BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD 1986/18

BMR DRILLING IN THE SOUTHERN AMADEUS BASIN, CURTIN SPRINGS, NORTHERN TERRITORY, 1985

by

G. Jacobson & K.R. Warne*

*Consulting geologist, Box 1402, Alice Springs, N.T.

CONTENTS

SUMMARY

Seven continuously cored holes were drilled by the Bureau of Mineral Resources at Curtin Springs, Northern Territory, in May 1985 in order to investigate the lithology and hydrogeology of a calcrete deposit in the southern half of the Amadeus Basin. The maximum depth of the drillholes was 21 m, the maximum thickness of calcrete intersected was 11 m, and the holes bottomed in weathered Ordovician sandstone. Four of the drillholes were completed as piezometers for water-level and chemistry observations.

INTRODUCTION

The hydrogeology of the Amadeus Basin is being studied in a three year project (1984-7). In the southern half of the Basin, calcrete aquifers are important sources of groundwater. In fact they represent virtually the only source of low-salinity water in the region. Calcrete occurs in palaeodrainage systems and is a carbonate deposit precipitated from groundwater.

A drilling program was undertaken in the calcrete deposit at Curtin Springs, Northern Territory, in May 1985, with the following objectives:

1. To provide core for sedimentological analyses and radiocarbon dating, in order to elucidate the origin and evolution of the calcrete;

2. To complete the holes for water-level measurement and sampling, in order to provide information on the hydrodynamics and hydrochemistry of the aquifer.

Seven diamond drillholes were completed by the BMR Gemco rig in May-June 1985. Field numbers were DDH 1-7 inclusive but the drillholes were renumbered BMR Ayers Rock 3-9 inclusive. Locations are shown on Figure 1. Drillcore is stored at the BMR Core & Cuttings Laboratory, Fyshwick, ACT.

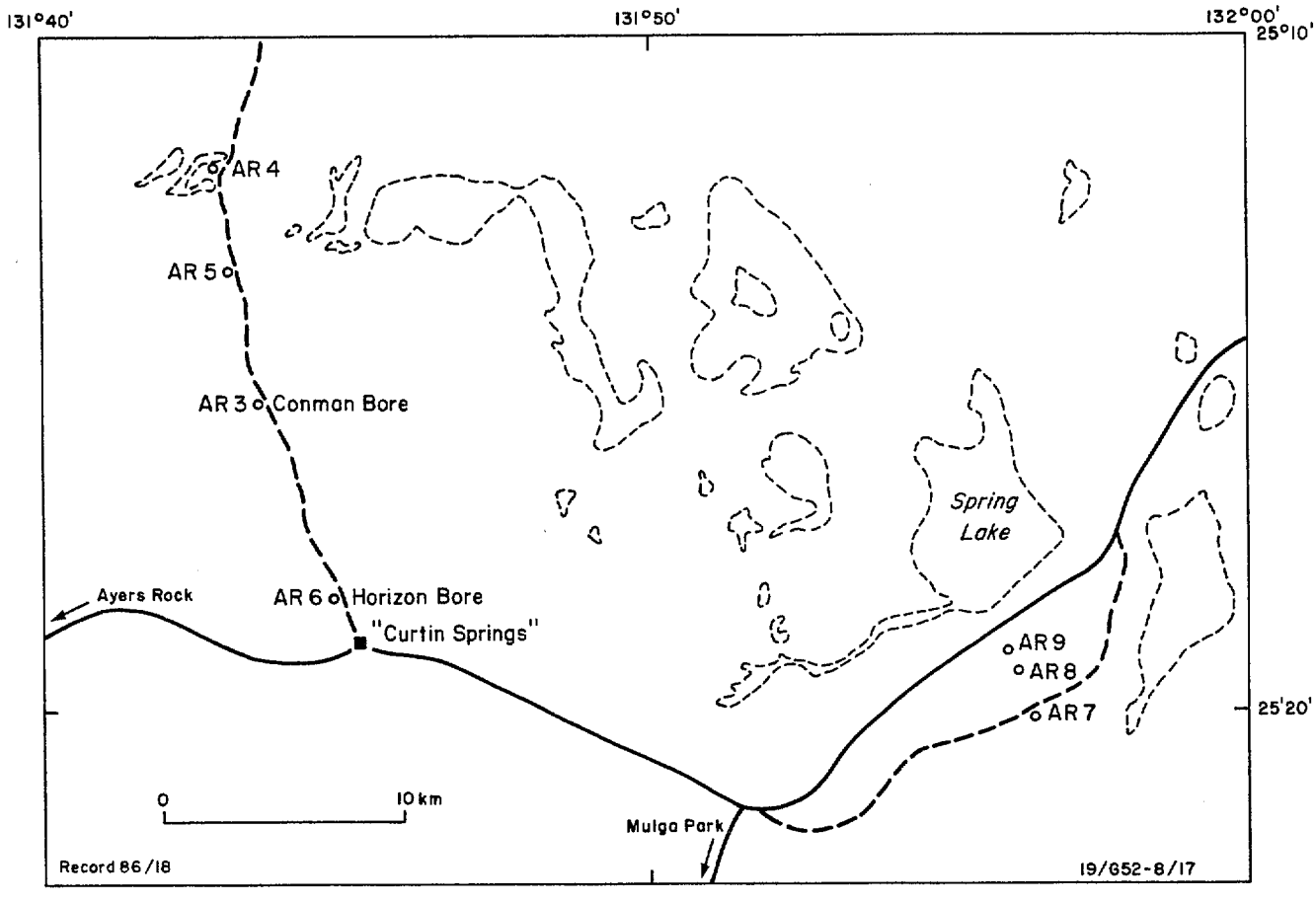


Fig.1. Location map

Concurrently, K. R. Warne carried out detailed geological mapping of the calcrete study area, and this is to be published as part of the Ayers Rock/Lake Amadeus hydrogeological map.

Previous BMR drilling in the Ayers Rock 1:250 000 sheet area has been documented by Bladon & Davies (1982). A mining company has investigated the calcrete at Curtin Springs as part of a uranium exploration program (Uranerz, 1983).

1985 DRILLING PROGRAM

Drillholes AR 3-6 inclusive were sited on a transect north from Curtin Springs homestead. Drillholes AR 3, 5, 6 intersected calcrete to depths of 10, 9 and 11 m respectively, bottoming in weathered sandstone of presumed Ordovician age. The water-table was at depths of 4-6 m in these holes. Drillhole 4, sited on an "island" in a chain of playas, intersected 2 m of gypcrete, overlying dune sand, and bottomed in weathered sandstone at 9.95 m.

Drillholes AR 7, 8, and 9 were sited on a transect south of the playa known as "Spring Lake" (Fig. 1). They intersected calcrete to depths of 9, 6 and 4 m respectively, and bottomed in weathered sandstone.

Drillholes 5, 7, 8 and 9 were completed as piezometers with 50 mm diameter slotted PVC casing. These four holes were subsequently sampled by the NT Water Resources Division, and chemical analyses of the groundwaters are given in Table 1. Drillholes 3 and 6

are on the sites of existing water bores, and chemical analyses of the groundwaters are in Table 1.

TABLE 1

Groundwater chemistry, BMR drillholes at Curtin Springs

	AR 3 (Conman Bore)	AR 5	AR 6 (Horizon Bore)	AR 7	AR 8	AR 9
TDS	1510	15600	1660	22800	53600	48000
Ca	95	480	80	560	710	735
Mg	50	450	40	900	2240	1620
Na	280	3850	370	5600	14300	13200
K	38	280	44	300	480	590
HCO_3	319	331	355	331	259	232
SO_4	200	2920	305	4800	12500	10200
Cl	394	6160	373	8980	21000	19300
NO_3	142	250	168	125	90	110
SiO_2	77	81	82	68	29	45
pH	7.5	7.5	7.5	7.5	7.4	7.6

7

The petrology and chemistry of samples from drillhole AR 3 are being investigated by A.V. Arakel of the Queensland Institute of Technology. Samples from this hole have been submitted for radiocarbon dating and for the determination of stable-isotope chemistry.

CONCLUSIONS

1. The extent and thickness of the calcrete deposit at Curtin Springs has been defined by this investigation. The drillcore obtained is now subject to petrological and chemical study, and dating, which should elucidate the origin and evolution of the calcrete.

2. The groundwater chemistry and flow pattern can be ascertained from the drillholes in conjunction with information from existing water-bores in the area. The calcrete forms a groundwater recharge and transmission zone, (Jacobson & Arakel, in press) and the freshest groundwater coincides with the thickest calcrete. This has implications for future water supply development in the area.

ACKNOWLEDGEMENTS

We thank Mr P. Severin, the owner, for access to Curtin Springs; Messrs G. Brandon and A. McDonald for drilling the holes; the NT Water Resources Division for sampling the bores; and AMDEL, Adelaide, for chemical analyses.

8

REFERENCES

BLADON, G.M. & DAVIES, P.M., 1982 - Ground magnetic survey and drilling (BMR Ayers Rock Nos 1 and 2) of a shallow magnetic-anomaly source in the southern Amadeus Basin, Northern Territory. Bureau of Mineral Resources, Australia - Record 1982/15.

JACOBSON, G. & ARAKEL, A.V., in press - Calcrete aquifers in the Australian arid zone. Proceedings of the International Conference on Groundwater Systems under Stress, Brisbane, 1986. Australian Water Resources Council - Conference Series.

URANERZ AUSTRALIA PTY LTD, 1983 - First and final report on exploration license 3468, Curtin Springs, Northern Territory, 1983. Open-file report in Northern Territory Department of Mines & Energy library.

APPENDIX 1

LOGS OF BMR DRILLHOLES

CURTIN SPRINGS, N.T.

MAY-JUNE, 1985

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE Curtin Springs, NT

1:100000 SHEET Curtin

SHEET NO 5247 GRID REFERENCE E 775000 N 7203120

R.N. ____

I.N. DDH 1

PROJECT CALCRETE INVESTIGATION

DOWNHOLE LOGGING

DRILLING METHOD Rotary coring diamond/tungsten

DATE HOLE COMMENCED 17.5.85

DATE HOLE COMPLETED 20.5.85

RL 490 m

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS	YIELD	S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
15 cm only recovered.					Friable sandy calcrete with 10% quartz sand grains in v. fine grained powdery matrix. Offwhite.	Drilled without water return. No mud used. Difficulty in coring friable material above the water table — only fragmentary core was recovered. Bore sited at known water bore 'Conman Bore' in calcrete.
1·00						
20 cm rec.					Nodular calcrete with nodules to 5 cm in sandy matrix.	
1·60						
15 cm rec.					Nodular calcrete — fine grained powdery matrix.	
2·00						
15 cm rec.					Nodular calcrete — fine grained powdery matrix.	
2·50						
2·65					Nodular calcrete — matrix sandy	
20 cm rec.					Nodular calcrete — 20% qtz sand grains in matrix.	
3·35						
30 cm rec.					Sandy calcrete — harder cemented. Powdery, clayey zone at 3.60 m. Offwhite.	
3·75						
30 cm rec.					Hard, sandy calcrete. Broken core.	
4·20						
10cm rec.					Hard sandy calcrete. Broken core.	
4·40						
45 cm rec.					Mainly fined grained recrystallised calcrete. Vugs with botryoidal calcite. Sandy patches.	
5·00						
25 cm rec.					Soft, more friable calcrete. Broken core. Sandy, powdery.	
5·40						
10 cm rec.					Friable, sandy calcrete.	
5·90						
90% rec.					Hard, dense, v. fine grained calcrete. Vugs with recrystallised calcite at the water table. Vugs are horizontally orientated. Greyish-white becoming white lower in section (below water table).	
			▽	S.W.L.		
6·80						
7·10					Hard, marble-like calcrete with soft friable zones	
30 cm rec.					Hard, dense, calcrete with irregular laminae and vugs	
7·50						
					Hard offwhite calcrete with mottled texture Irregular white patches in greyer matrix Inclusions of red crystalline dune sand Small vugs	
8·80						
					Hard massive calcrete, sandy texture. Vugs.	
9·20						
					Hard massive calcrete — mottled fine grained	
					Hard calcified sandstone. (50% qtz grains in calc. matrix)	

DRILLER G. Brandon, BMR

DRILL TYPE Gemco

LOGGED BY G. Jacobsen

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK 3

SHEET 1 OF 2

DRAWING NUMBER 19/GS2-8/1

Record 86/18

M(PI)281

11

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE

1:100000 SHEET _____

SHEET NO. _____ GRID REFERENCE _____

R.N _____

I.N _____

PROJECT _____

DOWNHOLE LOGGING

DRILLING METHOD

DATE HOLE COMMENCED _____

DATE HOLE COMPLETED _____

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS	YIELD	S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
					Hard calcified sandstone	
10·80					Calcite-veined sandstone. Horizontal veining about 50% of the rock	
11·80		A Q U I F E R			Med. gr. sandstone. Lt greyish-green.	
65cm core only						
14·80					No core	
16·00					Light greyish-green, slightly weathered, feldspathic sst	
140cm core					Reddish-brown, weathered, sandy mudstone	
17·90					END OF HOLE 17.90 m	

DRILLER _____

DRILL TYPE _____

LOGGED BY _____

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK 3

SHEET 2 OF 2

DRAWING NUMBER 19/GS2-B/2 12

Record 86/18

M(PF) 281

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE Curtin Springs, NT
1:100000 SHEET Curtin
SHEET NO 5247 GRID REFERENCE E 773500 N 7210000
R.N.
I.N. DDH 2
PROJECT CALCRETE INVESTIGATION

DOWNHOLE LOGGING
DRILLING METHOD Rotary coring, tungsten
DATE HOLE COMMENCED 21.5.85
DATE HOLE COMPLETED 21.5.85
RL 486 m

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS	YIELD	S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
70%	G				Gypcrete — firm, offwhite, porous	Drilled with no water return. No mud used. No core recovery in sand section. Bore sited on gypcrete 'island' in former playa which is now vegetated with halophytes.
1.00						
70%	G				Gypcrete — cemented sandstone — firm, friable, reddish	
					Gypcrete — firm, offwhite, porous	
2.00						
Nil recovery					Reddish brown quartz sand (dune sand). No core recovered. Sample of sludge only.	
5.00						
Nil					No core — presume sand.	
35 cm rec.	G				Layered gypcrete/red sandstone	
					Iron-stained sandstone fragments	
			▽	S.W.L.		
7.80						
~45 cm rec.		AQUIFER			Grey clay at top of fragmented core section — poss. weathered bedrock incl. one white qtz sst piece, then into weathered purple sandstone (bedrock).	
					END OF HOLE 9.95 m.	

DRILLER G. Brandon, BMR
DRILL TYPE Gemco
LOGGED BY G. Jacobson
Record 86/18

PROJECT AMADEUS BASIN HYDROGEOLOGY
BMR HOLE NUMBER AYERS ROCK 4
SHEET 1 OF 1
DRAWING NUMBER 19/GS2-8/3 13

M(PI)281

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE Curtin Springs, NT

1:100000 SHEET Curtin

SHEET NO. 5247 GRID REFERENCE E 773900 N 7208800

R.N. ____

I.N. DDH 3

PROJECT CALCRETE INVESTIGATION

DOWNHOLE LOGGING

DRILLING METHOD Rotary coring

DATE HOLE COMMENCED 21.5.85

DATE HOLE COMPLETED 24.5.85

RL 484 m

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS YIELD S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
15 cm rec.			Fragments of nodular, offwhite calcrete	Drilled without water return. No mud used. Hole collared in red dune sand with calcrete exposed at ~30 cm in road.
1.00				
15 cm rec.			Fragments of nodular calcrete – matrix material (sand?) ground away.	
2.00			Quartz sand (dune sand) – white	
			No core – prob. sand	
50 cm rec.			Calcrete – white/red/black mottled. Sandy texture (calcretised dune sand?) – siliceous in part. Manganese veins.	
3.85				
65 cm rec.			Calcrete – pinkish white mottled. Sandy texture with qtz grains. Lt green calcite veins and sandstone inclusions.	
4.80		S.W.L.		
25 cm rec.			Calcrete – offwhite; qtz sand grains in fine grained matrix.	
5.80				
30 cm rec.		AQUIFER	Calcrete – similar but fragmented core – prob. finer grained matrix.	
6.90				
5 cm rec.			A few fragments only of white powdery calcrete (aquifer? core washed out by water pressure)	
8.75				
10 cm rec.			Fragments of lt. brn sst with calcitic cement.	
9.95				

DRILLER G. Brandon, BMR

DRILL TYPE Gemco

LOGGED BY G. Jacobsen

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK 5

SHEET 1 OF 2

DRAWING NUMBER 19/CS2-8/4 14

Record 86/18

M(Pf)281

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE

1:100000 SHEET _____

SHEET NO _____ GRID REFERENCE _____

R.N _____

I.N. _____

PROJECT _____

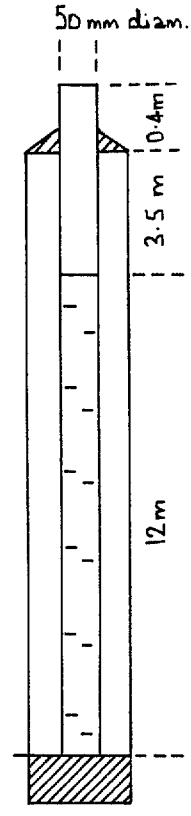
DOWNHOLE LOGGING

DRILLING METHOD

DATE HOLE COMMENCED _____

DATE HOLE COMPLETED _____

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS	YIELD	S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc*
10·00						
Nil rec.					No core recovered Red dune sand ? weathered sandstone	
11·80						
20 cm rec.					Weathered conglomerate – broken core Reddish brown sandstone pebbles in off white sandy matrix.	
13·50						
20 cm rec.					Fragments of weathered sandstone. Reddish brown.	
14·85						
30 cm rec.					Sandstone – white with black quartzose clasts to 2 cm. Broken core.	
15·50						
1.0 m rec.					Greyish-white fine gr. sandstone Red and grey mottled siliceous rock with brecciated texture.	
16·50					END OF HOLE 16·50 m	



Hole reamed to 15·5 m and 12 m.
Slotted casing installed.

DRILLER _____

DRILL TYPE _____

LOGGED BY _____

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK 5

SHEET 2 OF 2

DRAWING NUMBER 19/052-8/5 15

Record 86/18

M(Pt) 281

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE Curtin Springs, NT

1:100000 SHEET Curtin

SHEET NO 5247 GRID REFERENCE E776460 N7198900

R N

I.N. DDH 4

PROJECT CALCRETE INVESTIGATION

DOWNHOLE LOGGING

DRILLING METHOD

DATE HOLE COMMENCED 24.5.85

DATE HOLE COMPLETED 27.5.85

R.L. 490 m

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS	YIELD	S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc*
15 cm rec.					Fragments of light brown mottled calcrete	Drilled with water and no return; difficult to core friable material in top 3m (Vadose zone). Hole sited at existing water bore 'Horizon Bore' on calcrete outcrop with red dune sand adjacent.
1.00						
5 cm rec.					Fragments only — some white clayey calcrete — matrix material.	
1.60						
Nil rec.					Sand only recovered — mixture of white (presumably friable calcrete) and red dune sand.	
2.65						
5 cm rec.					Fragments of white calcrete.	
3.35						
100% rec.					Laminated white calcrete	Full core recovery
3.70					Laminated brown porous calcrete	
100% rec.					Brown & white mottled calcrete.	
4.10			Approx.			
100% rec.			S.W.L.		Hard, light brown calcrete with calcite clasts to 2 cm in sand matrix.	
4.70						
100% rec.					Calcrete — white to lt. brn., hard sandy texture	
5.00					" — calcite inclusions to 3 cm	
100% rec.					Calcrete — white, hard laminated in part. Vugs	
5.70						
100% rec.		Q			Calcrete — hard, offwhite — lt. brn. Vugs in top 20 cm then dense with brecciated texture — rounded lt. brn. sandy inclusions with white veining.	
6.90		U				
100% rec.		A			"	
7.20		T				
90 cm rec.		E			Laminated, lt. brn. calcrete — broken core	
		R				
		N			Lt. brn. calcrete — hard, dense with white calcite veins.	
8.75		A				
100% rec.					Calcrete — hard, dense. Pale tan calcrete with quartz sand grains (10%) and white calcite veins.	

DRILLER G. Brandon, BMR

DRILL TYPE Gemco

LOGGED BY G. Jacobson

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK 6

SHEET 1 OF 2

DRAWING NUMBER 19/G52-8/6

Record 86/18

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE

1:100000 SHEET _____

SHEET NO _____ GRID REFERENCE _____

R N _____

I.N. _____

PROJECT _____

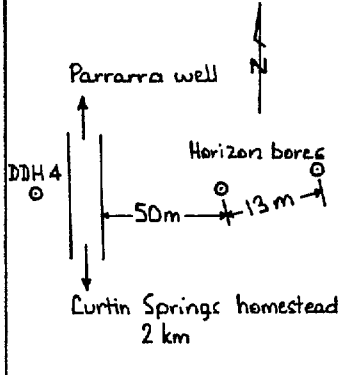
DOWNHOLE LOGGING

DRILLING METHOD

DATE HOLE COMMENCED _____

DATE HOLE COMPLETED _____

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS	YIELD	S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
					"	
10.55						
50 cm rec.					Light olive-green calcareous clay – friable core (weathered calcrete? or underlying clay?)	
11.80						
100% rec.					Clayey sandstone – lt. brn. to greenish. Porous, friable but intact core	
13.00						
100% rec.					Clayey sandstone (highly weathered sandstone) Lt. brn – lt. grn. Intact core – firm material.	
14.85						
100% rec.					Lt. brn – grn, highly weathered sandstone	
					Lt. olive-grn weathered calcareous sandstone	
16.00					END OF HOLE 16.00 m	



DRILLER _____

DRILL TYPE _____

LOGGED BY _____

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK 6

SHEET 2 OF 2

DRAWING NUMBER J2/G52-8/7

Record 86/18

M(PF)281

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE Curtin Springs, NT

1:100000 SHEET Curtin

SHEET NO 5247 GRID REFERENCE E 796 260 N 7 195 000

R.N. ----------

I.N. DDH 5

PROJECT CALCRETE INVESTIGATION

DOWNHOLE LOGGING

DRILLING METHOD

DATE HOLE COMMENCED 28.5.85

DATE HOLE COMPLETED 30.5.85

R.L. 476 m

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS	YIELD	S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
30 cm rec.					Fragments of calcrete – light brown, nodular	Hole collared in quarry with laminar tan-coloured calcrete at surface. Hole drilled with water & no circulation. Difficult to core friable material in top few metres.
0·70						
25 cm rec.					Nodular calcrete – lt. brn – offwhite, fragments	
1·70						
100%					Harder, offwhite calcrete – broken core	
2·20						
25 cm rec.					Dense, offwhite calcrete – 10% sand grains and greenish calcite in light tan matrix & vugs.	
2·65						
20 cm rec.					Fragments only " "	
3·15						
35 cm rec.					Offwhite calcrete – some broken core and friable, powdery, porous sections.	
3·85						
25 cm rec.					Light green porous calcrete	
5·00						
20 cm rec.					" "	
5·70						
45 cm rec.					" "	
6·90						
2 cm only					One piece only greyish-green calcrete.	
7·40			▽	S.W.L.		
					Small fragment only, grn-brn calcrete.	
8·30		AQUIFER			Chocolate-brown firm weathered siltstone with green joint coatings.	
8·70					" weathered siltstone – broken core.	
9·30					Reddish-brn weathered siltstone	
10·00						

DRILLER G. Brandon / A. MacDonald

DRILL TYPE Gemco

LOGGED BY G. Jacobson

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK 7

SHEET 1 OF 2

DRAWING NUMBER 19/G52-8/8

Record 86/18

M(Pf)281

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE

1:100000 SHEET _____

SHEET NO. _____ GRID REFERENCE _____

R.N. _____

I.N. _____

PROJECT _____

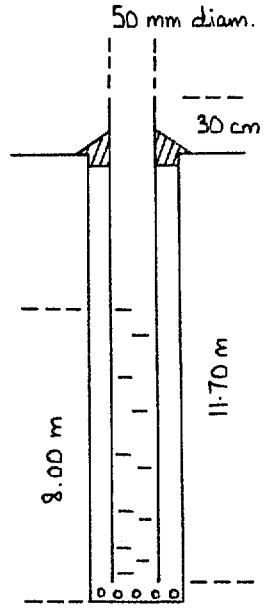
DOWNHOLE LOGGING

DRILLING METHOD

DATE HOLE COMMENCED _____

DATE HOLE COMPLETED _____

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS	YIELD	S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
10.00					Reddish-brown weathered siltstone — green joint fillings	Hole reamed to 12m and slotted casing inserted. Slots in bottom 8 m.
11.50					END OF HOLE 11.50 m	



DRILLER _____

DRILL TYPE _____

LOGGED BY _____

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK 7

SHEET 2 OF 2

DRAWING NUMBER 19/G52-8/9

Record 86/18

M(Pf)281

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE Curtin Springs, NT
1:100000 SHEET Curtin
SHEET NO 5247 GRID REFERENCE E 795 700 N 7 195 200
R.N. ____
I.N. DDH 6
PROJECT CALCRETE INVESTIGATION

DOWNHOLE LOGGING
DRILLING METHOD Diamond
DATE HOLE COMMENCED 4.6.85
DATE HOLE COMPLETED 7.6.85
R.L. 475 m

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS YIELD S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
		Qs/Qa	Pale brown, ferruginous stained fine-grained quartz sand with light brown – buff limey clays.	
No core rec.		Qc	Calcrete – weathered, & recemented 'carapace' hardcap. White-pale yellow and pale pink – weathering to soft powdery white lime-rich clays and rock in fractures, pink calcrete also in fractures tends to be hard; minor banding. Overall texture is sandy, gritty with 25-35% f.gr quartz sand.	Calcrete formation is weathered & recemented with limey clay forming hard flat carapace capping & also leaving soft sandy chalky lime infillings in fractures. Also hard dense pink calcrete in fracture areas.
2.00		Qc	Calcrete – white to pale f.gr. sandy texture possibly some relect f.gr. dune sand. Some brown to pale pink hard massive areas surrounded by chalky f.gr. recrystallised calcrete.	Have brown-pink massive concretionary calcrete areas surrounded by white chalky f.gr. recrystallised calcrete.
2.50		Qc	Calcrete – white hard massive, broken (fractured) – containing rounded pink calcrete fragments – irregularly dispersed.	Faint MnO_2 stainings in pink calcrete; limey clays in fract. rock.
2.65		Qc	Calcrete – white weathered porous 'powdery': degrading from a massive recemented f.gr. sandy calcrete to one containing rectangular 'blocky' white calcrete fragments rimmed with f.gr. pink sandy calcrete.	Reconstituted calcrete 'breccia' – conglomerate influenced by further solution depositional effects with influx of incr. groundwater.
0.20 / 0.35				
3.00		Qc	Calcrete – hard, tough, massive, white with vugs & pits infilled with secondary lime carbonates & clays, some brown ferruginous oxide staining. Minor spotted MnO_2 staining.	
0.24 / 0.85				
3.85		Qc	Calcrete – white – pale buff, weathered, with scattered pittings & vugs throughout with pale grey 'chunks' & fragments of massive calcrete welded into the white calcrete groundmass. Relict red-stained rounded quartz-grains scattered thru' out. Pale green clay mineral & white limey clays in fracture surfaces & vugs. A little scattered MnO_2 staining.	
0.26 / 1.00				
4.85		Ts	Clay → claystone	

DRILLER G. Brandon
DRILL TYPE Gemco 310
LOGGED BY K.R. Warne

PROJECT AMADEUS BASIN HYDROGEOLOGY
BMR HOLE NUMBER AYERS ROCK 8
SHEET 1 OF 5
DRAWING NUMBER 19/GS2-8/10

Record 86/18
M(Pf) 281

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE

1:100000 SHEET _____

SHEET NO. _____ GRID REFERENCE _____

R.N _____

I.N _____

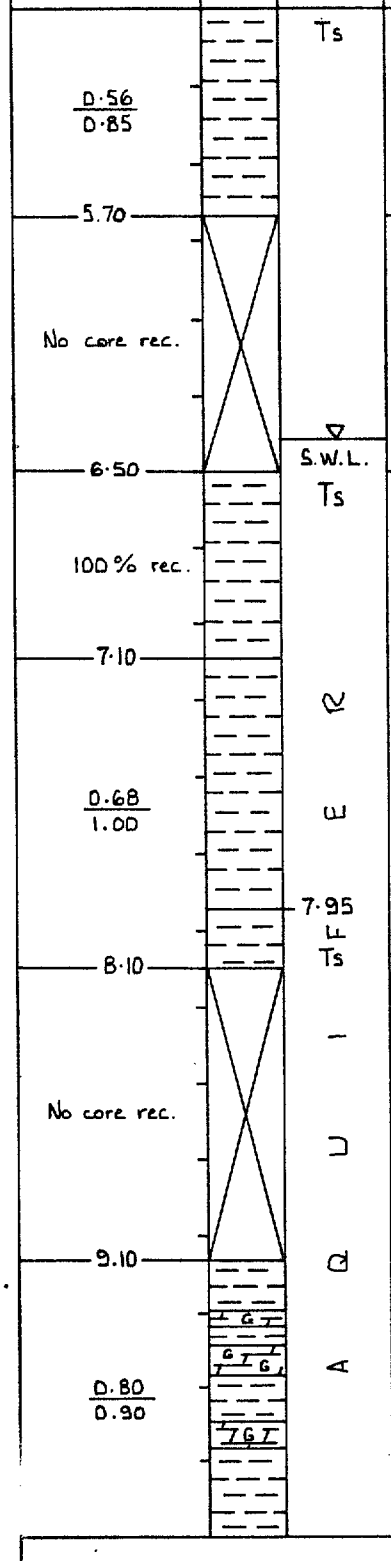
PROJECT _____

DOWNHOLE LOGGING

DRILLING METHOD

DATE HOLE COMMENCED _____

DATE HOLE COMPLETED _____



DEPTH (m) LIFT AND CORE RECOVERY	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc*
0·56 / 0·85	Clay – pale green to white soft plastic kaolinitic clay. 'Fracture' 90° to drill axis suggesting relict bedding at 0° (flat).	
5.70 — No core rec.		Drill water/mud return is of pale white-green sandy clay; minor brown clays.
6·50 — S.W.L.		
100% rec.	Pale green soft plastic kaolinitic sandy clay (claystone) with minor brown staining. Fracture 90° to drill axis. Relict bedding 90° to drill axis.	
7·10 — 0·68 / 1.00		
7·95	Silt tending to siltstone. Pale to dark brown soft silt – sandy silt fairly plastic but with some sandy patches. (Mainly a siltstone tending to mudstone with minor sandy patches).	
8·10 — No core rec.		Drill water return is pale – dark brown sandy silt – minor clays.
9.10 — 0·80 / 0·90	White transparent gypsum (selenite) bands between.	

DRILLER _____

DRILL TYPE _____

LOGGED BY _____

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK B

SHEET 2 OF 5

DRAWING NUMBER 19/G52-8/11

Record 86/18

M(PI) 281

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE

1:100000 SHEET _____

SHEET NO _____ GRID REFERENCE _____

R.N _____

I.N _____

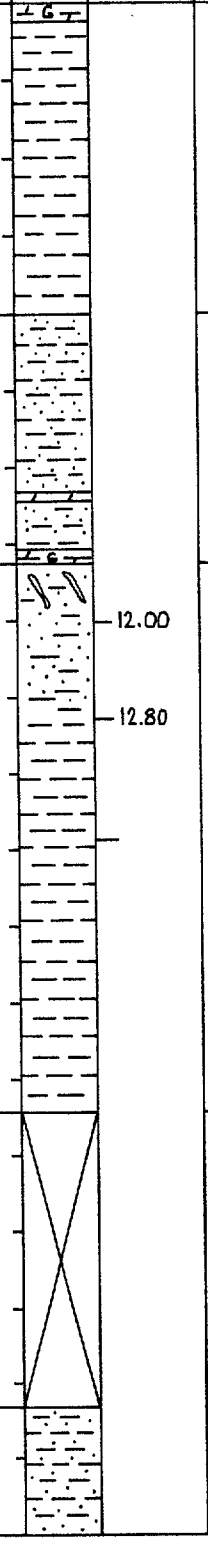
PROJECT _____

DOWNHOLE LOGGING

DRILLING METHOD

DATE HOLE COMMENCED _____

DATE HOLE COMPLETED _____



DEPTH (m) LIFT AND CORE RECOVERY	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
0.75 / 1.00	Clear white transparent gypsum (selanite). 85° to drill axis.	
0.75 / 0.80	Sandstone tending to silty sandstone. Brown, silty. Relict bedding 90° to drill axis.	
1.64 / 1.80	Silty sandstone, brown, fine-grained rounded quartz grains, silty/clay matrix. Bedding 90° to drill axis.	
	Mudstone - Clays. Soft, brown Relict bedding 90° to drill axis (flat bedding)	
No core rec.		
	Sandy siltstone. Brown, soft Relict bedding 90° to drill axis.	

DRILLER _____

DRILL TYPE _____

LOGGED BY _____

Record 86/18

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK B

SHEET 3 OF 5

DRAWING NUMBER 19/G52-8/12

M(Pt) 281

22

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE

1:100000 SHEET _____

SHEET NO. _____ GRID REFERENCE _____

R.N _____

I.N. _____

PROJECT _____

DOWNHOLE LOGGING

DRILLING METHOD

DATE HOLE COMMENCED _____

DATE HOLE COMPLETED _____

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS	YIELD	S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
1.34 / 1.40					Sandstone — brown, fine-grained, finely bedded Intermittent silty banding. Bedding 90° to drill axis.	
				15.60	Kaolinitic claystone after feldspathic sandstone. Pale yellow-green to white, sandy. Light brown spotted limonitic staining throughout, relict sandy texture. Rock represents a heavily leached environment. Intense red/brown spotted ferruginous staining between 16.00 – 16.65 m. Relict bedding/banding obliterated.	
16.00						
1.06 / 1.70						
17.70					Kaolinitic claystone — after heavily leached & altered feldspathic sandstone. Pale green-white kaolin clay, pitted vuggy texture. Intense purplish-red/brown ferruginous staining thru'out.	
0.28 / 1.40						
19.10						
0.45 / 1.60						

DRILLER _____

DRILL TYPE _____

LOGGED BY _____

Record 86/18

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK 8

SHEET 4 OF 5

DRAWING NUMBER 19/G52-8/13

M(Pf) 281

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE

1:100000 SHEET _____

SHEET NO. _____ GRID REFERENCE _____

R.N _____

I.N _____

PROJECT _____

DOWNHOLE LOGGING

DRILLING METHOD

DATE HOLE COMMENCED _____

DATE HOLE COMPLETED _____

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS	YIELD	S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc*
20.70						
D.22 / D.60					Kaolinitic claystone & mottled pale green/white kaolin clay mottled with red/brown ferruginous staining.	
21.30					END OF HOLE 21.30 m.	Slotted casing to 20 m.

DRILLER _____

DRILL TYPE _____

LOGGED BY _____

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS Rock 8

SHEET 5 OF 5

DRAWING NUMBER 19/G52-8/14

Record 86/18

M(Pt) 281

24

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE Curtin Springs, NT

1:100000 SHEET Curtin

SHEET NO 5247 GRID REFERENCE E 795 300 N 7196 900

R.N. ____

I.N. DDH 7

PROJECT CALCRETE INVESTIGATION

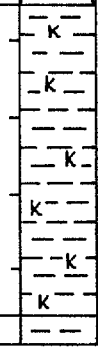
DOWNHOLE LOGGING

DRILLING METHOD Diamond

DATE HOLE COMMENCED 8.6.85

DATE HOLE COMPLETED 11.6.85

R.L. 474 m

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS / YIELD / S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
0.10 / 0.60			White to pale grey dense massive calcrete containing fragments of pale grey calcrete; fine sandy texture. Pale pink silty chalky calcrete cementing in fractures	Outcropping broken, fractured grey massive calcrete with pitted (karst type) weathering with light brown sandy lime soil.
0.60				Slotted casing to 8.8 m
0.15 / 0.40			Calcrete — massive white/pale grey calcrete 'agglomerate' containing fragments of recemented 'earlier' calcrete. Minor vugs & pittings with brown iron oxide.	
1.00				
0.15 / 0.80			Calcrete — buff white – pale grey massive. tight with small minor vugs showing weathering by solution effects. Pink massive secondary chalky calcrete (limestone).	
1.80				
0.20 / 0.85			Calcrete — pale earthy brown tending to white/grey, massive, 'agglomerate'. Solution effects shown by vugs. Secondary pink silty calcrete in top section of core.	
2.65				
0.01 / 0.30			Calcrete — broken, earthy brown, massive, tight recemented with pink-white tough secondary calcrete.	
2.95				
No core rec.			? Calcrete — grey, massive, minor vugs containing chalky lime clays.	
3.85				
0.16 / 1.05		▽ S.W.L.	Clay – claystone — pale green to brown, 'sandy'. Deeply weathered & leached kaolinitic feldspathic sandstone altered to kaolinitic clay. Relict texture obliterated.	
4.90				

DRILLER G. Brandon

DRILL TYPE Gemco 310

LOGGED BY K.R. Warne

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK 9

SHEET 1 OF 2

DRAWING NUMBER 19/G52-8/15

Record 86/18

M(Pf) 281

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF BORE HOLE

LOCATION OF BORE

1:100000 SHEET _____

SHEET NO. _____ GRID REFERENCE _____

R.N. _____

I.N. _____

PROJECT _____

DOWNHOLE LOGGING

DRILLING METHOD

DATE HOLE COMMENCED _____

DATE HOLE COMPLETED _____

DEPTH (m) LIFT AND CORE RECOVERY	GRAPHIC LOG	AQUIFERS	YIELD	S.W.L.	SUBSTANCE DESCRIPTION *Type of material: grain characteristics, colour, structure, minor components*	ADDITIONAL INFORMATION *Drilling rate, water loss, mud circulation, drilling problems etc.*
0.35 / 0.50					Mudstone — soft, brown silty	
5.40						
No core rec.						
5.70		A Q U I F E R			Sandstone — brown silty fine grained, finely bedded Bedding 90° to drill axis	
0.48 / 1.60						
					Siltstone tending to mudstone. Soft, moist, brown, plastic Minor MnO_2 staining.	
7.30						
7.45					Mudstone — soft, pale green/white kaolinitic, sandy.	
0.72 / 1.50	K					Pale brown sandy silt in drilling sludge.
8.80						
No core rec.						
9.90					END OF HOLE 9.90 m	

DRILLER _____

DRILL TYPE _____

LOGGED BY _____

Record 86/18

PROJECT AMADEUS BASIN HYDROGEOLOGY

BMR HOLE NUMBER AYERS ROCK 9

SHEET 2 OF 2

DRAWING NUMBER 19/G52-8/16

M(Pf) 281