# WEST WHIPTAIL 1

## FINAL WELL REPORT


Prepared by

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# CONTENTS

# Section 1
# General Well Summary

# WELL DATA

| | |
|---|---|
| Operator | : ESSO Australia Ltd |
| Well name | : West Whiptail 1 |
| Country | : Australia |
| Location | : Gippsland Basin |
| Field | : Whiptail |
| Permit | : Vic/L1 |
| Location AMG co-ordinates | : 544,121.32m E 5,758,030.22 m N |
| Location local co-ordinates | : Lat: 38° 19' 29.15" S Long: 147° 30' 17.167" E |
| Profile | : Vertical |
| Reference depth | : Rotary Table |
| RT to Seabed | : 78 metres |
| RT above M.S.L. | : 39 metres |
| Sea-water depth | : 39 metres |
| Proposed total depth | : 1539 metres |
| Actual total depth | : 1539 metres |
| True vertical depth | : 1539 metres |
| Spudded on | : 10th May 2004 |
| Total depth reached on | : 20th May 2004 |

**Drilling Contractor**

| | |
|---|---|
| Drilling Contractor | : ENSCO |
| Rig name | : 102 |
| Rig type | : Jackup |

**Drilling Phases**

| Diameter (inch) | From (mMDRT ) | To (mMDRT ) | Mud Type |
|---|---|---|---|
| 12 ¼" | 120 | 750 | |
| 8 ½" | 750 | 1539 | KCl / Glycol / PHPA |

**Cased Hole**

| Casing Diameter (inch) | Casing Type | Shoe Depth (mMDRT ) |
|---|---|---|
| 13 3/8" | Conductor | 120 |
| 9 5/8" | Surface | 745 |

# MUD LOGGING

Logging Unit Number: 171

Engineers: M. Boyd, M. Smith, P. Rady.

**Sampling Interval**

**Halibut A6A**

| Sample Type | Number of sets | Quantity per set | Sampling interval | From (m) | To (m) |
|---|---|---|---|---|---|
| Washed and Dried | 4 | 100 grams | 30 metres | 150 | 1040 |
| Washed and Dried | 4 | 100 grams | 5 metres | 1040 | 1539 |

**Cuttings Distribution**

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

# DRILLING SUMMARY

Spudded in at 23:00 hours on the 10th of May 2004 West Whiptail 1 was a Near Field Wildcat vertical well designed to test the Intra-Latrobe Group dip closure located between the Whiptail and Mulloway discoveries. The well was drilled to a Total Depth of 1539 mMDRT in a 3 phase drilling programme.

**CONDUCTOR**
The 17½" section was drilled using a 17½" Security EBXT1G bit on a 36" hole opener to a depth of 123 mMDRT, then 30" casing was run and cemented at 120 mMDRT.
Drilling parameters for this section of the hole were not recorded by Geoservices as the unit was in the initial rigging up stage during this section of the well. Returns for this section of the well went directly to the seafloor.
This section was drilled with seawater and HiVis pills, pumped every 15 metres, at TD a 100bbl hi vis pill was pumped. A wiper trip was performed and once back on bottom another 50bbl sweep was pumped, chased with seawater prior to the hole being displaced with 200 bbls of HiVis mud. Another 260 bbls HiVis mud was spotted on bottom once the bit had been pulled to 91m.

**BIT RUN No. 1**
The 12¼" second section was drilled to a depth of 750 mMDRT using a 12¼" Smith S91HPX bit. The $9^{5}/_{8}$" casing was run and cemented at 745 m. Geoservices were rigged up and operational from the start of the 12¼" hole section. Prior to drilling out of the $13^{3}/_{8}$" casing shoe, the hole was displaced to a Seawater/Bentonite Mud system. During the 12¼"open hole section the mud system was diluted with seawater and premix added to control solids build up whilst maintaining the mud properties.
Drilling Parameters
WOB 2 - 5 klbs average 4klbs
RPM 50 - 140, average 100
Torque 1000 – 3780 lb/ft average 2140 lb/ft
Stand Pipe Pressure 2080 – 3300 psi average 2620psi
Flow 640 – 1100 gpm average 1005 gpm
Lithology
Calcarenite and Calcisiltite with minor Sandstone

**BIT RUN No. 2**
The final 8½" section was drilled with a Smith S75HPX bit. The cement, $9^{5}/_{8}$" casing shoe and 3 metres of new formation were drilled, prior to a PIT (14.3 ppg EMW 590 psi) being performed using 9.7 ppg mud. The final section was drilled to TD at 09:00 Hrs on the 20th May 2004 at the prognosed depth of 1539m.
Seawater was initially used to drill out the shoe track. The hole was then displaced to a 9.7ppg KCL / PHPA / Glycol mud system before drilling out the $9^{5}/_{8}$" casing shoe. Once in open hole the mud volume was maintained with additions of premix with mud properties maintained with additions of Glycol, Baracor-129 and Caustic Potash and PHPA. During the Gippsland Limestone formation the Mud weight was maintained at 9.7 ppg but was allowed to increase with the influx of native clays prior to drilling the Lakes Entrance formation with a maximum mud weight of 9.95 ppg being reached by TD. The active mud system was also treated with 5 ppb Baracarb-25 and 5 ppb Baracarb-100 prior to entering the Latrobe formation to keep fluid losses into the formation at a minimum.
Drilling Parameters
WOB 3-10klbs average 5
RPM 70 – 150 average 130
Torque 1100 – 5930 average 2700
Stand Pipe Pressure 2500 - 3850psi average 3400psi
Flow 640 – 870gpm average 840gpm
Lithology
836m – 1179m Calcilutite grading to Marl with minor Siltstone
1179m – TD Sandstone with minor Siltstone grading to Sandstone and interbedded Siltstone and minor Coal with depth.

**Logging and end of well**
West Whiptail 1 reached a Total Depth of 1539 m at 09:00 hours on the 20th May 2004. A wiper trip was made to the $9^{5}/_{8}$" casing shoe prior to pulling out of the hole to run the Schlumberger electrical logs. Four runs were programmed with Run 1-PEX-HALS-HNGS-DSI, completed successfully but whilst running in hole for Run 2 MDT-GR, the tool was unable to progress past 1240m and so was pulled out of hole. Another wiper trip was run and the section between 1240 m to 1270 m was reamed. The MDT run was then completed successfully as were Run 3-CSAT-GR and Run 4-CSAT.

West Whiptail 1 was plugged back with 6 cement plugs and abandoned.

# PRESSURE ANALYSIS

West Whiptail – 1 was a normal pressured well. The pore pressure detection while drilling was monitored and interpreted using non-quantitative analysis. The data used for measuring the well pressure and balance were:
Torque and drag, including overpull when picking up the string and tripping.
Pit levels
Gas in the mud – background gas, connection gas, trip gas, CO2 and H2S.
The gas ratio analysis – concentrations of heavier gases.
Cuttings at surface – shape and size, shale analysis.
Temperature of the mud and anomalies associated with.
Mud resistivity.
Changes in these parameters can show whether a well has variations downhole indicating a zone of abnormal pressure. The drilling of the well had no problems associated with an overpressure zone but the presence of connection gases from 1200m indicated an underbalanced mud system for this section of the well. Quantitative detection of pore pressure requires the use of an overpressure log comparing drilling parameters with changes in lithology, compaction and pore pressure. Geoservices use a 'D'-exponent package using the Jordan and Shirley formula, modified for mud density employing the standard 'soft' values for overburden (S) and stress ratio (K). The Eaton models are used to calculate both formation and fracture pressures. Though the package was originally designed for use in under compacted shales in the Gulf of Mexico. Trends can be seen in any well using the logs for interpretation but can be limited. It is also requires constant drilling, with large shale sections present. The use of PDC bits does not help in interpretation of zones of pressure due to differences in drilling character, also with increased rotary with the use of down hole motors.

A KCL/PHPA/Glycol water based mud system was used to drill the 8½ section. mud weight ranged from 9.7 ppg at the start of the section to 9.85 ppg by TD at 1539 m.

A LOT was conducted after drilling out of the $9^5/_8$"casing shoe at 745mMDRT, with a mud weight of 9.7ppg and 590psi, an EMW of 14.3ppg was reached. During the drilling of the well, the ECD ranged from ( 8.7 ppg in 12¼" hole) 10.70 to 10.85 ppg in 8½" hole section.

The trends shown in this well and changes in anomalies, have been seen to be due to changes in lithology, mud weight and drilling parameters. Within the Limestones drilled it is possible to get over-pressured stringers of Claystone though no anomalies were seen. The well had no problems while drilling and changes in trends and gas can be seen to coincide with the lithology types and formation changes. Gas was low through-out the well. Minor problems seen were due to clays when tripping.

# WELL PROFILE

**Rotary Table to Mean Sea Level 39.0**

**Rotary Table to Sea Bed 78 m**
**30" Conductor Set at 120 m**
Plug 2 set at 110m – 170m

Plug 1e set at 669m – 843m

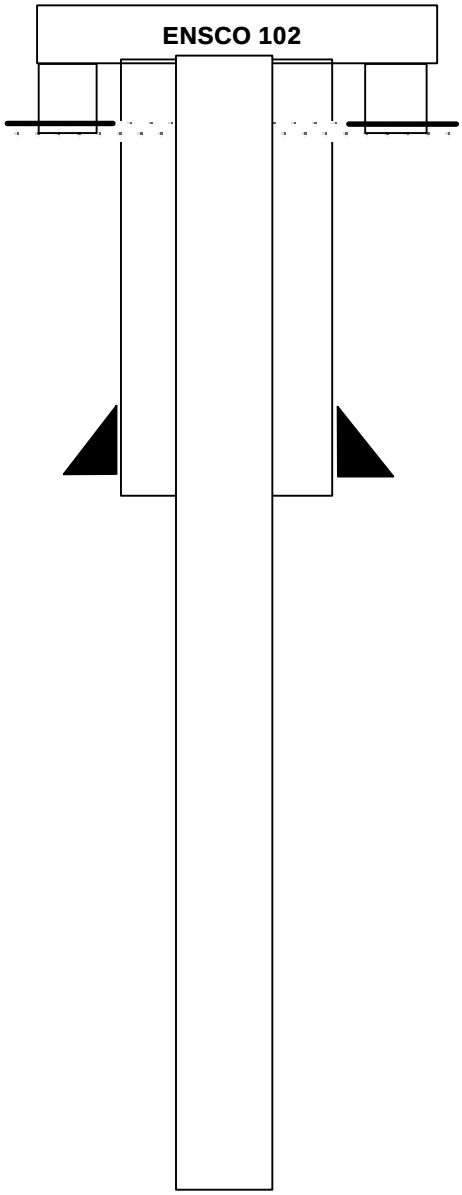
**$9^{5}/_{8}$" Casing Set at 745 m**

Plug 1d set at 843m – 1017m

Plug 1c set at 1017m – 1191m

Plug 1b set at 1191m – 1365m

Plug 1a set at 1365m – 1539m




**ENSCO 102**

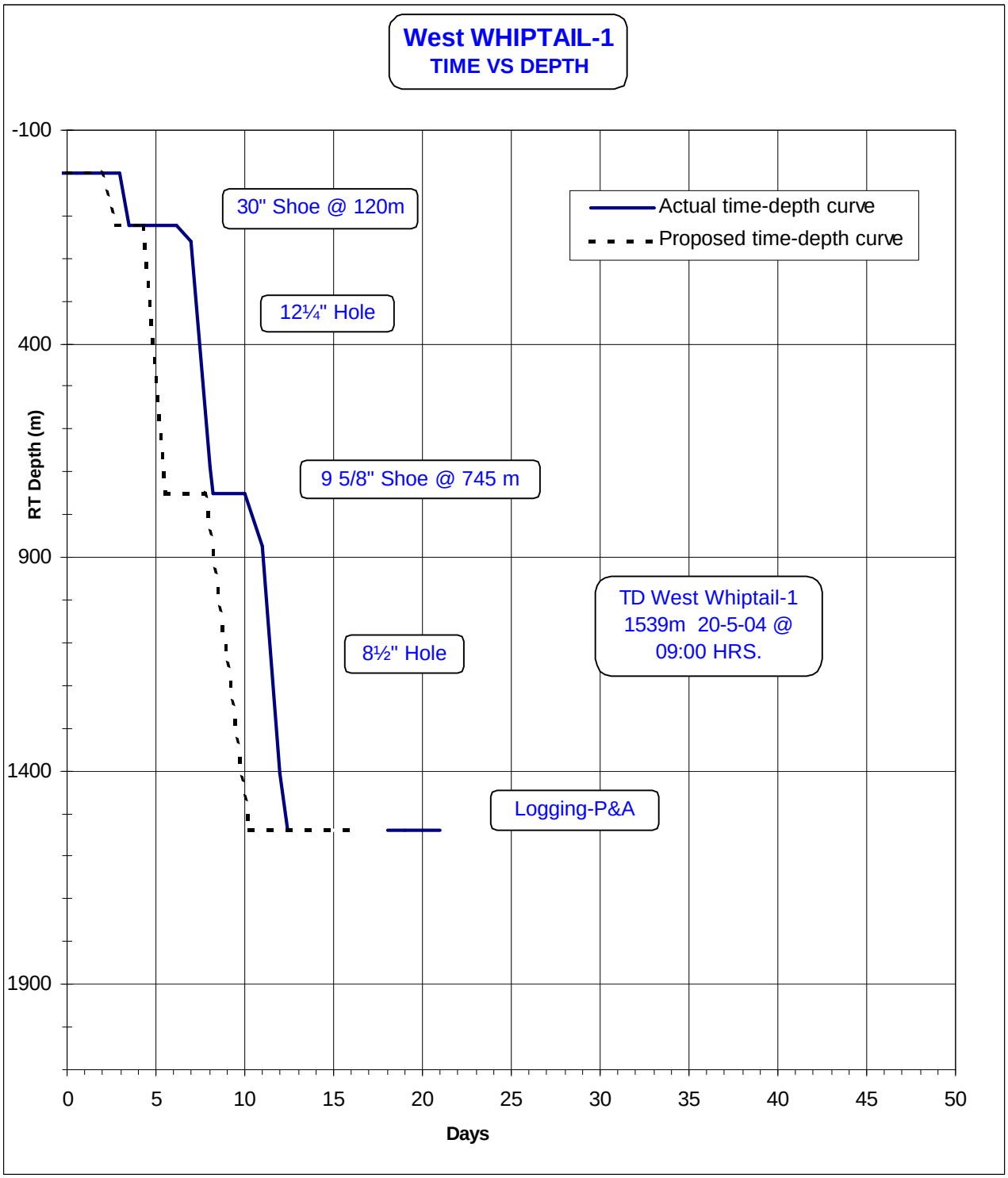
**Spudded West Whiptail 1**
**10th May 2004**

**12¼" Hole Drilled to 750 m**

**745.0 m – 1539.0 m**
**Mud Weight 9.0 – 9.9 ppg**

**8 ½" Hole drilled to 1539.0 m**

## DAYS vs. DEPTH



## BIT RUN SUMMARY

| BIT | Size (") | Type | Jets | In (m) | Out (m) | ROP m/hr | Hours | Condition |
|---|---|---|---|---|---|---|---|---|
| 2 | 12¼ | SMITH S91HPX | 9 x 11 | 120 | 750 | 27.1 | 23.24 | 1-1-CT-GX-O-NO-TD |
| 3 | 8½ | SMITH S75HPX | 7 x 11 | 750 | 1539 | 24.3 | 32.37 | 7-7-LT-X-I-ER-TD |

## BIT HYDRAULICS SUMMARY

| Bit No. | 2 | Bit No. | 2 | Bit No. | 3 |
|---|---|---|---|---|---|
| **Depth** | 150 | **Depth** | 690 | **Depth** | 840 |
| **Size** | 12¼" | **Size** | 12¼" | **Size** | 8 ½" |
| **Jets** | 9 x 11 | **Jets** | 9 x 11 | **Jets** | 7 x 11 |
| **Mud Density (ppg)** | 8.55 | **Mud Density (ppg)** | 9 | **Mud Density (ppg)** | 9.8 |
| **Mud Type** | KCL PHPA Glycol | **Mud Type** | KCL PHPA Glycol | **Mud Type** | KCL PHPA Glycol |
| **PV** | 4 | **PV** | 7 | **PV** | 12 |
| **YP** | 14 | **YP** | 33 | **YP** | 19 |
| **FLOW (gpm)** | 850 | **FLOW (gpm)** | 1070 | **FLOW (gpm)** | 820 |
| **Hydraulic Power** | 233.5 hp | **Hydraulic Power** | 488.8 | **Hydraulic Power** | 714.2 |
| **Bit Pressure Loss** | 464.1 psi | **Bit Pressure Loss** | 774 | **Bit Pressure Loss** | 1468.7 |
| **Pipe Pressure Loss** | 454.6 psi | **Pipe Pressure Loss** | 1552 | **Pipe Pressure Loss** | 1042.3 |
| **ECD** | 8.74 | **ECD** | 9.2 | **ECD** | 10.75 |
| **Annular Velocities** | | **Annular Velocities** | | **Annular Velocities** | |
| **DP – OH** | 2.2 | **DP – OH** | 10.1 | **DP – OH** | 85.9 |
| **DC – OH** | 1.9 | **DC – OH** | 4.4 | **DC – OH** | 26.9 |
| **Total Hydr power** | 583 | **Total Hydr power** | 1717 | **Total Hydr power** | 1409 |

| **Bit No.** | **3** | **Bit No.** | **3** | | |
|---|---|---|---|---|---|
| **Depth** | 1330 | **Depth** | 1539 m | | |
| **Size** | 8 ½" | **Size** | 8 ½" | | |
| **Jets** | 7 x 11 | **Jets** | 7 x 11 | | |
| **Mud Density (ppg)** | 9.85 | **Mud Density (ppg)** | 9.9 | | |
| **Mud Type** | KCL PHPA Glycol | **Mud Type** | KCL PHPA Glycol | | |
| **PV** | 18 | **PV** | 18 | | |
| **YP** | 25 | **YP** | 25 | | |
| **FLOW (gpm)** | 850 | **FLOW (gpm)** | 850 | | |
| **Hydraulic Power** | 795.2 | **Hydraulic Power** | 795.2 | | |
| **Bit Pressure Loss** | 1580.5 | **Bit Pressure Loss** | 1580.5 | | |
| **Pipe Pressure Loss** | 1435.8 | **Pipe Pressure Loss** | 1573.6 | | |
| **ECD** | 10.85 | **ECD** | 10.84 | | |
| **Annular Velocities** | | **Annular Velocities** | | | |
| **DP – OH** | 107.1 | **DP – OH** | 107.1 | | |
| **DC – OH** | 28.7 | **DC – OH** | 28.7 | | |
| **Total Hydr power** | 1768 | **Total Hydr power** | 1855 | | |

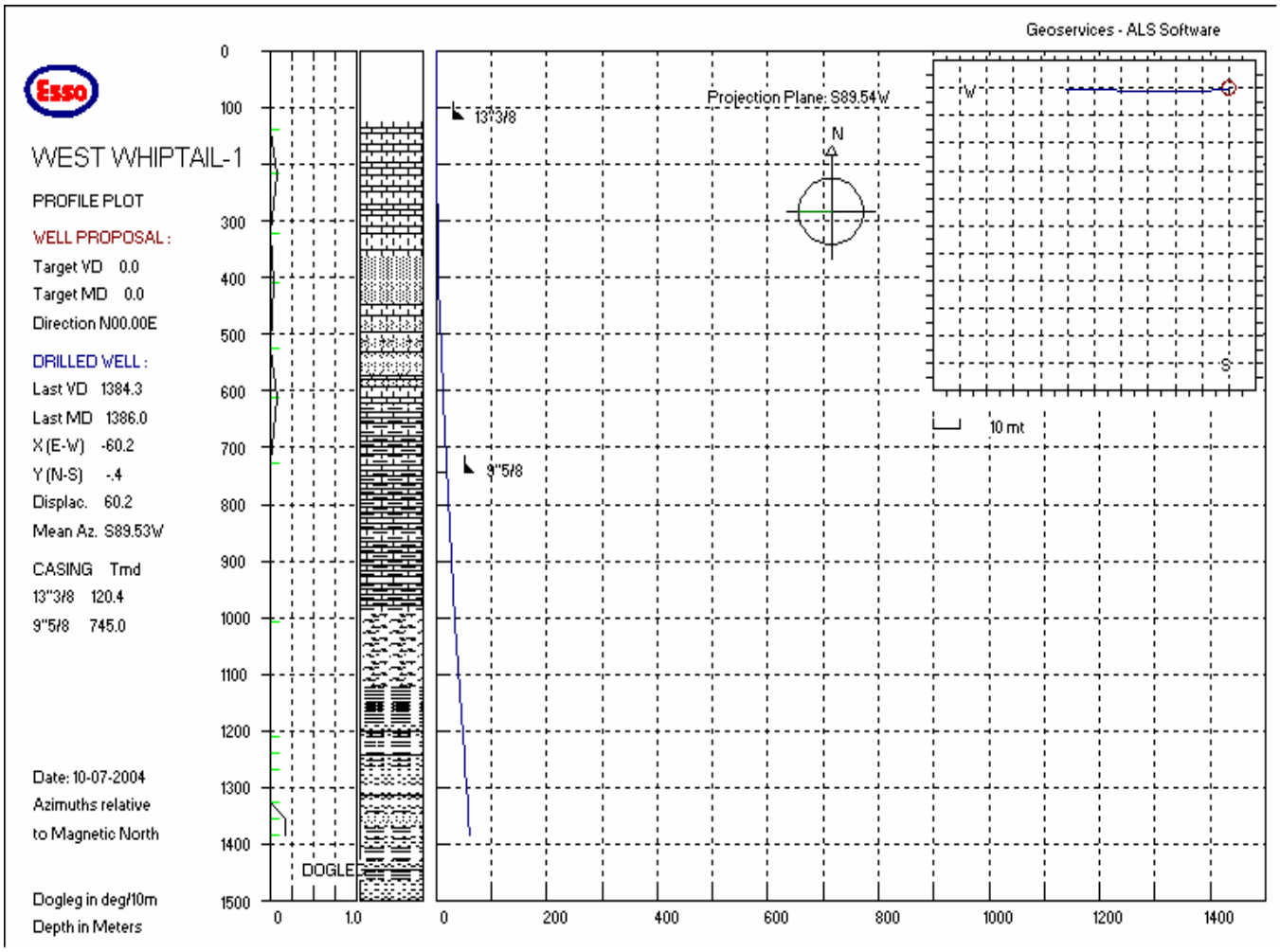
## CASING DATA

| **Type** | **Size** (Inches) | **Weight** (lb/ft) | **Grade** | **Thread** | **Depth** (mMDRT) |
|---|---|---|---|---|---|
| Conductor | 30 | 310 | X-52 | RL-4 | 120 |
| Surface | 9 5/8 | 47 | L-80 | LTC | 745 |

## CEMENTING DATA

| **Casing / Plug 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) |
|---|---|---|---|---|---|---|---|---|
| 30”x20”x 13 3/8" | CLASS G | 1084 | 1% CaCl<br>0.3 gal/bbl<br>NF-6 | 130 | 220 | 15.9 | 121 m<br>Seafloor (78 m) | 1408 psi |
| 9 5/8" | CLASS G (lead)<br>CLASS G (tail) | 415(lead)<br>323(tail) | Econolite 14.6gal / 10bbl (lead)<br>Neat Seawater (tail) | 130 (lead)<br>40 (tail) | 164 (lead)<br>68 (tail) | 12.5 (lead)<br>15.8 (tail) | 89 m<br>745 m | 1900 psi |
| PLUGS 1a | La Class G | 197 | 3 gal/10 bbl HR6L + 20 GAL/10BBL HAL 413 | 24 | 40.7 | 15.8 | 1365m – 1539m | Balanced plug |
| 1b | Class G | 208 | 3 gal/10 bbl HR6L + 20 GAL/10BBL HAL 413 | 25 | 43 | 15.8 | 1191 m– 1365 m | Balanced plug |
| 1c | Class G | 252 | 3 gal/10 bbl HR6L + 20 GAL/10BBL HAL 413 | 31 | 52.15 | 15.8 | 1017 – 1191 | Balanced plug |
| 1d | Class G | 222 | 3 gal/10 bbl HR6L + 20 GAL/10BBL HAL 413 | 27 | 45.86 | 15.8 | 843 – 1017m | Balanced plug |
| 1e | Class G | 222 | 1% CaCl | 25 | 42.6 | 15.9 | 669m – 843m | Tag cmt 675m |
| 2 | Class G | 70 | 1% CaCl | 8.5 | 14.6 | 15.9 | 110m - 170m | |

# WELL DIRECTIONAL PROFILE AND SURVEY DATA




| TMD | TVD | DRIFT | BEARING | E-W | N-S | DOGLEG |
|---|---|---|---|---|---|---|
| 140.0 | 140.0 | 0.21 | 236.92 | 0.2 W | 0.1 S | 0 |
| 216.7 | 216.7 | 0.73 | 264.77 | 0.8 W | 0.3 S | 0.07 |
| 322.6 | 322.6 | 1.12 | 265.47 | 2.5 W | 0.4 S | 0 |
| 409.8 | 409.8 | 1.37 | 264.38 | 4.4 W | 0.6 S | 0.03 |
| 526.0 | 525.9 | 2.92 | 262.43 | 8.7 W | 1.1 S | 0 |
| 613.1 | 612.9 | 2.48 | 270.68 | 12.8 W | 1.4 S | 0.07 |
| 729.4 | 729.0 | 3.25 | 271.35 | 18.6 W | 1.3 S | 0 |
| 1008.0 | 1007.2 | 3.50 | 271.00 | 35.0 W | 0.9 S | 0 |
| 1212.0 | 1210.7 | 4.00 | 271.00 | 48.4 W | 0.7 S | 0 |
| 1241.0 | 1239.6 | 4.00 | 271.00 | 50.4 W | 0.7 S | 0.01 |
| 1270.0 | 1268.6 | 4.00 | 271.00 | 52.4 W | 0.6 S | 0.01 |
| 1328.0 | 1326.4 | 4.00 | 271.00 | 56.5 W | 0.6 S | 0 |
| 1357.0 | 1355.4 | 3.50 | 271.00 | 58.3 W | 0.5 S | 0.17 |
| 1386.0 | 1384.3 | 4.00 | 271.00 | 60.2 W | 0.5 S | 0.17 |

# WELL DIARY

14th May 2004 — Nipple up BOPs, function test. Make up 12¼" BHA and run in hole, drill out shoe track, displace to mud and drill ahead in 12.25" hole.

15th May 2004 — Continue to drill ahead in 12¼" hole from 161m to 687 m.

16th May 2004 — Drill 12¼" hole from 687 m 750 m. Circulate hole clean rotating and reciprocating pipe. Displace hole with 400bbl of Hi Vis mud. Drop Gyro survey and pump 25bbl slug. Pull out of hole. Clear rig floor of excess equipment and clean mud from rig floor. Make up jetting tool and jet BOP stack. Rack back Jetting tool. Prepare rig floor to run $9^5/_8$" casing. Make up shoe track and run $9^5/_8$" casing.

17th May 2004 — Continue to run in hole with $9^5/_8$" casing. Pick up casing hanger and landing joints and set casing hanger into wellhead. Install diverter and hold pre job meeting. Pick up and make up cement head and lines. Displace and circulate hole with seawater. Pump 163 bbl of lead slurry (12.5ppg) and 68 bbl of tail slurry (15.8ppg) as per program. Displace cement with 20 bbl from cement unit and then with 160 bbl from rig. Bump plug with 1500 psi and circulate casing with seawater. Pump 330 bbl of sugar water; make up tool and jet stack. Make up and lock in seal assembly and casing hanger. Rig up to perform BOP tests.

18th May 2004 — Rig up to perform BOP tests. Test BOPs; lay down closing tools, jars and stabilisers. Hold pre job meeting. Pick up and make up 8½" BHA as running in hole. Drill out stage collar and continue to run in hole to tag cement at 720 m. Pressure test and drill cement to 740 m. Perform choke drill and pressure test Top Drive IBOP valves. Drill out cement and shoe track from 740 m to 745 m and clean out rat hole to 750 m. Drill 3 m of new formation to 753 m. Perform leak off test with 9.7ppg mud to 590psi EMW of 14.3ppg. Drill 8½" hole from 753 m to 875 m.

19th May 2004 — Continue to drill 8½" hole with surveys from 875 m to 1406 m.

20th May 2004 — Continue to drill 8½" hole with surveys from 1406 m to 1539 m. Circulate bottoms up and pull out of hole to shoe. Run back in hole and circulate hole clean. Pull out of hole, lay out 8½" BHA and rig up to run wireline logs. Run in hole with Schlumberger wireline.

21st May 2004 — Continue to run in hole with Schlumberger wireline to 1480 m. Log up from 1480 m to 1380 m. Run in hole and tag at 1529 m. Log from 1529 m to 745 m. Log casing from 745 m to surface. Remove radioactive source and lay out logging tools. Make up Run #2 tools and run in hole and hang up at 1241 m. Pull out of hole and lay out tools. Make up wiper trip BHA and run in hole to shoe and fill pipe. Run in hole and hang up at 1240 m. Wash and ream from 1240 m to 1290 m; circulate hole clean. Run in hole to 1522 m and wash and ream to TD. Circulate hole clean; condition mud; flow check and pump slug. Pull out of hole to tight spot at 1267 m; ream through and circulate clean. Pull out of hole to shoe and flow check. Pull out of hole and rack back BHA. Clear floor and rig up Schlumberger.

22nd May 2004 — Make up Run #2A tools and run in hole to 1345 m. Log from 1345 m to 1475 m. Pull out of hole and lay out tools. Make up Run #3 tools and run in hole. Hang up at 1271 m. Log up to 100 m; survey every 50 m. Pull out of hole and lay out tools. Rig down wire line and clear floor. Pick up and run $2^7/_8$" tubing and mule shoe to 243 m.

23rd May 2004 — Run in hole from 243 m to 1539 m; wash last stand to bottom. Circulate and condition mud. Pump and displace plug 1a. Pull out of hole to 1365 m and pump and displace plug 1b. Pull out of hole to 1191 m and reverse circulate. Pull back to 1170 m and circulate hole clean. Run in hole to 1191 m and pump and displace plug 1c. Pull out of hole to 1017 m and pump and displace plug 1d. Pull out of hole to 843 m and reverse circulate. Pull back to 825 m and circulate hole clean. Run in hole to 843 m and pump and displace plug 1e. Pull out of hole to 600 m and reverse circulate. Pull back to 550 m and circulate hole clean and displace to inhibited mud. Pull out of hole to 520 m and WOC.

24th May 2004

Continue to WOC. Run in hole and tag cement at 675 m. Pull out of hole and lay out tubing. Make up, run and set EZSV at 170 m. Pump and displace cement plug. Pull back to 100 m and displace casing to seawater. Pull out of hole with setting tool. Flush diverter lines and BOPs. Test cement to 1000 psi against blind rams. Attempt to retrieve seal assembly, jet BOP and retry to retrieve seal assembly. Lay out excess DP, run in hole and tag cement at 117 m. Nipple down BOPs and lines, while laying out DP.

25th May 2004

Lift BOPs; hoist gearbox failure stops operations. Lay down BOPs. Lay out 5" DP. Make up $9^5/_8$" mill / jetting tool assembly and jet seal assembly. Retrieve $9^5/_8$" seal assembly. Make up and run $9^5/_8$" casing cutter. Make casing cut at 87 m. Pull and lay out $9^5/_8$" casing. Make up and run in hole with hanger running tool. Attempt to engage hanger. Pull out of hole and make up $9^5/_8$" mill / jetting assembly.

# Section 2
# Geological Summary

# FORMATION TOPS

| DESCRIPTION | MD (m) RT | TVD (m) RT | TVD (m) SS |
|---|---|---|---|
| Top Gippsland Limestone | 78.6 | 78.6 | 39.6 |
| Lakes Entrance | 815 | 814.5 | 775.5 |
| Latrobe Group (TOL) | 1179 | 1178.5 | 1139.5 |
| Top Coarse Clastics | 1183 | 1182.5 | 1143.5 |
| Top N1.0 | 1403 | 1401.5 | 1362.5 |
| Top N1.1 | 1406 | 1404.5 | 1365.5 |
| Base N1.4 | 1430 | 1428.5 | 1389.5 |
| Total Depth | 1539 | 1539 | 1500 |

# GEOLOGICAL SUMMARY

**GIPPSLAND LIMESTONE**

120 m - 815 m CALCARENITE and CALCISILTITE with minor SANDSTONE

CALCARENITE Off white to light grey locally pale grey, light grey brown in parts, very fine to coarse, predominantly fine, moderately well sorted, sub angular to sub rounded, abundant calcareous cement and matrix, trace to common microfossil fragments, trace glauconite, moderately hard, tight visual porosity, trace mineral fluorescence.

CALCISILTITE Pale grey mottled white to off white, grading to MARL in part blocky in part, firm, occasional fossil fragments, trace glauconite, argillaceous.

SANDSTONE Clear to translucent, medium dark yellowish orange staining, very fine to coarse, predominantly fine to medium, poorly sorted, moderately weak calcareous and siliceous cement, loose, very good inferred porosity, no fluorescence.

**LAKES ENTRANCE FORMATION**

815 m – 1179 m CALCILUTITE grading to MARL with depth and minor SILTSTONE.

CALCILUTITE Medium grey, firm to friable, sub-blocky to blocky, argillaceous, silty in part, trace disseminated pyrite, trace glauconitic, CALCILUTITE grading to ARGILLACEOUS CALCILUTITE.

MARL light to medium grey, very pale green grey, very soft to rare firm, sub-blocky, silty in part, trace foraminifera, trace nodular glauconitic.

SILTSTONE Brown grey, very soft to soft, argillaceous, calcareous to very calcareous, rare very fine disseminated pyrite, very glauconitic in part.

**TOP of LATROBE GROUP**

1179 m – 1185 m SILTSTONE

SILTSTONE brown grey to dark brown, very soft to soft, sub-blocky, argillaceous, very calcareous, trace carbonaceous speaks, rare disseminated & nodular pyrite, very glauconitic in part.

**TOP of COARSE CLASTICS**

| | |
|---|---|
| 1185 m - 1406 m | SANDSTONE with minor SILTSTONE and rare COAL |
| SANDSTONE | Clear to off white, fine to very coarse, predominantly medium to very coarse, poorly sorted to moderately sorted with depth, sub rounded to sub-angular, weak siliceous cement, trace pyrite cement, abundant quartz overgrowths, trace white silty matrix, friable, good inferred porosity. |
| FLUORESCENCE | 1205 m to 1220 m; 5% decreasing to trace, moderately brittle, yellow, patchy to solid fluorescence, slow diffuse to instant yellow crush cut, thin ring residual. |
| FLUORESCENCE | 1260 m to 1270 m; 5% decreasing to trace, dull, solid, yellow fluorescence, slow crush cut, thin yellow white film residual. |
| SILTSTONE | 1) Pale to medium brown, argillaceous, common carbonaceous, lithics and glauconitic fragments, firm to mod hard, sub-blocky.<br><br>2) Very pale green to grey, arenaceous good to very fine SANDSTONE, common lithics fragments, moderately hard, sub-blocky. |
| COAL | Black, dull, grading to carbonaceous SILTSTONE, brittle, blocky. |

**N1.0**

| | |
|---|---|
| 1406 m - 1409.5 m | Interbedded SANDSTONE and SILTSTONE. |
| SANDSTONE | Clear to translucent, loose, fine to very coarse, predominantly coarse to very coarse, poorly sorted, sub-rounded to sub-angular, occasional angular fractured grains, clean, trace white argillaceous matrix, good inferred porosity, no fluorescence. |
| SILTSTONE | 1) Light to medium brown, occasional brown black, soft to firm, sub-blocky to fissile, argillaceous to occasional arenaceous, common carbonaceous material and carbonaceous laminae.<br><br>2) Trace – very pale green grey, firm, sub-blocky, argillaceous, very calcareous. |

**N1.1 and N1.2**

| | |
|---|---|
| 1409.5 - 1414.5 m | Interbedded SANDSTONE and SILTSTONE. |
| SANDSTONE | Clear to translucent, loose, fine to coarse, rarely very coarse, moderately sorted, sub rounded to angular, clean, trace siliceous and pyritic cement, good inferred porosity. |
| FLUORESCENCE | dull yellow pinpoint, no direct cut, trace very slow crush cut, trace white residue ring. |
| SILTSTONE | Light to medium brown, occasionally brown / black, soft to firm, sub blocky to fissile, argillaceous to occasionally arenaceous, common carbonaceous material and carbonaceous laminae. |

**Base of N1.2**

| | |
|---|---|
| 1414.5 m - 1418 m | Interbedded SANDSTONE, SILTSTONE and COAL |
| SANDSTONE | Clear - translucent, loose, fine - very coarse, predominantly coarse - very coarse, poorly sorted, sub rounded - sub angular, occasional angular fractured grains, clean, trace white argillaceous matrix, good inferred porosity. |
| SILTSTONE | (1) Light to medium brown, occasionally brown / black, soft to firm, sub blocky to fissile, argillaceous to occasionally arenaceous, common carbonaceous material and carbonaceous laminae.<br><br>(2) Trace - very pale green/grey, firm, sub blocky, argillaceous, very calcareous. |

| | |
|---|---|
| COAL | Black, dull - vitreous, firm, brittle, uneven - sub conchoidal fracture, slightly silty in part. |

**N1.3 and N1.4**

1418 m - 1432 m

| | |
|---|---|
| SANDSTONE | Clear - translucent, loose, coarse - very coarse, predominantly, poorly sorted, sub rounded - sub angular, occasional angular fractured grains, clean, trace weak siliceous cement, good inferred porosity. |
| SILTSTONE | Brownish grey - brownish black, firm, blocky - fissile, brittle in part, micro micaceous, very carbonaceous, common carbonaceous laminae and gradating to CARBONACEOUS SILTSTONE. |
| COAL | Black, dull - vitreous, firm, brittle, uneven - sub conchoidal fracture, slightly silty in part. |

**BaseN1.4**

1432 m - 1539 m

| | |
|---|---|
| SANDSTONE: | Clear to translucent, loose, medium to very coarse, common coarse to very coarse, sub-angular to sub-rounded, occasional very angular and fractured, poor sorted, clean, trace off white argillaceous matrix, good inferred porosity, no fluorescence. |
| SILTSTONE | (1) Light brown grey, occasional light brown, very argillaceous, occasional carbonaceous speaks and laminations, very soft, dispersive in part, amorphous.<br>(2) Trace – green grey, argillaceous, calcareous, occasional glauconitic, firm, sub-blocky to blocky. |
| **1539 m** | **TD** |

# GAS REPORT

No gas was recorded on drilling out of the $13^{3}/_{8}$" Conductor shoe at 120 mMDRT and not until 270 mMDRT first gas was recorded, which then remained steady at around 0.5 units until reaching the Surface Casing depth at 750 mMDRT. A compositional breakdown of this gas showed that it was solely Methane (C1). Upon drilling out of the $9^{5}/_{8}$" Casing Shoe gas levels rose to around 2 units but dropped on approach to the Top of the Lakes entrance at 815 mMDRT. A visual inspection revealed debris wrapped around the gas trap, but once cleared gas levels gradually rose through out the Lakes entrance until peaking at around 35 units at 1150 mMDRT prior to drilling into the Top of the Latrobe Group. Through the Base of the Lakes Entrance formation the first of the heavier gases C2 and C3 were recorded, with C4 and C5 seen immediately above the Latrobe Group top.

Through the Top of the Latrobe Group however after the gas peaked at 1192 mMDRT at around 25 units, gas levels dropped off to below 5 units where they remained through out the coarse Clastics with the heavier gases dropping off until primarily C1 and C2 were present. The highest peaks throughout this section were due to either the presence of interbedded Coals, connection gases or primarily because of the inpermeability of the overlying cap rock to hydrocarbons. The Fluorescence that was seen within this section occurred with gas peaks of between 15 to 20 units.

Gas levels increased again at the base of the coarse Clastics and remained between 15 and 30 units upon drilling into the N1.0, N1.1 and N1.2 package. Fluorescence was present between 1410 mMDRT to 1414.5 mMDRT. Through the Base N1.2, N1.3 N1.4 sands Gas levels dropped back to around 5 units right through to TD at 1539 m peak at 1432 m once through the N1.4 sand of around 21 units.

Localised increases in background gas are attributed to both lithology variations and the penetration rate. The presence of connection gas signified that drilling pressures were on balance. No CO2 or H2S was detected while drilling West Whiptail 1 well.

## GAS PEAKS THROUGH THE LATROBE GROUP

| Depth metres | Total Gas units | C1 ppm | C2 ppm | C3 ppm | iC4 ppm | nC4 ppm | iC5 ppm | nC5 ppm |
|---|---|---|---|---|---|---|---|---|
| 1191.5 | 24.7 | 3792 | 97 | 20 | 10 | 17 | 8 | 0 |
| 1202.5 | 23.3 | 2387 | 81 | 34 | 277 | 20 | 81 | 1 |
| 1245.5 | 18.2 | 2328 | 310 | 11 | 13 | 2 | 7 | 0 |
| 1261.0 | 20.7 | 2707 | 364 | 8 | 9 | 1 | 5 | 1 |
| 1280.0 | 10.4 | 1287 | 116 | 4 | 4 | 1 | 17 | 1 |
| 1314.5 | 10.0 | 1286 | 119 | 5 | 3 | 1 | 9 | 0 |
| 1324 | 8 | 1002 | 76 | 5 | 3 | 1 | 8 | 1 |
| 1348.5 | 7 | 840 | 56 | 6 | 5 | 1 | 7 | 0 |
| 1405.5 | 30.0 | 3830 | 149 | 111 | 12 | 7 | 4 | 1 |
| 1408.5 | 31.6 | 3867 | 154 | 87 | 18 | 16 | 12 | 8 |
| 1415.0 | 28.5 | 3399 | 310 | 59 | 15 | 11 | 12 | 6 |
| 1434.0 | 20.9 | 2221 | 157 | 82 | 31 | 24 | 12 | 6 |
| 1465.5 | 12.3 | 1058 | 75 | 54 | 20 | 22 | 16 | 6 |
| 1515.5 | 7.5 | 567 | 38 | 34 | 16 | 19 | 11 | 6 |

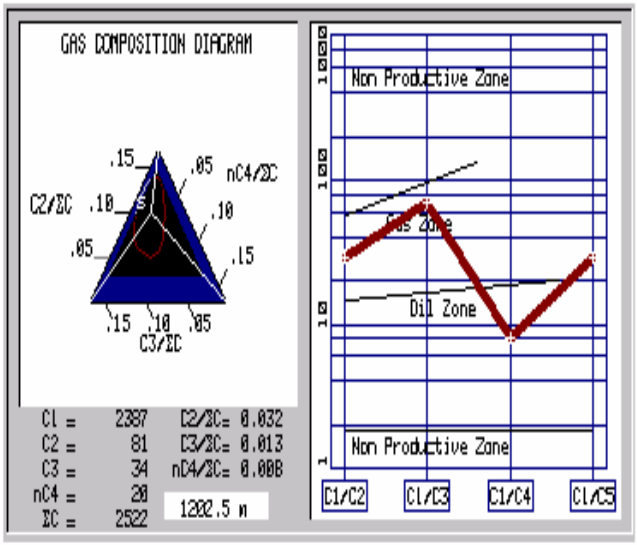
## FLUORESCENCE AND ASSOCIATED GAS

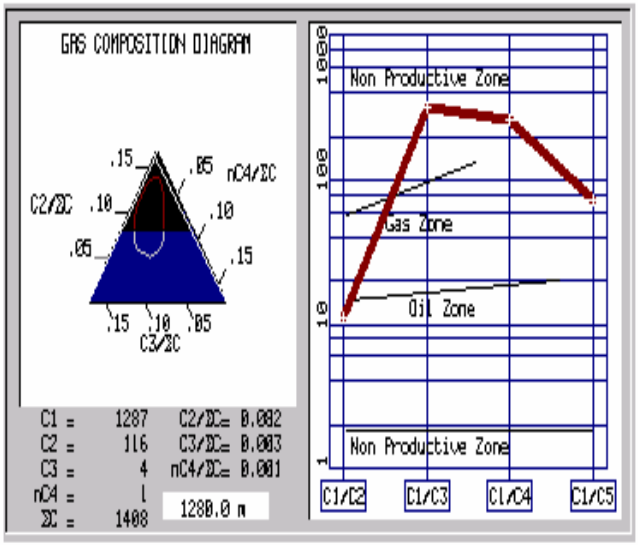
| Depth Metres | Total Gas units | C1 ppm | C2 ppm | C3 ppm | iC4 ppm | nC4 ppm | iC5 ppm | nC5 ppm |
|---|---|---|---|---|---|---|---|---|
| 1205 – 1220 | | | | | | | | |
| 1205 | 15 | 1330 | 50 | 20 | 155 | 14 | 39 | 2 |
| 1212 | 8 | 642 | 26 | 12 | 60 | 9 | 20 | 1 |
| 1220 | 5 | 315 | 14 | 6 | 32 | 5 | 14 | 1 |
| 1260 – 1270 | | | | | | | | |
| 1261 | 21 | 2396 | 325 | 7 | 8 | 1 | 5 | 1 |
| 1269 | 6 | 630 | 75 | 3 | 5 | 1 | 17 | 1 |
| 1410 - 1415 | | | | | | | | |
| 1410 | 20 | 2156 | 88 | 60 | 17 | 12 | 15 | 7 |
| 1415 | 29 | 3399 | 310 | 59 | 15 | 11 | 12 | 6 |

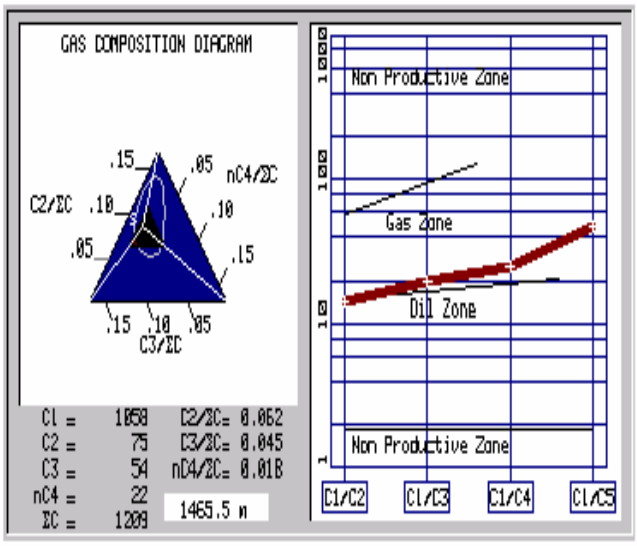
## MDT SUMMARY

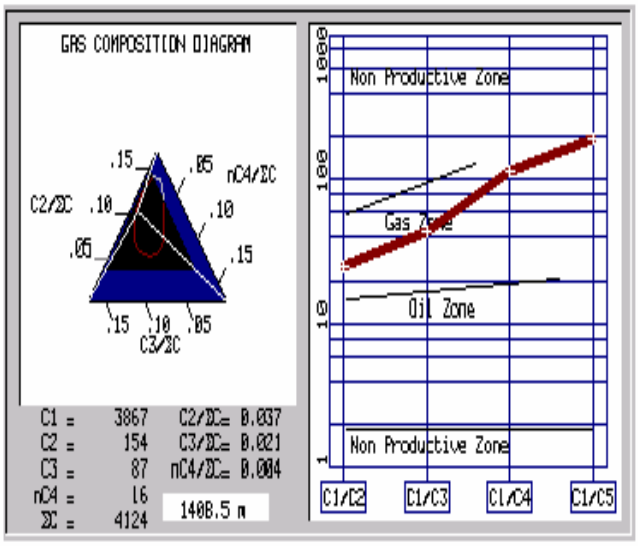
| Point No. | Depth M | TVD M | Drawdown Mobility MD/CP | Mud Pressure Before PSIA | Mud Pressure After PSIA | Formation Pressure PSIA | Test Type |
|---|---|---|---|---|---|---|---|
| 1 | 1364.0 | 1322.5 | 15860.0 | 2434.36 | 2434.21 | 1867.84 | 20cc drawdown |
| 2 | 1373.0 | 1331.5 | 118.6 | 2450.29 | 2450.05 | 1880.38 | 20cc drawdown |
| 3 | 1390.0 | 1348.5 | 14665.0 | 2480.09 | 2480.02 | 1903.99 | 20cc drawdown |
| 4 | 1398.4 | 1356.9 | 767.2 | 2494.99 | 2494.87 | 1915.67 | 20cc drawdown |
| 5 | 1407.0 | 1365.5 | | 2510.20 | | | Retrace |
| 6 | 1406.5 | 1365.0 | | 2509.28 | | | 5cc drawdown |
| 7 | 1407.5 | 1366.0 | | 2511.04 | | | Press Ltd drawdown |
| 8 | 1410.5 | 1369.0 | 2362.2 | 2516.19 | 2516.13 | 1936.18 | 10cc drawdown |
| 9 | 1412.5 | 1371.0 | 193.2 | 2519.70 | 2519.61 | 1938.40 | 20cc drawdown |
| 10 | 1414.0 | 1372.5 | 4.1 | 2522.38 | 2522.15 | 1940.13 | 20cc drawdown |
| 11 | 1420.5 | 1379.0 | 252.7 | 2533.72 | 2533.62 | 1946.78 | 20cc drawdown |
| 12 | 1425.0 | 1383.5 | 3803.0 | 2541.62 | 2541.55 | 1953.00 | 20cc drawdown |
| 13 | 1430.5 | 1389.0 | 2084.0 | 2551.27 | 2551.24 | 1960.67 | 20cc drawdown |
| 14 | 1440.0 | 1398.5 | 506.0 | 2568.18 | 2568.16 | 1976.03 | 20cc drawdown |
| 15 | 1461.0 | 1419.5 | 3363.0 | 2605.40 | 2605.27 | 2006.43 | 20cc drawdown |
| 16 | 1470.0 | 1428.5 | 4115.0 | 2621.50 | 2621.37 | 2019.67 | 20cc drawdown |
| 17 | 1412.5 | 1371.0 | | 2519.31 | 2519.32 | 1938.47 | Diverted flow |
| 18 | 1418.5 | 1377.0 | | 2529.22 | 2529.28 | | 10cc drawdown |
| 19 | 1419.0 | 1377.5 | 116.0 | 2580.08 | 2530.06 | 1945.19 | Diverted flow |
| 20 | 1413.8 | 1372.3 | 1.3 | 2520.76 | 2520.74 | 1940.99 | 20cc drawdown |
| 21 | 1413.5 | 1372.0 | 71.4 | 2520.19 | 2520.54 | 1939.82 | 20cc drawdown |

# GAS COMPOSITION DIAGRAM




| Revision | Date | Issued by | Approved by | Remarks |
|---|---|---|---|---|
| 1 | 25-05-2004 | Geoservices Unit 137 | Base Technical Assistant | |