

1996/58

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**A PROVISIONAL
PALYNOSTRATIGRAPHIC FRAMEWORK
FOR TERTIARY ORGANIC FACIES IN THE
BURT PLAIN, HALE, NGALIA,
SANTA TERESA, TI-TREE &
WAITE BASINS,
NORTHERN TERRITORY**

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BY

M. K. MACPHAIL

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AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION

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by

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Australian Geological Survey Organisation



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DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY

Minister for Primary Industries and Energy: Hon. J. Anderson, M.P.
Minister for Resources and Energy: Senator the Hon. W.R. Parer
Secretary: Paul Barratt

AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION

Executive Director: Neil Williams

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ISSN: 1039-0073

ISBN: 0 642 25002 2

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ABSTRACT

Tertiary deposits, in places over 200 m thick, infill a series of elongate basins which overlie and partly surround the Precambrian Arunta Block in the southern half of the Northern Territory. These are difficult to date due to the strong weathering overprint. The most reliable evidence of age is provided by fossil spores and pollen preserved in thin lignite and other carbonaceous facies recovered in drillcore. These facies represent local and short term events, and the majority of the plant microfossils are long-ranging types. Sufficient age-diagnostic species are present to allow the host facies to be correlated across the region and with basins along the southern and northern margins. Three broad phases of organic sedimentation are recognised: during the Early Eocene; during the Middle to Late Eocene; and during Oligo-Miocene time. The pollen data suggest that central Australian climates were drier than those along the southern margin up to the Late Miocene, although they were substantially wetter than those of the present day.

1. INTRODUCTION

This report presents the results of a palynological analysis of samples from core holes drilled by the Northern Territory Geological Survey (NTGS) in several Cenozoic basins in the Alice Springs region of Central Australia.

The objectives were:

- To establish the ages of samples using palynostratigraphic techniques.
- To establish depositional environments for the sampled sediments.
- To establish a basic palynostratigraphic framework for correlating geological horizons and dating geological events which may be of local and regional significance to the development of groundwater resources in Cenozoic sedimentary basins in the Alice Springs region.

The work provides a palynostratigraphic reference framework for hydrogeological investigations in the Western Water Study. The Western Water Study (Wiluraratja Kapi) is a project directed towards a decision-support system for groundwater resources in Aboriginal lands in the Northern Territory. AGSO is collaborating with the NT Power & Water Authority (PAWA) and the Central Land Council (CLC) in a two-year groundwater study in the Papunya-Kintore region in the southwest part of the Northern Territory. This region is believed to have unexplored groundwater resources in Cenozoic basins, and one of the objectives of the Western Water Study is the delineation of these basins. A stratigraphic reference framework is required for this delineation.

This is the first of two reports on the palynology of the central Australian basins undertaken for AGSO in 1996 (see also Macphail, in press).

Database

A total of 41 conventional core samples, representing the most organic-rich facies in a series of core holes drilled to investigate known or possible lignite deposits in the Hale, Santa Teresa, Ti-Tree, Burt Plain and Ngalia Basins (Wyche, 1983), were provided by AGSO (Appendix 1). These were complemented by a sample of Late Miocene sediments within diprotodontid remains from Alcoota in the Waite Basin.

NTGS lithostratigraphic logs were provided for all core holes. The stratigraphy and geological history of the basins are summarised in Senior *et al.* (1994a, 1994b).

Limitations of the database were: the paucity of organic facies preserving fossil pollen and spores; the absence of many zone index species and rarity of accessory age-diagnostic taxa; mud contamination of pervious facies resulting in mixed age palynofloras; probable differences in the times of First and Last appearance of age diagnostic species in Central Australia and in the reference basins along the southern (Gippsland, Murray Basins) and northern (Bonaparte Basin) margins; and the presence of a significant number of previously unrecorded spore and pollen types whose time distributions are unknown.

2. SUMMARY AND CONCLUSIONS

2.1 Algal cysts indicate that all organic facies accumulated in low-energy, brackish water depositional environments. Fully saline conditions may have existed in the Early Eocene in the Santa Teresa Basin - due to remobilised Early Cretaceous salts?

2.2 Yields, diversity and preservation of fossil spores and pollen varied markedly between and within basins, and over short intervals within individual cores.

Except for the Hale Basin, sediments above 40-60 m were barren or yielded modern contaminants only. This almost certainly reflects weathering during the Neogene and Quaternary due to groundwater movements.

2.3 The majority of fossil species are long-ranging and support a Tertiary age in a general way only. Changes in relative abundance of commonly occurring dryland taxa such as *Nothofagidites*, *Haloragacidites harrisii*, *Proteacidites* and gymnosperms may provide a reliable method for correlating organic units between basins, as well as a being a broad guide to geological age.

Changes in the relative abundance of herbaceous species whose distributions are controlled by water table level are an unreliable evidence of geological age.

Relatively few samples preserved species that are diagnostic of palynological zones in the southern and northern basin margins. Such species however do appear to provide reliable estimates of the geological age of Tertiary organic facies preserved in central Australia.

The same group of species are used to correlate the organic facies in terms of the palynostratigraphic framework erected for the Gippsland (Stover & Partridge, 1973) and Murray Basins (Macphail & Truswell, 1989, 1993).

2.3 Three broad phases of organic deposition have occurred in the Alice Springs basins since Paleocene time - (1) during the Oligo-Miocene, (2) during the Middle to Late Eocene and (3) during the Early Eocene.

These are correlated with the *Proteacidites tuberculatus-Canthiumidites bellus* Zone, Middle *Nothofagidites asperus* Zone and *Malvacipollis diversus* Zone respectively in the Gippsland Basin.

Published data (Truswell, 1987; Twidale & Harris, 1991) from the Uluru region indicate a fourth - Maastrichtian-?Paleocene - phase of organic deposition in Central Australia. This is likely to correlate with the *Forcipites* (al. *Tricolpites*) *longus-Lygistepollenites balmei* Zone in the Gippsland Basin.

2.4 Key samples or intervals are (core holes in upper case):

Oligo-Miocene - BURT PLAIN 81 BP2 at 138.56-138.58 m

A probable correlative occurs in BURT PLAIN 81 BP1 at 130.88-130.9m.

Middle-Late Eocene - HALE RIVER 78 HR1 at 41.7-42.85 m.

The interval is part of the type section of the Ulgnamba Lignite Member of the Hale River Formation in the Hale Basin.

Palynological data confirm the Ulgnamba Lignite also occurs at 28.2-29.44 m in HALE Basin core holes 78 HR2 at 28.2-29.44 m, 78 HR3 at 15.0-18.4 m and in 78 HR4 at 23.8-27.65 m.

Lithologically similar organic facies in Hale Basin core holes 78 HR5 at 31.1-31.17 m, 81 HR1 at 35.0-36.03 m, and 81 HR2 at 27.7-32.2 m appear to be older (Middle Eocene, Lower *N. asperus* Zone Equivalent?). If correct then deposition of the Ulgnamba Lignite was time transgressive in the basin.

Probable correlatives of the Ulgnamba Lignite occur in the BURT PLAIN Basin core hole 81 BP1 at 152.40-163.87 m, in BMR NAPPERBY-1 at 135.94-138.99 m (data from Kemp, 1976) and, less certain, in the TI-TREE Basin in core hole 81. TT1 at or above

196.3-198.67 m. Caved or reworked spores and pollen suggest that correlatives of the Ulgnamba Lignite are or were present in the SANTA TERESA Basin.

Samples between 53.05-102.32 m in SANTA TERESA core hole ST1 appear to pre-date the Middle-Late Eocene but are unlikely to be as old as Early Eocene.

Early Eocene - SANTA TERESA ST3 at 76.70-76.72 m; ST4 at 64.9-73.28 m.

Species diagnostic of an Early Eocene age occur in TI-TREE TTW2 at 119.05-119.10m, and in TT1 (196.3-196.8 m). At present it is unclear whether these species are *in situ* or have been reworked into a facies which is a correlative of the Middle-Late Eocene Ulgnamba Lignite

2.5 Palynologic dates from the Burt Plain, Santa Teresa and Ti-tree Basins are not wholly consistent with the model of Tertiary sediment accumulation proposed by Senior *et al.* (1994, 1995) for the eastern Arunta Block Central Australia.

2.6 It is strongly recommended that the palynostratigraphic framework be tested via further analysis of samples from these and other core holes, or basins in the region.

3. DEPOSITIONAL ENVIRONMENTS

All productive samples yielded low to abundant numbers of the brackish-water alga *Botryococcus* and an unidentified bean shaped cyst characterised by linear splitting along one wall. Less common aquatic taxa included the fresh to brackish water dinocyst genera *Cobricosphaeridium*, *Morkallacysta* and *Saepodinium*. Apart from two specimens of *Azolla massulae*, free-floating representatives of the aquatic higher plants were absent although all palynofloras included sedge and rush pollen in low to moderate numbers..

The data indicate that organic facies such as the Ulgnamba Lignite accumulated under brackish-water conditions, probably in streams or ponds in which water flow was sluggish. Streams were lined by wetlands and (gallery?) evergreen rainforest.

The occurrence of a 'marine' dinoflagellate (*Ceratopsis obliquipes*) indicative of high salinity levels during the Early Eocene in the Santa Teresa Basin (and at approximately the same time in the Lake Eyre Basin (M.K. Macphail, unpubl. data) is difficult to explain in terms of local or regional climates (see Macphail *et al.*, 1994).

The preferred explanation is that raised salt levels were due to the discharge into closed or semi-closed drainage basins of saline groundwater. One possible source of salt may have been marine facies deposited during the regressive phase of the Early Cretaceous transgression of Central Australia.

The scenario envisaged is that these salts were re-mobilized under the wet climates of the Early Eocene. Equivocal evidence for an Early Cretaceous marine influence in the Alice

Springs region is provided by marine dinoflagellates in TI-TREE TTW1 (137.1-137.15 m) although at least one (*Ascodinium*) is likely to be derived from drilling mud.

4. PALAEOENVIRONMENTS

The pollen data support Truswell & Marchant's (1986) suggestion that regional climates in Central Australia were drier and more seasonal than co-eval coastal habits during the Middle-Late Eocene although still substantially wetter than the present-day arid climatic regime.

This conclusion is supported by the composition of the kerogen extracts which are dominated by biodegraded and humified plant macerals. All samples yielded low but significant amounts of carbonised tissues including xylem - confirming local conditions were sufficiently dry/seasonal to support (infrequent?) wildfires.

5. PALYNOSTRATIGRAPHY

Age determinations are based on palynostratigraphic criteria developed to date and correlate Tertiary sediments in the Gippsland Basin (Stover & Partridge, 1973, 1982; A.D. Partridge & M.K. Macphail, unpubl. results) and the Murray Basin (Macphail & Truswell, 1989, 1993) in southeast Australia, and the Bonaparte Basin in northern Australia (M.K. Macphail, unpubl. results). Time distributions of Tertiary species in the Lake Eyre Basin of northeast South Australia (Sluiter, 1991) are considered to be unreliable (N.F. Alley, pers. comm. 1995) and have not been used in this report.

Insufficient data exist to erect a local palynostratigraphic zonation for Central Australia and, as for the Murray Basin (Macphail & Truswell, 1989), datable palynofloras have been referred to equivalent zones in the Gippsland Basin.

Species diagnostic of the Late Eocene, Middle *Nothofagidites asperus* Zone (*Triorites magnificus*, *Anacolosidites sectus*) and of the Oligocene-late Early Miocene *Proteacidites tuberculatus* Zone (*Cyatheacidites annulatus*) in the Gippsland and Murray Basins do not seem to have extended into Central Australia. Correlatives of these zones are recognised using less reliable criteria, e.g. accessory species such as *Tricolpites thomasii* and relative abundance data.

A significant proportion of the palynofloras consists of species whose time distribution is unknown or poorly constrained. These include previously unrecorded *Proteacidites*, tricolpate and tricolporate types, unusual morphological variants of species found in other basins, and species that are extremely rare elsewhere, e.g. *Cranwellia* spp, *Proteacidites* sp. A of Macphail & Truswell (1989) (= *P. retiporus* ms), *P. intricatus* and *Banksieaeidites* sp A of Dudgeon (1983).

The assumption has been made that at any point in time, climates (and therefore dryland vegetation) would have been relatively uniform across the Alice Springs region. This

allows the relative pollen abundance to be used for correlation purposes (see Macphail *et al.* 1994). Also, the times of First and Last appearance are likely to be earlier in Central Australian than in coastal basins (see Macphail *et al.* 1994). For this reason the Middle *Nothofagidites asperus* Zone Equivalent in Central Australia is suggested to represent the Middle as well as Late Eocene time - a period embracing the Lower *N. asperus* Zone in the Gippsland Basin.

Unless there is compelling evidence to the contrary, zone index species are presumed to be *in situ*.

5.1 HALE BASIN

Age determinations for the Hale Basin are based on the palynological analysis of organic facies from 7 core holes (number of samples in parentheses): 78DDH HR1 (4), 78DDH HR2 (3), 78DDH HR3 (2), 78DDH HR4 (3), 78DDH HR5 (1), 81 HR1 (2) and 81 HR2 (4).

5.11 Core hole 78DDH HR1

In this core hole, the organic facies consist of two intervals of brown silty clays (12.1-12.8m, 14.9-15.2 m) within a unit of white sandstones and, between 40.5-44.05 m, grey to black carbonaceous clays and lignites of the Ulgnamba Lignite Member of the Hale Formation

Samples from the Ulgnamba Lignite yielded abundant well preserved palynofloras dominated by *Botryococcus* and other brackish-freshwater algal cysts. The fossil spore and pollen component is dominated by *Nothofagidites* (*N. emarcidus-heterus*, *N. brachyspinulosus* s.l.). *N. asperus*, *N. flemingii* and *N. vansteenisii* were not recorded.

Although diverse, the number of species present in productive samples, especially of spores, is less than in co-eval palynofloras in the southern margin basins. The *Proteacidites* component lacked many of the zone-diagnostic species found in the Gippsland Basin, e.g. *P. rectomarginis*. Conversely two species found in extremely low numbers elsewhere were widespread in the Hale Basin palynofloras: *Cranwellia* spp. and *Proteacidites retiporus* ms. The interval yielded a small number of previously unrecorded species and larger number of geographical variants of described species are present, in particular *Nothofagidites* and *Sapotaceoidaepollenites* spp.

Middle *Nothofagidites asperus* Zone Equivalent 41.7-42.88 m Middle-Late Eocene

The interval is assigned to the Middle *Nothofagidites asperus* Zone Equivalent, based on the association of *Cranwellia costata*, *C. striatus*, *Tricolpites thomasii*, *Proteacidites reticulatus* and frequent *Aglaoreidia qualumis*. *Santalumidites cainozoicus*, *Proteacidites confragosus* and *P. tuberculiformis* are against the sample being younger than this zone.

These species confirm the Middle-Late Eocene age proposed for the Ulgnamba Lignite by Truswell & Marchant (1986) which had been based on a *Proteacidites confragosus*. This species is now known to range from Late Cretaceous into the Late Eocene.

Unusual or anomalous records include (time of First Appearance in the Murray Basin in parentheses): *Gyropollis psilatus* (Late Eocene), *Striasyncolpites laxus* (latest Eocene-earliest Oligocene) and *Densoisporites implexus* (Late Miocene-Early Pliocene).

Monotocidites galeatus Zone Equivalent? 12.1-14.93 m Late Miocene-Pliocene?

Samples of the brown silty clay (12.1-12.3 m, 14.9-14.93 m) yielded well-preserved but mixed-age palynofloras

These include *Santalumidites cainozoicus*, a species that is highly unlikely to range above the Middle *N. asperus* Zone Equivalent, and *Polyporina granulata* and *Rhoipites ampereaformis*, species which first appear in the Late Miocene, *Monotocidites galeatus* Zone and remain part of the modern Eremean flora.

Alternative explanations and ages for the unit are: (1) Late Miocene-Pliocene if *Rhoipites ampereaformis* and *Nothofagidites falcatus* are *in situ* or (2) Plio-Pleistocene if these and long-ranging Tertiary species such as *Araucariacites australis* and *Lygistepollenites florinii*, which range no higher than the latest Pliocene, are contaminants or reworked.

5.12 Core hole 78DDH HR2

The lithostratigraphy of core hole 78 HR2 is similar to that of 78 HR1 except that the presumed Ulgnamba Lignite Member occurs at shallower depths, between 27.5-31.6 m. Pollen analysis (this report) confirm the correlation. An interval of brown silty clays between 0-6.5 m was not sampled.

Middle *Nothofagidites asperus* Zone Equivalent 28.2-29.44 m Middle-Late Eocene

Samples from this interval yielded moderately diverse, well preserved palynofloras which lacked zone index species. The Middle-Late Eocene age is based on *Cranwellia costata*, *Dryadopollis retequetrus*, *Proteacidites*, *P. confragosus*, *P. crassus*, *P. reticulatus*, *P. tuberculiformis* and *Psilastephanocolporites micus* in palynofloras dominated by *Nothofagidites brachyspinulosus* s.l. and *N. emarcidus-heterus*.

The age determination is supported by specimens of the droseracean pollen *Fischeripollis halensis*, described by Truswell & Marchant (1986) from a sample of Ulgnamba Lignite from core hole 78 HR1. Anomalous records include *Densoisporites implexus* and *Thymelaepollis*, a taxon which elsewhere first appears in the Late Pliocene.

5.13 Core hole 78DDH HR3

Brown silty clay beds are absent in core hole 78 HR3. Organic facies interpreted as Ulgamba Lignite occur at surprisingly shallow depths between 14.0-20 m. Pollen analysis confirms the correlation - suggesting that up to 20 m of coverbeds have been removed by erosion at the core hole site.

Good preservation of palynomorphs at depths as shallow as 15 m is highly unusual in inland Australia. One explanation is that the Ulgamba Lignite includes hydrophobic facies (saturated by oil derived from the decomposition of *Botryococcus* and other algae?), which have prevented movement of groundwater through the unit. Alternatively, the stratum has been uplifted in the very recent geological past.

Middle *Nothofagidites asperus* Zone Equivalent 28.2-29.44 m Middle-Late Eocene

Samples between 15.0-18.4 m yielded essentially the same palynofloras as at 41.7-42.88 m in 78 HR1. Age diagnostic and zone accessory species included *Tricolpites thomasi*, *Psilastephanocolporites micus* and *Fischeripollis halensis*.

5.14 Core hole 78DDH HR4

Ulgamba Lignite occurs at 21.0-28.0 m in this core hole. Unlike in core holes 78 HR1-3, the formation is underlain by strata which include beds of light to dark brown (organic?) claystones which may predate the Middle-Late Eocene. Palynological analysis of the one or more samples from this unit (37.0-40.25 m) is strongly recommended.

Middle *Nothofagidites asperus* Zone Equivalent 23.8-27.65 m Middle-Late Eocene

The interval is dated as Middle *N. asperus* Zone Equivalent, based on morphological variants of *Tricolpites thomasi* in *Nothofagidites*-dominated palynofloras at 23.8-23.88 m and 27.6-27.65 m.

Proteacidites reticulatus occurs in the higher palynoflora; *P. confragosus* in the lower palynoflora. In spite of high to very high yields, diversities are lower than in correlative assemblages in Core holes HR 1-3. Rare species include *Azolla* (massulae only) and *Densoisporites implexus*.

5.15 Core hole 78DDH HR5

In this core hole, grey to black carbonaceous clays and lignites which appear to be Ulgamba Lignite occur between 29.1-35.9 m. These overlie grey-yellow carbonaceous clay (35.9-40.5 m) and dark grey to dark green slightly silty clays (40.5 to TD).

Palynomorphs indicate that the carbonaceous clays and lignites are older than Middle *N. asperus* Zone Equivalent but almost certainly not as old as Early Eocene based on assemblages from carbonaceous beds in the Santa Teresa and Ti-tree Basins (see below). Since the lithology indicates that the unit is Ulgamba Lignite, the data suggest that

deposition of this Member of the Hale Formation was time transgressive in the Hale Basin.

Lower *Nothofagidites asperus* Zone Equivalent 31.1-31.17m Middle Eocene?

The low diversity palynoflora at 31.1-31.17 m is provisionally assigned a Lower *N. asperus* Zone Equivalent age, based on the high relative abundance of *Haloragacidites harrisii* relative to *Nothofagidites* spp. and *N. falcatus*.

The sample appears to have been contaminated by drilling mud since it includes Asteraceae pollen. Rare species not previously recorded in the Ulgnamba Lignite in the Hale Basin are *Anacolosidites acutullus*, *Crassiretitriletes vanraadshoovenii* and *Malvacearumpollis* spp.

5.16 Core hole 81 HR1

In this core hole, black to grey carbonaceous clays and lignites presumed to be Ulgnamba Lignite occur at 31-39 m. This cannot be confirmed palynologically due to gross mud contamination of the one palynoflora from this interval (35.0-35.03m). The unit has been provisionally assigned a Lower *Nothofagidites asperus* Zone Equivalent age but it is recommended that the section be resampled.

Lower *Nothofagidites asperus* Zone Equivalent 31.1-31.17m Middle Eocene

The sample at 36.0-36.03 m yielded modern pollen only.

The provisional date is based on the close resemblance of the (mud contaminated) palynoflora at 35.0-35.03 m to the assemblage recovered at 31.1-31.17 m in core hole 78.HR5, viz. the high relative abundance of *Haloragacidites harrisii* relative to *Nothofagidites* spp. and presence of *Anacolosidites acutullus*, *Crassiretitriletes vanraadshoovenii* and *Malvacearumpollis* spp. *Nothofagidites falcatus* indicates the palynoflora is no older than Lower *N. asperus* Zone Equivalent.

Unusual records include the dinoflagellate *Morkallacysta pyramidalis* and a single (caved)specimen of the *Tubulifloridites pleistocenicus* which appears to be the first record of this Late Pliocene-Pleistocene index species in Central Australia.

5.17 Core hole 81 HR1

The lithostratigraphy of core hole 81 HR2 is similar to that of 81 HR1 except that the presumed interval of Ulgnamba Lignite at 30.4-34.1 m is underlain by green calcareous siltstones. Two samples of carbonaceous clays from 35.0-36.03 m yielded frequent to abundant algal cysts but relatively few spores and pollen. Both assemblages show mud contamination and the age determination is of low confidence.

Lower *Nothofagidites asperus* Zone Equivalent 35.0-36.03 m Middle Eocene

The sample at 35.0-35.03 m yielded a palynoflora dominated by *Haloragacidites harrisii* and *Gleicheniidites* spp. *Nothofagidites* spp. are frequent but do not include *N. falcatus*.

The sample at 36.0-36.03 m yielded modern contaminants including *Acacia*, Asteraceae, Chenopodiaceae-Amaranthaceae, Myrtaceae and Poaceae mixed with well-preserved specimens of *Nothofagidites brachyspinulosus*, *N. emarcidus-heterus* and *N. falcatus*.

5.18 Core hole 81 HR2

One organic facies was intersected in this core hole - a 4m thick sequence of dark grey and black carbonaceous clays and lignites between 30.4-34.1m which is presumed to be Ulgnamba Lignite. Yields and diversity are very low and it is uncertain if any of palynomorphs are *in situ*. It is recommended the section be resampled.

Lower *Nothofagidites asperus* Zone Equivalent 27.7-32.22m Middle-Late Eocene

The provisional date of Lower *N. asperus* Zone Equivalent, based on the abundance of *Haloragacidites harrisii* relative to *Nothofagidites* spp. at 27.7-27.72 m, and rare specimens of *Proteacidites tuberculiformis* and frequent *Nothofagidites falcatus* at 32.2-32.22 m. *Densoisporites implexus* and *Proteacidites pachypolus* occur in the latter assemblage.

Indeterminate 38.0-38.03 m

A sample at 38.0-38.03m from green siltstones underlying the presumed Ulgnamba Lignite yielded a very sparse palynoflora consisting of modern taxa mixed with (reworked?) Tertiary gymnosperm pollen (*Lygistepollenites florinii*, *Trisaccites* spp.).

5.2 SANTA TERESA BASIN

Age determinations for the Santa Teresa Basin are based on palynological analyses of organic facies in 3 core holes (number of samples in parentheses): 81 ST1 (5), 81 ST3 (3) and 81 ST4 (2).

Palynofloras recovered from the Santa Teresa samples differ from those preserved in the Ulgnamba Lignite in that *Nothofagidites* is absent to uncommon and many assemblages contained species which range no higher than the Early Eocene in the southern margin basins. Age-diagnostic species include *Integricorpus antipoda* ms, *Phyllocladidites reticulosaccatus* and *Tricolpites waiparaensis* and, less certain, several highly distinctive, undescribed types that were not been recorded in the Hale Basin samples, e.g. *Proxapertites granulatus* ms and *Tricolpites gigafoveolatus* ms.

Species which first appear in Early Eocene were rare. The most reliable of these are *Intratropollenites notabilis*, *Proteacidites nasus*, *P. pachypolus* and, less certain, *P. retiporus* ms. *Integricorpus antipoda* ms ranges no higher than the Early Eocene.

5.21 Core hole ST1

In this core hole, organic facies consist of grey to black carbonaceous clays between 35.5-56.2 m and much thinner (< 1m) bands of carbonaceous clays at 93.4-93.6 m and 102.3m within a massive limestone (66.0 to TD).

The highest sample of carbonaceous clays (36.26-36.30 m) yielded an equivocal Middle Eocene or younger palynoflora. Palynofloras recovered from the carbonaceous units below 46.0m are dominated by *Haloragacidites harrisii*.

Malvacipollis diversus Zone Equivalent 53.05-102.32 Early Eocene

The interval is provisionally dated as Early Eocene, *Malvacipollis diversus* Zone Equivalent, based on *Phyllocladidites reticulosaccatus*, *Proteacidites crassus*, *P. nasus*, and *P. pachypolus* at 102.3-102.32m.

The palynoflora includes trace numbers of *Proteacidites sinulatus*, *P. retiporus* ms and *Reevesiapollis reticulatus* associated with species which first appear in the Late Paleocene, Upper *Lygistepollenites balmei* Zone, e.g. *Banksieaeidites arcuatus*, *Malvacipollis subtilis*, *Proteacidites annularis* and several distinctive, previously unrecorded *Proteacidites* and *Tricolpites* spp. *Nothofagidites* is rare.

An alternative but less probable age determination for the interval is Middle Eocene, Lower *Nothofagidites asperus* Zone Equivalent if a specimen (assumed to be caved) of *Tricolpites thomasi* is in fact *in situ*. Other anomalous records include *Tricolpites incisus*, a species which typically first appears in the late Early Eocene *Proteacidites asperopolus* Zone in the Gippsland Basin (93.5-93.54m).

The sample at 90.5-90.53 m yielded modern pollen and one specimen of *Lygistepollenites florinii*: multiple specimens of *Phyllocladidites reticulosaccatus* are present in the *Haloragacidites harrisii*-dominated palynoflora at 53.05-53.1 m.

Indeterminate 36.26-36.30m

The sample at 36.26-36.30 m yielded a very sparse palynoflora of long-ranging Tertiary spp., including *Nothofagidites falcatus*. Lithological considerations make it unlikely that the clay unit is Middle-Late Eocene. Nevertheless the presence of *Nothofagidites* spp. does suggest that a correlative of the Ulgnamba Lignite does exist either upsection or elsewhere in the basin.

5.22 Core hole 81 ST3

Unlike in core holes 81 ST1 and ST2, the sediments in ST3 are non-calcareous. One very thin (2 cm) carbonaceous inclusion was found at 76.7 m, close to the top of a ca. 60 m thick section of grey claystones.

Two palynomorphs suggest that local salinity levels may have been high. These are: (1) low numbers of the typically marine Tertiary dinoflagellate *Ceratopsis (Deflandrea) obliquipes* in a sparse, mud contaminated, palynoflora at 70.66-70.68 m; and (2) the frequent occurrence at 76.70-76.72 m of a fern spore (*Cyathidites splendens*) whose closest modern equivalent is the subtropical-tropical Mangrove Fern *Acrostichum aureum*.

Malvacipollis diversus Zone Equivalent 70.66?-76.72 m Early Eocene

The sample at 76.70-76.72 m yielded a rich palynoflora dominated by *Haloragacidites harrisii* and small (< 20µm) undescribed species of *Proteacidites* and *Tricolpites*.

The maximum age is early Early Eocene based on *Intratropopollenites notabilis*, a determination that is supported by multiple specimens of an undescribed *Striatricolporites* species previously recorded only in the Bonaparte basin in association with Early Eocene dinoflagellates (M.K. Macphail, A.D. Partridge & R. Helby, unpubl. data).

The minimum age is Early Eocene, based on the absence of index species of the *Proteacidites asperopolus* and *Nothofagidites asperus* Zones, e.g. *Tricolpites incisus* and *Sapotaceoideaepollenites rotundus*.

Support for an Early Eocene age is provided by frequent occurrences of *Cyathidites splendens* and two *Anacolosidites* spp. (*A. acutullus*, *A. megacutullus* ms), *Proteacidites grandis*, *Tricolpites waiparaensis*, *Proxapertites granulosus* ms and *Tricolpites gigafoveolatus* ms.

Indeterminate 50.47-50.5 m.

A sparse palynoflora recovered at 50.47-50.5 m is 'dominated' by *Nothofagidites* spp. and modern pollen types. The former may indicate the presence of Middle Eocene to Oligo-Miocene organic facies elsewhere in the basin.

5.23 Core hole 81 ST4

One organic-rich facies was encountered in this core hole - a 1.7 m thick interval of dark grey clays within a thick sequence of medium-coarse, poorly sorted-angular fluvial sands at 52-71m.

Organic matter in the clay unit has been strongly degraded, resulting in the selective concentration of oxidation-resistant plant remains such as spores, pollen and carbonised xylem. Perfect preservation of palynomorphs and paucity of algal cysts suggests the deposit represents a rapidly buried flood plain deposit. *Cyathidites splendens* is common-abundant, possibly indicating high salinity levels at the time of deposition.

The fluvial sands are underlain by a 7m thick interval of light grey clays which also preserve minor amounts of organic matter. In this instance, the spore and pollen component has been strongly oxidised along with other plant remains. Abundant algal cysts indicate this clay stratum was deposited in a shallow, possibly ephemeral, pond or lake.

Malvacipollis diversus Zone Equivalent 64.9-73.28 m Early Eocene

Samples at 64.9-64.93 m and 73.25-73.28 m yielded palynofloras that are dominated by *Haloragacidites harrisii*, undescribed small *Proteacidites* spp and *Cyathidites splendens*. *Malvacipollis diversus* is common at 64.9-64.93 m.

The interval is assigned to the *M. diversus* Zone Equivalent, based on *Proteacidites leightonii*, *Tricolpites waiparaensis*, frequent to common *Anacolosidites acutullus* and *A. megacutullus* ms and multiple specimens of *Integricorpus antipoda*.

The maximum age is Late Paleocene, Upper *Lygistepollenites balmei* Zone Equivalent, based on *Crassiretitriletes vanraadshoovenii*, *Banksieaeidites lunatus* ms, *Proteacidites annularis* and *P. incurvatus* at 73.25-73.28m. The minimum age is *M. diversus* Zone based on *Integricorpus antipoda*, *Phyllocladidites reticulosaccatus*, *Proteacidites crassus* and, less certain, *Tricolpites gigafoveolatus* ms and frequent *Proxapertites granulatus* ms.

The assemblages include low numbers of spore species that are more typical of Late Cretaceous to Paleocene palynofloras in the southern margin basins, e.g. *Camaraozonosporites eyrensis* ms, *Ceratospores equalis*, *Interulobites* sp. cf. *I. intraverrucatus*, *Proteacidites* sp cf *P. otwayensis* ms, *Schizosporis reticulatus* and *Tricolpites gillii*.

Species used to support a Maastrichtian-?Paleocene age for lignites in Huckitta HUC-1 (Truswell, 1987) and at Ayers Rock (Twidale & Harris, 1991), e.g. *Australopollis obscurus*, *Camaraozonosporites bullatus*, *Gambierina rudata* and *Grapnelispora evansii*, are absent. Unusual or anomalous species include *Ricciaesporites* sp. cf *R. kawaraensis*, *Proteacidites reflexus*, and *P. sinulatus*.

5.3 TI-TREE BASIN

Age determinations for the Ti-tree Basin are based on the palynological analysis of organic facies in 3 core holes (number of samples in parentheses): 78.TTW1 (2), 78 TTW2 (4) and 81 TT1 (3).

5.31 Core hole 78 TTW1

Black to brown carbonaceous clays occur between 111.7-131.5 m. A thin unit of massive claystone between 135.5-137.3 m preserves minor amounts of organic matter.

Indeterminate 11.7-131.5 m, 135.5-137.3 m

The sample of carbonaceous clays at 112.57-112.6 m yielded modern contaminants only.

The same contaminants are present in a sample (137.1-137.15 m) of the massive claystones but are associated with low numbers of marine dinoflagellates (*Deflandrea* sp. cf. *D. phosporitica*, *Spinidinium*, *Tectadodinium*). The data are inadequate to decide if these have been reworked from an Early Cretaceous marine facies or come from mud used in drilling of the hole.

5.32 Core hole 78 TTW2

Organic facies in this core hole correspond closely in depth and lithology to those penetrated in TTW1.

Of the four samples provided, three (107.2-107.24 m, 127.4-127.44 m, 132.35-132.29 m) yielded modern contaminants mixed with negligible numbers of (recycled?) Tertiary species, including *Nothofagidites* spp. These suggest that the presence of Middle-Late Eocene correlatives of the Ulnamba Lignite in the basin.

The fourth sample, at 119.05-119.10m, is also mud-contaminated but yielded abundant algal cysts and a single specimen of *Nothofagidites emarcidus-heterus* mixed with 'Early Eocene' species which are highly unlikely to be caved.

The provisional date for this sample is based on the assumption that the latter are *in situ*. However preservation is moderate to poor and it is possible that the taxa have been reworked from Late Cretaceous to Paleocene strata elsewhere in the basin.

Malvacipollis diversus Zone Equivalent 119.05-119.10 m Early Eocene.

The sample is provisionally dated as *M. diversus* Zone Equivalent, based on *Anacolosidites megacutullus* ms and *Stereisporites (Tripunctisporis)* sp. and multiple specimens of *Integricorpus antipoda* ms and *Proxapertites granulatus* ms.

5.33 Core hole 81TT1

Sediments in core hole 81 TT1 consist mainly of white sand and siltstones which have been weathered to a depth of ca. 100m. A thin unit of friable, slightly to highly carbonaceous claystones and lignites occurs at the base (194.2-199.0 m). The interval appears to have been extensively contaminated by drilling mud.

The sample at 194.64-194.67 m was inappropriately processed and will need to be re-sampled. Additional samples are required if uncertainties in the provisional age are to be resolved.

Malvacipollis diversus Zone Equivalent (194.64?) 196.3-198.7 m Early Eocene.

Samples at 196.3-196.8 m and 198.67-198.7 m yielded rich *Nothofagidites*-dominated palynofloras that closely match assemblages preserved in the Ulnamba Lignite. Diagnostic species are *Santalumidites cainozoicus*, *Proteacidites reticulatus* and (196.3-196.8 m) *Tricolpites thomasi*.

Also present are isolated specimens of species which have not been recorded in the Ulnamba Lignite or correlative Middle-Late Eocene deposits elsewhere, viz. *Proxapertites granulosus* ms, *Anacolosidites megacutullus* ms and (196.3-196.8 m) *Integricorpus antipoda* ms.

The provisional age determination of *M. diversus* Zone Equivalent is based on the assumption that *Integricorpus antipoda* is *in situ*.

It is possible that this species and *Proxapertites granulosus* ms and *Anacolosidites megacutullus* ms are reworked. If correct, then the black carbonaceous clay unit is Middle *N. asperus* Zone Equivalent and therefore a correlative of the Middle-Late Ulnamba Lignite in the Hale Basin.

5.4 BURT PLAIN BASIN

Age determinations for the Burt Plain Basin are based on palynological analyses of organic facies in 2 core holes (number of samples in parentheses): 81 BP1 (3) and 81 BP2 (2).

Unusually thick sections of calcareous claystones and siltstones were intersected in both boreholes. Carbonaceous sediments include some that accumulated during the Oligo-Miocene. These are the youngest Tertiary organic deposits recorded in the Alice Springs region. A correlative of the Ulnamba Lignite may be present in core hole 81 BP1.

5.41 Core hole 81 BP1

The weathering front in core hole 81 BP1 extends to ca. 60 m. Below this level, shell fragments are preserved to a depth of ca. 125m. Sediments below 125.8 m are carbonaceous. These include thin beds of green slightly calcareous siltstones, e.g. at 125.8-131.0 m and, between 145-177 m, a much thicker section of (pyritic) black carbonaceous claystones. The claystones are separated from the weathered gneiss basement rocks by ca. 13m of sands and clays.

Proteacidites tuberculatus-*Canthiumidites bellus* Zone Equivalent 130.88-130.99 m
Oligo-Miocene

The palynoflora at 130.88-130.99 m is co-dominated by *Nothofagidites* spp., *Haloragacidites harrisii* with frequent to common *Araucariacites australis* and *Milfordia homeopunctata*. Zone index species are absent.

The palynoflora is provisionally dated as Oligo-Miocene based on the absence of distinctive *Proteacidites* spp. found in the Ulgamba Lignite and correlative sediments in the study area. Maximum and minimum dates are Middle Eocene, Lower *Nothofagidites asperus* Zone Equivalent and late Early-Middle Miocene *Canthiumidites bellus* Zone Equivalent, based on *Nothofagidites falcatus* and *Proteacidites annularis*.

An Oligo-Miocene age range is supported by an undescribed *Ericipites* species which closely resembles pollen of the modern epacrid *Sprengelia* (not present in the Eremean flora) and *Ischyosporites* sp. cf *Klukisporites lachlanensis* which is typical of Oligo-Miocene palynofloras in the Murray Basin. A second spore species, *Foveotriletes balteus*, ranges no higher than the *C. bellus* Zone in the Murray Basin.

Middle *Nothofagidites asperus* Zone Equivalent 152.4-163.87 m Middle-Late Eocene

Palynological dominance of the two palynofloras from 152.4-163.87 m are similar to the assemblage at 130.88-130.9 m except that *Lygistepollenites florinii* and *Gleicheniidites* are common.

The interval is provisionally dated as Middle *Nothofagidites asperus* Zone Equivalent based on the species that are not known to range above the Late Eocene, e.g. *Banksieaeidites* sp. A of Dudgeon 1982, *Cyathidites splendens*, *Proteacidites nasus*, *P. confragosus* and *Santalumidites cainozoicus*. Unusual or anomalous records are *Gothanipollis* sp. cf *G. gothanii* and a *Verrucosisporites* sp. related to *V. kopukuensis*.

5.42 Core hole 81 BP2

The lithostratigraphy of core hole 81 BP2 is similar to 81 BP1 except that black carbonaceous claystone facies are confined to two thin beds (126.9-127.7 m, 138.2-138.3 m) bracketing a 10 m thick unit of dark green, non-calcareous claystones. Both carbonaceous horizons preserve algal remains but only the deeper yielded *in situ* spores and pollen.

The data indicate the carbonaceous strata are a correlative of the green siltstone unit at 125.8-131.0 m in core hole 81 BP1, *not* the lithologically similar interval of black clays and lignites at 145-177 m in the same core hole.

Proteacidites tuberculatus-Canthiumidites bellus Zone Equivalent 138.56-138.58 m
Oligo-Miocene

The sample at 138.56-138.58 m yielded abundant *Nothofagidites* and *Tricolpites* spp. with frequent to common *Haloragacidites harrisii*. *Araucariacites australis* and *Lygistepollenites florinii* are relatively uncommon.

The palynoflora is dated as Oligo-Miocene, based on multiple specimens of *Corsinipollenites epilobiodes*. The determination is strongly supported by the presence of two spores closely related to the *C. bellus* Zone index species *Polypodiaceoisporites tumulatus* (frequent) and *Rugulatisporites cowrensis* (rare), and by multiple specimens of *Striasyncolpites laxus*, a species which first appears in the Late Eocene but which is more typical of younger zones. The palynoflora is no younger than *Canthiumidites bellus* Zone Equivalent based on *Proteacidites annularis* and (frequent) *Malvacearumpollis* spp.

The palynoflora includes *Densoisporites implexus*, a *Ricciaesporites* sp., *Ericipites* sp. cf *Sprengelia* and *Ischyosporites* sp. cf *Klukisporites lachlanensis* (cf core hole 81 BP1 130.88-130.99 m).

A sample at 127.15-127.18 m, from the higher of the two carbonaceous strata, yielded modern contaminants only.

5.5 NGALIA BASIN

Sediments intersected in core hole 81 NB1 are weakly to highly calcareous sands, silts and clays. The only carbonaceous unit encountered in the hole was a fine grained silty sandstone with a matrix of grey brown to black carbonaceous clays at ca. 125m.

A sample at 124.45-124.5 m from this sandstone yielded abundant humified (semi-opaque-opaque), finely dispersed organic material in which all traces of the original tissue structures has been lost.

No fossil spores or pollen were located, probably due to dilution effect of other acid-insoluble organic fragments.

5.6 WAITE BASIN

One sample of matrix surrounding a Late Miocene diprotodontid from the Alcoota Local Fauna (Murray & Megirian, 1992) was submitted for pollen analysis.

This yielded negligible organic material except for (very rare) modern pollen.

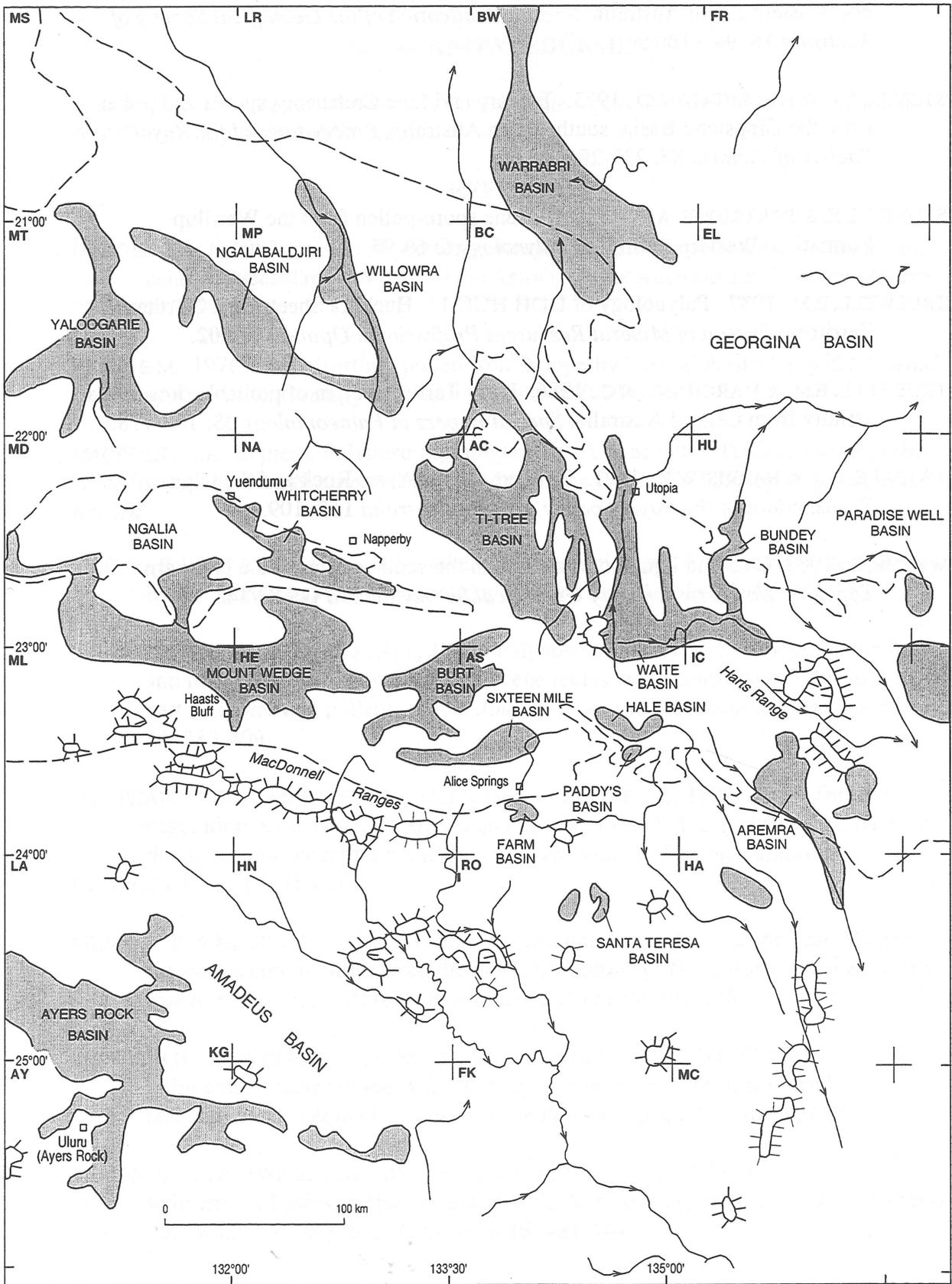
6. ACKNOWLEDGEMENTS

I thank the NT Geological Survey for access to the lignite drillcore, and Libbie Lau of AGSO for sampling the drillcore.

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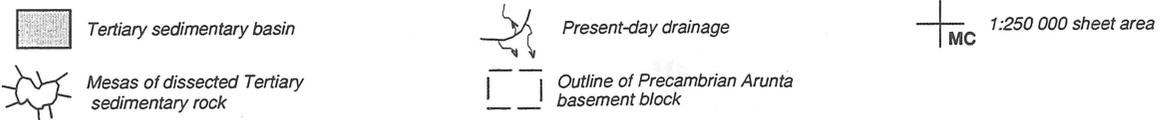


FIGURE 1 LOCATION MAP

APPENDIX 1:

SUMMARY OF BASIC DATA

COMMENT	DEPTH	TYPE	YIELD	COMMENT
Hale 78DDH HR1	12.1-12.13m	core	low	
Hale 78DDH HR1	14.9-14.93m	core	low	
Hale 78DDH HR1	41.7-41.74m	core	high	
Hale 78DDH HR1	42.85-42.88m	core	high	
Hale 78DDH HR2	28.2-28.23m	core	high	
Hale 78DDH HR2	29.4-29.44m	core	medium	
Hale 78DDH HR3	15.0-15.03m	core	high	
Hale 78DDH HR3	18.0-18.4m	core	high	
Hale 78DDH HR4	23.8-23.82m	core	high	
Hale 78DDH HR4	27.6-27.65m	core	v.high	
Hale 78DDH HR5	31.1-31.17m	core	low	
Hale 81HR1	35.0-35.03m	core	medium	
Hale 81HR1	36.0-36.03m	core	v.low	
Hale 81HR2	27.7-27.72m	core	v.low	
Hale 81HR2	32.2-32.22m	core	low	
Hale 81HR2	38.0-38.03m	core	v.low	
Santa Teresa 81ST1	36.26-36.30m	core	v.low	
Santa Teresa 81ST1	53.05-53.1m	core	medium	
Santa Teresa 81ST1	90.5-90.53m	core	v.low	
Santa Teresa 81ST1	93.5-93.54m	core	v.low	
Santa Teresa 81ST1	102.3-102.32m	core	high	
Santa Teresa 81ST3	50.47-50.5m	core	v.low	
Santa Teresa 81ST3	70.66-70.68m	core	low	
Santa Teresa 81ST3	76.7-76.72m	core	high	
Santa Teresa 81ST4	64.9-64.93m	core	v.high	
Santa Teresa 81ST4	73.25-73.28m	core	high	
Ti-Tree 78DDH TTW1	112.57- 112.60m	core	v.low	
Ti-Tree 78DDH TTW1	137.10- 137.15m	core	v.low	
Ti-Tree 78DDH TTW2	107.2-107.24m	core	v.low	
Ti-Tree 78DDH TTW2	119.05- 119.10m	core	low	
Ti-Tree 78DDH TTW2	127.4-127.44m	core	v.low	
Ti-Tree 78DDH TTW2	132.35- 132.39m	core	v.low	

Ti-Tree 78DDH TTW2	127.4- 127.44m	core	v.low	
Ti-Tree 78DDH TTW2	132.35- 132.39m	core	v.low	
Ti Tree 81TT1	194.64- 194.67m	core	high	
Ti Tree 81TT1	196.3- 196.8m	core	high	
Ti Tree 81TT1	198.6- 198.7m	core	high	
Burt Plain 81 BP1	130.88- 130.9m	core		
Burt Plain 81 BP1	152.4- 152.43m	core	high	
Burt Plain 81 BP1	163.84- 163.87m	core	high	
Burt Plain 81 BP2	127.15- 127.18m	core	v.low	
Burt Plain 81 BP2	138.56- 138.58m	core	v.high	
Ngalia Basin 81NB1	124.45- 124.5m	core	barren	
Alcoota <i>Kolopsis</i> <i>torus</i>	Main Pit		barren	

APPENDIX 2:

SUMMARY OF INTERPRETATIVE DATA

DRILL HOLE	DEPTH	AGE	ZONE	RATING
Hale 78DDH HR1	12.1-12.13m	Late Miocene-Pliocene	<i>Monotocidites galeatus</i>	v.low
Hale 78DDH HR1	14.9-14.93m	Late Miocene-Pliocene	<i>Monotocidites galeatus</i> Equivalent	v..low
Hale 78DDH HR1	41.7-41.74m	Middle-Late Eocene	Middle <i>Nothofagidites asperus</i> Equivalent	good
Hale 78DDH HR1	42.85-42.88m	Middle-Late Eocene	Middle <i>Nothofagidites asperus</i> Equivalent	good
Hale 78DDH HR2	28.2-28.23m	Middle-Late Eocene	Middle <i>Nothofagidites asperus</i> Equivalent	moderate
Hale 78DDH HR2	29.4-29.44m	Middle-Late Eocene	Middle <i>Nothofagidites asperus</i> Equivalent	good
Hale 78DDH HR3	15.0-15.03m	Middle-Late Eocene	Middle <i>Nothofagidites asperus</i> Equivalent	good
Hale 78DDH HR3	18.0-18.4m	Middle-Late Eocene	Middle <i>Nothofagidites asperus</i> Equivalent	good
Hale 78DDH HR4	23.8-23.82m	Middle-Late Eocene	Middle <i>Nothofagidites asperus</i> Equivalent	moderata
Hale 78DDH HR4	27.6-27.65m	Middle-Late Eocene	Middle <i>Nothofagidites asperus</i> Equivalent	moderata
Hale 78DDH HR5	31.1-31.17m	Middle Eocene	Lower <i>Nothofagidites asperus</i> Equivalent	low
Hale 81HR1	35.0-35.03m	Middle Eocene	Lower <i>Nothofagidites asperus</i> Equivalent	v.low
Hale 81HR1	36.0-36.03m	Middle Eocene?	Lower <i>Nothofagidites asperus</i> Equivalent	v.low
Hale 81HR2	27.7-27.72m	Middle Eocene?	Lower <i>Nothofagidites asperus</i> Equivalent	v.low

Hale 81HR2	32.2-32.22m	Middle Eocene?	Lower <i>Nothofagidites asperus</i> Equivalent	v.low
Hale 81HR2	38.0-38.03m	Indeterminate		
Santa Teresa 81ST1	36.26- 36.30m	Indeterminate		
Santa Teresa 81ST1	53.05-53.1m	Early Eocene	<i>Malvacipollis diversus</i> Equivalent	low
Santa Teresa 81ST1	90.5-90.53m	Indeterminate		
Santa Teresa 81ST1	93.5-93.54m	late? Early Eocene	<i>Malvacipollis diversus</i> Equivalent	low
Santa Teresa 81ST1	102.3- 102.32m	late? Early Eocene	<i>Malvacipollis diversus</i> Equivalent	moderate
Santa Teresa 81ST3	50.47-50.5m	Indeterminate		
Santa Teresa 81ST3	70.66- 70.68m	Early Eocene	<i>Malvacipollis diversus</i> Equivalent	low
Santa Teresa 81ST3	76.7-76.72m	Early Eocene	<i>Malvacipollis diversus</i> Equivalent	good
Santa Teresa 81ST4	64.9-64.93m	Early Eocene	<i>Malvacipollis diversus</i> Equivalent	good
Santa Teresa 81ST4	73.25- 73.28m	Early Eocene	<i>Malvacipollis diversus</i> Equivalent	good
Ti-Tree 78DDH TTW1	112.57- 112.60m	Indeterminate		
Ti-Tree 78DDH TTW1	137.10- 137.15m	Indeterminate		
Ti-Tree 78DDH TTW2	107.2- 107.24m	Indeterminate		
Ti-Tree 78DDH TTW2	119.05- 119.10m	Early Eocene	<i>Malvacipollis diversus</i> Equivalent	moderate
Ti-Tree 78DDH TTW2	127.4- 127.44m	Indeterminate		
Ti-Tree 78DDH TTW2	132.35- 132.39m	Indeterminate		
Ti Tree 81TT1	194.64- 194.67m			
Ti Tree 81TT1	196.3- 196.8m	Early Eocene	<i>Malvacipollis diversus</i> Equivalent	low
Ti Tree 81TT1	198.6- 198.7m	Early Eocene	<i>Malvacipollis diversus</i> Equivalent	v.low
Burt Plain 81 BP1	130.88- 130.9m	Oligo-Miocene	<i>Proteacidites tuberculatus- Canthiumidites bellus</i> Equivalent	v.low

Burt Plain 81 BP1	152.4- 152.43m	Middle-late Eocene	Middle <i>Nothofagidites asperus</i> Equivalent	low
Burt Plain 81 BP1	163.84- 163.87m	Middle-late Eocene	Middle <i>Nothofagidites asperus</i> Equivalent	low
Burt Plain 81 BP2	127.15- 127.18m	Indeterminate		
Burt Plain 81 BP2	138.56- 138.58m	Oligo-Miocene	<i>Proteacidites tuberculatus- Canthiumidites bellus</i> Equivalent	moderate
Ngalia Basin 81NB1	124.45- 124.5m	Indeterminate		
Alcoota <i>Kolopsis torus</i>	Main Pit			

APPENDIX 3:

SAMPLE DETAILS



record no: 01 date : 3/11/95 client: AGSO

WELL: 78DDH HR1 BASIN: Hale STATE: NT

SAMPLE TYPE: core ID : DEPTH: 12.1-.13m

YIELD [spore-pollen]: low YIELD [dinocysts]: -
DIVERSITY ["]: medium DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: lacustrine?

PREFERRED AGE : Late Miocene-Pliocene
ZONE : M. galeatus
CONFIDENCE RATING : very low
INDEX SPP. : Aglaoreidia qualumis, Rhoipites ampereaformis,
Polyporina granulata, Myrtaeidites cf lipsis,
Nothofagidites falcatus, Lygistepollenites
florinii.

MAXIMUM AGE : Middle-Late Eocene based on Santalumidites cainozoicus,
Palaeocoprosmadites zelandiae, Nothofagidites falcatus

MINIMUM AGE : Plio-Pleistocene based on relative abundance of Poaceae
and Asteraceae

CONTAMINANTS: Asteraceae & Poaceae?

REWORKED SPP: S. cainozoicus

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Asteraceae, Poaceae
2. Common [5-30%] :
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. :

COMMENTS: The sample yielded a mixed age palynofora which included
species such as S. cainozoicus which do not range above the
Late Eocene and species such as R. ampereaformis which
first appear in the Late Miocene. Asteraceae and Poaceae
are likely to first become abundant in Central Australia
during the Pliocene. There are no detectable differences
in preservation between these taxa.

The preferred date assumes at least some of the species
which first appear or become extinct in the Late Neogene
are in situ but this cannot be verified. It is highly
unlikely the sample is as old as Eocene.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 02 date : 3/11/95 client: AGSO

WELL: 78DDH HR1 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 14.9-.93m

YIELD [spore-pollen]: low YIELD [dinocysts]: -
DIVERSITY ["]: low DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: lacustrine? based on rare Botryococcus

PREFERRED AGE : Late Miocene-Pliocene
ZONE : Monotocidites galeatus Equivalent
CONFIDENCE RATING : very low
INDEX SPP. : Nothofagidites emarcidius-heterus, Rhoipites
 ampereaformis, Polyporina granulata,
 Proteacidites sp. cf P. punctiporus

MAXIMUM AGE : Middle Eocene, Lower Nothofagidites asperus Zone
Equivalent based on frequent Nothofagidites.

MINIMUM AGE : Late Pliocene based on Nothofagidites, Araucariacites
australis, Lygistepollenites florinii

CONTAMINANTS: Pinus, Acacia?, Asteraceae?
REWORKED SPP: L. florinii?, A. australis?, Nothofagidites?

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Poaceae
2. Common [5-30%] :
3. Rare [1-5%] : Nothofagidites emarcidius-heterus, Casuarinaceae

RARE/ANOMALOUS SPP. :

COMMENTS: The mixed-age palynoflora recovered from this sample is
almost certainly the result of mud-contamination of a
barren or near-barren sediment.

The preferred date assumes that at least some of the
species which first or last appear in the Late Neogene
are in situ.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 03 date : 3/11/95 client: AGSO

WELL: 78DDH HR1 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 41.7-.74m

YIELD [spore-pollen]: high YIELD [dinocysts]: -
DIVERSITY ["]: high DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: brackish-lacustrine based on abundant Botryococcus, Saeptodinium and other algal cysts

PREFERRED AGE : Middle-Late Eocene
ZONE : Middle Nothofagidites asperus Equivalent
CONFIDENCE RATING : good
INDEX SPP. : Tricolpites thomasii in a Nothofagidites-dominated palynoflora, Cranwellia costata, C. striata, Aglaoreidia qualumis, Proteacidites reticulatus, P. confragosus

MAXIMUM AGE : Middle-Late Eocene, Middle Nothofagidites asperus Zone Equivalent based on T. thomasii, C. costata, P. reticulatus, Psilastephanocolporites micus

MINIMUM AGE : Middle-Late Eocene, Middle N. asperus Zone Equivalent based on P. confragosus, P. micus, Santalumidites cainozoicus, Proteacidites tuberculiformis

CONTAMINANTS: None recognized
REWORKED SPP: ? Palaeozoic spore

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Nothofagus (Brassospora, Fuscospora)
2. Common [5-30%] : Casuarinaceae
3. Rare [1-5%] : Gleicheniaceae, Dacrydium, Podocarpus, A. qualumis, Nothofagidites falcatus, tricolporates

RARE/ANOMALOUS SPP. : Concolpites leptos, Densoisporites implexus, Gyropollis psilatus, Striasyncolpites laxus, Camptostemon sp. Cranwellia spp., Reevesiapollis reticulatus, Proxapertites sp. Numerous undescribed Proteacidites spp.

COMMENTS: The sample yielded a very rich, diverse palynoflora that includes many (but not all index) species characteristic of the Middle N. asperus Zone in coastal basins plus frequent occurrences of herbaceous taxa such as Cypaeaceaepollis (Cyperaceae) and Milfordia (Restionaceae) that are rare in Eocene assemblages from the offshore basins. Since species tend to appear earlier in central and northwest Australia, the zone is correlated with the Middle-Late, rather than Late Eocene. The assemblage appears to be diagnostic of the Ulgnamba Lignite Member of the Hale Formation in the Hale Basin.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 04 date : 3/11/95 client: AGSO

WELL: 78DDH HR1 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 42.85-.88m

YIELD [spore-pollen]: high YIELD [dinocysts]: -
DIVERSITY ["]: high DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: brackish-lacustrine based on abundant
Saeptodinium and other algal cysts

PREFERRED AGE : Middle-Late Eocene
ZONE : Middle Nothofagidites asperus Equivalent
CONFIDENCE RATING : good
INDEX SPP. : Tricolpites thomasi in a Nothofagidites-
dominated palynoflora, Cranwellia costata,
Aglaoreidia qualumis, Proteacidites
reticulatus, P. confragosus

MAXIMUM AGE : Middle-Late Eocene, Middle Nothofagidites asperus Zone
Equivalent based on T. thomasi, C. costata, P.
reticulatus, Psilastephanocolporites micus

MINIMUM AGE : Middle-Late Eocene, Middle N. asperus Zone Equivalent
based on P. confragosus, P. micus, Santalumidites
cainozoicus, Proteacidites tuberculiformis, P. crassus

CONTAMINANTS: None recognized
REWORKED SPP: Phyllocladidites reticulatus?

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Nothofagus (Brassospora, Fuscospora)
2. Common [5-30%] : Casuarinaceae, Proteaceae, Dacrydium,
Podocarpus
3. Rare [1-5%] : Sapotaceae

RARE/ANOMALOUS SPP. : Beureaidites verrucosus, Guettardidites sp.,
Gyropollis psilatus, Dryadopollis retequetrus,
Gyropollis sp. cf G. bassensis,
Palaeocoprosmadites zealandiae, Polyorificites
oblatus, Reevesiapollis reticulatus, Rubipollis
oblatus, Triporopollenites sp. cf T. ambiguus,
numerous undescribed Proteacidites spp.

COMMENTS: The sample yielded a very rich, diverse palynoflora that
includes many (but not all index) species characteristic of the
Middle N. asperus Zone in coastal basins plus persistent occurrences
of herbaceous taxa such as Cypaeaceaepollis (Cyperaceae) and
Milfordia (Restionaceae) that are rare in Eocene assemblages from the
offshore basins.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 05 date : 3/11/95 client: AGSO

WELL: 78DDH HR2 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 28.2-.23m

YIELD [spore-pollen]: high YIELD [dinocysts]: -
DIVERSITY ["]: high DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: brackish-lacustrine based on Botryococcus, Saetodinium and other algal cysts

PREFERRED AGE : Middle-Late Eocene
ZONE : Middle Nothofagidites asperus Equivalent
CONFIDENCE RATING : moderate
INDEX SPP. : Cranwellia costata, Proteacidites confragosus, P. reticulatus, P. tuberculiformis and Psilatstephanocolporites micus in a Nothofagidites-dominated palynoflora,

MAXIMUM AGE : Middle-Late Eocene, Middle Nothofagidites asperus Zone Equivalent based on C. costata, P. reticulatus, Psilatstephanocolporites micus & (?) Phyllocladidites mawsonii

MINIMUM AGE : Middle-Late Eocene, Middle N. asperus Zone Equivalent based on Dicotetradites meridianus, Proteacidites crassus, P. confragosus, P. tuberculiformis, Psilatstephanocolporites micus, Santalumidites cainozoicus, Triporopollenites ambiguus

CONTAMINANTS: None recognized
REWORKED SPP: None recorded

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Casuarinaceae
2. Common [5-30%] : Nothofagus (Brassospor, Fuscospora), Dacrydium,
3. Rare [1-5%] : Gleicheniaceae, Araucariaceae, Podocarpus, tricolporates

RARE/ANOMALOUS SPP. : Banksieaeidites sp. A of Dudgeon 1983, Camptostemon sp., Densoisporites implexus, Gyropollis psilatus, Fischeripollis halensis, Monolites alveolatus, Thymelaepollis.

COMMENTS: The sample yielded a moderately rich, diverse palynoflora that includes many (but not all) of the species characteristic of the Ulnamba Lignite in core hole 78DDH HR1 (records 03, 04). A major difference is that Casuarinaceae are relatively more common than Nothofagidites, and Araucariaceae are frequent. One explanation is that the sample is slightly younger than HR1 41.7-42.88m. The oxidation resistant organic extract includes carbonized xylem.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 06 date : 3/11/95 client: AGSO

WELL: 78DDH HR2 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 29.4-29.44m

YIELD [spore-pollen]: medium YIELD [dinocysts]: -
DIVERSITY ["]: medium DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: floodplain (riparian fernland-forest)

PREFERRED AGE : Middle-Late Eocene
ZONE : Middle Nothofagidites asperus Equivalent
CONFIDENCE RATING : good
INDEX SPP. : Tricolpites thomasii, Cranwellia striata,
 Proteacidites sp. cf P. confragosus,
 Psilatstephanocolporites micus.

MAXIMUM AGE : Middle-Late Eocene, Middle Nothofagidites asperus Zone
Equivalent based on C. striata, T. thomasii, P. micus
and (?) Phyllocladidites mawsonii

MINIMUM AGE : Middle-Late Eocene, Middle N. asperus Zone Equivalent
based on T. thomasii, Santalumidites cainozoicus

CONTAMINANTS: None recognized
REWORKED SPP: None recorded

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Casuarinaceae, Gleicheniaceae
2. Common [5-30%] : Nothofagus (Brassospora)
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. : Compositoiaepollenites sp., Densoisporites
 implexus, Gyropollis psilatus, Fischeripollis
 halensis, Strisyncolporites laxus

COMMENTS: The sample yielded a medium diverse palynoflora that
almost certainly is dominated by local or in situ plants.

A significant number of the species recovered from the Ulgumba
Lignite in core hole 78DDH HR1 (records 03, 04) are present in the
palynoflora - including index spp. such as Tricolpites thomasii,
Cranwellia striata and Fischeripollis halensis. As at 28.2-28.23m
(record 05), Casuarinaceae are more common than Nothofagidites
although Araucariaceae are rare. The oxidation resistant organic
extract includes carbonized xylem but almost no algal cysts.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 07 date : 3/11/95 client: AGSO

WELL: 78DDH HR3 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 15.0-.03m

YIELD [spore-pollen]: high YIELD [dinocysts]: -
DIVERSITY ["]: high DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: brackish lacustrine based on abundant
Botryococcus and frequent Saeptodinium.

PREFERRED AGE : Middle-Late Eocene
ZONE : Middle Nothofagidites asperus Equivalent
CONFIDENCE RATING : good
INDEX SPP. : Tricolpites thomasii, Proteacidites
 confragosus, P. reticulatus,
 Psilatstephanocolporites micus.

MAXIMUM AGE : Middle-Late Eocene, Middle Nothofagidites asperus Zone
Equivalent based on T. thomasii, P. micus and (?)
Fischeripollis halensis

MINIMUM AGE : Middle-Late Eocene, Middle N. asperus Zone Equivalent
based on T. thomasii, Santalumidites cainozoicus,
Proteacidites grandis

CONTAMINANTS: Malvacearumpollis sp.?
REWORKED SPP: None recorded

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Casuarinaceae
2. Common [5-30%] : Nothofagus (Brassospora, Fuscospora),
 Proteaceae, Dacrydium
3. Rare [1-5%] : Araucariaceae

RARE/ANOMALOUS SPP. : Banksieaeidites sp. A of Dudgeon 1983,
 Crotonipollis sp., Guettardidites sp.,
 Gyropollis psilatus, Fischeripollis halensis,
 Malvacearumpollis sp., Triporopollenites sp.
 cf T. ambiguus.

COMMENTS: The sample yielded a highly diverse palynoflora that
closely resembles the palynofloras recovered from recovered from the
Ulgamba Lignite in core hole 78DDH HR1 (records 03, 04). Like the
sample at 28.2-23 in HR2 (record 05), Casuarinaceae are more common
than Nothofagidites and Araucariaceae are frequent.

The oxidation resistant organic extract includes carbonized xylem but
otherwise is wholly dominated by Botryococcus. Oil from these cysts
is suggested to have made the facies impervious to penetration by
groundwater - hence excellent preservation at the unusually shallow
depth of 15m.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 08 date : 3/11/95 client: AGSO

WELL: 78DDH HR3 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 18.0-.4m

YIELD [spore-pollen]: high YIELD [dinocysts]: -
DIVERSITY ["]: high DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: brackish lacustrine based on algal cysts including (rare) Morkallacysta spp.

PREFERRED AGE : Middle-Late Eocene
ZONE : Middle Nothofagidites asperus Equivalent
CONFIDENCE RATING : good
INDEX SPP. : Tricolpites thomasii, Proteacidites sp. cf P. confragosus, P. reticulatus, Psilatstephanocolporites micus.

MAXIMUM AGE : Middle-Late Eocene, Middle Nothofagidites asperus Zone Equivalent based on T. thomasii, P. micus, Aglaoreidia qualumis and (?) Fischeripollis halensis

MINIMUM AGE : Middle-Late Eocene, Middle N. asperus Zone Equivalent based on T. thomasii, Santalumidites cainozoicus, Proteacidites grandis

CONTAMINANTS: Malvacearumpollis sp.?
REWORKED SPP: None recorded

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Casuarinaceae, Dacrydium
2. Common [5-30%] : Nothofagus (Brassospora, Fuscospora), Podocarpus
3. Rare [1-5%] : Gleicheniaceae, Cyperaceae

RARE/ANOMALOUS SPP. : Camptostemon sp., Dryadopollis retequetrus, Gyropollis psilatus, Fischeripollis halensis, Quintiniapollis sp., Proteacidites sp. cf Persoonia.

COMMENTS: The sample yielded a highly diverse palynoflora that broadly resembles the palynofloras recovered from recovered from the Ulgamba Lignite in core hole 78DDH HR1 (records 03, 04). Like the sample at 15.0-15.03m (record 07), Casuarinaceae are more common than Nothofagidites although Araucariaceae are rare.

Oil from Botryococcus 'horizons' at e.g. 15.0m, is suggested to have made sediments within the unit as a whole impervious to penetration by groundwater - hence the excellent preservation in this sample.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 11 date : 3/11/95 client: AGSO

WELL: 78DDH HR5 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 31.1-.17m

YIELD [spore-pollen]: low YIELD [dinocysts]: -
DIVERSITY ["]: medium DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: reed swamp based on frequent Aglaoreidia,
and algae including Botryococcus

PREFERRED AGE : Middle Eocene
ZONE : Lower Nothofagidites asperus Equivalent
CONFIDENCE RATING : low
INDEX SPP. : Nothofagidites falcatus

MAXIMUM AGE : Middle Eocene, Lower Nothofagidites asperus Zone
Equivalent based on N. falcatus

MINIMUM AGE : Middle Eocene, Lower N. asperus Zone Equivalent
based on Anacolosidites acutullus and the absence of
Middle N. asperus Zone Equivalent index spp. such as
Cranwellia striata, Tricolpites thomasii and a range
of Proteacidites spp.

CONTAMINANTS: Asteraceae, Dodonaea, Eucalyptus, Poaceae
REWORKED SPP: None recorded

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Casuarinaceae,
2. Common [5-30%] : Nothofagus (Brassospora),
3. Rare [1-5%] : Aglaoreidia qualumis, Nothofagus (Fuscospora),
Dacrydium, Gleicheniaceae

RARE/ANOMALOUS SPP. : Anacolosidites acutullus, Crassiretitriletes
vanraadshoovenii, Myrtaceidites eugenioides,
Malvacearumpollis sp.

COMMENTS: The sample yielded low numbers of spore-pollen although
the diversity is still moderate. The palynoflora differs from those
recovered from the Ulgamba Lignite in core hole 78DDH HR1 (records
03, 04) in that Casuarinaceae are dominant and the diversity of
Proteacidites spp. is very low.

The acid-insoluble residue includes fragments of carbonized xylem.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 12 date : 3/11/95 client: AGSO

WELL: 81 HR1 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 35.0-.03m

YIELD [spore-pollen]: medium YIELD [dinocysts]: -
DIVERSITY ["]: medium DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: fernland bordering a brackish? swamp, based on abundant Gleicheniaceae and an undescribed alga. Morkallacysta is present in low numbers

PREFERRED AGE : Middle Eocene
ZONE : Lower Nothofagidites asperus Equivalent
CONFIDENCE RATING : very low
INDEX SPP. : Nothofagidites falcatus

MAXIMUM AGE : Middle Eocene, Lower Nothofagidites asperus Zone Equivalent based on N. falcatus

MINIMUM AGE : Middle Eocene, Lower N. asperus Zone Equivalent based on the absence of Middle N. asperus Zone Equivalent index spp.

CONTAMINANTS: Acacia, Asteraceae, Brassicaceae, Chenopodiaceae, Eucalyptus, Poaceae and (frequent) Pinus

REWORKED SPP: None recorded

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Gleicheniaceae
2. Common [5-30%] : Casuarinaceae
3. Rare [1-5%] : Nothofagus (Brassospora, Fuscospora),
Dacrydium

RARE/ANOMALOUS SPP. : Crassiretiritetes vanraadshoovenii,
Malvacearumpollis sp., Tricolporites
pelargonioides, Tubulifloridites pleistocenicus

COMMENTS: The sample yielded a mixed age palynoflora that almost certainly is the result of extensive mud-contamination.

Abundant Gleicheniaceae spore-pollen are likely to be part of the in situ component and the date is based on the general resemblance of the palynoflora to that at 31.1-31.17m in 78DDH HR5 (record 11).

The acid-insoluble residue includes fragments of carbonized xylem.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 13 date : 3/11/95 client: AGSO

WELL: 81 HR1 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 36.0-.03m

YIELD [spore-pollen]: v. low YIELD [dinocysts]: -
DIVERSITY ["]: low DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: Indeterminate

PREFERRED AGE : Middle Eocene?
ZONE : Lower Nothofagidites asperus Equivalent
CONFIDENCE RATING : very low
INDEX SPP. : Nothofagidites falcatus

MAXIMUM AGE : Middle Eocene, Lower Nothofagidites asperus Zone
Equivalent based on N. falcatus

MINIMUM AGE : Late Pliocene based on N. falcatus

CONTAMINANTS: Acacia, Asteraceae, Chenopodiaceae, Dodonaea,
Eucalyptus, Poaceae and (frequent) Myrtaceae
REWORKED SPP: Nothofagidites spp. including N. falcatus?

RELATIVE ABUNDANCE : insufficient yield
1. Abundant [>30%] :
2. Common [5-30%] :
3. Rare [1-5%] : (Myrtaceae)

RARE/ANOMALOUS SPP. :

COMMENTS: The sample yielded a mixed age palynoflora that is
dominated by modern pollen contaminants.

It is uncertain whether Nothofagidites spp. in the assemblage are in
situ or reworked. The age determination is wholly unreliable.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 14 date : 3/11/95 client: AGSO

WELL: 81 HR2 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 27.7-.72m

YIELD [spore-pollen]: v. low YIELD [dinocysts]: -
DIVERSITY ["]: low DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: brackish lacustrine based on abundant
Botryococcus

PREFERRED AGE : Middle Eocene?
ZONE : Lower Nothofagidites asperus Equivalent
CONFIDENCE RATING : very low
INDEX SPP. : None recorded

MAXIMUM AGE : Middle Eocene, Lower Nothofagidites asperus Zone
Equivalent, based on frequent to common Nothofagidites
in an assemblage dominated by Haloragacidites harrisii

MINIMUM AGE : Late Miocene based on frequent to common
Nothofagidites

CONTAMINANTS: None recognized
REWORKED SPP: None recorded

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Casuarinaceae
2. Common [5-30%] : Nothofagus (Brassospora)
3. Rare [1-5%] : Podocarpus, Dacrydium

RARE/ANOMALOUS SPP. : Clavifera triplex, Triporopollenites spinosus

COMMENTS: The sample yielded low numbers of spore-pollen in a matrix
of algal cysts. Whilst it probable that all are in situ, the low
diversity and absence of index spp. (including N. falcatus) are
adequate only to show the sample is 'mid' Tertiary in age.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 15 date : 3/11/95 client: AGSO

WELL: 81 HR2 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 32.2-.22m

YIELD [spore-pollen]: low YIELD [dinocysts]: -
DIVERSITY ["]: medium DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: brackish lacustrine based on Botryococcus
and other algal cysts

PREFERRED AGE : Middle Eocene?
ZONE : Lower Nothofagidites asperus Equivalent
CONFIDENCE RATING : very low
INDEX SPP. : Nothofagidites falcatus

MAXIMUM AGE : Middle Eocene, Lower Nothofagidites asperus Zone
Equivalent, based on N. falcatus and frequent
Nothofagidites emarcidus-heterus and N.
brachyspinulosus in an assemblage dominated by
Haloragacidites harrisii

MINIMUM AGE : Middle-Late Eocene, Nothofagidites asperus Equivalent
Zone based on Proteacidites tuberculiformis.

CONTAMINANTS: Poaceae?
REWORKED SPP: None recorded

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Casuarinaceae
2. Common [5-30%] : Nothofagus (Brassospora + Fuscospora),
Dacrydium
3. Rare [1-5%] : Podocarpus

RARE/ANOMALOUS SPP. : Densoisporites implexus, Gyropollis psilatus,
Monolites alveolatus, Reevesiapollis
reticulatus.

COMMENTS: The sample yielded low numbers of spore-pollen in a matrix
of biodegraded plant macerals (including carbonized xylem).

The general resemblance of the palynoflora to those in core holes
78DDH HR1-5 suggests that the sample is likely to be older than
assemblages recovered from the Ulnamba Lignite. A Middle-Late
Eocene, Middle Nothofagidites asperus Zone Equivalent age remains
possible.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 16 date : 3/11/95 client: AGSO

WELL: 81 HR2 BASIN: HALE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 38.0-.03m

YIELD [spore-pollen]: v. low YIELD [dinocysts]: -
DIVERSITY ["]: low DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: Indeterminate

PREFERRED AGE : Indeterminate
ZONE : -
CONFIDENCE RATING : -
INDEX SPP. : -

MAXIMUM AGE : unknown

MINIMUM AGE : unknown

CONTAMINANTS: Acacia, Allocasuarina, Asteraceae, Poaceae
REWORKED SPP: Lygistepollenites florinii, Trisaccites sp.,
Gleicheniaceae?

RELATIVE ABUNDANCE : insufficient yield
1. Abundant [>30%] :
2. Common [5-30%] :
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. :

COMMENTS: The sample yielded a mixed assemblage of modern pollen plus (rare) specimens of Tertiary gymnosperm pollen.

The acid insoluble plant debris included carbonized xylem.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 24 date : 3/11/95 client: AGSO

WELL: 81 ST3 BASIN: SANTA STATE: NT

TERESA

SAMPLE TYPE: core ID : DEPTH: 76.70-.72m

YIELD [spore-pollen]: high YIELD [dinocysts]: -

DIVERSITY ["]: high DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: ?moderately saline lacustrine based on
frequent *Cyathidites splendens*

PREFERRED AGE : Early Eocene
ZONE : Malvacipollis diversus Equivalent
CONFIDENCE RATING : good
INDEX SPP. : *Anacolosidites megacutullus* ms,
Intratropopollenites notabilis, *Proxapertites*
granulatus ms, *Proteacidites crassus*,
Striatricolporites sp. nov., *Tricolpites*
waiparaensis, *T. gigafoveolatus* ms

MAXIMUM AGE : Early Eocene, *M. diversus* Zone Equivalent based on *I.*
notabilis, *Striatricolpites* sp. nov.

MINIMUM AGE : Early Eocene (as above)

CONTAMINANTS: Asteraceae, *Notghofagidites emarcidus-heterus*

REWORKED SPP: None recognized

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Monolete fern spores
2. Common [5-30%] : Casuarinaceae, Proteaceae, tricolpates
3. Rare [1-5%] : *Nothofagus* (*Brassospora*)

RARE/ANOMALOUS SPP. : *Proteacidites intricatus*, *Riiciaesporites* sp.
cf *R. kawaraensis*, *Tricolpites gigafoveolatus*
ms., *Proteacidites confragosus*, *Schizosporis*
reticulatus

COMMENTS: The palynofora includes an undescribed *Striatricolporites*
sp., previously recorded only in Early Eocene sediments in the
offshore Bonaparte Basin.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 27 date : 3/11/95 client: AGSO

WELL: 78DDH TTW1 BASIN: TI-TREE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 112.57-.6m

YIELD [spore-pollen]: v. low YIELD [dinocysts]: -
DIVERSITY ["]: v. low DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: Indeterminate

PREFERRED AGE : Indeterminate
ZONE : -
CONFIDENCE RATING : -
INDEX SPP. : -

MAXIMUM AGE : Indeterminate

MINIMUM AGE : Indeterminate

CONTAMINANTS: Acacia, Asteraceae, Chenopodiaceae, Eucalyptus,
Poaceae

REWORKED SPP: None recognized

RELATIVE ABUNDANCE : n/a
1. Abundant [>30%] :
2. Common [5-30%] :
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. :

COMMENTS: Mud contaminants only

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 28 date : 3/11/95 client: AGSO

WELL: 78DDH TTW1 BASIN: TI-TREE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 137.10-.15m

YIELD [spore-pollen]: v. low YIELD [dinocysts]: -
DIVERSITY ["]: v. low DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: Indeterminate (see Comments)

PREFERRED AGE : Indeterminate
ZONE : -
CONFIDENCE RATING : -
INDEX SPP. : -

MAXIMUM AGE : Indeterminate

MINIMUM AGE : Indeterminate

CONTAMINANTS: Acacia, Asteraceae, Chenopodiaceae, Eucalyptus,
Gyropollis psilatus, Poaceae, Proteaceae
REWORKED SPP: Ceratosporites equalis, Podocarpidites, marine
dinoflagellates

RELATIVE ABUNDANCE : n/a
1. Abundant [>30%] :
2. Common [5-30%] :
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. :

COMMENTS: Mud contaminants only? The sample is highly unusual in that it yielded a minimum of 4 genera of marine dinoflagelles, including a Deflandrea sp. cf D. phosphoritica. None of these obviously represent reworked Early Cretaceous species and their origin remains a mystery.

record no: 29 date : 3/11/95 client: AGSO

WELL: 78DDH TTW2 BASIN: TI-TREE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 107.2-107.24m

YIELD [spore-pollen]: v. low YIELD [dinocysts]: -
DIVERSITY ["]: v. low DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: Indeterminate

PREFERRED AGE : Indeterminate
ZONE : -
CONFIDENCE RATING : -
INDEX SPP. : -

MAXIMUM AGE : Indeterminate

MINIMUM AGE : Indeterminate

CONTAMINANTS: Asteraceae, Casuarinaceae, Gleicheniaceae?

REWORKED SPP: Microcachrydites antarcticus, Podocarpidites

RELATIVE ABUNDANCE : n/a
1. Abundant [>30%] :
2. Common [5-30%] :
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. :

COMMENTS: Mud contaminants only? The palynoflora includes a single grain of Nothofagidites brachyspinulosus, suggesting the core hole intersected a Middle-Late Eocene or younger interval.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 30 date : 3/11/95 client: AGSO

WELL: 78DDH TTW2 BASIN: TI-TREE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 119.05-.10m

YIELD [spore-pollen]: low YIELD [dinocysts]: (1 specimen)
DIVERSITY ["]: low DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: lacustrine based on abundant cysts of an unidentified alga. One marine dinoflagellate cyst was recorded

PREFERRED AGE : Early Eocene
ZONE : Malvacipollis diversus Equivalent
CONFIDENCE RATING : moderate
INDEX SPP. : Integricorpus antipoda ms, Proxapertites granulosus ms, Anacolosidites megacutullus ms

MAXIMUM AGE : Maastrichtian, based on first appearance of the index spp. (above) and Stereisorites (Tripunctisporis) sp.
MINIMUM AGE : Early Eocene, based on same spp.

CONTAMINANTS: Acacia, Asteraceae, Chenopodiaceae, Gyropollis psilatus, Ascodinium sp.

REWORKED SPP: Unknown

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Proxapertites granulosus ms
2. Common [5-30%] : Casuarinaceae, Gleicheniaceae, Proteaceae
3. Rare [1-5%] : Asteraceae

RARE/ANOMALOUS SPP. : Stereisorites (Tripunctisporis) sp.

COMMENTS: The palynoflora is mud-contaminated and includes single grains of Nothofagidites brachyspinulosus and N. emarcidus-heterus, suggesting the core hole intersected a Middle-Late Eocene or younger interval. The marine dinoflagellate Ascodinium is suggested to come from a North American lignite used in drilling mud.

Species such as Integricorpus antipoda ms, Anacolosidites megacutullus ms, and probably Proxapertites granulosus ms, are too uncommon to be contaminants although it is possible that all have been reworked into the facies from a Maastrichtian-Early Eocene source.

The preferred scenario is that all Tertiary palynomorphs except Nothofagidites are in situ and that the interval is Early Eocene (see record 33).

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 31 date : 3/11/95 client: AGSO

WELL: 78DDH TTW2 BASIN: TI-TREE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 127.4-.44m

YIELD [spore-pollen]: v. low YIELD [dinocysts]: -
DIVERSITY ["]: v. low DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: Indeterminate

PREFERRED AGE : Indeterminate
ZONE : -
CONFIDENCE RATING : -
INDEX SPP. : -

MAXIMUM AGE : -

MINIMUM AGE : -

CONTAMINANTS: Acacia, Asteraceae, Casuarinaceae, Chenopodiaceae,
Goodeniaceae, Gyrostemoaceae (Gyropollis psilatus),
Eucalyptus, Poaceae

REWORKED SPP: Gleicheniaceae?

RELATIVE ABUNDANCE : n/a
1. Abundant [>30%] :
2. Common [5-30%] :
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. : Tubulifloridites pleistocenicus

COMMENTS: Modern pollen contaminants only

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 32 date : 3/11/95 client: AGSO

WELL: 78DDH TTW2 BASIN: TI-TREE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 132.35-.39m

YIELD [spore-pollen]: v. low YIELD [dinocysts]: -
DIVERSITY ["]: v. low DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: Indeterminate

PREFERRED AGE : Indeterminate
ZONE : -
CONFIDENCE RATING : -
INDEX SPP. : -

MAXIMUM AGE : -

MINIMUM AGE : -

CONTAMINANTS: Acacia, Asteraceae, Casuarinaceae, Chenopodiaceae,
Gyrostemoaceae (Gyropollis psilatus), Eucalyptus,
Poaceae, unidentified tricolporate

REWORKED SPP: Nothofagidites emarcidus-heterus

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Poaceae, Asteraceae
2. Common [5-30%] : Chenopodiaceae
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. :

COMMENTS: Mud/dust contaminants only. The relative abundance values of Asteraceae, Chenopodiaceae and Poaceae are typical of the modern pollen rain in inland Australia. The presence of a single grain of Nothofagidites emarcidus-heterus is more difficult to explain unless the core hole has intersected a Middle Eocene or younger interval which preserves spore-pollen.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 33 date : 3/11/95 client: AGSO

WELL: 81 TT1 BASIN: TI-TREE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 196.3-.8m

YIELD [spore-pollen]: high YIELD [dinocysts]: -
DIVERSITY ["]: high DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: lacustrine based on alga and possible
Chara oogonia

PREFERRED AGE : Early Eocene
ZONE : Malvacipollis diversus Equivalent
CONFIDENCE RATING : low
INDEX SPP. : Integricorpus antipoda ms, Proxapertites ,
 granulosus ms, Tricolpites waiparaensis

MAXIMUM AGE : Late Cretaceous, based on the first appearance of the
above index spp. in the Bonaparte Basin although an
Early Eocene age is more probable based on data from
Central Australia.

MINIMUM AGE : Middle-Late Eocene, Middle Nothofagidites asperus
Equivalent Zone, based on Tricolpites thomasii,
Anacolosidites acutullus, Perforicolpites digitatus,
Proteacidites reticulatus, Santalumidites cainozoicus,
Triporopollenites ambiguus

CONTAMINANTS: None recognized
REWORKED SPP: Uncertain (see Comments)

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Nothofagidites (Brassospora), Casuarinaceae
2. Common [5-30%] :
3. Rare [1-5%] : Araucariaceae, Dacrydium, Gleicheniaceae,
Podocarpus, tricolporates
RARE/ANOMALOUS SPP. : Perforicolpites digitatus,

COMMENTS: The sample yielded a mixed age palynoflora which is (1)
dominated by a Middle-Late Eocene component that closely resembles
assemblages recovered from the Ulnamba Lignite in the Hale Basin,
but (2) includes rare specimens of species that are typical of Early
Eocene assemblages in the Santa Teresa Basin.

It is uncertain whether the latter are reworked, i.e. the sample is
Middle Nothofagidites asperus Zone Equivalent in age, or whether the
Middle-Late Eocene component is due to mud contamination.

The preferred age reflects the belief (which is difficult to
substantiate on the data available) that Integricorpus antipoda ms is
too rare to be expected to be found as a reworked species. If
incorrect, the the sample is a correlative of the Ulnamba Lignite

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 34 date : 3/11/95 client: AGSO

WELL: 81 TT1 BASIN: TI-TREE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 198.6-.7m

YIELD [spore-pollen]: high YIELD [dinocysts]: -
DIVERSITY ["]: high DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: lacustrine based on abundant algal cysts

PREFERRED AGE : Early Eocene
ZONE : Malvacipollis diversus Equivalent
CONFIDENCE RATING : very low
INDEX SPP. : Ceratosporites equalis, Proxapertites
 granulosus ms

MAXIMUM AGE : Late Cretaceous (see records 26, 33)

MINIMUM AGE : Middle-Late Eocene, Middle Nothofagidites asperus
 Equivalent Zone, Anacolosidites acutullus,
 Malvacearumpollis sp., Santalumidites cainozoicus and
 high relative abundance of Nothofagidites emarcidus-
 heterus

CONTAMINANTS: None recognized
REWORKED SPP: Uncertain (see Comments)

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Nothofagidites (Brassospora), Casuarinaceae
2. Common [5-30%] : Leptolepidites sp.
3. Rare [1-5%] : Myrtaceidites verrucosus

RARE/ANOMALOUS SPP. : Beaupreaidites verrucosus

COMMENTS: The sample yielded a mixed age palynoflora which is (1) dominated by a Middle-Late Eocene component that broadly resembles assemblages recovered from the Ulgamba Lignite in the Hale Basin, but (2) includes rare specimens of species that are typical of Early Eocene assemblages in the Santa Teresa Basin. Unlike at 196.3-196.8m (record 33) index species are absent.

It is possible the sample also includes an Oligo-Miocene component based on the low numbers of Ischyosporites sp. cf Klukisporites lachlanensis and Rugulatisorites sp. cf R. cowrensis.

It is uncertain which species (if any) are in situ.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 35 date : 3/11/95 client: AGSO

WELL: 81 TT1 BASIN: TI-TREE STATE: NT

SAMPLE TYPE: core ID : DEPTH: 194.64-.67m

YIELD [spore-pollen]: high YIELD [dinocysts]: -
DIVERSITY ["]: ? DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT:

PREFERRED AGE : (see Comments)
ZONE :
CONFIDENCE RATING :
INDEX SPP. :

MAXIMUM AGE :

MINIMUM AGE :

CONTAMINANTS:
REWORKED SPP:

RELATIVE ABUNDANCE :
1. Abundant [>30%] :
2. Common [5-30%] :
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. :

COMMENTS: The sample was inappropriately processed (coarse sieving only) which yielded an kerogen extract dominated by typically Paleocene-Early Eocene Camarozonosporites and Latrobosporites spp.

All (smaller) index species will have been lost.

The interval is listed for re-sampling and reprocessing.

record no: 36 date : 3/11/95 client: AGSO

WELL: 81 BP1 BASIN: BURT PLAIN STATE: NT

SAMPLE TYPE: core ID : DEPTH: 130.88-.9m

YIELD [spore-pollen]: medium YIELD [dinocysts]: -
DIVERSITY ["]: medium DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: ?brackish lacustrine based on low numbers
of Botryococcus

PREFERRED AGE : Oligo-Miocene
ZONE : Proteacidites tuberculatus-Canthiumidites
 bellus Equivalent
CONFIDENCE RATING : very low
INDEX SPP. : absence of Eocene indicators

MAXIMUM AGE : Middle Eocene, Lower Nothofagidites asperus Zone
Equivalent based on Nothofagidites falcatus.

MINIMUM AGE : Late Pliocene based on N. falcatus and frequent
Araucariacites australis. Foveotriletes balteus
ranges no higher than the C. bellus Zone in the
Murray basin.

CONTAMINANTS: None recognized
REWORKED SPP: None recorded

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Nothofagidites (Brassospora)
2. Common [5-30%] : Casuarinaceae, Araucariaceae
3. Rare [1-5%] : Monolete fern spores, Restionaceae, Nothofagus
(Fuscospora)

RARE/ANOMALOUS SPP. : Bryosporis sp., Foveotriletes balteus,
Sprengelia-type, Myrtaceidites eugenioides

COMMENTS: The sample lacks index species and is provisionally dated
as Oligo-Miocene based on the high relative abundance of
Nothofagidites and absence of Proteacidites spp. typical of Eocene
palynofloras in Central Australia.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 38 date : 3/11/95 client: AGSO

WELL: 81 BP1 BASIN: BURT PLAIN STATE: NT

SAMPLE TYPE: core ID : DEPTH: 163.84-.87m

YIELD [spore-pollen]: high YIELD [dinocysts]: -
DIVERSITY ["]: medium DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: brackish lacustrine based on abundant
Botryococcus

PREFERRED AGE : Middle-late Eocene
ZONE : Middle Nothofagidites asperus Zone Equivalent
CONFIDENCE RATING : low
INDEX SPP. : Banksiaeidites sp. A of Dudgeon 1983,
 Proteacidites confragosus, Santalumidites
 cainozoicus, Dilwynites tuberculatus

MAXIMUM AGE : Middle Eocene, Lower N. asperus Zone Equivalent
 based on Nothofagidites falcatus

MINIMUM AGE : Middle-Late Eocene, Middle N. asperus Zone based on
 P. confragosus, S. cainozoicus

CONTAMINANTS: None recognized

REWORKED SPP: None recorded

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Nothofagidites (Brassospora), Casuarinaceae
2. Common [5-30%] : Araucariaceae, Gleicheniaceae, Dacrydium,
 Nothofagus (Fuscospora), tricolporates
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. : Gyropollis psilatus, Monolites alveolatus,
 Verrucosisporites sp. cf V. kopukuensis

COMMENTS: The palynoflora was difficult to work due to the very high
amount of acid-insoluble algal remains, trapping and diluting the
fossil spore-pollen component.

As at 152.40-152.43m (record 37), the sample lacks index species.
It is provisionally dated as Middle-Late Eocene based on a broad
resemblance to Nothofagidites-dominated palynofloras from the
Ulgamba Lignite in the Hale Basin.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 39 date : 3/11/95 client: AGSO

WELL: 81 BP2 BASIN: BURT PLAIN STATE: NT

SAMPLE TYPE: core ID : DEPTH: 127.15-.18m

YIELD [spore-pollen]: v. low YIELD [dinocysts]: -
DIVERSITY ["]: v. low DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: brackish lacustrine based on rare
Botryococcus and other algal cysts

PREFERRED AGE : Indeterminate
ZONE : -
CONFIDENCE RATING : -
INDEX SPP. : -

MAXIMUM AGE : -

MINIMUM AGE : -

CONTAMINANTS: Eucalyptus
REWORKED SPP: None recorded

RELATIVE ABUNDANCE : n/a
1. Abundant [>30%] :
2. Common [5-30%] :
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. :

COMMENTS: Modern pollen contaminants only.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 40 date : 3/11/95 client: AGSO

WELL: 81 BP2 BASIN: BURT PLAIN STATE: NT

SAMPLE TYPE: core ID : DEPTH: 138.56-.58m

YIELD [spore-pollen]: v. high YIELD [dinocysts]: -
DIVERSITY ["]: medium DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: brackish lacustrine based on abundant
Botryococcus and other algal cysts

PREFERRED AGE : Oligo-Miocene
ZONE : Proteacidites tuberculatus-Canthiumidites
 bellus Equivalent

CONFIDENCE RATING : moderate
INDEX SPP. : Corsinipollenites epilobioides, frequent
 Polyodiaceoisporites sp. cf P. tumulatus
 Striasyncolpites laxus

MAXIMUM AGE : P. tuberculatus-C.bellus Zone Equivalent based on
C. epilobioides, frequent Malvacearumpollis spp.

MINIMUM AGE : Late Miocene based on Proteacidites annularis, high
relative abundance of Nothofagidites spp.

CONTAMINANTS: None recognized
REWORKED SPP: None recorded

RELATIVE ABUNDANCE :
1. Abundant [>30%] : Nothofagidites (Brassospora), tricolpates,
2. Common [5-30%] : Casuarinaceae, Podocarpus
3. Rare [1-5%] : Araucariaceae, Dacrydium, Gleicheniaceae

RARE/ANOMALOUS SPP. : Sprengelia-type, us, Monolites alveolatus,
Striasyncolpites laxus

COMMENTS: The palynoflora is distinguished from others recorded in
this report by very high numbers of a small, reticulate Tricolpites
sp., a probable, equally small undescribed Sparganiaceapollenites
sp., and the virtual absence of Proteacidites spp.

If in situ, Corsinipollenites epilobioides provides a reliable Early
Oligocene maximum age. The spore resembling Polyodiaceoidaesporites
tumulatus occurs in the Murray basin in C. bellus Zone palynoforas.
Multiple records of Striasyncolpites and Malvacearumpollis spp. are
more typical of the Oligo-Miocene than earlier periods.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 41 date : 3/11/95 client: AGSO

WELL: 81 NB1 BASIN: NGLAIA STATE: NT

SAMPLE TYPE: core ID : DEPTH: 124.45-.5m

YIELD [spore-pollen]: barren YIELD [dinocysts]: -
DIVERSITY ["]: - DIVERSITY ["]: -

DEPOSITIONAL ENVIRONMENT: Indeterminate

PREFERRED AGE : Indeterminate
ZONE : -
CONFIDENCE RATING : -
INDEX SPP. : -

MAXIMUM AGE : -

MINIMUM AGE : -

CONTAMINANTS: Modern pollen
REWORKED SPP: None recorded

RELATIVE ABUNDANCE : n/a
1. Abundant [>30%] :
2. Common [5-30%] :
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. :

COMMENTS: The sample yielded surprisingly large amounts of wholly degraded (opaque and semi-opaque) organic matter in which all traces of the original tissue structure have been lost. This almost certainly is due to oxidation, but does suggest that the sample is close to the base of the weathering front. If correct, palynomorphs will be adequately preserved in organic horizons deeper within the basin.

Consultant Palynological Services ph. 06-249-3676 fax 06-253-1032:

record no: 42 date : 3/11/95 client: AGSO

WELL: "main pit" BASIN: WAITE STATE: NT

SAMPLE TYPE: matrix ID : DEPTH: outcrop?

YIELD [spore-pollen]: barren YIELD [dinocysts]: -
DIVERSITY [" "]: - DIVERSITY [" "]: -

DEPOSITIONAL ENVIRONMENT: Indeterminate

PREFERRED AGE : [Early Miocene]
ZONE : -
CONFIDENCE RATING : -
INDEX SPP. : [marsupial remains]

MAXIMUM AGE : -

MINIMUM AGE : -

CONTAMINANTS: None recorded
REWORKED SPP: None recorded

RELATIVE ABUNDANCE : n/a
1. Abundant [>30%] :
2. Common [5-30%] :
3. Rare [1-5%] :

RARE/ANOMALOUS SPP. :

COMMENTS: The sample comes from sandy matrix enclosing the remains of a diprotodontid (part of the Early Miocene Alcoota Local Fauna).
The organic yield was negligible, consisting wholly of finely disseminated mineral carbon (charcoal?).

It is unclear why such palynomorphs should have been destroyed in this context when apparently similar facies in southeast Australia preserve abundant spore-pollen. Were the marsupial remains found on the surface?