MOBIL EXPLORATION NORWAY INC.

FINAL GEOLOGICAL SUMMARY

33/12-6

July 1976
Stavanger, Norway

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NORWAY OFFSHORE

LICENSE 037

WILDCAT WELL 33/12-6

WELL DATA

WELL NAME:	33/12-6
LOCATION:	61° 04' 36.41" N 01° 57' 17.76" E
CLASSIFICATION:	WILDCAT
DRILLING PERIOD	
SPUDDED:	2 MARCH 1976
COMPLETED DRILLING:	11 JUNE 1976
RIG RELEASED:	21 JUNE 1976
KB ELEVATION:	25m (82')
WATER DEPTH:	138.5m (454')
RIG:	"NORSKALD"/"DYVI ALPHA"
STATUS:	DRY HOLE Plugged and abandoned
TOTAL DEPTH:	
PLANNED:	4572m (K.B.) (15,000')
ACTUAL:	4612m (K.B.) (15,131')
OBJECTIVE:	Middle & Lower Jurassic sands, Upper Triassic sand.
COST ($)	
Planned:	10,000,000
Actual:	* 8,513,000

* Charges as of 30 June 1976.

INTRODUCTION

The 33/12-6 well was the sixth of eight wildcats required in the License 037 area, and the last of three deep test obligations. It was the first test of a large structural feature in the southeastern part of Block 33/12, located across a major regional fault bounding the eastern flank of the Brent and Statfjord Fields.

The prospect was defined seismically by the "R" horizon, interpreted as a near Top Triassic event, and the "J" seismic horizon, representing the Top Jurassic Kimmerian Unconformity. Structurally, the feature is a westerly tilted fault block with bounding normal faults to the northeast and southeast intersecting at the highest point of the prospect. It was anticipated that a Jurassic section similar to the Statfjord Field area would be present where hydrocarbon bearing Middle and Lower Jurassic sands subcrop and are sealed by Upper Jurassic or Lower Cretaceous shales at the Late Kimmerian Unconformity.

Primary objectives were the Middle Jurassic Brent and Lower Jurassic Statfjord Formation sands. The well was located approximately 50 meters (164') low to the high point of the structure, in an area where partial erosion of the Middle Jurassic was interpreted from seismic data. To evaluate possible Triassic reservoirs as a secondary objective, the well was programmed for a total depth of 4572 meters (15,000').

RESULTS

The 33/12-6 wildcat spudded on 2 March 1976 and was abandoned as a dry

hole on 21 June 1976. The well reached a total depth of 4612 meters (15,131') in probable Triassic sediments.

The objective Middle Jurassic Brent Formation was encountered at 2973 meters (9,754'), 217 meters (712') low to prognosis. Gross thickness of the Brent was 312 meters (1,024'). Only rare fluorescence with minor gas readings were noted in the sands. Higher gas readings encountered were associated with coal beds. Using cutoffs of 40 percent clay volume and 12.5 percent porosity, Schlumberger's coriband analysis indicates 103 meters (338') of net sand with an average porosity of 20 percent. The coriband analysis showed the sands to be wet with only 6 meters (20') of net pay, scattered throughout the unit, having water saturations less than 65 percent. Eighteen sidewall cores taken in the Brent had an average porosity of 20 percent with liquid permeabilities averaging 50.3 millidarcies. FIT No. 1 taken at 3070 meters (10,072') recovered 10.2 liters of filtrate and formation water (11,000 ppm NaCl).

Objective Lower Jurassic Statfjord Formation sands were topped at 3721 meters (12,208'), 626 meters (2,054') low to prognosis. Gross thickness was 309.5 meters (1015'). Using the same cutoff parameters as for the Brent formation, log analysis indicated 149 meters (489') of net sand with an average porosity of 16 percent and also showed the sands to be wet. Only 3 meters (10') of scattered thin zones had water saturations less than 65 percent. No shows were seen in the samples. However, Core No. 1, cut from 3736 to 3744 meters (12,257'-12,283') in the Statfjord sands had no shows but averaged 6.2 percent residual oil saturation over the 6.51 meters (21') recovered. Average core porosity was 16.5 percent with an average liquid permeability of 17.4 millidarcies. Two FIT tests

were attempted near the top of the Statfjord Formation, primarily for pressure data, but both were misruns.

Due to thickening in the Jurassic, the Top Triassic was encountered 782.5 meters (2,567') low to prognosis, at 4030.5 meters (13,223'). As a result the 33/12-6 well was abandoned at a total depth of 4612 meters (15,131') without reaching a secondary objective Upper Triassic sand found wet in the 33/12-2 and 33/12-5 wells. Only 581.5 meters (1,908') of Triassic section were evaluated compared to 1839 meters (6,033') in the 33/12-5 well.

The primary objectives Brent and Statfjord sands were wet, although scattered residual oil was indicated from logs and in a core in the Statfjord, suggesting that oil may have migrated through these formations. No shows or zones of interest were found in the Triassic from samples or logs.

Sample collection and mud logging were performed by Exploration Logging. Paleontological samples were sent to Robertson Research and their paleontological summary is presented in Table I. From 2685m (8809') to 3736m (12,257') a paleontologist from Robertson Research was present on the rig.

A detailed summary of Schlumberger wireline services and log run intervals is shown on Table II and they are graphically illustrated on the enclosed Summary Log.

For details of lithology refer to the enclosed Final Composite Log.

STRATIGRAPHY/STRUCTURE

The stratigraphic section penetrated in the well was essentially as predicted through the Upper Cretaceous, but below this level progressively larger variances to the original prognosis were encountered. Figure 1 is a comparison of actual versus prognosed stratigraphy and structural tops. The following is a brief summary of the geologic section penetrated in 33/12-6.

The Tertiary and Upper Cretaceous sections were similar to other wells in the area, consisting predominantly of claystones and siltstones with minor sands. An outer sublittoral to bathyal environment is interpreted.

Neither the Lower Cretaceous nor the Upper Jurassic "Hot Shale" were present in 33/12-6. The "Hot Shale" has probably been eroded from this crestal location and may be present on the flanks of the structure. The Lower Cretaceous was probably not deposited over the high point of the structure.

The Top Jurassic Kimmerian Unconformity was encountered at 2670 meters (8,760'), 83 meters (272') high to prognosis. An unexpected 303 meters (994') of Middle Jurassic Callovian to Bathonian age shales were found beneath the Kimmerian Unconformity. This is the thickest sequence of Middle Jurassic shale overlying the Brent Formation in the License 037 area. Previously, 33/9-4 and 33/9-5, located on the northern flank of the Statfjord Field, encountered only 13.5 meters (44') and 48 meters (157') of Middle Jurassic shale. This shale unit is also present to the west in neighboring blocks in U.K. waters and is suspected to be present down flank around much of the Statfjord Field structure.

Lithologically this unit consists of grayish brown silty shale and claystone, being micaceous, carbonaceous and pyritic. Because these Middle Jurassic shales can normally be distinguished from typical highly radioactive (very high gamma ray count) Upper Jurassic "Hot Shales", the informal name "Cold Shale" is used for this unit. An inner sublittoral environment with marine influence is interpreted.

The objective Brent Formation was encountered at 2973 meters (9754'). Originally, a partially eroded Brent was anticipated at this location. Because of the unexpected thick sequence of Middle Jurassic shale the Brent was encountered 217 meters (712') low to prognosis. Further, no erosion of the Brent is believed to have occurred and the 312 meters (1,024') present is 220 meters (722') thicker than prognosed. Brent lithology consists of sandstone, clear to white, very coarse to medium grained, micaceous and pyritic, with kaolinitic matrix and fair to good porosity, interbedded with grayish brown, micaceous claystone. Abundant coal beds in the Upper part of the Brent indicate a delta plain depositional environment. The coarsening upward sequence, as indicated by logs and samples, is indicative of distal bar deposition in the lower part of the Brent.

The Lower Jurassic Dunlin Formation was found at 3285 meters (10,777'), 440m low to prognosis and was 436 meters (1,430') thick. An inner sublittoral environment is suggested for the Dunlin Formation consisting of claystone and siltstone, gray to brown, occasionally calcareous, carbonaceous and micaceous. The Dunlin Formation was 186 meters (610') thicker than prognosed.

The objective Statfjord Formation was encountered at 3721 meters (12,208'), 626 meters (2,054') low to prognosis. Sands were clear to white, fine-very coarse grained, conglomeratic in the upper portion, calcareous and siliceous cemented, partly recrystallized, with a kaolinitic matrix and fair porosity. Interbedded claystones were grayish to light brownish red near the base, micaceous, slightly calcareous and occassionally carbonaceous. Lithology and logs indicate a fluvial to continental depositional environment. Gross thickness was 309.5 meters (1,015') which is 156.5 meters (513.4') thicker than prognosed.

All of the Jurassic units present in 33/12-6 were thicker than prognosed and, indeed, were the thickest seen in the License 037 area to date. The total Jurassic was 863 meters (2831') thicker than anticipated due to regional eastward thickening of all Jurassic formations.

The age of the interval below 3978m (13,051') is paleontologically and palynologically indeterminate. Lithology consists of red to brown sandy shale, red siltstone, and white to orange fine grained sandstone. The top of the Triassic was picked at 4030.5 meters (13,223') primarily on the basis of lithologic similarity to the Upper Triassic in the area. At total depth of 4612 meters (15,131'), 581.5 meters (1,908') of probable Triassic sediments were penetrated.

SUMMARY AND CONCLUSIONS

The primary objective Middle Jurassic Brent and Lower Jurassic Statfjord sands were found to be porous and much thicker than anticipated. Both the Brent and Statfjord were water bearing, with only minor residual oil saturation scattered throughout the section.

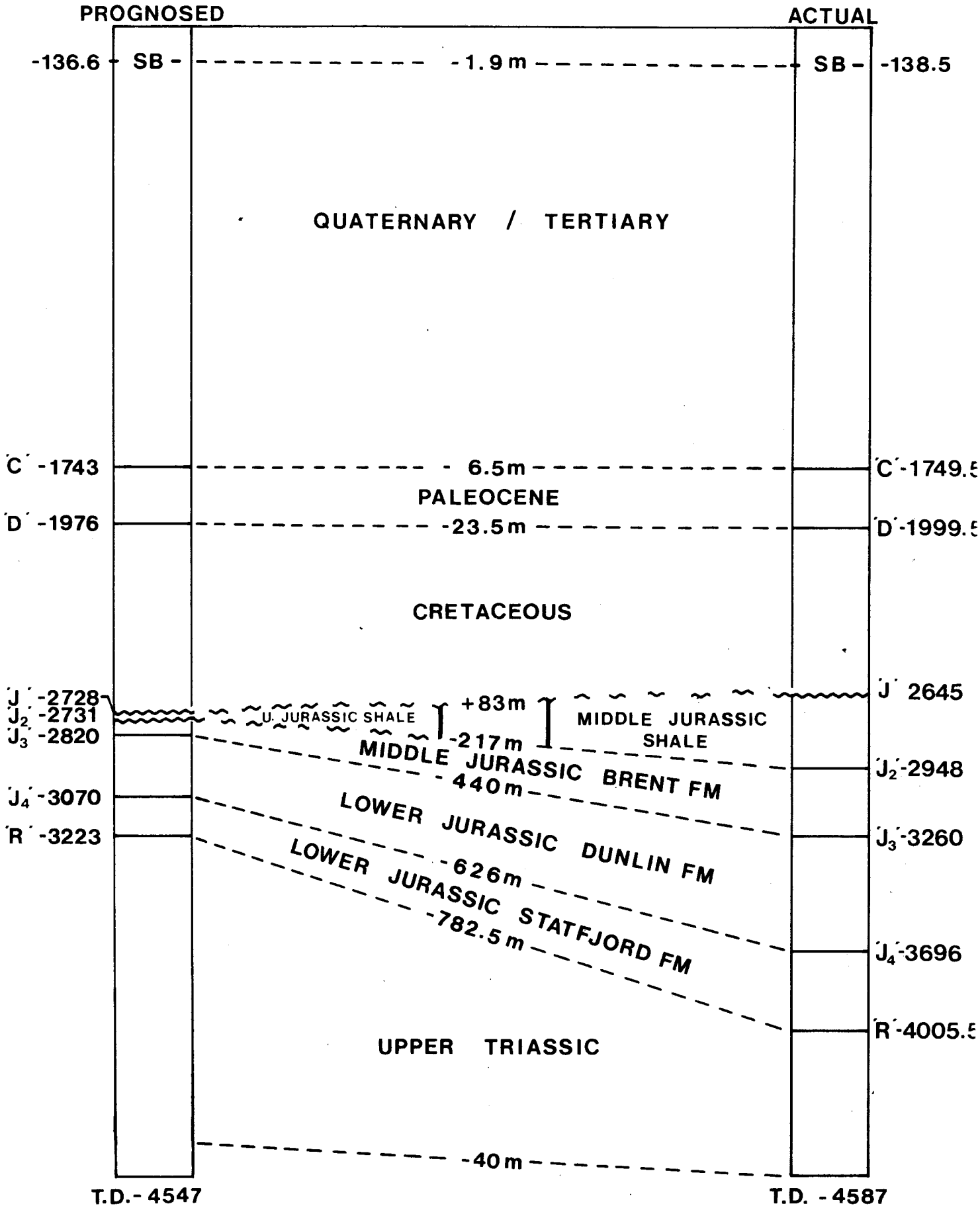
The presence of residual oil saturations suggests that oil may have migrated through the section. With much greater thicknesses of Brent and Statfjord sands than predicted, the northeast bounding fault did not seal these reservoirs. The fault, as currently interpreted has a throw of approximately 220 meters (656'). This is not sufficient to seal the 312 meters (1,024') of Brent sands against downthrown Upper/Middle Jurassic shales. Similarly, the 309.5 meters (1,015') of Statfjord sands would not be sealed across the fault. Any reserves which might remain updip from the location would in themselves not be commercial.

Regional eastward thickening explains the fact that all Jurassic Formations encountered in the well had the thickest sections found in the License 037 area to date.

The 33/12-6 well was credited as the last of the three required deep test obligations in the License 037 area. Valuable velocity and stratigraphic data was obtained to assist in evaluation of other prospects in the area.

The well was abandoned as a dry hole at a depth of 4612 meters (15,131'), in sediments of probable Triassic age on 21 June 1976.

WELL 33/12-6 PROGNOSIS VS. ACTUAL DEPTHS



ALL DEPTHS IN METER SUBSEA
VERTICAL SCALE: 1:20,000

A.L. JUNE 1976
MOEX Nº 76/0131

FIGURE 1

TABLE I

PALEONTOLOGICAL SUMMARY 33/12-6

Interval (kb,meters)	Stage/Substage	System/Sub-System
246-600		Pliocene
606-612		?Upper Miocene
612-894		Middle-Lower Miocene
900-1296		Oligocene
1302-1464		Eocene
1470-1818		Lower Eocene-Paleocene
1824-2022		Paleocene
2022-2028	Danian	Upper Cretaceous
2028-2100	Maastrichtian	
2106-2214	Early Maastrictian	
2220-2286	Late Campanian	
2292-2592	Early Campanian	
2598-2670	Santonian	
2676-2856	Callovian-Bathonian	Middle Jurassic
2862-2964	Bathonian	
2970-3168	Bathonian-Bajocian	
3174-3282	Bajocian, Early Bajocian	
3288-3474	Toarcian	Lower Jurassic
3480-3576	Domerian	
3582-3708	Domerian-Carixian	
3714-3720	Caraxian-Sinemurian	
3726-3972	Caraxian-Sinemurian to Hettangian	
3978-4612	Indeterminate	(?Triassic)

TABLE II

WIRELINE LOGGING SUMMARY

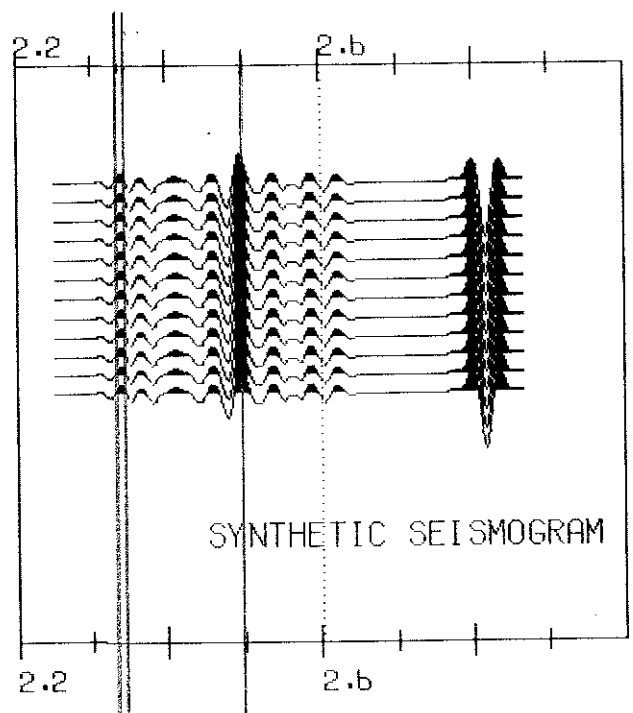
WELL 33/12-6

LOG TYPE	INTERVAL LOGGED	DATE
First log run ISF/Sonic GR (Run 1)	239-482	7 March 1976
Second log run ISF/Sonic/GR (Run 2)	468,5-1833,5	23 March 1976
Third log run ISF/Sonic/GR (Run 3)	1817-2629	25 April 1976
CNL-FDC-GR (Run 1)	1816,5-2628,5	26 April 1976
Fourth log run ISF/Sonic/GR (Run 4)	2618-4112	26 May 1976
CNL-FDC-GR (Run 2)	2622-4116,5	26 May 1976
DLL/MSFL (Run 1)	2940-4102	26 May 1976
HDT (Run 1)	2623,5-3806*	27 May 1976
Velocity Survey (Run 1)	490-2671-2976-3284-3725-4120	29 May 1976
FIT 1,2,3	2 seal failures in Statfjord 1 successful 3070m in Brent	1 June 1976
Fifth log run ISF/Sonic/GR (Run 5)	4050-4616	14 June 1976
CNL/FDC/GR (Run 3)	4050-4616	14 June 1976
SWC (Run 1)	26 of 30 recovered	14 June 1976

* HDT stuck at 3806

(1)

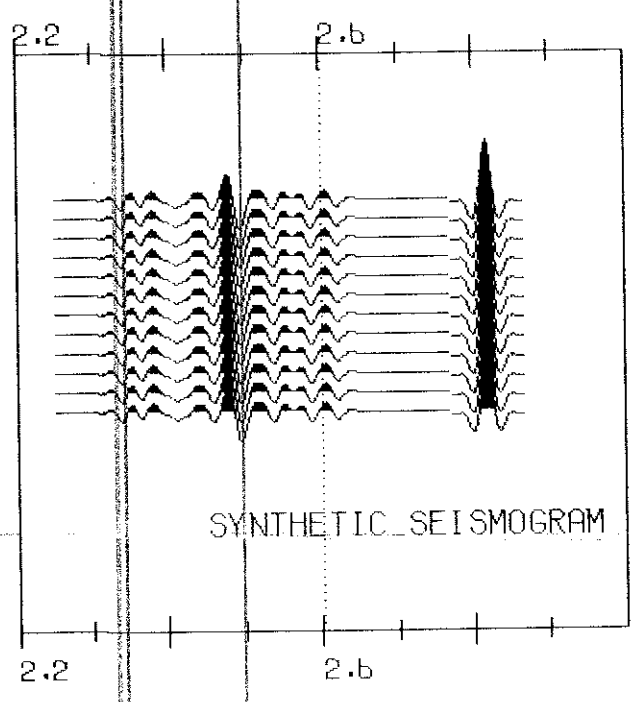
33/12-02



T-G
C-F
O-F
S+010

MOBIL 33/12-02 O/S NORWAY CHECKSHOT CORRECTIONS APPLIED

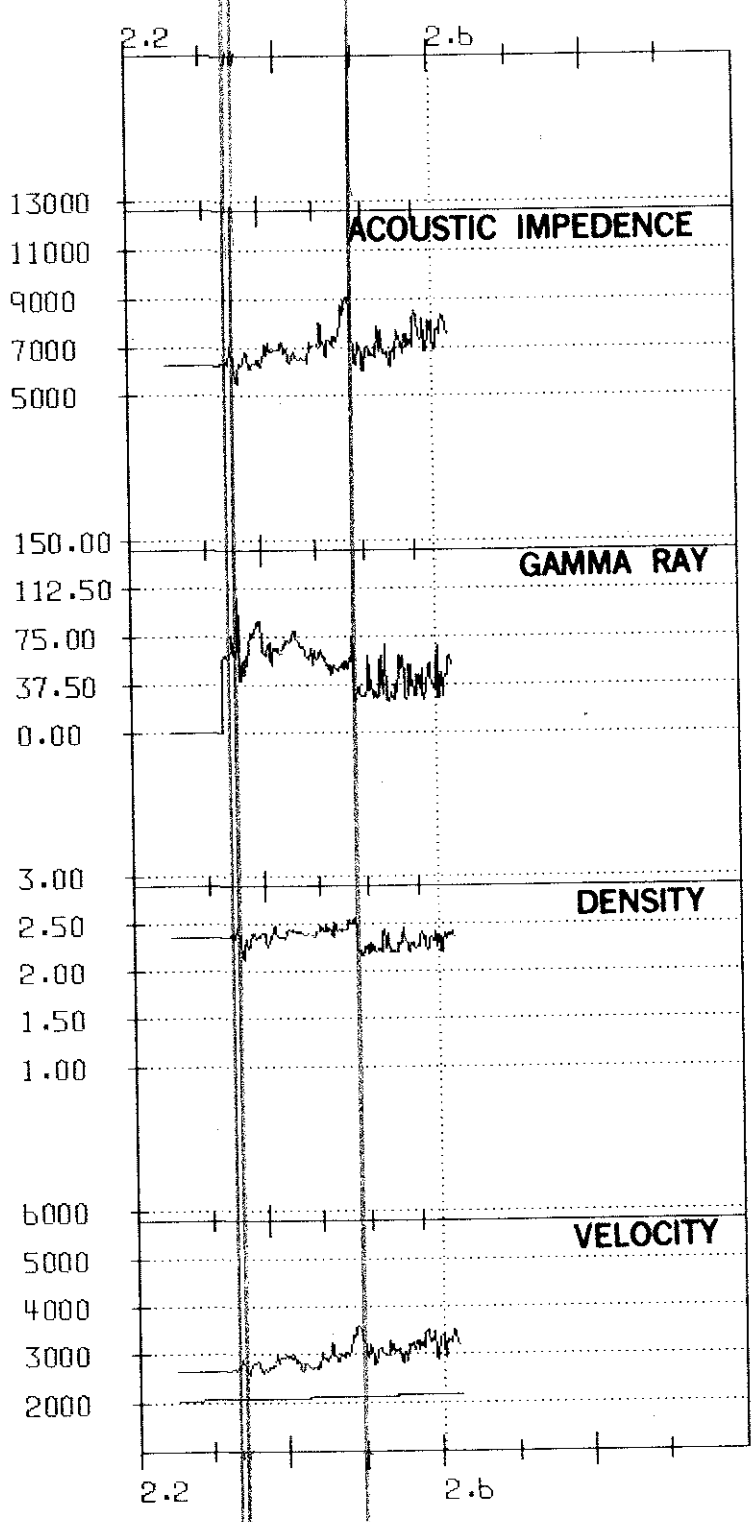
8/10-35/40 ZERO PH.WHITE



T-F
C-F
O-P
S+020

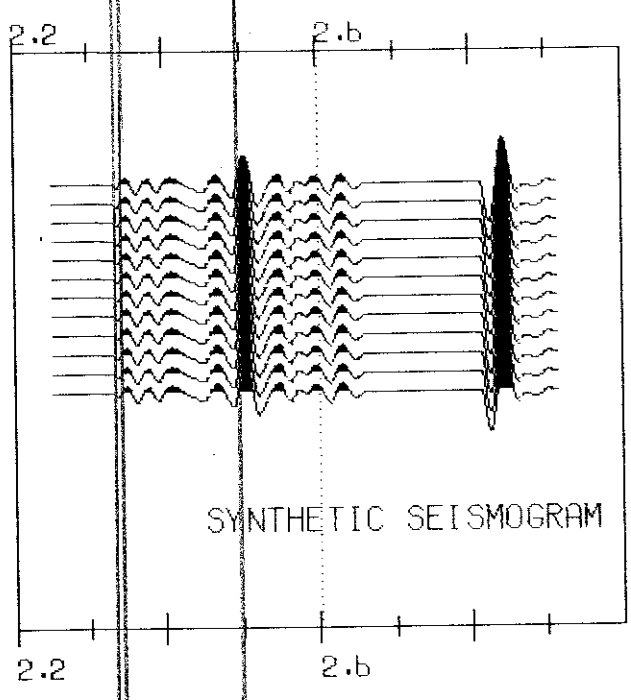
MOBIL 33/12-02 O/S NORWAY CHECKSHOT CORRECTIONS APPLIED

8/10-35/40 ZERO PH.BLACK



MOBIL 33/12-02 O/S NORWAY CHECKSHOT CORRECTIONS APPLIED

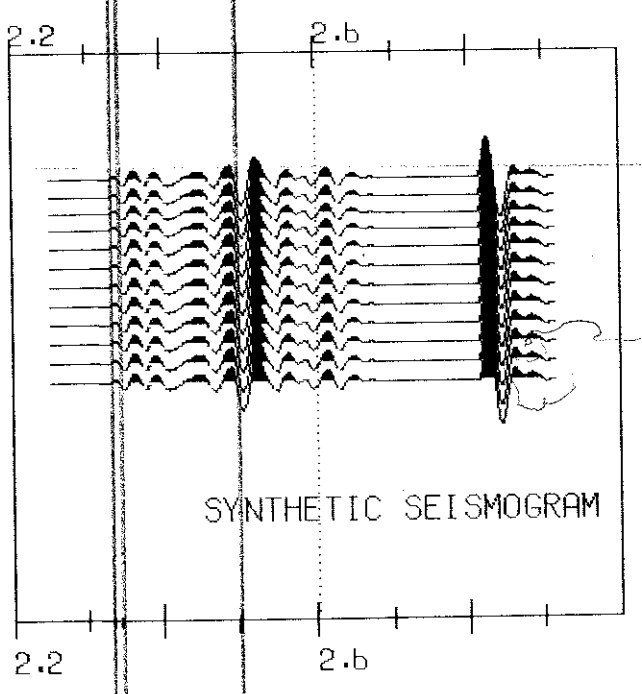
DEPTHS SUB SEA



T-F
C-F
O-P
S+005

MOBIL 33/12-02 O/S NORWAY CHECKSHOT CORRECTIONS APPLIED

8/10-35/40 MIN.PH.WHITE



T-P
C-P
O-P
S-010

MOBIL 33/12-02 O/S NORWAY CHECKSHOT CORRECTIONS APPLIED

8/10-35/40 MIN.PH.BLACK

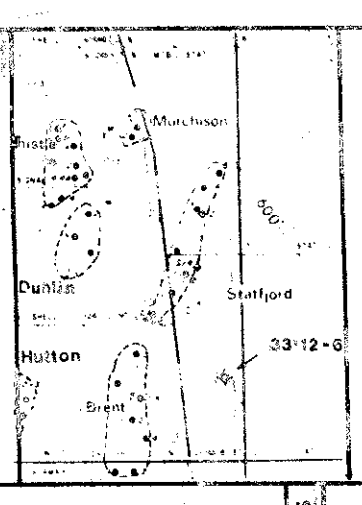
MOBIL EXPLORATION NORWAY INC.

MOBIL/STATOIL/CONOCO/ESSO/SHELL/AMOCO-SAGA

SUMMARY LOG 33/12-6

SCALE : 1 : 10,000

ENCLOSURE 1



COORDINATES: LAT. 61°04'36.41" LONG: 01°57'17.76"
ELEVATION KB: 25m RIGS: NORSKALD/DYVI ALPHA
WATER DEPTH: 138.5m SPUDDED: 2 MARCH 1976
TOTAL DEPTH: 4612m COMPLETED: 21 JUNE 1976
STATUS: DRY HOLE, PLUGGED AND ABANDONED

METERS | DEPTH K.B. STRATIGRAPHY: BIO, LITHO | SHOWS | CASING, CORES, TWO WAY CHECKSHOT TIME | LITHOLOGY-INDICATIONS-TEST RESULTS REMARKS | LOGS: ISF-SON-GR, HDT, CAL, DIL-FDC, DLL/MSFL, OTHER | FEET

SEA BED 163.5

NO SAMPLES

QUAT

TERTIARY — PLIOCENE (P)606 — MIOCENE (P)900 — OLIGOCENE (P)1302 — EOCENE (P)1470 — PALEOCENE-LATE EOCENE (P)1824 — PALEO-CENE (P)2028

CRETACEOUS — SANT. - MAAST. (P)2670

JURASSIC — BATH-CALL. (P)2970 — BAJ. - BATH. (P)3288 — CARIX.-DOM.-TOAR (P)3714 — HETT.-SINEM.-CARIX. — INDETERMINATE SECTION

TRIASSIC

(L) LOG TOPS
(P) PALEO TOPS

(L)1774.5 — (L)2024.5 — MIDDLE JURASSIC (L)2670 — BRENT FM (L)2973 — DUNLIN FM (L)3285 — FM (L)3721 — (L)4030.5

SHOWS: good, fair, poor

CASING: 30", 20" 490m 0.235 sec., 13 3/8", 9 5/8" 2671m 1.199sec

CORES: CORE #1 3725m 1.524 sec.

TWO WAY CHECKSHOT TIME: 2976 m 1.308 sec., 3284 m 1.399 sec., 4120m 1.629 sec., TD 4612m

SEA BED

SAND, clear, white, medium grainsize, sub-angular to sub rounded, medium sorted, abundant shell fragments. Interbedded CLAY.

CLAY, light grey, soft to soluble, slight calcareous, w/sandy stringers.

SANDSTONE, clear, fine to coarse, sub rounded medium sorted, occasionally some lignite, loose, interbedded with CLAY, lt grey to greenish grey.

CLAY grey to green, firm to soft

CALCILUTITE, white to light brown, hard micxln, tr, dololutite, brown hard.

CLAY/CLAYSTONE, silty light grey-reddish brown, calcareous, trace of pyrite, occasionally interbedded tuffaceous beds.

MARL/CALYSTONE, silty, grey firm to soft, sticky CLAYSTONE. occ LS stringers as above

CLAYSTONE, red to brown, soft and sticky, calcareous grading to MARL occasionally grey.

CLAYSTONE/SHALE, light greyish brown, micaceous, pyritic, carbonaceous, occ thin LS stringers.

MUDSTONE, dark grey, micaceous, pyritic carbonaceous, hard to firm.

FIT#1

SANDSTONE, clear, frosted, fine to very coarse subrounded, medium sorted, kaolinitic matrix, hard, good to poor porosity, w/COAL black, hard to firm, pyritic.

CLAYSTONE/SILTSTONE, grey, black, brown, micaceous, pyritic, carbonaceous.

FIT # 2 & # 3

SANDSTONE, clear, white, very coarse to medium grained, sub angular to subrounded, poorly sorted, silica and calcareous cemented, kaolinitic matrix, very hard, fair porosity.

CLAYSTONE/SILTSTONE, grey, red, purple occasionally green and yellow, blocky, fissile, non to slight calcareous, occasionally micro-micaceous.

SANDSTONE, red-white, friable-hard, fine-coarse, moderate to poorly sorted, slightly calcareous, kaolin. matrix, tr mica, poor porosity.

CORES

#1 3736-3764 m. Rec'd 6.51 m (61 %)

SIDEWALL CORES

26 Sidewall cores recovered out of 30 from BRENT and STATFJORD formations.

TESTS

FIT # 1: 3070 – BRENT FM

Sampling Press.	4940 psi
Flowshut in Press.	6150 psi
Final Hydrostatic	6626 psi

RECOVERED 10.2 L Filtrate and FM WATER (11000 p.p.m. NaCl)

FIT # 2: 3727.5 m – STATFJORD FM
Misrun due to seal failure.

FIT # 3: 3726.5 m – STATFJORD FM
Misrun due to tool failure

MOBIL EXPLORATION NORWAY

30/9-B MIDGARD

COORDINATES: LAT. 62°00'00"N LONG. 02°45'00"E

CONTRACTOR: ODECO DRILLING (UK) LTD.

RIG: ODECO JACK - DRILLING TYPE: SEMI SUB

SPUD DATE: 01.01.1900 COMPLETION DATE: 01.01.1900

TOTAL DEPTH: 1000.00 M

MAX DEVIATION: 0.00 DEG. AT 0.00 M

LITHOLOGY SYMBOLS
SANDSTONE
LIMESTONE
DOLOMITE
CHALK
MARL
SHALE
COAL
ANHYDRITE
SALT
CONGLOMERATE
BASALT
TUFF
VOLCANIC ASH
CHERT
PYRITE
GLAUCONITE
CARBONACEOUS MATERIAL
FOSSILS
CORE
SIDEWALL CORE
DRILL STEM TEST
CORE DESCRIPTION
CORE ANALYSIS
DRILL STEM TEST
CORE DESCRIPTION
CORE ANALYSIS
CORE DESCRIPTION
CORE ANALYSIS
DRILL STEM TEST

ROBERTSON RESEARCH INTERNATIONAL LIMITED

SUMMARY LOG: 33/12-6

AREA: NORWEGIAN NORTH SEA SPUD DATE: 2 MARCH 1976

COMPANY: MOBIL EXPLORATION NORWAY INC. COMPLETION DATE: 21 JUNE 1976

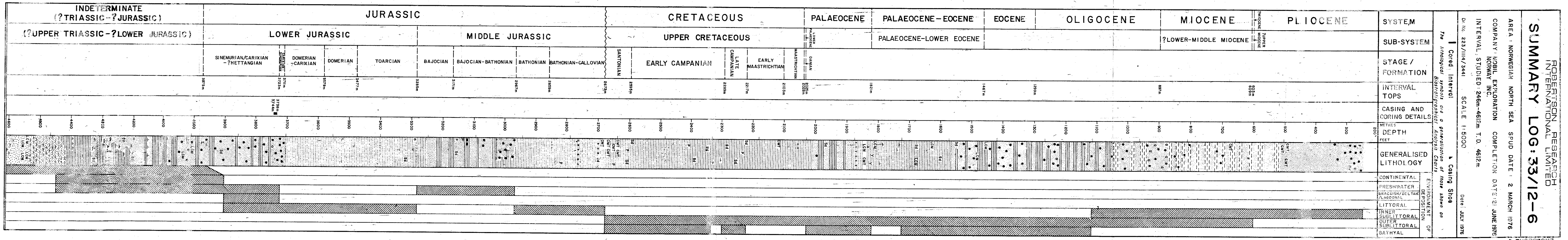
INTERVAL STUDIED: 246m-4612m T.D. 4612m

Dr. No. 223/114/3441 SCALE 1:5000 Date: JULY 1976

Cored Interval

Casing Shoe

The lithological symbols are a generalisation of those shown on Robertson Research Lithologs Charts.



ENCLOSURE 8

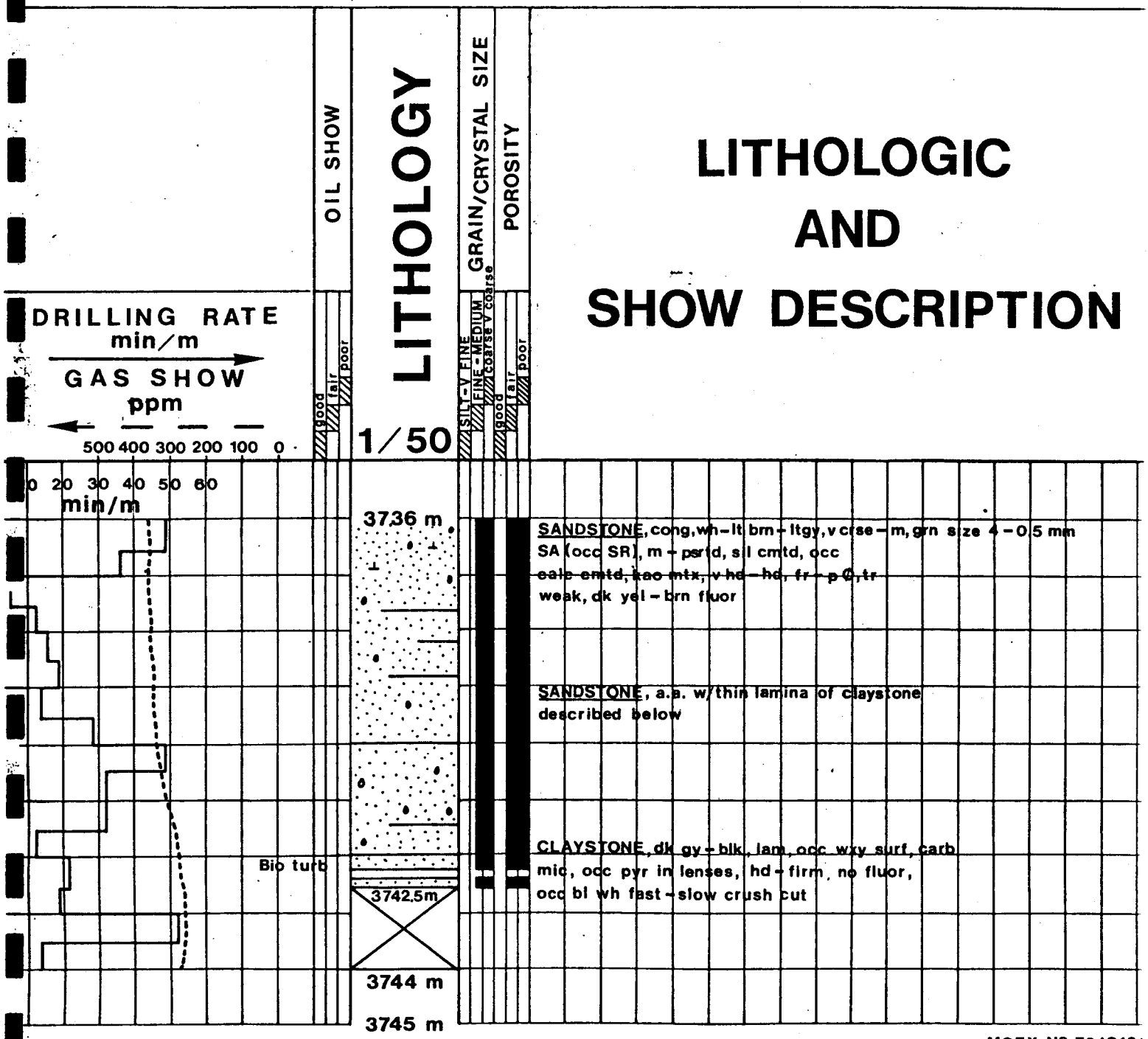
MOBIL EXPLORATION NORWAY INC.

CORE DESCRIPTION LOG

WELL : 33/12 - 6
CORE Nº : 1

INTERVAL : 3736 – 3744 meters
METERS CORED : 8
RECOVERY : 6.51 meters 81 %
TIPS :

BIT Nº & TYPE : 32 CHRS 4c 18
MUD & MUD WT : FCL 12.5
DATE/INITIALS : 9 JUNE 1976 A.



LITHOLOGIC AND SHOW DESCRIPTION

SIDEWALL CORES 33/12-6

DEPTH	DESCRIPTION
4009m	Sandstone, gray, vf-c/g, silty, v. pr srtg, sa, composite grains, pr porosity, silc cmt, kaolin matrix
3944m	Sandstone, gray, f-m/g, c/g composite qtz grains, SA, kaolin matrix, pr porosity
3912m	Sandstone, gray, f/g, kaolin matrix, abundant mica laminae (Biotite and Muscovite) pr porosity
3854m	Sandstone, gray, f-c/g, kaolin matrix, microxln pyrite, composite silc cmtd grains, pr porosity generally friable.
3724m	Sandstone, gray brn, f-c/g, pr srtg, SA-SR, friable, silty, good porosity
3279m	Sandstone, gray, f/g, silty, well srtd, SA, disseminated mica, rare fldsp., coal frag, friable, good porosity
3269m	Sandstone, gray, vf/g, mod srtg, friable, abundant muscovite, common biotite, silty, good porosity
3264m	Sandstone, gray, vf/g, mod srtg, friable, silty abundant muscovite and common biotite, rare feldspar, good porosity
3246m	Siltstone, gray, mod srtg, friable, common muscovite, fair porosity
3242m	Sandstone, gray, vf/g, well srtd, hard, silc cmt, qtz overgrowths, composite qtz grains, fair porosity, rare feldspar
3234m	Sandstone, gray brown, vf/g, sa, well srtd, firm disseminated abundant muscovite and biotite, overgrowths, fair porosity
3223m	Sandstone, gray-white, vf/g, v. silty, laminae of lignite, poor srtg, common muscovite, qtz overgrowths, fair porosity
3217m	Siltstone, gray brn, abundant muscovite and biotite poor porosity
3193m	Siltstone, gray white, sandy, common muscovite fair porosity

DEPTH	DESCRIPTIONS
3189m	Coal, brn black, conchoidal fracture, earthy-vitreous luster
3125m	Siltstone, gray brown, sandy, mod srtg, overgrowths on sand grains, friable, fair porosity
3123m	Siltstone, gray white, sandy, mod srtg, friable, fair porosity
3105.5m	Claystone, dark gray, micromicaceous
3070m	Mudstone, dark gray, v. micaceous, carbonaceous
3060m	Mudstone, dark gray, micaceous, carbonaceous
3011m	Sandstone, gray, f/g, poor srtg, v. silty, carbonaceous, common muscovite, fair porosity
3006.5m	Sandstone, gray white, f/g, v. silty, mod srtg, sa, good porosity
3003m	Sandstone, gray, f/g, silty, mod srtg, sa, good porosity, common muscovite
2993m	Sandstone, gray brn, m/g, poor srtg, silty, sli calc, composite qtz grains w/silc cmt., gd porosity
2985m	Mudstone, black, v. carbonaceous, micaceous, silty
2974m	Siltstone, gray brn, sandy, common muscovite, fair porosity