



Palynostratigraphic analyses of early Cenozoic core samples within the School Creek landslide, Tarooma, South East Tasmania

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Geological Consultant's Report





Mineral Resources Tasmania
Department of State Growth

Geological Consultant's Report 2025_01:

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Cover: Aerial view from Tarooma and Dixon Beaches on the Derwent River, across the grounds of the Tarooma High and Primary Schools towards the forested hills on the western side of the Channel Highway (from Google Earth™).

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Summary

- Preliminary (2001) age determinations from borehole **BH 3-99** located west of the central oval indicated deposits in the School Creek landslide at Taroona, South East Tasmania, began accumulating in the Early Eocene.
- This report, based on core chip samples from boreholes **BH92-11** and **I08-01** located on the upper (western) edge of the School Creek landslide at Taroona, South East Tasmania, show:
 1. The deposits began accumulating in the early Early Eocene and continued over a period of ca. 5 million (Ma) years into the mid–late Early Eocene.
 2. All three boreholes preserve cysts of extinct algal cysts (dinoflagellates) that elsewhere lived in brackish to saline water although it is unclear if any of the deposits in the School Creek landslide accumulated near to sea level during the Early Eocene.
- The sequence now partially affected by the School Creek landslides, which creeps downslope towards the River Derwent, consists of colluvium deposited at various times and under different conditions although it is uncertain whether the deposits are moving as one cohesive mass or as discrete bodies. Nor is it clear when the current slippage began (Quaternary?).
- Fault scarps within the School Creek landslide sediments and underlying basement rocks are (i) likely to involve movement of the Taroona Fault on the western side of the Channel Highway and (ii) presumed to be associated with normal faulting of Tertiary sediments offshore in the Derwent Graben.
- Reworked taxa hint that Paleocene sediments had been deposited across the basement rocks before deposition of Eocene and younger deposits in the School Creek landslide.

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1.0 INTRODUCTION

A 25–30 ha area of the grounds under the Tarooma Primary and High schools (hereafter School Creek landslide) is moving slowly towards the River Derwent and causing subsidence of the adjacent Channel Highway upslope (Frontispiece). Arrays of inclinometers and bore holes (Figure 1) drilled over the last 35 years by the Tasmanian Mines Department (now Mineral Resources Tasmania or MRT) suggest this subsidence is due to rain or groundwater water lubricating the movement of geologically old ‘deep-seated landslide deposits extending from the Highway to the River Derwent’ (Latinovic et al., 2001). More recently acquired data confirm this area is moving downslope towards the River Derwent at *ca.* 8 mm pa (N. Roberts, Mineral Resources Tasmania, pers. comm.).

1.1 This report

This report is centred on recently sampled drill core from the School Creek landslide archived in MRT’s Core Library at Mornington, Hobart (www.mrt.tas.gov.au/.../tasmania/landslides). The cores lack material suitable for isotopic age control and the age and age limits in this report are based on fossil spores and pollen (miospores) preserved in rare intervals of carbonaceous clays and lignite preserved within otherwise highly weathered sands, gravels and clays in two core holes – boreholes **IBH92-11** (now **BH92-11** in MRT’s TIGER database) and **I08-01** – drilled between the Channel Highway and Tarooma Primary School on the upper edge of the School Creek landslide.

2.0 GEOLOGIC BACKGROUND

The local geology comprises Tertiary colluvium and Quaternary alluvium separated by the NNE-trending Tarooma Fault from the upslope Jurassic dolerite and Permian

mudstone basement rocks of the Parmeener Supergroup. The landslide deposits comprise dolerite, siltstone and sandstone boulders eroded from the basement rocks embedded in clay, sand and gravel. The sequence is locally flat-lying to slightly inclined, but in places dips up to 65° towards the west and southwest. Slickenside fractures within the clay facies support the interpretation (Latinovic et al., 2001) that the colluvium was deposited during a series of ancient landslides over small fault escarpments arising from movements on the Tarooma Fault. To what extent the development of the school grounds has flattened any surface features resulting from movement on the underlying fault scarps or slippage of deposits draped over these buried fault escarpments is uncertain.

3.0 PREVIOUS AGE CONTROL

Landslide deposits underlying Quaternary cover beds on the School Creek landslide were assigned a broad Tertiary age by Latinovic et al. (2001), based on sparse fossil pollen and spore assemblages (microfloras) preserved in core, cuttings and a ‘sludge’ sample from borehole **IBH 3-99** (now **BH3-99** in MRT’s TIGER database), located in partly cleared bushland *ca.* 150 m north of the central oval (Figure 1). The two basal lithostratigraphic units in this borehole were provisionally dated as Early to Middle Eocene (58.–41.2 Ma) with minor reworking from Paleocene (66.0–56.0 Ma) sediments. A third (core chip) sample from 54–60 m depth yielded an abundance of an unidentified ‘horned dinoflagellate’, possibly the Early Eocene morphospecies *Deflandrea pachyceros* or *Morkallicysta pyramidalis* (cf. Stover, 1973: 173; Harris, 1973: 163). Dated basalts outcropping elsewhere around Hobart (Sutherland and Wellman, 1986) indicate a stratigraphically higher airfall unit on the School Creek landslide subsequently was deposited during the Oligo-Miocene (33.9–5.33 Ma).

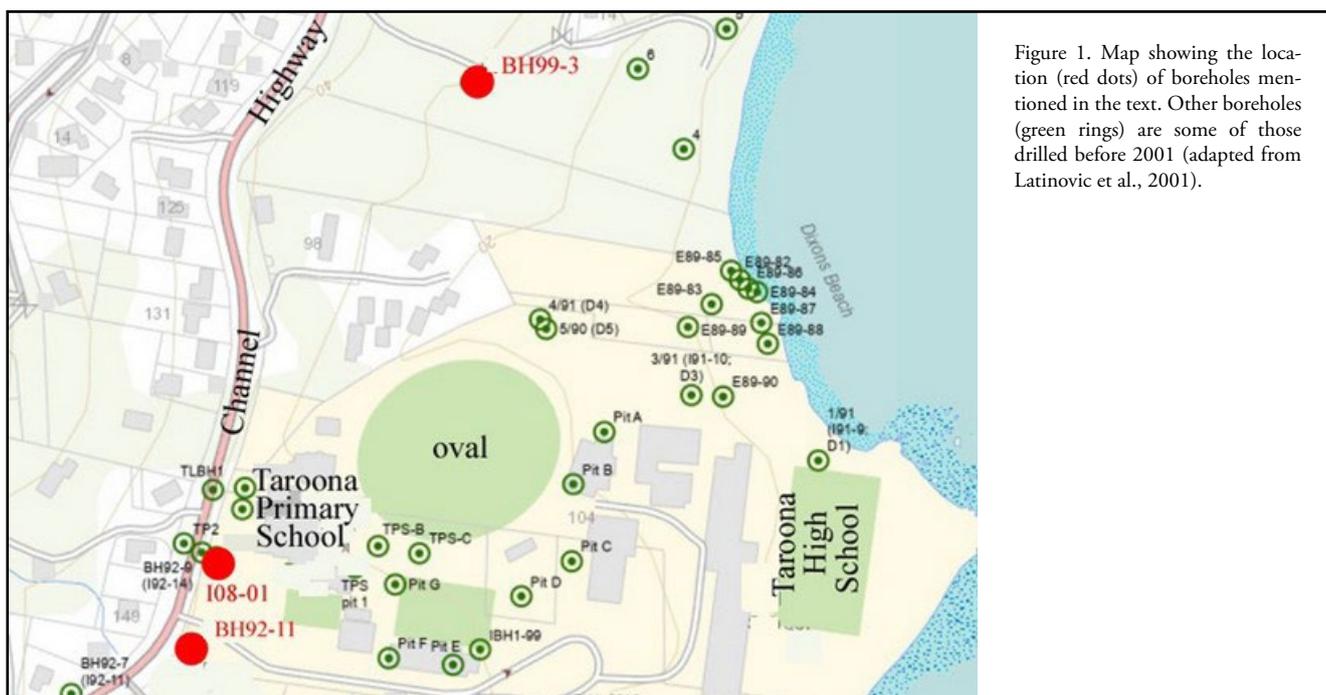


Figure 1. Map showing the location (red dots) of boreholes mentioned in the text. Other boreholes (green rings) are some of those drilled before 2001 (adapted from Latinovic et al., 2001).

4.0 PALYNOSTRATIGRAPHY

Core from boreholes sampled by S. Forsyth in 2001 either were not available or had not been archived by MRT. Accordingly, six alternative bore holes drilled into the School Creek landslide between 1992 and 2013 were inspected for carbonaceous facies in March 2025 (Table 1). Two of these were found to preserve thin intervals of carbonaceous sediments at 9.95 m and 40.3 m depth in **BH92-11** and 19.3 m depth in **I08-01** within otherwise strongly weathered unconsolidated but apparently cohesive sands, silts and clays.

4.1 Samples

Core chips analysed for plant microfossils are listed in Table 1 and illustrated in Plate 1. The mudstones from 9.95 m in **BH92-11** and 19.3 m in **I08-01** preserve carbonised plant remains on the bedding planes. The claystone from 40.30 m in **BH92-11** preserves well-defined slickenside fractures. All samples were processed by Morgan Goodall Palaeo Pty Ltd (Perth) for fossil pollen, spores, algal cysts and other plant remains. using the standard palynological techniques to concentrate the microspore component and other microfossils over 5 µm in minimum diameter (Traverse, 1988).

Table 1. Boreholes examined for carbonaceous facies in March 2025. Those sampled for palynostratigraphic dating in this study are highlighted in bold.

Borehole number	MRT ID	Date drilled	Total depth	Organic facies
3/91 (91-10 D3)	19566	1991	0–20 m	not seen
4/91 (D4)	19567	1991	0–19 m	not seen
BH92-10 (192-13)	20792	1992	0-9.95 m	not seen
BH92-11	20794	1992	0–42.25 m	9.95 m, 40.3 m
I08-01	25544	2008?	0–23.7 m	19.3 m
TLBH1	29453	?	0–15 m	not seen

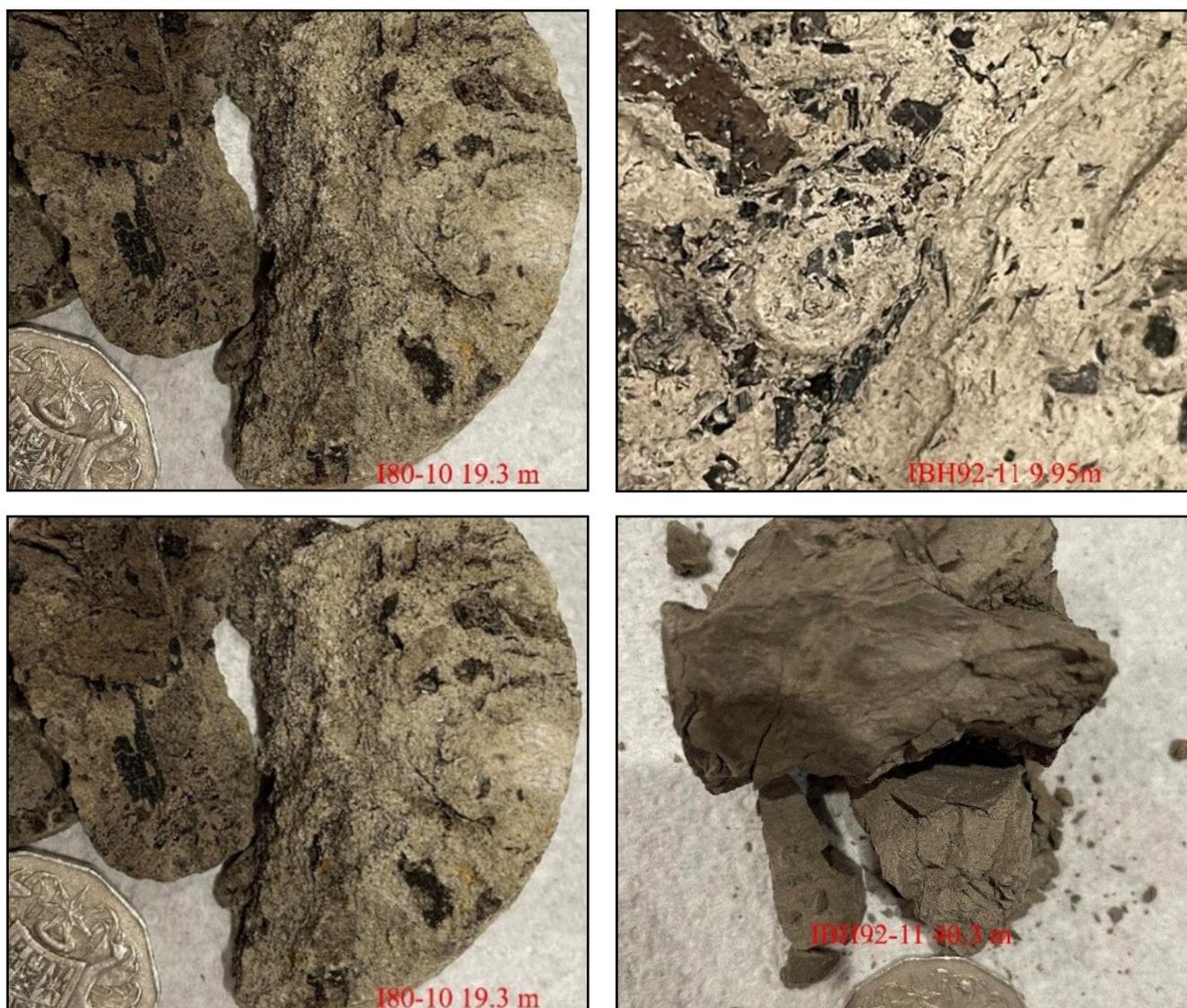


Plate 1. Images of core chips showing carbonised plant remains at 9.95 m in borehole BH92-11 (1BH99-11) and 19.3 m in borehole I08-01, and slickenside fractures at 40.3 m in Borehole BH92-11 (diameter of the 50-cent coin is 30 mm).

5.0 RESULTS

All samples yielded low numbers of mostly poorly preserved fossil pollen and spores in organic extracts that were dominated by strongly humified to well-preserved plant tissues. The stratigraphic distribution and estimates of relative abundance of all identifiable microfossils are given in Table 2. Age-diagnostic species (morphospecies) are illustrated in Plate 2.

5.1 Age and age limits

Inferred ages and age limits for **BH92-11** and **I08-01** are based on the First (FAD) and Last (LAD) appearances of age-diagnostic morphospecies that are shared with the Gippsland, Bass and Murray basins in mainland southeast Australia (cf. Stover and Evans, 1973; Stover and Partridge, 1973; Partridge, 1999; Partridge 2006; Macphail, 1999; Macphail et al., 2014). Partridge (2006) has subdivided a number of the biozones erected for the Gippsland Basin to subzones. These include the Early Eocene (early Ypresian) *Malvacipollis diversus* Zone based on the FADs of the eponymous morphospecies. For example (proposed ages in parentheses), the Lower *M. diversus* Zone is subdivided into the *Spinizonocolpites prominatus* Subzone (55.8–55.6 Ma) and the *Proteacidites grandis* Subzone (55.6–54.3 Ma), the Middle *M. diversus* Zone, which encompasses the *Proteacidites tuberculiformis* Subzone (54.3–52.2 Ma), and the Upper *M. diversus* Zone subdivided into the *Myrtaceidites tenuis* Subzone (52.2–51.5 Ma) and *Santalumidites cainozoicus* Subzone (51.5–50.5 Ma). The overlying *Proteacidites asperopolus* Zone (50.5–45.0 Ma) was not subdivided and encompasses late Ypresian time.

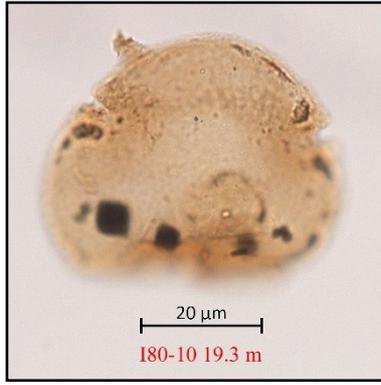
At present it is unclear if these subzones can be recognised outside of the Gippsland Basin although several of the age-diagnostic morphospecies whose FADs define the subzone boundaries are present in the School Creek landslide samples. In this report, the time distributions of age-diagnostic morphospecies in South East Tasmania are assumed to be approximately the same as in the offshore basins in Bass Strait. Based on these criteria, and in order of increasing stratigraphic depth, the proposed age and age limits of the three samples analysed in this study are:

BH92-11 9.95 m: Depending on the weight given to particular morphospecies, the maximum age of the microflora is either (1) late Early Ypresian Upper *Malvacipollis diversus* Zone Equivalent based on *Santalumidites cainozoicus* (FAD: *Santalumidites cainozoicus* Subzone of the Upper *Malvacipollis diversus* Zone) or (2) early Early Ypresian *Proteacidites grandis* Subzone based on multiple specimens of *Nothofagidites goniatus* (FAD: *Proteacidites grandis* Subzone). If *in-situ*, the minimum age is early

Early Ypresian Lower *Malvacipollis diversus* Zone based on *Peninsulapollis gillii* (LAD *Proteacidites grandis* Subzone). *Intratropollenites notabilis* is unhelpful in this respect since this morphospecies first occurs at the Late Paleocene/Early Eocene boundary and ranges through the *Proteacidites asperopolus* Zone. A single specimen of grass pollen (*Graminidites*) is assumed to be a modern contaminant although the morphogenus is recorded elsewhere in Eocene and? Paleocene deposits (Macphail and Hill, 2002).

I80-01 19.3 m: The microflora is dated as late Early Ypresian Upper *Malvacipollis diversus* Zone Equivalent, based on *Nothofagidites deminutus* (FAD *Myrtaceidites tenuis* subzone) and morphospecies with Lower *Malvacipollis diversus* Zone FADs e.g., *Nothofagidites goniatus*, *Intratropollenites notabilis* and *Peninsulapollis gillii*. (cf. **BH92-11** 9.95 m). The microfloras are distinguished by large numbers (24%) of a probable hepatic spore *Roussisporites* (al. *Triporetetes*) *reticulatus* (Dettmann, 1963), a single cyst of a non-cavate dinoflagellate dinocyst identified as the freshwater morphospecies *Saepetodinium gravattensis* (see Plate 1, Figures 1–2 in Harris, 1973), and a presumed caved specimen of the *Stephanocolpites oblatum* (FAD: Oligocene Upper *Nothofagidites asperus* Zone Equivalent).

BH92-11 40.3 m: The microflora is dated as early Early Eocene (early Ypresian) Lower *Malvacipollis diversus* Zone Equivalent based on *Nothofagidites goniatus*, *Intratropollenites notabilis*, *Peninsulapollis gillii* and questionably *Tricolporites adelaidensis* (FAD: *Malvacipollis diversus* Zone) in an assemblage lacking morphospecies that first appear in the middle Early Eocene. The maximum age of the sample is early Early Ypresian, if *Proteacidites nasus* has the same FAD in Tasmania as in the Gippsland Basin (see Partridge, 1999). The minimum age is *Proteacidites grandis* Subzone based on *Peninsulapollis gillii*. Anomalous records include *Camarozonosporites bullatus* and *Gambierina rudata* since these last occur in the Upper *Lygistepollenites balmei* Zone (57.0–55.8 Ma) in the Gippsland Basin but might(?) have extended ranges in southern Tasmania. The preferred explanation is that both taxa have been reworked from the underlying (now eroded?) Paleocene rocks or, considered a remote possibility, from Late Cretaceous sediments offshore. The algal components include multiple specimens of a cavate dinoflagellate dinocyst provisionally identified as the brackish water to marine *Deflandrea pachyceros* (see Figure 5 in Stover, 1973; Macphail, 1997). Other reworked taxa include taeniata bisaccate pollen from an extinct Permian gymnosperm clade.

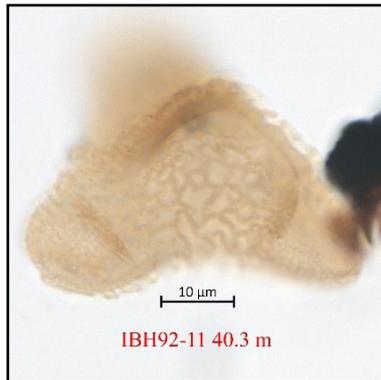
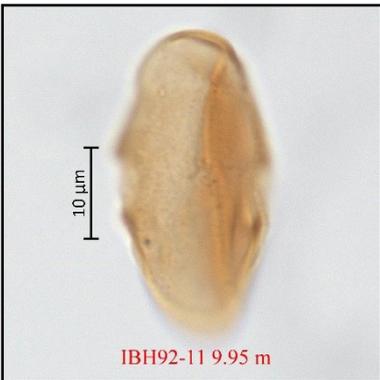


Intratriporopollenites notabilis



Nothofagidites goniatus

Peninsulapollis gillii



Santalumidites cainozoicus

Proteacidites nasus

Tricolporites adelaidensis



Camarozonosporites bullatus

Gambierina rudata

cf. *Deflandrea pachyceros*

Table 2. Estimates of relative abundance are based on the total spore-pollen count excluding fungal spores and algae.

FOSSIL TAXON	Nearest Living Relative (NLR)	BH99-11 9.95 m	I08-01 19.3 m	BH99-11 40.3 m
Algae				
<i>Botryococcus</i>	<i>Botryococcus</i>			+
<i>Circulisporis parvus</i>	<i>Zygnemataceae</i>	x		+
cf. <i>Deflandrea pachyceros</i>				x
<i>Saetodinium gravattensis</i>			x	
Fungal spores				
thalloid types		+	+	+
unassigned types		24%	23%	8%
Ferns and fern allies				
<i>Baculatisporites disconformis</i>	Hymenophyllaceae		x	+
<i>Camarozonosporites bullatus</i>	Lycopsidea?			x
<i>Cyathidites australis/minor</i>	Cyatheaceae	2%	x	1%
<i>Cyathidites splendens</i>	<i>Acrostichum</i> -type	4%	2%	+
<i>Gleicheniidites</i> spp.	Gleicheniaceae	x		x
<i>Laevigatosporites ovatus/major</i>	incl Blechnaceae	2%	x	+
<i>Matonisporites</i> cf. <i>Clavifera triplex</i>	Dicksoniaceae	x		
<i>Polypodiisporites</i> spp.	incl. Polypodiaceae	+		1%
<i>Retritiletes austroclavidites</i>	<i>Lycopodium</i>	x		
<i>Rouseisporites</i> spp.	Hepaticae	x	24%	
<i>Rugulatisporites mallatus</i>	<i>Calochlaena</i>	x	x	
<i>Stereisporites maastrichtensis</i>	extinct <i>Sphagnum</i>			x
<i>Trilites tuberculiformis</i>	Dicksoniaceae			+
<i>Verrucosporites kopukuensis</i>	<i>Lygodium</i>		cf.	
unassigned trilete spores		2%	2%	3%
TOTAL SPORES		13%	4%	5%
Gymnosperms				
<i>Araucariacites australis</i>	<i>Araucaria</i>	15%	41%	17%
<i>Dacrycarpites australiensis</i>	<i>Dacrycarpus</i>	+	1%	2%
<i>Dacrydiumites florinii</i>	<i>Dacrydium</i>	2%	2%	2%
<i>Dilwynites granulatus</i>	<i>Agathis/Wollemia</i>	2%	2%	x
<i>Dilwynites tuberculatus</i>	<i>Agathis/Wollemia</i>	8%	10%	5%
<i>Microcachryidites antarcticus</i>	<i>Microcachrys</i>	x	2%	3%
<i>Phyllocladidites mawsonii</i>	<i>Lagarostrobos franklinii</i>	2%	2%	1%
<i>Podocarpidites</i> spp.	<i>Podocarpus/Prumnopitys</i>	14%	18%	28%
<i>Podosporites microsaccatus</i>	extinct <i>Podocarpaceae</i>	14%	8%	8%
TOTAL GYMNOSPERMS		56%	85%	66%
Angiosperms				
<i>Ailanthipites paenestriatus</i>	Anacardiaceae		x	
<i>Cupanieidites orthoteichus</i>	Sapindaceae (Cupanieae)	+		
<i>Dicotetradites clavatus</i>	extinct clade	2%	+	+
<i>Ericipites</i> spp.	Ericaceae		x	
<i>Fischeripollis</i> sp.	Droseraceae			x
<i>Gambierina rudata</i>	extinct clade		cf.	x
<i>Graminidites</i>	Poaceae	x		

Table 2 continues on following page.

Table 2. Cont.

FOSSIL TAXON	Nearest Living Relative (NLR)	BH99-11 9.95 m	I08-01 19.3 m	BH99-11 40.3 m
<i>Halonragacidites harrisi</i>	Casuarinaceae	6%	3%	1%
<i>Intratriporopollenites notabilis</i>	Tiliaceae	x	x	x
<i>Liliacidites</i> spp.	lily family	+	+	
<i>Malvacipollis diversus</i>	<i>Austrobuxus</i>	x		
<i>Malvacipollis robustus</i>	<i>Austrobuxus?</i>			x
<i>Malvacipollis subtilis</i>	<i>Austrobuxus</i>	x	x	+
<i>Nothofagidites asperus</i>	<i>Nothofagus (Lophozonia)</i>	+		+
<i>Nothofagidites brachyspinulosus</i>	<i>Nothofagus (Fuscospora)</i>		x	x
<i>Nothofagidites</i> cf. <i>brachyspinulosus</i>	<i>Nothofagus (Fuscospora)</i>	8%	+	3%
<i>Nothofagidites deminutus</i>	<i>Nothofagus (Brassospora)</i>		x	
<i>Nothofagidites emarcidus</i> complex	<i>Nothofagus (Brassospora)</i>	2%	x	x
<i>Nothofagidites</i> cf. <i>endurus</i>	ancestral <i>Nothofagus</i>	x	+	+
<i>Nothofagidites flemingii</i>	<i>Nothofagus (Nothofagus)</i>	2%	2%	4%
<i>Nothofagidites goniatus</i>	<i>Nothofagus (Lophozonia)</i>	3%	1%	1%
<i>Nothofagidites</i> spp.	unassigned morphotypes	x	x	+
<i>Peninsulapollis gillii</i>	Proteaceae?	+	x	+
<i>Periporopollenites demarcatus</i>	Trimeniaceae?		x	
<i>Periporopollenites polyoratus</i>	Caryophyllaceae?	+	+	+
<i>Proteacidites</i> cf. <i>alveolatus</i>	Extinct Proteaceae			x
<i>Proteacidites</i> cf. <i>concretus</i>	extinct Proteaceae	x		
<i>Proteacidites crassimarginus</i>	extinct Proteaceae		x	
<i>Proteacidites nasus</i>	extinct Proteaceae			x
<i>Proteacidites pseudomoides</i>	extinct Proteaceae			x
<i>Proteacidites reticuloscabratus</i>	extinct Proteaceae	x		
<i>Proteacidites</i> cf. <i>rynthius</i>	extinct Proteaceae	x.	x	x
<i>Proteacidites scaboratus</i>	extinct Proteaceae			x
<i>Proteacidites simulatus</i>	extinct Proteaceae		cf.	
unassigned <i>Proteacidites</i>	extinct Proteaceae	+	x	5%
<i>Santalumidites cainozoicus</i>	Santalaceae	x		
<i>Stephanocolpites oblatus</i>	<i>Haloragodendron</i>		x	
unassigned <i>Rhoipites</i> spp.	unknown	x	x	x
unassigned <i>Tricolpites</i> spp.	unknown	2%		
<i>Tricolporites adelaidensis</i>	Meliaceae?			x
unassigned <i>Tricolporites</i> spp.	unknown	+	1%	1%
unassigned angiosperms	(poorly preserved/obscured)	3%	3%	6%
TOTAL ANGIOSPERMS		31%	11%	25%
POLLEN SUM		267	286	266
Carbon particles		x	x	x
Mesozoic-Paleozoic taxa				
<i>Corollinia</i> sp.	extinct gymnosperm			+
unassigned bisaccates	extinct gymnosperm			+

‘+’ indicates percents less than 1%.

‘x’ species recorded outside the pollen sum.

Taxa that last appear in the Paleocene elsewhere are shaded in green.

Taxa that first or last appear in the Early to Late Eocene are shaded in yellow.

Intratriporopollenites notabilis and *Santalumidites cainozoicus* have thermophile Nearest Living Relatives.

5.2 Dominance and diversity

All microfloras are dominated by the same small group of araucarian and podocarpaceous gymnosperms (Macphail et al., 2014) (Nearest Living Equivalents or NLRs in parentheses): *Araucariacites australis* (*Araucaria*) 15 to 42%, *Dilwynites tuberculatus* (extinct *Agathis-Wollemia* clade) 5 to 10%, *Dacrydiiumites florinii* (*Dacrydiium*) trace to 2%, *Phyllocladidites mawsonii* (*Lagarostrobos franklinii*-type) 1 to 2 %, *Podocarpidites* (*Podocarpus-Prumnopitys*) 14 to 28%, and *Podosporites microsaccatus* (extinct shrub podocarp) 8 to 14 %. Angiosperms comprise 11 to 31% of the pollen count, with the most commonly occurring types being *Haloragacidites harrisii* (Casuarinaceae) 1 to 6%, *Nothofagidites cf. brachyspinulosus* (*Nothofagus* subgenus *Fuscospora*) + to 8%, *Nothofagidites flemingii* (*Nothofagus* subgenus *Nothofagus*) 2 to 4%, *Nothofagus goniatus* (*Nothofagus* subgenus *Lophozonia*) 1 to 3%, and (**BH92-11** 40.3 m) *Proteacidites* (Proteaceae) 5%. Ferns and fern allies comprise 4 to 13% of the pollen sum but only the probable tree-fern morphospecies *Cyathidites australis/minor* (Cyatheaceae) and unidentified trilete spores are frequent in all samples. Sporadically frequent numbers of the extinct fern *Cyathidites splendens* (*Acrostichum*-type) in the two stratigraphically highest samples are typical of earlier Paleogene sediments.

5.3 Paleovegetation and climate

Assuming the palynologically prominent gymnosperm and angiosperm pollen types represent trees that dominated the canopy and subcanopy strata, the paleovegetation is likely to be a form of *Araucaria-Nothofagus* evergreen (warm) temperate rainforest in which the understory included a few small tree and shrub taxa with warm temperate to subtropical NLRs, e.g. *Cupanieidites orthoteichus* (Sapindaceae tribe Cupanieae), *Intratropipollenites notabilis* (Tiliaceae) and *Santalumidites cainozoicus* (Santalaceae). These morphogenera are the only moderately reliable indication of warmer conditions in the lower Derwent Graben during a period when temperatures elsewhere in southeast mainland Australia and western Tasmania were markedly higher than at present (Macphail et al., 2014 pp. 502-503).

6.0 CONCLUSIONS

Despite the limited number of samples, a number of conclusions can be inferred from the sedimentary sequence involved in the School Creek landslide:

- The microfloras indicate the mixed-lithology deposits accumulating in the early Ypresian (early Early Eocene Lower *Malvacipollis diversus* Zone Equivalent) continued into the mid Ypresian (mid-late Early Eocene Upper *Malvacipollis diversus* Zone Equivalent) at the **BH92-11** bore site. Microfloras recovered from borehole **I08-01** confirm the same upper age limit for the correlative deposit intersected at 19.3 m depth.

- Several of the morphospecies used by S. Forsyth (in Latinovic et al., 2001) to date samples from the School Creek landslide are now known to occur, albeit rarely, in sediments older than Early Eocene, e.g. *Beaupreaidites elegansiformis* and *Tripuripollenites ambiguus* (M. K. Macphail, unpublished data). Nevertheless, occurrences of *Nothofagidites goniatus* and *Intratropipollenites notabilis* in the 2001 sludge sample are provisional evidence that correlative Early Eocene *Malvacipollis diversus* Zone Equivalent deposits were present in borehole **BH 3-99**.
- Estimated age limits of 55.8–50.5 Ma for the Early Eocene *Malvacipollis diversus* Zone (Partridge, 2006) indicate the interval between 9.95 m and 40.3 m depth accumulated at the in **BH92-11** borehole site over a *ca.* 5 Ma period. The estimated age limits for the one sample from **I08-01** fall at the upper age limit (53.8–51.5 Ma) of the Upper *Malvacipollis diversus* Zone Equivalent.
- Corollaries are that the deposits are likely to comprise packages of colluvium deposited at various times and under different conditions within the Early Eocene. Whether these are slipping as one cohesive mass, or several masses, downslope towards the River Derwent is unknown.
- Landslides in the Early Eocene are likely to have involved movement on the Tarroona Fault since high resolution seismic shows that Tertiary sediments infilling the Derwent Graben have been extensively disrupted by normal faulting (Roach and Gibbons, 2003).
- Slippage of the Early Eocene sediments is circumstantial evidence that movement is being lubricated by groundwater at the base of the deposits. If correct, it is less clear how this can occur in the cohesive mass when, if as proposed by Latinovic et al. (2001), the deposits are draped over a number of pre-existing small fault scarps in the underlying basement rocks.
- Reworked taxa hint that Paleocene sediments had been previously deposited across the basement rocks underlying the School Creek landslide.
- If the dinocysts recorded at 40.3 m depth in **BH92-11** (this study) and also in sludge at 18–24 m in **BH 3-99** (Forsyth, 2001) are confirmed to be *Deflandrea pachyceros*, then the lower units within the Early Eocene sedimentary sequence deposits had either accumulated in subsaline depressions on the sides of the Derwent Graben now occupied by the Derwent River (cf. Macphail, 1997) or in marginal marine lagoonal environments close to mean sea level on the western side of the graben.

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