WCR VOL 1

TUNA-4

W868

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

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+ TDC 1 Sheet
+ Species List 1 Sheet
+ Log Calibration

PLEASE DO NOT TAKE APART.

OIL and GAS DIVISION

# WELL COMPLETION REPORT

# W868. TUNA-4 18 DEC 1984

## VOLUME I

## GIPPSLAND BASIN
## VICTORIA

## ESSO AUSTRALIA LIMITED

Compiled by: G.H.RODER

NOVEMBER, 1984

2/13D

# TUNA-4

## WELL COMPLETION REPORT

## VOLUME 1

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### FIGURES



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### ENCLOSURES



(7918f35)

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ESSO AUSTRALIA LTD

1.

COMPLETION REPORT

| | | |
|---|---|---|
| WELL | : | TUNA-4 |
| LOCATION | : | Latitude : 38° 11' 21.0" S<br>Longitude : 148° 22' 08.1" E<br>X = 619881<br>Y = 5772296<br>Map Projection: Transverse Mercator<br>Geographical Location: AMG Zone 55 Universal, Bass Strait, Victoria, Australia.<br>Field: TUNA |
| PERMIT | : | VIC/L4 |
| ELEVATION | : | 21.0m KB |
| WATER DEPTH | : | 60m |
| TOTAL DEPTH | : | 3321m KB |
| PLUG BACK TYPE | : | Cement Plug |
| REASONS FOR PLUGGING BACK | : | Plug and Abandonment |
| ARRIVED LOCATION | : | 17th May, 1984 |
| SPUDDED | : | 18th May, 1984 |
| REACHED T.D. | : | 29th August, 1984 |
| RIG RELEASED | : | 31st August, 1984 |
| OPERATOR | : | Esso Exploration and Production Ltd. |
| PERMITTEE OR LICENCEE | : | Esso Exploration and Production Ltd. |
| ESSO INTEREST | : | 50% |
| OTHER INTEREST | : | 50% |
| CONTRACTOR | : | South Seas Drilling Co. |
| RIG NAME | : | Southern Cross |
| EQUIPMENT TYPE | : | Semi-submersible Oilwell E-2,000 |
| TOTAL RIG DAYS | : | 107 |
| DRILLING AFE NO. | : | 234 004 |
| TYPE COMPLETION | : | Plugged and Abandoned |
| WELL CLASSIFICATION | : | Before Drilling Field Outpost/Deep Pool Test<br>After Drilling Deep Pool Discovery |

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2.

# CASING DATA

WELL TUNA-4

| CSG O.D. IN. | WT. LBS/FT | GRADE | CONN. | CSG LENGTH METRES | SHOE DEPTH R.K.B. | CENTRALIZER POSITION | REMARKS |
|---|---|---|---|---|---|---|---|
| 24" | 670 | | CC | 10.10 | | STRADDLING COLLARS FOR FIRST FIVE COLLARS | WELLHEAD/PILE JOINT EP7-1-2 |
| 20" | 129 | X52 | CCxJV | 12.53 | | | CROSSOVER |
| 20" | 94 | X52 | JV | 88.86 | | | 7 JOINTS |
| 20" | 94 | X52 | JV | 13.30 | 205.23 | | SHOE JOINT |
| 13-3/8" | 54.5 | K55 | BUTT. | 12.08 | | STRADDLING COLLARS FOR FOUR COLLARS INSIDE 20" CSG | HANGER JOINT EH33-1 ES32-1-2 |
| 13-3/8" | 54.5 | K55 | BUTT | 664.55 | | | 56 JOINTS |
| 13-3/8" | 54.5 | K55 | BUTT | 12.31 | | STRADDLING COLLARS FOR FIRST SIX COLLARS | FLOAT COLLAR JOINT |
| 13-3/8" | 54.5 | K55 | BUTT | 12.00 | | | FLOAT JOINT |
| 13-3/8" | 54.5 | K55 | BUTT | 12.43 | 793.89 | | SHOE JOINT |
| 9-5/8" | 47 | N80 | BUTT | 3.32 | | STRADDLING COLLARS FOR 10 COLLARS F/1358 TO 1476 | HANGER W/PUP EH96-1 ES96 |
| 9-5/8" | 47 | N80 | BUTT | 1273.24 | | | 109 JOINTS |

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2.

# CASING DATA

WELL TUNA-4

| CSG O.D IN. | WT. LBS/FT | GRADE | CONN | CSG LENGTH METRES | SHOE DEPTH R.K.B. | CENTRALIZER POSITION | REMARKS |
|---|---|---|---|---|---|---|---|
| 9-5/8" | 47 | N80 | BUTT | 201.47 | | FOR NINE COLLARS F/2245 TO 2339 | 1.87 PUP + 17 JOINTS (10 SANDBLASTED JTS BELOW PUP) |
| 9-5/8" | 47 | N80 | BUTT | 1.00 | | FOR THREE COLLARS F/2387 TO 2410 | DV COLLAR |
| 9-5/8" | 47 | N80 | BUTT | 850.71 | | | 73 JOINTS |
| 9-5/8" | 47 | N80 | BUTT | 12.15 | | ONE ON FLOAT COLLAR JOINT | FLOAT COLLAR JOINT |
| 9-5/8" | 47 | N80 | BUTT | 12.10 | 2434.42 | ONE ON FLOAT SHOE JOINT | FLOAT SHOE JOINT |
| 7" | 26 | N80 | LT&C | 5.15 | TOP @ 2227.00 | SIX F/ 2375 TO 2446 | OTIS LINER HANGER |
| 7" | 26 | N80 | LT&C X BUTT | 0.17 | | ELEVEN F/ 2488 TO 3015 | CROSSOVER |
| 7" | 26 | N80 | BUTT | 973.77 | | TEN F/ 3075 TO 3194 | 81 JOINTS + 2 PUPS; 6.11m PUP @ 2482-88 3.07m PUP @ 2548-51 LATCH DOWN COLLAR @3182 |
| 7" | 26 | N80 | BUTT | 12.92 | 3219.01 | | SHOE JOINT W/BALL CATCHER |
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| | | | | | | | |

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3.

# CEMENT DATA

WELL TUNA-4

| DATE | DEPTH METRES | TYPE JOB | TYPE CEMENT | AMOUNT | ADDITIVES | REMARKS |
|---|---|---|---|---|---|---|
| 18/5/84 | 205 | 20" CSG LEAD | CLASS "G" | 750 sx | 2.2% PHG | MIXED WITH 50/50 FW/SW |
| 18/5/84 | 205 | 20" CSG TAIL | CLASS "G" | 350 sx | - | MIXED WITH SEAWATER |
| 21/5/84 | 794 | 13-3/8" CSG PRIMARY | CLASS "G" | 1050 sx | - | MIXED WITH SEAWATER |
| 3/6/84 | 2434 | 9-5/8" CSG FIRST STAGE | CLASS "G" | 495 sx | 1% HR6L | MIXED WITH FRESHWATER |
| 3/6/84 | 1559 | 9-5/8" CSG SECOND STAGE | CLASS "G" | 375 sx | - | MIXED WITH FRESHWATER |
| 26/6/84 | 2391-2455 | TEMPORARY ABANDONMENT PLUG | CLASS"G" | 75 sx | 0.8% HR6L | MIXED WITH FRESHWATER |
| 11/7/84 | 3321-3237 | PLUG BACK OPEN HOLE | CLASS "G" | 113 sx | 1.0% HR6L | MIXED WITH FRESHWATER |
| 13/7/84 | 3219 | 7" LINER PRIMARY | CLASS "G" | 633 sx | 0.75% CFR2 0.75% HALAD 22A | MIXED WITH FRESHWATER |
| 14/7/84 | 2227 | SQUEEZE TOP OF LINER | CLASS"G" | 400 sx | 0.8% HR6L | MIXED WITH FRESHWATER |
| 25/8/84 | 2179-2477 | SQUEEZE PERFS. P&A PLUG ACROSS PACKER/ TOP OF LINER. | CLASS "G" | 240 sx | 0.5%HR6L | MIXED WITH FRESHWATER |
| 26/8/84 | 350-450 | P&A PLUG ACROSS 9-5/8" CSG STUB. | CLASS "G" | 235 sx | - | MIXED WITH SEAWATER |

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3.

# CEMENT DATA

WELL TUNA-4

| DATE | DEPTH METRES | TYPE JOB | TYPE CEMENT | AMOUNT | ADDITIVES | REMARKS |
|---|---|---|---|---|---|---|
| 27/8/84 | 120-210 | P&A PLUG ACROSS 13-3/8" CSG STUB | CLASS "G" | 505 sx | - | MIXED WITH SEAWATER |
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## SEQUENTIAL OPERATIONS

## TUNA-4

### Move and Moore

The Southern Cross departed the West Fortescue-1 well location under tow by the workboat Atlas Dampier at 1245 hrs on 16 May 1984. The rig was towed along the 61 km (33 N. mile) path in 19 hours. Since mooring operations had to be conducted in daylight hours, the low speed was limited to 3.2 km/hr (1.7 knots) so that the rig would arrive on location at daybreak. Before the rig crossed the Tuna pipelines on approach to the well location, the stern tow bridle was connected directly to the workboat Bass Tide.

The 90 foot tow chain, which was used in place of a nylon stretcher, was pulled onto the deck of the Atlas Dampier so that the chain would not be able to drag the seafloor as the pipelines were crossed. The Atlas Dampier towed both the rig and the Bass Tide across the pipelines and on to the well location. When the rig moved across the pipelines, the Flinders Tide took a position over the pipelines to ensure anchors were not set in the restricted zone and to provide a visual pipelines reference point for the workboats and the rig. The Lady Vera ran anchors 4, 2, and 3 while the Atlas Dampier and Bass Tide kept the rig over the well location. All three anchors were visually inspected on the seafloor by the Flinders Tide's RCV to ensure that none were improperly set before tensioning.

The rig was towed back across the pipelines by the Bass Tide and Atlas Dampier to approximately 300m NNW of the well location. As the rig crossed the Tuna pipelines, minimum tensions of 15, 15 and 30 kips were kept on mooring lines 4, 3, and 2, respectively to ensure that the lines stayed at least 5m above the pipelines. Anchors 7 and 6 were run by the Lady Vera as the Bass Tide and Atlas Damper pulled on the tow bridles to keep the required tensions on anchors 4, 3, and 2. The Flinders Tide checked the 7 and 6 anchor settings before the rig tensioned up the anchors. The Bass Tide and Atlas Dampier were then released from the tow bridle. The Bass Tide ran anchor 8 before the rig winched itself back across the pipelines to the well location. Tensions of 115, 55 and 40 kips were held on anchors 6, 7, and 8 respectively as the rig crossed the pipelines. The Lady Vera and the Bass Tide ran anchors 5 and 1 simultaneously.

All anchors were successfully tested to 335 kips. Tensions on anchors 6, 7, and 8 were relaxed to 125, 67, and 75 kips before the rig was ballasted down to the drilling draft of 14.5m. During daylight hours of the following day, the Flinders Tide checked the actual distance between each mooring line and the 200mm Tuna pipeline and found all above the 5m minimum. Refer to Special Engineering Report No. 1 for more details on mooring tensions and procedures.

### Final Rig Location

Latitude : 38° 11' 21.00" S
Longitude: 148° 22' 08.10" E
X = 619,881mE
Y = 5,772,296mN
AMG Zone 55, Universal Transverse Mercator Projection,
Australian Geodetic Datum.

The rig was located 7m at 252° from the called location and 48 km at 134° from Lakes Entrance, Victoria.

## 26" Hole for 20" Conductor

The drilling template was run and landed at a seafloor depth of 82m RKB. The 26" hole was drilled to 219m with seawater and displaced at TD with high viscosity gel mud. The 18-3/4" well head and 20" casing were then run and cemented at a shoe depth of 205m. The BOP stack and riser were run and the casing and collect connector tested against the shear rams to 500 psi.

## 17-1/2" Hole for 13-3/8" Surface Casing

The 20" casing shoe was drilled out and the 17-1/2" hole drilled to 811m using seawater with slugs of high viscosity gel mud. The hole was then logged with a BHC/GR tool.

The 13-3/8" casing was run and cemented at a shoe depth of 794m. The 13-3/8" seal assembly was set and pressure tested to 200/5000 psi. The BOP stack was then pressure tested to 200/3500/5000 psi. A Phase I PIT was conducted to 1500 psi after drilling out cement to 782m.

## 12-1/4" Hole for 9-5/8" Production Casing

The remaining cement and 6m of new hole were drilled and a Phase II PIT conducted to leakoff at 18.4 ppg EMW. The 12-1/4" hole as then drilled to 1380m, where the mud weight was 9.7ppg. This mud weight was programmed to provide a 300 psi overbalance into the top of Latrobe formation. Four cores were then cut from 1380 to 1414m. The 12-1/4" hole was then drilled down to 2445m. Wireline logs were run, including 4 RFT's and 2 sidewall coring runs.

The 9-5/8" casing was run and landed at a shoe depth of 2434m, 103m deeper than originally programmed. Intermediate casing was run to cover the gas-bearing M-1 reservioir in the top of Latrobe and the pressure depleted T-1 reservoir just above the shoe. The casing seat was deepened due to the presence of shows at the programmed setting depth and to ensure covering the base of the T-1 reservoir. The casing was cemented in two stages, using a DV stage cementing collar at 1559m. The first attempt to set and test the 9-5/8" seal assembly was unsuccessful due to the presence of drill cuttings at the wellhead, indicating insufficient washing on the first run. The well head was again washed and the seal assembly successfully set and pressure tested to 200/5000 psi. The BOP stack was pressure tested to 200/3500/5000 psi. The DV collar and cement were drilled out to 2429m, where a Phase I PIT was conducted to 3500 psi.

## 8-1/2" Hole for 7" Production Liner

The remaining cement and 6m of new hole were drilled out and a Phase II Pit conducted to leakoff at 16.8 ppg EMW. The hole was then drilled down to corepoint at 2481m with 9.4 ppg mud. This 9.4 ppg mud weight was designed to provide a 300 psi overbalance beneath the programmed 9-5/8" casing shoe. Five cores were cut down to 2564m. The 8-1/2" hole was then drilled to 2650m where intermediate logs, including 10 RFT's, were run. Drilling continued to the next core point at 2822.5m, with the mud weight being raised to 9.5 ppg at 2745m and 9.7 ppg at 2798m in response to positive indications of abnormal pressure. Two cores were then cut from 2822.5 to 2833m. The hole was drilled to 2975m and a Phase III PIT conducted to a leakoff of 14.6 ppg EMW at the shoe.

Drilling continued to the next logging point at 3011m where high gas units necessitated raising the mud weight to 10.5 ppg. Wireline logs were run, followed by 16 RFT's. The first RFT of this suite had to be fished after failing to pull past a suspected ledge at 2717m. A wiper trip was made with an 8-1/2" roller reamer before continuing with the RFT program. The last RFT also became wall stuck after sampling at 2929.5m. In both cases, the RFT tool was successfully fished by cutting the wireline at surface and stripping over the line with an overshot.

The well then was temporarily abandoned in order to repair a leak in the yellow pod. A tubing stinger was run to TD and the mud weight increased to 10.9 ppg. A 75 sack cement plug was set at 2430m and later tagged at 2391m inside the 9-5/8" casing. The plug was pressure tested to 3000 psi before setting an EZSV bridge plug at 2343m. The stack was then pulled to find that a 1" supply hose connector had failed due to corrosion. (See Special Engineering Report No. 3). The stack was repaired, rerun and pressure tested to 200/3500/5000 psi. The bridge plug and cement were then drilled out. The mud weight was cut back to 10.5 ppg while drilling ahead.

Drilling continued to 3237m, where the mud weight was increased to 10.9 ppg in response to high gas units. The hole was then drilled to 3273m, where the mud weight was again raised to 11.4 ppg. A core was cut from 3273 to 3282.5m, where another open hole PIT was conducted to 14.6 ppg EMW without leakoff. The hole was then drilled to TD at 3321m, with a final mud weight of 11.5 ppg. Final logs were then run, including a velocity survey, 4 RFT's and 3 sidewall coring runs.

The hole was then plugged back to a tagged depth of 3237m. The 7" liner was then run and set from 2227 to 3219m and cemented. An 8-1/2" drilling assembly was run; however, no cement was tagged above the liner top. The subsequent pressure test of the liner lap was unsuccessful with a leakoff at 16.7 ppg EMW (Phase II PIT - 16.8 ppg EMW). A tubing stinger was run below an RTTS packer and the liner lap squeezed with 230 sacks of cement. After cleaning out the 9-5/8" casing down to the liner top, the liner lap was pressure tested to 3500 psi. The 7" liner was also pressure tested to 3500 psi after drilling out 177m (22bbl) of excess cement found in the liner. A cement bond log was then run inside the 7" liner.

## Production Testing

Subsequent production testing operations are described in "Production Testing - Operations Sequence".

## Plug and Abandonment

The production testing program was concluded by squeezing 50 sacks of cement below the 7" Model "p" packer at 2447m. An additional 190 sacks were dumped on top of the packer to a calculated TOC at 2179m, 48m above the 7" liner top at 2227m. The plug was successfully pressure tested to 3500 psi.

A 9-5/8" EXSV bridge plug was set at 2105m after making a gauge ring/junk basket run down to 2109m. The 9-5/8" casing was then cut with a Pengo explosive cutter at 402m and an injection rate of 2-1/2" BPM at 800 psi established into the annulus. The casing was retrieved and 235 sack cement plug was then set across the stub from 350 to 450m, with 10-1/2 bbls squeezed into the 13-3/8" x 9-5/8" annulus. The plug was pressure tested to 1500 psi.

A 13-3/8" gauge ring/junk basket was run to 340m before setting an EZSV bridge plug at 330m. The 13-3/8" casing was then cut with a Pengo explosive cutter at 180m and an injection rate of 2-1/2 BPM at 300 psi established into the annulus. The casing was retrieved and a 505 sack cement plug set across the stub from 120 to 210m, with 18 bbls squeezed into the 20" x 13-3/8" annulus. The plug was pressure tested to 500 psi.

After the BOP stack and riser were pulled, the recently developed 3.9kg shaped charge explosive casing cutter was made up and run below the wellhead running tool. The running tool was made up into the wellhead and the 20" casing cut at 94m. The 20" casing stub was then retrieved along with the wellhead, for post guidebase, and drilling template. The rig was then deballasted while waiting on workboats.

## Pulling Anchors

The rig was demoored using the same procedures set forth in the mooring program. However, since 305m of wire had been cut from moorings 2, 3 and 4, these three anchors had to be reset closer to the rig so that enough wire would remain on each drum when the rig was winched across the pipelines.

Anchors 5 and 1 were retrieved before the rig winched itself across the pipelines. The Atlas Dampier was connected to the forward tow bridle and provided tension on moorings 2, 3 and 4 as anchors 6, 7 and 8 were retrieved by the Lady Sally and Swan Tide.

After anchor 6 was retrieved, the no. 6 wire was reeled completely out and bouyed off for later retrieval. The rig winched itself back across the pipelines before anchor 3 was retieved. The new no. 6 wire was reeled off the Swan Tide onto the no. 6 wire drum before anchors 4 and 2 were bolstered.

The rig departed the Tuna-4 location at 0400 hrs on 31 August 1984 enroute to the Cobia-2 subsea completion location. After the rig was moored over this location, the Swan Tide retrieved the no. 6 wire and the two piggyback anchors buoyed off near the Tuna location.

## SUMMARY OF WIRELINE FORMATION TEST PROGRAMME - TUNA-4

| TEST | SEAT | DEPTH (METRES) K.B. | CHAMBER | RECOVERY (LITRES) OIL | COND. | GAS | FORMATION WATER | MUD FILTRATE | HEWLETT-PACKARD FORMATION PRESSURE MPaa | Psia | HEWLETT-PACKARD HYDROSTATIC PRESSURE MPaa | Psia | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Litres | Litres | Litres | $m^3$ | Litres | Litres | | | | | |
| 1 | 1 | 2399.5 | Pretest | | | | | | 23.89 | 3465.1 | 27.74 | 4024.5 | Valid |
| | 2 | 2282.5 | Pretest | | | | | | 22.44 | 3255.0 | 26.40 | 3829.2 | Valid |
| | 3 | 2206.0 | Pretest | | | | | | 21.81 | 3164.0 | 25.53 | 3703.9 | Valid |
| | 4 | 2040.0 | Pretest | | | | | | 20.25 | 2936.9 | 23.65 | 3430.0 | Valid |
| | 5 | 1945.0 | Pretest | | | | | | 19.32 | 2801.8 | 22.56 | 3272.1 | Valid |
| | 6 | 1887.5 | Pretest | | | | | | 18.73 | 2716.7 | 21.91 | 3177.7 | Valid |
| | 7 | 1864.0 | Pretest | | | | | | 18.43 | 2674.1 | 21.64 | 3138.6 | Valid |
| | 8 | 1420.5 | Pretest | | | | | | 14.08 | 2042.9 | 16.45 | 2385.6 | Valid |
| | 9 | 1414.0 | Pretest | | | | | | 14.02 | 2033.9 | 16.37 | 2375.4 | Valid |
| | 10 | 1411.0 | Pretest | | | | | | 13.99 | 2030.1 | 16.34 | 2370.5 | Valid |
| | 11 | 1406.0 | Pretest | | | | | | 13.96 | 2025.6 | 16.28 | 2362.2 | Valid |
| | 12 | 1400.5 | Pretest | | | | | | 13.93 | 2020.8 | 16.22 | 2353.2 | Valid |
| | 13 | 1398.5 | Pretest | | | | | | 13.92 | 2019.7 | 16.20 | 2350.2 | Valid |
| | 14 | 1390.0 | Pretest | | | | | | 13.92 | 2018.4 | 16.10 | 2335.8 | Valid |
| | 15 | 1377.0 | Pretest | | | | | | 13.90 | 2016.0 | 15.95 | 2314.2 | Valid |
| | 16 | 1398.5 | Sample Pretest | | | | | | 13.93 | 2019.9 | 16.20 | 2350.0 | Valid |
| | 17 | 1398.4 | 22.5 | | trace | 2.40 | | 0.50 | 13.93 | 2020.1 | 16.21 | 2351.4 | Valid |
| 2 | 18 | 1400.5 | 22.5 | 13.0 | | 1.46 | | 2.25 | 13.93 | 2021.0 | 16.20 | 2350.5 | Valid |
| 3 | 19 | 1398.5 | 22.5 | | 0.34 | 2.40 | | 0.80 | 13.93 | 2020.6 | 16.18 | 2347.8 | Valid |
| 4 | 20 | 2369.5 | Pretest | | | | | | 23.58 | 3421.0 | 27.34 | 3966.2 | Valid |
| | 21 | 2369.4 | Pretest | | | | | | 23.64 | 3429.7 | 27.38 | 3972.1 | Slow Seal Failure |
| | 22 | 2369.6 | 22.5 | | | 0.018 | | 21.9 | 23.61 | 3424.3 | 27.38 | 3972.5 | Valid |
| | | | 10.4 | | | 0.0078 | | 9.0 | | | | | |
| 5 | 23 | 2639.0 | Pretest | | | | | | 26.44 | 3834.9 | 29.24 | 4241.9 | Valid |
| | 24 | 2610.0 | Pretest | | | | | | 26.08 | 3783.2 | 28.93 | 4195.4 | Valid |
| | 25 | 2601.7 | Pretest | | | | | | 26.01 | 3772.4 | 28.84 | 4184.0 | Valid |
| | 26 | 2594.2 | Pretest | | | | | | 25.93 | 3762.0 | 28.77 | 4174.0 | Valid |
| | 27 | 2583.0 | Pretest | | | | | | 25.83 | 3747.5 | 28.66 | 4157.0 | Valid |
| | 28 | 2568.0 | Pretest | | | | | | 25.70 | 3727.1 | 28.48 | 4132.0 | Valid |

## SUMMARY OF WIRELINE FORMATION TEST PROGRAMME - TUNA-4

| TEST | SEAT | DEPTH (METRES) K.B. | CHAMBER | OIL | RECOVERY (LITRES) COND. | GAS | FORMATION WATER | MUD FILTRATE | HEWLETT-PACKARD FORMATION PRESSURE MPaa | Psia | HEWLETT-PACKARD HYDROSTATIC PRESSURE MPaa | Psia | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Litres | Litres | Litres | $m^3$ | Litres | Litres | | | | | |
| 5 | 29 | 2566.0 | Pretest | | | | | | 25.68 | 3724.9 | 28.49 | 4133.0 | Valid |
| | 30 | 2557.5 | Pretest | | | | | | 25.65 | 3720.8 | 28.39 | 4118.0 | Supercharged |
| | 31 | 2550.0 | Pretest | | | | | | 25.55 | 3706.2 | 28.33 | 4109.0 | Valid |
| | 32 | 2545.0 | Pretest | | | | | | 25.51 | 3700.5 | 28.27 | 4101.0 | Valid |
| | 33 | 2527.3 | Pretest | | | | | | 25.39 | 3682.4 | 28.09 | 4075.0 | Valid |
| | 34 | 2524.5 | Pretest | | | | | | 25.38 | 3680.7 | 28.07 | 4072.0 | Valid |
| | 35 | 2507.2 | Pretest | | | | | | 25.17 | 3651.5 | 27.89 | 4046.0 | Valid |
| | 36 | 2502.7 | Pretest | | | | | | 25.12 | 3643.7 | 27.86 | 4042.0 | Valid |
| | 37 | 2500.0 | Pretest | | | | | | 25.16 | 3643.9 | 27.84 | 4038.0 | Valid |
| | 38 | 2489.0 | Pretest | | | | | | 25.12 | 3634.8 | 27.72 | 4021.0 | Valid |
| | 39 | 2485.7 | Pretest | | | | | | 25.04 | 3632.1 | 27.70 | 4018.0 | Valid |
| | 40 | 2475.5 | Pretest | | | | | | 24.92 | 3615.4 | 27.57 | 3999.4 | Valid |
| | 41 | 2470.5 | Pretest | | | | | | 24.89 | 3611.4 | 27.54 | 3994.8 | Valid |
| | 42 | 2466.0 | Pretest | | | | | | 24.92 | 3614.5 | 27.49 | 3987.5 | Supercharged |
| | 43 | 2451.5 | Pretest | | | | | | - | - | 27.34 | 3966.0 | Seal Failure |
| | 44 | 2451.3 | Pretest | | | | | | 24.60 | 3568.9 | 27.36 | 3968.4 | Valid |
| 6 | 45 | 2451.5 | 45.4 | | | 0.02 | | 41.55 | 24.60 | 3568.4 | 27.17 | 3941.0 | Valid |
| | | | 10.4 | | | | | 9.4 | | | | | |
| 7 | 46 | 2470.5 | Pretest | | | | | | - | - | 27.41 | 3975.7 | Seal Failure |
| | 47 | 2470.7 | Pretest | | | | | | 24.88 | 3609.4 | 27.38 | 3971.2 | Flowline Plugged |
| | 48 | 2470.4 | 45.4 | | | 0.035 | | 41.75 | 24.90 | 3611.6 | 27.39 | 3973.2 | Valid - then HP Gauge Problems |
| | | | 10.4 | | | 0.017 | | 9.25 | | | | | |
| | | | | | | | | | MPag | Psig | MPag | Psig | |
| 8 | 49 | 2470.4 | Pretest | | | | | | 24.75 | 3591.0 | 27.20 | 3946.0 | Valid |
| | 50 | 2475.0 | 45.4 | tr. oil scum | | 0.042 | | 41.75 | 24.79 | 3596.0 | 27.28 | 3958.0 | Valid |
| | | | 10.4 | 0.008 | | | | 8.55 | | | | | |
| | | | | | | | | | MPaa | Psia | MPaa | Psia | |
| 9 | 51 | 2550.0 | 45.4 | 15.55 | | 1.68 | | 18.30 | 25.54 | 3704.4 | 28.19 | 4089.0 | Valid |
| | | | 10.4 | Preserved | | | | | | | | | |
| 10 | 52 | 2566.0 | 45.4 | 6.1 | | 0.72 | | 25.1 | 25.66 | 3721.8 | 28.38 | 4116.5 | Valid |
| | | | 10.4 | 3.2 | | 0.17 | | 7.0 | | | | | |

## SUMMARY OF WIRELINE FORMATION TEST PROGRAMME - TUNA-4

| TEST | SEAT | DEPTH (METRES) K.B. | CHAMBER | RECOVERY (LITRES) OIL | COND. | GAS | FORMATION WATER | MUD FILTRATE | HEWLETT-PACKARD FORMATION PRESSURE MPaa | Psia | HEWLETT-PACKARD HYDROSTATIC PRESSURE MPaa | Psia | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Litres | Litres | Litres | $m^3$ | Litres | Litres | | | | | |
| 11 | 53 | 2582.8 | Pretest | | | | | | - | - | 28.57 | 4144.8 | Seal Failure |
| | 54 | 2582.8 | Pretest | | | | | | - | - | 28.56 | 4143.1 | Seal Failure |
| | 55 | 2582.8 | Pretest | | | | | | - | - | 28.55 | 4142.3 | Seal Failure |
| 12 | 56 | 2582.8 | 45.4 | | | 0.15 | | 40.4 | 25.83 | 3746.8 | 28.63 | 4153.5 | Valid |
| | | | 3.8 | | | 0.014 | | 3.5 | | | | | |
| 13 | 57 | 2507.2 | 45.4 | 5.25 | | 0.678 | | 32.95 | 25.15 | 3648.6 | 27.70 | 4017.9 | Valid |
| | | | 3.8 | Preserved | | | | | | | | | |
| 14 | 58 | 2470.0 | 45.4 | tr. oil scum | | 0.095 | | 41.55 | 24.86 | 3606.8 | 27.30 | 3959.7 | Valid |
| | | | 3.8 | tr. oil scum | | | | 3.5 | | | | | |
| 15 | 59 | 2995.2 | Pretest | | | | | | 36.76 | 5333.0 | 38.06 | 5521.0 | Tight |
| | 60 | 2948.5 | Pretest | | | | | | 33.26 | 4825.0 | 37.43 | 5429.0 | Valid |
| | 61 | 2929.5 | Pretest | | | | | | 33.03 | 4791.0 | 37.11 | 5383.5 | Valid |
| | | | | | | | | | MPag | Psig | MPag | Psig | |
| 15 | 62 | 2919.3 | Pretest | | | | | | 31.39 | 4553.0 | 35.17 | 5102.0 | Valid |
| | 63 | 2896.5 | Pretest | | | | | | 31.37 | 4450.0 | 34.90 | 5062.0 | Valid |
| | 64 | 2866.2 | Pretest | | | | | | 30.36 | 4404.0 | 34.56 | 5013.0 | Valid |
| | 65 | 2853.5 | Pretest | | | | | | - | - | 34.39 | 4989.0 | Tight |
| | 66 | 2853.5 | Pretest | | | | | | - | - | 34.39 | 4989.0 | Tight |
| | 67 | 2853.2 | Pretest | | | | | | - | - | 34.41 | 4991.0 | Tight |
| | 68 | 2840.0 | Pretest | | | | | | 29.85 | 4330.0 | 34.24 | 4967.0 | Valid |
| | 69 | 2827.0 | Pretest | | | | | | 28.65 | 4156.0 | 34.09 | 4945.0 | Valid |
| | 70 | 2812.5 | Pretest | | | | | | 28.56 | 4143.0 | 33.89 | 4916.0 | Valid |
| | 71 | 2803.5 | Pretest | | | | | | 28.52 | 4137.0 | 33.80 | 4903.0 | Valid |
| | 72 | 2790.5 | Pretest | | | | | | - | - | 33.66 | 4882.0 | Tight |
| | 73 | 2790.0 | Pretest | | | | | | - | - | 33.66 | 4882.0 | Seal Failure |
| | 74 | 2790.7 | Pretest | | | | | | 28.33 | 4109.0 | 33.66 | 4882.0 | Valid |
| | 75 | 2775.0 | Pretest | | | | | | 27.54 | 3995.0 | 33.45 | 4852.0 | Valid |
| | 76 | 2760.7 | Pretest | | | | | | 27.37 | 3970.0 | 33.28 | 4827.0 | Valid |
| | 77 | 2752.0 | Pretest | | | | | | 27.32 | 3963.0 | 33.18 | 4813.0 | Valid |
| | 78 | 2738.5 | Pretest | | | | | | 27.40 | 3975.0 | 33.03 | 4791.0 | Valid |
| 16 | 79 | - | Pretest | | | | | | - | - | - | - | Invalid - Tool malfunction |

# SUMMARY OF WIRELINE FORMATION TEST PROGRAMME - TUNA-4

| TEST | SEAT | DEPTH (METRES) K.B. | CHAMBER | RECOVERY (LITRES) OIL | COND. | GAS | FORMATION WATER | MUD FILTRATE | HEWLETT-PACKARD FORMATION PRESSURE MPaa | Psia | HEWLETT-PACKARD HYDROSTATIC PRESSURE MPaa | Psia | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Litres | Litres | Litres | $m^3$ | Litres | Litres | | | | | |
| 17 | 80 | 2686.2 | Pretest | | | | | | 27.22 | 3949.3 | 32.61 | 4730.4 | Valid |
| | 81 | 2656.2 | Pretest | | | | | | - | - | 32.25 | 4678.8 | Seal Failure |
| | 82 | 2656.2 | Pretest | | | | | | 27.26 | 3954.1 | 32.25 | 4678.6 | Tight |
| | 83 | 2656.0 | Pretest | | | | | | - | - | 32.28 | 4682.3 | Tight |
| | 84 | 2610.0 | Pretest | | | | | | 26.08 | 3783.7 | 31.73 | 4602.7 | Valid |
| | 85 | 2790.7 | Pretest | | | | | | - | - | 33.93 | 4922.3 | Plugged |
| | 86 | 2790.7 | Pretest | | | | | | - | - | 33.89 | 4916.3 | Plugged |
| | 87 | 2948.5 | Pretest | | | | | | - | - | 35.77 | 5188.2 | Probe Plugged |
| 18 | 88 | 2948.5 | 45.4 | 1.75 | | 0.43 | | 37.45 | 31.97 | 4637.0 | 35.74 | 5185.1 | Valid |
| | | | 10.4 | 1.50 | | 0.278 | | 6.75 | | | | | |
| 19 | 89 | 2896.5 | Pretest | | | | | | 31.09 | 4510.3 | 35.06 | 5086.0 | Valid |
| | 90 | 2896.3 | Pretest | | | | | | - | - | 34.98 | 5074.5 | Tight |
| | 91 | 2896.0 | Pretest | | | | | | 30.62 | 4442.0 | 34.97 | 5072.7 | Tight |
| | 92 | 2919.3 | Pretest | | | | | | 31.80 | 4613.2 | 35.38 | 5132.4 | Valid |
| | 93 | 2892.5 | Pretest | | | | | | 29.77 | 4318.0 | 34.92 | 5065.8 | Tight |
| | 94 | 2896.5 | 45.4 | Oil scum | | 0.032 | | 6.25 | 29.84 | 4328.0 | 34.99 | 5075.3 | Valid |
| | | | 10.4 | Not opened | | | | | | | | | |
| | 95 | 2827.0 | Pretest | | | | | | - | - | 34.16 | 4955.8 | Tool Failure |
| | 96 | 2827.0 | Pretest | | | | | | - | - | - | - | Tool Failure |
| 20 | 97 | 2896.5 | Pretest | | | | | | - | - | 35.07 | 5086.8 | Seal Failure |
| | 98 | 2896.5 | 45.4 | | | 0.24 | | 28.0 | 31.07 | 4506.5 | 35.05 | 5084.4 | Seal Failure during Sampling |
| | | | 10.4 | Did not open | | | | | | | | | |
| | 99 | 2896.5 | Pretest | | | | | | 31.01 | 4498.0 | 34.94 | 5069.1 | Seal Failure during Sampling |
| 21 | 100 | 2866.2 | 45.4 | | | 0.34 | | 28.5 | 30.75 | 4460.4 | 34.94 | 5068.0 | Valid |
| | | | 10.4 | | | 0.199 | | 4.6 | | | | | |
| 22 | 101 | 2827.0 | 45.4 | | | 0.040 | | 14.25 | 29.04 | 4211.6 | 34.35 | 4983.5 | Valid |
| | | | 10.4 | Oil scum | | | | 5.25 | | | | | |
| 23 | 102 | 2775.0 | 45.4 | | | 0.006 | | 1.1 | 27.95 | 4054.1 | 33.65 | 4881.6 | Valid |
| | | | 10.5 | Tr. oil scum | | 0.0003 | | 9.75 | | | | | |
| 24 | 103 | 2775.0 | 45.4 | | | 0.0073 | | 1.0 | 27.95 | 4053.9 | 33.61 | 4875.4 | Valid |
| | | | 10.4 | | | | | 9.0 | | | | | |
| 25 | 104 | 2775.0 | Pretest | | | | | | 27.92 | 4050.7 | 33.56 | 4867.6 | Valid |
| | 105 | 2775.0 | 10.4 | | | 0.0029 | | 6.75 | 27.81 | 4034.2 | 33.56 | 4867.6 | Valid |

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## SUMMARY OF WIRELINE FORMATION TEST PROGRAMME - TUNA-4

| TEST | SEAT | DEPTH (METRES) K.B. | CHAMBER | RECOVERY (LITRES) OIL | COND. | GAS | FORMATION WATER | MUD FILTRATE | HEWLETT-PACKARD FORMATION PRESSURE MPaa | Psia | HEWLETT-PACKARD HYDROSTATIC PRESSURE MPaa | Psia | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Litres | Litres | Litres | $m^3$ | Litres | Litres | | | | | |
| 25 | 106 | 2686.2 | 45.4 | | 0.25 | 2.12 | | 30.7 | 27.17 | 3941.3 | 32.45 | 4707.5 | Valid |
| 26 | 107 | 2919.5 | 45.4 | | Tr. | 3.42 | | 17.5 | 31.76 | 4606.9 | 35.26 | 5114.3 | Valid |
| | | | 10.4 | | 0.22 | 1.27 | | 1.85 | | | | | |
| 27 | 108 | 2812.5 | 45.4 | 2.35 | | 0.32 | | 32.3 | 28.93 | 4196.5 | 33.97 | 4927.7 | Valid |
| | | | 10.4 | 3.36 | | 0.38 | | 3.75 | | | | | |
| 28 | 109 | 2768.0 | 45.4 | Oil scum | | 0.054 | | 41.5 | 27.83 | 4037.6 | 33.48 | 4856.0 | Valid |
| | | | 3.8 | Oil scum | | 0.0063 | | 3.75 | | | | | |
| 29 | 110 | 2930.0 | Pretest | | | | | | 31.77 | 4608.2 | 35.37 | 5130.6 | Seal Failure |
| | 111 | 2930.0 | Pretest | | | | | | - | - | 35.33 | 5124.7 | Seal Failure |
| | 112 | 2929.5 | Pretest | | | | | | 31.78 | 4610.7 | 35.33 | 5124.7 | Valid - Seal Failure |
| | 113 | 2929.5 | Pretest | | | | | | - | - | 35.34 | 5125.8 | Seal Failure |
| | 114 | 2752.0 | Pretest | | | | | | 27.69 | 4016.9 | 33.27 | 4825.7 | Seal Failure |
| | 115 | 2752.0 | Pretest | | | | | | - | - | 32.96 | 4781.9 | Seal Failure |
| | 116 | 2752.0 | Pretest | | | | | | - | - | 33.03 | 4791.75 | Seal Failure |
| 30 | 117 | 2930.0 | Pretest | | | | | | - | - | 36.02 | 5224.5 | Tight |
| | 118 | 2929.5 | 45.4 | | | 0.027 | | 43.5 | 31.82 | 4615.4 | 36.02 | 5225.3 | Valid |
| | | | 10.4 | | Tr. | 0.50 | | 7.25 | | | | | |
| 31 | 119 | 3158.2 | Pretest | | | | | | - | - | 41.77 | 6063.2 | Seal Failure |
| | 120 | 3158.0 | Pretest | | | | | | - | - | 41.68 | 6049.0 | Tight |
| | 121 | 3157.8 | 45.4 | | | 0.10 | | 20.3 | 38.58 | 5599.4 | 41.67 | 6048.4 | Valid |
| | | | 10.4 | | | 0.15 | | 8.9 | | | | | |
| 32 | 122 | 3062.0 | 45.4 | 2.25 | | 6.42 | | 11.3 | 37.15 | 5392.1 | 40.58 | 5889.3 | Valid |
| | | | 10.4 | 0.35 | | 2.01 | | 0.73 | | | | | |
| 33 | 123 | 3031.5 | 45.4 | Waxy Scum | | 0.21 | | 11.75 | 36.29 | 5267.2 | 40.08 | 5817.0 | Valid |
| | | | 10.4 | 0.2 | | 1.02 | | 4.75 | | | | | |
| 34 | 124 | 3119.5 | Pretest | | | | | | - | - | 40.88 | 5933.5 | Probe Plugged |
| | 125 | 3119.4 | 45.4 | | | 0.03 | | 15.00 | 37.72 | 5474.5 | 40.87 | 5931.5 | Valid |
| | | | 10.4 | | | 0.01 | | 0.97 | | | | | |
| 35 | 126 | 2938.8 | Pretest | | | | | | - | - | 37.59 | 5455.5 | No Seal (Cased Hole) |
| | 127 | 2938.8 | Pretest | | | | | | - | - | 38.06 | 5454.0 | No Seal (Cased Hole) |

## SUMMARY OF WIRELINE FORMATION TEST PROGRAMME - TUNA-4

| TEST | SEAT | DEPTH (METRES) K.B. | RECOVERY (LITRES) CHAMBER Litres | OIL Litres | COND. Litres | GAS $m^3$ | FORMATION WATER Litres | MUD FILTRATE Litres | HEWLETT-PACKARD FORMATION PRESSURE MPaa | Psia | HEWLETT-PACKARD HYDROSTATIC PRESSURE MPaa | Psia | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 128 | 2938.8 | 45.4 | | | 0.05 | | 41.7 | 31.80 | 4616.2 | 37.96 | 5439.4 | Valid (Cased Hole) |
| | | | 10.4 | | | 0.03 | | 9.5 | | | | | |
| 36 | 129 | 2940.0 | 45.4 | Oil Scum | | 0.10 | | 28.25 | 31.78 | 4612.6 | 37.62 | 5460.3 | Valid (Cased Hole) |
| | | | 10.4 | 0.1 | | 0.03 | | 9.0 | | | | | |
| 37 | 130 | 2775.0 | 45.4 | | | 0.07 | | 7.7 | 27.85 | 4042.6 | 32.17 | 4669.7 | Valid (Cased Hole) |
| | | | 10.4 | Not opened | | | | | | | | | |
| 38 | 131 | 2752.0 | 45.4 | | | 0.03 | | 45.0 | 27.66 | 4014.3 | 31.77 | 4611.3 | Valid (Cased Hole) |
| | | | 10.4 | | | 0.01 | | 9.0 | | | | | |
| 39 | 132 | 2768.7 | 45.4 | 0.25 | | 0.04 | | 43.5 | 27.72 | 4023.9 | 31.98 | 4641.0 | Valid (Cased Hole) |
| | | | 10.4 | 0.18 | | 0.03 | | 9.2 | | | | | |

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# PRODUCTION TESTING OPERATIONS SEQUENCE

## TUNA-4

### Production Test No. 1
### Perforated Interval 3138-3147m

A CBL-VDL log was run in conjunction with a GR/CCL log over the interval 3184-2400m. After running a 7" gauge ring/junk basket to 3165m, a 7" Baker Model "D" production packer with flapper valve was run and set at 3080m. A 2-3/8" tubing packer with flapper valve was run and set at 3080m. A 2-3/8" tubing stinger was the run below the 7" packer seal assembly on drill pipe to 3150m. After pressure testing the tubing, packer, and casing below the packer to 5000 psi, the seals were unstung and 9 bbls of diesel spotted from 3150 to 3080m before pulling out of the hole. Diesel was spotted below the packer so that, should stimulation (ie. acidizing) have been necessary, the well bore would have been free of mud. The production test string was then run and tested to 5000 psi. The string was displaced with 59 bbls of diesel and 29 bbls of gaseous nitrogen at a final displacement pressure of 3250 psi. The well head pressure was bled to 2150 psi prior to perforating the interval 3138-3147m with a 2-1/8" Enerjet at 4 SPF. The well was opened to flow after running an HP gauge with dual Ameradas to the perforations. The gauges were later pulled and tandem bottom hole samplers run with the HP gauge. After taking a gradient survey and collecting the bottom hole samples, the HP and samplers were pulled and the well shut in. No build-up information was gathered, as the zone produced only gas in relatively small quantitities.

The seals were unstung and the tubing reverse circulated. An unsuccessful attempt was made to inject into the formation with 5000 psi surface pressure.

The test string was pulled and two cased hole RFT's were run at 2938.8 and 2940m. A Baker K-1 retainer was then run and set at 2930m and pressure tested to 3500 psi.

### Production Test No. 2
### Perforated Interval 2820-2829m

A 7" Baker Model "D" production packer with flapper valve was run and set at 2790m. The test string was run and pressure tested against the packer to 4000 psi before being displaced with 53 bbls of diesel and 26.5 bbls of gaseous nitrogen. The final displacement pressure of 3100 psi was bled to 1305 psi prior to perforating the interval 2820-2829m with a 2-1/8" Enerjet at 4 SPF. The perforating assembly was retrieved, and after repairing a fault in the wireline head, an HP gauge with dual Ameradas was run to the perforations. The well was opened for initial flow and allowed to clean up before retieving the bottom hole gauges. The Otis DHSIT (Down-hole Shut-in Tool) locking sub with dual Ameradas was then run and landed in the XN nipple at 2788m. After experiencing difficulty in running the Otis DHSIT and HP gauge on the Schlumberger wireline due to close tolerance inside the lubricator riser and crude waxing at surface, the DHSTT was run and landed in the locking sub and pressure tested from below. The well was then opened for flow. The inability to heat the high pour point crude (35$^{o}$ C) due to a failure of the heater burner prevented flowing through the separator. The decision was made to proceed with the major build up period while waiting on heater replacement parts, even though the DHSIT failed to seal when closed of final shut-in. When it became apparent that the build-up information would be severely affected by afterflow, it was decided to pull the DHSIT for redress. The tool was pulled and found to have a cut O-ring. The DHSIT was rerun, seated, and pressure tested from below. The well was opened and flowed through the repaired heater and the separator to determine flowrates, GOR, etc. The well was then shut in downhole and at surface for the major build-up period.

After 20-1/2 hours of build-up, the pressure gauges were pulled due to a leak in the SSTT control line which allowed the ball valves to partially close. The SSTT would have sheared the wireline if a differential pressure had been present across the valves. The gauges were pulled into the ball valves, where they became stuck. It was decided to pick up out of the packer and reverse circulate before pulling out of the hole to the SSTT.

After picking up 6m, a leak was found in the SSTT control line and was repaired. The ball valves were then opened and the DHSIT and HP gauge retrieved.

The tubing was then reverse circulated before laying down the upper test assembly. The DHSIT locking sub and only one Amerada gauge were retrieved. The knuckle joint connecting the two amerada gauges parted, leaving the bottom gauge in the hole. Drill pipe was used to run the tubing down to the packer before the string was displaced with water and the seals stabbed into the packer. An unsuccessful attempt was made to bullhead into the formation with 4000 psi surface pressure. The water was reversed out and the mud weight reduced to 9.6 ppg.

After an eight day delay following the failure of the #2 and #3 anchor lines, the tubing was pulled. Three cased hole RFT's were then run at 2775, 2752, and 2768.7m before setting a Baker K-1 retainer at 2601m. The plug was pressure tested to 3500 psi.

Testing operations were again interrupted in order to replace the plain AX ring gasket in the LMRP connector with a double resilient AX ring gasket after the connector failed to pressure test.

## Production Test No. 3
## Perforated Interval 2562-2569m

A 7" Baker Model "D" production packer with flapper valve was run and set at 2555m. The test string was run and pressure tested against the packer to 3500 psi before being displaced with 49 bbls of diesel and 24 bbls of gaseous nitrogen. The final displacement pressure of 2275 psi was bled to 1050 psi prior to perforating the interval 2562-2569m with a 2-1/8" Enerjet at 4 SPF. The perforating assembly was pulled into the test string and was stuck at 2544m (top of tool). The well was opened to flow while waiting on a fishing overshot. The Schlumberger line was retrieved after pulling out of the weak point at the rope socket.

Because of a high water cut and a high percentage of $CO_2$ in the associated gas, the produced fluids could not be effectively flared, hence the well was shut in. The Otis lubricator was rigged up and the fishing assembly run in the hole. No obstruction was found in the test string, indicating that the perforating assembly had fallen out of the tubing.

Tandem bottom hole samplers were run beneath an HP gauge and a gradient survey taken with 11 stops. The samples were taken at 2516m before pulling out of the hole. The well was then flowed into the separator for 10-1/2 hours before being shut in. An attempt to bullhead into the formation with 3500 psi surface pressure was unsuccessful; thus, the test string was reverse circulated before being pulled.

Following a gauge ring/junk basket run, a Baker K-1 retainer was run and set at 2554m and pressure tested to 3500 psi.

## Production Test No. 4
## Perforated Interval 2543-2552m

A 7" Baker Model "D" production packer with flapper valve was run and set at 2521m. The test string was run and pressure tested against the packer to 3500 psi before being displaced with 48 barrels of diesel and 24 bbls of gaseous nitrogen. Operations were temporarily suspended due to adverse weather. The perforating cushion was later reversed out and the upper test assembly was laid down before hanging of the test string.

When the weather eventually subsided, the LMRP was again pulled to assess a failure in the yellow pod. The control hose was found damaged just below the splash zone. The hose clamp had released the hose, allowing it to rub against the slip joint. After repairing the hose, the hang-off tool was retrieved and the upper test assembly rerun and pressure tested. The string was again displaced. The final displacement pressure of 2300 psi was bled to 1055 psi before perforating the interval 2543-2552m with a 2-1/8" Enerjet at 4SPF.

The well was opened for flow and allowed to clean up before running and landing the Otis DHSIT locking sub and Ameradas in the XN nipple at 2518m. The DHSIT and HP gauge were run and pressure tested from below before opening the well for the major flow period of ten hours. After five hours of build-up, the HP gauge and DHSIT were retrieved and the test string reversed out.

The upper test assembly was then pulled and the tubing hung off while W.O.W. The hang-off tool was then retrieved and the sting was run to bottom. An unsuccessful attempt was made to bullhead into the formation with 3500 psi surface pressure. The string was pulled and a Baker K-1 retainer was set at 2519m and pressure tested to 3500 psi.

## Production Test No. 5
## Perforated Interval 2469.5-2477m

A 7" Baker Model "D" production packer with flapper valve was run and set at 2447m. The test string was run and pressure tested against the packer to 3500 psi before being displaced with 47 bbls of diesel and 23 bbls of gaseous nitrogen. The final displacement pressure of 2020 psi was bled to 1010 psi prior to perforating the interval 2469.5-2477m with a 2-1/8" Enerjet at 4 SPF.

The well was opened for flow and allowed to clean up before running and landing the Otis DHSIT locking sub and Ameradas in the XN nipple at 2443m. The DHSIT and HP gauge were run and pressure tested from below before opening the well for major flow. The flow period had to be terminated after six hours due to adverse weather. The DHSIT and HP were retrieved and the test string reversed out before laying down the upper test assembly and hanging off.

After the weather had abated, the hang-off tool was retrieved and the upper test assembly rerun. The DHSIT locking sub and Ameradas were retrieved before running the Otis test plug into the XN nipple and pressure testing the test string to 3500 psi.

The DHSIT locking sub and Ameradas were rerun and the string displaced with 2 bbls of water and 70 bbls of diesel.

The DHSIT and HP gauge were run, landed and pressure tested from below. After measuring the inital formation pressure, the well was opened for flow. The well was shut in after nine hours of separator flow for the major build-up period.

The DHSIT, HP, locking sub, and Ameradas were retrieved prior to bullheading the formation fluids back into the formation. The string was reversed out and the upper test assembly laid down. The string was then run on drillpipe and displaced with water before stabbing into the packer. An injection rate of 3 BPM at 4000 psi was established. A 240 sack cement plug was mixed and pumped, with 50 sacks being squeezed below the packer and 190 sacks dumped on top. The calculated TOC was 2179m, or 48m above the top of the 7" liner at 2227m.

The string was pulled above the plug and reversed out before being laid down. The plug was pressure tested against the shear rams to 3500 psi. After running a 9-5/8" gauge ring/junk basket to 2109m, and EZSV bridge plug was run and set at 2105m.

WELL: TUNA-4

7. SAMPLES, CONVENTIONAL CORES, SIDEWALL CORES

| INTERVAL | TYPE |
|---|---|
| 205.0 - 811.0m | 3 sets of washed and air dried samples, 3 sets of washed and oven dried samples every 10 metres. One tin containing a composite of lightly washed samples from each 5 metres interval every 15 metres. |
| 811.0 - 3321.0m | 3 sets of washed and air dried samples, 3 sets of washed and oven dried samples every 5 metres. One tin containing a composite of lightly washed samples from each 5 metres interval every 15 metres. |
| 2426.0 - 1360.0m | Sidewall cores (shot 72, recovered 69) |
| 3309.5 - 2449.0m | Sidewall cores (shot 123, recovered 108) |
| 1380.0 - 1389.0m | Plastic sleeved Core No. 1 |
| 1389.0 - 1399.0m | Plastic sleeved Core No. 2 |
| 1399.0 - 1408.2m | Plastic sleeved Core No. 3 |
| 1404.6 - 1414.0m | Plastic sleeved Core No. 4 |
| 2481.0 - 2498.9m | Conventional Core No. 5 |
| 2498.9 - 2517.1m | Conventional Core No. 6 |
| 2517.1 - 2531.0m | Conventional Core No. 7 |
| 2531.0 - 2549.0m | Conventional Core No. 8 |
| 2549.0 - 2564.0m | Conventional Core No. 9 |
| 2822.5 - 2828.0m | Conventional Core No. 10 |
| 2828.0 - 2833.0m | Conventional Core No. 11 |
| 3273.9 - 3282.5m | Conventional Core No. 12 |

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## WIRELINE LOGS AND SURVEYS

| Type and Scale | | From | To |
|---|---|---|---|
| **Suite 1** | | | |
| BHC-GR | 1.200<br>1:500 | 807.5 | 60m |
| **Suite 2** | | | |
| DLT.E-MSFL-GR | 1:200<br>1:500 | 2439.0<br>2439.0 | 793.5m<br>1330.0m |
| LDT.C-CNT.H-GR | 1:200 | 2427.0 | 793.5m |
| FDC-CNL-GR | 1:200<br>1:500 | 2440.0 | 793.5m |
| BHC-GR | 1:200<br>1:500 | 2440.0 | 793.5m |
| HDT | 1:200 | 2441.0 | 793.5m |
| CYBERDIP (3 PAD) | 1:500 | 2440.0 | 2080.0m |
| CYBERDIP (4 PAD) | 1:500 | 2440.0 | 2080.0m |
| RFT RUN 1<br>(PRESSURE RECORD) | 1:200 | 2399.5 | 1377.0m |
| RFT RUNS 2 - 4<br>(SAMPLE RECORD) | 1:200 | 2369.5 | 1398.5m |
| RFT-HP RUN 1<br>(PRESSURE RECORD) | 1:200 | 2399.5 | 1377.0m |
| RFT-HP RUNS 2 - 4<br>(SAMPLE RECORD) | 1:200 | 2369.5 | 1398.5m |
| CST RUNS 1 - 2 | 1:200 | 2426.0 | 1360.0m |
| **Suite 3** | | | |
| DLT.B-MSFL-GR | 1:200<br>1:500 | 2649.0 | 2434.5m |
| LDT.C-CNT.H-GR | 1:200<br>1:500 | 2649.0 | 2434.5m |
| HDT | 1:200 | 2649.5 | 2434.5m |
| CYBERDIP | 1:500 | 2434.5 | 2649.5m |
| RFT-GR RUN 5<br>(PRESSURE RECORD) | 1:200 | 2639.0 | 2451.5m |
| RFT-HP RUN 5<br>(PRESSURE RECORD) | 1:200 | 2639.0 | 2451.5m |

Suite 3 cont'd

| | | | |
|---|---|---|---|
| HP-RFT RUN 6 - 14 (SAMPLE RECORD) | 1:200 | 2582.5 | 2451.5m |
| RFT-GR RUN 6 - 14 (SAMPLE RECORD) | 1:200 | 2582.5 | 2451.5m |

## Suite 4

| | | | |
|---|---|---|---|
| DLTE-MSFL-GR | 1:200<br>1:500 | 2434.5 | 3007.5m |
| LDTC-CNTH-GR | 1:200<br>1:500 | 3011.0 | 2600.0m |
| BHC-GR | 1:200<br>1:500 | 3010.0 | 2434.5m |
| RFT-GR RUN 15 - 17 PRESSURE RECORD | 1:200 | 2948.5 | 2610.7m |
| RFT-HP RUN 17 PRESSURE RECORD | 1:200 | 2948.5 | 2610.7m |
| JB & BRIDGE PLUG | | | 2343.0m |
| RFT-HP RUN 17 - 20 SAMPLING RUN | 1:200 | 2948.5 | 2896.5m |
| RFT-GR RUN 17 - 20 SAMPLING RUN | 1:200 | 2948.5 | 2896.5m |
| RFT-HP RUN 21 - 29 SAMPLING RUN | 1:200 | 2929.5 | 2686.2m |
| RFT-GR RUN 21 - 29 SAMPLING RUN | 1:200 | 2929.5 | 2686.2m |
| RFT-HP RUN 30 SAMPLING RECORD | 1:200 | | 2929.5m |
| RFT-GR RUN 30 SAMPLING RECORD | 1:200 | | 2929.5m |

## Suite 5

| | | | |
|---|---|---|---|
| BHC-GR | 1:200<br>1:500 | 3321.0 | 2925.0m |
| LDTC-CNTH-GR | 1:200<br>1:500 | 3322.0 | 2925.0m |
| DLT.E-MSFL-GR | 1:200<br>1:500 | 3319.0 | 2925.0m |
| HDT | 1:200 | 3322.0 | 2600.0m |
| CST-GR | 1:200 | 3309.5 | 2449.0m |
| RFT-GR RUN 31 - 34 SAMPLING RECORD | 1:200 | 3158.0 | 3031.5m |
| RFT-HP RUN 31 - 34 SAMPLING RECORD | 1:200 | 3158.0 | 3031.5m |

Suite 6

| | | | |
|---|---|---|---|
| CBL-WAVE-GR-CCL | 1:200 | 3182.0 | 2400.0m |
| CBL-VDL-GR-CCL | 1:200 | 3182.0 | 2400.0m |
| BAKER "D" PROD. PACKER | 1:200 | | 3080.0m |

Suite 7

| | | | |
|---|---|---|---|
| HP RECORD PROD. TEST 1 SAMPLE | | | 3143.0m |
| HP RECORDING PROD. TEST 1 | | | 3143.0m |
| PERFORATION PROD. TEST 1 | | 3147.0 | 3138.0m |

Suite 8

| | | | |
|---|---|---|---|
| BAKER "D" PROD PACKER | 1:200 | | 2790.0m |
| CH RFT-GR RUNS 1-2 SAMPLE RECORD | | | |
| HP RECORD PRODUCTION TEST 2 | | | |
| CH RFT-GR RUNS 35-36 SAMPLE RECORD | | | |
| CH RFT-HP RUNS 35-36 SAMPLE RECORD | | | |

Suite 9

| | | | |
|---|---|---|---|
| PERFORATION PROD. TEST 2 | | 2820.0 | 2829.0m |

Suite 10

| | | | |
|---|---|---|---|
| CH RFT-GR RUN 3 SAMPLE RECORD | | | |
| CH RFT-HP RUNS 3, 4, 5 SAMPLE RECORD | | | |
| BAKER "D" PRODUCTION PACKER | | | 2555.0m |

Suite 11

| | | | |
|---|---|---|---|
| HP RECORD PRODUCTION TEST 3 SAMPLE RECORD | | | |
| PERFORATION PRODUCTION TEST 3 | | 2569.0 | 2562.0m |

Suite 12

| | | | |
|---|---|---|---|
| BAKER "D" PRODUCTION PACKER | | | 2521.0m |
| HP RECORD PRODUCTION TEST 4 | | | |
| PERFORATION PRODUCTION TEST 4 | | 2543.0 | 2552.0m |

Suite 13

| | | | |
|---|---|---|---|
| HP RECORD PROD. TEST 4 | | | |
| PERFORATION PROD. TEST 4 | | 2543.0 | 2552.0m |

Suite 14

| | | | |
|---|---|---|---|
| BAKER "D" PRODUCTION PACKER | 1:200 | | 2447.0m |

Suite 15

| | | |
|---|---|---|
| HP RECORD PRODUCTION TEST 5 | | |
| PERFORATION PRODUCTION TEST 5 | 2469.5 | 2477.0m |

Suite 16

| | | |
|---|---|---|
| HP RECORD PRODUCTION TEST 5 | 2469.5 | 2477.0m |

20941/4-7

## TEMPERATURE RECORD - TUNA-4

| LOGGING RUN | THERMOMETER DEPTH (m) | MAX. RECORDED TEMPERATURE ($C^o$) | CIRCULATION TIME ($t_K$) (hours) | TIME AFTER CIRCULATION STOPPED (t) | HORNER TEMPERATURE ($C^o$) | GEOTHERMAL GRADIENT ($C^o$/km) |
|---|---|---|---|---|---|---|
| Suite 1 | | | | | | |
| BHC-GR | 807.5 | 34.0 | | 3.5 hrs | | |
| Suite 2 | | | | | | |
| DLT.E-MSFL-GR | 2439.0 | 84.0 | 1.5 hrs | 7.5 hrs | 102.5 | 39.2 |
| FDC-CNL-GR | 2440.0 | 91.0 | | 13.0 hrs | | |
| BHC-GR | 2440.0 | 93.0 | | 17.0 hrs | | |
| Suite 3 | | | | | | |
| DLT.B-MSFL-GR | 2649.0 | 93.0 | 1.5 hrs | 4.45 hrs | 99.2 | 34.7 |
| LDT.C-CNT.H-GR | 2649.0 | 94.5 | | 8.5 hrs | | |
| Suite 4 | | | | | | |
| LDTC-CNTH-GR | 3011.0 | 102.0 | 1.5 hrs | 11.5 hrs | 105.5 | 32.6 |
| DLTE-MSFL-GR | 3007.5 | 100.0 | | 4.0 hrs | | |
| BHC-GR | 3010.0 | 103.5 | | 14.5 hrs | | |
| Suite 5 | | | | | | |
| DLTE-MSFL-GR | 3322.0 | 102.0 | 1.5 hrs | 6.5 hrs | 130.0 | 37.0 |
| LDTC-CNTH-GR | 3322.0 | 111.0 | | 11.0 hrs | | |
| BHC-GR | 3322.0 | 117.0 | | 14.5 hrs | | |
| CST-GR | 3322.0 | 123.0 | | 39.5 hrs | | |

# FIGURES

# LOCALITY MAP
# TUNA-4

**SCALE 1:250 000**

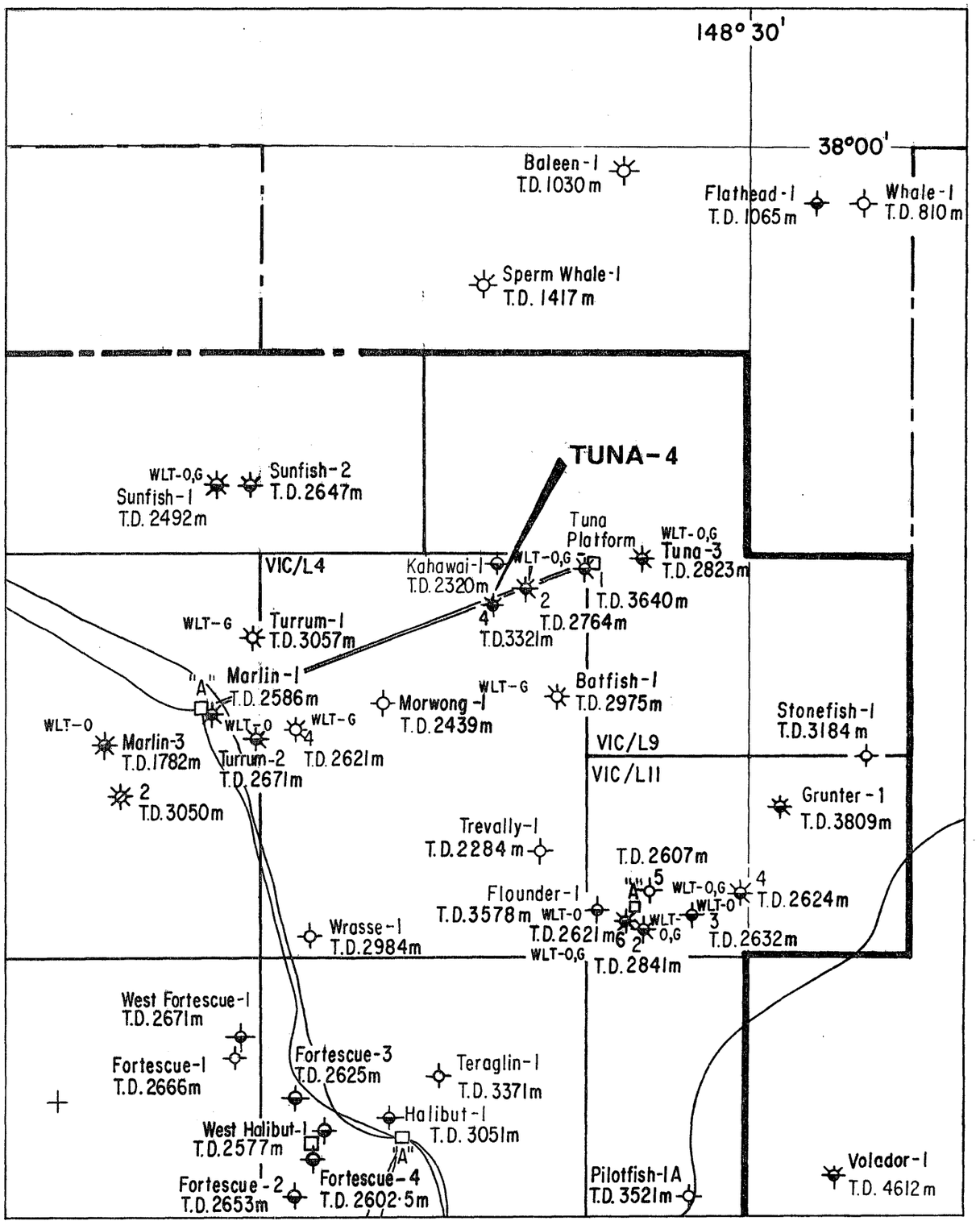



**Fig. 1**

FIG. 2

# WELL PROGRESS CURVE

WELL: TUNA-4 RIG: SOUTHERN CROSS

CASING SEAT — DESIGN / ACTUAL

LITHOLOGY — PROJECTED / ACTUAL

| DATES | | |
|---|---|---|
| Move | 1245 HRS | 16 MAY 84 |
| Arrive Loc. | 0745 HRS | 17 MAY 84 |
| Spud | 0430 HRS | 18 MAY 84 |
| T.D. Well | 1900 HRS | 7 JUL 84 |
| Begin Test | 1815 HRS | 11 JUL 84 |
| End Test | 0145 HRS | 26 AUG 84 |
| Depart Loc. | 0400 HRS | |

| | PROGRAM | ACTUAL |
|---|---|---|
| Water Depth S.S. | 60m | 61m |
| Well Depth | 3021m | 3321m |
| Total Days | 41(47 BUDGET) | 106.64 |
| Location | 619,888mE 5,772,297mN | 619,881mE 5,772,296mN |
| R.K.B. | 21m | 21m |

Projected: - - - - - -

Actual: ———

20" @ 203 205

13-3/8" @ 796 794

TOL @ 2227

9-5/8" @ 2331 2434

TD @ 3021 7" @ 3219

TD @ 3321

CUT 4 CORES

CUT 5 CORES

INTERMEDIATE LOGS

CUT 2 CORES

LOG/FISH 2 RFT'S/PULL STACK

CUT CORE

7" LINER/P.T.

PRODUCTION TEST

P&A/PULL ANCHORS

M-1 @ 1388

T-1 @ 2226

C @ 2911

13

24

0 500 1000 2500 3000 3500

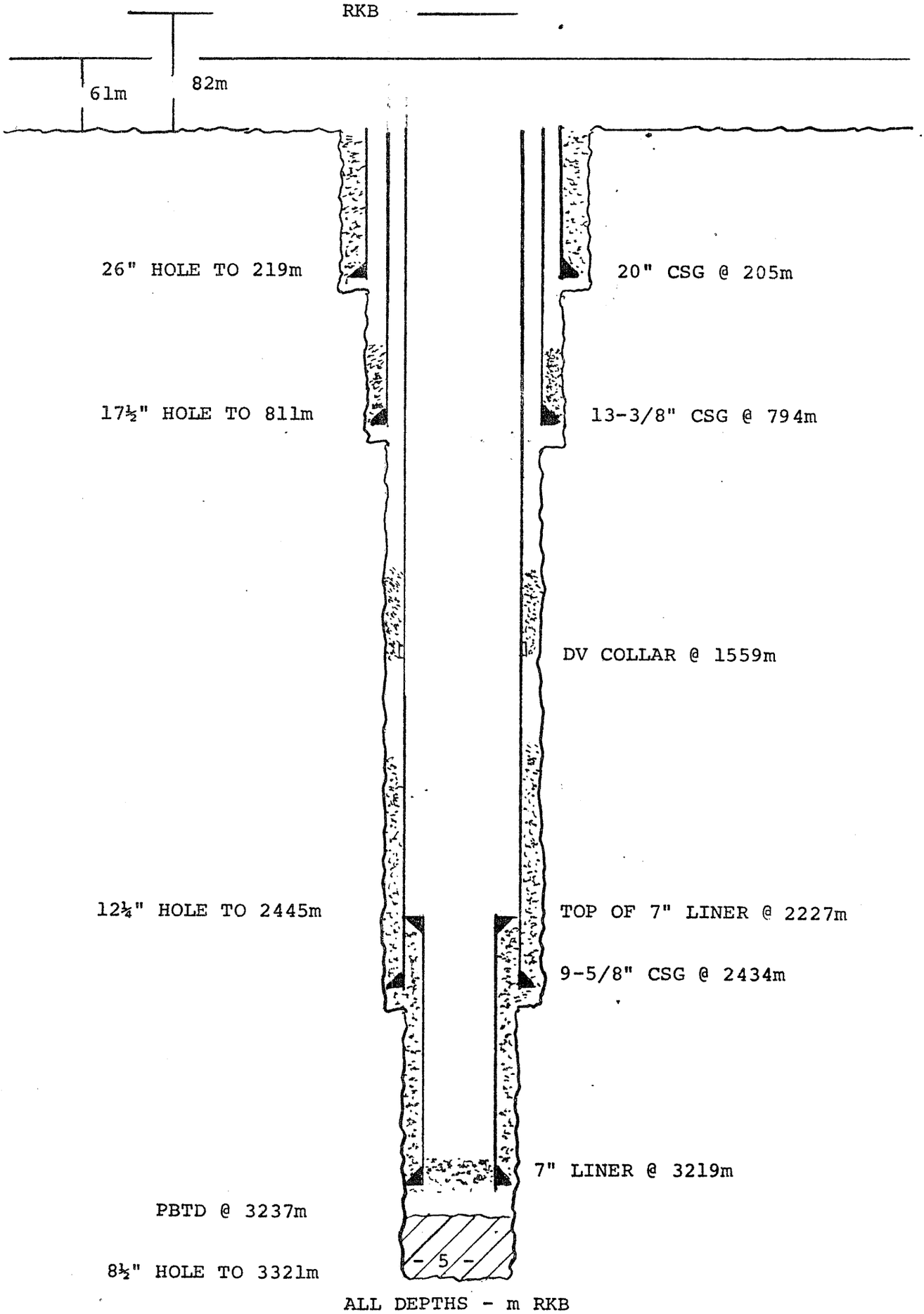
FEET IN HOLE

0 10 20 30 40 50 60 70 80 90 100 110

DAYS

FIG. 3 WELLBORE SCHEMATIC

TUNA-4




ALL DEPTHS - m RKB

FIG. 4 TOP HOLE ABANDONMENT SCHEMATIC

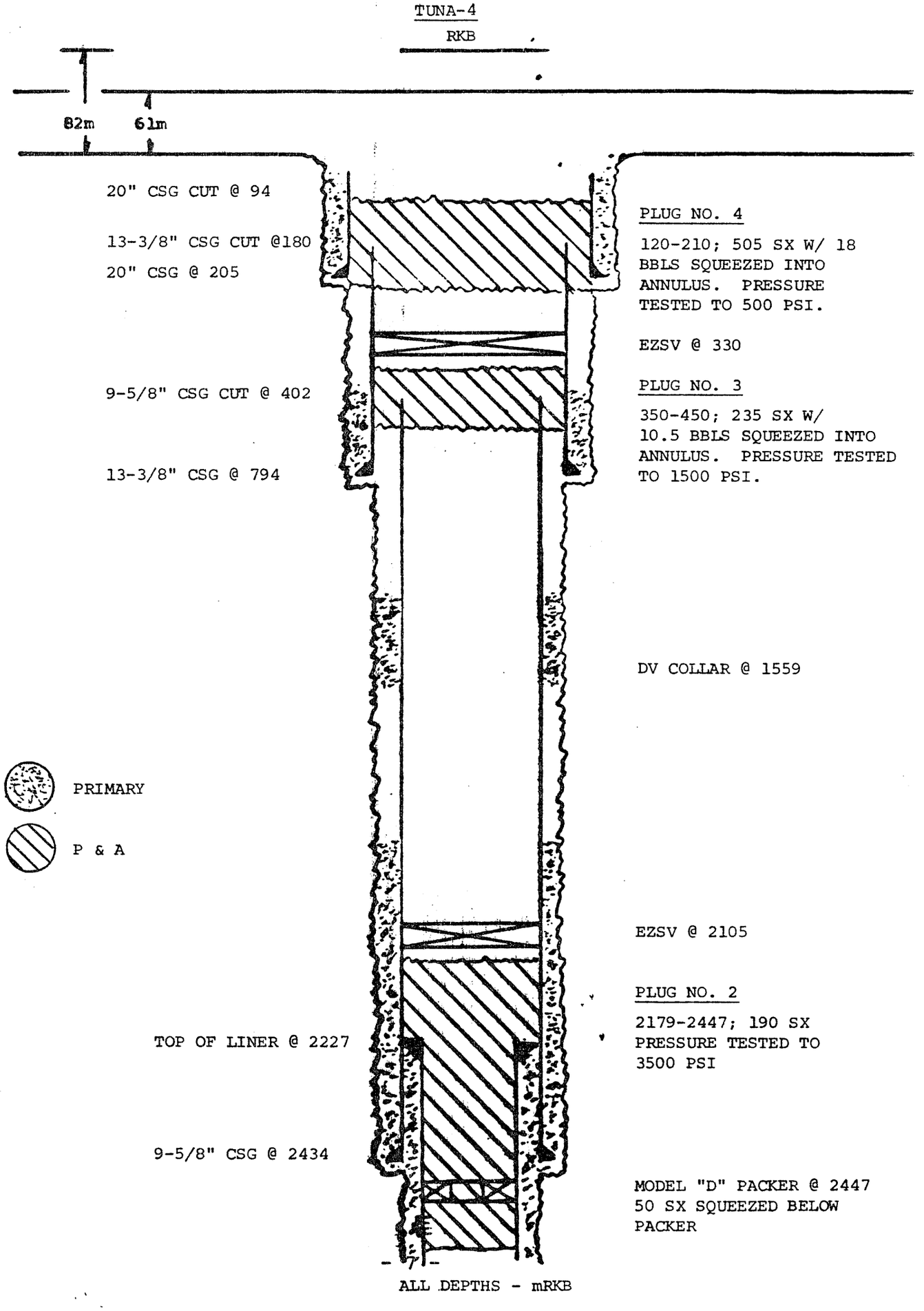
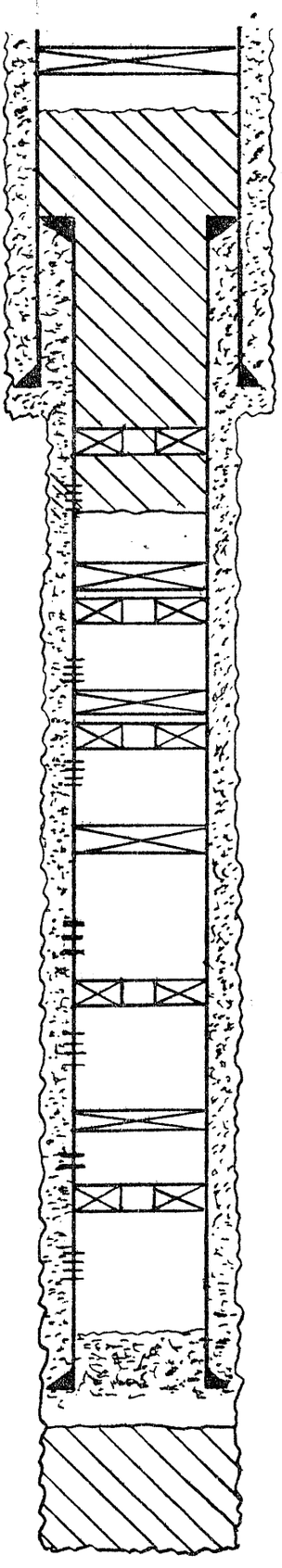


FIG. 5

BOTTOM HOLE ABANDONMENT SCHEMATIC

TUNA-4



EZSV BRIDGE PLUG @ 2105

PLUG NO. 2
2179-2477
PRESSURE TESTED TO 3500 PSI

TOP OF LINER @ 2227

9-5/8" CSG @ 2434

PROD. TEST NO. 5
PERFS 2469.5-2477

MODEL "D" PACKER @ 2447
50 SX SQUEEZED BELOW PACKER

K-1 RETAINER @ 2519
MODEL "D" PACKER @ 2521

PROD. TEST NO. 4
PERFS 2543-2552

K-1 RETAINER @ 2554
MODEL "D" PACKER @ 2555

PROD. TEST NO. 3
PERFS 2562-2569

K-1 RETAINER @ 2601

CHRFT NO. 4 @ 2752
CHRFT NO. 5 @ 2768.7
CHRFT NO. 3 @ 2775

PROD. TEST NO. 2
PERFS 2820-2829

MODEL "D" PACKER @ 2790

K-1 RETAINER @ 2930

CHRFT NO. 1 @ 2938.8
CHRFT NO. 2 @ 2940

MODEL "D" PACKER @ 3080

PROD. TEST NO. 1
PERFS 3138-3147

LINER PBTD @ 3182

7" LINER @ 3219

PLUG NO. 1
3237-3321
TAGGED W/15 KIPS

TD @ 3321

NOTE: ALL K-1 RETAINER WERE FITTED W/BRIDGE PLUGS & WERE PRESSURE TESTED TO A MINIMUM OF 3500 PSI

ALL DEPTHS m-RKB

FIG. 6

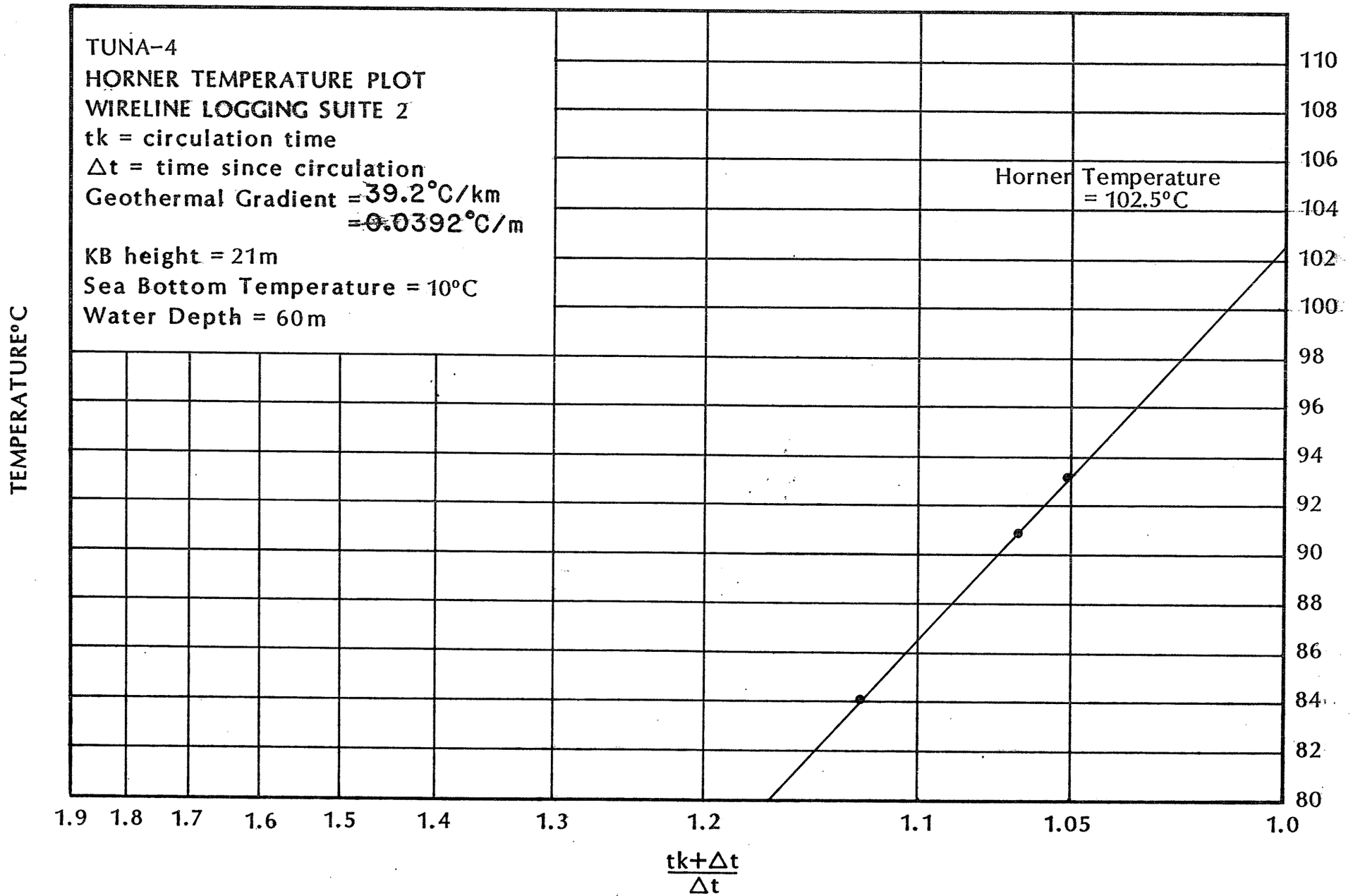

TUNA-4
HORNER TEMPERATURE PLOT
WIRELINE LOGGING SUITE 2
tk = circulation time
Δt = time since circulation
Geothermal Gradient = 39.2°C/km
= 0.0392°C/m
KB height = 21m
Sea Bottom Temperature = 10°C
Water Depth = 60m
Horner Temperature
= 102.5°C
TEMPERATURE°C
110
108
106
104
102
100
98
96
94
92
90
88
86
84
82
80
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.05
1.0
tk+Δt / Δt

FIG. 7

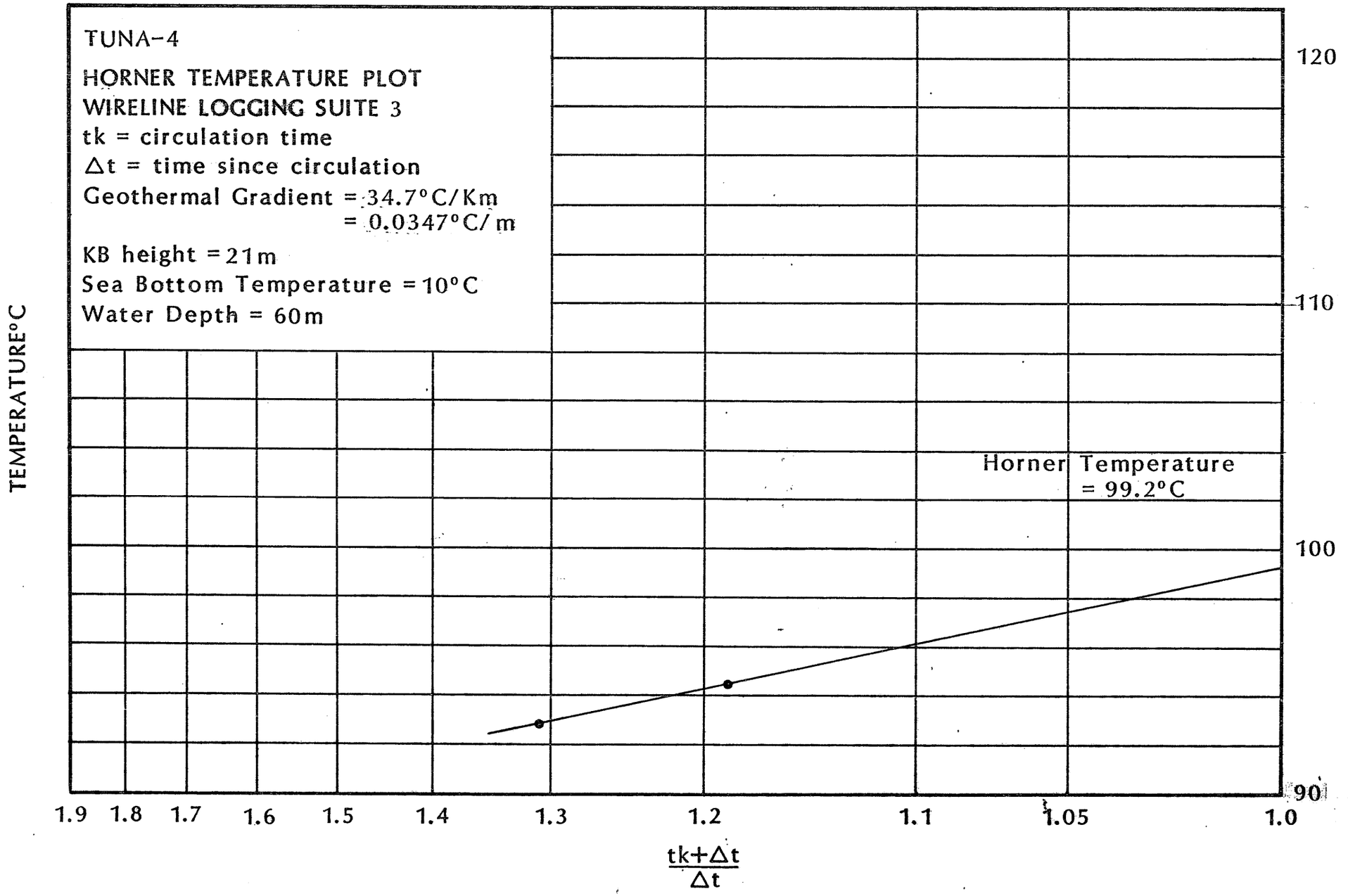

TUNA-4
HORNER TEMPERATURE PLOT
WIRELINE LOGGING SUITE 3
tk = circulation time
Δt = time since circulation
Geothermal Gradient = 34.7°C/Km
= 0.0347°C/m
KB height = 21m
Sea Bottom Temperature = 10°C
Water Depth = 60m
Horner Temperature
= 99.2°C
TEMPERATURE°C
120
110
100
90
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.05
1.0
tk+Δt / Δt

FIG. 8

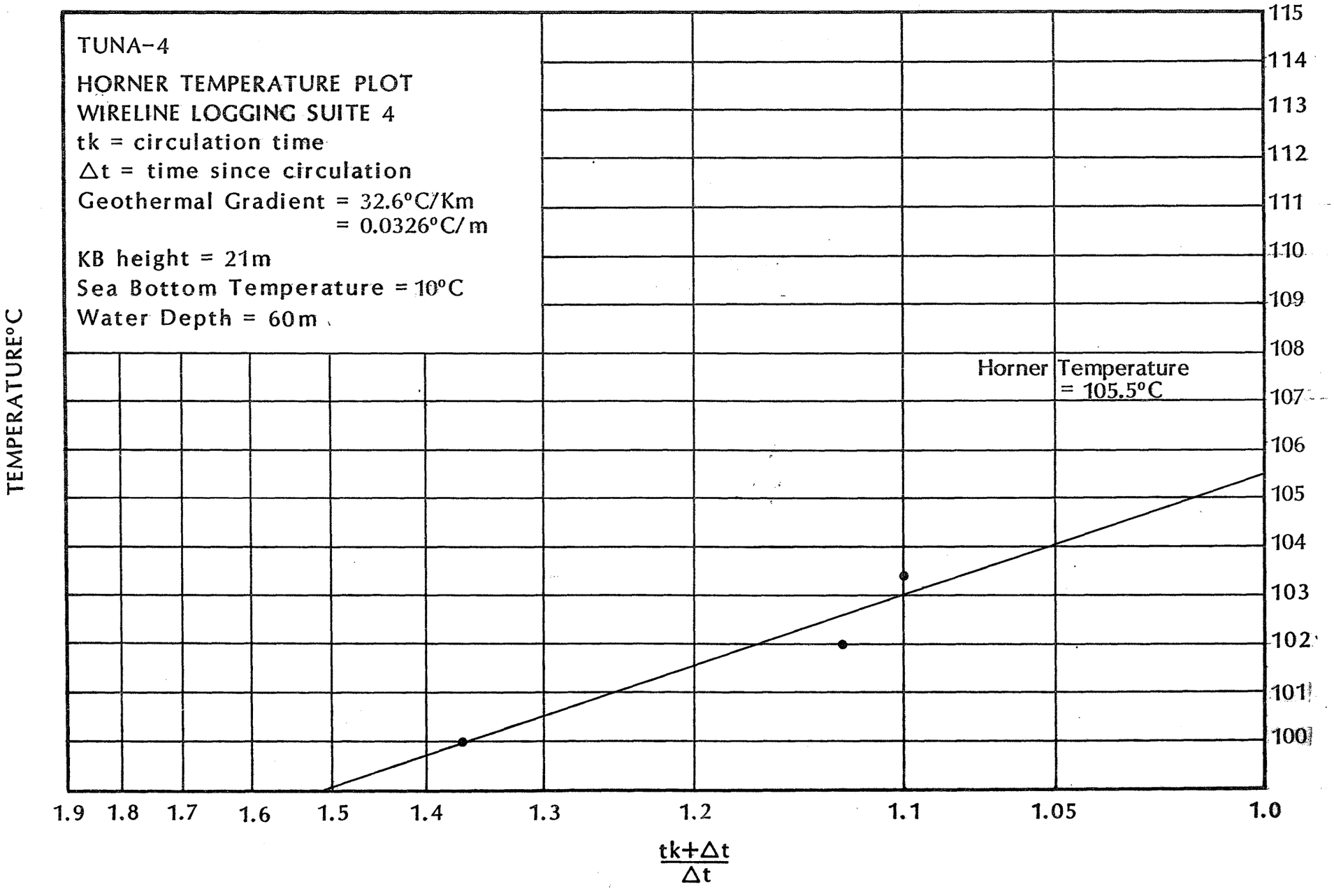
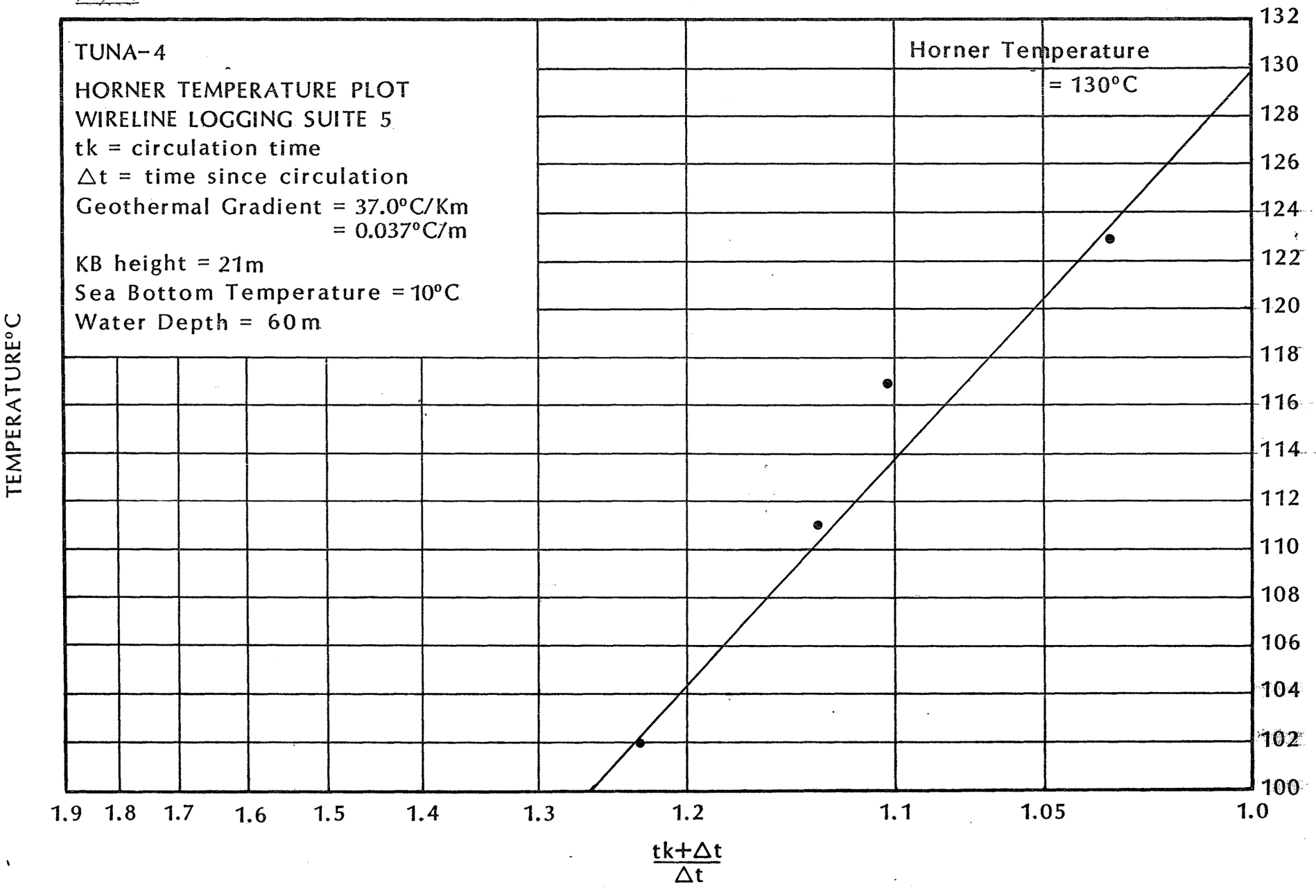

TUNA-4
HORNER TEMPERATURE PLOT
WIRELINE LOGGING SUITE 4
tk = circulation time
Δt = time since circulation
Geothermal Gradient = 32.6°C/Km
= 0.0326°C/m
KB height = 21m
Sea Bottom Temperature = 10°C
Water Depth = 60m
Horner Temperature
= 105.5°C
TEMPERATURE°C
115
114
113
112
111
110
109
108
107
106
105
104
103
102
101
100
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.05
1.0
tk+Δt / Δt

FIG. 9


TUNA-4
HORNER TEMPERATURE PLOT
WIRELINE LOGGING SUITE 5
tk = circulation time
Δt = time since circulation
Geothermal Gradient = 37.0°C/Km
= 0.037°C/m
KB height = 21m
Sea Bottom Temperature = 10°C
Water Depth = 60m
Horner Temperature
= 130°C
TEMPERATURE°C
132
130
128
126
124
122
120
118
116
114
112
110
108
106
104
102
100
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.05
1.0
tk+Δt / Δt

# APPENDIX 1

# APPENDIX 1

## LITHOLOGY DESCRIPTIONS

# TUNA-4

## Lithology Descriptions

| Depth | % | Descriptions |
|---|---|---|
| 240 - 250m | 50 | CASING CEMENT: Phenol red. |
| | 40 | CALCARENITE: light grey, firm, fine grained, subround to round, moderately well sorted calcareous cement. |
| | 10 | SANDSTONE: loose unconsolidated coarse clear to milky white quartz grains, subangular to rounded, moderately sorted. |
| | Trace | FOSSILS: forams, coral. |
| 250 - 260m | 70 | CALCARENITE: as above. |
| | 30 | CASING CEMENT: Phenol red. |
| | Trace | SANDSTONE: as above. |
| | Trace | FOSSILS: as above. |
| 260 - 270m | 80 | CALCARENITE: as above. |
| | 20 | CASING CEMENT: as above. |
| 270 - 280m | 90 | CALCARENITE: as above. |
| | 10 | CASING CEMENT: as above. |
| | Trace | FOSSILS: forams. |
| 280 - 290m | 90 | CALCARENITE: as above. |
| | 10 | SANDSTONE: as above. |
| | Trace | FOSSILS: forams. |
| 290 - 300m | 100 | CALCARENITE: as above. |
| | Trace | SANDSTONE: as above. |
| | Trace | FOSSILS: forams |
| 300 - 310m | 100 | CALCARENITE: light grey to very light grey, firm, fine grained, moderately well sorted, muddy calcareous cement. |
| 310 - 320m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: forams, minor coral. |
| 320 - 330m | 100 | CALCARENITE: as above. |
| 330 - 340m | 100 | CALCARENITE: as above. Gumbo over shakers. |
| 340 - 350m | 100 | CALCARENITE: Very light grey to light grey, soft to firm, fine to very fine grained, moderately well sorted, argillaceous/calcareous matrix/cement. The argillaceous matrix represents the gumbo over the shakers. |
| 350 - 360m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS. |
| 360 - 370m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: bryozoan fragments. |
| 370 - 380m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: forams, shelly fragments. |
| 380 - 390m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |
| 390 - 400m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |

| | | |
|---|---|---|
| 400 - 410m | 100 | CALCARENITE: as above with minor glauconite. |
| | Trace | FOSSILS: as above. |
| 410 - 420m | 95 | CALCARENITE: as above with minor glauconite. |
| | 5 | FOSSILS: shell fragments, forams, coral, bryozoans and possible crynoid stems. |
| 420 - 430m | 80 | CALCARENITE: as above with minor glauconite. |
| | 20 | FOSSILS: as above. |
| 430 - 440m | 100 | CALCARENITE: light grey, soft to firm, fine to very fine-grained, subangular to round, moderately well sorted, argillaceous - muddy/calcareous matrix/cement. Minor glauconite. |
| | Trace | FOSSILS. |
| 440 - 450m | 100 | CALCARENITE: as above. |
| 450 - 460m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |
| 460 - 470m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |
| 470 - 480, | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: forams. |
| 480 - 490m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: forams |
| 490 - 500m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: forams, bryozoans |
| 500 - 510m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: forams, bryozoans. |
| 510 - 520m | 100 | CALCARENITE: very light grey to light grey, soft to firm, fine to very fine grained, subangular to subrounded, moderately well sorted, muddy to argillaceous calcareous cement. Minor glauconite. |
| | Trace | FOSSILS: bryozoans, coral, rare forams. |
| 520 - 530m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |
| 530 - 540m | 100 | CALCARENITE: as above. |
| 540 - 550m | 100 | CALCARENITE: as above. |
| 550 - 560m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: bryozoans. |
| 560 -570 m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS - bryozoans, forams. |
| 570 - 580m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |
| 580 - 590 m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |

| | | |
|---|---|---|
| 590 - 600m | 100 | CALCARENITE: light grey to medium light grey, soft to firm, fine to very fine grained, subangular to subrounded, moderately well sorted, muddy calcareous cement, minor glauconite. |
| | Trace | FOSSILS: as above. |
| 600 - 610m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS; as above. |
| 610 - 620m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |
| 620 - 630m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |
| 630 - 640m | 100 | CALCARENITE, predominantly very fine grained otherwise as above. |
| | Trace | FOSSILS: as above. |
| 640 - 650m | 100 | CALCARENITE: light grey to medium light grey, firm, predominnatly very fine grained with minor fine grains, subangular to subrounded, moderately well sorted, muddy calcareous cement, minor glauconite. |
| | Trace | FOSSILS: as above. |
| 650 - 660m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: forams, radiolaria, possible bryozoa. |
| 660 - 670m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |
| 670 - 680 m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |
| 680 - 690m | 90 | CALCARENITE: as above. |
| | 10 | CALCISILTITE: light grey to medium light grey, firm, muddy calcareous cement. |
| | Trace | FOSSILS: as above. |
| 690 - 700m | 90 | CALCARENITE: as above. |
| | 10 | CALCISILTITE: as above. |
| | Trace | FOSSILS: as above. |
| 700 - 710m | 90 | CALCARENITE: very fine grained otherwise as above. |
| | 10 | CALCISILTITE |
| | Trace | FOSSILS: as above. |
| 710 - 720m | 100 | CALCARENITE: as above. |
| | Trce | FOSSILS: forams |
| 720 - 730m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: as above. |
| 730 - 740m | 100 | CALCARENITE: light grey to medium light grey, firm, very fine grained, subangular to subrounded, moderately well sorted, muddy calcareous cement. |
| | Trace | FOSSILS: forams |
| 740 - 750m | 100 | CALCARENITE: as above. |
| | Trace | FOSSILS: forams. |

| | | |
|---|---|---|
| 750 - 760m | 90 | CALCARENITE: as above. |
| | 10 | CALCISILTITE: as above. |
| | Trace | FOSSILS: bryozoan, forams. |
| 760 - 770m | 90 | CALCARENITE: Minor pyrite otherwise as above. |
| | 10 | CALCISILTITE: as above. |
| | Trace | FOSSILS: as above. |
| 770 - 780m | 100 | CALCARENITE: minor pyrite otherwise as above. |
| | Trace | FOSSILS: forams. |
| 780 - 790m | 90 | CALCARENITE: as above minor pyrite. |
| | 10 | CALCISILTITE: as above. |
| | Trace | FOSSILS: as above. |
| 790 - 800m | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| 800 - 811m (bottoms up sample) | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| 811 - 815m | 50 | CASING CEMENT |
| | 40 | CALCARENITE: as above. |
| | 10 | CALCISILTITE: as above. |
| 815 - 820m | 90 | CALCARENITE: very light grey to light grey, firm, very fine grained, subangular to subrounded, moderately well sorted, muddy to argillaceous calcareous matrix/cement. |
| | 10 | CALCISILTITE: light grey to medium light grey, firm, muddy to argillaceous calcareous cement. |
| 820 - 825m | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| | Trace | FOSSILS - forams |
| 825 - 830m | 80 | CALCARENITE: soft to firm otherwise as above. |
| | 20 | CALCISILTITE: soft to firm otherwise as above. |
| | Trace | FOSSILS: as above. |
| 830 - 835m | 90 | CALCARENITE: as above. |
| | 10 | CALCISILTITE: as above. |
| | Trace | FOSSILS: as above. |
| | | Abundant Gumbo over the Shakers. |
| 835 - 840m | 90 | CALCARENITE: as above. |
| | 10 | CALCISILTITE: as above. |
| 840 - 845m | 80 | CALCARENITE: with minor glauconite otherwise as above. |
| | 20 | CALCISILTITE: as above. |
| 845 - 850m | 90 | CALCARENITE: as above. |
| | 10 | CALCISILTITE: as above. |
| | Trace | FOSSILS: as above. |
| 850 - 855m | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| | | Abundant Gumbo over the Shakers. |

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| 855 - 860m | 80 | CALCARENITE: very light grey to light grey, soft to firm, very fine grained, subangular to subrounded, moderately well sorted, very argillaceous/muddy calcareous cement/matrix. Minor galuconite and pyrite. |
| | 20 | CALCISILTITE: medium light grey, soft to firm, muddy argillaceous calcareous cement/matrix. |
| | Trace | FOSSILS: forams, radiolaria. |
| 860 - 865m | 90 | CALCARENITE: as above. |
| | 10 | CALCISILTITE: as above. |
| 865 - 870m | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| 870 - 875m | 70 | CALCARENITE: as above. |
| | 30 | CALCISILTITE: as above. |
| | | Abundant Gumbo over the Shakers. |
| 875 - 880m | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| | Trace | FOSSILS: as above. |
| 880 - 885m | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| 855 - 890m | 90 | CALCARENITE: as above. |
| | 10 | CALCISILTITE: as above. |
| 890 - 895 | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| 895 - 900m | 90 | CALCARENITE: as above. |
| | 10 | CALCISILTITE: as above. |
| | Trace | FOSSILS: forams. |
| 900 - 905m | 100 | CALCARENITE: as above. |
| | Trace | CALCISILTITE: as above. |
| | Trace | FOSSILS: as above. |
| 905 - 910m | 90 | CALCARENITE: very light grey to light grey, soft to firm, very fine grained, subangular to subrounded, moderately well sorted, very argillaceous/muddy calcareous cement. Minor glauconite and pyrite. |
| | 10 | CALCISILTITE: medium light grey, firm, argillaceous/muddy calcareous cement. |
| | | Abundant Gumbo over the Shakers. |
| 910 - 915m | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| 915 - 920m | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above occasionally pyritic. |
| 920 - 925m | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| 925 - 930 | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| 930 - 935 m | 50 | CALCARENITE: as above. |
| | 50 | CALCISILTITE: as above. |
| | Trace | FOSSILS: as above. |

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| 935 - 940m | 60 | CALCARENITE: as above. |
| | 40 | CALCISILTITE: as above. |
| | Trace | FOSSILS: as above. |
| 940 - 945m | 70 | CALCARENITE: as above. |
| | 30 | CALCISILTITE: as above. |
| 945 - 950m | 70 | CALCARENITE: as above. |
| | 30 | CALCISILTITE: as above. |
| | Trace | FOSSILS: as above. |
| 950 - 955m | 80 | CALCARENITE: as above. |
| | 20 | CALCISILTITE: as above. |
| 955 - 970m | 70 | CALCARENITE: as above. |
| | 30 | CALCISILTITE: as above. |
| 970 - 975m | 100 | CALCARENITE: light grey to grey, very fine to fine grained, subrounded, well sorted, well cemented. |
| 975 - 990m | 80 | CALCARENITE: as above. |
| | 20 | CALCILUTITE: as above. |
| 990 - 1000m | 100 | CALCARENITE: as above. |
| 1000 - 1010m | 80 | CALCARENITE: as above. |
| | 20 | CALCILUTITE: as above. |
| 1010 - 1015m | 90 | CALCARENITE: occ. fossiliferous as above. |
| | 10 | CALCILUTITE: very light grey, soft. |
| 1015 - 1020m | 60 | CALCARENITE: as above. |
| | 40 | CALCILUTITE: light grey, soft, silty |
| 1020 - 1025m | 80 | CALCARENITE: as above. |
| | 20 | CALCILUTITE: as above. |
| 1025 - 1030m | 90 | CALCARENITE: grey to dark grey, fine to medium grained, moderately sorted, well cemented, occasionally fossiliferous. |
| | 10 | CALCILUTITE: light grey, soft. |
| 1030 - 1035m | 80 | CALCARENITE: as above. |
| | 20 | CALCILUTITE: as above. |
| 1035 - 104m | 70 | CALCARENITE: as above. |
| | 30 | CALCILUTITE: as above. |
| 1040 - 1045m | 90 | CALCAREITE: fine to medium grained as above. |
| | 10 | CALCILUTITE: as above. |
| 1045 - 1050m | 70 | CALCARENITE: as above. |
| | 30 | CALCILUTITE: as above. |
| 1050 - 1060m | 90 | CALCARENITE: as above. |
| | 10 | CALCILUTITE: as above. |
| 1060 - 1065m | 80 | CALCARENITE: pyritic otherwise as above. |
| | 20 | CALCILUTITE: as above. |
| 1065 - 1080m | 70 | CALCARENITE: as above. |
| | 30 | CALCILUTITE: as above. |

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| 1080 - 1085m | 90 | CALCARENITE: fine to medium, occasionally coarse grained, moderately to poorly sorted, fossiliferous, moderately compacted, trace carbonaceous material. |
| | 10 | CALCILUTITE/CALCISILTITE: light grey, soft, silty. |
| 1085 - 1090m | 70 | CALCARENITE: as above. |
| | 30 | CALCILUTITE/CALCISILTITE: as above. |
| 1090 - 1095m | 60 | CALCARENITE: as above. |
| | 40 | CALCISILTITE: as above. |
| 1095 - 1100m | 40 | CALCARENITE: as above. |
| | 60 | CALCISILTITE/CALCILUTITE: as above. |
| 1100 - 1105m | 20 | CALCARENITE: grey - dark grey, fine to medium grain. |
| | 80 | CALCILSILTITE/CALCILUTITE: grey - light grey, fossiliferous. |
| 1105 - 1110m | 30 | CALCARENITE: as above. |
| | 70 | CALCILSILTITE/CALCILUTITE: as above. Trace of carbonaceous material. |
| 1110 - 1115m | 30 | CALCILUTITE: light grey, white grey, soft. |
| | 70 | CALCISILTITE: light grey, grey, very fine grained, moderately firm, carbonaceous with fossil fragments. |
| 1115 - 1130m | 100 | CALCILSILTITE: as above with carbonaceous laminae. |
| 1130 - 1135m | 50 | CALCILSILTITE: as above. |
| | 50 | CALCILUTITE: as above. |
| 1135 - 1140m | 70 | CALCILSILTITE: as above. |
| | 30 | CALCILUTITE: as above. |
| 1140 - 1145m | 60 | CALCISILTITE: as above fossiliferous |
| | 40 | CALCILUTITE: light grey, soft, occasionally silty. |
| 1145 - 1150m | 70 | CALCISILTITE: as above. ) |
| | 30 | CALCILUTITE: as above. ) |
| | | ) SAMPLE |
| 1150 - 1160m | 60 | CALCISILTITE: as above. ) |
| | 40 | CALCILUTITE: as above. ) QUALITY |
| | | ) |
| 1160 - 1165m | 50 | CALCISILTITE: as above. ) VERY POOR |
| | 50 | CALCILUTITE: as above. ) |
| 1165 - 1170m | 80 | CALCISILTITE: dark grey, grey, very fine grained, slightly carbonaceous, occasionally sandy, firm. |
| | 20 | CALCILUTITE: as above. |
| 1170 - 1175m | 40 | CALCISILTITE: as above. |
| | 60 | CALCILUTITE: (marl) light grey to very light grey, soft sticky, occasionally sandy and carbonaceous. |
| 1175 - 1180m | 30 | CALCISILTITE: dark grey to grey, sandy, firm. |
| | 70 | CALCILUTITE: (marl) light grey, soft, sticky. |

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| 1180 - 1185m | 70 | CALCISILTITE: as above. |
| | 30 | CALCILUTITE: (marl) as above. |
| 1185 - 1190m | 100 | CALCISILTITE: grey, sandy, as above. Trace of gastropods. |
| 1190 - 1195m | 80 | CALCISILTITE: as above ) SAMPLE |
| | 20 | CALCILUTITE: as above ) |
| | | ) QUALITY |
| 1195 - 1205m | 70% | CALCISILTITE: as above ) |
| | 30 | CALCILUTITE: as above ) VERY POOR |
| 1205 - 1210m | 80 | CALCISILTITE: medium light grey to medium grey, firm, occassional very fine sand grains, minor pyrite. |
| | 20 | CALCILUTITE: light grey, soft and sticky, argillaceous. |
| 1210 - 1215m | 70 | CALCISILTITE: as above. |
| | 30 | CALCILUTITE: as above. |
| 1215 - 1220m | 70 | CALCISILTITE: as above. |
| | 30 | CALCILUTITE: as above. |
| 1220 - 1225m | 60 | CALCISILTITE: as above. |
| | 40 | CALCILUTITE: as above. |
| 1225 - 1235m | 50 | CALCISILTITE: as above, light grey, sandy. |
| | 50 | CALCILUTITE: as above white grey to very light grey occasionally glauconitic. |
| 1235 - 1240m | 20 | CALCISILTITE: as above. |
| | 80 | CALCILUTITE: as above. |
| 1240 - 1245m | 70 | CALCISILTITE: dark grey, grey, sandy. |
| | 30 | CALCILUTITE: light grey, soft, sticky. |
| 1245 - 1250m | 100 | CALCILUTITE: light grey, soft, sticky, slightly silty. |
| 1250 - 1255m | 60 | CALCISILTITE: as above. |
| | 40 | CALCILUTITE: as above. |
| 1255 - 1260m | 30 | CALCISILTITE: grey to dark grey, slightly sandy. |
| | 70 | CALCILUTITE: white, greyish white, soft. |
| 1260 - 1265m | 100 | CALCILUTITE: (marl) light grey to grey, soft. |
| 1265 - 1270m | 50 | CALCISILTITE: grey, very fine grained, firm, fossiliferous, occasionally sandy and glauconitic. |
| | 50 | CALCILUTITE: white, greyish white, micro carbonaceous. |
| 1270 - 1275m | 60 | CALCISILTITE: grey, greenish grey, firm, occasionally fossiliferous. |
| | 40 | CALCILUTITE: light grey, white grey, soft, sticky. Trace of glauconite. |
| 1275 - 1280m | 70 | CALCISILTITE: as above. carbonaceous fragments. |
| | 30 | CALCILUTITE: as above. micro carbonaceous. |

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| 1280 - 1285m | 40 | CALCISILTITE: as above. occasional glauconite. |
| | 60 | CALCILUTITE: as above. |
| 1285 - 1290m | 50 | CALCISILTITE: as above. carbonaceous fragments/occasional glauconite. |
| | 50 | CALCILUTITE: as above. |
| 1290 - 1295m | 60 | CALCILUTITE: light grey, soft, sticky, argillaceous. |
| | 40 | CALCISILTITE: medium light grey to medium grey, firm, occasionally becoming very fine grained, minor glauconite and pyrite. |
| | Trace | FOSSILS: forams. |
| 1295 - 1300m | 70 | CALCILUTITE: as above. |
| | 30 | CALCISILTITE: as above. |
| 1300 -1305m | 70 | CALCISILTITE: medium light grey to medium grey, firm, occasionally very fine grained, minor glauconite, pyrite. |
| | 30 | CALCILUTITE: very light grey to light grey, soft, sticky, argillaceous. |
| 1305 - 1310m | 60 | CALCISILTITE: as above. |
| | 40 | CALCILUTITE: as above. |
| 1310 - 1315m | 70 | CALCISILTITE: occasionally greenish grey due to the presence of glauconite, otherwise as above. |
| | 30 | CALCILUTITE: as above. |
| 1315 - 1320m | 50 | CALCISILTITE: as above. |
| | 50 | CALCILUTITE: as above. |
| 1320 - 1325m | 70 | CALCISILTITE: occasionally micro carbonaceous otherwise as above. |
| | 30 | CALCILUTITE: as above. |
| 1325 - 1330m | 80 | CALCISILTITE: occasionally light brown otherwise as above. |
| | 20 | CALCILUTITE: as above. |
| 1330- 1335m | 70 | CALCISILTITE: medium grey, greenish grey occasionally light brown, firm, occasionally very fine grained, minor glauconite, pyrite and microcarbonaceous. |
| | 30 | CALCILUTITE: very light grey to light grey, soft, sticky, argillaceous. |
| 1335 - 1240m | 90 | CALCISILTITE: as above. |
| | 10 | CALCILUTITE: as above. |
| 1340 - 1345m | 100 | CALCISILTITE: light grey, grey to greenish grey, firm, slightly sandy, fossiliferous, calcitic, microcarbonaceous, occasionally glauconitic. |
| 1345 - 1350m | 100 | CALCISILTITE: as above. |
| 1350 - 1355m | 100 | CALCISILTITE: as above. |
| 1355 - 1360m | 100 | CALCISILTITE: as above. |

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| 1360 - 1365m | 80 | CALCISILTITE: light grey, white, with disseminated glauconite. |
| | 20 | CALCILUTITE: as above. |
| 1365 - 1370m | 100 | CALCILUTITE: light grey, soft, slightly silty. |
| 1370 - 1372m (bottoms up sample) | 70 | CALCILUTITE: as above. |
| | 30 | CALCISILTITE: as above. |
| 1372 - 1374m (bottoms up sample) | 70 | SANDSTONE: loose quartz grains, clear to milky white, coarse to very coarse grained subangular to subrounded, moderately well sorted, good visual porosity, no fluorescence. |
| | 20 | CALCILUTITE |
| | 10 | CLAYSTONE: yellow, soft, slightly sticky, includes glauconite, pyrite. |
| 1374 - 1380m (bottoms up sample) | 60 | SANDSTONE: as above, no fluorescence |
| | 20 | CALCILUTITE: as above. |
| | 20 | CLAYSTONE: as above |
| 1380 - 1414m | | CORED INTERVAL<br>Core-1: 1380-1389m Cut 9.0m recov. 8.6m (95.6%).<br>Core-2: 1389-1399m cut 10m recov. 7.03m (70.3%).<br>Core-3: 1399-1408.2 cut 9.2m recov. 0.0 (0%).<br>Core-4: 1404.6-1414.0m cut 9.4m recov. 1.07m (11.4%). Fill in hole. |
| 1415 - 1420m | 100 | SANDSTONE: clear, white, very coarse grained quartz, subrounded to occasionally rounded, with 20% yellowish green fluorescence, very very slow even yellowish white cut. |
| 1420 - 1425m | 100 | SANDSTONE: clear opaque to occasionally clear grey coarse to very coarse quartz grains subangular to subrounded, 10% bright yellowish green fluorescence very very slow, weak yellowish white even cut. |
| 1425 - 1430m | 100 | SANDSTONE: as above with trace of bright yellowish green fluorescence, no cut. |
| 1430 - 1435m | 100 | SANDSTONE: clear white, minor clear grey coarse to very coarse quartz grains predominantly subrounded, occasionally subangular with 10% yellow to yellowish green fluorescence; with very slow yellowish white streaming cut. |
| 1435 - 1440m | 100 | SANDSTONE: as above with trace of yellow fluorescence. No cut. |
| 1440 - 1455m | 100 | SANDSTONE: clear opaque to clear grey coarse to very coarse quartz grains. Subangular to subrounded, well sorted, with trace of yellow fluorescence. No cut. |
| 1455 - 1465m | 100 | SANDSTONE: clear, white, coarse grained to very coarse grained quartz, unconsolidated subangular to subrounded. No shows. |

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| 1465 - 1470m | 100 | SANDSTONE: as above, medium to coarse grained, poorly sorted, unconsolidated. No shows. |
| 1470 - 1475m | 95 | SANDSTONE: as above. No shows. |
| | 5 | Trace of siltstone, dark grey, firm, slightly sandy. |
| 1475 - 1490m | 95 | SANDSTONE: as above. |
| | 5 | SILTSTONE: dark grey, very hard. |
| 1490 - 1510m | 95 | SANDSTONE: clear to occasionally grey possibly dolomitic, coarse to very coarse occasionally medium quartz grains, unconsolidated, subrounded to subangular. No shows. |
| | 5 | SILTSTONE: grey to dark grey, sandy firm. |
| 1510 - 1515m | 95 | SANDSTONE: coarse to very coarse grained, clear opaque quartz, subrounded, occasionally subangular, unconsolidated. No shows. |
| | 5 | Trace of coal black, siltstone greyish green to grey firm. |
| 1515 - 1520m | 100 | SANDSTONE: medium to coarse to very coarse grained quartz, unconsolidated, subangular to subrounded, occasionally angular to rounded, poorly to moderately sorted. No shows. Trace of possible dolomitic grains. |
| 1520 - 1525m | 95 | SANDSTONE: as above, clear opaque. No shows. Trace of possible dolomitic grains. |
| | 5 | SILTSTONE, grey, firm. |
| 1525 - 1530m | 60 | SANDSTONE: as above. |
| | 40 | SILTSTONE: greyish brown, soft to very hard microcarbonaceous, sandy, occasionally heavily pyritic. No shows. |
| 1530 - 1535m | 10 | SANDSTONE: as above. |
| | 90 | SILTSTONE: as above, soft. |
| 1535 - 1540m | 100 | SILTSTONE: grey to greyish brown micromicaceous, sandy, slightly calcareous, with occasionally disseminated pyrite. |
| 1540 - 1545m | 50 | SANDSTONE: as above (probably cavings). |
| | 50 | SILTSTONE: as above. |
| 1545 - 1550m | 50 | SANDSTONE: clear opaque quartz grains coarse grained, subrounded. No shows. |
| | 50 | SILTSTONE: greyish brown, soft, sandy, microcarbonaceous with clayey matrix. Trace of white clay (kaolinite). |
| 1550 - 1555m | 80 | SANDSTONE: as above. No shows. |
| | 20 | SILTSTONE: associated with kaolinite. |
| 1555 - 1560m | 80 | SANDSTONE: clear opaque quartz grains, medium to very coarse grained, moderately sorted subrounded. |
| | 20 | COAL: black, blocky. |
| 1560 - 1565m | 90 | SANDSTONE: as above. No shows. |
| | 10 | COAL: as above. |

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| 1565 - 1570m | 90 | SANDSTONE: unconsolidated quartz grains, coarse to very coarse grained, subrounded to well rounded, excellent visual porosity. No shows. |
| | 10 | COAL: black, hard, blocky. |
| | Trace | SILTSTONE: medium grey, firm, micromicaceous, microcarbonaceous. |
| 1570 - 1575m | 90 | SANDSTONE: as above. No shows. |
| | 10 | SILTSTONE: medium grey to pale brown, firm, microcarbonaceous, micromicaceous. |
| | Trace | COAL: as above. |
| 1575 - 1580m | 70 | SANDSTONE: clear to milky white quartz grains, unconsolidated, coarse grained, subangular to well rounded, well sorted, good visual porosity. No shows. (possible cavings). |
| | 20 | SILTSTONE: as above. |
| | 10 | COAL: as above. |
| 1580 - 1585m | 80 | SILTSTONE: medium grey to brownish grey, soft to firm, microcarbonaceous, micromicaceous. |
| | 10 | SANDSTONE: as above (possible cavings). No showss. |
| | 10 | COAL: as above. |
| 1585 - 1590m | 60 | SILTSTONE: as above. |
| | 40 | SANDSTONE: as above. No shows. |
| | Trace | COAL: black, hard, blocky. |
| 1590 - 1595m | 100 | SILTSTONE: light grey to medium light grey, firm, carbonaceous flecking and laminar, slightly calcareous, slightly micromicaceous. |
| | Trace | COAL: black, hard, blocky. |
| | Trace | SANDSTONE: clear to milky white unconsolidated quartz grains, coarse grained, rounded, well sorted, good visual porosity, no shows. (possible cavings). |
| 1595 - 1600m | 100 | SILTSTONE: as above. |
| | Trace | SANDSTONE: as above. No shows. |
| 1600 - 1605m | 90 | SILTSTONE: light grey, medium light grey to pale brown, firm, carbonaceous flecking and laminar, micromicaceous. |
| | 10 | SANDSTONE: as above. No shows. |
| 1605 - 1610m | 100 | SILTSTONE: as above. |
| | Trace | COAL: as above. |
| 1610 - 1615m | 90 | SILTSTONE: as above. |
| | 10 | COAL: as above. |
| 1615 - 1620m | 50 | SILTSTONE: medium light grey to brownish grey, firm, carbonaceous, micromicaceous. |
| | 40 | COAL: black, hard, blocky. |
| | 10 | SANDSTONE: clear to milky white quartz grains, coarse grained, rounded, well sorted, good visual porosity, no shows. |
| 1620 - 1625m | 60 | COAL: as above. |
| | 40 | SILTSTONE: as above. |
| 1625 - 1630m | 70 | SILTSTONE: as above. |
| | 30 | COAL: as above. |

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| 1630 - 1635m | 50 | COAL: hard, black, blocky. |
| | 40 | SILTSTONE: as above. |
| | 10 | SANDSTONE: medium grey, firm, very fine grained, subangular to subrounded, well sorted, silty matrix, poor visual porosity. No shows. |
| 1635 - 1640m | 100 | COAL: as above. |
| | Trace | SILTSTONE: as above. |
| 1640 - 1645m | 90 | COAL: as above. |
| | 10 | SILTSTONE: as above. |
| 1645 - 1650m | 80 | SILTSTONE: light grey to brownish grey, soft to firm, carbonaceous, slightly micromicaceous. |
| | 20 | COAL: as above. |
| 1650 - 1655m | 100 | SILTSTONE: as above. |
| | Trace | COAL |
| 1655 - 1660m | 90 | COAL: as above. |
| | 10 | SILTSTONE: as above. |
| 1660 - 1665m | 70 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to subrounded, moderately well sorted, good visual porosity, no shows. |
| | 20 | COAL: black, hard, blocky. |
| | 10 | SILTSTONE: medium light grey to brownish grey, soft to firm, very fine grained in part, carbonaceous, micromicaceous, slightly argillaceous. |
| 1665 - 1670m | 70 | SANDSTONE: as above. No shows. |
| | 20 | SILTSTONE: minor pyrite otherwise as above. |
| | 10 | COAL: as above. |
| 1670 - 1675m | 80 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to rounded, moderately sorted, good visual porosity, no shows. |
| | 20 | SILTSTONE: minor pyrite otherwise as above. |
| | Trace | COAL: black, hard, blocky. |
| 1675 - 1680m | 60 | SANDSTONE: unconsolidated clear to milky white quartz grains, fine to medium grained, subangular to subrounded, moderately sorted, moderate visual porosity, no shows. |
| | 30 | SILTSTONE: medium light grey to brownish grey, soft to firm, carbonaceous, argillaceous, minor pyrite, micromicaceous. |
| | 10 | COAL: black, blocky, hard. |
| 1680 - 1685m | 60 | SANDSTONE: as above. No shows. |
| | 30 | SILTSTONE: as above. |
| | 10 | COAL: as above. |
| 1685 - 1690m | 60 | SANDSTONE: as above. No shows. |
| | 30 | SILTSTONE: as above. |
| | 10 | COAL: as above. |
| 1690 - 1695m | 70 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse, occasionally very coarse, subangular to subrounded, moderately sorted, good visual porosity, no shows. |
| | 30 | SILTSTONE: medium grey to brownish grey, firm, carbonaceous, micromicaceous, minor pyrite. |
| | Trace | COAL: as above. |

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| 1695 - 1700m | 80 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grains, subangular to subrounded, moderately sorted, good visual porosity, no shows. | |
| | 20 | SILTSTONE: as above. | |
| 1700 - 1705m | 90 | SANDSTONE: as above. No shows. | |
| | 10 | SILTSTONE: as above. | |
| | Trace | COAL: as above. | |
| | | Abundant gumbo over the shakers. | |
| 1705 - 1710m | 80 | SILTSTONE: as above. | |
| | 10 | SANDSTONE: as above. No shows. | |
| | 10 | COAL: as above. | |
| | | Abundant gumbo over the shakers. | |
| 1710 - 1715m | 60 | COAL: black, blocky, hard. | |
| | 40 | SILTSTONE: brownish grey, sandy, micromicaceous, with clay matrix, firm. | |
| 1715 - 1720m | 50 | COAL: as above. | |
| | 50 | SILTSTONE: as above. | |
| 1720 - 1725m | 40 | COAL: as above | ) |
| | 60 | SILTSTONE: as above | )VERY |
| | | | ) |
| 1725 - 1730m | 50 | SILTSTONE: as above | )POOR |
| | 30 | COAL: as above | ) |
| | 20 | SANDSTONE: medium grained clear quartz grains. | )SAMPLE<br>) |
| | | | )QUALITY |
| 1730 - 1740m | 60 | SILTSTONE: as above | ) |
| | 10 | COAL: as above | ) |
| | 30 | SANDSTONE: as above | ) |
| 1740 - 1745m | 80 | SANDSTONE: clear, white, fine to medium grained, subrounded to rounded quartz grains. | |
| | 20 | SILTSTONE: as above. | |
| 1745 - 1750m | 70 | SANDSTONE: as above. | |
| | 20 | SILTSTONE: as above. | |
| | 10 | COAL: as above. | |
| 1750 - 1755m | 70 | SANDSTONE: clear, quartz, medium to coarse grained, subangular, occasionally subrounded, moderately sorted. | |
| | 20 | COAL: black, hard, blocky. | |
| | 10 | SILTSTONE: grey, sandy, firm. | |
| 1755 - 1760m | 75 | SANDSTONE: as above, occasionally very coarse grained. | |
| | 10 | SILTSTONE: as above. | |
| | 10 | COAL: as above. | |
| | 5 | WHITE CLAY (Kaolinite). | |
| 1760 - 1765m | 70 | SANDSTONE: as above. | |
| | 20 | SILTSTONE: as above. | |
| | 10 | COAL: as above. | |

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| 1765 - 1770m | 20 | SANDSTONE: as above. |
| | 40 | SILTSTONE: as above, trace of kaolinite. |
| | 40 | COAL: as above. |
| 1770 - 1775m | 20 | SANDSTONE: as above. |
| | 50 | SILTSTONE: as above. |
| | 30 | COAL: as above. |
| 1775 - 1780m | 40 | SANDSTONE: as above. |
| | 40 | SILTSTONE: as above. Trace of Kaolinite. |
| | 20 | COAL: as above. |
| 1780 - 1785m | 40 | SANDSTONE: as above. |
| | 60 | SILTSTONE: as above. |
| 1785 - 1790m | 70 | SILTSTONE: greyish brown, sandy, clayey, soft. |
| | 30 | SANDSTONE: clear, medium to coarse grained quartz. |
| | Trace | COAL: black, blocky, hard. |
| 1790 - 1795m | 10 | SILTSTONE: greyish brown, micromicaceous, microcarbonaceous, slightly sandy, with clayey matrix, slightly sticky with trace of kaolinite, white soft. |
| 1795 - 1800m | 90 | SANDSTONE: clear opaque, white, coarse to very coarse grained quartz, loose, subrounded to angular, moderately sorted. |
| | 10 | SILTSTONE: as above. |
| 1800 - 1805m | 90 | SANDSTONE: as above, medium to coarse grained subangular to rounded. |
| | 10 | SILTSTONE: brownish grey, micromicaceous sandy, firm, trace of coal. |
| 1805 - 1810m | 65 | SANDSTONE, clear opaque, medium to coarse grained, subrounded, as above. |
| | 10 | SILTSTONE: greenish grey, firm. |
| | 20 | SHALE: buff-dark brown, sandy, carbonaceous, sub fissile. |
| | Trace | PYRITE. |
| 1810 - 1815m | 80 | SANDSTONE: as above. |
| | 10 | SILTSTONE: as above. |
| | 10 | SHALE: as above. Trace of Pyrite. |
| 1815 - 1820m | 80 | SANDSTONE: clear opaque, medium to coarse grained, subrounded to subangular, moderately sorted quartz grains, loose. |
| | 20 | SHALE: brownish grey, subfissile, micromicaceous, carbonaceous, sandy, pyritic firm. |
| 1820 - 1825m | 60 | SANDSTONE: as above. occasionally pyritic. |
| | 40 | SHALE: as above. |
| 1825 - 1830m | 70 | COAL: black, blocky, firm. |
| | 30 | SHALE: soft, silty. |
| 1830 - 1835m | 80 | COAL: as above. |
| | 20 | CLAYSTONE: as above. Trace of Kaolinite. |
| 1835 - 1840m | 90 | SILTSTONE: greyish brown, micaceous, carbonaceous, slightly sandy, poor sample quality, gumbo. |
| | 10 | COAL: as above. |

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| 1840 - 1845m | 100 | GUMBO: (very poor quality) Probably Claystone. |
| 1845 - 1850m | 80 | SANDSTONE: clear opaque, medium to very coarse grained quartz (sample quality very poor). |
| | 20 | COAL: black, blocky, firm. |
| 1850 - 1855m | 100 | GUMBO: very sticky, dark grey (probably claystone). |
| 1855 - 1860m | 70 | SILTSTONE: dark grey, micromicaceous slightly sandy, relatively firm, slightly sticky. |
| | 30 | SANDSTONE: coarse grained quartz, unconsolidated, subangular. |
| 1860 - 1865m | 80 | SILTSTONE: medium dark grey to pale brown, soft to firm, carbonaceous specks, micromicaceous, slightly argillaceous. |
| | 20 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to subrounded, moderately sorted, moderate visual porosity, no shows. |
| 1865 - 1870m | 100 | SILTSTONE: as above. occasional pyrite. |
| | Trace | SANDSTONE: as above. no shows. |
| | Trace | COAL: black, hard, blocky. |
| 1870 - 1875m | 90 | SILTSTONE: brownish grey, soft to firm, carbonaceous specks and occasional laminar, micromicaceous, argillaceous. |
| | 10 | COAL: as above. |
| | | Abundant Gumbo over the shakers. |
| 1875 - 1880m | 100 | SILTSTONE: as above. |
| | Trace | COAL: as above. |
| 1880 - 1885m | 80 | SILTSTONE: as above. |
| | 20 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium grained, occasional coarse grains, subangular to subrounded, moderately well sorted. No shows. |
| 1885 - 1890m | 80 | SILTSTONE: medium light grey to brownish grey, soft to firm, carbonaceous, micromicaceous, argillaceous, minor disseminated pyrite. |
| | 20 | COAL: black, hard, blocky. |
| 1890 - 1895m | 60 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grained, predominantly coarse, subangular to rounded, moderately sorted, good visual porosity, no shows. |
| | 40 | SILTSTONE: as above. medium light grey cutting slightly calcareous. |
| | Trace | COAL: as above. |
| 1895 - 1900m | 90 | SILTSTONE: light grey to greenish grey, slightly calcareous, occasional disseminated pyrite, firm. |
| | 10 | COAL: black, subfissile to blocky. |
| 1900 - 1905m | 100 | SILTSTONE: as above. |
| 1905 - 1910m | 10 | SILTSTONE: as above. |
| | 90 | COAL: black, blocky, firm. |

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| 1910 - 1915m | 100 | COAL: as above. |
| 1915 - 1920m | 30 | COAL: as above. |
| | 40 | SILTSTONE: greyish brown, carbonaceous, soft argillaceous. |
| | 30 | WHITE CLAY (Kaolinite) |
| 1920 - 1930m | 100 | CLAYSTONE: light greyish white to white, very soft, microcarbonaceous, noncalcareous. Trace very weak yellow/orange fluorescence. No cut. |
| 1930 - 1935m | 90 | CLAYSTONE: as above. Trace of dull weak yellow fluorescence. No cut. |
| | 10 | COAL: as above. |
| 1935 - 1940m | 80 | CLAYSTONE: as above. Trace of dull weak yellow fluorescence. No cut. |
| | 20 | COAL: as above. |
| 1940 - 1945m | 90 | CLAYSTONE: light grey, greyish brown, slightly sandy, microcarbonaceous, occasionally slightly calcareous, very soft. (10% dull yellow fluorescence. No cut). |
| | Trace | SANDSTONE: medium to coarse to very coarse grained white/clear quartz grains, unconsolidated. |
| | Trace | COAL: black, blocky, hard. |
| 1945 - 1950m | 70 | CLAYSTONE: white, greyish white as above. 10% dull yellow fluorescence. No cut. |
| | 30 | SANDSTONE: clear opaque, medium to coarse to very coarse grained loose quartz, trace of possible dolomitic chips, cream/white, subangular, hard. |
| 1950 - 1955m | 20 | SANDSTONE: as above. |
| | 30 | SHALE: brownish grey, micromicaceous, carbonaceous, subfissile. |
| | 30 | COAL: black, blocky, hard. |
| | 20 | CLAYSTONE: white, microcarbonaceous, soft. |
| 1955 - 1965m | 70 | SILTSTONE: dark grey to grey, microcarbonaceous. |
| | 20 | SANDSTONE: as above sandy, soft to firm (Trace 10% dull fluorescence. No cut). |
| | 10 | COAL: as above. |
| 1965 - 1970m | 70 | SILTSTONE: dark grey, micromicaceous, microcarbonaceous. |
| | 30 | SANDSTONE: fine to medium, occasionally coarse subrounded quartz grains. Trace of pyrite nodules. |
| 1970 - 1975m | 30 | CLAYSTONE: greyish white, white, soft. |
| | 70 | SANDSTONE: 50% quartz grains, clear, moderately coarse to very coarse grained; 20% fine grained sandstone, cream to light grey, very well cemented, (calcareous) very hard, subangular. |
| 1975 - 1980m | 40 | COAL: black, blocky, hard. |
| | 30 | SANDSTONE: clear, medium to coarse quartz grain. |
| | 30 | CLAYSTONE: white, soft. |

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| 1980 - 1985m | 70 | COAL: as above. |
| | 20 | SANDSTONE: as above 10% clear quartz grains; 10% very fine grained with calcareous very hard cement. |
| | 10 | CLAYSTONE: white as above. |
| 1985 - 1990m | 80 | SANDSTONE: 60% clear, medium to coarse quartz grains; 20% cream, light grey, well cemented, very fine grained. |
| | 20 | COAL: as above. |
| 1990 - 1995m | 40 | COAL: black, hard, blocky, occasionally vitrinite. |
| | 40 | SANDSTONE: Type 1) 90% unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to subrounded, moderately sorted, good visual porosity. No shows. Type 2) 10% light grey, moderately hard, very fine grained, subangular to subrounded, moderately well sorted, muddy matrix with calcareous cement, poor visual porosity. No shows. |
| | 20 | SILTSTONE: medium light grey to medium dark grey to brownish grey, firm, carbonaceous, micromicaceous, medium light grey cuttings slightly calcareous, angular cuttings. 20% dull yellow mineral fluorescence; no cut. |
| 1995 - 2000m | 80 | COAL: as above. |
| | 10 | SILTSTONE: as above. |
| | 10 | SANDSTONE: Type 1) 100% as above. No shows. Type 2) Trace as above. No shows. 5% dull yellow mineral fluorescence; no cut. |
| 2000 - 2005m | 60 | COAL: as above. |
| | 30 | SILTSTONE: as above. |
| | 10 | SANDSTONE: Type 1) 90% as above. No shows. Type 2) 10% as above. Occasional carbonaceous laminar; no shows. 5% dull yellow mineral fluorescence; no cut. |
| 2005 - 2010m | 90 | COAL: as above. |
| | 10 | SILTSTONE: as above. |
| | Trace | SANDSTONE: Types 1) and 2). No shows. 5% dull yellow mineral fluorescence; no cut. |
| 2010 - 2015m | 40 | SILTSTONE: medium light grey with minor brownish grey cuttings, firm, carbonaceous, micromicaceous, occasionally slightly argillaceous. |
| | 30 | COAL: black, hard, blocky to angular cuttings. |
| | 30 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to occasionally coarse grained, subangular to subrounded, moderately sorted, moderate visual porosity, no shows. |
| 2015 - 2020m | 70 | SILTSTONE: as above. |
| | 30 | COAL: as above. |
| 2020 - 2025m | 40 | SILTSTONE: as above. |
| | 30 | COAL: slightly pyrite otherwise as above. |
| | 30 | SANDSTONE: medium light grey, firm, very fine grained, subangular to subrounded, moderately well sorted, muddy/silty matrix, poor visual porosity, no shows. |

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| 2025 - 2030m | 50 | COAL: as above. |
| | 40 | SILTSTONE: as above. |
| | 10 | SANDSTONE: as above. No shows. |
| 2030 - 2035m | 80 | COAL: black, hard, occasionally silty. |
| | 20 | SILTSTONE: occasionally becoming very fine grained, otherwise as above. |
| 2035 - 2040m | 80 | COAL: as above. |
| | 20 | SILTSTONE: as above. |
| 2040 - 2045m | 80 | COAL: as above. |
| | 20 | SILTSTONE: slight calcareous and argillaceous otherwise as above. |
| 2045 - 2050m | 60 | COAL: black, hard. |
| | 30 | SILTSTONE: as above. |
| | 10 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grained, rarely fine grained, subangular to subrounded, moderately sorted, good visual porosity, no shows. |
| 2050 - 2055m | 90 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to rounded, moderately well sorted, good visual porosity, no shows. |
| | 10 | SILTSTONE: medium grey to brownish grey, firm, carbonaceous flecking, micromicaceous, slightly calcareous, occasionally argillaceous. |
| | Trace | COAL: as above. |
| 2055 - 2060m | 90 | SANDSTONE: predominantly medium to coarse occasionally very coarse grained, minor pyritic coating otherwise as above. No shows. |
| | 10 | SILTSTONE: as above. |
| 2060 - 2065m | 70 | SANDSTONE: as above. No shows. |
| | 20 | SILTSTONE: as above. |
| | 10 | COAL: as above. |
| 2065 - 2070m | 60 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to subrounded, moderately well sorted, good visual porosity, no shows. |
| | 30 | SILTSTONE: as above. |
| | 10 | COAL: as above. |
| 2070 - 2075m | 70 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grained, occasionally very coarse grained, subangular to subrounded, moderately well sorted, good visual porosity, pyritic cement, no shows. |
| | 20 | SILTSTONE: medium light grey to occasionally brownish grey, firm carbonaceous, micromicaceous. |
| | 10 | COAL: black, hard, blocky to angular cuttings. |
| 2075 - 2080m | 50 | SANDSTONE: 90% Type 1) unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to subrounded, moderately well sorted, good visual porosity, no shows. 10% Type 2) quartzose aggregates; firm, very fine grained, subangular to subrounded, moderately well sorted, muddy/silty matrix, poor visual porosity, no shows. |

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| | 40 | SILTSTONE: as above. |
| | 10 | COAL as above. |
| 2080 - 2085m | 50 | SANDSTONE: Type 1) 80% as above, no shows. Type 2) 20% as above, no shows. |
| | 30 | SILTSTONE: as above. |
| | 20 | COAL: as above. |
| 2085 - 2090m | 60 | SILTSTONE: as above |
| | 30 | SANDSTONE: Type 1) as above, no shows. |
| | 10 | COAL: as above. |
| 2090 - 2095m | 40 | SANDSTONE: Type 1) 90% as above, no shows. Type 2) 10% as above, no shows. |
| | 30 | SILTSTONE: as above. |
| | 30 | COAL: as above. |
| 2095 - 2100m | 70 | SILTSTONE: medium light grey to medium dark grey, firm, carbonaceous specking and laminar, micromicacoues. |
| | 20 | SANDSTONE: Type 1) 60% unconsolidate clear to milky white quartz grains, medium grained, subangular to subrounded, well sorted, moderate visual porosity, no shows. Type 2) 40% light grey quartzose aggregates, moderately hard, very fine grained, subangular to subrounded, moderately well sorted, muddy/silty matrix, poor visual porosity, no shows. |
| | 10 | COAL: black, hard, occasionally silty. |
| 2100 - 2105m | 90 | SILTSTONE: as above. Trace pyrite. |
| | 10 | SANDSTONE: Type 1)as above. No shows. |
| | Trace | COAL: as above. |
| 2105 - 2110m | 90 | SILTSTONE: dark grey to grey, microcarbonaceous, micromicaceous, in part sandy firm to very soft. |
| | 10 | SANDSTONE: clear quartz grains, medium to coarse grained, unconsolidated. |
| 2110 - 2115m | 60 | SILTSTONE: as above. |
| | 30 | SANDSTONE: 20% Type 1) clear, medium coarse to very coarse quartz grains. 10% Type 2) very fine grained, subangular well cemented. |
| | 10 | COAL: black, subfissile to blocky, firm. |
| 2115 - 2120m | 80 | SILTSTONE: as above, occasionally grading into very fine grained sandstone. |
| | 10 | SANDSTONE: greyish cream, light grey, very fine grained well sorted, moderately cemented. |
| | 10 | CLAYSTONE: light grey to white, soft, carbonaceous. |
| 2120 - 2125m | 80 | SHALE: dark brown, micromicaceous laminated carbonaceous to microcarbonaceous subfissile, occasionally sandy. |
| | 20 | COAL: black, subfissile to blocky. |
| 2125 - 2130m | 70 | SHALE: dark brown, as above, firm. |
| | 20 | COAL: black, subfissile, occasionally argillaceous. |
| | 10 | SANDSTONE: clear, coarse to very coarse grained subangular quartz occasionally pyritic. |

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| 2130 - 2135m | 70 | COAL: black, subfissile. |
| | 30 | SHALE: dark brown, micromicaceous, microcarbonaceous, as above. |
| 2135 - 2140m | 60 | SANDSTONE: clear, medium to coarse, occasionally very coarse grained loose quartz grains, subangular, moderately sorted. |
| | 30 | SHALE: reddish brown, micromicaceous, microcarbonaceous, moderately firm. |
| | 10 | COAL: black, subfissile, firm. |
| 2140 - 2145m | 40 | COAL: as above. |
| | 30 | SANDSTONE: as above. |
| | 20 | SHALE: as above. |
| | 10 | CLAYSTONE: white, microcarbonaceous. |
| 2145 - 2150m | 40 | SANDSTONE: (cavings) |
| | 50 | SHALE: as above. |
| | 10 | COAL: as above. |
| 2150 - 2155m | 70 | SANDSTONE: clear opaque, white, coarse to very coarse grained, subangular pyritic quartz, unconsolidated. |
| | 30 | SHALE: as above. |
| 2155 - 2160m | 100 | SANDSTONE: clear opaque to white, medium to coarse grained, subangular, occasionally subrounded, unconsolidated quartz grains. No shows. |
| 2160 - 2165m | 60 | CLAYSTONE: white, light grey, soft. |
| | 40 | SILTSTONE: light grey, micromicaceous, microcarbonaceous. *NOTE: quartz grains are most likely to be cavings. |
| 2165 - 2170m | 50 | SANDSTONE: Type 1) 70% unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to subrounded, moderately well sorted, good visual porosity, no shows. Type 2) 30% light grey, firm very fine grained, subangular to subrounded, moderately sorted, muddy/silty matrix, poor visual porosity, no shows. |
| | 40 | SILTSTONE: medium light grey to pale brown, firm, carbonaceous flecking and laminar, micromicaceous. |
| | 10 | COAL: black, hard, subfissile, occasionally silty. |
| 2170 - 2175m | 30 | SANDSTONE: Type 1)20% as above. No shows. Type 2) 10% as above, no shows. |
| | 60 | SILTSTONE: as above. |
| | 10 | COAL: as above. |
| 2175 - 2180m | 100 | SILTSTONE: as above. |
| | Trace | COAL: as above. |
| 2180 - 2185m | 60 | SANDSTONE: unconsolidated clear to white quartz grains, medium to coarse grained, subangular to subrounded, moderately well sorted, good visual porosity, no shows. |
| | 20 | SILTSTONE: as above. |
| | 20 | COAL: as above. |

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| 2185 - 2190m | 90 | SILTSTONE: very argillaceous otherwise as above. |
| | 10 | COAL: as above. |
| 2190 - 2195m | 100 | SILTSTONE: as above. |
| | Trace | COAL: as above. |
| 2195 - 2200m | 90 | SILTSTONE: medium grey, soft to firm, carbonaceous flecking and laminar, microcarbonaceous, argillaceous. |
| | 10 | SANDSTONE: light grey, firm, very fine grained subangular to subrounded, moderately sorted, muddy/silty matrix, poor visual porosity, no shows. |
| 2200 - 2205m | 40 | SANDSTONE Type 1) 50% unconsolidated, medium to coarse grained, subangular to subrounded, moderately sorted, moderate visual porosity, no shows.<br>Type 2) 50% light grey, firm, fine grained, subangular to subrounded, moderately sorted, muddy/silty matrix, poor visual porosity, no shows. |
| | 50 | SILTSTONE: very argillaceous otherwise as above. |
| | 10 | COAL: black, hard, occasionally silty. |
| 2205 - 2210m | 80 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular, moderately sorted, moderate visual porosity, no shows. |
| | 20% | SILTSTONE: as above. |
| | Trace | COAL: as above. |
| 2210 - 2215m | 80 | SANDSTONE: Type 1) 80% unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to subrounded, moderately sorted, good visual porosity, no shows.<br>Type 2) 20% medium light grey, firm, fine grained, subangular to subrounded, moderately sorted, muddy/silty matrix, poor visual porosity, no shows. |
| | 20 | SILTSTONE: as above. |
| | Trace | PYRITE. |
| 2215 - 2220m | 100 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to predominantly coarse grained, subangular to subrounded, moderately well sorted, good visual porosity, no shows. |
| | Trace | SILTSTONE: as above. |
| 2220- 2225m | 100 | SANDSTONE: as above. No shows. |
| | Trace | SILTSTONE: as above. |
| 2225 - 2230m | 100 | SANDSTONE: trace of pyritic cement otherwise as above. No shows. |
| | Trace | SILTSTONE: as above. |
| 2230 - 2235m | 90 | SANDSTONE: Type 1) 90% unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to subrounded, moderately well sorted, good visual porosity, no shows.<br>Type 2) 10% quartzose aggregates, medium light grey, very fine grained, subangular to subrounded, moderately well sorted, muddy/silty matrix, poor visual porosity, no shows. |
| | 10 | SILTSTONE: medium grey, firm, microcarbonaceous, micromicaceous. |

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| 2235 - 2240m | 70 | SANDSTONE: Type 1) 90% as above. No shows. Type 2) 10% as above. No shows. |
| | 20 | SILTSTONE: argillaceous otherwise as above. |
| | 10 | COAL: black, hard, occasionally silty, subfissile. |
| 2240 - 2245m | 60 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to subrounded, moderately well sorted, moderate visual porosity, no shows. |
| | 40 | SILTSTONE: as above. |
| 2245 - 2250m | 60 | SILTSTONE: dark grey, firm, carbonaceous, micromicaceous, sandy, argillaceous. |
| | 40 | SANDSTONE: Type 1) 30% clear opaque, white, medium to coarse grained, subangular to angular unconsolidated quartz grains. Type 2) 10% fine grained, quartz aggregates with calcareous cement. No shows. |
| 2250 - 2255m | 50 | SANDSTONE: as above. No shows. |
| | 50 | SILTSTONE: as above. |
| 2255 - 2260m | 100 | SILTSTONE: medium grey to pale brown, firm, microcarbonaceous, micromicaceous, medium grey siltstone is calcareous. |
| | Trace | SANDSTONE: light grey, firm, very fine grained, subangular to subrounded, moderately well sorted, calcareous cement, poor visual porosity, no shows. |
| | Trace | COAL: black, hard, occasionally silty. |
| 2260 - 2265m | 30 | SANDSTONE: Type 1) 80% unconsolidated clear to milky white quartz grains, predominantly medium grained minor coarse grains, subangular, moderately well sorted, good visual porosity, no shows. Type 2) 20% light grey, hard, very fine grained, subangular to subrounded, moderately well sorted, calcareous cement, poor visual porosity, no shows. |
| | 70 | SILTSTONE: as above. |
| | Trace | PYRITE |
| | | 5% dull yellow mineral fluorescence. |
| 2265 - 2270m | 80 | SILTSTONE: medium light grey siltstone is not carbonaceous otherwise as above. |
| | 20 | SANDSTONE: unconsolidated clear to milky white quartz grains, medium to coarse grained, subangular to subrounded, moderately well sorted, good visual porosity, no shows. |
| | | 5% dull yellow mineral fluorescence. |
| 2270 - 2275m | 70 | SILTSTONE: medium grey to brownish grey, firm, calcareous, micromicaceous. |
| | 30 | SANDSTONE: Type 1) 50% as above. No shows. Type 2) 50% medium light grey, moderately hard, fine to very fine grained, subangular, moderately well sorted, muddy calcareous cement, carbonaceous, poor visual porosity, no shows. |
| | | 5% dull yellow mineral fluorescence. |

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| 2275 - 2280m | 60 | SILTSTONE: as above. |
| | 40 | SANDSTONE: Type 1) 40%, no shows<br>Type 2) 60%, no shows. |
| | Trace | COAL: as above. |
| 2280 - 2285m | 70 | SILTSTONE: as above. |
| | 30 | SANDSTONE: Type 2) 100% as above, no shows. |
| 2285 - 2290m | 80 | SILTSTONE: grey to light grey, sandy, micromicaceous, argillaceous, microcarbonaceous. |
| | 20 | SANDSTONE: Type 1) clear medium to coarse quartz grains, subrounded, with bright white mineral fluorescence, no show. |
| 2290 - 2295m | 70 | SANDSTONE: Type 2) very fine to fine grained, clear, subangular to subrounded, well sorted, moderately to well cemented, slightly calcareous occasionally carbonaceous, poor visual porosity. Dull to bright white mineral fluorescence, no cut. |
| | 20 | SILTSTONE: dark grey to grey, sandy, Carbonaceous, argillaceous, slightly calcareous, firm. |
| | 10 | COAL: black, shiny, concoidal, firm. |
| 2295 - 2300m | 50 | SILTSTONE: light grey, dark greyish brown sandy, firm, carbonaceous, micromicaceous. |
| | 30 | SANDSTONE: white, very fine to fine grained, subangular, slightly calcareous, moderately to well cemented, no show. |
| | 20 | COAL: black, firm. |
| 2300 - 2305m | 100 | SILTSTONE: dark greyish to reddish brown, very sandy and carbonaceous, micromicaceous, noncalcareous with trace of dull yellow fluorescence, no cut. |
| 2305 - 2310m | 90 | SILTSTONE: as above, no show. |
| | 10 | COAL: black, hard, blocky |
| 2310 - 2315m | 20 | SILTSTONE: as above. |
| | 30 | COAL: black, subfissile, hard |
| | 50 | SANDSTONE: Type 2) 30% very fine to fine grained, white, subangular to subrounded, well cemented, pyritic, slightly calcareous. Bright yellow fluorescence, no cut.<br>Type 1) 20% clear quartz grains, medium to coarse grained, subrounded. |
| 2315 - 2320m | 70 | SILTSTONE: as above. |
| | 30 | SANDSTONE: Type 2) as above.<br>Bright yellowish white fluorescence, no cut. |
| 2320 - 2330m | 80 | SILTSTONE: dark grey to very dark grey, sandy very carbonaceous to coaly, strongly micromicaceous, well cemented. |
| | 20 | SANDSTONE: Type 2) very fine to fine grained, subrounded, well cemented, slightly to noncalcareous with yellow bright fluorescence, no cut. |
| 2330- 2335m | 50 | SANDSTONE: Type 2) slightly calcareous as above, occasionally carbonaceous and micromicaceous. 10% mineral fluorescence. No show. |
| | 40 | SILTSTONE: dark reddish brown, argillaceous, |

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| | | occasionally sandy, micromicaceous, firm, carbonaceous, occasional pyrite. |
| | 10 | COAL: black, occasionally pyritic and silty, firm. |
| 2335 - 2340m | 50 | SANDSTONE: light grey to brownish grey, firm to moderately hard, fine to very fine grained, subangular to subrounded, moderately well sorted, muddy/silty matrix to well cemented, slightly calcareous, carbonaceous. No shows. |
| | 50 | SILTSTONE: pale brown to brownish grey, firm, micromicaceous, carbonaceous, occasionally becomes very fine grained. |
| | | 5% dull to bright yellow mineral fluorescence. |
| 2340- 2345m | 80 | SILTSTONE: as above. |
| | 20 | SANDSTONE: as above, no shows. |
| | | 5% dull to bright yellow mineral fluorescence. |
| 2345 - 2350m | 40 | SANDSTONE: well cemented, moderately hard, slightly calcareous otherwise as above. No shows. |
| | 60 | SILTSTONE: as above. |
| | | 10% dull to bright yellow mineral fluorescence. |
| 2350 - 2355m | 70 | SILTSTONE: occasionally sandy otherwise as above. |
| | 20 | SANDSTONE: as above. No shows. |
| | 10 | COAL: black, hard, vitrinite. |
| | | 5% dull to bright yellow/white mineral fluorescence. |
| 2355-2360m | 80 | SILTSTONE: brownish grey, firm, carbonaceous flecking and laminar, micromicaceous, occasionally sandy. |
| | 10 | SANDSTONE: light grey, moderately hard, fine to very fine grained, subangular to subrounded, moderately well sorted, well cemented, poor visual porosity, no shows. |
| | 10 | COAL: as above. |
| | | 5% dull to bright yellow/white mineral fluorescence. |
| 2360 - 2365m | 80 | SILTSTONE: as above. |
| | 20 | SANDSTONE: as above, no shows. |
| | | 5% dull to bright white/yellow mieral fluorescence, no cut. |
| 2365 - 2370m | 60 | SILTSTONE: as above. |
| | 20 | SANDSTONE: as above, no shows. |
| | 20 | COAL: black, hard, occasionally silty. |
| | | 5% dull to bright white yellow mineral fluorescence. |
| 2370 - 2375m | 70 | SILTSTONE: as above. |
| | 20 | COAL: as above. |

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| | 10 | SANDSTONE: light grey to medium light grey, firm, fine to very fine quartz grains, subangular to subrounded, moderately well sorted, muddy/silty matrix, poor visual porosity, no shows. |
| | | 5% dull to bright white/yellow mineral fluorescence. |
| 2375 - 2380m | 80 | SILTSTONE: medium light grey to medium dark grey, firm, micromicaceous, carbonaceous flecking and laminar. |
| | 20 | SANDSTONE: as above. No shows. |
| 2380 - 2385m | 60 | SILTSTONE: occasionally sandy otherwise as above. |
| | 40 | SANDSTONE: as above. No shows. |
| | | 5- 10% dull to bright white/yellow mineral fluorescence. |
| 2385 - 2390m | 60 | SANDSTONE: light grey to medium light grey, firm to moderately hard, fine to very fine grained, subangular to subrounded, moderately well sorted, muddy matrix, possible cement, poor visual porosity, no shows. |
| | 40 | SILTSTONE: as above. |
| | | 10% dull to bright white/yellow mineral fluorescence. |
| 2390 - 2395m | 70 | SANDSTONE: light grey to medium light grey, firm, fine grained, subangular, moderately well sorted, dolomitic/calcareous cement, poor visual porosity, no shows. |
| | 30 | SILTSTONE: as above. |
| | | 20% dull to bright yellow/white mineral fluorescence. |
| 2395 - 2400m | 90 | SANDSTONE: as above. No shows. |
| | 10 | SILTSTONE: as above. |
| | Trace | PYRITE |
| | | 30% dull to bright yellow/white mineral fluorescence. |
| 2400 - 2405m | 80 | SANDSTONE: Type 1) 30% unconsolidated clear to milky white quartz grains, medium grained, subangular, moderately sorted, moderate visual porosity, no shows.<br>Type 2) 70% light grey, firm to moderately hard, fine grained, subangular to subrounded, moderately well sorted, dolomitic/calcareous cement, minor carbonaceous flecks, poor visual porosity, no shows. |
| | 20 | SILTSTONE: medium grey to brownish grey, firm, micromicaceous, carbonaceous, slightly calcareous. |
| | Trace | COAL: as above. |
| | | 30% dull to bright yellow/white mineral fluorescence. |

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| 2405 - 2410m | 80 | SANDSTONE: Type 1) 20% as above. No shows. Type 2) 80%. No shows. |
| | 10 | SILTSTONE: as above. |
| | 10 | COAL: as above. |
| 2410 - 2415m | 60 | SANDSTONE: Type 1) 50%, Type 2) 50% as above, no show. |
| | 40 | COAL: black, blocky, hard. |
| 2415 - 2425m | 70 | SANDSTONE: Type 1) 70% very fine to fine grain, subangular to subrounded, well cemented, slightly dolomitic. No shows. Type 2) 30% clear, medium to coarse quartz grains, subangular to subrounded, unconsolidated. |
| | 20 | SILTSTONE: dark greyish brown, sandy micromicaceous and carbonaceous. |
| | 10 | COAL: black, blocky, firm. |
| 2425 - 2430m | 20 | SANDSTONE: Type 2) as above. |
| | 80 | COAL: Black, blocky, firm |
| 2430 - 2435m | 10 | SANDSTONE: Type 2) as above. |
| | 40 | SILTSTONE: dark grey to dark greyish brown, occasionally sandy, very carbonaceous, micromicaceous, firm. |
| | 50 | COAL: as above. |
| 2435 - 2440m | 60 | COAL: black, blocky, firm. |
| | 30 | SILTSTONE: greyish brown, firm, sandy, micromicaceous. |
| | 10 | SANDSTONE: white, very fine to fine grained subangular, well sorted, well cemented, slightly dolomitic. |
| 2440 - 2445m | 50 | CLAYSTONE: white, soft. |
| | 30 | SANDSTONE: Type 2) as above. |
| | 10 | COAL: as above. |
| | 10 | SILTSTONE: as above. |
| 2445 - 2450m | 80 | SILTSTONE: medium grey, argillaceous, slightly carbonaceous, subfissile, slightly sandy in part, slightly micromicaceous in part, moderately hard. |
| | 15 | COAL: black, hard, brittle, slightly pyritic. |
| | 5 | SANDSTONE: fine grained, subrounded, well cemented with strong white to buff dolomitic cement. Very poor visible porosity, hard cuttings, no shows. |
| | | Sample heavily contaminated with cement. |
| 2450 - 2455m | 50 | SILTSTONE: as above. |
| | 50 | SANDSTONE: as above. No shows. |
| | | Still abundant cement. |
| 2455 - 2460m | 60 | COAL: as above. |
| | 30 | SILTSTONE: as above. |
| | 10 | SANDSTONE: as above. No shows. |
| | | Still abundant cement in sample. |
| 2460 - 2464m | | POOH for bit change - did not CBU. |

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| 2464 - 2465m | 60 | SILTSTONE: as above. |
| | 15 | COAL: as above. |
| | 25 | SANDSTONE: as above. No shows. |
| | | Abundant cement in sample. |
| Spot sample @ 2468m | 60 | SANDSTONE: fine to medium grained, moderately well sorted, subrounded to occasionally subangular, well cemented with white to buff dolomitic cement, poor visible porosity. 50% light brown oil staining. 50% of sandstone has moderate bright yellow/green even fluorescence. Slow moderate bright yellow cut, moderate crush cut. |
| | 30 | SILTSTONE: dark grey to medium dark grey, micaceous, argillaceous, carbonaceous, subfissile. |
| | 10 | COAL: black, hard, brittle, slightly silty, slightly pyritic. |
| 2465 - 2470m | 60 | SANDSTONE: as above. 80% even moderate bright yellow/green fluorescence, slow moderate bright yellow/green cut, moderate crush cut. 80% light brown oil stain. Poor visible porosity. |
| | 40 | COAL: as above, slightly sandy in part. |
| 2470 - 2475m | 90 | SANDSTONE: 3 types - Type 1) 80% loose, medium to coarse grained, moderately well sorted, subrounded, excellent visible porosity; Type 2) 20% dolomite cemented, fine grained sandstone aggregates, subangular to subrounded, fine to occasionally medium grain, poor visible porosity, as above; Type 3) fine grain pyritic cemented aggregates, subangular to subrounded, moderately well sorted, trace amount only. |
| | | 90% even, moderately bright yellow/green fluorescence, slow moderately bright yellow/green cut from oil stained dolomite cemented aggregates Type 2) and loose grains Type 1). |
| | 5 | SILTSTONE: as above. |
| | 5 | COAL: as above. |
| Spot Sample 2475m | 85 | SILTSTONE: as above. |
| | 10 | COAL: as above. |
| | 5 | SANDSTONE: as above. Type 2) 90%, Type 1) 10%, 5% moderately bright yellow/green fluorescence associated with light brown oil staining. Slow moderate bright yellow stream cut. Moderate crush cut. |
| 2475 - 2480m, | 80 | SILTSTONE: as above. |
| | 15 | SANDSTONE: Type 2) 100% as above, gives 15% patchy moderate bright yellow/green fluorescence, slow moderate bright yellow/green cut. |
| | 5 | COAL: as above. |

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| 2480 - 2481m | 55 | SILTSTONE: as above. |
| CBU | 40 | SANDSTONE: Type 2) 100% fine to very fine grained sandstone aggregates. Poor visible porosity with strong white to buff dolomite cement. Trace Types 1) and 3) 40% moderate bright yellow/green fluorescence. Slow moderate bright yellow/green cut. Moderate crush cut. |
| | 5 | COAL: as above. |
| | | POOH for cores. |
| 2481 - 2564m | | See Cores 5, 6, 7, 8, 9 |
| 2564 - 2565m | | Unable to catch samples at 2665 and 2670m, insufficient sample at 2673m for a full set of samples, so one dried sample only was prepared. |
| 2573m | 70 | SILTSTONE: medium light grey to medium grey, firm to moderately hard, subrounded blocky cuttings, siliceous cement, quartz grain and carbonaceous matter inclusions. |
| | 30 | SANDSTONE: quartzose aggregates: very light grey to light grey, friable to occasionally moderately hard, very fine to fine grained, subrounded, well sorted, siliceous and trace dolomitic cement, poor visual porosity, dull weak white fluorescence, with faint very slow diffuse cut and crush cut (few cuttings in the sample show bright white fluorescence and weak fast streaming white cut - possibly cavings). |
| 2570 - 2575m | 70 | SILTSTONE: medium grey to brownish grey, common carbonaceous flecking and inclusions otherwise as above. |
| | 30 | SANDSTONE: aggregates: very fine grained and very fine to fine grained, carbonaceous inclusions, few cuttings (1/4 = 5 in sample) show bright white fluorescence and streaming cut as above - these aggregates have slightly larger grains hence better porosity. |
| | Trace | COAL: black, vitreous, firm, angular cuttings (probably as laminations within siltstone and sandstone). |
| 2575 - 2580m | 50 | SILTSTONE: as above, and light to medium light grey in parts. |
| | 50 | SANDSTONE: very fine to fine grained aggregates as above, with very occasional shows as above. Also minor loose quartz: clear to translucent, fine to occasionally medium grained, subrounded to occasionally angular, no shows. |
| | Trace | PYRITE: microcrystalline aggregates. |
| 2580 - 2585m | 60 | SILTSTONE: very carbonaceous in parts, otherwise as above. |
| | 30 | SANDSTONE: very fine to fine grained quartz aggregates occasional cuttings with shows as above. |
| | 10 | COAL: black, brittle, vitreous, angular cuttings. |
| | Trace | PYRITE: as above. |

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| 2585 - 2590m | 50 | SILTSTONE: as above. |
| | 50 | SANDSTONE: quartzose aggregates: very light grey, predominantly friable to occasionally moderately hard, very fine to occasionally medium grained, predominantly fine, subangular to subrounded, well sorted, siliceous with a, trace of dolomite cement in some cuttings, carbonaceous inclusions, micaceous, poor to occasionally moderate visual porosity, occasional cuttings with dull white to very occasionally bright, white fluorescence, with very slow, faint diffuse cut and crush cut, (these cuttings cavings?). Trace of white mineral fluorescence. Minor loose quartz as above. |
| 2590 - 2595m | 40 | SILTSTONE: very carbonaceous in parts, otherwise as above. |
| | 60 | SANDSTONE: quartz aggregates: fine to medium grained with occasional dull white and occasionally bright white fluorescence, and very slow, faint diffuse white cut and crush cut, poor visual porosity. |
| | Trace | DOLOMITE: light brown, hard, angular cuttings, cryptocrystalline. |
| 2595 - 2600m | 100 | SANDSTONE: loose quartz: transluscent, medium to coarse grained, subangular to subrounded, well sorted, no shows. Minor aggregates as above. |
| | Trace | SILTSTONE: as above. |
| | Trace | COAL: as above. |
| 2600 - 2605m | 70 | SANDSTONE: predominantly loose quartz and quartz aggregates as above. |
| | 30 | SILSTONE: light grey to medium grey, very soft, grading to claystone in parts, firm to occasionally moderately hard, carbonaceous flecking and inclusions micromicaceous, quartz grain inclusions. |
| | Trace | PYRITE: microcrystalline aggregates. |
| 2605 - 2610m | 80 | SANDSTONE: predominantly loose quartz: translucent, medium to very coarse grained, predominantly medium to coarse, predominantly subangular, moderately well sorted, no shows. Also minor quartzose aggregates: very light grey, moderately hard, fine to medium grained, subrounded, moderately well sorted, dolomite cement, carbonaceous inclusions, poor to no visual porosity, trace mineral fluorescence, no shows (very occasional cuttings probably cavings, have shows as above). |
| | 20 | SILTSTONE: as above, and pyritic in parts. |
| | Trace | PYRITE: microcrystalline aggregates, and as cement surrounding quartz grains. |
| 2610 - 2615m | 90 | SANDSTONE: predominantly loose quartz: as above. Minor aggregates: as above. |
| | 10 | SILTSTONE: as above. |
| | Trace | PYRITE: as above. |

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| 2615 - 2620m | 80 | SANDSTONE: predominantly loose quartz: as above. Also aggregates: as above. |
| | 10 | SILTSTONE: as above. |
| | 10 | CLAYSTONE: very light grey, very soft, blocky well rounded cuttings, with carbonaceous and quartz grain inclusions. |
| | Trace | PYRITE: as above. |
| 2620 - 2625m | 60 | SILTSTONE: medium grey to greyish brown, soft to firm, very carbonaceous in parts, otherwise above. |
| | 20 | SANDSTONE: loose quartz and aggregates as above. |
| | 10 | CLAYSTONE: as above. |
| | 10 | COAL: black, brittle, angular cuttings, vitreous. |
| 2625 - 2630m | 40 | SILTSTONE: as above. |
| | 50 | SANDSTONE: loose quartz and aggregates, as above. |
| | 10 | CLAYSTONE: slightly sticky in parts, otherwise as above. |
| | Trace | COAL: as above. |
| 2630 - 2635m | 30 | SILTSTONE: as above. |
| | 50 | SANDSTONE: loose quartz and aggregates as above. |
| | 20 | CLAYSTONE: very light grey to light grey to greyish brown, otherwise as above. |
| | Trace | DOLOMITE: yellow brown to pale brown, hard, angular cuttings, cryptocrystalline. |
| 2635 - 2640m | 20 | SILTSTONE: as above. |
| | 10 | CLAYSTONE: as above. |
| | 70 | SANDSTONE: predominantly loose quartz, also quartzose aggregates: as above. |
| | Trace | COAL: as above. |
| 2640 - 2645m | 50 | SILTSTONE: as above. |
| | 40 | CLAYSTONE: very light grey to dominantly medium grey, soft, well rounded, blocky cuttings. |
| | 40 | CLAYSTONE: carbonaceous. |
| | 10 | COAL: subvitreous, otherwise as above. |
| | Trace | SANDSTONE: loose quartz, medium grained, as above. |
| 2645 - 2650m | 10 | SANDSTONE: predominantly loose quartz, also aggregates, as above. |
| | 10 | COAL: as above. |
| | 30 | CLAYSTONE: sticky, otherwise as above. |
| | 50 | SILTSTONE: as above. |
| 2650 - 2655m | 50 | SANDSTONE: 3 types: 1) loose, medium grained, well rounded to rounded, well sorted, excellent visible porosity (50% of sandstone); 2) (50%) very fine grain to fine grain, well sorted, subrounded to subangular quartz sandstone aggregates. Strong white silica and dolomite cements. Very poor to no visible porosity; 3) Trace pyrite cement, fine grain sandstone, subangular to subrounded, well sorted. |

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| | | SHOWS: 40% spotty, dull, even, white fluorescence very slow diffuse dull white cut. Weak very slow crush cut. |
| | 30 | SILTSTONE: dark grey to brown grey, argillaceous, carbonaceous, sandy in part firm to hard. |
| | 20 | CLAYSTONE: white to light grey, firm to moderately hard, unusually subcrystalline texture, appears slightly silty - may prove to be altered volcanics. |
| | Trace | COAL: black, hard, brittle, vitreous. |
| 2655 - 2660m | 90 | SANDSTONE: Type 1) 90% as above, excellent visible porosity; Type 2) 10% as above; trace Type 3) as above. |
| | | SHOWS: 10% dull spotty white/green fluorescence from dolomite/silica cemented aggregates. 2 out of 7 tested give very slow dull diffuse white stream cut. Weak diffuse cream crush cut. |
| | 5 | SILTSTONE: as above. |
| | 5 | CLAYSTONE: as above. |
| 2660 - 2665m | 70 | SILTSTONE: as above. |
| | 20 | SANDSTONE: Type 1) 30% as above, Type 2) 70% as above giving 15% spotty dull white/green fluorescence. No visible streaming cut but weak dull white crush cut. |
| | 5 | CLAYSTONE: as above. |
| | 5 | COAL: as above. |
| 2665 - 2670m | 80 | SANDSTONE: Type 1) 5% as above, Type 2) 95% as above, giving 70% spotty dull to moderate bright white/green fluorescence (mostly dolomite mineral fluorescence). No streaming cut but weak, diffuse dull white/green crush cut. Trace Type III as above. (calcimetry - Tr - 1% Dolomite). |
| | 20 | SILTSTONE: as above. |
| | Trace | CLAYSTONE: White, to light brown, with exotic light green, rounded "silty" looking clasts and dark grey, sub-crystalline rounded clasts (possible altered volcanics). |
| 2670 - 2675m | 90 | SILTSTONE: White to grey to grey brown, otherwise as above. |
| | 10 | SANDSTONE: Predominantly Type 2) as above; minor Type 1) and 3) as above. Gives 10% spotty dull to moderately bright mineral fluorescence. No stream cut. Very weak, slow diffuse crush cut. |
| | Trace | COAL: as above. |
| 2675 - 2680m | 50 | SILTSTONE: as above. |
| | 40 | SANDSTONE: Predominantly Type 2) as above. Minor Type 1) and 3) as above. Gives 40% moderately bright to dull dolomite mineral fluorescence. No stream cut, weak diffuse crush cut. |
| | 10 | CLAYSTONE: as above. |

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| 2680 - 2685m | 80 | SANDSTONE: Type 1) 50% loose, medium to coarse grained, excellent visible porosity no shows. Type 2) 50% very fine to occasionally medium grained dolomite/silica cemented aggregates. Very poor to no visible porosity. 40% mixture of hyrdocarbon/mineral fluorescence. Approx. 50% of fluorescence cuttings give weak slow stream cut, moderate crush cut, possible light brown oil staining (or buff dolomite). Trace Type 3) pyrite cemented fine grained sandstone aggregates. No visible porosity. |
| | 20 | SILTSTONE: light grey to medium dark grey, firm, argillaceous and carbonaceous in part. Occasional carbonaceous laminar, micaceous in part. |
| | Trace | CLAYSTONE: silty appearance, occasional light green and dark grey silty looking clasts. |
| 2685 - 2690m | 90 | SANDSTONE: Type 1) 60% as above, Type 2) 40% with 35% moderately bright to dull yellow/green spotty fluorescence - mixture of hydrocarbon and mineral fluorescence approximately 20% (2 out of 9) cuttings give moderately slow to very slow cream streaming cut. All give moderate to weak crush cut. Trace Type 3) as above. |
| | 10 | SILTSTONE: as above. |
| 2690 - 2695m | 80 | SANDSTONE: Type 1) 5% as above. Type 2) 95% as above with predominantly silica cement. 30% dolomite cemented fluorescence - from these cuttings only weak dull cream streaming cut, weak to moderate crush cut, silica cemented cuttings (70%) have unusual "glazed" white to milky cement; trace Type 3) as above. |
| | 20 | SILTSTONE: as above. |
| | Trace | COAL: as above. |
| 2695 - 2700m | 90 | DOLERITE: medium light grey to green, hard to very hard, subangular cuttings, medium to occasionally coarsely crystalline, quartz, feldspar, ferromagnesiums. |
| | Trace | CLAYSTONE: as above. |
| | Trace | SILTSTONE: as above. |
| | 10 | SANDSTONE: quartzose aggregates: very light grey, friable to moderately hard, very fine to medium grained, subrounded, moderately well sorted, siliceous and trace dolomitic cement, carbonaceous inclusions, poor visual porosity, bright white fluorescence and slow to moderately fast streaming white cut, instant diffuse white crush cut. Also loose quartz: transluscent, medium to very coarse, subangular to well rounded, no shows. |
| 2700 - 2705m | 100 | DOLERITE: as above. |
| | Trace | SANDSTONE: aggregates and loose quartz as above. |
| | Trace | SILTSTONE: as above. |
| | Trace | CLAYSTONE: as above. |
| 2705 - 2710m | 100 | DOLERITE: green grey otherwise as above. |
| | Trace | SANDSTONE: aggregates and loose quartz as above. |
| | Trace | CLAYSTONE: greenish grey, soft, with green black and grey altered crystalline fragment inclusions. |

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| 2710 - 2715m | 100 | DOLERITE: as above. |
| | Trace | CLAYSTONE: as above. |
| | Trace | SANDSTONE: aggregates and loose quartz as above. |
| 2715 - 2720m | 100 | DOLERITE: as above. |
| | Trace | CLAYSTONE: as above. |
| 2720 - 2725m | 100 | DOLERITE: with occasional white quartz veins otherwise as above. |
| 2725 - 2730m | 100 | DOLERITE: medium dark grey, hard, subangular to angular cuttings, coarsely crystalline, quartz, feldspars, ferromagnesiums, quartz veins. |
| 2731.9 - 2735m | 90 | DOLERITE: medium dark grey to green, moderately hard, subangular to subrounded cuttings, medium to coarsely crystalline, high % of quartz also feldspar and ferromagnesiums, also clear to white quartz veins. |
| | 10 | SANDSTONE: loose quartz fragements: clear to milky white, medium to very coarse and occasionally granule grain size, subangular to angular, poorly sorted, no shows. Also quartzose aggregates: very light grey, moderately hard, very fine to medium grained, predominantly fine to medium, subrounded, moderately well sorted, silica cement (well cemented), trace dolomite cement, poor visual porosity, dull yellow mineral fluorescence, some cuttings show bright white fluorescence and moderately slow streaming white cut, and weak white diffuse crush cut. |
| 2735 - 2740m | 70 | DOLERITE: as above. |
| | 30 | SANDSTONE: predominantly loose quartz grains and fragments, as above. Also quartzose aggregates; fine to medium grained, with silica cement and 15% of sample has bright white fluorescence and slow diffuse white cut and instant diffuse crush cut. |
| 2740 - 2745 | 80 | DOLERITE: as above. |
| | 20 | SANDSTONE: loose quartz: predominantly medium to coarse otherwise as above. Aggregates: predominantly medium grained. Approx. 10% of sample has bright white fluorescence and very slow very faint white cut and crush cut. |
| 2745 - 2750m | 20 | DOLERITE: as above. |
| | 70 | SANDSTONE: predominantly loose quartz: subangular to subrounded, otherwise as above, some grains have patchy dull white fluorescence - no cut. Also aggregates: as above with bright white fluorescence and slow white streaming cut and diffuse white crush cut. The fluorescence from both is about 30% of sample. |
| | 10 | SILTSTONE: pale brown-grey, soft, very common quartz grain inclusions, carbonaceous flecking. |
| 2750 -2755m | 90 | SANDSTONE: loose quartz: clear to predominantly milky white, medium to very coarse grained, subangular to angular, moderately well sorted, with patchy dull white |

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| | | fluorescence and very slow, faint white cut. Trace aggregates: 2 types - Type 1) medium grained as above; Type 2) very fine grained, very light grey, moderately hard, very well sorted, poor visual porosity. Both types of aggregates have bright white fluorescence and slow weak white streaming cut, diffuse crush cut. Fluorescence from all 3 sandstone types amounts to 80% of sample. |
| | 10 | DOLERITE: as above. |
| | Trace | SILTSTONE: as above. |
| 2755 - 2760m | 90 | SANDSTONE: loose quartz: transluscent to milky white, medium to granule sized, predominantly coarse, otherwise as above with 50% (of whole sample) patchy dull to bright white fluorescence and very slow, faint white diffuse cut. |
| | 10 | DOLERITE: as above. |
| | Trace | SILTSTONE: as above. |
| 2760 - 2765m | 80 | SANDSTONE: predominantly loose quartz: as above (with some larger fragments showing one side subrounded to rounded i.e. indication they are broken off longer more rounded grains) with bright white fluorescence and very slow, very faint white cut. Also aggregates Types 1) and 2) as above with bright white diffuse fluorescence and very slow white diffuse cut and crush cut. Fluorescence from all 3 types is 30% of sample. |
| | 10 | SILTSTONE: as above, with abundant carbonaceous flecking. |
| | 10 | DOLERITE: as above (cavings). |
| 2765 - 2770m | 80 | SANDSTONE: predominantly loose quartz: as above and minor aggregates Types 1) and 2) as above. With 20% (of whole sample) patchy dull to bright white fluorescence and slow, weak cut as above (possibly cavings). |
| | 10 | SILTSTONE: as above also medium dark grey hard and siliceous. |
| | 10 | DOLERITE: as above. |
| | Trace | COAL: black, firm, vitreous, very angular cuttings. |
| 2770 - 2775m | 80 | SANDSTONE: predominantly loose quartz: occasional granule sized grains are rounded to well rounded otherwise as above; trace aggregates Type 1) as above. Shows: 20% (of sample) patchy bright white fluorescence and slow streaming to diffuse cut, diffuse crush cut. |
| | 10 | SILTSTONE: as above. |
| | 10 | DOLERITE: as above. |
| 2775 - 2780m | 80 | SANDSTONE: predominantly loose quartz: as above with some grains showing patchy bright white fluorescence and slow diffuse white cut and crush cut. Also quartzose aggregates: very light grey, moderately hard, very fine to very coarse grained, predominantly fine to medium or medium to coarse, subangular to subrounded, poorly sorted, dolomite and silica cement, well cemented rounded siltstone clasts, very poor to no visual porosity, a minority of aggregates have shows as above (total of 20% per sample). |

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| | 10 | SILTSTONE: as above. |
| | 10 | DOLERITE: as above. |
| | Trace | COAL: as above. |
| 2780 - 2785m | 40 | SILTSTONE: pale brown to medium dark grey, firm to moderately hard, subrounded to rounded cuttings, common carbonaceous flecking and inclusions, siliceous in parts, very fine quartz grain inclusions in part. |
| | 50 | SANDSTONE: loose quartz and aggregates as above. 10% cuttings (predominantly loose quartz) have shows as above - cavings? |
| | 10 | DOLERITE: (cavings) as above. |
| | Trace | PYRITE: as cement surrounding quartz grains. |
| 2785 - 2790m | 50 | SILTSTONE: buff to greyish brown and medium dark grey, as above and grading to very soft Claystone in parts. |
| | 40 | SANDSTONE: predominantly loose quartz: as above. Also minor aggregates as above. Trace shows as above. (probably cavings). |
| | 10 | DOLERITE: as above. |
| | Trace | COAL: as above. |
| 2790 - 2795m | 75 | SILTSTONE: very carbonaceous in parts, micromicaceous, otherwise as above. |
| | 20 | SANDSTONE: predominantly loose quartz also aggregates: as above, no shows. |
| | 5 | COAL: black, firm, brittle, vitreous, angular cuttings conchoidal fracture. |
| | Trace | DOLERITE: as above. |
| 2795 - 2800m | 10 | SILTSTONE: as above. |
| | 70 | SANDSTONE: loose quartz and aggregates as above. (Few cuttings weak shows - cavings.) |
| | 20 | DOLERITE: translucent green grey, moderately hard, quartz, feldspar ferromagnesiums, quartz veins. |
| | Trace | PYRITE: microcrystalline aggregates. |
| 2800 - 2805m | 90 | SANDSTONE: loose quartz: clear to milky white, medium to granule sized grains, angular to occasionally subrounded, predominantly subangular, poorly sorted. Also fine and medium grained aggregates as above. 40% dull white spotty fluorescence, and very slow, faint diffuse white cut and crush cut (crush cut - aggregates). |
| | 10 | DOLERITE: as above (cavings). |
| | Trace | SILTSTONE: as above. |
| 2805 - 2810m | 80 | SANDSTONE: loose quartz as above: and aggregates, with poor to occasionally moderate visual porosity, otherwise as above. 40% bright white fluorescence and slow diffuse to streaming white cut, and crush cut. |
| | 10 | DOLERITE: as above (cavings). |
| | 10 | SILTSTONE: as above. |
| 2810 - 2815m | 20 | SILTSTONE: very light grey to brownish grey, medium grey, soft to firm, blocky cuttings, common carbonaceous flecking and inclusions. |
| | 70 | SANDSTONE: loose quartz as above predominantly aggregates: white to very light grey, moderately hard, very fine to medium grained, |

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| | | subangular to subrounded, poorly sorted, dolomite cement, siltstone clasts, poor visual porosity with mineral fluorescence. 30% bright spotty white fluorescence, slow milky white diffuse cut and crush cut. |
| | 10 | DOLERITE: as above. |
| 2815 - 2820m | 10 | SILTSTONE: firm to moderately hard and grades to soft claystone in parts otherwise as above. |
| | 90 | SANDSTONE: loose quartz and aggregates as above with bright white fluorescence and slow milky white diffuse cut and crush cut. |
| | Trace | DOLERITE: as above. |
| 2820 - 2822m B.U. | 90 | SANDSTONE: predominantly loose quartz, as above. Also aggregates as above. 80% dull to bright white fluorescence and very slow diffuse milky white cut and crush cut. |
| | 10 | SILTSTONE: as above. |
| | Trace | DOLERITE: as above. |
| | Trace | PYRITE: as cement surrounding quartz grains. |
| | | POOH @ 2822.0 to cut Core-10 and 11 from 2822.5 - 2828.0 m and 2828 - 2833 m. |
| 2833 - 2835m | 60 | DOLERITE: green, grey, very hard, high quartz percentage, also black ferromagnesium, quartz veins. |
| | 40 | SILTSTONE: light grey to medium dark grey, occasionally pale brown, firm to hard, angular to subrounded blocky cuttings, carbonaceous/coaly inclusions in parts. |
| | Trace | COAL: black, brittle, angular cuttings, vitreous, conchoidal fracture. |
| | Trace | SANDSTONE: loose quartz and aggregate as above (probably cavings). |
| 2835 - 2840m | 10 | DOLERITE: as above. |
| | 75 | SILTSTONE: as above. |
| | 10 | SANDSTONE: loose quartz: clear to translucent medium to coarse grained, subangular to subrounded, no shows. Also aggregates: white to very light grey, very fine to medium grained, subrounded, well sorted, dolomitic and silicous cement, poor visual porosity, trace dull to bright spotty white fluorescence, slow weak faint white streaming cut and crush cut. |
| | 5 | COAL: as above, also earthy. |
| 2840 - 2845m | 85 | SILTSTONE: as above. |
| | 10 | SANDSTONE: aggregates as above, with trace fluorescence and cut as above. Trace loose quartz: as above. |
| | 5 | COAL: predominantly vitreous. |
| | Trace | DOLERITE: as above. |
| 2845 - 2850m | 90 | SILTSTONE: as above. |
| | 5 | COAL: as above. |
| | 5 | SANDSTONE: aggregates, siliceous cement, trace cuttings with shows as above. |

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| 2850 - 2855m | 65 | SILTSTONE: as above, grading to very soft claystone in parts. |
| | 5 | COAL: as above. |
| | 30 | SANDSTONE: loose quartz as above. Aggregates: light grey, fine grained, occasionally medium grained, friable, subrounded, well sorted, siliceous and doleritic cement, carbonaceous inclusions, poor visible porosity, trace patchy fluorescence, very very weak diffuse cut. |
| 2855 - 2860m | 50 | SILTSTONE: as above. |
| | 50 | CLAYSTONE: very light grey, very soft, blocky well rounded cuttings, fine quartz grain inclusions, carbonaceous inclusions, sticky in parts. |
| | Trace | SANDSTONE: loose quartz and aggregates as above. Aggregates have trace dull white mineral fluorescence. |
| | Trace | COAL: as above. |
| 2860 - 2865m | 30 | SILTSTONE: as above. |
| | 20 | CLAYSTONE: as above. |
| | 40 | SANDSTONE: predominantly loose quartz: medium to very coarse grained, otherwise as above. 10% aggregates with dull yellow fluorescence and very slow, weak white diffuse cut. |
| | 10 | COAL: as above. |
| 2865 - 2870m | 40 | SILTSTONE: as above. |
| | 10 | CLAYSTONE: as above. |
| | 50 | SANDSTONE: loose quartz: as above. Aggregates: as above with 10% dull white fluorescence and slow weak white cut. |
| | Trace | COAL: as above. |
| 2870 - 2875m | 80 | SILTSTONE: as above. |
| | 10 | CLAYSTONE: as above. |
| | 10 | SANDSTONE: loose grains and aggregates. Aggregates have trace dull spotty white fluorescence with very slow very faint weak diffuse cut. |
| | Trace | COAL: as above. |
| 2875 - 2880m | 90 | SILTSTONE: as above. |
| | 10 | CLAYSTONE: as above. |
| | Trace | COAL: as above. |
| | Trace | SANDSTONE: aggregates and loose quartz as above. |
| 2880 - 2885m | 20 | CLAYSTONE: as above. |
| | 80 | SILTSTONE: light grey to medium dark grey, brownish grey, firm to hard, subrounded to angular cuttings, with fine quartz grain and carbonaceous inclusions in parts, dolomitic in parts. |
| | Trace | COAL: as above. |
| 2885 - 2890m | 30 | SILTSTONE: as above. |
| | 70 | SANDSTONE: loose quartz fragments and grains: transluscent, fine to very coarse grained, predominantly medium to coarse, angular to subrounded, poorly sorted, no shows. Also trace aggregates: very light grey, friable to moderately hard, dolomitic cement, no fluorescence, no cut, very faint crush cut. |
| | Trace | CLAYSTONE: as above. |

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| 2890 - 2895m | 30 | SILTSTONE: as above. |
| | 70 | SANDSTONE: loose quartz: medium to coarse grained otherwise as above. Aggregates: very light grey, moderately hard, fine to medium grained, predominantly fine, subrounded, well sorted, dolomitic cement, carbonaceous inclusions, poor to no visual porosity, 30% dull gold mineral fluorescence, no shows. |
| | Trace | CLAYSTONE: as above. |
| 2895 - 2900m | 90 | SILTSTONE: as above. |
| | 5 | SANDSTONE: trace loose quartz grains: as above; trace dolomite cemented aggregates as above; trace fine grain silica cemented aggregates with very slow, weak streaming white cut. |
| | 5 | COAL: as above. |
| 2900 - 2905m | 90 | SILTSTONE: as above. |
| | 10 | CLAYSTONE: as above. |
| | Trace | SANDSTONE: loose quartz as above; no shows. Aggregates - fine grained with dolomitic cement, and dull gold mineral fluorescence, no shows. |
| 2905 - 2910m | 100 | SILTSTONE: as above. |
| | Trace | SANDSTONE: aggregates: fine grained, dolomitic as above, with dull gold mineral fluorescence and very slow, very faint and weak white cut and crush cut. Also occasional loose quartz: as above. |
| | Trace | CLAYSTONE: as above. |
| 2910 - 2915m | 30 | SILTSTONE: as above. |
| | 70 | SANDSTONE: loose quartz fragments and grains: clear to transluscent and milky white, medium to very coarse, predominantly medium to coarse, angular to rounded, no shows. Aggregates: fine grained as above; common dull orange mineral fluorescence, and a very slow very weak faint white cut, no crush cut. |
| | Trace | COAL: as above. |
| 2915 - 2920m | 90 | SANDSTONE: loose quartz predominantly coarse grained, and angular, otherwise as above. Rare aggregates, as above, with dull gold fluorescence and no shows. |
| | 10 | SILTSTONE: as above. |
| 2920 - 2925m | 70 | SANDSTONE: loose quartz fragments and grains as above. Trace aggregates as above with rare dull to moderate bright spotty white fluorescence and very slow, very faint and weak white cut and crush cut. |
| | 30 | SILTSTONE: soft in parts, otherwise as above. |
| | Trace | COAL: as above. |
| 2925 - 2930m | 50 | SILTSTONE: light grey to medium dark grey, occasionally soft (grades to claystone in places) to hard, predominantly firm to moderately hard, blocky cuttings, siliceous in parts, micromicaceous in parts, dolomitic in parts, commonly with carbonaceous inclusions. |
| | 50 | SANDSTONE: predominantly loose quartz: as above, no shows. Also 10% aggregates: as above with bright white mineral fluorescence, no shows. |

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| 2930 - 2935m | 80 | SANDSTONE: predominantly loose quartz; predominantly medium grained, subangular to subrounded otherwise as above; trace bright white fluorescence, slow weak diffuse white cut. Also trace Type 1) aggregates: very light grey, very friable, fine to predominantly medium grained, subrounded to rounded, well sorted, siliceous cement, carbonaceous inclusions, moderate to good visual porosity, trace 30% bright white fluorescence, moderately fast weak streaming to diffuse white cut 20% Type 2) aggregates: very light grey to cream, moderately hard, medium grained, subrounded to rounded, well sorted, dolomite cement, very poor to no visual porosity, 20% bright gold mineral fluorescence, no shows. |
| | 20 | SILTSTONE: as above. |
| 2935 - 2940m | 100 | SANDSTONE: loose quartz: predominantly medium to coarse grained, subangular, otherwise as above. Trace Type 1) aggregates as above. Loose quartz and Type 1) aggregates together have 30% bright white fluorescence, and both have moderately fast weak white diffuse cut and crush cut. Trace Type 2) aggregates: as above, no shows, bright gold mineral fluorescence. |
| | Trace | SILTSTONE: as above. |
| 2940 - 2945m | 30 | SILTSTONE: as above. |
| | 70 | SANDSTONE: predominantly loose quartz as above with minor aggregates Type 1) as above. Loose quartz and aggregates Type 1) together show 30% bright white fluorescence and slow weak streaming white cut. |
| 2945 - 2950m | 90 | SANDSTONE: predominantly loose quartz: translucent, medium to very coarse grained, predominantly coarse, angular to subrounded. Aggregates Type 1) medium to coarse grained, moderate to good visual porosity, otherwise as above. Loose quartz and Type 1) aggregates together have 40% bright, occasionally dull, white fluorescence and very slow, moderately weak streaming white cut and instant diffuse white crush cut. |
| | 10 | SILTSTONE: as above. |
| | Trace | COAL: black, firm, brittle, angular to subrounded cuttings, vitreous to subearthy in parts. |
| 2950 - 2955m | 60 | SILTSTONE: as above. |
| | 40 | SANDSTONE: predominantly loose quartz: as above. Also Type 3) aggregates: very light grey, friable, fine to medium grained siliceous cement, poor visual porosity (N.B: hard to tell porosity). Together the loose quartz and aggregates Type 1) give 40% bright, spotty white fluorescence and slow weak streaming cut and crush cut. |
| | Trace | COAL: as above. |
| 2955 - 2960m | 60 | SILTSTONE: as above. |
| | 10 | CLAYSTONE: very light to light grey, also greyish brown, very soft, sticky in parts, with very fine quartz grain and carbonaceous inclusions. |

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| | 30 | SANDSTONE: loose quartz: as above. Type 3) aggregates as above with trace of bright white fluorescence and slow faint weak streaming cut and crush cut. |
| 2960 - 2965m | 100 | SILTSTONE: as above. |
| | Trace | CLAYSTONE: as above. |
| | Trace | SANDSTONE: trace aggregates with gold mineral fluorescence and occasionally with bright white fluorescence and very slow, very faint weak white cut. Trace loose quartz as above. |
| | Trace | COAL: as above. |
| 2965 - 2970m | 70 | SILTSTONE: as above. |
| | 30 | CLAYSTONE: as above and sticky in parts. |
| | Trace | SANDSTONE: trace aggregates. Trace loose quartz as above. |
| | Trace | COAL: black, brittle, angular cuttings, vitreous. |
| 2970 - 2975m | 90 | SILTSTONE: medium light grey to medium dark grey, soft to moderately hard, blocky, tending to subfissile in parts, carbonaceous in parts. |
| | 10 | SANDSTONE: quartz aggregates: very poor to poor visual porosity, trace dull faint white fluorescence and very occasional bright white fluorescence and slow weak diffuse white cut. |
| | Trace | COAL: black, brittle, angular cuttings, vitreous, conchoidal fracture. |
| 2975 - 2980m | 90 | SILTSTONE: as above. |
| | 10 | SANDSTONE: aggregates as above predominantly with no shows. Occasional spotty bright white fluorescence and slow faint white streaming cut and instant weak crush cut. |
| | Trace | COAL: as above. |
| 2980 - 2985m | 100 | SILTSTONE: light grey to medium dark grey, very soft to moderately hard, blocky rounded to subrounded cuttings, very carbonaceous in parts, siliceous grading to a very fine grained sandstone in parts. |
| | Trace | SANDSTONE: Quartzose aggregates: very light grey, moderately hard, fine to occasionally medium grained, subrounded, well sorted, siliceous and slight dolomitic cement, very poor visual porosity, no shows. |
| | Trace | COAL: as above. |
| 2985 - 2990m | 100 | SILTSTONE: as above. |
| | Trace | SANDSTONE: trace aggregates as above, no shows. |
| 2990 - 2995m | 100 | SILTSTONE: as above and grading to very soft Claystone in parts. |
| | Trace | SANDSTONE: very fine to fine grained otherwise aggregates, as above, no shows. |
| | Trace | COAL: as above. |
| 2995 - 3000m | 70 | SILTSTONE: as above. |
| | 10 | CLAYSTONE: very light grey to greyish brown and medium dark grey, very soft, slightly sticky, carbonaceous. |
| | 10 | COAL: black, firm, brittle, angular cuttings, vitreous conchoidal fracture in parts. |
| | 10 | SANDSTONE: aggregates as above, no shows. |

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| 3000 - 3005m | 80 | SILTSTONE: as above. |
| | 20 | SANDSTONE: aggregates predominantly medium grained, rounded, otherwise as above and loose quartz: translucent medium to very coarse, subangular, no shows in either. |
| | Trace | CLAYSTONE: as above. |
| | Trace | COAL: as above. |
| 3005 - 3010m | 70 | SILTSTONE: as above. |
| | 30 | SANDSTONE: aggregates: fine to very coarse grained predominantly medium grains, subrounded, otherwise as above, no shows. |
| 3010 - 3013m | 60 | SILTSTONE: dark grey to grey, micro carbonaceous, non-calcareous, hard. |
| | 20 | SANDSTONE: white to clear, occasionally greenish grey, fine to medium grained quartz, subangular to subrounded, moderately to well sorted, well cemented, siliceous, with 5% - 10% dull yellow to white fluorescence, no cut. |
| | 10 | COAL: black, blocky, hard. |
| | 10 | CAVINGS: including trace of volcanics, metals, pyrite, sandstone, white clay, etc (poor sample quality). |
| 3013 - 3015m | 90 | SILTSTONE: dark grey to grey, micromicaceous, arenaceous, noncalcareous firm, occasionally carbonaceous, firm. Trace of coal, black conchoidal, firm. |
| | 10 | SANDSTONE: white, greenish grey, very fine - fine grained, moderately to well sorted, subrounded, moderately to well cemented, poor to no visual porosity. 5% bright white to dull yellow fluorescence. Very very slow stream cut. |
| 3015 - 3020m | 70 | SILTSTONE: as above. |
| | 20 | SANDSTONE: white, clear opaque, fine to medium, occasionally coarse grained quartz, subangular to subrounded moderately sorted, moderately silica cemented, poor to no visual porosity, 5% bright white to dull yellow fluorescence with slow stream cut. |
| | 10 | COAL: black, conchoidal, firm. |
| 3020 - 3025m | 60 | SANDSTONE: white, clear, medium to coarse occasionally very coarse grained quartz, subangular to subrounded, moderately cemented and sorted with trace glauconite and kaolinite, siliceous, firm. Trace of fluorescence with very weak even cut. Poor to no visual porosity. |
| | 40 | SILTSTONE: dark grey to grey, occasionally light grey, carbonaceous, micromicaceous, firm. |
| 3025 - 3030m | 80 | SANDSTONE: Type 1) 40% white to clear opaque, medium to coarse grained to very coarse grained quartz, subrounded to subangular occasionally rounded, poorly consolidated to unconsolidated with 10% bright, yellowish white fluorescence, with very slow even cut. Type 2) 60% white to greenish grey, fine to medium occasionally coarse grained, moderately sorted, well cemented, siliceous, kaolinite carbonaceous. Poor to no visual porosity with dull white fluorescence and bright yellow stream cut. |
| | 20 | SILTSTONE: as above. |

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| 3030 - 3035m | 70 | SILTSTONE: dark grey, micromicaceous, carbonaceous, sandy, firm. Trace of orange fluorescence with fast streaming bright yellow cut and reddish brown residue. |
| | 20 | SANDSTONE: greenish grey, grey, very fine to medium grained, subangular/subrounded, well sorted very well cemented (dolomitic cement), very poor to no porosity, microcarbonaceous, 5% bright white fluorescence with bright white streaming cut, |
| | 10 | COAL: black, firm. |
| 3035 - 3040m | 70 | SANDSTONE: grey to cream grey, very fine to coarse grained, poorly to moderately sorted, very well cemented, siliceous, argillaceous, carbonaceous. Trace of heavy minerals, no visual porosity. Trace of dull yellow/white fluorescence no cut. |
| | 30 | SILTSTONE: greyish white to grey, carbonaceous micromicaceous, argillaceous, non-calcareous occasionally sandy. |
| 3040 - 3045m | 60 | SILTSTONE: as above. |
| | 40 | SANDSTONE: as above, trace dull white fluorescence, no cut. |
| 3045 - 3050m | 60 | SILTSTONE: dark grey to grey, sandy, carbonaceous micromicaceous, firm. |
| | 40 | SANDSTONE: white to light grey, fine to medium grained, moderately sorted, moderate to well cemented, very poor to no visual porosity, kaolinite, siliceous, 5% yellowish white fluorescence with slow dull white cut. |
| 3050 - 3055m | 60 | SANDSTONE: clear/white fine to medium grained quartz, medium sorted and well cemented, kaolinite, siliceous, poor to no visual porosity, trace of white fluorescence with very slow streaming white cut. |
| | 30 | SILTSTONE: as above. |
| | 10 | COAL: as above. |
| 3055 - 3060m | 70 | SANDSTONE: Type 1) 70% clear opaque, coarse to very coarse grained quartz grains, unconsolidated, subangular, no show. Type 2) 30%, fine to medium grained white/clear subrounded, kaolinite, siliceous, moderately cemented, carbonaceous, heavy minerals. Trace dull yellow fluorescence, slow streaming yellow cut. |
| | 30 | SILTSTONE: as above. |
| 3060 - 3065m | 70 | SILTSTONE: medium grey to greyish black, carbonaceous, micromicaceous, firm. |
| | 20 | SANDSTONE: white to light grey, very fine grained, well sorted, well cemented with clay and dolomite, no visible porosity. No show. |
| | 10 | CHERT: angular, white (opaline), chonchoidal fracture. Trace of coal, high grade chonchoidal fracture. |
| 3065 - 3070m | 90 | SILTSTONE: as above. |
| | 10 | SHALE: carbonaceous. |
| 3070 - 3075m | 100 | SILTSTONE: as above. |

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| 3075 - 3080m | 80 | SILTSTONE: dark grey, as above. |
| | 20 | SANDSTONE: clear/white to light grey, fine to medium grained, subangular/subrounded, moderately to well sorted, well cemented, kaolinite, occasionally siliceous, trace of dark heavy minerals, no shows. |
| 3080 - 3085m | 90 | SILTSTONE: as above. |
| | 10 | SANDSTONE: as above. No show. |
| 3085 - 3090m | 90 | SANDSTONE: Type 2) 50%, clear to white, cream to greyish cream fine to coarse grained, subangular to rounded, well to moderately cemented with kaolinite and silica, moderate to no visual porosity, no shows. Sandstone Type 1) 50% coarse to very coarse grained, white, quartz grains, subangular to angular, unconsolidated, excellent porosity, with 5% dull orange and yellowish white fluorescence, no cut, very dull white crash cut. |
| | 5 | CLAYSTONE: white (kaolinite) with carbonaceous laminae. |
| | 5 | COAL. |
| 3090 - 3095m | 100 | SANDSTONE: Type 1) 90% as above, Type 2) 10%. Trace of coal. Trace of smokey quartz with occasional dull orange fluorescence. 20% bright yellow/white fluorescence no cut (crash cut after 30 minutes). |
| 3095 - 3100m | 80 | SANDSTONE: Type 1) as above, 30% bright yellow fluorescence, no cut. |
| | 20 | SILTSTONE: dark grey, sandy, carbonaceous, micromicaceous, trace of coal. |
| 3100 - 3105m | 60 | SILTSTONE: as above, sandy. |
| | 40 | SANDSTONE: Type 2) mainly with 10% bright yellow, with white cut after 20 minutes. Trace of coal. |
| 3105 - 3110m | 60 | SANDSTONE: predominantly Type 2), 30% Type 1), 5% bright yellow fluorescence with white cut after 20 minutes. |
| | 40 | SILTSTONE: dark grey, sandy, as above. |
| 3110 - 3115m | 80 | SANDSTONE: predominantly Type 1) 80% coarse to very coarse white occasionally smokey quartz grains, subangular to angular, unconsolidated, 5% dull orange to yellow fluorescence, no cut. Type 2) 20% fine to medium grained, subrounded, moderately to well cemented, siliceous and kaolinite, 5% yellow fluorescence with slow stream cut. |
| | 10 | SILTSTONE: as above. |
| | 10 | COAL: black, choncoidal. |
| 3115 - 3120m | 100 | SANDSTONE Type 1) 80% white, coarse to very coarse grained, subangular to angular, quartz grain, unconsolidated, excellent porosity, 40% bright yellow fluorescence with very very slow bright white diffuse cut (after 15 minutes). Type 2) 20% white to buff to clear to greenish grey, fine to medium occasionally coarse grained, well cemented, rare heavy minerals. Siliceous, poor to no visual porosity. |

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| 3120 - 3125m | 40 | CHERT: highly angular, milky white chonchoidal fracture (sand sized - broken up by drill bit). |
| | 30 | COAL: |
| | 20 | SHALE: dark grey, siliceous claystone. |
| | 10 | SANDSTONE: white to light grey (Type 2) above), clasts composed of small angular pieces of chert, well cemented with clay and silica; bright yellow fluorescence (on chert) streaming white to bright yellow cut. |
| 3125 - 3130m | 30 | CHERT: large sand sized (broken up by drill bit) fresh chonchoidal fractured surfaces. |
| | 20 | SANDSTONE: unconsolidated, chert clastics, subangular to subrounded. |
| | 30 | SILTSTONE: grey to dark grey. |
| | 10 | SHALE: dark grey to black. |
| | 10 | COAL. Fluorescence bright yellow; slow light yellow cut. |
| 3130 - 3135m | 60 | CHERT: milky white, fresh chonchoidal fractures. |
| | 40 | SILTSTONE/SHALE: grey to dark grey, carbonaceous, some larger pieces show fine lamina of siltstone grading into chert; bright yellow fluorescence; white to yellow streaming cut. |
| | | 3140m POOH for bit trip - did not CBU. |
| 3143.8 drilling break & gas inc. to 70 units. | 20 | CHERT: milky white, as above. |
| | 20 | SILTSTONE: fine grained, light grey to dark grey, dolomite cement. |
| | 10 | DOLOMITE: white to grey. |
| | 20 | SANDSTONE: fine grained, white chert clasts with dolomite cement. |
| | 10 | CHERT: dark grey. |
| | 10 | COAL: as above. |
| | 10 | SHALE: bituminous; yellow fluorescence; slow dull yellow cut. |
| 3140 - 3145m | 40 | CHERT: milky white, same above but smaller size, more rounded probably cavings. |
| | 30 | SILTSTONE: grey to dark grey. |
| | 20 | SANDSTONE: white chert clasts/dolomite cement. |
| | 5 | COAL: as above. |
| | 5 | DOLOMITE: as above. |
| | | Fluorescence - bright yellow. Cut - dull yellow. |
| 3145 - 3150m | 20 | CHERT: milky white to dull grey opaque, irregular cryptocrystalline to crystalline (relatively large clast broken from larger piece by drill bit) possible conchoidal fracture, probably flat preferential fracture, angled, very dull purple mineral fluorescence. |
| | 20 | SANDSTONE: fine to medium grained, rounded to occasionally angular, white to dull grey in a predominantly siliceous to clay matrix, commonly carbonaceous, grading in part to siltstone, no visual porosity, trace bright yellow fluorescence, with slow very dull yellow cut. |

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| | 60 | SILTSTONE: grey/dark grey to occasionally black, very carbonaceous, micromicaceous in a dominant clay argillaceous matrix grading in part to shale, occasionally exhibit fine carbonaceous laminea partings, platey to irregular laminations with possible chert, firm, no shows. |
| | Trace | COAL: black, vitreous, conchoidal fracture. |
| 3150 - 3155m | 20 | SANDSTONE: Type 1) fine, rounded quartz grains in a dominantly white kaolinite, matrix, unconsolidated; Type 2) buff, medium, subrounded quartz in a well silic cement, occasional white chert clast, tight, trace fluorescence, no shows. |
| | 80 | SILTSTONE: grey to dark grey, larger percentage of carbonaceous material, otherwise as above. |
| GRAB SAMPLE<br>3155 - 3156 m<br>Flow check<br>@ 3156 m | 70 | CHERT/SANDSTONE: Type 1) milky, predominantly coarse subrounded, unconsolidated broken chert clasts, hard, tight, grading to large chert pieces as above, no shows. Type 2) buff to white, fine grained subrounded quartz grains in a silica, possible dolomite cement, hard, tight, 50% even pale dull yellow fluorescence, slow diffuse yellow cut, possible oil staining. |
| | 30 | SILTSTONE: grey brown to dark grey, highly carbonaceous, to argillaceous, micromicaceous in part, occasional coal laminar partings, fine scattered carbonaceous filements throughout, grading to an occasional siliceous claystone - possible kaolinite, yellow fluorescence, slow diffuse cut. |
| 3156 - 3160m | 70 | SANDSTONE/CHERT: 80% even bright yellow fluorescence with streaming yellow white cut. Chert exhibits dull yellow fluorescence with no cut, otherwise lithology as above. |
| | 30 | SILTSTONE: as above. |
| 3160 - 3165m | 90 | SILTSTONE: as above. |
| | 10 | SANDSTONE: possible quartz pebble fragments - white, clear angled quartz due to bit action, otherwise as above. |
| 3165 - 3170m | 100 | SILTSTONE: light grey to dark grey, silica cement, some clay fluorescence - 10% dull yellow, no cut. |
| 3170 - 3175 | 40 | SILTSTONE: light grey to dark grey, silica cement, carbonaceous. |
| | 40 | SANDSTONE: white to buff, chert clasts, fine grained, subangular to rounded, well cemented with silica/kaolinite. |
| | 10 | CONGLOMERATE: broken chert grains, rounded edges on parts indicate breakdown from larger clasts, milky white. |
| | 10 | COAL: angular.<br>Fluorescence 30% yellow. Slow cut, diffuse, light yellow. |

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| 3175 - 3180m | 40 | SANDSTONE: white to buff, chert clasts, fine to coarse grained, rounded to subangular, cemented. |
| | 30 | SILTSTONE: light grey to dark grey. |
| | 20 | CONGLOMERATE: chert clasts, silica cemented. |
| | 10 | DOLOMITE: as above. |
| | | Fluorescence - 10% dull yellow to orange, no cut. |
| GRAB SAMPLE | 30 | SILTSTONE: grey to dark grey. |
| 3182 - 3183m | 20 | SANDSTONE: as above. |
| | 20 | CONGLOMERATE: chert fragments |
| | 10 | SHALE: bitumenous |
| | 10 | COAL: as above. |
| | 10 | DOLOMITE: as above. |
| 3180 - 3185m | 30 | SANDSTONE: fine to medium grained, silica clasts and cement, dolomite cement. |
| | 20 | CONGLOMERATE: chert clasts. |
| | 20 | SILTSTONE: quartz clasts and cement. |
| | 20 | SILTSTONE: quartz coal, dolomite |
| | 10 | COAL: as above. |
| | | Fluorescence - 2% dull yellow to orange fluorescence. |
| 3185 - 3190 | 40 | SANDSTONE: same as above. |
| | 40 | CONGLOMERATE: chert clasts. |
| ROR 6.9-7.0 | 20 | SILTSTONE: grey to dark grey |
| | Trace | COAL: as above. |
| | | Fluorescence - 20% bright yellow, may be mineral fluorescence, no cut. |
| GRAB SAMPLE 3194m | 60 | SANDSTONE: medium to coarse grained, silica and clay cement. |
| | 20 | CONGLOMERATE: chert clasts. |
| | 10 | SILTSTONE: dark grey to black. |
| | 10 | SHALE: black carbonaceous. |
| | | Fluorescence - yellow 20%, cut very slow, diffuse, dull yellow. |
| 3190 - 3195m | 40 | SANDSTONE: same as above. |
| | 30 | CONGLOMERATE: chert clasts. |
| | 20 | SILTSTONE: as above. |
| | 10 | SHALE: black carbonaceous |
| | | Fluorescence - yellow (mineral fluorescence), no cut. |
| 3195 - 3200m | 40 | SANDSTONE: very fine to fine quartz grain, silica and dolomite cement. |
| | 40 | CONGLOMERATE: chert pebble. |
| | 10 | SILTSTONE: light grey to dark grey |
| | 10 | COAL: as above. |
| | | Fluorescence - dull yellow 10%, cut - very very slow, diffuse yellow, almost none. |
| 3200 - 3205m | 40 | SANDSTONE: clear, opaque, fine, subrounded to subangular quartz grains in a dominantly silica, partly dolomitic cement, occasionally argillaceous, very poor sorting, minor yellow hydrocarbon and (mineral) fluorescence with no associated cut. |
| | 30 | SILTSTONE: light to dark grey, commonly carbonaceous to argillaceous, with scattered fine carbonaceous laminae throughout, slightly micromiceous, firm, kaolinitic. |

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| | | |
|---|---|---|
| | 30 | CONGLOMERATE: opaque, irregular cryptocrystalline coarse clast fragments, feldspathic. |
| | Trace | COAL: possible cavings. |
| 3205 - 3210m | 50 | SANDSTONE: clear fine to medium grained well silica cemented, tight quartz grading to poorly sorted opaque cryptocrystalline amorphous clast fragments. Spotty fluorescence with no cut. Probable conglomerate. |
| | 50 | SILTSTONE: as above. |
| 3210 - 3215m | 70 | SANDSTONE: essentially tight poorly sorted conglomerate fragments, with ferro magnesiums, broken chert and quartzic pebbles, otherwise as above. |
| | 30 | SILTSTONE: as above. Fluorescence even medium pale yellow hydrocarbon fluorescence, no cut. |
| 3215 - 3220m | 70 | SILTSTONE: as above. |
| | 30 | SANDSTONE: as above. |
| 3220 - 3225m | 60 | SILTSTONE: light to dark grey/brown, carbonaceous and argillaceous, fine dark carbonaceous flecks scattered throughout grading in part to a very fine quartzitic poorly sorted sandstone, tight, firm, no shows. |
| | 40 | SANDSTONE: white, fine to medium quartz grains, siliceous cemented in a argillaceous silt matrix, occasionally carbonaceous and grading in part to an opaque crystalline clast fragments, tight, 5% spotty yellow fluorescence with no cut. |
| | Trace | COAL; as above. |
| 3225 - 3230m | 70 | SILTSTONE: becoming very carbonaceous and grading in part to shale, otherwise as above. |
| | 30 | SANDSTONE: as above. |
| | Trace | COAL. |
| 3230 - 3235m | 50 | SILTSTONE: medium to dark grey, as above. |
| | 30 | SANDSTONE: same as above, dolomite cement. |
| | 20 | COAL. Fluorescence 5% dull yellow and orange. No cut. |
| GRAB SAMPLE 3236.5 | 40 | SILTSTONE: as above. |
| | 40 | SANDSTONE: as above with silica and dolomite cement. |
| | 10 | CONGLOMERATE: chert, milky white. |
| | 10 | COAL: as above. Fluorescence 2% yellow, no cut. |
| 3235 - 3240m | 70 | SANDSTONE: fine grained, quartzose, rounded to subrounded, dolomite and silica cemented. |
| | 20 | CONGLOMERATE: rounded to subangular quartz pebbles, coal clasts, cemented with dolomite. |
| | 10 | SILTSTONE: light grey to dark grey. Fluorescence 10% yellow (mineral fluorescence). Cut - very slow, diffuse dull yellow. |

| | | |
|---|---|---|
| 3240 - 3245m | 90 | SANDSTONE: as above. |
| | 10 | SILTSTONE: as above. |
| | | Fluorescence - 5% dull yellow, orange. No cut. |
| 3245 - 3250m | 40 | SANDSTONE: white to buff, quartz grains, rounded to subrounded, fine grained, dolomite cement, tight. |
| | 40 | SANDSTONE: grey to dark grey, quartz grains, fine, well rounded, silic cement - tight. |
| | 20 | SILTSTONE: dark grey to black, clay matrix. |
| | | Fluorescence - 10% dull yellow. No cut. |
| 3250 - 3255m | 80 | SANDSTONE: white, grey, rounded to subrounded fine grained quartz grains in a siliceous to dolomitic cement, occasionally argillaceous, tight, no visual porosity, rare yellow fluorescence. No cut. |
| | 20 | SILTSTONE: as above. |
| GRAB SAMPLE @ 3257m | 100 | SANDSTONE: clear, medium to coarse, subangular to subrounded, unconsolidated quartz with no associated matrix, trace clear very fine to fine, subrounded, silica cemented quartz aggregates, rare yellow fluorescence, no cut. |
| GRAB SAMPLE @ 3258m | 30 | SANDSTONE: Type 1) as above for 3257m. |
| | 50 | SANDSTONE: Type 2), white-light grey, tight, fine, subangular to subrounded, quartz aggregates in a dominantly siliceous, partly dolomitic cement, argillaceous silty matrix, trace yellow fluorescence, no cut. |
| | 20 | SILTSTONE: grey/brown, micromicaceous, argillaceous and carbonaceous, firm, tight. |
| | Trace | COAL: as above. |
| 3258 - 3260 | 15 | SANDSTONE: Type 1) as above. |
| | 70 | SANDSTONE: Type 2) trace yellow fluorescence with very slow streaming cut. |
| | 15 | SILTSTONE: as above. |
| | Trace | COAL: as above. |
| 3260 - 3265m | 50 | SANDSTONE: white, light grey, brown quartz aggregates, fine grained, subrounded, dominantly silica minor dolomitic cement, with an argillaceous siltstone matrix, tight, 10% patchy dull yellow fluorescence with trace very slow diffuse white cut. |
| | 50 | SILTSTONE: light to dark grey, argillaeous and carbonaceous flecks scattered throughout grading in part to a fissile carbonaceous brown firm shale. |
| 3265 - 3270m | 60 | SANDSTONE: light grey, buff, grey brown, fine to medium grained, subrounded to occasionally coarse angled grained aggregates in a siliceous and dolomitic cement amongst an argillaceous siltstone matrix, occasional biotite, tight; occasionally irregular crptyocrystalline silica cemented quartz/chert aggregates, 10% pale yellow fluorescence with slow yellow diffuse cut. |
| | 40 | SILTSTONE: light to dark grey, argillaceous, carbonaceous, micromicaceous, grading in part to very fine quartzitic sandstone and occasionally to firm fissile shale. No shows. |

| | | |
|---|---|---|
| GRAB SAMPLE 3270 - 3273m | 50 | SANDSTONE: white, light grey, buff, very fine to fine grained, subangular to subrounded, siliceous to occasionally dolomitic cement in an argillaceous siltstone matrix, kaolinite in part, becoming medium grained and well rounded, tight, occasional biotite, less than 2% bright yellow fluorescence with very slow diffuse pale yellow cut. |
| | 20 | SANDSTONE/CONGLOMERATE: opaque, irregular, coarse cryptocrystalline silica cemented aggregates, tight, very pale yellow fluorescence with no cut. |
| | 30 | SILTSTONE: as above. |
| | | POOH to cut core No. 12 |
| 3282.5 - 3285m | 50 | SANDSTONE: as above. |
| | 30 | CONGLOMERATE: as above. |
| | 20 | SHALE: black bituminous (as above). Fluorescence - 10% dull yellow, 10% orange, very slow pale diffuse yellow cut. |
| 3285 - 3290m | 70 | SANDSTONE: as above. |
| | 10 | CONGLOMERATE/SANDSTONE: as above. |
| | 20 | SHALE: grading in part to siltstone. |
| 3290 - 3295m | 70 | SANDSTONE: opaque, clear, frosted, subangular, fine grained quartz aggregates in a silica cement, occasionally light grey to pale yellow/brown, argillaceous, partly kaolinitic, tight, trace pale yellow fluorescence, very slow diffuse cut, scattered coarse cryptocrystalline angled quartzite, tight with very pale yellow fluorescence with no cut. |
| | 30 | SILTSTONE: light brown to dark brown, firm, grading in part to subfissile blocky shale, no shows. |
| 3295 - 3300m | 70 | SANDSTONE: as above. |
| | 30 | SILTSTONE: grading to shale as above. |
| 3300 - 3305m | 50 | SANDSTONE: as above. |
| | 50 | SILTSTONE: very carbonaceous otherwise as above. |
| 3305 - 3310m | 70 | SILTSTONE: light grey to dark grey very hard, dense, siliceous cement, slightly bituminous. |
| | 20 | SANDSTONE: as above. |
| | 10 | SANDSTONE: with carbonate cement. No fluorescence, no cut. |
| 3313m Spot Sample | 30 | SANDSTONE: white, opaque quartz clasts, angular to subangular silica and dolomite cement. |
| | 20 | SILTSTONE: bituminous. |
| | 20 | CONGLOMERATE: very angular, white clear, quartz. |
| | 20 | SANDSTONE: light grey to dark grey, bituminous, argillaceous. |
| 3310 - 3315m | 60 | SILTSTONE: grey to dark grey, bituminous, siliceous, |
| | 10 | SANDSTONE: dark grey, bituminous, very fine grained. |

| | | |
|---|---|---|
| | 10 | SANDSTONE: medium grained, white opaque, dolomite cement. |
| | 10 | CONGLOMERATE: angular, white quartz. |
| | 10 | MISCELLANEOUS: dolomite, bituminous shale 20% dull yellow fluorescence with slow diffuse white cut. |
| 3317m Spot Sample | 30 | SANDSTONE: medium gained, white to grey, opaque, dolomite cement. |
| | 30 | SANDSTONE: black to dark grey, bituminous. |
| | 30 | SILTSTONE: as above. |
| | 5 | COAL |
| | 5 | SHALE: black. |
| | | Fluorescence 5% orange, 2% bright yellow - streaming white to light yellow, bluish tinge cut. |
| 3315 - 3320m | 40 | SANDSTONE: coarse to medium grained, opaque white to light grey, subangular to rounded, siliceous cement. |
| | 30 | SANDSTONE: grey to black, bituminous. |
| | 20 | SILTSTONE: as above. |
| | 10 | CONGLOMERATE: as above. |
| | | 5% dull yellow fluorescence with moderate instantaneous streaming white to light yellow cut. |
| 3322m BU | 50 | SANDSTONE/SILTSTONE: fine grained, grey to black, bituminous. |
| | 30 | SANDSTONE: white to light grey as above. |
| | 10 | COAL. |
| | 10 | CARBONATE: white with black streaks. |
| | | No fluorescence - total sample. |

# APPENDIX 2

# APPENDIX 2

## CONVENTIONAL CORE RECORD

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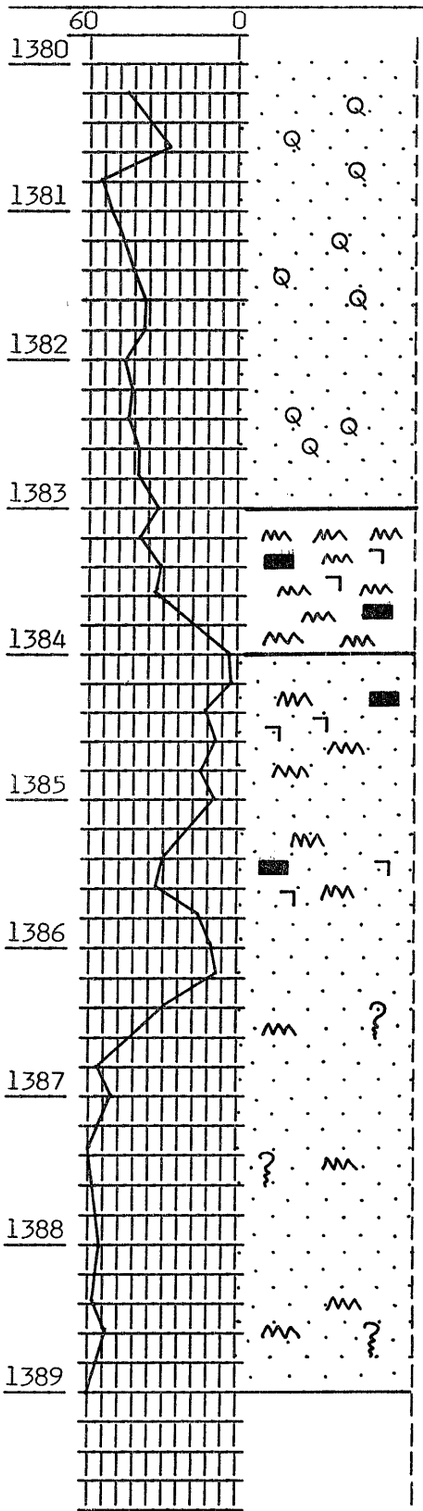
Core No. 1 Well : TUNA-4

Interval Cored : 1380-1389m
Cut : 9.0m Recovered : 8.6m (95.6%)
Bit Type : Christ RC-4 Bit Size : 8-1/2"
Described by : Shoghi/Sloan Date : 23/05/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|
| 1380 | 60 0 |  | | SANDSTONE: Yellowish brown, clear, quartz, medium to coarse grained, occasionally very coarse grained, angular to subangular, unconsolidated. This sample is heavily contaminated with drilling grease. No shows. |
| 1381 | | | | SANDSTONE: Greyish white, clear, quartz, medium grained, moderately sorted, subangular, subrounded, unconsolidated. No shows. |
| 1382 | | | | SANDSTONE: Predominantly fine, occasionally medium grained, moderately sorted, unconsolidated. No shows. |
| 1383 | | | | SILTSTONE: Brownish grey, firm, carbonaceous, micaceous subfissile. |
| 1384 | | | | SANDSTONE: Buff, firm, predominantly fine grained, occassionally medium grained, subangular to subrounded, moderately sorted, silty matrix, carbonaceous laminar, micromicaceous, moderate to poor usual porosity. No shows. |
| 1385 | | | | SANDSTONE: Light grey to medium light grey, firm, very fine grained, laminated siltstone, subangular to subrounded, moderately well sorted, silty matrix, carbonaceous micaceous. No shows. |
| 1386 | | | | SANDSTONE: Light medium grey, very friable, medium to coarse grained, subangular to subrounded, moderately sorted, minor silty matrix, good visual porosity. No shows. |
| 1387 | | | | SANDSTONE: Light medium grey, very friable, medium to coarse grained, subangular to subrounded, moderately sorted, minor silty matrix, good visual porosity. No shows. |
| 1388 | | | | SANDSTONE: Medium grey, friable, coarse grained with minor medium grains, subangular to rounded, moderately well sorted, minor silty matrix, moderate visual porosity. No shows. |
| 1389 | | | | |

Core No. 1 Cont'd  Well : TUNA-4

Interval Cored : 1380-1389mm
Cut : 9.0mm  Recovered : 8.6mm (95.6%)
Bit Type : Christ RC-4  Bit Size : 8-1/2
Described by : Shoghi/Sloan  Date : 23/05/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|
| | | | | SANDSTONE: Clear to milky white quartz grains set in minor medium light grey silty matrix, very friable, coarse to medium grained, subangular to subrounded, moderate sorting, minor silty matrix, good to moderate visual porosity. No shows. |

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Core No. 2 Well : TUNA-4

Interval Cored : 1389-1399m
Cut : 10.0m Recovered : 7.03m (70.3%)
Bit Type : Christ RC-4 Bit Size : 8-1/2"
Described by : Shoghi/Sloan Date : 23/05/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|
| 1389 | 60 0 | | | SANDSTONE: Clear white, medium grained, occasionally coarse grained quartz, subangular to subrounded, poorly consolidated, calcareous matrix. No shows. |
| 1390 | | | | SANDSTONE: Clear, greyish white, medium to coarse grained quartz, subangular to subrounded, poorly consolidated, with cacareous matrix, 5% dull, yellowish white fluorescence. No cut. |
| 1391 | | | | SANDSTONE: Clear white, fine to medium grained quartz, subangular to subrounded, friable, argillaceous, slight calcareous. No shows. |
| 1392 | | | | SANDSTONE: Clear, white, medium to coarse to very coarse grained, occasionally granule, poorly to moderately sorted, poorly cemented, kaolinitic, calcareous matrix, slightly carbonaceous. No shows. |
| 1393 | | | | SANDSTONE: Clear, greyish/white, medium to coarse grained, occasionally very coarse, poorly to moderately sorted, poorly cemented, kaolinite, slightly calcareous. No shows. |
| 1394 | | | | **GAS OIL CONTACT (1394.8)** |
| 1395 | | | | SANDSTONE: Clear grey, medium to coarse grained, occasional granules, poorly to moderately sorted, subangular to subrounded, argillaceous matrix, friable. No shows. |
| 1396 | | | | SANDSTONE: Clear, greyish/white, medium to coarse grained, subangular to subrounded, moderately sorted, slightly cemented, slightly argillaceous. 70% yellowish green fluorescence with slow, even cut. |
| 1397 | | | | SANDSTONE: Medium light grey to medium grey, friable, medium to predominantly coarse quartz grains, subangular to subrounded, moderately well sorted, minor mud/silty matrix, good visual porosity, 80% bright greenish yellow fluorescence. Moderate streaming white cut. |
| 1398 | | | | |
| 1399 | | | | |

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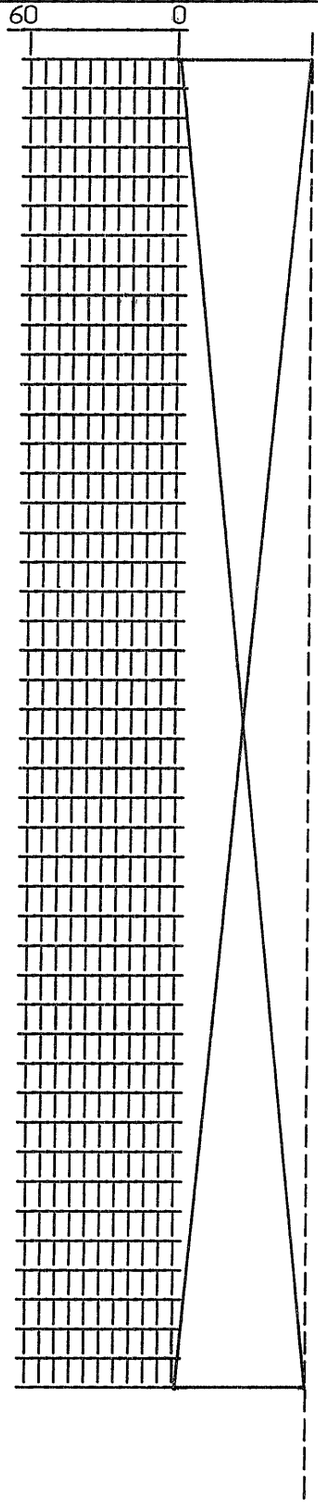
Core No. 3 Well : TUNA-4

Interval Cored : 1399-1408.2m
Cut : 9.2m Recovered : Nil
Bit Type : Christ RC-4 Bit Size : 8-1/2"
Described by : Shoghi/Sloan Date : 24/05/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|
| 1399 | 60 0 |  | | No recovery. |
| 1400 | | | | |
| 1401 | | | | |
| 1402 | | | | |
| 1403 | | | | |
| 1404 | | | | |
| 1405 | | | | |
| 1406 | | | | |
| 1407 | | | | |
| 1408.2 | | | | |

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Core No. 4 | Well : TUNA-4

Interval Cored : 1404.64-1414.0m
Cut : 9.4m | Recovered : 1.07m (11.4%)
Bit Type : Christ RC-4 | Bit Size : 8-1/2"
Described by : Shoghi/Sloan | Date : 24/05/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|
| 1404 | 90 0 | | | SILTSONE/SHALE: Medium dark grey, firm to moderately hard, slightly micaceous, slightly microcarbonaceous. |
| 1405 | | | | SANDSTONE: Medium dark, unconsolidated coarse to very coarse quartz grains, rounded to well rounded, well sorted, excellent visual porosity, 90% bright greenish yellow fluorescence. Moderately fast, bright white streaming cut. |
| 1406 | | | | REMARK: 1404.6m washed over fill for 3.6m to 1408.2m. Zero recovery for Core No. 3. Tagged true bottom at 1408.2m. Therefore the first 3.6m of Core No. 4 probably represents fill from Core No. 3. However Core No. 4 only recovered 1.07m and therefore probably is not truely representative of the rocks from the cored interval. |
| 1407 | | | | |
| 1408 | | | | |
| 1409 | | | | |
| 1410 | | | | |
| 1411 | | | | |
| 1412 | | | | |
| 1413 | | | | |
| 1414 | | | | |

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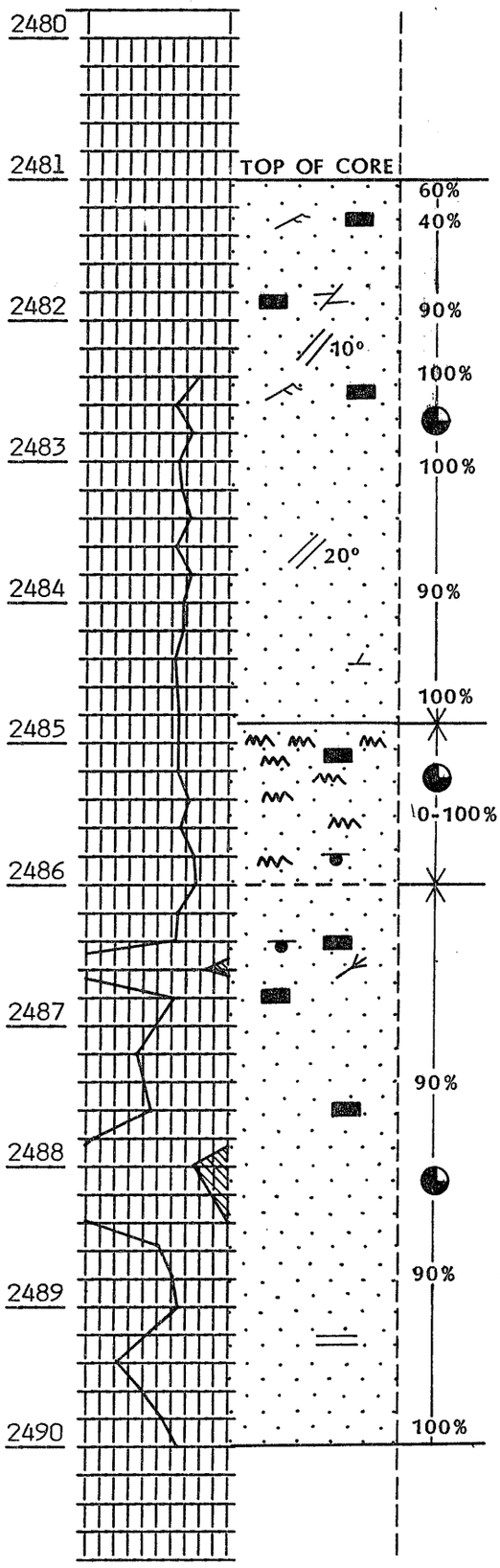
Core No. 5 | Well : TUNA-4

Interval Cored : 2481.0-2498.9m
Cut : 17.9m | Recovered : 16m (89%)
Bit Type : Christ RC-6 | Bit Size : 8-1/2"
Described by : R. Neumann | Date : 6/06/84




## Descriptive Lithology

2481.0 - 2484.86m

SANDSTONE: Fine to medium grained, subangular to subrounded, moderate to well sorted, clear quartz grains, minor carbonaceous impurities in matrix, minor white weak dolomite cement towards base. Moderate to good visual porosity and permeability. Virtually 100% light brown oil staining with associated bright yellow, even fluorescence and slow to moderately fast streaming cut. Weak, slow crush cut. Strong petroliferous odour, carbonaceous laminae common towards the top. These define small scale current ripples, faint parallel laminae (both horizontal and inclined at 10-20°) microfaults. Small (2cm x 5cm) sandy channels. Massive and faintly parallel laminae bedding most common. This sand unit has an erosional base, truncating the underlying silty sand at an angle of 10° to core axis. Fluvial-stacked channel sands, low sinuosity, high to medium energy stream channels.

2484.86 - 2486.0m

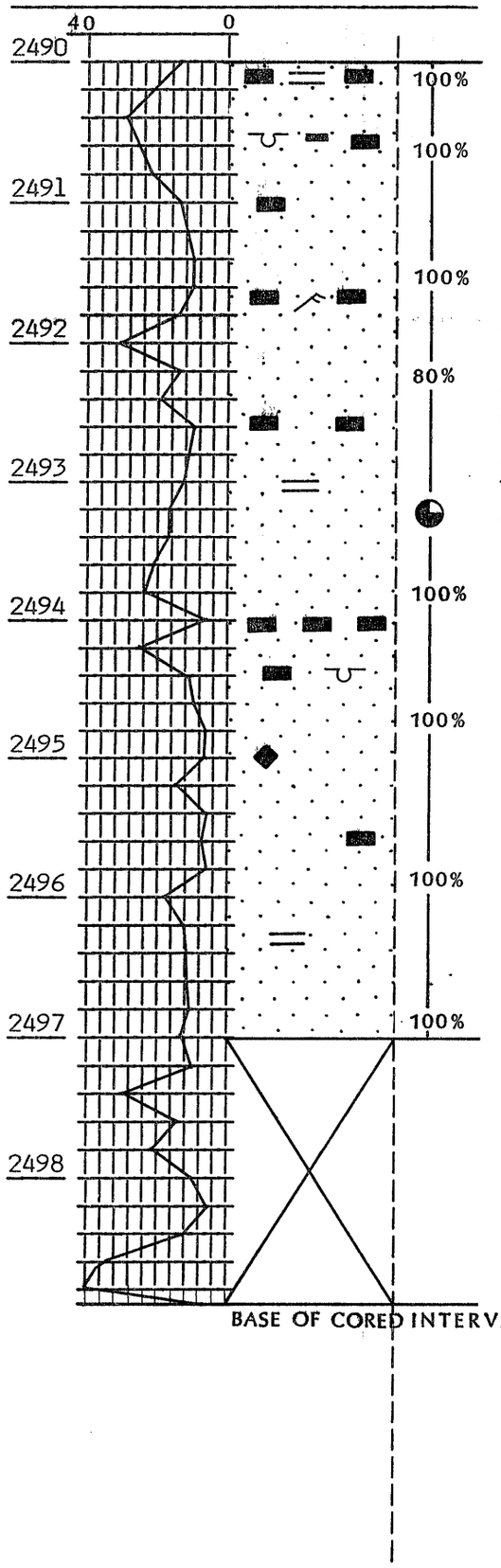
SILTY SANDSTONE: Interbedded siltstone, silty sandstone and sandstone. Siltstone is argillaceous, carbonaceous, slightly micaceous, occasionally subfissile, dark grey to medium dark grey. Fluoresence and light brown oil staining varies according to silt content. Sandstone has none to occasionally moderate visual porosity. A fining upwards sequence which is the cap to the underlying stacked channel sands. Small scale current ripples, load casts and parallel laminae defined by silty and carbonaceous laminae.

2486.0 - 2497.0m

SANDSTONE: Fine to medium grained, subangular to subrounded, moderately well to well sorted, clear quartz grains. Rare weak dolomite cemented, carbonaceous material and feldspar grains as impurities. Poor to moderate to occasionally good visual porosity and permeability. Common carbonaceous laminae as indicated below 2490m. Dominantly massive to faintly parallel laminae (horizontal and inclined at 10-15°). Carbonaceous laminae

Core No. 5 Cont'd  Well : TUNA-4

Interval Cored : 2481.0-2498.9m
Cut : 17.9m  Recovered : 16m (89%)
Bit Type : Christ RC-6  Bit Size : 8-1/2"
Described by : R. Neumann  Date : 6/06/84




Descriptive Lithology

define load casting, small scale current ripples, ball and pillow structures and abundant parallel laminae as indicated. Core is broken up around 2488.0, 2493.5 and 2496.8m. Spherical pyrite nodules around 2495m - 1 to 2cm diameter. 100% light brown oil staining, strong petroliferous odour and associated fluorescence and cut throughout interval. Fluvial-stacked sequence of channel sands capped by overlying silty sand. Proximal, quartz rich sediment source, moderately high to high energy, moderately sinuous stream channels.

2497.0 - 2498.9m

No recovery.

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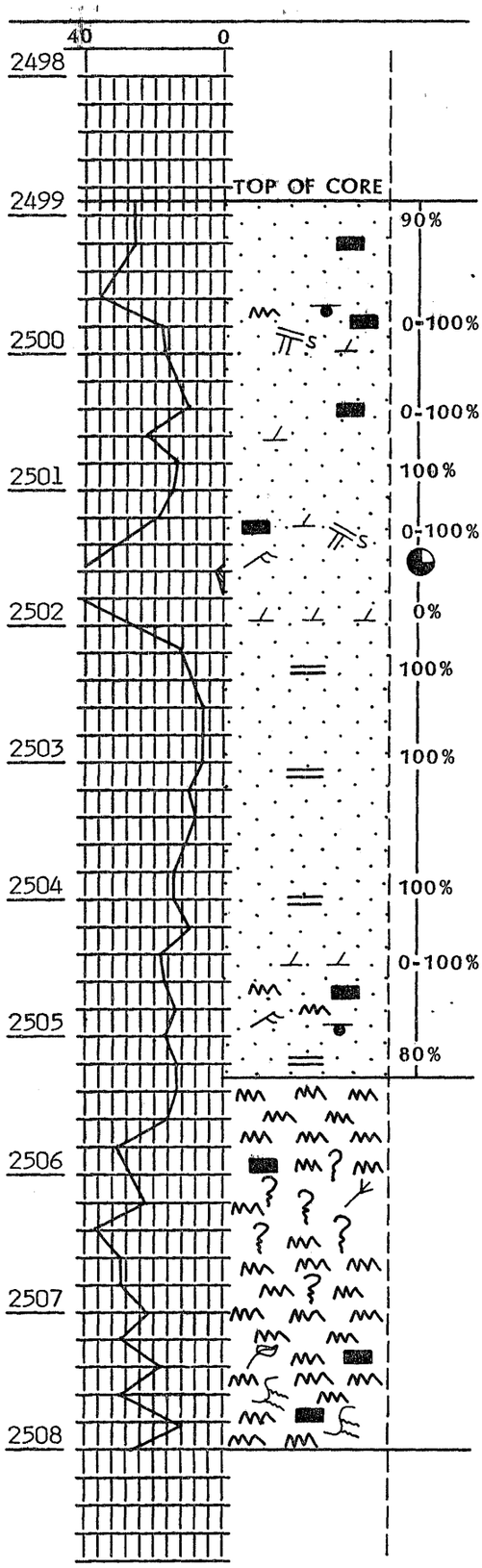
Core No. 6 Well : TUNA-4

Interval Cored : 2498.9-2517.1m
Cut : 18.2m Recovered : 12.7 (70%)
Bit Type : Christ RC-6 Bit Size : 8-1/2"
Described by : R. Neumann Date : 6/06/84




## Descriptive Lithology

2498.9m - 2505.32m

SANDSTONE: 0.5m to 2m stacked channel sandstones. Grain size varies from very coarse to fine but is consistent within sand packages. Two sand units in particular (2500.6-2501.06 and 2502.9-2503.8) are coarse to very coarse, friable with excellent visual porosities with 100% oil staining and bright even yellow fluorescence which has a slow to moderately fast stream cut and a moderate crush cut. Other sands are fine to dominantly medium grained, moderately to well sorted, subangular to subrounded, with poor to good visual porosities. Finer grained sandstones are commonly 100% dolomite cemented with no visual porosity. These show 100% even moderately bright orange mineral fluorescence and constitute 15% of the sandstone interval. (Hydrocarbon fluorescence descriptions with 0-100% are in sandstones with thin interbeds (1-5cm) of dolomite cemented fine grained sandstone in between porous and hydrocarbon fluorescing sandstones. Dolomite mineral fluorescence and hydrocarbon fluorescence are mutually exclusive). Common carbonaceous laminae define load casting, ball and pillow structures, small scale festoon cross-beds, current ripples and abundant parallel laminae (both horizontal and inclined at 10°). Unit has a sharp, current rippled, erosional base.

Note: Approximately 3m of probable unconsolidated to friable coarse grained sandstone has been lost from this sandstone interval - metre note at end of description.

2505.32 - 2511.75m

SILTSTONE/CLAYSTONE:

Argillaceous, slight to moderately carbonaceous, micromicaceous, hard, subfissile in part, common twigs, leaves, finely disseminated carbonaceous matter and rootlets. Claystone around 2506m is greyish brown with smooth "waxy" texture and has clearly developed slicken slides sub-parallel to bedding surface. Siltstone shows 100% dull orange, even mineral fluorescence from small dolomite content.

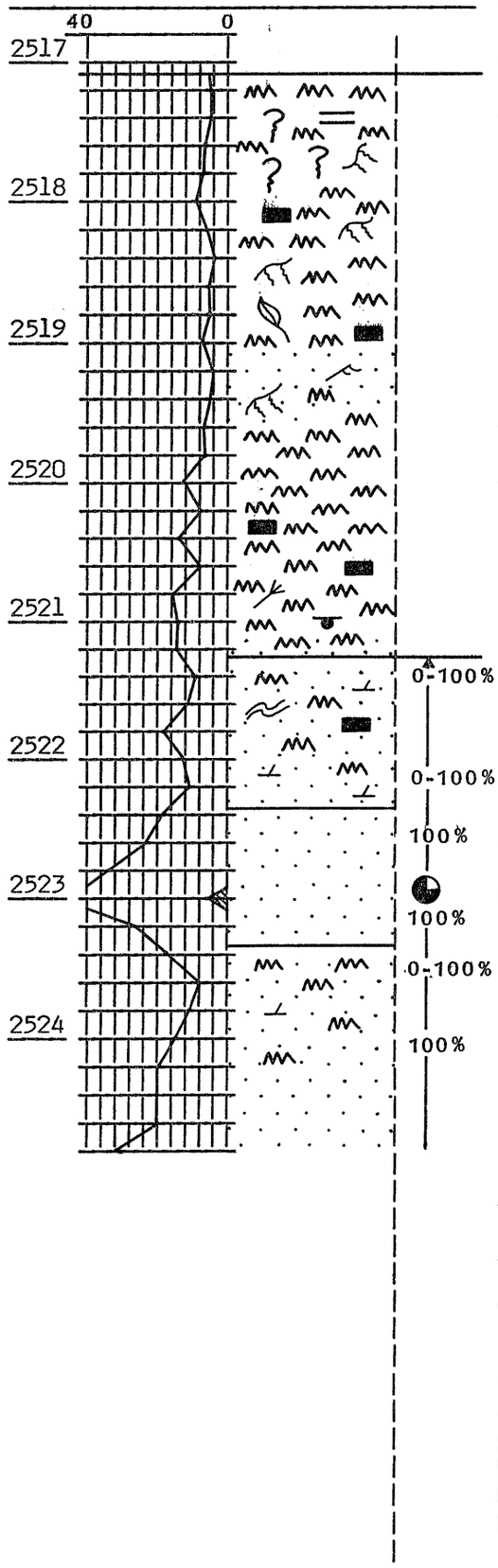
Core No. 6 Cont'd  Well : TUNA-4

Interval Cored : 2498.9-2517.1m
Cut : 18.2m  Recovered : 12.7 (70%)
Bit Type : Christ RC-6  Bit Size : 8-1/2"
Described by : R. Neumann  Date : 6/06/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|
| 2508 | 40 0 | | | Thinly interbedded fine grained sandstone laminae from 2508.0 to 2509.8. Porosity in these sands is totally occluded by dolomite content which gives 100% moderately bright even orange mineral fluorescence. Deepest 1/2 metre of core is completely broken up and partly ground down. Connection marks on core at 2510m (connection actually made at 2513m). |
| 2509 | | | | |
| 2510 | | | | |
| 2511 | | | | 2511.75 - 2517.1m<br>NO RECOVERY<br>Note: 5.55m of core lost. Position of connection marks on core suggest 3m of core has been lost above 2513m, presumably the fast drilling, friable sandstone from 2505.5 to 2508.5; 2.55m of core has been lost below 2513m which may have been ground up siltstone due to partially jammed barrel. |
| 2512 | | | | |
| 2513 | | | | ENVIRONMENT: Fluvial. Sandstone unit is a stacked sequence of high energy, low sinuosity channel sands which continue up into core number 5. Siltstone/claystone is vegetated overbank/abandoned channel facies in a fluvial environment. |
| 2514 | | | | |
| 2515 | | | | |
| 2516 | | | | |
| 2517 | | | | BASE OF CORED INTERVAL |

Core No. 7 Well : TUNA-4

Interval Cored : 2517.1-2531.0m
Cut : 13.9m Recovered : 9.76m (70%)
Bit Type : Christ RC-6 Bit Size : 8-1/2"
Described by : R. Neumann Date : 7/06/84




2517.1 - 2521.24m

SILTSTONE/CLAYSTONE: Medium dark grey to grey/brown, hard, very argillaceous to claystone around 2517.5m. Common carbonaceous material - leaves, twigs, rootlets, finely disseminated defining parallel laminae. Slightly sandy around 2519.2m. 100% even very dull orange mineral fluorescence. Dewatering structures and load casts near sandy base.

2521.24 - 2522.36m

SILTY SANDSTONE: Tight, partially dolomite cemented (60%) fine grained sandstone with common silty laminae. Slightly argillaceous in part, slightly carbonaceous and silty laminae defining low energy current ripples, parallel laminae, convolute bedding and ball and pillow structures. 0-100% even dull orange dolomite mineral fluorescence. 0-100% hydrocarbon fluorescence. (Mineral fluorescence and hydrocarbon fluorescence are mutually exclusive).

2522.36 - 2523.37m

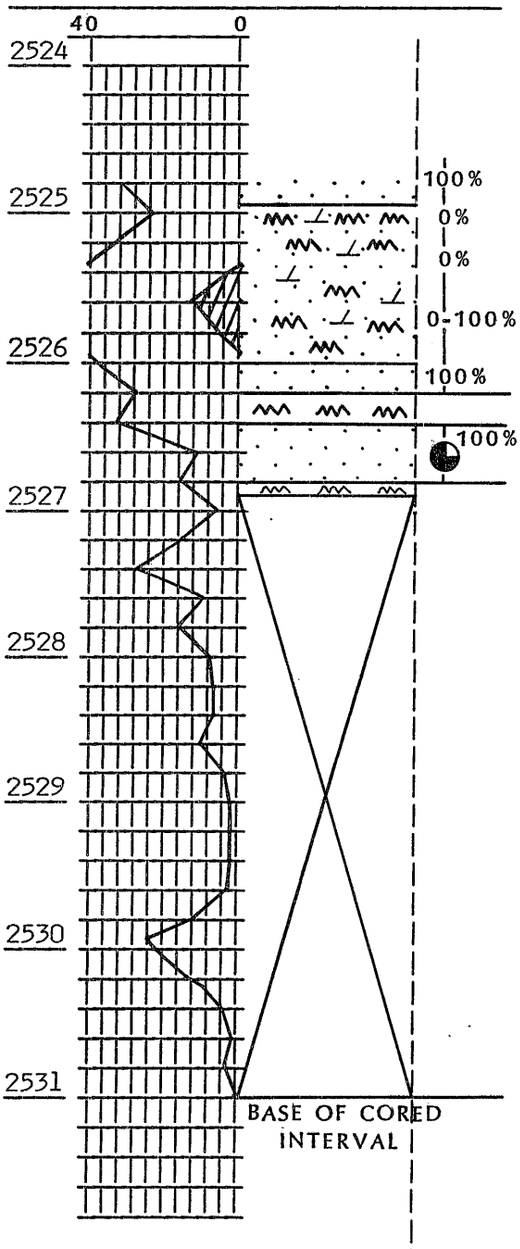
SANDSTONE: Massive to faintly parallel laminated, medium to occasionally fine grained quartz sandstone. Minor lithic and carbonaceous grains. Weak, subcrystalline to sucrosic silica cement. Moderate to good visual porosity and permeability. 100% light brown oil staining and associated fluorescence and cut. Core broken up around 2530m.

2523.37 - 2524.96m

SANDSTONE: Fining upwards to silty sandstone on top. Fine grained, moderately hard and silty on top, grading down to medium to coarse grained friable to unconsolidated (2525 to 2526.6m is probably missing). Moderate grading to good to very good visual porosity and permeability. Core is broken up and friable below 2524.0m. Minor carbonaceous laminae, erosional base.

Core No. 7 Cont'd  Well : TUNA-4

Interval Cored : 2517.1-2531.0m
Cut : 13.9m  Recovered : 9.76m (70%)
Bit Type : Christ RC-6  Bit Size : 8-1/2"
Described by : R. Neumann  Date : 7/06/84




2524.96 - 2526.0m

SILTY SANDSTONE: Fine grained to very fine grained, totally dolomite cemented with even, dull orange mineral fluorescence except for last 15cm which has thin, interbedded hydrocarbon bearing sand laminae. Silt and carbonaceous laminae define parallel laminae, low energy current ripples.

2526.0 - 2526.2m

SANDSTONE: Medium to coarse grained, weakly cemented to uncemented (sub-crystalline silica), moderate to very good visual porosity and permeability. Core is broken up, friable to unconsolidated. Appears this sand is from fast drilling 2527-2527.6m, 2526.2-2526.4m. Good shows as indicated.

SILTSTONE: Massive, micaceous, slightly carbonaceous, slightly argillaceous Lowermost part is ground up into a siltstone "paste". Suspect this is representative of slow drilling 2527.6-2529.7m - core barrel probably jammed (drop in pump press) and siltstone ground up and thus not recovered.

2526.4 - 2526.8m

SANDSTONE: Massive to faintly parallel laminated, medium to coarse grained sandstone. Moderate to good visual porosity and permeability. 100% light brown oil staining and associated fluorescence and cut as indicated. Suspect this is from fast coring 2529.7-2530.2m.

2526.8 - 2526.86m

SILTSTONE: Ground up and brecciated siltstone "paste". Suspect it's from slow coring 2530.2-2531m where the core barrel jammed (slow ROP's, pump pressure drop).

2526.86 - 2531.0m

NO RECOVERY

Core No. 7 Cont'd  Well : TUNA-4

Interval Cored : 2517.1-2531.0m
Cut : 13.9m  Recovered : 9.76m (70%)
Bit Type : Christ RC-6  Bit Size : 8-1/2"
Described by : R. Neumann  Date : 7/06/84

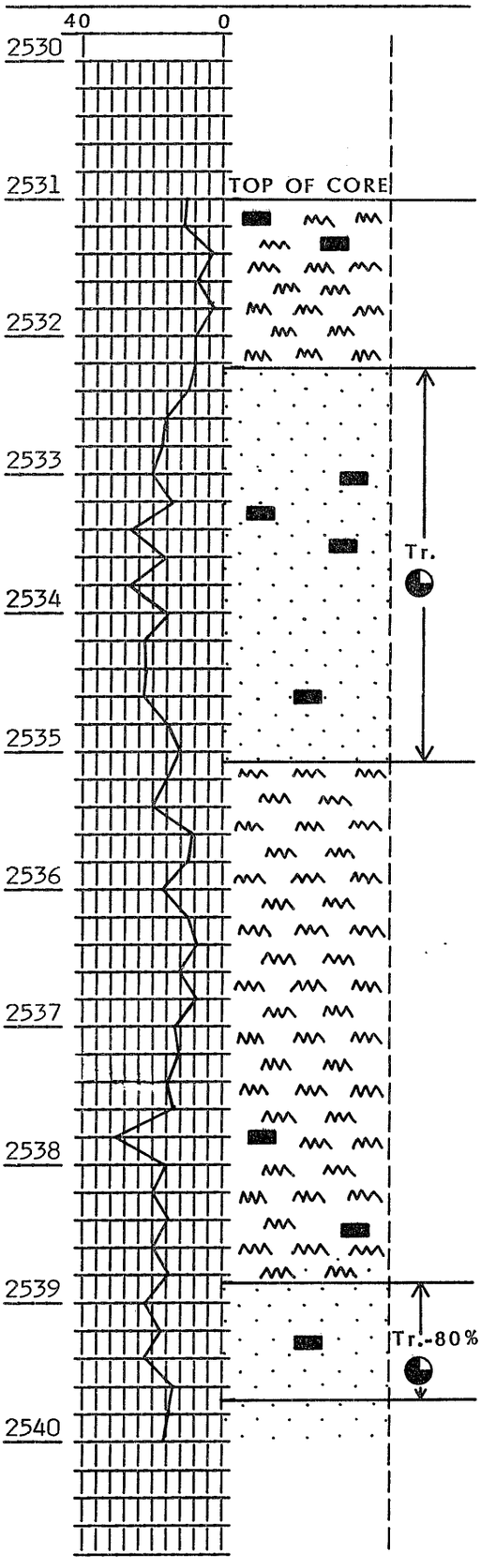
| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|
| | | | | ENVIRONMENT: Fluvial: - sandstone grading rapidly up to siltstone/claystone (2523.37 - 2517.1m) is abandoned channel facies. Fining upwards sequence (2524.96-2523.37) could be small point bar deposit. Lowermost sandstone and siltstone probably channel sands and abandoned channel/overbank flood plain facies deposits. |

Core No. 8

Well : TUNA-4

Interval Cored : 2531.0-2549.0m
Cut : 18.0m
Bit Type : Christ RC-4
Described by : Neumann/Priest

Recovered : 15.6m (86.7%)
Bit Size : 8-1/2"
Date : 7/06/84




2531.00 - 2532.21m

SILTSTONE: Medium grey, firm to moderately hard, siliceous, fine to very fine quartz grain inclusions, micaceous, carbonaceous to coaly in parts.

2532.21 - 2535.05m

SANDSTONE: Medium light grey to medium grey, moderately hard, grades from very fine to medium grained, angular to subrounded grains, moderate to well sorted, siliceous and minor dolomitic cement, carbonaceous and micromicaceous, predominantly poor visual porosity, trace white fluorescence and trace very slow white cut and crush cut, trace dull orange mineral fluorescence.

2535.05 - 2538.84m

SILTSTONE: Medium grey, firm to moderate hard, siliceous, occasionally subfissile, micromicaceous, carbonaceous to coaly in part, sandy in parts.

2538.84 - 2539.0m

SANDSTONE: Medium light grey, friable to moderately hard, very fine to fine grained, subrounded, well sorted, siliceous and trace dolomitic cement, poor to moderate visual porosity, carbonaceous inclusions, trace to 80% white fluorescence, moderately fast white cut and fast white crush cut, trace light brown oil staining.

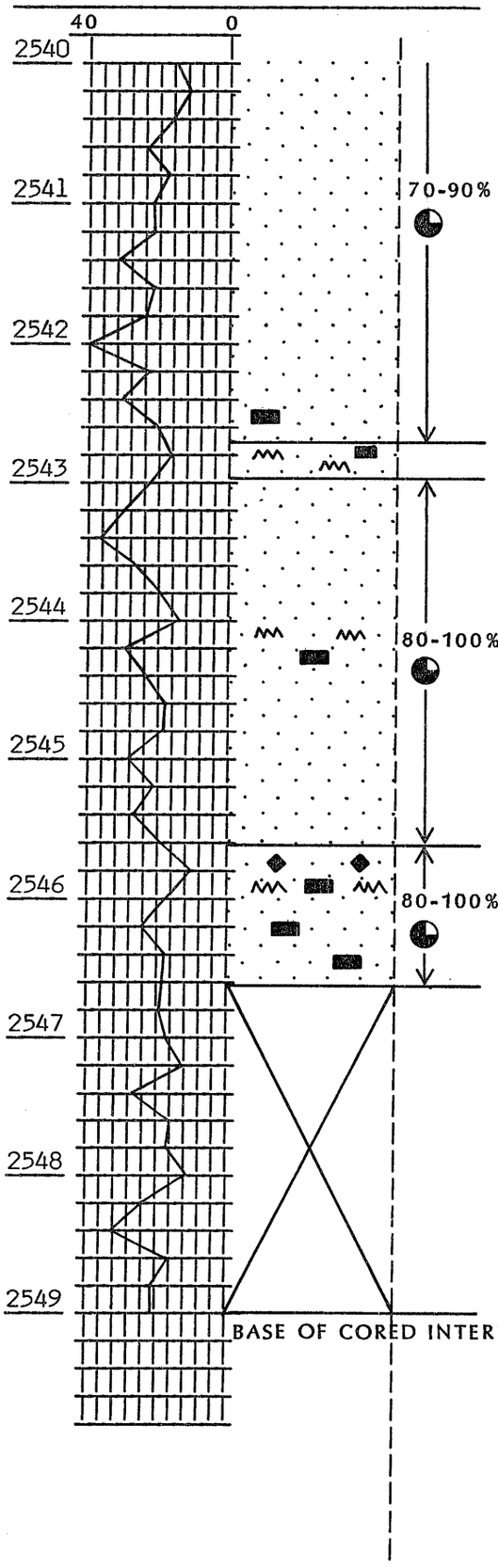
2539.70 - 2542.70m

SANDSTONE: Light to medium light grey, friable, fine to medium grained, predominantly medium grained, subangular to subrounded, well sorted, silica cement, moderate visual porosity, 70-90% white fluorescence, fast streaming white cut and crush cut, light brown oil staining.

Carbonaceous laminae towards base.

Core No. 8 Cont'd  Well : TUNA-4

Interval Cored : 2531.0-2549.0m
Cut : 18.0m  Recovered : 15.6m (86.7%)
Bit Type : Christ RC-4  Bit Size : 8-1/2"
Described by : Neumann/Priest  Date : 7/06/84




Descriptive Lithology

2542.70 - 2542.95m

SILTSTONE and dolomitic SANDSTONE laminations, dark grey, moderately hard to hard, carbonaceous.

2542.95 - 2545.6lm

SANDSTONE: Medium light grey, friable, fine to medium grained, moderately well sorted, silica cement, carbonaceous inclusions and laminations, moderate to good visual porosity, 80-100% white fluorescence, fast white cut and crush cut, light brown oil staining.

2545.6l - 2546.6lm

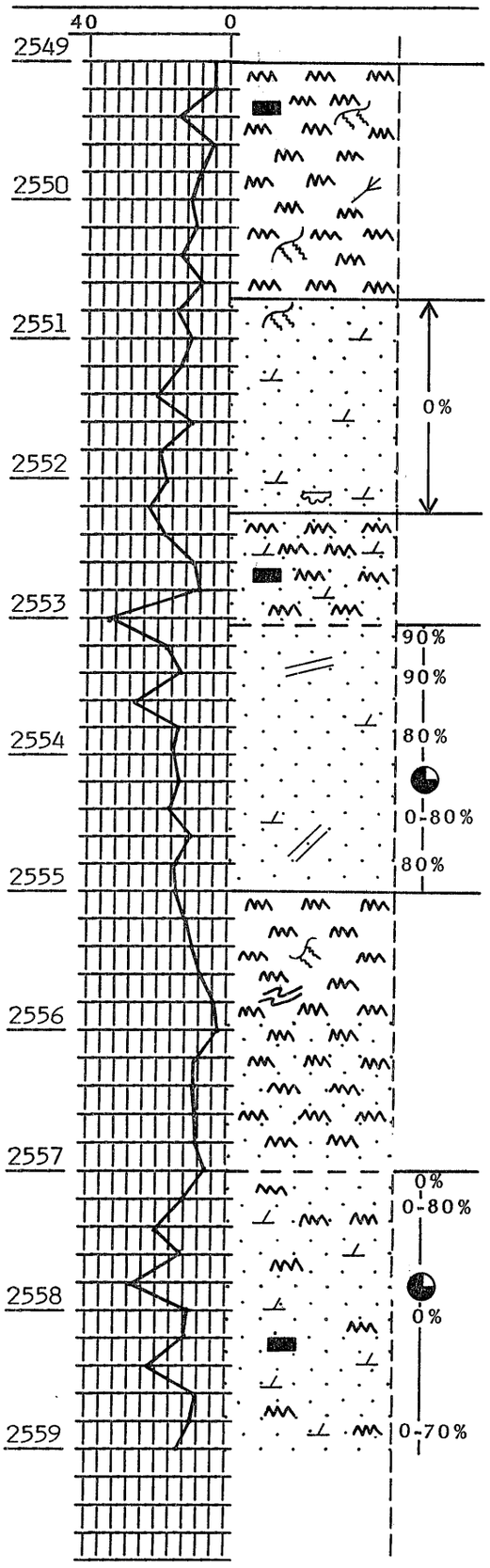
SANDSTONE: As above, with carbonaceous laminae and pyritic in parts, shows as above, occasionally dolomitic cement.

2546.6l - 2549.00m

NO RECOVERY

Core No. 9 Well : TUNA-4

Interval Cored : 2549.0-2564.0m
Cut : 15.0m Recovered :12.48m (83.2%)
Bit Type : Christ RC-4 Bit Size : 8-1/2"
Described by : Neumann/Priest Date : 7/06/84




2549.0 - 2550.71m

SILTSTONE: Carbonaceous, argillaceous micomicaceous, dark grey to medium dark grey, hard, tending to subfissile in part. Sharp base with underlying sandstone. Common carbonaceous laminae, rootlets and twigs. 100% even dull orange dolomite mineral fluorescence. Abandoned channel in fill.

2550.71 - 2552.25m

SANDSTONE: Totally dolomite cemented, fine grained quartz sandstone. Grains are well sorted, subangular to subrounded, with minor carbonaceous grains. Strong white to light brown sucrosic dolomite and silica cement. No visual porosity. No shows. Small rootlets near top, small sand filled channels and small scale current ripples at base.

2552.25 - 2553.15m

SILTY SANDSTONE: Interbedded silt and very fine to fine grained sandstone laminae. Sand grains are moderately well sorted, subangular to subrounded, totally cemented with white and buff sub-crystalline to sucrosic dolomite and silica cements. Carbonaceous laminae and silty laminae define convolute bedding (compaction distorted), dewatering structures and small scale current ripples. Grades downwards into underlying sandstone.

2553.15 - 2554.98m

SANDSTONE: Fine to medium grained, subangular to subrounded, well sorted quartz sandstone. Massive to faintly parallel laminae, minor carbonaceous laminae. Moderate to good visual porosity with light brown oil straining and associated fluorescence and cut except where dolomite cemented around 2554.5m. Weak sucrosic silica cement in part. High angle parallel laminae with silstone clast around 2554.7m.

Core No. 9 Cont'd  Well : TUNA-4

Interval Cored : 2549.0-2564.0m
Cut : 15.0m  Recovered :12.48m (83.2%)
Bit Type : Christ RC-4  Bit Size : 8-1/2"
Described by : Neumann/Priest  Date : 7/06/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|
| 2559 | 40 0 | | | 2554.98 - 2557.0m<br><br>SILTSTONE: Medium dark grey to dark grey, argillaceous, micromicaceous, hard. Abundant carbonaceous fragments, laminae and rootlets. Becomes sandy near base, grading down to underlying silty sandstone. Soft sediment folding and compaction disrupted bedding evident. |
| 2560 | | | 70%<br>0-80%<br>70%<br>0-100% | |
| 2561 | | | 100%<br>90% | 2557.0 - 2559.0m<br><br>SILTY SANDSTONE: Grades upwards to overlying siltstone and downwards to underlying sandstone. "Middle zone" of point bar sequence. Sand grains are very fine to fine grained subangular to subrounded, well sorted, well cemented with strong dolomite and silica cements. Zero to poor visual porosity and permeability. Carbonaceous to coaly in part. Silt and carbonaceous laminae define convolute bedding (compaction disrupted), load casting, ball and pillow structures, low energy, small scale ripples and small sand-filled channels. Up to 80% hydrocarbon fluorescence in the few places that are not cemented out. Otherwise 100% dull, even, orange dolomite mineral fluorescence. Note: Light brown oil seen bleeding from this tight sand at 2557.4m. |
| 2562 | | | | |
| 2563 | | | | 2559.0 - 2561.48m<br><br>SANDSTONE: Fine grained, grading down to medium grained near the base. Subangular to dominantly subrounded, submature to mature, moderately well sorted quartz sandstone. Moderately hard, grading down to friable and then unconsolidated near base. Poor, grading down to very good visual porosity and permeability. (Very good visual porosity for last 1/2m - unconsolidated) 70-100% light brown oil staining and associated fluorescence and cut except where dolomite cemented (approximately 20% of sand. Minor carbonaceous material, fainty parallel laminae. |
| 2564 | | | | |

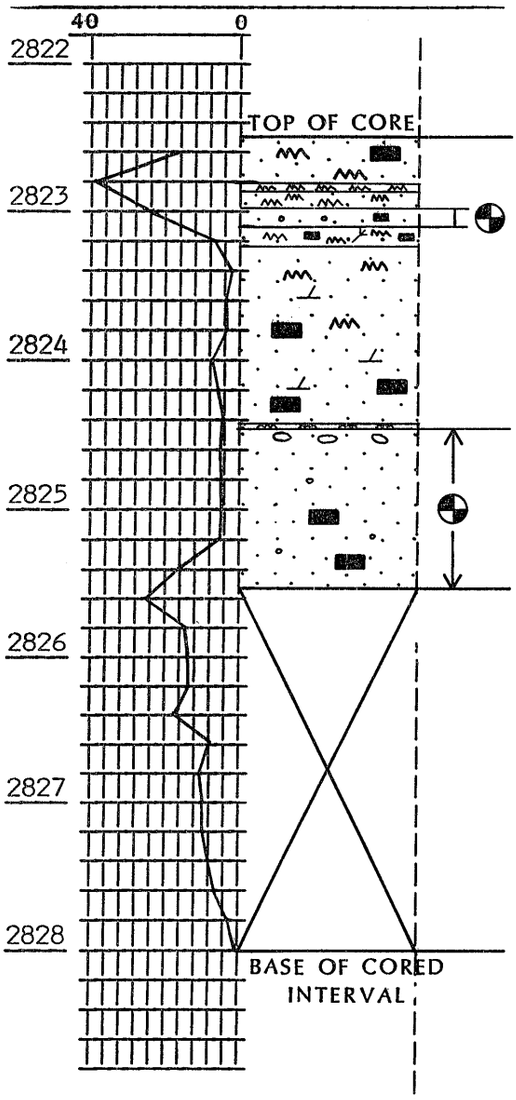
Core No. 9 Cont'd | Well : TUNA-4

Interval Cored : 2549.0-2564.0m
Cut : 15.0m | Recovered : 12.48m (83.2%)
Bit Type : Christ RC-4 | Bit Size : 8-1/2"
Described by : Neumann/Priest | Date : 7/06/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|
| | | | | 2561.48 - 2564.0m<br><br>NO RECOVERY<br><br>ENVIRONMENT: Fluvial: fining upwards sequence 2561.48-2554.98m is a classic point bar sequence. Fining upwards sequence 2554.98-2552.25m is a small channel fill. Sandstone/siltstone sequence 2552.25-2549.0m is channel sand with abandoned channel silty infill. |

Core No. 10 Well : TUNA-4

Interval Cored : 2822.5-2828.0m
Cut : 5.5m Recovered : 3.0m (54.6%)
Bit Type : MC 23 Bit Size : 8-1/2"
Described by : P. Priest Date : 15/06/84




Descriptive Lithology

2822.50 - 2822.80m

SANDSTONE: Light grey to medium light grey, moderately hard to hard, very fine to medium grade, predominantly fine to medium grade, subangular to subrounded, moderately well sorted, siliceous with trace dolomitic cement, common carbonaceous inclusions, very poor visual porosity, orange mineral fluorescence. Occasional siltstone laminations and clasts.

2822.80 - 2822.88m

SILTSTONE: Medium dark grey, moderately hard, carbonaceous coaly inclusions, micromicaceous, fine quartz grain inclusions, thin sandstone interbeds with coarse to very coarse grained, subangular to subrounded quartz grains,.

2822.88 - 2822.90m

SANDSTONE: Light grey, moderately hard, predominantly medium grained, also coarse grained, dolomitic cement, poor visual porosity, very coarse quartz grained inclusions, shale clasts, no shows, bright orange mineral fluorescence.

2822.90 - 2822.93m

SILTSTONE: Medium dark grey and medium light grey laminations, moderately hard.

2822.93 - 2922.97m

SANDSTONE: As for 2822.88-2822.90 with siltstone clasts and frequent carbonaceous clasts.

2822.97 - 2822.99

SILTSTONE: Medium grey, moderately hard, sandy in parts.

Core No. 10 (Cont'd) Well : TUNA-4

Interval Cored : 2822.5-2828.0m
Cut : 5.5m Recovered : 3.0m (54.6%)
Bit Type : MC 23 Bit Size : 8-1/2"
Described by : P. Priest Date : 15/06/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|

2822.99 - 2823.11m

SANDSTONE: Very light grey to light grey, moderately hard to hard, very fine to very coarse grained, predominantly fine to coarse grained, subangular to subrounded, poorly sorted, silica cement, common carbonaceous and silty inclusions, poor visual porosity, common small quartz pebbles and siltstone clasts, approximately 40% bright, white fluorescence and slow streaming white cut, instant strong white crush cut.

2823.11 - 2823.25m

SILTSTONE: Medium grey to medium dark grey, moderately hard, micromicaceous, fine to medium quartz grain inclusions, siliceous, carbonaceous and coaly inclusions. 2823.11-2823.17 occasional thin rootlets. 2823.17 sandstone lamination - siltstone clasts and sand volcano. 2823.17 - 2823.25 sandy.

2823.25 - 2824.43m

SANDSTONE: Light grey, moderately hard to hard, very fine to medium grained, subrounded, moderately well sorted, dolomite cement, carbonaceous inclusions, very poor visual porosity, bright orange mineral fluorescence, no shows. Fining upward sequence with occasional carbonaceous and silty laminae inclusions increasing in size and number towards the top, coaly clasts decrease towards top.

2824.43 - 2824.51m

SILTSTONE: Medium grey, moderately hard, very sandy at base, fines upward.

2824.51 - 2825.50m

SANDSTONE: Light grey, friable, medium to coarse grained, subrounded, moderately well sorted, common carbonaceous inclusions, argillaceous cement/matrix, common carbonaceous and silty inclusions, moderate to good visual porosity, 70% bright white fluorescence, moderately slow diffuse streaming white cut, occasional small quartz pebbles,

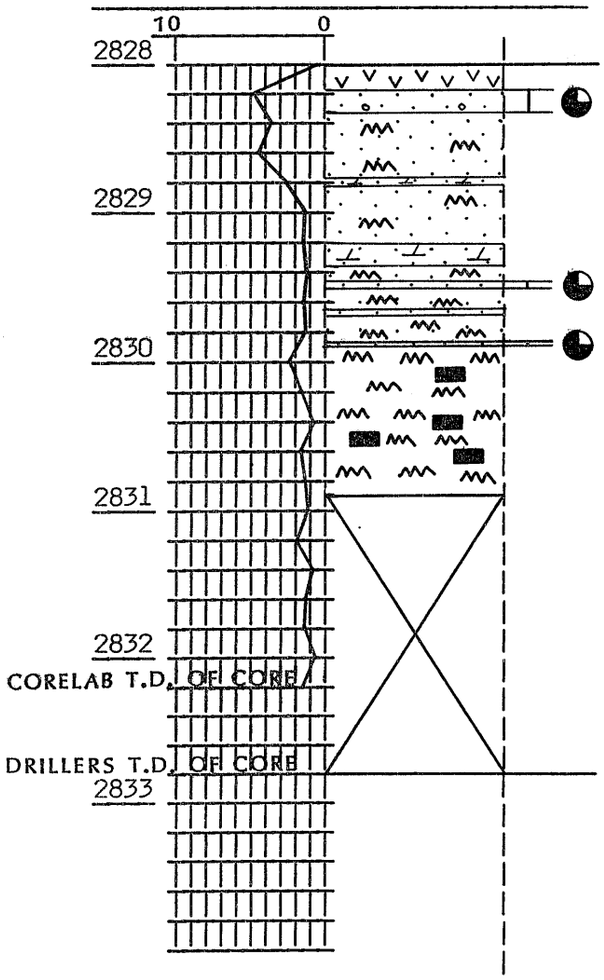
Core No. 10 (Cont'd) Well : TUNA-4

Interval Cored : 2822.5-2828.0m
Cut : 5.5m Recovered : 3.0m (54.6%)
Bit Type : MC 23 Bit Size : 8-1/2"
Described by : P. Priest Date : 15/06/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|
| | | | | siltstone/coaly clasts. Petroliferous odour. |
| | | | | 2825.5 - 2828.0m |
| | | | | NO RECOVERY |

Core No. 11 Well : TUNA-4

Interval Cored : 2828.0-2833.0m
Cut : 5.0m Recovered : 2.9m (58%)
Bit Type : MC 23 Bit Size : 8-1/2"
Described by : P. Priest Date : 15/06/84




Descriptive Lithology

2828.0 - 2828.18m

VOLCANICS: Medium dark grey to green, very hard, coarsely crystalline, high quartz %, also ferromagnesiums and feldspar.

2828.18 - 2828.36m

SANDSTONE: Buff to very light grey, friable, fines upward, grades from predominantly coarse grained with occasional granule sized grains to medium to coarse grained, subrounded to predominantly rounded grains, moderately well sorted, argillaceous matrix/cement, common silty inclusions and smoky quartz grains, moderate to good visual porosity, 80-100% bright, white fluorescence, moderate fast streaming white cut and instant strong white crush cut. Strong petroliferous odour, light brown oil staining.

2828.36 - 2829.87m

Interbedded and interlaminated SANDSTONE and SILTSTONE. Predominantly siltstone, medium dark grey, moderately hard, micromicaceous, carbonaceous inclusions, sandy in parts with frequent thin sandstone lenses and occasional sandstone beds as below.

2828.78 - 2828.82m

SANDSTONE: Very light grey, friable, moderately hard, very fine grained to fine grained, well sorted, dolomite cement, carbonaceous inclusions, poor visual porosity, bright orange-gold mineral fluorescence, no shows.

2829.21 - 2829.39m

SANDSTONE: Very fine to fine grained, predominantly fine grained, otherwise as for interval 2828.78-2828.82m.

Core No. 11 Cont'd Well : TUNA-4

Interval Cored : 2828.0-2833.0m
Cut : 5.0m Recovered : 2.9m (58%)
Bit Type : MC 23 Bit Size : 8-1/2"
Described by : P. Priest Date : 15/06/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|

2829.46 - 2829.57m

SANDSTONE: Buff to very light grey, friable, fine to medium grained, subrounded, moderately well sorted, siliceous cement, carbonaceous inclusions and laminae, poor to moderate visual porosity, 60% bright yellow fluorescence, slow, weak, white streaming cut, instant white crush cut. Petroliferous odour. Light brown oil staining.

2829.69 - 2829.73m

SANDSTONE: Light grey, friable, fine to medium grained, subangular to subrounded, moderately well sorted, dolomite cement, poor visual porosity, bright orange mineral fluorescence. No. shows.

2829.84 - 2829.86m

SANDSTONE: Medium light grey, friable to medium hard, very fine to fine grained, well sorted, siliceous cement, poor visual porosity. 80% dull yellow fluorescnce, moderately fast streaming white cut, instant strong white crush cut. Trace light brown oil staining, petroliferous odour.

Throughout the above section, i.e. 2828.36-2829.87m, all the sand lenses are dolomitic with orange to gold mineral fluorescence.

2829.87 - 2830.90m

SILTSTONE: Medium dark grey, hard, featureless other than common coaly/carbonaceous inclusions and thin coal lenses, rootlets. Coal is black and vitreous.

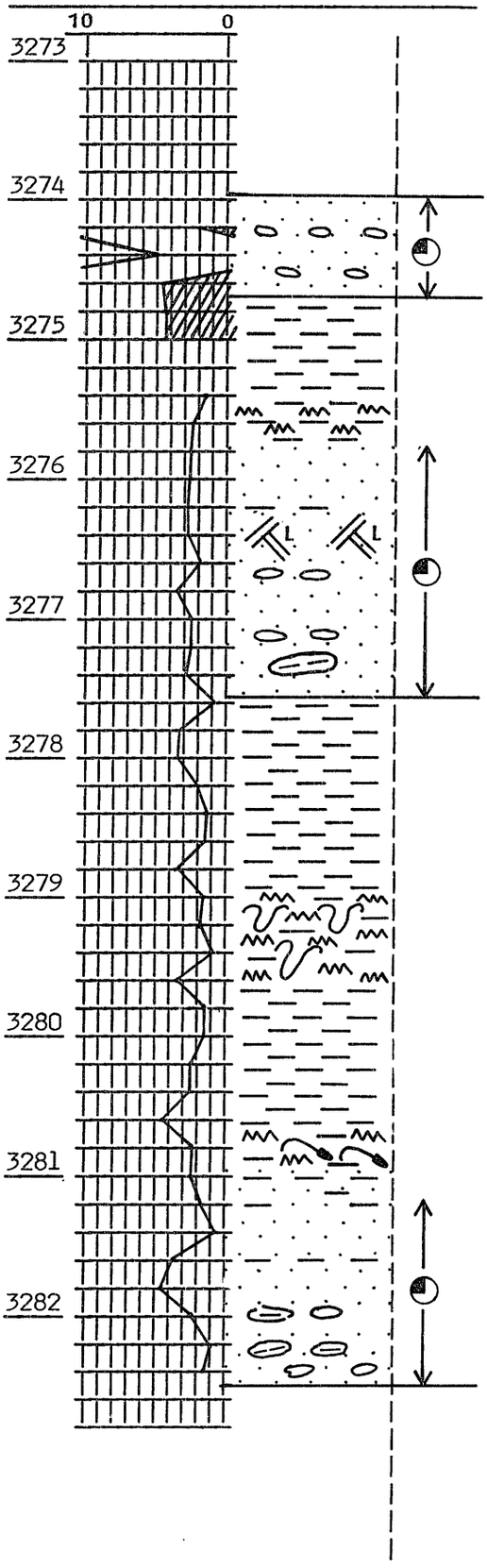
2830.90 - 2833.0:

NO RECOVERY

Note: Discrepancy between corelab and Driller's depths.

Core No. 12 Well : TUNA-4

Interval Cored : 3273.94-3282.50m
Cut : 8.56m Recovered : 8.56m (100%)
Bit Type : MC 23 Bit Size : 8-1/2"
Described by : Kulla/Roche Date : 15/06/84




3273.94 - 3274.70m

SANDSTONE: Opaque and clear subrounded coarse quartz aggregates in a dominantly siliceous cement, with a clay siltstone matrix, 5% coarse angular shale clasts randomly distributed, less 10% porosity, less than 2% pale yellow fluorescence with very slow (more than 10 minutes) diffuse, pale, yellow faint cut.

3274.70 - 3274.86m

SHALE: Black, bituminous, argillaceous, siliceous, blocky, no fluorescence, very slow pale yellow cut (more than 10 minutes).

3274.86 - 3274.89m

SANDSTONE LENS: As above.

3274.89 - 3275.52m

SHALE: As above grading to grey black, high siliceous with less bituminous content than above, no show.

3275.52 - 3275.73m

SILTSTONE: with argillaceous cross beds.

3275.73 - 3277.52m

SANDSTONE: (Fining upwards sequence) 3275.83: fine grained, clear, opaque, white to dark grey, predominantly quartz clasts, subangular, silica cemented, possible sucrosic quartz overgrowths, tight. 3276.60: Pebble content increases to 10%, otherwise as above.

3277.20m

Conglomeratic sandstone, quartz pebbles in a finely grounded sandstone matrix, angular to rounded.

3277.46m

Conglomeratic sandstone - very angular to subangular quartz and chert pebbles, some grains intergrown (pressure solution), highly cemented with silica. Shows: Little to no show at top of sand increasing to 30% dull yellow fluorescence with very slow light yellow

Core No. 12 Cont'd Well : TUNA-4

Interval Cored : 3273.94-3282.50m
Cut : 8.56m Recovered : 8.56m (100%)
Bit Type : MC 23 Bit Size : 8-1/2"
Described by : Kulla/Roche Date : 15/06/84

| Int. (m) | Depth & ROP (m/hr) | Graphic | Shows | Descriptive Lithology |
|---|---|---|---|---|

cut at top of conglomerate to 2% dull faint yellow fluorescence at bottom of conglomerate.

3277.52 - 3280.77m

SHALE/SILTSTONE: Bituminuous, siliceous, argillaceous, bioturbated in part, interbedded with light grey siltstone with contorted bedding at base. No show.

3280.77 - 3282.50m

SANDSTONE: (Fining upward sequence). 3281.45: very fine grained, white to light grey, clear angular quartz grains, some interbedded bituminous shale, silica cement. 3181.74: very fine to fine grained, otherwise as above.

3282.22 - 3282.5m

SANDSTONE/CONGLOMERATE: white to dark grey, opaque, very coarse to pebble size, subrounded quartz clasts in a sandstone matrix as above, common angular cryptocrystalline quartzite. Shows: Very pale yellow fluourescence with very slow diffuse cut (more than 10 minutes) tight.

# APPENDIX 3

# APPENDIX 3

## SIDEWALL CORE DESCRIPTIONS

# TUNA-4

## SIDEWALL CORE DESCRIPTIONS

| No. | Depth | Rec. (mm) | Rock Type | Description |
|---|---|---|---|---|
| 1 | 2426.0 | 15 | SANDSTONE | Medium dark grey, very fine to fine grained, moderately sorted, subangular to subrounded, firm, very argillaceous, micaceous, very poor to no visible porosity - too fine grained and argillaceous. |
| 2 | 2412.0 | 25 | COAL | Dark grey, firm, very silty, slightly sandy, vary argillaceous, silty coal/very carbonaceous siltstone. |
| 3 | 2384.5 | | | NO RECOVERY (EMPTY) |
| 4 | 2376.1 | 12 | SILTSTONE | Medium light grey, firm, slightly carbonaceous, slightly micaceous, clean siltstone. |
| 5 | 2369.5 | 27 | SANDSTONE | Light grey, fine to medium grained, moderately sorted, subangular to subrounded, friable, white carbonate cement, very slightly calcareous, 80% even, bright yellow/green fluorescence, moderately fast, bright cream fluorescent cut, 1/4 ring bright yellow cut residue, 80% light brown oil stain, poor to moderate visible porosity due to weak carbonate cement. Moderate crush cut. Probably residual hydrocarbons. |
| 6 | 2336.1 | 23 | SILTSTONE | Dark grey, firm, very argillaceous, slightly micaceous, slightly carbonaceous, clay rich. |
| 7 | 2299.5 | 27 | SILTSTONE | Dark grey, firm, very argillaceous, micaceous, carbonaceous laminae, slightly sandy, carbonaceous laminae up to 1 mm across. |
| 8 | 2264.3 | 12 | SILTSTONE | Dark grey, firm, sandy, carbonaceous, argillaceous, micaceous. |
| 9 | 2229.0 | 10 | SILTSTONE | Moderate to dark grey, firm, slightly argillaceous, micaceous, slightly carbonaceous. |
| 10 | 2193.0 | 21 | SILTSTONE | Medium light grey, firm, slightly micaceous, clean siltstone. |
| 11 | 2162.2 | 22 | SILTSTONE | Medium light grey, firm, pyritic, pyritised carbonaceous laminae. |
| 12 | 2125.8 | 44 | SILTSTONE | Light grey, firm, argillaceous, slightly carbonaceous, slightly micaceous, very clean siltstone. |
| 13 | 2089.4 | 27 | SILTSTONE | Medium grey, firm, slightly sandy, pyritic, micaceous, slightly carbonaceous, carbonaceous laminae replaced by pyrite. |

| | | | | |
|---|---|---|---|---|
| 14 | 2067.2 | 24 | SILTSTONE | Medium grey, firm, pyritic, sandy, argillaceous, micaceous disseminated pyrite throughout. |
| 15 | 2025.8 | 40 | SILTSTONE | Medium dark grey, firm, argillaceous, micaceous, slightly carbonaceous, slightly sandy. |
| 16 | 2019.7 | 18 | SILTSTONE | Medium grey, firm, micaceous, slightly argillaceous. |
| 17 | 2014.7 | 31 | SANDSTONE | Light grey, fine to medium grained, moderately sorted, subangular to subrounded, friable, carbonaceous cement (weak), slightly calcareous, moderate visible porosity. |
| 18 | 2011.1 | 22 | SANDSTONE | Medium light grey, very fine grained, moderately sorted, subangular to subrounded, friable, carbonaceous, slightly argillaceous, silty. |
| 19 | 1985.1 | 29 | SILTSTONE | Medium grey, firm, sandy laminae, carbonaceous, argillaceous, micacous, slightly calcareous. |
| 20 | 1952.4 | | | NO RECOVERY (SHOT OFF) |
| 21 | 1917.9 | | SILTSTONE | Light grey, firm, slightly micaceous, very slightly calcareous, clean siltstone. |
| 22 | 1887.5 | 35 | SANDSTONE | Light grey, coarse to very fine grained, poorly sorted, subangular to subrounded, friable to unconsolidated. slightly carbonaceous, carbonaceous laminae, slightly silty in part, 60% patchy dull yellow/green fluorescence, very slow dull cream fluorescent cut, 1/8 ring dull yellow cut residue, 10% light brown oil stain. Good visible porosity. |
| 23 | 1880.1 | 30 | COAL | Black, brittle, vitreous. |
| 24 | 1847.0 | 38 | COAL | Black, brittle, vitreous. |
| 25 | 1816.0 | 28 | SILTSTONE | Dark grey, firm, argillaceous, micaceous. |
| 26 | 1789.0 | 35 | SILTSTONE | Dark grey, firm, very argillaceous, micaceous, slightly carbonaceous, slightly sandy, faint parallel laminae. |
| 27 | 1777.2 | 31 | SILTSTONE | Dark grey, firm, very argillaceous, micaceous, carbonaceous. |
| 28 | 1737.0 | 34 | SILTSTONE | Dark grey, firm, very argillaceous, micaceous, slightly carbonaceous, slightly sandy, sandy laminae. |
| 29 | 1709.7 | 31 | SILTSTONE | Medium dark grey, firm, very argillaceous, carbonaceous, micaceous, slightly sandy. |
| 30 | 1703.0 | 25 | SILTSTONE | Medium grey, firm, slightly pyritic, argillaceous, micaceous, slightly carbonaceous. |

| | | | | |
|---|---|---|---|---|
| 31 | 1666.7 | | | NO RECOVERY (EMPTY) |
| 32 | 1646.1 | 10 | SILTSTONE | Dark grey, firm, argillaceous, sandy. Micaceous. |
| 33 | 1626.1 | 26 | SILTSTONE | Dark grey, firm, carbonaceous, micaceous pyritic. |
| 34 | 1595.8 | 17 | SILTSTONE | Light grey, firm, moderately calcareous. |
| 35 | 1581.8 | 36 | COAL | Black, brittle, conchodial fracturing. |
| 36 | 1574.3 | 35 | SILTSTONE | Dark grey to light grey, firm, micaceous, argillaceous, pyritic, carbonaceous, slightly calcareous, dark and light grey lamination. |
| 37 | 1563.5 | 20 | SILTSTONE | Light grey, firm, micaceous, argillaceous, carbonaceous. |
| 38 | 1562.7 | 35 | COAL | Black, brittle, subfissile. |
| 39 | 1561.8 | 26 | SILTSTONE | Light grey, firm, argillaceous. |
| 40 | 1560.5 | 30 | SILTSTONE | Light grey, firm, micaceous, argillaceous. |
| 41 | 1559.5 | 35 | COAL | Black, brittle. |
| 42 | 1555.1 | 23 | SANDSTONE | Light grey, medium to very coarse grained, moderately sorted, subrounded, friable, quartz, lithics, slightly calcareous. |
| 43 | 1550.0 | 28 | SANDSTONE | Light grey, medium to very coarse grained, moderately sorted, subrounded, friable, quartz, slightly calcareous. |
| 44 | 1531.0 | 25 | SILTSTONE | Grey, firm, quartz, argillaceous, micaceous, carbonaceous, slightly calcareous. |
| 45 | 1522.1 | 29 | SILTSTONE | Dark grey, firm, argillaceous, carbonaceous, micaceous. |
| 46 | 1516.6 | 30 | SANDSTONE | Dark grey/grey, firm, medium grained, moderately sorted, subangular, firm, argillaceous, carbonaceous, micaceous, slightly calcareous. |
| 47 | 1453.8 | 22 | SANDSTONE | Grey, fine to coarse grained, poor to moderately sorted, subrounded, friable, quartz. |
| 48 | 1412.6 | 30 | SANDSTONE | Grey, fine to medium grained, well sorted, subangular, friable, quartz, slightly calcareous, 60% even, dull white green fluorescence, even white fluorescent cut, even white cut residue. |
| 49 | 1411.8 | 34 | SANDSTONE | Grey, fine to coarse grained, moderately sorted, subangular, friable, quartz, slightly calcareous, 10% pinpoint, very dull white fluorescence. |

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|---|---|---|---|---|
| 50 | 1411.5 | 26 | SANDSTONE | Grey, fine to medium grained, moderately sorted, subrounded, friable, quartz, slightly calcareous. |
| 51 | 1411.1 | 27 | SANDSTONE | Grey, fine to coarse grained, moderately sorted, subrounded, friable, quartz, slightly calcareous, 40% bright yellow white pinpoint fluorescence, bright white even cut. |
| 52 | 1410.5 | 27 | SANDSTONE | Grey, fine to coarse grained, moderately sorted, subrounded, friable, quartz, slightly calcareous, 80% even medium bright yellow fluorescence, slow even dull yellow fluorescent cut; even dull yellow residue. |
| 53 | 1408.9 | 40 | SANDSTONE | Grey, very fine to fine grained, well sorted, rounded, friable, quartz, slightly calcareous, 90% even medium bright yellow fluorescence; even yellow fluorescent cut; even yellow cut residue. |
| 54 | 1401.0 | 30 | SANDSTONE | Grey, medium to coarse grained, moderately to poorly sorted, rounded to angular, friable, quartz, slightly calcareous, 80% even medium bright yellow fluorescence; even yellow fluorescent cut; even yellow cut residue. |
| 55 | 1400.4 | 35 | SANDSTONE | Grey, fine to coarse grained, moderately sorted, subrounded, friable, quartz, moderately calcareous, 70% even bright yellow fluorescence; slow even dull yellow fluorescent cut; even yellow cut residue. |
| 56 | 1400.0 | 26 | SANDSTONE | Grey, medium to coarse grained, moderately to well sorted, subrounded, friable, quartz, moderately calcareous, 30% pinpoint, faint yellow fluorescence; slow faint yellow fluorescent cut; faint yellow cut residue. |
| 57 | 1399.5 | 30 | SANDSTONE | Grey, fine to coarse grained, moderately to poorly sorted, subangular to subrounded, friable, quartz, moderately calcareous, 30% pinpoint, faint dull yellow fluorescence. |
| 58 | 1387.0 | 35 | SILTSTONE | Dark grey, firm, argillaceous, carbonaceous, 20% patchy bright yellow fluorescence; slow streaming yellow fluorescent cut. |
| 59 | 1376.0 | 40 | SANDSTONE | Dark grey to brown, medium to very coarse grained, poorly sorted, subrounded, firm, very argillaceous, glauconitic, pyritic. |
| 60 | 1375.5 | 43 | SILTSTONE | Brown, firm, argillaceous, quartz, glauconitic, pyritic. |

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|---|---|---|---|---|
| 61 | 1374.9 | 32 | SILTSTONE | Dark grey, firm, argillaceous, quartz, glauconitic, pyritic, slightly calcareous, 20% pinpoint, bright yellow fluorescence; slow faint yellow fluorescent cut; slow bright yellow cut residue. |
| 62 | 1374.0 | 45 | SILTSTONE | Dark grey to brown, firm, argillaceous, pyritic, glauconitic, sandy, moderately calcareous. |
| 63 | 1372.8 | 45 | SILTSTONE | Brown, firm, argillaceous, quartz, glauconitic, pyritic. |
| 64 | 1371.3 | 43 | SILTSTONE | Brown, firm, argillaceous, quartz, glauconitic, moderately calcareous. |
| 65 | 1370.0 | 37 | SILTSTONE | Dark grey, firm, argillaceous, micaceous, pyrite, moderately calcareous, pyrite along bedding planes. |
| 66 | 1369.5 | 38 | SILTSTONE | Dark grey, firm, argillaceous, sandy, glauconitic, micaceous, very calcareous. |
| 67 | 1369.0 | 55 | SILTSTONE | Dark grey, firm, very argillaceous, micaceous, pyrite, very calcareous, subfissile. |
| 68 | 1368.0 | 54 | SILTSTONE | Dark grey, firm, very argillaceous, micaceous, very calcareous, subfissile. |
| 69 | 1367.1 | 45 | SILTSTONE | Medium grey, firm, very argillaceous, sandy, micaceous, very calcareous, subfissile, predominantly siltstone with minor very fine sandstone laminae. |
| 70 | 1365.1 | 50 | SILTSTONE | Dark grey, moderately hard, very argillaceous, micaceous, very calcareous. |
| 71 | 1362.6 | 52 | SILTSTONE | Dark grey, firm, very argillaceous, micaceous, very calcareous. |
| 72 | 1360.1 | 35 | SILTSTONE | Medium grey, firm, argillaceous, sandy, micaceous, very calcareous, sandy siltstone, subfissile. |
| 73 | 3309.5 | | SANDSTONE | White to grey, fine grained, moderately sorted, subrounded, hard, quatz, sandy, 1% bright white fluorescence. |
| 74 | 3302.5 | | SHALE | Black, hard, carbonaceous, high Cl. |
| 75 | 3294.0 | | SANDSTONE | White to grey, fine grained, moderately sorted, subrounded, firm, quartz, sandy, high Cl. |
| 76 | 3286.5 | | SANDSTONE | White to grey, fine grained, moderately sorted, subrounded, firm, quartz, sandy. |
| 77 | 3281.0 | | SHALE | Black, hard, carbonaceous, high Cl. |
| 78 | 3277.0 | | SANDSTONE | White to grey, fine grained, moderately sorted, subrounded, firm, quartz, sandy, high Cl and C6. |

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|---|---|---|---|
| 79 | 3266.0 | | NO RECOVERY |
| 80 | 3261.0 | SANDSTONE | White to grey, very fine to fine grained, moderately sorted, subrounded, firm, quartz, sandy. |
| 81 | 3256.0 | SILTSTONE | White to grey, siltstone, well sorted, firm, quartz, sandy, argillaceous. |
| 82 | 3248.0 | | NO RECOVERY |
| 83 | 3239.0 | SANDSTONE | White to grey, fine grained, moderately sorted, subrounded, friable, quartz, sandy, dolomitic, high C6, 80% even bright white-blue fluorescence, dull white-blue fluorescent cut. |
| 84 | 3234.5 | SANDSTONE | White to grey, fine grained, moderately sorted, subrounded, firm, quartz, sandy. |
| 85 | 3225.0 | | NO RECOVERY |
| 86 | 3218.5 | SHALE | Black, hard, carbonaceous. |
| 87 | 3212.5 | SANDSTONE/ SHALE | Grey to black, firm to hard, quartz, sandy. Carbonaceous, high Cl. |
| 88 | 3207.0 | | NO RECOVERY |
| 89 | 3201.0 | SANDSTONE | Grey to black, moderately sorted, subrounded, firm to hard, quartz, sandy, carbonaceous, high Cl. |
| 90 | 3195.5 | SANDSTONE | Grey to black, fine grained, moderately sorted, subrounded, firm, quartz, sandy, carbonaceous. |
| 91 | 3190.0 | SANDSTONE | Grey to black, moderately sorted, subrounded, quartz, sandy, carbonaceous. |
| 92 | 3184.0 | SANDSTONE | Grey to white, medium grained, moderately sorted, subrounded, friable, quartz, sandy, carbonaceous. |
| 93 | 3179.5 | SHALE | Black, hard, carbonaceous, high Cl. |
| 94 | 3176.5 | | NO RECOVERY |
| 95 | 3169.0 | SILTSTONE | Dark grey, well sorted, firm, quartz, carbonaceous, argillaceous, sandy. |
| 96 | 3157.5 | SANDSTONE | White to grey, medium to coarse grained, moderately sorted, friable, quartz, sandy, 50% even, faint, blue-white fluorescence, dull blue-white fluorescent cut, high C6. |
| 97 | 3150.0 | | NO RECOVERY |
| 98 | 3146.5 | SANDSTONE | White to grey, medium to coarse grained, moderately sorted, friable, quartz, argillaceous. |

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|---|---|---|---|
| 99 | 3139.0 | SHALE | Dark grey, hard, carbonaceous. |
| 100 | 3131.5 | | NO RECOVERY |
| 101 | 3125.0 | SILTSTONE | Dark grey, hard, carbonaceous, argillaceous, high Cl. |
| 102 | 3119.5 | SANDSTONE | Dark grey to white, medium to coarse grained, moderately sorted, subangular, friable, carbonaceous, argillaceous, 80% even bright white-blue fluorescence, bright blue-white cut, high C6. |
| 103 | 3105.5 | | NO RECOVERY |
| 104 | 3100.0 | | NO RECOVERY |
| 105 | 3096.5 | | NO RECOVERY |
| 106 | 3089.0 | | NO RECOVERY |
| 107 | 3070.0 | SHALE | Dark grey, carbonaceous, argillaceous. |
| 108 | 3060.0 | SANDSTONE | Grey to white, fine to coarse grained, moderately sorted, subrounded, friable, carbonaceous, argillaceous. |
| 109 | 3056.0 | | NO RECOVERY |
| 110 | 3043.0 | SHALE | Dark grey, carbonaceous, high Cl. |
| 111 | 3034.3 | SHALE | Black, fine to medium grained, moderately sorted, subrounded, friable, carbonaceous, coal in part. |
| 112 | 3031.5 | SANDSTONE | Dark grey, medium to coarse grained, moderately sorted, subrounded, friable, carbonaceous, argillaceous, 30% even faint blue-white fluorescence, high C6. |
| 113 | 3026.0 | | NO RECOVERY |
| 114 | 3024.0 | SHALE | Dark grey, firm, carbonaceous, high Cl. |
| 115 | 3019.0 | | NO RECOVERY |
| 116 | 3010.5 | | NO RECOVERY |
| 117 | 3002.0 | | NO RECOVERY |
| 118 | 2995.5 | SANDSTONE | White, fine to medium grained, moderately sorted, subrounded, friable, quartz, sandy. |
| 119 | 2992.0 | | NO RECOVERY |
| 120 | 2976.0 | SHALE | Black, carbonaceous, high Cl. |
| 121 | 2970.0 | SANDSTONE | Grey, fine grained, moderately sorted, subrounded, friable, carbonaceous, argillaceous. |
| 122 | 2965.0 | | NO RECOVERY |

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|---|---|---|---|
| 123 | 2959.0 | SANDSTONE | Grey, fine grained, moderately sorted, subrounded, friable, argillaceous. |
| 124 | 2948.5 | | NO RECOVERY |
| 125 | 2946.0 | SHALE | Dark grey, firm, carbonaceous, argillaceous, high Cl. |
| 126 | 2943.5 | SANDSTONE | Light grey, fine grained, well sorted, subrounded, friable, argillaceous, micaceous, 80% even bright blue-white fluorescence, faint blue-white cut, high C6. |
| 127 | 2940.0 | SANDSTONE | Light grey, fine to medium grained, moderately sorted, subrounded, friable, argillaceous, micaceous, 80% even bright blue-white fluorescence, faint blue-white cut. |
| 128 | 2935.5 | SANDSTONE | Light grey, fine grained, poorly sorted, subrounded, friable, argillaceous, micaceous, 50% even bright blue-white fluorescence. |
| 129 | 2926.0 | SHALE | Dark grey, hard, carbonaceous, high Cl. |
| 130 | 2924.0 | SANDSTONE | Light grey, fine grained, moderately sorted, subrounded, friable, argillaceous, micaceous. |
| 131 | 2909.5 | SHALE | Dark grey, hard, carbonaceous. |
| 132 | 2900.0 | | NO RECOVERY |
| 133 | 2892.5 | SANDSTONE | White, fine to medium grained, well sorted, subrounded, friable, quartz, sandy. |
| 134 | 2885.0 | SHALE | Dark grey, hard, carbonaceous. |
| 135 | 2875.0 | SILTSTONE | Brown, firm, argillaceous, limestone. |
| 136 | 2871.0 | SANDSTONE | Light grey, medium to coarse grained, poorly sorted, subrounded, firm, silty, carbonaceous, micaceous, argillaceous, 10% spotty faint white fluorescence, high C6. |
| 137 | 2857.0 | SILTSTONE | Light brown, firm, argillaceous, sandy. |
| 138 | 2852.5 | SILTSTONE | Light brown, firm. argillaceous, sandy. |
| 139 | 2844.0 | SANDSTONE | Light grey, fine grained, moderately sorted, subrounded, firm, micaceous, quartz, carbonaceous. |
| 140 | 2840.0 | SANDSTONE | Light grey, fine grained, moderately sorted, subrounded, firm, micaceous, carbonaceous, quartz. |
| 141 | 2822.0 | SANDSTONE | Light grey, fine to medium grained, poorly sorted, subrounded, firm, micaceous, quartz, 50% even bright blue-white fluorescence, faint blue-white fluorescent cut. |

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| 142 | 2815.0 | SILTSTONE | Light brown, hard, argillaceous, high Cl. |
| 143 | 2808.0 | SANDSTONE | Light grey, medium to coarse grained, poorly sorted, subangular, friable, micaceous, quartz, 80% even bright blue-white fluorescence, faint blue-white cut, high C3-C6. |
| 144 | 2799.0 | SANDSTONE | Light brown, very fine grained, well sorted, firm, argillaceous, micaceous. |
| 145 | 2790.5 | SANDSTONE | Light grey, fine grained, moderately sorted, subrounded, firm, micaceous, quartz, 50% even dull, blue-white fluorescence, high C4-C6. |
| 146 | 2780.0 | SILTSTONE | Light brown, firm, argillaceous. |
| 147 | 2775.0 | SANDSTONE | White, coarse grained, moderately sorted, angular, friable, micaceous, quartz, 80% even bright, blue-white fluorescence, dull blue-white fluorescent cut, high C4-C6. |
| 148 | 2768.5 | SANDSTONE | White, coarse grained, moderately sorted, angular, friable, micaceous, quartz, 80% even bright, blue-white fluorescence, bright blue-white fluorescent cut, high C4-C6. |
| 149 | 2764.0 | SHALE | Black, carbonaceous, high Cl. |
| 150 | 2663.0 | SANDSTONE | Light grey, fine to medium grained, poorly sorted, subrounded, friable, micaceous, quartz. |
| 151 | 2757.0 | SANDSTONE | Light grey, fine to medium grained, moderately sorted, subrounded, friable, micaceous, quartz, 80% even bright blue-white fluorescence, dull blue-white fluorescent cut. |
| 152 | 2743.0 | SANDSTONE | White, fine grained, well sorted, subangular, friable, quartz, 80% even bright blue-white fluorescence, dull blue-white fluorescent cut. Very high C6. |
| 153 | 2738.5 | SANDSTONE | White, fine grained, well sorted, friable, quartz, micaceous, 50% spotty dull blue-white fluorescence, dull blue-white fluorescent cut. |
| 154 | 2730 | SANDSTONE | White, very fine grained, moderately sorted, subrounded, friable, quartz, argillaceous, silty. |
| 155 | 2683 | SILTSTONE | Light grey, friable quartz. |
| 156 | 2681.5 | SANDSTONE | Light grey, fine to medium grained, moderately sorted, subangular, friable, quartz, micaceous, 60% even dull blue-white fluorescence, faint blue-white fluorescent cut. |

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| 157 | 2673.0 | SILTSTONE | Light brown, friable, argillaceous. |
| 158 | 2663.0 | | NO RECOVERY |
| 159 | 2661.0 | SANDSTONE | White, fine grained, well sorted, subrounded, friable, quartz, micaceous. |
| 160 | 2661.0 | | NO RECOVERY |
| 161 | 2659.5 | SHALE | Dark grey, carbonaceous. |
| 162 | 2652.0 | | NO RECOVERY |
| 163 | 2642.0 | SHALE | Dark grey, hard, carbonaceous, coal. |
| 164 | 2634.0 | SILTSTONE | Light grey, argillaceous. |
| 165 | 2625.0 | SANDSTONE | Light grey, fine to medium grained, moderately sorted, friable, micaceous, spotty, faint white fluorescence, faint blue-white fluorescent cut. |
| 166 | 2608.5 | SILTSTONE | Light grey, firm, micromicaceous, argillaceous. |
| 167 | 2605.0 | SILTSTONE | Light grey, firm, argillaceous. |
| 168 | 2587.0 | SILTSTONE | Light grey, firm, argillaceous. |
| 169 | 2571.0 | SANDSTONE | Light grey to brown, friable, argillaceous. |
| 170 | 2462.0 | COAL | Black, very high Cl. |
| 171 | 2468.0 | | NO RECOVERY |
| 172 | 2464.5 | SILTSTONE | Light grey, firm argillaceous. |
| 173 | 2456.0 | | NO RECOVERY |
| 174 | 3266.0 | SHALE | Black, carbonaceous, silty. |
| 175 | 3248.0 | SILTSTONE | Dark grey, carbonaceous, high Cl. |
| 176 | 3225.0 | SHALE | Black, carbonaceous, silty, high Cl-C2. |
| 177 | 3207.0 | SANDSTONE | Light grey, fine grained, poorly sorted, subrounded, firm, argillaceous, sandy. |
| 178 | 3190.0 | SANDSTONE | White, fine grained, moderately sorted, subrounded, firm, sandy quartz, 10% spotty, faint white-blue fluorescence. |
| 179 | 3176.5 | SANDSTONE | Grey, fine grained, poorly sorted, subrounded, friable, sandy, quartz. |
| 180 | 3150.0 | SHALE | Dark grey, hard, carbonaceous, silty. |
| 181 | 3131.5 | SANDSTONE | Light grey, fine grained, moderately sorted, subrounded, firm, argillaceous. |
| 182 | 3105.5 | SANDSTONE | Light grey, fine grained, moderately sorted, subrounded, firm, argillaceous. |

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|---|---|---|---|
| 183 | 3100.0 | SHALE | Dark grey, firm, carbonaceous. |
| 184 | 3096.5 | | NO RECOVERY |
| 185 | 3089.0 | SANDSTONE | White, fine to coarse grained, friable, argillaceous, sandy. 10% spotty, blue white fluorescence. |
| 186 | 3056.0 | | NO RECOVERY |
| 187 | 3026.0 | SILTSTONE | Dark grey, argillaceous, carbonaceous. |
| 188 | 3019.0 | SANDSTONE | Dark grey, fine to medium grained, moderately sorted, subrounded, friable, carbonaceous, bitumous., high Cl. |
| 189 | 3010.5 | SANDSTONE | Black, medium to coarse grained, moderately sorted, subrounded, firm, carbonaceous, quartzose. |
| 190 | 2992.0 | SILTSTONE | Grey, firm, argillaceous, sandy in part. |
| 191 | 2965.0 | | NO RECOVERY |
| 192 | 2948.5 | SANDSTONE | Light grey, fine to medium grained, moderately sorted, subrounded, friable, argillaceous, 30% even bright blue-white fluorescence, faint blue-white fluorescent cut. |
| 193 | 2673.0 | SILTSTONE | Light brown, firm, argillaceous. |
| 194 | 2468.0 | SILTSTONE | Dark grey, friable, carbonaceous, high C2. |

# APPENDIX 4

# APPENDIX 4

## SIDEWALL CORE GAS ANALYSIS

# TUNA-4

## SIDEWALL CORE GAS ANALYSIS

| No. | Depth (m) | GAS % $C_1$ | $C_2$ | $C_3$ | $C_4$ | $C_5$ | $C_6$ |
|---|---|---|---|---|---|---|---|
| 1 | 2426.0 | - | - | - | - | - | - |
| 2 | 2412.0 | - | - | - | - | - | - |
| 3 | 2384.5 | No Sample | | | | | |
| 4 | 2376.1 | - | - | - | - | - | - |
| 5 | 2369.5 | - | - | - | - | - | - |
| 6 | 2336.1 | - | - | - | - | - | - |
| 7 | 2299.5 | - | - | - | - | - | - |
| 8 | 2264.3 | - | - | - | - | - | - |
| 9 | 2229.0 | - | - | - | - | - | - |
| 10 | 2193.0 | 5.0 | 6.0 | 6.0 | 5.7 | 6.2 | 7.9 |
| 11 | 2162.2 | 9.5 | 8.7 | 7.9 | 8.8 | 9.7 | 12.0 |
| 12 | 2125.8 | 7.6 | 8.5 | 7.3 | 8.2 | 9.2 | 11.6 |
| 13 | 2089.4 | 12.5 | 10.4 | 11.4 | 13.2 | 14.8 | 15.7 |
| 14 | 2067.2 | 15.1 | 11.7 | 9.6 | 11.0 | 14.4 | 21.4 |
| 15 | 2025.8 | 13.0 | 8.4 | 7.3 | 9.9 | 14.6 | 24.0 |
| 16 | 2019.7 | 9.5 | 6.1 | 5.8 | 9.0 | 14.4 | 24.0 |
| 17 | 2014.7 | 8.7 | 7.1 | 6.2 | 9.1 | 14.0 | 22.0 |
| 18 | 2011.1 | 8.2 | 10.6 | 5.6 | 9.0 | 9.2 | 15.6 |
| 19 | 1985.1 | 12.6 | 4.6 | 6.6 | 9.1 | 9.7 | 20.0 |
| 20 | 1952.4 | No Sample | | | | | |
| 21 | 1917.9 | 6.9 | 6.1 | 12.0 | 13.6 | 19.8 | 34.0 |
| 22 | 1887.5 | 6.9 | 6.4 | 6.8 | 12.6 | 21.3 | 36.8 |
| 23 | 1880.1 | 6.5 | 6.1 | 6.7 | 11.0 | 17.9 | 30.0 |
| 24 | 1847.0 | 6.3 | 5.6 | 7.9 | 8.9 | 13.9 | 22.9 |
| 25 | 1816.0 | 5.2 | 4.6 | 6.2 | 6.1 | 8.7 | 13.5 |
| 26 | 1789.0 | 7.8 | 8.2 | 7.4 | 10.8 | 15.9 | 25.5 |
| 27 | 1777.2 | 9.0 | 5.4 | 4.9 | 6.5 | 8.7 | 11.6 |
| 28 | 1737.0 | 6.7 | 6.4 | 6.8 | 13.2 | 18.9 | 20.6 |
| 29 | 1709.7 | 8.6 | 8.2 | 9.6 | 14.6 | 20.2 | 25.6 |
| 30 | 1703.0 | 9.0 | 6.1 | 5.8 | 9.6 | 14.9 | 24.0 |
| 31 | 1666.7 | No Sample | | | | | |
| 32 | 1646.1 | 12.0 | 18.0 | 26.0 | 28.0 | 36.0 | 40.0 |
| 33 | 1626.1 | 52.0 | 36.0 | 25.0 | 22.0 | 25.0 | 34.0 |
| 34 | 1595.8 | 23.0 | 15.0 | 12.0 | 12.0 | 12.0 | 19.0 |
| 35 | 1581.8 | 43.0 | 28.0 | 21.0 | 18.0 | 19.0 | 30.0 |
| 36 | 1574.3 | 39.0 | 26.0 | 19.0 | 16.0 | 17.0 | 23.0 |
| 37 | 1563.5 | 22.0 | 16.0 | 12.0 | 12.0 | 11.0 | 17.0 |
| 38 | 1562.7 | 13.0 | 6.6 | 5.8 | 9.0 | 14.0 | 20.0 |

| No. | Depth (m) | GAS % | | | | | |
|---|---|---|---|---|---|---|---|
| | | $C_1$ | $C_2$ | $C_3$ | $C_4$ | $C_5$ | $C_6$ |
| 39 | 1561.8 | 12.0 | 5.6 | 5.9 | 8.0 | 11.0 | 18.0 |
| 40 | 1560.5 | 13.0 | 6.2 | 6.7 | 8.6 | 9.7 | 12.2 |
| 41 | 1559.5 | 12.0 | 18.0 | 26.0 | 28.0 | 36.0 | 29.0 |
| 42 | 1555.1 | 13.6 | 14.0 | 9.0 | 8.0 | 26.0 | 32.0 |
| 43 | 1550.0 | 18.0 | 11.0 | 8.0 | 7.3 | 17.8 | 12.0 |
| 44 | 1531.0 | 24.0 | 17.0 | 13.0 | 13.0 | 16.0 | 23.0 |
| 45 | 1522.1 | 26.0 | 17.0 | 15.0 | 13.0 | 17.0 | 25.0 |
| 46 | 1516.6 | 30.0 | 15.0 | 12.0 | 13.0 | 17.0 | 24.0 |
| 47 | 1453.8 | 36.0 | 15.0 | 13.0 | 12.0 | 16.0 | 22.0 |
| 48 | 1412.6 | 24.0 | 15.0 | 13.0 | 11.0 | 12.0 | 22.0 |
| 49 | 1411.8 | 26.0 | 13.0 | 12.0 | 9.0 | 14.0 | 29.0 |
| 50 | 1411.5 | 28.0 | 14.0 | 12.0 | 13.0 | 18.0 | 31.0 |
| 51 | 1411.1 | 23.0 | 12.0 | 9.0 | 13.0 | 15.0 | 30.0 |
| 52 | 1410.5 | 20.0 | 12.0 | 9.0 | 16.0 | 19.0 | 31.0 |
| 53 | 1408.9 | 36.0 | 22.0 | 12.0 | 14.0 | 17.0 | 29.0 |
| 54 | 1401.0 | 17.0 | 5.0 | 8.0 | 9.0 | 12.0 | 19.0 |
| 55 | 1400.4 | 15.0 | 3.0 | 6.0 | 6.0 | 10.0 | 18.0 |
| 56 | 1400.0 | 17.0 | 7.0 | 9.0 | 11.0 | 11.0 | 19.0 |
| 57 | 1399.5 | 17.0 | 10.0 | 11.0 | 12.0 | 17.0 | 26.0 |
| 58 | 1387.0 | 18.0 | 9.0 | 11.0 | 12.0 | 19.0 | 24.0 |
| 59 | 1376.0 | 18.0 | 9.0 | 11.0 | 13.0 | 17.0 | 26.0 |
| 60 | 1375.5 | 18.0 | 6.0 | 7.0 | 10.0 | 16.0 | 27.0 |
| 61 | 1374.9 | 14.0 | 10.0 | 8.0 | 10.0 | 15.0 | 23.0 |
| 62 | 1374.0 | 13.0 | 11.0 | 7.0 | 10.0 | 17.0 | 21.0 |
| 63 | 1372.8 | 14.0 | 13.0 | 9.0 | 13.0 | 19.0 | 23.0 |
| 64 | 1371.3 | 12.0 | 5.0 | 6.0 | 9.0 | 10.0 | 20.0 |
| 65 | 1370.0 | 12.0 | 7.0 | 9.0 | 9.0 | 11.0 | 26.0 |
| 66 | 1369.5 | 14.0 | 13.0 | 10.0 | 15.0 | 17.0 | 28.0 |
| 67 | 1369.0 | 15.0 | 11.0 | 8.0 | 10.0 | 13.0 | 21.0 |
| 68 | 1368.0 | 13.0 | 10.0 | 6.0 | 7.0 | 12.0 | 19.0 |
| 69 | 1367.1 | 17.0 | 13.0 | 11.0 | 9.0 | 15.0 | 29.0 |
| 70 | 1365.1 | 11.0 | 8.0 | 7.0 | 11.0 | 16.0 | 24.0 |
| 71 | 1362.6 | 10.0 | 8.0 | 7.0 | 9.0 | 13.0 | 19.0 |
| 72 | 1360.1 | 13.0 | 13.0 | 10.0 | 12.0 | 16.0 | 24.0 |

NOTE: Gas Analyses from Suite 2 Sidewall Cores.

# APPENDIX 5

# APPENDIX 5

## VELOCITY SURVEY REPORT

# VELOCITY SURVEY REPORT

1. Marine Velocity Survey Report.

2. Schlumberger Velocity Report.

    1. Summary
    2. Data Acquisition
    3. Processing Parameters
    4. Shot Data
    5. Sonic Calibration
    6. Sonic Calibration Processing
    7. Geogram Processing

3. Schlumberger Field Report.

4. Check Shot Data Observed and Corrected.

## FIGURES

1. Stacked Check Shot Data.

2. Gun Geometry Sketch.

## ENCLOSURES

1. Schlumberger Seismic Calibration Log (Drift Curve, Adjusted Continuous Velocity Log, and Time-Depth Log.

2. Schlumberger WST - RAW Shots.

3. Schlumberger Geogram.

4. Time-Depth Curve.

# 1. MARINE VELOCITY SURVEY REPORT

| | | |
|---|---|---|
| CONTRACTOR | : | SCHLUMBERGER |
| BASIN | : | GIPPSLAND |
| WELL | : | TUNA #4 |
| LEASE | : | VIC-L-4 |
| CO-ORDINATES | : | 38 DEG. 11' 20.93" S<br>148 DEG. 22' 08.39" E |
| RIG | : | SOUTHERN CROSS |
| ELEVATIONS | : | GROUND LEVEL AT -60.0M AMSL<br>DERRICK FLOOR AT 20.7M AMSL |
| DATE OF SURVEY | : | JULY 8, 1984 |
| CASING DEPTHS | : | 20" @ 205m, 13 3/8" @ 2445m |
| TD AT SHOOTING | : | 3322 mKB |
| NO OF SHOOTING LEVELS | : | 18 |
| RECORDED BY: | | DAWSON/MANAN |
| WITNESSED BY: | | J. ROCHE |

# 2. SCHLUMBERGER VELOCITY REPORT

## 1. SUMMARY

A velocity check shot survey was conducted in the Tuna #4 well on July 8, 1984. Eighteen levels were shot using an airgun source and the results from these shots have been used in the calibration of the sonic log.

All shot times and the calibrated sonic times have been corrected to a nominal Mean Sea Level Datum.

## 2. DATA ACQUISITION

### FIELD EQUIPMENT

Energy Source : Bolt airgun (model 1900B)
200 cu. in.

Source Offset : 46.3m

Source Depth : 9.1m below MSL

Source Azimuth : 50 Deg.

Reference Sensor : Accelerometer

Sensor Offset : 46.3m

Sensor Depth : 9.1m below MSL

Downhole Geophone : Geospace HS-1
High temperature (350 Deg. F), Coil Resistance 225 Ohms + 10%, Natural Frequency 8-12 Hz, Sensitivity 0.45 V/in/sec. Maximum tilt angle 60 Deg. Min.

### Recording Instrument

Recording was made on the Schlumberger Computerised Service Unit (GSU) using LIS format recorded at 1ms sample interval.

## 3. PROCESSING PARAMETERS

| | | |
|---|---|---|
| Seismic Reference Datum (SRD) | : | Mean Sea Level |
| Elevation SRD | : | Mean Sea Level |
| Elevation Derrick Floor | : | 20.7m AMSL |
| Elevation Ground Level | : | -60.0m AMSL |
| Well Deviation | : | 0 Deg. |
| Total Depth | : | 3322m below DF |
| Sonic Log Interval | : | 221 - 3321m below DF |
| Density Log Interval | : | 795 - 3321m below DF |

## 4. SHOT DATA

| Level Depth (m below KB) | Stacked Shots | Rejected Shots | Quality | Comment |
|---|---|---|---|---|
| 3300 | 6 | 1 | Good | |
| 3030 | 4 | 0 | Good | |
| 3000 | 5 | 2 | Good | |
| 2696 | 0 | 5 | Poor | Omitted |
| 2685 | 4 | 0 | Good | |
| 2470 | 7 | 0 | Good | |
| 2400 | 4 | 0 | Good | |
| 2200 | 7 | 1 | Good | |
| 2040 | 5 | 0 | Good | |
| 1800 | 4 | 0 | Good | |
| 1565 | 5 | 0 | Good | |
| 1371 | 3 | 0 | Good | |
| 1200 | 3 | 0 | Good | |
| 1000 | 4 | 0 | Fair | Distorted |
| 800 | 27 | 0 | Fair | Distorted |
| 600 | 9 | 0 | Poor | Noisy |
| 414 | 7 | 0 | Poor | Noisy/Omitted |
| 0 | 13 | 0 | Good | |

A total of 18 check levels were shot with the number of stacked and rejected shots for each level being shown in the table above.

The general data quality was fair to good with a number of levels near the top of the well affected by noise distortions probably caused by casing arrivals.

Consequently, after comparison with the good signals at lower levels, the levels at 800m and 1000m below DF have been timed using the second visible break on the geophone signal. The check levels at 414m and 600m below DF are more severely distorted and the times obtained from these levels have not been used in the computations or calibration of the sonic log. However, after consultation with Esso Australia Ltd. it was decided to model an average velocity of 2075m/s from MSL to 600m below DF, hence a false "observed" time has been input at 600m in the computations.

No good data was available for stacking at the 2696m check level. A plot of the stacked check shot data is given in Figure 1.

Gun Offset

The shot at the surface is normally used to calculate the gun offset from the wellhead. Using the measured transit time of 26ms and water velocity of 1480m/s a gun offset distance of 38.5m was calculated. However, this distance disagreed with that measured by the field engineer of 46.3m. The measured distance was considered more accurate and consequently has been used in the computations.

## 5. SONIC CALIBRATION

Purpose: To adjust the sonic log using the vertical times obtained at each check level.

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

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

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

For a position drift $\frac{\Delta \text{ drift}}{\Delta \text{ depth}} > 0$, and the sonic time is smaller than the seismic time over that section of log.

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

Two methods of correction to the sonic log are used:

(a) Uniform or block shift.

This method applies a uniform correction to all sonic values over the interval. This uniform correction is applied in the case of positive drift and is the average correction represented by the drift curve gradient expressed in $\mu$s/ft.

(b) T Minimum

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

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

$$G = 1 + \frac{\text{Drift}}{\int(\Delta t - \Delta t \text{ minimum})\, dZ}$$

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

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

## 6. SONIC CALIBRATION PROCESSING

### OPEN HOLE LOGS

Both the sonic and density logs used in this report have been edited prior to input into the WST chain. The sonic log has been edited for noise spikes over the following intervals 2714.5-2715.5m, 2720-2721m, 2784-2785m below DF.

The density log has been edited in areas of washout, notably 1921-1923m, 1929-1930m, 2441-2443m, 2640-2643m, 2647-2650m, 2699-2730m, 3010-3011.5m, 3230.5-3231.5m and 3314.5-3315.5m.

### CORRECTION TO DATUM

Seismic reference Datum (SRD) is at Mean Sea Level. The airgun was positioned 9.1m below SRD.

### VELOCITY MODELLING

Due to poor check shot data at and above 600m below DF an average velocity of 2075m/s from seabed to 600m below DF was supplied by Esso Australia Ltd. Using this velocity an interval velocity of 1593m/s was modelled between MSL and the top of sonic at 22lm below DF.

### SONIC CALIBRATION RESULTS

The top of the sonic log is chosen as the origin for the calibration drift curve. All drift measurements are relative to this point.

The drift curve indicates a number of corrections to be made to the sonic log. Block shifts of 1.37 μs/ft and 4.26 μs/ft have been applied over the intervals 846-1559m and 1559-2467m below DF respectively. A zero shift has been applied from 2467 to 2727m and differential shifts using delta-t minimum values of 108.93 μs/ft and 61.69 μs/ft have been applied over the intervals 221-846m and 2727-3321m respectively (depths below DF).

The adjusted sonic curve is considered to be the best result using the available data.

## 7. GEOGRAM PROCESSING

Geograms were generated using zero and minimum phase Ricker wavelets with frequencies at 20, 25, 30 and 35 Hz.

The presentations include both normal and reverse polarity at 7.5 in/sec.

Geogram processing produces synthetic seismic traces based on reflection coefficients generated from sonic and density measurements in the well-bore. The steps in the processing chain are the following:

Time to depth conversion
Generate reflection coefficients
Generate attenuation coefficients
Choose a suitable wavelet
Convolution
Output

Schlumberger

# 3. WELL SEISMIC SERVICE FIELD REPORT

| COMPANY | WELL | DATE | LOCATION | ENGINEER | WITNESSED BY |
|---|---|---|---|---|---|
| ESSO AUSTRALIA | TUNA #4 | 8 JULY 1984 | SOUTHERN CROSS | DAWSON/MANAN | J. KULLA/J. ROACHE |

FEET ☐ METRES ☒ | JACK UP ☐ SHIP ☐ PLATFORM ☐ SEMI-SUB ☒ | WEATHER: SLIGHT BREEZE

| | | | | |
|---|---|---|---|---|
| SCHLUMBERGER ZERO | DF | AT ELEVATION | 20.7m | RELATIVE TO MEAN SEA LEVEL (M.S.L.) |
| LOG MEASURED FROM | | AT ELEVATION | | RELATIVE TO SCHLUMBERGER ZERO |
| DRILLING MEASURED FROM | DF | AT ELEVATION | 0.0m | RELATIVE TO SCHLUMBERGER ZERO |

**SOURCE**

GUN TYPE WATER ☐ AIR ☒
VOLUME 1 x 200 CU INCHES
PRESSURE 140 BARS
VIBRATOR TYPE -
SWEEP LENGTH - SECONDS
FROM - HZ TO - HZ

**TIDEL INFORMATION** (RECORD IF LEVEL VARIES MORE THAN 2 METRES DURING SURVEY)

| TIDE LEVEL TO M.S.L. (REF. FOR HIGH TIDE) | DISTANCE | HOUR | DATE |
|---|---|---|---|
| | 0 | 17:11 | 8/7 |
| | -.5 | 18:00 | 8/7 |
| | - 1 | 19:43 | 8/7 |
| | -2.5 | 21:22 | 8/7 |
| | -3.75 | 22:54 | 8/7 |

CSU SOFTWARE VERSION: 24.2 | MAX. HOLE DEV: 4° AZIM: 15°

NOTE: SHOTS HIGHLY RECOMMENDED AT TD, TOP EACH SONIC, ABOVE AND BELOW BAD HOLE INTERVALS

**UNCORRECTED RESULTS** Quality: G = Good, P = Poor, U = Unsatisfactory

| SHOT NO. | DEPTH | GUN PRESSURE | FILTERS | TRANSIT TIME | HOUR SHOT | FILE | STACK | STACKED SHOTS | QUALITY / REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0m | 140 BARS | NONE | 27.1 | 16:45 | 1 | 2 | 5 ONLY | MOON POOL SHOT |
| 2 | 414m | " | " | 188.1 | 17:00 | 1 | 3 | 9,10,11,12,13 | CASING NOISE |
| 3 | 600m | " | " | 257.9 | 17:50 | 1 | 4 | 14,15,16 | |
| 4 | 800m | " | " | 324.1 | 18:00 | 1 | 5 | 17,18,19 | |
| 5 | 3300m | " | " | 1090.4 | 18:45 | 1 | 6 | 22,23,24,26 | |
| 6 | 3030m | " | " | 1031.3 | 19:06 | 1 | 7 | 27,28,29,30 | |
| 7 | 3000m | " | " | 1025.1 | 19:17 | 1 | 8 | 31,34,36,37 | |
| 8 | 2685m | " | " | 951.4 | 19:45 | 1 | 9 | 44,45,46,47 | |
| 9 | 2470m | " | " | 896.1 | 20:09 | 1 | 10 | 53,54,55 | |
| 10 | 2400m | " | " | 876.2 | 20:20 | 1 | 11 | 56,57,58,59 | |
| 11 | 2200m | " | " | 821.4 | 20:33 | 1 | 12 | 61,64,65,67 | |
| 12 | 2040m | " | " | 774.3 | 20:50 | 1 | 13 | 69,70,71,72 | |
| 13 | 1800m | " | " | 697.3 | 21:00 | 1 | 14 | 73,74,75,76 | |
| 14 | 1565m | " | " | 619.3 | 21:10 | 1 | 15 | 77,78,79,81 | |
| 15 | 1371m | " | " | 560.1 | 21:20 | 1 | 16 | 82,83,84 | |
| 16 | 1200m | " | " | 496.0 | 21:25 | 1 | 17 | 85,86,87 | |
| 17 | 1000m | " | " | 402.0 | 21:33 | 1 | 18 | 88,89,90,91 | |
| 18 | 800m | " | " | 322.3 | 22:08 | 1 | 19 | 112,113,114,115 | |
| 19 | 600m | " | " | 257.1 | 22:24 | 1 | 20 | 118,119,120,121 | |
| 20 | 0.0m | " | " | 26.4 | 22:30 | 1 | 21 | 123,124,125,126 | |

# 4. TUNA-4 VELOCITY SURVEY

| LEVEL NUMBER | MEASURED DEPTH FROM KB (m) | VERTICAL DEPTH FROM MSL (m) | OBSERVED TRAVEL TIME HYD/GEO (ms)* | VERTICAL TRAVEL TIME MSL/ GEOPHONE (ms) | AVERAGE VELOCITY MSL/GEOPHONE (m/s) | DELTA DEPTH BETWEEN SHOTS (m) | DELTA TIME BETWEEN SHOTS (ms) | INTERVAL VELOCITY BETWEEN SHOTS (m/s) |
|---|---|---|---|---|---|---|---|---|
| 1 | 600.00 | 579.30 | 273.87 | 279.12 | 2075 | | | |
| | | | | | | 200.00 | 67.41 | 2967 |
| 2 | 800.00 | 779.30 | 341.00 | 346.53 | 2249 | | | |
| | | | | | | 200.00 | 78.14 | 2560 |
| 3. | 1000.00 | 979.30 | 419.00 | 424.67 | 2306 | | | |
| | | | | | | 200.00 | 77.09 | 2594 |
| 4. | 1200.00 | 1179.30 | 496.00 | 501.76 | 2350 | | | |
| | | | | | | 171.00 | 63.05 | 2712 |
| 5. | 1371.00 | 1350.30 | 559.00 | 564.82 | 2391 | | | |
| | | | | | | 194.00 | 60.05 | 3231 |
| 6. | 1565.00 | 1544.30 | 619.00 | 624.87 | 2471 | | | |
| | | | | | | 235.00 | 78.04 | 3011 |
| 7. | 1800.00 | 1779.30 | 697.00 | 702.91 | 2531 | | | |
| | | | | | | 240.00 | 77.03 | 3116 |
| 8. | 2040.00 | 2019.30 | 774.00 | 779.94 | 2589 | | | |
| | | | | | | 160.00 | 47.02 | 3403 |
| 9. | 2200.00 | 2179.30 | 821.00 | 826.96 | 2635 | | | |
| | | | | | | 200.00 | 55.02 | 3635 |
| 10. | 2400.00 | 2379.30 | 876.00 | 881.98 | 2698 | | | |
| | | | | | | 70.00 | 20.01 | 3499 |
| 11. | 2470.00 | 2449.30 | 896.00 | 901.99 | 2715 | | | |
| | | | | | | 215.00 | 55.02 | 3908 |
| 12. | 2685.00 | 2664.30 | 951.00 | 957.00 | 2784 | | | |
| | | | | | | 315.00 | 73.02 | 4314 |
| 13. | 3000.00 | 2979.30 | 1024.00 | 1030.02 | 2892 | | | |
| | | | | | | 30.00 | 7.00 | 4285 |
| 14 | 3030.00 | 3009.30 | 1031.00 | 1073.03 | 2902 | | | |
| | | | | | | 270.00 | 59.01 | 4574 |
| 15 | 3300.00 | 3279.30 | 1090.00 | 1096.04 | 2992 | | | |

* The observed travel times listed here differ slightly to the field transit times. Schlumberger edit the field data and use a different picking algorithm for final processing. The final data is more reliable.

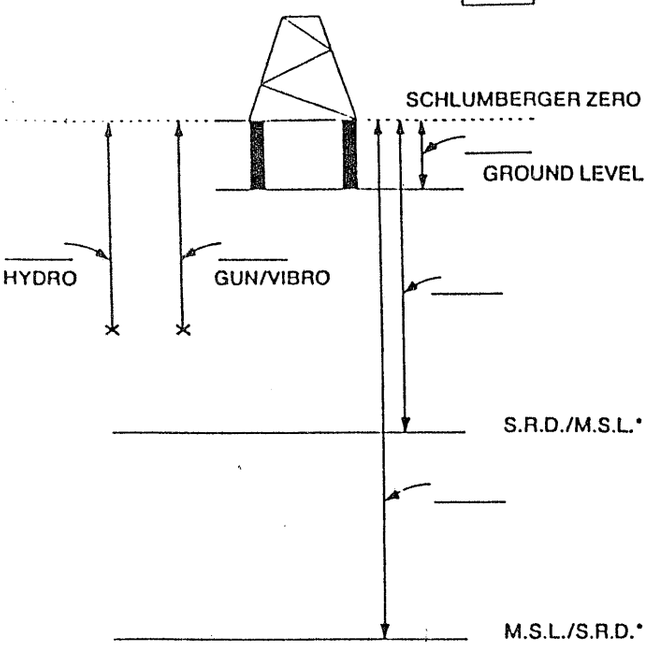
1175L

Schlumberger

# GUN GEOMETRY SKETCH

CLIENT: ESSO AUSTRALIA LTD. WELL: TUNA #4 DATE: 8TH JULY 1984

## LAND

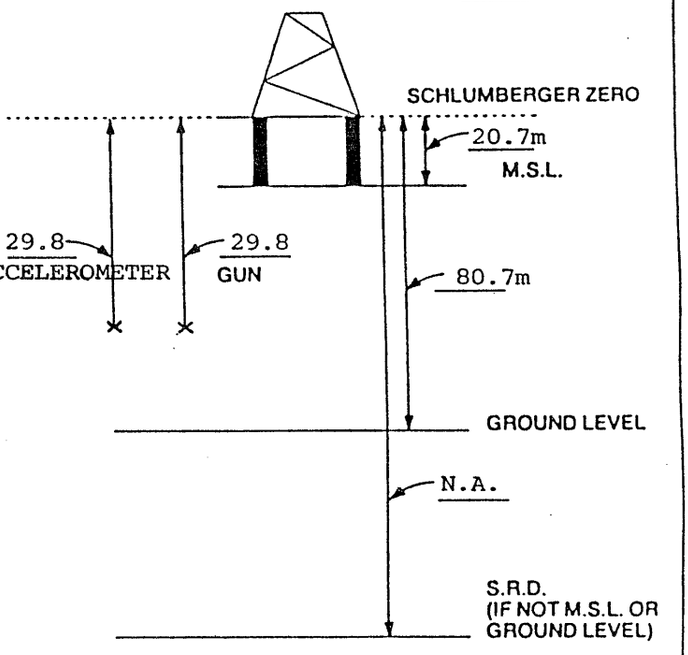



INDICATE ALL DISTANCES RELATIVE TO SCHLUMBERGER ZERO

* DELETE AS APPLICABLE

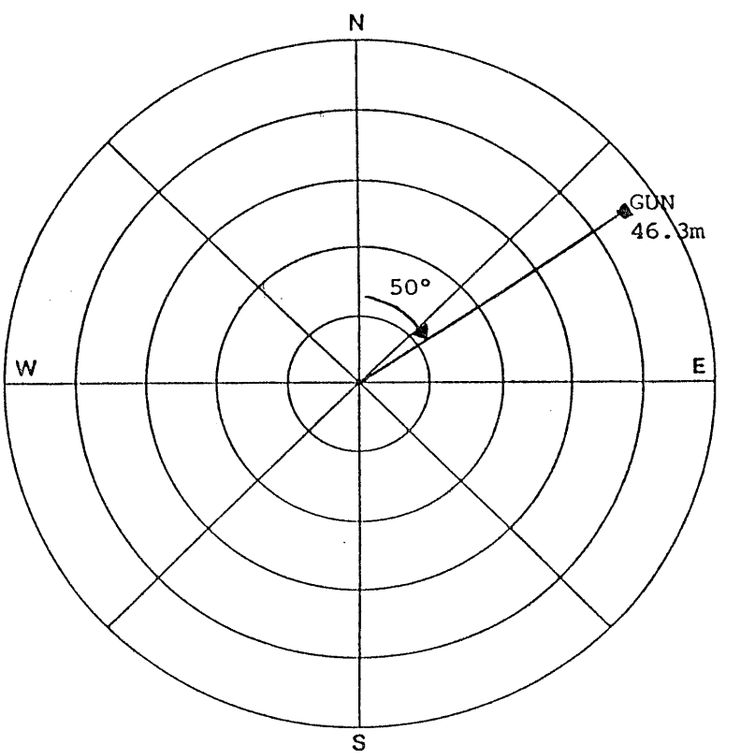
## OFFSHORE

XX




INDICATE ALL DISTANCES RELATIVE TO SCHLUMBERGER ZERO

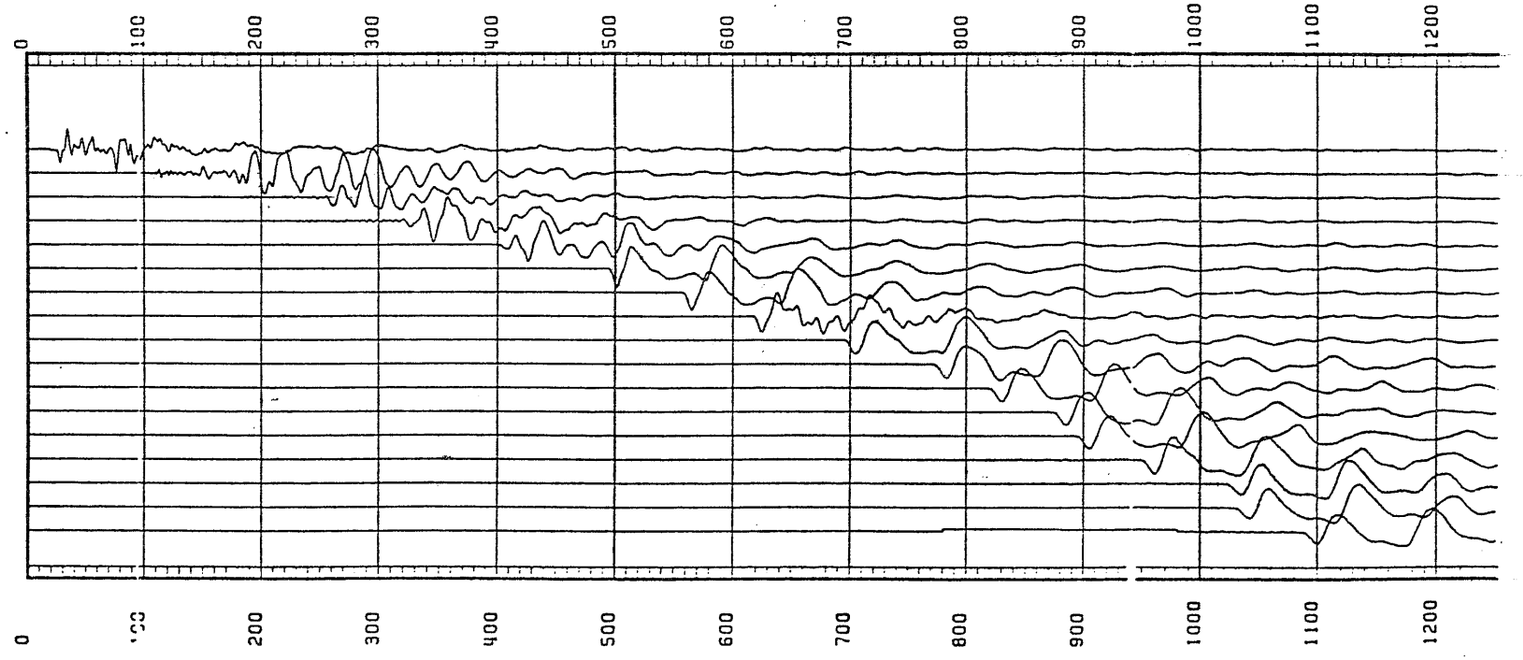
| SHOT POS'N | GUN OFFSET | HYDRO OFFSET | GUN DEPTH | HYDRO DEPTH |
|---|---|---|---|---|
| 1 | 46.3 | 46.3 | 9.1 | 9.1 |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |




INDICATE GUN/VIBRO AND HYDROPHONE OFFSET AND AZIMUTH RELATIVE TO NORTH

FIGURE 1 : STACKED CHECK SHOT DATA

| LEVEL | DEPTH M | TIME S | PEAK/PEAK |
|---|---|---|---|
| 19 | 0.0 | 0.026 | 266.93 |
| 18 | 414.1 | 0.179 | 39099.67 |
| 17 | 600.1 | 0.257 | 20359.28 |
| 16 | 800.1 | 0.341 | 10589.10 |
| 15 | 1000.0 | 0.419 | 10957.60 |
| 14 | 1200.1 | 0.496 | 7399.00 |
| 13 | 1371.0 | 0.559 | 5578.00 |
| 12 | 1565.0 | 0.619 | 4701.83 |
| 11 | 1800.0 | 0.697 | 2491.00 |
| 10 | 2040.0 | 0.774 | 1649.83 |
| 9 | 2200.0 | 0.821 | 1289.62 |
| 8 | 2400.0 | 0.876 | 1335.20 |
| 6 | 2470.0 | 0.896 | 961.38 |
| 5 | 2685.0 | 0.951 | 868.40 |
| 3 | 3000.0 | 1.024 | 913.33 |
| 2 | 3030.0 | 1.031 | 958.80 |
| 1 | 3300.0 | 1.090 | 634.86 |



PE906477

This is an enclosure indicator page.
The enclosure PE906477 is enclosed within the container PE902467 at this location in this document.

The enclosure PE906477 has the following characteristics:

| | |
|---|---|
| ITEM_BARCODE | = PE906477 |
| CONTAINER_BARCODE | = PE902467 |
| NAME | = Time-Depth Curve |
| BASIN | = GIPPSLAND |
| PERMIT | = VIC/L4 |
| TYPE | = WELL |
| SUBTYPE | = VELOCITY _CHART |
| DESCRIPTION | = Time-Depth Curve for Tuna-4 |
| REMARKS | = |
| DATE_CREATED | = 2/08/84 |
| DATE_RECEIVED | = 18/12/84 |
| W_NO | = W868 |
| WELL_NAME | = TUNA-4 |
| CONTRACTOR | = |
| CLIENT_OP_CO | = ESSO AUSTRALIA LIMITED |

(Inserted by DNRE - Vic Govt Mines Dept)

PE603831

This is an enclosure indicator page.
The enclosure PE603831 is enclosed within the container PE902467 at this location in this document.

The enclosure PE603831 has the following characteristics:

| | |
|---|---|
| ITEM_BARCODE | = PE603831 |
| CONTAINER_BARCODE | = PE902467 |
| NAME | = Seismic Calibration Log |
| BASIN | = GIPPSLAND |
| PERMIT | = VIC/L4 |
| TYPE | = WELL |
| SUBTYPE | = VELOCITY _CHART |
| DESCRIPTION | = Seismic Calibration Log for Tuna-4 |
| REMARKS | = |
| DATE_CREATED | = 24/07/84 |
| DATE_RECEIVED | = 18/12/84 |
| W_NO | = W868 |
| WELL_NAME | = TUNA-4 |
| CONTRACTOR | = SCHLUMBERGER |
| CLIENT_OP_CO | = ESSO AUSTRALIA LIMITED |

(Inserted by DNRE - Vic Govt Mines Dept)