Government of Western Australia

Department of
Mines and Petroleum

REPORT 107

A REVIEW OF MID-CARBONIFEROUS TO TRIASSIC STRATIGRAPHY, CANNING BASIN, WESTERN AUSTRALIA

by AJ Mory

Geological Survey of Western Australia

Government of **Western Australia**
Department of **Mines and Petroleum**

REPORT 107

A REVIEW OF MID-CARBONIFEROUS TO TRIASSIC STRATIGRAPHY, CANNING BASIN, WESTERN AUSTRALIA

by
AJ Mory

Geological Survey of Western Australia

MINISTER FOR MINES AND PETROLEUM
Hon. Norman Moore MLC

DIRECTOR GENERAL, DEPARTMENT OF MINES AND PETROLEUM
Richard Sellers

ACTING EXECUTIVE DIRECTOR, GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
Rick Rogerson

REFERENCE
The recommended reference for this publication is:
Mory, AJ 2010, A review of mid-Carboniferous to Triassic stratigraphy, Canning Basin, Western Australia: Geological Survey of Western Australia, Report 107, 130p.

National Library of Australia
Cataloguing-in-publication entry

Mory, AJ (Arthur John), 1953–
A review of mid-Carboniferous to Triassic stratigraphy, Canning Basin, Western Australia

Bibliography.
ISBN 9781741682984 (pdf)

1. Paleontology — Western Australia — Canning Basin
2. Paleontology — Triassic
3. Paleontology — Carboniferous

I. Geological Survey of Western Australia
II. Report. (Series: Report (Geological Survey of Western Australia); 107)

560.9941

ISSN 0508–4741

Grid references in this publication refer to the Geocentric Datum of Australia 1994 (GDA94). Locations mentioned in the text are referenced using Map Grid Australia (MGA) coordinates, Zone 50. All locations are quoted to at least the nearest 100 m.

Copy editor: NS Tetlaw
Cartography: SN Dowsett, M Prause, and D Sutton
Desktop publishing: KS Noonan

Published 2010 by Geological Survey of Western Australia
This Report is published in digital format (PDF) and is available online at www.dmp.wa.gov.au/GSWApublications.
Laser-printed copies can be ordered from the Information Centre for the cost of printing and binding.

Further details of geological publications and maps produced by the Geological Survey of Western Australia are available from:

Information Centre
Department of Mines and Petroleum
100 Plain Street
EAST PERTH, WESTERN AUSTRALIA 6004
Telephone: +61 8 9222 3459 Facsimile: +61 8 9222 3444
www.dmp.wa.gov.au/GSWApublications

Cover photograph:
Tesselated pavement within the Grant Group, Grant Range, 33 km southeast of Derby, Western Australia

Back cover photograph:
Abandoned drilling equipment from Poole Range 5, drilled April 1932 to April 1933 to 471 m by Kimberley Freney Oil next to outcrop of the Grant Group, 80 km south-southeast of Fitzroy Crossing

Contents

Appendices

Plates

Figures

Table

A review of mid-Carboniferous to Triassic stratigraphy, Canning Basin, Western Australia

by

AJ Mory

Abstract

A review of the mid-Carboniferous to Triassic succession of the Canning Basin shows conflicting stratigraphic nomenclatures between outcrop and subsurface sections, especially for the basal glacial succession (Reeves Formation and Grant Group). In these highly variable facies, glacial characters appear to be locally overwhelmed by coarse-grained fluviodeltaic facies, so correlation over any great distance is unreliable. The wide spacing between most exploration wells, and the low resolution and poorly defined palynological zonation below the Sakmarian hinder correlation, and requires an integrated approach based on good-quality seismic plus well data to resolve. By comparison, the upper Sakmarian Poole Sandstone and younger strata show a relatively consistent stratigraphy over the region, although deposition at this time appears to contract into the Fitzroy Trough, Lennard Shelf, and Gregory and Kidson Sub-basins. By the Triassic deposition in the onshore part of the basin is almost entirely confined to the Fitzroy Trough and Lennard Shelf.

The reservoir character of the glacigene sandstone-dominated Reeves Formation and Grant Group is excellent, although seals in that part of the succession are relatively thin and impersistent, as shown by three of the small fields (Boundary, Sundown, and West Terrace) on the Lennard Shelf. The potential for hydrocarbon generation within the succession is poor as only the basal portion within the Fitzroy Trough and its southeastern extension lies within the oil window; possibly influenced by late Permian igneous intrusions as well as the relatively thicker sections along these sub-basins. Nevertheless, deeper source rocks are present as indicated by numerous shows, even though the most significant are below the mid-Carboniferous. In addition, the thick mudstone-dominated Noonkanbah Formation may be capable of generating small volumes of gas, in spite of its low maturity; however, this has yet to be evaluated. Despite the low hydrocarbon generation potential of much of the mid-Carboniferous – Permian succession, the lower sandstone-dominated units may be best utilized for CO_2 sequestration, with the Noonkanbah Formation as the top seal.

KEYWORDS: Carboniferous, Permian, Triassic, lithostratigraphic unit, biostratigraphy, glacial sediments, regional geology, petroleum potential, Canning Basin, Western Australia.

Introduction

The intracratonic Canning Basin covers approximately 640 000 km^2, of which about 530 000 km^2 is onshore (Fig. 1, Plate 1), and contains an Ordovician to Cretaceous sedimentary succession that reaches 15 km in thickness within the Fitzroy Trough (Forman and Wales, 1981; Towner and Gibson, 1983; Brown et al., 1984; Yeates et al., 1984; Kennard et al., 1994a). Of this section the mid-Carboniferous to Triassic succession comprises up to 4000 m of dominantly siliciclastic sedimentary rocks, and has the greatest lateral extent compared to the other major stratigraphic divisions within the basin.

The basin was initiated as a northwest-oriented early Paleozoic intracratonic rift, and was subjected to mid-Devonian extension, mid-Carboniferous compression, and Early Permian thermal sag (Yeates et al., 1984; Kennard et al., 1994a). The basin onlaps, and is surrounded by, mainly Paleoproterozoic–Neoproterozoic terranes. The southeastern margin is at least partly faulted, but is poorly constrained because of extensive cover, poor exposure, and insufficient drilling or seismic data. Offshore, the basin is overlain by the Roebuck Basin, which is dominated by a thick Mesozoic section.

Understanding of the regional stratigraphy and structure of the Canning Basin relies heavily on exploration drilling and seismic data, due to thin, but extensive, Cenozoic cover. However, the density of wells is low (1960 km^2 per well) and the distribution of seismic lines is patchy. Deposition in the basin took place during a number of extensional and transpressional events, interspersed with

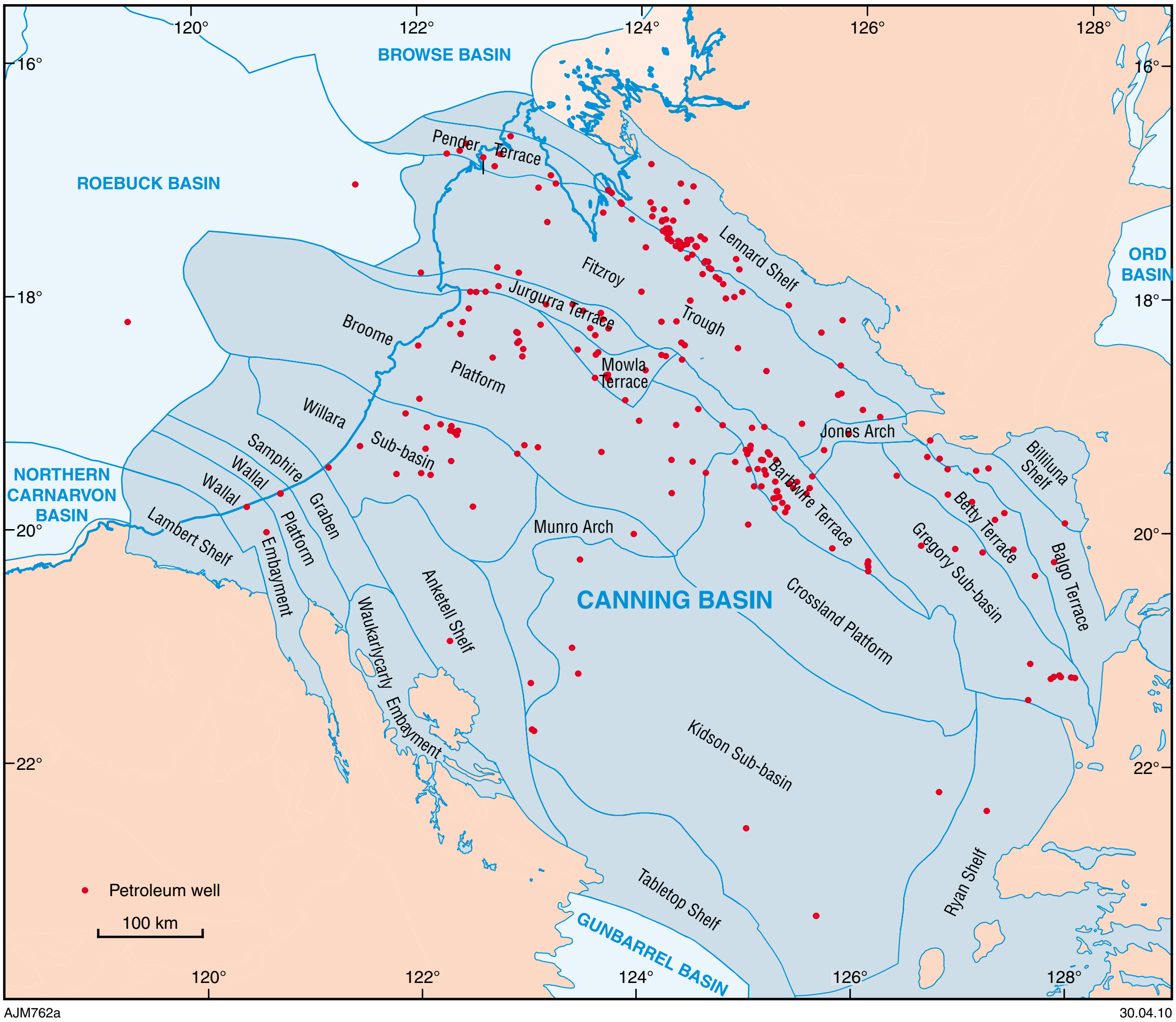


Figure 1. **Tectonic elements of the Canning Basin with distribution of petroleum wells and mineral exploration bores used in study. For a more detailed version see Plate 1 (after, Hocking, 1994).**

episodes of thermal subsidence. The four main phases of deposition are:

- Ordovician–Silurian (marine shifting to marginal marine and evaporitic facies);
- Devonian – Early Carboniferous (marine facies, including extensive carbonate reefs, overlain by deltaic facies);
- mid-Carboniferous – Triassic (glacial, non-marine to cool temperate marine facies); and
- Jurassic – Early Cretaceous (thin, mostly temperate to subtropical, non-marine facies).

The Canning Basin is subdivided into a number of mostly northwesterly trending elements based largely on seismic and potential field data. The major elements are: an elongate depocentre near the northeastern margin (Fitzroy Trough – Gregory Sub-basin); a mid-basin platform (Broome–Crossland Platforms); and southern depocentres (Willara–Kidson Sub-basins). The entire periphery of the basin is flanked by the Lennard, Billiluna, Ryan, Tabletop, and Anketell Shelves, which in the southwest of the basin are contiguous with the Sherriff Shelf of the Gunbarrel Basin. All other structural divisions (e.g. terraces flanking the Fitzroy Trough and Gregory Sub-basin), are here considered sub-divisions of the major sub-basins (Fig. 1; after Hocking, 1994).

The mid-Carboniferous to Lower Triassic succession is represented, at least in part, in 250 of the 270 wells drilled across the basin to date (Appendices 1–4). Mineral exploration holes, especially where fully cored, have also been assessed where possible (Appendix 2), even though few of these holes have downhole logs available. Although seismic data quality in the basin is highly variable, and the mid-Carboniferous to Lower Triassic succession is often poorly imaged, an integrated approach combining seismic plus well data is necessary to resolve, or at least attempt to resolve, the correlation difficulties found in the present study.

This study is considered to be a preliminary assessment of the mid-Carboniferous to Lower Triassic succession as it largely confined to well data because of time constraints. Well locations (Appendix 1) are as in WAPIMS (Western Australian Petroleum and Geothermal Information Management System), and are rounded to the nearest second where provided in the text. Coordinates for outcrops, including type sections (Appendix 3) and localities mentioned (Appendix 9), are derived from Google Earth: such positions are within 20 m of that indicated by small GPS devices over most of the basin. Whilst an attempt was made to assemble a consistent set of formation picks for petroleum wells (Appendix 4), some uncertainties cannot be resolved as detailed in notes on selected wells in Appendix 5.

Biostratigraphy

Correlation of the mid-Carboniferous to Triassic of the Canning Basin relies primarily on the palynological zonation of Backhouse (1991, 1998) and Apak and Backhouse (1999), which follow the work of Kemp et al. (1977), Foster (1982), Price (1983), Powis (1983, 1984), Backhouse (1993), and Mory and Backhouse (1997). This zonation (Fig. 2) provides relatively robust correlations within Western Australia, but its correlation to international stages (after Nicoll et al., 2009) is imprecise, as Upper Carboniferous faunas are sparse in eastern Australian and absent in Western Australia, and Australian Permian faunas and floras exhibit a degree of provincialism (Archbold and Shi, 1996; Archbold, 2000).

While there is a growing amount of palynological information from petroleum exploration wells and shallow boreholes, much of it is not published. The earlier work, in particular, needs updating, as it can be difficult to relate to more recent zonations. The relationships of the major schemes are shown in Figure 2, along with stage names (including superseded stages used in earlier work summarized in Appendix 6). Most outcrops are oxidized and therefore difficult to date palynologically; their position within the succession relies heavily on lithostratigraphic or macrofaunal (if present) correlations. Mid-Carboniferous to Triassic biostratigraphic data from all petroleum wells, and selected mineral exploration holes, are summarized in Appendix 6. Future work should include an updated biostratigraphic framework, even though it may be impractical to revisit such determinations for all existing wells. The following notes on the palynozones from the Canning Basin are based largely on the determinations summarized in Appendix 6, as well as Apak and Backhouse (1999) and Mory and Backhouse (1997), although the latter is based on the Southern Carnarvon Basin. Ages for zones follow Young and Laurie (1996) and Nicoll et al. (2009) unless specified otherwise.

Carboniferous

The Australian mid- to Late Carboniferous palynological zonation is a series of long-ranging assemblage zones each with a greater duration than international stages (Fig. 2), and strongly subject to environmental influences. The ages of the *Diatomozonotriletes birkheadensis,* and *Deusilites tenuistriatus* zones, in particular, are poorly constrained, especially as their duration as depicted in Figure 2 is derived from Roberts et al.'s (1995) correlation, in which they had no data for the upper Pennsylvanian. Furthermore, the former zone is a non-marine spore–pollen association whereas the latter is based on acritarchs implying the two zones are at least partially equivalent. Mid- to Late-Carboniferous macrofaunas have yet to be reported from Western Australia, and in eastern Australia this part of the Carboniferous appears to be represented by a single, faunally impoverished brachiopod zone (*Auriculispina levis*, Roberts et al., 1976, 1993) providing little help in differentiating international stages.

Grandispora maculosa zone

The *G. maculosa* zone (Kemp, 1977) is characterized by the presence of the distinctive spore *S. ybertii* and the absence of monosaccate and bisaccate pollen. The zone was dated as late Viséan to Namurian by Kemp et al. (1977), but Jones (1996) and Nicoll et al. (2009) confine it to the late Viséan. In most wells the zone lies within the Anderson Formation, but in Fraser River 1 it is present over 1301.2 – 1404.2 m, the lower part of the type section of the Reeves Formation as defined by Apak and Backhouse (1998, 1999). While Playford and Powis (1979) recorded the zone as high as 1252.7 m in this well, the presence of the zone at that level could not be verified for the present study. Other occurrences of the zone in the Reeves Formation are questionable, but the good preservation and high yield of palynomorphs from at least core 72 in Fraser River 1, indicates either inconsistencies in how the zone or the formation has been applied, or massive reworking from the Anderson Formation at this location. The presence of the zone in the other two wells mentioned by Apak and Backhouse (1999; Cycas 1 and Lake Betty 1) is now considered uncertain (Appendix 6).

Spaeotriletes ybertii zone

The *S. ybertii* zone (*Anabaculites ybertii* assemblage of Kemp et al., 1977, p. 182) is 'marked by the first appearance of bilaterally and radially symmetrical monosaccate pollen ...', and the highest occurrence of consistent or common *S. ybertii* is used to define the top of the zone. The Namurian age assigned to the zone is based on the first appearance of monosaccate pollen at the base of the Namurian (Jones, 1996) and associated conodont and ostracods in the Bonaparte Basin (Jones et al., 1975; Gorter et al., 2005); these are the youngest Carboniferous marine faunas in western Australia. One of the significant difficulties with the eponymous species is that it is a robust form, and is commonly reworked into much younger strata. Furthermore, in low yielding samples monosaccates can be rare hindering the differentiation of this zone from the underlying *G. maculosa* zone. This may explain, at least in part, the apparent extension of the latter zone from the Anderson Formation into the base of the Reeves Formation in some wells.

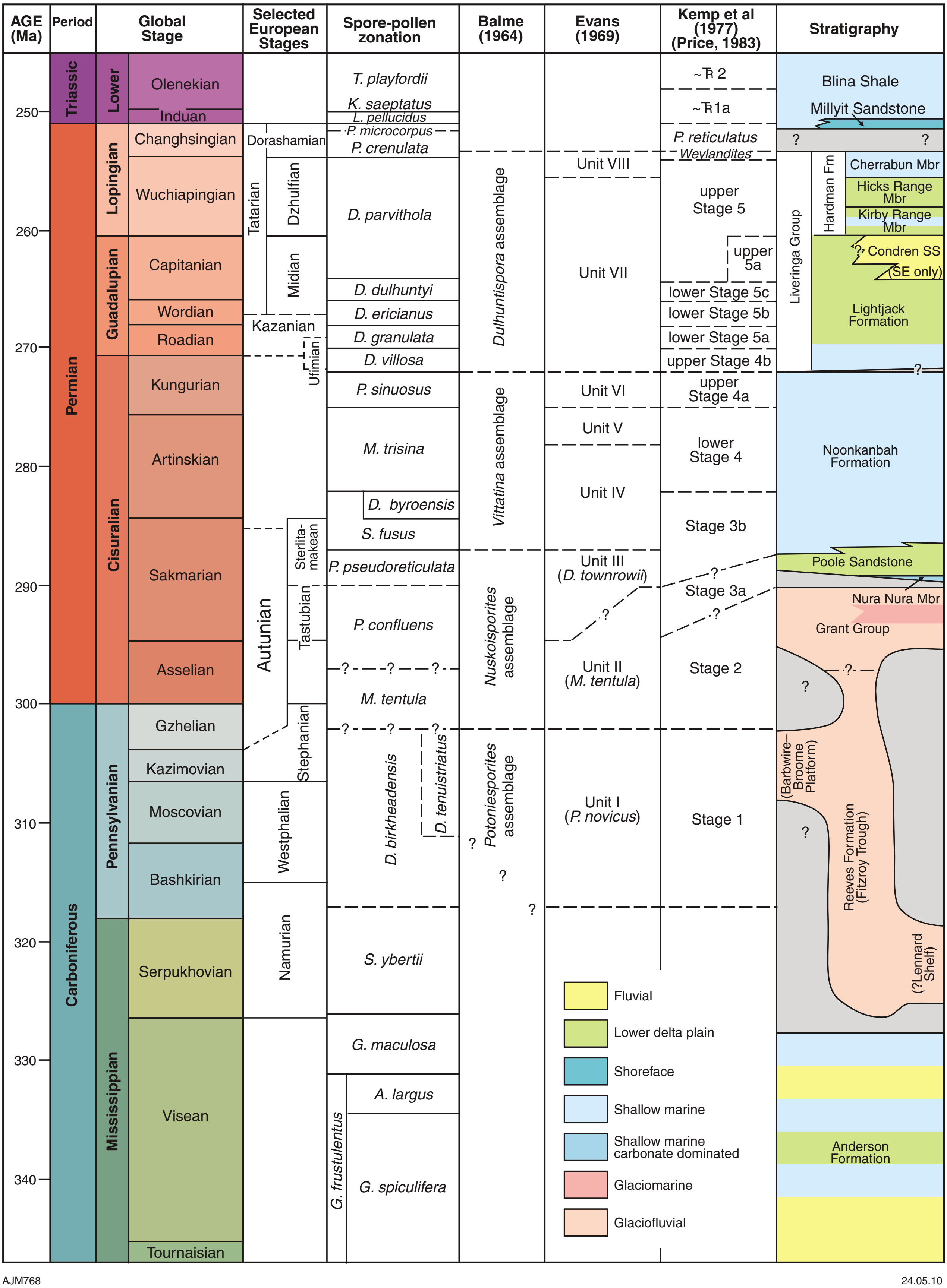


Figure 2. Summary of biostratigraphic schemes used in the Canning Basin and present stratigraphic nomenclature.

Diatomozonotriletes birkheadensis zone

First established in the Galilee Basin (Queensland) by Powis (1983, 1984), the *D. birkheadensis* zone was originally placed between *S. ybertii* and Stage 1 assemblages, even though at the time the *S. ybertii* zone was not known from eastern Australia. The spore–pollen zone is differentiated largely on the rarity of *S. ybertii*, and as such 'some individual, isolated assemblages are difficult to assign with confidence to either unit' (Apak and Backhouse, 1999, p. 5).

Apak and Backhouse (1999, p. 5) indicate an age 'somewhere in the range Namurian to early Stephanian' while showing late Namurian to late Stephanian (~Pennsylvanian) in their figure 3, 'based partly on zircon dates', presumably those of Roberts et al. (1995, 1996). This age was subsequently accepted by Jones et al. (1998) and modified again by Nicoll et al. (2009) to incorporate the *D. tenuistriatus* zone (see below). Jones (1996) shows this zone as equivalent to the faunally impoverished *A. levis* brachiopod zone, but this provides little help in correlating to international stages.

Deusilites tenuistriatus zone

The *D. tenuistriatus* zone (Apak and Backhouse, 1998, 1999) originally refered to assemblages between those containing *D. birkheadensis* and *P. confluens*. The eponymous species was first described from the Upper Carboniferous and Lower Permian of Argentina (Gutierrez et al., 1997). However, Apak and Backhouse (1998, 1999) equated the assemblages with this species to the Stephanian (Kazimovian–Gzhelian), presumably to accommodate Stage 2 assemblages at that time considered Asselian, as applied in the Collie and Perth Basins, but not represented in the Canning Basin. The zone has a patchy distribution in the Canning Basin, and is possibly better regarded as a partial lateral equivalent or a subzone of the *D. birkheadensis* zone. The age of the *D. tenuistriatus* zone is here further restricted to early Bashkirian – mid-Gzhelian to accommodate uncertainty in the age of the overlying *M. tentula* zone, while acknowledging that there is virtually no age control after the mid-Bashkirian for Late Carboniferous palynomorph zones in Australia.

Carboniferous–Permian boundary

In Western Australia the Carboniferous–Permian boundary has been placed between the *Deusilites tenuistriatus* (Apak and Backhouse, 1989, 1999) and *Microbaculispora tentula* (equivalent to Stage 2 of Backhouse, 1991, 1998) zones by Nicoll et al. (2009), which are among the least satisfactorily defined zones in the State. The *D. tenuistriatus* zone is defined by the eponymous acritarch in a section with few indications of marine facies (Apak and Backhouse, 1989, 1999). In addition, there are few other palynomorphs restricted to, or making their first appearance, in this zone. Recognition of the latter zone depends on the absence of *Pseudoreticulatispora confluens*, and is based mostly on impoverished microfloras so that its separation from zones above and below is not straightforward. There are no marine macrofaunas associated with the *M. tentula* zone in Western Australia so the Asselian age indicated by Nicoll et al. (2009) is tentative, but is consistent with the correlation suggested by Stephenson (2008). Clearly, differentiating the *D. tenuistriata* and *M. tentula* zones is not always possible, and as Playford and Dino (2005) indicate, 'dating of individual zones … was (and remains) understandably tentative ... especially near the Carboniferous–Permian boundary'. Helby (2006) used a somewhat different zonation based on four wells from the Arafura Basin in the Northern Territory and commented that the mid-Carboniferous to Asselian palynological zonation in Australia is in need of revision. Following Archbold (1995, 1998) who extends the base of the succeeding *P. confluens* zone in the mid-Asselian, and discussions with J Backhouse, the *M. tentula* zone probably spans the Carboniferous–Permian boundary.

Microbaculispora tentula zone

The zone is approximately equivalent to Stage 2 faunas from the Collie and Perth Basins described by Backhouse (1991, 1993) to which he assigned an approximately Asselian age based the Asselain to Tastubian age of the overlying *P. confluens* zone. In most cases *M. tentula* was not differentiated from *P. confluens* in company palynological reports on the Canning Basin, so the only occurrence of the zone accepted here is based on Backhouse (in prep.) from Fraser River 1 (868.7 – 880.6 m), Grant Range 1 (426.4 – 1181.1 m), Lawford 1 (1300 m), and Point Moody 1 (1068.6 – 1374.4 m). In all wells these intervals are within the upper part of the Reeves Formation.

Permian

In general, Permian outcrops in Western Australia are too oxidized to yield palynomorphs so the correlation with macrofaunal ages relies on stratigraphic correlations. Unfortunately, macrofossils are rare in the Asselian–Sakmarian and tend to show low diversity due to cold water temperatures (~8°C; Lowenstam, 1964; Archbold and Shi, 1995). Records of such faunas from the subsurface are even rarer, which further limits their biostratigraphic usefulness. Correlations to international stages have largely depended on the ages deduced from coexisting ammonite faunas, which are uncommon in Western Australia, and rare in eastern Australia (Archbold, 1993, 1998a,b, 2002a,b; Foster and Archbold, 2001; Leonova, 1998). Zircon dating of volcanic horizons in eastern Australia (Roberts et al., 1995, 1996) that supplement these ages are approximate (Korte et al., 2008). Permian conodont faunas, which elsewhere provide a detailed correlation with international stages, are of limited use to correlate to international stages as they are restricted to just a few horizons in Western Australia, and exhibit strong provincialism (Nicoll and Metcalfe, 1998). Archbold (1999, p. 70) noted that the Canning Basin 'is worth noting for the … Upper Permian marine faunas and a rather incomplete succession of Sakmarian to Ufimian brachiopod zones', but that 'Considerable work is required to produce an integrated biostratigraphy … and to determine the nature and duration of breaks'. Nevertheless, palynology at least allows a good correlation with the Carnarvon Basin, which Archbold (1999) regarded as the western Australian reference section for at least Sakmarian to Roadian faunas. By comparison, correlation of the Asselian and Wordian to Upper Permian of the region is less certain (Archbold, 2002a).

Pseudoreticulatispora confluens zone

Although Foster and Waterhouse (1988) suggest an entirely Asselian age for their zone, Archbold (1995, 1999) considered it to range from the Tastubian into the Asselian. The upper boundary of the zone is generally marked by the last occurrence of *P. confluens* and the lowest of *P. pseudoreticulata*, although some overlap has been noted (Apak and Backhouse, 1989, 1999). The upper limit of the zone marks a significant palynofloral boundary and is associated with the end of glacial conditions south of the Canning Basin (Eyles et al., 2002). In the Canning and Bonaparte Basins this relationship is less clear. Stage 2 (Evans, 1969) or Unit II (Kemp et al., 1977) spore–pollen assemblages contain *P. confluens*, sometimes in abundance, a species that was not differentiated from *M. tentula* until 1979 (and also sometimes may have been included in *P. pseudoreticulata*), so most occurrences of these assemblages fall within the *P. confluens* zone. In effect, the *P. confluens* zone has been identified from 93 wells in the basin, probably because the Grant Group is the Permian unit most targeted by petroleum exploration companies.

Pseudoreticulatispora pseudoreticulata zone

The zone covers the interval between the first appearances of *P. pseudoreticulata* and *S. fusus*, and corresponds to Stage 3a/b of Powis (1984). The zone is associated with Sterlitamakian (upper Sakmarian) macrofaunas in the Carnarvon and Perth Basins (Archbold, 1998b). Although palynological assemblages Unit III of Evans (1969) and Stage 3a of Kemp et al. (1977) are now equated with the *P. pseudoreticulata* zone (Mory and Backhouse, 1997; Jones et al., 1998), in older company well completion reports, where revised, these assemblages belong within the underlying *P. confluens* zone. The ambiguity in ages for these assemblages in the Canning Basin is shown by diachronous boundaries in columns 6 and 7 of Figure 2. The zone appears to be correctly identified in about 10 wells, in which it is restricted to the Poole Sandstone and basal Noonkanbah Formation. An unusually rich *S. fusus – M. trisina* palynoflora containing abundant *P. pseudoreticulata*, recovered from corehole BHP PND 1 (Plate 3), indicates the possibility that other palynofloras placed within the *P. pseudoreticulata* zone belong within higher zones, but are too lean to be identified as such.

Striatopodocarpites fusus zone

The *S. fusus* zone covers the interval between the first appearances of *S. fusus* and *Microbaculispora trisina* or *M.* sp. cf. *trisina*, and is associated with late Sakmarian to early Artinskian macrofaunas in the Southern Carnarvon Basin (Mory and Backhouse, 1997; Archbold, 1998b). The zone, which corresponds to Stage 3b of Powis (1984), has been identified from seven wells within the basin in the upper Poole Sandstone and lower Noonkanbah Formation. As noted by Mory and Backhouse (1997), *D. byroensis* makes its first appearance in the upper part of this zone. The *D. byroensis* subzone has been identified in just two wells in the Canning Basin (Blackstone 1 and Puratte 1, from the lower Noonkanbah Formation), which represent the first appearance of the zone outside of the Carnarvon Basin.

Microbaculispora trisina zone

The zone covers the interval between the first appearances of *M. trisina* (or *M.* sp. cf. *trisina*) and *S. fusus*, and corresponds to lower Stage 4 of Powis (1984) and to Unit V plus the upper part of Unit IV of Evans (1969). The zone is correlated with the mid-Artinskian by Archbold (1999) and the mid- to upper Artinskian by Nicoll et al. (2005) based largely on palynozones, which are in turn dated by referring to Archbold's brachiopod zones. The *M. trisina* zone has been identified within the Noonkanbah Formation in 14 wells in the basin.

Praecolpatites sinuosus zone

The zone covers the interval between the first appearances of *P. sinuosus* and *M. villosa*, and is correlated with late Artinskian to earliest Ufimian (=late Kungurian) brachiopod faunas by Archbold (1999). Nicoll et al. (2009) modify the age of the zone to early to mid-Kungurian to accommodate correlation of the lower Ufiminian with the uppermost Kungurian as shown by Gradstein et al. (2005, fig. 16.2). The zone corresponds to Unit VI of Evans (1969) and upper Stage 4a of Powis (1984), and has been identified positively from eight wells in the Noonkanbah Formation.

Microbaculispora villosa zone

The base of the zone is marked by the first appearance of *M. villosa*, and the top by the first appearance of *D. granulata.* The zone is equivalent to upper Stage 4b of Kemp et al. (1977), and is considered to be late Kungurian in age (Nicoll et al., 2009). The zone is represented in just three wells (Moogana 1 and Puratte 1 in the north of the basin, and BMR Lucas 14 in the southeast) within the lower Lightjack Formation, and probably represents a relatively thin stratigraphic interval in the Canning Basin.

Dulhuntyispora granulata zone

The zone covers the interval between the first appearance of *D. granulata* and *D. ericianus*, and is equivalent to lower Stage 5a of Kemp et al. (1977). Nicoll et al. (2009) equate the zone approximately with the Roadian. The zone covers the middle of the Lightjack Formation (lower Liveringa Group) but has been found in just four locations

(BHP PND1, BMR Lucas 14, Kilang Kilang 1, and Moogana 1). As with the underlying *M. villosa* zone, the *D. granulata* zone is probably very thin in the Canning Basin.

The only recorded Permian SHRIMP date in Western Australia is from alunite altered tuff layers in this zone within the Binthalya Formation (Kennedy Group) of the Southern Carnarvon Basin (Lever and Fanning, 2004). Most of the zircons recovered proved to be recycled, but two yielded imprecise Permian maximum depositional ages (273 ± 18 Ma and 269 ± 16 Ma), which broadly agree with the upper Ufimian (approximately uppermost Kungurian – lowermost Roadian) age of the group suggested by Mory and Backhouse (1997).

Didecitriletes ericianus zone

The *D. ericianus* zone covers the interval between the first appearances of the eponymous species and *D. dulhuntyi*, and is approximately equivalent to lower Stage 5b assemblages of Kemp et al. (1977). However, in rare instances *D. dulhuntyi* is found below lowest occurrence of *D. ericianus*. Nicoll et al. (2009) equate the zone approximately with the Wordian. The zone has been found in four widely spaced locations across the basin (Blackstone 1, BMR Mount Bannerman 1, Kilang Kilang 1, and Patience 1), from the upper Lightjack Formation (lower Liveringa Group).

Dulhuntyispora dulhuntyi zone

The zone covers the interval between the first appearances of *D. dulhuntyi* and *D. parvithola*, and is equivalent to lower Stage 5c of Price (1983). Nicoll et al. (2009) equate the zone approximately with the lower Capitanian. The zone is known in the basin only in the upper part of the Liveringa Group in Moogana 1 (Pender Terrace) and the upper Lightjack Formation in BMR Cornish 1, BMR Crossland 1 and BMR Lucas 14 (southeast of the Fitzroy Trough).

Dulhuntyispora parvithola zone

The *D. parvithola* zone is equivalent to the whole of upper Stage 5 of Price (1983), and has been assigned a mid-Capitanian to Wuchiapingian age by Nicoll (2009). The zone is present in the upper part of the Lightjack Formation, the Condren Sandstone, and Hardman Formation of the Liveringa Group. Subdivision of this interval is possible where diverse species of *Dulhuntyispora* are recorded (e.g. Price 1983).

Playfordiaspora crenulata–Lunatisporites pellucidus zones

These three zones, considered to extend from the Changsingian into the Induan (Nicoll et al., 2009; Shi et al., 2010), have been identified in just five locations, but not from a single section in the basin. The *Playfordiaspora crenulata* zone has not been identified separately, but in association with the succeeding *Protohaploxypinus microcorpus* zone (Foster, 1982) in the upper Liveringa Group in Puratte 1. The *P. crenulata* zone is rarely identified in Western Australia. The *P. microcorpus* zone has only been identified as a seperate entity in Paradise core holes close to the top of the Liveringa Group. The *Lunatisporites pellucidus* zone is present in the overlying Blina Shale in those sections (Morante, 1996) as well as in Jum Jum 1 and BMR Lucas 13 (Appendix 6). However, the level at which the zone appears in Jum Jum 1 (750 m) high in the Blina Shale is anomalous compared to all other wells in which the zone lies close to the base of the unit. Although Jones and Young (1993) indicated a stratigraphic break more or less equivalent to these three zones, it is possible that their gap is related to the lack of detailed sampling at this level. The age of the *P. microcorpus* zone is equivocal; Gorter et al. (2009) suggest a Griesbachian (earliest Triassic) age whereas Nicoll et al. (2009) indicate a late Changsingian (latest Permian) age. The most recent review by Shi et al. (2010) places the Permian–Triassic boundary within the basal part of the *L. pellucidus* zone, but notes that 'As yet, there is no means for tying the Australian palynozones to the Global Stratotype Section directly on the basis of spore–pollen taxa'.

Early Triassic

Kraeuselisporites saeptatus and *Triplexisporites playfordii* zones

The *K. saeptatus* zone is approximately equivalent to the *Protohaploxypinus samoilovichii* zone, which is regarded as early Olenekian (upper Lower Triassic) in age, and the succeeding *T. playfordii* zone extends into the earliest Ladinian (upper Middle Triassic; Nicoll et al., 2009). The latter is the youngest Triassic palynozone identified in the basin.

Stratigraphy

Carboniferous

Reeves Formation

The mid- to Upper Carboniferous Reeves Formation (formerly considered a large portion of the Betty Formation of the Grant Group, or the 'Lower Grant Group') was excluded from the Grant Group by Apak and Backhouse (1998, 1999) due to the presence of a regional break covering the Asselian between the two units. In effect, as lithological differences are minor, the Reeves Formation is differentiated from the Grant Group based on this age difference, the former being Carboniferous and the latter dominantly Tastubian (early Sakmarian). However, rare Gzhelian–Asselian *M. tentula* palynofloras (e.g., from Fraser River 1, Grant Range 1, Lawford 1, and Point Moody 1) imply that in the centre of the Fitzroy Trough deposition may have been continuous throughout this period, so differentiating the unit from the overlying Grant Group is problematic in this area. Therefore, there is a case for reinstating this part of the succession within the Grant Group. The base of the formation on the underlying Lower Carboniferous Anderson Formation is probably a major erosive surface.

On wireline logs (Plate 2) the Reeves Formation is clearly dominated by thick clean sandstone sections, here considered to be of fluvial–deltaic origin, akin to outcrop facies of the Carolyn Formation (Grant Group). The sandstone-dominated Reeves Formation has not been recognized in outcrop, but a glacial affinity may be implied from diamictites and contorted bedding (e.g. in Point Moody 1 and BHP WRD 1), as well as distinct glacial features in core from coeval subsurface sections of the Bonaparte (lower Kulshill Group; Mory, 1991; Gorter et al., 2005, 2008) and Southern Carnarvon Basins (lower Lyons Group; Mory et al., 2008).

There is some doubt as to the validity of Apak and Backhouse's (1998) type section in Fraser River 1 (866–1411 m; 17°24'58"S 123°9'49"E on DERBY*). This section incorporates palynomorphs of the *G. maculosa*, *S. ybertii*, *D. birkheadensis*, and *M. tentula* zones (Appendix 6). The only other wells in which the *G. maculosa* zone probably has its upper limit in the Reeves Formation are Booran 1, Grant Range 1, and Lake Betty 1 — in all other wells in which this zone is unequivocally present (Bindi 1, Curringa 1, Cycas 1, East Yeeda 1, Hakea 1, Hangover 1, Jum Jum 1, Kilang Kilang 1, Kora 1, Moogana 1, Puratte 1, West Kora 1, and Whitewell 1), it is within the underlying Tournaisian–Viséan Anderson Formation. All these occurrences may not represent the same palynological assemblage, as it is likely that low yields hinder its differentiation, especially from the overlying *S. ybertii* zone. Alternatively, these zonal designations may represent different approaches by several palynologists. Nevertheless, it remains extremely unlikely that the Anderson and Reeves Formations are laterally equivalent, even in part as implied by the distribution of the *G. maculosa* zone, as there is a major break between them. The base of the Reeves Formation in Fraser River 1 probably is more appropriately placed at 1174 m, thereby restricting the *G. maculosa* zone to the underlying section and giving the Reeves Formation a thickness of 308 m, intermediate between the nearest wells (Jum Jum 1, 34 km north-northwest, 134 m; and Booran 1, 54 km east-northeast, 402 m).

The Reeves Formation is almost 2000 m thick in Grant Range 1 (Plate 2). The next thickest sections are in Nerrima 1 (AFO) (>1539 m, base not reached), St George Range 1 (1167 m), Point Moody 1 (1067 m), Cycas 1 (986 m), White Hills 1 (>984 m), Jones Range 1 (591 m), Fraser River 1 (545 m), and East Yeeda 1 (531 m). During deposition of the formation, the Fitzroy Trough and Gregory Sub-basin were probably a single entity as the only other well sections greater than 300 m thick outside these sub-basins are in Jones Range 1 (Jones Arch), or on the flanks of these sub-basins in Curringa 1 (Pender Terrace) and Bindi 1 (Betty Terrace).

To the north of the Fitzroy Trough most intersections of the Reeves Formation are along the southern margin of the Lennard Shelf where the unit falls entirely within the *S. ybertii* zone (Plates 3–5), and on the Pender Terrace (Plate 6). To the south the Reeves Formation is present across the Jurgurra Terrace (Plate 7); in three Broome Platform wells and possibly two wells at the northern edge of the Willara Sub-basin; four on the Barbwire Terrace (Plate 8); and five in the Kidson Sub-basin (Plates 9 and 12). Of the sections south of the Jurgurra Terrace, palynology is available only from Hedonia 1 (Plate 11), indicating the *D. birkheadensis* zone, whereas dating of the Reeves Formation on the Barbwire Terrace has yielded the *D. tenuistratus* zone. Ages from the Kidson Sub-Basin are hindered by low-diversity microfloras, but Unit 1 (~*D. tenuistriatus* zone) palynomorphs have been recovered from Auld 1 and Frankenstein 1. The young ages from the Reeves Formation south of the Fitzroy Trough represent indicate late onlap, possibly into glacial valleys in the case of the Broome Platform and Barbwire Terrace (Fig. 3). The significance of intersections of the Reeves Formation near the south of the Kidson Sub-basin (Plate 12) is difficult to assess as it is unclear if these sections represent an isolated depocentre or are connected to the Gregory Sub-basin (Fig. 3). The break between the Reeves Formation and Grant Group along the Lennard Shelf (Figs 2 and 4) implies tectonic control or possibly glacial rebound, as does the anomalous section in Drossera 1 (Plate 8), just west of the Dummer Fault on the Crossland Platform. Alternatively, the *S. ybertii* zone palynomorphs from the Lennard Shelf sections (Plates 3–5) may be due to reworking, in which case the Reeves Formation is absent there, and there is no need to infer relative uplift throughout the Upper Carboniferous in those areas.

Permian

Paterson Formation

The Paterson Formation (Paterson Range series; Talbot, 1920) refers to Gzhelian–Sakmarian diamictite, sandstone, and siltstone extending from the southern Canning Basin into the Gunbarrel Basin (Fig. 1), although Talbot (1920, p. 71) clearly applied the name to virtually the entire Permian succession of the Canning basin 'from near No. 26 well, on the Canning Stock Route to Kimberley'. The formation was named after Paterson Range where Traves et al. (1956, p. 19) nominated the type section (PATERSON RANGE: 21°45'30"S 122°10'00"E, 8 km southwest of Telfer). The most recent depiction of the type section is by Towner and Gibson (1980, appendix 3). In the Canning Basin the name has yet to be used in petroleum exploration wells. Most sections of the Paterson Formation are relatively thin and overlie basement rocks. On LAKE CARNEGIE, about 500 km of the type section for example, extensive boulder lags and isolated exposures over Precambrian basement are assigned to the formation.

The unit consists of a basal diamictite, with varied exotic clasts, commonly overlain by cross-bedded, texturally and compositionally immature sandstone, in a succession at most tens of metres thick. To date only palynomorphs of the *P. confluens* zone have been recovered in the southern part of the Canning Basin, whereas predominantly

* Capitalized names refer to standard 1:250 000 map sheets

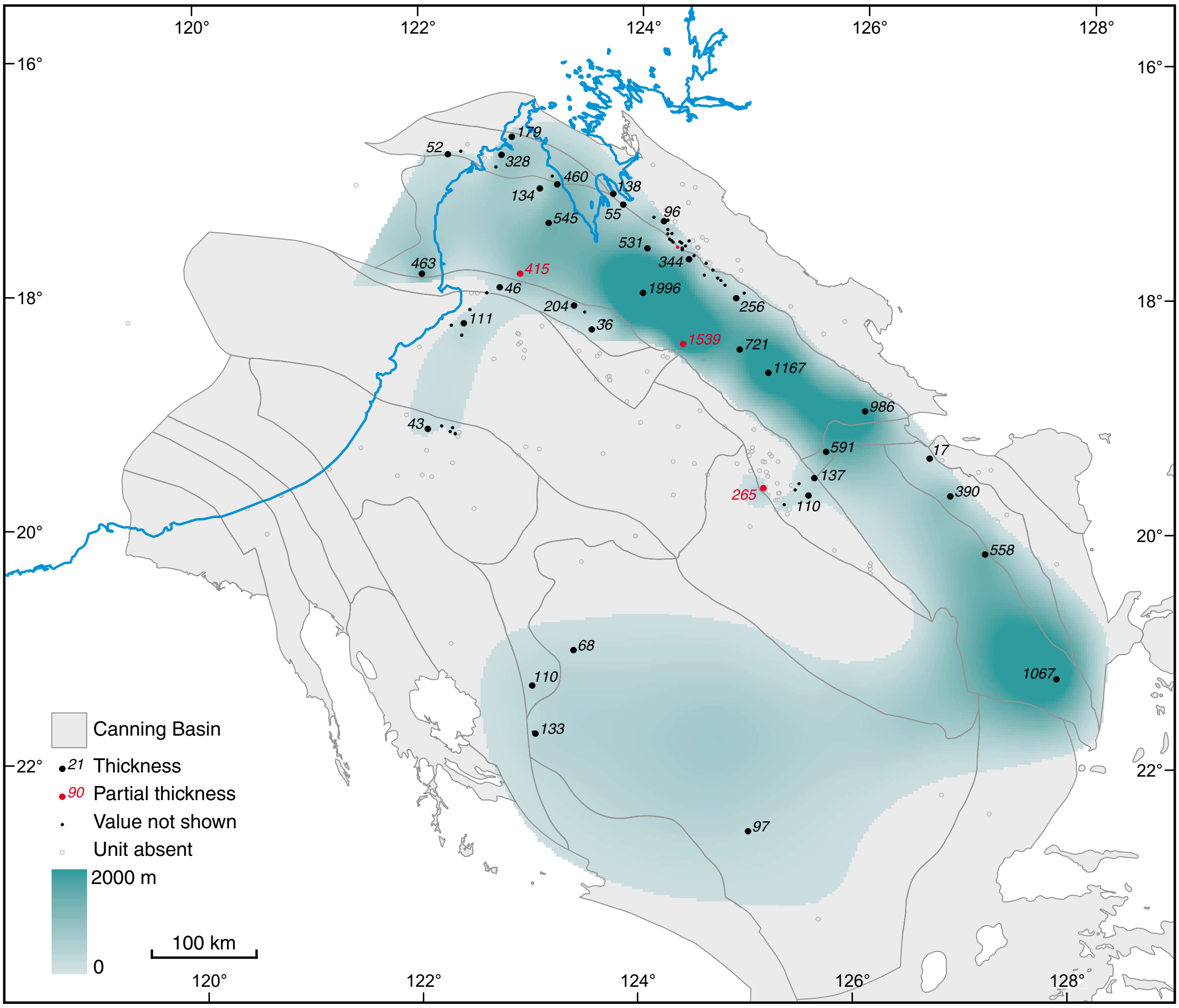


Figure 3. Isopach map of the Reeves Formation.

Carboniferous and Stage 2 (?Asselian) ages prevail in cored sections assigned to this formation in the Gunbarrel Basin. On this basis the latter sections could be re-assigned to a new unit, as at least a partial equivalence with the Reeves Formation in the northern and central Canning Basin is indicated, whereas the presence of the *G. confluens* zone indicates equivalence with the Grant Group. Crowe and Towner (1976b) indicate the unit interfingers with the Grant Group, and Towner (1981) suggests equivalence with the 'Betty Formation' (Reeves Formation – basal Grant Group) — it is unclear why the Paterson Formation should not be included within the Grant Group (Fig. 4). The 'Braeside Tillite' (Clapp, 1925; Traves et al., 1956) is now considered part of the Paterson Formation (Crowe and Towner, 1976b).

Glacially incised valleys filled by the Paterson Formation in the Pilbara region along the southern margin of Canning Basin indicate ice movement trending between 330° and 030°, as do associated striated basement surfaces (Playford, 2001) and roche moutonnées present near the Oakover River (Traves et al., 1956). Radiometric and SRTM elevation data, as well as outcrop, show the Paterson Formation follows paleovalleys on Paterson Range. These valleys (possibly tunnel valleys) probably represent the last significant ice movement across basement in this area, possibly in the Sakmarian or late Asselian based on sparse Sakmarian palynofloras described from the region by Backhouse (1974, 1976). Significant manganese deposits are associated with the tunnel valleys at Woodie Woodie (Ferguson et al., 2006).

Grant Group

The Grant Group (Crowe and Towner, 1976b; originally 'Grant Range Beds' of Woolnough, 1933, then amended to 'Grant Formation' by Guppy et al., 1952) is a Lower Permian (?Asselian – early Sakmarian) fluvial to marine glacigene succession dominated by siliciclastic strata that is probably over 1000 m thick in the northwestern part of the Fitzroy Trough. The name is from the Grant

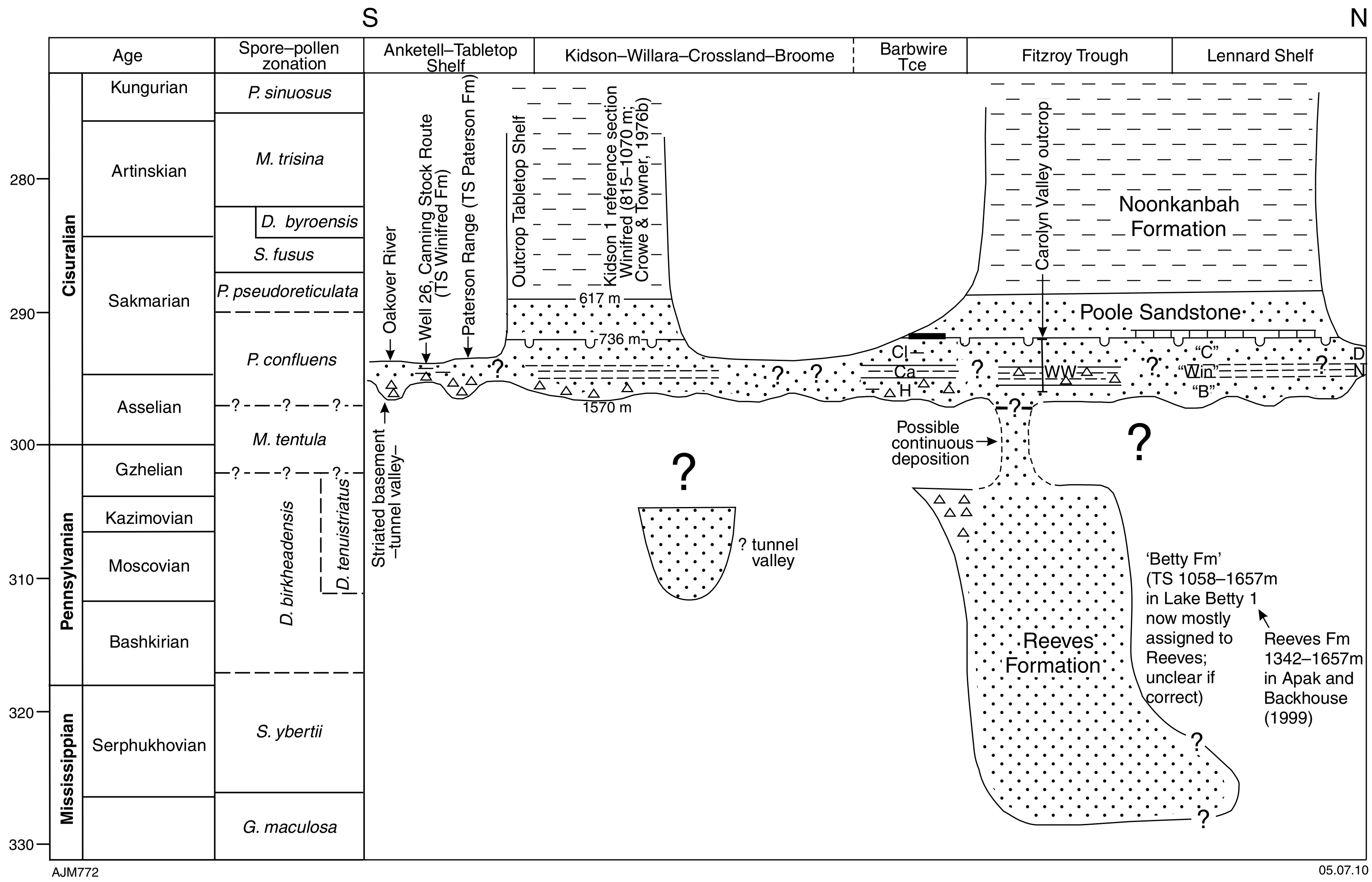


Figure 4. Mid-Carboniferous–Early Permian time–space diagram showing different stratigraphic nomenclatures. Grant Group formations: Crowe and Towner's (1976b) 'three ladies': B = Betty Fm., W = Winifred Fm., and C = Carolyn Fm.; Redfern's (1991) 'floral' units: Ca = Calytrix Fm., Cl = Clianthus Fm., and H = Hoya Fm.; Carolyn Formation members: Playford (2002): D = Deeadeea Sandstone, and N = Ngumban Claystone Mbr; and Crowe and Towner (1976a): M = Millajiddee Mbr, and WW = Wye Worry Mbr.

Range (Woolnough, 1933; Guppy et al., 1952). The unit was informally divided into upper and lower parts in many (generally unpublished) reports, with the name later restricted to the upper part by Apak and Backhouse (1998, 1999) based on a perceived break between the two parts. Although the paucity of Asselian ages suggests that the group disconformably overlies the Reeves Formation, Backhouse (in prep.) indicates that this perception may be due to ill-defined zonation. Over much of the area south of the Fitzroy Trough and Gregory Sub-basin, and along the basin margins, the Grant Group unconformably overlies older rocks including Precambrian basement.

Outcrop of the Grant Group extends along the central part of the Fitzroy Trough (especially in the Grant, St George, and Poole Ranges; Figs 5 and 6), as well as sporadically across the Lennard Shelf, whereas in the southern part of the basin equivalent exposures are variously assigned to this group or the Paterson Formation. Exposures of the Grant Group are dominated by clean, massive to cross-bedded sandstone of likely fluviodeltaic origin (Fig. 5a–d), but also include diamictite, mudstone with erratic clasts (some striated), contorted beds, probable varves, and striae typical of glacial deposition in both marine and non-marine environments (Crowe and Towner, 1976a; Fig. 7). The group onlaps striated pavements along the basin margin, thereby providing direct evidence of sedimentation after glaciation. Resedimentation, while possibly related to fault movements, is just as likely to be due to rapid deglaciation and high sedimentation rates, and these processes can effectively rework glacial deposits and hinder identification of the primary depositional mechanism.

One of the most striking glacial features in outcrop are striae within a 10 m-thick interval of the lower part of the Wye Worry Member (see **Carolyn Formation**) in central Grant Range (O'Brien and Christie-Blick, 1992) and 40 km to the south-southeast next to Mount Wynne (Fig. 7d). These indicate grounded ice moving toward the northwest (330° and 290°, respectively), probably from an ice sheet rather than sea ice as the directions are remarkably consistent in these sections.

A striated pavement in the Lennard Shelf, north of the Fitzroy Trough, indicates ice movement to the north-northwest (Playford, 2002). Strongly karstified Devonian limestone, draped by Grant Group diamictites on this margin of the basin was interpreted by Playford (2002) as the result of extensive planation by carbonate dissolution below an ice sheet. The similar marked unconformity across the Barbwire Terrace at the base of the Hoya Formation, which is clearly evident on seismic and in core sections, is interpreted as a glacially eroded surface overlain by an extensive basal diamictite that could be a lodgement tillite (Redfern, 1991; Redfern and Williams, 2002). The basal Hoya Formation contains thick diamictites, mudstones with dropstones (Mory et al., 2008, fig. 4), and massive sandstone that have been interpreted as proximal sediments following deglaciation of a large ice sheet (Redfern and Williams, 2002), or as redeposited deeper-water facies (Eyles and Eyles, 2000).

Significant glacial activity probably ceased within the Tastubian (early Sakmarian), based on brachiopod faunas near the top of the Wye Worry Member (see **Carolyn Formation**), above distinctly glacial facies (Dickins, 1996; Archbold, 1995). The presence of glacial indicators, such as striated dropstones in marine claystone and siltstone, at the top of this member in St George Ranges is in direct contrast with the lack of such features in the thick, predominantly coarse-grained facies at the same stratigraphic level in the Grant Range to the northwest. These latter facies are interpreted as rapid fluvial-deltaic outwash, which at times overwhelmed marine sedimentation.

In outcrop, the upper contact of the group is abrupt; a disconformity is indicated by a local breccia (Crowe and Towner, 1976a, plate 16), and a rootlet bed at the base of the overlying Poole Sandstone, which is clearly onlapping a slump at the top of the group (see Fig. 8b). Although Crowe and Towner (1976a) claim to demonstrate a regional angular unconformity at this level, neither of their sections (#3 and #16) convincingly shows that the uppermost sandstone member of the group has been removed by erosion (see 'Millajiddee Member' of 'Carolyn Formation'), nor is there an obvious angular relationship at this contact. Exposure in their section 3 (Mount Thorlan) is poor, although nearby sections in Poole Range show the Millajiddee Member to be at least 30 m thick, consistent with St George Ranges where the member is 40–70 m thick. Their section 16 (northwestern St George Ranges) is here interpreted to start within the Millajiddee Member; about 3 km to the west the member is at least 65 m thick. Nevertheless, the sharp break at the top of the Grant Group is regionally significant as it can be seen at least between Poole Range and the western end of S George Ranges, a distance of 100 km.

Outcrops of the Grant Group are difficult to date due to oxidization and the paucity of macrofauna (there are just two marine macrofossil localities known from outcrop of the Wye Worry Member, Archbold, 1995), but in the subsurface palynology is available from the group in at least 120 subsurface sections (Appendix 6). Although this data is of variable vintage and quality, almost all analyses place the Grant Group within the Sakmarian *P. confluens* zone or its equivalents (summarized in Fig. 2). The only exception is from Lawford 1 where the Asselian *M. tentula* zone was recovered (Lawford 1, Appendix 6), apparently from near the base of the group. Note that all previous assignations to this zone or Stage II in the Canning Basin, where reassessed, belong to the *P. confluens* zone, although differentiating between these zones is not always clear cut. In contrast, the upper contact of the *P. confluens* zone with the *P. pseudoreticulata* zone appears to be one of the better Permian palynological datums, but is generally is not well constrained in the Canning Basin. Blackstone 1 on the Lennard Shelf provides most tightly constrained example in the basin for this zonal boundary (between SWC samples from 827.5 m and 851.3 m, Appendix 6). In this well the zonal boundary is presumed to lie at the Poole Sandstone – Grant Group contact (at 846 m) at the base of the Nura Nura Member. The underlying coarsening-upwards section, characterized by the gamma-ray log in Blackstone 1 and nearby wells (40–60 m thick, Plates 3 and 4) thereby lies within the Grant Group rather than in the Poole Sandstone, as it appears in many well completion reports.

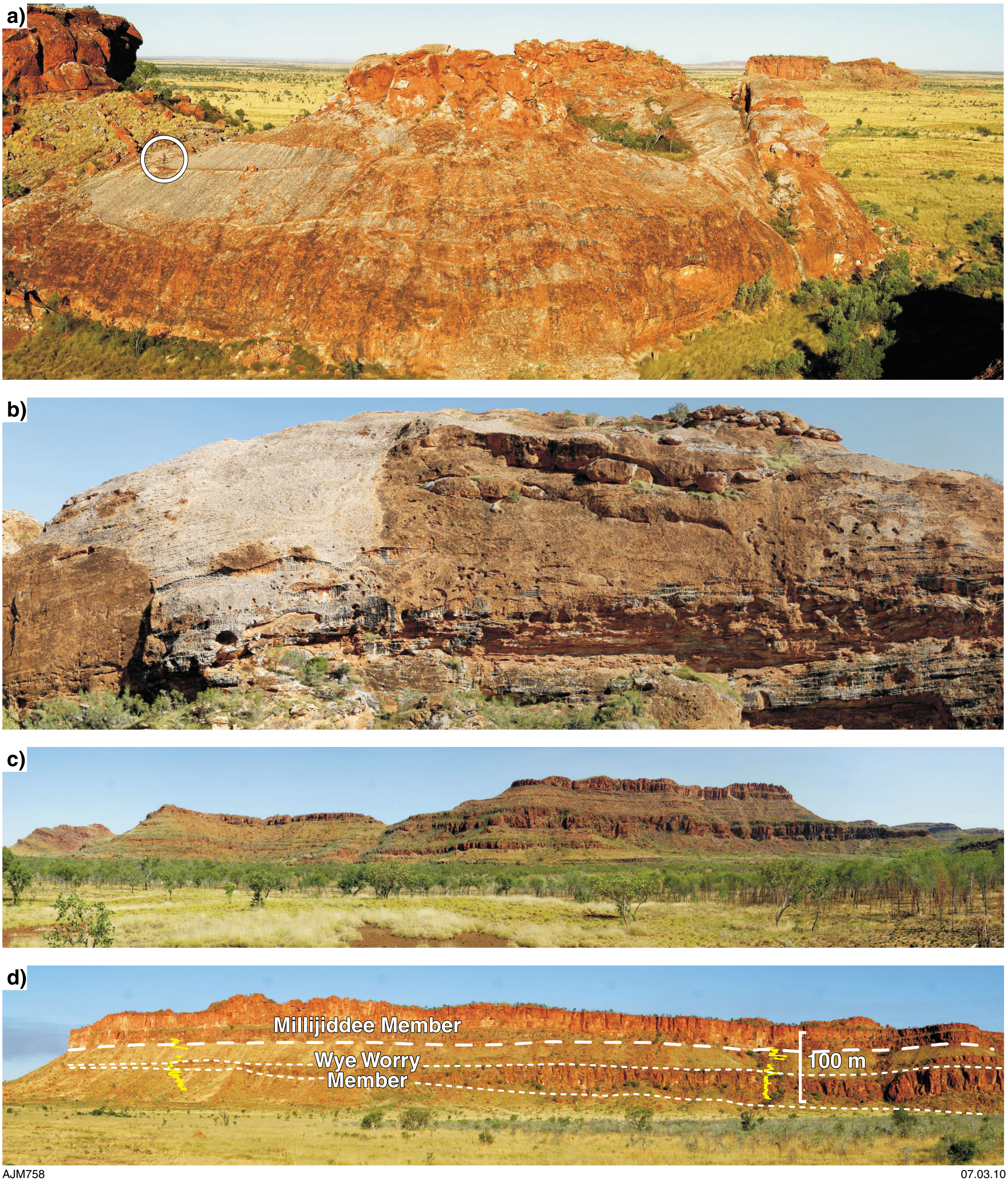


Figure 5. Panoramas of the Grant Group: a) sandstone filled channels, Poole Range; b) large, low-angle foresets (cliff 50 m high), Grant Range; c) general view of south limb of Grant Range anticline; and d) large channel in Wye Worry Member, Carolyn Valley with outcrop gamma superimposed.

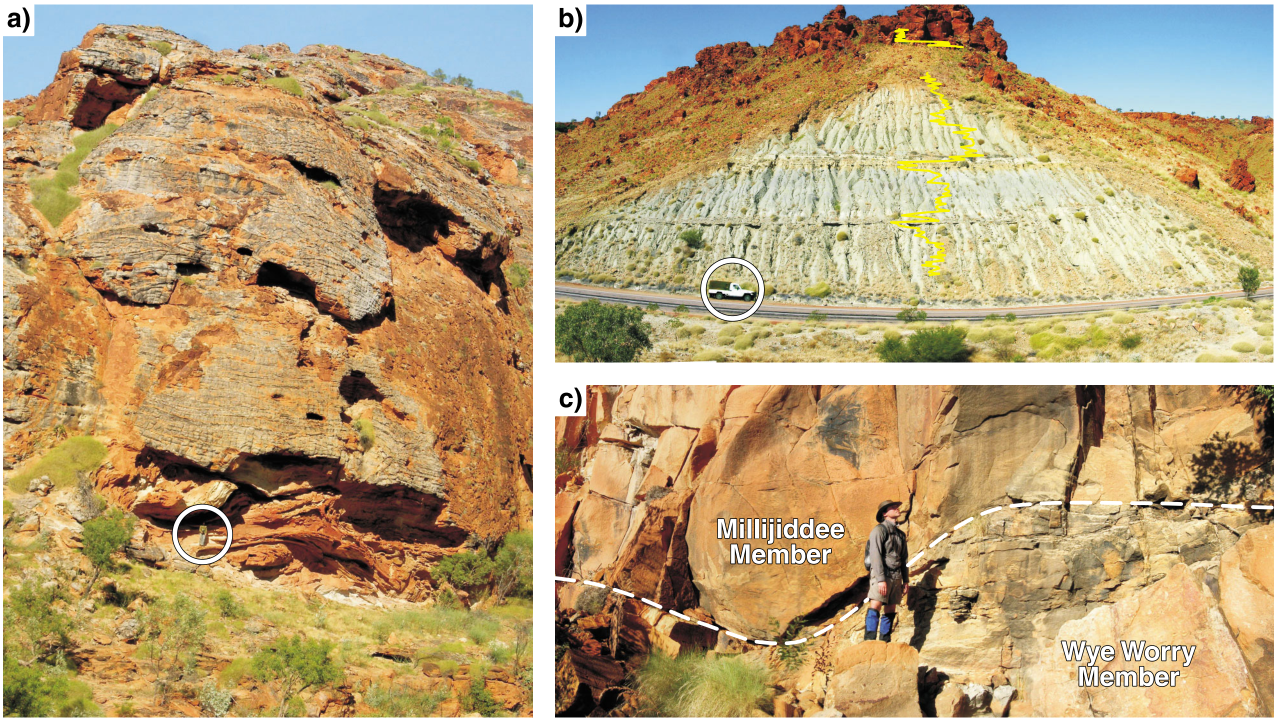


Figure 6. (Top right) Exposures of Grant Group: a) large slump overlain by massive to cross-bedded sandstone, Grant Range; b) Deeadeea Sandstone and Ngumban Claystone Members, Deeadeea Cliff with outcrop gamma superimposed; and c) erosional contact between Millajiddee Sandstone and Wye Worry Member, Carolyn Valley.

The 'Grant Formation' was revised to group status by Crowe and Towner (1976b) because of the 'confusion in correlating surface and subsurface units'. The group has typically been divided into 3 or 4 units, which in older company reports include units such as the 'Braeside Tillite', 'Cuncudgerie Sandstone', and 'Dora Shale'. Of these units, the first is now considered part of the Paterson Formation, a lateral equivalent of the Grant Group in the southernmost part of the basin, and the latter two are considered synonyms of younger Permian units, or lateral equivalents as depicted by Traves et al. (1956, table 2). However, all divisions of the group rely heavily on the presence of a middle shale unit to differentiate the upper and lower sandstone-dominated units (e.g. Crowe and Towner, 1976a). It is uncertain if the different schemes can be correlated unambiguously (Fig. 4); the matter is not helped by the entire group, which is up to 1000 m thick, lying entirely within the *P. confluens* zone. Some of the early divisions do not appear to be consistent over any great distance and incorporate Carboniferous sections (here placed in the Reeves Formation). Nonetheless, two formal divisions of the group have been proposed, by Crowe and Towner (1976b) and Redfern (1991).

Crowe and Towner's (1976b) division of the Grant Group (Betty, Winifred, and Carolyn Formations, in ascending order, herein referred to as the 'three ladies' for brevity) is based on outcrops and, at the time, relatively limited drilling. Although these units have been used extensively across the basin, especially in company reports on wells within the Lennard Shelf, a number of major difficulties arise with this scheme, specifically:

a) a large part of the type section of the Betty Formation in Lake Betty 1 (1056–1675 m) was reassigned to the Carboniferous Reeves Formation (1342–1675 m by Apak and Backhouse, 1989, 1999; 1249–1675 m, herein);
b) the type section of the Winifred Formation is a thin, isolated, deeply weathered exposure making the relationship with the other formations unclear, especially as it lies some 400 km to the south of the Fitzroy Trough and Lennard Shelf where the unit has been applied most commonly in the sub-surface;
c) the base of the Carolyn Formation was not defined; and
d) the large distance between their type sections creates considerable doubt as to how they correlate.

Redfern's (1991) division (Hoya, Calytrix, and Clianthus Formations, in ascending order; formalized by Apak and Backhouse, 1999; herein referred to as the 'floral units' for brevity) is based on fully cored sections on the Barbwire Terrace (Plate 8). However, this scheme is difficult to apply away from that area due to:

a) the generally thin sections of the group across the Barbwire Terrace compared to sections in the Fitzroy Trough and Lennard Shelf;
b) the paucity of core from the Grant Group away from the Barbwire Terrace;
c) the lack of internal palynological sub-divisions within the group; and
d) lateral variability of some of these units, especially the Hoya and Clianthus Formations.

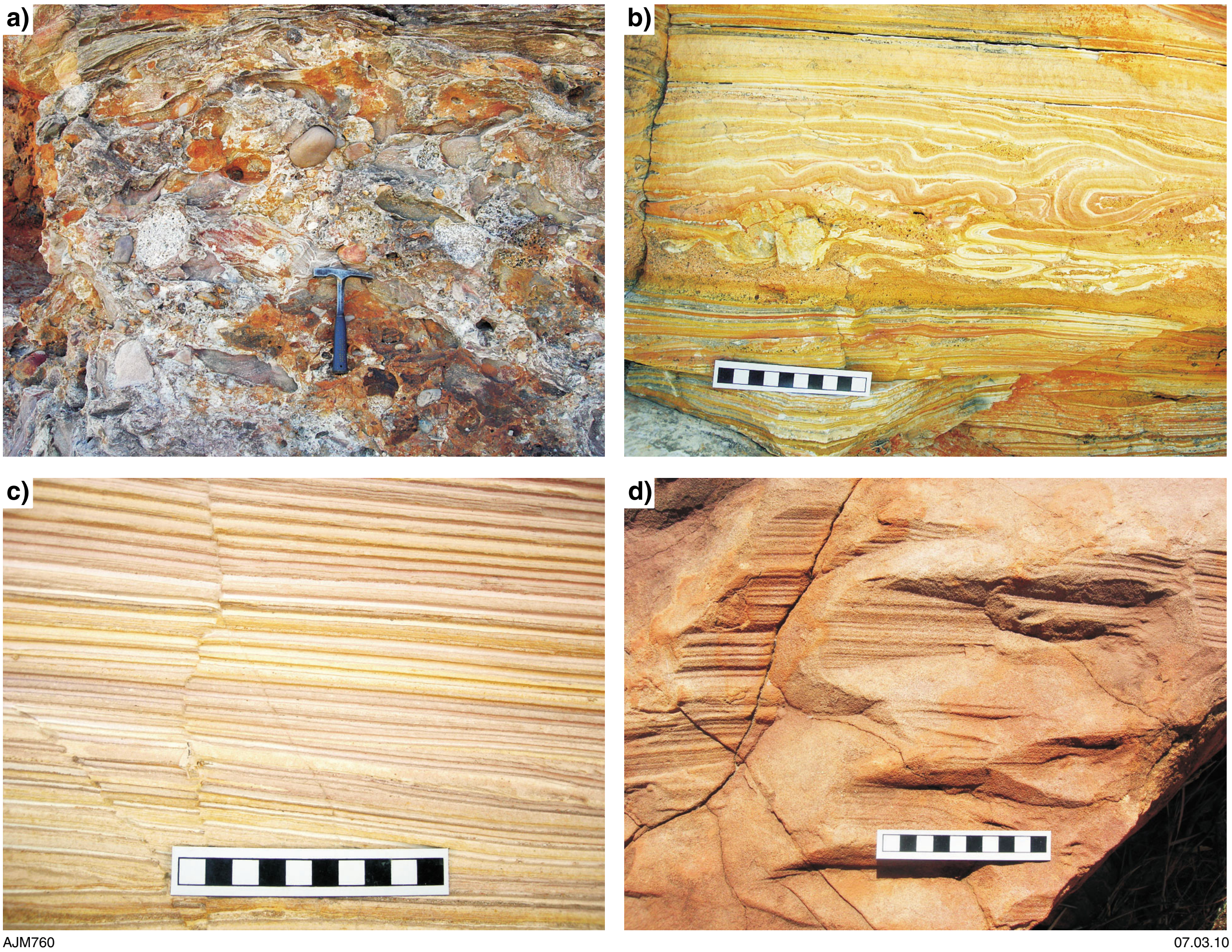


Figure 7. (Bottom right) Glacial features in the Grant Group: a) diamictite, Lauris Range; b) contorted bedding, Lauris Range; c) probable varves, Lauris Range; and d) striae in sandstone, Mount Wynne.

Correlation of the ‘three ladies' and ‘floral' schemes is problematic (Fig. 4; Mory et al., 2008). The upper two formations on the Barbwire Terrace show little glacial character (Redfern, 1991). In this regard the Clianthus Formation resembles the medium- to coarse-grained sandstone Millajiddee and Deeadeea Members of the Carolyn Formation in outcrop (Crowe and Towner, 1976b; Playford, 2002). The mudstone-dominated Wye Worry and Ngumban Members (below the Millajiddee and Deeadeea Members, respectively; all within the Carolyn Formation) are lithologically similar to the Calytrix Formation, but show clear glacial characters (dropstones, varves, striae); a correlation that contradicts, at least locally, the scheme proposed by Crowe and Towner (1976b). Archbold (1995) correlated a brachiopod fauna from the base of the Calytrix Formation with another within the Wye Worry Member in Carolyn Valley, but it is unclear how reliable this correlation is given the rarity of marine faunas within the group. It is also unclear how much the top of the Wye Worry Member has been eroded.

In St George Range 1, drilled next to outcrop of the Carolyn Formation in the centre of the St George Ranges anticline, the base of that formation cannot be placed any deeper than 253 m, below a predominantly undifferentiated sandstone succession. Carboniferous ages support assignment of the deeper section to the Reeves Form'n, and that such characters are not a suitable datum for correlation within the basin.

Alternatively, it may be that correlations based on ‘middle shale' units beyond (or in some cases, within) specific sub-basins are unsound because of the highly variable nature of glacial environments. In the case of the Canning Basin, this difficulty may be exacerbated by thick sections of fluviodeltaic origin with little, if any, glacial character. The implication is that the input of such sediment locally overwhelmed any glacial signature, and in some areas may have eroded shaly intervals. From a regional perspective, this alternative seems unlikely given the virtually ubiquitous presence of ‘middle shale' units across the basin. Some exceptions are across the Broome Platform, where the group is relatively thin, in wells on the northern margin of the Lennard Shelf (e.g. Lukins 1, Plate 4; Valentine 1, Plate 6; and East Crab Creek 1, Plate 7). In these cases, it is likely that large channels have removed the ‘middle shale', leaving a difficult to discern sand-on-sand contact. However, there are significant lateral changes

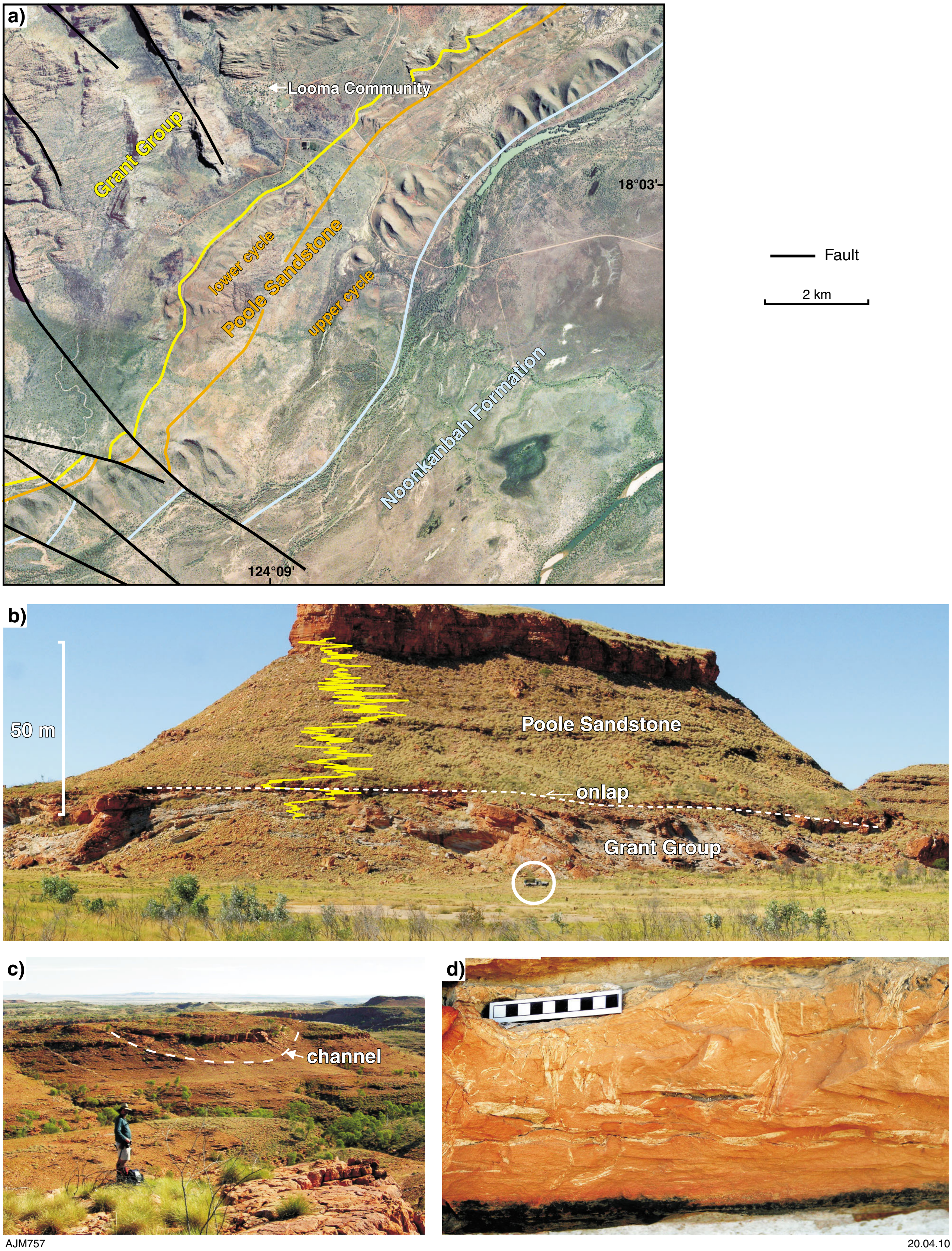


Figure 8. Exposures of the Poole Sandstone: a) general view of the type area, South Looma; b) onlap across slump in the Grant Group, Mt Hutton (note that the outcrop gamma was measured at the southern end of the exposure); c) large channel, Poole Range; and d) rootlet bed near top of Mt Hutton section. The background image for a) is reproduced by permission of the Western Australian Land Information Authority, CL 19/2010 (www.landgate.wa.gov.au).

within the Grant Group, making correlation especially difficult where wells are widely spaced, i.e. away from the Lennard Shelf and Barbwire Terrace. Formation picks within the group, therefore, are regarded as tentative, bringing into question whether or not the group would be better regarded as a formation.

Other difficulties include the necessity of revising the existing palynology. Kemp et al. (1977) and Powis (1984), for example, reported stage 2 (presently considered Asselian) palynofloras, but subsequent work by Backhouse (Appendix 6) indicates these are Sakmarian. The presence of Asselian strata in the basin has yet to be proved conclusively: a revision of the palynozonation of a significant number of wells is required. However, in Blackstone 1 and Meda 1, which Kemp et al. (1977) used as their principal reference sections for the basin, the Asselian appears to be missing and their Unit I equates with the *S. ybertii* zone. Similar correlation difficulties exist with some members of the Carolyn Formation, especially in the southeast of the Lennard Shelf, where silty diamictites and overlying sandstones were defined as the Ngumban Claystone and Deeadeea Sandstone Members, respectively (Playford, 2002). Lithostratigraphically, these units resemble the Wye Worry and Millajiddee Members of Crowe and Towner (1976a), but it is possible that they correlate with a lower level within the group.

A different approach, based on sequence stratigraphic principles, was adopted by Jackson et al. (1993) and O'Brien et al. (1998) across the Lennard Shelf where they identified a series of systems tracts composed of extensive sheets of relatively well-sorted sandstone and separated by major erosion surfaces. This implied that the assumption of relatively continuous deposition, inherent in the lithostratigraphic units identified in many well completion reports, was invalid, and that a far more complex nomenclature was required.

At present, the correlation between the stratigraphic successions developed for outcrop and the subsurface is hindered by the lack, or imprecision, of available biostratigraphic control. It is further complicated by the apparent interfingering of glacial and fluvial members or facies in outcrop of the Carolyn Formation. Without a full integration of well and seismic data, as attempted by Jackson et al. (1993) and O'Brien et al. (1998), it is not possible to satisfactorily subdivide the Grant Group. The likelihood is that a single, regionally applicable division is unlikely to be feasible. On the other hand, developing a series of local divisions for the group is not necessarily desirable as it could lead to a confusing plethora of subdivisions.

Evidence for extensive Permian–Carboniferous glaciation is compelling as glacially influenced deposits are widespread across Western Australian Basins. O'Brien et al. (1998) interpreted a succession of highstand and lowstand glacial deposits on the edge of the Fitzroy Trough of the Canning Basin as recording the interplay between sea level, subsidence, and sediment supply rates. By comparison, Eyles et al. (2002) claimed that most basins in the State show a lower glacial package, a middle mud-dominated package, and an upper sand-rich package, in which neither the middle nor upper package contain direct indicators of glacial affinities. Eyles and Eyles (2000) and Eyles et al. (2001, 2006) questioned the primary glacial character of many of these successions, noting the high degree of modification by resedimentation processes such as mass flow. The non-synchronous shift in depositional style between basins, from underfilled with a glacial influence to overfilled with little or no glacial influence, was interpreted by these workers as indicating an overall tectonic control on the end of glacial deposition. However, the emphasis on tectonically induced resedimentation espoused by Eyles and Eyles (2000), and Eyles et al. (2001) based on mixed facies within the Grant Group is not unambiguous as such facies are also common in purely glacial deposits (Mory et al., 2008).

There is little direct evidence for significant fault activity during deposition of the Grant Group due to the discontinuous nature of outcrops and variable seismic quality. However, there is some thickening of the Grant Group into the Fitzroy Trough and the Kidson and Willara Sub-basins (Fig. 9) implying at least local penecontemporaneous fault movements, although not as dramatic as for the Carboniferous (Fig. 3, Plates 9 and 10). The available seismic data in the Canning Basin suggests that significant fault movement had mostly ceased by the Early Permian, when thermal sag became the dominant subsidence mechanism. Thinning of the Grant Group across features such as the Munro Arch, and the Broome–Crossland Platforms imply these areas were relative highs during deposition, even though younger Permian units are largely missing across these sub-basins (Plates 7–11).

Betty Formation

The formation as originally proposed by Crowe and Towner (1976b) is the basal unit of the Grant Group, but the type section in Lake Betty 1 (1058–1675 m; MOUNT BANNERMAN 19°34'06"E, 126°19'57"S) was largely incorporated into the Reeves Formation by Apak and Backhouse (1989, 1999; 1342–1657 m). The unit is dominated by sandstone but also contains minor conglomerate and shale intervals.

Apak and Backhouse (1989, 1999) presumably considered that questionable *P. confluens* zone palynomorphs at 1240 m in Lake Betty 1 invalidated the Betty Formation as a formation, as there is a break at the base of this zone over much of the basin. In the present report, Crowe and Towner's (1976b) type section is split approximately between the Hoya Formation (1056–1249 m) and Reeves Formation (1249–1657 m) based on regional correlations. However, these correlations are tenuous at best as the nearest wells with mid- to Upper Carboniferous sections (Bindi 1 and Jones Range 1; 54 km and 73 km, to the east-southeast and west-northwest, respectively) have limited biostratigraphy available. In addition, some significant facies changes are evident (Plate 2) making Lake Betty 1 unsatisfactory as a type section. Nevertheless, the Betty Formation has been applied across a large portion of the basin, especially on the Lennard Shelf. In that area the unit lies entirely within the *P. confluens* zone, at least where the Reeves Formation (or 'Lower Grant Group')

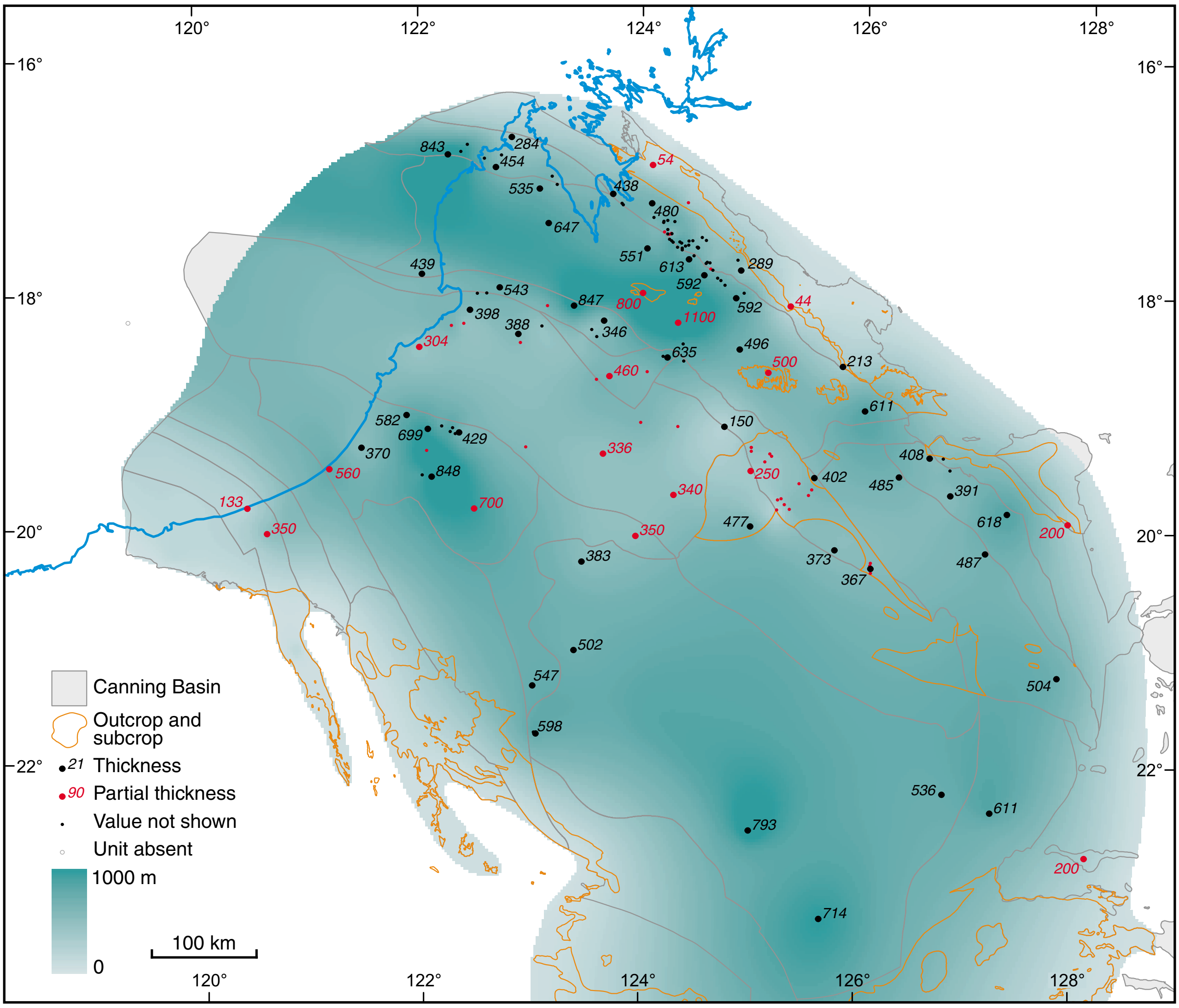


Figure 9. Isopach map of the Grant Group.

has been differentiated from it, implying an approximate equivalence with the Hoya Formation on the Barbwire Terrace.

Winifred Formation

The unit is considered to lie within the middle of the Grant Group even though the type section nominated by Crowe and Towner (1976b, locality 68) is an isolated exposure 13 km east-northeast of well 26 on the Canning Stock Route (Tabletop: 22°52'57"S 123°36'27"E). This section consists of 19 m of mudstone with minor fine-grained sandstone and includes graded bedding interpreted by Towner et al. (1976) as varves. Neither the top nor the base of the section is exposed but, given the low dips in this area, the thickness is unlikely to exceed 40 m. The section had previously been assigned to the 'Cuncudgerie Sandstone' by Veevers and Wells (1961, section T14 in fig. 46, fig. 48). Crowe and Towner's (1976b, fig. 4) correlation with nearby sections suggests that the Winifred Formation is overlain by a 7.5 m thick sandstone interval, which they assign to the Carolyn Formation. As dips are low in this area and outcrops assigned to the Poole Sandstone and Noonkanbah Formation lie 12 km further north, the likelihood is that the Winifred Formation lies high in the Grant Group (or possibly the laterally equivalent Paterson Formation) within the *P. confluens* zone.

Definitive correlation to the succession within the Fitzroy Trough is impossible at present as South Auld 1 and Kidson 1, the nearest petroleum wells to the Winifred Formation type section, are over 130 km away. Although Crowe and Towner (1976b) nominated the interval 815–1070 m in Kidson 1 (150 km east-northeast of the type section) as a reference section, the application of the name to shale units within the Grant Group in the Fitzroy Trough (over 400 km to the north) is here regarded as tenuous given the difficulty in unambiguously recognizing this unit in intervening wells. Correlation of the 'Winifred Formation' in Kidson 1 with other wells near the southern margin of the basin indicates that the lower part of the unit becomes noticeably sandier in Sahara 1 to the west (above the dashed line in Plate 12), implying an interfingering relationship with the ‘lower sandstone' of the Grant Group. Correlation of the ‘Winifred Formation' in Frankenstein 1 to Kidson 1 with Patience 1 and 2 and Wilson Cliffs 1 to the east shows major facies changes within the Grant Group (Plate 12).

In spite of the difficulties in correlation, the ‘Winifred Formation' has been applied extensively to the ‘middle shale' unit within the Grant Group across the basin, and especially across the Lennard Shelf (Fig. 4). In that area the unit contains numerous sandstone bodies, and appears to migrate higher in the group towards the southeast, reaching its most elevated stratigraphic position within the group in Blackstone 1 and Thompsons 1 (Plate 3). Whether this shift represents lateral migration of this facies or not is unclear.

In general, marine indicators are rare in this unit. Fossiliferous marine facies are only clearly identified from Roebuck Bay 1 cores 30–34 (Crespin and Condon, 1956), and McLarty 1 core 2. However, even though these faunas include arenaceous and calcareous foraminifera, their low diversity (Crespin (1958) lists just three species from the group, presumably the Winifred Formation) makes it uncertain how such facies correlate. Elsewhere crinoid, bryozoans, and echinoid fragments have been noted in cuttings from the unit (e.g. in the Sahara 1 well completion report).

Carolyn Formation

Named after Carolyn Valley, western St George Ranges, the type section is a composite section along the valley (NOONKANBAH: 18°44'20"S 124°54'30"E and 18°41'53"S 124°54'30"E) incorporating (in ascending order) undifferentiated sandstone, the Wye Worry Member, and the Millajiddee Member. The formation is dominated by massive and cross-bedded sandstone but also contains grey mudstone, mostly in the Wye Worry Member, and diamictite (Figs 5–7). The Carolyn Formation has been widely applied across the Lennard Shelf; it makes up the entire Grant Group in outcrop and shallow sections in the east of the shelf, whereas in the dominantly sub-surface sections to the west only the uppermost sandstone-dominated succession above the Winifred Formation is attributed to this formation (Fig. 4).

The base of the formation is not exposed in the St George Ranges anticline, but lies no deeper than 253 m (top of the Carboniferous Reeves Formation) in St George Range 1 (Plate 2), drilled in the centre of the anticline. As the well was spudded next to outcrop mapped as Wye Worry Member, the dominantly Permian sandstone section seen in the well is presumably equivalent to the undifferentiated Carolyn Formation below that member in the ranges, and indicating an overall thickness of the formation of about 400 m in that area.

A similar deduction can be made from Grant Range 1, spudded in the centre of the Grant Range anticline, that reached the base of the Permian at about 400 m (Plate 2), implying an overall thickness of about 750 m for the Carolyn Formation in that area. In effect, in both the St George Ranges and Grant Range anticlines the Grant Group is composed solely of the Carolyn Formation (Fig. 4), implying that the Wye Worry and Millajiddee Members are equivalent to Redfern's (1991) upper two formations (Calytrix and Clianthus Formations, see p. 25 and 26) from the Barbwire Terrace (even though the latter show no glacial characteristics). Alternatively, it is possible that the disconformity at the top of the group clearly seen in outcrop (Fig. 8b) represents a significant time break, and there is little equivalence between the two stratigraphic schemes. Unfortunately neither possibility can be tested independently given the low resolution of the biostratigraphy available for the Grant Group.

Wye Worry Member

Crowe and Towner (1976c) and Crowe et al. (1978) place the type section in the eastern St George Ranges (NOONKANBAH: 18°46'45"S 125°18'44"E) whereas Crowe and Towner (1981) show the type section 2.6 km southwest of Wye Worry Bore. The most continuous exposure of the member lies 4 km southwest of that bore where an approximately 50-m thick succession shows a transition from diamictite to claystone with dropstones. Although Crowe et al. (1978) indicate the member is at least 110 m thick in the Grant Range, Gibson and Crowe's (1982) mapping implies that the member is close to 250 m thick in the southern limb of that anticline (Fig. 5b–c); however, much of this section is dominated by massive and cross-bedded sandstone that is difficult to assign to a specific unit within the Grant Group.

In outcrop a marine macrofauna is known from are from just one locality in Carolyn Valley, and was described by Dickins et al. (1977) and Archbold (1995)*. The fauna is dominated by pelecypods and brachiopods, but also contain gastropods, bryozoans, and crinoids. Dickins et al. (1977) attributes a late Sakmarian age to this material, whereas Archbold (1995) favoured a Tastubian (early Sakmarian) age based on the brachiopods and correlated it with material from Calytrix 1 (first described by Foster and Waterhouse, 1988). The Calytrix 1 fauna, from the top of the Hoya Formation and base of the Calytrix Formation, lies within the *P. confluens* zone, considered by Archbold (1995) to range from the Tastubian into the Asselian.

Although the glacial character of the Wye Worry Member is obvious, the extent of marine influence is unclear. Varves, probably deposited in lacustrine settings, are present in the type section and possibly also in the Poole Range (Crowe and Towner, 1976a), as well as in the Lauris Range (Fig. 7b). A large sandstone-filled channel in the Carolyn Valley (Fig. 5d) implies a strong fluvial influence during deposition of the member, at least in that area.

Millajiddee Member

The type section lies in the western part of St George Ranges, south of Carolyn Valley (NOONKANBAH: 18°44'30"S 124°55'50"E), at the top of the Carolyn Formation (Crowe and Towner, 1976c). Although included within the Grant Group, the member shows little evidence of a cool climate,

* Phil O'Brien (written comm., 2010) indicates that the fossils he collected, described by Archbold (1995), are from the same locality detailed in Dickins et al. (1977).

apart from rare glacial striae near Fitzroy Crossing and south of Yakanarra community, that elsewhere are found lower in the formation (e.g. at Mount Wynne, Fig. 7d). To date, such striae have not been found in situ within exposures of the member. The contact with the underlying Wye Worry Member is abrupt and clearly erosional in places (Fig. 6c)

In general the member is 30–70 m thick and consists of massive and cross-bedded medium- to coarse-grained sandstone. The presence of bioturbated bedding surfaces, interference ripples, flat-topped ripples, and plant impressions in the member is consistent with the delta-plain depositional environment favoured by Crowe and Towner (1976a). Erosion at the base of the member (Fig. 6c) implies some incision backfilled with bay-head delta sands.

Deeadeea Sandstone and Ngumban Claystone Members

The type sections for these members is in the road cutting through Deeadeea Cliff (Mount Ramsay: 18°45'4.7"S 126°4'56.2"E; Fig. 6b; Playford, 2002) In this section the Ngumban Claystone and Deeadeea Sandstone Members are about 50 m and 19 m thick, respectively. The former contains sandy and diamictite horizons, whereas the latter is dominated by medium- to coarse-grained sandstone. The units extends west at least as far as Goongewa (zinc and lead) mine site (27 km west-northwest) where the claystone onlaps a striated pavement on Devonian limestone (Playford, 2002, figs 3d and 10a–c). The units are presumably also present in BHP GCD 1 (4 km northwest of the mine) where about 20 m of pebbly sandstone overlies micaceous siltstone with plant debris (21.6–50.4 m) with a basal, 20-cm thick sandy diamictite. The siltstone has yielded palynomorphs of the *P. confluens* zone, but appears to have no microfauna in the claystone (D Haig, 2008, written comm.) implying a fluvial origin for this facies.

As none of the drillholes in the area in which the members have been mapped (north of the Pinnacle Fault) penetrated Permian units younger than the Grant Group, and the Ngumban Claystone Member onlaps Carboniferous and older strata in this area, the relative position of these units within the group is unclear. Furthermore, correlation of the Ngumban Claystone Member with other shale-dominated units in the group, such as the Wye Worry Member or Calytrix Formation, is unlikely, as these units cannot be identified in BHP PND 1 (14 km west of Deeadeea Cliff, and south of the Pinnacle Fault). Although it is possible that the Deeadeea Sandstone and Ngumban Claystone Members belong within the uppermost part of the Grant Group, a correlation with a deeper part of the group not inter-sected in that drillhole cannot be ruled out as there is evidence of at least a minor break at that level in outcrop (e.g., Fig. 8b).

A locality showing infilled clastic dykes, at what was considered the contact between the Millajiddee and Wye Worry Member, 11 km south-southeast of Deeadeea Cliff (at 18°50'34"S 126°07'28"E; Crowe and Towner, 1976c, fig. 3; Towner, 1981), is here considered more appropriately assigned to the Ngumban Claystone and Deeadeea Sandstone Members. These dykes extend into the claystone member for at least 12 m and are here considered to be minor tectonic features, the tops of which are infilled by material from the Deeadeea Sandstone Member, rather than ice wedges as suggested by Crowe and Towner (1976c).

Hoya Formation

Redfern (1991) did not cite a type section, so Apak and Backhouse (1999) nominated 236–298 m in Pratia 1 (Crossland: 19°21'50"S 125°0'14"E) based on the description of that section in Redfern and Millward (1994). In the type section the unit lies disconformably on Devonian limestone and is conformably overlain by the Calytrix Formation. Named after Hoya 1, the formation is well established from cored intervals on the Barbwire Terrace (Plate 8), but the paucity of core away from this area, the relative thin sections on the terrace, and the distance to other wells, hinders its identification elsewhere.

The Hoya Formation is up to 250 m thick and consists of sandstone, mudstone, and diamictite, which according to Redfern (1991) and Redfern and Williams (2002) were deposited in a variety of proximal marine and lacustrine glacial environments following the deglaciation of a large ice sheet. By comparison, Eyles and Eyles (2000) and Eyles et al. (2001) consider the formation to represent redeposited deeper-water facies, albeit derived from primary glacial deposits. Unfortunately, glacial deposits can be highly mobile and features used in these alternative interpretations are not necessarily unambiguous.

The only fossils known from the Hoya Formation are palynomorphs of the *P. confluens* zone, and a marine macrofauna from the uppermost 6 m of the unit in Calytrix 1 (and extending into the lowermost Calytrix Formation; Foster and Waterhouse, 1988). Archbold (1995) considers this palynological zone to be Tastubian to late Asselian (Early Permian) and the macrofauna to be Tastubian.

Calytrix Formation

Named after Calytrix 1 by Redfern (1991), Apak and Backhouse (1999) nominated 152–236 m in Pratia 1 (Crossland: 19°21'50"S 125°0'14"E) as the type section, following Redfern and Millward (1994). The Calytrix Formation lies conformably between the Hoya Formation (below) and the Clianthus Formation (above).

The formation is up to 120 m thick and is dominated by mudstone of non-glacial origin, but also contains thin fine-grained sandstone beds. In some wells, a thin basal fossiliferous limestone is present, implying an overall regressive sequence probably from marine to lagoonal facies. Foraminifera faunas from Hoya 1 support this interpretation as they decrease in abundance and diversity, and become dominated by arenaceous forms up section (D Haig, 2009, written comm.).

The Hoya Formation falls within the *P. confluens* zone, and marine macrofauna from the basal 4 m of the unit in Calytrix 1 (Foster and Waterhouse, 1988) matches that of the basal 10 cm in Hoya 1. Archbold (1995) considers this palynological zone to be Tastubian to late Asselian (Early Permian) and the macrofauna to be Tastubian.

Clianthus Formation

Although named after Clianthus 1 by Redfern (1991), Apak and Backhouse (1999) formally nominated 61–152 m in Pratia 1 (Crossland: 19°21'50"S 125°0'14"E) as the type section based on Redfern and Millward (1994). The formation abruptly, but probably conformably, overlies the Calytrix Formation, and is in turn overlain by the Poole Sandstone. However, intersections of the latter unit are rare across the Barbwire Terrace: the only wells that intersect it are Mangaloo 1, Placer Camelgooda 1, and BHP CL 1, and possibly Aristida 1, Calytrix 1, Clianthus 1, Crossland 3, Panicum 1, and Percival 1.

Overall, the Clianthus Formation forms a coarsening upwards regressive sequence up to 170 m thick, dominated by cross-bedded, rippled and massive, very fine to medium-grained sandstone and lesser amounts of siltstone. There is no evidence of marine influence, and woody material is common throughout the unit. In this regard the unit resembles the Millajiddee Member of the Carolyn Formation, but its identification away from the Barbwire Terrace is best regarded as tentative. Glacial influence appears to be non-existent, but there is some ambiguity in that Kunzea 1, for example, contains a sand-rich glacial facies above 50 m that may belong in this formation. The formation appears to fall entirely within the *P. confluens* zone.

Poole Sandstone

The Poole Sandstone is a Lower Permian (mid-Sakmarian to earliest Artinskian) deltaic to marine siliciclastic unit possibly up to 160 m thick, with a basal carbonate member (Nura Nura Member) and thin coaly beds. The lower contact with the Grant Group is abrupt, implying a disconformable relationship; rootlet beds characterize the base of the formation in the eastern outcrops. In the western and central parts of the basin the unit contains distinct coarsening upward cycles, assigned to the Tuckfield Member in outcrop. By comparison, such cycles are not as obvious in the easternmost part of the basin as the unit is far more sandy (e.g. Plate 2), indicating a greater fluvial influence, which is consistent with the uppermost Christmas Creek Member in the Poole Range. However, the latter two members are here considered superfluous.

Originally mapped as the ‘Poole Range Series' and ‘lower ferruginous sandstone' (Wade, 1937), the ‘type area' was originally nominated as the Poole Range (Guppy et al., 1952, 1958; McWhae et al., 1958). Although Playford et al. (1975) and Burns et al. (1981) correctly indicate that no type section had been designated, the southeastern end of the Grant Range, included by Guppy et al. (1958) in their appendix II (details of type sections), was later taken as the type section (e.g. Crowe and Towner, 1976; Towner and Gibson, 1983). That section (Mount Anderson: 18°04'38"S 124°08'16"E, according to Forman and Wales, 1981, table 6) consists of two major upward coarsening cycles (Fig. 8a) over a thickness of about 160 m, although the upper contact with the Noonkanbah Formation is not exposed. By comparison, cyclicity in the Poole Range sections is less obvious, and the sections there are much thinner (e.g. Adkins, 2003; Hocking et al., 2008).

Outcrop of the unit is confined to the flanks of anticlines in the centre of the Fitzroy Trough, which approximate the depocentre of the unit (Fig. 10), and belts of poor exposures along the Lennard Shelf and northwestern Balgo Terrace. Additional poor exposures near the southern margin of the basin (on the Anketell and Tabletop Shelves), now attributed to the formation, were originally mapped as the Cuncudgerie Sandstone. The distribution of the unit along the southern side of the Gregory Sub-basin onto the Crossland Platform (Fig. 10) relies on poor exposures in the former area and inferences based on limited drilling and the identification of the overlying Noonkanbah Formation in the latter. Nevertheless, it is clear that the formation extends along the Fitzroy and Gregory Sub-basins as well as onto the flanking sub-basins, especially the Lennard Shelf, and Kidson Sub-basin and onto the margins of that region. There are no intersections of the unit west of 123° east or south of the Jurgurra–Mowla Terrace; therefore, it is uncertain if the formation was deposited across this area. The isopach map (Fig. 10) could be modified so that the Poole Sandstone extends across that terrace, similar to the underlying Grant Group (Fig. 8), or so that the Poole Sandstone is absent over much of the western part of the basin, similar to the overlying Noonkanbah Formation (Fig. 11).

Marine fossils are rare apart from those in the Nura Nura Member and its equivalents at the base of the Poole Sandstone on the southern limb of the St George Ranges anticline, and in the ‘Cuncudgerie Sandstone' along the southern margin of the basin. Plant fossils are more common throughout the formation and include distinctive rootlet beds (Fig. 8d), some of which Retallack (written comm., 2007) suggests may be horsetail stems and gymnosperm (but not glossopterid) roots. Wave-generated ripples are common, and Crowe and Towner (1976a) invoked a lagoonal depositional environment. That interpretation is here considered consistent with the low-energy, shallow-marine environment favoured by Goldstein and Hubbard (1984) as part of a dipmeter study of Hakea 1. By comparison, Adkins (2003) identified a series of regressive systems tract cycles in dominantly shore-zone to supratidal facies. However, many of the vertical burrow trace fossils she identifies are likely to be rootlet beds, although Hocking et al. (2008) were ambivalent about distinguishing vertical burrows from root traces (compare Adkins, 2003, fig. 6 with Hocking et al., 2008, fig. 18).

The Poole Sandstone appears to lie within the *P. pseudoreticulata* zone of early Sterlitamakian (mid-Sakmarian) age (Fig. 2), but the zone has been identified in only 10 wells within the basin. The exception is in BHP PND 1, a corehole near the easternmost end of the Fitzroy Trough, from which an unusually rich *S. fusus–M. trisina* palynoflora containing abundant *P. pseudoreticulata* was recovered from the middle of the formation. The abundance of this species suggests that other palynofloras placed within the *P. pseudoreticulata* zone belong within the *S. fusus* zone, but the assemblages are too lean to be identified as such. Alternatively, the Poole Sandstone

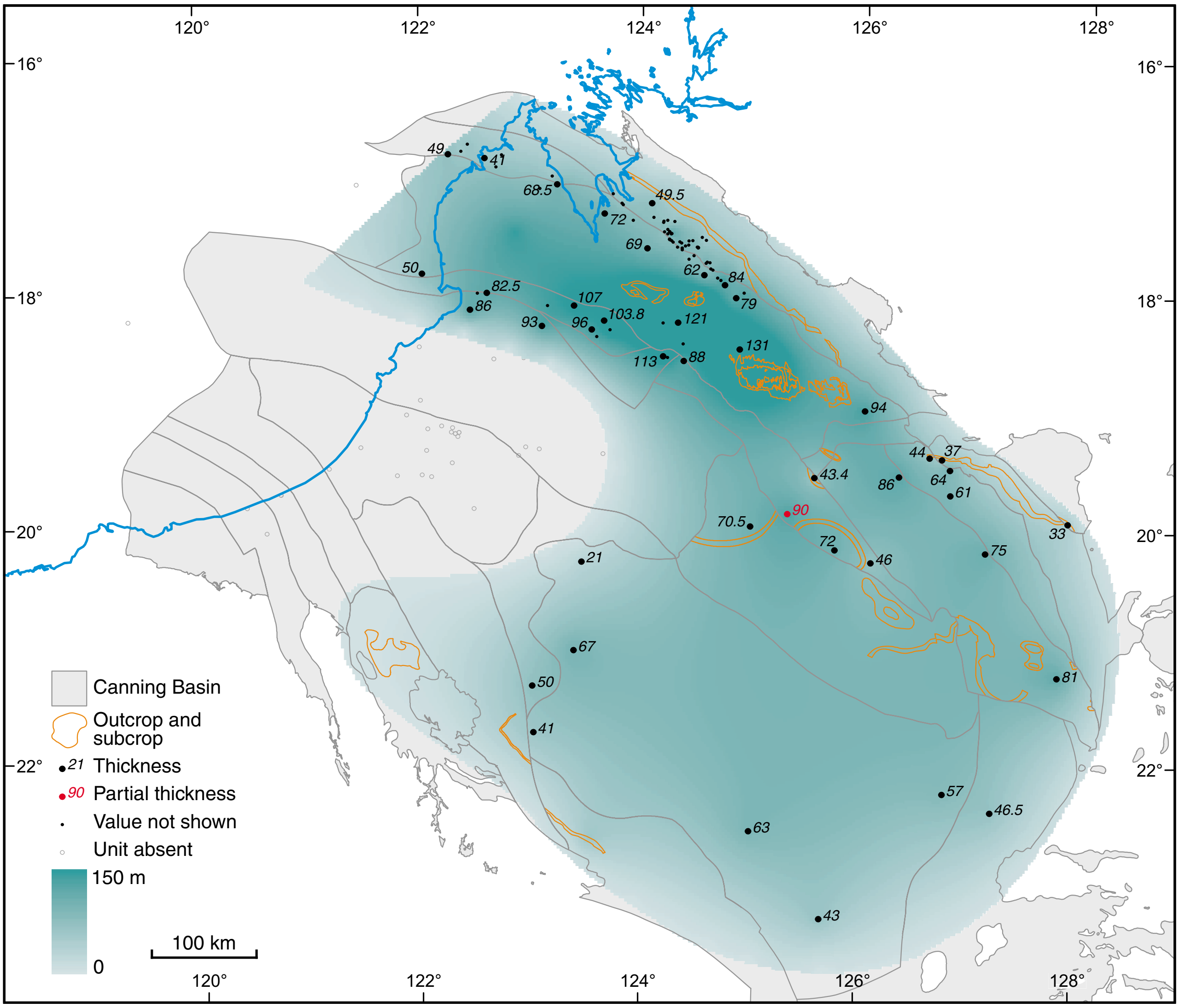


Figure 10. Isopach map of the Poole Sandstone.

may be diachronous, with the easternmost occurrences, such as in BHP PND 1, representing a slightly younger section. If the former possibility is correct, the break between the Grant Group and Poole Sandstone could be at least 3 Ma rather than about 1 Ma as depicted on Figure 2. Unfortunately, the age of the formation is poorly constrained further southeast within the Gregory Sub-basin, and even along the Lennard Shelf there are few wells with palynology from this unit. Log correlation of the formation along the Lennard Shelf (Plate 3) show a number of wells in which the upper contact with the Noonkanbah Formation is ambiguous due to the basal portion of the latter unit being sandier than usual (e.g. Boronia 1, Aquanita 1, and Philydrum 1), thereby demonstrating a limitation of lithostratigraphy.

Nura Nura Member

The Nura Nura Member (Guppy et al., 1952; originally 'Nura-Nura Limestone', Wade, 1937) outcrops along the southwestern end of Nura Nura Ridge over a distance of 1.5 km to the north side of Lake Jocelyn where it contains up to three distinct, fossiliferous, sandy limestone beds, and appears to be no more than 10 m thick. The precise location of the type section is uncertain as the coordinates provided by Guppy et al. (1958, p. 46) are too generalized, and those given by Forman and Wales (1981, table 6, station 73) are near the northern limit of the outcrop belt. The most accessible locality, at 18°05'09"S 124°24'34"E (Noonkanbah) just south of a fence line, is here considered the type section. Wade (1937) also reported an occurrence 16 km south of Gogo Homestead but that exposure could not be located, and is not mentioned in any other reports on the region. Fossiliferous sandstone and siltstone that outcrops along the southern side of the St George Ranges as well as samples from the Cuncudgerie Sandstone in the southern part of the basin correlate with the member, but are lithologically distinct. Exposures of rootlet beds at the base of the Poole Sandstone along the northern and easternmost parts of the St George Ranges and extending to the Poole Range were assigned to the Nura Nura Member by Crowe and Towner (1976a,d). However,

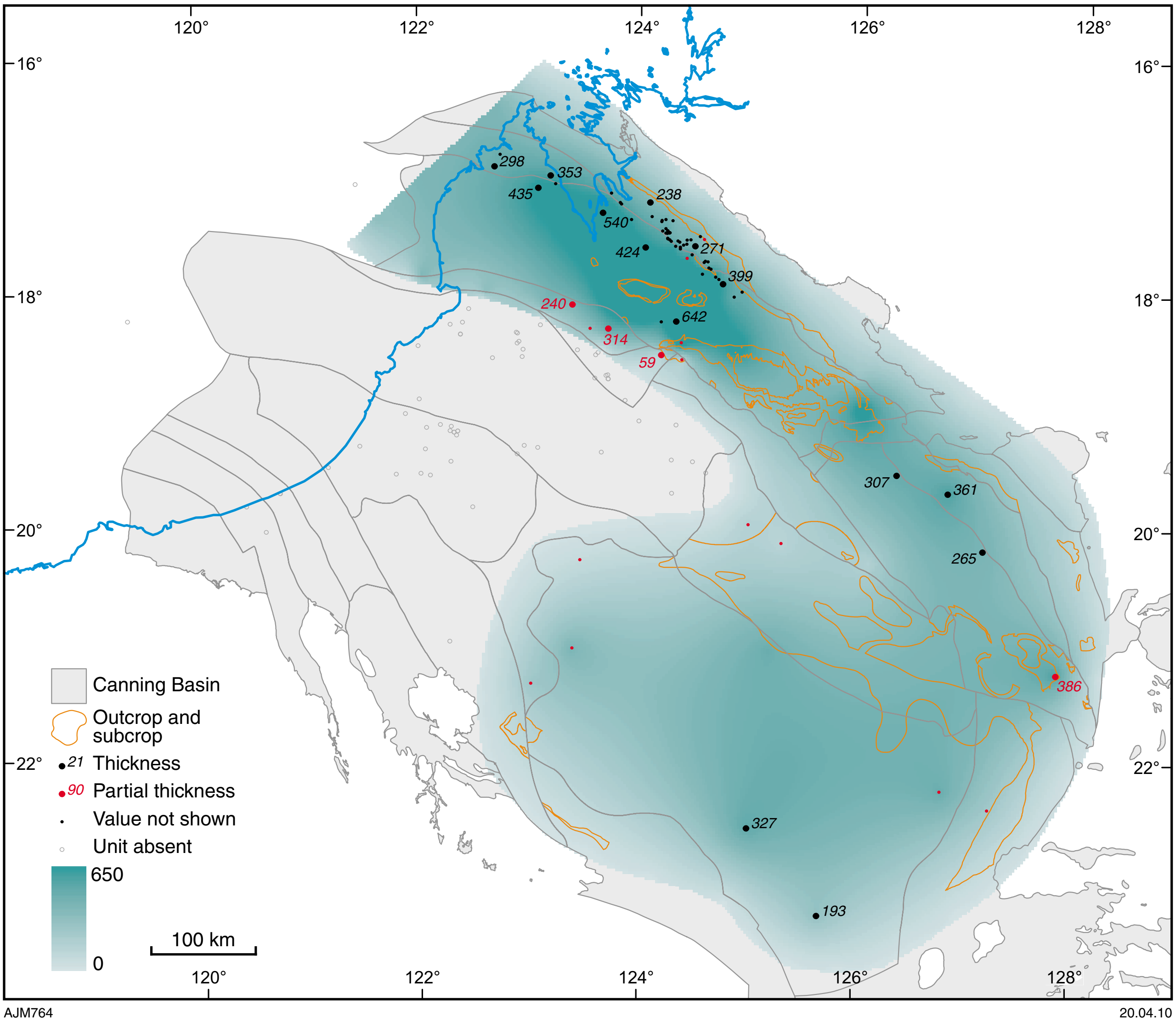


Figure 11. Isopach map of the Noonkanbah Formation.

these facies are here excluded from the unit as they are non-marine and, although both the carbonate and rootlet facies occupy a basal position in the Poole Sandstone, their lateral equivalence cannot be confirmed. Similarly at Liveringa Ridge the succession mapped as Nura Nura Member on NOONKANBAH coincides with the lower upward coarsening cycle of the Poole Sandstone (Fig. 8a). Although this minor fossil occurrence lies at the base of the succession, overall it is dominated by fluviodeltaic siliciclastic facies.

Marine fossils from the Nura Nura Member indicate a correlation with the Fossil Cliff Member of the Holmwood Shale in the Perth Basin and the Callytharra Formation in the Carnarvon Basin (Guppy et al., 1958). Ammonoids indicate a likely Sterlitamakian (upper Sakmarian; Glenister et al., 1993) age, possibly to extending into the lower Aktastinian (earliest Artinskian) based on brachiopods (Archbold, 2002a, fig. 2).

Outcrops of sandy limestone at the southern end of the Stansmore Range questionably assigned to the Nura Nura Member by Yeates et al. (1975a, fig. A6) appear to have no fossil content to confirm such an assignation. As such, the stratigraphic position of this section is uncertain given the lack of marine indicators or glacial affinities in the underlying strata; the previous suggestion by Veevers and Wells (1961, fig. 55) that it is part of the 'Balgo Member' of the Lightjack Formation cannot be discounted.

Fossils from the 'Cuncudgerie Sandstone' in the southern Canning Basin are similar to those from the Nura Nura Member, prompting Crowe and Towner (1976b) and Towner and Gibson (1980) to suggest that the 'Cuncudgerie Sandstone' is a facies of the Poole Sandstone. Outcrop in that area is poor and identification of the Poole Sandstone in the nearest wells (Auld 1, South Auld 1, and Frankenstein 1; Plate 12) supports the discarding of the term 'Cuncudgerie Sandstone'. Although Archbold (1990) indicated that the 'Cuncudgerie' fauna is not completely identical to that of the Nura Nura Member, he suggested inadequate sampling or differences in biofacies as the reason for this difference.

Tuckfield Member

The member was proposed by Crowe and Towner (1976b) for the 'middle Poole Sandstone' (Crowe and Towner, 1976a) with the type section at Mount Tuckfield (18°42'15"S 124°53'35"E on NOONKANBAH). The member comprises the larger part of the Poole Sandstone; but as the distinctive basal Nura Nura Member is thin and not present in many sections, and the Tuckfield Member is similar to the overlying Christmas Creek Member, differentiating this member within the Poole Sandstone is here considered superfluous.

Christmas Creek Member

In the type section (NOONKANBAH: 18°53'50"S 125°48'00"E, near Mount Piper, Poole Range; Crowe and Towner, 1976c) the Christmas Creek Member is marked by a prominent basal cross-bedded pebbly sandstone, about 8 m thick (Hocking et al., 2008, fig. 18), which terminates against a channel 100 m to the northwest. Whereas channel-fill facies are relatively common in the upper part of the Poole Sandstone, in the absence of a distinct basal bed or a clear crosscutting relationship it is not easy to differentiate them lithologically from the underlying part of the formation (e.g. Fig. 8c). As such, the validity of this member as a mappable unit is questionable, and it is unlikely to be identifiable in the subsurface.

Noonkanbah Formation

The formation was named after Noonkanbah Homestead ('Noonkanbah Series' of Wade, 1937) and early writers nominated nearby outcrops as the type locality (Guppy et al., 1952, 1958; Fairbridge, 1953), unfortunately these are poorly exposed. McWhae et al. (1958) and Playford et al. (1975) later placed the type section southwest of Bruten Hill (NOONKANBAH: 18°42'11"S 125°36'22" E). The inclusion of WAPET's PN1 section as a better example than 'the type locality near Noonkanbah Homestead' by Guppy et al. (1958; appendix II, details of type sections) possibly influenced this decision. Even so, the exposures near Bruten Hill are patchy and show variable dips in this section. Neither the top nor base of the unit is exposed, although an uppermost carbonate bed within the section is questionably assigned to the Lightjack Formation (basal Liveringa Group) by Crowe and Towner (1981) based on Crockford's (1957) assignment of the bryozoans. The abrupt contact with the overlying Lightjack Formation at some locations (e.g. BHP PND 1) implies the upper contact is locally disconformable.

In the sub-surface the Noonkanbah Formation is arguably the most easily recognized Permian unit in the basin, as it is dominated by mudstone with thin sandstone beds. Resistant sandy carbonate beds dominate outcrop, which is usually poor, but in general these beds comprise only a small part of the succession. Cored intervals are available from just 11 petroleum wells. Of these cores the longest is 6.1 m (core 3, BMR 01 Mount Anderson). The only fully cored section through the formation is in BHP PND 1 (137–311 m), drilled on the northeastern edge of the Fitzroy Trough (and 36 km east of the type section).

The unit is up to 640 m thick in Myroodah 1 and in exposures along the southern limb of the Grant Range. The main depocentre for the formation is in the Fitzroy Trough, and a secondary depocentre is also evident in the Gregory and Kidson Sub-basins based on Bindi 1 (361 m, Betty Terrace) Kidson 1 (321 m), Point Moody 1 (>343 m), and Wilson Cliffs 1 (>288 m). From these sections it can be inferred that there was some continuity between the Gregory and Kidson Sub-basins during deposition of the formation (Fig. 11). Unfortunately, there are just two complete sections in the southeastern part of the basin (Kidson 1 and Patience 1–2; Plate 12), and outcrop is confined to the margins of the latter sub-basin, so its distribution in the subsurface is uncertain. The formation is absent west of the Kidson Sub-basin and south of the Jurgurra Terrace, and possibly was never deposited in that area. There are no complete sections along the southern margin of the Fitzroy Trough, so it is unclear whether the formation thins gradually (as it does onto the Lennard Shelf to the north) or abruptly as might be expected in this strongly faulted region.

Palynomorphs from the Noonkanbah Formation include Stages 3b to 4a of Kemp et al. (1977); this equates with the *S. fusus* to *P. sinuosus* zones (Backhouse, 1991, 1993), which indicate a mid-Sterlitamakian (late Sakmarian) to mid-Kungurian age. Rarely, palynomorphs of the *P. pseudoreticulata* zone are found in the basal part of the formation, but it is unclear if this indicates a diachronous lower contact due to the patchy distribution of samples between wells or if these are impoverished microfloras from the lower *S. fusus* zone in which *P. pseudoreticulata* can be a dominant form. Although the formation contains a distinctive and diverse shallow-marine fauna (222 forms are listed in Skwarko (1993) collected mainly from outcrop), no ammonoids have been found within it.

The 'Dora Shale', defined from outcrops along the northeastern shore of Lake Dora (Guppy et al., 1956), is regarded as a synonym of the Noonkanbah Formation as it is lithologically and stratigraphically similar (Crowe and Towner, 1976b) with foraminifera typical of the Noonkanbah Formation recovered from the bed of the lake (Crespin, 1956b, 1958). Although Koop (1966) refers to marine macrofossils from the top of the 'Dora Shale' (near Scott Bluff, Lake Blanche) as similar to those from the Nura Nura Member (Poole Sandstone), Towner et al. (1976) indicate that this fauna is more likely to be derived from the Poole Sandstone, which was not mapped in the area during the early 1960s. It is unclear how the name 'Dora Shale' became associated with the Grant Group, as Traves et al. (1956, table 2) clearly show that it is equivalent to the Noonkanbah Formation.

Liveringa Group

The Liveringa Group was originally named the 'Upper Ferruginous or Liveringa Series' by Wade (1937), then subsequently referred to as the 'Liveringa Sandstone' (Guppy et al., 1950) and 'Liveringa Formation' (Guppy et al., 1958), before Yeates et al. (1975) assigned it group status. The designation of the 'Liveringa Group' (comprising 'Liveringa Iron Sandstone', 'Belina* Shale', and Erskine Sandstone) by Guppy et al. (1952) appears to derived from the stratigraphic section of Reeves (1951, p. 2491), but was largely ignored by subsequent workers. As presently defined the group contains the Lightjack Formation, Condren Sandstone, and Hardman Formation (in ascending order) and is restricted to the Middle to Upper Permian succession of siliciclastic and carbonate rocks with thin coal seams. The Condren Sandstone is present in the southeastern part of the basin. Its absence in the Fitzroy Trough could be due to non-deposition, erosion, or facies changes, as there is little change in the thickness of the group as a whole between these areas. The lower contact with the Noonkanbah Formation is possibly disconformable based on the locally sharp basal contact of the Lightjack Formation. Correlation of the group in petroleum wells is commonly hindered by the positioning of the casing shoe near the base of the group so that the gamma-ray log was taken through the casing, thereby considerably diminishing its response (e.g., Kennedia 1, Metters 1, Sundown 1, Plate 3; Hangover 1, Janpam 1, West Blackstone 1, Plate 4; Nemile 1, Plate 5). This, and the lack of prospectivity at the shallow depths the group is usually intersected, probably explains why units of the Liveringa Group are rarely identified in petroleum wells. For these reasons, differentiation of formations (and members) within the group is not attempted in this report, although brief descriptions are provided for each unit based on previous, mostly outcrop-based, work.

The group may be up to 620 m thick in the Fitzroy Trough, based on a composite section presented by Morante (1996, fig. 4; after Galloway and Howell, 1975, unpublished). In this section the group contains palynomorphs of lower Stage 5b (= *D. ericianus* zone) to the *P. microcorpus* zone, thereby implying a Wordian to mid-Changhsingian age. However, the Lightjack Formation appears to be largely missing in this section, either due to a break in the section or difficulties in correlating the individual bores. In either case it is possible that the true maximum thickness of the group in this area is over 700 m. The next thickest section, in Myroodah 1 (435 m), is also incomplete. Isopachs (Fig. 12) show that the main onshore depocentre is along the Fitzroy Trough and Gregory Sub-basin. Thinner sections, presumed equivalent to the lower part of the group, are also present in the Kidson Sub-basin (Kidson 1 and Patience 1, Plate 12), Tabletop–Anketell Shelf (in outcrop), and the northern Wallal Platform (BMR 04A Madura 1, Plate 10). Near the western edge of the Kidson Sub-basin and the southwestern Gregory Sub-basin the group is absent from the upper part of a number of wells, even though they are relatively close to outcrop of the group (Fig. 12). Possibly this is best explained by Mesozoic erosion of relatively thin sections at these locations.

The Chirup Formation (Burns et al., 1981) defined from 499–537 m in Chirup 1 (MANDORA: 19°51'S 120°26'E) appears to be a lateral equivalent of the Liveringa Group based on a general late Permian age in the well completion report. The formation is recorded only from one other well (BMR 04A Mandora, ?587–612 m; Plate 10) and, although geographically remote from outcrop and other well sections, it is here assigned to undifferentiated Liveringa Group.

* 'Belina' and 'Bylina' appear to now abandoned spellings of 'Blina'.

Lightjack Formation

Originally named the Lightjack Member (Guppy et al., 1958), the type section at Lightjack Hill (NOONKANBAH: 18°59'16"S 125°50'47"E) is a partial section about 30 m thick. According to Burns et al. (1981) the thickest section is in Liveringa Ridge (305 m based on unpublished WAPET work), although this is partially covered and faulted. The formation is dominated by siltstone and calcareous to ferruginous sandstone; minor coal and fossiliferous beds are present near the base of the unit. Pisolitic bodies in ferruginous sandstone, also near the base of the formation (Guppy et al., 1952; Edwards, 1953, 1959), are no more than a few metres thick and probably discontinuous. A sample of the 'oolitic iron' from Jimberlura Ridge assayed 50.63% Fe_2O_3 (Edwards, 1953, 1959). It is unclear if this lithology is part of the Lightjack Formation or post-depositional.

Brachiopods from the Lightjack Formation indicate a Roadian age (lower Guadalupian; Archbold, 2002a) consistent with the age of the ammonoid genera *Daubichites* (Glenister et al., 1993). In the subsurface the unit contains palynomorphs of the *D. granulata* to *D. parvithola* zones indicating a Roadian to Capitanian (Guadalupian, Fig. 2) age. However, the younger ages have been recorded mostly from the Gregory Sub-basin, implying some diachroneity and interfingering with the Condren Sandstone, at least in the upper part of the formation.

Condren Sandstone

Yeates et al. (1975b) placed the type section at Condren Pinnacles (LUCAS: 20°06'01"S 127°39'01"E) as this was not specified directly by Casey and Wells (1964) for their 'Condren Sandstone Member'. In outcrop, which extends from the southern end of the Fitzroy Trough near Millyit Range to the southern end of the Gregory Sub-basin, the unit is dominated by sandstone with minor siltstone and abundant plant macrofossils. The formation is up to 75 m thick in BMR Crossland 1, about 50 m in the Millyit Range, and thins rapidly further northwest. The only palynological data is from shallow drillholes (upper Stage 5 or *D. ericianus* zone in BMR Crossland 1 and 2, and BMR Mount Bannerman 1 and 2; Appendix 6). However, the stratigraphic position of the section in BMR Crossland 2 is unclear as, according to the CROSSLAND sheet, this well was spudded below or near the base of the formation. As the unit is overlain by the Hardman Formation, which also contains this palynoflora, the age of the Condren Sandstone is presumed to be mostly Capitanian, i.e., corresponding to the lower part of the microfloral age range (Capitanian–Wuchiapingian). Correlation with nearby petroleum wells such as Bindi 1 and Kilang Kilang 1 should be feasible, but is hindered by the short sections of these BMR wells.

Hardman Formation

Originally defined as the Hardman Member of the Liveringa Formation (Guppy et al., 1958), the formation was named after Mount Hardman, where the type section

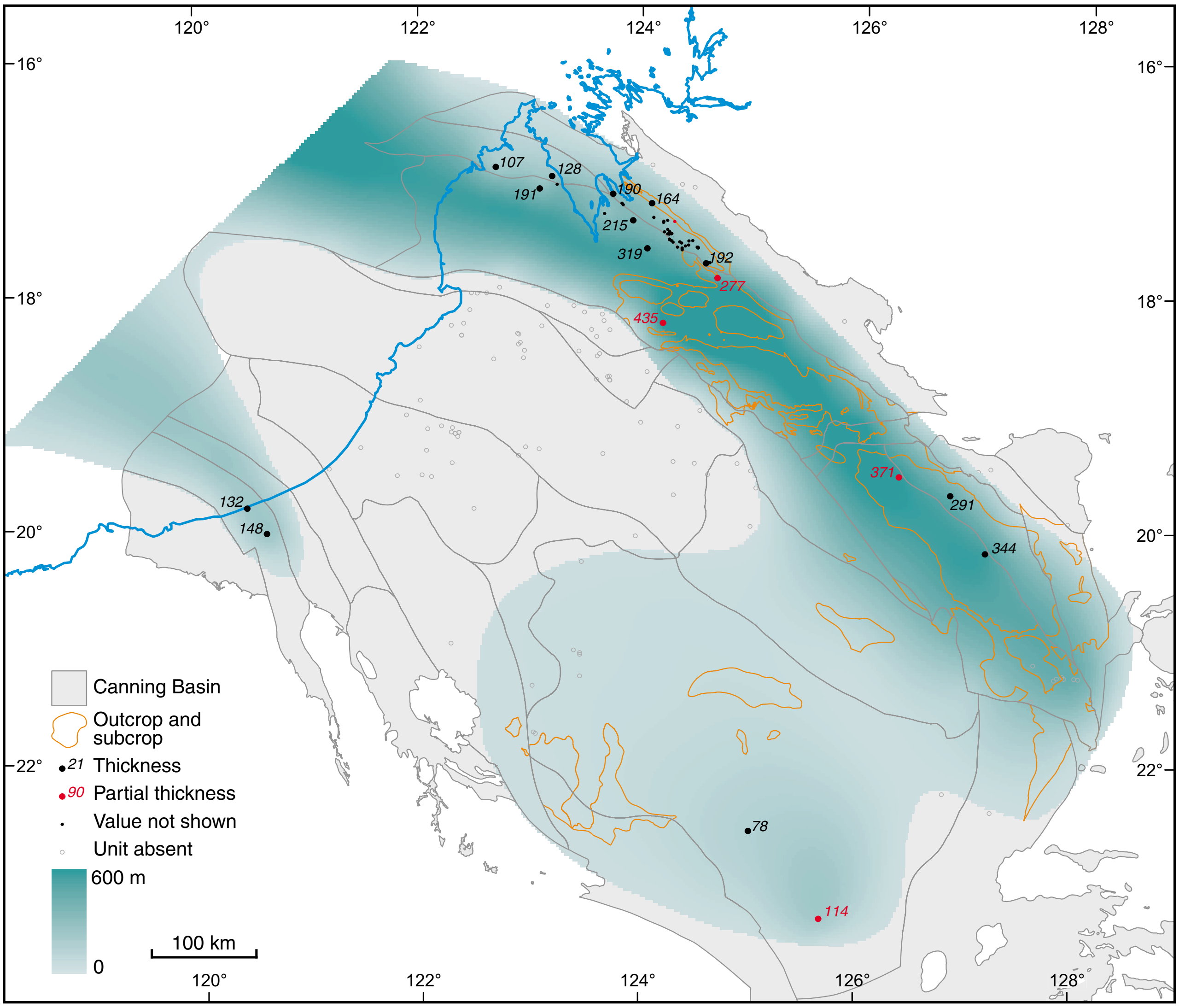


Figure 12. Isopach map for the Liveringa Group.

is located (Noonkanbah: 18°18'40"S 124°38'50"E). The formation consists mostly of thinly bedded, micaceous, silty sandstone with lesser siltstone, and minor thin coal seams and fossiliferous limestone beds. The thickest section is about 540 m, based on a composite of Australia Inland Exploration's Paradise drillcore depicted in Morante (1996, fig. 4), about 20 km northeast of the type area. The formation was divided into three members by Yeates et al. (1975b) with type sections in the northeastern quadrant of Crossland. The members have been mapped in outcrop as far west as Mount Anderson which implies they should be identifiable in the subsurface. The following summaries are from Yeates et al. (1975a,b).

Kirkby Range Member

The type section is 1.5 km west of Spring Creek on the northern scarp of Millyit Range (Crossland: 19°09'33"S 125°34'14"E). The member consists of sandstone, with lesser amounts of sandy siltstone, and minor calcareous sandstone. The greatest thickness identified is about 75 m in BMR Crossland 1. It contains brachiopods of the *Liveringia magnifica* Zone (Archbold, 1988). Palynomorphs of upper Stage 5 have been recovered from cores 1–3 in BMR Crossland 1 (Patten and Price, 1975), with the equivalent *D. parvithola* zone recovered from spoil around Pyramid Bore, 6 km south-southeast of Mount Hardman, near the middle of the member (Backhouse, 2007).

Hicks Range Member

The type section is in central Hicks Range (Crossland: 19°13'14"S 125°53'51"E) where the member is almost 28 m thick. Micaceous sandstone is the dominant lithology. The member is unfossiliferous, and is dated as Late Permian based on its position between the Kirkby Range and Cherrabun Members.

Cherrabun Member

The type section is at the head of a tributary to Spring Creek in the Millyit Range (Crossland: 19°9'46"S

125°33'27"E). The member consists of sandstone (locally richly fossiliferous), laminated siltstone, and rare limestone beds; such as at the foot of Mount Hardman. A late Wuchiapingian (Lower Lopingian) is indicated by the ammonoid *Cyclobus persulcatus* (Glenister et al., 1990) and brachiopods of the *Waagenoconcha imperfecta* Zone (Archbold, 1988, 2002a).

'Godfrey beds'

The 'Godfrey beds' (McWhae et al., 1958, Casey and Wells, 1964) are known only from outcrops in the central northern part of CORNISH, the west of LUCAS, and possibly in the southwest of MOUNT BANNERMAN. The type section lies in the main exposures of the unit northwest of Godfrey Tank (CORNISH: 20°14'07"S 126°32'16"E), apparently between the overlying Millyit Sandstone and underlying Condren Sandstone. The unit consists of sandstone and thin-bedded siltstone with rhizocorallid burrows and shell fragments (Yeates et al., 1975b). On LUCAS the unit lies below the Millyit Sandstone in BMR Lucas 13, and above outcrop of the Condren Sandstone, implying it is a lateral equivalent of the Hardman Formation. Palynomorphs of the *D. parvithola* zone in BMR Lucas 13 are consistent with such a correlation.

Triwhite Sandstone

The unit was defined from Triwhite Hills about 1.6 km east of Dunn Soak in the southern part of the basin (TABLETOP: 18°59'8.5"S 125°50'1.2"E; Traves et al., 1956). In outcrop it consists of mostly fine-grained sandstone with minor claystone, worm traces and ripple marks. A sparse marine macrofauna indicates a general correlation with the upper Noonkanbah Formation or lower Liveringa Group. Outcrops are less than 25 m thick. Auld 1 and South Auld 1 possibly were spudded into sandstone of this unit, based on nearby poor outcrop, but neither these exposures nor the upper 76 and 78 m, respectively, in these wells can be differentiated from Mesozoic units. Therefore correlation of the unit to the subsurface is problematic, although a general lithological equivalence with the lower part of the Liveringa Group is implied, at least for the type area. It is probably for this reason that the name was not discarded, unlike the names 'Cuncudgerie Sandstone' and 'Dora Shale' from this region (Crowe and Towner, 1976b).

Triassic

In ascending order the Triassic succession comprises the Millyit Sandstone, up to 90 m of medium- to fine-grained sandstone; the Blina Shale, up to 410 m of fossiliferous mudstone and fine-grained sandstone; the Erskine Sandstone, up to 270 m of very fine to fine-grained sandstone; and the Culvida Sandstone, up to 200 m of fine- to coarse-grained sandstone and conglomerate. The Blina Shale and Erskine Sandstone have their type sections in the Erskine Range (near the highway next to the small Blina oil terminal).

The most recent overall review of this succession was by Gorter (1978a,b) who indicated that the succession extends up to the lower Anisian (Middle Triassic). The Blina Shale and Millyit Sandstone are grouped together in Figure 13, as Gorter (1978a) indicated that interfingering was common between these formations. In Figure 13, isopachs are assumed to be continuous between the Fitzroy Trough and Gregory Sub-basin despite a gap of 130 km between the main outcrop/subcrop areas. Onshore, deposition was largely confined to the Fitzroy Trough and the southern edge of the Lennard Shelf, and extended into equivalent sub-basins to the southeast. A thin, but incomplete, section (25 m) of the Blina Shale is present in the Wallal Platform, and possibly also extends into the Samphire Graben (Fig. 13). The thickest Triassic section preserved onshore is 571 m in Millard 1 near the northwestern end of the Fitzroy Trough, although this is likely to have been reduced by erosion.

Millyit Sandstone

The Millyit Sandstone (Elliot, in McWhae et al, 1958) is a basal Triassic sandstone and siltstone unit that lies disconformably on the Liveringa Group and has a transitional upper contact with the Blina Shale, with which it also interfingers according to Gorter (1978a). The type section is at the head of Spring Creek in the Millyit Range (CROSSLAND: 19°11'15"S 125°33'00"E), and lies near the western limit of outcrop of the unit. In this section it is about 25 m thick, although the top is eroded. The greatest thickness of the Millyit Sandstone is 93 m in BMR Lucas 13, 230 km to the east-southeast of the type section, where it is probably laterally equivalent to the basal portion of the Blina Shale to the west. In BMR Lucas 13 the combined thickness of the two units (178 m) is about half of the maximum thickness of the Blina Shale near the northern end of the Fitzroy Trough (401 m in Booran 1).

Blina Shale

Brunnschweiler (1954) defined the Blina Shale, citing Reeves (1951) as the originator of the name, but did not designate a type section. Subsequently, Playford et al. (1975) suggested the section measured by McKenzie (1961) at the southeastern end of the Erskine Range (DERBY: 17°51'27" S 124°21'43"E) even though the base is not exposed at this location.

The formation is dominated by claystone, sandy siltstone, and fine-grained sandstone with ripple marks and bioturbation, and is up to 403 m thick (in Millard 1). Onshore it is present in the Fitzroy Trough and Gregory Sub-basin, and also probably at the northern end of the Wallal Platform (in BMR 04A Mandora).

The unit contains a fauna indicative of seasonal fluvial flooding (reptiles, amphibians, fish and plants), alternating with restricted marine facies containing foraminifera, lingulid brachiopods, conchostracans, and rare gastropods, ammonites, and conodonts (Gorter, 1978a). The presence of the *L. pellucidus* zone at the base of the Blina Shale (Morante, 1996, fig. 4) indicates a basal Triassic age as shown by Nicoll et al. (2009). The youngest age from the formation is the *T. playfordii* zone (Olenikian–Anisian) in

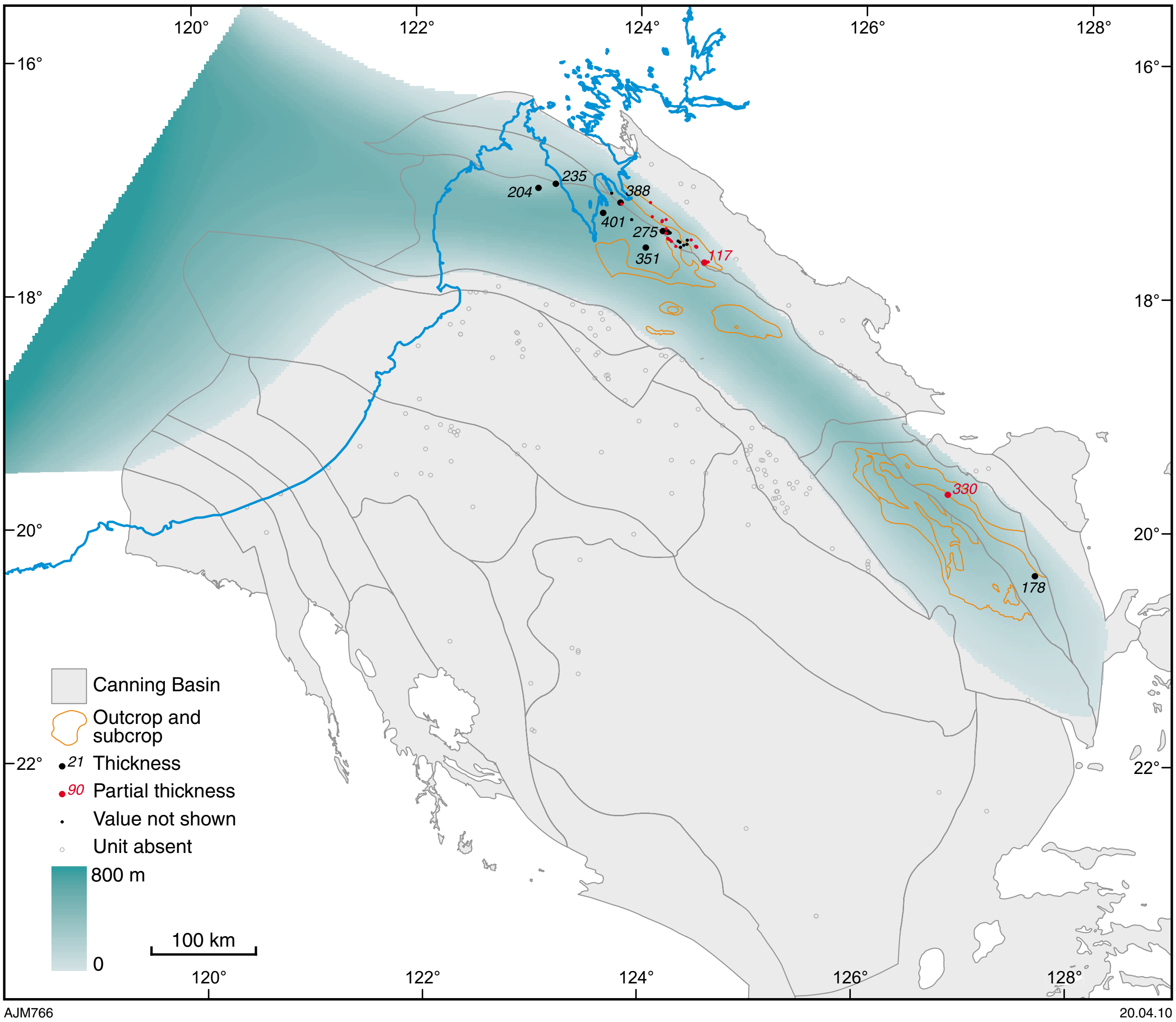


Figure 13. Isopach map of the Blina Shale plus Millyit Sandstone (Lower Triassic).

Booran 1, East Yeeda, and possibly Puratte 1 (Appendix 6); the latter zone also extends into the overlying Erskine Sandstone in Booran 1.

Erskine Sandstone

Wade's (1937) 'Erskine Series' was amended to Erskine Sandstone by Guppy et al. (1952) and Brunnschweiler (1954). The unit was named after Erskine Range where the 33-m thick type section is located (Derby: 17°50'20"S 124°20'22"E; Playford et al., 1975). The unit consists of massive and cross-bedded silty sandstone, with interbedded conglomerate. It is known in the subsurface in the northwestern Fitzroy Trough and southwestern Lennard Shelf where it was shown as up to 255 m thick (in Derby Town Bore; Playford, 1955; Crowe et al., 1978, appendix 1, fig. 4). In Booran 1 and Millard 1 near Derby the formation is here interpreted as 118 m and 182 m thick, respectively, but the top is eroded. In water bores east of the town, the Erskine Sandstone is interpreted as up to 265 m thick (Laws and Smith, 1989), but this thickness probably incorporates sandy facies within the uppermost part of the underlying Blina Shale. The Erskine Sandstone also outcrops in the Gregory Sub-basin and Betty Terrace where it is up to 88 m thick (Burns et al., 1981), but there appear to be no well intersections in this region.

Plant macrofossils, mud-cracks and the lack of marine fossils point to a non-marine depositional setting. Spores and pollen of the Olenikian–Anisian *T. playfordii* zone (late Early – early Middle Triassic) are present in the unit in Booran 1, possibly East Yeeda 1 and Puratte 1 (Appendix 6) consistent with the late Scythian to Anisian age indicated by Burns et al. (1981). By comparison, water bores east of Derby have also yielded the *S. quadrifidus* zone (Backhouse, 1987a–c) indicating the unit extends into the Ladinian (late Middle Triassic).

Culvida Sandstone

The type section is 1 km south of Culvida Soak (Cornish: 20°14'00"S 126°56'00"E; Veevers and Wells, 1961; Casey and Wells, 1964). The unit is dominated by medium- to coarse-grained sandstone and contains abundant fossil leaves. Patten and Price (1975) indicate a late Early to early Middle Triassic age based on spores and pollen from BMR Cornish 2, thereby implying the formation is largely coeval with the Erskine Sandstone. The Culvida Sandstone is only found within 20 km of the type area, and is only mapped as a separate unit within 10 km of Culvida Soak on CORNISH; the surrounding exposures are shown as undifferentiated Erskine and Culvida Sandstones (Crowe, 1978).

Munkayarra Shale

East of Derby, up to 185 m of multicoloured claystone, referred to the Munkayarra Shale (Laws and Smith, 1989), overlies the Erskine Sandstone. The unit is present in 6 water bores, but has yet to be penetrated in a petroleum exploration well. No palynology is available but a Middle to Late Triassic age is inferred from the unit's stratigraphic position above the Erskine Sandstone (Laws and Smith, 1989).

Igneous rocks

Igneous rocks are present in nine wells in the Canning Basin and in three wells in the adjacent Roebuck Basin (Table 1). Of these, three are situated within Permian strata (Corbett 1 — basalt in Liveringa Group; Minjin 1 and Perindi 1 — dolerite in Betty Formation). The rest are within the Viséan (Early Carboniferous) Anderson Formation (dolerite in Barlee 1 and gabbro in Fraser River 1), unassigned units, or basement. Petrographically the intrusions above basement are evolved tholeiites; the similarity in composition indicates a co-magmatic or similar source for all of these igneous bodies (Reeckman and Mebbersson, 1984). All are considered to be emplaced in the Late Permian, apart from the basalt in Corbet 1, which may be Mesozoic in age.

Petroleum geology

The most recent evaluations of the petroleum geology of the basin (Burt et al., 2002: D'Ercole et al., 2003) emphasize that charge, timing, migration, reservoir quality, and trap integrity are the key risks within the basin. As this review is based mostly on well data, the following summary is restricted to reservoir quality, seals, source potential, and maturity.

Reservoirs

In their review of reservoir quality of the Carboniferous–Permian of the Canning Basin, Havord et al. (1997) indicated excellent sandstone reservoir quality is common down to and including the Grant Group, although it generally decreases with depth and age. The following is summarized from their report and D'Ercole et al. (2003). Relatively few sections of the Reeves Formation were identified but the unit appears to have core-derived porosities and permeabilities up to 25% and 1463 md. By comparison, the Grant Group has porosities that range from 1.2% to 40% (average 20%), and permeabilities up to 5520 md (average 605 md in the central part of the basin). High porosities and permeabilities were recorded for the Poole Sandstone, of which the highest (39% and 1700 md) were from near the top of the unit in Sahara (not the same sample). Whereas sandstone intervals in the overlying Noonkanbah Formation have measured porosities up to 21%, their permeabilities were <1 md in all cases. Core analyses from the Liveringa Group are limited, but log-derived sandstone porosity exceeds 30% in most wells.

To date the only producing fields in the Permian of the Canning Basin are the Boundary, Sundown, and West Terrace fields on the Lennard Shelf (Jonasson, 2001). Porosities from the producing horizons average 18%, 20%, and 22%, respectively. Although there is no permeability data for Boundary, in Sundown permeability averages 200–900 md with a maximum of 2.38 darcies. In West Terrace the permeability of the pay zone is up to 2.9 darcies, but drops to 40 md below the oil/water contact (Jonasson, 2001). Total production to 31 December 2008 from these three fields was 125.8 ML (Department of Mines and Petroleum, 2009) since 1984. This is less than half that from the Blina field, 25 km to the east-southeast, that produces from the base of the Lower Carboniferous Fairfield Group and the top of the Upper Devonian Nullara Limestone.

Of the small bitumen (usually biodegraded) shows, in mineral exploration holes, the most interesting is from core taken next to Petaluma 1 by Blackfin Resources that contains tar sand within the Lightjack Formation (not the Grant Group as reported in Middleton et al., 2007). The tar is too biodegraded to analyse, so its origin cannot be determined, but it probably represents part of a migration pathway, possibly along a nearby fault zone.

Seals

There are no seal capacity tests available from the onshore part of the basin to date. Nevertheless, at least some sealing capacity is demonstrated by shales within the Grant Group of the Boundary, Sundown, and West Terrace fields on the Lennard Shelf (Jonasson, 2001). Even though these small fields are just 7.5 km apart, the sealing horizon in the Boundary field is a 1–2 m-thick shale bed high in the Betty Formation rather than the generally fine-grained Winifred Formation as it is in the other two fields (Fig. 14). This implies that the Winifred Formation has a variable sealing quality or, perhaps, that oil in the Boundary field was emplaced via a circuitous migration pathway. Certainly in this area the formation contains a number of sandstone bodies that could compromise its seal capacity. Whereas mudstones within the Grant Group are likely to form effective seals, at least locally, the glacial character of the unit implies seal capacity could be compromised or highly variable where sufficient coarse-grained sediment has been mixed into such fine-grained facies.

Even though the paucity of shows in the Poole Sandstone is discouraging, the major mudstone unit in the basin, the

Table 1. Well intersections of igneous rocks in the Canning and Roebuck Basins

Well	WAPIMS reference number	Intervals (m)	Samples taken	Samples available (excluding cuttings	Age	Description
Barlee 1	S 98	2301–2302; 2385 – 2394.5	Core 17 (part)	Core piece only; some at GA; ?TS	?Late Permian	Microgabbro (in Anderson Formation)
Corbett 1	S 20212	333–343	Cuttings	None	?Early Permian or Mesozoic	Basalt (in Liveringa Group)
Fraser River 1	S 95	3062–3092	Cores 125–127	Core pieces only	Late Permian 233 ± 13 Ma (Gleadow and Duddy, 1984)	Microgabbro (in Anderson Formation)
Minjin 1	S 2528	1391–1476	Cuttings		?Early Permian	Dolerite (in lower Grant Group)
Moogana 1	S 1578	2105–2213	SWC	?TS, swc at GA	?Precambrian	Dolerite, amphibolite (?basement)
Needle Eye Rocks 1	S 3223	1521–1665	Core 2	?TS	Precambrian	Biotite tonalite (basement)
Padilpa 1	S3205 A2	1791–2184 TD	Core 1	½ at GSWA	?Viséan 336 ± 2 Ma	Microgabbro (unit uncertain)
Pearl 1	S 2340	2032–2052; 2144–2203	Cuttings	None	Late Permian 249 ± 2 Ma (K–Ar))	Dolerite (?Fairfield Group
Perindi 1	S 2342	1330–1333; 1337–1340; 1343–1345; 1364–1370; 1379–1535; 1552–1553; 1593–1595; 1600–1602;	Cuttings	?TS	Early Permian 255 ± 13 Ma (Gleadow and Duddy, 1984)	Dolerite (in lower Grant Group)
Bedout 1	S 646	3021–3073	Core 1; 8 SWCs	¼ GSWA; ¼ GA	?Late Permian	Basaltic breccia and dolerite (below Upper Triassic)
La Grange 1	S 2259	2869–3260	Cuttings	None	Late Permian 253 ± 5 Ma	Volcanic and volcaniclastic rocks, (unit uncertain)
Wamac 1	S 907	2246–2257; 2367–2471; 2553–2566; 2674–2682; 2726–2764	Cuttings	None	?Late Permian ~240 Ma (Gleadow and Duddy, 1984)	Dolerite (unit uncertain)

NOTES: swc side wall core
TD total depth
TS thin section

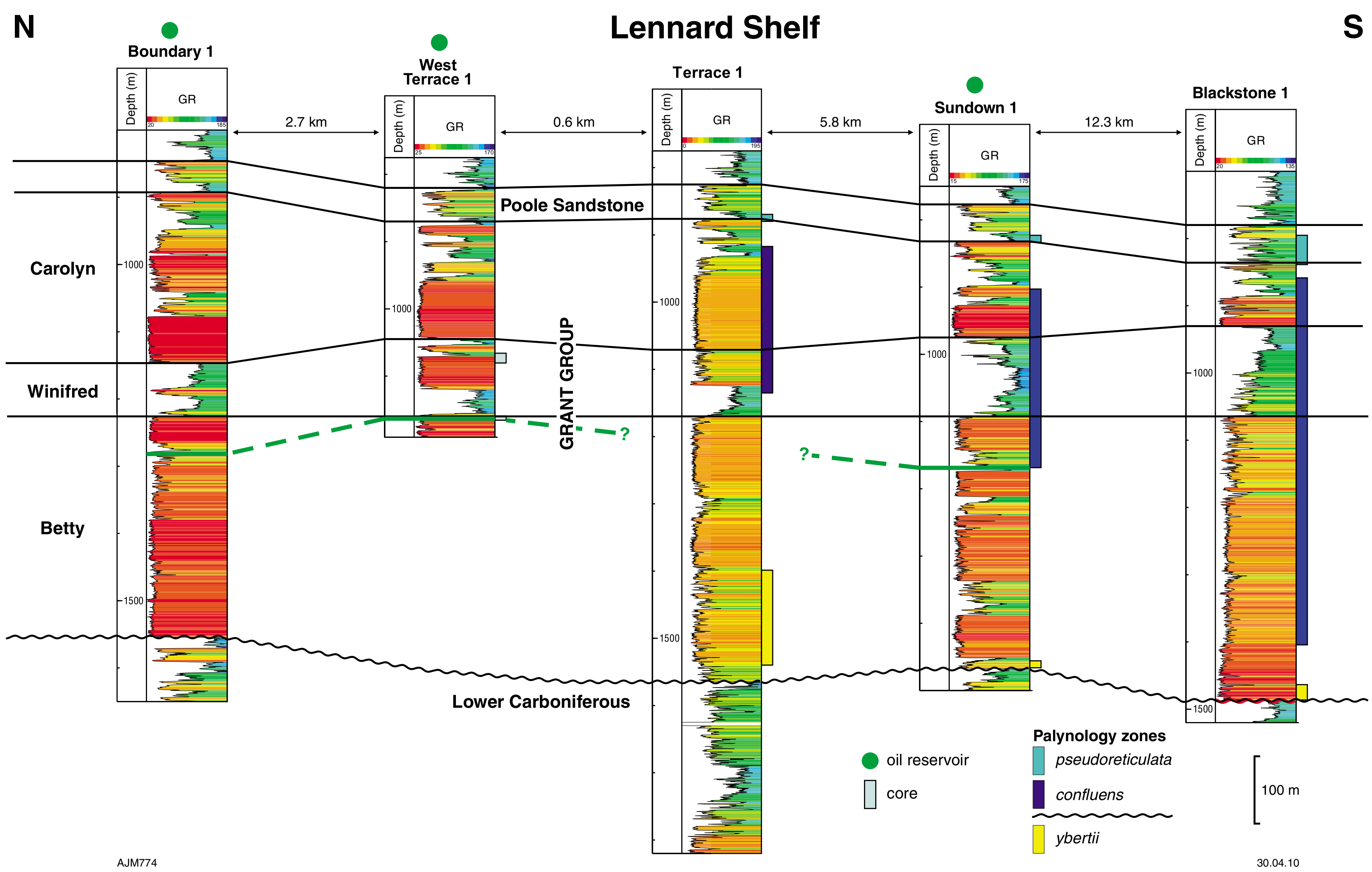


Figure 14. Correlation of Boundary 1 to Blackstone 1, Lennard Shelf, showing producing horizons.

Noonkanbah Formation, could be expected to form a top seal, given it is up to 640 m thick. Younger shaly units within the Liveringa Group, and the Blina Shale, are an unlikely seal mainly due to the unlikelihood of closed structures at such shallow depths.

Source potential

Source potential, summarized in Figure 15, based on Rock-Eval data (Appendix 7) shows that potential source rocks in the Permian is gas- to oil and gas prone, and that generation capacity can be good to excellent in the Grant Group, Poole Sandstone, and Noonkanbah Formation. Although the analyses have been limited to those in which either TOC is >2% and S_1+S_2 is >2.5 mg/gm rock (representing about 4% of all analyses available from the mid-Carboniferous and Permian), they indicate at least some source potential for the succession. Whereas potential source intervals in the Poole Sandstone and Grant Group are likely to be thin and of limited extent, the thick, mudstone-dominated Noonkanbah Formation appears to be the most likely interval capable of generating hydrocarbons. Stratigraphically higher similar intervals in the Liveringa Group and Blina Shale are unlikely to be mature enough to generate hydrocarbons, at least in the onshore part of the basin.

The moderate hydrocarbon generating potential of the Noonkanbah Formation (Fig. 15b) could easily be underestimated by the low number of samples presently available. If this is the case, the unit has minor potential for shale gas based on the criteria outlined in Law and Curtis (2002), but as yet no exploration has been directed at this objective. Similarly, the potential for coal seam methane from the Lightjack Formation and shale gas from the Blina Shale and fine-grained intervals in the Liveringa Group has not been evaluated largely due to the paucity of core available from these units.

Maturity

Of the 250 wells that intersected the mid-Carboniferous to Permian succession in the basin, just 42 have relatively modern reflectance data from this interval (Appendix 8). Data from Horstman (1984, table 2) has been incorporated into Figure 16. In general there is a broad spread within the data probably due to poor samples with low vitrinite content, and differences between laboratories.

Most rocks of mid-Carboniferous to Permian age in the Canning Basin lie above the oil window. However, it appears that the lower parts of this succession (Reeves Formation and lower Grant Group) lie inside the oil window within the Fitzroy Trough and its southeastern extension (Fig. 16). This trend could be due to deeper burial along the greater Fitzroy Trough, local intrusive bodies (Reeckman and Mebberson, 1984) or a combination of these two factors. For example, the Grant Range 1, Perindi 1, and Puratte 1 (near the western end of the Fitzroy Trough) have significantly higher maturities (vitrinite reflectance values of 1.12, 1.06, and 1.11%,

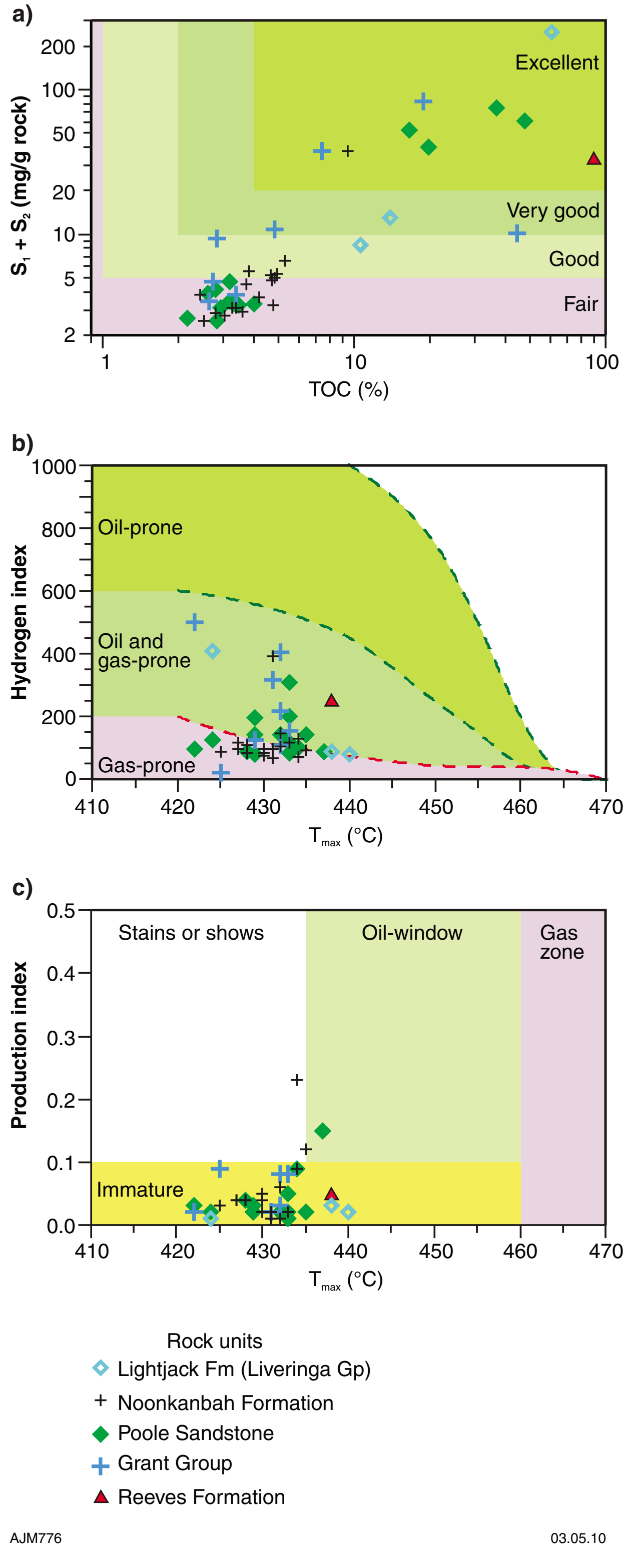


Figure 15. Summary of Permian petroleum geochemistry from Rock-Eval data: a) generation potential; b) kerogen typing; and c) maturity. Data from Appendix 7.

respectively) than all the other wells (maximum 0.88%), but it is clear the latter two have been significantly affected by Late Permian intrusions. Gleadow and Duddy (1984) and Kennard et al. (1994) indicate this event elevated temperatures in the western Pender Terrace (Perindi 1

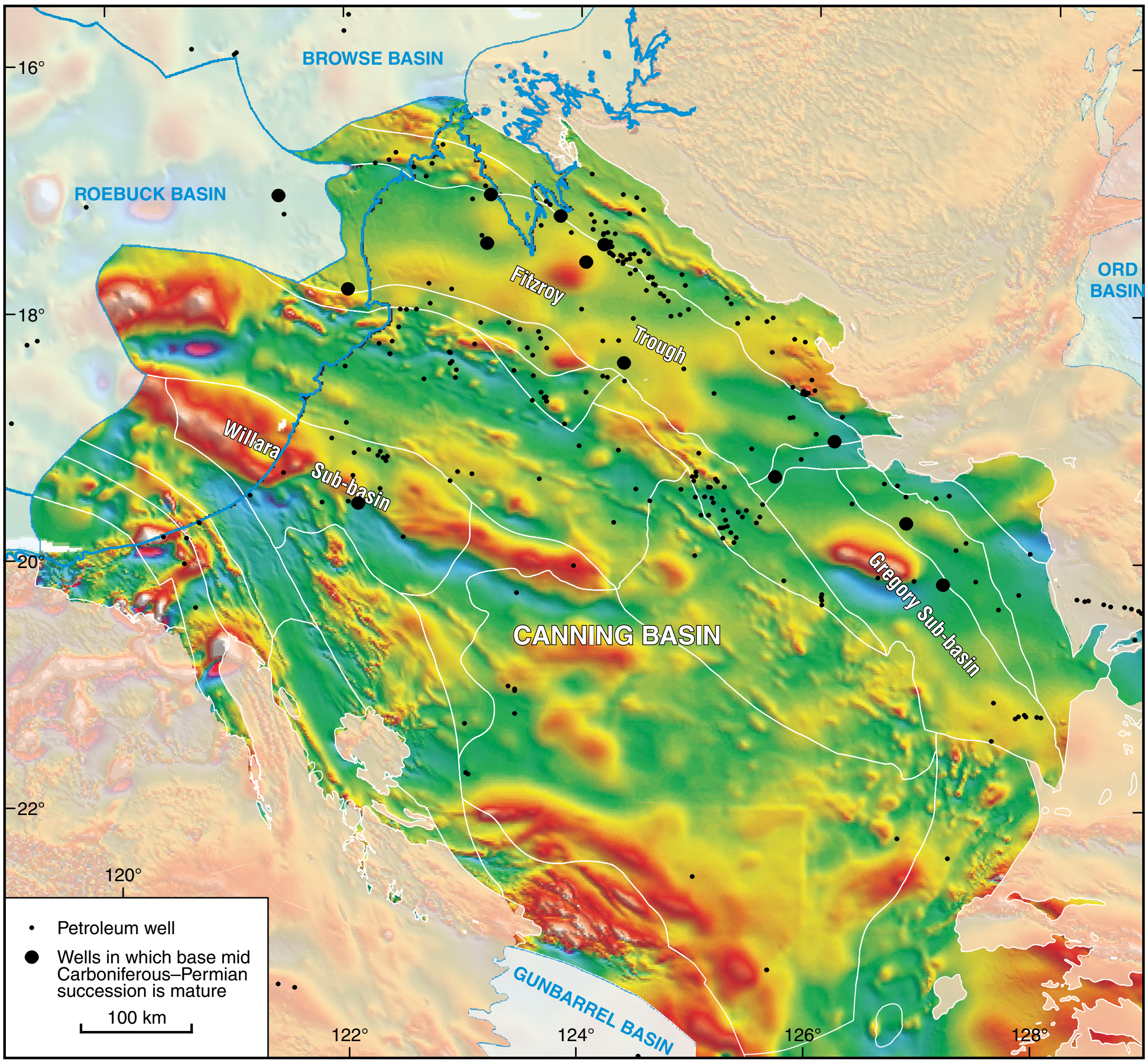


Figure 16. Distribution of mature mid-Carboniferous–Permian rocks based on vitrinite reflectance data, with aeromagnetic image of the Canning Basin. Maturity data from Appendix 8.

and Kambara 1) but the effect diminished southwest to Wamac 1 and east to Curringa 1. Elevated thermal maturity in Fraser River 1 (Kennard et al., 1994) possibly is due to a separate intrusive body. The reliability of the reflectance value for Grant Range 1 (1.12% R_o at 1675 m, from Horstman, 1984) is uncertain, but is not inconsistent with the spore–pollen colouration at this depth (TAI 2^+ to 3^-; Backhouse, in prep.). Other data, apparently unreliable, from Kilang Kilang 1 (Gregory Sub-basin), Sunshine 1 (Broome Platform), and BMR Bannerman 1 (Balgo Terrace) are indicated in Figure 16. In addition, data from Darriwell 1, Willara Sub-basin, appears anomalous as it is just within the oil window (0.84% R_o at 1193 m), but the only other well with vitrinite reflectance data in this region (Calamia 1, 0.4% R_o at 882 m) has a much thinner Permian section. Similarly, data from low in the Grant Group in Kidson 1 may be unreliable. In both cases it is uncertain if the base of the upper Paleozoic section has a similar maturity across these sub-basins, or if the relatively high values are reliable.

In the available data, maturity of Permian rocks within the Broome Platform, and adjoining Barbwire, Mowla, and Jurgurra Terraces, do not exceed 0.6% R_o implying relatively little of the section has been eroded from this region. At least some parts of the Fitzroy Trough appear to have similar maturities to parts of the Lennard Shelf and Gregory Sub-basin where depths are about 1000 m shallower (Fig. 17). Conversely, the Permian section across the Balgo and Betty Terraces is considerably less mature than at comparable depths across the Gregory Sub-basin. This implies significantly higher paleo-heat flows, probably from shallow basement in parts of the Lennard Shelf, and a possible large intrusion within the Gregory Sub-basin based on interpretation of aeromagnetic data (Fig. 16). At least some parts of the Fitzroy Trough, by comparison, are relatively unaffected by such intrusions. Of all sub-basins, the Pender Terrace shows the greatest increase in maturity with depth, possibly reflecting the proximity of igneous intrusions to that area (Reeckman and Mebberson, 1984).

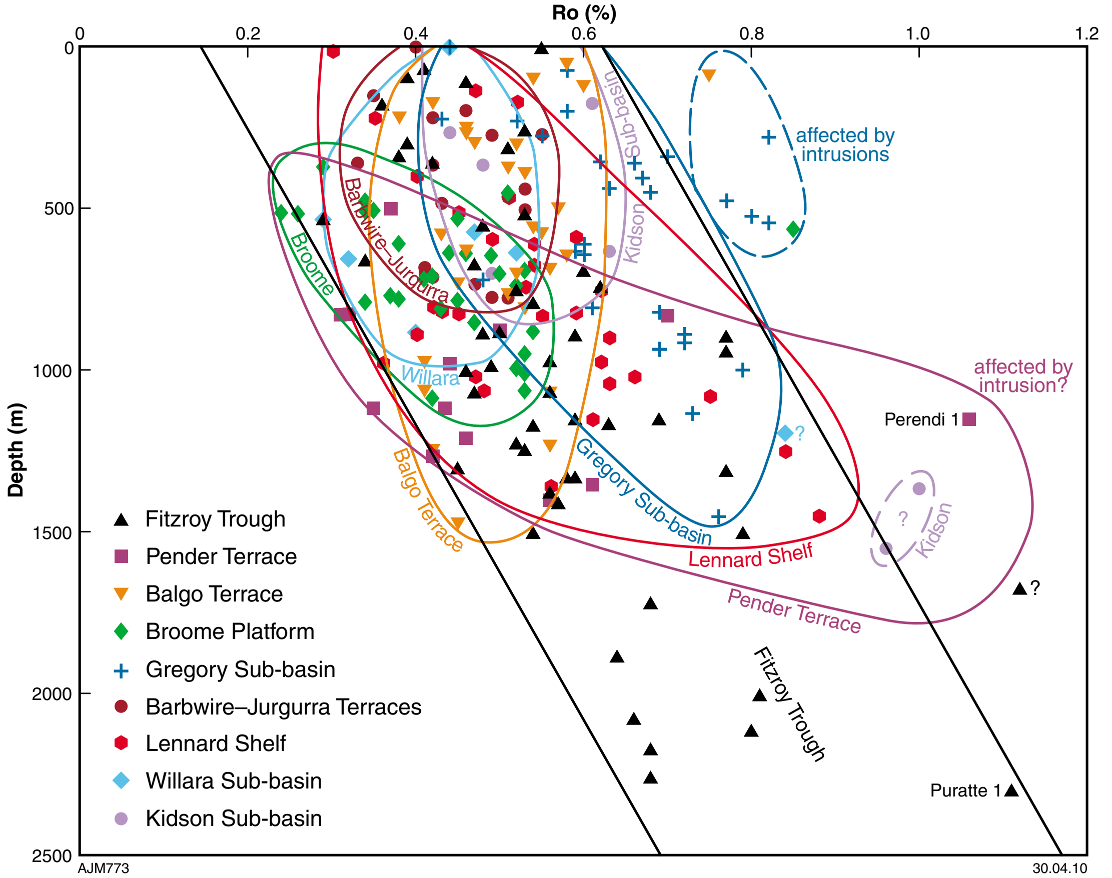


Figure 17. Vitrinite reflectance maturity versus depth by sub-basin. Maturity data from Appendix 8 and Horstman (1984).

Maturity data from Petaluma 1 is inconsistent with that from a shallow coal exploration bore drilled next to it, with the latter giving a significantly higher value (0.63 versus 0.36% R_o) at a similar depth (170–180 m) within the Lightjack Formation. This difference may be due to a difference in calibration between laboratories. The higher value from Keiraville Konsultants is considered more reliable, and implies that the lower Noonkanbah Formation (642 m thick in this well) and deeper units are within the oil window, at least in this locality.

Summary

Although source-rock quality is patchy, and maturities are generally low, reservoir quality is excellent implying that the upper Paleozoic succession, especially the sandstone-prone Grant Group, has significant potential to reservoir hydrocarbons generated from deeper in the succession. However, the general paucity (or poor quality) of shows within the basin, and the upper Paleozoic in particular, is probably a reflection of the low maturity of the underlying sequences across much of the basin and, by inference, low levels of hydrocarbon generation. Clearly, this does not apply across the entire basin as there are small fields in Permian rocks of the Lennard Shelf (Sundown, Terrace, and Boundary) presumably sourced from the deeper Lower Carboniferous strata (AGSO and Geomark Inc., 1996) within the adjacent Fitzroy Trough. Apart from the northwestern Lennard Shelf and central Barbwire Terrace, the density of exploration wells is very low, especially in much of the Crossland Platform, Gregory Sub-basin, and Kidson Sub-basin, but there still remains significant potential for further exploration even in the relatively densely drilled parts of the basin.

To date exploration has focussed on conventional plays. Within the upper Paleozoic this has been directed mostly at the Grant Group with minor success on the Lennard Shelf. By comparison, little attention has been directed at the thick, carbonaceous mudstone succession of the Noonkanbah Formation for shale gas, or the underlying sandstone-dominated glacial units for CO_2 sequestration apart from a brief review focussed on the Leveque Shelf and Pender Terrace (Spenser, 2005). However, Rey Resources (2009) has an interest in coal-bed methane and underground coal gas in the Lightjack Formation in association with their coal leases on Myroodah and Liveringa stations and adjacent areas.

Coal

Coal has been intersected over a wide area of the Canning Basin, but the only significant seams found to date are in the Lightjack Formation (lower part of the Permian

Liveringa Group). Seams have also been intersected in the Condren Sandstone and the Hardman Formation (Liveringa Group), the Lower Permian Poole Sandstone, the Lower Carboniferous Anderson Formation, and the Upper Jurassic to Lower Cretaceous Jarlemai Siltstone, but all these are extremely thin (Le Blanc Smith, 1990). A more detailed account of the coal resources of the basin can be found in Hassan (2004) and Rey Resources (2009) on which this summary is based.

Coal seams were first discovered during well sinking on ‘Lower Liveringa Station' in 1909 (Simpson, 1910; Woodward, 1915). Extensive deposits were tested by Premier Mining Co. (Baada, 1966), Thiess Brothers (Pickering, 1968), Australian Inland Exploration Company and Texas Gulf Australia (Gair, 1972; Lee et al., 1980), and by Broken Hill Proprietary Company Limited (1978), mostly from the Liveringa Formation. The deposits were considered to be low-grade, and seam thicknesses appear to have been under-estimated due to poor core recovery and the lack of density logs.

Australian Inland Exploration Company calculated an inferred resource at Liveringa Ridge of 35 Mt of sub-bituminous coal over a strike length of 8 km, down dip to 300 m, using a seam thickness of 3.3 m, and based on eight drillholes (Lee et al., 1980). The coal has high ash (24–35%), a calorific value of 7500 k cal/kg, moisture of between 6.5 and 12.5%, and volatile matter in the range between 31 and 33%, which is attractive for steaming coal (Lee et al., 1980). Gair (1972) indicates the coal has a crucible swelling number of 2, indicating that it is approaching a coking coal (with a crucible swelling number of 5), and suggested that it is possible that coking coal will be found where there has been a greater depth of burial.

Rey Resources and the ASF Group are actively reassessing seams in the Lightjack Formation around the southern to northeastern flanks of the Mount Wynne structure and south of Ellendale Homestead, respectively. Calorific values, ash content, moisture, and volatile matter reported by Rey Resources (2009) are consistent with earlier work, but total resources are 511 Mt over the Duchess–Paradise leases (35 Mt measured, 144 Mt indicated, 332 Mt inferred) based on 29 cored holes and 220 mud-rotary holes over an area of about 50 km^2. Two main seams, which locally are contiguous, have been identified in the Duchess–Paradise area: P1 averages 2.2 m in thickness (range 0.2 – 3.2 m), and the stratigraphically deeper P2 averages 6.8 m along Duchess Ridge but thins to the north and is not present in the Paradise area. Depths are shallow in these areas and the seams, which dip at 7–8°, are oxidized above 10–20 m depth. On the southern limb of Grant Range (Liveringa Ridge) Rey identified a 3 m-thick upper seam and lower banded coal measures up to 30 m thick. At present Rey Resources is focusing on the Duchess–Paradise area because of the steeper dip to the south (about 25°) at Liveringa.

Acknowledgements

I wish to thank John Backhouse for his efforts in reviewing the palynology of numerous wells in the basin, as well as David Haig (UWA), and Bob Nicoll (Geoscience Australia), for innumerable discussions on the succession. In addition, Simon Lang and Neil Marshall (Woodside Energy) reviewed the manuscript and provided helpful discussions on the biostratigraphy, respectively. Jamie Lankford provided data on cores held by Geoscience Australia. Assistance in the field by Steve Abbott (Southern Cross University, now Eromanga Uranium), Joe Martin (University of Manchester, now Shell International Exploration and Production) and Keita Shewan (now Total Energy) was appreciated.

References

Adkins, RM 2003, Regressive systems tract cyclicity in shore-zone deposits: sedimentology and stratigraphy of the Lower Permian Tuckfield Member (Poole Sandstone), onshore Canning Basin, Western Australia: Australian Journal of Earth Sciences, v. 50, p. 365–376.

Australian Geological Survey Organisation and Geomark Research Inc. 1996, The oils of Western Australia — petroleum geochemistry and correlation: Australian Geological Survey Organisation, Canberra; and Geomark Research, Houston (unpublished).

Apak, SN and Backhouse, J 1998, Stratigraphy and petroleum exploration objectives of the Permian–Carboniferous of the Barbwire Terrace and Adjacent Areas, Northeast Canning Basin: Geological Survey of Western Australia, Report 68, 30p.

Apak, SN and Backhouse, J 1999, Re-interpretation of the Permo-Carboniferous Succession, Canning Basin, Western Australia, *in* The Sedimentary Basins of Western Australia 2 *edited by* PG Purcell and RR Purcell: Proceedings of the Petroleum Exploration Society of Australia Symposium, Perth WA, p. 683–694.

Archbold, NW 1988, Studies on Western Australian Permian brachipods 8. The Late Permian brachiopod fauna of the Kirkby Range Member, Canning Basin. Proceedings of the Royal Society of Victoria, v. 100, p. 21–32.

Archbold, NW 1990, Studies on Western Australian Permian brachiopods 9. The Sterlitamakian brachiopod fauna of the Cuncudgerie Sandstone, Canning Basin: Proceedings of the Royal Society of Victoria, v. 102, p. 1–13.

Archbold, NW 1993, A zonation of the Permian brachiopod faunas of Western Australia, *in* Gondwana Eight: Assembly evolution and dispersal *edited by* RH Findlay, R Unrug, MR Banks, and JJ Veevers: Proceedings of the 8th Gondwana Symposium, Hobart, Tasmania, Australia, 21–24 June 1991: A.A. Balkema, Rotterdam, p. 313–321.

Archbold, NW 1995, Studies on Western Australian brachiopods: 12. Additions to the late Asselian–Tastubian faunas: Proceedings of the Royal Society of Victoria, v. 107, p. 95–112.

Archbold, NW 1998a, Correlations of the Western Australian Permian and Permian ocean circulation patterns. Proceedings of the Royal Society of Victoria, v. 110, p. 85–106.

Archbold, NW 1998b, Marine biostratigraphy and correlation of the west Australian Permian basins, *in* The sedimentary basins of Western Australia, Volume 2 *edited by* PG Purcell and RR Purcell: Petroleum Exploration Society of Australia Perth, Western Australia, p. 553–568.

Archbold, NW 1999, Permian Gondwanan correlations: the significance of the western Australian marine Permian: Journal of African Earth Sciences, v. 29, p. 63–75.

Archbold, NW 2000, Palaeobiogeography of the Australasian Permian. Memoirs of the Association of Australasian Palaeontologists, v. 23, p. 287–310.

Archbold, NW 2001, Pan-Gondwanan, Early Permian (Asselian–Sakmarian–Aktastinian) correlations, *in* Contributions to Geology and Palaeontology of Gondwana in Honour of Helmut Wopfner *edited by* H Weiss: Univ. Cologne, Cologne, p. 29–39.

Archbold, NW 2002a, Peri-Gondwanan Permian correlations: The meso-Tethyan Margins, *in* The Sedimentary Basins of Western Australia, Volume 3 *edited by* M Keep and SJ Moss: Petroleum Exploration Society of Australia, Perth, Western Australia, p. 223–240.

Archbold, NW 2002b, Correlation of the Permian sequences of Gondwana: relationships to the Arctic Permian: Canadian Society of Petroleum Geologists, Memoir 19, p. 1–11.

Archbold, NW and Shi, GR 1996, Western Pacific Permian marine invertebrate palaeobiogeography: Australian Journal of Earth Sciences, v. 43 (6), p. 635–641.

Archbold, NW and Shi, GR 1995, Permian brachiopod faunas of Western Australia: Gondwanan–Asian relationships and Permian climate: Journal of Southeast Asian Earth Sciences, v. 11, p. 207–215.

Baada, FD 1966, Geological report on coal investigations west Kimberley area, Western Australia — Temporary Reserve nos. 3462H–3434H and 3754H; Premier Mining Co. Proprietary Limited: Geological Survey of Western Australia, Statutory mineral exploration report, A35828 (unpublished).

Backhouse, J 1974, Palynology of a borehole in the southern part of the Yarrie Sheet: Geological Survey of Western Australia, Palaeontology Report 1974/28 (unpublished).

Backhouse, J 1976, Palynology of the Oakover River boreholes: Geological Survey of Western Australia, Palaeontology Report 1976/6 (unpublished).

Backhouse, J 1987a, Derby Regional Investigation Groundwater Bore 2D: Geological Survey of Western Australia, Palaeontology Report 1987/20 (unpublished).

Backhouse, J 1987b, Derby Regional Investigation Groundwater Bore 15D: Geological Survey of Western Australia, Palaeontology Report 1987/21 (unpublished).

Backhouse, J 1987c, Derby Regional Investigation Groundwater Bore 15D: Geological Survey of Western Australia, Palaeontology Report 1987/22 (unpublished).

Backhouse, J 1991, Permian palynology of the Collie Basin, Western Australia: Review of Palaeobotany and Palynology, v. 67, p. 237–314.

Backhouse, J 1993, Palynology and correlation of Permian sediments in the Perth, Collie and Officer Basins, Western Australia: Geological Survey of Western Australia, Report 34, p. 111–128.

Backhouse, J 1998, Palynological correlation of the Western Australian Permian: Proceedings of the Royal Society of Victoria, v. 110, p. 107–114.

Backhouse, J 2007, Palynology of 5 samples from assorted localities in the Canning Basin: Geological Survey of Western Australia, Statutory petroleum exploration report G31870 A1 (unpublished).

Broken Hill Proprietary Company Limited 1978, Temporary Reserves 6615H, 6616H and 6617H, Fitzroy Trough, final report: Geological Survey of Western Australia, Statutory mineral exploration report, A35894 (unpublished).

Brown, SA, Boserio, IM, Jackson, KS and Spence, KW 1984, The geological evolution of the Canning Basin — implications for petroleum exploration, *in* The Canning Basin, W.A. *edited by* PG Purcell: Proceedings of the Geological Society of Australia/Petroleum Exploration Society of Australia Symposium, Perth, Western Australia, p. 85–96.

Brunnschweiler, RO 1954, Mesozoic stratigraphy and history of the Canning Desert and Fitzroy Valley, Western Australia: Journal of the Geological Society of Australia, v. 1, p. 35–54.

Burns, RV, Gorter, JD and Passmore, VL 1981, Appendix 4. Stratigraphic units of interval 4, *in* Geological evolution of the Canning Basin, Western Australia *compiled by* DJ Foreman and DW Wales: Bureau of Mineral Resources, Australia, Geology and Geophysics. Bulletin 210, Appendices, p. 58–84.

Burt, A, Champ, P and Parks, A 2002, Petroleum Prospectivity of the Eastern Canning Basin, WA: Report to Department of Mineral and Petroleum Resources by Troy-Ikoda, Australasia: Geological Survey of Western Australia, Statutory petroleum exploration report G31870 A2 (unpublished).

Casey, JN and Wells, AT 1964, The Geology of the North-east Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Report 49, 41p.

Clapp, FG 1925, A few observations on the geology and geography of the Northwest and Desert Basins, Western Australia: Proceedings of the Linnean Society of New South Wales, v. 50, p. 47–66.

Crespin, I 1956, Appendix C Microfossils from the South-West part of the Canning Basin, Western Australia, *in* The geology of the south-western Canning Basin, Western Australia: Australia *by* DM Traves, JN Casey, and AT Wells: Bureau of Mineral Resources, Australia, Geology and Geophysics Report 29, p. 54–55.

Crespin, I 1958, Permian Foraminifera of Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Bulletin 48, 207p.

Crespin, I and Condon, MA 1956, Micropalaeontology and stratigraphy of Roebuck No. 1 Bore, Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics Record 1956/139, 6p.

Crockford, J 1957, Permian Bryozoa from the Fitzroy Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics Bulletin 34, 134p.

Crowe, RWA (compiler) 1978, Cornish, Western Australia: Australian Bureau of Mineral Resources, Geology and Geophysics, and Geological Survey of Westem Australia, 1:250 000 Geological Series Explanatory Notes, 19p.

Crowe, RWA and Towner, RR 1976a, Permian Depositional History of the Noonkanbah 1:250,000 Sheet Area: Bureau of Mineral Resources, Australia, Geology and Geophysics Record 1976/24, 50 p.

Crowe, RWA and Towner, RR 1976b, Definitions of some new and revised rock units in the Canning Basin: Geological Survey of Western Australia, Record 1976/24, 23 p.

Crowe, RWA and Towner, RR 1976c, Permian stratigraphic nomenclature, Noonkanbah 1:250 000 sheet: Geological Survey of Western Australia, Annual Report for 1975, p. 56–58.

Crowe, RWA and Towner, RR 1976d, Environmental interpretation of the Permian Nura Nura Member of the Poole Sandstone, Noonkanbah sheet area, Canning Basin: a gradation between fluviatile and shallow-water marine facies: Western Australia Department of Mines, Annual Report for 1975, p. 59–62.

Crowe, RWA and Towner, RR 1981, Noonkanbah, W.A.: Bureau of Mineral Resources, Australia, Geology and Geophysics, and Geological Survey of Western Australia, 1:250 000 Geological Series Explanatory Notes, 51p.

Crowe, RWA, Towner, RR and Gibson, DL 1978, Permian and Mesozoic Geology of the Derby and Mount Anderson 1:250 000 sheet areas, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Record 1978/8, 59p.

Department of Mines and Petroleum 2009, Petroleum in Western Australia, April 2009, 72p.

D'Ercole, C, Gibbons, L and Ghori, KAR 2003, Prospects and leads, central Canning Basin, Western Australia, 2003: Geological Survey of Western Australia, Record 2003/14, 89p.

Dickins, JM 1996, Problems of a late Palaeozoic glaciation in Australia and subsequent climate in the Permian: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 125, p. 185–197.

Dickins, JM, Towner, RR and Crowe, RWA 1977, A Permian cold water marine fauna in the Grant Formation of the Canning Basin, Western Australia: Journal of the Palaeontological Society of India, v. 20, p. 275–278.

Edwards, AB 1953, Oolitic iron formation from north-west Western Australia: Commonwealth Scientific and Industrial Research Organisation, Mineragraphic Report 540, 3p.

Edwards, AB 1959, Oolitic iron formations in northern Australia: Geologisches Rundschau, v. 47, p. 668–682.

Evans, PR 1969, Upper Carboniferous and Permian palynological stages and their distribution in eastern Australia *in* Gondwana Stratigraphy: International Union of Geological Sciences, 1st Gondwana Symposium, Buenos Aires, United Nations Educational, Scientific and Cultural Organization, Paris, p. 41–50.

Eyles, CH and Eyles, N 2000, Subaqueous mass flow origin for Lower Permian diamictites and associated facies of the Grant Group, Barbwire Terrace, Canning Basin, Western Australia: Sedimentology, v. 46, p. 342–356.

Eyles, N, Eyles, CH, Apak, N and Carlsen, GM 2001, Permian–Carboniferous tectono-stratigraphic evolution and petroleum potential of the northern Canning Basin, Western Australia: The American Association of Petroleum Geologists, Bulletin, v. 85, p. 989–1006.

Eyles, N, Mory, AJ and Backhouse, J 2002, Carboniferous–Permian palynostratigraphy of west Australian marine rift basins: Resolving tectonic and eustatic controls during Gondwanan glaciations: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 184, p. 305–319.

Eyles, N, Mory, AJ and Eyles, CH 2006, 50-million-year-long record of glacial to postglacial marine environments preserved in a Carboniferous–Lower Permian graben, northern Perth Basin, Western Australia: Journal of Sedimentary Research, v. 76, p. 618–632.

Fairbridge, RW 1953, Australian Stratigraphy: University of Western Australia Press, 576p.

Ferguson, km, Bagas, L and Ruddock, I 2006, Mineral occurrences and exploration potential of the Paterson area: Geological Survey of Western Australia, Report 97, 43p.

Forman, DJ and Wales, DW 1981, Geological evolution of the Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Bulletin 210, 91p.

Foster, CB 1982, Spore-pollen assemblages of the Bowen Basin, Queensland (Australia): Their relationship to the Permian boundary: Review of Palaeobotany and Palynology, v. 36, p. 165–183.

Foster, CB and Archbold, NW 2001, Chronological anchor points for the Permian and Early Triassic of the Eastern Australian Basins, *in* Contributions to Geology and Palaeontology of Gondwana in Honour of Helmut Wopfner *edited by* RH Weiss: Cologne, Geological Institute, University of Cologne, p. 175–197.

Foster, CB and Waterhouse, JB 1988, The *Granulatisporites confluens* Oppel-zone and Early Permian marine faunas from the Grant Formation on the Barbwire Terrace, Canning Basin, Western Australia: Australian Journal of Earth Sciences, v. 35, p. 135–157.

Gair, HS 1972, Report on drilling for coal in the Fitzroy Sub-basin of the Canning Basin, W.A.; Australian Inland Exploration Company Inc: Geological Survey of Western Australia, Statutory mineral exploration report, A35877 (unpublished).

Galloway, M and Howell, D 1975, Relinquishment Report of TR 5851H to 5869H, 5878H to 5880H, Fitzroy Trough, Western Australia; Esso Australia: Geological Survey of Western Australia, Statutory mineral exploration report, A63549 V1 (unpublished).

Gibson, DL and Crowe, RWA 1982, Mount Anderson WA Sheet SE 51-11 (second edition): Geological Survey of Western Australia, 1:250 000 Geological Series Explanatory Notes, 44p.

Gleadow, AJW and Duddy, IR 1984, Fission track dating and thermal history analysis of apatites from wells in the north-west Canning Basin, WA, *in* The Canning Basin, W.A. *edited by* PG Purcell: Proceedings of the Geological Society of Australia/ Petroleum Exploration Society of Australia Symposium, Perth, p. 378–387.

Glenister, BF, Baker, C, Furnish, WM and Dickins, JM 1990, Late Permian ammonoid cephalopod *Cyclobus* from Western Australia: Journal of Paleontology, v. 64, p. 399–402.

Glenister, BF, Rogers, FS and Skwarko, SK 1993, Ammonoids, *in* Palaeontology of the Permian of Western Australia *edited by* SK Skwaro: Geological Survey of Western Australia, Bulletin 136, p. 54–63.

Goldstein, BA and Hubbard, JJ 1984, Comparison and geological interpretation of alternative dipmeter analyses from a Permo-Carboniferous sequence in the Fitzroy Graben, *in* The Canning Basin, W.A. *edited by* PG Purcell: Proceedings of the Geological Society of Australia/Petroleum Exploration Society of Australia Symposium, Perth, p. 505–519.

Gorter, JD 1978a, Triassic environments in the Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Journal of Australian Geology and Geophysics, v. 3, p. 25–33.

Gorter, JD 1978b, A review of the Triassic palaeo-environments in the Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Record 1978/1, 52p.

Gorter, JD, Jones, PJ, Nicoll, RS and Golding, CJ 2005, A reappraisal of the Carboniferous stratigraphy and the petroleum potential of the southeastern Bonaparte Basin (Petrel sub-basin), northwestern Australia: The APPEA Journal, v. 45, p. 275–296.

Gorter, JD, Poynter, SE, Bayford, SW and Caudullo, A 2008, Glacially influenced petroleum plays in the Kulshill Group (Late Carboniferous Early Permian) of the southeastern Bonaparte Basin, Western Australia: The APPEA Journal, v. 48, p. 69–113.

Gradstein, FM, Ogg, JG, Smith, AG, Agterberg, FP, Bleeker, W, Cooper, RA, Davydov, V, Gibbard, P, Hinnov, L, House, MR, Lourens, L, Luterbacher, H-P, Mcarthur, J, Melchin, MJ, Robb, LJ, Shergold, J, Villeneuve, M, Wardlaw, BR, Ali, J, Brinkhuis, H, Hilgen, FJ, Hooker, J, Howarth, RJ, Knoll, AH, Laskar, J, Monechi, S, Powell, J, Plumb, KA, Raffi, I, Röhl, U, Sanfilippo, A, Schmitz, B, Shackelton, NJ, Shields, GA, Strauss, H, van Dam, J, Veizer, J, van Kolfschoten, TH and Wilson, D 2004, A Geologic Time Scale 2004, Cambridge University Press, New York, 589p.

Guppy, DJ, Cuthbert, JD and Lindner, AW 1950, Geology of the Nerrima Dome, Kimberley Division, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Report 4, 13p.

Guppy, DJ, Lindner, AW, Rattigan, JH and Casey, JN 1952, The stratigraphy of the Mesozoic and Permian sediments of the Desert Basin, Western Australia: XIX International geological congress (Gondwana Symposium), Alger, 1952, p. 107–114.

Guppy, DJ, Lindner, AW, Rattigan, JH and Casey, JN 1958, The geology of the Fitzroy Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Bulletin 36, 116p.

Gutiérrez, P R, Cesari, SN and Archangelsky, S 1997, *Deusilites tenuistriatus* sp. nov. (Acritarca) en el Pérmico Inferior de la Cuenca Chacoparanense (Argentina): Ameghiniana, v. 34, p. 247–250.

Hassan, LY 2004, Mineral occurrences and exploration potential of the west Kimberley: Geological Survey of Western Australia, Report 88, 88p.

Helby, R 2006, A palynological reconnaissance of new cuttings samples from the Arafura-1, Kulka-1 and Tasman-1 wells, *in* New Datasets for the Arafura Basin *compiled by* HIM Struckmeyer: Geoscience Australia, Record 2006/06, 17p.

Havord, PJ, Apak, SN and Carlsen, GM 1997, Permo-Carboniferous petroleum reservoir data, selected wells, Canning Basin, Western Australia: Geological Survey of Western Australia, Record 1996/11, 155p.

Hocking, RM 1994, Subdivisions of Western Australian Neoproterozoic and Phanerozoic sedimentary basins: Geological Survey of Western Australia, Record 1994/4, 84p.

Hocking, RM, Playford, PE, Haines, PW and Mory, AJ 2008, Paleozoic geology of the Canning Basin — a field guide: Geological Survey of Western Australia, Record 2008/18, 40p.

Horstman, EL 1984, Evidence for post-Permian epeirogenic uplift in the Canning Basin from vitrinite reflectance data, *in* The Canning Basin, W.A. *edited by* PG Purcell: Proceedings of the Geological Society of Australia/Petroleum Exploration Society of Australia Symposium, Perth, p. 401–409.

Jackson, MJ, Kennard, LM, Moffat, M, O'Brien, PE, Sexton, MJ, Southgate, PN and Zeilinger, I 1993, Canning Basin project Stage 1, Lennard Shelf: Explanatory notes and map folios: Australian Geological Survey Organisation, Record 1993/001, 24p.

Jonasson, KE 2001, Onshore Canning Basin: Department of Mineral and Petroleum Resources, Western Australian, Atlas of Petroleum Fields, v. 2, part 1, 72p.

Jones, PJ 1996, Carboniferous (Chart 6), *in* Australian Phanerozoic Timescale *edited by* GC Young and LR Laurie: Oxford University Press, Melbourne, p. 110–126.

Jones, PJ, Campbell, KSW and Roberts, J 1975, Correlation chart for the Carboniferous System of Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Bulletin 156A, 40p.

Jones, PJ, Nicoll, RS, Edwards, DS, Kennard, JM and Glenn, KC 1998, Canning Basin biozonation and stratigraphy: Australian Geological Survey Organisation, Chart 2.

Jones, PJ and Young, GC 1993, Summary of Phanerozoic biostratigraphy and palaeontology of the Canning Basin (Lennard Shelf): Australian Geological Survey Organisation, Record 1993/004, 62p.

Kennard, JM, Jackson, MJ, Romine, KK, Shaw, RD and Southgate, PN 1994a, Depositional sequences and associated petroleum systems of the Canning Basin, W.A., *in* The sedimentary basins of Western Australia *edited by* PG Purcell and RR Purcell: Petroleum Exploration Society of Australia; Western Australian Basins Symposium, Perth, WA, 1994, Proceedings, p. 657–676.

Kennard, JM, Jackson, MJ, Romine, KK and Southgate, PN 1994b, Canning Basin Project (Stage II) - Geohistory modelling: Australian Geological Survey Organisation, Record 1994/67, 243p.

Kemp, EM, Balme, BE, Helby, RA, Kyle, RA, Playford, G and Price, PL 1977, Carboniferous and Permian palynostratigraphy in Australia and Antarctica: A review: Bureau of Mineral Resources, Australia, Journal of Australian Geology and Geophysics, v. 2, p. 177–208.

Koop, WJ 1966, Recent contributions to Palaeozoic Geology in the South Canning Basin, Western Australia: The APEA Journal, v. 6, p. 105–109.

Korte, C, Jones, PJ, Brand, U, Mertmann, D and Veizer, J 2008, Oxygen isotope values from high-latitudes: Clues for Permian sea-surface temperature gradients and Late Palaeozoic deglaciation: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 269, p. 1–16.

Law, BE and Curtis, JB 2002, Introduction to Unconventional Petroleum Systems: American Association of Petroleum Geologists, Bulletin 86, p. 1851–1852.

Le Blanc Smith, G 1990, Coal, *in* Geology and Mineral Resources of Western Australia: Geological Survey of Western Australia, Memoir 3, p. 625–631.

Lee, TA, Benthan, DR and Hancock, RG 1980, Preliminary feasibility study of Liveringa Ridge; Texas Gulf Australia Limited: Geological Survey of Western Australia, Statutory mineral exploration report, A35878 (unpublished).

Leonova, TB 1998, Permian ammonoids of Russia and Australia: Proceedings of the Royal Society of Victoria, v. 110, p. 157–162.

Lever, H and Fanning, CM 2004, Alunite alteration of tuffaceous layers and zircon dating, Upper Permian Kennedy Group, Carnarvon Basin, Western Australia: Australian Journal of Earth Sciences, v. 51, p. 189–203.

Lowenstam, HA 1964, Palaeotemperatures of the Permian and Cretaceous Periods, *in* Problems in Palaeoclimatology *edited by* AEM Nairn: London, Interscience, p. 227–248.

McKenzie, KG 1961, Vertebrate localities in the Triassic Blina Shale of the Canning Basin, Western Australia: Journal of the Royal Society of Western Australia, v. 44, p. 69–76.

McWhae, JRH, Playford, PE, Lindner, AW, Glenister, BF and Balme, BE 1958, The stratigraphy of Western Australia: Journal of the Geological Society of Australia, v. 4 (2), p. 1–161.

Middleton, MF, de Beer, F, Haines, P and Mory, A 2008, Evaluation of tar deposits using neutron tomography, Canning Basin, Western Australia: Australian Society of Exploration Geophysics, Extended Abstracts for 2007, Abstract 79, 4p.

Morante, R 1996, Permian and Early Triassic isotopic records of carbon and strontium in Australia and a scenario of events about the Permian–Triassic boundary: Historical Biology, v. 11, p. 289–310.

Mory, AJ 1991, Geology of the Offshore Bonaparte Basin, Northwestern Australia: Geological Survey of Western Australia, Report 29, 47p.

Mory, AJ and Backhouse, J 1997, Permian stratigraphy and palynology of the Carnarvon Basin, Western Australia: Geological Survey of Western Australia, Report 51, 41p.

Mory, AJ, Redfern, J and Martin, JR 2008, A review of Permian–Carboniferous glacial deposits in Western Australia, *in* Resolving the Late Paleozoic Ice Age in Time and Space *edited by* CR Fielding, TD Frank, and JL Isbell: Geological Society of America, Special Paper 441, p. 29–40.

Nicoll, RS and Metcalfe, I 1998, Early and Middle Permian conodonts from the Canning and southern Carnarvon basins, Western Australia: their implications for regional Biogeography and Palaeoclimatology: Proceedings of the Royal Society of Victoria, v. 110 (1/2), p. 419–461.

Nicoll, RS, Laurie, JR, Kelman, AP, Mantle, DJ, Haines, PW, Mory, AJ and Hocking, RM 2009, Canning Basin biozonation and stratigraphy: Geoscience Australia, Chart 31.

O'Brien, PE and Christie-Blick, N 1992, Glacially-grooved surfaces in the Grant Group, Grant Range, Canning Basin and the extent of the late Paleozoic Pilbara ice sheets: Bureau of Mineral Resources, Australia, Journal of Australian Geology and Geophysics, v. 13, p. 87–92.

O'Brien, PE, Lindsay, JM, Knauer, K and Sexton, MJ 1998, Sequence stratigraphy of a sandstone-rich Permian glacial succession, Fitzroy Trough, Canning Basin, Western Australia: Australian Journal of Earth Sciences, v. 45, p. 533–545.

Patten, R and Price, P 1975, Appendix C. Palynological study of cores cut in BMR stratigraphic drill holes *in* Notes on the Gregory Sub-basin and adjacent areas of the Canning Basin, Western Australia *by* AN Yeates, RWA Crowe, RR Towner, LAI Wyborn, and VL Passmore: Bureau of Mineral Resources, Australia, Geology and Geophysics, Record 1975/77.

Pickering, R 1968, Report on coal exploration on TRs 3518H, 3571H and 3886H; Geotechnics Australia for Theiss Brothers: Geological Survey of Western Australia, Statutory mineral exploration report, A35826 (unpublished).

Playford, G and Dino, R 2005, Chapter 5 Carboniferous and Permian palynostratigraphy *in* Applied Stratigraphy *edited by* EAM Kousoukas: Springer, Dordrecht, p. 101–121.

Playford, G and Powis, GD 1979, Taxonomy and distribution of some trilete spores in Carboniferous strata of the Canning Basin, Western Australia: Pollen et Spores, v. 21, p. 371–394.

Playford, PE 2001, The Permian-Carboniferous glaciation of Gondwana: Its legacy in Western Australia: Geological Survey of Western Australia, Record 2001/5, p. 15–16.

Playford, PE 2002, Palaeokarst, pseudokarst, and sequence stratigraphy in the Devonian reef complexes of the Canning Basin, Western Australia, *in* The sedimentary basins of Western Australia, Volume 3 *edited by* M Keep and SJ Moss: Petroleum Exploration Society of Australia, Perth, Western Australia, p. 763–793.

Playford, PE, Cope, RN, Cockbain, AE, Low, GH and Lowry, DC 1975, Chapter 2. Phanerozoic *in* The geology of Western Australia: Geological Survey of Western Australia, Memoir 2, p. 223–433.

Powis, GD 1983, The palynostratigraphy of the Permo-Carboniferous of the Galilee Basin, Queensland, *in* Permian Geology of Queensland: Symposium on Permian Geology of Queensland, Brisbane 1982, Proceedings Geological Society of Australia, Queensland Division, Abstract, p. 213.

Powis, GD 1984, Palynostratigraphy of the Late Carboniferous sequence, Canning Basin, WA, *in* The Canning Basin *edited by* PG Purcell: Geological Society of Australia/Petroleum Exploration Society of Australia, Perth, Western Australia, p. 429–438.

Price, PL 1983, A Permian palynostratigraphy for Queensland, *in* Permian Geology of Queensland: Symposium on Permian Geology of Queensland, Brisbane 1982, Proceedings Geological Society of Australia, Queensland Division, p. 155–211.

Redfern, J 1991, Subsurface facies analysis of Permian-Carboniferous glaciogenic sediments, Canning Basin, *in* Gondwana 7 Proceedings *edited by* H Ulbrich and A Rocha-Campos: University of Sao Paulo, Sao Paulo, p. 349–363.

Redfern, J and Millward, E 1994, A review of the sedimentology and stratigraphy of the Permian-Carboniferous Grant Group, Canning Basin, Western Australia, *in* The sedimentary basins of Western Australia *edited by* PG Purcell and RR Purcell: Petroleum Exploration Society of Australia, Perth, Western Australia, p. 753–756.

Redfern, J and Williams, BPJ 2002, Canning Basin Grant Group glaciogenic sediments: Part of the Gondwanan Permian-Carboniferous hydrocarbon province, *in* The sedimentary basins of Western Australia, Volume 3 *edited by* M Keep and SJ Moss: Petroleum Exploration Society of Australia, Perth, Western Australia, p. 851–871.

Reeckman, SA and Mebberson, AJ 1984, Igneous intrusions in the north-west Canning Basin and their impact on oil exploration, *in* The Canning Basin, W.A. *edited by* PG Purcell: Proceedings of the Geological Society of Australia/Petroleum Exploration Society of Australia Symposium, Perth, p. 389–399.

Reeves, F 1951, Australian oil possibilities: Bulletin of the American Association of Petroleum Geologists, v. 35, p. 2479–2525.

Rey Resources 2009, Rey Resources, Sydney, NSW, viewed 29 June 2009, <http://www.reyresources.com/irm/content/project_coal_canningbasin.html>.

Roberts, J, Claoué-Long, JC and Foster, CB 1996, SHRIMP zircon dating of the Permian System of eastern Australia: Australian Journal of Earth Sciences, v. 43, p. 401–421.

Roberts, J, Claoué-Long, JC, Jones, PJ and Foster, CB 1995, SHRIMP zircon dating of Gondwana sequences in Late Carboniferous and Early Permian Australia, *in* Dating and Correlating Biostratigraphically Barren Strata *edited by* RE Dunnay and EA Hailwood: Geological Society of London, Special Publication 89, p. 145–174.

Roberts, J, Hunt, JW and Thompson, DM 1976, Late Carboniferous marine invertebrate zones of eastern Australia: Alcheringa, v. 1, p. 197–225.

Roberts, J, Jones, PJ and Jenkins, TBH 1993, Revised correlations for Carboniferous marine invertebrate zones of eastern Australia: Alcheringa, v. 17, p. 353–376.

Shi, GR, Waterhouse, JB, and McLoughlin, S 2010, The Lopingian of Australasia: a review of biostratigraphy, correlations, palaeogeography and palaeobiogeography: Geological Journal, 34p (published online).

Skwarko, SK (editor) 1993, Palaeontology of the Permian of Western Australia: Geological Survey of Western Australia, Bulletin 136, 417p.

Spenser, LK 2005, Dampierland-Leveque Shelf; Northwest Canning Basin Area: Carbon Dioxide Storage Review: CRC for Greenhouse Gas Technologies, Canberra. CO2CRC Report RPT05-0002, 24p.

Stephenson, MH 2008, A review of the palynostratigraphy of Gondwanan Late Carboniferous to Early Permian glaciogene successions, *in* Resolving the Late Paleozoic Ice Age in Time and Space *edited by* CR Fielding, TD Frank, and JL Isbell: Geological Society of America, Special Paper 441, p. 317–330.

Talbot, HWB 1920, Geology and mineral resources of the North-west, Central and Eastern Divisions between Long. 119° and 122°E, and Lat. 22° and 28°S: Geological Survey of Western Australia, Bulletin 83, 217p.

Towner, RR 1981, Late Palaeozoic tillites of the Canning Basin, Western Australia, *in* Earth's pre-Pleistocene glacial record *edited by* MJ Hanbrey and WB Harland: Cambridge University Press, Cambridge, p. 449–452.

Towner, RR and Gibson, DL 1980, Geology of the Late Carboniferous and younger rocks of the onshore western Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Record 1980/30, 67p.

Towner, RR and Gibson DL, 1983, Geology of the onshore Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics Bulletin 215, 51p.

Towner, RR, Crowe, RWA and Yeates, AN 1976, Notes on the geology of the southern part of the Canning Basin: Bureau of Mineral Resources, Australia, Geology and Geophysics, Record 1976/95, 108p.

Traves, DM, Casey, JN and Wells, AT 1956, The geology of the south-western Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics Report 29, 74p.

Veevers, JJ and Wells, AT 1961, The geology of the Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics Bulletin 60, 310p.

Wade, A 1937, The geology of the West Kimberley district of Western Australia: Investigations undertaken in the search for petroleum: Final report on concessions held by Freney Kimberley Oil Company (1932) NL, 69p.

Woodward, HP 1915, The coal resources of Western Australia: Geological Survey of Western Australia, Bulletin 64, p. 7–12.

Woolnough, WG 1933, Report on aerial survey operations in Australia during 1932: Australia Commonwealth Parliamentary Paper 2164, 83p.

Yeates, AN, Crowe, RWA, Towner, RR, Wyborn, LAI and Passmore, VL 1975a, Notes on the geology of the Gregory Sub-basin and adjacent areas of the Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics Record 1975/77, 123p.

Yeates, AN, Crowe, RWA, Passmore, VL, Towner, RR and Wyborn LIA 1975b, New and revised stratigraphic nomenclature, northeast Canning Basin: Geological Survey of Western Australia, Annual Report for 1974, p. 49–51.

Yeates, AN, Gibson, DL, Towner, RR and Crowe, RWA 1984, Regional geology of the onshore Canning Basin, W.A., *in* The Canning Basin, W.A. *edited by* PG Purcell: Geological Society of Australia and Petroleum Exploration Society of Australia; Canning Basin Symposium, Perth, Western Australia, 1984, Proceedings, p. 24–55.

Young, GC and Laurie, JR (editors) 1996, An Australian Phanerozoic Timescale: Oxford University Press, Melbourne, 279p.

Appendix 1

Summary of wells and mineral bores used in the study

Well name	S no.	Type	Latitude	Longitude	Rig elevation (m)	Total depth (m)	TD age	Year	Operator	Status 1	Status 2	Gas show	Oil show	Sub-basin
Abutilon 1	1846	STR	19°27'12.95"E	125°07'04.66"S	233	850.3	Devonian	1981	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Acacia 1	1847	STR	19°19'45.23"E	125°00'15.90"S	211.4	1 208.7	Ordovician	1981	WMC	Dry	P&A	Poor	Excellent	Barbwire Terrace
Acacia 2	2161	NFW	19°19'46.95"E	125°00'16.34"S	217	1 575	PreCambrian	1982	WMC	Dry	P&A	Poor	Good	Barbwire Terrace
Anna Plains 1	3233	NFW	19°20'13.53"E	121°28'04.83"S	5.4	1 161	Ordovician	1987	Sydney	Dry	P&A	Nil	Nil	Willara Sub-basin
Antares 1	3238	NFW	18°43'57.59"E	123°41'42.61"S	122.7	1 298.5	Ordovician	1988	Bridge	Dry	P&A	Nil	Nil	Mowla Terrace
Aquanita 1	2211	NFW	17°37'39.07"E	124°21'31.19"S	81.2	3 000	Devonian	1982	Home	Dry	P&A	Nil	Nil	Lennard Shelf
Aquila 1	2240	NFW	18°34'53.02"E	122°40'13.69"S	180	1 735	Ordovician	1982	Eagle	Dry	P&A	Nil	Nil	Broome Platform
Aristida 1/1A	2399	STR	19°53'49.95"E	125°19'40.67"S	177	734	Devonian	1983	WMC	Dry	P&A	Nil	Fair	Barbwire Terrace
Atrax 1	2625	STR	19°24'05.46"E	126°36'18.36"S	289.4	786	Devonian	1984	Gulf	Dry	P&A	Nil	Nil	Balgo Terrace
Auld 1	2718	NFW	21°46'49.05"E	123°01'33.77"S	250	817	Devonian	1985	Churchill	Dry	P&A	Nil	Poor	Anketell Shelf
Babrongan 1	20	NFW	18°23'19.99"E	123°35'46.27"S	107	1 949.2	Devonian	1962	WAPET	Dry	P&A	Nil	Nil	Jurgurra Terrac
Barbwire 1	723	STR	19°10'33.32"E	125°01'04.01"S	215.5	1 071.4	Ordovician	1972	WAPET	Dry	P&A	Nil	Nil	Barbwire Terrace
Barlee 1	98	NFW	17°48'19.14"E	122°42'50.14"S	18.9	2 469.2	Carboniferous	1960	WAPET	Dry	SUSP	Poor	Nil	Fitzroy Trough
Bedout 1	646	NFW	18°14'35.14"E	119°23'27.36"S	141.7	3 073	Triassic	1971	Woodside	Dry	P&A	Nil	Nil	Bedout Sub-basin
Bindi 1	2609	NFW	19°43'14.79"E	126°48'02.22"S	284.8	2 507	Carboniferous	1984	Santos	Dry	P&A	Nil	Poor	Betty Terrace
Blackstone 1	379	NFW	17°35'07.92"E	124°21'10.98"S	61.6	3 049.5	Ordovician	1967	WAPET	Dry	P&A	Poor	Nil	Lennard Shelf
Blina 1	1819	NFW	17°37'21.44"E	124°30'06.10"S	57	2 498	Devonian	1981	Home	Oil	shut in	Nil	Producer	Lennard Shelf
Blina 2	1913	NFW	17°37'04.60"E	124°29'50.98"S	55.4	1 588	Devonian	1981	Home	Oil	shut in	Nil	Producer	Lennard Shelf
Blina 3	1986	EXT	17°37'17.77"E	124°29'52.22"S	56.38	1 580	Devonian	1981	Home	Oil	shut in	Nil	Producer	Lennard Shelf
Blina 4	2116	EXT	17°37'13.00"E	124°30'01.19"S	55.6	1 526	Devonian	1982	Home	Oil	Producer	Nil	Producer	Lennard Shelf
Blina 5	2782	EXT	17°37'29.49"E	124°30'15.05"S	57.7	1 600	Devonian	1985	Home	Oil	SUSP	Nil	Good	Lennard Shelf
Blina 6	2821	EXT	17°37'23.48"E	124°30'07.51"S	56.7	1 260	Devonian	1985	Home	Oil	SUSP	Nil	Producer	Lennard Shelf
Blina 7	3240	DEV	17°37'36.99"E	124°30'03.88"S	57.4	1 551	Devonian	1987	Home	Dry	P&A	Nil	Fair	Lennard Shelf
Blina 8	20032	DEV	17°37'06.05"E	124°29'34.07"S	55	1 550	Devonian	1990	PSEL	Dry	P&A	Nil	Nil	Lennard Shelf
BMR 01 Mount Anderson[1]	3044	STR	18°19'48.00"E	123°42'56.16"S	69.49	512	Permian	1955	BMR	Dry	P&A	Nil	Nil	Jurgurra Terrace
BMR 02 Noonkanbah[2]	3044	STR	18°07'05.88"E	125°20'04.92"S	171	1 219	Devonian	1955–56	BMR	Dry	P&A	Nil	Nil	Lennard Shelf
BMR 04 Mandora[3]	3044	STR	19°44'12.12"E	120°44'27.96"S	9	430	Jurassic	1958	BMR	Dry	P&A	Nil	Nil	Wallal Platform
BMR 04A Mandora	3044	STR	19°44'17.88"E	120°44'35.88"S	9	679	PreCambrian	1958	BMR	Dry	P&A	Nil	Nil	Wallal Platform
BMR Billiluna 1*	BMR Rec 1975/77	STR	19°56'31.00"S	127°52'04.00"E	NA	123	Permian	1972	BMR	Dry	Abd	Nil	Nil	Balgo Terrace
BMR Cornish 1*	BMR Rec 1975/77	STR	20°09'56.00"S	126°34'05.00"E	NA	164	Permian	1975	BMR	Dry	Abd	Nil	Nil	Gregory Sub-basin
BMR Cornish 2*	BMR Rec 1975/77	STR	20°11'06.00"S	126°52'40.00"E	NA	227	Permian	1975	BMR	Dry	Abd	Nil	Nil	Gregory Sub-basin
BMR Cornish 3*	BMR Rec 1975/77	STR	20°10'43.00"S	127°24'25.00"E	NA	109.6	Permian	1975	BMR	Dry	Abd	Nil	Nil	Betty Terrace
BMR Crossland 1*	BMR Rec 1975/77	STR	19°12'57.00"S	125°53'35.00"E	NA	262	Permian	1975	BMR	Dry	Abd	Nil	Nil	Jones Arch
BMR Crossland 2*	BMR Rec 1975/77	STR	19°08'09.00"S	125°28'06.00"E	NA	138.7	Permian	1975	BMR	Dry	Abd	Nil	Nil	Fitzroy Trough
BMR Lucas 13*	BMR Rec 1975/77	STR	20°23'59.00"S	127°36'25.00"E	NA	189	Permian	1975	BMR	Dry	Abd	Nil	Nil	Balgo Terrace
BMR Lucas 14*	BMR Rec 1975/77	STR	20°16'36.00"S	127°46'44.00"E	NA	102.1	Permian	1975	BMR	Dry	Abd	Nil	Nil	Balgo Terrace
BMR Mount Bannerman 1*	BMR Rec 1975/77	STR	19°55'42.00"S	127°13'50.00"E	NA	203	Permian	1975	BMR	Dry	Abd	Nil	Nil	Betty Terrace
BMR Mount Bannerman 2*	BMR Rec 1975/77	STR	19°03'56.00"S	126°10'23.00"E	NA	139	Permian	1975	BMR	Dry	Abd	Nil	Nil	Fitzroy Trough
BMR Mount Bannerman 3*	BMR Rec 1975/77	STR	19°29'13.00"S	127°09'37.00"E	NA	94	Permian	1975	BMR	Dry	Abd	Nil	Nil	Balgo Terrace
BMR Mount Bannerman 4*	BMR Rec 1975/77	STR	19°30'43.00"S	127°03'06.00"E	NA	151	Permian	1975	BMR	Dry	Abd	Nil	Nil	Betty Terrace
Boab 1	1848	STR	19°34'36.95"E	125°08'49.66"S	202	1 033.4	Silurian	1981	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Booran 1	2215	NFW	17°20'03.32"E	123°39'53.47"S	18	2 800	Permian	1982	Esso	Dry	P&A	Nil	Nil	Fitzroy Trough
Boronia 1	2055	NFW	17°45'24.64"E	124°34'22.43"S	58.5	3 391	Devonian	1982	IEDC	Oil	P&A	Nil	Excellent	Lennard Shelf
Boundary 1	20034	NFW	17°29'09.14"E	124°14'42.72"S	39	1 670	Carboniferous	1990	PSEL	Oil	shut in	Nil	Producer	Lennard Shelf

Boundary Southeast 1	21076	NFW	17°29'21.18"E	124°14'47.16"S	40	1710	Carboniferous	2006	Terratek	Dry	P&A	Nil	Poor	Lennard Shelf
Caladenia 1	2423	STR	19°40'40.95"E	125°06'30.67"S	170	296.5	Devonian	1983	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Calamia 1	3245	NFW	19°34'44.40"E	121°47'51.80"S	94	1700	PreCambrian	1987	OCOA	Dry	P&A	Nil	Nil	Willara Sub-basin
Calytrix 1	2569	STR	20°21'17.24"E	126°05'22.17"S	283	450	Devonian	1984	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Canegrass 1	20189	NFW	17°23'24.95"E	124°13'36.62"S	30	2006.5	Ordovician	1993	Bow Valley	Dry	P&A	Fair	Nil	Lennard Shelf
Canopus 1	2166	NFW	18°56'47.98"E	123°52'05.88"S	174	1779	Ordovician	1982	Getty	Dry	P&A	Nil	Nil	Mowla Terrace
Capparis 1	2398	STR	19°27'01.95"E	125°06'08.66"S	220	521	Devonian	1984	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Carina 1	2164	NFW	19°21'12.18"E	123°04'48.77"S	111	1603	Ordovician	1982	Getty	Dry	P&A	Nil	Poor	Broome Platform
Cassia 1	1849	STR	19°44'04.64"E	125°30'58.66"S	194.7	1576.6	Devonian	1981	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Chestnut 1	20225	NFW	17°43'41.28"E	124°51'25.57"S	122.6	2669	Devonian	1994	Bow Valley	Dry	P&A	Good	Poor	Lennard Shelf
Chirup 1	441	STR	19°50'54.51"E	120°26'09.72"S	3.05	762.6	Permian	1968	WAPET	Dry	P&A	Nil	Nil	Wallal Embayment
Clianthus 1	2570	STR	20°18'30.74"E	126°05'23.67"S	258	450	Permian	1984	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Contention Heights 1	874	NFW	22°25'30.93"E	127°13'35.72"S	418.4	1790.7	Ordovician	1973	Aquitaine	Dry	P&A	Nil	Nil	Ryan Shelf
Corbett 1	20212	NFW	20°04'04.05"E	120°36'45.74"S	80	800	Permian	1994	Stirling	Dry	P&A	Nil	Nil	Wallal Embayment
Cow Bore 1	2480	NFW	17°58'04.74"E	122°43'30.50"S	13.4	2940	Devonian	1983	Gulf	Dry	P&A	Nil	Nil	Jurgurra Terrace
Crab Creek 1	3255	NFW	18°01'05.84"E	122°31'27.08"S	5.9	1790	Devonian	1987	Bridge	Dry	P&A	Nil	Poor	Broome Platform
Crimson Lake 1	3346	NFW	17°53'00.17"E	124°40'40.18"S	89.6	1980.9	Carboniferous	1988	Kufpec	Dry	P&A	Nil	Good	Fitzroy Trough
Crossland 1	652	STR	19°42'57.33"E	125°15'06.29"S	181	913.2	Devonian	1971	WAPET	Dry	P&A	Nil	Nil	Barbwire Terrace
Crossland 2	652	STR	20°00'30.43"E	124°59'35.17"S	175	914.4	Ordovician	1971	WAPET	Dry	P&A	Nil	Nil	Crossland Platform
Crossland 3	652	STR	20°12'03.76"E	125°45'39.45"S	230.7	915.3	Devonian	1971	WAPET	Dry	P&A	Nil	Nil	Barbwire Terrace
Crystal Creek 1	3363	NFW	18°33'22.26"E	123°36'07.99"S	131	2504	Ordovician	1988	Kufpec	Dry	P&A	Poor	Nil	Mowla Terrace
Cudalgarra 1	2648	NFW	19°13'13.15"E	122°19'20.25"S	92.6	1703	Ordovician	1984	Sydney	Dry	SUSP	Fair	Fair	Willara Sub-basin
Cudalgarra 2	2852	NFW	19°121°5.02"E	122°16'33.95"S	103.76	1550	Ordovician	1985	Sydney	Dry	SUSP	Nil	Poor	Willara Sub-basin
Cudalgarra North 1	3626	NFW	19°10'10.09"E	122°17'55.00"S	147	1220	Ordovician	1989	Command	Dry	P&A	Nil	Nil	Willara Sub-basin
Curringa 1	2137	NFW	16°49'53.48"E	122°44'34.52"S	55	2335	Devonian	1982	Esso	Dry	P&A	Nil	Nil	Pender Terrace
Cycas 1	2375	NFW	19°00'29.58"E	126°00'58.04"S	178	3019	Carboniferous	1983	IEDC	Dry	P&A	Nil	Poor	Fitzroy Trough
Dampier Downs 1	90	STR	18°17'56.11"E	123°06'09.31"S	139.6	922.9	Ordovician	1956	WAPET	Dry	P&A	Nil	Nil	Broome Platform
Dampiera 1A	1851	STR	19°46'00.95"E	125°16'10.67"S	184	1856.9	Devonian	1982	WMC	Dry	P&A	Nil	Poor	Barbwire Terrace
Darriwell 1	3337	NFW	19°35'18.54"E	122°06'19.14"S	94.3	1600	Ordovician	1988	OCOA	Dry	P&A	Poor	Poor	Willara Sub-basin
Dodonea 1	2864	NFW	19°23'06.15"E	125°09'43.35"S	213.6	2215	Ordovician	1985	WMC	Dry	P&A	Fair	Poor	Barbwire Terrace
Dodonea 2	3149	NFW	19°24'12.95"E	125°10'45.66"S	207.2	1688	Ordovician	1987	WMC	Dry	P&A	Nil	Poor	Barbwire Terrace
Doran 1	430	STR	18°10'49.10"E	123°29'16.19"S	63.7	763.22	Devonian	1968	WAPET	Dry	P&A	Nil	Nil	Jurgurra Terrace
Drosera 1	2421	STR	19°40'40.96"E	125°02'26.67"S	165	450	Silurian	1984	WMC	Dry	P&A	Nil	Nil	Broome Platform
East Crab Creek 1	2503	NFW	18°01'01.00"E	122°36'36.67"S	11.6	2813	Devonian	1983	Gulf	Dry	P&A	Nil	Nil	Broome Platform
East Yeeda 1	2774	NFW	17°37'54.17"E	124°02'54.59"S	91.9	3556	Devonian	1985	Bridge	Dry	P&A	Nil	Poor	Fitzroy Trough
Edgar Range 1	435	STR	18°45'19.94"E	123°35'43.23"S	132	1968.1	Ordovician	1968	Total	Dry	P&A	Nil	Poor	Broome Platform
Ellendale 1	1551	NFW	17°54'12.94"E	124°42'19.62"S	95.2	3190.5	Devonian	1979	Amax	Dry	P&A	Good	Poor	Fitzroy Trough
Eremophila 1	2107	STR	19°46'44.94"E	125°21°07.38"S	173.6	1252	Devonian	1982	WMC	Dry	P&A	Nil	Fair	Barbwire Terrace
Eremophila 2	2418	STR	19°46'43.95"E	125°13'09.67"S	173	360	Devonian	1983	WMC	Dry	P&A	Nil	Fair	Barbwire Terrace
Eremophila 3	2419	STR	19°46'40.95"E	125°14'17.67"S	176	464	Devonian	1983	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Ficus 1	1852	STR	19°49'02.95"E	125°17'57.67"S	185	1083.7	Devonian	1982	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Fitzroy River 1	1523	NFW	18°29'33.93"E	124°52'54.63"S	75.6	3134	Carboniferous	1980	Amax	Dry	P&A	Nil	Nil	Fitzroy Trough
Frankenia 1	2406	STR	19°26'53.95"E	125°14'21.66"S	190	479	Devonian	1984	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Frankenstein 1	3417	NFW	21°22'50.57"E	123°01'01.64"S	280.3	2803	Proterozoic	1988	Command	Dry	P&A	Nil	Nil	Anketell Shelf
Fraser River 1	95	NFW	17°24'58.17"E	123°09'49.02"S	53	3091.9	Carboniferous	1955–56	WAPET	Dry	P&A	Nil	Nil	Fitzroy Trough
Fraser River No. S-1 Structure Hole	571	STR	17°28'50.00"E	123°12'30.00"S	42.7	366.37		1955	WAPET	Dry	P&A	Nil	Nil	Fitzroy Trough
Freney 1	3446	NFW	18°00'53.63"E	122°28'18.00"S	3.6	1116	Carboniferous	1988	Ampol	Dry	Water	Nil	Nil	Broome Platform
Frome Rocks 1	97	NFW	18°11'46.97"E	123°38'47.51"S	67.4	1220.1	Devonian	1959	WAPET	Dry	P&A	Nil	Nil	Jurgurra Terrace
Frome Rocks 2	96	NFW	18°15'13.96"E	123°39'40.51"S	87.5	2287.2	Devonian	1959	WAPET	Dry	P&A	Nil	Poor	Jurgurra Terrace
Fruitcake 1	20753	NFW	19°28'19.97"E	124°28'51.77"S	140	1696	Ordovician	2001	Hughes	Dry	P&A	Nil	Nil	Broome Platform
Gap Creek 1	3345	NFW	18°37'51.30"E	125°48'40.17"S	151.1	1541.2	PreCambrian	1988	Kufpec	Dry	P&A	Nil	Nil	Lennard Shelf
Goldwyer 1	91	NFW	18°22'46.10"E	122°23'03.61"S	78.9	1438.7	PreCambrian	1958	WAPET	Dry	P&A	Nil	Poor	Broome Platform
Goodenia 1	2415	STR	19°51'46.95"E	125°13'48.67"S	171	163.3	Devonian	1983	WMC	Dry	P&A	Nil	Fair	Barbwire Terrace
Goorda 1	202	STR	18°34'21.00"E	122°56'24.00"S	194	152	Jurassic	1963	WAPET	Dry	P&A	Nil	Nil	Broome Platform

Appendix 1 (continued)

Well name	*S no.*	*Type*	*Latitude*	*Longitude*	*Rig elevation (m)*	*Total depth (m)*	*TD age*	*Year*	*Operator*	*Status 1*	*Status 2*	*Gas show*	*Oil show*	*Sub-basin*
Grant Range 1	92	NFW	18°00'49.07"E	124°00'36.91"S	68.4	3936.5	Carboniferous	1954–55	WAPET	Dry	P&A	Nil	Nil	Fitzroy Trough
Great Sandy 1	1911	NFW	19°12'42.73"E	122°21'22.02"S	87.2	1770.8	Ordovician	1981	Meridian	Dry	P&A	Nil	Fair	Willara Sub-basin
Great Sandy 2	20013	DEV	19°12'42.73"E	122°21'21.83"S	92.2	1576.1	Ordovician	1990	WMC	Dry	P&A	Nil	Fair	Willara Sub-basin
Grevillea 1	2133	NFW	18°21'03.32"E	125°37'57.47"S	115.5	2581	PreCambrian	1982	IEDC	Dry	P&A	Nil	Fair	Lennard Shelf
Hakea 1	2431	NFW	17°41'32.27"E	124°27'55.09"S	76.5	1703	Carboniferous	1983	IEDC	Dry	P&A	Nil	Nil	Fitzroy Trough
Halgania 1	2403	STR	19°41'22.95"E	125°23'48.66"S	200	500	Devonian	1983	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Hangover 1	2319	NFW	17°34'34.09"E	124°16'36.47"S	46.3	1655	Carboniferous	1983	Home	Dry	P&A	Nil	Nil	Lennard Shelf
Harold 1	3150	NFW	17°33'35.43"E	124°34'22.67"S	63.8	1550	Devonian	1987	Home	Dry	P&A	Nil	Nil	Lennard Shelf
Hawkstone Peak 1	47	NFW	17°14'18.97"E	124°24'35.99"S	49.1	1187.8	PreCambrian	1962	WAPET	Dry	P&A	Nil	Nil	Lennard Shelf
Hedonia 1	2599	NFW	18°16'31.02"E	122°24'09.69"S	44.7	1543	PreCambrian	1984	Gulf	Dry	P&A	Nil	Poor	Broome Platform
Hibiscus 1	3179	NFW	19°38'11.94"E	125°25'53.66"S	215.4	2394	Devonian	1987	WMC	Dry	P&A	Poor	Poor	Barbwire Terrace
Hilltop 1	3177	NFW	18°17'31.92"E	122°17'24.13"S	31.7	1770	PreCambrian	1987	Bridge	Dry	P&A	Nil	Nil	Broome Platform
Hoya 1	2571	STR	20°23'32.15"E	126°05'23.27"S	283	450	Devonian	1984	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Janpam 1	2229	NFW	17°36'02.94"E	124°24'56.62"S	90	2263	Devonian	1982	Home	Dry	P&A	Fair	Nil	Lennard Shelf
Janpam North 1	3186	NFW	17°34'01.79"E	124°25'04.60"S	55.8	2202	Devonian	1987	Home	Oil	SUSP	Nil	Good	Lennard Shelf
Jones Range 1	1064	NFW	19°21'38.16"E	125°40'13.52"S	227.3	2541	Devonian	1974	WAPET	Dry	P&A	Nil	Nil	Gregory Sub-basin
Jum Jum 1	2836	NFW	17°07'15.70"E	123°05'02.05"S	89.5	2600	Carboniferous	1985	Esso	Dry	P&A	Nil	Nil	Fitzroy Trough
Juno 1	2872	NFW	19°21'49.83"E	122°03'47.81"S	51.9	1750	Ordovician	1985	RSEI	Dry	P&A	Nil	Poor	Willara Sub-basin
Justago 1	2713	NFW	18°51'59.37"E	126°14'13.07"S	216	3150	Ordovician	1984–85	IEDC	Dry	P&A	Nil	Poor	Lennard Shelf
Kambara 1	2197	NFW	16°44'29.82"E	122°26'19.92"S	23.2	3147	Devonian	1982–83	Esso	Dry	P&A	Nil	Nil	Pender Terrace
Kanak 1	20232	NFW	18°22'36.32"E	122°23'02.39"S	79.2	1365	Ordovician	1994	Maple	Dry	P&A	Poor	Fair	Broome Platform
Katy 1	2323	NFW	17°38'34.92"E	124°21'33.97"S	80	1952	Carboniferous	1983	Home	Dry	P&A	Nil	Nil	Lennard Shelf
Kemp Field 1	439	STR	20°19'04.79"E	123°27'52.46"S	234.1	1181.1	Silurian	1968	Total	Dry	P&A	Nil	Nil	Kidson Sub-basin
Kennedia 1	2815	NFW	17°45'10.34"E	124°36'23.93"S	60.7	3387.5	Devonian	1985	IEDC	Dry	P&A	Poor	Poor	Lennard Shelf
Kidson 1	244	STR	22°36'59.52"E	125°00'34.93"S	355.1	4431.5	Ordovician	1965–66	WAPET	Dry	P&A	Nil	Nil	Kidson Sub-basin
Kilang Kilang 1	2644	NFW	20°12'41.91"E	127°07'41.64"S	287	2300	Carboniferous	1984	Ranger	Dry	P&A	Nil	Nil	Gregory Sub-basin
Kora 1	2190	NFW	17°15'33.37"E	123°49'47.14"S	9	3100	Devonian	1982	Esso	OS	P&A	Nil	Excellent	Lennard Shelf
Kunzea 1	2604	STR	19°32'01.35"E	124°59'27.56"S	180	450	Ordovician	1984-85	WMC	Dry	P&A	Nil	Poor	Broome Platform
Lacepede 1A	580	NFW	17°05'13.40"E	121°26'46.01"S	58.5	2286	Permian	1970–71	Woodside	Dry	P&A	Nil	Nil	Oobagooma Sub-basin
Lake Betty 1	648	NFW	19°34'05.88"E	126°19'57.34"S	273.7	3145.8	Devonian	1971	WAPET	Dry	P&A	Poor	Nil	Gregory Sub-basin
Lake Hevern 1	20508	NFW	21°27'52.04"E	127°34'44.21"S	338.25	2296	Ordovician	1998	Amity	Dry	P&A	Nil	Nil	Gregory Sub-basin
Langoora 1	41	NFW	17°18'06.00"E	124°06'53.00"S	21	1617	PreCambrian	1962	WAPET	Dry	P&A	Nil	Nil	Lennard Shelf
Lawford 1	21301	NFW	19°15'38.00E"	126°37'50.00"S	286	?	Carboniferous	2008–09	New Standard	?	SUSP	?	?	Gregory Sub-basin
Leo 1	3368	NFW	19°14'50.17"E	122°20'44.31"S	83.6	2411.3	Ordovician	1988	Command	Dry	P&A	Poor	Poor	Willara Sub-basin
Lloyd 1	3144	NFW	17°27'58.17"E	124°15'01.07"S	39.3	2001	Devonian	1987	Home	Oil	shut in	Nil	Producer	Lennard Shelf
Lloyd 2	3246	EXT	17°28'06.22"E	124°15'10.98"S	38.4	1580	Carboniferous	1987	Home	Dry	P&A	Nil	Good	Lennard Shelf
Lloyd 3	20505	EXT D	17°28'06.22"E	124°15'10.98"S	38.4	1590	Carboniferous	1998	Terratek	Oil	SUSP	Poor	Excellent	Lennard Shelf
Logue 1	656	NFW	18°07'28.18"E	123°23'29.07"S	54	2698.7	Devonian	1972	WAPET	Dry	P&A	Nil	Nil	Jurgurra Terrace
Looma 1	20358	NFW	19°07'24.86"E	123°59'39.42"S	177	2535	PreCambrian	1996	Shell	Dry	P&A	Good	Good	Broome Platform
Loris 1	20427	NFW	17°30'24.50"E	124°13'41.18"S	42	1897	Permian	1997	Capital	Dry	P&A	Nil	Nil	Lennard Shelf
Lovells Pocket 1	20014	NFW	18°30'52.14"E	123°26'13.98"S	110	1924	Ordovician	1990	Kufpec	Dry	P&A	Poor	Poor	Mowla Terrace
Lukins 1	2901	NFW	17°32'09.58"E	124°32'08.94"S	55.8	1675	Devonian	1985	Home	Dry	P&A	Nil	Nil	Lennard Shelf
Mahe 1	20437	NFW	18°07'33.73"E	123°09'11.13"S	80	1098	Carboniferous	1997	Stirling	Dry	P&A	Nil	Nil	Jurgurra Terrace
Mangaloo 1	2817	NFW	19°35'12.34"E	125°34'06.15"S	212.6	3100	Devonian	1985	IEDC	Dry	P&A	Nil	Nil	Barbwire Terrace
Mariana 1	2613	NFW	17°33'51.60"E	124°27'13.47"S	48.4	1700	Devonian	1984	Home	Dry	P&A	Nil	Nil	Lennard Shelf
Matches Spring 1	500	NFW	18°41'21.11"E	124°03'06.81"S	144.2	2834.6	Ordovician	1969	Total	Dry	P&A	Nil	Poor	Mowla Terrace

May River 1	357	NFW	17°14'44.02"E	124°05'10.94"S	17.1	1677.9	PreCambrian	1967	WAPET	Dry	P&A	Nil	Nil	Lennard Shelf
McLarty 1	415	NFW	19°23'38.87"E	123°39'24.40"S	170.1	2590.8	Ordovician	1968	Total	Dry	P&A	Nil	Nil	Broome Platform
Meda 1	89	NFW	17°23'51.12"E	124°11'36.91"S	26.8	2685	PreCambrian	1958	WAPET	Dry	P&A	Poor	Good	Lennard Shelf
Meda 2	177	NFW	17°24'30.08"E	124°11'28.81"S	26.8	2325	Devonian	1959	WAPET	Dry	P&A	Poor	Poor	Lennard Shelf
Melaleuca 1	2572	STR	19°41'12.82"E	125°32'49.18"S	198	450	Permian	1984	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Mellany 1	3154	NFW	17°24'01.52"E	124°17'22.41"S	32.9	1476	PreCambrian	1987	Home	Dry	P&A	Nil	Nil	Lennard Shelf
Metters 1	20257	NFW	17°56'36.42"E	124°44'36.04"S	89	1505	Carboniferous	1994	Wildcat	Dry	P&A	Nil	Nil	Fitzroy Trough
Millard 1	20416	NFW	17°23'32.02"E	123°55'09.67"S	50.4	1680	Permian	1997	Capital	Dry	P&A	Nil	Nil	Fitzroy Trough
Mimosa 1	895	NFW	17°44'52.58"E	124°35'04.99"S	54	4117	Devonian	1973	WAPET	Dry	P&A	Poor	Poor	Lennard Shelf
Minjin 1	2528	NFW	16°48'02.74"E	122°22'49.38"S	21.2	1850	Devonian	1984	Esso	Dry	P&A	Nil	Nil	Pender Terrace
Mirbelia 1	2729	NFW	19°39'02.65"E	125°21'41.16"S	200.3	2670	Silurian	1985	WMC	Dry	P&A	Poor	Good	Barbwire Terrace
Mirbelia 2	3430	EXT	19°38'56.32"E	125°21'43.91"S	198.1	2818.6	Ordovician	1988	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Missing 1	20739	NFW	19°33'57.97"E	124°36'10.67"S	150	1810	Ordovician	2001	Hughes	Dry	P&A	Nil	Nil	Broome Platform
Moogana 1	1578	NFW	16°56'11.98"E	122°41'31.69"S	33	2213	PreCambrian	1980	Esso	Dry	P&A	Nil	Nil	Pender Terrace
Mowla 1	528	NFW	18°43'44.99"E	123°42'39.68"S	123.1	762.9	Ordovician	1969	Total	Dry	P&A	Nil	Nil	Mowla Terrace
Mount Hardman 1	919	NFW	18°00'32.86"E	124°54'53.04"S	112	3360	Devonian	1973	WAPET	Dry	P&A	Poor	Nil	Fitzroy Trough
Mount Wynne 1	1355	NFW	18°05'14.07"E	124°26'58.67"S	63	273	Permian	1922–23	Freney Kimb	Dry	P&A	Nil	Poor	Fitzroy Trough
Mount Wynne 3	1355	NFW	18°05'14.07"E	124°26'58.67"S	63	657	Permian	1923–25	Freney Kimb	Dry	P&A	Nil	Poor	Fitzroy Trough
Munda 1	655	STR	19°28'21.62"E	122°17'38.62"S	94.5	1066.8	Silurian	1971	WAPET	Dry	P&A	Nil	Nil	Willara Sub-basin
Munro 1	698	NFW	19°51'50.15"E	122°29'23.26"S	55.2	2115.6	PreCambrian	1972	WAPET	Dry	P&A	Nil	Nil	Willara Sub-basin
Musca 1	2168	NFW	19°20'14.33"E	122°57'24.97"S	109	1535	Ordovician	1982	Getty	Dry	P&A	Nil	Poor	Broome Platform
Myroodah 1	592	NFW	18°16'09.96"E	124°11'31.65"S	122	1829.1	Carboniferous	1955–56	Ass Freeney	Dry	P&A	Nil	Nil	Fitzroy Trough
Napier 1	482	STR	17°121°4.94"E	124°31'40.61"S	70.4	1801.4	PreCambrian	1969	Lennard	Dry	P&A	Nil	Nil	Lennard Shelf
Napier 2	504	NFW	17°04'49.94"E	124°21'24.61"S	82.3	1606.9	PreCambrian	1969	Lennard	Dry	P&A	Nil	Nil	Lennard Shelf
Napier 4	527	STR	16°54'54.94"E	124°05'39.60"S	88.1	965	PreCambrian	1970	Lennard	Dry	P&A	Nil	Nil	Lennard Shelf
Napier 5	596	STR	17°06'24.94"E	124°28'10.61"S	70.7	1657.8	PreCambrian	1970	Lennard	Dry	P&A	Nil	Nil	Lennard Shelf
Needle Eye Rocks 1	3223	NFW	18°14'23.31"E	125°49'15.21"S	129	1664.9	PreCambrian	1987	Kufpec	Dry	P&A	Nil	Poor	Lennard Shelf
Nemile 1	20205	NFW	17°51'32.05"E	124°33'29.94"S	55.5	1601	Carboniferous	1994	Wildcat	Dry	P&A	Poor	Poor	Fitzroy Trough
Nerrima 1 (AFO)	593	NFW	18°26'55.00"E	124°22'17.00"S	115.8	2765	Carboniferous	1955	Ass Freeney	Dry	P&A	Nil	Nil	Fitzroy Trough
Nerrima 1 (FKO)	1355	NFW	18°28'15.96"E	124°24'02.00"S	113	1302	Permian	1939–41	Freney Kimb	Dry	P&A	Nil	Nil	Fitzroy Trough
Ngalti 1	2638	NFW	19°52'02.90"E	127°18'50.63"S	280	2758	Devonian	1984	Ranger	Dry	P&A	Nil	Nil	Balgo Terrace
Nita Downs 1	2452	NFW	19°09'15.13"E	122°11'59.57"S	107.5	1849	Ordovician	1983	Sydney Oil	Dry	P&A	Nil	Fair	Willara Sub-basin
Nollamara 1	2812	NFW	18°33'57.72"E	124°13'56.85"S	127.7	1719	Devonian	1985	IEDC	Dry	P&A	Nil	Poor	Mowla Terrace
Notabilis 1	2581	NFW	18°19'43.33"E	123°33'05.21"S	113.3	2811.5	Devonian	1984	IEDC	Dry	P&A	Nil	Nil	Jurgurra Terrace
Nuytsia 1	2681	NFW	18°33'23.06"E	124°11'34.67"S	149.2	1350	Devonian	1984	IEDC	Dry	P&A	Nil	Nil	Mowla Terrace
Olios 1	2478	NFW	19°30'15.16"E	126°47'34.88"S	311	1963.5	Devonian	1983	Gulf	Dry	P&A	Nil	Poor	Balgo Terrace
Orange Pool 1	1826	NFW	17°18'12.77"E	124°12'38.33"S	27.7	1171.6	PreCambrian	1981	Home	Dry	P&A	Nil	Nil	Lennard Shelf
Padilpa 1	3205	NFW	17°00'57.67"E	123°11'39.18"S	44.4	2184.3	Carboniferous	1987	Sydney Oil	Dry	P&A	Poor	Nil	Pender Terrace
Palm Spring 1	724	STR	17°48'50.94"E	124°53'12.36"S	118	1066.8	Devonian	1972	WAPET	Dry	P&A	Nil	Nil	Lennard Shelf
Pandorea 1	2693	NFW	19°51'22.35"E	125°20'41.67"S	180	2274.5	Devonian	1984–85	WMC	Dry	P&A	Nil	Poor	Barbwire Terrace
Panicum 1	2405	STR	19°32'22.95"E	125°08'03.66"S	201	278	Devonian	1984	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Parda 1	198	NFW	18°56'02.24"E	122°00'33.01"S	102.1	1908.8	PreCambrian	1965	WAPET	Dry	P&A	Nil	Nil	Broome Platform
Patience 1	2919	NFW	23°21'40.97"E	125°40'11.84"S	403.4	1869	Silurian	1986	Sydney Oil	Dry	P&A	Nil	Nil	Sherriff Shelf
Patience 2		NFW	23°21'40.97"E	125°40'11.93"S	403.35	4184	Ordovician	1987	Nerdlihc	Dry	P&A	Nil	Nil	Sherriff Shelf
Pearl 1	2340	NFW	17°50'59.12"E	122°01'44.76"S	18	2203	Permian	1983	Home	Dry	P&A	Nil	Nil	Fitzroy Trough
Pegasus 1	3338	NFW	20°05'45.60"E	123°57'08.83"S	260	2995	Ordovician	1988	Amoco	Dry	P&A	Nil	Nil	Munro Arch
Pender 1	722	NFW	16°40'43.20"E	122°50'10.20"S	21	911.7	PreCambrian	1972	WAPET	Dry	P&A	Nil	Nil	Pender Terrace
Percival 1	2819	NFW	20°19'50.64"E	126°05'00.03"S	269.6	2447.6	Ordovician	1985	WMC	Dry	P&A	Nil	Poor	Barbwire Terrace
Perindi 1	2342	NFW	16°49'37.18"E	122°15'51.98"S	23	1867	Devonian	1983	Esso	Dry	P&A	Nil	Fair	Pender Terrace
Petaluma 1	3241	NFW	18°16'00.59"E	124°19'34.83"S	84.5	2086	Carboniferous	1987	Ultramar	Dry	P&A	Poor	Poor	Fitzroy Trough
Philydrum 1	2697	NFW	17°48'54.49"E	124°38'00.90"S	69.6	1608	Devonian	1984	IEDC	Dry	P&A	Nil	Poor	Lennard Shelf
Pictor 1	2607	NFW	18°45'46.83"E	123°42'57.68"S	133	2146	PreCambrian	1984	BHP	Dry	SUSP	Excellent	Excellent	Mowla Terrace
Pictor 2	20049	EXT	18°45'52.15"E	123°42'52.07"S	134.5	1085	Ordovician	1990	Bridge	Dry	SUSP	Good	Good	Mowla Terrace
Placer Camelgooda 1	20256	NFW	18°35'47.95"E	124°22'48.66"S	95	1170	Devonian	1989	Placer	Dry	P&A	Nil	Nil	Barbwire Terrace
Point Moody 1	238	STR	21°15'34.00"E	127°48'22.00"S	422.8	2441.1	Carboniferous	1965–66	Aquitaine	Dry	P&A	Poor	Nil	Gregory Sub-basin

Appendix 1 (continued)

Well name	S no.	Type	Latitude	Longitude	Rig elevation (m)	Total depth (m)	TD age	Year	Operator	Status 1	Status 2	Gas show	Oil show	Sub-basin
Point Torment 1	20140	NFW	17°09'52.77"E	123°44'19.50"S	8.8	2130	Devonian	1992	Anzoil	Gas	SUSP	Producer	Good	Lennard Shelf
Poole Range 3	1355	NFW	18°53'00.00"E	125°47'28.00"S	187	995	Permian	1927–30	Freney Kimb	Dry	P&A	Nil	Poor	Fitzroy Trough
Poole Range 5	1355	NFW	18°52'14.00"E	125°49'16.00"S		470.9	Permian	1932–33	Freney Kimb	Dry	P&A	Nil	Nil	Fitzroy Trough
Pratia 1	2407	STR	19°21'49.95"E	125°00'14.34"S	204	464	Devonian	1984	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
Prices Creek 4	1355	NFW	18°40'48.00"E	125°53'37.00"S	148	135	Permian	1923	Freney Kimb	Dry	P&A	Nil	Nil	Lennard Shelf
Puratte 1	1558	NFW	17°05'11.10"E	123°14'22.05"S	27.4	3750	Devonian	1979–80	Esso	Dry	P&A	Nil	Nil	Fitzroy Trough
Robert 1	20728	NFW	19°09'21.96"E	124°19'47.67"S	203	1628	Ordovician	2001	Hughes	Dry	P&A	Nil	Nil	Broome Platform
Roebuck Bay 1	102	STR	18°09'33.05"E	122°27'33.33"S	40.5	1222.25	Ordovician	1956	WAPET	Dry	P&A	Nil	Nil	Broome Platform
Runthrough 1	3148	NFW	17°29'17.81"E	124°12'00.92"S	50.5	1380	Permian	1987	Home	Dry	P&A	Nil	Nil	Lennard Shelf
Sahara 1	182	NFW	21°04'36.23"E	123°23'39.97"S	264.6	2120.2	Silurian	1965	WAPET	Dry	P&A	Nil	Nil	Kidson Sub-basin
Sally May 1	20955	NFW	19°44'39.00"E	124°17'46.64"S	203	1700	Ordovician	2004–05	Kingsway	Dry	P&A	Nil	Poor	Broome Platform
Samphire Marsh 1	101	NFW	19°31'13.14"E	121°10'58.93"S	4.9	2031.2	PreCambrian	1958	WAPET	Dry	Water	Nil	Nil	Willara Sub-basin
Santalum 1A	2426	STR	19°28'18.12"E	124°52'10.67"S	200	629.2	Ordovician	1983	WMC	Dry	P&A	Nil	Fair	Broome Platform
Scarpia 1	20044	NFW	18°03'07.71"E	124°50'40.65"S	98.4	1600	Carboniferous	1990	Kufpec	Dry	P&A	Nil	Poor	Fitzroy Trough
Scrubby 1	21084	NFW	17°30'35.70"E	124°14'29.50"S	40.2	1250	Confidential	2006	Terratek	Dry	P&A	Nil	Nil	Lennard Shelf
Selenops 1	2621	STR	19°24'50.11"E	126°43'05.66"S	309.4	1263	Devonian	1984	Gulf	Dry	P&A	Nil	Nil	Balgo Terrace
Setaria 1	3433	NFW	19°24'02.95"E	124°58'32.66"S	196.6	955.5	Ordovician	1989	WMC	Dry	P&A	Nil	Fair	Barbwire Terrace
Sharon Ann 1	20231	NFW	18°28'34.62"E	122°00'06.49"S	25.5	1830	Ordovician	1994	Maple	Dry	Water	Nil	Nil	Broome Platform
Solanum 1	2408	STR	19°21'53.95"E	124°57'46.66"S	194	834	Ordovician	1984	WMC	Dry	P&A	Nil	Nil	Barbwire Terrace
South Auld 1	2803	NFW	21°47'34.05"E	123°02'41.77"S	249	857	Permian	1985	Churchill	Dry	P&A	Nil	Nil	Anketell Shelf
St George Range 1	223	NFW	18°41'16.30"E	125°08'22.70"S	172.5	4437.3	Carboniferous	1965–66	Continental	Dry	P&A	Good	Poor	Fitzroy Trough
Stansmore Range 1	185	STR	21°15'35.00"E	127°57'55.00"S	493.8	106.7	Permian	1964	Hackathorn	Dry	P&A	Nil	Nil	Gregory Sub-basin
Stansmore Range 2	185	STR	21°15'50.00"E	128°00'00.00"S	506	102.1	Permian	1964	Hackathorn	Dry	P&A	Nil	Nil	Gregory Sub-basin
Stansmore Range 3	185	STR	21°15'40.00"E	127°52'20.00"S	466.3	105.2	Permian	1964	Hackathorn	Dry	P&A	Nil	Nil	Gregory Sub-basin
Stansmore Range 4	185	STR	21°14'40.00"E	127°51'30.00"S	451.1	32	Permian	1964	Hackathorn	Dry	P&A	Nil	Nil	Gregory Sub-basin
Stansmore Range 5	185	STR	21°16'45.00"E	127°46'50.00"S	420.6	53.3	Permian	1964	Hackathorn	Dry	P&A	Nil	Nil	Gregory Sub-basin
Sundown 1	2233	NFW	17°33'04.98"E	124°14'35.48"S	39.2	2736	Devonian	1982	Home	Oil	shut in	Nil	Producer	Lennard Shelf
Sundown 2	2321	EXT	17°33'12.93"E	124°14'46.17"S	39.6	1965	Carboniferous	1983	Home	Oil	shut in	Nil	Producer	Lennard Shelf
Sundown 3	2687	DEV	17°33'24.14"E	124°14'53.44"S	40.5	1220	Permian	1984	Home	Oil	shut in	Poor	Excellent	Lennard Shelf
Sundown 3H	2687	DEV	17°33'24.14"E	124°14'53.44"S	40.5	1645	Permian	1995	Santos	Oil	Producer	Poor	Producer	Lennard Shelf
Sundown 4	2838	DEV	17°33'06.88"E	124°14'42.12"S	39.3	1800	Permian	1985	Home	Oil	shut in	Nil	Producer	Lennard Shelf
Sundown 5	20195	DEV	17°33'18.92"E	124°14'41.80"S	40	1151.7	Carboniferous	1993	Minora	Oil	shut in	Fair	Producer	Lennard Shelf
Sunshine 1	20110	NFW	18°27'26.04"E	122°53'41.08"S	178.7	738	Carboniferous	1991	Bridge	Dry	P&A	Nil	Nil	Broome Platform
Sunup 1	2799	NFW	17°37'08.14"E	124°19'02.40"S	58.2	1500	Permian	1985	Home	Dry	P&A	Nil	Nil	Lennard Shelf
Tandalgoo 1	157	NFW	21°06'00.00"E	123°27'00.00"S	267	33.53	Permian	1963	WAPET	Dry	Water	Nil	Nil	Kidson Sub-basin
Tandalgoo 2	157	NFW	21°07'00.00"E	123°27'00.00"S	263.7	152.4	Permian	1963	WAPET	Dry	P&A	Nil	Nil	Kidson Sub-basin
Tandalgoo 3	157	NFW	21°18'00.00"E	123°27'00.00"S	302	125	Permian	1963	WAPET	Dry	P&A	Nil	Nil	Kidson Sub-basin
Tappers Inlet 1	641	NFW	16°51'32.79"E	122°35'26.79"S	18.9	2856.3	PreCambrian	1971	WAPET	Dry	P&A	Nil	Nil	Pender Terrace
Terrace 1	2597	NFW	17°30'18.30"E	124°15'55.00"S	31.8	2389	Devonian	1984	Home	Dry	P&A	Nil	Good	Lennard Shelf
Thangoo 1A	94	NFW	18°21'43.88"E	122°53'11.94"S	170.4	1654.8	Ordovician	1959–60	WAPET	Dry	P&A	Nil	Poor	Lennard Shelf
Thangoo 2	852	NFW	18°26'27.27"E	122°54'37.21"S	188.1	1472	PreCambrian	1973	WAPET	Dry	P&A	Nil	Nil	Broome Platform
The Sisters 1	42	NFW	17°43'25.94"E	124°25'13.63"S	90.2	2995.6	Devonian	1956–57	Ass Freeney	Dry	P&A	Nil	Nil	Fitzroy Trough
Thompsons 1	2227	NFW	17°36'36.40"E	124°23'14.97"S	79.9	2009	Devonian	1987	Home	Dry	P&A	Poor	Poor	Fitzroy Trough
Triodia 1	2404	STR	19°38'11.95"E	125°14'01.67"S	178	631	Devonian	1984	WMC	Dry	P&A	Nil	Nil	Lennard Shelf
Twin Buttes 1	3135	NFW	18°30'37.13"E	122°56'46.67"S	209	1600.3	Ordovician	1987	Santos	Dry	P&A	Nil	Poor	Barbwire Terrace
Typha 1	2425	STR	19°31'40.95"E	125°04'22.66"S	184	395	Devonian	1984	WMC	Dry	P&A	Nil	Nil	Broome Platform
Valentine 1	21195	NFW	17°08'23.67"E	123°42'32.41"S	12.4	3430	Devonian	2007	Arc	Dry	P&A	Poor	Nil	Pender Terrace
Valhalla 1	21222	NFW	18°04'03.69"E	124°46'04.25"S	114.3	3466	Devonian	2007	Arc	Dry	P&A	Poor	Poor	Fitzroy Trough
Vela 1	2170	NFW	19°24'37.71"E	122°53'40.79"S	112	1909	Ordovician	1982	Getty	Dry	P&A	Nil	Nil	Broome Platform
Wattle 1	20233	NFW	17°28'08.81"E	124°13'39.56"S	39	3056	Devonian	1994	Bow Valley	Dry	P&A	Fair	Excellent	Lennard Shelf

West Blackstone 1	2801	NFW	17°34'26.61"E	124°20'16.89"S	55.2	1943	Devonian	1985	Home	Dry	P&A	Nil	Poor	Lennard Shelf
West Kora 1	2555	NFW	17°14'42.50"E	123°49'04.74"S	9.3	2606	Devonian	1984	Esso	Oil	SUSP	Nil	Excellent	Lennard Shelf
West Philydrum 1	2757	NFW	17°48'15.44"E	124°36'57.83"S	65.5	1109	Permian	1985	IEDC	Dry	P&A	Nil	Nil	Lennard Shelf
West Terrace 1	2786	NFW	17°30'21.34"E	124°15'35.83"S	32.2	1250	Carboniferous	1985	Home	Oil	Producer	Nil	Producer	Lennard Shelf
West Terrace 2	2855	NFW	17°30'09.63"E	124°15'39.41"S	32	1200	Carboniferous	1987	Home	Oil	Producer	Nil	Producer	Lennard Shelf
Whistler 1	20109	NFW	18°22'15.49"E	122°53'49.09"S	170.3	884	Devonian	1991	Bridge	Dry	P&A	Nil	Nil	Broome Platform
White Hills 1	2086	NFW	21°09'15.25"E	127°35'19.65"S	357.2	4148	Devonian	1982	Mobil	Dry	P&A	Fair	Fair	Gregory Sub-basin
Whitewell 1	2575	NFW	17°33'56.83"E	124°15'44.64"S	40.56	1753.8	Carboniferous	1984	Home	Dry	P&A	Nil	Poor	Lennard Shelf
Willara 1	214	NFW	19°10'47.66"E	122°04'30.30"S	75.9	3903.3	Ordovician	1965	WAPET	Dry	P&A	Poor	Nil	Willara Sub-basin
Willara Hill 1	432	NFW	19°03'31.70"E	121°52'57.50"S	75.3	858	Permian	1968	WAPET	Dry	P&A	Nil	Nil	Willara Sub-basin
Wilson Cliffs 1	419	NFW	22°16'33.94"E	126°47'00.28"S	440.1	3722.2	Proterozoic	1968	Aquitaine	Dry	P&A	Nil	Poor	Kidson Sub-basin
Woods Hills 1	2710	NFW	19°34'28.94"E	122°01'13.31"S	108.7	1978	Ordovician	1984	RSEI	Dry	P&A	Nil	Nil	Willara Sub-basin
Yarrada 1	1828	NFW	17°21'54.48"E	124°06'13.65"S	21.2	3295	Devonian	1981	Home	Dry	P&A	Nil	Nil	Lennard Shelf
Yulleroo 1	348	NFW	17°51'11.03"E	122°54'29.68"S	50	4572.3	Devonian	1967	GE	Dry	P&A	Good	Nil	Fitzroy Trough

Well name	*A no.*	*Latitude (E)*	*Longitude (S)*	*Rig elevation (m)*	*Total depth (m)*	*TD age*	*Year*	*Operator/project*		*Comments*	*Sub-basin*
Selected mineral bores											
BHP ARD 1	29288	19°43'05.3"	125°14'55.6"	?	900.3	Devonian	1989	BHP Minerals	Clapp Ridge	~50 m from Crossland 1	Barbwire Terrace
BHD 21	38874	18°57'00.6"	126°20'08.3"	?	451	Devonian		BHP Minerals	Bohemia Downs		Lennard Shelf
BHP CD 8	?	18°44'28.6"	126°00'27.2"	?	363	Carboniferous		BHP Minerals	Cadjebut		Lennard Shelf
BHP CD 9	?	18°44'26.6"	125°59'53.5"	?	190	Carboniferous		BHP Minerals	Cadjebut		Lennard Shelf
BHP DBD 1	17456	17°35'37.8"	124°40'06"	?	333.5	basement		BHP Minerals	Davies Bore	11 km east of Harold 1	Lennard Shelf
BHP GCD 2	19957	18°35'55.6"	125°50'12.4"	?	355.8	Devonian		BHP Minerals	Gap Creek – 12 mile Bore	4.5 km northeast of Gap Creek 1	Lennard Shelf
BHP GCD 6	21315	18°36'02.9"	125°50'03.3"	?	473	Devonian		BHP Minerals	Gap Creek – 12 mile Bore	4 km northeast of Gap Creek 1	Lennard Shelf
BHP MBD 2	28423	18°32'14.1"	123°37'24.0"	?	529.85	Devonian	1988	BHP Minerals	Mowla Bluff	3 km northeast of Crystal Creek 1	Mowla Terrace
BHP MBD 4	28423	18°32'19.3"	123°35'50.3"	?	313.7	Permian		BHP Minerals	Mowla Bluff	near Lovells Pocket 1	Mowla Terrace
BHP PND 1	?	18°44'00.8"	125°57'02.3"	?	500.15	Permian		BHP Minerals	Pinnacle Creek	7.5 km southeast of Prices Creek 4	Fitzroy Trough
BHP PND 2	?	18°42'16.4"	125°55'13.5"	?	264	Permian		BHP Minerals	Pinnacle Creek	M04/189	Lennard Shelf
BHP PND 3	15605	18°43'02"	125°56'19."	171	299	Permian	1985	BHP Minerals	Pinnacles area		Lennard Shelf
BHP PND 5	21385	18°44'16.4"	125°58'36.8"	170	423.3	Devonian	1986	BHP Minerals	Pinnacles area		Lennard Shelf
BHP RD 8	17893	18°34'39"	125°46'02.4"	?	183.7	?Carboniferous		BHP Minerals	Prices Hill		Lennard Shelf
BHP VCD 1	?37416	18°38'01"	125°48'56.3"	?	?340	? Devonian		BHP Minerals	Virgin Creek	near Gap Ck 1	Lennard Shelf
BHP WRD 1	29366	19°10'00.13"	125°07'44.2"	?	497.5	Devonian	1982	BHP Minerals	Worral Range prospect	12 km east of Barbwire 1	Barbwire Terrace
CRAE DD86SS2	22015	19°13'16"	122°19'23"	88.5	1 753.6	Ordovician	1986	CRAE	Admiral Bay		Willara Sub-basin
CRAE DD86SS3	22015	19°12'32"	122°17'13"	96.3	1 723	Ordovician	1986	CRAE	Admiral Bay		Willara Sub-basin
CRAE DD88CL1	27976	19°09'21"	124°44'59"	~210	398.5	Devonian	1988	CRAE	Barbwire East	minor bitumen	Broome Platform
Pasminco BW9	48672	19°27'45"	124°07'22"	231	700	Devonian	1992	Pasminco	Barbwire	1.1 km south-southeast of Abutilon 1	Barbwire Terrace

NOTES:

Depths and heights rounded to nearest 10 cm
Status 2 at December 2007

Abd	abandoned
DEV	development
EXT	extension
NFW	new field wildcat
OS	oil well, suspended
P&A	plugged and abandoned
STR	stratigraphic
SUSP	suspended
1	formerly BMR Jugurra Creek 1
2	formerly BMR Laurel Downs 2
3	formerly BMR Wallal 4A
*	Co-ordinates approximate — calculated from 1:250 000 geological maps

Amax	Amax Petroleum (Australia) Inc
Amity	Amity Oil NL
Amoco	Amoco Australia Petroleum Company
Ampol	Ampol Exploration Ltd
Anzoil	Anzoil NL
Arc	Arc Energy Limited
Ass Freeney	Associated Freney Oilfields NL
Aquitaine	Australian Aquitaine Petroleum Pty Ltd
BHP	BHP Petroleum (Australia) Pty Ltd
Bow Valley	Bow Valley (Australia) Ltd
Bridge	Bridge Oil Limited
BMR	Bureau of Mineral Resources (Geoscience Australia)
Capital	Capital Energy NL
Churchill	Churchill Resources NL
Command	Command Petroleum Holdings NL
Continental	Continental Oil Company Of Australia Ltd
CRAE	Conzinc Rio Tinto of Australia Exploration
Eagle	Eagle Corporation Ltd
Esso	Esso Exploration and Production Australia Inc
Freney Kimb	Freney Kimberley Oil Co (1932) NL
Getty	Getty Oil Development Co Ltd
GE	Gewerkschaft Elwerath
Gulf	Gulf (Aust) Resources NL
Hackathorn	Hackathorn New Zealand Oils Ltd
Home	Home Energy Co Ltd
Hughes	Hughes and Hughes Australia Pty Ltd
IEDC	International Energy Development Corporation of Aust.
Kingsway	Kingsway Resources 2001 Pty Ltd
Kufpec	Kufpec Australia Pty Ltd
Lennard	Lennard Oil NL
Maple	Maple Oil and Exploration NL
Meridian	Meridian Oil NL
Minora	Minora Energy (Australasia) Pty Ltd
Mobil	Mobil Oil (Australia) Ltd
New Standard	New Standard Exploration Pty Ltd
OCOA	Oil Company of Australia
PSEL	Petroleum Securities Energy Limited
Placer	Placer Exploration Ltd
Ranger	Ranger Oil (Australia) Ltd
RREI	Royal Resources Exploration Inc
Santos	Santos Australia Ltd
Shell	Shell Development (Australia) Pty Ltd
Stirling	Stirling Resources NL
Sydney	Sydney Oil
Terratek	Terratek Drilling Tools Pty Limited
Total	Total Exploration Australia Pty Ltd
Ultramar	Ultramar Australia Inc
WAPET	West Australian Petroleum Pty Limited
WMC	Western Mining Corporation Ltd
Wildcat	Wildcat Australia Pty Ltd
Woodside	Woodside Petroleum Development Pty Ltd

Appendix 2

Summary of available core from the mid-Carboniferous to Lower Triassic

Well	*Core*	*Top (m)*	*Base (m)*	*Recovery (m)*	*Lithology*	*Unit*	*Comments*	*GSWA portion*	*GA portion*
Abutilon 1	1	7.15	80.8	~100%	sandstone, claystone, siltstone	Clianthus	HQ	1	
Abutilon 1	2	101.8	565.9	~100%	sandstone, siltstone, dolomite	Clianthus/Calytrix/Hoya	HQ	1	
Acacia 1	HQ	39	450	~100%	sandstone, claystone, siltstone, limestone	Clianthus/Calytrix/Hoya/Devonian	HQ	1	
Aristida 1	NQ	112	216	~100%	claystone, sandstone	Clianthus/Calytrix/Hoya/Devonian	NQ	1	
Aristida 1A	HQ	154	183.2	~100%	claystone, sandstone	Clianthus/Calytrix/Hoya/Devonian	HQ	1	
Aristida 1A	NQ	183.2	734	~100%	claystone, sandstone	Hoya/Devonian	NQ	1	
Atrax 1	1	583	588.4	4.8	sandstone	Grant/Devonian	4" diameter	¼–¾	
Auld 1	1	304.1	312.5	5.9	sandstone, shale	Grant	PQ (304.1–310 m held)	1	
Auld 1	2	710	715.2	0.5	conglomerate	Grant	PQ	1	
Babrongan 1	1	273.4	277.35	1.07	sandstone, siltstone	Grant	PQ disintegrated	½	0
Babrongan 1	2	623.6	627.9	0.76	conglomerate	Grant	PQ	½	fragments
Bedout 1	1	3035.8	3044.95	8.53	volcanic conglomerate	unnamed	4" diameter	¼	¼
Blackstone 1	1	1447.8	1462.1	13.3	sandstone, minor quartz siltstone, and shale	?Grant–Reeves	4" diameter	1	
BMR Billiluna 1	1	22.9	25.9	65%	siltstone	Noonkanbah	?HQ3		1
BMR Billiluna 1	2	53.3	56.4	85%	sandstone	Poole	?HQ3		1
BMR Billiluna 1	3	83.8	86.9	100%	sandstone	Grant	?HQ3		1
BMR Billiluna 1	4	120.4	123.4	80%	sandstone	Grant	?HQ3		1
BMR Cornish 1	1	47.2	49.8	~85%	sandstone	Condren	?HQ3		1
BMR Cornish 1	2	85.3	88.4	~80%	sandstone	Lightjack	?HQ3		1
BMR Cornish 1	3	144.8	147.6	~90%	sandstone	Lightjack	?HQ3		1
BMR Cornish 1	4	160.9	164.0	~85%	sandstone	Lightjack	?HQ3		1
BMR Cornish 2	1	132.6	135.2	100%	sandstone	Culvida	?HQ3		1
BMR Cornish 2	2	190.5	193.5	100%	siltstone and sandstone	Culvida	?HQ3		1
BMR Cornish 2	3	222.5	225.6	100%	sandstone, minor siltstone	Erskine	?HQ3		1
BMR Cornish 3	35	97.5	100.6	92%	siltstone and sandstone	Godfrey	?HQ3		1
BMR Cornish 3	36	100.6	103.6	70%	siltstone and sandstone	Godfrey	?HQ3		1
BMR Cornish 3	37	103.6	106.7	55%	siltstone and sandstone	Godfrey	?HQ3		1
BMR Cornish 3	38	106.7	109.7	35%	siltstone and sandstone	Godfrey	?HQ3		1
BMR Crossland 1	1[4]	9.5	12.5	~60%	shale	Hardman	?HQ3		1
BMR Crossland 1	2	12.5	15.4	100%	shale	Hardman	?HQ3		1
BMR Crossland 1	3	39.6	41.9	100%	shale and sandstone	Hardman	?HQ3		1
BMR Crossland 1	4	71.6	74.6	100%	sandstone	Condren	?HQ3		1
BMR Crossland 1	5	103.6	106.6	100%	sandstone and pebbly sandstone	Condren	?HQ3		1
BMR Crossland 1	6	144.8	147.7	~90%	sandstone	Condren	?HQ3		1
BMR Crossland 1	7	194.2	195.3	~90%	sandstone	Lightjack	?HQ3		1
BMR Crossland 1	8[4]	255.7	262	~33%	shale and sandstone	Lightjack	?HQ3		1
BMR Crossland 2	1	9.1	10.7	100%	sandstone	Condren	?HQ3		1
BMR Crossland 2	2	44.2	47.2	100%	sandstone, minor shale	Condren	?HQ3		1
BMR Crossland 2	3	99.1	102.1	~90%	siltstone	Condren	?HQ3		1
BMR Crossland 2	4	135.6	136.9	~85%	sandstone	Condren	?HQ3		1
BMR Lucas 13	1	49.9	51.8	100%	siltstone	Blina	?HQ3		1
BMR Lucas 13	2	80.8	83.8	~80%	siltstone and sandstone	Blina	?HQ3		1
BMR Lucas 13	3	121.9	125.0	~80%	sandstone	Millyit	?HQ3		1
BMR Lucas 13	4[4]	153.5	157	~80%	sandstone	Millyit	?HQ3		not held
BMR Lucas 13	5[4]	185.5	189	100%	siltstone	Godfrey	?HQ3		not held

BMR Lucas 14	1	30.5	31.7	~80%	siltstone and sandstone	Lightjack	?HQ3		1
BMR Lucas 14	2	76.2	79.2	~95%	siltstone	Lightjack	?HQ3		1
BMR Lucas 14	3 [4]	98.8	102.1	100%	siltstone and sandstone	Lightjack	?HQ3		not held
BMR Mount Bannerman 1	1	57.9	61.0	~65%	clay	Cenozoic	?HQ3		1
BMR Mount Bannerman 1	2	112.8	115.8	~70%	sandstone	Condren	?HQ3		1
BMR Mount Bannerman 1	3	138.7	141.7	?	sandstone	Condren	?HQ3		1
BMR Mount Bannerman 1	4	167.6	170.7	100%	siltstone and sandstone	Lightjack	?HQ3		1
BMR Mount Bannerman 1	5	199.6	202.7	100%	sandstone	Lightjack	?HQ3		1
BMR Mount Bannerman 2	1	9.6	11.8	~75%	siltstone	Condren	?HQ3		1
BMR Mount Bannerman 2	2	45.2	46.4	~45%	siltstone and sandstone	Condren	?HQ3		1
BMR Mount Bannerman 2	3	76.2	78.8	~95%	siltstone	Condren	?HQ3		1
BMR Mount Bannerman 2	4	99.7	102.7	100%	sandstone	Lightjack	?HQ3		1
BMR Mount Bannerman 2	5	135.6	139.0	100%	siltstone	Lightjack	?HQ3		1
BMR Mount Bannerman 3	1	35.0	37.8	~67%	sandstone	Grant	?HQ3		1
BMR Mount Bannerman 3	2	67.1	70.0	100%	sandstone	Grant	?HQ3		1
BMR Mount Bannerman 3	3	90.2	91.8	100%	siltstone	Grant	?HQ3		1
BMR Mount Bannerman 4	1	67.0	69.6	~85%	sandstone	Grant	?HQ3		1
BMR Mount Bannerman 4	2	110.6	113.3	100%	siltstone	Grant	?HQ3		1
BMR Mount Bannerman 4	3	147.5	150.6	100%	sandstone	Grant	?HQ3		1
BMR 01 Mount Anderson[1]	1	25.3	31.4	2.23	siltstone, quartz greywacke	Noonkanbah	fragments, chips	0	fragments
BMR 01 Mount Anderson	2	54.85	59.15	2.9	siltstone	Noonkanbah	fragments, chips	0	fragments
BMR 01 Mount Anderson	3	85.35	91.45	6.1	siltstone, quartz greywacke	Noonkanbah	NX fragments	0	1
BMR 01 Mount Anderson	4	115.2	121.3	2.29	siltstone, quartz greywacke	Noonkanbah	fragments, chips	0	fragments
BMR 01 Mount Anderson	5	146.3	152.4	5.49	siltstone, quartz greywacke	Noonkanbah	NX broken up	0	1
BMR 01 Mount Anderson	6	176.8	182.9	5.79	quartz greywacke, siltstone, shale	Noonkanbah	NX broken up	0	1
BMR 01 Mount Anderson	7	207.25	212.75	2.74	siltstone, quartz greywacke	Noonkanbah	NX broken up	0	1
BMR 01 Mount Anderson	8	237.75	243.85	2.13	siltstone, intraformational breccia	Noonkanbah	NX broken up	0	1
BMR 01 Mount Anderson	9	243.85	249.95	2.13	siltstone, quartz sandstone	Noonkanbah	fragments, chips	0	fragments
BMR 01 Mount Anderson	10	268.2	271.25	1.07	quartz greywacke	Noonkanbah	fragments, chips	0	fragments
BMR 01 Mount Anderson	11	297.5	303.6	3.60	siltstone, quartz greywacke	Noonkanbah	NX broken up	0	1
BMR 01 Mount Anderson	12	329.2	335.3	1.92	quartz sandstone, siltstone	Poole	NX broken up	0	1
BMR 01 Mount Anderson	13	359.65	365.75	1.68	quartz sandstone	Poole	NX broken up	0	1
BMR 01 Mount Anderson	14	390.15	394.7	1.98	quartz greywacke interlaminated	Poole	NX broken up	0	1
BMR 01 Mount Anderson	15	420.6	426.7	4.11	laminated siltstone and quartz sandstone	Poole	NX broken up	0	1
BMR 01 Mount Anderson	16	451.1	457.2	3.60	siltstone, quartz sandstone	Grant	NX broken up	0	1
BMR 01 Mount Anderson	17	481.6	487.7	0.46	quartz greywacke, siltstone	Grant	NX broken up	0	1
BMR 01 Mount Anderson (water)	1	9.1	15.25	1.60	siltstone	Noonkanbah	?size	0	1
BMR 01 Mount Anderson (water)	2	47.25	50.3	1.60	siltstone, minor sandstone	Noonkanbah	?size	0	1
BMR 01 Mount Anderson (water)	3	50.3	53.35	3.05	siltstone, minor sandstone	Noonkanbah	?size	1	1
BMR 02 Noonkanbah[2]	1	15.25	18.3	0.06	quartz greywacke	Grant	NX (1 bag pebbles)	0	1
BMR 02 Noonkanbah	2	45.7	49.4	1.31	quartz greywacke, siltstone	Grant	NX disintegrated	0	1
BMR 04A Mandora[3]	6	605.95	608.4	2.13	siltstone, shale	Blina	NX broken up	0	1
BMR 04A Mandora	7	639.45	642.5	1.37	shale, sandstone, fossils	Liveringa	NX broken up	0	1
BMR 04A Mandora	8	661.1	664.15	1.52	siltstone, fossils	Grant	NX broken up	0	1
BMR 04A Mandora	9	676.65	677.6	0.76	gneiss and sandstone	?basement or eratic in Grant	NX broken up	0	1
Boab 1	NQ	141	639	~100%	claystone, quartz sandstone, dolomite	Grant/Devonian	HQ	1	
Caladenia 1	NQ	80.7	296.5	~100%		Grant/Devonian	NQ	1	
Calytrix 1	1	84.5	146	~97%	sandstone	?unit/Grant	HQ	1	
Calytrix 1	2	146	450	~94%	sandstone, shale, dolomite	Grant/Devonian	NQ	1	
Capparis 1	HQ	19.1	134	~100%	sandstone, siltstone	Clianthus/Calytrix	HQ	1	
Capparis 1	NQ	134	521	~100%	siltstone, claystone, dolomite	CalytrixHoya/Devonian	NQ	1	
Cassia 1	HQ	131.5	842.3	~100%	sandstone, claystone, siltstone	Clianthus/CalytrixHoya/?Reeves	HQ	1	
Chirup 1	8	516.65	521.2	4	shale, sandstone	Liveringa		0	
Chirup 1	9	521.2	525.8	0.3	shale, sandstone	Liveringa	NQ	1	
Chirup 1	10	615.1	619.65	4	sandstone, shale, minor lignite	Liveringa or Grant		0	
Chirup 1	11	682.75	687.3	3.35	claystone, sandstone	Grant	NQ	1	

Appendix 2 (continued)

Well	*Core*	*Top (m)*	*Base (m)*	*Recovery (m)*	*Lithology*	*Unit*	*Comments*	*GSWA portion*	*GA portion*
Chirup 1	12	757.75	762.6	4.27	claystone, sandstone	Grant	NQ	1	
Clianthus 1	HQ	112	146.5	98.8%		Clianthus	PQ	1	Clianthus 1
NQ	146.5	450	99.3%		Clianthus/CalytrixHoya	NQ	1		
CRAE DD86SS2	HQ	1096	1110			Grant	Grant interval only	1	
CRAE DD86SS3	NQ	1138	1220	?		Grant	Grant interval only	1	
CRAE DD88CL1	HQ	30.3	398.5	91.5%	sandstone, siltstone, minor coal	Poole/Grant/Devonian	HQ	1	
Crossland 2	1	408	414	2.74	siltstone, sandstone	Grant	HQ	¾	
Cycas 1	1	983	1000	17	sandstone	Grant	4" diameter	½	
Dampier Downs 1	14	329.2	332.25		sandstone, siltstone	Noonkanbah	NQ disintegrated	1	
Dampier Downs 1	15	359.65	362.7		siltstone, sandstone	Noonkanbah	NQ disintegrated	1	
Dampier Downs 1	16	390.15	393.2		sandstone, minor siltstone	Poole	NQ disintegrated	1	
Dampier Downs 1	17	420.6	423.65		sandstone, siltstone	Poole	NQ disintegrated	1	
Dampier Downs 1	18	451.1	453.85		siltstone, sandstone	Poole	NQ disintegrated	1	
Dampier Downs 1	19	470.9	473.95		siltstone, sandstone, calcarenite	Nura Nura	NQ disintegrated	1	
Dampier Downs 1	20	501.4	504.45		coarse sandstone	Grant	NQ disintegrated	1	
Dampier Downs 1	21	530.35	533.4		sandstone, pebbly mudstone	Grant	NQ disintegrated	1	
Dampier Downs 1	22	551.7	554.75		sandstone	Grant	NQ disintegrated	1	
Dampier Downs 1	23	582.15	585.2		sandstone	Grant	NQ disintegrated	1	
Dampier Downs 1	24	621.5	623		pebbly and sandy siltstone	Grant	NQ disintegrated	1	
Dampier Downs 1	25	642.5	645.55		pebbly siltstone	Grant	NQ broken up	1	
Dampier Downs 1	26	669.05	672.1		sandstone	Grant	NQ disintegrated	1	
Dampier Downs 1	27	701.05	704.1		sandstone	Grant	NQ disintegrated	1	
Dampier Downs 1	28	731.5	734.55		siltstone, sandstone	Grant	NQ disintegrated	1	
Dampier Downs 1	29	762.6	765.65		sandstone	Grant	NQ disintegrated	1	
Dampier Downs 1	30	792.5	793.4		siltstone, sandstone	Grant	NQ disintegrated	1	
Dampiera 1A	1	130	767.8	~100%		Calytrix/Hoya/Lower Carboniferous	HQ	1	
Doran 1	4	232.55	237.15	0					
Doran 1	5	310.3	314.85	0					
Doran 1	6	314.85	315	0.15		Grant	?NQ	fragments	pebbles
Doran 1	7	388.35	392.9	0.23	tillitic sandstone	Grant	?NQ	fragments	pieces
Doran 1	8	392.9	396.25	0.53	siltstone	Grant	?NQ	fragments	piece
Doran 1	9	456.3	460.85	2.74	shale	Grant	?NQ	1	pieces
Doran 1	10	497.75	502.3	3.05	shale with lignite fragments	Grant	?NQ	1	pieces
Doran 1	11	553.5	558.1	2.44	sandy siltstone	Grant	?NQ	1	pieces
Doran 1	12	628.5	632.45	1.83	sandy siltstone	?Reeves	?NQ	fragments	piece
Doran 1	13	690.7	695.25	0					
Doran 1	14	695.25	698	0.3	sandstone with shale bands	?Reeves	?NQ	fragments	pieces
Drosera 1	1	46	314	268	sandstone, claystone, conglomerate	Calytrix/Hoya/?Reeves	HQ	1	
Drosera 1	2	314	450	136	sandstone, claystone	?Reeves/Ordovician	HQ	1	
Edgar Range 1	1	121.9	124.95	0.66	sand	?Clianthus	?4"	¼	sand/chips
Eremophila 1	1	116.7	497.2	~100%	sandstone, shale, dolomite	Clianthus/Calytrix/Hoya/Devonian	PQ	1	
Eremophila 2	1	91	360	~99%	sandstone, siltstone, dolomite	Clianthus/Calytrix/Hoya/Devonian	NQ	1	
Eremophila 3	1	75	86	11 m		Clianthus/Calytrix	HQ	1	
Eremophila 3	2	86	127.6	41.6 m		Calytrix	HQ	1	
Eremophila 3	3	127.6	464	336 m		Calytrix/Hoya/Devonian	NQ	1	
Ficus 1	HQ	90	647.7	~100%	siltstone, quartz sandstone and conglomerate beds	Clianthus/Calytrix/Hoya/?Reeves/ Lower Carboniferous	HQ	1	
Frankenia 1	HQ	42	122	~100%		Grant	HQ	1	

Frankenia 1	NQ	122	479	~100%		Grant/Devonian	NQ	1	
Frankenstein 1	1	910.5	919.7	8.1	sandstone, siltstone	?Reeves	4" diameter	½	
Fraser River 1	11	218.85	219.75	average 65% for all core in well	sandstone	Grant	AQ	pieces	pieces
Fraser River 1	12	219.75	222.5		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	13	222.5	225.25		sandstone	Grant	AQ	pieces	fragments
Fraser River 1	14	225.25	228		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	15	228	230.75		sandstone	Grant	AQ	pieces	fragments
Fraser River 1	16	230.75	233.5			Grant	?no recovery		
Fraser River 1	17	233.5	236.2			Grant	?no recovery		
Fraser River 1	18	236.2	238.65			Grant	?no recovery		
Fraser River 1	19	238.65	241.7		sandstone	Grant	AQ	pieces	fragments
Fraser River 1	20	241.4	244.15		sandstone	Grant	AQ	pieces	pebbles
Fraser River 1	21	244.15	246.3		sandstone	Grant	AQ	pieces	fragments
Fraser River 1	22	246.3	247.8		sandstone	Grant	AQ	pieces	pebbles
Fraser River 1	23	247.8	253.9		sandstone	Grant	AQ broken up	pieces	pieces
Fraser River 1	24	253.9	256.65		sandstone	Grant	AQ	pieces	pebbles
Fraser River 1	25	256.65	259.4		sandstone	Grant	AQ	pieces	pebbles
Fraser River 1	26	259.4	262.15		sandstone	Grant	AQ	pieces	
Fraser River 1	27	262.15	264.9		sandstone	Grant	AQ	pieces	fragments
Fraser River 1	28	264.9	267.9		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	29	267.9	270.65		sandstone	Grant	AQ	pieces	pebbles
Fraser River 1	30	270.65	273.1		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	31	273.1	275.85		sandstone	Grant	AQ	pieces	fragments
Fraser River 1	32	275.85	278.6		sandstone	Grant	AQ	pieces	pebbles
Fraser River 1	33	278.6	281.35		sandstone	Grant	AQ	pieces	pebbles
Fraser River 1	34	281.35	284.1		sandstone	Grant	AQ	pieces	pebbles
Fraser River 1	35	284.1	286.8		sandstone	Grant	AQ	pieces	pebbles
Fraser River 1	36	286.8	289.55		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	37	289.55	291.7		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	38	327.65	330.4		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	39	357.55	360.25		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	40	387.1	389.85		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	41	417.6	420		sandstone and conglomerate	Grant	AQ	pieces	pieces
Fraser River 1	42	445	447.15		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	43	481.6	484.35		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	44	512.05	518.15		sandstone	Grant	HQ broken up	pieces	pieces
Fraser River 1	45	545	548.05		sandstone	Grant	NQ	pieces	fragments
Fraser River 1	46	572.4	574.55		sandstone	Grant	AQ	pieces	piece
Fraser River 1	47	602	604.7		sandstone/subgreywacke	Grant	AQ	pieces	pieces
Fraser River 1	48	632.45	635.2		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	49	662.95	665.7		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	50	696.45	699.2		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	51	755.9	758.65		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	52	786.4	789.15		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	53	816.85	819.6		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	54	839.4	841.55		sandstone	Grant	AQ	pieces	pieces
Fraser River 1	55	877.8	880.55		sandstone	Reeves	AQ	pieces	pieces
Fraser River 1	56	908.3	911.05		sandstone	Reeves	AQ	pieces	pieces
Fraser River 1	57	936.35	939		siltstone	Reeves	AQ	pieces	pieces
Fraser River 1	58	939	940.6		sandstone/siltstone	Reeves	AQ	pieces	fragments
Fraser River 1	59	940.6	946.7		siltstone	Reeves	PQ broken up	1	piece
Fraser River 1	60	975.05	977.8		siltstone	Reeves	AQ	pieces	pieces
Fraser River 1	61	1005.85	1008.6		claystone	Reeves	PQ or AQ?	pieces	pieces
Fraser River 1	62	1036.3	1039.05		claystone/sandstone	Reeves	PQ or AQ?	pieces	pieces

Appendix 2 (continued)

Well	*Core*	*Top (m)*	*Base (m)*	*Recovery (m)*	*Lithology*	*Unit*	*Comments*	*GSWA portion*	*GA portion*
Fraser River 1	63	1065.9	1068.65		sandstone	Reeves	PQ or AQ?	pieces	pieces
Fraser River 1	64	1068.65	1074.7		sandstone	Reeves	PQ broken up	1	pieces
Fraser River 1	65	1104.9	1107.65		claystone/sandstone	Reeves	AQ	pieces	pieces
Fraser River 1	66	1137.8	1140.55		sandstone	Reeves	PQ or AQ?	pieces	pieces
Fraser River 1	67	1162.2	1164.95		subgreywacke/sandstone	Reeves	PQ or AQ?	pieces	pieces
Fraser River 1	68	1191.75	1194.5		sandstone/siltstone	?Reeves/Anderson	PQ or AQ?	pieces	pieces
Fraser River 1	69	1222.25	1225		sandstone/siltstone	?Reeves/Anderson	PQ or AQ?	1	piece
Fraser River 1	70	1252.75	1258.8		sandstone	?Reeves/Anderson	PQ	pieces	pieces
Fraser River 1	71	1298.45	1301.2		siltstone	?Reeves/Anderson	AQ	pieces	pieces
Fraser River 1	72	1301.2	1303.95		siltstone	?Reeves/Anderson	AQ	pieces	pieces
Fraser River 1	73	1350.55	1353.3		sandstone	?Reeves/Anderson	AQ	pieces	pieces
Fraser River 1	74	1399.05	1404.2		sandstone	?Reeves/Anderson	AQ	pieces	pieces
Frome Rocks 2	1	212.15	215.2	3.05	sandstone, siltstone	Noonkanbah	PQ	½	fragments
Frome Rocks 2	2	334.35	337.4	2.44	shale, minor siltstone	Noonkanbah	PQ	½	pieces
Frome Rocks 2	3	456.6	459.65	1.83	sandstone	Noonkanbah	PQ	½	pieces
Frome Rocks 2	4	631.55	635	2.74	sandstone, siltstone	Poole/Nura Nura	PQ	½	pieces
Frome Rocks 2	5	721.45	724.5	0			PQ		
Frome Rocks 2	6	819.3	822.35	0.61	sandstone	Grant	PQ	½	piece
Frome Rocks 2	7	946.7	949.75	3.05	sandstone	Grant	PQ	½	pieces
Frome Rocks 2	8	1053.7	1056.75	2.44	sandstone	Grant	PQ	½	pieces
Goodenia 1	1	100	104	4		Grant/L Carboniferous	PQ	1	
Grant Range 1	1	366.65	369.7	0.46	sandstone	Grant	AQ	1	
Grant Range 1	2	424.9	426.4	1.52	shale	Reeves	AQ	1	
Grant Range 1	3	516	519.05	3.05	sandstone	Reeves	AQ	1	
Grant Range 1	4	619.05	622.1	3.05	sandstone	Reeves	AQ	1	
Grant Range 1	5	699.8	702.85	1.52	sandstone	Reeves	AQ	1	
Grant Range 1	6	777.25	780.3	1.52	sandstone	Reeves	AQ	1	
Grant Range 1	7	780.3	781.8	0.91	sandstone	Reeves	AQ	1	
Grant Range 1	8	815.65	817.15	0					
Grant Range 1	9	817.15	818.7	0.61	sandstone	Reeves	AQ	1	
Grant Range 1	10	900.4	903.45	0		Reeves			
Grant Range 1	11	903.45	904.95	0.03	quartz conglomerate	Reeves	AQ	1	
Grant Range 1	12	904.95	905.55	0.03	quartz conglomerate	Reeves	AQ	1	
Grant Range 1	13	905.55	906.15	0.03	sandstone	Reeves	AQ	1	
Grant Range 1	14	918.05	920.2	0.3	quartz conglomerate and sandstone	Reeves	AQ	1	
Grant Range 1	15	1079	1081.75	2.13	sandstone	Reeves	AQ	1	
Grant Range 1	16	1179.6	1181.1	1.52	sandstone	Reeves	AQ	1	
Grant Range 1	17	1289.3	1292.05	1.22	sandstone	Reeves	AQ	1	
Grant Range 1	18	1362.75	1364.6	cuttings	sandstone	Reeves	AQ	1	
Grant Range 1	19	1364.6	1365.5	0.46	sandstone and sandy siltstone	Reeves	AQ	1	
Grant Range 1	20	1435.6	1437.45	0.91	sandstone	Reeves	AQ	1	
Grant Range 1	21	1515.75	1518.5	0.61	sandstone	Reeves	AQ	1	
Grant Range 1	22	1518.5	1519.45	0.61	sandstone	Reeves	AQ	1	
Grant Range 1	23	1616.95	1618.2	1.22	sandstone	Reeves	AQ	1	
Grant Range 1	24	1677.9	1679.15	0.15	siltstone and shale	Reeves	AQ	1	
Grant Range 1	25	1679.15	1679.45	0					
Grant Range 1	26	1694.4	1695.3	0.91	shale, siltstone	Reeves	AQ	1	
Grant Range 1	27	1734.3	1737.05	2.74	sandstone	Reeves	AQ	1	
Grant Range 1	28	1828.8	1830.3	0.3	sandstone	Reeves	AQ	1	

Grant Range 1	29	1830.3	1831.85	0.91	sandstone	Reeves	AQ	1	
Grant Range 1	30	1856.25	1857.45	1.22	sandstone and shale	Reeves	AQ	1	
Grant Range 1	31	1857.45	1858.35	0.91	sandstone and shale	Reeves	AQ	1	
Grant Range 1	32	1858.35	1861.1	0.61	shale	Reeves	AQ	1	
Grant Range 1	33	1861.1	1863.85	1.52	shale	Reeves	AQ	1	
Grant Range 1	34	1880	1881.55	1.52	shale	Reeves	AQ	1	
Grant Range 1	35	1881.55	1883.35	1.83	shale	Reeves	AQ	1	
Grant Range 1	36	1883.35	1885.2	0.3	shale	Reeves	AQ	1	
Grant Range 1	37	1885.2	1885.5	0.3	shale	Reeves	AQ	1	
Grant Range 1	38	1892.5	1895.25	2.44	sandstone	Reeves	AQ	1	
Grant Range 1	39	1895.25	1898	0.61	sandstone	Reeves	AQ	1	
Grant Range 1	40	1898	1899.5	1.52	sandstone	Reeves	AQ	1	
Grant Range 1	41	1899.5	1901.05	1.22	siltstone	Reeves	AQ	1	
Grant Range 1	42	1951.35	1952.85	1.52	sandstone	Reeves	AQ	1	
Grant Range 1	43	1952.85	1955	2.13	siltstone	Reeves	AQ	1	
Grant Range 1	44	2005	2005.6	0.3	sandstone	Reeves	AQ	1	
Grant Range 1	45	2032.7	2034.85	2.13	sandstone	Reeves	AQ	1	
Grant Range 1	46	2103.1	2103.75	0.46	sandstone	Reeves	AQ	1	
Grant Range 1	47	2163.45	2164.4	0.3	sandstone	Reeves	AQ	1	
Grant Range 1	48	2164.4	2166.2	0.3	sandstone	Reeves	AQ	1	
Grant Range 1	49	2222.6	2225.65	3.05	sandstone	Reeves	AQ	1	
Grant Range 1	50	2286.6	2287.5	0.91	siltstone and sandstone	Reeves	AQ	1	
Grant Range 1	51	2352.75	2354.3	0.91	sandstone	Reeves	AQ	1	
Grant Range 1	52	2410.05	2411.6	1.52	shale	Anderson	AQ	1	
Hakea 1	1	825	840	13.2	sandstone	Grant	4" diameter	1	
Hakea 1	2	840	856.75	16.8	sandstone, conglomeratic at base	Grant	4" diameter	1	
Hakea 1	3	856.75	858.2	1.4	sandstone with conglomeratic bands	Grant	4" diameter	¾	
Halgania 1	NQ	133	500	~100%		Calytrix/Hoya/Fairfield	NQ	1	
Hoya 1	HQ	84	152.5	100%		Clianthus/Calytrix	HQ	1	
Hoya 1	NQ	152.5	450	99%		Calytrix/Hoya/Devonian	NQ	1	
Kemp Field 1	1	135.95	139	2.41	sandstone	Noonkanbah	PQ	¼	pieces
Kidson 1	1	1053.1	1056.15	0					
Kidson 1	2	1551.45	1556.3	4.88	sandstone	Grant ('Braeside')	4" diameter	1	
Kunzea 1	1	8.5	91.8	99%		Calytrix	HQ	1	
Kunzea 1	2	91.8	132	25%		Calytrix/Clianthus	HQ	1	
Kunzea 1	3	132	140	100%		Clianthus	HQ	1	
Kunzea 1	4	140	176	99%		Clianthus/Hoya	NQ	1	
Kunzea 1	5	176	259	25%		Hoya	NQ	1	
Kunzea 1	6	259	450	99%		Hoya/Ordovician	NQ	1	
Lacepede 1A	5	2282.95	2286	3.05	sandstone, siltstone, minor shale	?Liveringa	4" diameter	¼	¼
Langoora 1	1	577.6	581.55	3.66	sandstone, siltstone	?Poole/Grant	PQ 1845-1907' on boxes	pieces	¾
Langoora 1	2	730.3	734.85	4.57	sandstone	Grant	PQ	¼	¾
Langoora 1	3	915.6	918.65	3.05	sandstone	Grant	PQ	¼	¾
Langoora 1	4	1033.25	1036.3	3.05	sandstone	Grant	PQ	¼	¾
Langoora 1	5	1139.95	1143.9	1.83	sandstone	Reeves	PQ	¼	¾
Langoora 1	6	1224.7	1229.55	4.88	calcareous sandstone	Reeves	PQ	¼	¾
Matches Spring 1	1	166.1	171.9	2.32	sandstone, shale streaks	Grant	4" or PQ?	¼	¼
McLarty 1	1	151.5	156.35	0					
McLarty 1	2	236.2	236.85	0.45	fossiliferous siltstone	Grant ('Dora' = Winifred)	4" diameter	¾	¼
McLarty 1	3	293.2	299.9	0.90	sandstone, minor shale	Grant ('Cuncudgerie Mbr')	4" diameter	¾	¼
McLarty 1	4	424	427.35	1.52	sandstone/conglomerate	Grant ('Cuncudgerie Mbr')	4" diameter	½+	¼
Meda 1	1	429.75	435.85	6.1	siltstone, shale and sandstone	Noonkanbah	PQ	small pieces	pieces
Meda 1	2	592.25	598.3	2.44	shale, siltstone and limestone	Noonkanbah	PQ	small pieces	pieces
Meda 1	3	719.65	723.9	4.27	siltstone, sandstone, bryzoal sandstone	Poole	PQ	small pieces	pieces

Appendix 2 (continued)

Well	Core	Top (m)	Base (m)	Recovery (m)	Lithology	Unit	Comments	GSWA portion	GA portion
Meda 1	4	900.7	906.8	4.88	siltstone, sandstone	Grant (Carolyn)	PQ	small pieces	pieces
Meda 1	5	1050.65	1051.55	0.91	claystone	Grant (Winifred)	PQ	small pieces	pieces
Meda 1	6	1232.9	1237.5	1.52	sandstone	Grant	PQ	small pieces	pieces
Melaleuca 1	HQ	78	125	97.7%		Clianthus	HQ	1	
Melaleuca 1	NQ	125	450	90.0%		Clianthus/Calytrix/Hoya	NQ	1	
Myroodah 1	1	411.5	417.6	5.50	greywacke, silty shale	Liveringa	~PQ	pieces	pieces
Myroodah 1	2	1262.5	1265.2	2.74	sandstone	Grant	~PQ	pieces	pieces
Myroodah 1	3	1428.6	1431.35	2.74	argillaceous sandstone, conglomerate, shale	Grant	~PQ	pieces	pieces
Myroodah 1	4	1501.75	1505.4	3.66	shale	Grant	~PQ	pieces	pieces
Nerrima 1 (AFO)	1	475.5	481.6	3.05	shale with thin sandstone beds	Noonkanbah	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	2	662.35	667.5	3.66	sandstone to small pebble conglomerate	Grant	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	3	823	826	2.82	quartz sandstone	Grant	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	4	986.65	989.7	2.74	quartz sandstone	Grant	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	5	1150.9	1153.95	2.29	quartz sandstone	Grant	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	6	1301.5	1304.5	2.9	quartz sandstone	Grant	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	7	1461.5	1464.6	2.9	quartz sandstone	Grant	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	8	1603.2	1606.3	1.68	quartz sandstone	Grant	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	9	1761.7	1763.3	1.22	quartz sandstone	Grant	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	10	1916.3	1920.8	3.96	sandstone, conglomerate, shale	Grant	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	11	1974.5	1979.1	2.44	quartz sandstone	Grant	~3½"	v small pieces	0
Nerrima 1 (AFO)	12	1994.6	1997.7	2.74	silty sandstone	Grant	~3½"	v small pieces	0
Nerrima 1 (AFO)	13	2083.9	2084.5	0.19	calcareous sandstone	Grant	~3½"	v small pieces	0
Nerrima 1 (AFO)	14	2158.9	2161.9	2.49	sandstone	Grant	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	15	2294.8	2297.0	2.16	massive pebbly calcareous siltstone	?Grant/Reeves	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	16	2433.8	2435.4	1.6	sandstone, conglomerate	?Grant/Reeves	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	17	2450.3	2451.2	0.71	sandstone	?Grant/Reeves	~3½"	v small pieces	0
Nerrima 1 (AFO)	18	2482.6	2486.6	2.13	sandstone	?Grant/Reeves	~3½"	v small pieces	pieces
Nerrima 1 (AFO)	19	2759.4	2760.0	0.38	sandstone, shale	?Grant/Reeves	~3½"	0	pieces
Panicum 1	HQ	108	130.4	99%	siltstone/mudstone/sandstone	Clianthus/Calytrix	HQ	1	
Panicum 1	NQ	130.4	278	99%	sandstone, quartz sandstone	Calytrix/Hoya/Devonian	NQ	1	
Perindi 1	1	872	881	7.8	limestone, mudstone/claystone	Nura Nura/Grant	4" diameter	¼	¼
Perindi 1	2	881	883.85	1.2	sandstone	Grant	4" diameter	¼	¼
Point Moody 1	1	142.05	145.7	3.66	shale, fossiliferous siltstone	Noonkanbah	PQ	¼	¼
Point Moody 1	2	278.3	279.8	1.52	shale, sandstone	Noonkanbah	PQ	¼	¼
Point Moody 1	3	370.65	374.3	3.26	sandstone with siltstone laminae	?Poole	PQ	¼	¼
Point Moody 1	4	462.7	465.75	2.74	sandstone, minor conglomerate	?Grant	PQ	¼	¼
Point Moody 1	5	514.2	520.3	6.10	sandstone, shale, siltstone	Grant	PQ	¼	¼
Point Moody 1	6	617.85	621.5	0					
Point Moody 1	7	643.15	646.8	3.58	sandstone, minor shale and siltstone	Grant	PQ	¼	¼
Point Moody 1	8	751.05	754.1	3.05	pebbly sandstone, slickensided shale	Grant	PQ	¼	¼
Point Moody 1	9	837.6	841.25	3.66	sandstone	Grant	PQ	¼	¼
Point Moody 1	10	929.35	932.4	3.05	pebbly sandstone	?Reeves	PQ	¼	¼
Point Moody 1	11	1065	1068.65	3.58	diamictite and pebbly sandstone	?Reeves	PQ	¼	¼
Point Moody 1	12	1212.8	1215.85	2.38	thinly bedded shale and sandstone, plants	?Reeves	PQ	¼	¼
Point Moody 1	13	1325.9	1328.95	2.90	shale and pebbly sandstone, slumps	?Reeves	PQ	¼	¼
Point Moody 1	14	1417.6	1419.75	1.92	fractured sandstone	?Reeves	PQ	¼	¼
Point Moody 1	15	1425.85	1430.45	4.57	fractured sandstone	?Reeves	PQ	¼	¼
Point Moody 1	16	1518.8	1521.9	3.05	sandstone, diamictite	?Reeves	PQ	¼	¼

Point Moody 1	17	1597.45	1600.5	3.05	sandstone	?Reeves	PQ	¼	¼
Point Moody 1	18	1647.45	1648.35	0.89	shale	?Reeves	PQ	¼	¼
Point Moody 1	19	1721.8	1723.65	1.30	sandstone, minor shale beds	?Reeves	PQ	¼	¼
Point Moody 1	20	1813.55	1814.8	1.22	pebbly sandstone, siltstone	?Reeves	PQ	¼	¼
Point Moody 1	21	1911.1	1912.6	1.52	pebbly sandstone, sandy siltstone	?Reeves	PQ	¼	¼
Point Moody 1	22	1944.95	1945.55	0.46	sandstone, silty sandstone	?Reeves	PQ	¼	¼
Pratia 1	1	22.5	151	~96.5%	sandstone, claystone, siltstone	?Poole/Clianthus/Calytrix	HQ	1	
Pratia 1	2	151	464	~91%	sandstone, siltstone, claystone, dolomite	Calytrix/Hoya/Devonian	NQ	1	
Roebuck Bay 1	19	484.65	487.7	1.83	siltstone, sandstone	Noonkanbah	NQ	pieces	
Roebuck Bay 1	20	515.1	518.15	2.44	siltstone, sandstone	Noonkanbah	NQ	pieces	
Roebuck Bay 1	21	545.6	548.65	0.3	siltstone, sandstone	?Poole	NQ	1	
Roebuck Bay 1	22	576.05	579.1	1.22	sandstone, siltstone	Poole	NQ	pieces	
Roebuck Bay 1	23	606.25	609.3	0.91	calcarenite	Nura Nura	NQ	pieces	
Roebuck Bay 1	24	609.3	611.45	0.15	calcarenite	Nura Nura	NQ	pieces	
Roebuck Bay 1	25	637.05	640.1	0.04	sandstone	Grant		0	
Roebuck Bay 1	26	640.1	643.75	0					
Roebuck Bay 1	27	667.5	670.55	1.52	sandstone	Grant		0	
Roebuck Bay 1	28	698	701.05	2.9	siltstone, ?diamictite	Grant (Winifred)	NQ	½	
Roebuck Bay 1	29	728.45	731.5	0.3		Grant (Winifred)	NQ	1	
Roebuck Bay 1	30	745.55	747.65	0.91	silty sandstone, ?diamictite	Grant (Winifred)	NQ	1	
Roebuck Bay 1	31	775.1	778.15	2.44	silty sandstone	Grant (Winifred)	NQ	1	
Roebuck Bay 1	32	804.65	807.1	0					
Roebuck Bay 1	33	807.1	808.65	2.44	silty sandstone	Grant (Winifred)	NQ	1	
Roebuck Bay 1	34	834.55	837.6	3.05	sandstone	Grant (Winifred)	NQ	1	
Roebuck Bay 1	35	865.95	868.1	2.13	silty sandstone, diamictite	Grant (Winifred)	NQ	1	
Roebuck Bay 1	36	896.4	899.45	3.05	sandstone	Grant	NQ	1	
Roebuck Bay 1	37	926.6	929.65	3.05	sandstone	Grant	NQ	1	
Roebuck Bay 1	38	957.05	960.1	3.05	sandstone	Grant	NQ	1	
Roebuck Bay 1	39	988.15	991.2	2.74	sandstone	Grant	NQ	1	
Roebuck Bay 1	40	1012.25	1014.1	1.29	siltstone, sandstone, diamictite	Grant	NQ	1	
Sahara 1	1	307.55	310.6	2.13	siltstone, silty sandstone	?Poole	4"	pieces	pieces
Sahara 1	2	651.95	655	3.05	sandstone, siltstone	Grant	4"	pieces	pieces
Sahara 1	3	766.55	769.6	0		Grant	4"		
Sahara 1	4	869.3	872.95	0.76	sandy diamictite	Grant	4"	pieces	pieces
Samphire Marsh 1	1	748.9	756	3.3	siltstone	Grant (‘Cuncudgerie')	PQ	½	pieces
Samphire Marsh 1	2	1039.4	1043.9	2.1	siltstone	Grant (‘Cuncudgerie')	PQ	½	pieces
Samphire Marsh 1	3	1168	1173.2	3.0	sandstone	Grant (‘Cuncudgerie')	PQ	½	pieces
Santalum 1	NQ	132.6	250	~100%	sandstone, claystone, conglomerate	Clianthus/Calytrix/Hoya	NQ	1	
Santalum 1	NQ	250	287	~75%	sandstone, conglomerate, siltstone	Hoya	NQ	1	
Santalum 1	NQ	287	296	0%					
Santalum 1A	1	252.75	341	~50%	sandstone, claystone, conglomerate	Hoya/Ordovician	HQ	1	
Scarpia 1	1	483	501	14.2	sandstone, claystone	Poole	NQ	1	
Solanum 1	1	6	47	100%		Clianthus	NQ	1	
Solanum 1	2	93	254	~100%		Calytrix/Hoya/Ordovician	NQ	1	
St George Range 1	1	91.45	94.5	3.05	sandstone, minor siltstone	Grant (‘Binda')	PQ	1	
St George Range 1	2	167.65	170.7	2.44	sandstone, shale inclusions	Grant (‘Binda')	PQ	1	
St George Range 1	3	259.1	262.15	3.05	sandstone, minor siltstone	Reeves (‘Cuncudgerie')	PQ	1	
St George Range 1	4	545.9	548.95	3.05	sandstone, minor siltstone	Reeves (‘Cuncudgerie')	PQ	1	
St George Range 1	5	740.05	743.1	3.05	sandstone, shale inclusions	Reeves (‘Cuncudgerie')	PQ	1	
St George Range 1	6	1099.7	1102.75	0.61	sandstone	Reeves (‘Cuncudgerie')	PQ	1	
St George Range 1	7	1360.65	1364.6	3.96	sandstone, minor siltstone	Reeves (‘Cuncudgerie')	PQ	1	
Sundown 2	1	1095	1099	3.82	sandstone (oil stained), siltstone	Grant	4"		
Sundown 2	2	1099	1104.5	5.14	sandstone (oil stained)	Grant	4"		
Sundown 2	3	1104.5	1122.5	9.6	sandstone (oil stained to 1114 m)	Grant	4"		
Sundown 3	1	895	913	17.82	siltstone/sandstone	Poole	4"		

Appendix 2 (con tinued)

Well	*Core*	*Top (m)*	*Base (m)*	*Recovery (m)*	*Lithology*	*Unit*	*Comments*	*GSWA portion*	*GA portion*
Sundown 3	2	1086	1104	12.6	shale/siltstone and sandstone	Grant (Winifred/'Betty')	4"		
Sundown 3	3	1174	1192	15.84	siltstone and sandstone	Grant (‘Betty')	4"		
Sundown 4	1	1090	1108	18	sandstone	Grant (‘Betty')	4"		
Sundown 4	2	1172	1190	18	sandstone	Grant (‘Betty')	4"		
Terrace 1	1	934	943.17	9.2	sandstone	Grant (Carolyn)	4"		
Thangoo 1A	11	464.8	470.3	4.88	siltstone, sandstone	Grant (Carolyn)	?PQ	0	0
The Sisters 1	1	443.8	446.85	3.05	silty shale	Noonkanbah	PQ broken up	1	
The Sisters 1	2	555.05	561.15	6.1	shale, sandstone, conglomerate	Noonkanbah/Poole	PQ	1	
The Sisters 1	3	798.9	805	6.1	sandstone	Grant	PQ	1	
The Sisters 1	4	1284.45	1287.8	3.35	sandstone with conglomerate bands	?Grant/Reeves	PQ	1	
The Sisters 1	5	1339.3	1344.8	5.49	sandstone, shale, siltstone	?Grant/Reeves	PQ	1	
The Sisters 1	6	1559.35	1561.5	2.13	sandstone	?Grant/Reeves	PQ	1	
Triodia 1	NQ	138	631	~100%		Calytrix/Hoya/Devonian	NQ	1	
Typha 1	HQ	106.5	127	~99%	siltstone, claystone	Clianthus	HQ	1	
Typha 1	NQ	127	395	~99%	sandstone, mudstone, conglomerate	Clianthus/Calytrix/Hoya/Devonian	NQ	1	
West Terrace 1	1	1057	1075	16.74	sandstone	Grant (Carolyn)	4" diameter		
West Terrace 1	2	1075	1084	8.6	sandstone/shale	Grant (Carolyn)	4" diameter		
West Terrace 1	3	1156.3	1174.7	18.4	sandstone	Grant (‘Betty')	4" diameter		
West Terrace 2	1	1150	1152	1.5	shale	Grant (Winifred)	4" diameter		
West Terrace 2	2	1152	1170	17.4	shale, sandstone	Grant (Winifred/'Betty')	4" diameter		
Whitewell 1	1	862	871	8.6	shale, sandstone	Poole	4" diameter		
Willara 1	1	1146.95	1150.6	3.66		Grant Gp	PQ	½	½
Willara Hill 1	4	691	696	0					
Willara Hill 1	5	696	698	0.2		Grant (Winifred)	6 cm length at GA	rubble	¾
Willara Hill 1	6	760	764	2		Grant (‘Cuncudgerie')	20 cm length at GA	rubble	¾
Wilson Cliffs 1	1	922.95	929.05	5.49	sandstone, conglomerate, siltstone	Grant	PQ	¼	¼
Yulleroo 1	1	689.9	698.45	5.18	sandstone	Reeves	PQ	¾	
Yulleroo 1	2	828.9	837.45	8.53	shale, sandstone	Reeves	PQ	¾	
Other bores									
BMR 3 Noonkanbah water bore	1	18.2	24.4	1.5	sandstone with plant remains	Grant	2¼" diameter		1

NOTES: Depths rounded to nearest 5 cm, portion indicates logitudinal cut
core diameter (mm): AQ 27.0; NQ 47.6; NX 54.7; HQ 63.5; PQ 85.0
formation names in brackets are from the well completion report
[1] formerly BMR Jugurra Creek 1
[2] formerly BMR Laurel Downs 2
[3] formerly BMR Wallal 4A
[4] depths from BMR Record 1975/77 app. B

Appendix 3

Summary of mid-Carboniferous to Lower Triassic stratigraphy

Unit	*Thickness (m)*	*Lithology relationships*	*Stratigraphic*	*Type section*	*Fossils and age*	*Depositional environment*	*Comments*	*References*
TRIASSIC								
Munkayarra Shale	Up to 100 m	multicoloured claystone	Conformably overlies Erskine Sandstone	RGI-2D waterbore 85–270 m (DERBY: 17°25'50"S 123°44'38"E PA)	?Middle–Late Triassic	Fluvial		Laws and Smith (1989)
Culvida Sandstone	Up to 207 (in BMR Cornish 2)	Fine- to coarse-grained sandstone; siltstone; poorly sorted granule and pebble conglomerate	?Conformably overlies and interfingers with Erskine Sandstone	1 km south of Culvida Soak (CORNISH : 20°14'00"S 126°56'00"E)	Plant fossils; Middle Triassic	Fluvial	Probably a local variant of the Erskine Sandstone	Casey and Wells (1964); Yeates et al. (1975); White and Yeates (1976)
Erskine Sandstone	Up to 200	Very fine to fine-grained sandstone	Conformably overlies Blina Shale	Erskine Range (DERBY: 17°50'20"S 124°20'22"E)	Macroflora of equisetaleans and lycopods, microflora; Olenekian to early Anisian	Fluvial	–	Crowe et al. (1978)
Blina Shale	Up to 500	Mudstone and fine-grained sandstone	Passes laterally into, and conformably overlies, Millyit Sandstone; disconformably overlies Chirup Formation and Liveringa Group	SE Erskine Range (DERBY: 17°51'27"S 124°21'43"E)	Vertebrates; conchostracans, plant remains, brachiopods and abundant microplankton, foraminifera; Scythian	Shallow marine	–	Yeates et al. (1975); Crowe et al. (1978); Towner and Gibson (1980)
Millyit Sandstone	Up to 90 (in BMR Lucas 13	Medium to fine-grained sandstone	Unconformably overlies Hardman Formation; disconformably overlies Condren Sandstone	Head of Spring Creek (CROSSLAND: 19°11'15"S 125°33'00"E)	Fossil plants indicate Late Permian to Early Triassic; palynology indicates early Triassic age	Fluvial	–	Yeates et al. (1975); Crowe et al. (1 978)
PERMIAN								
LIVERINGA GROUP	Up to 1000?	Sandstone and mudstone, minor coal and limestone	Abruptly overlies Noonkanbah Formation	Liveringa Ridge on south flank of Grant Range ((MOUNT ANDERSON: 17°52'57"E 123°55'00"E)		Shallow marine to fluvial	–	Forman and Wales (1981)
Hardman Formation	Up to 700	Sandstone and mudstone with minor coal and limestone	Conformably and disconformably overlies Condren Sandstone	Mount Hardman (NOONKANBAH: 18°18'40"S 124°38'50"E)	Brachiopods, bivalves, plant fossils (*Glossopteris*), and palynomorphs; Wuchiapingian	Shallow marine and fluvial	–	Forman and Wales (1981)
Cherrabun Member	Up to 100	Sandstone, siltstone and rare limestone	upper member of Hardman Formation	Tributary to Spring Creek (CROSSLAND: 19°9'46"S 125°33'27"E)	Macrofauna indicates late Wuchiapingian	Regressive marine	–	Yeates et al. (1975)

Appendix 3 (continued)

Unit	*Thickness (m)*	*Lithology relationships*	*Stratigraphic*	*Type section*	*Fossils and age*	*Depositional environment*	*Comments*	*References*
Hicks Range Sandstone Member	Up to 325	sandstone	middle member of Hardman Formation	Central Hicks Range (CROSSLAND: 19°13'14"S 125°53'51"E)	–	Fluvial	–	Towner and Gibson (1983)
Kirkby Range Member	Up to 300	sandstone, sandy siltstone	basal member of Hardman Formation	1.5 km west of Spring Creek on north scarp of Millyit Range (CROSSLAND: 19°09'33"S 125°34'14"E)	Macrofauna indicates early Wuchiapingian	Regressive marine	–	Towner and Gibson (1983)
Condren Sandstone	Up to 130	Sandstone	Conformably overlies Lightjack Formation	Condren Pinnacles (LUCAS: 20°06'01"S 127°38'01"E)	Plant fossils include *Gangamopteris* and *Glossopteris*; microflora indicates Late Permian age	Low-energy fluvial or deltaic, some swampy conditions	Well exposed in breakaways, cliffs, strike ridges, mesas, buttes, and low hills	Casey and Wells (1964), Yeates et al. (1975)
Lightjack Formation	Up to 300	Mudstone, sandstone, and conglomerate	Conformably between Noonkanbah Formation and Condren Sandstone or Hardman Formation; partly equivalent to Triwhite Sandstone	Lightjack Hill (NOONKANBAH: 18°59'16"S 125°50'47"E)	Bivalves, brachiopods, trace fossils, and plant fragments; *Atomodesma exerta* and *Stutchburia muderongensis* characteristic and indicate late Artinskian to early Kazanian age	Shallow marine to lagoonal and swampy	Forms prominent strike ridges, breakaways mesas, and hills	Yeates et al. (1975); Crowe et al. (1978)
Triwhite Sandstone	Up to 100	Sandstone interbedded with siltstone and intraformational claystone and conglomerate	?Conformably overlies Dora Shale; ?equivalent to upper Noonkanbah Formation and Lightjack Formation	1.6 km east of Dunn Soak (TABLETOP: 22°03'8.5"S 123°10'1.2"E)	Fossils including *Astartila blatchfordi* and *Atomodesma mytiloides* indicate Early Permian age	Shallow marine	–	Towner et al. (1976); Towner and Gibson (1980)
Noonkanbah Formation	Up to 640	Mudstone interbedded with sandstone	Conformable between Poole Sandstone and Triwhite Sandstone or Lightjack Formation	Near Bruten Hill (NOONKANBAH: 18°42'11"S 125°36'22"E)	Brachiopods, bryozoans, corals, crinoids, and molluscs; Artinskian	Shallow marine		Crowe et al. (1978)
Poole Sandstone	Up to 430	Sandstone and siltstone	Unconformably (in Fitzroy Trough) or disconformably (elsewhere) overlies Paterson Formation and Grant Group	Generally taken as southeastern Grant Range (MOUNT ANDERSON: 18°04'38"S 124°08'16"E)	Brachiopods, ammonites, bryozoans, foraminifera, bivalves, conodonts, crinoids, ostracods and conularids, leaf and root fossils; Late Sakmarian	Shallow water; fluvial and marine	–	Crowe et al. (1978); Towner and Gibson (1980)
Christmas Creek Member	Up to 25	Sandstone and pebbly sandstone	Upper member of Poole Sandstone	Mount Piper, Poole Range (NOONKANBAH: 18°53'50"S 125°48'00"E)	Artinskian based on ages of encloing units	Fluvial	Continuity in question as unit is cut out by channel within 500 m of type section	Crowe and Towner (1976)

Tuckfield Member	Up to 160	Sandstone, minor siltstone	Composed of most of the Poole Sandstone	Mount Tuckfield (NOONKANBAH: 18°42'5"S 124°53'30"E)	–	Deltaic to fluvial	–	Crowe and Towner (1976)
TRIASSIC								
Nura Nura Member	Up to 20	Calcareous quartz sandstone and sandy limestone	basal member of Poole Sandstone; disconformably overlies Grant Group	Nura Nura Ridge (MOUNT ANDERSON: 18°05'09"S 124°24'34"E)	Brachiopods, bivalves, bryozoans, foraminifers,` ostracods, ammonites; upper Sakmarian	Shallow marine	–	Guppy et al. (1958); Veevers and Wells (1961)
Paterson Formation	Up to 150	Claystone and siltstone	Unconformably overlies Precambrian, Devonian and possibly Ordovician rocks	Patterson Range (PATTERSON RANGE: 21°45'30"S 122°10'00"E)	Microfossils; Sakmurian in type area but also extends into Gzhelian in Gunbarrel Basin	Initially lacustrine and then fluvial under glacial influence	Associated with striated pavements on RUDALL	Towner and Gibson (1980); Jackson and van de Graaf (1981)
GRANT GROUP	Up to ?1000	Sandstone, conglomerate and mudstone	Disconformably overlies basement to mid-Carboniferous units, conformable to disconformable on Reeves Formation	Grant Range (MOUNT ANDERSON: 18° 02'S 124°05'E)	Rare macrofossils, and *P. confluens* palynoflora; Sakmarian–?Asselian	Non-marine and marine glacial	–	Towner et al. (1976); Crowe et al. (1978); Towner and Gibson (1980)
Carolyn Formation	Up to 415	Sandstone, conglomerate and mudstone	Conformably overlies Winifred Formation or disconformably overlies Lower Carboniferous and older rocks	Composite section: (NOONKANBAH: 18°44'20"S 124°54'30"E and 18°41'53"S 124°54'30"E)	Rare marine macrofossils, (including *Eurydesma* and *Deltopecten lyonensis*) and *P. confluens* palynoflora; Sakmarian–?Asselian	Non-marine and marine glacial	–	Towner et al. (1976); Crowe et al. (1978); Towner and Gibson (1980)
Millajiddee Member	Up to 70	Medium to coarse-grained sandstone	Conformably overlies Wye Worry Member	Western St George Range (NOONKANBAH: 18°44'29"S 124°55'51"E)	Trace fosssils, Sakmarian based on ages of enclosing units	Fluvial to tidally influenced	–	Crowe and Towner (1976)
Wye Worry Member	Up to 95	Siltstone with dropstones, sandstone	Conformably overlies undifferentiated Carolyn Formation	Eastern St George Range (NOONKANBAH: 18°46'45"S 125°18'44"E)	Trace fosssils, Sakmarian based on ages of enclosing units	Glacial lacustrine to shallow marine	–	Crowe and Towner (1976)
Deadea Sandstone Member	Up to 30	Medium to coarse-grained sandstone	Abruptly overlies Ngumban Claystone Member	Deadea Cliff (MOUNT RAMSAY: 18°45'4.7"S 126°4'56.2"E)	Probably lies in *P. confluens* palynozone; Sakmarian	?Glacial non-marine	Restricted to eastern-most Lennard Shelf	Playford (2002)
Ngumban Claystone Member	Up to 40	Siltstone with dropstones, minor sandstone	Unconformably overlies Devonian and older rocks	Deadea Cliff (MOUNT RAMSAY: 18°45'4.7"S 126°4'56.2"E)	Lies in *P. confluens* Zone; Sakmarian	Glacial lacustrine to ?lagoonal	Restricted to eastern-most Lennard Shelf	Playford (2002)
Winifred Formation	Up to 278 (in The Sisters 1)	Siltstone, minor limestone	Conformably overlies Betty Formation	13 km ENE well 26 on Canning Stock Route (TABLETOP: 22°52'57"S 123°36'27"E)	Crinoids, bryozoans, *P. confluens* palynoflora; Sakmarian	Glacial possibly lagoonal to lacustrine	Ttype section in isolated outcrop, position relationship to other units uncertain	Crowe and Towner (1976)

Appendix 3 (continued)

Unit	Thickness (m)	Lithology relationships	Stratigraphic	Type section	Fossils and age	Depositional environment	Comments	References
Betty Formation	Up to ?1714 (in Grant Range 1)	Sandstone and conglomerate/ diamictite, minor siltstone	Unconformably overlies pre-Permian rocks	Lake Betty 1 1058–1675 m (MOUNT BANNERMAN: 19°34'10"E 126°19'52"S)	Palynoflora; Sakmarian–?Asselian	Shallow water glacial environment	Subsurface only, appears to be equivalent to Hoya and Reeves Formations	Crowe and Towner (1976)
Clianthus Formation	Up to 170	Sandstone, minor siltstone	Upper formation of Grant Group on Barbwire Terrace	Pratia1 61–152 m (CROSSLAND: 19°21'50"E 125°0'14.3"S)	Brachiopods, foraminifera, *P. confluens* palynoflora; Sakmarian	Deltaic to fluvial	No glacial influence in type area (Barbwire Terrace)	Apak and Backhouse (1998, 1999)
Calytrix Formation	Up to 120	Siltstone claystone, fine-grained sand-stone, thin basal limestone	Middle formation of Grant Group on Barbwire Terrace	Pratia 1 152–236 m (CROSSLAND: 19°21'50"E 125°0'14.3"S)	*P. confluens* palynoflora; Sakmarian	Shallow marine to lagoonal	Little if any glacial influence in type area (Barbwire Terrace)	Apak and Backhouse (1998, 1999)
Hoya Formation	Up to 250	Sandstone, mudstone, and diamictite	Middle formation of Grant Group on Barbwire Terrace; unconformably overlies pre-Permian rocks including Reeves Formation	Pratia 1 236–298 m (CROSSLAND: 19°21'50"E 125°0'14.3"S)	*P. confluens* palynoflora; Sakmarian–?Asselian	Glacial shallow marine to fluvial	–	Apak and Backhouse (1998, 1999)
CARBONIFEROUS								
Reeves Formation	Up to 2000	Sandstone, mudstone, and diamictite	Unconformably overlies Lower Carboniferous strata	Fraser River 1 866–1174 m (modified herein; DERBY: 17°24'58"E 123°9'49"S)	*S. ybertii – M. tentula palynofloras*; Serpukovian–Gzhelian (mid- to late Carboniferous)	Glacial deltaic to fluvial	–	Apak and Backhouse (1998, 1999)
Anderson Formation	Up to 1800	Sandstone, siltstone and shale	Conformably overlies Fairfield Group	Grant Range 1 2404–3936 m (MOUNT ANDERSON: 18°00'48"S 124°00'22"E)	*G. maculosa* palynoflora; Visean	Continental– marine	–	McWhae et al. (1958); Playford et al. (1975)
SUPERSEDED OR ABANDONED UNITS								
Balgo Member	–	Sandstone and siltstone	Superseded by Lightjack Formation	Carnegie Bluff (STANSMORE: 21°48'45"S 127°56'50"E)	–	–	–	Casey and Wells (1964); Veevers and Wells (1961)
Braeside Tillite	–	Mudstone, sandstone, and diamictite	Considered part of Paterson Formation	3 km north-northwest of Braeside homestead on Oakover River (NULLAGINE: 21°11'05"S 120°59'15"E)	–	–	–	Wells (1959); Veevers and Wells (1961)
Binda Sandstone Member	About 100	Sandstone	Upper part of Grant Group	Lake Betty 1 764–868 m (MOUNT BANNERMAN: 19°34'6"S 126°19'57"E)	–	–	Possibly equivalent to Millajiddee Member	Nott (1973, unpublished)

Chirup Formation	About 40	Interbedded grey to black carbonaceous shale, and fine-grained to conglomeratic sandstone	Unconformably overlies Grant Group, equivalent to Liveringa Group	Chirup 1 499–538 m (MANDORA: 19°50'54.5"S 120°26'9.7"E)	Microflora; late Permian	Shallow marine	Only known from Chirup 1	Towner and Gibson (1980)
Cuncudgerie Sandstone	About 40	Sandstone, minor siltstone	Equivalent to Poole Sandstone	16 km east-southeast of Cuncudgerie Hill (PATTERSON RANGE: 21°02'24"S 121°40'47"E)	Macrofauna equivalent to that in Nura Nura Member, Poole Sandstone	–	–	Wells (1959); Veevers and Wells (1961)
Dora Shale	About 12	Mudstone, minor sandstone	Equivalent to Noonkanbah Formation	East side Lake Dora at (PATTERSON RANGE: 21°58'00"S 122°56'40"E)	Foraminifera; Artinskian	–	–	Veevers and Wells (1961); Foreman and Wales (1981)
Godfrey Beds	Up to 90 in outcrop	Sandstone, minor mudstone, and conglomerate	Straigraphic position poorly known: possibly disconformable on Condren Sandstone, unconformable on older units	Near Godfreys Tank, 3 km east-northeast of Twin Heads (CORNISH: 20°14'07"S 126°32'16"E)	Trace fosssils	–	Outcrops on CORNISH and LUCAS; possible equivalent to part of Hardman Formation	Elliot et al. (1958), Crowe and Muhling (1978); Forman and Wales (1981); Veevers and Wells (1961)
Lucas Beds	Probably over 200 m	Sandstone, minor shale and dolomite	Originally considered equivalent to the Noonkanbah Formation	Yam Hill (LUCAS: 20°50'28"S 128°42'59"E)	Unfossiliferous	–	Bed of Lake White nominated as type by Casey and White (1964) on STANSMORE, but 2nd edition map shows no outcrop of the unit there; the name has been applied to ?Devonian stata in NT	Casey and Wells (1964); Veevers and Wells (1961); Playford et al. (1975)

Appendix 4

Formation picks

Well	*Ersk.*	*Blina*	*Liver.*	*Noon.*	*Poole*	*NN*	*Grant*[a]	*Caly.*	*Hoya*	*Win.*	*Betty*	*Ree.*	*base G/R*	*Comments*	*TD*
Abutilon 1	a	a	a	a	a		47	[b]?132.45	[b]240.6			a	[b]327.3		850.3
Acacia 1	a	a	a	a	a		41	139	[b]220.1			a	[b]361.6		1208.7
Acacia 2	a	a	a	a	a		56	?160	245			a	374		1575
Anna Plains 1	a	a	a	a	a		653			?684	?735	?a	1023		1161
Antares 1	a	a	a	a	a		57	266	290			a	326		1298.5
Aquanita 1	a	33	333	545	798		871			?988	?1022	?1338	1580		3000
Aquila 1	a	a	a	a	a		467					a	672		1735
Aristida 1/1A	a	a	a	a	?		?90	136	151			a	205		734
Atrax 1	a	a	a	32	?117		?161	?391	?428			?569	586		786
Auld 1	a	a	a	?a	76		?117	?209	?280		?500	?715	795		817
Babrongan 1	a	a	a	110	178	260.9	266.4					?	699		1949.2
Barlee 1	a	a	a	a	a		a					a	a	No Permian	2469.2
Barbwire 1	a	a	a	a	a		0	67	129			a	143		1071.4
BHP Brooke 1	a	a	a	a	a		231	231	?393			a	787		2469.2
BHP PND 1	a	a	?	137	311	a	351	a	?351			NP	NP		500.15
BHP WRD 1	a	a	a	a	a		a					?	480		497.5
BHP Gingerah Hill 1	a	a	a	a	a										3073
Bindi 1	a	8	338	629	990		1051	?1215	?1303	?	?	1442	1832		2507
Blackstone 1	5	9	319	500	780		846			930	967	1402	1486		3049.5
Blina 1	a	30	133	335	585		636			776	812	a	1104		2498
Blina 2	a	35	139	334	585		630			768	800	a	1076		1588
Blina 3	a	21	140	319	590		644			746	768	a	1125		1580
Blina 4	a	27.5	135	309	581		634			769	793	a	1071		1526
Blina 5	a	21	132	333	589.5		645			792	810	a	1124		1600
Blina 6	a	17	133	323	585		636			776	808	a	1107		1260
Blina 7	a	5	145	343	599		658			798	833	a	1125		1551
Blina 8	?7	50	160	333	606		667			793	830	a	1150		1550
BMR 04A Mandorah	a	?587	?612	?a	?644		?					?a	?	TD in eratic in Grant Group or basement	679
BMR 01 Mount Anderson	a	a	a	4	318		427						np		512
BMR 02 Noonkanbah	a	a	a	a	a		9					a	53		1219
BMR Billiluna 1	a	a	a	0	43		76						np		123
BMR Cornish 1	a	a	0	np	np		np						np	0–51 Condren, 51–164 Lightjack	164
BMR Cornish 2	np	np	np	np	np		np						np	6–213 Culvida, 213–227 Erskine	227
BMR Cornish 3	np	np	np	np	np		np						np	99.1–109.7 Godfrey	109.7
BMR Crossland 1	a	a	0	np	np		np						np	0–75 Hardman, 75–150 Condren, 150–262 Lightjack	262
BMR Crossland 2	a	a	0	np	np		np						np	0–138.7 Condren [possibly all Lightjack]	138.7
BMR Lucas 13	np	0	178	np	np		np						np	0–85 Blina, 85–178 Millyit, 178–189 ?Godfrey	189
BMR Lucas 14	a	a	0	np	np		np						np	0–1.3 ?Godfrey, 1.3–102.1 Lightjack	102.1
BMR Mount Bannerman 1	a	a	64	np	np		np						np	64–152 Condren, 152–203 Lightjack	203
BMR Mount Bannerman 2	a	a	0	np	np		np						np	0–82 Condren, 82–139 Lightjack	139
BMR Mount Bannerman 3	a	a	a	a	0		32						np		93
BMR Mount Bannerman 4	a	a	a	5.5	29		58						np		151
Boab 1	a	a	a	a	a		64	?64	[b]179.3			a	[b]209.5		1033.4
Booran 1	5	?118	519	696	1236	1301	1308			?1500	?1515	?1850	2252		2800
Boronia 1	a	7	124	348	644		697			833	877.5	a	1185		3391
Boundary 1	0	106	370	552	845		892			1146	?1225	?1380	1554		1670

Boundary Southeast 1	4	106	360	546	841		889			1143	1210	?1369	1542		1710
Caladenia 1	a	a	a	a	a		40	40	(b)110.45			a	(b)139.9		296.5
Calamia 1	a	a	a	a	a		477	645	765			a	888		1700
Calytrix 1	a	a	a	a	?3		32	143	200			a	399	?Noonkanbah Fm outcrops nearby	450
Canegrass 1	a	0	134	264	555	598	601	?881	?958			?a	1175		2006.5
Canopus 1	a	a	a	a	a		157	275	337			a	365.5		1779
Capparis 1	a	a	a	a	a		51	120	175			a	212		521
Carina 1	a	a	a	a	a		367			?406	?491	a	664		1603
Cassia 1	a	a	a	a	a		49	200.5*	230*			?388.5	550		1576.6
Chestnut 1	a	a	a	0	?		40			203	233	a	448		2669
Chirup 1	a	a	498	a	a		630						np		762.6
Clianthus 1	a	a	a	?18	?30	?76	?84	225	310			a	np	?Noonkanbah Fm outcrops nearby	450
Contention Heights 1	a	a	a	88	175		221.5	475	540			?a	833		1790.7
Corbett 1	a	a	324	a	a		472	?740	?np				np	Basalt 333–343 m	800
Cow Bore 1	a	a	a	a	a		517	710	735			?1060	1106		2940
Crab Creek 1	a	a	a	486	711	784.5	792	966	1045			a	1263		1790
CRAE DD88CL1	a	a	a	?60	?100	a	197	?263	344.5			a	347.8	Fully cored	398.5
Crimson Lake 1	a	a	0	277	712		780			1055	1088	?1312	1471		1980.9
Crossland 1	a	a	a	a	a		?62	86	152			a	301		913.2
Crossland 2	a	a	a	?64	115		183	301	?427			a	660		914.4
Crossland 3	a	a	a	?9	?30		101	233	332			a	475.5		915.3
Crystal Creek 1	a	a	a	a	a		97	239	263			a	289		2504
Cudalgarra North 1	a	a	a	a	a		460	544	605			?1117	1169		1703
Cudalgarra 1	a	a	a	a	a		622	745	782			?a	1141		1550
Cudalgarra 2	a	a	a	a	a		520	606	650			a	1126		1220
Curringa 1	a	a	565	583	882	xx	920			?1138	?1158	?1267	1595		2335
Cycas 1	a	a	a	?0	441		535	?875	?900			1146	2132.5		3019
Dampier Downs 1	a	a	a	316	389	469	482	594	648			a	800		922.9
Dampiera 1A	a	a	a	a	a		49	133	335			a	378		1856.9
Darriwell 1	a	a	a	a	a		391	391	573			?1060	1239		1600
Dodonea 1	a	a	a	a	a		22	?	?			?a	334		2215
Dodonea 2	a	a	a	a	a		35	?	?			a	333		1688
Doran 1	a	a	a	a	a		182	?418	?475			?562	741		763.22
Drossera 1	a	a	a	a	a		16	16	60			?176	(b)440.55		450
East Crab Creek 1	a	a	a	477	676	750	758.5	a				a	1252		2813
East Yeeda 1	17	54	405	724	1148	1200	1217			?1456	?1468	1802	2299		3556
Edgar Range 1	a	a	a	a	a		112	185	260			?a	571		1968.1
Ellendale 1	a	a	5	268	620		?725			1015	1050	?1260	1425		3190.5
Eremophila 1	a	a	a	a	a		33	97	(b)191.7			a	228		1252
Eremophila 2	a	a	a	a	a		?45	85	186			a	228		360
Eremophila 3	a	a	a	a	a		19	78	193			a	297		464
Ficus 1	a	a	a	a	a		67	(b)171	(b)254			?375	475	On logs top Hoya = 254 m	1083.7
Fitzroy River 1	a	a	a	4	?377		498			?760	?805	?994	1715		3134
Frankenia 1	a	a	a	a	a		42	?162	?226			a	248		479
Frankenstein 1	a	a	a	69	207		?257	?390	?461		?628	?804	914		2803
Fraser River No 1 SH	a	a	a	a	a		234						np	No gamma-ray log or core	366.37
Fraser River 1	a	a	a	a	a		219			?411	?429	866	?1174	Base Reeves previously 1411 m	3091.9
Freeney 1	a	a	a	500	745.5	814	822	?944.5	?1005			np	np		1116
Frome Rocks 1	a	a	a	a	a		a					a	a	Salt below Mesozoic	1220.1
Frome Rocks 2	a	a	a	63	539	635.2	642.8	805	858			?989	1084		2287.2
Fruitcake 1	a	a	a	a	a		96					a	215		1696
Gap Creek 1	a	a	a	a	a		24					a	237		1541.2
Goldwyer 1	a	a	a	a	a		533			582	630	?759	849	?Limestone in Betty	1438.7
Goodenia 1	a	a	a	a	a		6					a	105		163.3
Grant Range 1	a	a	a	a	a		0	a				400	2396		3936.5

Appendix 4 (continued)

Well	*Ersk.*	*Blina*	*Liver.*	*Noon.*	*Poole*	*NN*	*Grant*[(a)]	*Caly.*	*Hoya*	*Win.*	*Betty*	*Ree.*	*base G/R*	*Comments*	*TD*
Great Sandy 1	a	a	a	a	a		702	856	903			a	1098		1770.8
Great Sandy 2	a	a	a	a	a		673	852	906			a	1102		1576.1
Grevillea 1	a	a	a	a	a		a					a	a		2581
Hakea 1	a	a	40	166	550		603.5			725	799	1107	1335		1703
Halgania 1	a	a	a	a	a		26	120	229			a	310		500
Hangover 1	a	25	207	440	770	825.5	828			?987	?1024	?1490	1539	No palynology in ?Reeves Fm	1655
Harold 1	a	a	a	6	221	a	?260			a	?	a	656		1550
Hawkstone Peak 1	a	a	a	a	a		15					a	186		1187.8
Hedonia 1	a	a	a	a	a		489			658	688	805	916		1543
Hibiscus 1	a	a	a	a	a		?65	170	261			?412	425		2394
Hilltop 1	a	a	a	a	a		491			585	615	a	953		1770
Hoya 1	a	a	a	a	?a		18	145	205			?	434	?Noonkanbah Fm outcrops nearby	450
Janpam 1	0	76	320	516	785	863	847			?940	?975	?	1394		2263
Janpam North 1	4	25	259	445	715	765	772			?800	?940	?a	1332		2202
Jones Range 1	a	a	a	a	a		73	73	167			?385	976		2541
Jum Jum 1	577	715	919	1110	1545		1604	1803	1852			?2139	2273		2600
Juno 1	a	a	a	a	a		563					1156.5	1344		1750
Justago 1	a	a	a	a	a		a					a	a	No mid-Carboniferous–Permian	3150
Kambara 1	a	a	a	655	809	843	852			?1168	?1201	?a	1570		3147
Kanak 1	a	a	a	a	a		528			?575	?622	?739	842		1365
Katy 1	a	a	30	330	704		763			?911	?934	?1260	1778		1952
Kemp Field 1	a	a	a	103	158		179	?344.5	?434			a	562		1181.1
Kennedia 1	a	15	110	303	600		657			?844	?858	a	1027		3387.5
Kidson 1	a	a	212	290	617		?680	?815	?896	815	1070	?1473	1570	Winifred Fm reference section	4431.5
Kilang Kilang 1	a	a	10	354	?660		?735	?883	?952.5			1147	?1701		2300
Kora 1	0	40	443	642	998	?1025	1047			1235.5	1271.5	?1525	?1580		3100
Kunzea 1	a	a	a	a	a		29	?125	?170			a	261		450
Lacepede 1A	a	a	2000	a	a		a					a	a		2286
Lake Betty 1	a	a	0	371	678		764	?956	1056			?1249.4	1657	Spudded near outcrop of Millyit Ss	3145.8
Lake Hevern 1	a	a	a	a			?a					?11	301		2296
Langoona 1	a	32	127	311	540	a	594			798	842.5	?1112	1274		1617
Leo 1	a	a	a	a	a		592			702	765	a	943		2411.3
Llyod 1	5	47	355	533	823		873			1125	1153.5	?1330	1432		2001
Llyod 2	5	90	355	534	819		869			1118	1153	?1332	1445		1580
Logue 1	a	a	a	165	405	505	512			927	1010	1359	1563		2698.7
Looma 1	a	a	a	a	a		0	185	265	185	330	?a	435		2535
Loris 1	0	146	410	608	917	?970	972			1221	1275	?1557	1596		1897
Lovells Pocket 1	a	a	a	a	a		225	377.5	388				445		1924
Lukins 1	a	a	7.5	49.5	306	a	?351			?	?	a	668		1675
Mahe 1	a	a	a	245	518	607.5	612	906.5	1011			np	np		1098
Mangaloo 1	a	a	?60	105	212		255.4	?415	?517			?657	794		3100
Mariana 1	a	20	181	362	632	678	691			754	785		1162		1700
Matches Spring 1	a	a	a	a	a		104					a	546		2834.6
May River 1	a	20	37	201	439	478.5	488.5			690	741	a	969		1677.9
Mclarty 1	a	a	a	a	a		126	?				a	462		2590.8
Meda 1	a	18	218	388	678	723	726			1012	1069	?1185	1281		2685
Meda 2	a	21	254	435	725	768	?780			1040	1113	?	1262		2325
Melaleuca 1	a	a	a	a	a		18	214	250			a or np	np		450
Mellany 1	a	a	5	173	436	a	478			780	829		1020		1476

Metters 1	a	a	5	247	646		730			996	1052	?1305	1450		1505
Millard 1	4	?181	575	790	1178	?	1235						np		1680
Mimosa 1	a	0	119	311	605		675			863	890	a	1088		4117
Minjin 1	a	a	a	745	789	819	827			?1210	?1235.5	?a	1549	Dolerite 1371–1476 m	1850
Mirabelia 1	a	a	a	a	a		38	129	227			a	309		2670
Mirabelia 2	a	a	a	a	a		15	131	225			a	301		2818.6
Missing 1	a	a	a	a	a		75	?75	?128.5				?293		1810
Moogana 1	a	?675	?713	?820	1118	1159	1167			?1370	?1390	?1675	1877		2213
Mowla 1	a	a	a	a	a		28	322	341			a	474		762.9
Mount Hardman 1	a	a	5	14	325		413			650	687	?996	1080		3360
Munda 1	a	a	a	a	a		410	?	?			?a	800		1066.8
Munro 1	a	a	a	a	a		491			874	903		1171		2115.6
Musca 1	a	a	a	a	a		505			?553	630	a	913		1535
Myroodah 1	a	a	0	435	823		?960					?	?	No gamma-ray log, partial SP log	1829.1
Napier 1	a	a	a	a	a		a					a	a	No mid-Carboniferous–Permian	1801.4
Napier 2	a	a	a	a	a		a					a	a	No mid-Carboniferous–Permian	1606.9
Napier 4	a	a	a	a	a		14					a	68		965
Napier 5	a	a	a	a	a		a					a	a	No mid-Carboniferous–Permian	1657.8
Needle Eye Rocks 1	a	a	a	a	a		a					a	a	No mid-Carboniferous–Permian	1664.9
Nemile 1	a	a	5	289	770		832			1021	1054	?1424	1559		1601
Nerrima 1 (AFO)	a	a	a	0	485		?597			867	938	?1226	?np	Lamporite sills over 68.6–257.6 m	2765
Ngalti 1	a	a	a	30	?f		?178	279	310	555	650	a	796		2758
Nita Downs 1	a	a	a	a	a		640	767	836			a	1174		1849
Nollamara 1	a	a	a	50	122		232					?a	867		1719
Notabilis 1	a	a	a	138	340		436					?767	803		2811.5
Nuytsia 1	a	a	a	80	139		252					a	825		1350
Olios 1	a	a	a	61	306		370	?555	?581			a	815		1963.5
Orange Poole 1	a	a	21	75	320		395			470	541	?a	829		1171.6
Padilpa 1	a	428	560	688	1041		1081			?1267	?1310.5	?1556	1791	Reeves overlies gabbro	2184.3
Palm Spring 1	a	a	a	6	155	a	204			355	371	a	462		1066.8
Pandorea 1	a	a	a	a	a		5	175	240			a	387		2274.5
Panicum 1	a	a	a	a	?0		?34	124	148			a	179		278
Pasminco BW9	a	a	a	a	a		10	?132	181.3			a	310		700
Parda 1	a	a	a	a	a		?612			?734	?782	a	980		1908.8
Patience 1	a	a	278	392	578		?621	?833	?863			a	1335		1869
Patience 2	a	a	?278	?392	585		?632	822.5	864			a	1343		4184
Pearl 1	a	a	a	706	902		?934	1152	1207			?1390	1853		2203
Pegasus 1	a	a	a	a	a		85	?166	234			a	408		2995
Pender 1	a	a	a	a	a		?441			463	495.5	?725	904.3	?Reeves overlies basement	911.7
Percival 1	a	a	a	?10	?a		47	155	237			a	448		2447.6
Perindi 1	a	a	a	a	828	867	877			1234	1256	?1720	1772	Dolerite 1379–1535 m	1867
Petaluma 1	a	a	4	274	916		1037			?1456.6	?1469.5		np		2086
Philydrum 1	a	a	30	186	582		645			890	908	?1120	1289		1608
Pictor 1	a	a	a	a	a		108	298	356			a	385		2146
Pictor 2	a	a	a	a	a		170	?	?			a	394		1085
Placer Camelgooda 1	a	a	a	50	118		206	?	?			a	760	Company picks based on cuttings	1170
Point Moody 1	a	a	a	18	?404	a	?485	?659	?734			?908	?1975		2441.1
Point Torment 1	7	23	?370	515	894	?939	?940			?1112	?1142	?1378	1516		2130
Poole Range 3	a	a	a	a	a	a	0					?	?		995
Poole Range 5	a	a	a	a	a	a	0					?	?np		470.9
Pratia 1	a	a	a	a	?		?6	152	236			a	300		464
Prices Creek 4	a	a	a	a	a		0						22		135.4
Puratte 1	425	549	784	1016	1435	1496	1504			?1670	?1715	?1900	2360		3750
Robert 1	a	a	a	a	a		51	110	158				367		1628

Appendix 4 (continued)

Well	*Ersk.*	*Blina*	*Liver.*	*Noon.*	*Poole*	*NN*	*Grant*[(a)]	*Caly.*	*Hoya*	*Win.*	*Betty*	*Ree.*	*base G/R*	*Comments*	*TD*
Roebuck Bay 1	a	a	a	477	538	606	624			778	874	a	1022		1222.25
Runthrough 1	10	180	455	655	981	1032	1031			?1286.5	?	np	np		1380
Sahara 1	a	a	a	59	295		362	445	531		?711	?863.5	931		2120.2
Sally May 1	a	a	a	a	a	a	?40	?40	?109.5			a	?365		1700
Samphire Marsh 1	a	a	a	a	a		688			?1008	?1036	?a	1240		2031.2
Santalum 1/1A	a	a	a	a	a		6	?180	?216			a	321		629.2
Scarpia 1	a	a	8	156	473		552			839	1033	?1144	1400		1600
Scrubby 1	4	131	390	586	881	?933	?936			1149	?np		np		1250
Selenops 1	a	a	a	28	55		92	?346.5	?375.7			?a	464		1263
Setaria 1	a	a	a	a	a		41.5	?	?			a	145.5	No logs	955.5
Sharon Ann 1	a	a	a	a	a		586			654	?708	a	890		1830
Solanum 1	a	a	a	a	a		12	?77	?105			a	137		834
South Auld 1	a	a	a	a	78		?129	?223	?286		?503	?670	803		857
Stansmore Range 1	a	a	?	?	np		np						np		106.7
Stansmore Range 2	a	a	0	27	np		np						np		102.1
Stansmore Range 3	a	a	3	27	70		?np						np		105.2
Stansmore Range 4	a	a	9	np	np		np						np		32
Stansmore Range 5	a	a	a	21	np		np						np		53.3
St Georges Range 1	a	a	a	a	a		0			?208	?240	?253	1420		4437.3
Sundown 1	a	26	229	449	777	?a	831.5			1017.5	1053.5	?1337	1470		2736
Sundown 2	a	17	222	444	785		840			980	1094	?	1451		1965
Sundown 3		32	214	444	779		835			?1022	1060		np		1220
Sundown 4	a	30	229	443	783		835			968	1090	?	1451		1800
Sundown 5	a	27	220	450	785		841			1017	1059.5		np		1151.7
Sunshine 1	a	a	a	a	a		?445			445	485	a	689		738
Sunup 1	a	12	73.5	339	756	?812	816			?1002	?1017	?1380	np		1500
Tandalgoo 2	a	a	a	55	np	np	np	np	np	np	np	np	np		152.4
Tandalgoo 3	a	a	a	109	np	np	np	np	np	np	np	np	np		125
Tappers Inlet 1	a	a	a	641	930	967	971			?1198	?1225	?a	1532		2856.3
Terrace 1	17	88	360	542	827	?	880			1124	1168	?1320	1565		2389
Thangoo 1	a	a	a	a	428	442	457			585	619	a	848		1654.8
Thangoo 2	a	a	a	a	a		422			498	545		788		1472
The Sisters 1	a	a	0	?159	560		617			?860	?885	?1230	1574	No mid-Carboniferous–Permian	2995.6
Thompsons 1	5	82	351	539	815	?868	877			946	980	?1433	1501		2009
Tridonia 1	a	a	a	a	a		17	58	160			a	196		631
Twin Buttes 1	a	a	a	a	a		461					a	662		1600.3
Typha 1	a	a	a	a	a		30	?	?			a	225		395
Valentine 1	0	62	400	534	926	?965	968			a		?1410.5	1798		3430
Valhalla 1	a	a	32	193	558		641			912	971	?1230	1449		3466
Vela 1	a	a	a	a	a		302			324	?384	a	659		1909
Wattle 1	0	143	409	575	900		953			1213	?1241	?1441	1590		3056
West Blackstone 1	8	32	303	488	766		834			921.5	958.5	?1459	1489		1943
West Kora 1	6	40	428	625	977	1000	1024			?1222	1264	?1528	1557		2606
West Philydrum 1	a	a	13	235	579		637			794	1120	np	np		1109
West Terrace 1	17	103	362	541	825		930	1120	1154	1041	1154		np		1250
West Terrace 2	4	85	357	535	825		931	1120	1157	1043	1157		np		1200
Whistler 1	a	a	a	a	418	440	453	573	612			a	833		884
White Hills 1	a	a	a	a	?a		?a					?14	998		4148
Whitewell 1	a	12	197	425	748.5		805			988	1029.5	?1426	1454		1753.8
Willara Hill 1	a	a	a	a	a		630			?630	?716	?	np		3903.3

Willara 1	a	a	a	a	a		513	637	707			?1212	1255		858
Wilson Cliffs 1	a	a	a	145	373		430	?640	?650			a	966		3722.2
Woods Hills 1	a	a	a	a	a		448	a	448			a	1081		1978
Yarrada 1	a	30	325	506	799	843	848			1100	1157	?1370	1559		3295
Yulleroo 1	a	a	a	a	a		?a					?443	858	?*Birkheadensis* implies Reeves	4572.3

NOTES:

(a) Presence of Calytrix and/or Hoya Formations implies top unit of Grant Group is Clianthus Formation, likewise Winifred and/or Betty Formations implies Carolyn Formation; conversely, the group is undifferentiated if no formations are indicated

(b) Formation pick from core

Ersk. Erskine Sandstone
Blina Blina Shale
Liver. Liveringa Group
Noon. Noonkanbah Formation
Poole Poole Sandstone
NN Nura Nura Member
Grant Grant Group

Caly. Calytrix Formation
Hoya Hoya Formation
Win. Winifred Formation
Betty Betty Formation
Ree. Reeves Formation
base G/R base Grant Group/Reeves Formation

a unit absent
np not penetrated
? presence uncertain
SP spontaneous potential

Appendix 5

Stratigraphic notes on selected wells

Introduction

These notes are intended to indicate some of the constraints and limitations in picking formations from well data. The wells are arranged by major basin subdivisions as discussed in the main text. Well locations are given in Appendix 1 and shown on Plate 1. The logs for individual wells shown on Plates 2–12 are referenced in the text. Cored intervals are summarized in Appendix 2, and preferred formation picks are in Appendix 3. Ages, if not referenced, are from Appendix 6 (Summary of biostratigraphic data); the relationship between biostratigraphic schemes and with the stratigraphy is summarized in Figure 2 and is discussed in the main text. Note that older palynological zones shown in Plates 2–12 are left uncoloured where their modern equivalents are ambiguous or uncertain. Well completion and associated reports, and digital data, can be retrieved from the Western Australian Petroleum and Geothermal Information Management System (WAPIMS) with the reference given in column 2 of Appendix 1. Company reports on mineral bores can be accessed via Western Australian Mineral Exploration Reports index (WAMEX).

Balgo and Betty Terraces

Atrax 1

The silty interval 32–117 m and underlying somewhat more sandy section 117–145 m were assigned to the Noonkanbah Formation and Poole Sandstone, respectively, in the well completion report. The base of the Poole Sandstone is here placed at 161 m based on a correlation with Olios 1 (22 km southeast) via Selenops 1 (12 km east) even though the gamma-ray log shows an overall fining-upwards response, which is atypical of the formation. Low outcrop 2.5 km east of the well questionably assigned to the Grant Group on the MOUNT BANNERMAN* geological sheet may be Noonkanbah Formation. Shallow drilling 7–14 km to the west of the well intersected probable Noonkanbah Formation (Hamersley Exploration, 1982). Thin limestone beds within the Grant Group (145–586 m) over 391–428 m indicate a possible correlation with the Calytrix Formation. The presence of Unit II palynomorphs over 408–566 m and correlation with Lake Betty 1 suggest that if the Reeves Formation is present it lies below 596 m (Plate 9).

Ngalti 1

Unit IV palynomorphs over 137 – 175.5 m confirms that the Noonkanbah Formation is present from about 112 to 178 m. The overlying interval is also placed in this unit rather than the Liveringa Group, as indicated in the well completion report, based on the low thickness of the Noonkanbah Formation below this depth and the distorted gamma-ray response above the casing shoe at 108 m.

The sandstone interval 178–279 m placed in the Poole Sandstone in the well completion report has a strongly ‘blocky' gamma-ray response; implying channel facies. There is no palynology available from this interval, and the facies is atypical of the Poole Sandstone. Correlation with Bindi 1, 56 km to the west-northwest, implies this interval may be within the upper Grant Group with a fault at 178 m removing the Poole Sandstone at this location. Kilang Kilang 1 (44 km south-southwest) shows a similar log response (although of higher resolution, and therefore apparently somewhat more thinly bedded) for the dominantly sandstone interval 660–804 m that similarly lies between palynomorph assemblages indicative of the Noonkanbah Formation and Grant Group. Correlation with Selenops 1 (80 km northwest) implies that 555–638 m is the Clianthus or Winifred Formation. By comparison, correlation with Kilang Kilang 1 implies 638–796 m is the Reeves Formation.

Olios 1

The presence of Unit III (*D. townrowii*) assemblage palynomorphs between 277 and 322 m and correlation with the fully cored BHP PND 1 (even though it is 124 km to the west-northwest) indicates that 306–370 m is probably the Poole Sandstone. An abrupt change to silty lithologies below and the presence of the Unit II (*M. tentula*) assemblage from 375 to 819 m implies a disconformable relationship with the underlying Grant Group (370–815 m). There are at least three high-density beds (402–404 m, 580–581 m, and 697–700 m) below silty sections which could be thin limestone beds although carbonates were not noted in the cuttings. A tentative correlation of 555–581 m with the Calytrix Formation is based on similarities with Selenops 1 (13 km northwest). Alternatively, the entire Grant Group in this well may correlate with the Hoya Formation.

Selenops 1

Correlation with Olios 1 (13 km southeast), places the Poole Sandstone at 55–92 m, as indicated in the well completion report, and confirms that the uppermost interval (29–55 m) is Noonkanbah Formation, even though the well lies about 1 km southwest of a small cluster of poor outcrops shown as Grant Group on the MOUNT BANNERMAN geological sheet. The interval 346.6 – 375.7 m in the Grant Group (92–464 m) is tentatively correlated with the Calytrix Formation even though the top is close to the casing shoe (347 m). The Hoya formation is 372 m

* Names shown in small capitals denote 1:250 000 map sheets.

thick compared to 408 m in Atrax 1 (12 km west) and 445 m in Olios 1 (13 km southeast). Unit II palynomorphs have been recovered from 150–360 m (Plate 9).

Barbwire Terrace

Abutilon 1 and Capparis 1

The gamma-ray log for Abutilon 1 is comprised of low resolution data (with spikes possibly corresponding to joins in the 3½" casing to 445.5 m), so formations have been picked primarily from the core. The Calytrix Formation (132.45 – 240.6 m) corresponds to a high gamma-ray interval above the Hoya Formation (240.6 – 327.3 m). In Capparis 1 (Plate 9), 1.7 km west, this formation is considerably thinner (120–175 m), as is the Hoya Formation (175–212 m), consistent with the usual westerly thinning of units across the Barbwire Terrace. Pasminco Barbwire BW 9, 1.1 km south-southeast of Abutilon 1, shows continued eastward thickening of the Hoya Formation (178.5 – 311.7 m). The foraminiferal assemblage from the Calytrix Formation in BW 9 is distinctly marine, and is similar to those from this unit in Hoya 1 (140 km southeast) and the 'Winifred Formation' in Roebuck Bay 1 (315 km northwest; DW Haig, 2009, written comm.).

Acacia 1 and 2

The wells show only minor differences in stratigraphy as they are just 50 m apart. The Grant Group is overlain disconformably by Jurassic or younger sandstone at 41.5 and 41 m, respectively. In Acacia 1 (Plate 8), which was fully cored from 39 m, a 2-cm diameter igneous pebble in fissile claystone at 185 m in the Calytrix Formation (148–220 m) is a possible dropstone. There is little evidence of glacial affinities above the Hoya Formation elsewhere on the Barbwire Terrace. In Acacia 2 the 13" casing shoe was set at 187 m within the Calytrix Formation (?160–244 m) hindering picking the top of the unit from the gamma-ray log. The Hoya Formation (220 – 361.6 m and 244–374 m, respectively) appears to sit unconformably on the Tandalgoo Formation and, in Acacia 1, contains Devonian limestone boulders up to 1.5 m across near the base of the unit, which is marked by a polymictic conglomerate. In Acacia 2 conglomerate extends down to about 357 m so the base of the unit may incorporate the sandstone assigned to the Tandalgoo Formation in Acacia 1. Either way, the Hoya Formation appears to be slightly thicker in Acacia 1. Palynomorphs from 71–289 m in Acacia 1 are from the *P. confluens* zone, and indicate some thinning within the Grant Group towards CRA CL1 (33 km northwest), in which the Clianthus Formation is 66 m thick compared to at least 113 m in Acacia 2.

Aristida 1/1A

The top of the Grant Group is somewhat arbitrarily placed at 90 m at the top of a sandy mudstone interval. The overlying sandstone is too oxidized to determine if it is Permian or Mesozoic. The assignment of 136–151 m to the Calytrix Formation is based largely on the gamma-ray log and follows Eyles et al. (2001, fig. 5). It represents one of the thinner sections of this unit above the Hoya Formation (151–205 m) on the Barbwire Terrace.

Barbwire 1

It is uncertain if the uppermost 67 m is the Jurassic Barbwire Formation or Permian Clianthus Formation. Jurassic strata outcrop 2.5 km to the northeast in Worral Range, and may extend to the well location. The Calytrix Formation (67–129 m) overlies thin Hoya Formation (129–143 m) above Devonian limestone (Plate 8). There is no paleontology available from the Permian section.

BHP WRD 1

Drilled near the north end of seismic line W82-021B on the southwest side of the Fenton Fault, the cored section above the Devonian (279–480 m) appears to be entirely within the upper Carboniferous Reeves Formation based on preliminary palynology by J Backhouse (Appendix 6). There are no wireline logs and the cuttings descriptions do not allow differentiation of the Grant Group/Reeves Formation, let alone formations within the Grant Group, from the upper part of the hole. Sandy diamictite beds are common in the cored section, but most clasts appear to be angular fragments of Devonian carbonate — there are relatively few exotic clasts — implying these beds are a fault talus rather than a glacial deposit. Another significant difference to other sections of the Reeves Formation on the Barbwire Terrace is that the *A. concinnus – S. ybertii* assemblage (294.5 – 393.3 m) represents an older part of the formation whereas other occurrences of the formation in the region lie within the *D. tenuistriatus* or *D. birkheadensis* zones. The nearest well, Barbwire 1 (12 km west), lacks a Carboniferous section.

Boab 1

The Grant Group (64 – 209.5) contains a relatively thick Calytrix Formation (64 – 179.3 m) above a thin section of the Hoya Formation (179.3 – 209.5 m).

Caladenia 1

The well intersected the Calytrix (40 – 110.45 m) and Hoya (110.45 – 139.9 m) Formations overlying Devonian carbonate (Plate 8). The nearest well, Drossera 1 (7 km west), shows a considerably thicker Hoya Formation (184 m, and the Reeves Formation is also present), but lies on the Crossland Platform.

Calytrix 1, Clianthus 1, Hoya 1, and Percival 1

Drilled in an approximately north–south line of 9.3 km near the western limit of CORNISH (Plate 8), the first three are the eponymous wells for the tripartite division of the Grant Group on the Barbwire Terrace first proposed by Redfern (1991). Although Calytrix 1, Clianthus 1, and Hoya 1 were fully cored from a short interval below the top of the Grant Group, Apak and Backhouse (1999) chose Pratia 1 (156 km to the northwest) as the type section for these units based on Redfern and Millward (1994). Log correlations imply that Clianthus 1 (the northernmost of the 4 wells) has the most complete cored intersection of this unit (84–225 m): only the uppermost 28 m were not cored. Picks for the top of the group in Percival 1 (47 m), Calytrix 1 (32 m), and Hoya 1 (18 m) are tentative as it is difficult to be certain if the shallow section is Poole Sandstone. In Percival 1 the silty interval 10–47 m may be the Noonkanbah Formation sitting directly on the Grant Group. By comparison, Redfern (1991) placed the top of the Grant Group at 152 m in Clianthus 1 (probable *P. confluens* zone palynomorphs have since been recovered from 112–447 m), 78 m in Calytrix 1, and 72 m in Hoya 1. He infers that the overlying section is the Nura Nura Member whereas Foster and Waterhouse (1988) followed the company interpretation that this is weathered but without indicating an age. Unfortunately the only core above this level from Clianthus 1 is oxidized and contains little fine-grained material suitable for palynology. Higher in Clianthus 1 (30–84 m) the gamma-ray log shows two poorly defined upward coarsening cycles with a possible calcareous siltstone at the base (76–84 m). However, there is no paleontology to confirm that these intervals are the Poole Sandstone and Nura Nura Member, nor were any calcareous lithologies indicative of the member noted in the cuttings. Outcrop near the wells (shown as Noonkanbah Formation) is extremely poor. The Grant Group is less than 400 m thick in these wells, and appears to correlate well with Bindi 1 and Kilang Kilang 1 on the northern margin of the Fitzroy Trough (Plate 12).

Cassia 1

The dominantly siltstone interval 200.5 – 230 m with minor limestone is assigned to the Calytrix Formation on the basis of correlation with the nearest well, Melaleuca 1 (6.2 km north-northeast), in which the formation was encountered at a similar depth (214–254 m; Plate 8). Alternatively, the predominantly siltstone–claystone interval 297–388 m, corresponding to a sharp decrease in gamma-ray values just above the first thin polymictic conglomerate bed, may be this unit, but common contorted bedding implies a glacial origin (and therefore assignation to the Hoya Formation). The gamma-ray log shows some similarity to that of Jones Range 1, 45 km to the north-northeast on the Jones Arch. The siltstone intervals 200.5 – 230 m and 297 – 388.5 m appear to correlate with 214–260 m and 306–385 m in Jones Range 1, respectively. Although there is no palynology below 149–211 m (*P. confluens* zone), correlation with Melaleuca 1, in which the *P. confluens* zone extends to 450 m (TD), implies that the base of the Grant Group in Cassia 1 lies near or deeper than about 400 m. However, the interval 388.5 – 550 m immediately below a polymictic conglomerate is tentatively correlated with the Reeves Formation in Ficus 1 (375–475 m), Drossera 1 (244 – 440.6 m), and Mangaloo 1 (657–794 m). In these wells the base of the diamictite–sandstone succession is considerably deeper than other wells on the Barbwire Terrace, implying deeper local erosion, possibly along tunnel valleys.

CRAE DD88 CL1

The corehole (Plates 8 and 9) was drilled near the Dummer Fault (the boundary between the Broome Platform and Barbwire Terrace). The section is anomalous in that it contains possible Noonkanbah Formation (60–100 m), and Poole Sandstone (100 – 197.1 m) in an area where these units are otherwise absent. The nearest well to intersect these units unambiguously is Placer Camelgooda 1 (73 km northwest). Outcrop along the north side of the Dummer Fault (3.3 km northeast of the drillhole) depicted as Liveringa Group on the DUMMER geological sheet, does not accord with the Pasminco bore (BW 24) at the southern end of the fault, which reached the base of the Grant Group at 192 m. It is uncertain what Permian section is present in the nearest of the Pasminco bores (BW 27, 1.5 km east), apart from reaching the base of the Grant Group at 416 m, as there is insufficient data to re-evaluate this bore although it was fully cored from 276 m. Core gamma of the CL1 core reveals a series of coarsening upwards cycles comparable to wells and outcrop in the Fitzroy Trough. The 40-cm thick coal seam at the base of the Poole Sandstone is correlated with the basal rootlet bed of the formation in outcrop from St George Ranges to Poole Range, 50 km to the north. Palynology from 134.2 m and 336.4 m yielded the *P. pseudoreticulata* and *P. confluens* zones, respectively. Based on core gamma, the Grant Group (197.1 – 347.8 m) is similar to the nearest petroleum well (Barbwire 1, 28 km east) in that the Hoya Formation is thin (3.2 versus 14 m). Acacia 1 (33 km southeast) shows a similar gamma-ray response above the Hoya Formation, but that well yielded the *P. confluens* zone from up to 72 m, a level that appears similar to that from which the *P. pseudoreticulata* zone was found in CRAE CL1 on the gamma-ray logs. In CRAE DD88 CL1 there is some uncertainty if the overlying siltstone (263 – 344.5 m) is the Calytrix Formation, as it contains a very sparse foraminifera fauna and probably represents a marginal marine facies, whereas Hoya 1 and Pasminco Barbwire BW 9 contain a moderately diverse fauna, especially near the base of this formation (DW Haig, 2009, written comm.). Correlation to the west is more difficult as it is unclear if the Grant Group can be subdivided in the nearest wells on the Broome Platform (Robert 1, Fruitcake 1, Missing 1, and Santalum 1A). Correlation with Solanum 1 (32 km southwest) implies that the Hoya Formation thickens to the southeast, whereas the Calytrix thins. Minor bitumen was found in the basal 2.9 m thick diamictite of the Hoya Formation, and in the calcareous facies of the underlying Tandalgoo Formation.

Crossland 1

Correlation with the Eremophila wells 7 – 8.6 km southwest implies that the well spudded into Jurassic sandstone possibly overlying the Clianthus (?62–86 m), Calytrix (86–152 m), and Hoya (152–301 m) Formations (based on the gamma-ray log) above Devonian carbonate. However, core from BHP ARD 1, drilled within 50 m from Crossland 1 (as shown in WAMEX mineral exploration report Item A29288), reveals a monotonous interval (120–303 m) of thinly bedded siltstone and fine-grained sandstone, lacking glacial indicators or pebbles or coarse grains, sitting on Devonian carbonate. Stage 2 —

P confluens zone palynomorphs recovered from 302 m are compatible with the Grant Group. There is no wireline log for the mineral hole, but their proximity and similar depths to the base of the Permian indicates a close correlation. Also implied is that the gamma-ray log in Crossland 1 possibly does not provide a reliable guide to formations within the Grant Group. Nevertheless, correlation with Crossland 2 and 3 (Fig. 5.1) shows that at least the Calytrix Formation has a consistent gamma-ray response.

Crossland 3

Drilled within 2 km of outcrop of the Noonkanbah Formation on DUMMER, the formation appears to be restricted to 9–30 m. The base of the Poole Sandstone could be either at 62.5 m or 102 m. There is no biostratigraphy above 158 m and too few wells in the region to correlate with to determine which is the most likely pick. However, the high-gamma interval 94.5 – 102 m could be equivalent to a likely calcareous interval in the nearest other well, Clianthus 1 (76–84 m), 36 km east-southeast. Correlation with Crossland 2 (83 km west-northwest) indicates the likely Poole Sandstone in that well has a significantly different log character. Correlation with Clianthus 1 and Crossland 2 shows that the Grant Group can be divided into the Clianthus (?62.5 or 101 to 233 m), Calytrix (233–332 m) and Hoya (332 – 475.5 m) Formations (Fig. 5.1, Plates 8 and 12).

Dampiera 1A

The well was fully cored from 130 m and shows a thick dominantly siltstone succession from 133–335 m that is assigned to the Calytrix Formation, and a relatively thin Hoya Formation (335–378 m; Plate 8). By comparison, nearby wells show a thinner Calytrix Formation and a thicker Hoya Formation (Eremophila 3, 3.5 km west, 101 and 104 m; Ficus 1, 6.5 km south-southeast, 139 and 165 m; and Crossland 1, 6 km north-northwest, 66 and 149 m; respectively) suggesting local faults were active during deposition of these units. Alternatively, the top of the Calytrix Formation may be higher in wells east of Dampiera 1 to include a sandstone plus overlying siltstone interval (Ficus 1, ?89 m; Halgania 1, ?38 m; Cassia 1, ?134 m; Melaleuca 1, 107 m).

Dodonea 1–2

The gamma-ray log of rocks assigned to the Grant Group in these two wells (22–334 m and 35–333 m, respectively) shows little similarity even though they are just 2.8 km apart. This is puzzling as the drill rig, hole size, casing, and logging contractors were identical, and similar mud additives were used for both holes. Neither well has a calliper log over the Grant Group, nor was that section cored. The differences between the wells either indicates rapid changes in glacial facies, or the proximity of Dodonea 1 to a fault active in the Early Permian.

Eremophila 1–3

The three wells (Plate 8) show the Hoya Formation thickening to the east from 36 to 104 m whereas the overlying Calytrix Formation shows relatively little variation (94.7 – 101 m). The weathered sandstone above the Clianthus Formation is either weathered Grant Group or Jurassic; assignment of this section to the Poole Sandstone as implied by Redfern and Williams (2002, fig. 9) is not supported by the log response, but there is no palynology available from these sections to confirm either interpretation.

Ficus 1

The Calytrix Formation (171–254 m) is picked on the basis of the predominantly siltstone succession from the core coincident with an abrupt decrease in the gamma-ray log, and is in agreement with Apak and Backhouse (1998, Plate 8). By comparison, Eyles et al. (2001, fig. 5) and Redfern and Williams (2002, fig. 9) show the base of the unit at 312 m. The interval in question (254–312 m) is a thin-bedded, fine-grained sandstone with no obvious glacial character to justify the identification of the Hoya Formation. The presence of the *D. tenuistriatus* zone at 450 m led Eyles et al. (2001) to place the interval 424–475 m within the Reeves Formation). The top of the Reeves Formation is here tentatively placed at the major lithology/log break at 375 m. By comparison, Redfern and Williams (2002, fig. 9) placed the entire interval 312–475 m in the Hoya Formation.

Frankenia 1

Lithologically, the mudstone interval 162–226 m can be assigned to the Calytrix Formation (Plate 9), but correlation with the nearest wells (Dodonia 1 and 2; 11 and 8 km northwest, respectively) implies only the Hoya Formation is present within the Grant Group.

Goodenia 1

According to the well completion report: the uppermost 90 m is weathered but contains igneous and metamorphic rock fragments; 90–96 m was assigned to the 'middle mudstone member', which usually equates with the Calytrix Formation; and 96–105.2 m is a basal polymictic conglomerate dominated by angular dolomite clasts from the underlying unit. Coring commenced at 100 m and there is no palynology available above 105.2 m. The gamma-ray log was run through surface casing, hindering correlation with even the nearest well (Ficus 1, 8.8 km northwest).

Halgania 1

The intervals 120–229 m and 229–310 m are assigned to the Calytrix and Hoya Formations, respectively, following Eyles et al. (2001; see Plate 8). The highest diamictite and granite clasts are near the top of the Hoya Formation.

Hibiscus 1

The intervals 170–261 m and 261–412 m are correlated with the Clianthus and Hoya Formations on the basis of a gamma-ray log correlation with Halgania 1 and Mirbelia 1

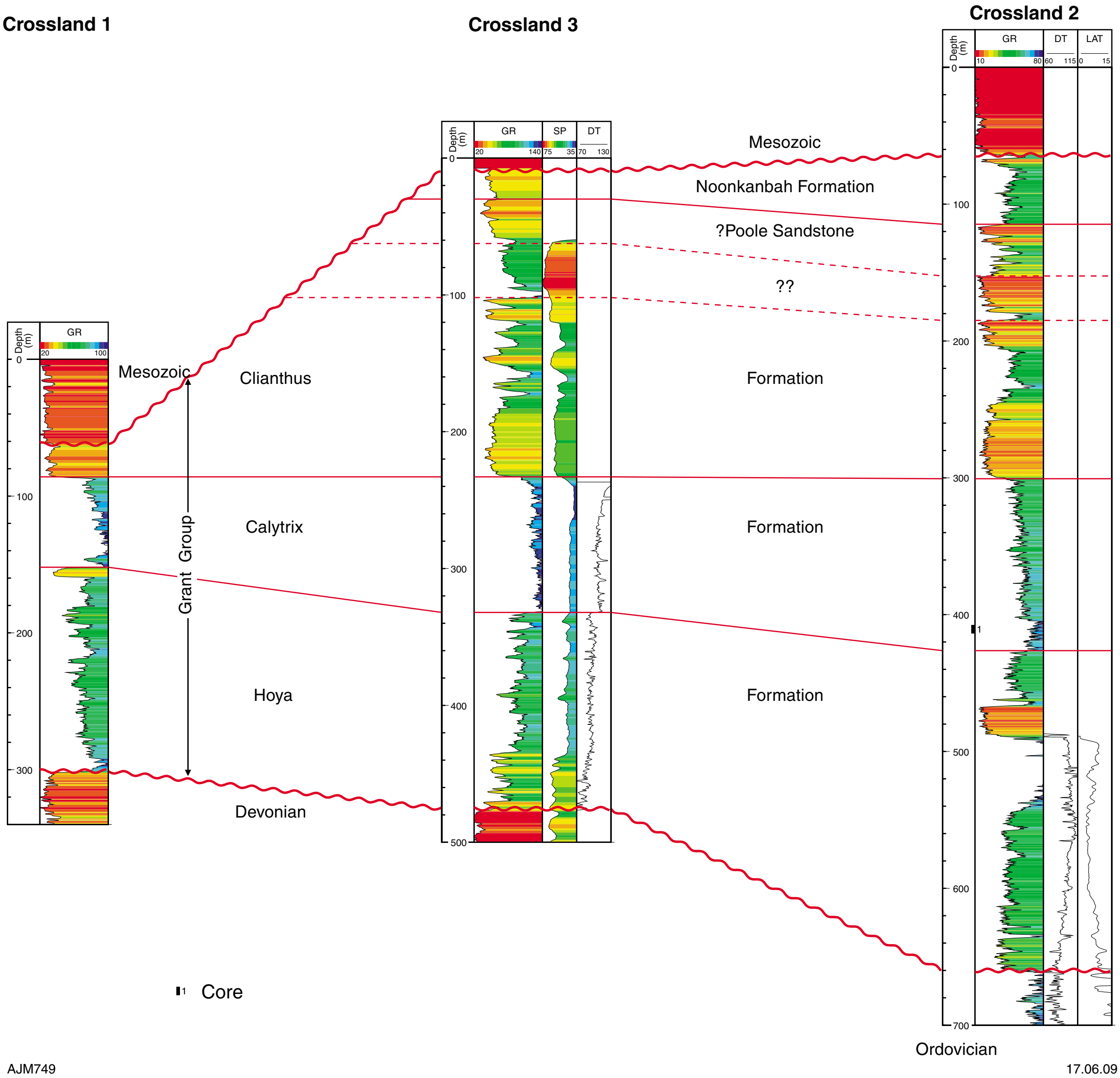


Figure 5.1. Correlation of Crossland 1–3, Barbwire Terrace – Crossland Platform.

and 2 (7 km southwest and west-southwest). The clean sandstone over 412–425 m could correlate with the Reeves Formation in Mangaloo 1 (15 km east-northeast; Plate 9). There is no core or palynology available from the Grant Group in both wells.

Mangaloo 1

The well was drilled south of the Fenton Fault, 8 km southeast of poorly exposed Lightjack Formation. Unspecified Permian palynomorphs from cuttings over 80–90 m were ignored in the well completion report, and Unit IV palynomorphs in cuttings from 140–145 m were interpreted as from the Poole Sandstone, but are here considered as possibly from the Lightjack and Noonkanbah Formations, respectively. The top of the Poole Sandstone is tentatively placed at a small decrease at the gamma-ray log at 212 m indicative of a more sandy succession. The base of the Poole Sandstone is poorly constrained but is here placed at 255.4 m coinciding with the base of the low gamma-ray response following the position of this boundary in Olios 1 and Selenops 1 (120 km west). Unit II palynomorphs (305–485 m) were recovered only from the upper part of the Grant Group. The lack of age control until 842.5 m (*G. spiculifera* zone) hinders a clear assignation of the top of the Reeves Formation: the clean sandstone interval commencing at 657 m is tentatively assigned to the Reeves Formation based on correlation with Lake Betty 1 (26 km north-northeast; Plate 9).

Melaleuca 1

Following Eyles et al. (2001) and Redfern and Williams (2002) 18–214 m is assigned to the Clianthus Formation, 214–250 m to the Calytrix Formation, and 250–450 m

(TD) to the Hoya Formation (Plate 8). The *P. confluens* zone is present below 124.5 m to TD.

Mirbelia 1 and 2

The wells were drilled 210 m apart and show similar logs indicating the Clianthus Formation is at least 116 m thick, the Calytrix Formation is 94–98 m thick, and the Hoya Formation is 76–82 m thick. The Reeves Formation is assumed to be missing: neither well has palynology or core available in the Grant Group (Plate 9).

Pandorea 1

The lack of core and dissimilarity of the wireline logs to nearby wells (Aristida 1/1A, 4.75 km south; Ficus 1, 6.4 km northwest; and Goodenia 1, 12 km east) hinders subdivision of the Grant Group (5–387 m). The assignment of 175–240 m to the Calytrix Formation is tentative.

Panicum 1

The Grant Group (34–179 m) is divided into the Clianthus (34–124 m), Calytrix (124–147 m), and Hoya (147–179 m) mainly from the core descriptions following Eyles et al. (2001). No palynology is available.

Placer Camelgooda 1

This mineral exploration hole was drilled 2 km southwest of the Fenton Fault at the northwest end of the of the Barbwire Terrace and so has more in common with Nollamara 1 and Nuytsia 1 on the Mowla Terrace (15 and 20 km east) than the nearest other well on the Barbwire Terrace (Barbwire 1, 91 km southeast). The well lies 1.6 km south of outcrop of the Noonkanbah Formation, which it intersected at 50–118 m below presumed Jurassic strata. Formation picks are based on the gamma-ray log. Neither core nor palynology is available so the presumed lack of the Reeves Formation follows the interpretations of Nollamara 1 and Nuytsia 1. The Grant Group (206–760 m) was split into 3 units in the well completion report based on a fine-grained interval at 350–380 m determined from cuttings. This interval cannot be differentiated as either Calytrix or Winifred Formations as the gamma-ray log does not clearly differentiate this unit, and the overlying interval had abundant lithic grains and pebbles, atypical of the overlying units. The basal part of the Poole Sandstone (118–206 m) is dominated by carbonaceous shale and is not differentiated as the Nura Nura Member here.

Pratia 1

Apak and Backhouse (1999) chose this well as the type section for the Hoya (236–298 m), Calytrix (152–236 m), and Clianthus (61–152 m) Formations based on Redfern and Millward (1994). The disadvantage of using this well as the type section is that it is unclear if it intersected the top of the Clianthus Formation, and there is no palynology available. However, the range of the *P. confluens* zone in Acacia 1 (71–289 m; 3.8 km north) at least indicates that at least the top of the interval assigned to the Clianthus Formation is within the Grant Group. Although Redfern and Millward (1994) indicate the presence of the Poole Sandstone above 61 m, it is equally possible that the Clianthus Formation was intersected from 6 m (as depicted in Plates 8 and 9). Unfortunately, the stratigraphic position of this part of the section is unclear — coring commenced at 22 m, but the section is strongly oxidized, so attempts to recover palynomorphs are unlikely to succeed. Note that the top of the Calytrix Formation (152 m) was picked from the core rather than the change in log response associated with the casing shoe (150 m).

Setaria 1

There is no core available; picks for the Clianthus (41.5 – 58 m), Calytrix (58–74 m), and Hoya (74–145.5 m) Formations are based on cuttings descriptions and the gamma-ray log.

Solanum 1

The interval 77–106 m, referred to as the 'middle mudstone member' in the well completion report, is probably the Calytrix Formation; it largely coincides with a gap in the core. The unit is intermediate in thickness between Pratia 1 (84 m, 4 km east), and Setaria 1 (16 m, 4.3 km southeast). The Hoya Formation (105–137 m), by comparison is thinner than in either of these two wells (62 m and 71 m, respectively; Plate 9).

Triodia 1

The interval 58–160 m is assigned to the Clianthus Formation, 8 m higher than shown by Eyles et al. (2001) thereby placing thinly bedded sandstone with small exotic pebbles in the Hoya Formation (160–196 m). The thicknesses of units in the Grant Group are similar to those in Mirbelia 1 and 2 (13 km east-southeast).

Typha 1

The interval 101–131 m is tentatively assigned to the Calytrix Formation following its designation as the 'middle mudstone member' in the well completion report. The Hoya Formation (131–225 m) is noticeably thicker than in the nearest well (32 m, Panicum 1, 6.5 km east-southeast). However, the wireline logs do not support this correlation that is based largely on core descriptions.

Broome and Crossland Platforms, Jurgurra and Mowla Terraces

In the following wells the Permian succession is limited to a thin section of Grant Group. which is difficult to subdivide, and for which no conventional core is available: Antares 1, Aquila 1, Canopus 1, Crystal Creek 1 (Plate 7), Fruitcake 1 (Plate 7), Hilltop 1, Kanak 1, Looma 1, Lovells Pocket 1, Matches Spring 1, McLarty 1, Missing 1 (Plates 7 and 9), Mowla 1, Pictor 1 and 2, Robert 1 (Plates 7 and 8), Sally May 1 (Plate 9), Sharon Ann 1 (Plate 11), Sunshine 1 (Plate 11), and Twin Buttes 1 (Plate 10). These wells cover most of the Broome Platform and Mowla Terrace and lie well south of the Fitzroy Trough. Based on the limited palynology available, the Grant Group in these wells appears to lie entirely within the *P. confluens* zone. BHP MBD 2, 3 km northeast of Crystal Creek 1, contains a low-yielding palynoflora of likely Stage 2 — *P. confluens* zone age from 303.5 m (10 cm above Devonian carbonates).

Antares 1, Mowla 1, and Pictor 1 and 2

Antares 1 was drilled 1.7 km west of Mowla 1, and the Pictor wells lie 3.8 km south of Mowla 1. All intersected the Grant Group with likely Calytrix/Winifred Formation thickest in the Pictor wells (58 m) compared to 24 m and 25 m in Antares 1 and Mowla 1, respectively (Plate 7). However, the identification of these mudstone intervals as Calytrix Formation depends more on relative position above the base of the Group rather than a similar gamma-ray log character to wells on the Barbwire Terrace. In Mowla 1 the ?Hoya/Betty Formation is relatively thicker (127 m) compared to the other wells (29–36 m). Possibly the upper mudstone interval (28–118 m) in Mowla 1 is the Noonkanbah Formation; if so, there may be a fault near the base of this interval as the Poole Sandstone cannot be identified unambiguously. The Reeves Formation appears to be absent.

Babrongan 1

The Poole Sandstone (178 – 266.4 m) is picked from the gamma-ray log and the Nura Nura Member (260.9 – 266.4 m) as described in the well completion report. No subdivision of the Grant Group (266.4 – 669 m) is possible on the gamma-ray log.

BMR 01 Mount Anderson

There is no modern biostratigraphy although 17 cores were cut. Furthermore, wireline logs (SP and resistivity only) are available from just the upper 300 m making it difficult to confirm the formation picks in this well. The original formation pick for the top of the Poole Sandstone and the revised pick for the top of the Grant Group are accepted because they include predominantly sandstone in the cores cut as well as indicating a thickness for the Poole Sandstone (112 m) close to that in Babrongan 1 (88 m, 14 km southwest) and Notabilis 1 (96 m, 17.5 km west).

Canopus 1

The mudstone section 275–337 m within the Grant Group (157 – 365.5 m) shows a striking similarity to the gamma-ray log response of the Calytrix Formation in wells on the Barbwire Terrace (125 km east-southeast; Plate 7). D'Ercole et al. (2003, p.13, plate 2) indicate *P. confluens – S. ybertii* zones palynomorphs were recovered from approximately 390–630 m. This age appears to be from AGSO, but as the interval D'Ercole et al. (2003) ascribe to the Reeves Formation (?365.5 – ?707 m) has only cuttings samples available, and regional correlation does not indicate other sections of the Reeves Formation nearby, the palynomorphs are assumed to be caved from above 365.5 m. The broad zonal allocation is probably a function of a low yield and/or reworking.

Carina 1, Musca 1, and Vela 1

The 3 wells lie up to 20 km apart at the southern margin of the Broome Platform and 60 km from the nearest other wells. The Permian section is 300–400 m thick, and consists entirely of the Grant Group. All wells show a similar upward-fining trend. The tops of the Calytrix and Hoya Formations are tentatively placed at 406 m and 491 m, 553 m and 630 m, and 324 m and 384 m, respectively (Plate 11), although the position of the casing shoes in Carina 1 (431 m) and Musca 1 (564 m) create some difficulties in interpreting the logs from these wells.

Cow Bore 1

The Grant Group (517–1060 m) contains Unit II palynomorphs (568–730 m), here considered equivalent to the *P. confluens* zone, whereas the underlying shaly section (877–1099 m) has yielded possible Stage I (or lower Stage II) palynomorphs. The thin mudstone interval 710–735 m is tentatively assigned to the Calytrix/Winifred Formation. The fine-grained interval 1060–1106 m below a thick sandstone is here questionably assigned to the Reeves Formation based on correlation with Pearl 1 (75 km west-northwest; Plate 7).

Crab Creek 1

The formation picks in the well completion report are accepted with the tentative identification of the Calytrix/Winifred Formation (966–1045 m) based on a wireline-log correlation with Freney 1 (5.5 km west) and Roebuck Bay 1 (17 km south; Plate 7). Unit II palynomorphs (equivalent to the *P. confluens* zone) from 853–1273 m indicate the Reeves Formation is absent as Upper Devonian carbonate facies are present at 1263 m.

Crossland 2

Drilled 15 km west of low outcrop of the Noonkanbah Formation on the northern edge of DUMMER, the well possibly intersected Cenozoic–Mesozoic strata to 64 m above the Noonkanbah Formation (64–115 m). Correlation with the nearest wells 30 km to the northeast on the Barbwire Terrace is complicated by the reduced thickness of the Grant Group and general lack of overlying units there. Similarly, correlation to the west is not clear (Plate 7). Correlation with Crossland 3, 83 km east-southeast, is only obvious for the Calytrix Formation (301–426 m). The base of the Poole Sandstone could be placed at either 152.5 m or 185 m; the lack of modern palynology and logs other than gamma-ray above 213 m does not help resolve this choice. Within the Grant Group the Hoya Formation (426–660 m) shows little similarity with that formation in Crossland 3 (Fig. 5.1).

Dampier Downs 1

The revised WAPET formation picks are accepted, with the exception of those for the Nura Nura Member. The original picks in the well completion report for that unit (468.8 – 482.2 m) appear reliable as they are consistent with nearby wells. The mid-Grant Group shaly interval (594–648 m) contains pebbly mudstone suggesting a correlation with the Calytrix Formation on the Barbwire Terrace is unlikely. Lower Unit II palynomorphs from 621.6 – 739.6 m imply the Reeves Formation is absent or very thin (Plates 7 and 10).

Doran 1

The silty interval 418–475 m within the Grant Group (182–?562 m) is tentatively assigned to the Calytrix/ Winifred Formation although 'tillitic sandstone' 20 m above in core 7 indicates the formations from the Barbwire Terrace may not be directly applicable. The presence of *S. ybertii* palynomorphs over 566–652 m implies the interval 562–741 m lies within the Reeves Formation but correlation with nearby wells implies the palynomorphs may be reworked as the Grant Group appears too thin (Plate 10). Furthermore, the *S. ybertii* zone is rare south of the Fitzroy Trough.

Drosera 1

The well lies 2.6 km west of the Dummer Fault and is therefore on the Broome Platform, but shows similarities to nearby wells on the Barbwire Terrace. The dominantly siltstone interval 16–60 m is assigned to the Calytrix Formation. Possibly influenced by the presence of the *P. confluens* zone at 110.9 m, Apak and Backhouse (1999) placed the base of the Grant Group at the log break at 111 m whereas Redfern and Williams (2002), taking heed of the presence of the *D. tenuistriatus* zone over 254–311 m indicated 110–441 m was within the lower Hoya/Reeves Formations. In core the log break at 111 m appears to lie within a coarsening up cycle from 176 m to 60 m, here assigned to the Hoya Formation. The top of the Reeves Formation could be placed above the *D. tenuistriatus* zone at either of the significant lithological breaks at 176 m or 244 m Correlation with Caladenia 1 (7.1 km east, Plate 8) and Boab 1 (16 km northeast) favours the Apak and Backhouse (1999) pick, whereas correlation with Abutilon 1 (26 km north-northeast), the nearest well with palynology to near the base of the Grant Group, indicates a greater thickness for the Hoya Formation. Alternatively, it is possible that the *D. tenuistriatus* zone palynomorphs are reworked into a channel at the base of the Grant Group. However, the Reeves Formation also has been identified in Ficus 1 on the basis of Upper Carboniferous palynomorphs and the somewhat thicker glacial section compared to most wells in this area — there are few, if any, lithological differences to the Grant Group. The greater thickness of the lower coarse-grained interval in Drosera 1 (176–441 m) compared with nearby wells implies either contemporaneous movement along the Dummer Fault, or infill of a tunnel valley. The 'mounded structure' illustrated by Apak and Backhouse (1999, fig. 10) intersected by this well is likely to be related to this fault — steeper dips near the top of the Silurian Carribuddy Group above lower dipping strata imply the seismic line crosses this fault zone obliquely.

East Crab Creek 1

The formation picks in the well completion report are accepted (Plate 7). The Nura Nura Member (750 – 758.5 m) is easily recognized. The Grant Group is dominated by clean sandstone, and correlation with Crab Creek 1 (9 km west) and Cow Bore 1 (13 km east-northeast) indicates the Calytrix/Winifred Formation is absent. The only evidence for the Reeves Formation is ?*D. birkheadensis* zone at 1247 m, but the lower range of Unit II at 1229.5 m indicates that if this formation is present it is less than 20 m thick (?1234–1252 m).

Edgar Range 1

The silty interval 185–260 m within the Grant Group (112–571 m) is tentatively assigned to the Calytrix/ Winifred Formations. Lower Unit II palynomorphs recovered over 124–467 m indicate that little, if any, Reeves Formation is present.

Freney 1

The formation picks in the well completion report are accepted with the tentative addition of the Calytrix/ Winifred Formation over 944–1005 m.

Frome Rocks 2

The formation picks from the well completion report are accepted apart from the top of the Poole Sandstone, which is lowered to 538 m in accordance with the gamma-ray log and Unit IV (Artinskian–Sakmarian) palynomorphs over 335–460 m. In addition, 805–858 m is tentatively assigned to the Calytrix/Winifred Formations. It is unclear if the Reeves Formation is present as there is no palynology between 750 m (Unit II) and 1086 m (Upper Devonian), and correlation of this level with Doran 1 (17 km west; Plate 10) and Notabilis 1 (18 km southwest) is not clear as the unit appears to be 179 m and 36 m thick, respectively, in these wells.

Goldwyer 1, Hedonia 1, Hilltop 1, and Kanak 1

The top of the Permian was originally placed at 468 m in Goldwyer 1 in the well completion report, but later revised to 533 m by WAPET, whereas in Kanak 1 this level is about 528 m. The two wells are 300 m apart. Palynomorphs of 'lower Unit II' from 613–759 m in Goldwyer 1 indicate that at least the upper part of the Permian–Carboniferous succession in both wells probably is limited to the Grant Group. The 'middle shale' is tentatively assigned to the Calytrix/Winifred Formation (580–630 m and 576–636 m, respectively). The equivalent unit in Hedonia 1, 11 km north, is 608–680 m. In that well the *D. birkheadensis* zone has been identified from cuttings over 808–873 m, 8 m below the lowest occurrence of the *P. confluens* zone (493–800 m), implying that the top of the Reeves is at about 805 m. The equivalent levels in Goldwyer 1 and Kanak 1 appear to be 750 m and 739 m, respectively, but this correlation is uncertain. Hilltop 1, 14 km northwest of Goldwyer 1, by contrast shows a much sandier section than the other three wells over the presumed Grant Group (491–953 m) with Unit II palynomorphs near the base (915–930 m) implying the Reeves Formation is absent, or that the *D. birkheadensis* zone palynomorphs in Hedonia 1 are reworked. Such reworking is implicit in the similarity of the thickness of the Reeves Formation plus 'lower Grant Group' in Hedonia 1 to that of the 'lower Grant Group' in the closest wells (Plate 11).

Kunzea 1

Redfern and Williams (2002) correlate 14–29 m with the Calytrix Formation and interpret the siltstone, sandstone, and conglomerate with metamorphic clasts down to 125 m as a diamictite within the Hoya Formation (29–125 m). They place the underlying mudstone/siltstone (125–170 m) and sandstone with polymictic conglomerate (170–261 m) within the lower Hoya or Reeves Formations based on correlation with Drosera 1 (Plate 8). There is no palynology available to support or refute this correlation. By comparison, the well completion report assigns 125–170 m to the 'Middle Mudstone Member' that usually equates with the Calytrix Formation but that could equally be a deeper level within the Hoya Formation, similar to the mudstone interval 100–180 m in Drosera 1, 17 km south-southeast.

Looma 1

The mudstone interval 185–238 m within the Grant Group (0–435 m) shows a gamma-ray log response similar to the likely Calytrix Formation in Canopus 1 (24 km north-northwest), but the underlying Hoya Formation is 200 m thick (238–438 m) compared to 30 m in Canopus 1 (Plate 7).

Lovells Pocket 1

The Grant Group (225–445 m) contains two distinctive mudstone intervals (225–236 m and 337.5 – 388 m) but it is unclear if either is the Calytrix/Winifred Formation, although correlation with Crystal Creek 1 (18 km east-southeast) and Antares 1 (37 km southeast) favours the lower interval (Plate 7).

Logue 1

The formation picks in the well completion report are largely accepted, but *S. ybertii* palynomorphs from 1453–1555 m, if not reworked, indicate the presence of the Reeves Formation (?1359–1563 m; Plate 10). The upper limit of this formation is constrained by Unit II palynomorphs from 1060 – 1326.5 m.

Mahe 1

The formation picks in the well completion report are accepted, except that the limestone below the Poole Sandstone is incorporated into that formation as the Nura Nura Member (607.5 – 612 m), and the base of the 'Winifred Formation' is placed at 1011 m based on correlation with Dampier Downs 1 (20 km south) and Logue 1 (25 km east Plate 10).

Notabilis 1

The formation picks in the well completion report are accepted apart from the 'pre-Grant' (767–803 m) containing *D. birkheadensis* zone palynomorphs, which here is referred to as the Reeves Formation, and the Nura Nura Member, which here is not differentiated within the Poole Sandstone (340–436 m). Subdivisions of the Grant Group are not considered feasible.

Matches Spring 1

The Grant Group (104–546 m) lies on Devonian strata and contains palynomorphs of the *P. confluens* zone from 166–399 m and lower Unit II from 398–542 m (Plate 8) implying the Reeves Formation is absent; there is some uncertainty as these determinations are based on cuttings.

McLarty 1

The entire Permian section (126–462 m) is assigned to the Grant Group on the basis of *Nuskoisporites* II palynomorphs from 237–293 m (Appendix 6), here considered to be equivalent to at least part of the *P. confluens* zone. The silty interval 126–261 m with fossils (in core 2) originally assigned to the 'Dora Shale' is possibly equivalent to the Calytrix Formation.

Nollamara 1

The well was drilled 8 km south of the Fenton Fault and 3.7 km west of outcrop of the Noonkanbah Formation, but the uppermost 50 m are probably Mesozoic or younger. The company picks are accepted, with the exception of the Nura Nura Member (196–232 m), which is here left as undifferentiated Poole Sandstone (122–232 m) as there is no limestone characteristic of this unit. The members 'A–C' of the 'Grant Formation' (232–867 m) differentiated in the well completion report are not equated with the 'floral' subdivisions from the Barbwire Terrace as the presence of granite, schist, jasper, and chert fragments within and above the dominantly siltstone 'member B' (530–590 m) indicates an equivalence with the Clianthus Formation is unlikely. Nuytsia 1, 4.2 km west, intersected a similar succession (Plate 8). The presence of a possible Unit I palynoflora at 775 m and 830.25 m is difficult to evaluate, but given the lack of nearby wells apart from Nuytsia 1, the assignment of the interval 590–867 m to the Reeves Formation by D'Ercole et al. (2003) is equivocal.

Nuytsia 1

The well was drilled 4.3 km west of Nollamara 1 and intersected a similar succession (Plate 8). The company picks in the well completion report are accepted with the exception, as with Nollamara 1, of the Nura Nura Member, which appears to be absent, and the members of the 'Grant Formation', which are modified slightly. The presence of Unit II and Unit I/II palynofloras from 350–640 m and 685–791 m, respectively, is indicative of the Grant Group especially as the lower sample contains numerous reworked palynomorphs.

Parda 1

The Permian section (612–980 m) was placed in the Poole Sandstone and Grant Group in the well completion report but later revised by WAPET to the 'Dora Member' of the 'Grant Formation'. Palynology from SWCs indicates the presence of Stage 3a (with *P. pseudoreticulata)* over 621.8 – 780.3 m and Stage 2 over 838–977 m. The upper zonal designation is normally associated with the Poole Sandstone but the wireline logs are atypical of this unit and none of the nearby wells intersect this unit (Plate 11).

Roebuck Bay 1

The intervals 477–538 m and 538–624 m are placed in the Noonkanbah Formation and Poole Sandstone, respectively, based on the SP log and the presence of fossiliferous siltstone in cores 19–22, and fossiliferous limestone of the Nura Nura Member in cores 23 and 24 (Crespin and Condon, 1956; Crespin, 1956c). Of cores 25–40, cut in the Grant Group (624–1022 m), diamictite facies are present in numbers 28, 30, 35, and 40. The 'middle shale' (776–874 m) of the Grant Group has yielded foraminifera (from cores 30–34; Crespin and Condon, 1956) similar to those in the Calytrix Formation on the Barbwire Terrace (DW Haig, 2009, written comm.) where it is associated with the Tastubian *P. confluens* zone. As diamictite is present above this level in Roebuck Bay 1, internal correlation of the Grant Group to the Barbwire Terrace is unclear as glacial features there are virtually absent above the Hoya Formation. Correlation with Crab Creek 1 (17 km north-northeast) and East Crab Creek 1 (22 km northeast) implies the Reeves Formation is absent (Plates 7 and 11).

Santalum 1A

The Clianthus, Calytrix, and Hoya Formations (6–180 m, 180–216 m, and 216–320 m respectively) are picked on the basis of the core descriptions. No palynology is available.

Thangoo 1–2 and Whistler 1

In Thangoo 1 fossiliferous calcarenite identified from cuttings over 442–449 m suggest the Nura Nura Member of the Poole Sandstone (428–449 m), but there is no paleontology to support this. Whistler 1 (700 m southeast of Thangoo 1) also has a similar carbonate bed (440–445 m). In Whistler 1 the shaly interval 570–612 m may be the Calytrix Formation. Unit II palynomorphs (probably equivalent to the *P. confluens* zone) are present throughout the Grant Group from 452 to 785 m in this well, and probably also in Thangoo 2 over 426–775 m. In that well the Grant Group is the only Permian unit (Plates 10 and 11).

Fitzroy Trough and Gregory Sub-basin

BHP PND 1

Drilled 600 m southwest of the Pinnacle Fault, this mineral corehole contains the only fully cored sections of the Noonkanbah Formation and Poole Sandstone to date. Downhole logs were not run, and the correlation with wells on the Lennard Shelf (Plate 3) is on the basis of lithology and core-gamma measurements. The Lightjack Formation was cored from 89 to 136.5 m and consists of thinly bedded, low-angle cross-beds, and rippled to laminated fine- to very fine grained sandstone with minor siltstone. The base of the unit is marked by a thin, pebbly, medium- to coarse-grained sandstone. The Noonkanbah Formation (136.5 – 311 m) is dominated by laminated to massive siltstone with lesser thinly bedded, very fine grained sandstone and minor calcareous siltstone and limestone. Calcareous beds total 4.5 m of this section. Bioturbation is moderately common, but shelly fossils are rare. The Poole Sandstone (311 – 351.05 m) consists of thinly bedded, very fine to medium-grained sandstone with lesser carbonaceous siltstone. Laminated, rippled, and massive beds predominate, but there are 4 thin rootlet beds and a 6-cm thick coal seam. The base of the unit is a 10-cm thick very coarse-grained pebbly sandstone below a 5-m thick medium- to coarse-grained, massive to cross-bedded sandstone with minor carbonaceous laminae. The Grant Group (351.05 – 500.15 m) consists of very fine to medium-grained sandstone and silty sandstone and minor sandy siltstone (<12 m in total). Massive, contorted and irregular bedding dominates, but exotic clasts are rare.

The only paleontology available is Backhouse (1983; in prep.; Appendix 6). In the former, he indicates the presence of Unit IV palynomorphs from 168 m and 192.3 m in the Noonkanbah Formation (approximately *S. fusus – M. trisina* zones) and Unit II or III at 482.4 m (probably *P. confluens* zone) in the Grant Group. The later work indicates the presence of *S. fusus – M. trisina* zones in the Poole Sandstone and basal Noonkanbah Formation, the *M. trisina* and ?*P. sinuosus* or higher zones in the middle and upper part of the Noonkanbah Formation, respectively, and the *D. granulata* zone in the Lightjack Formation. Foraminifera from the Noonkanbah Formation are being examined by DW Haig (UWA).

Bindi 1

Drilled a short distance from outcrop of the Blina Shale on Mount Bannerman, the shale is present to 292 m overlying the Millyit Sandstone (represented by a distinct low-gamma interval) that extends to 338 m and the Liveringa Group, which extends to 629 m. The predominantly siltstone interval 629–982 is placed in the Noonkanbah Formation with the underlying sandstone, with minor thin coal in the Poole Sandstone. The low-gamma interval 910–921 m is interpreted as the distinct sandy carbonate marker bed low in the Noonkanbah Formation. The interval 990–1051 m is here placed in the Poole Sandstone as it incorporates Upper Unit III palynomorphs (including *P. pseudoreticulata*) at 1047 m above Lower Unit II at 1065 m (Plate 2).

P. confluens zone palynomorphs from 1085–1422 m and *D. tenuistriatus* zone palynomorphs from 1475–1497 m imply the base of the Grant Group is best placed at the log break at 1442 m. The interval 1215–1303 m is tentatively assigned to the Calytrix Formation. The section 1442–1832 m placed in the Reeves Formation has no palynological control below 1497 m. The *G. maculosa* zone identified at 1919 m appears to lie in the Anderson Formation.

BMR Lucas 13

The well was drilled adjacent to outcrop of Erskine Sandstone at Point Alphonse; the presence of the Blina Shale at the base of that exposure (Yeates et al., 1975, fig. A31) indicates that the Blina Shale is about 90 m thick in this area. The basal 9 m of siltstone in the well, assigned to the 'Godfrey beds' by Yeates et al. (1975) yielded earliest Triassic palynomorphs (Paten and Price, 1975); elsewhere the unit is considered Permian.

BMR Lucas 14

The well was drilled near outcrop of the Lightjack Formation. The assignation of the uppermost 1.3 m to the 'Godfrey beds' is questionable as it could equally be a Cenozoic unit.

Booran 1

The only formation picks modified from the well completion report are the top Blina Shale (to 118 m) to make it consistent with Millard 1 (28 km east-southeast), and the identification of the Reeves Formation. Correlation with East Yeeda 1 (52 km southeast) and Fraser River 1 (54 km west) implies the top of the Reeves Formation lies near 1850 m between Stage 2 and ?*D. birkheadensis* palynological assemblages. On the wireline logs the base of the Reeves appears to be at a major break at 2252 m, which appears to lie within the range of the *G. maculosa* zone (2075–2586 m; Plate 2). Possibly these palynomorphs have been reworked into the base of the Reeves Formation as in most wells this zone lies within the Anderson Formation.

Crimson Lake 1

The interval 712–780 m is placed in the Poole Sandstone based on regional palynological and wireline correlations — there is no palynology available above 1067 m in this well. However, the underlying coarsening cycle (780–845 m) is moderately consistent along the nearby part of the Lennard Shelf and correlation with Nemile 1 (13 km west-northwest) indicates a possible break at the base of this cycle: below 845 m the Carolyn Formation (780–1045 m) has a similar gamma-ray response to 900–1135 m in Nemile 1 (180 m below the top of the Grant Group versus 65 m below that level in Crimson Lake 1). The presence of palynomorphs assigned to Unit II at 1067 m and the *S. ybertii* zone at 1457 m implies a break in the succession between the Grant Group and Reeves Formation, here placed at the top of a somewhat cleaner sandstone interval (1312–1471 m; Plate 3).

Cycas 1

The well spudded in Noonkanbah Formation according to the Mount Bannerman geological sheet but the uppermost 246 m appears sandier than usual for that unit. The identification of the Liveringa Group in the well completion report is considered unlikely and is not helped by this part of the well having been logged through the casing. The Poole Sandstone (441–535 m) appears to contain Unit IV palynomorphs (339–502 m), but this is questionable as that assemblage is normally confined to the Noonkanbah Formation. The base of the Grant Group is placed at the prominent log break at 1146 m between the *P. confluens* (988 m) and *D. tenuistriatus* (1150 m) zones. The Reeves Formation (1146 – 2132.5 m) also contains possible *D. birkheadensis* (1152–2072 m) zone palynomorphs. The interval 2132.5 – 2299.5 m, included within the Grant Group in the well completion report, is atypical of the lower Reeves as it is thinly bedded with minor limestone. This section is here included within the Anderson Formation and thereby excludes the *G. maculosa* zone (?2182–2305 m) from the Reeves Formation (Plate 2).

East Yeeda 1

Only the formation boundaries below the Poole Sandstone are modified from the well completion report. The top of that unit is lowered to 1148 to exclude the upper coarsening upward cycle (1085–1148 m) which includes palynomorphs of the *P. sinuosus – M. trisina* zone (at 1092.5 m) and the *M. trisina*/*D. byroensis* zone (at 1132.5 – 1149 m). This places the Poole Sandstone within the range of the *P. pseudoreticulata* zone (?1190–1213 m). The latter zone also questionably extends down to 1265 m into the Grant Group, based on two cuttings samples. The Calytrix/Winifred Formation is tentatively identified as 1456–1468 m. The top of the Reeves Formation is placed at the top of a sandstone interval at 1802 m (the base of a thick sandstone interval) between the ranges of the *G. confluens* (1282–1767 m) and S. *ybertii* (1804–2291 m) zones (Plates 2, 5, and 10). In this well most of the Reeves Formation (1802–2299 m) lies within the *S. ybertii* zone (2185–2291 m), and the ?*G. maculosa* zone at 2301 m appears to be within the uppermost Anderson Formation.

Ellendale 1

The Poole Sandstone (650–725 m; picked largely on regional log correlations; Plate 3) lies directly above a 290 m-thick low gamma-ray sandstone (?Carolyn Formation). There are no carbonate beds in the Poole Sandstone that can be attributed to the Nura Nura Member. The Winifred Formation (1015–1050 m) is the most notable mudstone unit in the Grant Group, the base of which is tentatively placed at 1260 m where the sandstone below becomes slightly cleaner. The only palynology above the base of the Reeves Formation (?1260–1425 m) is from 1094 m and is probably equates with the *P. confluens* zone.

Fitzroy River 1

The well was spudded into the Noonkanbah Formation 6 km east of Noonkanbah homestead. The formation picks in the well completion report are accepted. The high gamma-ray shale over 760–805 m in the Grant Group is tentatively assigned to the Calytrix Formation but the base of the group/top of the Reeves Formation is poorly constrained as there is no palynology available above 1000 m. That contact is tentatively placed at the base of a clean sandstone at 994 m above Unit 1 (1000–1290 m) and *S. ybertii* (1495–1725 m) assemblage palynomorphs (Plate 2).

Fraser River 1

The dominantly sandstone interval 219–866 m below Jurassic strata contains *P. confluens* zone palynomorphs over 447.1 – 819.3 m, and is assigned to the Grant Group. Correlation with Booran 1 (54 km east) indicates that the slightly silty interval 411–429 m may be the Winifred Formation (Plate 2). The sandstone and mudstone interval 866–1411 m (cores 55–74) was proposed as the type section of the Reeves Formation by Apak and Backhouse (1999) and is underlain by the Anderson Formation with possible *G. frustulentus* zone palynomorphs in core 75 (1432.6 – 1438.7 m). So defined, the Reeves Formation contains the *M. tentula* (868.7 – 880.6 m), *D. birkheadensis* (939.1 – 1008.6 m), *S. ybertii* (1039.1 – 1164.6 m), and *G. maculosa* (1301.2 – 1404.2 m) zones. The *G. maculosa* zone possibly extends as high as 1252.7 m according to Playford and Powis (1979).

There is little evidence of glacial character in the cores cut in this well, especially below core 61, thereby hindering sub-division of the Grant Group, and creating difficulties as to whether or not the interval containing the *G. maculosa* zone should be excluded from the Reeves Formation (as this zone is associated with the Anderson Formation in most other wells).

Grant Range 1

The well was spudded in the centre of Grant Range at a level below the Wye Worry Member of the Carolyn Formation. The Grant Group extends down to at least core 1 (366.65 – 369.7 m) based on the presence of *P. confluens* zone palynomorphs over 146.3 – 367 m. Given that Stage 2 or the *D. tenuistriatus* zone cannot be differentiated from cores 2–15 (424.9 – 1181.1 m), the top of the Reeves Formation cannot be placed with certainty, but for convenience is here placed at the top of the shaly interval 400–435 m similar to East Yeeda 1 (42 km north). There are no significant fine-grained intervals within the Grant Group implying that the entire section of Grant Group in this well, although dominated by sandstone, can be correlated with the Hoya Formation, and the overlying units, if present, are restricted to outcrop. The Reeves Formation (400–2396 m) is dominated by blocky sandstone intervals up to 500 m thick on the gamma-ray log, and contains *M. tentula* (426.4 – 1181.1 m), *S. ybertii* (1955 – 2005.6 m), and ?*G. maculosa* (2287.5 m, core 50) zone palynomorphs. The latter zone is normally associated with the Anderson Formation, and a case could be made to place the top of that unit at a prominent log break at 2140 m; however, relocating this level also affects the top of the Anderson Formation, for which this well is the type section (2408–3936 m, TD, according to Playford et al., 1975). Unfortunately cores 47–49 in the questioned interval are either barren or virtually devoid of palynomorphs, and justifying such a change on a tenuous palynological assignment from a single sample is questionable. Core 52 (2410 – 2411.6 m) near the top of the Anderson Formation contains conchostraceans (Tasch and Jones, 1979; Jones and Chen, 2000) as well as *G. frustulentus* zone palynomorphs indicating a Viséan age. The well is shown in Plates 2 and 10.

Hakea 1

The well (Plate 3) was drilled near the northern side of the Fitzroy Trough, 8 km south of the Blina Field. The gamma-ray log run through the casing to 464 m has a strongly subdued response so it is difficult to be certain of the position of the top of the Noonkanbah Formation: 166 m (the company pick) or 182 m seem equally likely. The Poole Sandstone (550–604 m) appears to lack the distinctive Nura Nura Member. It is unclear if the Unit III palynomorphs at 608 m are equivalent to the *P. pseudoreticulata* or *P. confluens* zones, or if the palynomorphs are from this depth, given the SWC in question apparently was from a clean sandstone. Unit II palynomorphs extend over 657.8 – 1093.5 m throughout most of the Grant Group (604–1107 m). Unit I palynomorphs indicated on the composite well log at 1068.6 m and 1093.5 m are interpreted as reworked into Unit II in the associated palynology report. The Reeves Formation (?1107–1335 m) is identified from regional log correlation, but its top may be considerably lower. The age of the upper part of the unit is poorly constrained, but the *S. ybertii* zone is present over 1299 – 1307.5 m.

The well was the subject of a dipmeter interpretation by Goldstein and Hubbard (1984), who favoured an alluvial–

lacustrine–deltaic setting for the Grant Group, and low-energy, shallow to distal marine environments for the Poole Sandstone and Noonkanbah Formation, respectively. Dip azimuths in sandstone-dominated parts of the Grant Group are dominantly to the south and southwest, but there are also significant northerly directed paleocurrents. The upper 'Lower Grant Formation' (= Reeves Formation) shows a striking reversal in dip azimuths but there is little difference in dip azimuths between their basal sandstone unit of the 'A Member ' (=Betty Formation) and the 'upper preglacial unit' of the 'Lower Grant Formation' (=Reeves Formation), implying a significant break at this level (1107 m herein) is unlikely. Note that Goldstein and Hubbard (1984) used a datum of about 470 m below the rotary table for their logs and core descriptions.

Jones Range 1

The upper 73 m was interpreted as Jurassic in the well completion report, but it is possible that the Permian section commences at 8 m. There is no paleontology from this interval, nor are there Jurassic exposures nearby. The nearest outcrops are of the mid-Permian Lightjack Formation (6 km southwest and 10 km northeast). The presence of Unit II palynomorphs from 148–375 m supports the assignment of at least that interval to the Grant Group. The Calytrix/Winifred Formation is most likely to include the shaly interval 73–167 m based on the cuttings descriptions and correlation with nearby wells. This corresponds to the top of the 'Dora Shale' in the well completion report (73–261 m), but which includes scattered coarse grains indicative of diamictite facies. Therefore, the overlying section is possibly the Carolyn or Clianthus Formation. The interval 385–976 m is dominated by clean sandstone and could be assigned to either the Grant Group or Reeves Formation: there is no palynology available between 375 and 898 m. The highest Carboniferous age in Jones Range 1 is from palynomorphs of the *S. ybertii* zone at 898 m; their presence in cuttings below 976 m is interpreted as caving. The top of the Reeves is tentatively placed at the top of the sandy interval at 385 m based on a correlation with Cycas 1 (53 km northeast, but where the top of the unit is well-dated shale interval), Lake Betty 1 (73 km east-southeast), and Bindi 1 (125 km east-southeast). The well is shown on Plates 2 and 9.

Jum Jum 1

The formation picks in the well completion report are accepted with the possible addition of the Reeves Formation (2139–2273 m) based on a correlation with nearby Padilpa 1 (16.5 km northeast) and Puratte 1 (17 km east-northeast; Plate 6). The distinctive Nura Nura Member (1594–1604 m) is relatively thick. The *G. maculosa* zone (2317–2471 m) appears to be confined to the Anderson Formation below the Reeves Formation but the latter unit, if identified correctly, lacks palynological data in this well.

Kilang Kilang 1

The Liveringa Group (10–354 m) contains palynomorphs of the *D. parvithola*, *D. ericianus,* and *D. granulata* zones whereas the underlying Noonkanbah Formation (354–660 m) contains the *P. sinuosus* and *M. trisina* zones (Backhouse, 1998). The *M. villosa* zone is either thin or absent due to erosion between these two units. Correlation with the nearest well, Ngalti 1 (44 km north-northeast) implies that the sandy interval 562–571 m is the lower marker bed in the Noonkanbah Formation. According to Backhouse (1998) this level lies between the *P. sinuous* (359–545 m) and *M. trisina* (610 – 642.5 m) zones, which are both normally found in this formation. The thinly bedded sandstone from 660 to 804 m assigned to the Poole Sandstone in the well completion report is atypical of the formation in that it lacks obvious upward coarsening cycles and instead may be, at least in part, within the Grant Group. This raises the possibility that the Poole Sandstone may be a thin undated interval just above 660 m or it may be absent in this well. Although there is a similar interval in the nearest well, Ngalti 1 (44 km north-northeast), it also lacks palynology to help resolve the stratigraphic placement of this interval.

The Calytrix Formation is tentatively placed at 885–950 m based on a poorly constrained correlation with Clianthus 1 (110 km east) and Bindi 1 (65 km northwest). The gap in palynology between the P. confluens (807–1135 m) and D. birkheadensis (1185–1456 m) zones implies a break between the Grant Group and underlying Reeves Formation at 1147 m on top of a sandy interval. The base of the Reeves Formation is uncertain; although it was placed at 1512 m by Apak and Backhouse (1999), the major break shown by the wireline logs is at 1701 m. At this level the unit incorporates palynomorphs of the ?*G. maculosa* zone (at 1590.1 m) — the zone is present within the formation in just four other wells in the basin, normally the basal part of the unit contains *S. ybertii* zone palynomorphs. The well is represented on Plates 2 and 12.

Lake Betty 1

The well spudded in outcrop of the Millyit Sandstone, which at the time was assigned to the Liveringa Group; the top of the group is placed at 30 m based on the gamma-ray log. The presence of the *Vittatina* assemblage from 431.9 – 635.5 m and the *P. confluens* palynoflora from 781–904 m indirectly supports the Poole Sandstone as picked in the well completion report (678–764 m) and shows that this unit has changed character to a relatively 'ratty' sand compared to the clear upward coarsening cycles further west in the basin. The interval 868–1057 m assigned to the 'Dora Shale' in the well completion report (renamed by Crowe and Towner, 1976, as the Winifred Formation) is here modified to 956–1056 m, and could equally be assigned to the Calytrix Formation, based on correlation with nearby wells, especially Bindi 1. Possibly, the dominantly sandstone interval 764–868 m equates with the Millajiddee Member (or Clianthus Formation). Crowe and Towner (1976) made 1058–1657 m in this well the type section of the 'Betty Formation', whereas Apak and Backhouse (1999) assigned a significant part of this interval (1342–1657 m) to the Reeves Formation. Presumably Apak and Backhouse (1999) felt that the presence of questionable *P. confluens* zone palynomorphs at 1240.8 m compromised the Betty Formation as there is an apparent break at the base of this zone in many sections in the basin. The presence of palynomorphs identified as Unit 1 at 1578.85 m, later revised to ?*G. maculosa* zone (1469.1 – 1639.8 m) is problematic as the latter zone is associated with both the lower part of the Reeves Formation and the Anderson Formation, but not in a consistent manner. Nevertheless, a log correlation with Bindi 1 (52 km east-southeast) supports the suggestion that the Betty Formation spans the Permian–Carboniferous boundary, and that 1249.4 – 1657 m belongs within the Reeves Formation. The presence of *G. frustulentus* from 1660.6 – 2479.2 m is consistent with the Fairfield Group. The well is shown on Plates 2 and 9.

Lake Hevern 1

The thinly bedded sandstone and siltstone interval 11–301 m is placed tentatively in the Reeves Formation based on the presence of *A. largus* palynomorphs indicative of the Fairfield Group from 390–902 m, and correlation with Point Moody 1 (33 km northeast) and White Hills 1 (35 km north) where the unit is over 800 m thick. A possible diamictite (310–325 m) is described in the daily geological report but not in the cuttings descriptions. Low outcrop to the east of the well shown as Lightjack Formation on STANSMORE is considerably higher in the succession than the Reeves Formation, and is consistent with the well being located over a diapir as shown by Burt et al., (2002, fig. 4.3).

Metters 1

There is no palynology available for this well. The interval 646.5 – 730 m is here tentatively assigned to the Poole Sandstone based on regional log correlations, rather than 571 – 645.5 m as indicated in the well completion report. The 'pre-Grant' (1305–1450 m) in that report is possibly the Reeves Formation (Plate 3).

Millard 1

The formation picks amended from those in the well completion report are the top of the Blina Shale (to 181 m) and the Poole Sandstone (1176.6 – 1235 m) to better match Kora 1 and West Kora 1 (18 km north-northwest), Booran 1 (28 km west-northwest), and Yarrada 1 (20 km east). The Winifred Formation appears to be absent. There is no palynology available and no density and sonic logs below 1190 m (Plate 2).

Mount Hardman 1

The formation picks in the well completion report are accepted with minor modifications; the top of the Winifred Formation is lowered to 650 m to encompass the most shaly part of the Grant Group, and the basal part of the group is identified as Reeves Formation (996–1080 m) based on the presence of ?Unit I/*S. ybertii* assemblage palynomorphs and regional log correlation (Plate 3). Unfortunately little detail is given in the palynology report, but the range of this zonal allocation (934–1068 m) coincides with two SWCs that recovered siltstone. The age in the upper sample is discounted based on a correlation with Blackstone 1, admittedly 76 km to the northwest, but in it the Grant Group/Reeves Formation is constrained within 62 m by palynology.

Mount Wynne 1 and 3

The wells were spudded into the Grant Group on the north limb of a surface anticline, and were drilled to 273 m and 657 m, respectively. Only driller's logs are available (Blatchford, 1927): they indicate the sections are dominated by sandstone. The only samples that remain are about 120 m of large diameter core from Mount Wynne 1 abandoned at the site. The core consists of oxidized medium- to coarse-grained sandstone from the upper part of the well, and is unsuitable for microfossil analysis. A crude comparison with Metters 1 (35 km northeast) and Valhalla 1 (34 km east) implies the deeper well may have reached top of the Reeves Formation. The nearest other well (Petaluma 1, 23 km south-southwest) did not fully penetrate the Grant Group, but shows that the group thickens dramatically southwards within the Fitzroy Trough.

Myroodah 1

The well lies 14 km east of Petaluma 1, which has more reliable information — a gamma-ray log is not available, and the only available paleontology is from the Liveringa Group and Noonkanbah Formation (Crespin, 1956a, 1958). Both wells spudded in the Liveringa Group. The Noonkanbah Formation appears to be 270 m thicker in Petaluma 1. The revised formation picks by WAPET include the Nura Nura Member, but the interval in question (1151–1161 m, and immediately below) did not contain limestone in the cuttings, and indicates a considerably thicker Poole Sandstone than in Petaluma 1 (338 m versus 121 m, respectively). Assuming the Poole Sandstone has a similar thickness between these wells the lower contact in Myroodah 1 would be around 960 m. The SP logs in these wells look dissimilar hindering correlation so it is uncertain which unit is present at TD. Drummond et al. (1991, fig. 3a) indicate that the base of the Grant Group (includes the Reeves Formation herein) lies 0.75 seconds below the well, implying a combined thickness for the Grant Group and Reeves Formation of about 2 km at this location.

Nemile 1

The well shows the greatest similarity with Crimson Lake 1 (13 km east-southeast); formation picks down to the top of the Winifred Formation are within 50 m of each other. The Poole Sandstone is here restricted to 770–832 m based on correlation with Crimson Lake 1 and Philydrum 1 (9.3 km northeast). The Winifred Formation was originally identified as the mostly fine-grained interval (1021–1254 m) but could equally well be restricted to 1130–1168 m or 1021.5 – 1054 m depending on whether greater emphasis is placed on a correlation with Crimson Lake 1 or Philydrum 1 (Plate 5). Identification of the Reeves Formation (?1424–1559 m) is based on regional correlations; there is no palynology for the well.

Nerrima 1 (AFO) and Nerrima 1 (FKO)

The wells lie 4 km apart and were drilled in 1955 and 1939, respectively. It is not straightforward to re-evaluate the stratigraphy of the older well as wireline logs were run only in Nerrima 1 (AFO), and only the cores cut from that well are available. The only paleontology on hand for these wells is from the Noonkanbah Formation (Crespin, 1956b, 1958) and a preliminary palynological assessment of cores 15–19, which possibly belong within the Reeves Formation (Appendix 6). Correlation of the gamma-ray log in Nerrima 1 (AFP) with Petaluma 1 (21 km north) implies 485–597 m is the Poole Sandstone, but the original pick for the base of the Poole Sandstone (659 m) cannot be dismissed completely as the log character of the underlying section down to the Hoya/Betty Formation is dissimilar between these wells. The Winifred Formation (867–938 m) is thicker than in Petaluma 1 (by 58 m). The underlying section correlates closely with Petaluma 1 (at least to the base of the available gamma-ray log at 1520 m), so the top of the Reeves Formation probably belongs at the base of the mudstone interval 1200–1226 m. Massive pebbly siltstone in core 16 (2434–2435 m) is probably glacial in origin and is assigned to the Reeves Formation based on palynomorphs no older than the *S. ybertii* zone from core 15 (2294.8 – 2297) — possibly the well did not fully penetrate that unit.

Four leucite-bearing lamproite sills are present over 68.6 – 257.6 m within the Noonkanbah Formation, and were described as medium-grained wolgidite (Prider, 1960). The thickest is at 68–86 m. No other lamproite intrusions are known in the immediate area. All West Kimberley lamproites appear to have been emplaced in the Miocene (Jaques et al., 1986).

Pearl 1

The Noonkanbah Formation is tentatively identified as the dominantly silty interval 706–902 m below Jurassic strata from which *M. trisina* was recovered at 850 m. The top 50 m of this interval is sandy and may be the basal part of the Liveringa Group but there is no paleontological data to confirm this. The sandstone interval 902–934 m lies between Unit II and III/IV palynofloras, and is tentatively assigned to the Poole Sandstone. Although the shaly interval 1153–1205 m lies within the upper range of Unit I palynomorphs (1173–1680 m; ~*D. birkheadensis* zone), correlation of the wireline logs indicate it is better assigned to the Winifred/Calytrix Formation rather than the Reeves Formation. Correlation with Roebuck Bay 1 (57 km southeast), Crab Creek 1 (56 km east-southeast), and East Crab Creek 1 (64 km east-southeast) indicates that the base of the Grant Group lies at 1390 m (or deeper). Cow Bore 1 also has a similar siltstone succession at this level, but considerably thinner. Correlation with Perindi 1 (116 km north) shows that whereas the thickness of the Grant Group plus Reeves Formation is similar, the latter unit is considerably thinner in Perindi 1. The well is shown in Plates 6 and 7.

Petaluma 1

The top of the Poole Sandstone is here picked at the sharp decrease in the gamma-ray log at 916 m where the company placed the top of the Nura Nura Member. Lowering the top of the formation to this level places it at a level palynologically equivalent to other wells in the region such as East Yeeda 1 (76 km north-northwest) and Blackstone 1 (76 km north), in that it excludes the interval with Unit IV palynomorphs. Within the Grant Group (1037–?1823 m) the siltstone interval 1775–1827 m that the company referred to as the ‘B Member' is here considered to lie well below the ‘Winifred Formation' based largely on a correlation with Fitzroy River 1 (64 km east-southeast). This formation is tentatively placed at 1456.6 – 1469.5 m, well within the range of Unit II (= *P. confluens*) palynomorphs. Based on a correlation with Grant Range 1 (43 km northwest) and St Georges Range 1 (98 km east-southeast), the top of the Reeves Formation is tentatively placed at 1823 m, at the top of the clean sandstone below a thin mudstone interval, but could lie at a much deeper level (?below TD at 2086 m) as there is no palynology available below 1820 m (Plate 2).

Organic petrography from the base of the Liveringa Group in a mineral exploration hole (0.64% R_o at 198.85 m) drilled next to Petaluma 1 indicates that the maturity of the section in the petroleum well was underestimated by about 0.3% R_o, and implies most of the lower Permian is within the oil window near this location.

Point Moody 1

The well was spudded near outcrop of the Noonkanbah Formation, which it intersected at 18 m. The Poole Sandstone (?361–404 m) is tentatively picked above the clean sandstone interval commencing at 404 m, and correlation of the gamma-ray log with Kilang Kilang 1 (136 km northwest). Although this interval has yielded *P. pseudoreticulata* zone palynomorphs typical of the formation from core 3 (373.3 m), it is finer grained than usual for the formation, and there is a possibility that the formation is missing in this well. The *P. confluens* zone is present in core 5 (520 m), and possibly extends down to 753.8 m (core 8) whereas upper to mid-Carboniferous palynological assemblages (*M. tentula* to ?*S. ybertii* zones) are present over 1069–1946 m (cores 11–22). Accordingly, the base of the Grant Group is placed at the base of a distinct mudstone at 885–908 m, similar to Kilang Kilang 1 and Bindi 1. The silty interval 659–734 m in the Grant Group is tentatively identified as the Calytrix Formation. The thickness of the Reeves Formation (1067 m) implies the Gregory Sub-basin is an extension of the Fitzroy Trough (Plates 2 and 12).

Poole Range 3 and 5

The wells were drilled within the Poole Range; Poole Range 3 spudded in the Wye Worry Member of the

Carolyn Formation, whereas Poole Range 5 spudded in or just below the Millajiddee Member. The only data are driller's logs that indicate both wells intersected interbedded mudstone and sandstone. There appear to be no samples available for microfossil analysis, making any stratigraphic correlation difficult. Nevertheless, a crude comparison with Jones Range 1 (53 km south) implies that the deeper well (Poole Range 3, TD 995 m) reached the Reeves Formation, and possibly also a small section of the Anderson Formation.

Puratte 1

The formation picks from the well completion report are accepted with the addition of the Reeves Formation (1900 – 2056.5 m; Plate 6). The fine-grained interval 1670–1715 m in the Grant Group is tentatively assigned to the Winifred/Calytrix Formation. The Reeves Formation incorporates Stage 1, *S. ybertii* and *G. maculosa* palynological assemblages according to the well completion report. A reinterpretation of these assemblages (by Backhouse, in prep.) reassigns them to the *?P. confluens, ?M. tentula* and *S. ybertii* zones with the section below 2056.5 m containing *?G. maculosa* zone here assigned to the Anderson Formation.

Scarpia 1

The formation picks in the well completion report are accepted with some minor modifications; the base of the Winifred Formation is raised to 892 m so that it is restricted to the most fine-grained part of the Grant Group, and 1144–?1277 m is placed within the Reeves Formation based on the presence of *S. ybertii* zone palynomorphs at 1068 m in Mount Hardman 1 (8.75 km west). The ‘lower pre-glacial unit' (1277–1400 m) could be part of the Reeves Formation, or the uppermost part of the Anderson Formation; the former is preferred based on a correlation with Mount Hardman 1 in which the *G. frustulentus* microflora was found 12 m below the lowest occurrence of the *S. ybertii* (Plate 3). There is no palynology available between 673.5 – 884 m (Unit II) and 1531–1588 m (*G. frustulentus* zone) in Scarpia 1.

St George Range 1

The well (Plate 2) was spudded in the centre of the ranges near outcrop of undifferentiated Carolyn Formation in the centre of the St George Ranges anticline. The contact with the Reeves Formation could be placed at the top of a sandy interval at 165 m or near 253 m below a shale interval at 208–240 m based on the presence of *P. confluens* and *D. tenuistriatus* zone palynomorphs at 91–171 m and 259–262 m, respectively. It is unlikely that the shale interval 208–240 m correlates with the Calytrix Formation as there are glacial facies within the stratigraphically higher Wye Worry Member in outcrop within St George Ranges — some equivalence of the Hoya Formation with that member is implied. The palynological data for the Reeves Formation (253–1420 m) is based on just a few samples as the section is dominated by sandstone.

The Sisters 1

The WAPET formation picks are difficult to reassess due to the lack of palynology and a gamma-ray log. The top of the Noonkanbah Formation is here placed at 159 m based on the cuttings descriptions and a rough correlation with nearby wells especially Hakea 1 (5.9 km northeast) and Katy 1 (11 km northwest) which indicate the formation is about 380 m thick in this area. Note that there are no wireline logs above 247 m in The Sisters 1. The interval assigned to the Grant Group in the well completion report (616–1574 m) possibly incorporates some of the Reeves Formation (?1230–1574 m) based on correlation with nearby wells and Playford and Powis' (1979) record of the *S. ybertii* assemblage from core 5 (1339 – 1344.8 m). The SP log does not allow the Winifred Formation to be discriminated easily, but correlation with nearby wells implies that unit is most likely present over 860–885 m (Plate 5).

Valhalla 1

Most formations are picked based on correlation with Scarpia 1 (8.3 km east-northeast; Plate 3). The ‘Winifred Formation' (912–971 m) within the Grant Group (641–?1230 m) contains a thick sandstone unlike nearby wells. The base of the Reeves Formation is placed at 1449 m (the base of a relatively ‘blocky' sandstone) above palynomorphs of the *S. ybertii* or *D. birkheadensis* zones from cuttings at 1460–65 m that may be caved. The stratigraphic position of the dominantly sandstone interval 1449–1600 m is ambiguous as it lies above the highest occurrence of the *G. frustulentus* zone at 1665–70, but the limestone beds within this interval are more typical of Lower Carboniferous units than the Reeves Formation.

White Hills 1

In a review of the well, van Neil (1985) identified from possible Unit I–III from cuttings over 60–300 m whereas Balme (1983) assigned most of this interval to the *P. novicus* zone (~Stage 1) but provided no details. If the species *M. trisina* and *P. sinuosus* were correctly identified by van Neil (1985), their presence (even if caved) implies part of the succession belongs within the Noonkanbah Formation. The presence of likely *S. ybertii* zone palynomorphs over 821–865 m indicates a correlation with the Reeves Formation (Plate 12). In Point Moody 1, 25 km southeast, the unit is almost 1100 m thick implying that most of the section above 998 m in White Hills could be Reeves Formation. There is little in common between the wireline logs of the two wells apart from the generally blocky gamma-ray character below 360 m similar to the lower part of the Reeves in Point Moody 1 (1350–1975 m). The nearest outcrop to White Hills 1 is Lightjack Formation (5 km north and south) suggesting the well was drilled on a pronounced dome even if it intersected the Poole Sandstone at 14 m as claimed in the well completion report. Possibly the poor correlation with nearby wells can be explained, at least in part, by a series of faults through this section.

Yulleroo 1

The presence of *D. birkheadensis* palynoflora in cuttings from 681–837 m implies the presence of the Reeves Formation down to 858 m, assuming minimal caving. The high gamma interval 443–620 m, which was assigned to the Grant Group in the well completion report, could be either the Reeves Formation or Jurassic in age. The few Carboniferous/Permian palynomorphs in the dominantly Mesozoic assemblage from this interval are non-diagnostic, and may be reworked. There only obvious log correlation with the nearest wells, Cow Bore 1 (23 km southwest) and Barlee 1 (21 km west) confirms that the upper part of the Anderson Formation directly below the Reeves Formation in Yulleroo 1.

Kidson Sub-basin

For convenience, this section also incorporates nearby wells on the Anketell Shelf, Munro Arch, and Ryan Shelf.

Auld 1 and South Auld 1

The two wells (Plate 12) are 2.4 km apart and were spudded near low outcrop of the ?Triwhite Sandstone (equivalent to the basal part of the Liveringa Group) in the southwest corner of SAHARA, but it is unclear if this unit or Mesozoic strata are present in the upper part of either well (or if the nearby outcrops are Permian or Mesozoic). The Noonkanbah Formation appears to be thin in both wells and the Poole Sandstone could be one of two, or both, upward coarsening cycles in both wells (Auld 1: 76 – 143 – 207.6 m; South Auld 1: 78–147–223 m). Based on a correlation with Sahara 1 (87 km north-northeast), via Frankenstein 1 (44 km north), the base of the Poole Sandstone could be placed at 117 m in Auld 1 and 129 m in South Auld 1. The only available palynology close to this level in these four wells is from Sahara 1 (Unit II in core 1). Correlation of the underlying section to the top of the Tandalgoo Formation between the two wells (?117–795 m in Auld 1 and ?129–803 m in South Auld 1) appears uncomplicated, but the lowermost part of the unit (715–795 m and 670–803 m, respectively) is less clear, most probably reflecting a highly variable fluvio-glacial succession. These intervals are tentatively placed in the Reeves Formation based on Unit II palynomorphs from 219–710 m, and Unit 1 palynomorphs at 776.1 m in Auld 1 (Plate 9 and 12).

In South Auld 1 probable dropstones appear at 296 m implies this level lies within the Hoya Formation. Superficially, the wireline-log response over 318–500 m in Auld 1 (and 315–497 m in South Auld 1) is similar to that over 915–1070 m in Kidson 1 (lower part of the Winifred Formation), but that well lies 220 km to the east-southeast. The intervals 209–280 m and 223–286 m in Sahara 1 and 2, respectively, are tentatively assigned to the Calytrix/Winifred Formation based on a correlation with Frankenstein 1.

Contention Heights 1

The only Permian units present are the Noonkanbah Formation (88–175 m), Poole Sandstone (175 – ?221.5 m), and Grant Group (?221.5 – 833 m) between undifferentiated Mesozoic and Devonian Mellinjerie Limestone. The Calytrix Formation is tentatively identified as the shaly interval 475–540 m. Although the group shows little similarity on the wireline logs with the nearest well, Wilson Cliffs 1 (49 km west-northwest), its thickness is fairly similar (611.5 versus 536 m; Plate 12).

Frankenstein 1

The base of the Noonkanbah Formation (69–207 m) is here placed near the disconformity above an 'abandoned delta-front lobe' identified in the well completion report. With the exclusion of this section, the Poole Sandstone (207–?257 m) is here restricted to a poorly defined upward coarsening cycle (the gamma-ray log was run through the surface casing to 404 m). The base of the Poole Sandstone may be deeper (?282 m): there is too little data to be certain but correlation with Sahara 1 (52 km northeast) favours the higher pick. The Grant Group (257–?804 m) contains Unit II palynomorphs from 434–680 m; 390–461 m is tentatively identified as the Clianthus Formation. By comparison, 390–628 m can be correlated with the reference section of the Winifred Formation in Kidson 1 (815–1070 m) but a correlation with Sahara 1 (Plates 9 and 12) shows significant changes in the lower part of that formation and implies it cannot be traced further north. The top of the ?Reeves Formation is placed at a small log break at 804 m above late Carboniferous palynomorphs (from 882–901 m), and its base is placed below the conglomerate bed at approximately 914 m in core 1. The possibility that these palynomorphs have been reworked into the Grant Group cannot be discounted.

Kemp Field 1

The presence of *Vittatina* assemblage palynomorphs (approximately *S. fusus – P. sinuosus* zones) in core 1 implies that the shaly interval 103–158 m is Noonkanbah Formation. Similarly, the Stage 2/*P. confluens* zone palynomorphs from 184–426 m indicates an age consistent with the Grant Group, and is consistent with 158–179 m belonging to the Poole Sandstone, as indicated in the well completion report. The interval 344.5 – 434 m is correlated with the Calytrix/Winifred Formation rather than the shaly interval 179–235 m that was assigned to the 'Dora Shale' in the well completion report. However, this is uncertain given the distance to the nearest other wells (Pegasus 1, 55 km northeast; Sahara 1, 82 km S; Plate 9).

Kidson 1

The Liveringa Group has an eroded upper contact with Cretaceous strata at 212 m and overlies the Noonkanbah Formation (290–617 m). The Poole Sandstone (617–?680 m) is picked on the basis of the gamma-ray log. In this section the Poole Sandstone displays some cyclicity but there is no modern palynology to support this assignment. Crowe and Towner (1976) designated 815–1070 m as a reference section for the Winifred Formation (to replace the miss-correlated 'Dora Shale'), possibly as the well was then the closest one to the type section (150 km east, next to the Canning Stock Route between Wells 26 and 27). The lowering of the top 'Dora Shale' from 736 m (top 'Grant Formation' in the well completion report) suggests some attempt to recognize the Carolyn Formation. The relatively uniform high gamma-ray response over 915–1070 m suggests an affinity with the Calytrix Formation, but the distance to other wells renders such a correlation uncertain. The interpretation of varves in the type section (Towner et al., 1976) implies some glacial influence, and the lower part of the 'Winifred Formation' in Kidson 1 possibly correlates better with the Hoya Formation on the Barbwire Terrace. Spores from core 2 (1551.45 – 1556.3 m) cannot be dated more precisely than *S. ybertii* to *M. tentula* (Stage 2) zones, so it is unclear if the low-gamma interval 1473–1570 m is the Reeves Formation. Note that the SP log changes polarity at 710 m (Plate 12).

Patience 1 and 2

Patience 1 (Plate 12) intersected undifferentiated Liveringa Group (278–392 m) below Jurassic sandstone with palynomorphs of the Middle Permian *D. ericianus* zone at 280 m, Noonkanbah Formation (392–578 m), Poole Sandstone (578–621 m), and Grant Group (621–1335 m) above Devonian Mellinjerie Limestone. Palynomorphs of the *P. confluens* zone were recovered from cuttings over 873–1323 m. The Calytrix/Winifred Formation may be either largely shaly interval 833–863 m or 1043–1125 m. Although drilled as about 200 m north of Patience 1, there are enough differences in the logs for Patience 2 to imply some unreliability of the wireline data given the proximity of the two holes. Below the Noonkanbah Formation the wells show little similarity to the nearest well, Kidson 1 (107 km west-northwest).

Pegasus 1

The interval 85–408 m is assigned to the Grant Group on the basis of *P. confluens* from cuttings over 200–410 m indicating a Sakmarian age. The silty interval 166–234 m is tentatively correlated with the Calytrix/Winifred Formation although the upper boundary corresponds to the casing shoe (Plate 9).

Sahara 1 and Tandalgoo 1–3

The nearest wells to Sahara 1 (Plates 9 and 12), Tandalgoo 1–3 (6–7 km southeast and 25 km south-southeast, respectively), bottomed in the Noonkanbah Formation and correlation of the deeper Permian units with the next closest well, Frankenstein 1 (51 km southwest) is not clear. Fossiliferous intervals shown on the Sahara 1 composite well log extend below the Poole Sandstone (295–362 m) to 373 m. The revision of the palynology for this well summarized in Jackson et al. (1994) indicates Unit II (probably *P. confluens* zone) from core 1 (307.6 – 310.6 m), implying that the Poole Sandstone is no more than 10 m thick in this well. Unfortunately, the provenance of this information is uncertain. The Calytrix/Winifred Formation (445–531 m) is a fine-grained interval that correlates well with Frankenstein 1. In addition, 863.5 – 931 m appears to correlate with the ?Reeves Formation in Frankenstein 1, but the lack of modern palynology at this level, and the distance to the nearest wells makes these correlations uncertain.

Wilson Cliffs 1

The top of the Noonkanbah Formation is tentatively place at the gamma-ray log break at 145 m below undifferentiated Mesozoic. The Poole Sandstone (373–430 m) is picked as a series of coarsening upwards cycles on the gamma-ray log. The interval 640–650 m may be the Calytrix Formation within the Grant Group (430–966 m), but is far too thin to provide any confidence that the group can be subdivided meaningfully. Overall the group shows a subdued character on the gamma-ray log (Plate 12).

Lennard Shelf

Of the 67 wells drilled across the Lennard Shelf just 18 have palynology to assist in differentiating stratigraphic units. In this sub-basin both the extent of the Reeves Formation, and the stratigraphic level of limestone beds ascribed to the Nura Nura Member within the Poole Sandstone, are uncertain.

The following wells are shown within the Lennard Shelf on the GSWA interactive map (GeoVIEW.WA) but WAPIMS places them in the Fitzroy Trough; Boronia 1, Kora 1, Philydrum 1, Prices Creek 4, West Kora 1, and West Philydrum 1. Conversely, the following wells are shown within the Fitzroy Trough, but WAPIMS indicates they lie within the Lennard Shelf; Katy 1, Sundown 1–5, Sunup 1, and Whitewell 1. The difficulty appears to lie in mapping the Pinnacle Fault System west of the Emanuel Range. Prices Creek 4 lies between the Cadjebut and Pinnacles Fault, and is here classified as lying within the Lennard Shelf rather than Fitzroy Trough.

Aquantia 1

The Blina Shale/Liveringa Group contact at 333 m is obscured on the gamma-ray log by casing (to 541 m), which also throws doubt on the pick of the top of the Noonkanbah Formation at 547 m. The Poole Sandstone is an overall coarsening-up succession on the gamma-ray log here picked from 798 to ?871 m. The company pick at 769 m is likely to be a thin sandy carbonate near the base of the Noonkanbah Formation. Unit III (*D. townrowii*) assemblage palynomorphs (863–1328 m) are equivalent to the *P. pseudoreticulata* zone normally associated with the Poole Sandstone plus the *P. confluens* zone that is always associated with the Grant Group. The silty interval (988–1337 m) is probably the Winifred Formation, and is slightly thicker than in nearby Katy 1 and Thompsons 1. The undated blocky sandstone interval below (1337–1580 m) is assigned to the Reeves Formation based on correlation with nearby wells (Plate 3).

Blackstone 1 and West Blackstone 1

Blackstone 1 (Plate 3 and 4) is one of the palynologically constrained wells in the Lower Permian of the basin (based on sidewall cores), and confirms that the Poole Sandstone/Grant Group contact (830 m) is close to the boundary between the *P. pseudoreticulata* (774–827 m) and *P. confluens* (851–1401 m) zones. In addition, most, if not all, of the section attributed to the Grant Group (830–1468 m) lies within the *P. confluens* zone. The thin interval (1449–1482 m) with *S. ybertii* zone palynomorphs correlates with the Reeves Formation, but it is unclear if those palynomorphs are in situ or reworked. The wireline logs indicate clean sandstone between 1200 and 1468 m with no obvious contact — the contact is provisionally placed at the top of the slightly lower gamma-ray response commencing at 1402 m.

In West Blackstone 1, 2 km northwest of Blackstone 1, the base of the Poole Sandstone is placed at 834 m at the base of a thin calcareous bed. The Unit II/*M. tentula* palynomorph assemblage (850–1415 m) extends throughout most of the Grant Group (817–1459 m). The Reeves Formation (?1459–1489 m) is undated in this well, but is identified tentatively via a correlation with Blackstone 1.

Blina 1–8

Of the eight holes drilled in the field, Blina 5 and 8 are the furthest apart (1.4 km). No palynology is available from the Triassic–Permian. Only the base of the Poole Sandstone and the Winifred Formation are significantly altered from the depths given in the well completion reports. In Blina 1, a thin carbonate bed at 636 m is tentatively identified as the Nura Nura Member from the wireline logs (Plate 3). The thin mudstone 776–812 m is assigned to the Winifred Formation in Blina 1 and is correlated across the field with the most significant anomalies in Blina 3 where the unit (746–768 m) is relatively high in the group, and Blina 7 in which the unit (798–833 m) is relatively thick. In the Betty Formation a middle silty unit is evident in Blina 3, 4, and 8, but not in the other wells. The Reeves Formation appears to be absent in these wells (Fig. 5.2).

BMR 02 Noonkanbah

The well was drilled 1.4 km west-northwest of low outcrop of the Grant Group, which it intersected over 9–53 m (according to WAPIMS, whereas Henderson et al. (1964) indicate 9–76 m). The group is described as a quartz greywacke (=sandy diamictite) and contains microfossils in core 2 (Henderson et al., 1963). It is possible they are from reworked older limestone. There are no wireline logs or definitive paleontology available from the unit in this well.

Boronia 1, Kennedia 1, and Mimosa 1

Boronia 1 and Kennedia 1 lie 1.6 km southwest and 2.4 km east-southeast of Mimosa 1 (Plates 3 and 5). Of these wells only Kennedia 1 has palynological data. Based on regional correlations 644–697 m in Boronia 1, 599–657m in Kennedia 1, and 605–675 m in Mimosa 1 are assigned to the Poole Sandstone. Unit III palynomorphs identified over 588.5–610.2 m in Kennedia 1 are presumed to be equivalent to the *P. pseudoreticulata* zone. Correlation between Mimosa 1 and Kennedia 1 is clear, but the formation could be lower in Boronia 1 (?697–755 m) or could incorporate this interval as well. If this is the case it would imply some interfingering between the Poole Sandstone and Noonkanbah Formation on a regional scale as the formation appears to have a moderately consistent thickness and character across much of the Lennard Shelf. Although the Grant Group has a similar thickness and character in Kennedia 1 and Mimosa 1 (370.5 m and 363 m, respectively), it is thicker in Boronia 1 (488 m). That well has a much thicker shaly section (830–987 m) than in Mimosa 1 or Kennedia 1. In Boronia 1 the Winifred Formation could be placed over the entire shaly interval 830–987 m, but here is restricted to 833–?877 m or 901 m to best correlate with the unit in Hakea 1 (13.5 km northwest) as well as Mimosa 1.

Boundary 1 and Boundary Southeast 1

Boundary Southeast 1 was drilled 400 m south-southeast of Boundary 1. Most formation contacts are shallower by15 m or less in Boundary Southeast 1. The Nura Nura Member is questionably placed at 890–892 m and 887–889 m, respectively, based on the wireline logs. The Winifred Formation is here restricted to 1146–1183 (or 1225) m and 1143–1183 (or 1210) m, respectively, based on a regional correlation across the Lennard Shelf (the position of the lower contact is uncertain).The Reeves Formation (1380–1554 m and 1369–1542 m, respectively) is picked on similar criteria within the clean sandstone interval below the Winifred Formation as there is no palynology available for these wells. Boundary 1 is shown on Figure 5.3 and Plate 3

Canegrass 1

The formation picks in the well completion report are accepted with the minor modification of the Nura Nura Member (598–601 m) and the tentative identification of the Winifred/Calytrix Formation (881–958 m). No palynology is available, but correlation with Meda 1 (3.6 km west-southwest) implies the Reeves Formation is absent.

Chestnut 1

The well lies 4 km along strike from poor outcrop of the Noonkanbah Formation, but correlation with Palm Spring 1 (10 km east-southeast) indicates the Poole Sandstone lies above 40 m in an interval lacking wireline logs. The mudstone interval 203–233 m is assigned to the Winifred Formation; the Reeves Formation is absent (Plate 5).

Gap Creek 1

Although drilled within 300 m of poor outcrop shown as Noonkanbah Formation on the NOONKANBAH geological sheet, the well penetrated Grant Group from 24 to 237 m, consisting of thinly bedded siltstone and sandstone (20–178 m) overlying sandstone with minor conglomerate containing metamorphic and igneous material (178–237 m). No attempt is made to divide the group in this well. BHP VCD 1 (600 m southeast) intersected a similar succession consisting of fine-grained sandstone

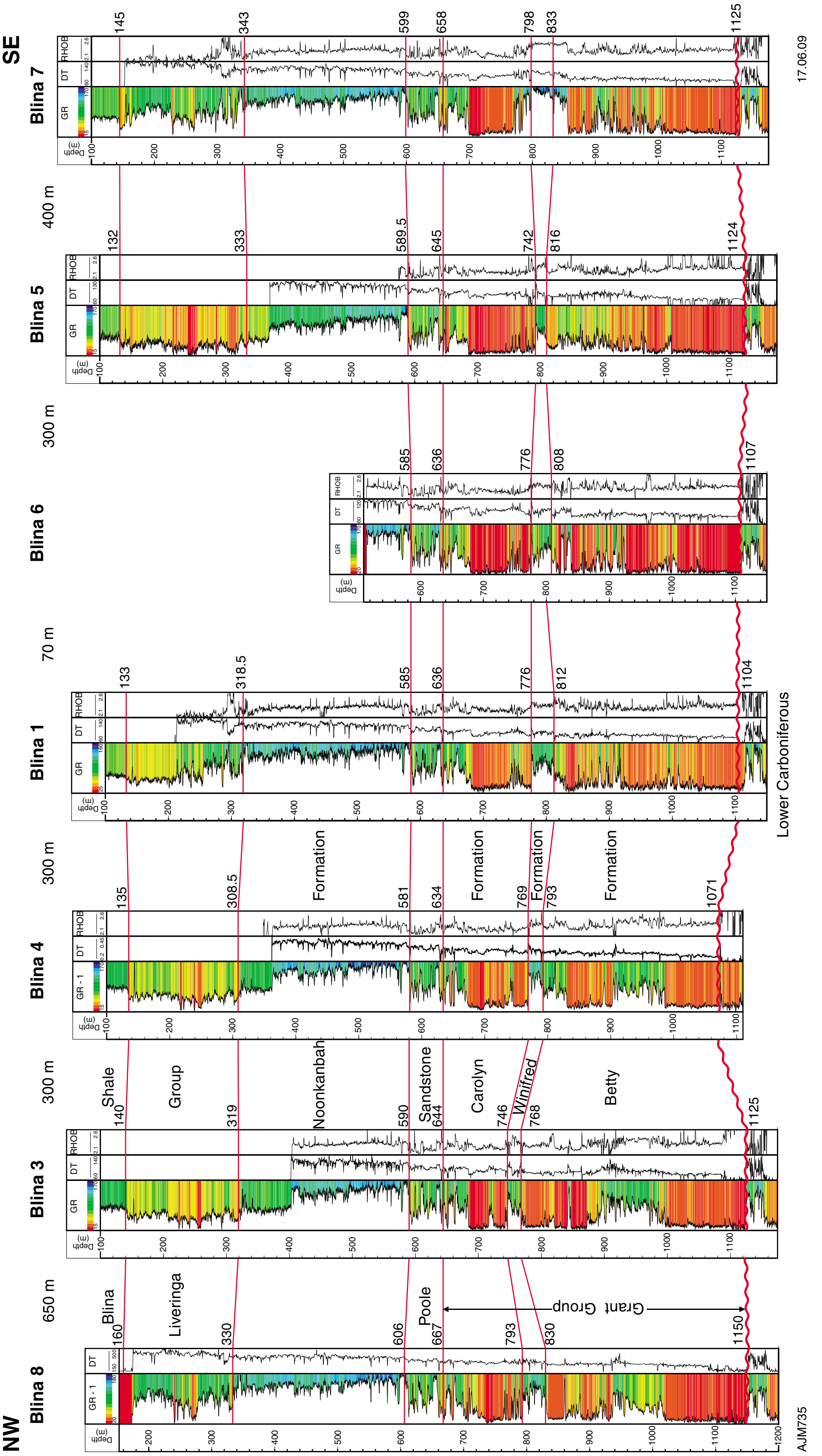


Figure 5.2. Correlation across the Blina Field, Lennard Shelf,

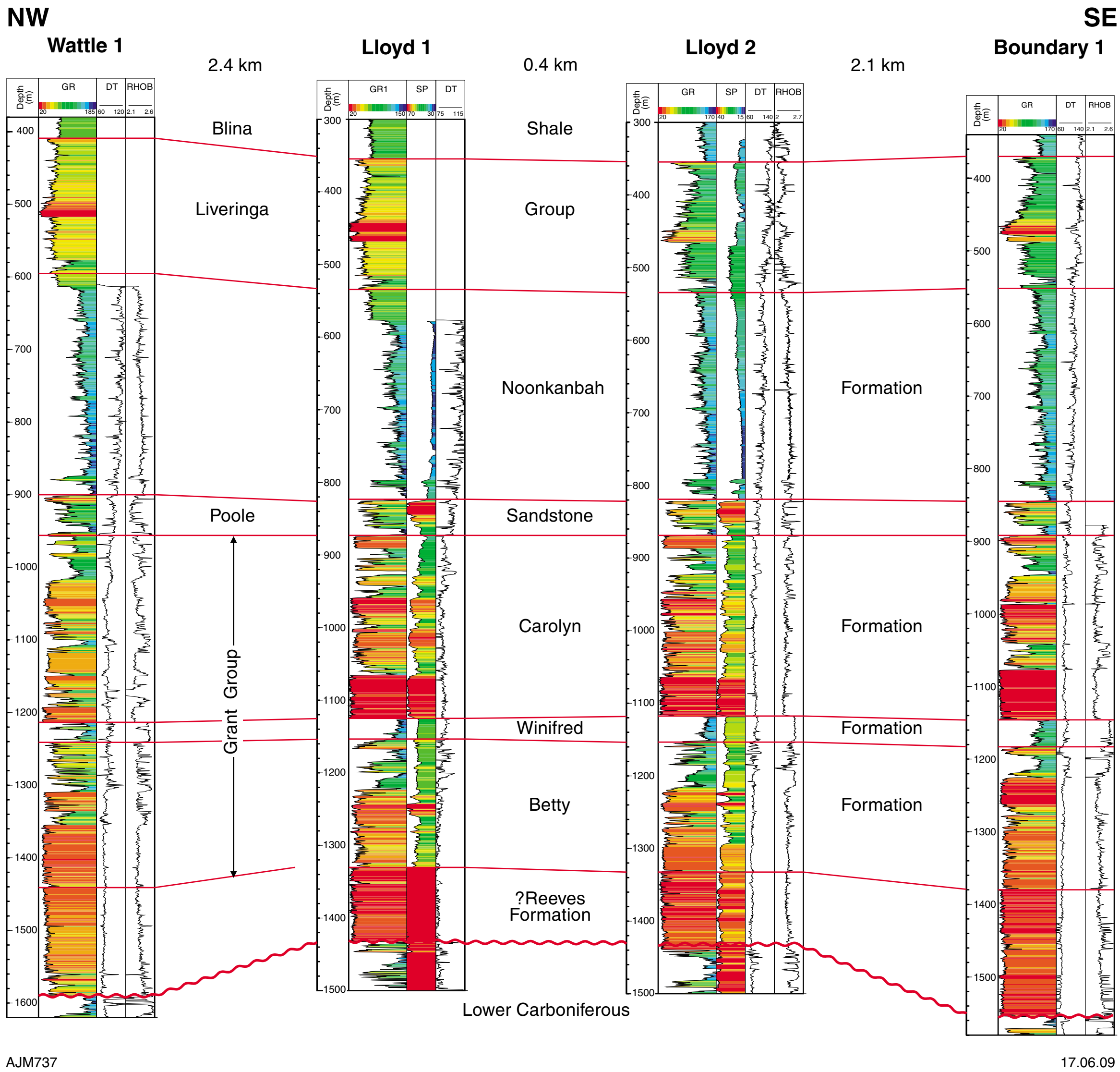


Figure 5.3. Correlation of Lloyd 1–2 with Wattle 1 and Boundary 1, Lennard Shelf.

and laminated siltstone to 173 m above fine- to coarse-grained sandstone with minor diamictite near the base of the core (114–216 m). BHP GCD 2 (4.5 km northeast) intersected Grant Group to 50 m consisting of coarse-grained sandstone with some granite clasts (9.5 – 21.6 m), overlying micaceous siltstone with plant debris (21.6 – 50.4 m) with a basal, 20 cm-thick sandy diamictite. That section presumably correlates with the Deeadeea Sandstone and Ngumban Claystone Members of the Carolyn Formation, and has yielded palynomorphs of the *P. confluens* zone from 44.5 m. Presumably the thicker fine-grained upper section in Gap Creek 1 is equivalent to the Ngumban Claystone Member. As none of these drillholes penetrated younger Permian units, and the Grant Group onlaps Carboniferous and older strata in this area, the relative position of the two members within the group is unclear.

Hangover 1

The Noonkanbah Formation (440–770 m) is well dated from Unit III–VI palynomorphs (approximately the *P. pseudoreticulata* to *P. sinuosus* zones). Unit III (756–822 m) extends into the underlying Poole Sandstone. By comparison, in Sundown 1 (4.5 km northwest) Unit III is either absent or very thin (<5 m) in the Noonkanbah Formation. The base of the Poole Sandstone is here placed at 828 m just below a possible carbonate bed (825.5 – 827 m picked the density and sonic logs) that is tentatively identified as part of the Nura Nura Member. This level lies between the range of Unit III/*D. townrowii* (756–822 m) and *M. tentula* (849–1204 m) palynofloras that probably equate with the *P. pseudoreticulata* and *P. confluens* zones, respectively, but further work is required to confirm this. The shaly interval 987–1024 m is identified as the Winifred Formation rather than the lower shaly interval 1109–1214 m based on correlation with nearby wells. The clean sandstone succession from 1214–1539 m lacks palynology but lies between likely *P. confluens* (1204 m) and *G. maculosa* (1543 m) zones. Correlation with Blackstone 1 (8 km east-southeast) and West Blackstone 1 (6.5 km east) suggests that the Reeves Formation is present, but is less than 60 m thick (Plate 4).

Harold 1 and Lukins 1

The wells lie 4.7 km apart (Plate 4) near the base of poor outcrop of the Liveringa Group on the western edge of LENNARD SHELF. In Harold 1 Unit II/*H. ramosus* assemblage palynomorphs extend over 457–679 m. The lower part of this range is within carbonates of the Fairfield Group (below 656 m), and probably is due to contamination. Nevertheless, the Reeves Formation clearly is absent in both wells. In Harold 1, 221–308 m was referred to the Poole Sandstone in the well completion report, but that unit is here tentatively restricted to the upper half (221–260 m) based on regional log correlations. In Lukins 1 the Poole Sandstone is similarly restricted to 306–351 m. Identification of the Winifred Formation in Harold 1 is dubious, and the unit is probably absent in Lukins 1 (Plate 4).

Hawkstone Peak 1

The well was drilled 3 km west of outcrop of the Grant Group on DERBY, and reached the base of the group at 186 m. No paleontology is available in this sandstone-dominated section.

Janpam 1 and Janpam North 1

The wells are 3.7 km apart but Thompsons 1 lies closer to Janpam 1 (3.2 km west-southwest; Plate 4). Of these wells only Janpam 1 has palynological data (Unit III at 833 m and Unit II over 886–1188 m) from the Poole Sandstone and Grant Group, respectively. In Janpam 1 the Poole Sandstone is here restricted to 785–847 m to exclude shale and limestone above (part of Noonkanbah Formation) and sandstone below the Nura Nura Member (863–?847 m) that is likely to be part of Grant Group. In Janpam North 1, 715–772 m is probably the Poole Sandstone.

Katy 1

Unit–IV palynomorphs were recovered from 11.5 m above the base of the Noonkanbah Formation (330–704 m) consistent with Sundown 1 (16 km northwest). Unit II/*M. tentula* palynomorphs at 829 m imply the Poole Sandstone lies at a higher level. That formation is here placed above the base of a thin possible limestone bed at 763 m (possible Nura Nura Member) based on the wireline logs. The presence of the *S. ybertii* zone at 1743 m implies the presence of the Reeves Formation (?1260–1778 m). That unit is considerably thicker (518 m) than in Aquantia 1 (242 m), 1.7 km north; Plate 3).

Kora 1 and West Kora

The wells were drilled 2 km apart near the northern margin of the Fitzroy Trough. Formation boundaries are generally 20 m shallower in West Kora 1. The Poole Sandstone in Kora 1 is here restricted to 998–1047 m to better match West Kora 1 in which thin limestone beds indicate the Nura Nura Member from 1000–1024 m. The 'Winifred Formation' is clearly defined on the gamma-ray logs in Kora 1 (1235.5 – 1271.5 m) but the equivalent interval in West Kora 1 (?1222–1264 m) appears to be much more sandy especially above 1244 m. It is unclear if the Stage 1 palynomorphs identified from West Kora 1 (1459–1550 m) belong within the *D. tenuistriatus* zone or not, but the clean sandstone (1525–1580 m and 1528–1557 m, respectively) is tentatively placed in the Reeves Formation. In West Kora 1 the *G. maculosa* zone is confined to the underlying Anderson Formation. Kora 1 is shown on Plate 3, and West Kora on Plate 6.

Langoora 1

The base of the Poole Sandstone is placed at 579 m based on correlations with nearby wells and the absence of limestone of the Nura Nura Member — other formation picks in the well completion report are accepted with the minor adjustment of the base of the Winifred Formation to 842.5 m. The interval 1112–1274 m is tentatively identified as Reeves Formation based on the presence of *S. ybertii* zone palynomorphs in core 6 and correlation with nearby wells (Plates 2 and 6).

Lloyd 1–3

Lloyd 2 and 3 were drilled from the same surface location 400 m southeast of Lloyd 1. No cores or palynology are available from the Triassic–Permian succession, nor were the las files for Lloyd 3 available. The formation picks in the well completion reports for Lloyd 1 and 2 are mostly accepted with minor modifications, except for the base of the Poole Sandstone and Winifred Formation which are both placed higher based on regional correlations. The Reeves Formation is also tentatively identified based on regional correlation of the clean sandstone immediately above the Anderson Formation (Fig. 5.3).

Loris 1 and Scrubby 1

Scrubby 1 was drilled 1.6 km east-southeast of Loris 1 (Plate 4). The base of the Poole Sandstone is placed at 972 m and 936 m at the base of likely 2 m- and 3 m-thick carbonate beds, respectively, interpreted from the wireline logs. The middle of the Winifred Formation (1221–1275 m and 1149–?TD, respectively) shows a similar sandy interval in both wells. The conglomerate interval 1557–1596 m in Loris 1 is tentatively assigned to the Reeves Formation. Neither well has palynology available.

Mariana 1

The Poole Sandstone (632–691 m) contains 2 distinct limestone beds (663–667 m and 678–681 m) of which the lower one is referred to the Nura Nura Member (678–691 m). The base of the formation is modified from the well completion report to between the range of the Unit III/*D. townrowii* (675–690 m) and Unit II/*ramosus* (705–975 m) palynological assemblages. Identification of the Winifred Formation is dubious, and the Reeves Formation appears to be absent (Plate 4).

May River 1

Most of the formation picks in the well completion report are accepted with minor changes (Plate 6). The top of the Grant Group is placed at the base of the fossiliferous limestone at 478.5 – 488.5 m, here identified as the Nura Nura Member. Alternatively, the base of the Poole Sandstone could be at 520 m at the base of an underlying coarsening-up cycle as indicated by the wireline logs. Although there is no palynological data for this well, and insufficient in nearby wells to be definitive, on regional correlations the thicker carbonate appears to be the Nura Nura Member.

Meda 1 and 2

In Meda 1 (Plate 3) the Nura Nura Member was tentatively identified based on the presence of bryozoa within the basal 30 cm of core 3 and cuttings over 723.3 – 739.4 m in the well completion report. Based on log correlations the lower limit of the member is here placed at 726 m. The Grant Group is divided into Betty (?1069–1185 m) Winifred (1012–1069 m) and Carolyn (725–1012 m) Formations — all lie within the *P. confluens* zone. The middle shale unit was described as tillitic in the well completion report indicating a different facies to the Calytrix Formation. Correlation with Terrace 1 to the east implyies the base of the section previously assigned to the Grant Group lies within the Reeves Formation (?1185–1281 m).

In Meda 2 (1.2 km south of Meda 1) the gamma-ray log shows a close similarity to Meda 1 down to the top of the Grant Group. The variations in log response within the Carolyn Formation are probably due to rapid facies changes, given the wells (and their logs) are of similar vintage. It is unclear where the top of the Reeves Formation is in Meda 2, but the sandstone-dominated section below the Winifred Formation (Betty plus Reeves Formation) is 60 m thicker than in Meda 1.

Mellany 1

The only change to the company formation picks suggested is that the base of the Poole Sandstone is placed at 478 m to be consistent with nearby wells. The Nura Nura Member appears to be absent (or lacking limestone). The divisions of the Grant Group are based on regional correlations given that the section is dominated by sandstone. No palynology is available for the well (Plate 10).

Napier 4

The well was drilled 2.5 km west of outcrop of the Grant Group on Yampi, and reached the base of the group at 68 m. No paleontology is available from this sandstone-dominated section.

Orange Pool 1

The well was drilled 2 km southwest of outcrop of the Lightjack Formation and intersected the base of that unit at 75 m. The Poole Sandstone forms a clear upward coarsening cycle (319.5 – 369.5 m) but there was no sign of fossiliferous limestone of the Nura Nura Member. Therefore it is unclear if the underlying coarsening-up cycle (369.5 – 395 m) belongs in the formation, although correlation with May River 1 and Meda 1 implies otherwise.

Palm Spring 1

The well (Plate 5) was drilled along strike from poor outcrop of the Noonkanbah Formation. The Poole Sandstone is modified from the company pick (143–173 m) to 155–173 m between a dominantly silty section (Noonkanbah Formation) and prominent sandstone (Grant Group). In lowering the Poole Sandstone the *Vittatina* assemblage (121 – 148.5 m; approximately *S. fusus – P. sinuosus* zones) falls entirely in the Noonkanbah Formation. There was no sign of the Nura Nura Member. In the Grant Group (204–462 m) the predominantly claystone interval 355–371 m is tentatively correlated with the Winifred Formation. *Nuskoisporites* assemblages (Asselian–Sakmarian) were recovered from 368.5 – 418.2 m implying that the Reeves Formation, if present, is less than 44 m thick. Undated fossiliferous limestone beds from 399–436 m either indicate a marine influence near the base of the Grant Group, or could be part of an older unit.

Philydrum 1 and West Philydrum 1

The wells were drilled 2.3 km apart (Plate 5) and, although the Lennard River geological sheet shows Philydrum 1 within outcrop of the Noonkanbah Formation, both wells clearly were spudded in the Liveringa Group (Plate 5). Whereas the top Noonkanbah varies by 49 m between the wells (186 and 235 m, respectively), the Poole Sandstone (582–645 m and 579–637 m, respectively) contacts vary by no more than 8 m. It is unclear if this is due to erosion of the top of the Noonkanbah, interfingering between the Liveringa Group and Noonkanbah Formation, small faults within the Noonkanbah Formation, or thinning of that unit to the west-northwest. Conversely, there are clear differences within the Grant Group, and the position of the Winifred Formation (889–908 m and 794–832 m, respectively) implies interfingering and/or erosion of facies within the Grant Group. The identification of the Reeves Formation in Philydrum 1 (1020–1289 m) is based largely on correlation with Crimson Lake 1 (8.9 km south-southeast; Plate 3).

Point Torment 1 and Valentine 1

No palynology is available for either well. The Valentine 1 formation picks are preliminary and are based entirely on the wireline logs. In that well 926–968 m is probably the Poole Sandstone based on the presence of a thin (about 1 m thick) basal limestone bed, here correlated with the Nura Nura Member (?965–968 m). Correlation with Valentine 1 (4.2 km southeast, Plate 6) shows that in the Grant Group only the uppermost cycle (894–940 m in Point Torment) is easily correlated between the two wells. In Valentine 1 the bulk of the Grant Group (968 – ?1410.5 m) is dominated by sandstone, so it is not possible to subdivide this unit even though it contains a distinctive fine-grained interval in Point Torment 1. The Reeves Formation is differentiated from the Grant Group as the clean sandstone over 1378–1516 m in Point Torment 1, and ?1410–1798 m in Valentine 1, but this is speculative as it is based on a regional correlation (Plate 6).

Prices Creek 4

This shallow bore was drilled just north of a sandstone outcrop of the Carolyn Formation (Grant Group) on NOONKANBAH and intersected sandstone down to 22 m above limestone and shale of presumed Ordovician age. Plant fossils from the nearby water bore for BMR 3 Noonkanbah (originally 'Prices Creek'; White, 1956) indicate a general Permian age. The water bore bottomed at 30.5 m in Grant Group (Henderson, 1956) indicating some local variation in the depth to the base of the Grant Group.

Runthrough 1

Limestone attributed to the Nura Nura Member (1032–1037 m) lies above a coarsening up cycle also included within the Poole Sandstone (982–1094 m) in the well completion report. There is no palynology to confirm which unit the interval below the limestone belongs to, but regional correlation suggests the base of the Poole Sandstone is at 1037 m. Correlation with Loris 1 (3.6 km southeast) indicates that the Winifred Formation cannot be easily distinguished (Plate 4).

Sundown 1–5

In Sundown 2 the Noonkanbah Formation (444–785 m) contains Unit IV–VI palynomorphs (approximately *S. fusus*–*P. sinuosus* zones). In this well Unit IV was recovered over 744–780 m indicating that little, if any, of Unit III is present within this formation. In both Sundown 1 and 2, Unit II extends into the 'lower Poole Sandstone' as depicted in the well completion reports. Regional correlations suggest that this zone is restricted to the Grant Group. In both wells Unit II extends below the shale assigned to the Winifred Formation by Crostella (1998). In Sundown 1 (Plate 3) palynomorphs of the *S. ybertii* zone were recovered from 1452 m; assuming these are not reworked the top of the Reeves Formation could be placed at the log break at 1337 m based on a correlation with Terrace 1 (12 km north-northeast, Plates 3 and 10) or at 1387 m from the correlation shown on Plate 4.

Sunup 1

The Nura Nura Member is here restricted to 812–816 m based on regional correlation and the wireline logs. The Winifred Formation is tentatively identified as the thin mudstone interval 1002–1017 m. However, this appears to be thinner than in the nearby Blackstone 1 and Aquantia 1 (37 m and 34 m, respectively, compared to 15 m) and lower within the Grant Group by at least 80 m, so it is possible that the formation is missing in Sunup 1 (possibly removed by channels at the base of the Carolyn Formation). The upper contact of the Reeves Formation is tentatively placed at 1380 m above a monotonous clean sandstone interval based on correlation with Blackstone 1 (5.3 km northeast) in which this level is moderately well constrained by palynology (Plate 3).

Terrace 1

The base of the Poole Sandstone presumably lies between the Unit III/*D. townrowii* and Unit II/*H. ramosus* palynological assemblages in cuttings from 875 m and 902 m, respectively, and is here placed at 880 m. The logs indicate possible carbonate beds (?Nura Nura Member) at 857.5 – 859 m and 878–880 m, but these were not seen in the cuttings. The upper contact of the Reeves Formation (1320–1565 m) is placed at a minor log break a short distance above the *S. ybertii* zone (1396.7 – 1508 m; Plates 3 and 10).

Thompsons 1

The Poole Sandstone (815–877 m) contains 3 likely carbonate beds at 848 m, 856 m, and 868–869 m of which the lowermost is probably part of the Nura Nura Member. The identification of the Reeves Formation (?1384–1501 m) is based on a correlation with Blackstone 1 (4.5 km northwest, Plate 4) and Aquantia 1 (3.6 km southwest; Plate 3). There is no palynology available.

Wattle 1

The interval 990–956 m is identified as the Poole Sandstone based on a correlation using the wireline logs to Blackstone 1 (18.5 km southeast; Plate 3) in which the lower contact is tightly constrained by palynology. The Winifred Formation could be either 1213–1241 m or 1213–1310 m. In either case, the 69 m-thick interval in question consists of a coarsening up cycle, which probably represents a channel deposit and correlates with a 42 m-thick sandstone–mudstone interval in Boundary 1 (2.6 km southeast, Fig. 5.3). The top of the Reeves Formation is placed at 1441 m just below a thin mudstone based on a poorly constrained regional correlation of the clean sandstone interval 1335–1590 m within this well (Unit C of the Grant Group in the well completion report).

Whitewell 1

Most of the formation picks in the well completion report are accepted with minor changes, but the top of the Grant Group is here placed at 805 m to be consistent with wells with good palynological control in the Lennard Shelf (Plate 4). The palynology in this well is from cuttings, and therefore likely to be somewhat unreliable. There is no palynology from the lower part of the Grant Group or Reeves Formation: the latter is identified by correlation with Sundown 1 (2.6 km northwest) and may be thicker than shown on Plate 4. Shales assigned to the Winifred Formation in the Sundown wells do not correlate easily with Whitewell 1 even though Sundown 3 lies just 1.8 km northwest. This may be due to channels at the base of the Carolyn Formation cutting through this level. Cuttings from 1460–1470 m at the top of the underlying Anderson Formation contain palynomorphs assigned to the Viséan *G. maculosa* zone.

Yarrada 1

The formation picks in the well completion report are accepted with minor modification to the base of the Poole Sandstone (848 m) and the tentative assignment of units A–C of the Grant group to the Carolyn, Winifred, and Betty Formations, respectively. The Nura Nura Member is here restricted to 843–848 m based on the description of calcareous fossiliferous sandstone in cuttings from 840–845 m and the wireline logs. The clean sandstone between the Winifred and Anderson Formations is undated and possibly includes the Reeves Formation over 1370–1559 m (Plate 3).

Pender Terrace (part of Lennard Shelf)

Curringa 1

The fossiliferous limestone over 915–920 m is probably the Nura Nura Member, thereby implying the Poole Sandstone extends up to 882 m and, similar to nearby wells, is dominantly fine grained. An alternate interpretation (in the well completion report) places the Poole over 922–971 m with the Nura Nura Member over 948–971 m based on thin possible limestone beds (up to 1 m thick) identified from the wireline logs. Both the *M. tentula* (972–1185 m; ? = *P. confluens*) and *S. ybertii* (1284–1563 m) zones are present and implies that the Grant Group/Reeves Formation contact lies at about 1267 m. However, the Reeves Formation is significantly thicker than in nearby wells (Plate 6), raising the possibility that the upper limit of the *S. ybertii* zone in this well may represent reworked material within the basal Grant Group. The top of the Reeves Formation could equally be placed at 1371 m, at the top of the ‘cleaner' sandstone interval (Plate 6). The 30 m thick ‘multicoloured siltstone' at the top of the Anderson Formation contains *G. maculosa* zone palynomorphs, a zone that in some wells falls within the Reeves Formation (Apak and Backhouse, 1999).

Kambara 1

As with the nearby Minjin 1 and Perindi 1 (Plate 6), the largely fine-grained interval assigned to the Poole Sandstone (809–852 m) is identified from the distinctive Nura Nura Member (843–852 m). The underlying section assigned to the Grant Group (852–1570 m) contains a thin mudstone (1168–1201 m) with Stage 2 palynomorphs here tentatively assigned to the Winifred Formation. The underlying clean sandstone (1201–1570 m) clearly represents a channel complex but has no internal evidence of its age. Correlation with Moogana 1 (34.5 km southeast) implies that at least some of the clean sandstone interval could be the Reeves Formation.

Minjin 1

The interval 819–827 m was identified in the well completion report as the Nura Nura Member, and lies between Stage 3b (750–766 m) and 3a (828–1266 m) palynomorphs. The overlying interval 789–819 m was assigned of the Poole Sandstone even though it is atypical of this unit. Correlation of the interval 827–1549 m above Devonian carbonate with Perindi 1 (13 km west-southwest) indicates it is entirely within the Grant Group (Plate 6). The dolerite intrusion (1391–1476 m) within this section has not been dated.

Moogana 1

The well has a relatively detailed palynological analysis, but the late Permian palynomorphs above 713 m in the ?Blina Shale probably are reworked. The Liveringa Group covers ?713–820 m based on late Permian palynomorphs (Upper Stage 4b to . *D. parvithola* zones, inclusive) and the wireline logs. The Poole Sandstone (1118–1167 m) includes the distinctive Nura Nura Member (1159–1167 m), but the age for the upper part of the Grant Group is anomalous as the Stage b (1197–1513 m; equivalent to the *P. pseudoreticulata* zone) is normally restricted to the Poole Sandstone and lowermost Noonkanbah Formation. The mudstone interval 1370–1390 m is probably the Calytrix/Winifred Formation based on correlation with nearby wells. The lower limit of the Grant Group presumably lies between the *M. tentula* zone (1550–1650 m, likely to be *P. confluens* zone) and *S. ybertii* zone (1700–1885 m), and is tentatively placed at 1675 m within a very clean sandstone with no obvious contact based on the wireline logs (Plate 6). The *G. maculosa* zone (1922.5 – 1977.5 m) appears to be confined to the underlying Anderson Formation.

Padilpa 1

The formation picks in the well completion report are accepted with minor modifications (Plate 6). The Poole Sandstone (1041 – 1080.5 m) is a distinct fine-grained and overlying sandstone interval, within the lower range of Stage 3a palynomorphs (955–1079 m; equivalent to the *P. pseudoreticulata* zone). Distinct carbonate beds of the Nura Nura Member appear to be absent even though they are present in the nearest wells (Puratte 1, 9 km southeast, and Jum Jum, 16.5 km southwest, in the Fitzroy Trough). Of the two fine-grained intervals in the Grant Group (1267 – 1310.5 m and 1388–1465 m), the upper is tentatively assigned to the Winifred/Calytrix Formation based on similarly placed intervals in Jum Jum 1 and Puratte 1. All of these fine-grained appear to lie within the *P. confluens* zone or its equivalents. The ‘pre-Grant' (1583–1791 m) is a relatively clean sandstone interval, here assigned to the Reeves Formation (the upper contact is placed 27 m higher than in the well completion report) assuming the *S. ybertii* zone (1606–1764 m) does not represent reworking. The Reeves Formation sits directly on gabbro dated as Early Carboniferous by K–Ar (336 Ma; appendix 11 of well completion report).

Pender 1

The well intersected the Grant Group (441–?725 m) and ?Reeves Formation sitting directly on basement (at 904.3 m) below the Jurassic. The identification here of the Winifred/Calytrix Formation (563 – 495.5 m) is highly speculative (Plate 6); there is no palynology.

Perindi 1

The Poole Sandstone (828–877) lies below Jurassic strata and is predominantly fine grained, similar to the section in Minjin 1 (12.8 km east-north east). Core 1 (872–881 m) shows the Nura Nura Member contact with the Grant Group at 877 m. Stage 3a palynomorphs from 877.3 – 1594 m probably equate with the *P. confluens* zone. The interval 1234–1256 m is correlated with the Winifred/Calytrix Formation. The lower part of the Grant Group includes several dolerite intervals; that from 1379–1535 m yielded a K–Ar date from cuttings of 291 ± 2 Ma (Sakmarian) and a fission track date of 255 ± 13 Ma (late Permian – early Triassic; Reekman and Mebberson, 1984; Gleadow and Duddy, 1984). The interval assigned to the Grant Group in the well completion report (877–1772 m) appears to include some Reeves Formation based on the presence of *S. ybertii* zone palynomorphs over 1735–1770 m; Plate 6).

Tappers Inlet 1

The Noonkanbah Formation lies directly below Jurassic strata at 641 m. The Poole Sandstone (930–971 m) is identified largely on the presence of the Nura Nura Member (967–971 m) based on the logs and cuttings. The mudstone interval 1198–1225 m is tentatively placed in the Winifred Formation based on correlation with Kambara 1 (21 km northwest). Correlation with Moogana 1 (14 km southeast) implies a thin section of Reeves Formation is present, whereas correlation with the wells to the west (Perindi 1, Minjin 1, and Kambara 1; Plate 6) indicates otherwise, as does the presence of the *Nuskiosporites* microflora at 1509 m.

Southwest

This area combines the Willara Sub-basin, and Wallal Platform and Embayment. No petroleum wells have been drilled on the Samphire Graben or Waukarlucarly Embayment. The only wells on the Anketell Shelf and Munro Arch are near the south-eastern and eastern ends, respectively, and are included with the Kidson Sub-basin wells.

Anna Plains 1

Jurassic strata directly overlie the Grant Group at 653 m. The presence of Stage 3a and Stage 2 palynomorphs over 655–839 m and 885–1019 m, respectively, implies the presence of the Grant Group (653–891 m), and possibly the Reeves Formation (891–1023 m) as the Stage 3a identification appears to be within the *P. confluens* zone. Superficially, the siltstone interval 683.5 – 730 m could be assigned to the Calytrix or Winifred Formations but correlation with Calamia 1 (43 km southeast) suggests that only the Hoya Formation is present. Similarly, the presence of siltstone with 'rain out' grains in core 5, 66 m below the top of the unit in Willara Hill 1 (52 km northeast) supports placing the entire Grant Group in Anna Plains 1 within the Hoya Formation. The presence of common bryozoa in the underlying sandstone indicates at least some marine influence. Correlation with the nearest well, Samphire Marsh 1 (36 km southwest) is hindered by the limited log suite in that well (particularly the lack of a gamma-ray log; Plate 11).

BMR 4A Madora

Previously referred to as BMR 4A Wallal (Henderson et al., 1963), it is the only well on the Wallal Platform — an area of shallow basement of the Rudall Complex. The Permian section in the well is anomalously thin with 25 m of Triassic (?Blina Shale) above 32 m of ?Liveringa Group apparently disconformable on 32 m of Grant Group based on palynology from cores 6, 7, and 8. There is no evidence for either the Noonkanbah Formation or Poole Sandstone (Plate 10). Although the wireline logs are inadequate to re-evaluate the stratigraphy in the well, the existing interpretation is consistent with Chirup 1 (34 km west-southwest) and Corbett 1 (39 km south-southwest) within the Wallal Embayment. Furthermore, the mid-Permian break is similar to that across the Peedamullah Shelf (Mory and Backhouse, 1997, fig. 8), over 500 km to the west-southwest.

The well was terminated at 679 m, 1.2 m into fresh, albeit hydrothermally altered, granitic or gneissic rock (based on the description of core 9). This may be an erratic boulder from the Grant Group rather than basement as claimed in the completion report; shallow basement on the Wallal Platform is not consistent with thicker intersections of the Grant Group in Chirup 1 and Corbett 1 to the southwest where gravity images from Lockwood (2004, fig. 16) show that basement is somewhat shallower than across the Wallal Platform.

Calamia 1

The Permian Grant Group (477–882 m) lies unconformably between Jurassic and Ordovician strata, and contains palynomorphs from Units II (572 – 887.5 m) and ?III (532 m) here considered equivalent to the *P. confluens* zone. Although the dominance of fine-grained lithologies makes any assignment to formations tenuous, correlation with Woods Hill 1 (23 km east) and Darriwell 1 (32 km east) implies that the section is equivalent to the Hoya and Calytrix Formations (Plate 10).

Chirup 1, Corbett 1, and Pandanus 1

Of these shallow wells in the Wallal Embayment, Chirup 1 (Plate 10) and Corbett 1 penetrated Upper

Permian Liveringa Group and probable Lower Permian Grant Group below Jurassic sandstone at 498 m and 324 m, respectively, based on late and early Permian palynomorphs in Chirup 1 from 503 m (SWC 3) and 683–687 m (core 11), respectively. Although the wireline logs allow a detailed correlation between these two wells, it is uncertain if the coarsening-up interval 398–472 m in Corbett 1 and the equivalent interval 563–630 m in Chirup 1 belong in the Liveringa or Grant Groups. In Chirup 1 thin coal in core 10 (615.1 – 619.65 m) implies a correlation with the Liveringa Group. Both wells were terminated within the Grant Group. A thin layer of basalt in Corbett 1 (333–334 m) near the top of the Liveringa Group may belong within the Jurassic; the major log break is at 355 m but there is no palynology available from this well. An early Cretaceous age is likely for the basalt.

There is no well completion report or analytical data available for Pandanus 1 (40 km south of Corbett 1). Wireline log data and lithological descriptions in the daily drilling reports indicate a break at 615 m that may be the base Mesozoic unconformity above the Grant Group, and micaceous quartzite encountered below 854 m is probably Precambrian basement.

Darriwell 1

The Upper Paleozoic lies between Jurassic and Ordovician strata over 391–1239 m. The presence of palynomorphs of Lower Unit II (equivalent to *P. confluens* zone) over 571–773 m and possible *D. birkheadensis* zone over 1010–1193 m implies the lower part of the interval lies within the Reeves Formation. Whereas correlation with Calamia 1 (32 km west), which contains Unit II palynomorphs, via Woods Hills 1 indicates that the Carboniferous palynomorphs may be reworked, the top of the Reeves Formation is tentatively placed at 1060 m based on log correlation of similar low-gamma intervals in Willara 1, Juno 1, and Cudalgarra North 1 (Fig. 5.4, Plate 10). The Upper Paleozoic succession is assigned to the Grant Group and tentatively further divided into the Calytrix/Winifred (391–573 m) and Hoya/Betty (573–1060 m) Formations (Plate 10).

Cudalgarra 1–2, Cudalgarra North 1, Great Sandy 1–2, and Leo 1

This cluster of wells (Fig. 5.4) near the northern edge of the Willara Sub-basin show similar sections of the Grant Group with Cudalgarra North 1 and Leo 1 being the furthest apart (10 km). The middle shale unit (?Calytrix/Winifred Formation) is present in all wells and shows a relatively consistent thickness (47–63 m). The underlying section (?Hoya Formation) shows a thickness variation (178–512 m), implying deposition on an undulating surface. Whereas the majority of the Grant Group in Great Sandy 2 clearly lies within the *P. confluens* zone (719.5 – 1070 m; equivalent to Unit II/*H. ramosus* zone in Leo 1 and Cudalgarra North 1), palynomorphs in the upper parts of the group in Cudalgarra 1 and 2 appear to belong within the *P. pseudoreticulata* zone. This could be due to misidentification of the zone due to changes in species concepts, or laboratory contamination. The presence of Stage 1 or *S. ybertii* zone palynomorphs at 1106 m in Cudalgarra 1 is anomalous, and may represent reworking as that level appears to correlate with an interval containing Stage 2 palynomorphs in Cudalgarra 2 based on the wireline logs.

Great Sandy 1 and 2 were drilled 50 m apart but the wireline logs are somewhat different in the upper part of the Grant Group. The middle shale unit (?Calytrix/Winifred Formation) is tentatively placed over 856–903 m and 852–906 m, respectively.

The Reeves Formation is tentatively identified in Cudalgarra North 1 (1117–1169 m) based on a log correlation with Darriwell 1 (49 km south-southwest; Plate 10) in which ?*D. birkheadensis* zone palynomorphs have been identified. The nearest other well that the formation possibly is present in is Willara 1 (29 km west), but there is no paleontological evidence of Carboniferous ages in that well.

Juno 1

The interval 563–1344 m assigned to the Grant Group below Jurassic strata correlates well with the Grant Group in Willara 1, 20 km north, from which Sakmarian palynomorphs have been recovered. The silty interval 563–844 m is tentatively assigned to the Winifred/Calytrix Formation above the ?Hoya Formation (844 – 1156.5 m). Note that the upper boundary of the Permian is close to the casing shoe depth (565 m). The Reeves Formation (1156.5 – 1344 m) is tentatively identified based on correlation with Darriwell 1 and Cudalgarra 1 (Plate 10).

Munda 1

The Grant Group (411–800 m) lies between Jurassic and ?Ordovician strata. Correlation with Juno 1 (27 km northwest) and Darriwell 1 (24 km southwest) indicates the lower part of the Grant Group in those wells is missing in Munda 1. The group is tentatively divided into the Calytrix (411–589 m) and Hoya (589–800 m) Formations.

Munro 1

The Grant Group (491–1171 m) is the only Upper Paleozoic unit present (Plate 11) Sakmarian palynomorphs from 609–1110 m. Correlation with the nearest well (Darriwell 1; 51 km northwest) is hindered by the subdued gamma-ray log above the casing shoe at 593 m in the Calytrix/Winifred Formation.

Nita Downs 1

The Grant Group (640–1174 m) contains palynomorphs assigned to Stage 3a over 785–1127 m. This is inconsistent with Cudalgarra 1 and 2 (10–15 km southeast) and Willara 1 (14 km west-southwest) in which this zone is restricted to the upper part of the Grant Group, and Great Sandy 2 (17.6 km southwest) in which the majority of the group lies within the *P. confluens* zone (Fig. 5.4). The differences probably represent either changes in species concepts, or laboratory contamination.

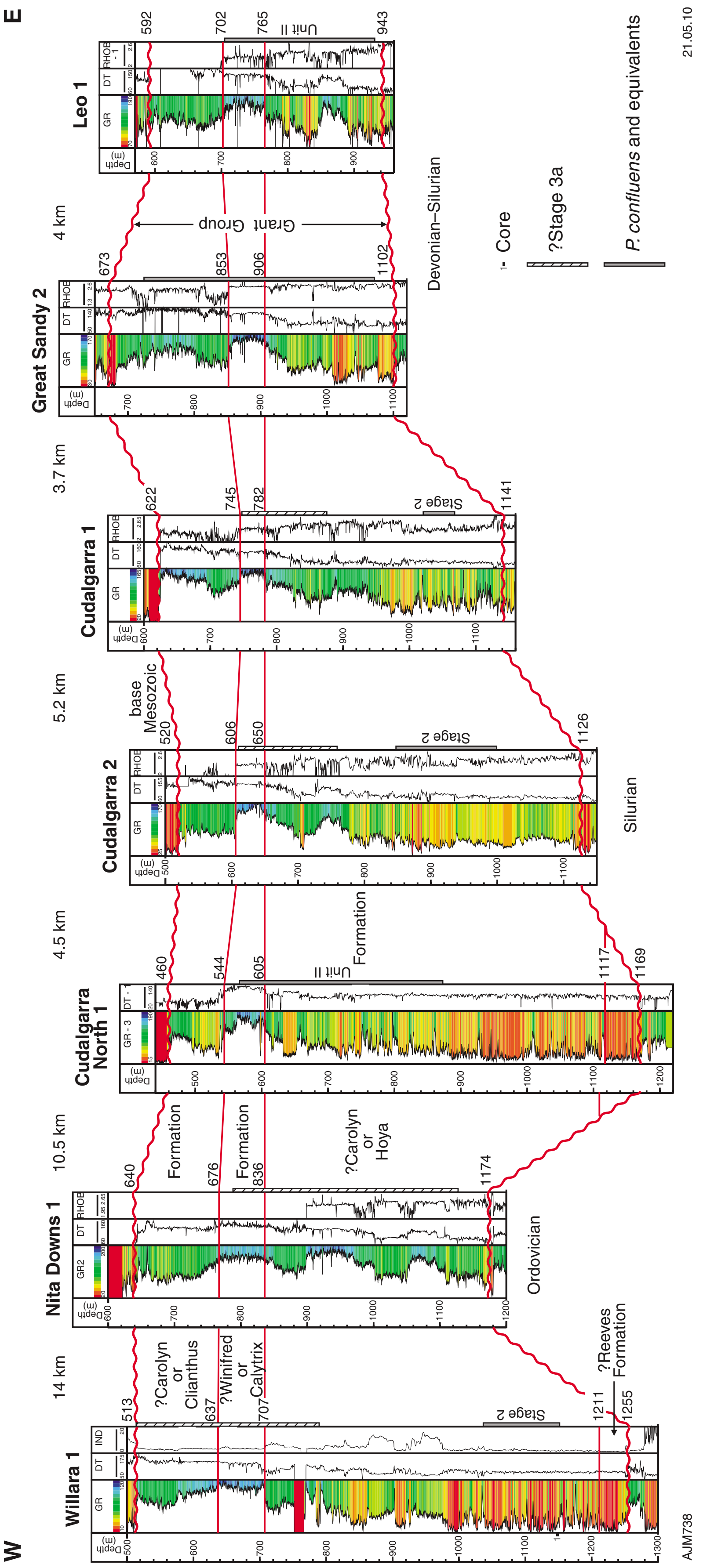


Figure 5.4. Correlation of Willara 1 to Leo 1, northern Willara Sub-basin.

Samphire Marsh 1

Correlation with other wells is hampered by the limited log suite (particularly the lack of a gamma-ray log; Plate 11). The interval 688–1240 m, between Jurassic and Ordovician strata, is tentatively correlated with the Hoya Formation. Palynomorphs of Stage 2 (750 m) and 1/2 (808–1175 m) reported from the well probably are all within the *P. confluens* zone.

Willara 1

The interval 513–1212 m assigned to the Grant Group below Jurassic strata contains Stage 2 (1043–1150 m) and 3a (511–788 m) palynomorphs that possibly all belong within the *P. confluens* zone. The silty interval 637–707 m is tentatively assigned to the Winifred/Calytrix Formation, and 708–1212 m to the ?Hoya Formation. The basal low-gamma interval 1212–1255 m is tentatively assigned to the Reeves Formation based on a log correlation with Cudalgarra North 1 (29 km east, Fig. 5.4).

Willara Hill 1

The interval 630 m to TD (858 m) is tentatively assigned to the Calytrix/Winifred (630–716 m) and Hoya/Betty (716–858 m) Formations (Plate 11). Core 5 (696–698 m) contains exotic granules suggestive of glacial 'rain out', whereas there is little indication of glacial character in the type section of the Calytrix Formation on the Barbwire Terrace.

Woods Hills 1

The only Upper Paleozoic unit present is the Grant Group (448–1081 m) which is here consigned entirely to the Hoya Formation based on correlation with Darriwell 1 (9 km east). There is no palynology available.

Anomalous wells

Barlee 1 (Fitzroy Trough) and Frome Rocks 1 (Jurgurra Terrace) have no Permian sections even though surrounding wells do, so these wells are probably located over salt domes or, in the case of Barlee 1, an igneous intrusion. Justago 1 (Lennard Shelf) also had no Permian section; evidently it was spudded into a stratigraphically lower level than nearby Permian outcrop on MOUNT RAMSEY.

In the Oobagooma Sub-basin of the Roebuck Basin (previously considered an extension of the Fitzroy Trough in the offshore Canning Basin), Wamac 1 has conflicting evidence of Permian or Lower Carboniferous palynomorphs. Reeckman and Mebberson (1984) place this section in the Lower Carboniferous Anderson Formation directly below Jurassic strata. By comparison Lacepede 1A (17.5 km to the north-northwest) appears to have been terminated within the Liveringa Group (1999–2286 m) based on paleontological evidence. However, the log response is not typical, possibly because the well is 174 km east of the nearest well to intersect the unit (Jum Jum 1).

References

Backhouse, J 1998, Palynological correlation of the Western Australian Permian: Proceedings of the Royal Society of Victoria, v. 110, p. 107–114.

Balme, BE 1983, Review of Carboniferous – Early Permian palynostratigraphy Fitzroy Graben, Canning Basin; Geological Survey of Western Australia, Statutory petroleum exploration report, G3996 A1 (unpublished).

Blatchford, T 1927, The Geology of Portions of the Kimberley District, with special references to the Fitzroy Basin and the possibilities of the occurrence of Mineral Oil: Geological Survey of Western Australia, Bulletin 93, 51p.

Burt, A, Champ, P and Parks, A 2002, Petroleum Prospectivity of the Eastern Canning Basin, WA: Report to Department of Mineral and Petroleum Resources by Troy-Ikoda, Australasia: Geological Survey of Western Australia, Statutory petroleum exploration report G31870 A2 (unpublished).

Crespin, I 1956a, Stratigraphy and micropalaeontology of Myroodah No. 1 Bore, Fitzroy Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Record 1956/126, 6p.

Crespin, I 1956b, Foraminifera from Associated Freney Oilfields Nerrima No. 1 Exploration Well, Fitzroy Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Record 1956/64, 6p.

Crespin, I 1956c, Micropalaeontological examination of bore cores from Roebuck Bay No. 1 stratigraphical bore, Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Record 1956/90, 2p.

Crespin, I and Condon, MA 1956, Micropalaeontology and stratigraphy of Roebuck Bay No. 1 bore, Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Record 1956/139, 6p.

Crespin, I 1958, Permian Foraminifera of Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Bulletin 49, 207p.

Crostella, A 1998, A review of oil occurrences within the Lennard Shelf, Canning Basin, Western Australia: Geological Survey of Western Australia, Report 56, 40p.

Crowe, RWA and Towner, RR 1976, Definitions of some new and revised rock units in the Canning Basin: Geological Survey of Western Australia, Record 1976/24, 23p.

D'Ercole, C, Gibbons, L and Ghori, KAR 2003, Prospects and leads, central Canning Basin, Western Australia, 2003: Geological Survey of Western Australia, Record 2003/14, 89p.

Drummond, BJ, Sexton, MJ, Barton, TJ and Shaw, RD 1991, The Nature of Faulting Along the Margins of the Fitzroy Trough, Canning Basin, and Implications for the Tectonic Development of the Trough: Exploration Geophysics, v. 22, p. 111–116.

Eyles, N, Eyles, CH, Apak, N and Carlsen, GM 2001, Permian–Carboniferous tectono-stratigraphic evolution and petroleum potential of the northern Canning Basin, Western Australia: The American Association of Petroleum Geologists Bulletin, v. 85, p. 989–1006.

Foster, CB and Waterhouse, JB 1988, The *Granulatisporites confluens* Oppel-zone and Early Permian marine faunas from the Grant Formation on the Barbwire Terrace, Canning Basin, Western Australia: Australian Journal of Earth Sciences, v. 35, p. 135–157.

Gleadow, AJW and Duddy, IR 1984, Fisson track dating and thermal history analysis of apatites from wells in the north-west Canning Basin, WA, *in* The Canning Basin, W.A. *edited by* PG Purcell: Proceedings of the Geological Society of Australia/ Petroleum Exploration Society of Australia Symposium, Perth, p. 378–387.

Goldstein, BA and Hubbard, JJ 1984, Comparison and geological interpretation of alternative dipmeter analyses from a Permo-Carboniferous sequence in the Fitzroy Graben, *in* The Canning Basin, W.A. *edited by* PG Purcell: Proceedings of the Geological Society of Australia/Petroleum Exploration Society of Australia Symposium, Perth, p. 505–519.

Hamersley Exploration Pty Ltd 1982, Annual Report, Temporary Reserves 8188H–8206H inclusive 1981/1982: Geological Survey of Western Australia, Statutory mineral exploration report, A36014 (unpublished).

Henderson, SD 1956, Stratigraphic Bore B.M.R. 3, Prices Creek, Fitzroy Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Record 1956/96, 6p.

Henderson, SD, Condon, MA and Bastian, LV 1963, Stratigraphic drilling, Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Geology and Geophysics, Report 60, 78p.

Jackson, MJ, Kennard, JM, Romine, KK and Southgate, PN 1994, Canning Basin Project, Stage II, interpreted wells and seismic data: Geoscience Australia, Record 1994/59 (CD-ROM).

Jaques, Al, Lewis, JD and Smith, CB 1986, The kimberlites and lamproites of Western Australia: Geological Survey of Western Australia, Bulletin 132, 268p.

Jones, PJ and Chen, P-J 2000, Carboniferous and Permian Leaioidea (Branchiopoda: Conchostraca) from Australia: taxonomic revision and biostratigraphic implications: Records of the Australian Museum, v. 52, p. 223–244.

Lockwood, AM 2004, Isostatic residual gravity anomaly of Western Australia and depth to basement model: Geological Survey of Western Australia, Record 2004/14, 31p.

Mory, AJ and Backhouse, J 1997, Permian stratigraphy and palynology of the Carnarvon Basin, Western Australia: Geological Survey of Western Australia, Report 51, 41p.

Patten, R and Price, P 1975, Appendix C. Palynological study of cores cut in BMR stratigraphic drill holes *in* Notes on the Gregory Sub-basin and adjacent areas of the Canning Basin, Western Australia *by* AN Yeates, RWA Crowe, RR Towner, LAI Wyborn, and VL Passmore: Bureau of Mineral Resources, Australia, Geology and Geophysics, Record 1975/77.

Playford, G and Powis, GD 1979, Taxonomy and distribution of some trilete spores in Carboniferous strata of the Canning Basin, Western Australia: Pollen et Spores, v. 21, p. 371–394.

Playford, PE, Cope, RN, Cockbain, AE, Low, GH and Lowry, DC 1975, Chapter 2. Phanerozoic *in* The geology of Western Australia: Geological Survey of Western Australia, Memoir 2, p. 223–433.

Prider, RT 1960, The leucite lamproites of the Fitzroy Basin, Western Australia: Journal of the Geological Society of Australia, v. 6, p. 71–118.

Redfern, J 1991, Subsurface facies analysis of Permian-Carboniferous glaciogenic sediments, Canning Basin, *in* Gondwana 7, Proceedings *edited by* H Ulbrich and A Rocha-Campos: University of Sao Paulo, Sao Paulo, p. 349–363.

Redfern, J and Millward, E 1994, A review of the sedimentology and stratigraphy of the Permian-Carboniferous Grant Group, Canning Basin, Western Australia, *in* The sedimentary basins of Western Australia *edited by* PG Purcell and RR Purcell: Perth, Western Australia, Petroleum Exploration Society of Australia, p. 753–756.

Redfern, J and Williams, BPJ 2002, Canning Basin Grant Group glaciogenic sediments: Part of the Gondwanan Permian-Carboniferous hydrocarbon province, *in* The sedimentary basins of Western Australia, Volume 3 *edited by* M Keep and SJ Moss: Perth, Western Australia, Petroleum Exploration Society of Australia, p. 851–871.

Reekman, SA and Mebberson, AJ 1984, Igneous intrusions in the north-west Canning Basin and their impact on oil exploration *in* The Canning Basin, WA *edited by* PG Purcell: Geological Society of Australia/Petroleum Exploration Society of Australia, p. 389–399.

Tasch, P and Jones PJ 1979, Carboniferous and Triassic conchostraca from the Canning Basin, Western Australia: Bureau of Mineral Resources, Australia, Bulletin 85, p. 2–20.

Towner, RD, Crowe, RWA and Yeates, AN 1976, Notes on the geology of the southwestern Canning Basin, Western Australia: Bureau of Mineral resources, Australia, Record 1976/95, 108p.

Van Niel, JP 1985, Palynology of the Canning Basin wells White Hills-1 (Permit EP-308) and some intervals of Wilson Cliffs-1 and Contention Heights-1; Shell Company of Australia Limited: Geological Survey of Western Australia, Statutory petroleum exploration report, G2982 A1 (unpublished).

White, ME 1956, Permian plant remains from water bore for B.M.R. Price's Creek, Kimberley Division, Western Australia: Bureau of Mineral Resources, Geology and Geophysics, Australia, Record 1956/105,4p.

Yeates, AN, Crowe, RWA, Towner, RR, Wyborn, LAI and Passmore, VL 1975, Notes on the Gregory Sub-basin and adjacent areas of the Canning Basin, Western Australia: Bureau of Mineral Resources, Geology and Geophysics, Australia, Record 1975/77, 123p.

Appendix 6

Summary of available biostratigraphy from the mid-Carboniferous to Lower Triassic

Well	Author	Source	Location slides	Zone/assemblage	Top (m)	Base (m)	Age	Remarks	Sample
Abutilon 1	Foster CB	S1846 A1 V2	–	Unit II	153.55	303.9	Sakmarian	non marine	core
Acacia 1	Backhouse J, 1999	G31322 A2	GSWA	*P. confluens*	71.3	289.4	Tastubian–Asselian	?non marine, 8 samples	core
Acacia 1	Foster CB	W 1847 A2 V2	–	Unit II	71.3	289.4	Sakmarian	non marine, 6 samples	core
Anna Plains 1	McMinn A	S3233 A2	–	Stage 3a	654.8	839	Permian	[marine influence]	SWC
Anna Plains 1	McMinn A	S3233 A2	–	Stage 2	885	1019	Carboniferous	[marine influence] at 885m	SWC
Antares 1	Purcell RR	S3238 A4	–	Lower Unit II/*H. ramosus*	225	315	Stephanian	fresh to brackish water, 2 sample	cutt
Aquanita 1	Purcell RR	S2211 A7	–	Unit III or *D. townrowii*	863	1328	Asselian–Sakmarian	end galcial, restricted brackish, 4 samples [lower 3 samples ?contaminated]	SWC
Aquanita 1	Purcell RR	S2211 A7	–	*G. frustulentus*	1643	1643	Tournaisian to Visean	–	SWC
Aquila 1	Hos DPC	W 2240 A3	–	Unit II	470	665	Carboniferous	intermediate – ?non marine, 4 samples	cutt
Aquila 1	Purcell RR, 1987	S6114 A32	–	Lower Unit II	470	665	Lower Carboniferous	fresh/brackish, 5 samples	cutt
Atrax 1	Purcell RR	S2625 A8	– –	Unit II/*H. ramosus*	408	566.4	Stephanian	fluvial up to brackish, 13 samples	SWC
Auld 1	Purcell RR, 1985	S2718 A4	–	Unit II/*H. ramosus*	219.1	710.5	Stephanian	fluvial to brackish, 11 samples	SWC
Auld 1	Purcell RR, 1985	S2718 A4	–	Unit I / P. novicus	776.1	776.1	Early Stephanian	fresh water	SWC
Babrongan 1	Balme BE	W 20 A1	–		134.112	630.95	Early Permain		cutt
Babrongan 1	Balme BE	W 20 A1	–		134.112	137.15	Early Artinskian	continental	cutt
Babrongan 1	Dickens JM	W 20 A1	–		270.97	271.25	Permian	brachiopods, crinoid	core 1
Babrongan 1	Purcell RR, 1984	G3101 A1	–	Unit II	273.4	279.5	Upper Carboniferous	[no further details provided]	cutt
Babrongan 1	Balme BE	W 20 A1	–		273.4	277.35	Sakmarian	?marine	cutt
Babrongan 1	Balme BE	W 20 A1	–		626.67	630.95	Sakmarian	continental	cutt
Barbwire 1	Dolby G and McTavish RA	S723 A1	–	*Nuskoispitites* II	128.65	128.67	Sakmarian	no evidence of marine	SWC
BHP ARD 1	Backhouse J, 2007	–	– –	Stage 2 – *P. confluens*	302	–	?Asselian–Early Sakmarian	low yield	core
BHP GCD 2	Backhouse J, 2007	–	–	*P. confluens*	44.5	–	Early Sakmarian		core
BHP MBD 2	Backhouse J, 2007	–	–	Stage 2 – *P. confluens*	303.5	–	?Asselian–Early Sakmarian	low yield	core
BHP PND 1	Backhouse J	in prep.	GSWA	*D. granulata*	99.9	–	–	1 sample	core
BHP PND 1	Backhouse J	in prep.	GSWA	?*P. sinuosus*	158.3	206.8	–	2 samples	core
BHP PND 1	Backhouse J, 1983	Paleo 1983/24	unknown	Unit IV	168	192.3	Early Artinskian	2 samples	core
BHP PND 1	Backhouse J	in prep.	GSWA	*M. trisina*	253.5	–	–	1 sample	core
BHP PND 1	Backhouse J	in prep.	GSWA	*S. fusus – M. trisina*	301.4	330.2	–	2 samples, unusually rich assemblage	core
BHP PND 1	Backhouse J, 1983	Paleo 1983/24	unknown	Unit II or III	482.3	–	–	[probably *P. confluens* Zone]	core
BHP PND 5	Backhouse J, 2007	–	–	*P. confluens*	55.3	–	Early Sakmarian	–	core
BHP PND 5	Backhouse J, 2007	–	–	*R. lepidophyta*	156.5	–	latest Famennian or Tournaisian	probably Fairfield Group	core
BHP RD 8	Backhouse J, 2007	–	–	*P. confluens*	183.6	–	Early Sakmarian	–	core
BHP WRD 1	Backhouse J, 2009	A81466 (WAMEX)	GSWA	*A. concinnus – S. ybertii*	294.5	393.3	Late Carboniferous	4 samples	core

BHP WRD 1	Backhouse J, 2009	A81466 (WAMEX)	GSWA	*R. lepidophyta*	478.85	–	Latest Devonian – Tournaisian	1 sample	core
Bindi 1	Purcell RR	W 2609 A5 V2	–	Unit V	859.2	905.6	Sakmarian	shallow marine, 2 samples	SWC
Bindi 1	Purcell RR	W 2609 A5 V2	–	Unit IV	921	930.1	Sakmarian	marginal to shallow marine, 2 samples	SWC
Bindi 1	Purcell RR	W 2609 A5 V2	–	Unit III	976	976	Asselian–Sakmarian	shallow marine	SWC
Bindi 1	Purcell RR	W 2609 A5 V2	–	Upper Unit III *V. pseudorecticulatus*	1047.5	1047.5	Stephanian	nearshore; brackish	SWC
Bindi 1	Purcell RR	W 2609 A5 V2	–	Lower Unit II *H. ramosus*	1065	1405.1	Stephanian	fluvial to marginal marine, 9 samples	SWC
Bindi 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	1085.1	1422.3	Tastubian–Asselian	?non marine, 4 samples	SWC
Bindi 1	Purcell RR	W 2609 A5 V2	–	Unit I *P. novicus*	1422.3	1475.4	Stephanian	fluvial to marginal marine, 2 samples	SWC
Bindi 1	Backhouse J, 1999	G31322 A2	–	*D. tenuistratus*	1475.4	1497	Stephanian	?non marine, 2 samples	SWC
Bindi 1	Purcell RR	W 2609 A5 V2	–	*D. birkenheadensis*	1497	1497	Westphalian	marginal marine	SWC
Bindi 1	Purcell RR	W 2609 A5 V2	–	*G. maculosa/G. frustulensis*	1918.7	1918.7	Tournaisian	continental	SWC
Bindi 1	Purcell RR	W 2609 A5 V2	–	*G. frustulentus*	2173	2481.4	Tournaisian	marginal marine at 2435.5, continental above, 9 samples	SWC
Blackstone 1	Balme BE	S379 A1	–	–	178.3	320.05	Early Triassic	–	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*K. saeptatus*	320	320	Early Triassic	1 sample	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	?	325.5	335	possibly Permian	1 sample	SWC
Blackstone 1	Balme BE	S379 A1	–	*Dulhuntyispora*	335	482.2	–	[=Unit VII–VIII of Kemp et al., 1977]	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*D. parvithola*	335	472.4	Wordian	marine, 11 samples	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*D. ericianus*	482.2	–	–	1 sample	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*?P.sinuosus*	510.8	557.5	–	3 samples	SWC
Blackstone 1	Balme BE	S379 A1	–	*Vittatina* III	510.8	585.5	–	[=Unit VI of Kemp et al., 1977]	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*?M. trisina*	557.5	557.5	?Artinskian	marine, 1 sample	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*P.sinuosus*	585.5	648	–	2 samples	SWC
Blackstone 1	Balme BE	S379 A1	–	*Vittatina* II	648	725.4	–	[=Unit VI of Kemp et al., 1977]	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*?P.sinuosus*	668.7	705.6	–	3 samples	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*M. trisina*	725.4	742.5	–	3 samples	SWC
Blackstone 1	Balme BE	S379 A1	–	*Vittatina* I	734	774.2	–	[=Unit IV of Kemp et al., 1977]	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*D. byroensis*	746.8	–	–	1 sample	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*S. fusus*	749.2	–	–	1 sample	SWC
Blackstone 1	Balme BE	S379 A1	–	*Nuskoisporites* III	811.7	827.55	–	[=Unit III of Kemp et al., 1977]	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*P. pseudoreticulata*	821.1	827.5	Sterlitamakian	2 samples	SWC
Blackstone 1	Balme BE	S379 A1	–	*Nuskoisporites* II	838.8	1177.75	Late Carboniferous – Early Permian	[=Unit II of Kemp et al., 1977]	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*?P. confluens*	838.8	838.8	–	1 sample	SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*P. confluens*	851.3	1400.6	Tastubian–?Asselian	9 samples	SWC/ cutt
Blackstone 1	Balme BE	S379 A1	–	–	1447.8	1462.15	Carboniferous	[~Unit I of Kemp et al., 1977]	SWC/ core 1
Blackstone 1	Backhouse J	in prep.	GSWA	*S. ybertii*	1448.8	1481.6	Namurian (Sepukhovian)	2 samples	core 1/ SWC
Blackstone 1	Backhouse J	in prep.	GSWA	*G. frustulentus*	1501.1		Tournaisian–Visean	1 sample	SWC
Blina 1	Ingram BS	W 1819 A1 V2	–	*P. limpidus*	1010	1010	Early Permian	no older than Stage 3	cutt
BMR 01 Mount Anderson	Crespin I	BMR Report 60	–	–	9.15	15.25	Permian	foram *Hyperammina acicula* indicates Noonkanbah Formation	?cutt

Appendix 6 (continued)

Well	Author	Source	Location slides	Zone/assemblage	Top (m)	Base (m)	Age	Remarks	Sample
BMR 01 Mount Anderson	Crespin I	BMR Report 60	–	–	15.25	18.3	Permian	forams *Thurammina philaeformis*	?cutt
BMR 01 Mount Anderson	Balme B	UWA fossil collection	UWA	–	24.4	422.1	Lower Permian	5 productive samples	cores 1–15
BMR 04A Mandora	Balme B	BMR Bulletin 60 apdx 10	–	–	605.95	608.4	Early Triassic	abundant microplankton, minor spores and pollen	core 6
BMR 04A Mandora	Balme B	BMR Bulletin 60 apdx 10		[?*D. parvithola*]	639.5	642.5	Upper Permian	abundant spores and pollen	core 7
BMR 04A Mandora	Balme B	BMR Bulletin 60 apdx 10	–	–	661.1	664.2	Sakmarian, or impoverished Artinskian flora	rare, poorly preserved spores	core 8
BMR Cornish 1	Paten and Price	BMR Record 1975/87	unknown	lower stage 5c	49	164	[Middle] Permian	–	cores 1–4
BMR Cornish 2	Paten and Price	BMR Record 1975/88	unknown	Tr3	133	134.4	Late Early to early Middle Triassic	[? ~*S. quadrifidus* zone]	core 1
BMR Cornish 2	Paten and Price	BMR Record 1975/89	unknown	Tr2	222.5	–	Early Triassic	[~*T. playfordii* zone]	core 3
BMR Cornish 3	Paten and Price	BMR Record 1975/90	unknown	Tr1a	114.3	–	Late Permian	some marine influence [~*L. pellucidus* – *K. saeptatus* zones]	core 38
BMR Crossland 1	Paten and Price	BMR Record 1975/82	unknown	upper stage 5	9.7	39.6	Late Permian	marine	cores 1–3
BMR Crossland 1	Paten and Price	BMR Record 1975/83	unknown	upper stage 5a	71.9	147.5	[Middle] to Late Permian	possibly non-marine	cores 4–6
BMR Crossland 1	Paten and Price	BMR Rec 1975/84	unknown	lower stage 5c	194.5	259.4	[Middle] Permian	–	cores 7–8
BMR Crossland 2	Paten and Price	BMR Record 1975/85	unknown	upper stage 5	10.1	136.9	[Middle] to Late Permian	possibly non-marine	cores 1–4
BMR Crossland 2	Paten and Price	BMR Record 1975/86	unknown	upper stage 5a	138.4	–	[Middle] to Late Permian	possibly non-marine	core 4
BMR Lucas 13	Paten and Price	BMR Record 1975/77	unknown	Tr2	48.8	51.8	Early Triassic	some marine influence [~*T. playfordii* zone]	core 1
BMR Lucas 13	Paten and Price	BMR Record 1975/77	unknown	–	80.1	83.8	Early Triassic	some marine influence	core 2
BMR Lucas 13	Backhouse, 2009	G32079	GA	*L. pellucidus*	80.5	83.8	?Griesbachian (Early Triassic)	marine, but not strongly	core 2
BMR Lucas 13	Paten and Price	BMR Record 1975/77	unknown	Tr1b	121.9	125	Early Triassic	some marine influence	core 3
BMR Lucas 13	Paten and Price	BMR Record 1975/77	unknown	Tr1b (basal)	188.9	–	Early Triassic	marine influence	core 5
BMR Lucas 13	Backhouse, 2009	G32079	GA	*D. parvithola*	189	–	[Capitanian or younger (M–L Permian)]	shelfal marine	core 5
BMR Lucas 14	Paten and Price	BMR Record 1975/78	unknown	lower stage 5c	79.2	–	[Middle] Permian	–	core 1
BMR Lucas 14	Backhouse, 2009	G32079	GA	upper *D. granulata*	79.2	–	[late Roadian (early Middle Permian)]	–	core 2
BMR Lucas 14	Paten and Price	BMR Record 1975/78	unknown	lower stage 5a	88.4	91	[Middle] Permian	–	cutt
BMR Lucas 14	Paten and Price	BMR Record 1975/79	unknown	upper stage 4b	102.1	–	Early Permian	–	core 3
BMR Lucas 14	Backhouse, 2009	G32079	GA	*M. villosa*	102.1	–	[early Roadian (early Middle Permian)]	no evidence marine	core 3
BMR Mount Bannerman 1	Paten and Price	BMR Record 1975/79	unknown	upper stage 5	113.1	141.7	[Middle] to Late Permian	probably non-marine	cores 2–3
BMR Mount Bannerman 1	Backhouse, 2009	G32079	GA	*D. parvithola*	115.8	168.6	[Capitanian or younger (M–L Permian)]	no evidence marine	cores 2–4

BMR Mount Bannerman 1	Paten and Price	BMR Record 1975/79	unknown	upper stage 5a	162.5	–	[Middle] Permian	probably non-marine	core 4
BMR Mount Bannerman 1	Paten and Price	BMR Record 1975/79	unknown	lower stage 5	202.4	202.7	[Middle] Permian	probably non-marine	core 5
BMR Mount Bannerman 1	Backhouse, 2009	G32079	GA	*D. ericianus*	202.7	–	[Roadian–Wordian (Middle Permian)]	no evidence marine	core 5
BMR Mount Bannerman 2	Paten and Price	BMR Record 1975/79	unknown	upper stage 5a	138.7	–	[Middle] Permian	possibly non-marine	core 5
BMR Mount Bannerman 2	Paten and Price	BMR Record 1975/79	unknown	upper stage 5	?	102.8	[Middle] to Late Permian	possibly non-marine	cores 1–4
BMR Mount Bannerman 3	Paten and Price	BMR Record 1975/80	unknown	stage 3	97.7	–	Early Permian	–	core 3
BMR Mount Bannerman 4	Paten and Price	BMR Record 1975/81	unknown	stage 3	25.9	112.5	Early Permian	–	cutt/ core 2
Boab 1	Foster CB	S1848 A1 V1	–	–	144.05	144.05	Early Permian	non marine	core
Booran 1	Helby R, 1983	S2215 A3	unknown	*T. playfordii*	75	225	Early Triassic	marine, *K. saeptatus* from junk basket at 1502 m	cutt
Booran 1	Helby R, 1983	S2215 A3	unknown	Upper Stage 5	530	650	Late Permian	marine, 2 samples	cutt
Booran 1	Helby R, 1983	S2215 A3	unknown	Stage 3a – lower Stage 4	1000	1294	Early Permian	5 samples	SWC
Booran 1	Helby R, 1983	S2215 A3	unknown	Stage 2–3a	1300	1690	Late Carboniferous.	11 samples	SWC
Booran 1	Helby R, 1983	S2215 A3	unknown	Stage 2 – *D. birkheadensis*	1703.5	1895	Late Carboniferous.	3 samples [?*M. tentula* 1703.5–1725.4, ? *D. birkheadensis* 1890–1895 m]	SWC/ cutt
Booran 1	Helby R, 1983	S2215 A3	unknown	*D. birkheadensis*	1948	–	Late Carboniferous.	1 sample	SWC
Booran 1	Helby R, 1983	S2215 A3	unknown	*G. maculosa*	2115.7	2586.2	Late Visean to Early Namurian	12 SWCs; contaminated at 2289 & 2311 m	SWC
Booran 1	Helby R, 1983	S2215 A3	unknown	*G. frustulentus*	2610.4	2761	Early to mid-Carboniferous	9 samples	SWC
Calamia 1	Pickering S	S3245 A2 V1	–	?Unit III	532	532	Early Permian	brackish/marginal marine	SWC
Calamia 1	Pickering S	S3245 A2 V1	–	Lower Unit II (*H. ramosus*)	572	795	Late Carboniferous	fresh–brackish, 7 samples	SWC
Calamia 1	Pickering S	S3245 A2 V1	–	Lower Unit II (*H. ramosus*)	860	887.5	Late Carboniferous	brackish/marginal marine, 3 samples	SWC
Calytrix 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	97.4	354.4	Tastubian–Asselian	?non marine, 11 samples	core
Calytrix 1	Foster and Waterhouse, 1988	AJES v. 35 p. 135–157	–	*G. confluens*	97.42	354.37	mid-Asselian	marine, 11 samples, some macrofauna	core
Canopus 1	?	AGSO	unknown	not younger than *G. confluens*	390	405	–	?1 sample, from well summary sheet	cutt
Canopus 1	?	AGSO	unknown	*G. confluens* – not older than *S. ybertii*	415	635	–	from well summary sheet	cutt
Carina 1	Purcell RR	S2164 A2	–	Unit II or *Microbaculispora tentula*	487	657	Late Carboniferous	8 samples	SWC
Cassia 1	Foster CB	S1849 A1 V2	–	Unit II	149.1	210.8	Early Permian	non marine, 2 samples	core
Cassia 1	Foster CB	S1849 A1 V2	–	*R. lepidophyta*	577.3	901.5	Late Devonian	5 samples	core
Chirup 1	Balme BE	S441 A1	–	–	502.9	502.9	Late Permian	marine, abundant acritarchs	SWC
Chirup 1	Balme BE	S441 A1	–	*Nuskoisporites* II	682.75	687.3	Sakmarian	marine	core 11
Clianthus 1	Backhouse J, 1995	Paleo 1995/25	–	Stage 2	112	447	Early Permian	10 samples [probably *P. confluens*]	core
Contention Heights 1	Alliot C	S 874 A3	–	–	173.75	792.5	Early Permian	–	cutt
Cow Bore 1	Purcell RR, 1987	S6114 A32	–	Unit II	568	730	Late Carboniferous	fresh/brackish, 2 samples	cutt
Cow Bore 1	Purcell RR, 1984	W 2480 A4 V2	–	Unit II or *M. tentula*/*H. ramosus*	583	904	Stephanian–Autunian	brackish, 3 samples	cutt
Cow Bore 1	Purcell RR,1987	S6114 A32	–	?Unit I/II	877	1099	Late Carboniferous	fresh/brackish, 2 samples	cutt
Cow Bore 1	Ross CA, 1984	W 2480 A4 V2	–	V-3	1089.5	1392	Meramecian, [mid-] Visean	3 samples	SWC
Cow Bore 1	Purcell RR, 1984	W 2480 A4 V2	–	Unit I – lower Unit II	1098.5	1098.5	Late Westphalian – Early Stephanian	–	SWC
Cow Bore 1	Purcell RR, 1984	S6114 A32	–	*G. frustulentus*	1109.5	1285	Tournaisian–Visean	shallow marine, 5 samples	SWC
Crab Creek 1	Purcell RR	S3255 A3	–	Unit III or *D. townrowii*	706.5	706.5	Sakmarian		SWC

Appendix 6 (continued)

Well	*Author*	*Source*	*Location slides*	*Zone/assemblage*	*Top (m)*	*Base (m)*	*Age*	*Remarks*	*Sample*
Crab Creek 1	Purcell RR	S3255 A3	–	Unit II	853	853	Late Stephanian – Early Autunian	*V. pseudoreticulatus* implies Upper Unit II	SWC
Crab Creek 1	Purcell RR	S3255 A3	–	Lower Unit II or *H. ramosus*	1010.5	1010.5	Late Stephanian – Early Autunian	–	SWC
Crab Creek 1	Purcell RR	S3255 A3	–	Unit II	1264	1273	Stephanian	minor reworking, caving from Lower Permian	SWC
CRAE DD88CL1	Backhouse J	M0000779	–	*P. pseudoreticulatus*	134.2	134.2	late Sakmarian	–	core
CRAE DD88CL1	Backhouse J	M0000779	–	*P. confluens*	336.4	336.4	early Sakmarian	–	core
Crimson Lake 1	Purcell RR	W 3346 A1 V2	–	Lower Unit II (*H. ramosus*)	1067	1067	Stephanian	fresh to brackish, *Botryococcus* sp and *Leiosphaeridia* sp common (14%)	SWC
Crimson Lake 1	Purcell RR	W 3346 A1 V2	–	*S. ybertii*	1457	1457	Namurian–Westphalian	nearshore; shallow marine, spinose acritarchs rare	SWC
Crimson Lake 1	Purcell RR	W 3346 A1 V2	–	*A. largus*	1519.2	1519.2	Visean	no marine indicators	SWC
Crossland 1	Williams AJ	S652 A1	–	*Nuskoisporites* II	144.78	144.8	Sakmarian	weakly marine	cutt
Crossland 1	Williams AJ	S652 A1	–	*Nuskoisporites* II	197.5	279.5	Sakmarian	no evidence marine	cutt
Crossland 2	Williams AJ	S652 A1	–	*Vittatina* I or *Nuskoisporites* III	212.75	234.1	Upper Sakmarian or Lower Artinskian	weakly marine	cutt
Crossland 2	Williams AJ	S652 A1	–	*Nuskoisporites* III	317.3	327.65	Sakmarian	no evidence marine	cutt
Crossland 2	Williams AJ	S652 A1	–	*Nuskoisporites* III	410.55	410.55	Sakmarian	no evidence marine	core 1
Crossland 2	Backhouse, 2009	G32079	GA	*confluens*	410.6	410.9	Early Sakmarian	no evidence marine	core 1
Crossland 2	Williams AJ	S652 A1	–	*Nuskoisporites* III or II	635.5	635.5	Sakmarian	weakly marine	SWC
Crossland 2	Williams AJ	S652 A1	–	–	689.5	883.9	nothing older than Permian	?contamination	core 2/ SWC
Crossland 3	Williams AJ	S652 A1	–	*Nuskoisporites* III	158.5	310.9	Sakmarian	no evidence marine	SWC
Crossland 3	Williams AJ	S652 A1	–	*Nuskoisporites* II	371.9	416.05	Sakmarian	fresh water	SWC
Crystal Creek 1	Purcell RR	S3363 A2 V1	–	Lower Unit II *H. ramosus*	245	255	Stephanian	brackish water	SWC
Cudalgarra 1	McMinn A, 1984	S2648 A2 V2	–	Stage 3a *V. pseudoreticulatus*	748	877	Early Permian	2 samples	SWC
Cudalgarra 1	McMinn A, 1984	S2648 A2 V2	–	Stage 2 (*Protohaploxypinus* spp)	1020	1068	Late Carboniferous	2 samples	SWC
Cudalgarra 1	McMinn A, 1984	S2648 A2 V2	–	Stage 1 could be *A. ybertii*	1106	1106	–	–	SWC
Cudalgarra 2	McMinn A	S2852 A3 V3	–	Stage 3a *V. pseudoreticulatus*	609.8	760.3	Early Permain	4 samples	SWC
Cudalgarra 2	McMinn A	S2852 A3 V3	–	Stage 2 *H. ramosus*	850.9	1003.4	Late Carboniferous	4 samples	SWC
Cudalgarra North 1	Purcell RR	S3626 A2	–	Lower Unit II or *H. ramosus*	567	876	Late Stephanian – Early Autunian	dominantly brackish water, 8 samples	cutt
Curringa 1	Powis GD, 1982	S2137 A2	–	Unit V / Lower Stage 4 (*P. crenulata*)	782	824	Artinskian	2 samples	SWC
Curringa 1	Powis GD, 1982	S2137 A2	–	Unit IV / Lower Stage 4 / stage 3b	828	851.5	Artinskian	2 samples	SWC
Curringa 1	Powis GD, 1982	S2137 A2	–	*D. townrowii*	888.5	921	Artinskian	3 samples	SWC
Curringa 1	Powis GD, 1982	S2137 A2	–	*M. tentula*	972	1185	Stephanian	9 samples	SWC
Curringa 1	Powis GD, 1982	S2137 A2	–	*S. ybertii*	1284	1563	Namurian	5 samples	SWC
Curringa 1	Powis GD, 1982	S2137 A2	–	*G. maculosa*	1600.9	1618	Visean–Namurian	2 samples	SWC
Cycas 1	Purcell RR	W 2375 A2 V2	–	Unit IV	339.2	502	Early Permian	shallow marine, 3 samples	SWC
Cycas 1	Purcell RR	W 2375 A2 V2	–	Unit III	532.4	883.5	Early Permian	near shore – brackish water, 4 samples	SWC
Cycas 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	988	998.7	Tastubian–Asselian	?non marine, 3 samples	core 1
Cycas 1	Purcell RR	W 2375 A2 V2	–	Unit II	998.4	998.4	Late Carboniferous	strong fresh water influence	core 1

Cycas 1	Purcell RR	W 2375 A2 V2	–	Unit I	1150	1695	Late Carboniferous	fresh water influence, 6 samples	SWC/ cutt
Cycas 1	Backhouse J, 1999	G31322 A2	–	*D. tenuistriatus*	1150	1150	Stephanian	?non marine, 1 sample	SWC
Cycas 1	Backhouse J, 1999	G31322 A2	–	?*D. birkheadensis*	1152.5	2072.5	Westphalian – Late Namurian	?non marine, 8 samples	cutt
Cycas 1	Purcell RR	W 2375 A2 V2	–	*S. ybertii*	1722.5	2136	Late Carboniferous	fresh water; continental, 4 samples	cutt/ SWC
Cycas 1	Purcell RR	W 2375 A2 V2	–	*G. maculosa*	2182.5	2300.5	Carboniferous	continental	SWC/ cutt
Cycas 1	Backhouse J, 1999	G31322 A2	–	?*G. maculosa*	2182.5	2255	Visean	?non marine, 6 samples	SWC/ cutt
Cycas 1	Backhouse J, 1999	G31322 A2	–	*G. maculosa*	2300.5	2300.5	Visean	?non marine	SWC
Cycas 1	Purcell RR	W 2375 A2 V2	–	*G.frustulentus*	2357.5	2602	Lower Carboniferous	6 samples	SWC/ cutt
Dampier Downs 1	Balme BE, 1957	W 90 A1	–	–	329.2	332.25	Artinskian	similar to Noonkanbah Formation in BMR 01 Noonkanbah	core 14
Dampier Downs 1	Purcell RR, 1987	S6114 A32	–	Unit IV/V	329.3	332.3	Early Permian	shallow marine, 1 sample	core 14
Dampier Downs 1	Purcell RR, 1987	S6114 A32	–	Unit IV	359.7	362.8	Early Permian	1 sample	core 15
Dampier Downs 1	Balme BE, 1957	W 90 A1	–	–	359.7	362.7	Artinskian	similar to Noonkanbah Formation in BMR 01 Noonkanbah	core 15
Dampier Downs 1	Balme BE, 1957	W 90 A1	–	–	420.6	423.65	Artinskian	similar to Noonkanbah Formation in BMR 01 Noonkanbah	core 17
Dampier Downs 1	Purcell RR, 1987	S6114 A32	–	Unit III	451.2	454.3	Early Permian	1 sample	core 18
Dampier Downs 1	Balme BE, 1957	W 90 A1	–	*P. gratensis*	470.9	473.95	Artinskian	similar to Grant Group and Poole Sandstone in BMR 01 Noonkanbah	core 19
Dampier Downs 1	Fisher NH, 1957	W 90 A1	–	–	470.9	473.95	Permian	forams: *A. nitidus*; *G. triagularis*; *Glomospira* sp; *Nodesaria* sp; *N. irwinensis*; bryozoa	core 19
Dampier Downs 1	Purcell RR, 1987	S6114 A32	–	Lower Unit II	621.6	793.6	Late Carboniferous	fresh to brackish water, 3 samples	core 24–30
Dampiera 1A	Foster CB	S1851 A1 V1	–	Unit II	162	369	Early Permian	non marine, 4 samples	core
Darriwell 1	Pickering S	W 3337 A2 V1	–	Lower Unit II (*H. ramosus*)	571	773	Late Carboniferous	brackish marine, oxic partially oxic, 6 samples	SWC SWC
Darriwell 1	Pickering S	W 3337 A2 V1	–	?*D. birkheadensis*	1010	1193.3	?Westphalian	?marine, reworked or contamination? 2 samples	
Doran 1	Balme BE	S430 A1	–	*Nuskoisporites* II	388.3	392.9	Sakmarian	marine influence	core 7
Doran 1	Balme BE	S430 A1	–	*Nuskoisporites* II	388.3	392.9	Upper Carboniferous	?marine	core 10
Doran 1	Purcell RR, 1984	G31010 A1	–	Unit II	420.6	472.15	Upper Carboniferous	[no further details provided]	cutt
Doran 1	Purcell RR, 1984	G31010 A1	–	*S. ybertii*	566.3	651.65	Upper Carboniferous	[no further details provided]	cutt
Doran 1	Balme BE	S430 A1	–	*Nuskoisporites* I or impoverished II	628.5	632.45	Late Carboniferous or Early Permian	–	core 12
Doran 1	Balme BE	S430 A1	–	*Nuskoisporites* I or II	695.25	698	Late Carboniferous or Early Permian	–	core 14
Doran 1	Balme BE	S430 A1	–	–	752.85	752.85	No older than Late Carbonferous–Early Permian	–	SW

Appendix 6 (continued)

Well	Author	Source	Location slides	Zone/assemblage	Top (m)	Base (m)	Age	Remarks	Sample
Drosera 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	110.85	110.88	Tastubian–Asselian	?non marine	core
Drosera 1	Backhouse J, 1999	G31322 A2	–	*D. tenuistratus*	253.6	311.5	Stephanian	?non marine. ?marine at 268.9 m, 7 samples	core
East Crab Creek 1	Purcell RR, 1987	S6114 A32	–	Unit V	550	579	Early Permian	shallow marine, 2 samples	cutt
East Crab Creek 1	Purcell RR, 1987	S6114 A32	–	Unit IV	591	594	Early Permain	shallow marine, 2 samples	cutt
East Crab Creek 1	Purcell RR and Ingram B	S2503 A2 V1	–	?Unit III–IV	657	657	?Early Permian	*M. tentula*; *Verrucosisporites* spp; *Indotriradites* spp	SWC
East Crab Creek 1	Purcell RR and Ingram B	S2503 A2 V1	–	Unit III (Kemp); *D. townrowii* (Powis)	748	748	Asselian–Sterlitamakian	marginal marine	SWC
East Crab Creek 1	Purcell RR and Ingram B	S2503 A2 V1	–	Unit II (Kemp). *H. ramosus*	814.5	982.1	Late Carboniferous	fluvial, 4 samples, *V. pseudoreticulatus* restricted to Upper Grant Group	SWC
East Crab Creek 1	Purcell RR	S2503 A2 V1	–	Unit II or *M. tentula* (*H. ramosus*)	1133	1229.5	Late Carboniferous	fluvial, 7 samples	SWC
East Crab Creek 1	Purcell RR, 1987	S6114 A32	–	Unit I/II	1245	1251.1	Late Carboniferous	fresh/brackish, 2 samples, could be *D. birkheadensis*	SWC
East Crab Creek 1	Purcell RR and Ingram B	S2503 A2 V1	–	?*D. birkheadensis*	1247	1247	Late Carboniferous	marginal marine	SWC
East Crab Creek 1	?	AGSO	–	*S. ybertii* or younger	1263	?	–	from well summary sheet in AGSO Canning Basin project Stage II	?SWC
East Crab Creek 1	Purcell RR	S2503 A2 V1	–	*G. frustulentus*	1320	1320	Tournaisian–Visean	shallow marine	SWC
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	prob. *T. playfordii*	55	150	Early Triassic	3 samples	cutt
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	*K. saeptatus*	200	405	Early Triassic	7 samples	cutt
East Yeeda 1	Purcell RR and Milne L	S2774 A2 V2	–	*K. saeptatus*	200	405	Early Triassic	moderately marine, 7 samples	cutt
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	*D. parvithola*	410	720	Capitanian–Wuchiapingian	6 samples	cutt
East Yeeda 1	Purcell RR and Milne L	S2774 A2 V2	–	Unit VIII	410	410	Late Permian	marine	cutt
East Yeeda 1	Purcell RR and Milne L	S2774 A2 V2	–	Unit VII, Upper Stage 5	500	730	Late Permian	marine, 7 samples	cutt
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	?*D. parvithola*	725	800	–	3 samples	cutt
East Yeeda 1	Purcell RR and Milne L	S2774 A2 V2	–	Unit V	800	1080	Artinskian	transgressive from shallow marine to marine, 7 samples	cutt/ SWC
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	?*D. ericianus*	850	850	–	1 sample	cutt
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	prob. *P. sinuosus*	900	950	–	2 samples	cutt
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	*P.sinuosus* – *M. trisina*	995	1092.5	–	4 samples	SWC
East Yeeda 1	Purcell RR and Milne L	S2774 A2 V2	–	Unit IV	1092.5	1092.5	Early Artinskian	marginal marine	SWC
East Yeeda 1	Purcell RR and Milne L	S2774 A2 V2	–	Unit III. *D. townrowii*	1132.5	1213	Permian	nearshore brackish, 3 samples	SWC
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	prob. *M. trisina*/*D. byroensis*	1132.5	1149	–	2 samples	SWC
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	?*P. pseudoreticulata*	1190	1220	–	2 samples	cutt
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	*P. pseudoreticulata*	1213	–	Sterlitamakian	1 sample	SWC
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	?*P. pseudoreticulata*	1235	1265	–	2 samples	cutt
East Yeeda 1	Purcell RR and Milne L	S2774 A2 V2	–	Unit II. *M. tentula* or *H. ramosus*	1282	1766.6	Stephanian	fluvial to brackish, 7 samples	SWC
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	*P. confluens*	1282	1766.6	Tastubian–Asselian	5 samples	SWC
East Yeeda 1	Purcell RR and Milne L	S2774 A2 V2	–	Unit I – ?II or *P. novicus*	1793.7	2185.8	Early Stephanian	brackish to marginal marine, 8 samples	SWC

East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	?*P. confluens* or older	1793.7	–	?Bashkirian	1 sample	SWC
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	*S. ybertii*	1803.7	2291.1	?Serpukhovian	5 samples	SWC
East Yeeda 1	Purcell RR and Milne L	S2774 A2 V2	–	*S. ybertii*	2291.1	2291.1	Namurian to Westphalian	marginal marine	SWC
East Yeeda 1	Purcell RR and Milne L	S2774 A2 V2	–	?*G. maculosa*	2301	2301	Late Visean to Westphalian	marginal to shallow marine	SWC
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	?*G. maculosa*	2301	–	–	1 sample	SWC
East Yeeda 1	Purcell RR and Milne L	S2774 A2 V2	–	*G. frustulentus*	2357	3553	Tournaisian to Visean	continental, 36 samples	SWC
East Yeeda 1	Backhouse J, 2009	in prep.	GSWA	*A. largus*	2357	–	–	1 sample	SWC
Edgar Range 1	Purcell RR, 1987	S6114 A32	–	Lower Unit II	124	467.9	Late Carboniferous	fresh to brackish, 5 samples	cutt/ core 1
Edgar Range 1	Balme BE, 1968	P 6114 R1 A32	–	*Nuskoisporites* II	124.8	124.8	Sakmarian	–	core 1
Ellendale 1	Balme BE and Ingram BS	S1551 A7	–	*Potonieisporites*	1094	1094	Stephanian	[probably *P. confluens* Zone]	SWC
Ellendale 1	Balme BE and Ingram BS	S1551 A7	–	*G. spiculifera*	1440	2155	Early–Late Tournaisian	marine especially 1929.5–2038.5 m, 24 samples	SWC/ cutt
Ficus 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	94.3	360.7	Tastubian–Asselian	?non marine. ?marine at 195.75 m, 10 samples	core
Ficus 1	Backhouse J, 1999	G31322 A2	–	?*D. tenuistratus*	427.2	427.2	Stephanian	?non marine	core
Ficus 1	Backhouse J, 1999	G31322 A2	–	*D. tenuistratus*	449.6	450.35	Stephanian	?non marine, 2 samples	core
Ficus 1	Foster CB, 1983	S1852 A1	–	*R. lepidophyta*	498.1	601	Late Devonian	marine, 5 samples	core
Fitzroy River 1	Purcell RR	S1523 A2	–	*Potonieisporites* (Unit 1)	1000	1290	Stephanian	some marine influence, ?glacial, 3 samples	cutt
Fitzroy River 1	Purcell RR	S1523 A2	–	*A. ybertii*	1495	1725	Late Namurian – Wesphalian	pre-glacial, 3 samples	cutt
Fitzroy River 1	Purcell RR	S1523 A2	–	–	1740	1860	Visean	5 samples	cutt
Frankenstein 1	Purcell RR	S3417 A2 V2	–	Lower Unit II	434.5	680.05	Stephanian	fresh to brackish, shallow marine at 451.5 m, 6 samples, 45% acritarchs in 451.5 m	SWC
Frankenstein 1	Purcell RR	S3417 A2 V2	–	?Unit I	742	742	Stephanian	fresh to brackish water	SWC
Frankenstein 1	Purcell RR	S3417 A2 V2	–		882	901.05	Late Carboniferous	palynomorphs rare, 2 samples	SWC
Fraser River 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	445	841.6	Tastubian–Asselian	?non marine, 10 samples	cores 42–54
Fraser River 1	Backhouse J	in prep.	GSWA	*P. confluens*	447.1	819.3	Tastubian–Asselian	5 samples	cores 42–53
Fraser River 1	Balme BE	W 95 A3	–	–	632.45	635.2	Permian	–	core 48
Fraser River 1	Balme BE	W 95 A3	–	–	755.9	758.65	Early Permian	–	core 51
Fraser River 1	Backhouse J	in prep.	GSWA	?*M. tentula*	841.6		Moscovian–Asselian	1 sample	cores 54
Fraser River 1 55	Backhouse J	in prep.	GSWA	*M. tentula*	868.7	880.6	Moscovian–Asselian	2 samples	cutt/core
Fraser River 1	Backhouse J, 1999	G31322 A2	–	*D. tenuistratus*	877.8	880.6	Stephanian	?non marine, 1 sample	core 55
Fraser River 1	Backhouse J, 1999	G31322 A2	–	*D. birkheadensis*	936.3	1039.1	Westphalian – Late Namurian	?non marine, 6 samples	cores 57–62
Fraser River 1	Balme BE	W 95 A3	–	–	936.35	940.6	Early Permian	–	cores 57, 58
Fraser River 1	Backhouse J	in prep.	GSWA	*D. birkheadensis*	939.1	1008.6	Bashkirian	4 samples	cores 57–61
Fraser River 1	Backhouse J	in prep.	GSWA	*S. ybertii*	1039.1	1164.6	Serpukhovian	4 samples	cores 62–67
Fraser River 1	Backhouse J, 1999	G31322 A2	–	*S. ybertii*	1104.9	1164.9	Namurian	?non marine, ?marine at 1162.2–1164.9 m, 3 samples	cores 65–67
Fraser River 1	Balme BE	W 95 A3	–	–	1104.9	1110.34	Early Permian		core 65
Fraser River 1	Backhouse J, 1999	G31322 A2	–	?*S. ybertii*	1191.8	1194.5	Namurian	?non marine, 1 sample	core 68

Appendix 6 (continued)

Well	Author	Source	Location slides	Zone/assemblage	Top (m)	Base (m)	Age	Remarks	Sample
Fraser River 1	Backhouse J, 1999	G31322 A2	–	*G. maculosa*	1252.7	1404.2	Visean	?non marine, 4 samples	cores 70–74
Fraser River 1	Cox LR	W 95 A3	–	–	1299.35	1300.3	Carboniferous	*Nuculana* sp; *Sanguinolites* ?sp; *Pleurophorus*?sp; *Orbiculoidea* sp; macrofossils	core 71
Fraser River 1	Backhouse J	in prep.	GSWA	*G. maculosa*	1301.2	1404.2	late Visean	3 samples	cores 71–74
Fraser River 1	Balme BE	W 95 A3	–	–	1301.2	1303.3	Not younger than very Early Permian; ?older	–	core 72
Fraser River 1	Backhouse J	in prep.	GSWA	?*G. frustulentus*	1438.7	1534		2 samples	cutt
Freney 1	Purcell RR	S3446 A2	–	Unit IV (= Stage 3b)	738.1	738.1	Early Artinskian	brackish	SWC
Freney 1	Purcell RR	S3446 A2	–	Unit III (upper Stage 3a)	781.6	781.6	Asselian–Sterlitamakian	marginal marine	SWC
Freney 1	Purcell RR	S3446 A2	–	Lower Unit II or *H. ramosus*) (Stage 2	880.55	1105	Stephanian	fresh to brackish, marginal marine at 880.55 and 1087 m, 4 samples	SWC
Frome Rocks 2	Purcell, 1984	G31010 A1	–	Unit V	213.35	216.4	Early Permian	[no further details provided]	core 1/ ?SWC
Frome Rocks 2	?Balme B, 1959	W 96 A1	–	–	213.4	216.4	Permian	–	core 1/ ?SWC
Frome Rocks 2	Purcell, 1984	G31010 A1	–	Unit IV	335	460.25	Early Permian	[no further details provided]	cores 2, 3/?SWC
Frome Rocks 2	?Balme B, 1959	W 96 A1	–	–	335	338	Artinskian	–	core 2/ ?SWC
Frome Rocks 2	?Balme B, 1959	W 96 A1	–	–	457.2	460.25	Early Permian	–	core 3/ ?SWC
Frome Rocks 2	?Balme B, 1959	W 96 A1	–	–	630.9	634	Artinskian	–	core 4
Frome Rocks 2	Purcell, 1984	G31010 A1	–	Unit III	630.95	634	Early Permian	[no further details provided]	core 4
Frome Rocks 2	Purcell, 1984	G31010 A1	–	Unit II	694.95	749.8	Late Carboniferous	[no further details provided]	?SWC
Goldwyer 1	McTavish RA	W91 A2	–	–	81.7	848.85	[?] Permian	conodont [?reworked or contamination]	cutt
Goldwyer 1	Purcell RR, 1987	S6114 A32	–	Lower Unit II	612.8	759.1	Late Carboniferous	fresh to brackish water, 4 slides	cutt
Grant Range 1	Purcell RR, 1984	G3101 A1	–	Unit II	121.9	146.3	Upper Carboniferous	[no further details provided]	?
Grant Range 1	Backhouse J, 2009	in prep.	GSWA	*P. confluens*	146.3	367	Tastubian–Asselian	2 samples	cutt/ core 1
Grant Range 1	Purcell RR, 1984	G3101 A1	–	?Unit II	366.65	781.8	Upper Carboniferous	reworking from Upper Devonian to *S. ybertii* assemblages [no further details provided]	?
Grant Range 1	Backhouse J, 2009	in prep.	GSWA	*M. tentula*	426.4	1181.1	Moscovian–Asselian	9 samples	cores 2–16
Grant Range 1	Purcell RR, 1984	G3101 A1	–	?Unit I – *S. ybertii*	817.15	1856.25	Upper Carboniferous	[no further details provided]	?
Grant Range 1	Backhouse J, 2009	in prep.	GSWA	?*S. ybertii*/*D. birkheadensis*	1516.4	1618.2	?Moscovian	3 samples	cores 21–23
Grant Range 1	Backhouse J, 2009	in prep.	GSWA	?*D. birkheadensis*	1695.3	1830.9		2 samples	cores 26 and 29
Grant Range 1	Backhouse J, 2009	in prep.	GSWA	?*S. ybertii*	1857.5	1952.9	?Serpukhovian	10 samples	cores 30–42

Grant Range 1	Backhouse J, 2009	in prep.	GSWA	*S. ybertii*	1955	2005.6	?Serpukhovian	2 samples	cores 43–44
Grant Range 1	Backhouse J, 2009	in prep.	GSWA	?*G. maculosa*	2287.5		late Visean	1 sample	core 50
Grant Range 1	Purcell RR, 1984	G3101 A1	–	*G. maculosa*	2407.9	2604.5	Lower Carboniferous	[no further details provided]	?
Grant Range 1	Backhouse J, 2009	in prep.	GSWA	*G. frustulentus*	2411.6		Tournaisian–Visean	1 sample	core 52
Great Sandy 2	Foster CB, 1990	S20013 A2 V1	–	*G. confluens*	719.5	1070	Early Permian	4 samples	SWC
Hakea 1	Purcell RR	S2431 A2	–	Unit IV	549.1	549.1	Artinskian	shallow brackish water	SWC
Hakea 1	Purcell RR	S2431 A2	–	Unit III or *D. townrowii*	608	608	Asselian–Sterlitamakian	fresh to brackish water	SWC
Hakea 1	Purcell RR	S2431 A2	–	Unit II or *M. tentula*	657.8	1093.5	Stephanian	strong fresh water influence, ?glacial, 5 samples	SWC/ core 3
Hakea 1	Purcell RR	S2431 A2	–	*S. ybertii*	1299	1307.5	Namurian–Westphalian	continental, 2 samples	SWC/ cutt
Hakea 1	Purcell RR	S2431 A2	–	*G. maculosa*	1347	1417	Visean	3 samples	SWC
Hakea 1	Purcell RR	S2431 A2	–	*G. frustulentus*	1699	1702.5	Tournaisian–Visean	shallow marine, 2 samples	SWC/ cutt
Halgania 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	166.1	265.29	Tastubian–Asselian	?non marine, 4 samples	core
Halgania 1	Backhouse J, 1999	G31322 A2	–	?*P. confluens*	296	296.03	Tastubian–Asselian	?non marine, 1 sample	core
Hangover 1	Purcell RR	S2319 A6	–	Unit VI	510	510	Early Permian	marine	SWC
Hangover 1	Purcell RR	S2319 A6	–	Unit V	577	613	Artinskian	shallow marine, 2 samples	SWC
Hangover 1	Purcell RR	S2319 A6	–	Unit IV	694	694	Artinskian	shallow marine	SWC
Hangover 1	Purcell RR	S2319 A6	–	Unit III or *D. townrowii*	756	822	Asselian–Sterlitamakian	warmer terrestrial, 4 samples	SWC
Hangover 1	Purcell RR	S2319 A6	–	*M. tentula*	849	1204	Stephanian–Autunian	strong fresh-water influence, 16 samples	SWC
Hangover 1	Purcell RR	S2319 A6	–	*G. maculosa*	1543.7	1543.7	Visean	–	SWC
Hangover 1	Purcell RR	S2319 A6	–	*A. largus*	1554.5	1554.5	Visean	–	SWC
Harold 1	Purcell RR	S3150 A2 V1	–	Lower Unit II or *H. ramosus*	457	632	Stephanian	fresh to brackish, 7 samples	SWC
Hedonia 1	Purcell RR and Ingram BI	S2599 A2 V2	–	Unit II or *H. ramosus*	492.7	800	Stephanian–Autunian	fresh to brackish, 15 samples	SWC
Hedonia 1	Purcell RR, 1987	S6114 S32	–	?Unit III	492.7		Early Permian	1 sample	cutt
Hedonia 1	Purcell RR, 1987	S6114 S32	–	Lower Unit II	610	800	Stephanian–Autunian	fresh/brackish, 4 samples	cutt
Hedonia 1	Purcell RR, 1987	S6114 S32	–	*D. birheadensis*	808.2	907	Westphalian	marginal marine, 5 samples	cutt
Hedonia 1	Purcell RR and Ingram BS	S2599 A2 V2	–	*D. birheadensis*	808.2	873	Westphalian	brackish marginal marine, 3 samples	SWC
Hilltop 1	Purcell RR, Ingram BS	S3177 A2 V1	–	–	525	540	?Late Carboniferous/ Early Permian	1 sample	cutt
Hilltop 1	Purcell RR, Ingram BS	S3177 A2 V1	–	Unit II or *H. ramosus*	915	930	Stephanian	fresh to brackish, 1 sample	cutt
Hoya 1	Backhouse, J, 2007	G31849A1	–	*P. confluens*	99.8	245.2	Early Sakmarian	5 samples	core
Janpam 1	Purcell RR	S2229 A3	–	*G. spiculifera*	659.5	659.5	Tournaisian	marine, [?mislabelled or reworked from] upper Fairfield Group	SWC
Janpam 1	Purcell RR	S2229 A3	–	Unit III or *D. townrowii*	833	833	Asselian–Sterlitamakian	restricted brackish	SWC
Janpam 1	Purcell RR	S2229 A3	–	Unit II or *M. tentula*	886.5	1188.5	Stephanian–Autunian	restricted brackish, 3 samples	SWC
Janpam 1	Purcell RR	S2229 A3	–	*G. frustulentus*	1399	1399	Tournaisian–Visean	–	SWC
Jones Range 1	Purcell RR, 1984	G31010 A1	–	Unit II	148	375	Upper Carboniferous	[no further details provided]	cutt
Jones Range 1	Dolby G	S1064 A2	–	*Nuskoisporites* II	148	252	Sakmarian	no evidence of marine	cutt
Jones Range 1	Dolby G	S1064 A2	–	*Nuskoisporites* I/ II	375	375	Sakmarian	no evidence of marine	cutt
Jones Range 1	Purcell RR, 1984	G31010 A1	–	*S. ybertii*	898	1145	Upper Carboniferous	[no further details provided]	cutt
Jones Range 1	Dolby G	S1064 A2	–	*Nuskoisporites* I	898	898	Sakmarian	no evidence of marine	cutt
Jones Range 1	Dolby G	S1064 A2	–	–	980	1645	?Late Tournaisian – Visean	non marine	cutt
Jones Range 1	Purcell RR, 1984	G31010 A1	–	*G. frustulentus*	1150	2236	Upper Carboniferous	[no further details provided]	cutt
Jones Range 1	Dolby G	S1064 A2	–	*G. frustulentus*	1670	2260	Tournaisian cu 1– cu Iia	lagoonal to marginal marine	cutt
Jum Jum 1	Hannah MJ	S2836 A4 V2	–	*L. pellucidus*	750	750	Early Triassic	–	SWC

Appendix 6 (continued)

Well	Author	Source	Location slides	Zone/assemblage	Top (m)	Base (m)	Age	Remarks	Sample
Jum Jum 1	Hannah MJ	S2836 A4 V2	–	–	923	1075	Late Permian	3 samples	SWC
Jum Jum 1	Hannah MJ	S2836 A4 V2	–	*P. sinuosus*	1115	1150	Early Permian	2 samples	SWC
Jum Jum 1	Hannah MJ	S2836 A4 V2	–	Stage 3b	1340	1340	Early Permian	–	SWC
Jum Jum 1	Hannah MJ	S2836 A4 V2	–	Stage 3a–b	1590	1605	Early Permian	3 samples	SWC
Jum Jum 1	Hannah MJ	S2836 A4 V2	–	Stage 3a	1650	1947	Late Carboniferous	6 samples	SWC
Jum Jum 1	Hannah MJ	S2836 A4 V2	–	*G. maculosa*	2317	2471	Middle Carboniferous	7 samples	SWC
Kambara 1	Helby R	S2197 A5	–	Stage 3a to lower Stage 4	756	802	Early Permian	3 samples	SWC
Kambara 1	Helby R	S2197 A5	–	Stage 3b or *D. townrowii*	831.2	831.2	Early Permian	–	SWC
Kambara 1	Helby R	S2197 A5	–	Stage 3a	881	894.4	Permian	–	SWC
Kambara 1	Helby R	S2197 A5	–	Stage 2	919	1198	Latest Carboniferous	8 samples	SWC
Kambara 1	Helby R	S2197 A5	–	*G. frustulentus*	1590.5	1753.7	Tournaisian	11 samples	SWC
Katy 1	Purcell RR	S2323 A4	–	Unit V	476	540	Artinskian	marginal marine; brackish, 2 samples	SWC
Katy 1	Purcell RR	S2323 A4	–	Unit IV	692.5	692.5	Artinskian	shallow brackish water	SWC
Katy 1	Purcell RR	S2323 A4	–	Unit II or *M. tentula*	829	829	Stephanian–Autunian	strong freshwater influence, ?glacial	SWC
Katy 1	Purcell RR	S2323 A4	–	*S. ybertii*	1742.9	1742.9	Namurian	continental	SWC
Katy 1	Purcell RR	S2323 A4	–	*A. largus*	1831.2	1891	Visean	continental to nearshore, 2 samples	SWC
Kemp Field 1	Dickins JM	S439 A2	–	–	135.95	139	Permian	marine, 2 chonetid species and pelecypod	core 1
Kemp Field 1	Balme BE, 1969	S439 A2	–	*Vittatina*	136.1	136.1	Early Artinskian	non marine	core 1
Kemp Field 1	Backhouse J, 1995	GSWA Paleo 1995/25	–	Stage 2/*confluens*	184.4	426.7		7 samples [previously assigned to *Nuskiosporites* by AJ Williams in G1081A1V1]	cutt
Kennedia 1	Purcell RR	S2815 A2 V2	–	Unit III or *D. townrowii*	588.5	610.2	Sakmarian	brackish to marginal marine at 610.2 m, marginal to shallow marine at 588.5 m, 2 samples	SWC
Kennedia 1	Purcell RR	S2815 A2 V2	–	Lower Unit II or *M. tentula*/*H. ramosus*	871	871	Stephanian	fresh to brackish	SWC
Kidson 1	Balme BE	S244 A1	–	–	335.3	548.65	Artinskian	some marine influences	SWC
Kidson 1	Balme BE	S244 A1	–	–	707.1	707.15	Sakmarian or Early Artinskian	–	SWC
Kidson 1	Balme BE	S244 A1	–	–	728.5	728.5	?Sakmarian	–	SWC
Kidson 1	Balme BE	S244 A1	–	–	835.15	1448.4	Sakmarian	–	SWC
Kidson 1	Backhouse J, 2009	G 31918 A1	GSWA	*S. ybertii* to *M. tentula*	1551.4	1556.3	Early Permian or Late Carboniferous	1 sample	core 2
Kidson 1	Balme BE	S244 A1	–	–	1553.25	1553.25	Early Permian or Late Carboniferous	–	core 2
Kilang Kilang 1	Backhouse J, 1998	RSV v. 110, p. 111	GSWA	*D. parvithola*	131.8	236.8	Midian–Dzhulfian	4 samples	SWC
Kilang Kilang 1	Purcell RR	W 2644 A3 V2	–	Unit VII	131.8	338.7	Early Permian	transgressive from marginal marine to marine, 7 samples	SWC
Kilang Kilang 1	Backhouse J, 1998	RSV v. 110, p. 111	GSWA	*D. ericianus*	274	294	Kazanian	2 samples	SWC
Kilang Kilang 1	Backhouse J, 1998	RSV v. 110, p. 111	GSWA	*D. granulata*	338.7		late Ufimian	1 sample	SWC
Kilang Kilang 1	Purcell RR	W 2644 A3 V2	–	Unit VI	359	406.7	Early Permian	shallow marine, 2 samples	SWC
Kilang Kilang 1	Backhouse J, 1998	RSV v. 110, p. 111	GSWA	*P. sinuosus*	359	545	late Artinskian – Kungurian	5 samples	SWC

Kilang Kilang 1	Purcell RR	W 2644 A3 V2	–	Unit V	437.7	610	Early Permian	marginal to shallow marine, 6 samples	SWC
Kilang Kilang 1	Backhouse J, 1998	RSV v. 110, p. 111	GSWA	*M. trisina*	610	642.5	Artinskian	3 samples	SWC
Kilang Kilang 1	Purcell RR	W 2644 A3 V2	–	Unit IV	637	642.5	Early Permian	marginal marine, 2 samples	SWC
Kilang Kilang 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	807	1135	Tastubian–Asselian	?marine 807–822.1 m, ?non marine 889–1048 m, marine 1135 m, 8 samples	SWC
Kilang Kilang 1	Purcell RR	W 2644 A3 V2	–	Unit II	807	1135	Late Carboniferous	fluvial to brackish, 8 samples	SWC
Kilang Kilang 1	Backhouse J, 1999	G31322 A2	–	*D. birkheadensis*	1185	1453.6	Westphalian	marine, 2 samples	SWC
Kilang Kilang 1	Purcell RR	W 2644 A3 V2	–	Unit I	1185	1185	Late Carboniferous	fresh to brackish	SWC
Kilang Kilang 1	Purcell RR	W 2644 A3 V2	–	*D. birkheadensis*	1453.6	1453.6	Late Carboniferous	marginal marine	SWC
Kilang Kilang 1	Backhouse J, 1999	G31322 A2	–	?*S. ybertii*	1512.2	1512.2	Namurian	?non marine, 1 sample	SWC
Kilang Kilang 1	Purcell RR	W 2644 A3 V2	–	*S. ybertii*	1512.2	1512.2	Late Carboniferous	fresh to brackish	SWC
Kilang Kilang 1	Purcell RR	W 2644 A3 V2	–	?*G. maculosa*	1590.1	1590.1	Early–Late Carboniferous	–	SWC
Kilang Kilang 1	Purcell RR	W 2644 A3 V2	–	*G. frustulentus*	1757.1	1882	Early Carboniferous	?continental or shallow marine, 2 samples	SWC
Kora 1	Helby R, 1983	W 2190 A1	–	Upper Stage 4a	675	675	Early Permian	marine	SWC
Kora 1	Helby R, 1983	W 2190 A1	–	Stage 3b	820	1020	Early Permian	intermittent marine, 4 samples	SWC
Kora 1	Helby R, 1983	W 2190 A1	–	Stage 3a	1101	1101	Early Permian	marine	SWC
Kora 1	Helby R, 1983	W 2190 A1	–	Stage 2–3a	1205	1205	Latest Carboniferous – Earliest Permian	–	SWC
Kora 1	Helby R, 1983	W 2190 A1	–	*G. maculosa* – Stage 2	1350	1350	Mid–Late Carboniferous	–	SWC
Kora 1	Helby R, 1983	W 2190 A1	–	upper *G. maculosa*	1581	1587	Late Visean – Namurian	3 samples	SWC
Kora 1	Helby R, 1983	W 2190 A1	–	middle *G. maculosa* (*W.?australis*)	1595	1637	Late Visean – Namurian	3 samples	SWC
Kora 1	Helby R, 1983	W 2190 A1	–	lower *G. maculosa* or older (*S. ybertii*)	1647	1905	Late Visean – Namurian or older	11 samples	core 1/ SWC/ cutt
Kora 1	Helby R, 1983	W 2190 A1	–	*G. frustulentus*	1922	2557	Early Carboniferous	19 samples	SWC/ cutt
Lacepede 1A	Lister TR,	W 580 V2 A1	–	–	2001	2286	Late Permian	non marine, 35 samples	SWC
Lacepede 1A	Ingram BS, 1991	G30264 A2	–	Unit I	2002.2	2013.2	Late Carboniferous	non marine, highly mature	SWC/ cutt
Lake Betty 1	Williams AJ and Dolby G	W 648 A1	–	*Dalhuntyspora*	210.3	210.3	Late Permian	marine	SWC
Lake Betty 1	Williams AJ and Dolby G	W 648 A1	–	*Vittatina* (Unit II)	431.9	431.9	Artinskian	weakly marine	SWC
Lake Betty 1	Williams AJ and Dolby G	W 648 A1	–	*Vittatina* ?Unit I)	635.5	635.5	Artinskian	no evidence marine	SWC
Lake Betty 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	780.9	904	Tastubian–Asselian	?non marine, 2 samples	SWC
Lake Betty 1	Williams AJ and Dolby G	W 648 A1	–	*Nuskoisporites* (Unit III)	780.9	780.9	Sakmarian	no evidence marine	SWC
Lake Betty 1	Purcell RR, 1984	G31010 A1	–	Unit III	823	823	Lower Permian	[no further details provided]	?
Lake Betty 1	Williams AJ and Dolby G	W 648 A1	–	*Nuskoisporites* (Unit II)	904.05	1240.85	Sakmarian	no evidence marine, 2 samples	SWC
Lake Betty 1	Purcell RR, 1984	G31010 A1	–	Unit II	904.05	1240.85	Upper Carboniferous	[no further details provided]	?
Lake Betty 1	Backhouse J, 1999	G31322 A2	–	?*P. confluens*	1240.8	1240.8	Tastubian–Asselian	?non marine, 1 sample	SWC
Lake Betty 1	Backhouse J, 1999	G31322 A2	–	?*G. maculosa*	1469.1	1639.8	Visean	?non marine, 3 samples	cutt/ SWC
Lake Betty 1	Williams AJ and Dolby G	W 648 A1	–	*Nuskoisporites* (Unit I)	1578.85	1578.85	Late Carboniferous	no evidence marine	SWC
Lake Betty 1	Purcell RR, 1984	G31010 A1	–	Unit I	1578.85	1578.85	Upper Carboniferous	[no further details provided]	?
Lake Betty 1	Williams AJ and Dolby G	W 648 A1	–	*Apiculatisporis turriculaeformis*	1660.55	1660.55	?Tournaisian	no evidence marine	SWC
Lake Betty 1	Purcell RR, 1984	G31010 A1	–	*G. frustulentus*	1660.6	2476.2	Lower Carboniferous	[no further details provided]	?
Lake Betty 1	Williams AJ and Dolby G	W 648 A1	–	*G. frustulentus* etc	1897.4	2497.25	?Tournaisian	no evidence marine, 4 samples	SWC
Lake Hevern 1	Purcell RR, 1998	S20508 A2 V2	–	*A. largus* or older	390	902	Visean or older	caving	cutt
Langoora 1	Jones PJ and Young GC, 1993	AGSO Record 1993/4	–	– –	37	128	E Triassic	conchostracans, lingulids, microvertebrate and wood remains, megaspores	cutt

Appendix 6 (continued)

Well	Author	Source	Location slides	Zone/assemblage	Top (m)	Base (m)	Age	Remarks	Sample
Langoora 1	Fowler EM, 1962	W 41 A1	–	–	577.6	581.25	Upper Sakmarian or Lower Artinskian	–	Core 1
Langoora 1	Jones PJ and Young GC, 1993	AGSO Record 1993/4	–	Stage 3a–3b	577	581	Early Permian	non-marine	Core 1
Langoora 1	Fowler EM, 1962	W 41 A1	–	–	915.6	918.65	Sakmarian or Lower Artinskian	–	Core 3
Langoora 1	Fowler EM, 1962	W 41 A1	–	–	1224.7	1229.6	Upper Carboniferous	–	Core 6
Langoora 1	Jones PJ and Young GC, 1993	AGSO Record 1993/4	–	*ybertii*	1225	1230	L Carboniferous	–	Core 6
Lawford 1	Backhouse J, 2009	W21301 A1	GSWA	*M. tentula*	1300	1305	Asselian to latest Carboniferous	lies below *P. confluens* Zone, no marine acritarchs present, 2 samples	cutt
Leo 1	Purcell RR	S3368 A2	–	Lower Unit II (*H. ramosus*)	705	933	Late Carboniferous	shallow marine to brackish, 8 samples	SWC
Lloyd 1	Purcell RR	S3144 A3 V2	–	*G. frustulentus*	1529.1	1529.1	Early Carboniferous	continental	core 1
Logue 1	Balme BE, 1972	W 656 A2	–	*Vittatina* I	391.05	391.05	Artinskian	no evidence of marine	SWC
Logue 1	Purcell RR, 1987	S6114 A32	–	Unit IV	391.2	391.2	Early Permian		cutt
Logue 1	Balme BE, 1972	W 656 A2	–	*Nuskoisporites* III	492.25	694.35	Sakmarian	no evidence of marine	SWC
Logue 1	Purcell RR, 1987	S6114 A32	–	Unit III	492.4	694.5	Early Permian	brackish	cutt
Logue 1	Balme BE, 1972	W 656 A2	–	?*Nuskoisporites* II	938.5	938.5	Sakmarian	no evidence of marine	SWC
Logue 1	Purcell RR, 1987	S6114 A32	–	Lower Unit II	938.7	1326.8	Late Carboniferous	fresh – brackish	cutt
Logue 1	Balme BE, 1972	W 656 A2	–	*Nuskoisporites* I	980.55	1015.3	Late Carboniferous	no evidence of marine	SWC
Logue 1	Purcell RR, 1984	G31010 A1	–	Unit II	1059.8	1326.5	Late Carboniferous	[no further details provided]	SWC
Logue 1	Purcell RR, 1984	G31010 A1	–	?Unit I	1402.1	1447.8	Late Carboniferous	[no further details provided]	cutt
Logue 1	Purcell RR, 1987	S6114 A32	–	Unit I/II	1402.4	1453.4	Late Carboniferous		cutt
Logue 1	Purcell RR, 1984	G31010 A1	–	*S. ybertii*	1453	1554.5	Late Carboniferous	[no further details provided]	SWC/ cutt
Logue 1	Balme BE, 1972	W 656 A2	–	–	1453	1477.65	Carboniferous	no evidence of marine, weakly marine at 1477.67 m	SWC
Logue 1	Purcell RR, 1987	S6114 A32	–	Unit I	1468.3	1554.9	Late Carboniferous	glacial, yields low but diverse, reworking present	cutt
Logue 1	Balme BE, 1972	W 656 A2	–	–	1496.5	1527.65	?Visean	no evidence of marine, weakly marine at 1527.66 m	SWC
Logue 1	Purcell RR, 1984	G31010 A1	–	*R. lepidophyta*	1569.72	2638.05	Late Devonian	[no further details provided]	SWC/ cutt
Lukins 1	Purcell RR	S2901 A2	–	*G. frustulentus*	754	754	Tournaisian–Visean	marginal marine	SWC
Mangaloo 1	Purcell RR, 1986	S2817 A2 V1	–	late Unit III or younger	80	90	Permian	fresh to brackish water, *M. trisina* and *Botryococcos* sp	cutt
Mangaloo 1	Purcell RR, 1986	S2817 A2 V2	–	Unit IV	140	145	Early Artinskian	marginal marine	cutt
Mangaloo 1	Purcell RR, 1986	S2817 A2 V2	–	Unit II	305	485	Stephanian	fluvial to brackish, 2 samples	cutt
Mangaloo 1	Purcell RR, 1986	S2817 A2 V2	–	*G. spiculifera*	842.5	842.5	Tournaisian	shallow marine	cutt
Mariana 1	Purcell RR	S2613 A2 V2	–	Unit III or *D. townrowii*	675	690	Asselian–Sterlitamakian	nearshore, 2 samples	SWC
Mariana 1	Purcell RR	S2613 A2 V2	–	Unit II or *H. ramosus*	705	975.1	Stephanian	marginal marine, 4 samples	SWC
Mariana 1	Purcell RR	S2613 A2 V2	–	*G. frustulentus*	1276	1276	Tournaisian–Visean	marine	SWC
Matches Spring 1	Purcell RR, 1987	S6114 A32	–	Unit III	146.3	171.9	Early Permian	shallow marine, 1 new sample examined	core 1/ cutt
Matches Spring 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	166.1	399.3	Tastubian–Asselian	?non marine, 3 samples	cutt
Matches Spring 1	Balme BE, 1970	W 500 A1	–	*Nuskoisporites* II	166.1	171.9	Sakmarian	marine	core 1

Matches Spring 1	Purcell RR, 1987	S6114 A32	–	Lower Unit II	397.9	542.7	Late Carboniferous	fresh to brackish	cutt
Matches Spring 1	Millepied P, 1970	W 500 A1	–	–	554.4	555.35	Permian	[probably Devonian]	core 2
McLarty 1	Balme BE, 1968	W 415 A1	–	*Nuskoisporites* II	236.7	293.5	?Early Sakmarian	–	cores 2, 3
Meda 1	Balme BE, 1958	W 89 A1	–	*Leuckisporites S*1	73.152	185.928	Triassic	–	cutt
Meda 1	Balme BE, 1958	W 89 A1	–	*Tholosporites*	240.8	249.95	Late Permian	[=Unit VIII of Kemp et al., 1977]	cutt
Meda 1	Balme BE, 1958	W 89 A1	–	?*Tholosporites*	371.85	381	Late Permian	[=Unit VII of Kemp et al., 1977]	cutt
Meda 1	Balme BE, 1958	W 89 A1	–	?*Striatites*	390.15	407.05	Artinskian	3 samples	SWC/ core 1
Meda 1	Balme BE, 1958	W 89 A1	–	*Striatites*	409.5	481.9	Artinskian	5 samples	SWC
Meda 1	Crespin I, 1958	W 89 A1	–	–	429.75	435.85	Permian	rich foram assemblage	core 1
Meda 1	Thomas GA, 1959	W 89 A1	–	–	429.75	435.85	Permian	macrofauna	core 1
Meda 1	Backhouse, J, 1997	Paleo 1997/2	–	*P. sinuosus*	429.8	429.8	Kungurian	–	core 1
Meda 1	Backhouse J, 2009	in prep.	GSWA	*P. pseudoreticulata* or younger	435.9	598.3	?Sakmarian–Artinskian	2 samples	cores 1–2
Meda 1	Backhouse, J, 1997	Paleo 1997/2	–	?*P. sinuosus*	592.2	592.2	?Kungurian	–	core 2
Meda 1	Balme BE, 1958	W 89 A1	–	?*Cirratriradites*	592.25	598.3	Artinskian	–	cutt
Meda 1	Crespin I, 1958	W 89 A1	–	*Hyperammina* sp.	592.25	598.3	Permian	forams	core 2
Meda 1	Thomas GA, 1959	W 89 A1	–	–	592.25	598.3	–	spiriferid fragment	core 2
Meda 1	Balme BE, 1958	W 89 A1	–	*Cirratriradites*	650.45	746.75	Lower Artinskian	14 samples	SWC/ cores 2, 3
Meda 1	Backhouse, J, 1997	Paleo 1997/2	–	*M. trisina*	719.6	719.6	Artinskian	–	core 3
Meda 1	Crespin I, 1958	W 89 A1	–	–	719.65	723.9	Permian	forams, cf Dampier Downs 1, core 19	core 3
Meda 1	Backhouse J, 2009	in prep.	GSWA	*P. pseudoreticulata*	723.9		Sakmarian–Artinskian	1 sample	core 3
Meda 1	Balme BE, 1958	W 89 A1	–	?*Nuskoisporites*	748.3	748.3			SWC
Meda 1	Balme BE, 1958	W 89 A1	–	*Nuskoisporites*	749.8	760.95	Upper Sakmarian	2 samples	SWC
Meda 1	Backhouse, J, 1997	Paleo 1997/2	–	*P. confluens*	900.7	1232.9	Asselian – early Sakmarian	3 samples	cores 4–6
Meda 1	Backhouse J, 2009	in prep.	GSWA	*P. confluens*	906.8	1051.6	Tastubian–Asselian	2 samples	cores 4–5
Meda 1	Backhouse J, 2009	in prep.	GSWA	?*P. confluens*, *M. tentula* or *S. ybertii*	1237.5	–	–	1 sample	core 6
Meda 1	Backhouse J, 2009	in prep.	GSWA	*G. frustulentus*	1386.8	–	–	1 sample	cutt
Melaleuca 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	124.5	450	Tastubian–Asselian	?non marine, 8 samples	core
Mimosa 1	Dolby G/McTavish/Quilty	S895 A2	–	–	105	105	EarlyTriassic	–	SWC
Mimosa 1	Jones PJ and Young GC, 1993	AGSO Record 1993/4	–	*K. saepatus*	105	–	EarlyTriassic (Griesbachian)	–	SWC
Mimosa 1	Dolby G/McTavish/Quilty	S895 A2	–	–	120	180	late Late Permian	marine, 3 samples	cutt
Mimosa 1	Jones PJ and Young GC, 1993	AGSO Record 1993/4	–	*P. crenulata*/Unit VIII	120	180	Late Permian (Dzhulfian)	3 samples	cut
Mimosa 1	Dolby G/McTavish/Quilty	S895 A2	–	–	201	201	Late Permian	no evidence of marine	SWC
Mimosa 1	Jones PJ amd Young GC, 1993	AGSO Record 1993/4	–	Lower Stage 5/Unit VII	201	300	Permian (?Kungurian–Kazanian)	2 samples	SWC/ cutt
Mimosa 1	Dolby G/McTavish/Quilty	S895 A2	–	*Vittatina* III	406	406	Artinskian	marine	SWC
Mimosa 1	Jones PJ and Young GC, 1993	AGSO Record 1993/4	–	Unit VI	406	406	Artinskian	–	SWC
Mimosa 1	Dolby G/McTavish/Quilty	S895 A2	–	*Vittatina* I	541	541	Artinskian	marine	SWC
Mimosa 1	Jones PJ and Young GC, 1993	AGSO Record 1993/4	–	Unit IV	541	541	Artinskian		SWC
Mimosa 1	Dolby G/McTavish/Quilty	S895 A2	–	*Nuskoisporites* II	732	982	Sakmarian	no evidence of marine, 2 samples	SWC

Appendix 6 (continued)

Well	*Author*	*Source*	*Location slides*	*Zone/assemblage*	*Top (m)*	*Base (m)*	*Age*	*Remarks*	*Sample*
Mimosa 1	Jones PJ and Young GC, 1993	AGSO Record 1993/4	–	Unit II	732	1075	Asselain	3 samples	SWC
Mimosa 1	Dolby G/McTavish/Quilty	S895 A2	–	*Nuskoisporites* II	1075	1075	Sakmarian	no evidence of marine	SWC
Minjin 1	Powis GD	S2528 A4 V2	–	Stage 3b	750	766	Early Permian	2 samples	SWC
Minjin 1	Powis GD	S2528 A4 V2	–	Stage 3a/b	816	816	Early Permian	–	SWC
Minjin 1	Powis GD	S2528 A4 V2	–	Stage 3a	828.3	1266	Late Carboniferous	17 samples	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*W. lucifer* (Upper 5c)	550	550	Late Permian	–	cutt
Moogana 1	Stacey HE	S1578 A2 V1	–	*A. villosa* (Upper 4b)	636.2	636.2	Permian	sample out of place	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*Lunatisporites*	652	709.5	Early Triassic	8 samples	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*D. parvithola* (Upper 5a)	713.4	713.4	Permian	–	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*D. dalhuntyspora* (Lower 5c)	730.2	730.2	Permian	–	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*D. granulata* (Lower 5a)	802	806.4	Permian	2 samples	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*L. vermithola* (Upper 4b)	814.7	814.7	Permian	–	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*P. sinuosa* (Upper 4a)	822	916	Permian	4 samples	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*M. trisina* (3b)	932	1109	Permian	6 samples	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*V. pseudoreticulatus* (3a)	1197	1513.5	Permian	11 samples, reworked Carboniferous from 1511 and 153.5 m	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*M. tentula* (Stage 2)	1550	1650	Late Carboniferous	3 samples	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*S. ybertii* (A) Zone	1700	1885	Middle Carboniferous	2 samples	SWC
Moogana 1	Stacey HE	S1578 A2 V1	–	*G. maculosa* (G) Zone	1922.5	1977.5	Middle Carboniferous	6 samples	SWC
Mount Hardman 1	Dolby, McTavish, Quilty	S919 A3	–	*Vittatina* I	317	317	Artinskian	no strong evidence of marine, rich assemblage dominated by *Kraeuselisporites* sp	SWC
Mount Hardman 1	Dolby, McTavish, Quilty	S919 A3	–	*Vittatina* I	386	386	Artinskian	no strong evidence of marine	SWC
Mount Hardman 1	Dolby, McTavish, Quilty	S919 A3	–	?*Nuskoisporites* III	390	390	Sakmarian	no evidence of marine, rich *Nuskoisporites* III – *Vittatina* I assemblage	cutt
Mount Hardman 1	Dolby, McTavish, Quilty	S919 A3	–	*Nuskoisporites* II	420	420	Sakmarian	no evidence of marine	cutt
Mount Hardman 1	Dolby, McTavish, Quilty	S919 A3	–	*Nuskoisporites* II	650	650	Sakmarian	no evidence of marine, reworked Late Famennian	SWC
Mount Hardman 1	Dolby, McTavish, Quilty	S919 A3	–	*Nuskoisporites* I–II	685	746	Sakmarian	no strong evidence of marine, 2 samples	SWC
Mount Hardman 1	Purcell RR, 1984	G31010 A1	–	Unit II	746	846	Late Carboniferous	[no further details provided]	SWC
Mount Hardman 1	Dolby, McTavish, Quilty	S919 A3	–	*Nuskoisporites* I	790	934	Carboniferous	no strong evidence of marine, 5 samples	SWC
Mount Hardman 1	Purcell RR, 1984	G31010 A1	–	Unit I/ *S. ybertii*	934	1068	Late Carboniferous	[no futher details provided; lower limit of 2068 m assumed to be a typo.]	SWC
Mount Hardman 1	Purcell RR, 1984	G31010 A1	–	*G. frustulentus*	1080	2202	Early Carboniferous	[no further details provided]	SWC
Mowla 1	Purcell RR, 1984	S30129 A1		Upper Unit II or *V. pseudoreticulatus*	26	289.6			
Mowla 1	Purcell RR, 1984	S30129 A1		Lower Unit II or *H. ramosus*	417.6	448.1			
Munda 1	Williams AJ	S655 A2	–	*Nuskoisporites* II or ?III	655.3	655.3	Sakmarian	no evidence of marine	SWC
Munda 1	Williams AJ	S655 A2	–	*Nuskoisporites* II or III (?Unit II)	780.3	780.3	Sakmarian	weakly marine	SWC
Munda 1	Williams AJ	S655 A2	–	–	816.85	990.6	No older than Permian	3 samples, v rare palynomorphs [unreliable]	SWC

Munro 1	Dolby G	S698 A1	–	*Nuskoisporites* III	609.6	883.92	Sakmarian	weakly marine at 670.55 m, no evidence of marine in other 2 samples	SWC
Munro 1	Dolby G	S698 A1	–	*Nuskoisporites* II	1060.7	1110.1	Sakmarian	no evidence of marine	SWC
Musca 1	Purcell RR	S2168 A2	–	*H. ramosus* Unit II	579	579	–	–	SWC
Myroodah 1	?Balme B, ?year	UWA fossil collection	–	–	53.3	417.6	Upper Permian	4 productive samples	?cutt
Myroodah 1	Crespin I, 1956	BMR Record 1956/126	–	–	251.45	304.8	–	forams; no age given but assigned to 'Liveringa Formation'	cutt
Myroodah 1	Crespin I, 1956	BMR Record 1956/126	–	–	440.4	762	–	forams; no age given but assigned to Noonkanbah Formation	cutt
Myroodah 1	?Balme B, ?year	UWA fossil collection	–	–	1428.6	1431.3	Lower Permian	1 sample	cutt
Nerrima 1 (AFO)	Crespin I, 1956	BMR Record 1956/64	–	–	13.7	210.3	–	forams; no age given but assigned to Noonkanbah Formation; also ostracods and bryozoans	cutt
Nerrima 1 (AFO)	Backhouse J, 2009	in prep.	GSWA	*?S. ybertii*	2158.9	2161.9	–	1 sample	core 14
Nerrima 1 (AFO)	Backhouse J, 2009	in prep.	GSWA	*S. ybertii*	2294.85	2297	–	1 sample	core 15
Nerrima 1 (AFO)	Backhouse J, 2009	in prep.	GSWA	*?S. ybertii*	2433.8	2435.4	–	1 sample	core 16
Ngalti 1	Purcell RR	S2638 A4	–	Unit V	137.3	137.3	Early Permian	marginal marine	SWC
Ngalti 1	Purcell RR	S2638 A4	–	Unit IV	175.5	175.5	Artinskian	fresh to brackish water	SWC
Ngalti 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	299	631.5	Tastubian–Asselian	?non marine, 3 samples	SWC
Nita Downs 1	McMinn A	S2452 A5 V1	–	Stage 3a	785	1127	Early Permian	marine; marginal marine or brackish, 8 samples, rare acritarchs	SWC
Nollamara 1	Purcell RR	S2812 A2 V2	–	Unit IV	155	160	Early Artinskian	marginal marine, 1 sample	cutt
Nollamara 1	Purcell RR	S2812 A2 V2	–	Unit II or *H. ramosus*	365	589	Stephanian	fluvial to brackish, 4 samples	cutt
Nollamara 1	Purcell RR	S2812 A2 V2	–	?Unit I	775	830.25	Stephanian	brackish to fluvial, 2 samples	SWC
Notabilis 1	Purcell RR, 1984	S2581 A2	–	Unit IV	415		Artinskian	shallow marine	cutt
Notabilis 1	Purcell RR, 1984	S2581 A2	–	Unit III	450		Sakmarian	marginal marine	cutt
Notabilis 1	Purcell RR, 1984	S2581 A2	–	Unit II	682	735	Stephanian	fluvial, 4 samples	SWC
Notabilis 1	Purcell RR, 1984	S2581 A2	–	*D. birkheadensis*	769	769	Westphalian	preglacial freshwater	SWC
Notabilis 1	Purcell RR, 1984	S2581 A2	–	*R. lepidophyta*	862	1061	Late Devonian	[no other details provided]	–
Nuytsia 1	Purcell RR	S2681 A3 V1	–	Unit IV	120	120	Artinskian	fresh to brackish	SWC
Nuytsia 1	Purcell RR	S2681 A3 V1	–	Unit III	240	240	Sakmarian	marginal marine	SWC
Nuytsia 1	Purcell RR	S2681 A3 V1	–	Unit II or *M. tentula*	350	640	Stephanian	fluvial to brackish, 4 samples	SWC
Nuytsia 1	Purcell RR	S2681 A3 V1	–	Unit I/II	685	791	Stephanian	dominant fresh water influence, 3 samples	SWC
Olios 1	Purcell RR	S2478 A4 V1	–	Unit IV	220	269.1	Early Permian	shallow marine, 3 samples	SWC
Olios 1	Purcell RR	S2478 A4 V1	–	Unit III or *D. townrowii*	276.5	322.4	Early Permian	brackish, 3 samples	SWC
Olios 1	Purcell RR	S2478 A4 V1	–	Unit II or *M. tentula*	375	819	Late Carboniferous	continental to nearshore, glacial, 14 samples	SWC
Olios 1	Purcell RR	S2478 A4 V1	–	*G. frustulentus*	826	1337.75	Early Carboniferous	shallow marine, 13 samples	SWC
Padilpa 1	?	S3205 A2	–	Stage 3a. *P. pseudoreticulata*	955.2	1079.3	Permian	4 samples	?SWC
Padilpa 1	?	S3205 A2	–	*H. ramosus*	1111.5	1334.6	Carboniferous	5 samples	?SWC
Padilpa 1	?	S3205 A2	–	*P. novicus*	1417.3	1542.5	Carboniferous	4 samples	?SWC
Padilpa 1	?	S3205 A2	–	*S. yberti*	1606	1764.5	Carboniferous	3 samples	?SWC
Palm Spring 1	McTavish, Dolby, Williams	S724 A2	–	*Vittatina* I–II	120.7	120.7	Artinskian	no strong evidence of marine	SWC

Appendix 6 (continued)

Well	Author	Source	Location slides	Zone/assemblage	Top (m)	Base (m)	Age	Remarks	Sample
Palm Spring 1	McTavish, Dolby, Williams	S724 A2	–	*Vittatina* I	147.5	148.45	Artinskian	marine	SWC
Palm Spring 1	McTavish, Dolby, Williams	S724 A2	–	*Nuskoisporites* II	368.5	418.2	Sakmarian	no evidence of marine, 3 samples	SWC
Parda 1	McMinn A	G30278 A1	–	Stage 3a	621.8	780.3	Early Permian	4 samples	SWC
Parda 1	Balme BE	S198 A1	–	–	621.8	734.25	Sakmarian	some evidence for marine, 3 samples	SWC
Parda 1	McMinn A	G30278 A1	–	Stage 2	838.2	977.2	Late Carboniferous	4 samples	SWC
Parda 1	Balme BE	S198 A1	–	–	977.2	977.2	?Late Carboniferous – Early Permian	–	SWC
Patience 1	Backhouse J, 1997	Paleo 1997/1	–	*D. ericianus*	280	–	Late Permian	probably non-marine	cutt
Patience 1	Backhouse J, 1997	Paleo 1997/1	–	*P. confluens*	873	1323	Tastubian (Sakmarian)	probably non-marine, 3 samples	cutt
Pearl 1	Purcell RR, 1990	G30264 A2	–	Unit III / IV	770	850	Permian	nearshore marine	cutt
Pearl 1	Purcell and Milne, 1983	S2340 A3	–		770	850	?Permian	shallow marine, 2 samples	cutt
Pearl 1	Purcell RR, 1990	G30264 A2	–	Unit II	940	1100	Late Carboniferous	brackish	SWC/ cutt
Pearl 1	Purcell and Milne, 1983	S2340 A3	–	Unit II or *M. tentula*	940	1100	Stephanian–Autunian	strong freshwater influence, ?glacial, 3 samples	SWC/ cutt
Pearl 1	Purcell RR, 1990	G30264 A2	–	Unit I	1173	1680	Late Carboniferous	brackish, poor assemblages with common reworking	SWC/ cutt
Pearl 1	Purcell and Milne, 1983	S2340 A3	–	Unit I or *P. novicus*	1173	1680	Carboniferous	freshwater, lower part ?shallow marine, 14 samples, reworked Ord. and Late Devonian	SWC/ cutt
Pearl 1	Purcell RR, 1990	G30264 A2	–	*A. largus*	1859	1982	Early Carboniferous	shallow marine	SWC/ cutt
Pegasus 1	Purcell RR, 1988	W 3338 A3	–	Lower Unit II/*H. ramosus*	200	410	Late Carboniferous	brackish water, 4 samples	cutt
Pender 1	Nygreen PW	S722 A2	–	*Nuskoisporites* II	444.4	597.4	Sakmarian	no evidence of marine, 5 samples, some reworking	SWC
Pender 1	Nygreen PW	S722 A2	–	*Nuskoisporites* I; ?*Nuskoisporites* II	624.85	723	Late Carboniferous or ?Early Permian	no evidence of marine, 6 samples, some reworking	SWC
Pender 1	Nygreen PW	S722 A2	–	*Nuskoisporites* I	748.6	807.1	Carboniferous	no evidence of marine, 2 samples, dominated by *Verrucososporites* and *Granulatisporites*	SWC
Pender 1	Nygreen PW	S722 A2	–	?*Nuskoisporites* I	816.85	816.85	Carboniferous	no evidence of marine, some reworking of Famennian	SWC
Perindi 1	Powis GD	S2342V2A5	–	Stage 3a or youger	830.3	831.8	Early Permian	4 samples	SWC
Perindi 1	Powis GD	S2342V2A5	–	Stage 3a	877.3	1594	Late Carboniferous	9 productive samples | [probably *P. confluens* Zone]	core 1/ SWC
Perindi 1	Powis GD	S2342V2A5	–	Stage 1 S. ybertii	1735	1770	Late Carboniferous	4 samples	cutt
Perindi 1	Powis GD	S2342V2A5	–	*G. frustulentus*	1772	1780	Early Carboniferous	4 samples	SWC/ utt
Petaluma 1	Purcell RR	S3241 A1 V1	–	Unit VII Lower Stage 5c (Price)	150	160	Roadian–Guadalupian	shallow marine	cutt
Petaluma 1	Purcell RR	S3241 A1 V1	–	Unit V Lower Stage 4	350	560	Early Artinskian	shallow marine, 2 samples	cutt
Petaluma 1	Purcell RR	S3241 A1 V1	–	Unit IV	670	800	Early Artinskian	shallow marine, 2 samples	cutt

Petaluma 1	Purcell RR	S3241 A1 V1	–	Unit III *D. townrowii* (Powis)	850	1030	Asselian–Sterlitamakian	nearshore; brackish, 6 samples	cutt
Petaluma 1	Purcell RR	S3241 A1 V1	–	Upper Unit II/Unit III	1060	1230	Asselian–Sterlitamakian	shallow marine, 2 samples	cutt
Petaluma 1	Purcell RR	S3241 A1 V1	–	Unit II or *H. ramosus*	1270	1820	Stephanian	brackish, 5 samples	cutt
Philydrum 1	Purcell RR	S2697 A2 V2	–	Unit IV	512	551	Artinskian	marginal marine, 2 samples	SWC
Philydrum 1	Purcell RR	S2697 A2 V2	–	Unit III	580.5	580.5	Sakmarian	marginal marine	SWC
Philydrum 1	Purcell RR	S2697 A2 V2	–	Unit II or M. tentula *H. ramosus*	724.2	939.9	Stephanian	fresh to brackish, 4 samples	SWC
Philydrum 1	Purcell RR	S2697 A2 V2	–	Unit I/II	1064	1169	Stephanian	fresh to brackish, 3 samples	cutt/ SWC
Philydrum 1	Balme BE	S2697 A2 V2	–	–	1230	1252.5	Late Carboniferous – Early Permian	Unit III attributed to caving, 2 samples	cutt
Philydrum 1	Balme BE	S2697 A2 V3	–	*G. frustulentus*	1310	1370	Tournaisian–Visean	2 samples	cutt
Pictor 1	Purcell RR	S2607	–	Unit II or *H. ramosus*	221	329	Stephanian	fluvial at 329–305 m; brackish/marginal marine at 266.5–221 m, 5 samples	SWC
Point Moody 1	Backhouse J, 2009	in prep.	GSWA	*S. fusus* or younger	145.7	279.8	Early Permian	2 samples	cores 1, 2
Point Moody 1	Evans PR	S238 A3	–	Unit P1c+	278.45	278.45	Permian	marine	core 2
Point Moody 1	Evans PR	S238 A3	–	?*V. pseudoreticulatus*	372.45	463.9	Permian	core 4 virtually barren, 2 samples	cores 3, 4
Point Moody 1	Backhouse J, 2009	in prep.	GSWA	*P. pseudoreticulata*	373.7	–	–	1 sample	core 3
Point Moody 1	Evans PR	S238 A3	–	Unit P1b	514.8	643.75	Early Permian	2 samples	cores 5, 7
Point Moody 1	Backhouse J	in prep.	GSWA	*P. confluens*	520.3	645.9	Tastubian	2 samples	cores 5, 6
Point Moody 1	Backhouse J	in prep.	GSWA	?*P. confluens*	648.6	753.8	–	2 samples	cores 7–8
Point Moody 1	Evans PR	S238 A3	–	Units C2 – P1a	929.35	929.35	Late Carboniferous – Early Permian		core 10
Point Moody 1	Backhouse J	in prep.	GSWA	?*M. tentula*	932.4	–	–	1 sample	core 10
Point Moody 1	Evans PR	S238 A3	–	Unit C1	1065	1945.55	Carboniferous	7 productive samples, cores 14–15 barren	cores 11–22
Point Moody 1	Backhouse J	in prep.	GSWA	*M. tentula*	1068.6	1327.4	Late Carboniferous	3 samples	cores 11–13
Point Moody 1	Backhouse J	in prep.	GSWA	?*M. tentula*	1521.9	1648.4	Late Carboniferous	3 samples	cores 16–18
Point Moody 1	Backhouse J	in prep.	GSWA	?*D. birkheadensis*	1722.1	–	–	1 sample	core 19
Point Moody 1	Backhouse J	in prep.	GSWA	?*S. ybertii*	1814.8	1945.9	–	3 samples	cores 20–22
Puratte 1	Stacy HE	S1558 A3	–	*Lunatisporites*	536	765	Early Triassic	marine, 12 samples	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*T. playfordii*	430	510	Early Triassic	7 samples	SWC
Puratte 1	Backhouse J	in prep.	GSWA	?*T. playfordii*	536	559	Early Triassic	4 samples	SWC
Puratte 1	Backhouse J	in prep.	GSWA	?*K. saepatus*	566	572	Early Triassic	2 samples	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*K. saepatus*	578	765	Early Triassic	5 samples	SWC
Puratte 1	Stacy HE, 1980	S1558 A3	–	*P. reticulatus*	795	812	Permian	2 samples	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*P. microcorpus*/*P. crenulata*	795	812	Late Permian	2 samples	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*D. parvithola*	850	894	Late Permian	4 samples	SWC
Puratte 1	Stacy HE, 1980	S1558 A3	–	Upper 5a	850	850	Late Permian	–	cutt
Puratte 1	Stacy HE, 1980	S1558 A3	–	Lower 5b/c	852	894	Late Permian	–	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*D. granulata*	926	–	–	1 sample	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*M. villosa*	940	–	–	1 sample	SWC
Puratte 1	Stacy HE, 1980	S1558 A3	–	Upper 4b	940	940	Early Permian	–	SWC
Puratte 1	Stacy HE, 1980	S1558 A3	–	Upper 4a	956	1017	Early Permian	4 samples	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*P. sinuosus*	956	1222	–	10 samples	SWC

Appendix 6 (continued)

Well	Author	Source	Location slides	Zone/assemblage	Top (m)	Base (m)	Age	Remarks	Sample
Puratte 1	Stacy HE, 1980	S1558 A3	–	Lower 4	1044	1077	Early Permian	3 samples	SWC/ cutt
Puratte 1	Stacy HE, 1980	S1558 A3	–	Stage 3b/4	1105	1222	Early Permian	5 samples	SWC
Puratte 1	Stacy HE, 1980	S1558 A3	–	Stage 3b	1251	1345	Early Permian	3 samples	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*?P. sinuosus*	1251.5	–	–	1 sample	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*D. byroensis*	1345	–	–	1 sample	SWC
Puratte 1	Stacy HE, 1980	S1558 A3	–	Stage 3a	1403	1494	Latest Carboniferous – Early Permian	3 samples.	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*M. trisina/S. fusus*	1432	–	–	1 sample	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*P. pseudoreticulata*	1494	–	–	1 sample	SWC
Puratte 1	Stacy HE, 1980	S1558 A3	–	Stage 2	1560	1681	Late Carboniferous	5 samples	SWC/ cutt
Puratte 1	Backhouse J	in prep.	GSWA	*P. confluens*	1560	1681	–	3 samples	SWC
Puratte 1	Stacy HE, 1980	S1558 A3	–	Stage 1 or Potoniesporites	1903	1975	Late Carboniferous	5 samples	SWC
Puratte 1	Backhouse J	in prep.	GSWA	?M. tentula	1928.5	–	–	1 sample	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*?P. confluens*	1943	–	–	1 sample	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*?M. tentula*	1960	1975	–	2 samples	SWC
Puratte 1	Stacy HE, 1980	S1558 A3	–	*S. ybertii*	2060	2074	Middle Carboniferous	3 samples	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*?S. ybertii*	2074	–	–	1 sample	SWC
Puratte 1	Backhouse J	in prep.	GSWA	*?G. maculosa*	2084	2143	–	3 samples	SWC
Puratte 1	Stacy HE, 1980	S1558 A3	–	*G. maculosa*	2109	2172.5	Middle Carboniferous	3 samples	SWC
Roebuck Bay 1	Crespin I and Condon MA, 1956	BMR Record 1956/139	–	–	477.6	606.25	–	arenaceous forams; Noonkanbah Formatiion	cores 19, 20, 22
Roebuck Bay 1	CSIRO, 1957	W 102 A1	–	–	484.65	518.2	Artinskian	–	cores 19, 20, 22
Roebuck Bay 1	Purcell RR, 1987	S6114 S32	–	Unit III	484.8	609.8	Early Permian	–	
Roebuck Bay 1	Crespin I and Condon MA, 1956	BMR Record 1956/139	–	–	606.25	624.25	–	forams; bryozoa; productid spines; Nura Nura Member	cores 23–24
Roebuck Bay 1	Crespin I, 1956	BMR Record 1956/90	–	–	606.25	609.3	Early Permian	*Calcitornella* sp; *Geinitzina* sp; *G triangularis*	core 23
Roebuck Bay 1	Purcell RR, 1987	S6114 S32	–	Upper Unit II or *V. pseudoreticulatus*	611.6	667.7	Late Carboniferous	–	incl. cores 25 and 27
Roebuck Bay 1	Crespin I and Condon MA, 1956	BMR Record 1956/139	–	–	624.25	1022.9	Early Permian	aenaceous forams in cores 31, 33	cores 28–33
Roebuck Bay 1	Purcell RR, 1987	S6114 S32	–	Lower Unit II or *H. ramosus*	698.2	868.3	Late Carboniferous	–	cores 28–35
Roebuck Bay 1	CSIRO, 1957	W 102 A1	–	–	728.45	731.5	?Artinskian	–	core 29
Roebuck Bay 1	Crespin I, 1956	BMR Record 1956/90	–	–	807.1	809.85	Early Permian	*Hyperamminoides* sp; *Nodosaria* sp	core 33
Roebuck Bay 1	CSIRO, 1957	W 102 A1	–	–	834.55	837.6	?Sakmarian	*Nuskoisporites*; *Lueckisporites*; *Vestigisporites*	core 34
Roebuck Bay 1	CSIRO, 1957	W 102 A1	–	–	1012.25	1014.05	Early Permian	*Nuskoisporites*; *Lueckisporites*; *Vestigisporites*	core 40

Sahara 1	Balme BE, 1965	W 182 A1	–	–	307.55	310.6	Late Sakmarian or ?Early Artinskian	[*D. townrowii*/Unit II — well summary sheet from AGSO Canning Basin Project Stage II]	core 1
Sahara 1	Balme BE, 1965	W 182 A1	–	–	651.95	655	?Sakmarian	[no younger than *G. confluens* — AGSO well summary sheet]	core 2
Samphire Marsh 1	Balme BE, 1958	W 101 A1	–	–	749.8	755.9	Sakmarian or basal Artinskian	–	core 1
Samphire Marsh 1	McMinn A	G30279 A1	–	Stage 2	749.8	749.8	Late Carboniferous	–	core 1
Samphire Marsh 1	McMinn A	G30279 A1	–	Stage 1/2	807.7	1175	Late Carboniferous	3 samples	cutt/ core 2
Samphire Marsh 1	Balme BE, 1958	W 101 A1	–	–	1040.85	1044.85	Permian	–	core 2
Scarpia 1	Purcell R, 1990	W20044 A2	–	Unit II	673.5	884	Stephanian	brackish, 3 samples	SWC
Scarpia 1	Purcell R, 1990	W20044 A2	–	*G. frustulentus*	1531	1588.5	Tournaisian–Visean	continental to brackish, 4 samples	SWC
Selenops 1	Purcell RR	W 2621 A5 V1	–	?Unit II–IV	120	135	Late Carboniferous – Early Permian	2 samples	cutt
Selenops 1	Purcell RR	W 2621 A5 V1	–	Unit II. *M tentula*	150	360	Stephanian	continental, 10 samples	cutt
Selenops 1	Backhouse J, 1999	G31322 A2	–	*P confluens*	150	345	Tastubian–Asselian	150 m marine;165–315 m and 345 m ?non marine; 330m ?marine, 8 samples	cutt
St George Range 1	Backhouse J, 1999	G31322 A2	–	*P. confluens*	91.4	94.5	Tastubian–Asselian	?non marine, 1 sample	core 1
St George Range 1	Backhouse J	in prep.	GSWA	*P. confluens*	94.5	170.7	Tastubian–Asselian	2 samples	cores 1–2
St George Range 1	Purcell RR, 1984	G31010 A1	–	Unit II	91.4	94.5	Upper Carboniferous	1 sample	core 1
St George Range 1	Purcell RR, 1984	G31010 A1	–	?Unit II	167.65	170.7	Upper Carboniferous	[no further details provided]	core 2
St George Range 1	Purcell RR, 1984	G31010 A1	–	Unit I	210.3	244.15	Upper Carboniferous	[no further details provided]	cutt
St George Range 1	Backhouse J	in prep.	GSWA	prob. *D. birkheadensis*	262.1	–	–	1 sample	core 3
St George Range 1	Backhouse J, 1999	G31322 A2	–	*D. tenuistratus*	259.1	262.1	Stephanian	?marine, 1 sample	core 3
St George Range 1	Backhouse J	in prep.	GSWA	*D. tenuistriata*	259.1	262.1	Moscovian–Gzhelian	1 sample	core 3
St George Range 1	Balme BE	W 223 A1 V1	–	–	669.95	669.95	?Early Permian	–	bit
St George Range 1	Balme BE	W 223 A1 V1	–	*Nuskoisporites* and *Alisporites*	676.65	679.7	Late Carboniferous	–	cutt
St George Range 1	Backhouse J, 1999	G31322 A2	–	*D. birkheadensis*	740.1	743.1	Westphalian	?non marine, 1 sample	core 5
St George Range 1	Backhouse J	in prep.	GSWA	*S. ybertii*	740.7	1364.6	–	2 samples	cores 5, 7
St George Range 1	Purcell RR, 1984	G31010 A1	–	*S. ybertii*	743.1	1364.6	Upper Carboniferous	[no further details provided]	cores 5, 7
St George Range 1	Backhouse J, 1999	G31322 A2	–	*S. ybertii*	1360.6	1364.6	Namurian	?non marine, 2 samples	core 7
St George Range 1	Backhouse J	in prep.	GSWA	*G. frustulens*	15554	–		slide incorporates several SWCs so can only be applied to deepest depth	SWC
Sundown 1	Purcell RR	S2233 A1 V2	–	Unit III or *D. townrowii*	818.9	818.9	Asselian	restricted brackish	SWC
Sundown 1	Purcell RR	S2233 A1 V2	–	Unit II or *M. tentula*	892.5	1172.5	Stephanian	restricted brackish or nearshore, glacial, 4 samples	SWC
Sundown 1	Purcell RR	S2233 A1 V2	–	*S. ybertii*	1452	1452	Namurian–Wesphalian	Pre-glacial	SWC
Sundown 2	Purcell RR	S2321 A13	–	Unit VI	518	518	Leonardian–Roadian	marine	SWC
Sundown 2	Purcell RR	S2321 A13	–	Unit V	655	655	Artinskian	shallow marine	SWC
Sundown 2	Purcell RR	S2321 A13	–	Unit IV	744.5	780	Artinskian	shallow marine, 2 samples	SWC
Sundown 2	Purcell RR	S2321 A13	–	Unit III or *D. townrowii*	836	836	Asselian–Sterlitamakian	nearshore brackish	SWC
Sundown 2	Purcell RR	S2321 A13	–	Unit II or *M. tentula*	902	1221	Stephanian–Autunian	strong fresh water influence, 7 samples	SWC

Appendix 6 (continued)

Well	Author	Source	Location slides	Zone/assemblage	Top (m)	Base (m)	Age	Remarks	Sample
Sunshine 1	Purcell RR, 1992	W20110 A2	–	Unit II (Stage 2)	477	637.5	Stephanian	restricted marginal marine, increasing freshwater influence upwards, 4 samples, *M. tentula*; *H. ramosus* etc	SWC
Sunshine 1	Purcell RR, 1992	W20110 A2	–	?Unit II	645.5		Stephanian	biodegraded amorphous material	SWC
Tandalgoo 2	Balme BE, 1963	W 157 V3 A1	–	*Vittatina*	76.2	79.25	Artinskian	marine	cutt
Tandalgoo 2	Balme BE, 1963	W 157 V3 A1	–	*Vittatina*	137.15	140.2	Artinskian	marine	cutt
Tandalgoo 3	Balme BE, 1964	W 157 V3 A1	–	*Vittatina*	118.85	124.95	Artinskian	marine, 2 samples	cutt
Tappers Inlet 1	Quilty PG, 1972	S641 A2	–	–	655.95	838.2	Artinskian	forams	cutt
Tappers Inlet 1	Williams AJ, 1972	S641 A2	–	*Vittatina* II	692.5	692.5	Artinskian	marine	SWC
Tappers Inlet 1	Quilty PG, 1972	S641 A2	–	–	838.2	1044.85	Sakmarian	–	SWC/cutt
Tappers Inlet 1	Williams AJ, 1972	S641 A2	–	*Vittatina* I	947	947	Artinskian	no clear evidence of marine	SWC
Tappers Inlet 1	Williams AJ, 1972	S641 A2	–	?*Vittatina*	1044.85	1044.85	Artinskian	–	SWC
Tappers Inlet 1	Quilty PG, 1972	S641 A2	–	–	1121.35	1524	Sakmarian	–	SWC/cutt
Tappers Inlet 1	Williams AJ, 1972	S641 A2	–	?*Nuskoisporites* III	1210.65	1210.65	Sakmarian	weakly marine	SWC
Tappers Inlet 1	Williams AJ, 1972	S641 A2	–	*Nuskoisporites* II or III	1509.35	1509.35	Sakmarian	no evidence of marine	SWC
Terrace 1	Purcell RR	S2597 A2 V2	–	?Unit V	565	565	Artinskian	shallow marine	SWC
Terrace 1	Purcell RR	S2597 A2 V2	–	Unit IV	823	823	Artinskian	shallow marine	SWC
Terrace 1	Purcell RR	S2597 A2 V2	–	Unit III, *D. townrowii*	875	875	Early Permian	nearshore brackish water	SWC
Terrace 1	Purcell RR	S2597 A2 V2	–	Lower Unit II – *H. ramosus*	902	1129	Stephanian	fresh to brackish, 6 samples	SWC
Terrace 1	Backhouse J, 2009	G31918 A1	–	*P. confluens*	1129	–	Early Sakmarian	–	SWC
Terrace 1	Backhouse J, 2009	G31918 A1	–	?*P. confluens*	1153	–	?Early Sakmarian	abundant reworked *S. ybertii*	SWC
Terrace 1	Purcell RR	S2597 A2 V2	–	*S. ybertii*	1153	1508	Namurian–Wesphalian	marginal marine, 3 samples	SWC
Terrace 1	Backhouse J, 2009	G31918 A1	–	*S. ybertii*	1396.7	1508	Late Carboniferous	2 samples	SWC
Terrace 1	Backhouse J, 2009	G31918 A1	–	?*S. ybertii*	1529		Late Carboniferous	SWC mislabelled?	SWC
Terrace 1	Backhouse J, 2009	G31918 A1	–	*G. frustulentus*	1566.1		Early Carboniferous	–	SWC
Terrace 1	Purcell RR	S2597 A2 V2	–	*A. largus*	1566.1	1700.5	Mid to Late Visean	continental to marginal marine, 4 samples	SWC
Terrace 1	Purcell RR	S2597 A2 V2	–	*G. spiculifera*	1754.5	1857.5	Tournaisian	marine at 1857.5 m to continental at 1754.5 m, 5 samples	SWC
Thangoo 2	Dolby G, McTavish RA	S852 A1	–	*Nuskoisporites* II	426	543	Sakmarian	no evidence of marine, 3 samples	SWC
Thangoo 2	Dolby G, McTavish RA	S852 A1	–	–	775	775	Sakmarian	no evidence of marine	SWC
The Sisters	?Balme B	UWA fossil collection	–	–	1283.8	1287.8	Lower Permian	1 sample [caving?]	cutt
Twin Buttes 1	Jones MJ and Wood GR	S3135 A1 V1	–	Upper Stage 2 PPI	465	633	Stephanian–Asselian	6 samples, *M. tentula* dominant, equivalent to *H. ramosus Z*	SWC
Valhalla 1	Purcell RR	W21222 A2	–	?*P. confluens*	955–60	1085–90	?Early Sakmarian	2 samples [zone interpreted from basic palynology report]	cutt
Valhalla 1	Purcell RR	W21222 A2	–	?*S. ybertii* or *D. birkheadensis*	1460–65	–	mid to Late Carboniferous	1 sample [zone interpreted from basic palynology report]	cutt

Valhalla 1	Purcell RR	W21222 A2	–	*G. frustulentus*	1665–70	3435–40	Early Carboniferous	13 samples [zone interpreted from basic palynology report]	cutt
Vela 1	Purcell RR	S2170 A1	–	Upper Unit II or *V. pseudoreticulatus*	305	305	Late Carboniferous [contamination?]	–	SWC
Vela 1	Purcell RR	S2170 A1	–	Lower Unit II or *H. ramosus*	390	390	Late Carboniferous	restricted nearshore, glacial	SWC
Wamac 1	Lister TR, 1973	S907 A2	–	[?*frustulensis*]	1970	2760	Lower Carboniferous	continental, highly mature	SWC/ cutt
Wamac 1	Price PL, 1973	S907 A2	–	–	1970	2594	Possibly Permian	marine influence	SWC
Wamac 1	Morgan and Ingram, 1990	S30147 A1	–	–	2181	2645	Early Carboniferous	–	cutt
West Blackstone 1	Purcell RR	S2801 A2	–	Unit II. M tentula	850	1415	Stephanian	fluvial to brackish, 6 samples	SWC
West Blackstone 1	Purcell RR	S2801 A2	–	–	1450	1450	Late Carboniferous	fluvial to brackish, species from *S. ybertii* Ass., *M. tentula* most common	SWC
West Blackstone 1	Purcell RR	S2801 A2	–	*G. spiculifera*	1489.5	1568	Tournaisian	shallow marine at 1568 m, marginal marine at 1489.5 m, 3 samples	SWC
West Kora 1	Hannah MJ	S2555 A4 V2	–	*T. cicaricosa*	630	630	Early Permian	–	SWC
West Kora 1	Hannah MJ	S2555 A4 V2	–	Stage 3b *M. trisina*	975	975	Early Permian	–	SWC
West Kora 1	Hannah MJ	S2555 A4 V2	–	Stage 3a–b *D. townrowii*	1021	1021	Early Permian	–	SWC
West Kora 1	Hannah MJ	S2555 A4 V2	–	Stage 3a *V. pseudoreticulatus*	1075	1076	Late Carboniferous	2 samples	SWC
West Kora 1	Hannah MJ	S2555 A4 V2	–	Stage 2	1195	1273.5	Late Carboniferous	3 samples, 1273.5 m with reworked Devonian	SWC
West Kora 1	Hannah MJ	S2555 A4 V2	–	Stage 1	1459	1550	Late Carboniferous	3 samples	SWC
West Kora 1	Hannah MJ	S2555 A4 V2	–	*G. maculosa*	1591.4	1988	Early–Late Carboniferous	5 samples	SWC
West Philydrum 1	Purcell RR	S2757 A2 V1	–	Unit VII	13	25	Roadian–Guadalupian	marine	cutt
West Philydrum 1	Purcell RR	S2757 A2 V1	–	Unit V	400	400	Artinskian	shallow marine	SWC
West Philydrum 1	Purcell RR	S2757 A2 V1	–	Unit IV	545	545	Early Artinskian	marginal marine	SWC
West Philydrum 1	Purcell RR	S2757 A2 V1	–	Unit II or *M. tentula* or *H. ramosus*	699	1042	Stephanian	fluvial to brackish, 6 samples	SWC
West Terrace 1	Purcell RR	S2786 A3	–	Lower Unit II. *H. ramosus*	1077.5	1078.9	Stephanian	shallow to mainal marine at 1077.5 m, marginal marine – brackish at 1078.9 m, 2 samples	core 2
Whistler 1	Purcell R, 1991	W20109 A2	–	Unit II (Kemp) Stage 2 (Price)	452	785	Stephanian	marginal marine, 6 samples	SWC
White Hills 1	van Niel JP, 1985	G2982 A1	–	?Unit I – ?Unit III	60	300	Stephanian – Early Permian	heavy caving, 11 samples	cutt
White Hills 1	Balme BE, 1983	G3996 A1	–	*P. novicus*	170	790	Late Carboniferous	–	cutt/ SWC
White Hills 1	Balme BE, 1983	G3996 A1	–	?*S. ybertii*	821	1090	Namurian–Stephanian	continental	SWC/ cutt
White Hills 1	van Niel JP, 1985	S2982 A1	–	*S. ybertii*	840	865	Namurian–Westphalian	2 samples	cutt
White Hills 1	van Niel JP, 1985	S2982 A1	–	*G. frustulentus*	1130	2295	Tourniasian–Visean	–	cutt
Whitewell 1	Purcell RR	S2575 A2	–	Unit III/IV	845	867	Sakmarian–Artinskian	2 samples	cutt
Whitewell 1	Purcell RR	S2575 A2	–	Unit II or *M. tentula*	910	1137	Late Carboniferous	fresh water to marginal marine, 3 samples	cutt
Whitewell 1	Purcell RR	S2575 A2	–	*G. maculosa*	1460	1470	Visean	continental	cutt
Willara 1	McMinn A	S30277A1	–	Stage 3a	511.15	788.6	Early Permian	marine/marginal marine, 3 samples	SWC
Willara 1	Balme BE	S214 A1	–	–	511.15	511.15	?Late Sakmarian	?marine	SWC
Willara 1	Balme BE	S214 A1	–	–	667.5	667.5	?Late Sakmarian		SWC
Willara 1	McMinn A	S30277A1	–	Stage 2	1034.8	1150	Late Carboniferous	marine/marginal marine, 3 samples	SWC/ core 1
Willara 1	Balme BE	S214 A1	–	–	1147.55	1150.6	Early Permian	some marine influence	core 1
Willara Hill 1	Balme BE	S432 A1	–	*Nuskoisporites* II	631.85	680.3	Sakmarian	marine influences	SWC

Appendix 6 (continued)

Well	*Author*	*Source*	*Location slides*	*Zone/assemblage*	*Top (m)*	*Base (m)*	*Age*	*Remarks*	*Sample*
Willara Hill 1	Balme BE	S432 A1	–	–	695.85	761.4	Sakmarian	3 samples	cores 4–6
Wilson Cliffs 1	SNPA, 1969	S419 A1	–	Unit 3	173.75	1356.36	Early Permian	[contamination below ` 967 m (base Grant Group)]	cutt/ cores 1–5
Wilson Cliffs 1	van Niel JP, 1985	S2982 A1	–	–	841.2		?Early Permian	Late Permian palynomorphs presumed to be caving	cutt
Yarrada 1	Ingram BS	S1828 A5 V1	–	*M. tentula* or Stage II *H. ramosus*	1156	1156	Late Carboniferous	restricted marine, ?nearshore, glacial	SWC
Yulleroo 1	Purcell RR, 1987	S6114 A32	–	*D. birkenheadensis*	681.7	837.4	Westphalian–Stephanian	marginal marine, 2 samples	cores 1–2
Yulleroo 1	Purcell RR, 1987	S6114 A32	–	*A. largus*	1072.8	1880.5	Visean	non marine, 4 samples	cut

NOTES: Depths rounded to nearest 5 cm; barren samples omitted. No attempt has been made to update the zones to those now used in Western Australia, or revise stages to those of Gradstein et al. (2006) — see discussion in text. All remarks etc from original reports, unless in square brackets

bit	bit sample
cut	cuttings
SWC	sidewall core
AJES	Australian Journal of Earth Sciences
Paleo	GSWA Paleontology Report
RSV	Journal of the Royal Society of Victoria
SNPA	Société Nationale des Pétroles d'Aquitaine

Appendix 7

TOC (>2%) and Rock-Eval (S_1+S_2 > 2.5 mg/gm rock) data from the mid-Carboniferous to Lower Triassic

Well	*Data extracted from*	*Sample type*	*Top (m)*	*Base (m)*	*TMAX (°C)*	*S1*	*S2*	*S3*	*TOC*	*PI*	*S_1+S_2*	*HI*	*OI*	*Unit*	*Comments*	*Approx. % Ro*
BHP Noonkanbah PND1	M0001331	core	322.3	–	431	0.04	3.19	0.96	4.75	0.01	3.23	67	20	Pn	–	–
BHP Noonkanbah PND1	M0001331	core	333.6	–	433	0.5	51.5	4.2	16.6	0.01	52.00	311	25	Pp	–	–
BHP Noonkanbah PND1	M0001331	core	343.2	–	433	0.4	39.7	5.3	19.7	0.01	40.10	202	27	Pp	–	–
Bindi 1	S2609 A10	SWC	921.0	–	427	0.26	6.33	0.55	5.30	0.04	6.59	119	10	Pn	–	0.4
Bindi 1	S2609 A10	SWC	976.0	–	432	0.22	3.63	0.41	2.44	0.06	3.85	149	17	Pn	–	0.4
Booran 1	W2215	SWC	1160.0	–	435	0.59	4.46	0.39	4.81	0.12	5.05	93	8	Pn	–	0.5
Booran 1	W2215	SWC	1235.0	–	434	0.49	5.01	0.45	3.80	0.09	5.50	132	12	Pn	–	0.5
Booran 1	W2215	SWC	1294.0	–	437	0.46	2.63	0.35	2.93	0.15	3.09	90	12	Pp	–	0.5
Canegrass 1	W20189	SWC	525.0	–	430	0.10	4.68	0.60	4.70	0.02	4.78	100	13	Pn	–	–
Canegrass 1	W20189	SWC	595.0	–	433	0.05	2.58	0.14	2.17	0.02	2.63	119	6	Pp	–	–
Canegrass 1	W20189	SWC	845.0	–	432	0.09	3.74	0.31	3.38	0.02	3.83	111	9	PG	–	–
Contention Heights 1	S2981 A1	cutt	106.7	112.8	–	–	–	–	2.05	–	–	–	–	Pn	–	–
Curringa 1	W2137	SWC	806.0	–	–	–	–	–	3.55	–	–	–	–	Pp	–	–
Cycas 1	G3147A1V1	SWC	339.2	–	432	0.06	5.27	1.85	4.91	0.01	5.33	107	37	Pn	–	0.5
Cycas 1	G3147A1V1	SWC	426.6	–	431	0.43	36.95	2.57	9.37	0.01	37.38	394	27	Pn	–	0.5
Cycas 1	W2375	cutt	1310	1312.5	–	–	–	–	16.90	–	–	–	–	Cr	–	0.8
Cycas 1	G31974A1	cutt	1310	1312.5	438	4.50	84.60	7.50	33.50	0.05	89.10	253	22	Cr	coaly chips	
East Yeeda 1	W2774	cutt	1070	1085	425	0.09	3.01	1.34	3.38	0.03	3.10	89	40	Pn	–	0.6
East Yeeda 1	W2774	cutt	1130	1145	427	0.09	2.44	1.86	2.52	0.04	2.53	97	74	Pn	–	0.6
Hakea 1	W2431	SWC	657.8	–	431	0.22	9.08	0.20	2.85	0.02	9.30	319	7	PG	–	–
Hangover 1	S2319 A3	cutt	680	–	–	–	–	–	2.12	–	–	–	–	Pn	–	–
Hangover 1	S2319 A3	cutt	705	–	–	–	–	–	2.59	–	–	–	–	Pn	–	–
Hangover 1	S2319 A3	cutt	715	–	–	–	–	–	2.80	–	–	–	–	Pn	–	–
Jum Jum 1	W2336	SWC	1570.1	–	433	0.12	2.38	0.74	2.85	0.05	2.50	84	26	Pp	–	–
Kambara 1	W2197	SWC	802.8	–	434	0.70	2.40	0.40	3.27	0.23	3.10	73	12	Pn	–	0.4
Katy 1	S2323 A4	cutt	695.0	–	431	0.06	2.78	0.64	2.80	0.02	2.84	99	22	Pn	–	–
Kennedia 1	W2815	SWC	588.5	–	433	0.07	4.47	1.19	3.74	0.02	4.54	120	32	Pn	–	0.6
Kilang Kilang 1	W2644A3V1	cutt	630	660	429	0.10	3.77	0.11	2.62	0.03	3.87	144	4	Pp	–	0.6
Kilang Kilang 1	W2644A3V1	SWC	631.0	–	428	0.14	3.07	1.61	3.48	0.04	3.21	88	46	Pp	–	0.6
Kilang Kilang 1	W2644A3V1	cutt	660	690	429	0.09	3.33	0.24	2.63	0.03	3.42	127	9	PG	–	0.6
Kora 1	W2190	cutt	940	–	–	–	–	–	3.85	–	–	–	–	Pn	–	0.4
Kora 1	W2190	cutt	970	–	–	–	–	–	4.05	–	–	–	–	Pn	–	–
Kora 1	W2190	cutt	1000	–	–	–	–	–	3.85	–	–	–	–	Pp	–	–
Kora 1	W2190	cutt	1012	–	–	–	–	–	3.31	–	–	–	–	Pp	–	–
Kora 1	W2190	cutt	1030	–	–	–	–	–	3.62	–	–	–	–	Pp	–	–
Kora 1	W2190	cutt	1060	–	–	–	–	–	3.44	–	–	–	–	Pp	–	–
Kora 1	W2190	cutt	1225	–	–	–	–	–	2.18	–	–	–	–	PG	–	–
Kora 1	W2190	cutt	1570	–	–	–	–	–	4.08	–	–	–	–	PG	–	0.5
Lake Betty 1	S30125 A1	cutt	762.0	–	434	0.30	3.18	2.46	3.19	0.09	3.48	100	77	Pp	–	–
Lake Betty 1	S30125 A1	cutt	792.5	–	432	0.30	10.45	1.40	4.81	0.03	10.75	217	29	PG	–	–
Lake Betty 1	S30125 A1	cutt	823.0	–	433	0.37	4.29	1.16	2.73	0.08	4.66	157	42	PG	–	–
Meda 1	AGSO[(a)]	cutt	595	595	–	–	–	–	2.20	–	–	–	–	Pn	–	–
Mimosa 1	W895	cutt	510	560	–	–	–	–	2.20	–	–	9	–	Pn	–	–
Moogana 1	WCR/S1578 A3	cutt	1145	–	–	–	–	–	3.01	–	–	–	–	Pn	–	0.6

Appendix 7 (continued)

Well	Data extracted from	Sample type	Top (m)	Base (m)	TMAX (°C)	S1	S2	S3	TOC	PI	S_1+S_2	HI	OI	Unit	Comments	Approx. % Ro
Moogana 1	WCR/S1578 A3	cutt	1475	–	–	–	–	–	2.81	–	–	–	–	PG	–	0.6
Moogana 1	WCR/S1578 A3	cutt	1595	–	–	–	–	–	4.55	–	–	–	–	PG	–	0.6
Moogana 1	WCR/S1578 A3	cutt	1820	–	–	–	–	–	2.30	–	–	–	–	Cr	–	0.7
Ngalti 1	W2638	SWC	175.5	–	429	0.06	3.23	0.34	4.00	0.02	3.29	81	9	Pp	–	0.4
CRA Crossland CL 1	M0000779	core	197.1	197.10	424	1.40	59.50	48.40	47.69	0.02	60.90	125	101	Pp	coal seam	–
Perindi 1	W2342A5V3	SWC	839.8	–	422	0.11	3.16	1.74	3.31	0.03	3.27	95	53	Pp	–	0.7
Perindi 1	W2342A5V4	cutt	860	–	–	–	–	–	37.10	–	–	–	–	Pp	–	0.5–0.7
Perindi 1	W2342A5V5	cutt	890	–	–	–	–	–	2.04	–	–	–	–	PG	–	0.5–0.7
Perindi 1	W2342A5V6	cutt	920	–	–	–	–	–	2.38	–	–	–	–	PG	–	0.5–0.7
Petaluma 1	W3241	cutt	295	300	430	0.10	2.64	1.96	3.05	0.04	2.74	87	64	Pn	–	0.4
Petaluma 1	W3241	cutt	305	310	428	0.16	3.49	3.87	4.20	0.04	3.65	83	92	Pn	–	0.4
Petaluma 1	W3241	cutt	670	675	430	0.14	2.79	2.27	3.58	0.05	2.93	78	63	Pn	–	0.5
Philydrum 1	W2697	SWC	512.0	–	428	0.19	5.04	1.10	4.65	0.04	5.23	108	24	Pn	–	0.5
Puratte 1	W1558	cutt	1170	–	–	–	–	–	2.48	–	–	–	–	Pn	–	0.6
Puratte 1	W1558	cutt	1365	–	–	–	–	–	3.18	–	–	–	–	Pn	–	0.6
Puratte 1	W1558	cutt	1650	–	–	–	–	–	2.42	–	–	–	–	PG	–	0.6
Puratte 1	W1558	cutt	1820	–	–	–	–	–	3.86	–	–	–	–	PG	–	0.6
Puratte 1	W1558	cutt	2165	–	–	–	–	–	5.48	–	–	–	–	PG	–	0.7
Puratte 1	W1558	cutt	2310	–	–	–	–	–	2.02	–	–	–	–	PG	–	?1.1
REY D16 C1	–	core	42.6	–	424	1.6	249	7.1	60.7	0.01	250.20	410	12	PLl	coal	–
REY LR 12C	–	core	71.4	–	438	0.4	12.6	2	13.9	0.03	13.00	90	14	PLl	coal	–
REY D0 603	–	cutt	56	57	440	0.2	8.3	1.2	10.6	0.02	8.50	79	11	PLl	coal	–
Sundown 1	W2233	cutt	818.8	435.0	435	0.10	4.07	1.62	2.82	0.02	4.17	144	57	Pp	–	0.4
Sundown 1	W2233	cutt	818.9	432.0	432	0.11	4.57	1.30	3.20	0.02	4.68	143	41	Pp	–	0.4
West Terrace 1	W2786A3	core 2	1078.9	–	422	0.60	37.34	0.44	7.45	0.02	37.94	501	6	PG	–	–
White Hills 1	W2086	cutt	395	405	–	–	–	–	18.00	–	–	–	–	PG	–	–
Willara 1	AGSO[a]	cutt	887.0	905.3	432	6.60	76.20	25.18	18.80	0.08	82.80	405	134	PG	–	–
Wilson Cliffs 1	AGSO[a]	cutt	347.5	362.8	–	–	–	–	2.48	–	–	–	–	Pn	–	–
Wilson Cliffs 1	G31974A1	cutt	408.4	420.6	429	1.40	72.80	25.20	36.59	0.02	74.20	199	69	Pp	coaly chips	–
Wilson Cliffs 1	AGSO[a]	cutt	408.5	426.8	–	–	–	–	39.20	–	–	–	–	Pp	–	–
Wilson Cliffs 1	AGSO[a]	cutt	493.9	512.2	–	–	–	–	30.70	–	–	–	–	PG	–	–
Wilson Cliffs 1	G31974A1	cutt	506.0	509.0	425	0.95	9.26	58.24	44.52	0.09	10.21	21	131	PG	coaly chips	–
Wilson Cliffs 1	AGSO[a]	cutt	631.0	637.2	–	–	–	–	2.50	–	–	–	–	PG	–	–

NOTES:

(a)	Jackson, MJ, Zeilinger, I, Kennard, JM, and Southgate, PN, 1994, Canning Basin Project (Stage II) - geochemical and porosity/permeability data: AGSO Record 1994/59, 240p
Cr	Reeves Formation
PG	Grant Group
PLl	Lightjack Formation (Liveringa Group)
Pn	Noonkanbah Formation
Pp	Poole Sandstone
cutt	cuttings
SWC	side wall core

Appendix 8

Summary of vitrinite reflectance data from the mid-Carboniferous to Lower Triassic

Well	*Data source*	*Top depth (m)*	*Base depth (m)*	*Sample*	*Maceral*	*Mean*	*Max*	*Min*	*Number of readings*	*Comments*
Aquanita 1	S2211 A7	826	–	SWC	Reworked	0.93	0.93	0.93	1	Reworked
Aquanita 1	S2211 A7	826	–	SWC	Vitrinite	0.45	0.52	0.39	17	Indigenous
Bedout 1	S30141 A2	3022	–	cutt	Vitrinite	0.65	0.81	0.51	6	Inert sparse; Exin rare to sparse; Vit rare
Bindi 1	S2478 A4 V2/S260	859.2	–	SWC	Vitrinite	1.04	1.28	0.7	?20	Vit population poorly def. I>?V>E. Exinite refl 0.24-0.72%
Bindi 1	S2478 A4 V2/S260	976	–	SWC	Vitrinite	0.41	0.48	0.32	34	–
Bindi 1	S2478 A4 V2/S260	1065	–	SWC	Vitrinite	0.41	0.48	0.33	23	–
Bindi 1	S2478 A4 V2/S260	1071	–	SWC	Vitrinite	0.56	0.76	0.42	18	2 Vit pops. I>?V>E
Bindi 1	S2478 A4 V2/S260	1235	–	SWC	Inertinite	1.3	1.54	1		Exin comm; Inert sparse; Vit rare
Bindi 1	S2478 A4 V2/S260	1235	–	SWC	Vitrinite	0.56	0.64	0.48	10	Exin comm; Inert sparse; Vit rare
Bindi 1	S2478 A4 V2/S260	1248.5	–	SWC	Vitrinite	0.42	0.5	0.35	6	–
Bindi 1	S2478 A4 V2/S260	1475.4	–	SWC	Vitrinite	0.45	0.53	0.38	4	Includes reworked Vit
Booran 1	S2215 A3	1000	–	SWC	Vitrinite	0.46	0.52	0.36	8	Inert abun; Vit rare
Booran 1	S2215 A3	1502	–	SWC	Vitrinite	0.54	0.6	0.48	6	Exin comm; Inert sparse; Vit rare
Calamia 1	S3245 A2 V1	532	–	SWC	Vitrinite	0.29	0.3	0.25	4	–
Calamia 1	S3245 A2 V1	654	–	SWC	Vitrinite	0.32	0.41	0.26	26	–
Calamia 1	S3245 A2 V1	881.5	–	SWC	Vitrinite	0.4	0.58	0.32	8	–
Cow Bore 1	S2480 A4 V2	485	490	cutt	Vitrinite	0.43	0.47	0.37	30	–
Cow Bore 1	S2480 A4 V2	1069	–	SWC	Inertinite	1.43	1.81	1.23	5	Inert sparse; Exin rare; Vit absent
Cow Bore 1	S2480 A4 V2	1079	–	SWC	Inertinite	1.26	1.54	1.03		No measurable Vit
Crab Creek 1	S3255 A3	706.5	–	SWC	Inertinite	0.99	1.84	0.6	21	Inert and Exin abund; Vit rare to sparse
Crab Creek 1	S3255 A3	706.5	–	SWC	Vitrinite	0.44	0.51	0.37	15	Inert and Exin abund; Vit rare to sparse
Crab Creek 1	S3255 A3	853	–	SWC	Inertinite	1.01	1.7	0.62	14	Inert comm; Exin sparse; Vit rare
Crab Creek 1	S3255 A3	853	–	SWC	Vitrinite	0.47	0.53	0.4	10	Inert comm; Exin sparse; Vit rare
Crab Creek 1	S3255 A3	1010	–	SWC	Inertinite	1.11	1.7	0.7	20	Inert comm; Exin sparse; Vit rare
Crab Creek 1	S3255 A3	1010	–	SWC	Vitrinite	0.53	0.56	0.5	3	Inert comm; Exin sparse; Vit rare
CRAE DD88CL 1	M0000779	197.1	–	core	Inertinite	1.81	0.78	5.1	9	Inertinite and liptinite minor
CRAE DD88CL 1	M0000779	197.1	–	core	Vitrinite	0.46	0.41	0.5	31	Coal, abundant sporinite and cutinite, vit. abund.
Crimson Lake 1	Report	1067	–	SWC	Inertinite	1.09	2.14	0.8	16	Inert comm; Exin sparse tp comm; Vit rare
Crimson Lake 1	Report	1067	–	SWC	Vitrinite	0.47	0.5	0.48	3	Inert comm; Exin sparse tp comm; Vit rare
Cycas 1	S2375 A2 V2	255	260	cutt	Vitrinite	0.53	0.62	0.43	4	Inert abund; Exin sparse to comm; Vit rare
Cycas 1	S2375 A2 V2	515	520	cutt	Vitrinite	0.53	0.68	0.41	20	Inert comm; Exin and Vit sparse
Cycas 1	S2375 A2 V2	750	755	cutt	Vitrinite	0.52	0.54	0.49	5	Exin sparse; Inert and Vit rare
Cycas 1	S2375 A2 V2	890	895	cutt	Vitrinite	0.59	0.62	0.51	2	Inert and Exin sparse; Vit rare
Cycas 1	S2375 A2 V2	1150	–	SWC	Vitrinite	0.69	0.79	0.58	7	Inert and Exin sparse; Vit rare
Cycas 1	S2375 A2 V2	1310	1312.5	cutt	Vitrinite	0.77	0.91	0.61	35	Vit abund; Exin and Inert sparse
Cycas 1	S2375 A2 V2	1502.5	1505	cutt	Vitrinite	0.79	0.89	0.68	20	Sst>Coal.Exin abund in C; Vit; Inert and Exin sparse

Appendix 8 (continued)

Well	*Data source*	*Top depth (m)*	*Base depth (m)*	*Sample*	*Maceral*	*Mean*	*Max*	*Min*	*Number of readings*	*Comments*
Cycas 1	S2375 A2 V2	2005	2007.5	cutt	Vitrinite	0.81	0.88	0.75	5	Sst>Clst>C.
Cycas 1	S2375 A2 V2	2115	2117.5	cutt	Vitrinite	0.8	0.92	0.7	8	Inert; Vit; Exin rare
Darriwell 1	Report	571	571	SWC	Vitrinite	0.47	0.52	0.37	6	–
Darriwell 1	Report	635	635	SWC	Vitrinite	0.52	0.52	0.52	1	–
Darriwell 1	Report	1193.3	1193.3	SWC	Vitrinite	0.84	0.84	0.83	2	–
East Yeeda 1	S2774 A2 V3	65	67	cutt	Vitrinite	0.41	0.46	0.36	25	Exin comm; vit sparse; ; Inert rare
East Yeeda 1	S2774 A2 V3	105	110	cutt	Vitrinite	0.46	0.53	0.37	12	Exin and Vit sparse; Inert absent
East Yeeda 1	S2774 A2 V3	1885	1891	cutt	Vitrinite	0.64	0.78	0.51	30	Coal dom. DOM major; Vit maj; Exin comm; Inert rare. Live green oil in some cracks
East Yeeda 1	S2774 A2 V3	2260	2263	cutt	Inertinite	1.6	1.91	1.29	2	Live grn oil in coal
East Yeeda 1	S2774 A2 V3	2260	2263	cutt	Vitrinite	0.68	0.83	0.56	25	Live grn oil in coal
Ellendale 1	S1551 A7	1170	1190	cutt	Inertinite	2.19	2.24	2.16	4	–
Ellendale 1	S1551 A7	1170	1190	cutt	Vitrinite	0.54	0.54	0.54	1	–
Ellendale 1	S1551 A7	1330	1350	cutt	Vitrinite	0.58	0.62	0.53	3	–
Fraser River 1	S30141 A2	940	946.7	core 59	Vitrinite	0.77	0.88	0.65	19	Vit and Inert rare to sparse; Exin rare
Freney 1	S3446 A2	738.09	–	SWC	Inertinite	1.08	1.6	0.72	25	Inert abund; Exin comm; Vit rare
Freney 1	S3446 A2	738.09	–	SWC	Vitrinite	0.52	0.69	0.4	7	Inert abund; Exin comm; Vit rare
Freney 1	S3446 A2	781.58	–	SWC	Inertinite	1.24	2.02	0.94	18	Inert and Exin sparse; ?Vit rare
Freney 1	S3446 A2	781.58	–	SWC	Vitrinite	?0.44			?1	Inert and Exin sparse; ?Vit rare
Freney 1	S3446 A2	880.55	–	SWC	Inertinite	1.07	1.82	0.72	21	Exin and Inert sparse; Vit rare
Freney 1	S3446 A2	880.55	–	SWC	Vitrinite	0.54	0.58	0.49	3	Exin and Inert sparse; Vit rare
Freney 1	S3446 A2	950.04	–	SWC	Inertinite	1.09	1.88	0.74	22	Inert comm; Exin sparse; Vit rare
Freney 1	S3446 A2	950.04	–	SWC	Vitrinite	0.53	0.6	0.42	7	Inert comm; Exin sparse; Vit rare
Freney 1	S3446 A2	995.01	–	SWC	Inertinite	1.16	1.72	0.74	14	Inert comm; Exin sparse; Vit rare
Freney 1	S3446 A2	995.01	–	SWC	Vitrinite	0.52	0.57	0.47	3	Inert comm; Exin sparse; Vit rare
Freney 1	S3446 A2	1064.03	–	SWC	Inertinite	1.25	2.22	0.78	18	Inert sparse to comm; Exin sparse; Vit rare
Freney 1	S3446 A2	1064.03	–	SWC	Vitrinite	0.53	0.66	0.42	7	Inert sparse to comm; Exin sparse; Vit rare
Freney 1	S3446 A2	1087.2	–	SWC	Inertinite	1.17	1.54	0.94	3	Exin rare to sparse; Vit and Inert rare
Freney 1	S3446 A2	1087.2	–	SWC	Vitrinite	0.42			2	Exin rare to sparse; Vit and Inert rare
Freney 1	S3446 A2	1104.96	–	SWC	Inertinite	1.3	1.88	0.88	8	Inert and Exin sparse; Vit rare
Freney 1	S3446 A2	1104.96	–	SWC	Vitrinite	?0.47			1	Inert and Exin sparse; Vit rare
Gap Creek 1	Report	135	140	cutt	Inertinite	1.14	1.68	0.8	15	Exin and Inert sparse; Vit rare
Gap Creek 1	Report	135	140	cutt	Vitrinite	0.47	0.54	0.41	7	Exin and Inert sparse; Vit rare
Gap Creek 1	Report	170	175	cutt	Inertinite	1.12	1.74	0.75	16	Inert comm; Exin sparse; Vit rare
Gap Creek 1	Report	170	175	cutt	Vitrinite	0.52	0.6	0.38	5	Inert comm; Exin sparse; Vit rare
Hakea 1	S2431 A2	549.1	–	SWC	Vitrinite	0.48	0.6	0.39	13	Vit and Exin abund; Vit sparse
Hakea 1	S2431 A2	657.8	–	SWC	Vitrinite	0.34	0.44	0.27	36	Exin and Inert comm; Vit sparse to comm
Hakea 1	S2431 A2	796.9	–	SWC	Exinite	0.35	0.49	0.27	4	Inert and Exin rare to sparse; Vit rare
Hilltop 1	S3177 A2 V2	770	775	cutt	Vitrinite	0.37	0.46	0.32	16	Exin rare to sparse; Inert and Vit rare

Hilltop 1	S3177 A2 V2	780	785	cutt	Vitrinite	0.38	0.5	0.29	12	Vit sparse; Exin rare to sparse; Inert rare
Hilltop 1	S3177 A2 V2	790	795	cutt	Vitrinite	0.34	0.38	0.3	8	Exin and Vit rare to sparse; Inert rare
Hilltop 1	S3177 A2 V2	810	830	cutt	Inertinite	1.16	1.8	0.6	15	Inert sparse; Exin and Vit rare
Hilltop 1	S3177 A2 V2	810	830	cutt	Vitrinite	0.43	0.51	0.36	6	Inert sparse; Exin and Vit rare
Janpam 1	S2229 A3	833	–	SWC	Vitrinite	0.55	0.58	0.5	12	–
Janpam 1	S2229 A3	1360	–	SWC	Vitrinite	0.56	0.56	0.56	1	–
Jones Range 1	S2981 A1	355	360	cutt	Vitrinite	0.62	0.72	0.55	12	–
Jones Range 1	S2981 A1	405	410	cutt	Vitrinite	0.67	0.67	0.66	2	–
Kambara 1	S2197 A5	980	985	cutt	Vitrinite	0.44	0.48	0.39	5	–
Kambara 1	S2197 A5	1119	–	SWC	Vitrinite	0.35	0.35	0.35	1	Exin comm; Inert sparse; Vit rare
Kambara 1	S2197 A5	1168.4	–	SWC	Vitrinite	<0.84				Inert sparse; no Vit
Kennedia 1	S2815 A2 V2	588.5	–	SWC	Vitrinite	0.59	0.73	0.46	20	Exin and Inert abund; vit rare. Rare oil droplets
Kennedia 1	S2815 A2 V2	871	–	SWC	Inertinite	1.16	1.89	0.7	5	Exin and Inert rare; Vit absent
Kidson 1	GSWA Rec 2006/7	265.2	268.2	cutt	Vitrinite	0.44	0.36	0.5	28	–
Kidson 1	GSWA Rec 2006/7	265.2	268.2	cutt	Inertinite	1.3	0.88	1.8	10	–
Kidson 1	GSWA Rec 2006/7	701.1	710.2	cutt	Vitrinite	0.49	0.41	0.6	9	–
Kidson 1	GSWA Rec 2006/7	701.1	710.2	cutt	Inertinite	1.26	0.96	1.7	20	–
Kidson 1	GSWA Rec 2006/7	1551.4	1556.3	cutt	Vitrinite	?0.96	0.66	1.1	6	–
Kilang Kilang 1	S2644 A3V1	131.8	–	SWC	Exinite	0.57			1	Inertinite abundant; Exinite common; Vitrinite absent
Kilang Kilang 1	S2644 A3 V1	131.8	131.8	SWC	Exinite	0.57			1	Inert abund; Exin comm; Vit absent
Kilang Kilang 1	S2644 A3V1	131.8	–	SWC	Inertinite	1.3	1.88	1	15	–
Kilang Kilang 1	S2644 A3 V1	131.8	131.8	SWC	Inertinite	1.3	1.88	1	15	Inert abund; Exin comm; Vit absent
Kilang Kilang 1	S2644 A3 V1	197.8	197.8	SWC	Inertinite	1.55	2.34	1.19	17	Inert sparse; Exin and Vit rare
Kilang Kilang 1	S2644 A3 V1	197.8	197.8	SWC	Vitrinite	0.58			1	Inert sparse; Exin and Vit rare
Kilang Kilang 1	S2644 A3 V1	229.3	229.3	SWC	Inertinite	1.35	2.5	0.74	14	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	229.3	229.3	SWC	Vitrinite	0.52	0.62	0.47	8	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	236.8	236.8	SWC	Inertinite	1.41	1.7	1.24	7	Inert and Exin rare; Vit absent
Kilang Kilang 1	S2644 A3 V1	274	274	SWC	Exinite	0.3	0.41	0.21	3	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	274	274	SWC	Inertinite	1.25	1.48	0.95	11	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	274	274	SWC	Vitrinite	0.55	0.63	0.46	8	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	294	294	SWC	Inertinite	1.41	2	0.96	14	Inert and Exin rare; Vit absent
Kilang Kilang 1	S2644 A3 V1	338.7	338.7	SWC	Exinite	0.31			1	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	338.7	338.7	SWC	Inertinite	1.38	2.26	0.94	16	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	338.7	338.7	SWC	Vitrinite	0.7	0.8	0.58	11	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	359	359	SWC	Exinite	0.3	0.35	0.25	5	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	359	359	SWC	Inertinite	1.49	2.24	0.96	16	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	359	359	SWC	Vitrinite	0.66	0.88	0.55	7	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	406.4	406.4	SWC	Exinite	0.36	0.57	0.25	8	Inert abund; Exin sparse; Vit absent
Kilang Kilang 1	S2644 A3 V1	406.4	406.4	SWC	Inertinite	1.34	1.79	1	20	Inert abund; Exin sparse; Vit absent
Kilang Kilang 1	S2644 A3 V1	437.7	437.7	SWC	Exinite	0.4	0.47	0.29	3	Inert comm; Exin and Vit rare
Kilang Kilang 1	S2644 A3 V1	437.7	437.7	SWC	Inertinite	1.63	2.68	1.1	12	Inert comm; Exin and Vit rare
Kilang Kilang 1	S2644 A3 V1	437.7	437.7	SWC	Vitrinite	0.63	0.74	0.52	4	Inert comm; Exin and Vit rare
Kilang Kilang 1	S2644 A3 V1	450	450	SWC	Exinite	0.34	0.44	0.29	4	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	450	450	SWC	Inertinite	1.45	2.18	0.93	13	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	450	450	SWC	Vitrinite	0.68	0.83	0.61	8	Inert abund; Exin sparse; Vit rare

Appendix 8 (continued)

Well	*Data source*	*Top depth (m)*	*Base depth (m)*	*Sample*	*Maceral*	*Mean*	*Max*	*Min*	*Number of readings*	*Comments*
Kilang Kilang 1	S2644 A3 V1	476	476	SWC	Exinite	0.44	0.48	0.4	2	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	476	476	SWC	Inertinite	1.47	1.86	1.11	15	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	476	476	SWC	Vitrinite	0.77	0.8	0.75	3	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	524	524	SWC	Exinite	0.42				Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	524	524	SWC	Inertinite	1.47	2022	1.06	15	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	524	524	SWC	Vitrinite	0.8	0.92	0.71	4	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	545	545	SWC	Inertinite	1.61	2.02	1.28	12	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	545	545	SWC	Vitrinite	0.82	0.89	0.71	6	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	610	610	SWC	Exinite	0.34	0.43	0.25	4	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	610	610	SWC	Inertinite	1.37	2.24	0.85	13	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	610	610	SWC	Vitrinite	0.6	0.68	0.46	14	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	631	631	SWC	Exinite	0.29	0.46	0.19	6	Inert and Exin abund; Vit rare
Kilang Kilang 1	S2644 A3 V1	631	631	SWC	Inertinite	1.47	2.54	0.77	10	Inert and Exin abund; Vit rare
Kilang Kilang 1	S2644 A3 V1	631	631	SWC	Vitrinite	0.59	0.67	0.47	14	Inert and Exin abund; Vit rare
Kilang Kilang 1	S2644 A3 V1	642.5	642.5	SWC	Exinite	0.28	0.43	0.2	4	Inert and Exin abund; Vit rare
Kilang Kilang 1	S2644 A3 V1	642.5	642.5	SWC	Inertinite	1.38	1.98	0.82	8	Inert and Exin abund; Vit rare
Kilang Kilang 1	S2644 A3 V1	642.5	642.5	SWC	Vitrinite	0.6	0.69	0.52	14	Inert and Exin abund; Vit rare
Kilang Kilang 1	S2644 A3 V1	807	807	SWC	Exinite	0.19			1	Inert and Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	807	807	SWC	Inertinite	1.45	2.36	0.84	15	Inert and Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	807	807	SWC	Vitrinite	0.61	0.65	0.54	5	Inert and Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	822	822.1	SWC	Exinite	0.32	0.33	0.31	2	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	822	822.1	SWC	Inertinite	1.48	2.02	1.06	15	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	822	822.1	SWC	Vitrinite	0.69	0.77	0.59	6	Inert abund; Exin comm; Vit rare
Kilang Kilang 1	S2644 A3 V1	889	889	SWC	Inertinite	1.28	1.75	0.96	15	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	889	889	SWC	Vitrinite	0.72	0.77	0.68	8	Inert abund; Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	915	915	SWC	Inertinite	1.37	1.77	1.01	15	Exin and Inert sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	915	915	SWC	Vitrinite	0.72	0.76	0.7	3	Exin and Inert sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	935	935	SWC	Inertinite	1.46	1.88	1.18	15	Exin sparse to comm; Inert sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	935	935	SWC	Vitrinite	0.69	0.87	0.45	10	Exin sparse to comm; Inert sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	1000	1000	SWC	Inertinite	1.44	1.78	1.1	15	Inert and Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	1000	1000	SWC	Vitrinite	0.79	0.86	0.69	6	Inert and Exin sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	1048	1048	SWC	Inertinite	1.41	1.78	1.1	7	Inert and Exin rare; Vit absent
Kilang Kilang 1	S2644 A3 V1	1135	1135	SWC	Inertinite	1.55	2.02	1.2	17	Inert comm; Exin and Vit sparse
Kilang Kilang 1	S2644 A3 V1	1135	1135	SWC	Vitrinite	0.73	0.85	0.53	14	Inert comm; Exin and Vit sparse
Kilang Kilang 1	S2644 A3 V1	1453.6	1453.6	SWC	Inertinite	1.59	1.92	1.22	9	Exin and Inert sparse; Vit rare
Kilang Kilang 1	S2644 A3 V1	1453.6	1453.6	SWC	Vitrinite	0.76	0.9	0.51	8	Exin and Inert sparse; Vit rare
Kora 1	Report	1350	–	SWC	Vitrinite	?0.49			?1	–
Mangaloo 1	S2817 A2 V2	270	280	cutt	Inertinite	1.3	2.38	0.92	18	Inert and Exin comm;Vit rare
Mangaloo 1	S2817 A2 V2	270	280	cutt	Vitrinite	0.55	0.65	0.46	10	Inert and Exin comm;Vit rare

Mangaloo 1	S2817 A2 V2	505	515	cutt	Inertinite	1.39	2	0.99	10	Exin sparse; Inert rare to sparse; Vit rare
Mangaloo 1	S2817 A2 V2	505	515	cutt	Vitrinite	0.53	0.61	0.46	4	Exin sparse; Inert rare to sparse; Vit rare
Mariana 1	S2613 A2 V2	675	–	SWC	Vitrinite	0.54	0.59	0.47	17	–
Mariana 1	S2613 A2 V2	743	–	SWC	Vitrinite	0.53	0.6	0.48	5	–
Mariana 1	S2613 A2 V2	975	–	SWC	Vitrinite	0.62	0.62	0.62	1	–
Minjin 1	S2528 A4 V2	828.3	–	SWC	Vitrinite	0.31	0.36	0.29	5	Inert abund; Exin comm; Vit rare
Minjin 1	S2528 A4 V2	1118	–	SWC	Vitrinite	0.434	0.52	0.35	12	Exin sparse; Inert and Vit sparse
Minjin 1	S2528 A4 V2	1209.5	–	SWC	Vitrinite	0.46	0.53	0.39	5	Exin abund; Inert comm; Vit sparse
Minjin 1	S2528 A4 V2	1266	–	SWC	Vitrinite	0.42	0.47	0.38	4	Inert sparse; Exin sparse; Vit rare to sparse
Moogana 1	S1578 A2 V1	490	500	cutt	Vitrinite	0.16	0.3	0.12	30	–
Moogana 1	S1578 A2 V1	652	–	SWC	Vitrinite	<0.56				Exin 1-2%
Moogana 1	S1578 A2 V1	707.5	–	SWC	Vitrinite	?0.45				Sporinite comm; ?Vit rare
Moogana 1	S1578 A2 V1	710	–	cutt	Vitrinite	0.16	0.2	0.12	30	Exin absent
Moogana 1	S1578 A2 V1	916	–	SWC	Vitrinite	<0.56				Chiefly Inert; Sporinite comm
Moogana 1	S1578 A2 V1	1355	–	cutt	Vitrinite	0.61				–
Ngalti 1	S2638 A4 V2	137.3	–	SWC	Inertinite	1.25	1.68	0.84	17	Inert sparse; Exin rare; Vit absent
Ngalti 1	S2638 A4 V2	175.5	–	SWC	Bituminite	0.25	0.25	0.25	1	Inert and Exin abund; Vit sparse
Ngalti 1	S2638 A4 V2	175.5	–	SWC	Vitrinite	0.42	0.66	0.26	7	Inert and Exin abund; Vit sparse
Ngalti 1	S2638 A4 V2	299	–	SWC	Inertinite	1.3	1.3	1.3	1	Inert and Exin abund; Vit sparse
Ngalti 1	S2638 A4 V2	299	–	SWC	Vitrinite	0.47	0.6	0.34	8	Inert and Exin abund; Vit sparse
Ngalti 1	S2638 A4 V2	581.9	–	SWC	Inertinite	1.4	1.4	1.4	1	Inert comm; Exin and Vit sparse
Ngalti 1	S2638 A4 V2	581.9	–	SWC	Vitrinite	0.43	0.61	0.31	19	Inert comm; Exin and Vit sparse
Ngalti 1	S2638 A4 V2	631.5	–	SWC	Inertinite	0.97	1.54	0.74	1	Inert sparse; Vit and Exin rare
Ngalti 1	S2638 A4 V2	631.5	–	SWC	Vitrinite	0.46	0.5	0.41	2	Inert sparse; Vit and Exin rare
Nollamara 1	S2812 A2 V2	155	160	cutt	Exinite	0.33	0.49	0.25	27	Vit and Inert absent
Nollamara 1	S2812 A2 V2	365	370	cutt	Vitrinite	0.42	0.45	0.41	5	Exin sparse; vit and Inert rare
Nollamara 1	S2812 A2 V2	465	470	cutt	Inertinite	1.12	1.74	0.81	8	Exin sparse; Inert and Vit rare
Nollamara 1	S2812 A2 V2	465	470	cutt	Vitrinite	0.51	0.53	0.49	5	Exin sparse; Inert and Vit rare
Nollamara 1	S2812 A2 V2	589	–	SWC	Vitrinite	?0.46			?1	Macerals rare
Nollamara 1	S2812 A2 V2	778	–	SWC	Vitrinite	0.51	0.61	0.41	8	Exin rare to sparse; Inert and Vit rare
Nollamara 1	S2812 A2 V2	830.25	–	SWC	Inertinite	1.3	1.57	1.13	4	Inert and Exin rare; Vit absent
Notabilis 1	S2581 A2	360	–	cutt	Vitrinite	0.33	0.41	0.19	25	No Exin
Notabilis 1	S2581 A2	440	–	SWC	Vitrinite	0.53			1	Inert and Exin abund; Vit rare
Notabilis 1	S2581 A2	682	–	SWC	Vitrinite	0.41			1	Exin abund; Inert and Vit rare
Notabilis 1	S2581 A2	713.5	–	?SWC	Vitrinite	0.42	0.47	0.36	16	Exin abund; Vit comm; Inert sparse
Notabilis 1	S2581 A2	735	–	?SWC	Vitrinite	0.47	0.49	0.43	8	Exin abund; Inert comm; Vit rare
Nuytsia 1	S2681 A3 V1	150	–	cutt	Vitrinite	0.35	0.55	0.29	6	Exin abund; Inert abund; Vit rare
Nuytsia 1	S2681 A3 V1	220	–	cutt	Vitrinite	0.42	0.5	0.3	17	No Exin; Coal>>sst
Nuytsia 1	S2681 A3 V1	775	–	cutt	Vitrinite	0.49	0.53	0.45	3	Exin and Inert sparse; Vit rare
Olios 1	S2478 A4 V1	220	–	SWC	Inertinite	1.04	1.41	0.72	10	Inert abund; Exin sparse to comm; Vit rare

Appendix 8 (continued)

Well	*Data source*	*Top depth (m)*	*Base depth (m)*	*Sample*	*Maceral*	*Mean*	*Max*	*Min*	*Number of readings*	*Comments*
Olios 1	S2478 A4 V1	220	–	SWC	Vitrinite	0.38	0.53	0.25	9	Inert abund; Exin sparse to comm; Vit rare
Olios 1	S2478 A4 V1	251.9	–	SWC	Inertinite	1.07	1.58	0.7	13	Inert abund; Exin sparse to comm; Vit sparse
Olios 1	S2478 A4 V1	251.9	–	SWC	Vitrinite	0.46	0.52	0.38	15	Inert abund; Exin sparse to comm; Vit sparse
Olios 1	S2478 A4 V1	269.1	–	SWC	Inertinite	1.08	1.58	0.74	9	Inert abund; Exin and Vit comm
Olios 1	S2478 A4 V1	269.1	–	SWC	Vitrinite	0.46	0.66	0.38	25	Inert abund; Exin and Vit comm
Olios 1	S2478 A4 V1	303.5	–	SWC	Inertinite	0.88	1.04	0.71	3	Exin abund; Inert comm to abund; Vit sparse
Olios 1	S2478 A4 V1	303.5	–	SWC	Vitrinite	0.52	0.66	0.38	19	Exin abund; Inert comm to abund; Vit sparse
Olios 1	S2478 A4 V1	375	–	SWC	Inertinite	1.34	1.34	1.34	2	Exin and Inert abund; Vit sparse
Olios 1	S2478 A4 V1	375	–	SWC	Vitrinite	0.51	0.65	0.38	7	Exin and Inert abund; Vit sparse
Olios 1	S2478 A4 V1	392	–	SWC	Inertinite	1.02	1.31	0.78	7	Inert abund; Exin comm to abund; Vit rare to sparse
Olios 1	S2478 A4 V1	392	–	SWC	Vitrinite	0.53	0.6	0.41	6	Inert abund; Exin comm to abund; Vit rare to sparse
Olios 1	S2478 A4 V1	501	–	SWC	Inertinite	1.21	1.81	0.97	4	Inert rare to sparse; Vit and Exin rare
Olios 1	S2478 A4 V1	501	–	SWC	Vitrinite	0.57	0.69	0.39	3	Inert rare to sparse; Vit and Exin rare
Olios 1	S2478 A4 V1	560	–	SWC	Inertinite	1.13	1.33	0.92	8	Vit and Exin sparse
Olios 1	S2478 A4 V1	560	–	SWC	Vitrinite	0.54	0.68	0.38	13	Vit and Exin sparse
Olios 1	S2478 A4 V1	577.9	–	SWC	Inertinite	1.24	1.4	0.98	4	Inert sparse to comm; Exin sparse; Vit rare
Olios 1	S2478 A4 V1	577.9	–	SWC	Vitrinite	0.55	0.71	0.41	8	Inert sparse to comm; Exin sparse; Vit rare
Olios 1	S2478 A4 V1	647	–	SWC	Inertinite	1.1	1.4	0.81	9	Reworked
Olios 1	S2478 A4 V1	647	–	SWC	Vitrinite	0.58	0.7	0.43	12	Inert sparse; Exin rare to sparse; Vit rare
Olios 1	S2478 A4 V1	688.1	–	SWC	Inertinite	1.01	1.19	0.87	3	Inert comm; Exin sparse; Vit rare
Olios 1	S2478 A4 V1	688.1	–	SWC	Vitrinite	0.56	0.66	0.47	19	Inert comm; Exin sparse; Vit rare
Olios 1	S2478 A4 V1	703	–	SWC	Inertinite	1.29	1.29	1.29	1	Inert comm;Vit sparse; Exin rare to sparse
Olios 1	S2478 A4 V1	703	–	SWC	Vitrinite	0.52	0.62	0.42	5	Inert comm;Vit sparse; Exin rare to sparse
Olios 1	S2478 A4 V1	733.1	–	SWC	Inertinite	1.35	1.74	0.96	6	Caved
Olios 1	S2478 A4 V1	733.1	–	SWC	Vitrinite	0.45	0.56	0.39	8	Inert sparse; Exin and Vit rare
Olios 1	S2478 A4 V1	766.5	–	SWC	Inertinite	1.22	1.22	1.22	1	Inert sparse;Vit and Exin rare
Olios 1	S2478 A4 V1	766.5	–	SWC	Vitrinite	0.51	0.64	0.4	6	Inert sparse;Vit and Exin rare

Olios 1	S2478 A4 V1	810	–	SWC	Inertinite	1.55	2.18	1.04	5	Caved
Olios 1	S2478 A4 V1	810	–	SWC	Vitrinite	0.53	0.67	0.43	6	All three macerals rare
Pearl 1	S3599 A1	530	535	cutt	Vitrinite	0.29	0.33	0.25	3	–
Pearl 1	S3599 A1	985	–	cutt	Vitrinite	0.49	0.57	0.42	7	–
Pearl 1	S3599 A1	1720	–	cutt	Vitrinite	0.68	0.72	0.65	5	–
Perindi 1	S2342 A5 V3	500	–	SWC	Vitrinite	0.37	0.44	0.29	3	Exin abund; Inert and Vit rare
Perindi 1	S2342 A5 V3	827.3	–	SWC	Vitrinite	0.32	0.41	0.2	21	–
Perindi 1	S2342 A5 V3	830.3	–	SWC	Vitrinite	0.7	0.83	0.52	8	Inert sparse; Vit rare. Could be contaminant
Perindi 1	S2342 A5 V3	878	–	core 1	Vitrinite	?<1.1				No Exin fluor; abund Inert; no other macerals
Perindi 1	S2342 A5 V3	878.3	–	core 1	Vitrinite	0.5	0.55	0.44	8	–
Perindi 1	S2342 A5 V3	966.3	–	SWC	Vitrinite	<1.54				No Exin fluor; Inert sparse
Perindi 1	S2342 A5 V3	1152.1	–	SWC	Vitrinite	1.06	1.21	0.95	11	No Exin fluor; Vit may include some Inert
Perindi 1	S2342 A5 V3	1804	–	SWC	Inertinite	2.38	6	1.34	19	Vit absent.Rv est 1.3%
Perindi 1	S2342 A5 V3	1812	–	SWC	Vitrinite	?1.5			?1	No Exin fluor. Inert abund
Petaluma 1	S3241 A1 V1	175	180	cutt	Vitrinite	0.36	0.44	0.3	11	Inert comm; Vit sparse; Exin rare
Blackfin Liveringa P01		189.85	–	core	Vitrinite	0.64	0.75	0.5	25	Shaly coal, inertinite 90%; vitrinite 7.5%; liptinite 2.5% [drilled next to Petaluma 1]
Petaluma 1	S3241 A1 V1	295	300	cutt	Vitrinite	0.39	0.56	0.25	26	Inert comm; Exin and Vit sparse
Petaluma 1	S3241 A1 V1	335	340	cutt	Vitrinite	0.38	0.51	0.31	11	Inert abund; Exin sparse;Vit rare to sparse
Petaluma 1	S3241 A1 V1	355	360	cutt	Vitrinite	0.42	0.53	0.32	11	Inert abund; Exin sparse;Vit rare to sparse
Petaluma 1	S3241 A1 V1	550	555	cutt	Inertinite	1.26	1.8	0.74	20	Inert abund; Exin sparse to comm;Vit rare
Petaluma 1	S3241 A1 V1	550	555	cutt	Vitrinite	0.48	0.61	0.36	9	Inert abund; Exin sparse to comm;Vit rare
Petaluma 1	S3241 A1 V1	670	675	cutt	Vitrinite	0.47	0.56	0.38	27	Inert and Exin abund; Vit sparse
Petaluma 1	S3241 A1 V1	790	795	cutt	Vitrinite	0.54	0.65	0.42	26	Inert and Exin comm; Vit sparse
Petaluma 1	S3241 A1 V1	880	885	cutt	Inertinite	1.38	2.04	0.86	25	Exin and Inert abund; Vit rare
Petaluma 1	S3241 A1 V1	880	885	cutt	Vitrinite	0.5	0.6	0.4	7	Exin and Inert abund; Vit rare
Petaluma 1	S3241 A1 V1	970	975	cutt	Vitrinite	0.56	0.7	0.46	27	Inert comm; Exin sparse to comm; Vit sparse
Petaluma 1	S3241 A1 V1	1065	1070	cutt	Inertinite	1.44	1.7	1.08	8	All 3 maceral groups rare
Petaluma 1	S3241 A1 V1	1065	1070	cutt	Vitrinite	0.56			1	All 3 maceral groups rare
Petaluma 1	S3241 A1 V1	1150	1155	cutt	Inertinite	1.48	2.26	0.94	13	Inert sparse to comm; Exin sparse; Vit rare
Petaluma 1	S3241 A1 V1	1150	1155	cutt	Vitrinite	0.59	0.64	0.57	4	Inert sparse to comm; Exin sparse; Vit rare
Petaluma 1	S3241 A1 V1	1225	1230	cutt	Inertinite	1.6	2.48	1	8	Inert sparse; Exin and ?Vit rare
Petaluma 1	S3241 A1 V1	1225	1230	cutt	Vitrinite	0.52	0.62	0.44	3	Inert sparse; Exin and ?Vit rare
Petaluma 1	S3241 A1 V1	1455	1460	cutt	Inertinite	1.37	2.26	0.94	17	Inert comm; Exin rare to sparse; Vit absent
Petaluma 1	S3241 A1 V1	1535	1540	cutt	Inertinite	1.61	1.86	1.36	2	Inert sparse; Exin rare; Vit absent
Petaluma 1	S3241 A1 V1	1810	1815	cutt	Inertinite	1.53	2.46	0.88	14	Inert comm; Exin sparse; Vit absent
Philydrum 1	S2697 A2 V2	512	–	SWC	Vitrinite	0.45	0.59	0.3	26	Inert and Exin abund; Vit comm

Appendix 8 (continued)

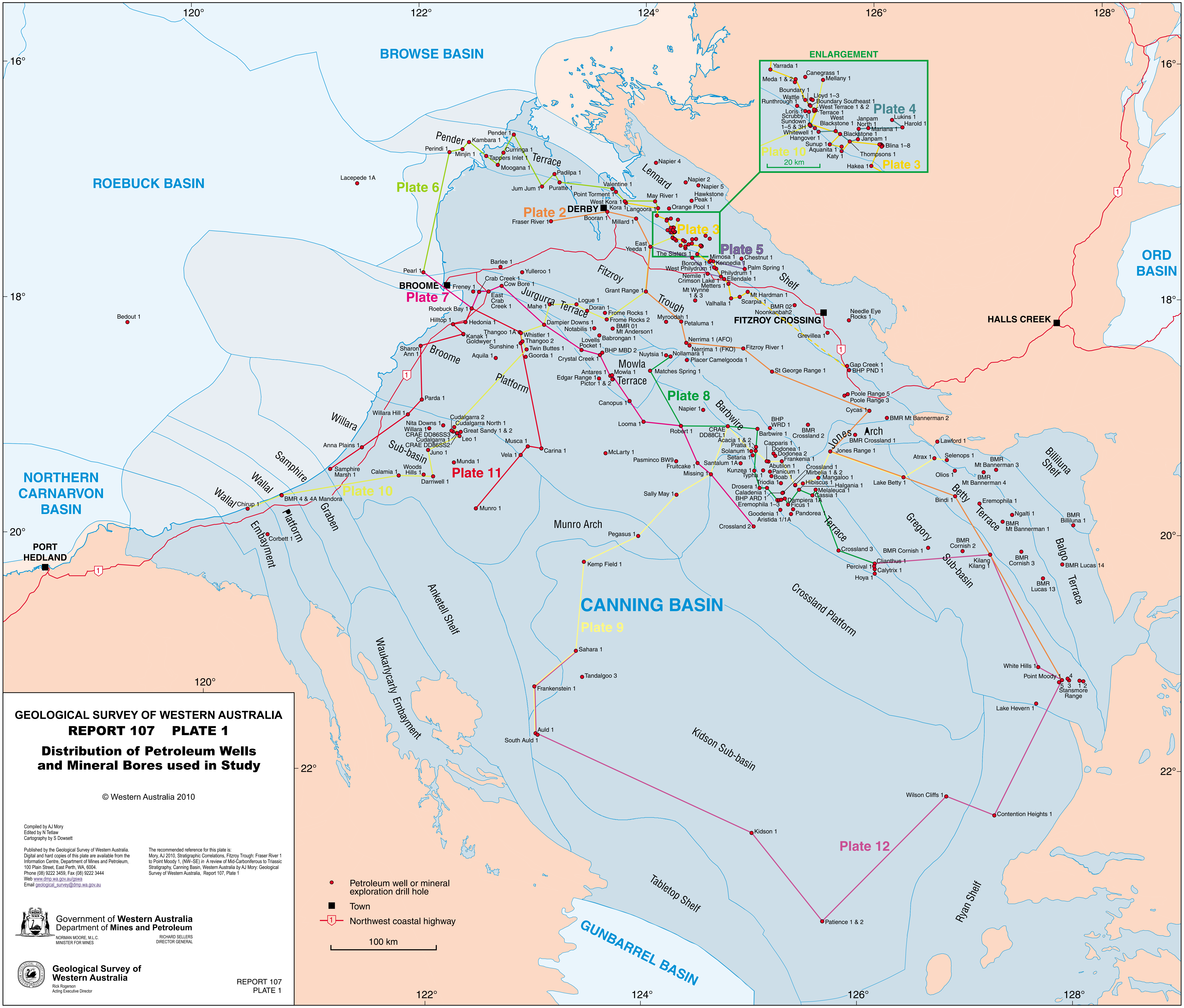
Well	Data source	Top depth (m)	Base depth (m)	Sample	Maceral	Mean	Max	Min	Number of readings	Comments
Philydrum 1	S2697 A2 V2	551	–	SWC	Inertinite	1.28	1.54	0.84	8	Vit and Exin absent
Philydrum 1	S2697 A2 V2	724.2	–	SWC	Inertinite	1.52	1.72	1.28	4	Exin abund; Inert rare; Vit absent
Philydrum 1	S2697 A2 V2	890	–	SWC	Inertinite	1.28	1.52	1.02	10	Exin comm; Inert rare; Vit absent
Philydrum 1	S2697 A2 V2	890	–	SWC	Vitrinite	0.4			1	Exin comm; Inert rare; Vit absent
Philydrum 1	S2697 A2 V2	1064	–	SWC	Inertinite	1.41	1.5	1.32	2	Exin sparse; Vit and Inert rare
Philydrum 1	S2697 A2 V2	1064	–	SWC	Vitrinite	0.48	0.51	0.44	2	Exin sparse; Vit and Inert rare
Philydrum 1	S2697 A2 V2	1250.9	–	SWC	Inertinite	1.44	2.06	1.16	16	Vit and Exin absent
Puratte 1	S1558 A3	894	–	SWC	Vitrinite	0.77	0.82	0.7	5	Exin rare
Puratte 1	S1558 A3	1017	–	SWC	Vitrinite	?0.78			1	Exin rare; Inert abund; some reworked Vit
Puratte 1	S1558 A3	1165	–	SWC	Vitrinite	0.63	0.64	0.61	2	Rare ?Vit
Puratte 1	S1558 A3	1245	1270	cutt	Inertinite	1.35	2.32	0.9	25	Inert abund; Exin sparse; Vit rare
Puratte 1	S1558 A3	1245	1270	cutt	Vitrinite	0.53	0.59	0.47	5	Inert abund; Exin sparse; Vit rare
Puratte 1	S1558 A3	1330	1350	cutt	Inertinite	1.35	1.94	0.82	20	Inert abund; Exin comm; Vit rare
Puratte 1	S1558 A3	1330	1350	cutt	Vitrinite	0.59	0.66	0.42	8	Inert abund; Exin comm; Vit rare
Puratte 1	S1558 A3	1377	–	SWC	Vitrinite	0.56	0.67	0.5	4	Exin abund
Puratte 1	S1558 A3	1410	1435	cutt	Vitrinite	0.57	0.74	0.45	20	Inert abund; Exin comm; Vit sparse
Puratte 1	S1558 A3	2078	–	SWC	Vitrinite	0.66	0.74	0.59	9	–
Puratte 1	S1558 A3	2172.5	–	SWC	Vitrinite	0.68	0.87	0.52	7	–
Puratte 1	S1558 A3	2300	–	SWC	Vitrinite	1.11	1.3	0.98	30	–
Rey D16C1		42.5	–	core	Vitrinite	0.45	0.6	0.3	25	Coal, vitrinite 90%; inertinite 4%; liptinite 2%
Rey LR 12C		71.4	–	core	Vitrinite	0.51	0.7	0.4	25	Coal, vitrinite 90%; inertinite 4%; liptinite 6%
Scarpia 1	Report	90	95	cutt	Vitrinite	0.39	0.5	0.31	30	All three macerals abund
Scarpia 1	Report	310	315	cutt	Vitrinite	0.51	0.61	0.42	7	Inert abund; Lip comm; Vit sparse
Scarpia 1	Report	884	–	SWC	Vitrinite	0.48	0.57	0.36	4	Lip and Inert comm; vit rare
Scarpia 1	Report	1302	1305	cutt	Vitrinite	0.45	.56.5	0.33	5	Inert and Lip sparse; Vit rare
Sundown 1	S2233 A1 V2	818.8	–	SWC	Vitrinite	0.43	0.51	0.37	13	Indigenous
Sundown 1	S2233 A1 V2	1081.5	–	SWC	Vitrinite	0.75			1	Indigenous
Sundown 1	S2233 A1 V2	1452	–	SWC	Vitrinite	0.88	0.87	0.82	8	Indigenous
Sunshine 1	Report	371	–	SWC	Vitrinite	0.29	0.38	0.24	26	Lip and Vit comm; Inert rare
Sunshine 1	Report	477	–	SWC	Vitrinite	0.34	0.42	0.27	20	Lip sparse; Vit and Inert rare
Sunshine 1	Report	506	–	SWC	Inertinite	0.9	1.28	0.71	4	All three macerals rare
Sunshine 1	Report	506	–	SWC	Vitrinite	0.35	0.4	0.29	2	All three macerals rare
Sunshine 1	Report	513	–	SWC	Inertinite	0.92	1.13	0.72	6	Lip sparse; Inert rare; Vit absent
Sunshine 1	Report	513	–	SWC	Vitrinite	0.24			1	Lip sparse; Inert rare; Vit absent
Sunshine 1	Report	516	–	SWC	Inertinite	0.97	1.17	0.8	4	All three macerals rare
Sunshine 1	Report	516	–	SWC	Vitrinite	0.26	0.28	0.24	2	All three macerals rare
Sunshine 1	Report	531	–	SWC	Vitrinite	0.45	0.56	0.3	9	Lip sparse; Vit and Inert rare
Sunshine 1	Report	564	–	SWC	Inertinite	0.37	0.43	0.32	2	Lip sparse; Vit and Inert rare

Sunshine 1	Report	564	–	SWC	Vitrinite	0.85	0.97	0.71	5	Lip sparse; Vit and Inert rare
Sunshine 1	Report	637.5	–	SWC	Vitrinite	0.44	0.56	0.3	14	Lip and Inert sparse; Vit rare
Sunshine 1	Report	639	–	SWC	Vitrinite	0.46	0.58	0.35	14	Inert and Lip sparse; Vit rare
Sunshine 1	Report	645.5	–	SWC	Vitrinite	0.49	0.6	0.37	10	All three macerals rare
Sunshine 1	Report	692	–	SWC	Vitrinite	0.53	0.6	0.45	5	Lip sparse; Inert and Vit rare
Sunshine 1	Report	702	–	SWC	Vitrinite	0.5	0.63	0.38	8	Lip sparse; Inert and Vit rare
Terrace 1	S2597 A2 V2	823	–	SWC	Vitrinite	0.59	0.66	0.49	25	Indigenous.
Terrace 1	S2597 A2 V2	1153	–	SWC	Vitrinite	0.61	0.64	0.58	3	Indigenous. I>>Sp>>Alg>V
West Kora 1	S2555 A4 V2	900	–	SWC	Vitrinite	0.63	0.72	0.5	12	Inert and Exin abund; V sparse
West Kora 1	S2555 A4 V2	1021	–	SWC	Vitrinite	0.66	0.78	0.54	9	Inert and Exin abund;Vit rare
West Kora 1	S2555 A4 V2	1252	–	SWC	Vitrinite	0.84	1.04	0.62	11	Inert abun; Exin comm; Vit rare
West Philydrum 1	S2757 A2 V1	13	25	cutt	Inertinite	1.06	1.28	0.92	5	Inert sparse to comm; Exin and Vit sparse
West Philydrum 1	S2757 A2 V1	13	25	cutt	Vitrinite	0.3	0.4	0.26		Rv equiv of Ri
West Philydrum 1	S2757 A2 V1	220	230	cutt	Inertinite	1.19	1.65	0.85	10	Inert abund; Exin comm; Vit rare
West Philydrum 1	S2757 A2 V1	220	230	cutt	Vitrinite	0.35	0.6	0.24		Rv equiv of Ri
West Philydrum 1	S2757 A2 V1	400	–	SWC	Inertinite	1.31	1.92	0.98	25	Inert abund; Exin comm; Vit sparse
West Philydrum 1	S2757 A2 V1	400	–	SWC	Vitrinite	0.4	0.82	0.27		Rv equiv of Ri
West Philydrum 1	S2757 A2 V1	699	–	SWC	Vitrinite	0.41	0.61	0.3	28	Exin and Vit abund; Inert sparse
West Philydrum 1	S2757 A2 V1	805	–	SWC	Inertinite	1.33	1.86	0.88	25	Exin abund; Inert comm; vit rare
West Philydrum 1	S2757 A2 V1	805	–	SWC	Vitrinite	0.42	0.75	0.25		Rv equiv of Ri
West Philydrum 1	S2757 A2 V1	978.5	–	SWC	Inertinite	1.22	1.62	0.86	13	Inert and Exin sparse; Vit rare
West Philydrum 1	S2757 A2 V1	978.5	–	SWC	Vitrinite	0.36	0.57	0.24		Rv equiv of Ri
West Philydrum 1	S2757 A2 V1	1020.5	–	SWC	Inertinite	1.46	1.93	1.05	10	Exin sparse; Inert and Vit rare
West Philydrum 1	S2757 A2 V1	1020.5	–	SWC	Vitrinite	0.47	0.83	0.3		–
West Philydrum 1	S2757 A2 V1	1042	–	SWC	Inertinite	1.81	2.3	1.43	10	Exin comm; Inert and Vit rare
West Philydrum 1	S2757 A2 V1	1042	–	SWC	Vitrinite	0.63	0.71	0.53	9	Exin comm; Inert and Vit rare
Whistler 1	Report	452	–	SWC	Vitrinite	0.51	0.61	0.37	8	Lip and Inert sparse; Vit rare
Whistler 1	Report	507	–	SWC	Inertinite	1.12	1.17	1.07	2	Lip sparse; Inert and Vit rare
Whistler 1	Report	507	–	SWC	Vitrinite	0.34			1	Lip sparse; Inert and Vit rre
Whistler 1	Report	609	–	SWC	Vitrinite	0.38	0.52	0.31	10	Lip sparse; Inert and Vit rare
Whistler 1	Report	709.5	–	SWC	Vitrinite	0.42	0.53	0.31	10	Lip comm; Inert sparse; Vit rare
Whistler 1	Report	718.5	–	SWC	Vitrinite	0.41	0.55	0.32	10	Lip sparse; Inert and Vit rare
Whistler 1	Report	785	–	SWC	Vitrinite	0.45	0.59	0.31	24	Lip sparse; Inert and Vit rare
Yulleroo 1	GSWA Rec 2006/7	690.07	691.3	cutt	Vitrinite	?0.60			1	–
Yulleroo 1	GSWA Rec 2006/7	690.07	691.3	cutt	Inertinite	1.27	0.96	1.9	7	–

Appendix 9

Gazetteer of place names

Locality	*Latitude*	*Longitude*
Blina oil terminal	17°50'50"S	124°22'12"E
Bruten Hill	18°41'45"S	125°37'23"E
Carolyn Valley	125°37'23"E	124°52'18"E
	to 124°52'18"E	to 125°00'26"E
Condren Pinnacles	20°06'01"S	127°39'01"E
Culvida Soak	20°13'36"S	126°55'53"E
Deadea Cliff	18°45'02"S	126°04'54"E
Derby	17°18'13"S	123°37'50"E
Derby Town Bore (PA)	17°18'48"S	123°38'41"E
Duchess Ridge	18°08'10"S	124°30'02'E
Dunn Soak	22°03'13"S	123°09'07"E
Ellendale homestead	17°55'40"S	124°48'41"E
Erskine Range	17°50'34"S	124°20'35"E
Fitzroy Crossing	18°11'49"S	125°34'02"E
Godfrey Tank	20°14'27"S	126°33'59"E
Gogo homestead	18°17'31"S	125°35'14"E
Goongewa mine (abd)	18°37'44"S	125°51'30"E
Grant Range	17°59'11"S	124°00'31"E
	to 18°3'51"S	to 124°07'00"E
Hicks Range	19°13'52"S	125°53'54"E
Jimberlura Ridge	17°59'58"S	124°28'29"E
Kirkby Range	19°05'51"S	125°06'44"E
	to 19°06'34"S	to 125°12'21"E
Lake Blanche	22°27'25"S	123°10'55"E
Lake Dora	22°03'30"S	122°57'20"E
Lauris Range	18°10'16"S	125°25'48"E
Lightjack Hill	18°59'16"S	125°50'47"E
Liveringa Ridge	18°05'21"S	124°01'46"E
Lower Liveringa station (now Balginjirr community)	17°54'16"E	123°47'13"E
Millyit Range	19°09'51"S	125°28'38"E
Millajiddee homestead (abd)	18°48'59"S	124°57'04"E
Mount Hardman	18°18'40"S	124°38'47"E
Mount Hutton	18°49'29"S	125°37'47"E
Mount Piper	18°53'54"S	125°47'19"E
Mount Thorlan	18°47'56"S	125°46'26"E
Mount Tuckfield	18°42'08"S	124°53'31"E
Mount Wynne	18°05'55"S	124°27'38"E
Noonkanbah homestead (now Yungngora community)	18°30'19"S	124°49'33"E
Nura Nura Ridge	18°05'04"S	124°24'24"E
	to 18°01'17"S	to 124°28'30"E
Oakover River	21°18'53"S	121°03'09"E
Paradise outstation	18°01'08"S	124°31'55"E
Paterson Range	21°45'28"S	122°09'50"E
Point Alphonse	20°23'34"S	127°36'35"E
Poole Range	18°52'25"S	125°46'16"E
Pyramid Bore	18°21'34"S	124°39'33"E
Scott Bluff	22°27'30"S	123°12'58"E
South Looma community	18°03'15"S	124°08'17"E
Spring Creek	19°10'00"S	125°33'44"E
St George Ranges	18°41'35"S	124°52'13"E
	to 18°48'35"S	to 125°24'56"E
Stansmore Range	21°23'55"S	128°04'55"E
Telfer	21°42'35"S	122°13'34"E
Triwhite Hills	22°03'12"S	123°10'02"E
Well 26, Canning Stock Route	22°54'59"S	123°30'21"E
Wye Worry Bore	18°42'29"S	125°15'18"E
Yakanarra community	18°40'16"S	125°17'52"E



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

REPORT 107 PLATE 1

Distribution of Petroleum Wells and Mineral Bores used in Study

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

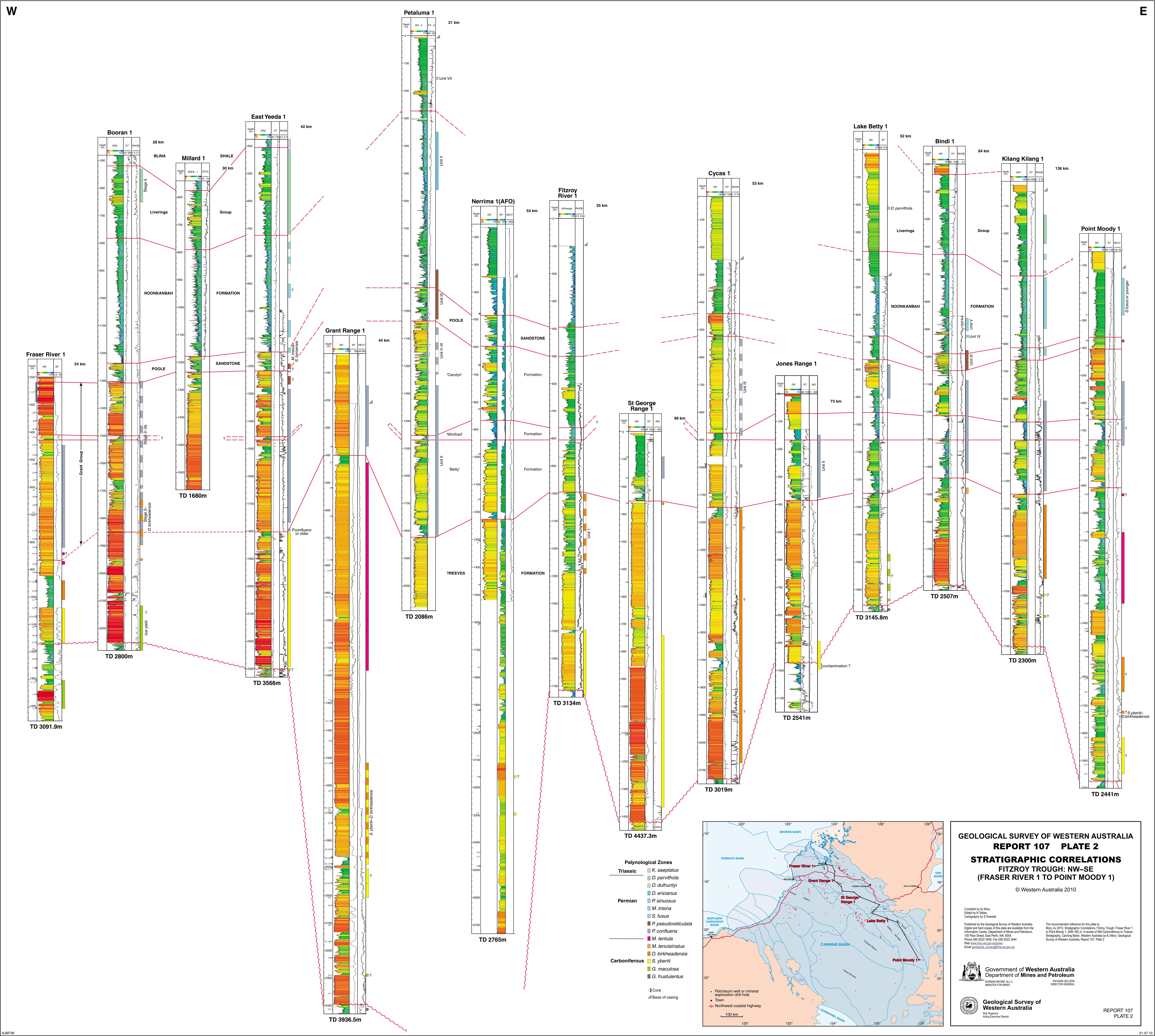
Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004. Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) *in* A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia by AJ Mory: Geological Survey of Western Australia, Report 107, Plate 1

Government of Western Australia
Department of Mines and Petroleum
NORMAN MOORE, M.L.C.
MINISTER FOR MINES
RICHARD SELLERS
DIRECTOR GENERAL

Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

REPORT 107
PLATE 1



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
REPORT 107 PLATE 2
STRATIGRAPHIC CORRELATIONS
FITZROY TROUGH: NW–SE (FRASER RIVER 1 TO POINT MOODY 1)

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004. Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) *in* A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia *by* AJ Mory: Geological Survey of Western Australia, Report 107, Plate 2

Government of **Western Australia**
Department of **Mines and Petroleum**
NORMAN MOORE, M.L.C.
MINISTER FOR MINES
RICHARD SELLERS
DIRECTOR GENERAL

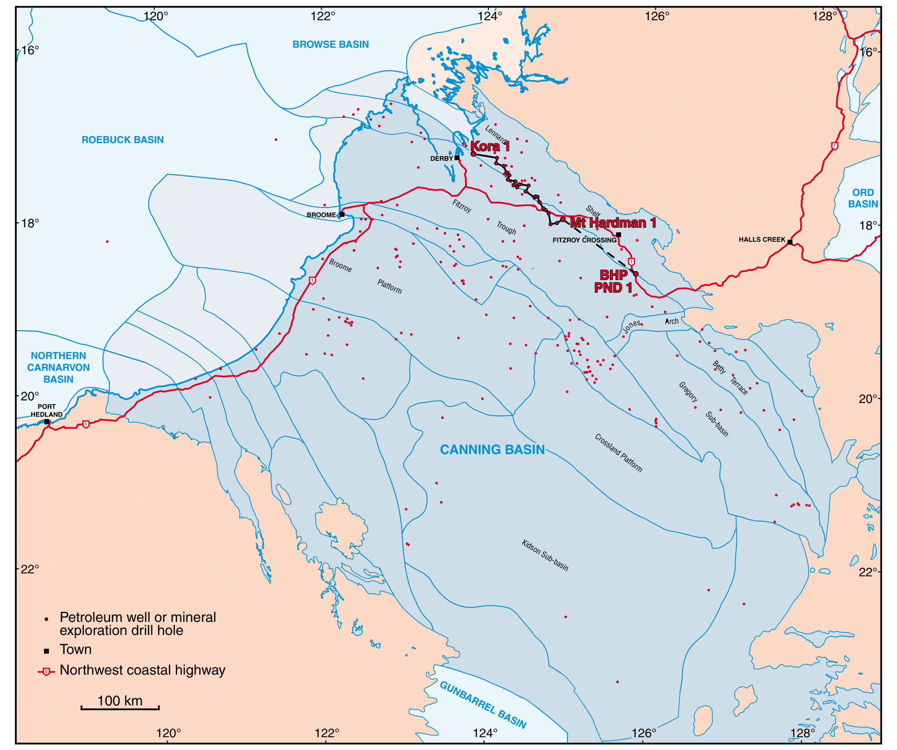
Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

REPORT 107
PLATE 2

Palynological Zones

Triassic	*K. saeptatus*
Permian	*D. parvithola*
	D. dulhuntyi
	D. ericianus
	P. sinuosus
	M. trisina
	S. fusus
	P. pseudoreticulata
	P. confluens
Carboniferous	*M. tentula*
	M. tenuistriatus
	D. birkheadensis
	S. ybertii
	G. maculosa
	G. frustulentus

1 Core
Base of casing



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
REPORT 107 PLATE 3
STRATIGRAPHIC CORRELATIONS
LENNARD SHELF: NW–SE
(KORA 1 TO BHP PND 1)

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

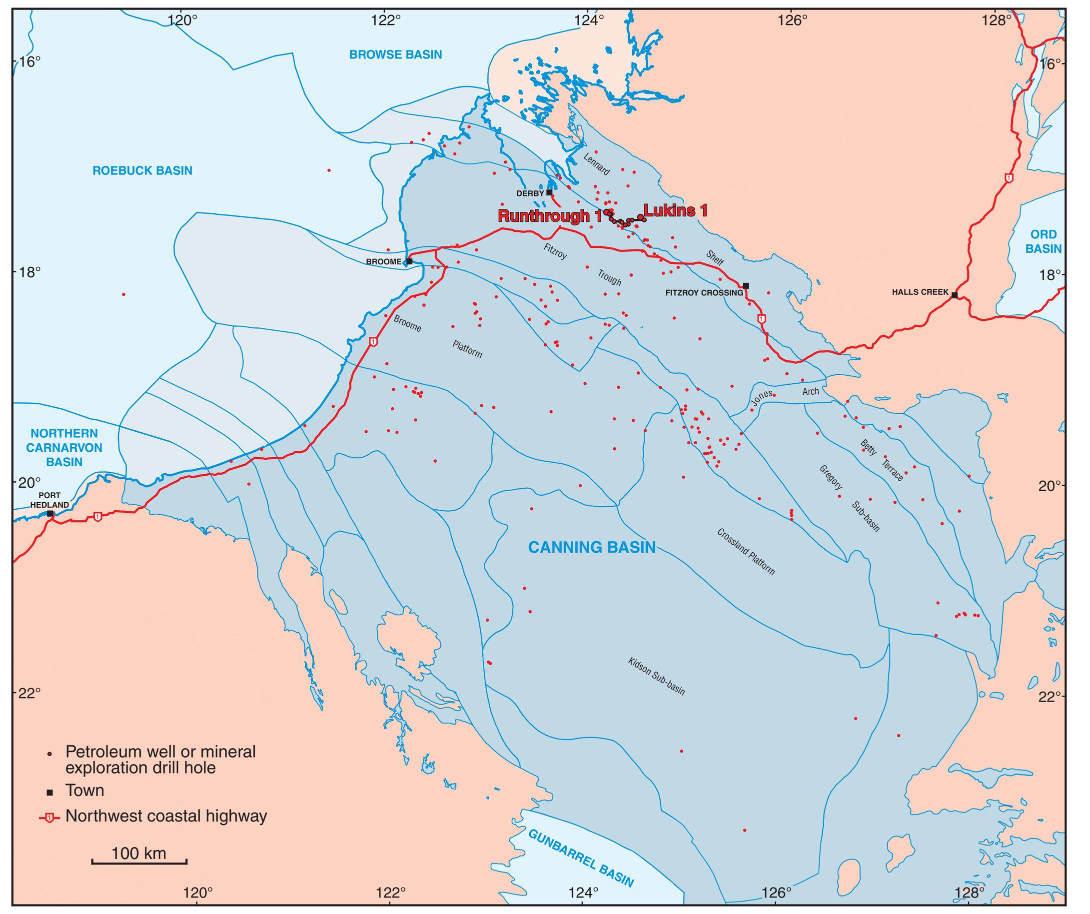
Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004.
Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) *in* A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia *by* AJ Mory: Geological Survey of Western Australia, Report 107, Plate 3

Government of **Western Australia**
Department of **Mines and Petroleum**
NORMAN MOORE, M.L.C.
MINISTER FOR MINES
RICHARD SELLERS
DIRECTOR GENERAL

Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

REPORT 107
PLATE 3



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
REPORT 107 PLATE 4
STRATIGRAPHIC CORRELATIONS
LENNARD SHELF: W–E
(RUNTHROUGH 1 TO LUKINS 1)

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004. Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) *in* A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia *by* AJ Mory: Geological Survey of Western Australia, Report 107, Plate 4

Government of Western Australia
Department of Mines and Petroleum
NORMAN MOORE, M.L.C.
MINISTER FOR MINES
RICHARD SELLERS
DIRECTOR GENERAL

Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

REPORT 107
PLATE 4

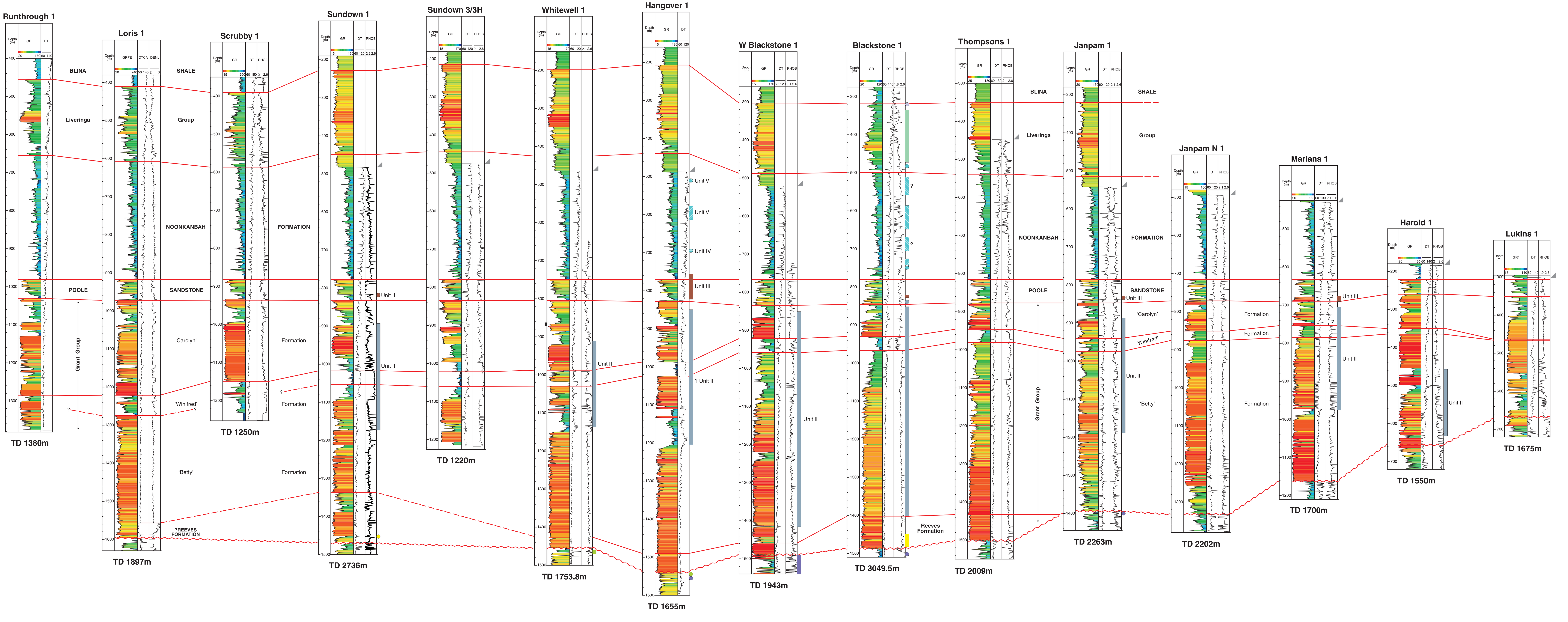
Palynological Zones

Triassic
- *K. saeptatus*
- *D. parvithola*
- *D. dulhuntyi*

Permian
- *D. ericianus*
- *P. sinuosus*
- *M. trisina*
- *S. fusus*
- *P. pseudoreticulata*
- *P. confluens*
- *M. tentula*

Carboniferous
- *M. tenuistriatus*
- *D. birkheadensis*
- *S. ybertii*
- *G. maculosa*
- *G. frustulentus*

Core
Base of casing



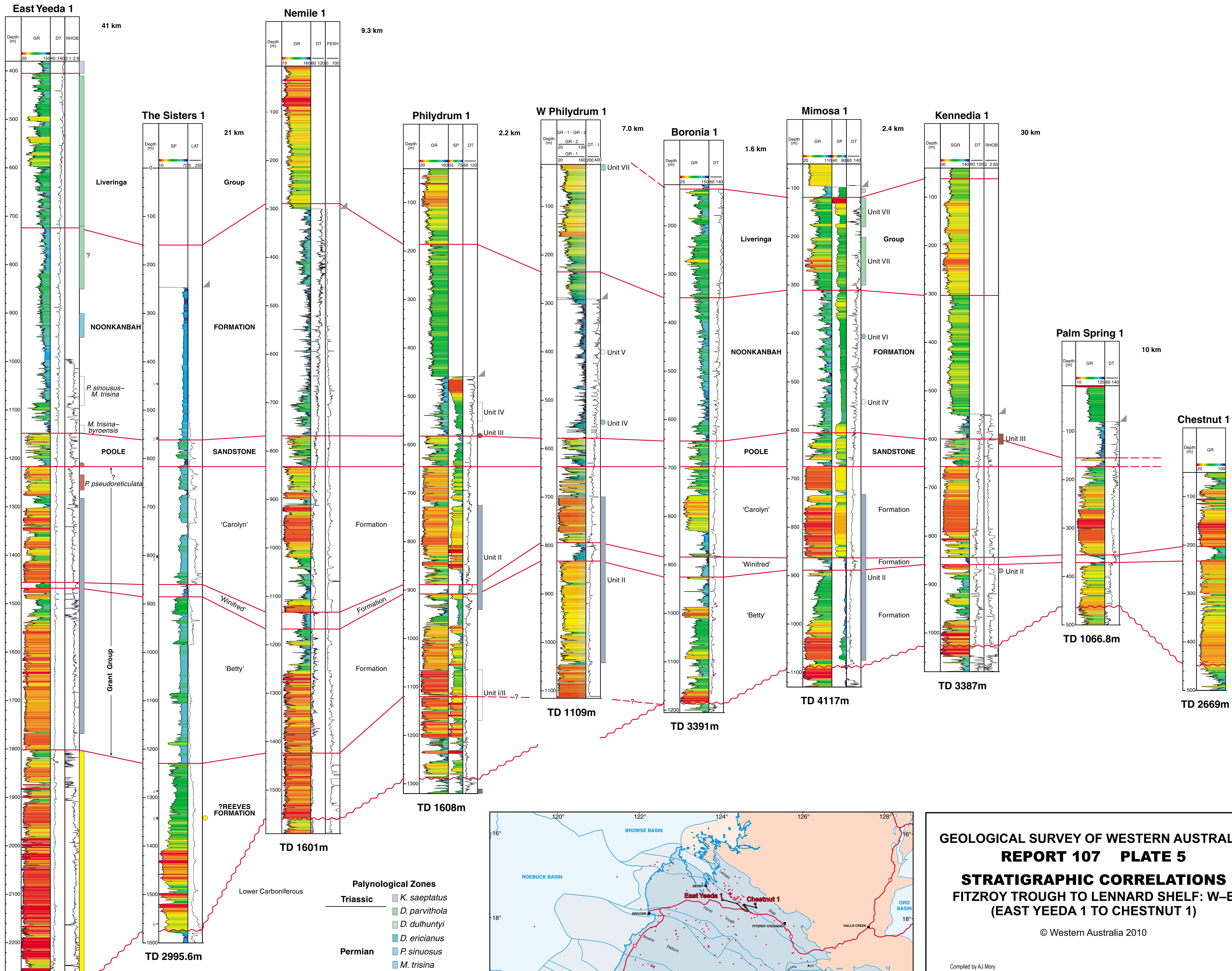
W

E

AJM741

21.07.10

W E



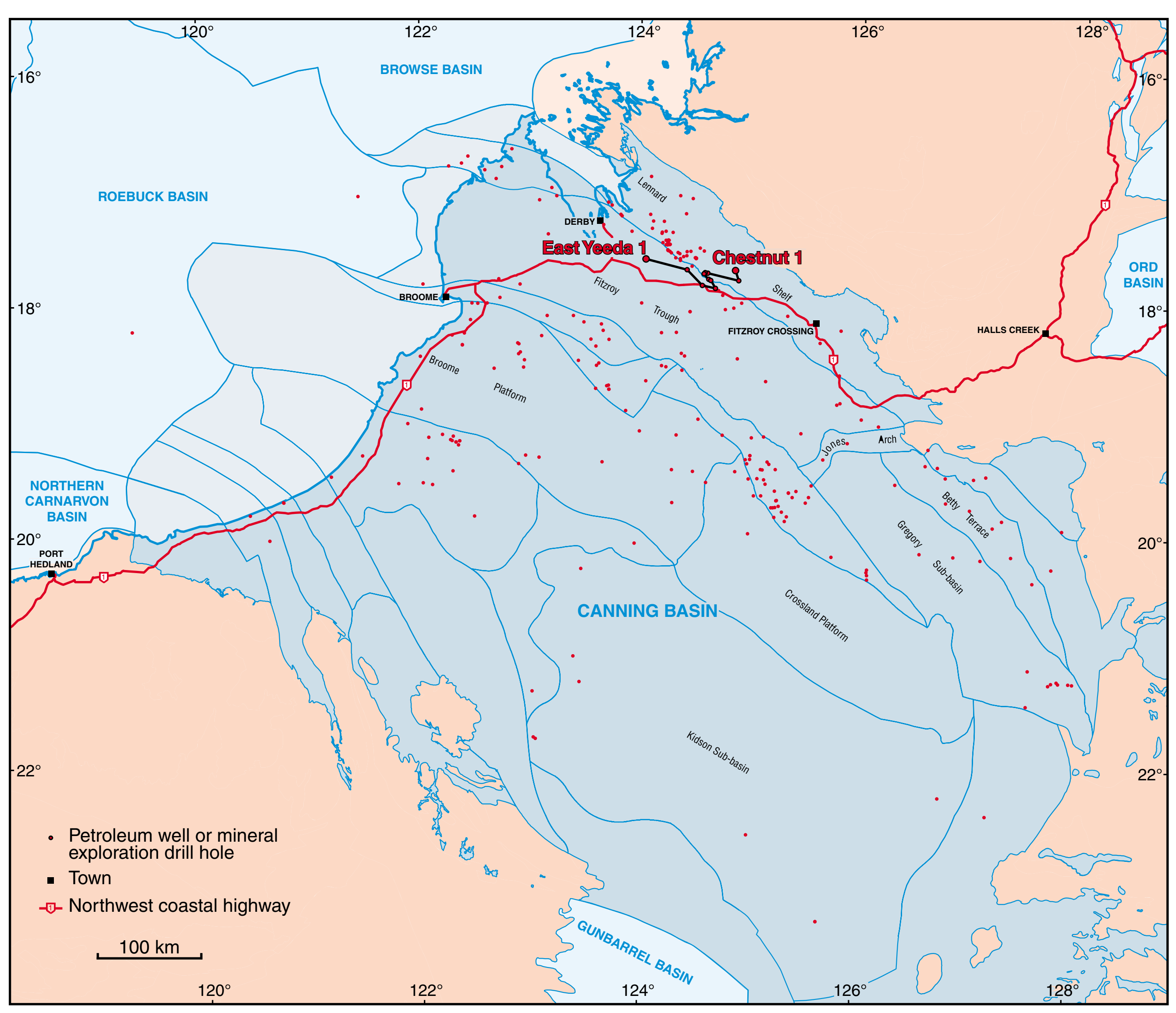
Palynological Zones

Triassic
- *K. saeptatus*

Permian
- *D. parvithola*
- *D. dulhuntyi*
- *D. ericianus*
- *P. sinousus*
- *M. trisina*
- *S. fusus*
- *P. pseudoreticulata*
- *P. confluens*

Carboniferous
- *M. tentula*
- *M. tenuistriatus*
- *D. birkheadensis*
- *S. ybertii*
- *G. maculosa*
- *G. frustulentus*

Core
Base of casing



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
REPORT 107 PLATE 5
STRATIGRAPHIC CORRELATIONS
FITZROY TROUGH TO LENNARD SHELF: W–E (EAST YEEDA 1 TO CHESTNUT 1)

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004. Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

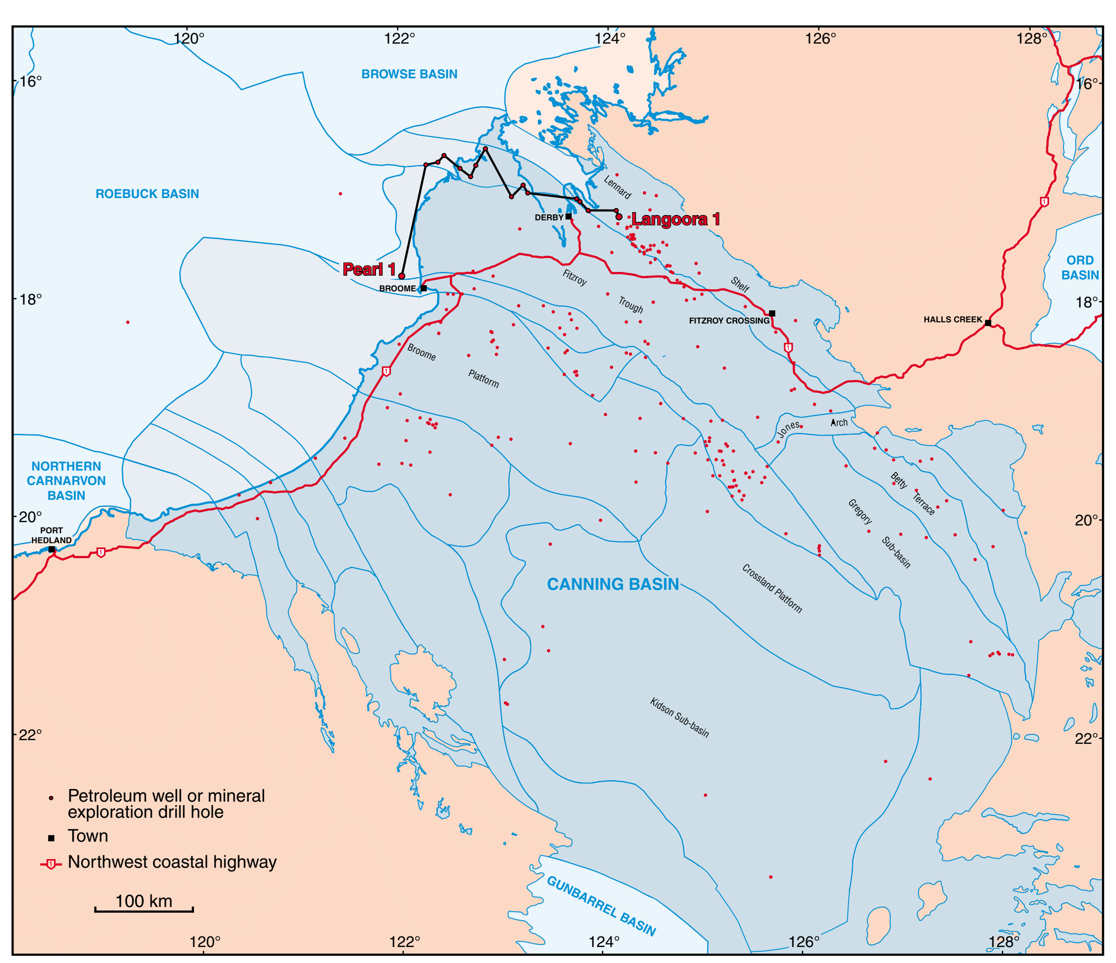
The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) in A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia by AJ Mory: Geological Survey of Western Australia, Report 107, Plate 5

Government of Western Australia
Department of Mines and Petroleum
NORMAN MOORE, M.L.C. MINISTER FOR MINES
RICHARD SELLERS DIRECTOR GENERAL

Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

REPORT 107
PLATE 5

AJM744
21.07.10



Palynological Zones

Triassic
- *K. saeptatus*
- *D. parvithola*
- *D. dulhuntyi*
- *D. ericianus*

Permian
- *P. sinuosus*
- *M. trisina*
- *S. fusus*
- *P. pseudoreticulata*
- *P. confluens*

Carboniferous
- *M. tentula*
- *M. tenuistriatus*
- *D. birkheadensis*
- *S. ybertii*
- *G. maculosa*
- *G. frustulentus*

Core

Base of casing

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
REPORT 107 PLATE 6
STRATIGRAPHIC CORRELATIONS
PENDER TERRACE: W–E
(PEARL 1 TO LANGOORA 1)

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004.
Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) *in* A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia *by* AJ Mory: Geological Survey of Western Australia, Report 107, Plate 6

Government of **Western Australia**
Department of **Mines and Petroleum**
NORMAN MOORE, M.L.C.
MINISTER FOR MINES
RICHARD SELLERS
DIRECTOR GENERAL

Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

REPORT 107
PLATE 6

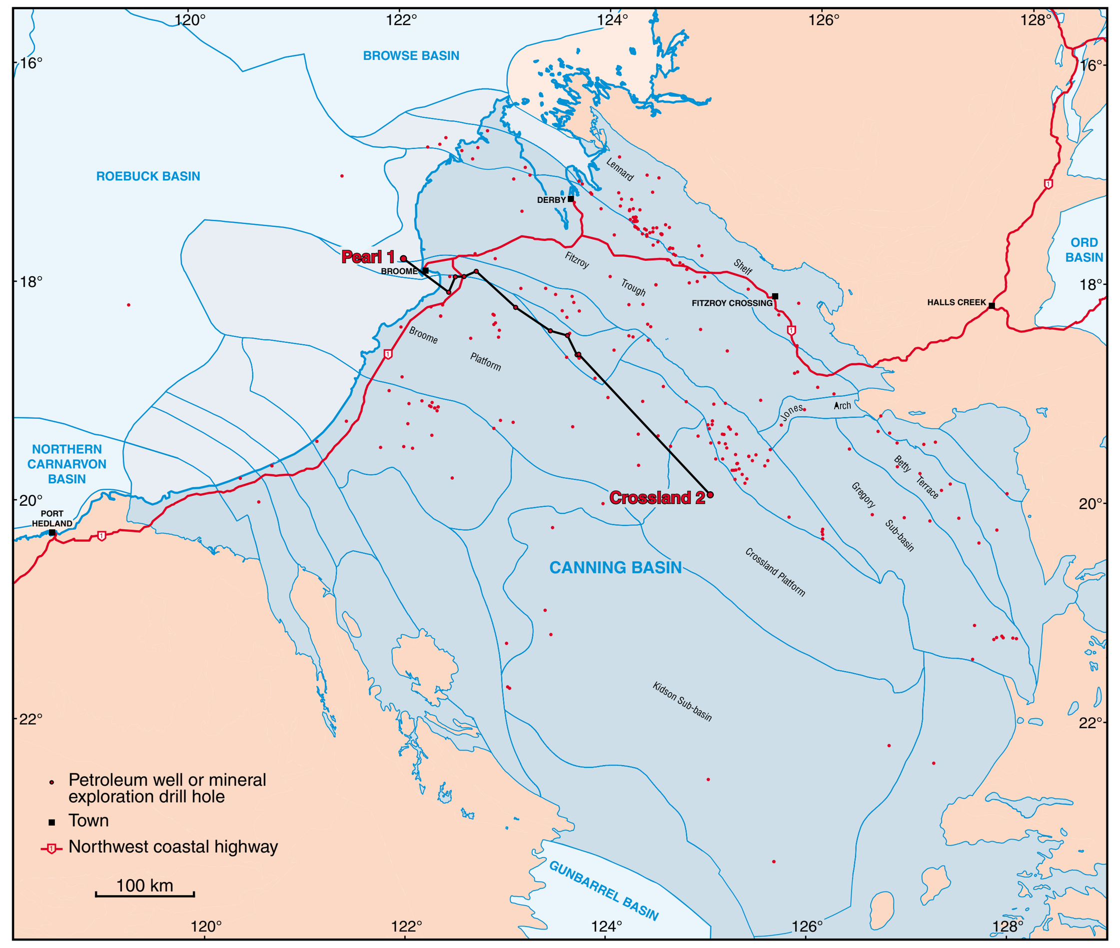
NW SE

Palynological Zones

Triassic	*K. saeptatus*
Permian	*D. parvithola*
	D. dulhuntyi
	D. ericianus
	P. sinuosus
	M. trisina
	S. fusus
	P. pseudoreticulata
	P. confluens
Carboniferous	*M. tentula*
	M. tenuistriatus
	D. birkheadensis
	S. ybertii
	G. maculosa
	G. frustulentus

1 Core

Base of casing



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
REPORT 107 PLATE 7
STRATIGRAPHIC CORRELATIONS
NORTHWEST JURGURRA TERRACE TO CROSSLAND PLATFORM: NW–SE (PEARL 1 TO CROSSLAND 2)

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004.
Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) *in* A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia *by* AJ Mory: Geological Survey of Western Australia, Report 107, Plate 7

Government of **Western Australia**
Department of **Mines and Petroleum**
NORMAN MOORE, M.L.C.
MINISTER FOR MINES
RICHARD SELLERS
DIRECTOR GENERAL

Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

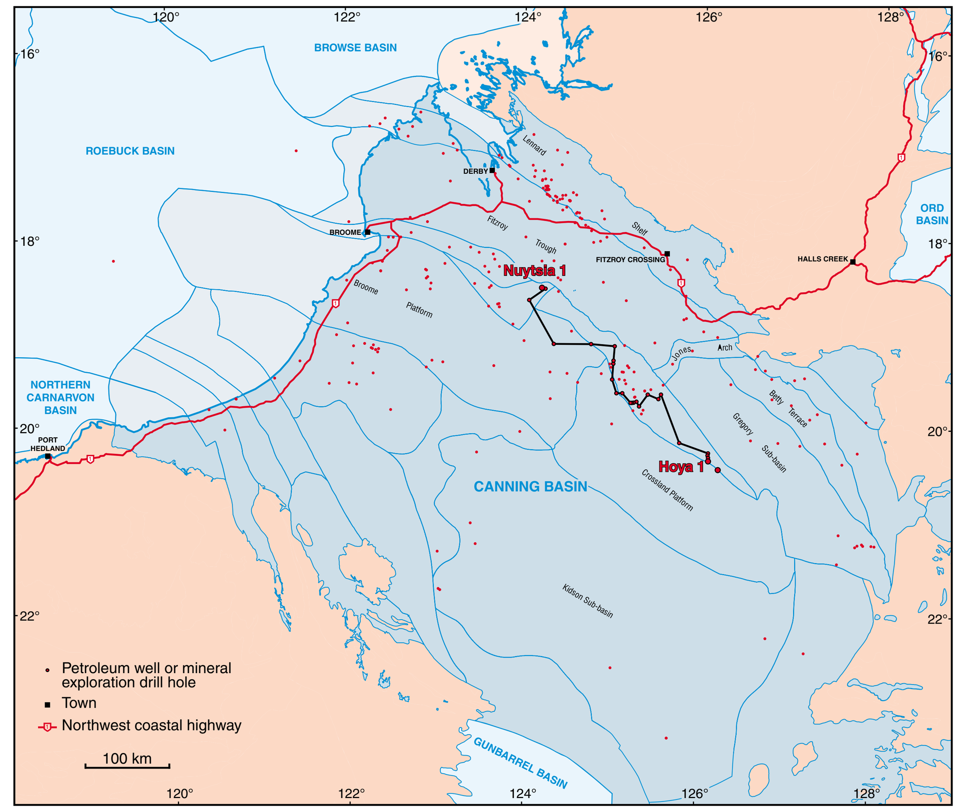
REPORT 107
PLATE 7

Palynological Zones

Triassic	*K. saeptatus*
Permian	*D. parvithola*
	D. dulhuntyi
	D. ericianus
	P. sinuosus
	M. trisina
	S. fusus
	P. pseudoreticulata
	P. confluens
Carboniferous	*M. tentula*
	M. tenuistriatus
	D. birkheadensis
	S. ybertii
	G. maculosa
	G. frustulentus

1 Core

Base of casing



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
REPORT 107 PLATE 8
STRATIGRAPHIC CORRELATIONS
BARBWIRE TERRACE: NW–SE (NUYTSIA 1 TO HOYA 1)

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004.
Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) *in* A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia *by* AJ Mory: Geological Survey of Western Australia, Report 107, Plate 8

Government of Western Australia
Department of Mines and Petroleum
NORMAN MOORE, M.L.C.
MINISTER FOR MINES
RICHARD SELLERS
DIRECTOR GENERAL

Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

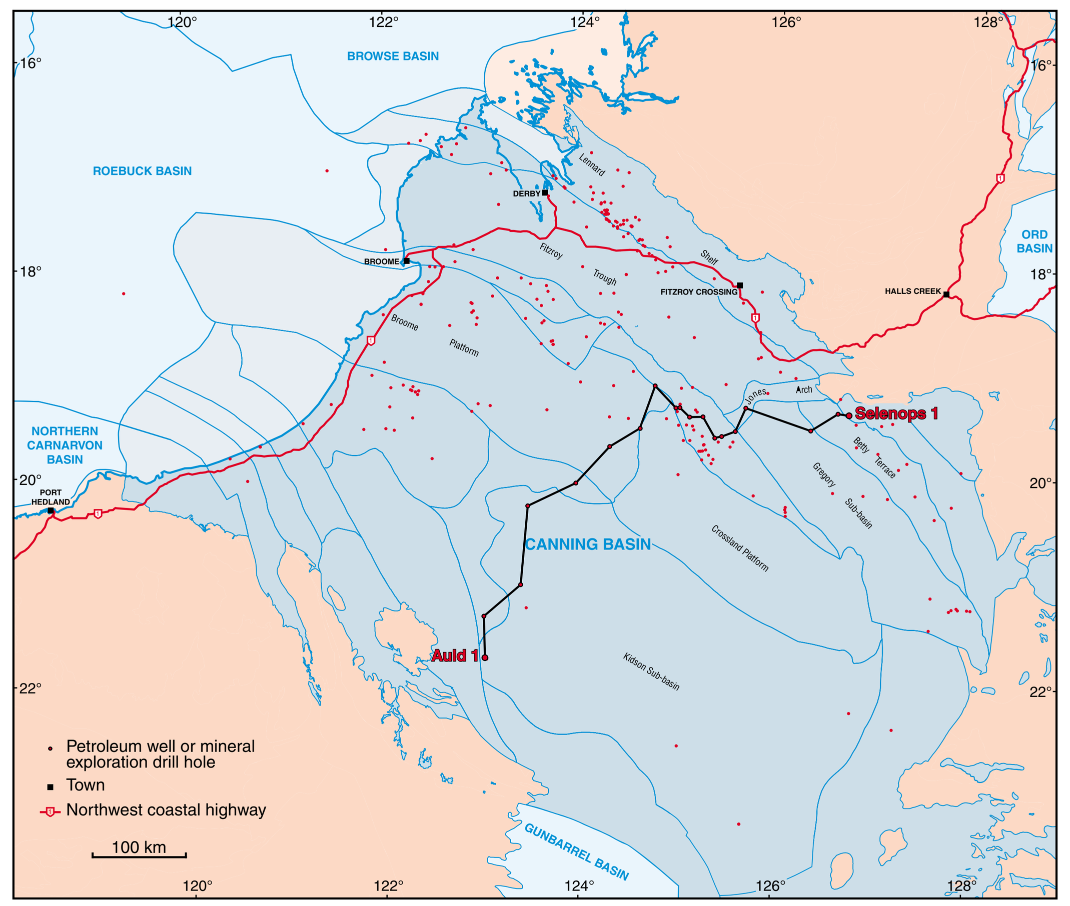
REPORT 107
PLATE 8

AJM746

21.07.10

SW

NE



Palynological Zones

Triassic	*K. saeptatus*
	D. parvithola
	D. dulhuntyi
Permian	*D. ericianus*
	P. sinuosus
	M. trisina
	S. fusus
	P. pseudoreticulata
	P. confluens
Carboniferous	*M. tentula*
	M. tenuistriatus
	D. birkheadensis
	S. ybertii
	G. maculosa
	G. frustulentus

Core
Base of casing

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
REPORT 107 PLATE 9
STRATIGRAPHIC CORRELATIONS
CENTRAL TRAVERSE: SW–NE (AULD 1 TO SELENOPS 1)

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004. Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) *in* A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia *by* AJ Mory: Geological Survey of Western Australia, Report 107, Plate 9

Government of **Western Australia**
Department of **Mines and Petroleum**
NORMAN MOORE, M.L.C.
MINISTER FOR MINES
RICHARD SELLERS
DIRECTOR GENERAL

Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

REPORT 107
PLATE 9

AJM747

21.07.10

SW

NE

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
REPORT 107 PLATE 10
STRATIGRAPHIC CORRELATIONS
WESTERN TRAVERSE: SW–NE
(CHIRUP 1 TO MELLANY 1)

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

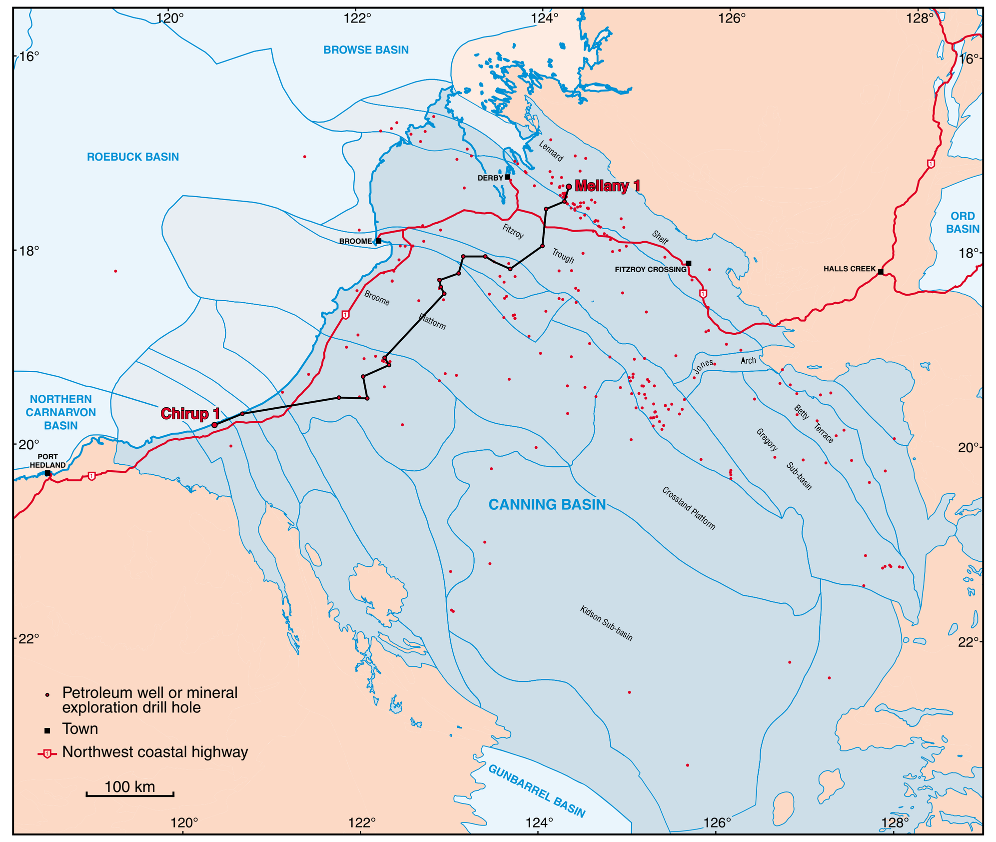
Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004. Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) *in* A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia *by* AJ Mory: Geological Survey of Western Australia, Report 107, Plate 10

Government of **Western Australia**
Department of **Mines and Petroleum**
NORMAN MOORE, M.L.C.
MINISTER FOR MINES
RICHARD SELLERS
DIRECTOR GENERAL

Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

REPORT 107
PLATE 10



Palynological Zones

Triassic	*K. saeptatus*
Permian	*D. parvithola*
	D. dulhuntyi
	D. ericianus
	P. sinuosus
	M. trisina
	S. fusus
	P. pseudoreticulata
	P. confluens
Carboniferous	*M. tentula*
	M. tenuistriatus
	D. birkheadensis
	S. ybertii
	G. maculosa
	G. frustulentus

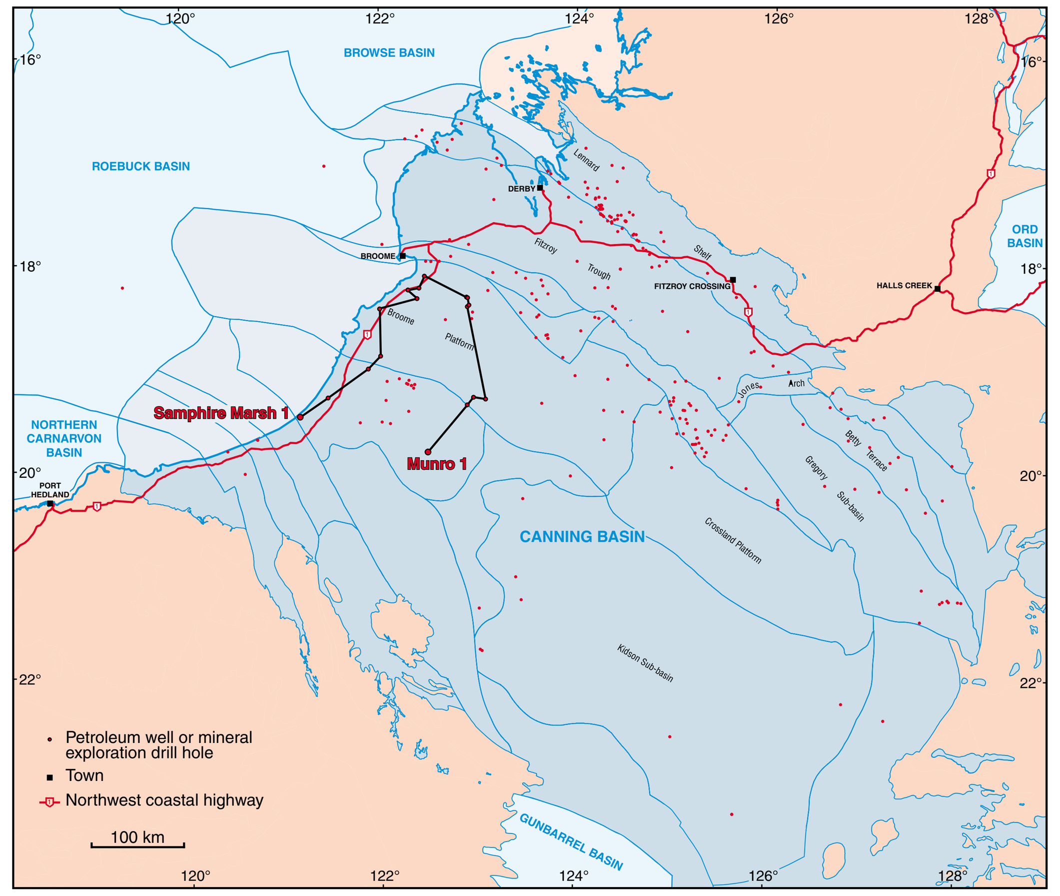
Core
Base of casing

Palynological Zones

Triassic	*K. saeptatus*
Permian	*D. parvithola*
	D. dulhuntyi
	D. ericianus
	P. sinuosus
	M. trisina
	S. fusus
	P. pseudoreticulata
	P. confluens
Carboniferous	*M. tentula*
	M. tenuistriatus
	D. birkheadensis
	S. ybertii
	G. maculosa
	G. frustulentus

1 Core

Base of casing



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
REPORT 107 PLATE 11
STRATIGRAPHIC CORRELATIONS
WILLARA AND BROOME PLATFORM: Loop (SAMPHIRE MARSH 1 TO MUNRO 1)

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004.
Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

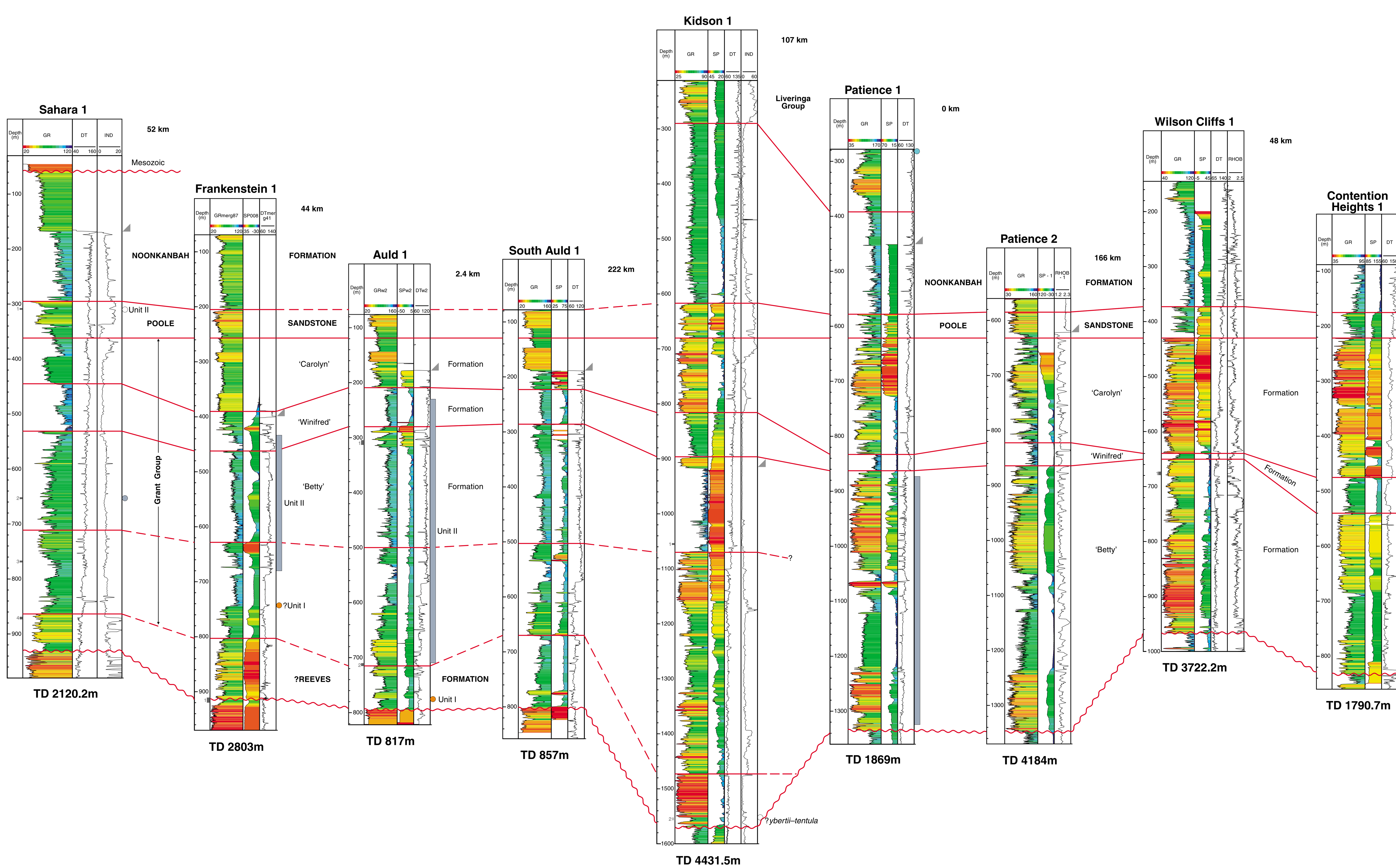
The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) *in* A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia *by* AJ Mory: Geological Survey of Western Australia, Report 107, Plate 11

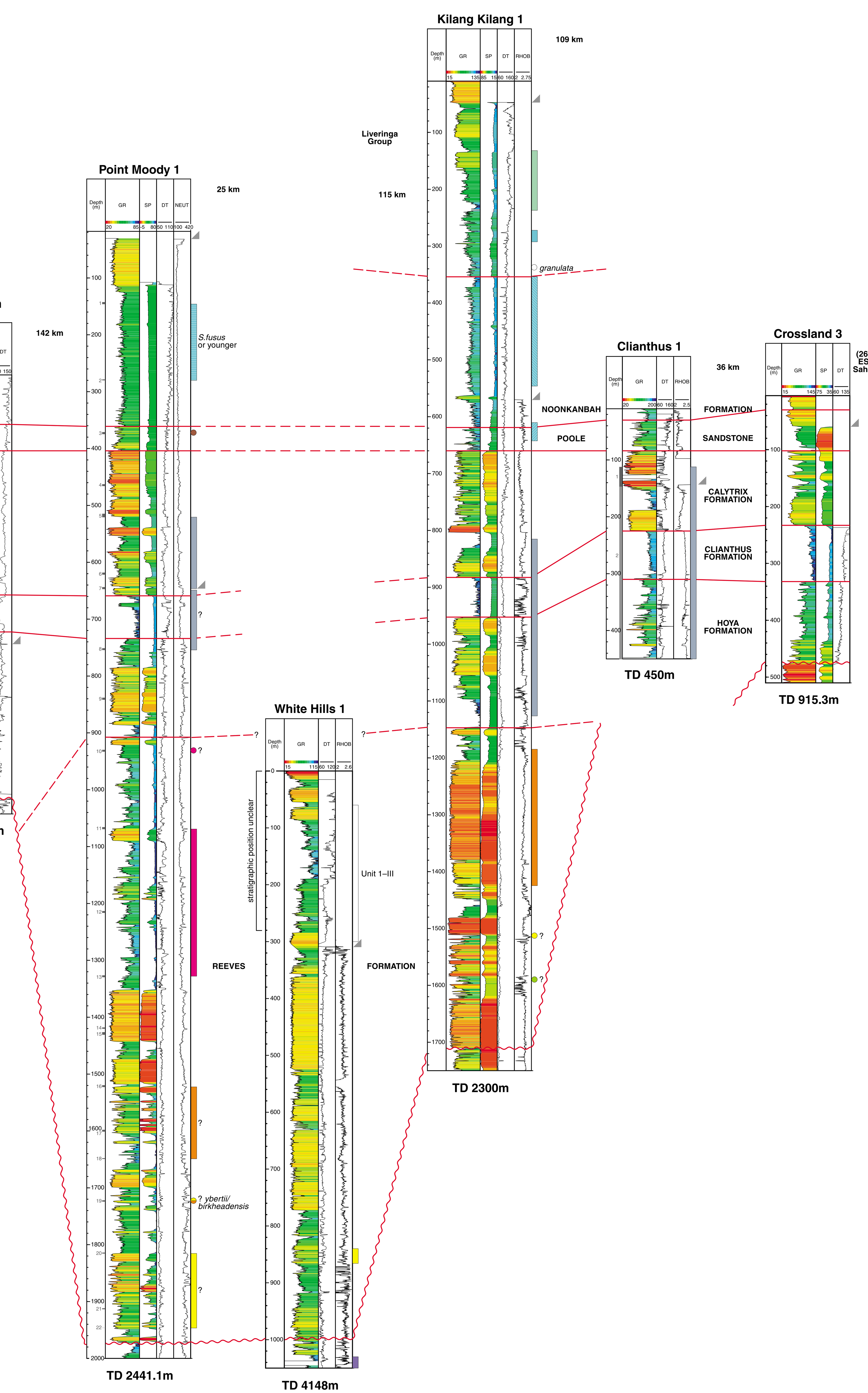
Government of **Western Australia**
Department of **Mines and Petroleum**
NORMAN MOORE, M.L.C.
MINISTER FOR MINES
RICHARD SELLERS
DIRECTOR GENERAL

Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

REPORT 107
PLATE 11

W S N NW

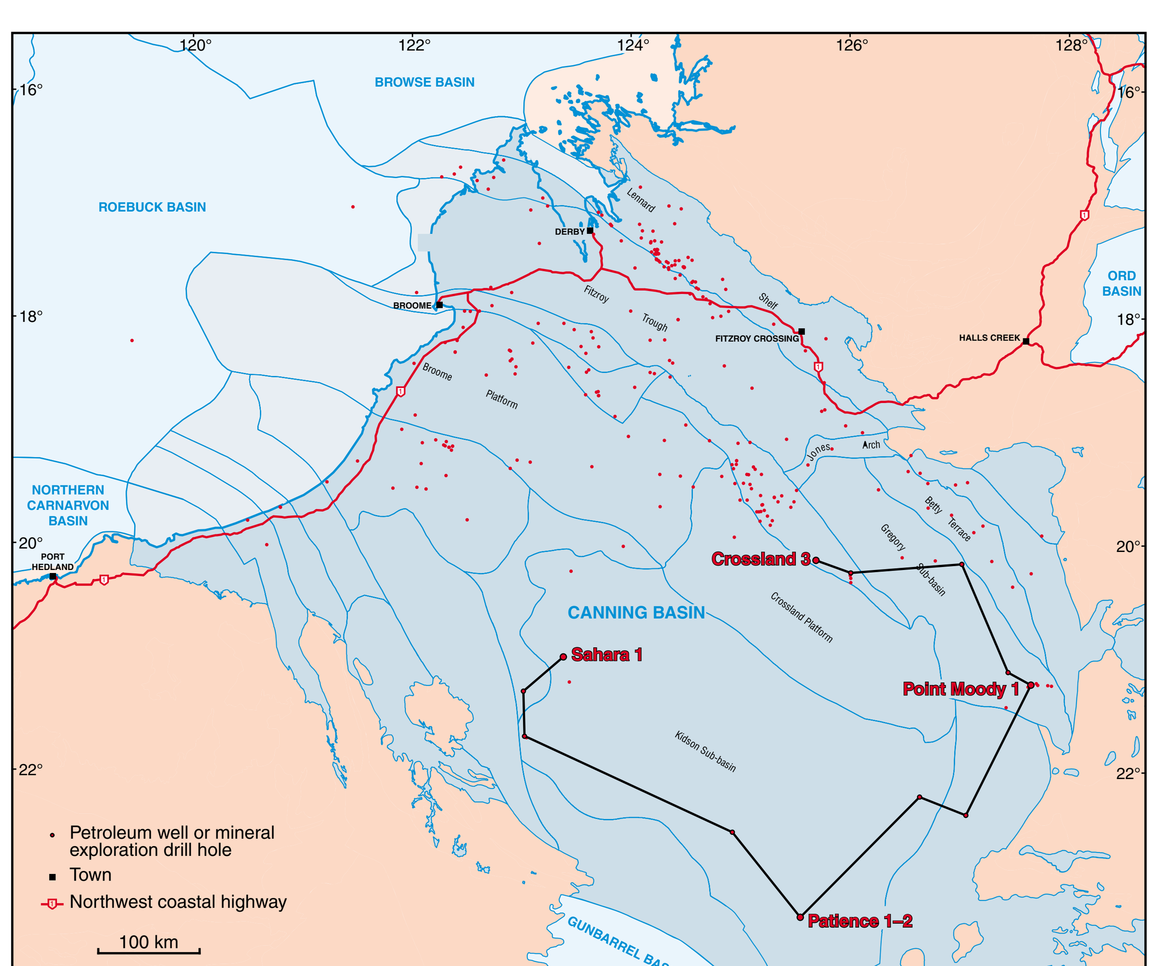




Palynological Zones

Triassic	*K. saeptatus*
	D. parvithola
	D. dulhuntyi
	D. ericianus
Permian	*P. sinuosus*
	M. trisina
	S. fusus
	P. pseudoreticulata
	P. confluens
	M. tentula
	M. tenuistriatus
Carboniferous	*D. birkheadensis*
	S. ybertii
	G. maculosa
	G. frustulentus

Core
Base of casing



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

REPORT 107 PLATE 12

STRATIGRAPHIC CORRELATIONS

SOUTHERN KIDSON SUB-BASIN and margins: Loop (SAHARA 1 TO CROSSLAND 3)

Compiled by AJ Mory
Edited by N Tetlaw
Cartography by S Dowsett

Published by the Geological Survey of Western Australia. Digital and hard copies of this plate are available from the Information Centre, Department of Mines and Petroleum, 100 Plain Street, East Perth, WA, 6004. Phone (08) 9222 3459, Fax (08) 9222 3444
Web www.dmp.wa.gov.au/gswa
Email geological_survey@dmp.wa.gov.au

The recommended reference for this plate is:
Mory, AJ 2010, Stratigraphic Correlations, Fitzroy Trough: Fraser River 1 to Point Moody 1, (NW–SE) in A review of Mid-Carboniferous to Triassic Stratigraphy, Canning Basin, Western Australia by AJ Mory: Geological Survey of Western Australia, Report 107, Plate 12

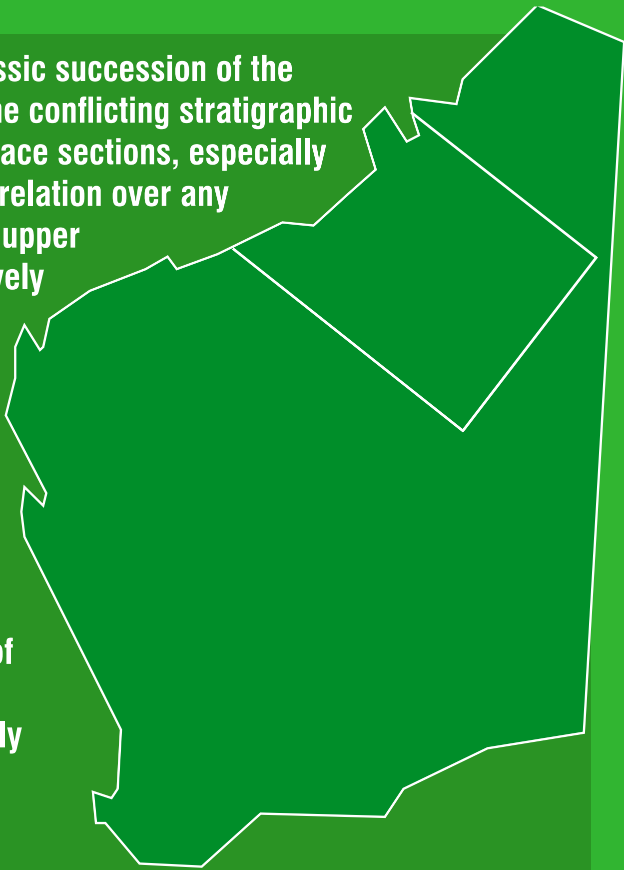
Government of Western Australia
Department of Mines and Petroleum
NORMAN MOORE, M.L.C. MINISTER FOR MINES
RICHARD SELLERS DIRECTOR GENERAL

Geological Survey of Western Australia
Rick Rogerson
Acting Executive Director

REPORT 107
PLATE 12

AJM739 21.07.10

This review of the Mid-Carboniferous to Triassic succession of the Canning Basin discusses the limitations of the conflicting stratigraphic nomenclatures between outcrop and subsurface sections, especially for the basal glacial succession in which correlation over any great distance is unreliable. By comparison, upper Sakmarian and younger strata show a relatively consistent regional stratigraphy, although deposition gradually contracted to the north of the basin.
Whereas the reservoir character of the basal glacigene sandstone-dominated succession is excellent, seals in that part of the succession are relatively thin and impersistent, and its potential to generate hydrocarbon is poor. Only the basal portion of the succession within the northern deep sub-basins lies within the oil window, possibly also influenced by late Permian igneous intrusions. The low hydrocarbon potential of this succession suggests the lower sandstone-dominated units may be suitable for CO_2 sequestration.



Further details of geological publications and maps produced by the Geological Survey of Western Australia are available from:

Information Centre
Department of Mines and Petroleum
100 Plain Street
East Perth, WA 6004
Phone: (08) 9222 3459 Fax: (08) 9222 3444

www.dmp.wa.gov.au/GSWApublications

AJ Mory

A review of mid-Carboniferous to Triassic stratigraphy, Canning Basin, Western Australia

REPORT 107