

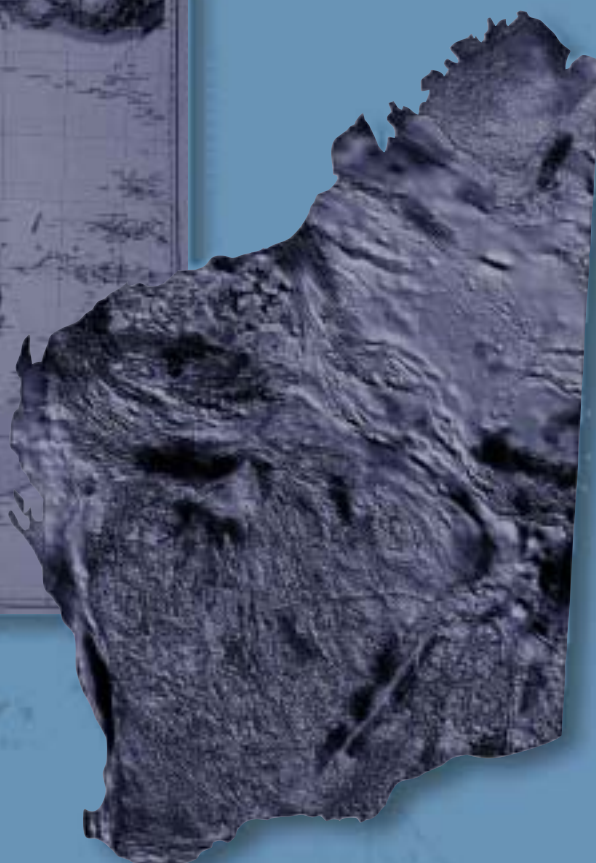
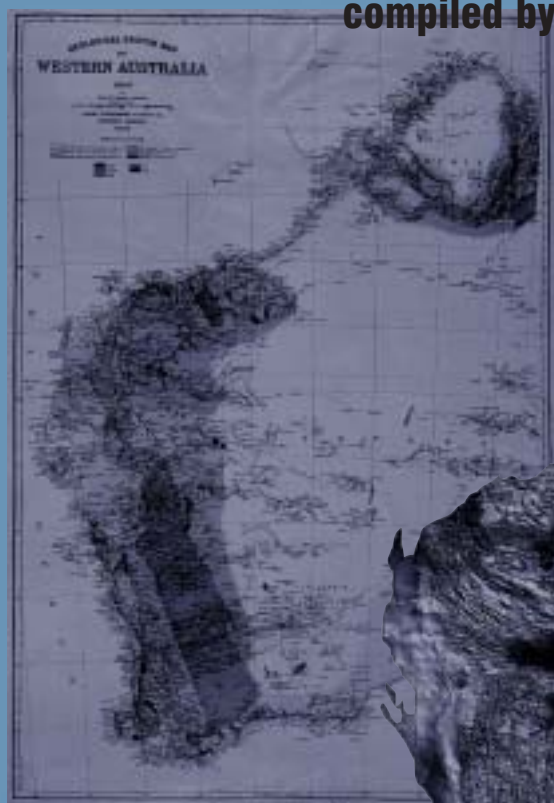


Department of
Mineral and Petroleum Resources

**RECORD
2002/6**

**GSWA YINNI 1
WELL COMPLETION REPORT (BASIC DATA)
GASCOYNE PLATFORM
SOUTHERN CARNARVON BASIN
WESTERN AUSTRALIA**

compiled by A. J. Mory and M. Dixon



Geological Survey of Western Australia



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

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**compiled by
A. J. Mory and M. Dixon¹**

**with contributions from
J. Backhouse² and D. W. Haig¹**

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Perth 2002

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GSWA Yinni 1 well completion report (basic data), Gascoyne Platform, Southern Carnarvon Basin, Western Australia

compiled by
A. J. Mory and M. Dixon¹

with contributions from
J. Backhouse² and D. W. Haig¹

Abstract

GSWA Yinni 1 is a stratigraphic well drilled in 2001 on the Gascoyne Platform in the Southern Carnarvon Basin. It is located at latitude 26°03'22.8"S and longitude 114°48'58.5"E, and was drilled to a depth of 158.2 m. The interval 36.7 – 87.9 m was continuously cored by diamond drilling with a recovery rate of 85%. It penetrated the following Lower Cretaceous units below Quaternary alluvium: lower part of the Gearle Siltstone, Windalia Radiolarite, Muderong Shale, and Birdrong Sandstone, before being terminated in the upper part of the Lower Jurassic Woodleigh Formation.

KEYWORDS: Cretaceous, Jurassic, stratigraphy, diamond drilling.

Introduction

Geological Survey of Western Australia (GSWA) Yinni 1 is a stratigraphic well located about 78 km southeast of Carnarvon on Woodleigh Station (Fig. 1). The well lies 6 km due east of the homestead (Fig. 1), which is situated 43 km by road east of the North West Coastal Highway, and 1 km south of the station track to the Woodleigh 3 water bore. The nearest petroleum and stratigraphic wells are Woodleigh 1, Woodleigh 2A, and Yaringa 1, located 15, 29, and 45 km to the west respectively. Yinni 1 was drilled within a topographic low over a gravity anomaly interpreted to lie on the eastern flank of the central uplift of the Woodleigh impact structure (Iasky et al., 2001). No hydrocarbons were encountered, nor was there evidence of significant mineralization.

The primary objective of Yinni 1 was to investigate the nature of thinning within the Winning Group towards the eastern side of the Gascoyne Platform by continuously coring the Winning Group. In previous drilling in this part of the Gascoyne Platform, the Cretaceous section was not cored in the central part of the platform, thereby hindering the identification of constituent formations, their precise thickness, and the magnitude of the breaks between them. Drilling was undertaken in collaboration with the University of Western Australia as part of an Australian

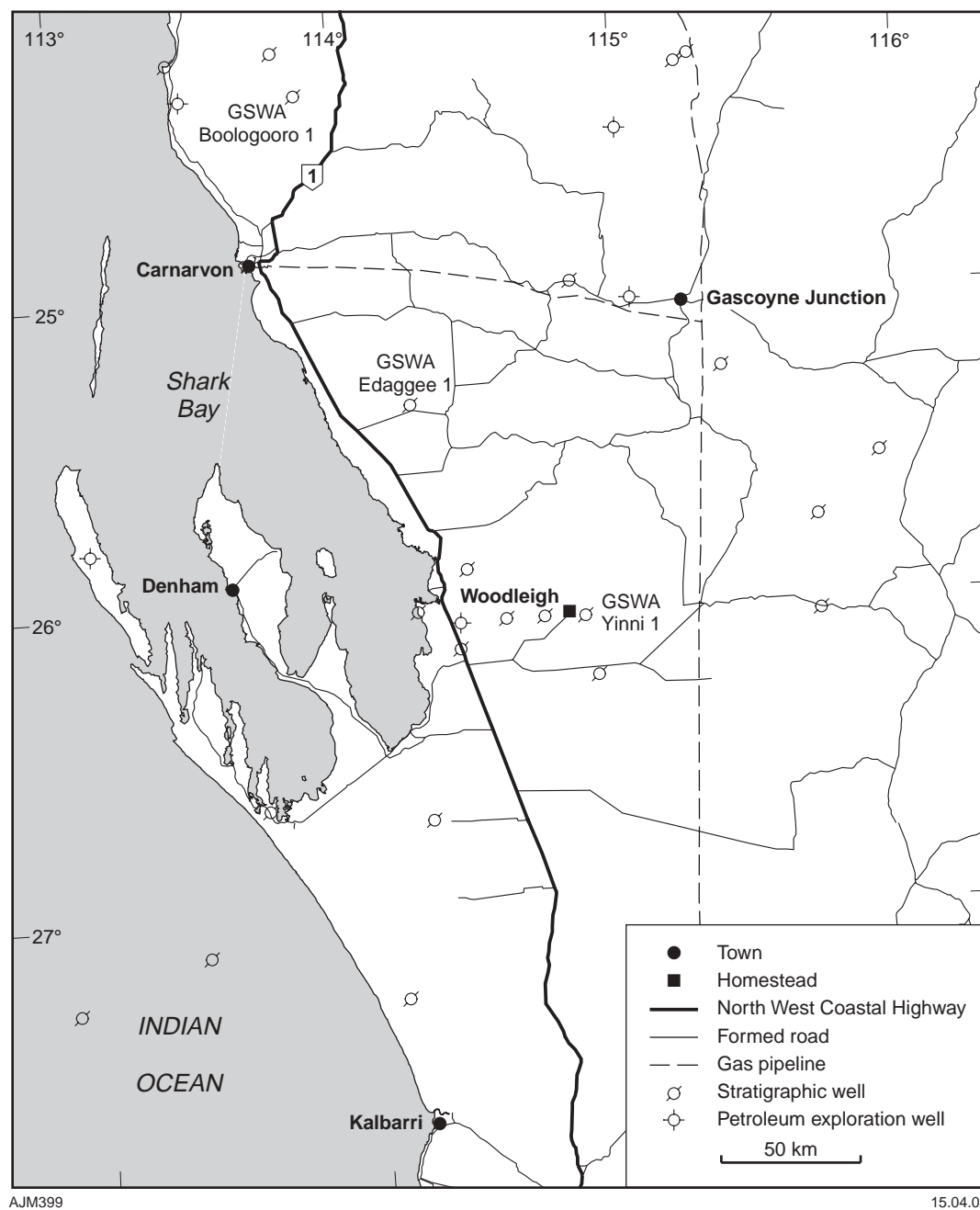
Research Council project on the Cretaceous succession. This joint project also involved drilling two other wells (Edaggee 1 and Booloogoro 1, 94 and 215 km to the north-northwest respectively; Mory and Dixon, 2002a,b). Because seismic control in the region is sparse and of poor quality, Yinni 1 was located with secondary objectives — to investigate underlying strata and the nature of a gravity anomaly within the Woodleigh impact structure. Another consideration for favouring this locality was that water for drilling is easily accessible from the network of pipelines on Woodleigh Station.

Yinni 1 was terminated within the Woodleigh Formation after it became difficult to maintain the stability of the hole due to caving of soft shale within this formation and the overlying Birdrong Sandstone. Because of excessive caving, the hole was not logged and the secondary objective to evaluate the source of the underlying gravity anomaly was not achieved.

This Record provides the basic data for Yinni 1, including the operations report (Appendix 1), core photographs (Appendix 2), a provisional well summary sheet (Appendix 3), and a provisional composite well log (Plate 1). Additional analyses, including petroleum and mineral geochemistry, and palynology, foraminifera, and nannofossil biostratigraphy, will be supplied in an interpretive well completion report at a future date. Detailed images of the core are available on the University of Western Australia's Department of Geology and Geophysics website (see biostratigraphy group).

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Figure 1. Location of petroleum and stratigraphic wells in the central Gascoyne Platform

Well history

General data

Permit:	Vacant
Location:	Latitude 26°03'22.8"S, Longitude 114°48'58.5"E (GDA94) Northing 7116250, Easting 281530 (MGA Zone 50; from Global Positioning System, GPS)
Derivation of name:	Yinni Tank on the Wooramel River floodplain, 24 km north of Yinni 1
Total depth (TD):	158.2 m (driller)
Date spudded:	28 May 2001
Reached TD:	1 June 2001
Logging:	Not logged
Date abandoned:	2 June 2001
Elevation:	131 m Australian Height Datum (AHD), estimated from Woodleigh 1:100 000 topographic map (1990)
Drill floor:	Ground level
Status:	Abandoned

Drilling data

Drilling contractor:	Mt Magnet Drilling, 33 Paramount Drive, Wangara, W.A. 6065
Rig:	Hydco SD 1000
Rig datum:	Ground level
Hole size:	0–18 m 140 mm with HW casing cemented into place 18 – 36.7 m 115 mm with HWT casing (retrieved) 36.7 – 92.8 m 90 mm with HQ casing (retrieved) 92.8 – 158.2 m 76 mm open hole (NQ)
Mud:	Mixture of KCl and polymer-based muds
Core recovery:	36.7 – 81.7 m (HQ) 63.5 mm diameter; recovered 43.57 m (85%)
Hole deviation:	Not measured

Logging

Wireline logs were not run due to excessive caving of soft shale within the Woodleigh Formation and the overlying Birdrong Sandstone.

Regional structural setting

Yinni 1 was drilled within the southwestern part of the Gascoyne Platform (Fig. 2) in the Southern Carnarvon

Basin, which contains a lower to middle Palaeozoic section covered by flat-lying Cretaceous and, locally, Lower Jurassic strata (Fig. 3). The Gascoyne Platform is a structurally high area between the Merlinleigh, Byro, and Coolcalalaya Sub-basins to the east, and the Bernier Platform and Edel Terrace to the west (Fig. 2; Hocking et al., 1987; Hocking et al., 1994; Iasky and Mory, 1999). The Gascoyne Platform contains a thin cover of mostly subhorizontal Cretaceous strata unconformably overlying up to 5000 m of faulted and folded Ordovician–Devonian strata (Iasky and Mory, 1999, fig. 4). The Wandagee and Ajana Ridges mark the raised eastern rim of the platform. The Merlinleigh, Byro, and Coolcalalaya Sub-basins were a major middle Carboniferous – Permian depocentre along the eastern margin of the basin. Yinni 1 was drilled on the eastern flank of the central uplift of the 120 km-diameter Woodleigh impact structure (Mory et al., 2000; Iasky et al., 2001), which is likely Late Devonian in age (Uysal et al., 2001). The well did not reach below the Jurassic strata and so does not contain any direct evidence of the impact. Dips in the Cretaceous section within Yinni 1 are typically less than 2°, consistent with seismic data in the region.

Stratigraphy

The southern Gascoyne Platform contains Ordovician–Devonian, Lower Jurassic, and Cretaceous units (Fig. 3). Yinni 1 was spudded in Quaternary sand below which the Winning Group overlies the Lower Jurassic Woodleigh Formation, within which drilling was terminated (Fig. 4).

Quaternary sediments

The uppermost section of Yinni 1 (0 – 38.7 m) comprises red to brown, very coarse to medium-grained loose sand and minor silt and clay.

Winning Group

All formations of the Winning Group (in descending order: Gearle Siltstone, Windalia Radiolarite, Muderong Shale, and Birdrong Sandstone) are present in Yinni 1, although the upper part of the Gearle Siltstone is missing, presumably due to erosion. These units are separated by minor breaks that are well documented within the region in Barrabiddy 1 and 1A (Mory and Yasin, 1999), Coburn 1 (Yasin and Mory, 1999a), Edagee 1 (Mory and Dixon, 2002a), and Booloogo 1 (Mory and Dixon, 2002b).

Gearle Siltstone

The Gearle Siltstone (38.7 – 52.3 m) consists of dark-grey to black, locally bioturbated claystone. Foraminifera from the base of the unit indicate an early Albian age and a mid-neritic (water depths of 50–100 m) depositional environment (Table 1). Although no palynomorphs were recovered from this unit, the Albian *C. denticulata* Zone is tentatively identified at the base of this unit in Woodleigh 2A, 30 km to the west (Mory et al., 2001, appendix 5).

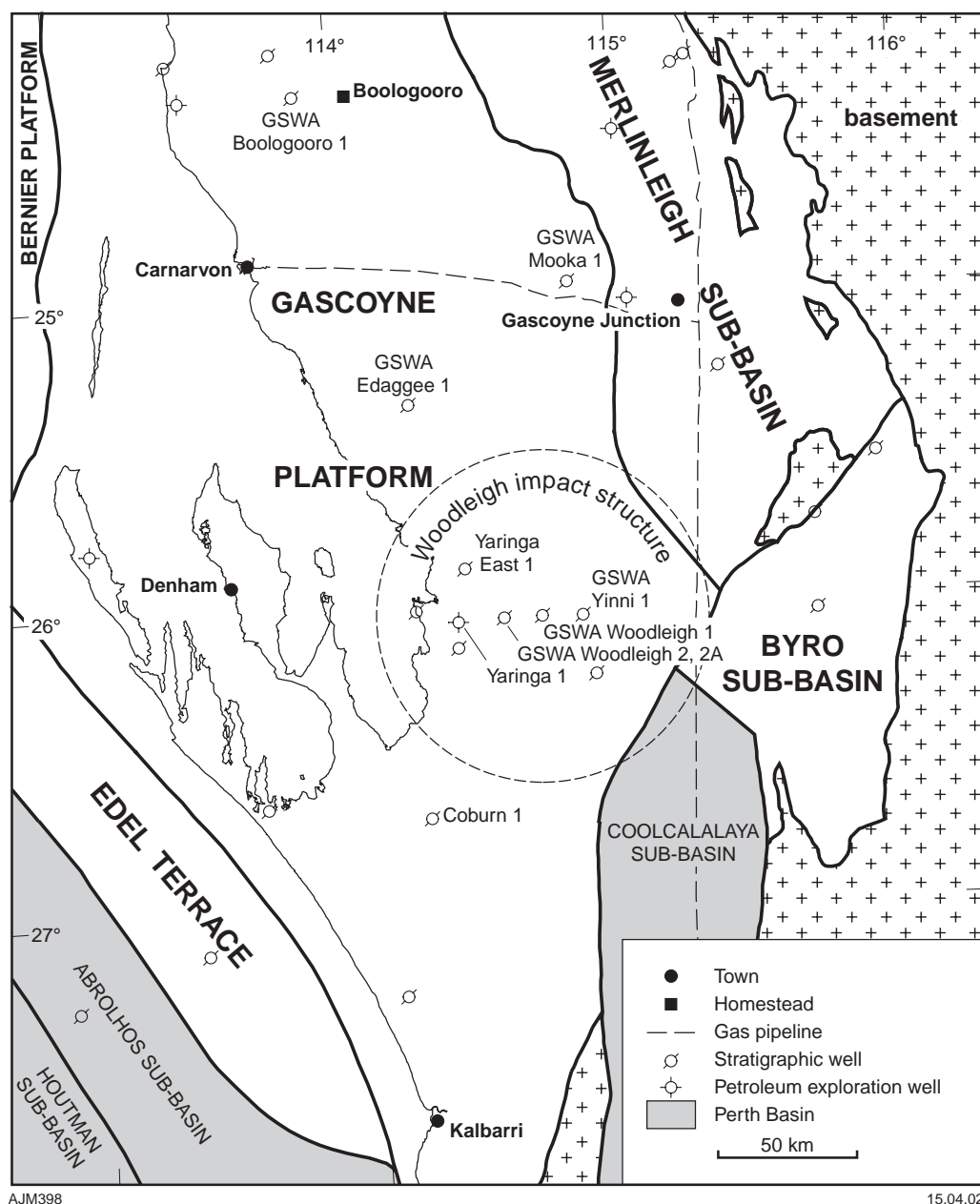


Figure 2. Tectonic elements of the southern Gascoyne Platform showing location of petroleum and stratigraphic wells

Windalia Radiolarite

The Windalia Radiolarite (52.3 – 74.2 m) is characterized by distinctly siliceous radiolarian-rich dark-grey to black siltstone. The late Aptian *D. davidii* Zone is present in samples from 57.05 and 62.2 m (Table 2). Other wells in the region that intersected the unit and in which this zone has been identified include Barrabiddy 1 and 1A (Mory and Yasin, 1999), Mooka 1 (Mory and Yasin, 1998), Yaringa East 1 (Yasin and Mory, 1999b), a water bore next to Woodleigh Homestead (Backhouse, 2000), and Edaggee 1 (Mory and Dixon, 2002a). Foraminifera similarly indicate a late Aptian age and deposition under inner to mid-neritic conditions (water depths of ~30–50 m; Table 1).

Muderong Shale

The Muderong Shale (74.2 – 81.7 m) consists of a light to medium-grey mudstone, with palynomorphs from the early Aptian *O. operculata* Zone. Foraminifera similarly indicate an early Aptian age as well as deposition in a low-energy, innermost neritic environment (just below the intertidal zone).

Birdrong Sandstone

The Birdrong Sandstone (81.7 – 145 m) can be divided into an upper sand-rich unit (81.7 – 101 m) and a lower finer grained and muddier unit (101 – 145 m). The

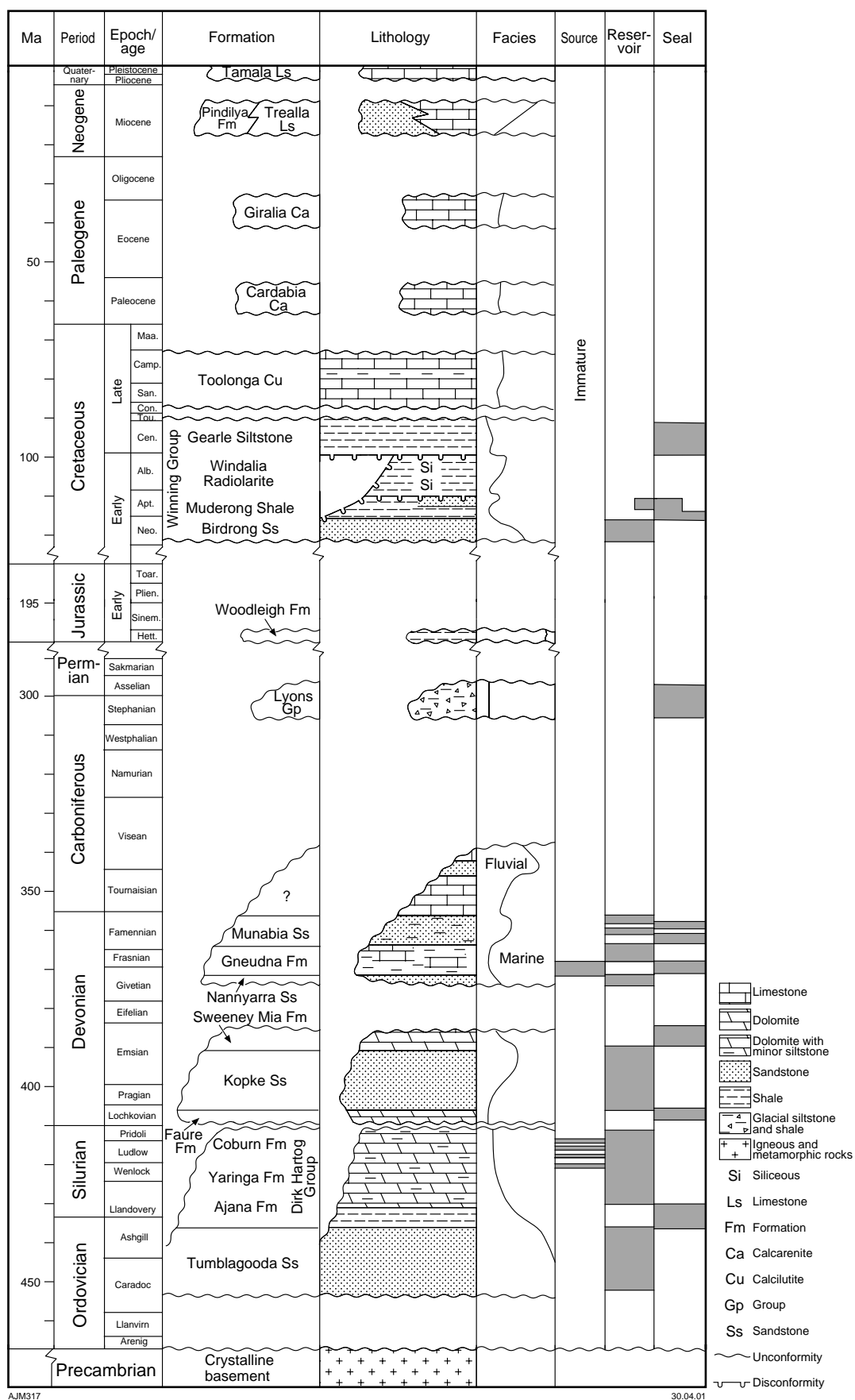
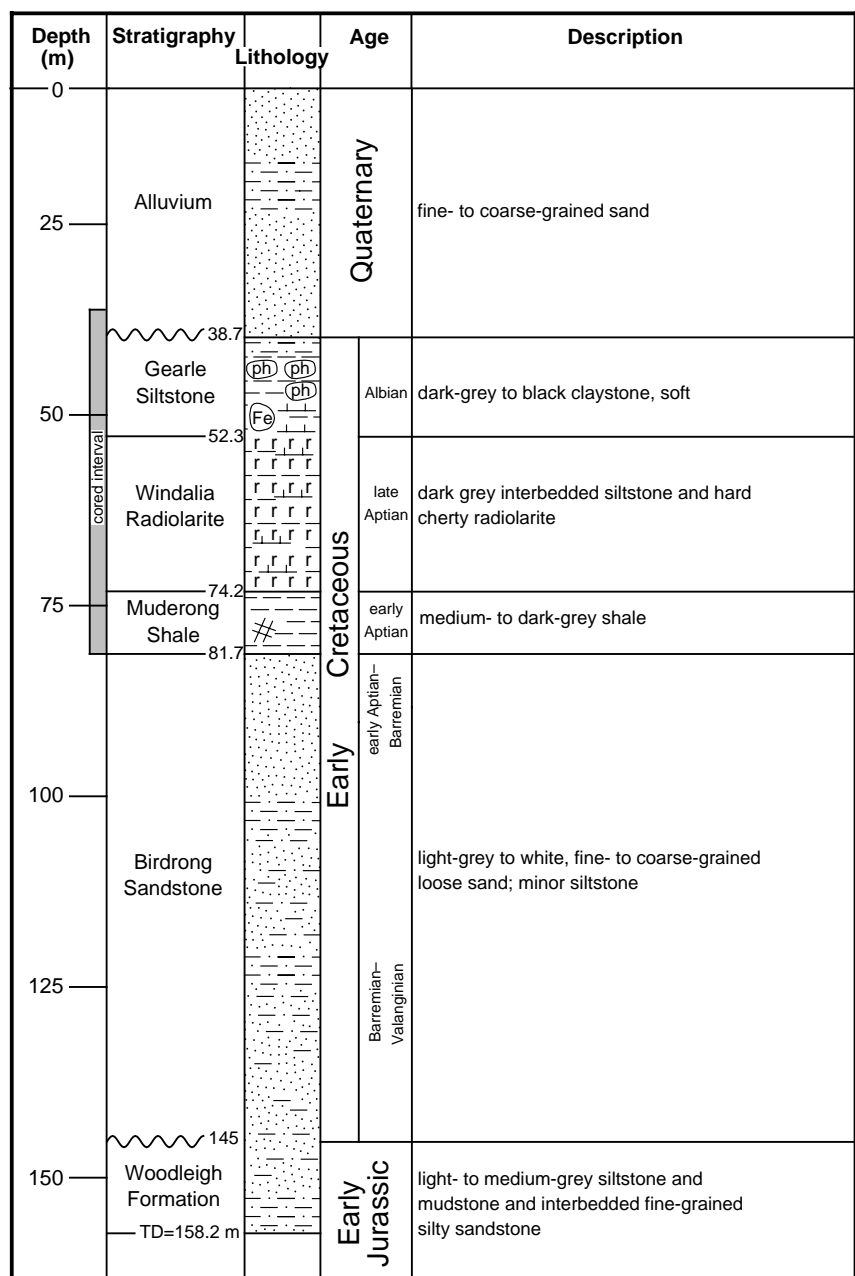


Figure 3. Regional stratigraphy of the Gascoyne Platform, Southern Carnarvon Basin



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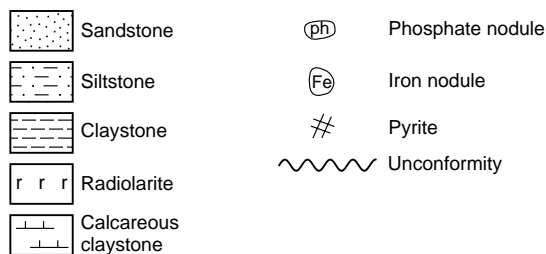


Figure 4. Yinni 1 stratigraphy

Table 1. Summary of foraminiferal and radiolarian ages (by D. W. Haig)

Depth range (m)	Sample type	Foraminiferal yield	Radiolarian yield	Age	Water depth (m)
39.05 – 50.85	core	moderate (49.35 – 50.85 m)	high	early Albian	mid- to outer neritic (~50–100 m)
53.25 – 73.1	core	high (50.25 – 54.65 m)	high (53.25 – 69.45 m) ^(a) low (71.35 – 73.1 m) ^(a)	late Aptian	inner to mid-neritic (~30–50 m)
75.1 – 81.85	core	low	low (75.1 – 76.1 m)	?early Aptian	innermost neritic (<30 m)

NOTE: (a) only friable intervals sampled

Table 2. Summary of spore–pollen and dinoflagellate zones (by J. Backhouse)

Depth (m)	Sample type	Organic yield (cc/g)	Microfossil yield	Preservation	Zone	Subzone	Age
50.65	core	0.050	barren	–	–	–	–
57.05	core	0.371	high	excellent	<i>D. davidii</i>	Middle	late Aptian
62.2	core	0.329	high	excellent	<i>D. davidii</i>	?Lower	late Aptian
72.2	core	0.335	high	excellent	<i>O. operculata</i>	?Upper	early Aptian
75.1	core	0.406	high	excellent	<i>O. operculata</i>	?Upper	early Aptian
79.25	core	0.310	high	excellent	<i>O. operculata</i>	Lower	early Aptian
81.85	core	0.279	high	excellent	<i>M. australis</i>	?Upper	early Aptian – Barremian
104–107	cuttings	0.067	high	excellent	<i>M. australis</i>	Middle	early Aptian – Barremian
125–128	cuttings	0.028	high	excellent	<i>B. limbata</i>	–	Barremian–Valanginian
140–143	cuttings	nd	high	excellent	<i>B. limbata</i>	–	Barremian–Valanginian
149–152	cuttings	nd	high	excellent	<i>C. turbatus</i>	–	Early Jurassic
158	cuttings	0.050	high	excellent	<i>C. turbatus</i>	–	Early Jurassic

NOTE: nd not determined

sand-rich unit comprises extremely friable, well-sorted, well-rounded, medium- to coarse-grained quartz sand that was not possible to core. It contains palynomorphs of the Aptian–Barremian *M. australis* Zone, whereas the lower unit contains undifferentiated Barremian–Valanginian *B. limbata* Zone (Table 2). A similar palynomorph assemblage was found in the water bore 2 km west of Woodleigh 1 (Backhouse, 2000) and in Woodleigh 2 (Mory et al., 2000). Most of the unit was deposited in a high-energy, nearshore marine environment, but the basal part (*B. limbata* Zone) is probably non-marine. Within other wells in the region such as Coburn 1, Mooka 1, and Yaringa East 1, the undifferentiated *B. limbata* Zone is not represented, implying a somewhat restricted distribution for this facies.

Woodleigh Formation

The Woodleigh Formation (145 – 158.2 m) comprises black carbonaceous claystone containing spores and pollen of the Early Jurassic *C. turbatus* Zone. The unit is differentiated from the overlying lower muddy facies of the Birdrong Sandstone entirely on the basis of the contained palynoflora.

Acknowledgements

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Appendix 1

Operations report

Introduction

GSWA Yinni 1 is a vertical stratigraphic well located on the Gascoyne Platform, Southern Carnarvon Basin, in an area of poor seismic control over a gravity anomaly within the Woodleigh impact structure. The well was drilled from 28 May to 1 June 2001 and lies about 78 km south-southeast of Carnarvon (6 km east of Woodleigh Homestead) at latitude 26°03'22.8"S, longitude 114°48'58.5"E (GDA94), and an elevation of about 131 m Australian Height Datum (AHD). The objective was to continuously core the Lower Cretaceous Winning Group and to investigate the nature of underlying strata.

Yinni 1 was drilled by Mt Magnet Drilling using a Hydco SD 1000 rig mounted on a 8 × 4 MAN diesel prime mover. The well was abandoned at 158.2 m on 2 June 2001 after the HQ casing was retrieved, and was not logged due to stability problems in the lower 50 m. A summary of the stratigraphy, casing used, and core cut is given on the well index sheet (Appendix 3).

Well history

Yinni 1 was spudded at 1530 hours on 28 May 2001 with a 140 mm PW blade-bit to 11.7 m. After the bit detached from the string and could not be retrieved in the soft ground, the rig was moved 2 m north and re-drilled with a PW roller bit to 18.0 m. PW casing was then set in concrete to this depth. Drilling continued with a HWT clore bit to 36.7 m after which HQ barrel was run in and HQ3 core was cut to the top of the Birdrong Sandstone at 81.7 m. After attempting to ream through the loose sand (hindered by excessive wear on the bit and caving of the sand) the hole was cased-off with HQ to 88.6 m. The hole was then deepened with a NQ clore bit in an attempt to find more indurated strata in which to recommence coring. During this drilling the HQ casing was advanced to 92.8 m.

Yinni 1 was terminated at 158.2 m on 1 June 2001 within the Woodleigh Formation at 1400 hours, due to difficulties in maintaining the stability of the hole and slow progress caused by caving of soft shales within this unit. The free casings were retrieved the following morning.

Operations

Water supply

Water was provided via polypipe connected to the station's pipeline at a point 3 km east of the Number 3 water bore and 1 km north of the drill site.

Drilling fluids

A mixture of KCl and various polymer muds were used for drilling Yinni 1, based on tests conducted prior to drilling by Baroid Industrial Drilling Products (2001) on cuttings from the Boollogooro water bore (provided by the Waters and Rivers Commission).

Drilling operations

The drilling operations were carried out in single 12-hour shifts commencing at about 0530 hours and finishing around 1730 hours. One driller and two offsidiers operated the rig. Yinni 1 was drilled by a combination of mud rotary (PW roller: 0 – 18.0 m; HWT clore: 18.0 – 36.7 m; NQ clore: 92.8 – TD), and HQ continuous wireline coring (36.7 – 87.9 m). Two plastic tanks were used for mixing mud in conjunction with two excavated mud pits for storing and recycling the mud returning from the hole. Drilling operations are outlined in chronological order in Figure 1.1 and Table 1.1.

Sample collection and handling

Cuttings samples were collected in a bucket over the intervals 0 – 36.7 m and 92.8 – 158.2 m from the returning mud at the wellhead, and amalgamated to make a 3 m composite sample. The samples collected during reaming between 87.9 and 92.8 m are mostly caved material from the top of the Birdrong Sandstone. Unwashed cuttings (up to 2 kg) were collected in cloth bags and dried.

Core cut over the interval 36.7 – 87.9 m was measured using a steel tape so that the percentage recovery could be calculated for each run (Table 1.2). A 1:100 graphic log was recorded at the well site and has been archived in Geological Survey of Western Australia (GSWA) statutory petroleum exploration report S20734 V1.

Casing

The casing strings used in Yinni 1 are shown in Table 1.3 and are depicted graphically in Figure 1.1, which also indicates the time and order in which they were installed. The casing below 18 m was only seated temporarily so that it could be removed at abandonment.

Orientation surveys

No orientation surveys were run.

Geophysical logging

No geophysical logging was undertaken.

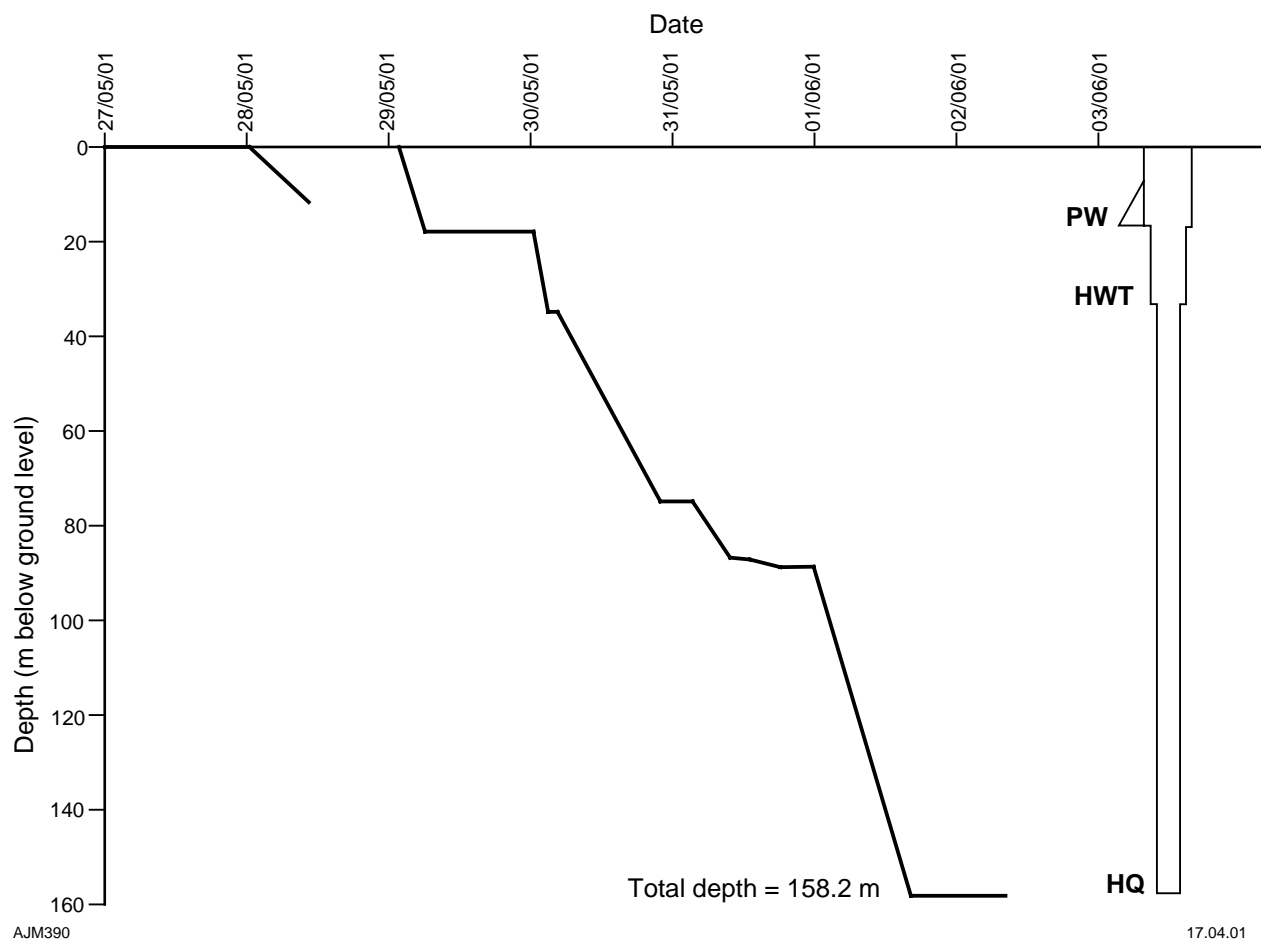


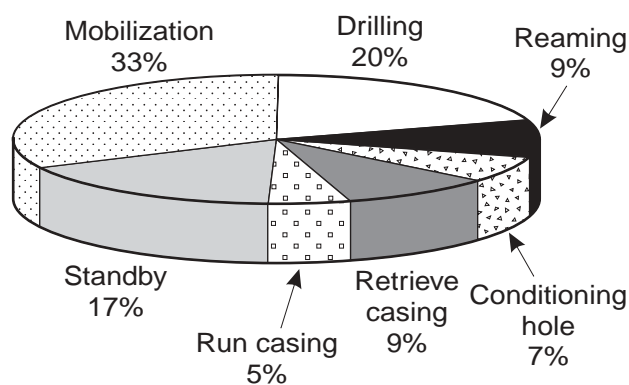
Figure 1.1. Time versus depth curve for Yinni 1

Table 1.1. Chronological summary of drilling operations

Date	Time (h)		Activity
	Start	Finish	
27 May 2001	1000	1230	Mobilize from Carnarvon to Woodleigh
	1230	1630	Set up
28 May 2001	0600	1100	Set up
	1100	1630	PW blade to 11.7 m
29 May 2001	1630	1730	Attempt to retrieve detached bit
	0600	0700	Move rig north 2 m and set up to re-spud
	0700	0900	PW roller to 18 m
	0900	1000	Pull rods and cement casing
30 May 2001	1000	1800	Standby
	0600	0730	PW clore from 18 to 36.7 m (last 1.7 m with no returns)
	0730	0800	Run HWT casing to 36 m and change bit
	0800	1730	HQ3 coring from 36.7 to 75.9 m (HWT casing parted from PW and slipped 20 cm during coring)
31 May 2001	0630	0730	Lift HWT casing up and reweld to PW casing, condition hole
	0730	1030	HQ3 coring from 75.9 to 81.7 m, ream through running sand to 87.9 m
	1030	1130	Remove HQ barrel to replace worn bit
	1130	1430	Mud rotary to 88.6 m; slow due to running sand
1 June 2001	1430	1900	Standby waiting for NQ clore bit
	0600	1400	Run NQ into hole and advance HQ over NQ, clore to 158.2 m; slow drilling due to running sand
2 June 2001	1400	1730	Pull NQ barrel and set up to remove HQ casing, commence packing up site
	0630	1000	Back-hammer HQ and HWT casing and remove
	1000	1300	Pack up site Demobilize to Perth

Table 1.2. Core recovery from Yinni 1

From (m)	To (m)	Metres drilled	Metres recovered	Recovery rate (%)	Remarks
36.7	37.1	0.4	0.36	90	
37.1	39.2	2.1	1.21	58	0.9 m core loss
39.2	39.7	0.5	0.54	110	
39.7	42.9	3.2	3.10	97	
42.9	45.8	2.9	2.77	96	
45.8	48.9	3.1	2.69	87	0.3 m core loss
48.9	50.7	1.8	1.84	102	brittle fractures
50.7	51.9	1.2	1.19	99	
51.9	54.9	3.0	2.96	99	
54.9	57.9	3.0	3.02	101	
57.9	60.5	2.3	2.55	111	
60.5	63.6	3.1	2.90	94	
63.6	66.7	3.1	3.15	102	
66.7	69.3	2.6	2.40	92	0.2 m core loss
69.3	71.6	2.3	2.30	100	
71.6	72.9	1.3	1.31	101	
72.9	75.9	3.0	2.26	75	
75.9	78.6	2.7	3.10	115	
78.6	81.7	3.1	3.10	100	
81.7	84.9	3.2	0.82	27	2.1 m core loss at base
84.9	87.9	3.0	0	0	no return
Totals		51.2	43.57	85	



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Figure 1.2. Breakdown of operation time for Yinni 1

Reference

BAROID INDUSTRIAL DRILLING PRODUCTS, 2001, Drilling fluids proposal for Mt Magnet Drilling, Carnarvon Basin: Western Australia Geological Survey, Statutory petroleum exploration report, S20734 V2 A1 (unpublished).

Operation time analysis

The relative duration of the operational activities for Yinni 1 is shown in Figure 1.2.

Well completion

Yinni 1 was abandoned on 2 June 2001 with all free casing and drill strings pulled out. A capped steel pipe on which the well name and the total depth are recorded was placed over the surface casing.

Table 1.3. Casing strings used in Yinni 1

Casing	Outer diameter (mm)	Inner diameter (mm)	Depth interval (m)
PW	139.7	127.0	0 – 18
HWT ^(a)	114.3	101.6	0 – 36.7
HQ ^(a)	88.9	77.8	0 – 92.8

NOTE: (a) retrieved during abandonment

Appendix 2

Core photographs

(see Core photo library on this disk)

Appendix 3

Preliminary well index sheet

ORGANIZATION: Geological Survey of Western Australia and University of Western Australia			Statutory Petroleum Exploration Report No.: S20734 V3		
WELL: GSWA Yinni 1			BASIN: Carnarvon Basin		
SPUDED: 28 May 2001			SUB-BASIN: Gascoyne Platform		
COMPLETED: 2 June 2001			ELEVATION (GL): 131 m AHD		
TD: 158.2 m			LATITUDE: 26°3'22.8"S; LONGITUDE: 114°48'58.5"E (GDA94)		
STATUS: Abandoned			NORTHING: 7116250; EASTING: 281530 (MGA Zone 50)		
FORMATION		TOPS (m)		LITHOLOGICAL SUMMARY	
		DRILL	SUBSEA		
Alluvium		Surface	+131	Red-brown, fine- to coarse-grained sand Dark-grey to black claystone, soft Dark-grey interbedded siltstone, hard cherty radiolarite Medium- to dark-grey shale Light-grey to white, fine- to coarse-grained loose sand; minor siltstone Light- to medium-grey siltstone and mudstone, interbedded fine-grained silty sandstone	
Gearle Siltstone		38.7	+93.2		
Windalia Radiolarite		52.3	+78.7		
Muderong Shale		74.2	+56.8		
Birdrong Sandstone		81.7	+49.3		
Woodleigh Formation		145	14		
CORE	Continuously cored; NQ: 36.7 – 87.9 m (85% recovery)				
LOGS	None				
CASING	PW	(OD 139.7 mm, ID 127.0 mm):	0 – 18 m		
	HWT ^(a)	(OD 114.3 mm, ID 101.6 mm):	0 – 36.7 m		
	HQ ^(a)	(OD 88.9 mm, ID 77.8 mm):	0 – 92.8 m		

NOTE: (a) removed before abandonment



Department of
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MINISTER FOR STATE DEVELOPMENT

JIM LIMERICK
DIRECTOR GENERAL



Geological Survey of
Western Australia

TIM GRIFFIN
DIRECTOR

GSWA Yinni 1

Composite Well Log

Company	Geological Survey of WA
Well Name	GSWA Yinni 1
Country	Australia
State	Western Australia
County or Rig name	Hydco SD 1000
Latitude	26 03 22.8 S
Longitude	114 48 58.5 E
Permanent Datum	MSL
Elevation of PD	.00 M
Elevation of DF	131.00 M
Elevation Log Zero	131.00 M
Log measured from	DF
Drill measured from	DF
Number of runs	0
Well class	Stratigraphic
Basin	Carnarvon Basin
Sub-Basin	Gascoyne Platform
Tenement/Concession	vacant
Geographic datum	GDA 94
On-Shore Flag	yes
Date spudded	28 May 2001
Date completed	2 June 2001

CROCKER

DATA PROCESSING

PETROLOG SOFTWARE Revision 8.00

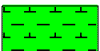
LITHOLOGIES



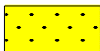
Mudstone



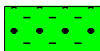
Siltstone



Calcareous mudstone



Sandstone



Sandy mudstone



Radiolarite

SYMBOL LEGEND



Erosional boundary



Planar laminations



Burrow networks



Belemnites



Ferruginous nodules



Phosphate nodules



Pyrite



Silica veinlets



Pyrite veinlets

