Mobil

FINAL GEOLOGICAL SUMMARY 33/9–10

MOBIL EXPLORATION NORWAY INC.
SEPTEMBER 1978

MOBIL EXPLORATION NORWAY INC.
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FINAL GEOLOGICAL SUMMARY

33/9-10

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NORWAY OFFSHORE

LICENSE 037

WILDCAT WELL 33/9-10

WELL DATA

WELL NAME:	33/9-10
LOCATION:	61°28' 00.21" N 01°46' 29.63" E
CLASSIFICATION:	WILDCAT
DRILLING PERIOD:	
SPUDDED:	7 APRIL 1978
COMPLETED DRILLING:	1 JUNE 1978
RIG RELEASED:	13 JUNE 1978
KB ELEVATION:	25.5 m
WATER DEPTH:	162 m
RIG:	"FERNSTAR"
STATUS:	PLUGGED AND ABANDONED AS DRY
TOTAL DEPTH:	
PLANNED:	3695 m (kb)
ACTUAL:	3715m(kb), VERTICAL DEPTH IS 3693.4 m(kb)
OBJECTIVE:	MIDDLE & LOWER JURASSIC SANDS.
COST ($)	
PLANNED:	6,855,000
ACTUAL:	4,470,280 (July 30, 1978)
	1,341,084 - MOBIL SHARE (30%)

INTRODUCTION

Wildcat well 33/9-10 was drilled to test the 33/9-Zeta prospect in the northwestern part of License 037. The Middle Jurassic Brent sand was the primary objective with the Lower Jurassic Statfjord sand as a secondary objective.

The 33/9-Zeta prospect was seismically defined by the "J" reflector, (representing the Kimmerian Unconformity surface) and the Near Top Statfjord reflector. Seismic depth maps were made on these two horizons.

The Top "J" seismic reflector was good within the Zeta area, but the character of the Near Top Statfjord reflector was poor. At Near Top Statfjord, the Zeta structure was mapped as several north-to-northwest dipping fault blocks.

However, since the structure is bounded on all sides by faults, the Top Statfjord reflector could not be tied with confidence across the bounding faults from the adjacent areas where it was controlled by wells.

The Top Brent structure map was constructed by subtracting 280 meters (140 meters of Lower Jurassic Dunlin and 140 meters of Middle Jurassic Brent Formation) from the Near Top Statfjord Seismic depth map. The well was programmed for a total depth of 3695m, which was interpreted to be 30m into the Statfjord Formation.

RESULTS AND ANALYSIS

The 33/9-10 wildcat was spudded on 7 April 1978. It was abandoned dry on 13 June 1978 at a total depth of 3715m in probably-Triassic sediments. A total of 69 days were spent on location.

The primary objective Brent Formation was water bearing. No shows were seen in the ditch samples. One core was cut from 3358 to 3376m. Very poor shows were observed in the core, but electric logs and Schlumberger Coriband analysis indicated the Brent Formation to be water-wet and the shows in the core are explained by flushing of the core with diesel and protectomagic mud.

Core porosity averaged 16.7 per cent (ranging up to 22 per cent) and liquid permeability averaged 40 millidarcies (ranging up to 370 millidarcies). No residual oil was measured in the coreplugs.

In the secondary objective Statfjord Formation no shows were seen in the samples and electric log analysis confirmed the Statfjord Formation to be water-wet. Total depth was reached 215m below the top of the Statfjord Formation in probably-Triassic sediments.

Schlumberger's coriband analysis gave the following results:

> The Brent Formation, 67.5m thick, had 37.1m of net sand with a porosity greater than 12 per cent and clay volume less than 40 per cent. Average porosity in the net sand was 16.4 per cent.

The Statfjord Formation was interpreted to be 37.5m thick, though correlation with the type well for the North Sea Stratigraphic Nomenclature Report, well 33/12-2, located 28km SSW, suggests the Statfjord Formation could be 80m thicker. Stratigraphic criteria for the base Statfjord - top Triassic pick are very questionable in this area.

Of the 37.5m thick Statfjord Formation, electric log analysis showed 22.6m net sand averaging 16 per cent porosity. The well data is summarized on the well Record Sheet (Attachment 1).

STRATIGRAPHY/STRUCTURE

The thin Jurassic Brent sand and Dunlin shale were the significant variations from the expected stratigraphic sequence. See Attachment 2.

(Tertiary)

The Tertiary was dominated by gray clays and claystones. Sands, silts and carbonates were only minor occurrences except for Miocene sands in the interval 975-1091m. In the Paleocene Balder Formation typical tuffaceous grey and red claystones were present and were also observed above and below the Balder. Detailed descriptions of the section drilled in 33/9-10 are presented in the Lithologic Log, previously submitted.

(Cretaceous)

The Upper Cretaceous Shetland Group was comprised of gray and brown claystones and siltstones with only minor sands and carbonates. In this area of the North Sea an unconformity exists between the Upper and Lower

Cretaceous. Only the wellsite paleontological report is now available and the unconformity has not been confirmed. The Final Paleontological Report will be submitted when received from Robertson Research. The electric log pick of the top of the Lower Cretaceous Cromer Knoll Group is at 3113m, the Lower Cretaceous being 146.8m thick.

Lithologically, the Lower Cretaceous consists of 20.3m of Barremian limestone at the base with red marl interbedded with the overlying claystone section.

(Jurassic)

The Upper Jurassic Humber Group was topped at 3259.8m, 15.7m high to prognosis. The thickness was 88.2m out of which the upper 69.2m was the Kimmeridge Clay Formation and the lower 19m was the Heather Formation. The lithology of the Humber Group is grey to dark grey, silty claystone.

The Brent Formation was found at 3348m, 37.5m high to prognosis. The sandstone was argillaceous, medium grained, and had fair to poor porosity. Of the expected 140m of Brent Formation, only 67.5m was found. This section correlates with the Rannoch (Lower Brent) Member in near-by wells. Attachment 3 shows correlation of the Jurassic into U.K. waters and gives also a presentation of the new Jurassic nomenclature.

The top Dunlin Formation at 3415.5m was 110m high to prognosis. The Dunlin Formation was 84.5m thick versus the prognosed 140m. Like the Brent Formation, only the lower section of the Dunlin Formation was present. The Drake member and part of the Cook Member are absent.

The Statfjord Formation was topped at 3500m, 165.5m high to prognosis. The Statfjord sands were tight with calcareous cement. The well was drilled to 3715m to reach the progammed 3695m vertical total depth in order to reach and identify the seismic reflector originally mapped as the Near Top Statfjord event. From 3635m to TD there are a total of 20m of very calcareous sandstone stringers that appear to account for this reflector.

The 33/9-10 well drilled more of probably-Upper Triassic sediments than any of the few other wells in the area. In most of the near-by wells only about 30m of the Statfjord was drilled to prove the Statfjord sands to be water-wet. The 33/9-10 well, therefore, gave additional stratigraphic information for and below the Statfjord Formation. For further information see the Final Composite Log and the Summary Log, Enclosures 1 and 2 respectively.

SUMMARY AND CONCLUSIONS

33/9-10 found both the primary objective Brent Formation and the secondary objective Statfjord Formation to be water bearing.

The Jurassic, prognosed to be at least 420m, was found to be only 277.7m thick.

Any possible reserves remaining updip to the well in the Zeta prospect would be too small to be commercial by themselves.

Failure of the Zeta prospect to trap oil can be explained by nonsealing faults to the west and to the south for both Jurassic sands. Correlation of the Near Top Statfjord seismic event from one fault block to another is always a potential source of error. At Zeta, the Statfjord coming in so high to prognosis has, in effect, increased the throw on the fault which bounds the structure on the east, where the Statfjord event on the downthrown side is tied to the 33/9-6 and 33/9-8 wells. Similarly, the throw on the fault which bounds the structure on the west and southwest has been diminished since the Statfjord event on the upthrown side is tied to the 211/19-6 well and the Murchison Field. This diminished throw has destroyed the integrity of the trap.

Also a question arises whether hydrocarbon migration has occurred through the Zeta fault block complex at all. The coreplugs from other dry wells, drilled with same mud weight and from same depth, have carried residual oil up to 13 per cent. The possible implications of the absence of residual oil in 33/9-10 are not yet understood.

AL/RLW:sb

Mobil MOBIL EXPLORATION NORWAY INC.

WELL NAME: 33/9-10

well record sheet

COMPANY: MOBIL EXPLORATION NORWAY	STATUS: DRY HOLE, PLUGGED & ABANDONED
AREA/BLOCK 33/9 Norway	RIG & PICK UP DATE: FERNSTAR, 6 APRIL 1978
LATITUDE: 61° 28' 00.21" N	SPUDDED: 7 APRIL 1978 / REACHED T.D.: June 1978
LONGITUDE: 01° 46' 29.63" E	RIG RELEASE DATE: 13 JUNE 1978
CLASSIFICATION: WILDCAT	RIG MONTHS: 2.25 / TRADE DATA:
K.B.: 25.5m(84') / AGE OR FM. AT T.D: U. Triassic ?	WATER DEPTH: 162m/531'
T.D.: 3715m(12188') / CASING: 30" at 264m, 20" at 499.5m, 13 3/8" at 1321m, 9 5/8" at 1858m	

LOGS: ISF/SONIC 246-3700m, FDL/CNL 1858-3700m, DLL/MSFL 3230-3700m, HDT 1858-3700m

16 check shots 300-3690m

STRATIGRAPHIC TOPS

UNIT	K.B. DEPTH		SUBSEA DEPTH		THICKNESS	
	METERS	FEET	METERS	FEET	METERS	FEET
TERTIARY						
ROGALAND GROUP (PALEOCENE)	1666.2	5466.5	-1640.7	-5382.5	228.2	749
BALDER FORMATION	1666.2	5466.5	-1640.7	-5382.5	98.8	324
LISTA FORMATION	1765.0	5790.6	-1739.5	-5706.6	129.4	424
SHETLAND GROUP (U. CRETACEOUS)	1894.4	6215.1	-1868.9	-6131.1	1218.6	3998
CROMER KNOLL GROUP (L. CRETACEOUS)	3113.0	10213.1	-3087.5	-10129.1	146.8	482
BARREMIAN LIMESTONE UNIT	3239.5	10628.2	-3214.0	-10544.2	20.3	67
HUMBER GROUP (U./M. JURASSIC)	3259.8	10694.8	-3234.3	-10610.8	88.2	289
KIMMERIDGE CLAY FM. (U. JURASSIC)	3259.8	10694.8	-3234.3	-10610.8	69.2	227
HEATHER FM. (M./U. JURASSIC)	3329.0	10921.8	-3303.5	-10837.8	19.0	62
BRENT FM. (M. JURASSIC)	3348.0	10984.1	-3322.5	-10900.1	67.5	221
TARBERT MEMBER)						
NESS MEMBER) Undiff						
) U/M Brent	3348.0	10984.1	-3322.5	-10900.1	32.4	106
ETIVE MEMBER)						
RANNOCH MEMBER	3380.4	11090.4	-3354.9	-11006.4	35.1	115
Base Reservoir Sands	3415.5	11205.6	-3390.0	-11121.6		
BROOM MEMBER	Absent	-	-	-	-	-
DUNLIN FM. (L. JURASSIC)	3415.5	11205.6	-3390.0	-11121.6	84.5	277
DRAKE MEMBER	Absent	-	-	-	-	-
COOK MEMBER	3415.5	11205.6	-3390.0	-11121.6	32.5	107
BURTON MEMBER	3448.0	11312.2	-3422.5	-11228.2	22.0	72
AMUNDSEN MEMBER	3470.0	11385.4	-3444.5	-11301.4	30.0	98
STATFJORD FM. (L. JURASSIC/U. TRIASSIC)	3500.0	11482.8	-3474.5	-11398.8	37.5	123
NANSEN MEMBER	3500.0	11482.8	-3474.5	-11398.8	37.5	123
Calc. Ss Unit	3500.0	11482.8	-3474.5	-11398.8	37.5	123
EIRIKSSON MEMBER	Absent?	-	-	-	-	-
RAUDE MEMBER	Absent?	-	-	-	-	-
BASE STATFJORD FORMATION	?3537.5	11605.8	- 3512.0	-11521.8		
CORMORANT FORMATION (U.TRIASSIC)	?3537.5	11605.8	- 3512.0	-11521.8	177.5+	582+
TOTAL DEPTH (FORMATION:)	3715.0	12188.2	- 3689.5	-12104.2		

ADDITIONAL INFORMATION: CORE 1. Cut from 3358-3376m (18m) 100% recovery. Average core porosity: 16.7%. Permeability averages 40md, ranging from 0.15 to 370md. Coriband analysis of Brent Formation: Gross sand 67.5m, 37.1m net sand having less than 40% clay content and greater than 12% porosity. Average net sand porosity: 16.4%. Net Sand average water saturation Sw-100%. E-log analysis at Statfjord Fm: Gross Sand 37.5m, Net Sand 22.6m. Average Net Sand porosity 16%. Avg. Net Sand Sw=100%.

NOTE: ALL LOG TOPS PICKED ON/OR CORRELATED TO THE IES OR ISF/SONIC LOG UNLESS OTHERWISE NOTED.

MOEX N 75-1

Attachment 1

* From L. Cretaceous to T.D. well deviation increases from 10° to 20°. Drilled T.D. is 3715m kb depth true vertical depth is 3693.4m. All listed tops are drilled depths.

PALEONTOLOGY / PALYNOLOGY

WELLSITE PALEONTOLOGICAL BREAKDOWN

(FINAL PALEO REPORT WILL BE SUBMITTED LATER).

INTERVAL(meters)	STAGE/AGE	SYSTEM/SERIES
2990 - 3125	Early Campanian/Santonian	Upper Cretaceous
3125 - 3257	Cenomanian/Albian	Upper/Lower Cretaceous
3257 - 3263	Barremian	Lower Cretaceous
3263 - 3302	Volgian - Kimmeridgian ?	Upper Jurassic
3302 - 3338	Kimmeridgian	—"—
3338 - 3358	Oxfordian	—"—
3358 - 3416	Bathonian	Middle Jurassic
3416 - 3452		Lower Jurassic
3452 - 3488	Carixian-Domerian	Lower Jurassic

TEST DATA (INDICATE IF DST, PT, OR FIT) (TIMES IN MINUTES, PRESSURE IN P.S.I.)

NO.	INTERVAL	TOTAL FLOW PERIOD	RECOVERY AND REMARKS	MAX. PRESSURE		
				FFP	FSIP	HH
			no tests			

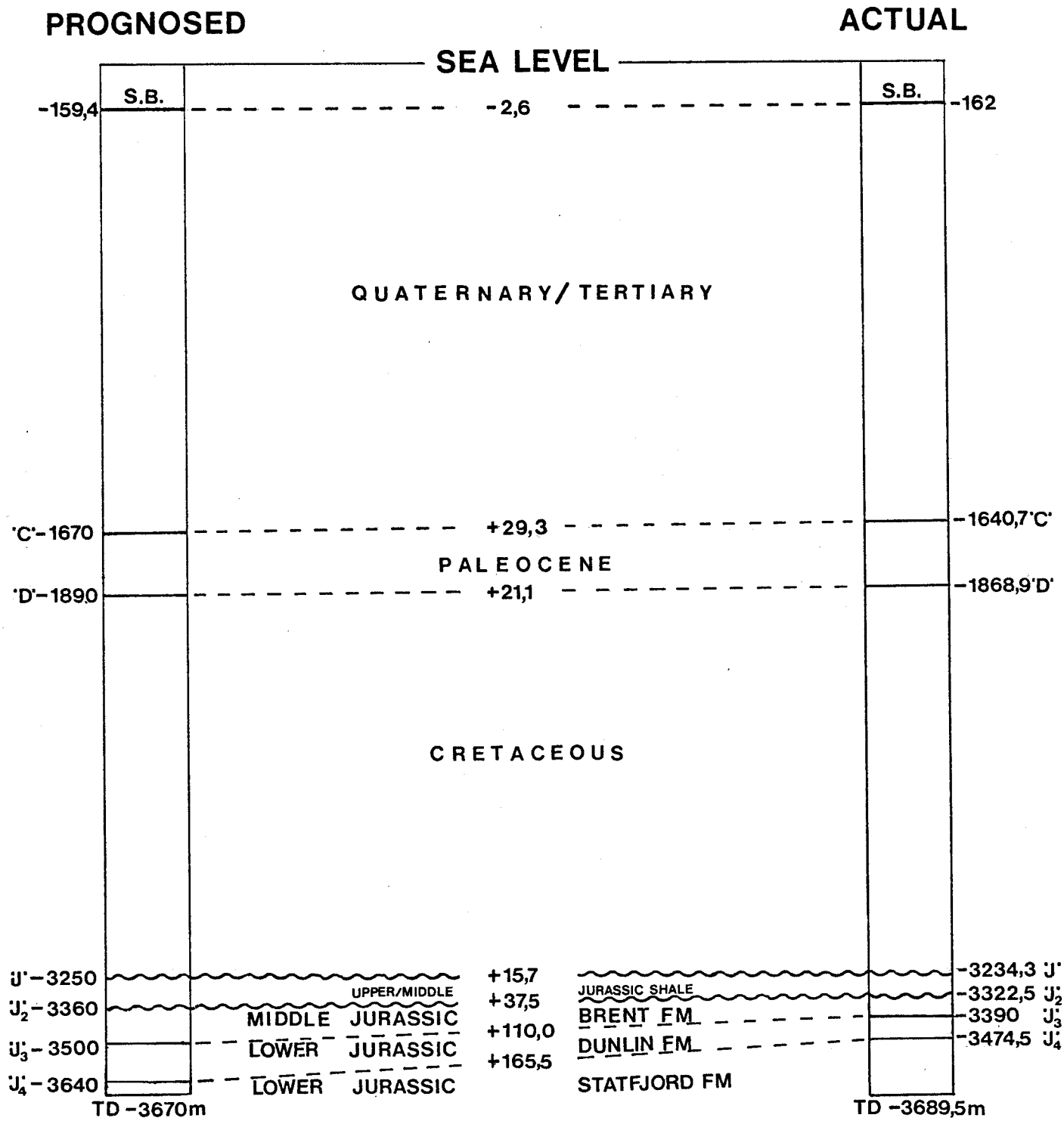
ABBREVIATIONS:

NP	NOT PRESENT	ER	ERODED	SL	SONIC LOG
NL	NOT LOGGED	F	FAULTED	DL	DENSITY LOG
NR	NOT REACHED	GR	GAMMA RAY LOG	NL	NEUTRON LOG
		PT	PALEO TOP	ST	SAMPLE TOP
				SD	SCOUT DATA

BY: A. Linjordet

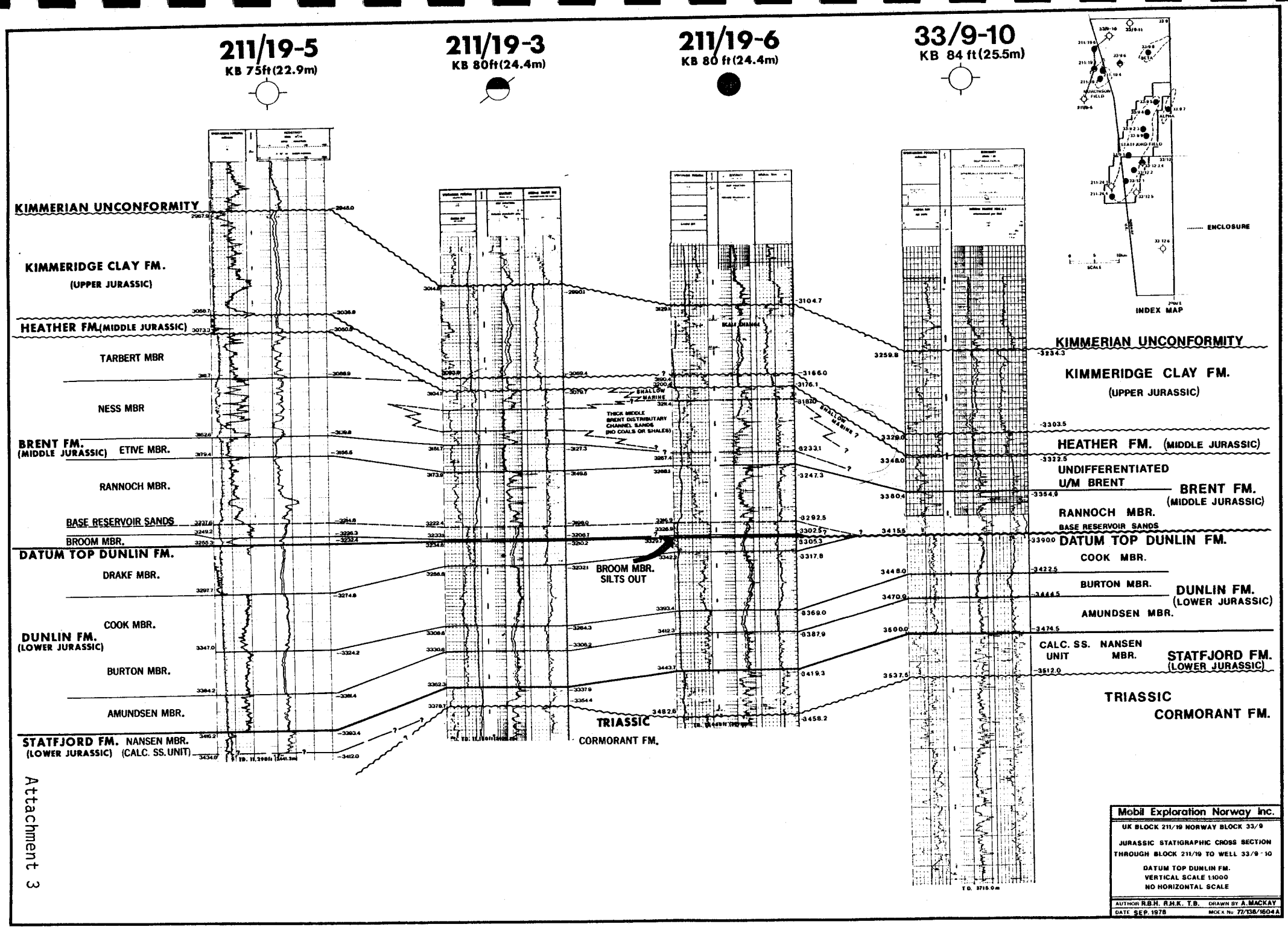
DATE: 11 August 1978 REVISED:

WELL 33/9-10 PROGNOSIS VS ACTUAL DEPTHS



ALL DEPTHS IN METER SUBSEA
VERTICAL SCALE: 1:20000
NE 6/78

Attachment 2



Attachment 3

MOBIL EXPLORATION NORWAY INC.

25/11-16

FINAL COMPOSITE LOG

LOCATION: LAT. 58°26'24.24" N
LONG. 02°27'00.00" E
NORTHING: 6479.6 m
EASTING: 0.0 m
COMPLETED: 21-JUN-1978

TD: 1750.0 m
ELEVATION: KB: 25.0 m
WATER DEPTH: 70.0 m
RIG: SEDCO 703
DRILL FLOOR ELEVATION: 25.0 m
WATER DEPTH: 70.0 m

DRILL STATION: 25/11-16

CASING SHOES		CORE DATA	
30" CONDUCTOR	100.0 m	CORE NO.	INTERVAL
20" CASING	1750.0 m	NO CORES	
13 3/8" CASING	1750.0 m		
9 5/8" CASING	1750.0 m		
7" CASING	1750.0 m		
5" LINER	1750.0 m		
3 1/2" LINER	1750.0 m		
2 7/8" LINER	1750.0 m		
2 3/8" LINER	1750.0 m		

DATE		DATE	
21-JUN-1978		21-JUN-1978	
DRILL BIT		DRILL BIT	
17 1/2"		17 1/2"	
DRILL BIT		DRILL BIT	
17 1/2"		17 1/2"	
DRILL BIT		DRILL BIT	
17 1/2"		17 1/2"	