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MOBIL EXPLORATION NORWAY INC

FINAL WELL REPORT

33/12-2

February, 1975
Stavanger, Norway

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NORWAY OFFSHORE

WILDCAT 33/12-2

WELL DATA

Well Name	33/12-2
Location (Geco Rig Positioning Service)	61° 13' 31.18" N European Datum 01° 51' 25.97" E
Classification	Wildcat
Drilling Period:	
Spuddded:	6 June, 1974
Completed/ Rig Released	25 August, 1974
KB/Elevation	82 feet
Water Depth	484 feet (MSL)
Rig	Norskald
Status	Oil Discovery Plugged and Abandoned
Total Depth	
Planned	15,000 feet
Actual	14,286 feet
Objectives	Middle Jurassic (Brent Fm) and Lower Jurassic (Statfjord Fm) Sandstone Possible Triassic, Permian and Devonian Reservoirs
Cost (M$)	
Planned	6,000
Actual	5,100

INTRODUCTION

The wildcat well, 33/12-2, was spudded on 6 June, 1974, and reached a total depth at 14,286 feet in Triassic sediments. Following wireline logging and drillstem testing, the well was plugged and abandoned as a Statfjord Formation oil discovery.

Primary objective of the well was the Lower Jurassic Statfjord Formation which was known to be productive in Brent Field located about 20 kilometers to the southwest in the U.K. offshore. The Statfjord Formation was water wet in the 33/12-1 and 33/9-1 tests. The 33/12-2 wildcat was located so as to encounter the Statfjord Formation approximately 700 feet high to the 33/12-1 well. The Middle Jurassic Brent Formation was prognosed to be erosionally thin or absent. Triassic, Permian and Devonian reservoirs were secondary possibilities.

The proposed total depth of 15,000 feet was believed to be possibly sufficient to reach Devonian age rocks or "Petroleum Basement". This test was programmed to be one of the three deep tests called for by the License 037 work obligation. At 14,286 feet the drill string twisted off leaving a fish at 13,640 feet. Attempts to remove the fish were unsuccessful so drilling was terminated at that depth.

The structural configuration of the Statfjord Field is a north-northeast trending fault block, tilted to the west and bounded on the east by a major

down-to-the-east fault. Two previous wells found hydrocarbon bearing Brent sands below the regional Late Kimmerian unconformity.

The area of closure for the Statfjord Formation reservoirs, as mapped from seismic data, is in excess of 5500 acres.

RESULTS

As predicted, the Middle Jurassic Brent Formation was thin (52 feet gross) and oil bearing (38 feet net). Exact correlation of the Brent section in the 12-2 well with nearby wells is questionable. Test data similar to that of the 33/12-1 well and "best fit" log correlation indicates that the upper reservoir in the 33/12-2 well is a section of the Brent sand and is in communication with the Brent Formation in the 33/12-1 and 33/9-1 wells.

As in the two previous license 037 wildcat wells, very high gas readings were encountered in the Brent sands below the Late Kimmerian unconformity. Total gas readings in the interval 8160-85 were off scale at greater than 400,000 ppm. Other readings were: ethane 28,500 - 23,370 ppm, propane 23,900 - 14,000 ppm, normal butane 4000 - 1334 and isobutane 12,650 - 7670 ppm. The sands had good brown oil stain, bright yellow fluorescence and blue white flash cut. Schlumberger's CORIBAN log interpretation indicates an average porosity of 25 percent and an average water saturation of 20 percent.

Core No. 1 in the 33/12-2 was taken from 8653 - 8702 feet with 41 feet or 84 percent recovery. The core was cut following a fifteen foot drilling break

which was assumed to be the top of the Statfjord Formation. Lithology of the core was shale. Paleontological data and log correlation show the cored interval to be in the Dunlin Formation.

The Statfjord Formation top was found at -8779 feet subsea which was 329 feet lower than prognosed. The sand was oil bearing through 414 gross feet of section containing 284 feet of net pay sand above an oil/shale contact at -9192 feet subsea. The next sand at -9221 is definitely water bearing from log data. Log analysis indicates an average porosity of 25 percent and an average water saturation of 20 percent. Two conventional cores were taken at the top of the Statfjord Formation. The first core was cut from 8870 - 8919 feet (Kb) with recovery of 31 feet (63%). The second core was cut from 8919 - 39 feet (Kb) with 10 feet recovery (50%). Measured porosities from the cores range from 20 to 30 percent, with an average of 25 percent. Measured permeabilities from the cores range from 200 to as high as 15,000 millidarcies and average about 2,500 millidarcies. The reservoir sands are fine to coarse grained, occasionally conglomeratic, sub-rounded, poorly sorted, intercalated with carbonaceous laminae and contain kaolinite as matrix material. The cores have been stored at Robertson Research in Wales, where they are available for examination.

The Triassic section was encountered at -9216 feet subsea based on log and lithologic correlation. The age of the rocks at total depth (14,286 feet) is Lower Triassic, and 4988 feet of Triassic sediments were penetrated. The total Triassic thickness prognosed at this location was 4,750 feet.

A prominent seismic reflection, the "X" horizon, has been referred to as Permian (?) from regonal control. The reflector appears to correlate with a faunal and lithologic change occuring in the 33/12-2 well at 13,280 feet. Palynological studies have tentatively identified this horizon as Lower Triassic, Upper Buntsandstein in age.

Five drillstem tests were taken in the 33/12-2 well. Three of the tests were taken in the Statfjord Formation, one in a shaly-sand section near the top of the Dunlin Formation and one in the Brent Formation. Results of the tests are summarized on the enclosed composite log and complete results are contained in the "Well History and Completion Report".

Sampling and mud logging were performed by Exploration Logging. Samples were collected at 20 foot intervals from 1660 to 6100 feet and at 10 foot intervals from 6100 feet to total depth. Paleontological samples for analysis by Robertson Research were also collected at the same intervals. The final paleontological report has been distributed. A summary of the results is presented in Table I.

In addition to normal mud logging procedures, shale densities were measured in samples below 5000 feet and the "d" exponent calculated and plotted to detect overpressure zones. These data served as a guide to determine correct mud weights.

Wireline logging was done by Schlumberger. Logging points for the three runs were 5304 feet, 9537 feet, and 13,635 feet (Kb depths). A detailed listing of specific services and log run intervals is shown on Table II and graphically illustrated on the enclosed summary log.

NORTHERN NORTH SEA FORMATION NOMENCLATURE

A number of papers were presented concerning Northern North Sea formation nomenclature at the SPWLA conference in London in October, 1974, and at the London Geological Society conference on Petroleum and the Continental Shelf of Northwest Europe, held in November, 1974.

In the final Geological Report for 33/12-2, we have attempted to follow, with a few modifications, the Jurassic formation nomenclatures outlined in Figure I.

We do not propose that the nomenclature as used in this report be considered final; however, we would consider this a working model for correlative rock stratigraphic units as opposed to the generalized time stratigraphic units which have been previously used.

A stratigraphic committee under the chairmanship of the Norwegian Petroleum Directorate is currently actively preparing recommendations for subsurface stratigraphic terminology. Their proposal will be adopted at the appropriate time.

STRATIGRAPHY

The stratigraphy encountered in 33/12-2 was essentially as predicted although certain horizons were deeper than prognosed. The comparison of the prognosis with actual tops is shown in Figure II.

The Tertiary and Cretaceous section consists predominantly of claystones,

siltstones with minor sands and sandstones. Paleo-environments determined by Robertson Research range from sublittoral through the Miocene to outer sublittoral and bathyal from Oligocene through Cretaceous. Tops within the Tertiary section are determined paleontologically. The Paleocene and Cretaceous tops are based on log correlations and lithologic markers.

The thin section of Lower Cretaceous Berremian age carbonates, found in the 33/12-1 and 33/9-1 wells between the Upper Cretaceous and the Kimmeridgian "Hot Shale" was not paleontological identified by Robertson Research and does not appear on the wire line logs.

Seven feet of "Hot Shale" overlies approximately 50 feet of Brent Formation in the 33/12-2 well. The Brent Formation has been identified with considerable confidence, however, specific zonal designation cannot be assigned at this time. The Brent sandstone section consisted of sandstone, gray to brownish gray, very fine grained, poorly cemented with carbonaceous partings. From lithologic and regional consideration Robertson Research identified the paleoenvironment of deposition as probable deltaic.

Approximately 500 feet of Brent Formation and Dunlin Formation is missing in the 12-2 well. The missing section is probably largely due to erosion, however, dipmeter analysis indicates possible faulting.

The 33/12-2 well penetrated 739 feet of Dunlin Formation. The upper part consists of interbedded dark gray, silty claystones, and brown very fine grained, silty, and occasionally lignitic sandstones. The lower part is composed

predominantly of dark gray, hard, subfissile shales with occasional sand interbeds. Paleontological data suggests an inner sublittoral environment of deposition for the upper part of the Dunlin Formation and deeper water sublittoral conditions in the lower part.

The gross thickness of the Statfjord Formation is 437 feet in the 33/12-2 well. In general, the sand intervals of the formation consist of clean quartz grains that vary from fine to coarse grained, occasionally conglomeratic and contain varying amounts of kaolinite matrix. Lithology of the upper part of the formation, Sinemurian in age, suggests a very shallow water, marginal marine or fluvial environment of deposition. The Hettangian age sediments in the lower part of the formation were deposited in a non-marine fluvial environment.

Nearly 5000 feet of Triassic section were drilled in the 33/12-2 well. Continental deposition is predominant throughout. The section is characterized by fine grained, white to gray, occasionally calcareous cemented sands with poor porosity and red to variegated, soft shales. Locally calcareous siltstones and limestones are abundant.

The Triassic section is sparsely fossiliferous making definitive age assignments difficult. Robertson Research identified a Carnian-? Ladinian (Upper-? Middle Triassic) miospore assemblage in the 11820 - 14280 feet (Kb) interval and based on this has placed the overlying interval from 9390 - 11810 feet (Kb) in the ? Rhaetian -? Carnian (Upper Triassic). Work by a Mobil palynologist carried out while the well was drilling suggested an Upper Buntsandstein age for the

interval from 13,250 to total depth. Robertson Research was not able to verify the Bunter age in their analysis, therefore, Bunter is the maximum age of the sediments at total depth and they may well be only Middle Triassic.

TABLE I

PALEONTOLOGICAL SUMMARY 33/12-2

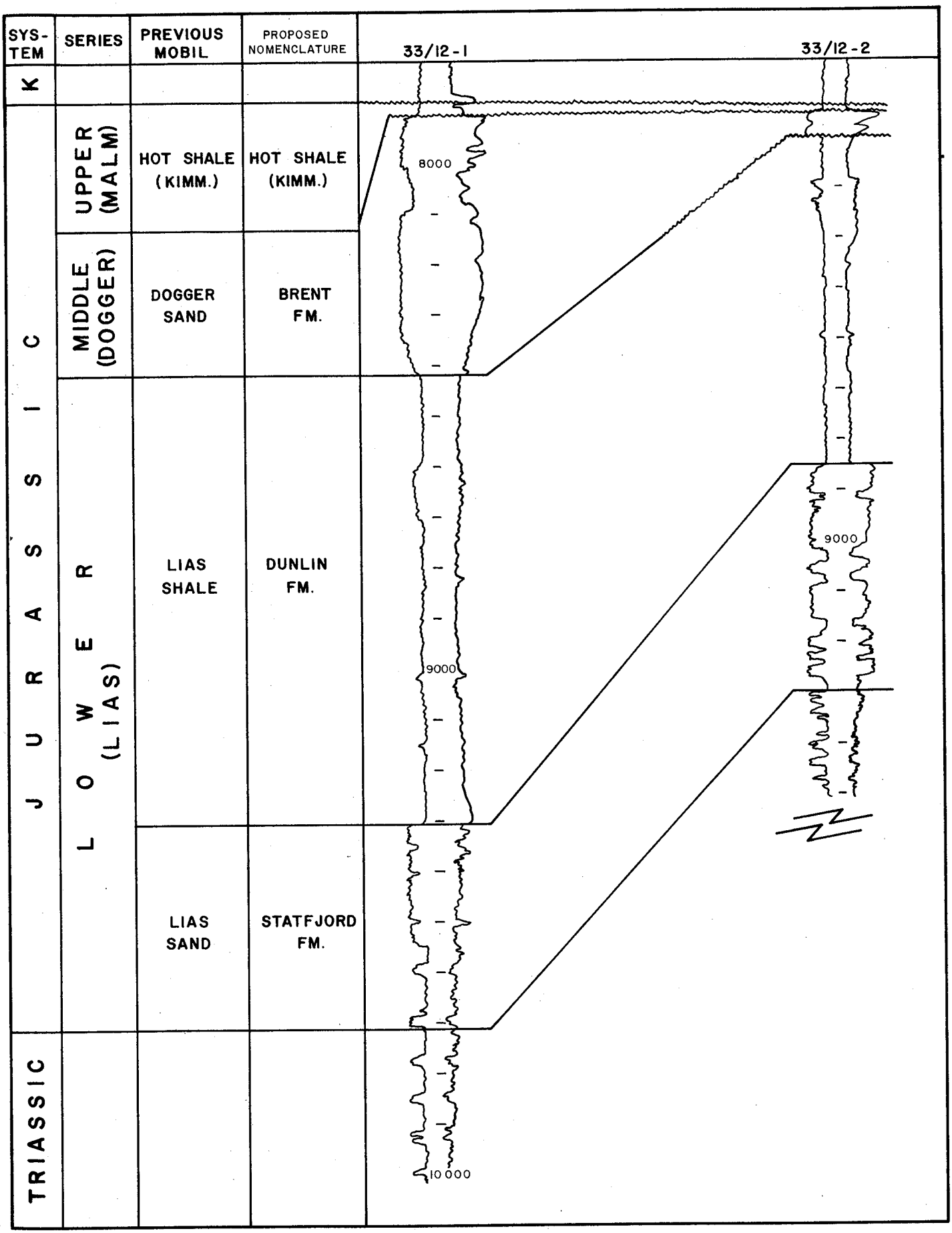
Interval	Thickness	Stage	System/Subsystem
1660' - 1760'	+ 100'	-	Upper Miocene
1780' - 2480'	± 700'	-	Middle Miocene
2500' - 2920'	± 420'	-	Lower Miocene
2940' - 4120'	±1180'	-	Oligocene
4140' - 4380'	± 240'	-	?Eocene
4400' - 4500'	± 100'	-	Eocene
4520' - 5420'	± 900'	-	Lower Eocene-Paleocene
5440' - 6100'	± 660'	-	Paleocene
6120' - 6380'	± 260'	Maastrichtian	Upper Cretaceous
6400' - 6620'	± 220'	Lower Maastrichtian	
6640' - 7940'	±1300'	Campanian	
7960' - 8140'	± 180'	Santonian	
8160'		Kimmeridgian	Upper Jurassic
8160' - 8200'	± 40'	-	Middle Jurassic
8250' - 8330'	± 80'	Toarcian	Lower Jurassic
8350' - 8630'	± 280'	Domerian	
8650' - 8810'	± 160'	Carixian - Upper Sinemurian	
8830' - 9100'	± 270'	Sinemurian	
9120' - 9380'	± 260'	?Hettangian	
9390' -11810'	±2420'	?Rhaetian - ?Carnian	Upper Triassic
11820' -13250'	±1430'	Carnian - ?Ladinian	Upper -?Middle Triassic
13250' -14250'	±1000'	U. Buntsandstein	

TABLE II

WIRELINE LOGGING OPERATIONS

WELL 33/12-2

Log Type	Interval logged, ft.	Date
First Log Run		
IES/SP	1620 - 5304	18 June, 1974
BHC/GR	1620 - 5304	18 June, 1974
Second Log Run		
IES/SP	5240 - 9537	6 July, 1974
BHC/GR	5240 - 9535	6 July, 1974
FDC/CNL/GR	5240 - 9536	7 July, 1974
MLL/ML	8000 - 9536	7 July, 1974
LLD/GR	8000 - 9537	7 July, 1974
HDT	5239 - 9528	7 July, 1974
CBL	1525 - 9541	6 July, 1974
Seismic Ref. Survey	2000 - 9490	7 July, 1974
Third Log Run		
IES/SP	9534 - 13600	8 August, 1974
BHC/GR	9534 - 13600	8 August, 1974
FDC/CNL/GR	9533 - 13600	8 August, 1974
HDT	Various intervals between 9544 - 13600	8 August, 1974
CBL	4000 - 9530	8 August, 1974
Seismic Ref. Survey	9300 - 13530	8 August, 1974



NORTHERN NORTH SEA NOMENCLATURE CHART AND STRATIGRAPHIC SECTION

FIGURE 1

12/74 A.L.C.

WELL 33/12 - 2

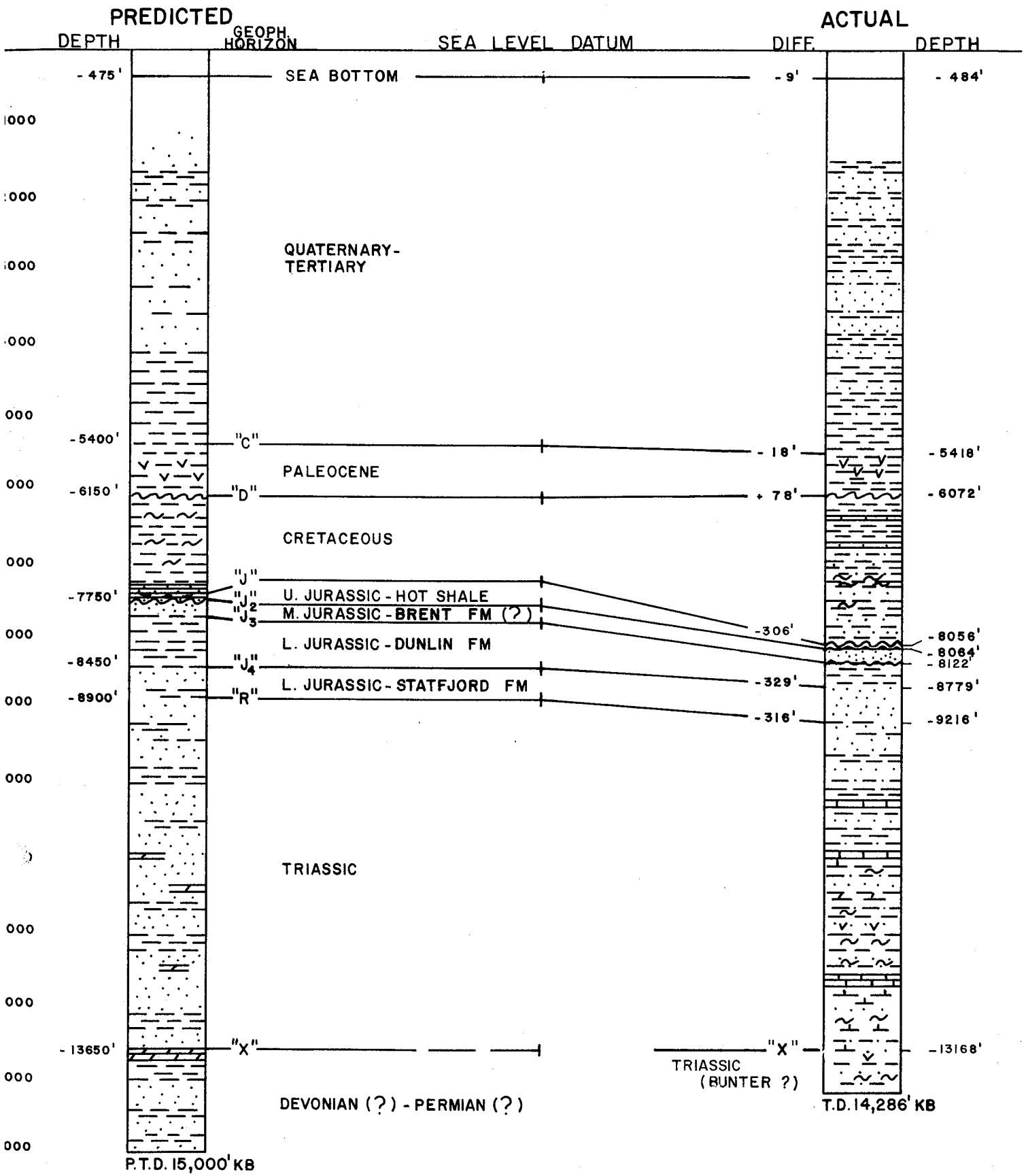


FIGURE : II
ALL DEPTHS ARE SUB SEA.

A. L. C. 1974

SIDEWALL CORES 33/12-2

(Attempted 51 - Recovered 33)

No.	Depth	Recovery	Description
3	13,382	0.5"	Sandst, red, vf/g, silty, pr srtg, SR, pr Ø v. micaceous, loc blk stn, fldsp.
4	13,308	0.5"	AA, sli calc, w/o blk stn.
5	13,304	0.75"	AA.
6	13,300	0.5"	AA.
8	13,292	1.0"	Sandst, red, vf/g, pr srtg, SA, mica, silty, pr Ø.
13	12,785	2.0"	Mudst, red, mica, non calc.
20	12,489	0.75"	Siltst, red, v micaceous.
21	12,378	0.75"	Siltst, gy, micaceous, loc abt, grdg to silty limestone.
22	12,343	0.50"	Siltstone, ltgy-dkgy, laminated-mottled. Highly calc, poss tuffaceous.
31	11,985	0.50"	Shale, red, micaceous.
32	11,890	0.50"	Siltst, red, micaceous, non calc.
33	11,848	0.50"	Siltst, gy-red, v calc, mica.
34	11,690	0.50"	Siltst, gy, w srtd, non calc.
25	11,451	0.50"	Sandst, lt grn, f/g, silty, micaceous, fldsp, v calc, fr Ø.
26	11,447	1.25"	Sandst, lt grn, f-m/g, micaceous, fldsp, pr srtg, grn lith frag, fr Ø.
36	11,443	0.50"	Sandst, lt grn, f-m/g occl c/g, silty, fldsp, mica, non calc, grn lith frag, fr Ø.
37	11,434	1.00"	Sandst, lt grn, vf-f/g, silt, abnt mica, fldsp, tourmaline frag, fr Ø.
38	11,425	0.75"	Sandst, lt grn, f/g, silty, fldsp, mica, grn lith frag, AA.
39	11,416	1.00"	Mudst, red, v micaceous.

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No.	Depth	Recovery	Description
40	11,294	0.50"	Siltst, red gy, arg, v micaceous, blk lith frag.
28	11,290	1.00"	Mudst, red, non calc, v micaceous.
41	11,286	1.00"	Siltst, grn gy, v micaceous, calc.
29	11,282	0.50"	Siltst, gy, micaceous, abnt blk mica(?) grains, sli calc.
42	11,280	0.50"	Siltst, grnsh gy, v mica, calc.
43	11,276	0.50"	Siltst, gnsh gy, micaceous, calc.
30	11,196	1.00"	Shale, red, micaceous.
44	11,190	0.75"	Mudst, red, v micaceous.
45	11,166	0.50"	Sandst, lt grn, vf/g, v silty, v micaceous, pr Ø.
46	11,099	1.00"	Siltst, lt grn, v micaceous, sli calc.
48	11,079	0.50"	Siltst, gy, micaceous.
49	11,069	0.75"	Shale, red, abnt mica.
50	11,054	0.75"	Sandst, lt grn, vf/g, silty, mica, tr fldsp, fr Ø.
51	10,903	0.50"	Siltst, grn gy, v micaceous, blk laminae.

HRT/jg