INTRODUCTION

Permit D. R56 CL is situated in Italian waters in the Southern Adriatic Basin. The license is held by the following group of companies.

Cluff (Operator)	22.78%
PetroCanada	27.78%
Norcen International	22.22%
Canada Northwest Italiana	22.22%
Scarboro Resources	5.00%

Farmkey Investments have a 2½% carried royalty interest.

Figure 1 shows the location of the licensed block.

The license area is 600 sq.kms., awarded to the group on 3rd September, 1980 and gazetted on 31st October, 1980. The work programme is as follows:

(i) Purchase available seismic, reprocess and interpret it.

(ii) Acquire 100kms. of new seismic within the first year of the license, process and interpret it.

(iii) Drill one well into the Lower Cretaceous to a depth of between 2700m. to 3000m., to spud by 31st October, 1983.

Items (i) and (ii) of this programme have been carried out.

GEOLOGY

Introduction

The permit, offshore Brindisi, lies within a transition zone between the Apulia platform and the deeper Southern Adriatic basin.

Information regarding the likely reservoir rocks in the permit is derived mostly from seismic stratigraphy studies. Some information can be gained from the onshore sequence immediately west of the permit regarding lithologies for deeper Cretaceous/Jurassic carbonates. The bulk of the geological input is derived from scouted data from surrounding wells and regional geology related to the position of the block.

General Geological History

During the Triassic, the area was covered by a large deep-sea basin (trending northwest to southeast) and formed an area of deposition of evaporitic dolomite, black shales, anhydrite and salt. This basin was surrounded by open shallow marine platform.

During the Middle Jurassic a system of regional normal faults developed; by the end of the Cretaceous, the average vertical displacement of these faults was approximately 2000 metres. Maximum displacement and subsidence occurred along the Apulian Platform axis where 4400m. of Cretaceous sediments occur.

Thus, a NW-SE elongated belt of basinal sediments was deposited during the Cretaceous, including cherty limestones (argillaceous at times) and marls. These basinal facies were bordered by platform facies including shelf dolomite and limestone, with clastic carbonates of a low energy environment. The border between the two facies is marked by a strip of transitional sediments with detrital and oolitic limestone and reef growth.

The platform facies and transition zone still existed in the Eocene-Palaeocene, however most of this depositional sequence has been eroded. From presently available little knowledge of surrounding wells, it is anticipated that little Palaeogene rocks will be encountered, with Miocene probably resting on Cretaceous.

The Miocene sequence is again expected to be transitional with the absence of Lower Middle Miocene in Apulia, attributed to erosion. Argillaceous limestone and marl probably make up the Miocene sedimentary sequence in this permit.

The Upper Miocene (Messinian) deposits rest upon these marls. Regionally these are evaporitic, but locally they are expected to be predominantly marls. A major unconformity follows this depositional sequence; several hundred metres of prograding Plio-Quaternary sediments complete the depositional picture.

Petroleum Geology

Source Rocks

Black shales occur in the Triassic evaporite sequence in the region and are also found in the Aptian-Albian, and Turonian intervals. Dark shales in Triassic evaporites in Foresta Umbra-1 contain 4-9% organic carbon. The Eastern margin of the Southern Adriatic Basin has fields producing Miocene-sourced oil.

The seismically-derived picture of a Cretaceous starved basin is strongly supportive of the local development of a basinal source rock sequence at a depth of burial sufficient to provide hydrocarbon generation and expulsion, aided by the known high heat-flow rates of the Southern Adriatic.

Reservoir Rocks

The permit lies in a transition zone and the environment of deposition afforded by the horst block is ideal for reef growth during the Cretaceous. Porous reefs have been encountered on the Gargano Peninsula and in the Jolly-1 well. The reef identified on the seismic data is clearly consistent with the regional pattern and must represent the prime reservoir in the block.

The identification of a reef on the seismic data and the geological history of the area indicate that the presence of reefal limestones as a reservoir is likely.

Other carbonate reservoir horizons may be present in the deeper Jurassic and in the Upper Cretaceous-Palaeogene (Scaglia) interval.

Cap Rocks

Argillaceous sediments within the Scaglia sequence and the overlying Miocene. In addition, lateral seal updip of the reef prospect is provided by lagoonal facies micritic limestones.

Surrounding Wells

See Location Map (figure 1).

Imago 1 (Agip/Shell)

Dry hole.

Depth	Age	Lithology
167-600	QUATERNARY	Calcareous shale, traces pyrite and lignite.
600-663	UPPER-MIDDLE PLIOCENE	Shaly marl and marly limestone.
663-822	APTIAN-ALBIAN	Recrystallized packstone, rare wackestone & grainstone.

Jolly-1 (Agip/Union Texas)

Discovered water-bearing reefs in the Lower Cretaceous.

Rovesti-1 (Agip) W.D. 957m., T.D. 3347m.

Oil discovery. Reservoir reported as Upper-Middle Cretaceous in age (Scaglia Formation).
Top Carbonate 2358m. (Palaeocene).
Upper Cretaceous 2374m.
Base Oil shows 2550m.
Recovered 60 bbls 27° API, testing unsuccessful for mechanical reasons.
Primary porosity 3-4% and fractures.

Aquila-1 W.D. 827m., T.D. 4246m.

Oil discovery. Top Carbonate (Palaeocene/U. Cretaceous) 3828m.
O.W.C. 3990m. (72m. pay zone).
DST - 3000 BOPD, ¾" choke, 35.37° API.
Primary porosity 7-10%.

Falco-1 T.D. 2820m.

Oil and gas discovery in Lower Pliocene and Upper Miocene Clastics and Cretaceous Carbonates.
Porosity in Upper Cretaceous (reported as 17%).

GEOPHYSICS

Data available:

Airgun survey (DR-lines) recorded by G.S.I. in 1969., reprocessed in 1981 - (DPTS) and partially reprocessed in 1982 (CGG).

Vaporchoc survey (81 CLA-lines) recorded and processed in 1981 (CGG), partially reprocessed in 1982 (CGG).

The available data forms a grid approximately 2km. x 3km. over the prospective zone, but coarser over the remainder of the block. Data from both surveys has been reprocessed during 1982 to specifically highlight the prospects outlined in this report.

As can be seen on figures 8 and 9, four horizons have been mapped as follows:

Base Plio-Quaternary (Top Messinian)
Intra-Miocene Unconformity
Top Scaglia
Top Jurassic

Well control for these horizons is based largely on scouted information. Consequently, the resulting interpretation is based mainly on seismic character and stratigraphic considerations, and is consistent with regional tectonics and depositional history.

Results of Seismic Mapping (Figures 3 to 7)

Regional dip within the mapped area was from north to south at the three lower mapped levels. All four horizons mapped show east-west trending elongate structural closure over a region corresponding the the outer edge of the shelf, the closed area increasing with age of formation. In addition a substantial seismic anomaly was clearly detected within the Cretaceous interval over the shelf zone at its point of maximum elevation in an east-west direction. The top of this anomaly, and its thickness, have also both been mapped. The extent of the anomaly can be clearly seen on figures 8 and 9, coloured yellow.

An analysis of the seismic properties of the anomaly indicates a very high probability of the anomaly being a carbonate (reefal) build-up. Rudist reefs are common in the Cretaceous in the intermediate zone having been proved for example in the Gargano Peninsula and in the Jolly-1 well to the north.

The seismic characteristics leading to this conclusion are as follows:

(i) Lack of internal reflection, and termination of external reflections at edge of anomaly.
(ii) Localised strong hummocky reflector at top of anomaly.
(iii) Seismic interval velocity of about 4000 m/s.
(iv) Palaeogeographical location at edge of shelf in sheltered back basin.
(v) Drape and settlement faulting in overlying sediments.

From other considerations it is clear that this anomaly could not be either volcanic or allochthonous in origin.

Structure

Figure 2 shows the deduced Cretaceous-to-Miocene structural elements of the area in the vicinity of the block, most of which lies in a depositional environment between the Apulian Platform facies to the south and the deep basin facies to the north. Within this intermediate environment, certain localised positive and negative features are apparent. From the south these are:

1. Apulian Platform : outside the block to the south.
2. Moderately deep back-basin: situated in the south of the block.
3. Shelf : occupying the centre of the block.
4. Horst : in the northern part of the block.
5. Deep Basin : which is situated to the north of the block. Within this deep basin, a second east-west elongate ridge can be observed, less positive than the horst (4). This has been drilled by Rovesti-1, which discovered oil within the Cretaceous.

Depositional Model

Seismic stratigraphy and structural considerations lead to the following conclusions on depositional history regarding hydrocarbon potential.

1. Triassic evaporites, with widely distributed organic matter, probably underlie the prospect area at sufficient depth and in sufficient volume to generate oil.

2. Jurassic block-faulted dolomites floor the Cretaceous basin, showing a substantial mapped closure area in the centre of the block, and providing a possible reservoir unit.

3. Cretaceous sedimentation follows a classic inclined-ramp regresive carbonate platform pattern with a thick shelf-edge reef, bounded to the north by micritic lagoonal platform deposits, and to the south by 'starved' basinal deposits, mostly dark shales, basinal carbonates and evaporites with high organic content. This forms a source-migration-reservoir relationship of very considerable potential.

4. Upper Cretaceous to Palaoegene (Scaglia Formation) expected to consist of deeper water transgressive calcarenites and interbedded shales and marls.

5. Miocene shales and marls, culminating in a Messinian evaporite or marly sequence.

6. Plio-Quaternary claystone deposits.

RESERVES

Reserve calculations for the three potential reservoir levels are shown on the second plat. These can be summarized as:

Cretaceous Reef : 650 MMBBL oil.
Scaglia Calcarenites : 53 MMBBL oil.
Jurassic Dolomites : 20 MMBBL oil.

LICENCE D. R56. CL

AWARD DATE : 31 OCTOBER 1980

AREA : 600 SQ km

INTERESTS :

CLUFF 22.78%

PETROCANADA 27.78%

NORCEN 22.22%

CANADA NORTHWEST 22.22%

SCARBORO 5.00%

FARMKEY INVESTMENTS HAVE 2.5% CARRIED ROYALTY

OUTSTANDING WORK PROGRAMME :

DRILL ONE WELL TO 2700 m TO SPUD BY 31 OCT 1983

BRINDISI MARE PROSPECT

STRUCTURAL CLOSURE AT TOP SCAGLIA

AREA : 9.4 sq km

CLOSURE HEIGHT : 136m

ASSUMED NET/GROSS : 0.30

POROSITY : 17.5%

SW : 35%

1/FVF : 0.9

RECOVERY : 40%

RECOVERABLE RESERVES : 53 MMBBL OIL

STRUCTURAL CLOSURE AT TOP JURASSIC

AREA : 11.4 sq km

CLOSURE HEIGHT : 240m

ASSUMED NET GROSS : 0.10

POROSITY : 12.5%

SW : 35%

1/FVF : 0.85

RECOVERY : 30%

RECOVERABLE RESERVES : 20 MMBBL OIL

CRETACEOUS STRATIGRAPHIC (REEF) TRAP

AREA : 58.1 sq km

MAX. GROSS THICKNESS : 900m

ASSUMED NET/GROSS : 0.25

POROSITY : 15%

SW : 35%

1/FVF : 0.9

RECOVERY : 35%

RECOVERABLE RESERVES : 650 MMBBL OIL

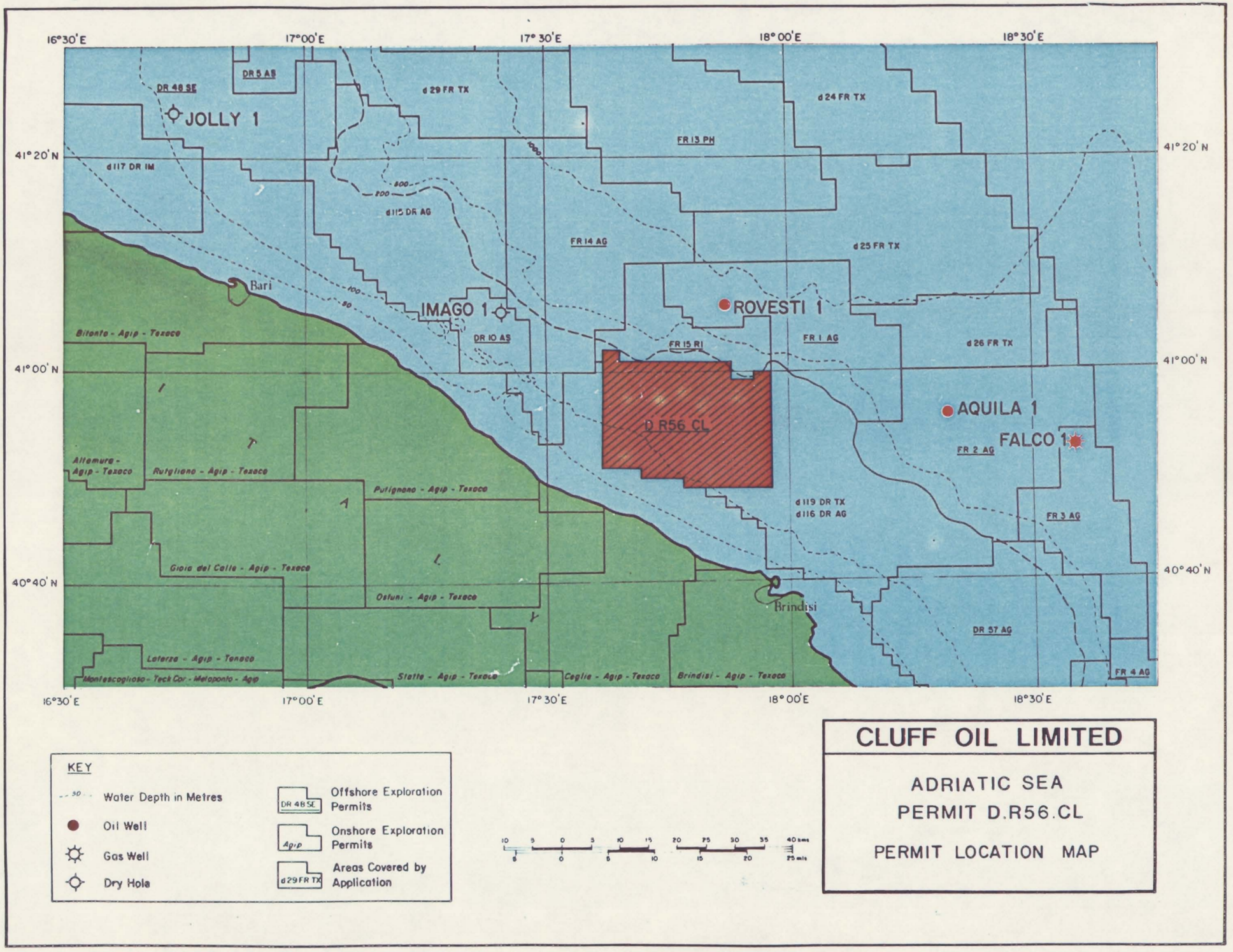
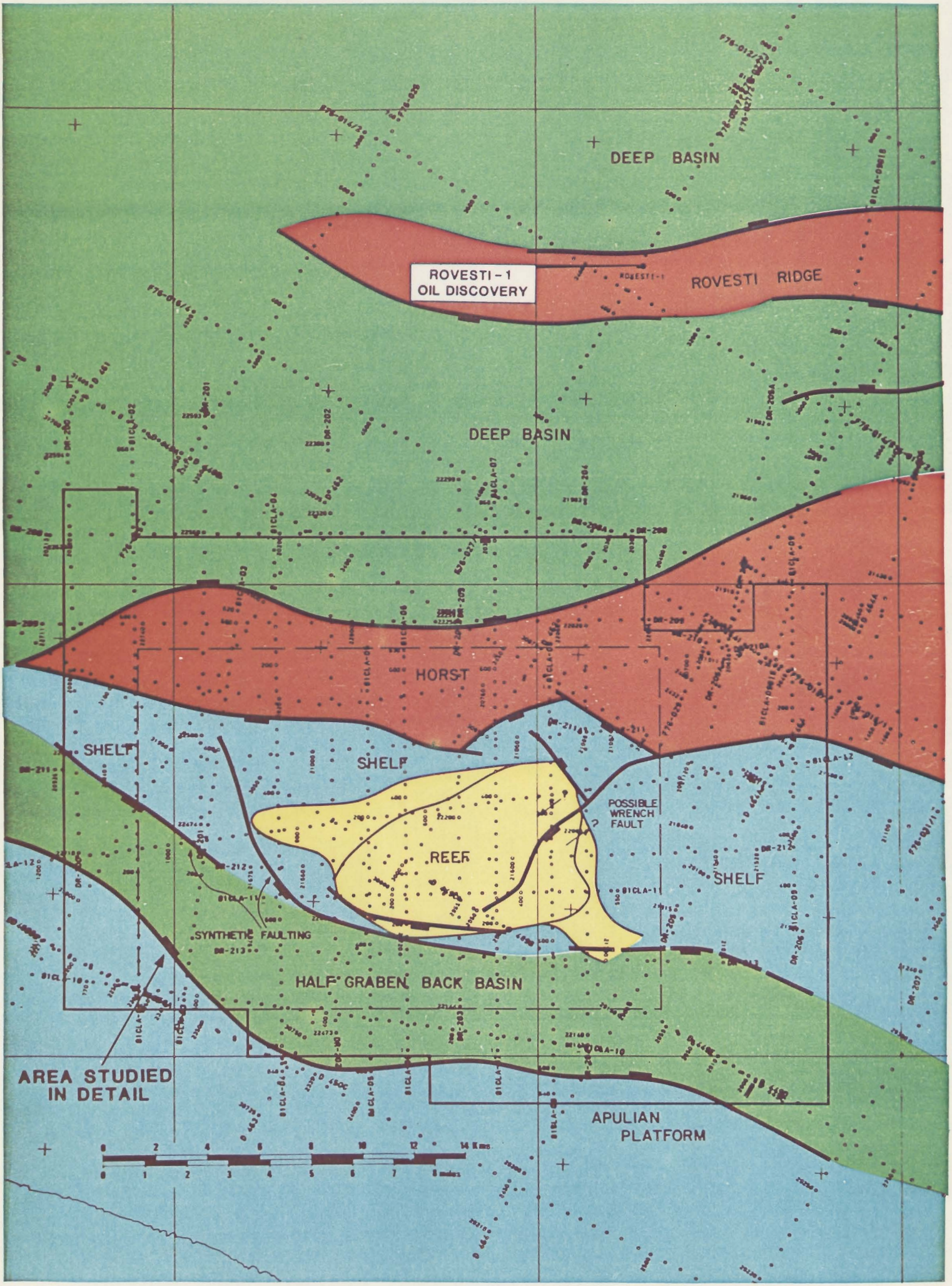

16°30'E
17°00'E
17°30'E
18°00'E
18°30'E
41°20'N
41°00'N
40°40'N
DR 48 SE
DR 5 AS
JOLLY 1
d 29 FR TX
d 24 FR TX
FR 13 PH
d 117 DR IM
d 115 DR AG
FR 14 AG
d 25 FR TX
Bari
IMAGO 1
ROVESTI 1
DR 10 AS
FR 15 RI
FR 1 AG
d 26 FR TX
D R56 CL
AQUILA 1
FALCO 1
FR 2 AG
Bitonto - Agip - Texaco
Altamura - Agip - Texaco
Rutigliano - Agip - Texaco
Putignano - Agip - Texaco
d 119 DR TX
d 116 DR AG
FR 3 AG
Gioia del Colle - Agip - Texaco
Ostuni - Agip - Texaco
Brindisi
DR 57 AG
Laterza - Agip - Texaco
Montescaglioso - Teck Cor - Metaponto - Agip
Statte - Agip - Texaco
Ceglie - Agip - Texaco
Brindisi - Agip - Texaco
FR 4 AG
KEY
Water Depth in Metres
Oil Well
Gas Well
Dry Hole
Offshore Exploration Permits
Onshore Exploration Permits
Areas Covered by Application
CLUFF OIL LIMITED
ADRIATIC SEA
PERMIT D.R56.CL
PERMIT LOCATION MAP

FIGURE 1



CRETACEOUS - MIOCENE STRUCTURAL EVENTS

FIGURE

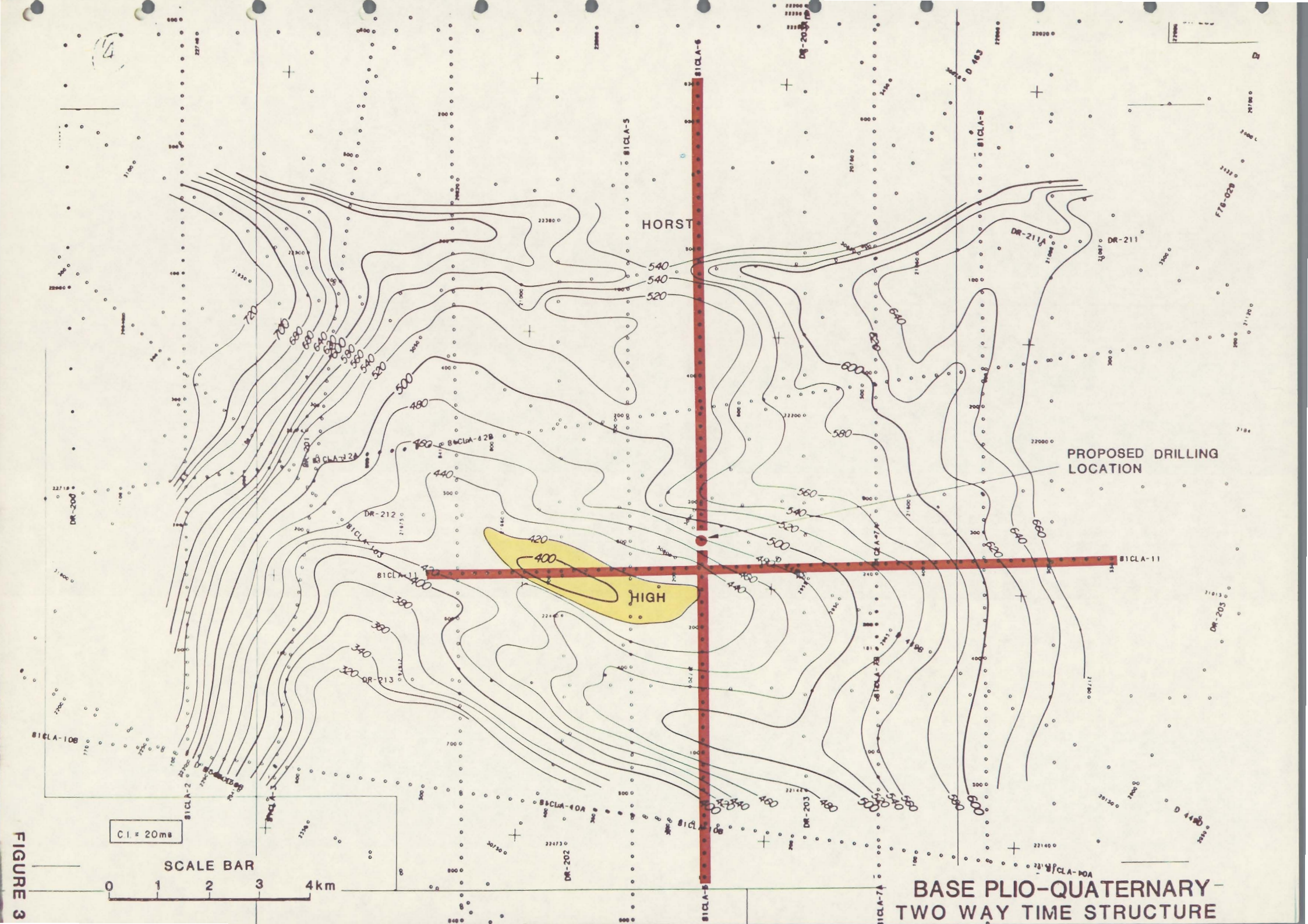


FIGURE 3

BASE PLIO-QUATERNARY - TWO WAY TIME STRUCTURE

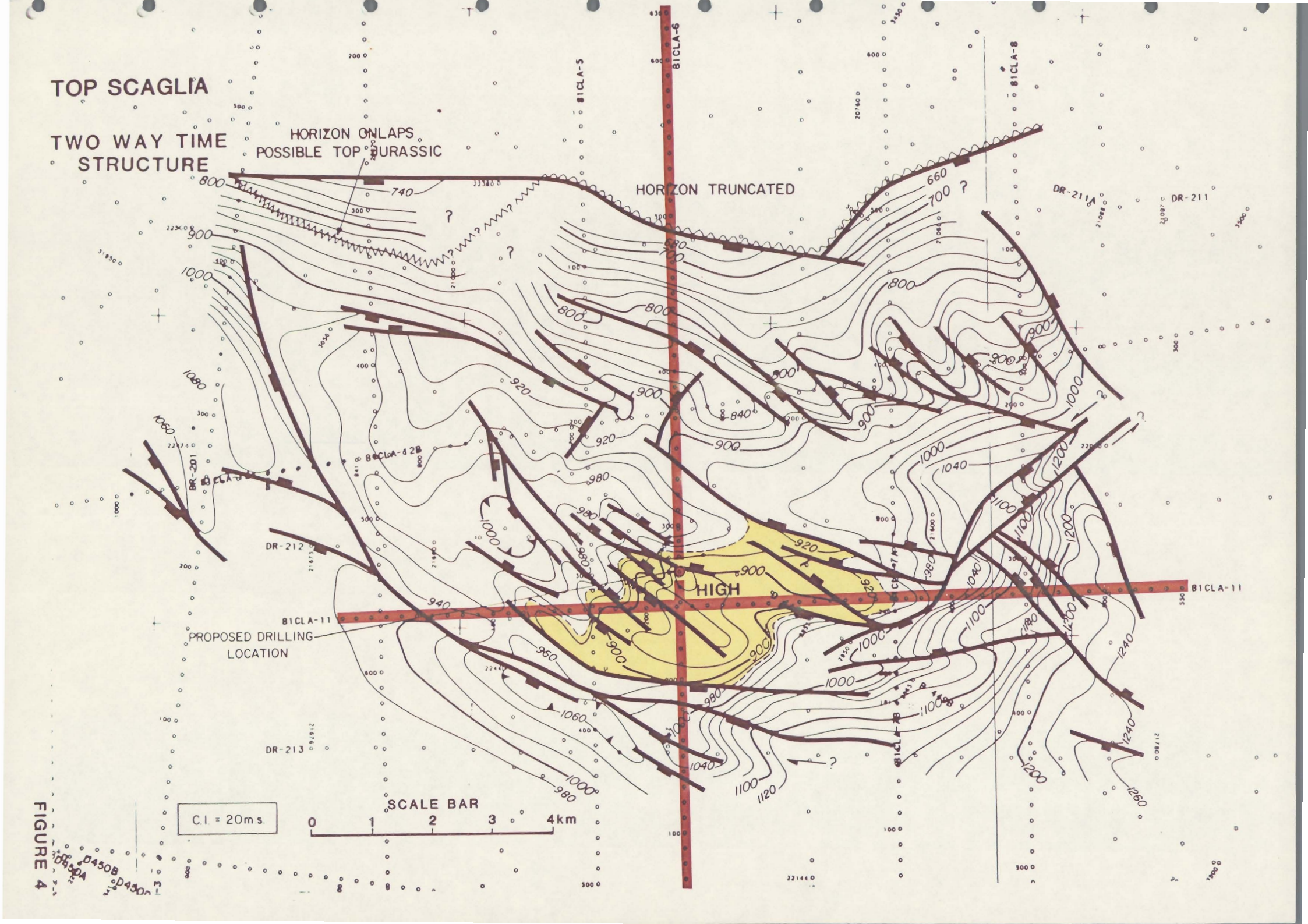

TOP SCAGLIA
TWO WAY TIME STRUCTURE
HORIZON ONLAPS POSSIBLE TOP JURASSIC
HORIZON TRUNCATED
81CLA-5
81CLA-6
81CLA-8
81CLA-11
DR-211A
DR-211
DR-212
DR-213
BR-201
81CLA-42B
HIGH
PROPOSED DRILLING LOCATION
C.I. = 20ms.
SCALE BAR
0 1 2 3 4km

FIGURE 4

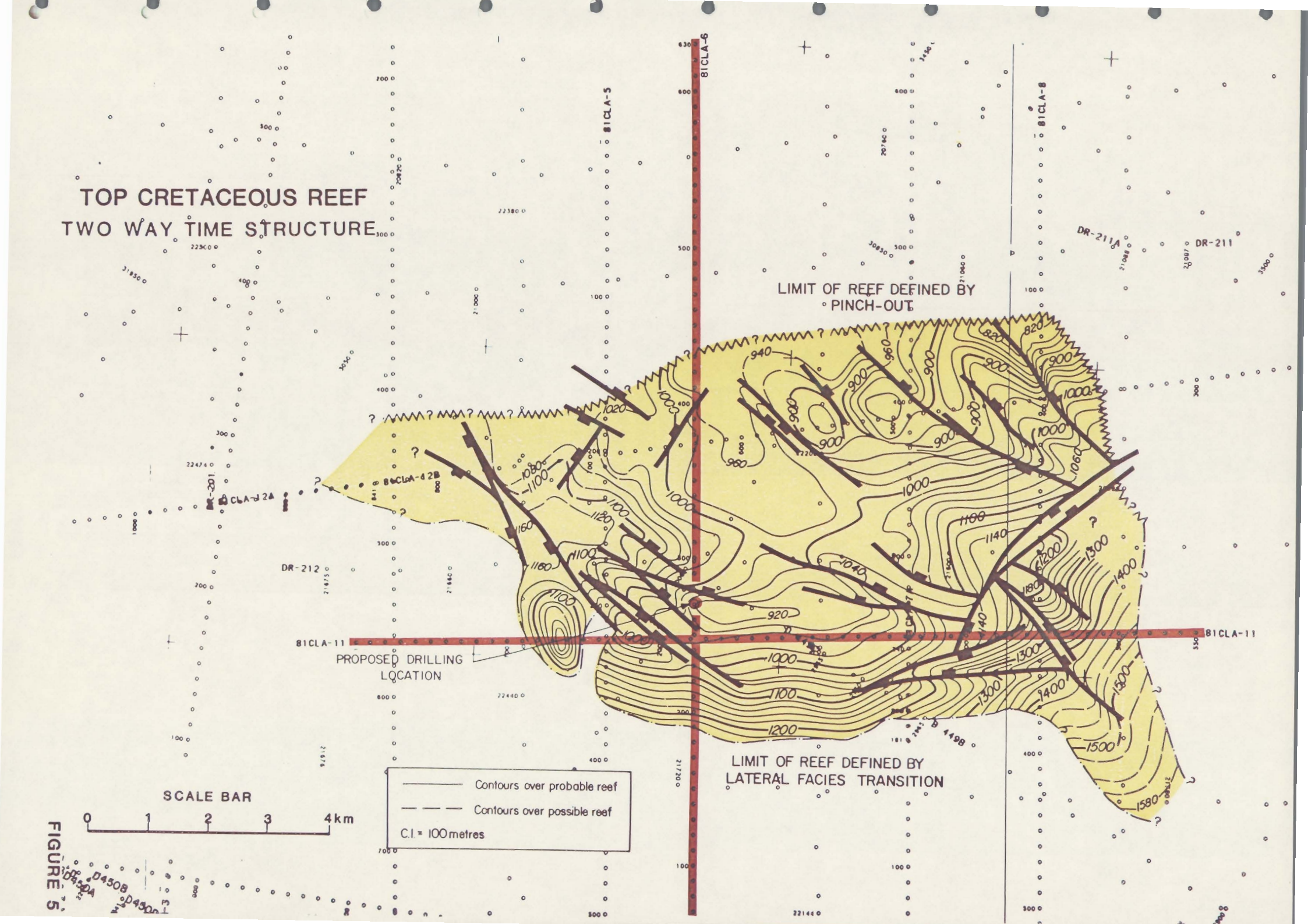

TOP CRETACEOUS REEF
TWO WAY TIME STRUCTURE
LIMIT OF REEF DEFINED BY PINCH-OUT
LIMIT OF REEF DEFINED BY LATERAL FACIES TRANSITION
PROPOSED DRILLING LOCATION
81CLA-6
81CLA-5
81CLA-8
81CLA-11
81CLA-11
DR-211A
DR-211
DR-212
DR-201
SCALE BAR
0 1 2 3 4km
Contours over probable reef
Contours over possible reef
C.I. = 100 metres

FIGURE 5

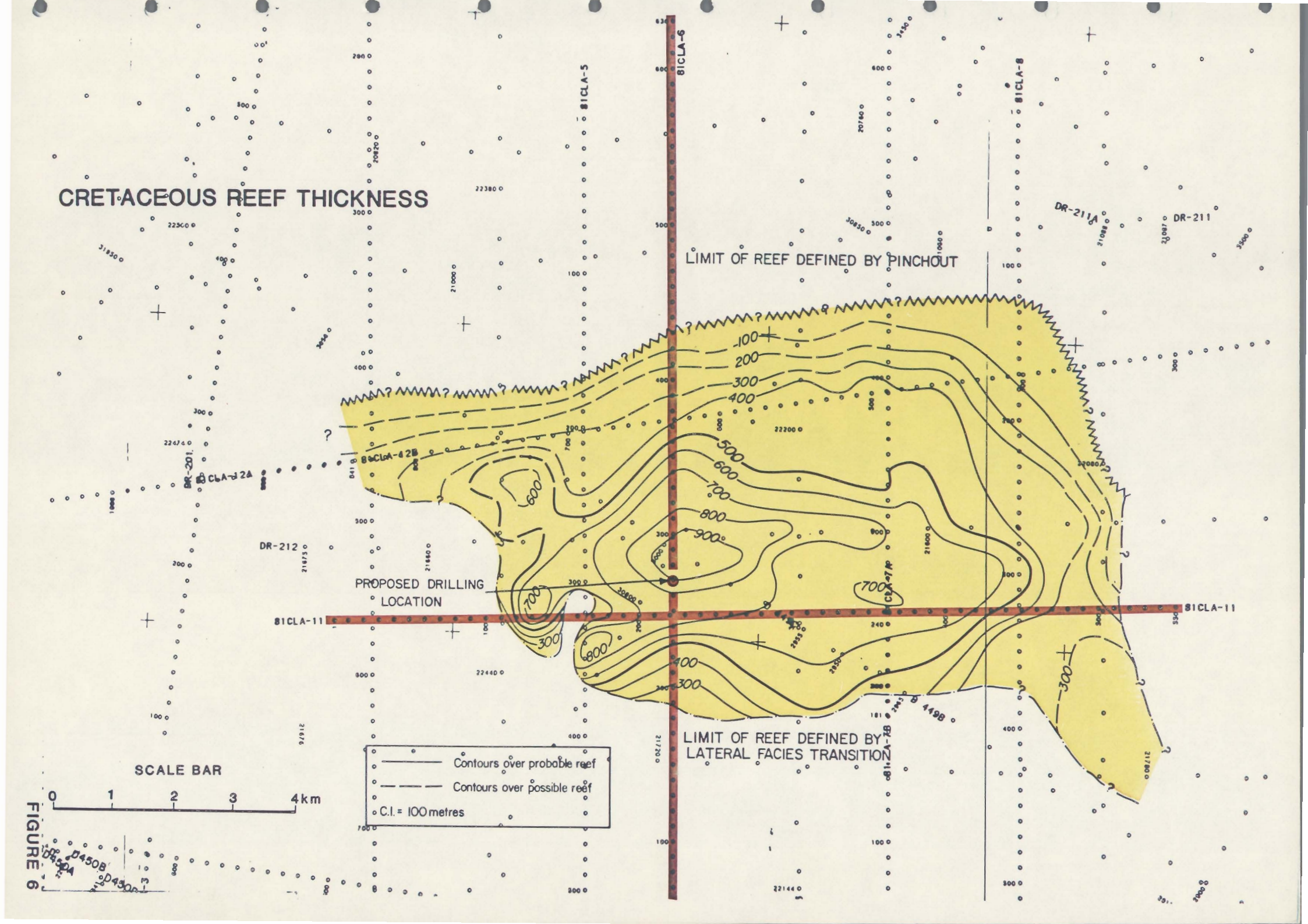

CRETACEOUS REEF THICKNESS
LIMIT OF REEF DEFINED BY PINCHOUT
LIMIT OF REEF DEFINED BY LATERAL FACIES TRANSITION
PROPOSED DRILLING LOCATION
8ICLA-5
8ICLA-6
8ICLA-8
8ICLA-11
8ICLA-12A
8ICLA-12B
DR-201
DR-211A
DR-211
DR-212
100
200
300
400
500
600
700
800
900
SCALE BAR
0 1 2 3 4km
Contours over probable reef
Contours over possible reef
C.I. = 100 metres

FIGURE 6

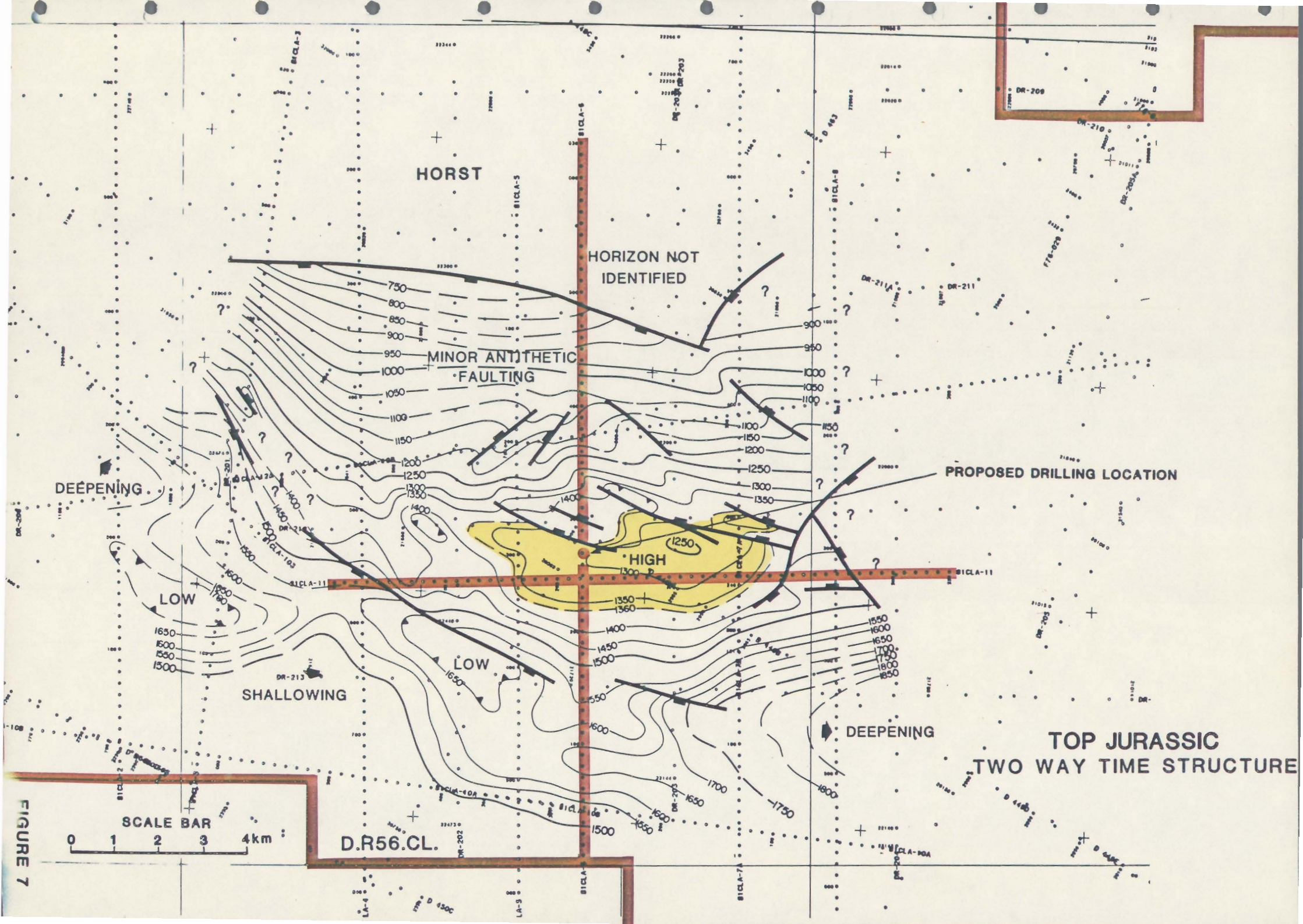

HORST
HORIZON NOT IDENTIFIED
MINOR ANTITHETIC FAULTING
DEEPENING
PROPOSED DRILLING LOCATION
HIGH
LOW
LOW
SHALLOWING
DEEPENING
TOP JURASSIC
TWO WAY TIME STRUCTURE
SCALE BAR
0 1 2 3 4km
D.R56.CL.

FIGURE 7

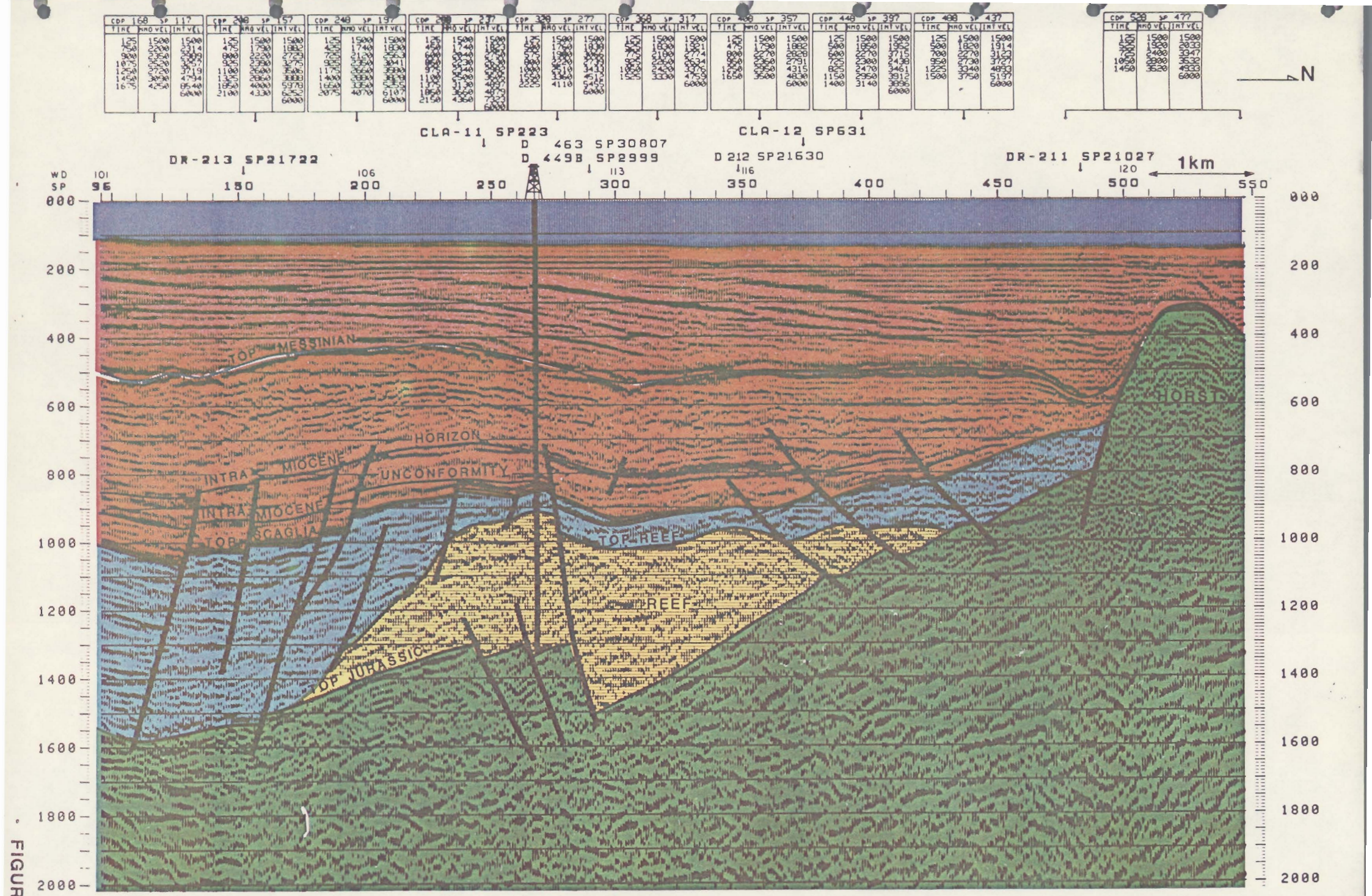
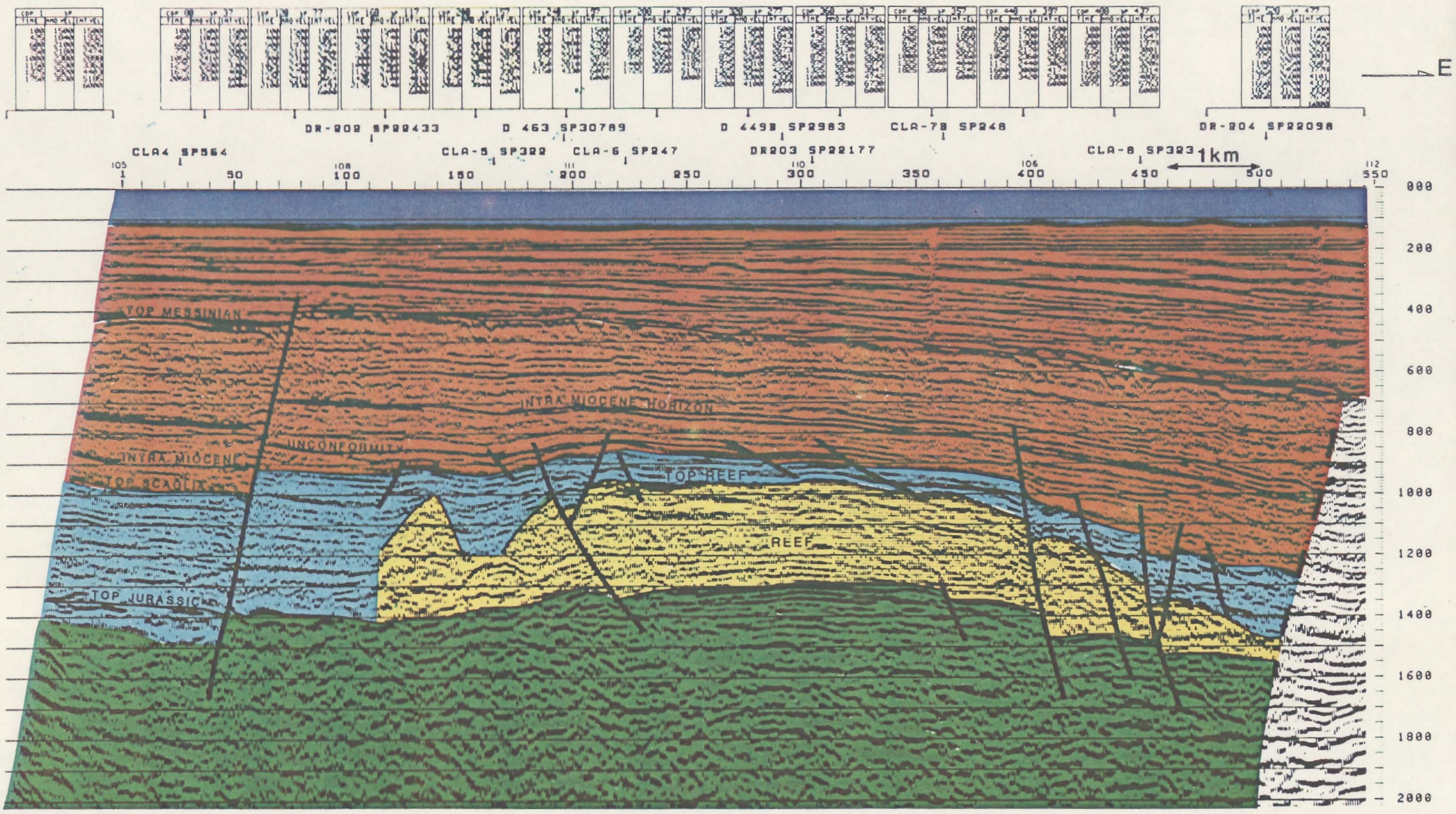


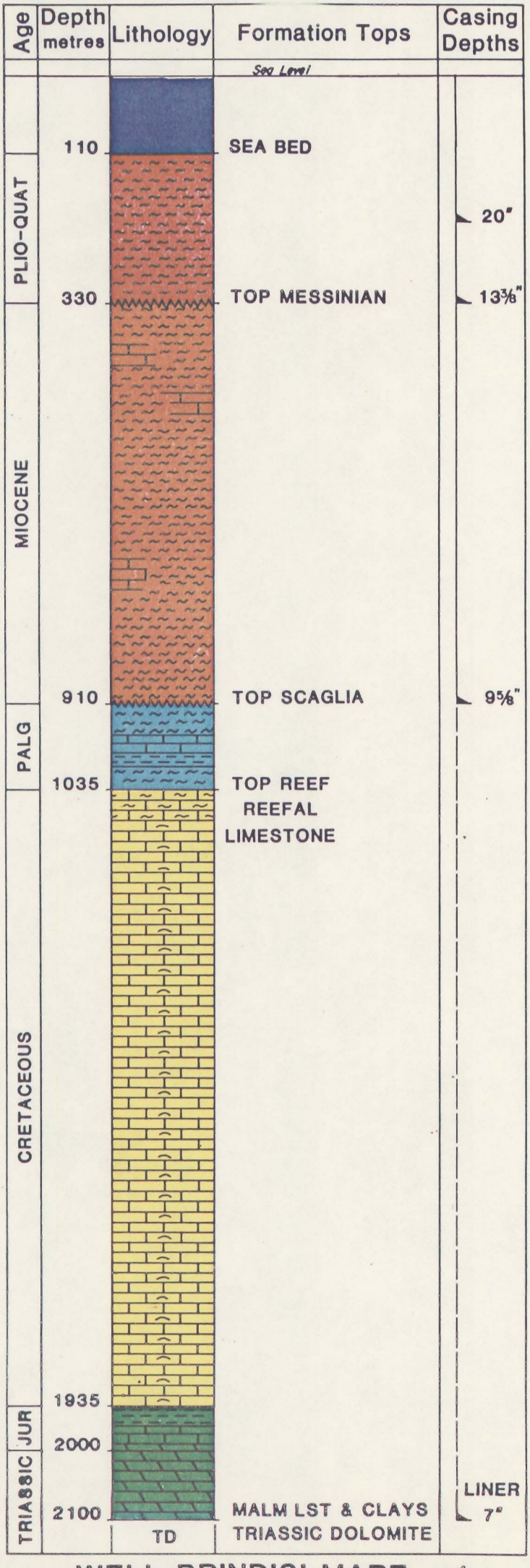
FIGURE 8

SEISMIC LINE 81CLA-06



SEISMIC LINE 81CLA-11

FIGURE 9



WELL BRINDISI MARE – 1

FIGURE 10