



BIOSTRATIGRAPHIC REPORT  
ON  
BURONG NO. 1

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## I. SUMMARY

Eight sidewall cores from Hartogen Energy Limited, Burong-1 indicate the following biostratigraphic subdivision:-

| SAMPLE  | FORAM ZONE    | NANNO ZONE  | PALY ZONE                    | AGE   | ENVIRONMENT    |
|---|---------------|-------------|------------------------------|---|----------------|
| SWC 29, 2086'<br>(635.8m)                               | H1            | Upper NN1   | <u>P. tuberculatus</u>       | basal Early<br>Miocene                      | middle Neritic |
| SWC 27, 2123'<br>(647.1)                                | Indeterminate | NP23-NP24   | <u>P. tuberculatus</u>       | latest Early-<br>earliest Late<br>Oligocene | inner Neritic  |
| SWC 26, 2255'<br>(687.3)                                | Indeterminate | Barren      | middle<br><u>N. asperus</u>  | Late Middle -<br>Late Eocene                | Non-marine     |
| SWC 18, <del>2920'</del><br>2820' (890.0m)<br>(1859.5m) | Barren        | Not studied | middle<br><u>N. asperus</u>  | Late Middle -<br>Late Eocene                | Non-marine     |
| SWC 5, 3829'<br>(1167.1)                                | Not studied   | Not studied | Indeterminate                | Tertiary undiff.                            | Non-marine     |
| SWC 3, 3986'<br>3956' (214.9m)<br>(205.8)               | Not studied   | Not studied | lower<br><u>M. diversus</u>  | Late Palaeocene<br>- Early Eocene           | Non-marine     |
| SWC 2, 4009'<br>(1221.9)                                | Not studied   | Not studied | lower<br><u>M. diversus</u>  | Late Palaeocene<br>- Early Eocene           | Non-marine     |
| SWC 1, 4053'<br>(1235.4)                                | Not studied   | Not studied | ?lower<br><u>M. diversus</u> | ?Late Palaeocene<br>- Early Eocene          | Non-marine     |

## II. INTRODUCTION

Eight sidewall cores from Burong-1 were provided by Hartogen Energy Limited for micropalaeontological and palynological analysis. Palynomorphs were recovered from all eight samples but only three of the four samples used for micropalaeontology contained any useful calcareous microfossils. The observed palynomorphs are listed in Enclosure 1 and the calcareous microfossils are listed in Appendix 1.

## III. PALYNOLOGY

2086' P. tuberculatus Zone (Oligocene-Early Miocene) :  
Open Marine

A rich assemblage of spores, pollen and dinoflagellates was obtained from this sample. Dinoflagellates overwhelm the other palynomorphs and one species in particular, viz. *Spiniferites ramosus*. *Operculodinium* spp. are also plentiful

and this suggests a correlation with the *Operculodinium* sp. Zone of Evans (1971) which correlates with the *P. tuberculatus* Zone (Raine, 1984). The presence of the spore *Cyatheacidites annulatus* confirms the assignation to the *P. tuberculatus* Zone.

2123' *P. tuberculatus* Zone (Early Oligocene) : Open Marine

Dinoflagellates are again common in this sample and *Operculodinium* spp. are the most abundant. Of the spores/pollen present, *Cyatheacidites annulatus* and *Kuylisporites waterbolckii* definitely restrict the sample to the *P. tuberculatus* Zone while *Periporopollenites demarcatus* and *P. vesicus* probably further restrict the assignment to the lower half of the zone (i.e. Early Oligocene) using the biostratigraphy of Stover & Partridge (1973).

2255' middle *N. asperus* Zone (late Middle-Late Eocene) : Non-Marine

Dinoflagellates are absent from this sample and the environment of deposition was probably completely non-marine. The presence of the pollen *Tricolpites simatus*, and the spore *Verrucosisporites cristatus* indicates the age.

2920' middle *N. asperus* Zone (Late Middle-Late Eocene) :  
Non-marine

The presence of *Liliacidites bainii*, *Triorites magnificus* and *Tripoporopollenites ambiguus* indicate that this sample should be ascribed to the middle *N. asperus* zone. Because *Proteacidites tenuiexinus* has not been observed by Stover & Partridge (1973) above the base of the middle *N. asperus* Zone the sample possibly correlates closely with the boundary of the early and middle *N. asperus* Zones. The age would then be uppermost Middle Eocene.

3829' Tertiary undifferentiated : non-marine

Only a few spores/pollen were observed and none were age diagnostic. Microplankton were not observed and thus the depositional environment was probably non-marine.

3986' lower *M. diversus* Zone (Late Palaeocene-Early Eocene) :  
non-marine

*Stereisporites regium*, *Latrobosporites crassus* and *Tricolpites gillii* have tops above the base of the lower *M. diversus* Zone and *Crassoretitriletes vanraadshooveni* starts at the base of that zone. They restrict the age.

4009' lower *M. diversus* Zone (Late Palaeocene-Early Eocene) : non-marine.

A low yield of pollen and spores was obtained from this sample and it is not altogether certain that there was no mud contamination. However, the presence of *Gambierina rudata*, *Nothofagidites asperus* and *Tricolpites gillii* suggest a correlation with the lower *M. diversus* Zone of Stover & Partridge (1973) which is Late Palaeocene-Early Eocene in age (Partridge, 1976). The absence of microplankton indicates a non-marine origin.

4053' ?lower *M. diversus* Zone (Late Palaeocene-Early Eocene) : non-marine.

Significant contamination of this sample by drilling mud was evident in the sidewall core and in the pollen assemblage. In fact it is not impossible for the assemblage to have originated entirely from contamination. Pollen which were definitely introduced from higher in the sequence include *Aglaoredia qualumis*, *Anacolosidites sectus* and *Paripollis ochesis*. The presence of *Latrobosporites crassus* suggests an age no younger than early Eocene.

#### IV. MICROPALAEONTOLOGY

A total of 4 sidewall core samples from the interval 2086.0-2920.0 ft were analysed for foraminifera and calcareous nannoplankton. Calcareous microfossil species identified in the well section, interpreted zonation and depositional environment subdivision have been plotted on the micropalaeontological distribution chart (Appendix 1).

The planktonic foraminiferal letter zonal scheme of Taylor (in prep.) and the NP-NN calcareous nannoplankton letter scheme of Martini (1971) are used in this investigation. Foraminiferal studies by Carter (1964) and Jenkins (1971), and calcareous nannoplankton investigations by Edwards (1971) and Siesser (1979) have also been consulted.

##### (A) Calcareous Nannoplankton Biostratigraphy

i) 2086.0ft : upper Zone NN1 (basal Early Miocene)  
The absence of *Zygrhablithus bijugatus* and *Helicosphaera cartieri* in a high yielding and well preserved nannofossil assemblage is indicative of an upper NN1 zonal assignment (= *Reticulofenestra gartneri* Zone of Edwards (1971)).

ii) 2123.0ft : Zones NP23-NP24 (Early/Late Oligocene Boundary).

The association of *Chiasmolithus oamaruensis*, *Dictyococcites bisectus* and *Zygrhablithus bijugatus* without *Reticulofenestra umbilica*, indicates that the nannofossil assemblage at 2123.0

ft is assignable to Zones NP 23 and NP 24 (= *Cyclococcolithus neogammation* and *Syracosphaera clathrata* Zones of Edwards, 1971).

iii) 2255.0 ft : Indeterminate

The sample at 2255.0 ft is barren of calcareous nannoplankton.

(B) Planktonic Foraminiferal Biostratigraphy

i) 2086.0 ft : Zone H1 (basal Early Miocene)

The occurrence of *Globigerina woodi connecta* without *Globigerinoides trilobus* is indicative of Zone H1.

ii) 2123.0-2920ft: Indeterminate

The sample at 2123.0ft lacks age-diagnostic planktonic foraminifera. The sample at 2255.0ft contains caved planktonic foraminifera from the Seaspray Group. The sample at 2920.0ft is barren of foraminifera.

(C) Environment of Deposition

i) 2086.0ft : Middle neritic

A middle neritic environment of deposition for the sample at 2086.0ft is indicated by a moderate yielding planktonic foraminiferal fauna, high yielding calcareous nannoplankton assemblage and a rich benthonic foraminiferal fauna comprising *Sphaeroidina bulloides*, *Siphouvigerina proboscidea*, *Pullenia bulloides* and *Brizalina* spp. The planktonic foraminiferal percentage is approximately 15%.

ii) 2123.0ft : Inner-middle neritic

The sample at 2123.0ft contains a benthonic foraminiferal fauna including *Globocassidulina subglobosa*, *Gyroidina zelandica* and *Pullenia bulloides*. The yield of planktonic foraminifera is low while calcareous nannoplankton are abundant. The glauconitic marl sample at 2123.0ft is interpreted to have been deposited in an inner to middle neritic environment.

iii) 2255.0 and 2920.0 ft : Indeterminate

The sample at 2255.0 ft contains juvenile planktonic foraminifera which are interpreted to be contaminants from the Seaspray Group. Palynological evidence suggests that the sample at 2255.0ft is *Middle N. asperus* in age and non-marine. The sample at 2920ft is barren of foraminifera and is considered to be non-marine on the basis of palynological evidence.

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| SAMPLE TYPE OR NO. * | DEPTHS      |             |             |             | FOSSIL NAMES                       |
|----------------------|-------------|-------------|-------------|-------------|------------------------------------|
|                      | 2086.0ft 29 | 2123.0ft 27 | 2255.0ft 26 | 2920.0ft 18 |                                    |
|                      |             |             |             |             | PLANKTONIC FORAMINIFERA            |
|                      |             |             |             |             |                                    |
|                      |             |             |             |             | <i>Globigerina praebulloides</i>   |
|                      |             |             |             |             | <i>Globigerina woodi connecta</i>  |
|                      |             |             |             |             | <i>Globigerina</i> spp.            |
|                      |             |             |             |             |                                    |
|                      |             |             |             |             | CALCAREOUS NANNOPLANKTON           |
|                      |             |             |             |             |                                    |
|                      |             |             |             |             | <i>Cyclicargolithus floridanus</i> |
|                      |             |             |             |             | <i>Sphenolithus moriformis</i>     |
|                      |             |             |             |             | <i>Sphenolithus</i> spp.           |
|                      |             |             |             |             | <i>Braarudosphaera bigelowi</i>    |
|                      |             |             |             |             | <i>Coccolithus eupelagicus</i>     |
|                      |             |             |             |             | <i>Micrantholithus attenuatus</i>  |
|                      |             |             |             |             | <i>Pontosphaera</i> spp.           |
|                      |             |             |             |             | <i>Discoaster deflandre</i>        |
|                      |             |             |             |             | juvenile coccoliths                |
|                      |             |             |             |             | <i>Chiasmolithus oamaruensis</i>   |
|                      |             |             |             |             | <i>Dictyococcites bisectus</i>     |
|                      |             |             |             |             | <i>Zygrhablithus bijugatus</i>     |
|                      |             |             |             |             | <i>Rhabdosphaera longistylus</i>   |
|                      |             |             |             |             |                                    |
|                      |             |             |             |             | BENTHONIC FORAMINIFERA             |
|                      |             |             |             |             |                                    |
|                      |             |             |             |             | <i>Sphaeroidina bulloides</i>      |
|                      |             |             |             |             | <i>Dorothia</i> spp.               |
|                      |             |             |             |             | <i>Pullenia bulloides</i>          |
|                      |             |             |             |             | <i>Textularia</i> spp.             |
|                      |             |             |             |             | <i>Siphovigerina proboscidea</i>   |
|                      |             |             |             |             | <i>Lagena acuticostata</i>         |
|                      |             |             |             |             | <i>Heronallenia lingulata</i>      |
|                      |             |             |             |             | <i>Lagena hexagona</i>             |
|                      |             |             |             |             | <i>Lenticulina</i> spp.            |
|                      |             |             |             |             | <i>Siphovigerina interrupta</i>    |
|                      |             |             |             |             | <i>Gyroidina</i>                   |
|                      |             |             |             |             | <i>Hanzawai sumitomo</i>           |
|                      |             |             |             |             | <i>Fissurina</i> spp.              |
|                      |             |             |             |             | <i>Ammodiscus</i> spp.             |
|                      |             |             |             |             | <i>Cassidulina laevigata</i>       |
|                      |             |             |             |             | <i>Pullenia quinqueloba</i>        |
|                      |             |             |             |             | <i>Cibicides vortex</i>            |
|                      |             |             |             |             | <i>Cibicides</i> spp.              |
|                      |             |             |             |             | <i>Dentalina</i> spp.              |
|                      |             |             |             |             | <i>Marssonella</i> spp.            |
|                      |             |             |             |             | <i>Lagena semistriata</i>          |
|                      |             |             |             |             | <i>Trifarina bradyi</i>            |
|                      |             |             |             |             | <i>Pyrulina cyclindroides</i>      |
|                      |             |             |             |             | <i>Quinqueloculina</i> spp.        |
|                      |             |             |             |             | <i>Karrerria maoria</i>            |
|                      |             |             |             |             | <i>Brizalina anastomosa</i>        |
|                      |             |             |             |             | <i>Astrononion tasmaniensis</i>    |
|                      |             |             |             |             | <i>Eponides praecinctus</i>        |
|                      |             |             |             |             | <i>Cibicides mediocris</i>         |
|                      |             |             |             |             | <i>Gyroidina subzelandica</i>      |
|                      |             |             |             |             | <i>Siphonina australis</i>         |
|                      |             |             |             |             | <i>Globocassidulina subglobosa</i> |

