APPENDIX V

PALAEONTOLOGICAL REPORT

NERITA -1 WELL

by

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CONTENTS

1. INTRODUCTION

Nerita -1 was drilled twelve miles offshore in the Torquay Sub-basin of the Otway Basin, at latitude 38° 37' 43.19"S and longitude 144°13'44.85"E.

No conventional cores were taken. Of a total of 97 sidewall cores received, 32 were examined for foraminifera, 25 were used for microfloral analysis and 26 cores were thin-sectioned.

Cutting samples were also used for foraminiferal analysis in critical intervals and where sidewall cores were widely spaced, or unsuitable for analysis. Samples were examined from 672' to the top of the Otway Group at 4798'. No *in situ* foraminifera were found below 2000'; the 33 sidewall core and cutting samples examined below this depth have not been documented in this report. The positions of samples which yielded *in situ* foraminifera are given in enclosure 1, with a quantitative tabulation of the main species found. A condensed range chart of stratigraphically important species is given in text-figure 1.

All depths given are below drilling floor (B.D.F.) which was 112' above mean sea level. The sea bed was 357' B.D.F.

With the exception of the top of the Eocene, all zonule boundaries are taken at an arbitrary point between two samples and are therefore approximate.

2. THE FORAMINIFERAL SEQUENCE

Nerita -1 began drilling in Lower Miocene silty clays, and penetrated an unknown thickness of Miocene and Oligocene sediments before the first cutting returns at 620 feet. A sample at 4'10" in sea bottom core 5 contained a rich planktonic fauna, including *Globigerinoides glomerosa curva*, *Globigerinoides bisphérica* and *Globigerinoides triloba*, indicating Zonule E (highest Lower Miocene). This seafloor outcrop was overlain in places by a thin veneer of Recent sand.

Taylor in mind work.

Sidewall samples at 672 and 704 feet contain a Middle Oligocene (Zonule I2) fauna. Dominant planktonic species are *Globigerina ampliapertura* and *Globorotalia extans*, while benthonics include *Bolivina anastomosa*, *Cibicides perforatus*, *Anomalina mera*, *Fabrs*, and *Anomalinoides procolligera*.

A sidewall core at 808 feet contains *Globigerina cf. angiporoides*, *Globorotalia opima*, *Globoquadrina larmeni*, and *Cerobertina kakahoica*, indicating Lower Oligocene Zonule J. Sidewall cores at 946 and 1090 feet also contain good Zonule J faunas, including *Globigerina angiporoides* and *Planorbulinella johannae*. The highest appearance of *Chiloguembelina cubensis* is in a sidewall core at 1035 feet. The index fossil for the zone, *Globorotalia tentarugosa*, was not positively identified in any sample. The *Bolivina pontis* stage of the *B. pontis - B. anastomosa* lineage appears at 1090 feet, very close to the base of Zonule J.

The top of the Eocene is defined by the first appearance of *Globigerina linaperta* at 1100 feet. A rich Zonule K fauna continues down to 1650 feet. The fauna of the upper part of the zonule includes *Globigerina linaperta*, *G. quaportura*, *G. ampliapertura*, *G. angiporoides*, *Globorotalia cf. munda*, *G. extans*, and *Chiloguembelina cubensis*. Benthonic species include *Bolivina pontis*, *Cerobertina kakahoica*, *Cibicides perforatus*, *Cibicides vortex*, *Uvigerina sp. 1*, and *Angulogerina ototara*.

Below 1300 feet an important element of the planktonic population is a globigerinid closely resembling Globigerapsis index, but lacking supplementary apertures on the spiral side of the test. The species has been noted in Upper Eocene deposits of Zonule M age from Browns Creek, in the Aire district, but its stratigraphic range is not known. Because of its broad morphological similarity to Globigerapsis index, it has been designated "Globigerapsis sp." in this report, although it may be a Globigerina.

Below 1400 feet there is a gradual increase in the number of species and individuals of arenaceous foraminifera. Dorothia cf. elongata, Textularia spp., Haplophragmoides cf. incisa and H. rotundata become prominent below 1550 feet, reflecting a shallower facies.

The top of Upper Eocene Zonule L is marked at about 1680 feet by the appearance of Globigerapsis index. "Globigerapsis sp.", Globigerina apertura, Catapsydrax unicavus and rare Globorotalia spp. complete the rather sparse planktonic assemblage. Between 1700 and 1950 feet calcareous benthonic species Spirillina spp., Robulus spp., Cibicidoides subglobosa and miliolids, along with arenaceous species, reflect shallow water conditions.

A cutting sample at 2000 feet contains a fauna of over 50% arenaceous species, and below this depth the total number of foraminifera falls off sharply. No foraminifera were found in a sidewall core at 2055 feet, or in any deeper sidewall cores. Thus the foraminiferal succession is believed to end just below 2000'.

3. BIOSTRATIGRAPHIC INTERPRETATION (Paleontology and Palynology).

The Upper Cretaceous part of the sequence appears to be almost entirely continental; neither foraminifera nor microplankton were found in sidewall cores between 4245 and 4782', except for sparse microplankton in the lowest core. Glauconite and ripple marks also suggest limited marine influence in the sediments overlying the Otway group.

The boundary between the Tertiary and Cretaceous cannot yet be accurately fixed by palynological analysis. As in Pecten-1A there is a zone which may be assigned to either the lowermost Tertiary or uppermost Cretaceous. There appears to be no palynological or lithological evidence for an unconformity between Tertiary and Cretaceous in Nerita -1.

The top of the continental Paleocene sequence is above 2570' (see Appendix VI). Sidewall cores between 2106' and 2496' contain an Eocene pollen assemblage assigned to Cookson's Assemblage C. The flora suggests that these samples belong to the Upper Eocene part of this assemblage, and the Upper Eocene foraminiferal sequence begins at round 2000'. The evidence suggests that a hiatus existed during Lower and possibly Middle Eocene times; and that it is represented by a depositional break within the interval 2496' - 2570'.

The marine succession in Nerita -1 began in Upper Eocene (Zonule L) times, just above the base of the dark siltstones of the Demon's Bluff formation. (This is slightly earlier than the onset of marine sedimentation in the Bass Basin.) The high proportion of arenaceous and certain calcareous benthonic species indicates shallow water conditions between 2000 and 1700 feet. Planktonic species are rare at first, and increase steadily up the sequence. A continuous slow sinking of the depositional area is indicated from Zonule L time until shortly before the end of the Eocene. Open marine circulation began to influence the composition offaunas soon after marine deposition began.

Near the end of the Eocene, the relatively uniform deep water facies of the Demon's Bluff formation is disturbed by uplift. A series of thinly interbedded sands, silts and marls forms a transition between the siltstone sequence and the dominantly carbonate Torquay group. The Eocene - Oligocene boundary falls within these transition beds, and deposition appears to be continuous. A continuous sequence is also present at Bell's Headland, in the Torquay district. Elsewhere the boundary between the Torquay group and the Demon's Bluff formation is a disconformity.

After the deposition of the very shallow water transitional beds, there is a return to deeper marine conditions during Zonule 3 and 1 2 times with the deposition of the Torquay group.

The rich planktonic fauna and fine-grained silty clay of the Lower Miocene sea floor cores indicates a rather deep shelf environment little influenced by current sorting, and probably distant from sources of detrital supply.

RANGE CHART OF SIGNIFICANT FORAMINIFERA FROM NERITA -1

(See also enclosure 1 for more detailed distribution)

Appendix V. Fig. 1

PLANKTONICS

- *Globigerinoides glomerosus*
- *G. triloba*
- *Globigerina apertura*
- *G. woodi*
- *G. bulloides*
- *Globorotalia menardii group*
- *Globigerina eoapertura*
- *G. ampliapertura*
- *Globoquadrina larmeui*
- *Globorotalia opima group*
- *G. obesa*
- *Globigerina angiporoides*
- *G. linaperta*
- *Catapsydrax unicavus*
- *Chiloguembelina cubensis*
- *"Globigerapsis sp."*
- *Globigerapsis index*
- *Hastigerina micra*

BENTHONICS

- *Bolivina anastomosa*
- *B. pontis*
- *Cerobertina kakahaica*
- *Uvigerina sp. 1*
- *Angulogerina otatara*
- *Cibicides sp. 1*

DEPTH BDF. 400 600 800 1000 1200 1400 1600 1800 2000

ZONULE F ? I J K L

LOWER MIOCENE | No samples | MIDDLE OLIGOCENE | LOWER OLIGOCENE | UPPER EOCENE

Drawing 1238