cement. Pick up BOP's and install slips. Cut and dress casing. Nipple down BOP and riser. Install B section and test. Nipple up BOP and riser and test.
- 6th December 2003** Continue to test BOP's. Make up scraper assembly and run in hole. Wash last 2 stands to bottom and circulate hole clean. Displace hole to inhibited seawater. Test lines and pressure test casing. Pull out of hole. Rig service. Rig up and prepare to run guns on wireline.
- 7th December 2003** Make up and run perforation guns on wireline. Pull spent guns out of hole and make up and run guns for 2nd perforations. Pull out of hole with spent guns. Rig down Schlumberger wireline and rig up to run 2^{7/8}" tubing. Make up completion assembly and run in hole with tubing.
- 8th December 2003** Continue to run in hole with tubing and completion. Rig up to correlate with Schlumberger. Run correlation. Rig down Schlumberger.
- 9th December 2003** Run in tubing hanger (end of tubing at 2739m) and place packers on depth. Run in with wireline and set N test tool in XN nipple. Pressure up on tubing and set packers. Pull out N test tool and rig down wireline. Pressure test tubing and casing. Install BPV and pressure test tubing hanger. Nipple down BOPs and install tree. Pressure test. Make up lubricator and pull BPV. Test SSSV. Prepare to skid rig at 24:00 hrs to HLA-A6 on 09/12/03.
- 10th December 2003** Continue to prepare to skid rig. Skid rig to HLA-A6.

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Section 2 Geological Summary

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FORMATION TOPS

DESCRIPTION	MD (m) RT	TVD (m) RT	TVD (m) SS
Lakes Entrance	2459.5	2173.0	2143.55
Latrobe Group (TOL)	2674.5	2327.3	2297.85
Coarse Clastics	2680.0	2330.0	2300.55
M141 sand	2721.5	2352.2	2322.75
M148U sand	2764.0	2374.2	2344.75
M151A sand	2798.5	2391.5	2362.05
M151B sand	2816.0	2400.2	2370.75
Basal M151 sand	N/A	N/A	N/A
M161 sand	N/A	N/A	N/A
Field original OWC	N/A	N/A	N/A
M171 sand	N/A	N/A	N/A
Total Depth	2952.0	2459.9	2430.445

GEOLOGICAL SUMMARY

GIPPSLAND LIMESTONE

616.0 m – 2459.5 m **CALCILUTITE and CALCISILTITE with minor CLAYSTONE beds at depth**

CALCILUTITE Pale olive grey to moderate olive grey, occasionally pale yellow brown, minor pale to light grey in parts, occasionally silty grading to very finely arenaceous, grading to CALCISILTITE in parts, minor to trace disseminated pyrite, trace fossil fragments and ooids, minor to trace lithics, soft to moderately hard, amorphous, sub-blocky to block in parts.

CALCISILTITE Pale olive grey to moderate olive grey, occasionally pale yellowish brown, occasionally argillaceous grading to very finely arenaceous, grading to CALCILUTITE in parts, occasional minor mottled off white to pale green crystalline and micro-crystalline LIMESTONE inclusions, minor to trace disseminated pyrite, trace fossil fragments and ooids, trace micro- micaceous in parts, firm to predominantly moderately hard, sub-blocky to block in parts.

CLAYSTONE Light olive grey to olive grey, moderate grey to light bluish grey, slightly to moderately calcareous in parts, trace disseminated pyrite, slightly micro-micaceous in parts, trace glauconite grains and inclusions, brittle to moderately hard, subfissile to sub-blocky.

LAKES ENTRANCE FORMATION

2459.5m – 2674.5 m **Interbedded CALCILUTITE and CLAYSTONE**

CALCILUTITE Pale to light olive grey, common fossil fragments, slightly micro-micaceous, minor disseminated pyrite, firm, sub-blocky.

CLAYSTONE Light olive grey to olive grey, moderate grey to light bluish grey, slightly calcareous in parts, trace disseminated pyrite, slightly micro-micaceous in parts, trace glauconite grains and inclusions, brittle to moderately hard, subfissile to sub-blocky.

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LATROBE GROUP

2674.5m – 2680.0 m **CALCAREOUS CLAYSTONE**

CLAYSTONE Light grey to light olive grey, 5% medium grey to medium dark grey, 25% to 30% calcareous, 2% to 5% silt, trace to 2% micro-micaceous, trace Foraminifera, trace very fine disseminated carbonaceous material (occasional irregular microlaminations), soft to predominantly firm, plastic in part, subblocky.

COARSE CLASTICS

2680.0 m – 2721.5m **SILTSTONE with minor interbedded SANDSTONE**

SILTSTONE Brown grey to olive grey, 20% to 30% clay, grading to silty CLAYSTONE, trace calcareous, trace to 5% disseminated very fine carbonaceous material, trace to 2% micro-micaceous, firm to occasionally moderately hard, amorphous and soft in part.

SANDSTONE Quartzose, medium to coarse grained, moderately to poorly sorted, subangular to angular, sub-spherical to sub-elongate, trace siliceous cement, 5% dolomitic cement, 10% argillaceous matrix, 90% loose grains, 10% moderately hard aggregates, poor visual porosity, poor inferred porosity, fluorescence.

FLUORESCENCE 2705.0-2721.5 m; 40% moderately bright even blue white fluorescence, slow diffuse direct cut, instant diffuse crush cut, faint thin residue.

M141 SAND

2721.5 m – 2764.0 m **SANDSTONE and Trace Interbedded SILTSTONE**

SANDSTONE Quartzose, clear to predominantly translucent, fine to very coarse grained, predominantly coarse grained, moderately to poorly sorted, subangular to subrounded, sub-spherical, trace weak siliceous cement, trace argillaceous/silty matrix, loose grains, poor to fair visual porosity, poor to fair inferred porosity, fluorescence.

SILTSTONE Brown grey to olive grey, 20 to 30% clay, grading to silty CLAYSTONE, trace calcareous, trace to 5% disseminated very fine carbonaceous material, trace to 2% micro-micaceous, firm to occasionally moderately hard, amorphous and soft in part.

FLUORESCENCE 2721.5-2730.0 m; 40% moderately bright even blue white fluorescence, slow diffuse direct cut, instant diffuse crush cut, faint thin residue.

FLUORESCENCE 2730.0-2764.0 m; Trace to 30% moderately bright even blue white fluorescence, slow diffuse direct cut, instant diffuse crush cut, faint thin residue.

M148U SAND

2764.0 m – 2798.5 m **SILTSTONE and minor Interbedded SANDSTONE**

SILTSTONE Olive grey to predominantly moderate yellow brown, 20% clay, trace to 5% very fine carbonaceous material (commonly occurring as microlaminations), trace to 2% micro-micaceous, trace pyrite, firm, subfissile to fissile.

SANDSTONE Quartzose, clear to predominantly translucent, predominantly medium to coarse grained, occasionally very coarse grained, moderately sorted, subangular to angular, sub-spherical to sub-elongate, trace weak siliceous cement, trace to 2% argillaceous / silty matrix, 1% siliceous overgrowths, loose grains, fair visual and inferred porosity, fluorescence.

FLUORESCENCE 2764.0-2781.0 m; Trace to 30% moderately bright even blue white fluorescence, slow diffuse direct cut, instant diffuse crush cut, faint thin residue.

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FLUORESCENCE 2781.0-2798.5 m; 20% to trace moderately bright even blue white fluorescence, slow diffuse direct cut, instant diffuse crush cut, faint thin residue.

M151A SAND

2798.5 m – 2816.0 m **SANDSTONE and minor Interbedded SILTSTONE**

SILTSTONE Olive grey to predominantly moderate yellow brown, 20% clay, trace to 5% very fine carbonaceous material (commonly occurring as microlaminations), trace to 2% micro-micaceous, trace pyrite, firm, subfissile to fissile.

SANDSTONE Quartzose, clear to predominantly translucent, predominantly medium to coarse grained, occasionally very coarse grained, moderately sorted, subangular to angular, sub-spherical to sub-elongate, trace weak siliceous cement, trace to 2% argillaceous / silty matrix, 1% siliceous overgrowths, loose grains, fair visual and inferred porosity, fluorescence.

FLUORESCENCE 2798.5-2816.0 m; 20% to trace moderately bright even blue white fluorescence, slow diffuse direct cut, instant diffuse crush cut, faint thin residue.

M151B SAND

2816.0 m – 2952.0 m **SANDSTONE and minor Interbedded SILTSTONE with CLAYSTONE at base**

SILTSTONE Medium light grey to predominantly light brownish grey, moderate yellowish brown in part, 15% to 20% clay, 5% micro-micaceous, 5% fine carbonaceous material, firm, subfissile to fissile.

SANDSTONE Quartzose, clear to predominantly translucent, medium to very coarse grained, predominantly coarse grained, moderately sorted, subangular to angular, common fractured granules, trace siliceous cement, trace to 2% argillaceous / silty matrix, loose grains, fair to good inferred porosity, fluorescence.

CLAYSTONE Medium light grey to light olive grey in part, minor silty, trace calcareous in part, trace micro-micaceous in part, commonly sticky, soft to amorphous, commonly washing out.

FLUORESCENCE 2816.0-2880.0 m; 20% to trace moderately bright even blue white fluorescence, slow diffuse direct cut, instant diffuse crush cut, faint thin residue.

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GAS REPORT

Background Gas was first observed from a depth of 690 mMDRT where it was present in low concentrations of around 1 to 2 units. Present solely as methane (C1) it remained at this low concentration until around 1000 mMDRT where a small increase of about 3 units was observed but this may have been due to increased mud levels at the Gas trap. Gas levels remained higher at about 3 to 5 units until 1465 mMDRT where another increase was observed to around 40 to 50 units with the composition being mainly C1. The background gas dropped off to between 30 to 40 units where it remained until the bit was pulled out of hole due to slow penetration rate at 2781 mMDRT. During the later part of this bit run consistent drop offs in the background gas were attributed to alternating between rotating and sliding intervals.

The lower gas levels for bit run 2 compared to bit run 1 were attributed to the significantly slower drilling rate for bit 2.

On entering the Coarse Clastics at 2680 mMDRT gas levels increased from a background of 1 to 3 units to a background of between 12 and 15 units. This was accompanied by a change in the composition of the gases with a greater proportion of heavier (ethane-C2 to pentane-C5) gases present. Sandstone lithology's tended to have higher levels of C4 and C5 gases and there was a corresponding increase in lighter, C1 and C2 gases in areas with more Siltstone.

On drilling into the secondary target of the M141 sand at there was an increase in gas from a background of 12 to 15 units to a 28 unit peak. This peak was rich in C3 to C5 gases and fluorescence was noted in cuttings samples from 2710 mMDRT onwards. Background gas levels also increased slightly after drilling through this zone.

At 2764 mMDRT the M148U sands were drilled. There was a small increase in gas units shortly after this and fluorescence persisted in the cuttings at this depth, the composition of the gas showed a slightly higher percentage of Methane (C1). At 2770 mMDRT there was a failure of the data acquisition equipment and gas data was not recorded from 2770 mMDRT through to 2781 mMDRT. After a trip to change the bit at 2781 mMDRT gas levels returned to a background of 14 units.

Gas units gradually increased though to the top of the M151B sand at 2816 mMDRT and at 2824 mMDRT there was a peak of 39 units. This peak was relatively richer in the heavier C4 and C5 gases than the gas in the previous section. Gas levels stayed above 35 units until approximately 2854 mMDRT where they gradually started to decrease. The composition of the gas in this section was once again high in C4 and C5 gases with proportionally less C1 than at the top of this section.

From 2854 mMDRT until reaching Total Depth at 2952mMDRT gas units gradually decreased from a maximum of 35 units to 3 units at Total Depth.

Fluorescence was present in the sandstone cuttings from 2705 mMDRT until 2880 mMDRT.

Localised increases in background gas are attributed to both lithology variations and the penetration rate, which was dependant upon the drilling method (being either rotary or slide) carried out at the time. No CO₂ or H₂S was detected while drilling Halibut A-1A.

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Gas peaks through the Latrobe Group

Depth metres	Total Gas units	C ₁ %	C ₂ %	C ₃ %	iC ₄ %	nC ₄ %	iC ₅ %	nC ₅ %
2688.5	13	0.010	0.003	0.009	0.004	0.008	0.004	-
2694.0	17	0.015	0.005	0.012	0.006	0.010	0.005	0.001
2698.5	11	0.009	0.002	0.006	0.003	0.005	0.003	-
2708.5	12	0.017	0.005	0.010	0.003	0.006	0.002	-
2718.5	28	0.041	0.016	0.034	0.011	0.021	0.008	0.001
2727.0	22	0.017	0.006	0.016	0.007	0.014	0.007	0.001
2748.5	16	0.009	0.002	0.008	0.004	0.008	0.004	-
2754.5	14	0.011	0.003	0.008	0.003	0.007	0.003	-
2760.5	11	0.011	0.002	0.006	0.002	0.005	0.002	0.001
2770.0	20	0.016	0.004	0.011	0.005	0.008	0.004	0.001
2791.0	14	0.026	0.004	0.009	0.005	0.007	-	0.001
2802.0	18	0.040	0.009	0.014	0.007	0.012	-	0.001
2824.0	39	0.038	0.011	0.024	0.018	0.027	0.002	0.001
2836.5	41	0.021	0.006	0.019	0.014	0.022	0.002	0.001
2854.0	37	0.018	0.006	0.018	0.014	0.021	0.001	0.001
2885.0	30	0.016	0.005	0.013	0.010	0.016	0.001	0.001
2903.5	22	0.008	0.002	0.007	0.006	0.009	0.001	0.001
2926.0	8	0.002	0.001	-	-	-	-	-
2952.0	3	0.003	0.001	-	-	-	-	-

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